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—THE—

CANADIAN ARCHITECT AND BUILDER,

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

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

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Improvement of the Architect and Builder.

FROM this time forward each number of the CANADIAN ARCHITECT AND BUILDER will include 36 pages of letter press instead of 28 as heretofore, in addition to the usual illustrations. The added space at our disposal will be especially devoted to information of a practical character designed to interest and prove helpful to contractors in all departments of building work. This information will be found in this and succeeding numbers under the title of "The Builder." It is hoped that this increase in size and scope will be appreciated by our readers, and lead to an increase in our already large list of subscribers.

Building Conditions.

THERE is a fair amount of activity in building enterprise throughout the Dominion, the volume of which will probably equal that of last season. On the whole, however, the work is of a less important character than last year, and the expenditure proportionately less. Toronto architects and builders have good cause to complain of the lifeless conditions prevailing in that city the present year. The number and value of buildings for which permits have been granted is greatly below the record of last year. This is in a large measure due to the fact that with one exception there have been no fires of any consequence involving the destruction of buildings. While rightly enough every precaution is taken to prevent the danger to life and property from fire, we are sometimes led to wonder what would become of architects and builders if the destroying element were put entirely under control. The amount of their occupation would be so greatly reduced that many would be forced into other callings.

What Constitutes a Party Wall?

CANADIAN architects and builders should be interested in a point of law relating to the definition of a party wall, which came up for argument in the English courts recently. A firm of store-keepers were summoned to appear in court on the charge of having violated the London building law by piercing openings in a party wall. The section of the law bearing on the case reads as follows: "Every party wall shall be carried up of a thickness in a building in the warehouse class, equal to the thickness of such wall in the topmost story above the roof-flat or gutter of the highest building adjoining thereto to such a height as will give a distance of at

least three feet measured at right angles to the slope of the roof. The wall in question divided one portion of the defendant's warehouse, one-story in height, from another portion, five stories in height. The defendants contended that only the portion of the wall to the height of the one-story part of the warehouse could properly be classed as a party wall, and that above this height it should be classed as an exterior wall. The court sustained the defendants in this contention.

Queen's Park Improvement.

THE work of improving that part of Queen's Park in front of the Toronto Legislative Buildings will very soon be completed. The large stretch of sloping and finely graded lawn, with its statues, walks, trees and flowerbeds, produces a very agreeable effect. The driveway in the Avenue from Queen Street north and around the west side of the park has been entirely reconstructed since last season. This is one of Toronto's beauty spots, and it is gratifying to see it being put in a condition somewhat becoming its importance and possibilities.

The Recent Labour Troubles.

JUST as our May issue had left the press a settlement was reached between the Toronto Builders' Exchange and the builders' laborers with respect to the wage question. The latter have agreed to accept the same rate as was paid during the season of 1895, viz., 18 cents per hour, an agreement having been signed to that effect covering a period of two years from the first of May last. This step removes the possibility of any further dispute between the master builders and employees during the present season, agreements having now been signed with all the trades. This is a cause of congratulation, for while it was imperative upon the laborers to accept the offer made by the master builders, the wisdom of so doing becomes more apparent as the season advances and few new buildings are shown to be in contemplation.

School Sanitation.

WE are pleased to learn that the Toronto Public School Board has taken a very important step this season towards bringing all the school premises under their control up to a proper sanitary standard. There are still quite a number of the schools where the closets are the old-fashioned brick pit in open sheds. While they are provided with sewer outlet and kept in as good condition as possible, they are in some respects positively unsanitary. At one of the large schools these outside closets will be removed, and complete new modern water-closets will be provided in the basement of the main building, with the best plumbing work and thorough ventilation. This is the first time that such a change has been made by the Board except in case of rebuilding or enlargement of a school, and will undoubtedly be followed by the same kind of improvement at other schools as rapidly as funds for the purpose can be obtained.

What Should be Taught in our Public Schools?

WE have occasionally heard the opinion expressed that our system of public education is too liberal, in that it goes beyond instruction in the three R's. Strange to say, this opinion is sometimes heard from well-educated persons. This is on a par with the opposition of representatives of labor organizations to manual training in the public schools. Both ideas are wrong. Train the mind and train the hand of the young as liberally as can be afforded. True education need not be feared by anyone, but will prove an advantage to all. Such critics as those referred to would shut out from a public system of education such studies as drawing and hygiene. But a careful grounding of pupils in these studies develops a taste for art and an interest in sanitation, which is of positive advantage to architects and builders, as well as the public, in that it stimulates the demand for artistic and healthful buildings.

Value of Improved Fire Protective Appliances.

THE fire which destroyed one of the large departmental stores in Toronto on the evening of the 9th inst., furnished several good lessons to persons interested in city property and business. The building and stock were of a very inflammable character, and were burning fiercely before attacked by the firemen. Had it not been for the improved fire apparatus supplied to the department last year, especially the water-tower and the steam engines, the loss would have been far greater. The outlay for new apparatus was clearly saved many times over in this instance alone. Notwithstanding, had there been a fair to strong breeze the danger would have been greatly increased. Three things are indispensable to prevent the ruinous spread of such fires—first, buildings constructed as nearly fire-proof as possible, consistent with their location and purpose; secondly, the best appliances for extinguishing fires; and thirdly, competent men in a well organized fire department. The first of the above mentioned requirements is first also in importance.

Safe Construction.

THE bridge failure at Victoria, B. C., on the Queen's Birthday, involving the sudden destruction of nearly one hundred lives, is a startling reminder of the necessity of proper design and construction not only of bridges but also of buildings, upon the safety of which human life depends. Especially does it emphasize the danger of putting a structure to a different use from that which it was designed to serve. The bridge at Victoria was originally constructed for vehicular and foot traffic only, but was afterwards subjected to the enormously increased strain imposed by overcrowded street cars, with what result is now sadly apparent. Since the disaster the statement has been made that the safety of the bridge had previously been called in question. Presuming this to be the case, the warning, as too frequently happens, was disregarded. Now that a large number of precious lives have been lost, and sorrow carried to hearts in every part of the Dominion, a rigid inspection of the bridges throughout the province has been undertaken. This bears the appearance of locking the stable door after the horse has been stolen, yet it is to be commended, in view of the possible prevention of like disasters, and we trust will lead to similar action being taken by the governing authorities of the other provinces. Investigation would be certain to reveal the existence of many unsafe structures of an engineering and architectural character. Periodical inspection of traffic bridges and buildings by officials of either municipal or provincial authorities, seems to be necessary for the public safety. Of even greater importance than this, however, is the need of legislation such as the Ontario Association of Architects have sought to obtain,

restricting the use of the titles "Architect" and "Engineer" to persons who shall have given proof of qualification for the work.

DEFECTIVE ELECTRIC WIRING.

To the Editor of the CANADIAN ARCHITECT AND BUILDER.

SIR,—As perhaps no part of house fitting has made such rapid headway and none is known less about by the average citizen than electrical wiring, will you kindly permit me to use your columns in giving a few hints in this direction which will be of service to the public.

Let us suppose Mr. Citizen decides to erect a house, electrically equipped for bells and light. He naturally knows little or nothing about the matter, but hands it over to the architect, who in nine cases out of ten knows less, but contents himself with inserting a few stereotyped phrases in the specifications, which he has learned parrot fashion, and as like as not, to save himself a little trouble, includes it in the plumber's tender, (although why, now that the electrical trade is recognized as a distinct business, he does not just as reasonably include it in the plasterer's tender, can only be explained by the parrot theory). The contract is adjudged to the lowest tenderer, whether it be John Jones, who carries his office in his hat, and is here to-day and there to-morrow, or the None-Such Electrical Company of recognized ability and honesty—taxpayers, with an established place of business where they can always be found.

Does Mr. Citizen happen to be skeptical about Mr. Architect's knowledge, he is at once met by the latter triumphantly pointing to the clause that the wiring is "subject to Underwriters' rules" (parrot again). But Mr. Citizen has been posting himself and knows that the Underwriters have never been known to pay any attention to whether their rules were adhered to or not, and that so far as the insurance companies are concerned, this clause might as well read "subject to the rule of thumb." Again Mr. Architect is ready, and inserts another (parrot) clause, that a certificate of inspection will be demanded from the successful tenderer, said certificate to be paid for by the latter (not by insurance company), and the citizen feels that now indeed he has taken every precaution. Vain hope; false security! The initiated know that this certificate reads that "the work has been inspected and found free from grounds and short circuits, at time inspection was made," which is usually before plastering, the most fruitful season for both these evils, and does not cover grounds in wiring of fixtures not then put up. The job is finished, the contractor is paid and the citizen is left—to discover that he has either to do without his light or employ some on to put it in shape, whose account, added to the "lowest bidder's," makes the cost for this patched-up job more than if he had given it to the highest tenderer at first, and he does the inspector a grave injustice by including him in the blame which rightly should be saddled upon himself for sacrificing everything to price, and to the architect, for not advising him otherwise.

This condition of things can only be remedied by adopting the United States plan of putting safety before cost, and by either the city or insurance companies making certain rules compulsory, and seeing them enforced. As it is, an inspection certificate is optional, and is not a complete safeguard if received. A specification may call for rubber-covered wire, and the house be wired throughout under plaster, with cheap weather-proofing which only a man in the electrical business could distinguish, but which would be likely to cause a fire, and neither citizen nor architect be the wiser, by unscrupulous tenderers goaded on to low prices. I can point to houses in the city of Montreal to-day so wired.

Go into any supply house in our city and ask for dummy rosette, and you will get them; ask their use and you will be told they are merely a blind. Let me try to talk up the superior merit of some article to an architect and he will answer: "A socket is a socket," —without my daring to remind him (under the penalty of his everlasting wrath) that "an egg is an egg," but there are such things as rotten ones.

I fear I have already encroached too much upon your space for the present, but may take a future opportunity of further expressing my views on the subject.

Yours truly,

"WIREMAN."

Montreal, June 8, 1896.

A GREAT MOSAIC.

THE British Vice-Consul in Venice in his last report says that mosaics still continue in great demand there. The Venice and Murano Company executed last year a splendid mosaic for a palace now in course of construction in Vienna. It measures a thousand square feet, and is copied from cartoons by the painter Edward Weitk. It represents the five parts of the world. Murope stands in the centre of the frieze, represented by the symbolic figures of its various nations, having on one side the emblems of industry and trade, and at the top the emblem of the flying genius of light. On the right are Asia, India, China and Japan, with their rajahs, mandarines and the allegorical chrysanthemum. Next follows Africa, with camel drivers, palm trees and other African symbols; on the left, America and Australia, with natives on horseback and on foot, foliage and other emblems. All this variety of types, from the fair Circassian down to the negro, and the display of costumes from the most decorative to the simplest, have enabled the painter to arrange twenty-four figures with great delicacy of coal and in an artistic manner. Over these figures, which rest on an ornamental base, a blue sky reflects all around its light so as to unite all the tints of the mosaic, and to give the whole a harmony of effect which is said to be most delightful to the eye. The same company is executing another important mosiac for the apse of the Guards' Chapel at the Wellington Barracks, in London, from cartoons painted by Messrs. Clayton & Bell.—London Times.

At the Master Plumbers' session recently held at Cleveland, the Executive Committee was instructed to aid the master plumbers of Canada to organize their Dominion Association.

The roof pitch of forty-five degrees from the horizontal, leaving ninety degrees at the ridge, is not too flat for head-room nor to shed rain and snow. Roofs should as far as possible have one predominating pitch over all the house.

An interesting little brochure relating to the use of Cabot's Sheathing and Deafening Quilt in sound-proof construction, has reached our table. This "quilt" consists of fettled matting of eel-grass, held in place between two layers of strong manilla paper by quilting. Mr. Samuel Cabot, Boston, Mass., is the manufacturer.

ARCH AND VAULT TESTS OF THE AUSTRIAN SOCIETY OF ENGINEERS AND ARCHITECTS.*

DURING the years 1891 and 1892 the Austrian Society of Engineers and Architects conducted a series of tests on brick and concrete arches and vaults that were in every way much more complete than any hitherto attempted. The results obtained have attracted much attention from engineers and architects, although the arches tested are not in general use in this country.

Some idea of the scale on which these tests were conducted may be gained from the statement of the contributions of money,

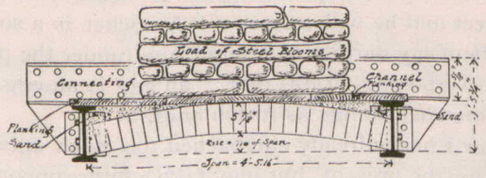


FIG. 1.—SECTION OF BRICK ARCH.

materials and labor from Government departments, railroads, manufacturing companies and private concerns, the total contributions from these sources amounting to $19,800.

The report covers (1) tests of eighteen floor arches, representing eight different types of floor construction; (2) tests of two culverts of 32.8 feet span and 1 in 10 rise; (3) tests of four bridges of 75 feet span and 1 in 5 rise; (4) an exhaustive series of tests to determine the strength and elasticity of all materials used in the above arches; (5) a theoretical calculation based on the results attained; (6) conclusion from the results in regard to theory and construction.

The object of the society in printing the report for general circulation is to bring about desired improvements.

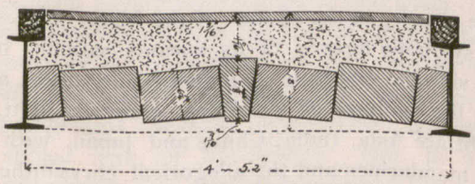


FIG. 2.—SCHOBER SYSTEM.

Of the various tests made those on the flat arches for floor construction will probably prove of most interest to architects. These tests include four arches of ordinary brick, five of flat tiles

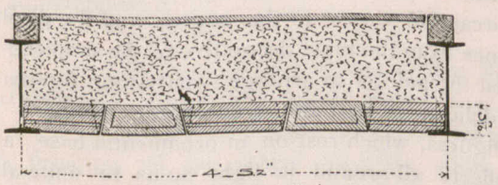


FIG. 3.—HONEL SYSTEM.

(differing entirely from those used in this country), three of concrete, three according to the Monier system, two of corrugated iron and one arch constructed according to the system Melan.

The above tests were divided into three series: A, seven arches with a span of 4 feet 5.16 inches; B, seven arches with a span of 8 feet 10.2 inches; C, four arches having a span of 13 feet 3.6 inches.

The arches in the first and second series were built between I-beams, which were rigidly secured and supported, so that no possible movement could take place. The third series was built between solid masonry abutments, as shown in Fig. 6.

This latter series of arches were regarded as a connecting link

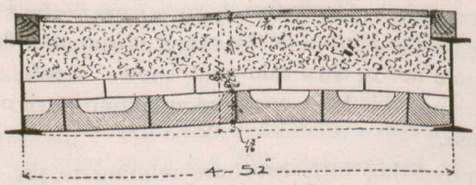


FIG. 4.—GLUCKSELIG SYSTEM.

between floor arches of small span and those of highway bridges, and the tests were instituted principally for making a comparison between arches of concrete, those of the Monier system and of brickwork. The tests of the flat arch systems were for spans of 4 feet 5.2 inches only, as these arches are not designed for much greater spans.

The construction of these arches is shown in Figs. 2 to 5.

Of the seven arches in the short-span series two were of brick (one header, one stretcher), one of concrete and one of each of the systems shown in Figs. 2-5.

The two brick arches laid up in white lime mortar showed practically no change under a load of 1,436 pounds per square foot.

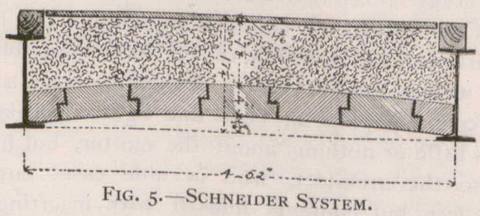


FIG. 5.—SCHNEIDER SYSTEM.

Of the ways of laying the bricks—headers or stretchers—the latter in every case showed a superiority, probably on account of the lesser number of joints.

The concrete arch, which was only 2 15/16 inches thick, with a rise of 4½ inches, was composed of one part Portland cement and five parts sand, and sustained 1,638 pounds per square foot without failure or cracking. The deflections of the concrete were about an average of the two brick arches, hence this arch may be considered as equal in strength to a brick arch 5⅞ inches thick, while it has the advantage of lesser weight.

The four flat arches showed an unexpectedly high carrying capacity.

The Schober arch (Fig. 2) and the Honel arch (Fig. 3) gave evidence of a very small deflection, even less than that of the brick arches, and a load of 1,638 pounds per square foot caused them to undergo very little change.

The Gluckselig arch (Fig. 4) failed under 1,638 pounds per square foot, and the Schneider arch (Fig. 5) under 1,651 pounds per square foot, both arches showing considerable deflection beforehand.

It may therefore be concluded that these arches are completely safe for all practical purposes, provided the skewback beams are not placed too far apart and the workmanship is first-class.

When using either of these systems, however, one must not be too economical in the use of tie-rods, to prevent any lateral deflection of the floor beams.

All of the above arches were tested by loading with iron and steel blooms. To get as uniform a load as possible a layer of cinders, etc., was evenly distributed over the arch and a planking composed of floor boards was placed thereon. The load was applied over the whole surface, and the arch had at least four months to set before testing.

SECOND SERIES.—This series consisted of one concrete arch 3⅜ inches thick, one arch of ordinary bricks, one arch of Honel's bricks, two Monier arches (one leveled up with cinders, the other with concrete) and two arches of corrugated iron, one with the edges reinforced and the other without reinforcements.

All were sprung between I-beams placed 8 feet 10.2 inches apart between the webs.

Each of these arches was loaded over one-half of the arch only, although the arches were leveled up and the planking laid over the whole surface as in the first series.

The arch composed of ordinary bricks gave evidence of but little change under a load of 410 pounds per square foot, and carried 885 pounds per square foot before it failed. This arch was 5 5/16 inches thick, composed of a single course of brick, and had a rise of 9.85 inches.

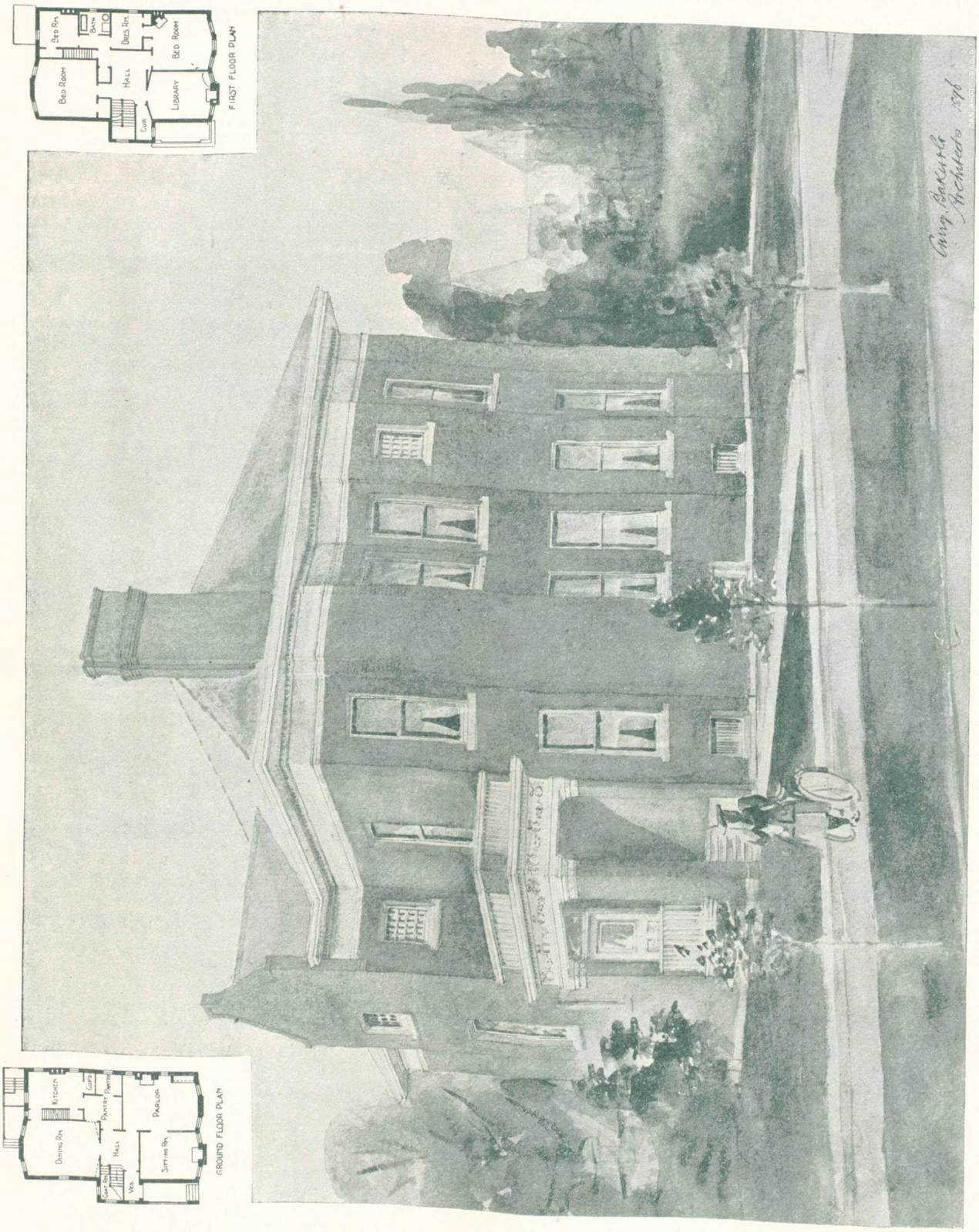
To see if a thinner arch would answer the same purpose, one arch was constructed of "Honel's" bricks, which were only 3 15/16 inches thick, with a rise of 5 5/16 inches (1 in 20). This arch, however, failed under an eccentric load of 491 pounds per square foot, after having shown considerable deflection beforehand. It does not seem advisable, therefore, to use a 4-inch arch for so great a span.

The arch of concrete 3 5/16 inches thick, with a rise of 1 in 10, composition 1 to 4, fulfilled all requirements, as it sustained 614.4 pounds per square foot before it began to crack appreciably, and failed under an eccentric load of 1,130 pounds per square foot.

The two Monier arches deflected on an average equally as much as the concrete arch, and showed no appreciable superiority.

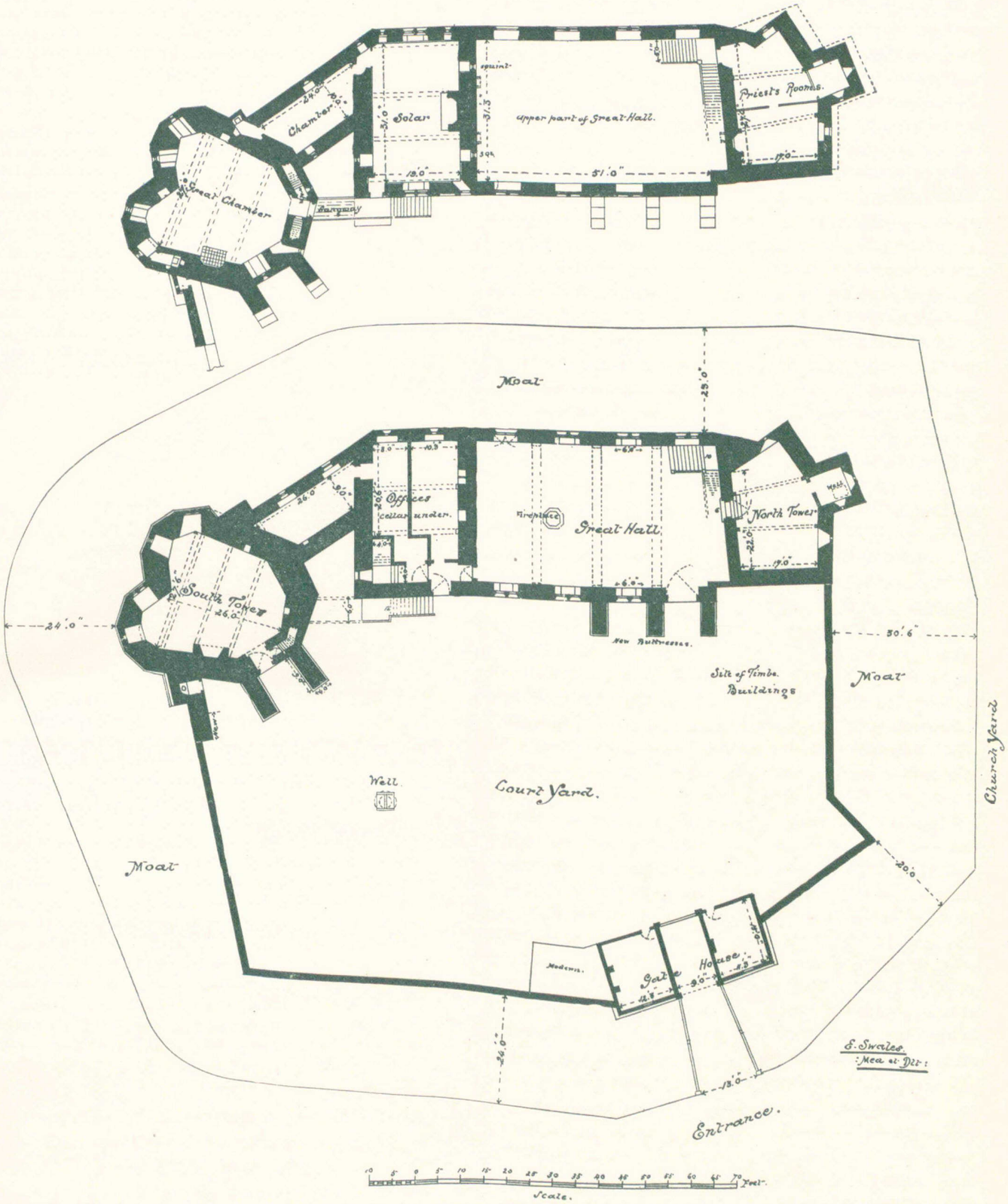
The arch leveled up with the concrete showed an increase in

* Report of the Committee on Arches and Vaults of the Austrian Society of Engineers and Architects. Special reprint from the Journal, Nos. 20-34. Vienna, 1895. (Printed in German.)



RESIDENCE, SPADINA ROAD, TORONTO.

CURRY, BAKER & CO., ARCHITECTS.



PLAN OF STOKESAY CASTLE.

DRAWN BY EDWARD SWALES.

strength of only 8 per cent., although the superficial layer of concrete was applied immediately after the arch itself had been built.

The arches of corrugated iron deflected at the crown very much more than either the concrete and Monier arches.

The arch which had 2.3x2 3-inch angles riveted to the edges of the iron proved about 13 per cent. the stronger.

THIRD SERIES.—Span of 13 feet 3.6 inches.

The brick arch, 4⅞ inches thick, with a rise of 13¾ inches, commenced to crack under an eccentric load of 137.5 pounds per square foot, showing that it was much too weak for the purpose.

The concrete arch, 3 15/16 inches thick, with a rise of 15⅞ inches, failed under an eccentric load of 812 pounds per square foot.

The Monier arch, 2 inches thick, with a rise of 15½ inches, failed under an eccentric load of 895 pounds per square foot. The deflections of this arch were somewhat greater than those of the concrete arch.

After the above arches had been tested a new system appeared, the Melan patent, and an arch of this type being constructed by the manufacturers, it was tested in 1893 by the same committee.

This arch which had a span of 13 feet 11 inches and a rise of 11.4 inches, was constructed of curved ribs of 3⅛-inch I-beams, spaced 3 feet 3 inches apart, with 1 to 5 concrete rammed in between. The thickness of the arch was the same as that of the I-beams, 3⅛ inches. On account of the lack of material the loading of this arch was interrupted after 1,412 pounds per square foot, over one half of the arch, had been imposed. The

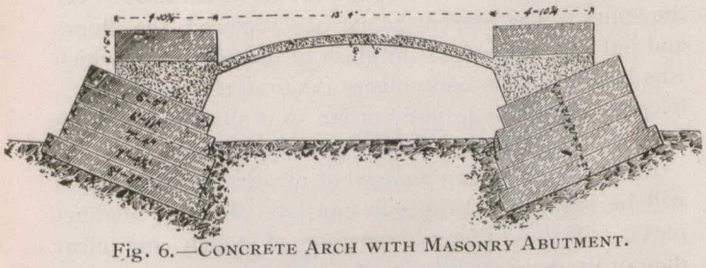


Fig. 6.—CONCRETE ARCH WITH MASONRY ABUTMENT.

permanent changes discovered after the removal of this load were very slight.

The report states: "From the behaviour of this construction there is no doubt that these vaults have a far superior carrying capacity than either the plain concrete or the Monier arch."

Aside from the great strength displayed by the Melan arch, which may be considered as a direct outcome of these tests, the most important fact developed is the superiority of the plain concrete arch, from a commercial point of view, over the Monier arch.

The ordinary Monier arch consists of wire netting imbedded in the concrete. To hold the netting the concrete must not be coarser than 1 to 3, which makes this system much more expensive than the plain concrete arch.

Referring to the two types of arches, the report says: "Compared with a plain concrete arch, a concrete arch with one wire netting has shown but little more carrying capacity, so that the difference cannot have any importance to the ordinary building practice."

Engineers have for a long time recommended Monier arches with two wire nettings for large spans, bnt it is nearly impossible to use two nettings in a small span.

In making all of the tests careful measurements were made of the deflection under different stages of loading, and these are given in the tables contained in the report.

ILLUSTRATIONS.

SHORING AND STRUTTING.—REPRODUCED FROM "THE BUILDER."

RESIDENCE, SPADINA ROAD, TORONTO.—CURRY, BAKER & CO., ARCHITECTS.

STOKESAY CASTLE.—MEASURED AND DRAWN BY EDWARD SWALES.

IN this number of the ARCHITECT AND BUILDER I give the ground plan and what we should call the first floor plan of this interesting old building, together with the elevation to the court yard and elevations of the north and south towers, and also a section through the great hall. There has already appeared in this paper a measured drawing of the gate house, in the New Year Number a sketch of the castle from the northwest corner, and in the May number a photographic reproduction of the Solar room.

The plans, I think, will be found interesting. Whether the founder of the house originally intended it for defence is not very apparent. The site at the foot of the hill would in these days be completely at the mercy of modern warfare. The gables and mullioned windows of the house are more suggestive of domestic life, and are so placed that attack would be easy from across the moat. The tower and moat bespeak a troubled time, when the owners found it expedient to strengthen their dwelling against their enemies. So we must consider it an early example of a moated dwelling rather than a castle or stronghold like its neighbor, Ludlow.

Little alteration seems to have taken place through the chances and changes that have levelled so many other similar buildings of that period; thus it has a special interest to the archaeologist. The moat was originally supplied from a pool which existed on the west side, and this by a small stream which ultimately flowed into the river Onny. Whether it was used to supply the moat to the original building is not easy to determine, and the depth cannot now be fixed. It is used as a garden and the ground is of different levels. A string course which runs round the hall and south tower is wanting round the northern one, and the masonry being also of a ruder description, indicating this to be the earliest portion of the structure. The batten on the base of this north tower and the depth of the foundations at this part, show that this portion was moated, a defence with which nearly all the earlier habitations were provided.

The gate-house replaces the original drawbridge, and the court yard was evidently surrounded by a strong parapet, pierced for cross-bows, of which the only remaining part is a few feet abutting on the south tower. Traces of foundations, probably of timber structures, which were usually built up to the parapet, can be traced near the north tower, and may have been used as stables, etc. On the opposite side stands the great hall, and at its southern end the Solar or withdrawing room, with the offices of the household. These would be the private apartments of the lord of the castle, and by the two squints his lordship could keep his eye on the retainers in the great hall below, which at night became the common dormitory for guests and servants. Then even in palaces the common sleeping place was a bench or the floor, which was covered with rushes; while a crib with a straw couch was probably the only furniture in a lady's bed-chamber. The priest and probably the principal guests were housed in the north tower. The south tower was intended as a last defence in case of siege, there being no indication of a drawbridge existing in place of the gangway. There is no doubt that it was always a temporary structure that could be easily destroyed. A covered way, probably of half timber, at one time led from the lower door to the Solar, as indicated by the string weathering under the window.

However picturesque these old buildings may look, the domestic arrangements must have been very draughty even in their best days. The well proportioned windows to the hall, mullioned and transomed with trefoils and circle, are excellent specimens of early English tracery, grooved in the upper parts for sashes, and in the lower, instead of grooves, holes sunk for iron bars, and supplied with shutters. Before the twelfth century glass was a

great luxury. Between the windows are three buttresses, which were found necessary to counteract the weight of the roof, which has thrown the walls out of perpendicular. These additions are considerably later, and marked new on plan.

On entering the hall you are at once struck by its proportions. The massive beams which support the roof are arched, springing from stone corbels on each side. The windows have stone seats, except the two northern ones, which are only half length, the one over the entrance being now built up, and the one at the end on the west side, which will be seen in the sketch published in January, has somehow lost its upper part, and horizontal beams of wood are inserted and now fitted with doors. There was the remains of some iron work, which by some authorities is supposed to have belonged to part of a drawbridge, but it is very unlikely that a drawbridge would communicate direct into the great hall. Some years ago it was used as a barn, and this doorway was made, in my opinion, at that time. There is no appearance at the upper end of any dais, for the small door at the end is on a level with the rest of the floor. Probably a temporary one was used. The hall has never been paved or tiled in any way, except nearly midway between the sides there is an octagonal pavement for the brazier—the only provision for a fire. There is no chimney. The beams of the roof above are blackened with the smoke of centuries. Everything in the place recalls the mediaeval baronial hall, and there still remain parts of heraldic devices that can be faintly traced in the now crumbling plaster.

The northern tower has been fully described in a previous number of this journal. The very narrow loopholes and rubble masonry show that it is the earliest portion remaining. In the lower chamber a well is sunk. Here again rude ornament can be traced on the walls.

Returning to the hall, a flight of solid oak steps lead to the chambers called the priests' rooms, and here is a collection of tiles, the "Centaur" and an "Archer with a Long Bow" being the more unusual patterns. An ogee window has been inserted in this room, and it may have been used as a chapel, although the church, which is quite as old as this tower, is close to the moat. At the southern end of the hall, through a square-headed trefoil doorway, characteristic of Edwardian architecture, into two small apartments, wainscoated and used as store-rooms, and an inner room terminating at the tower, steps lead into the only cellar. Well lighted by windows into the moat, above these rooms, and approached by the external stone steps already mentioned, is the handsome Solar. The tracery of the windows are similar to those of the hall, and are like them furnished with stone seats. In addition they are flanked with small lancets. On the court side the lancet window has been blocked up, and an ogee added, presumably to gain a better view of the gate-house. The two small squints with shutters at each side the fireplace, I have mentioned before. The remains of the elaborate panelling, and the magnificent chimney piece of oak of Charles II. time, still showing the color and guilding, with grotesque figures and scroll work, has even now an extremely rich effect. It rests on a massive grey stone arch. I hope to give a measured drawing of it at a future date. The inner chamber corresponding to the one below is provided with a wardrobe, and was the principal sleeping apartment.

Decending to the court an archway between the buttresses opens into the lower apartment of the south tower. In this is a large fireplace, and has no doubt been used as the kitchen. The principal entrance, however, is from the level of the Solar across the gangway, and in time of siege the lower doorway would be blocked up and the only approach destroyed.

The plan appears somewhat irregular, and the angles within and without do not correspond on examination, a good illustration of the carelessness of the old builders. It appears, as it were, two octagonal towers placed side by side, forming a rude heart shape. The walls are very thick in places (six feet). Each floor is provided with a fireplace, and for better defence the lancet windows on each floor command the different angles of the tower—each with a stone seat. A stair in the thickness of the wall leads from floor to floor, and in one room the decoration, consisting of a gray paint with flecks of brown, like whisps of hair, is still discernible.

The battlements on the roof consist of large embrasures, which originally had shutters, alternating with loop-holes for the use of cross-bows. A short flight of steps on the north side lead to a small watch tower over the stairs. The present owner has repaired the floors and put a good lead flat in place of the old roof which was burnt, and in many places repaired the walls, etc., keeping the whole in good order, but allowing nothing to be destroyed, and nothing is restored to death.

From the foregoing somewhat meagre description, it will be seen that Stokesay consists of three distinct parts. Of these the only portion of which any clear date of its erection can be fixed is the south tower. Any attempt to fix the order in which the others were built must rest on inferences drawn from the plan or the history of its owners. The castle now belongs to Mr. Allcroft, who keeps it in an excellent state of repair. The whole country from Liverpool to Hereford, through Shrewsbury and Ludlow, teams with interesting spots for the artist and archaeologist, and with historical associations—a splendid field for the architectural student visiting England. And the district is comparatively little known.

EDWARD SWALES.

ARTS AND CRAFTS ASSOCIATION.

THE Arts and Crafts Association of Hamilton opened its doors for the third annual exhibition on June 4th. Among the articles of interest was a carved mahogany piano stool by J. R. Seavey, which was a neat piece of workmanship. A. Lutes, an amateur, contributed a pedestal, surrounded at top and foot with oak leaves. P. L. Seriven's wood engravings were also creditable. Bell-Smith's Westminster and Port Neuf's pictures were models in architectural drawing.

Mr. and Mrs. Norris gave an exhibition of pottery-making, which was repeatedly applauded. R. Carroll, wood-carver, exhibited and worked on a panel a modern Italian renaissance, with cupids as central figures. It is a masterpiece of wood-carving, bringing out the cupids to good advantage.

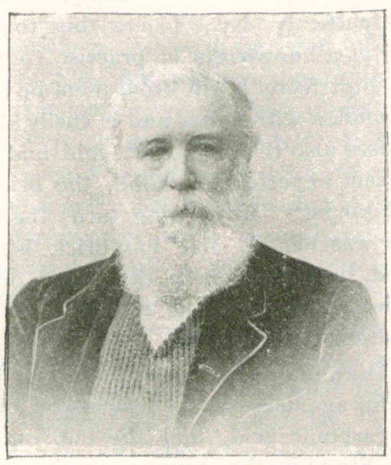
Metal spinning and metal work were among the interesting features of the exhibition. The exhibition lasted ten days, and was creditable to the city of Hamilton.

The Kingston News says there is an opening for a cement works at Kingston, with plenty of material close at hand from which to make cement and pressed brick.

MR. KIVAS TULLY, C. E.

We have the pleasure to present to our readers the accompanying portrait and particulars of the long and active career of Mr. Kivas Tully, C.E., who has recently retired from the active duties of the position of Chief Architect of the Public Works Department of Ontario.

Mr. Tully, second son of the late Commander John P. Tully, R. N., was born in Queen's County, Ireland, in 1820, educated at the Royal Naval School, Canterwell, London, England, and served his time as architect and civil engineer with the late W. H. Owen, architect and civil engineer, Limerick. After serving his time he was engaged in the erection of workhouses in Ireland, under Mr. Wilkinson, architect for the Poor Law Commissioners, having acted as inspector of buildings during the latter portion of 1843. In 1844 Mr. Tully emigrated to Canada and started business in Toronto as an architect and civil engineer. During 1845 the Custom House and Bank of Montreal on the corner of Front and Yonge streets, recently pulled down for the erection of the present structures, were constructed from his designs, after competition with other architects, and in 1848 the town hall and market building were erected by Mr. Tully, after competition. In 1850-51, Trinity College, Toronto, was erected by Mr. Tully, the



Mr. Kivas Tully, C. E.

Welland County court house and jail in 1854-55, and the Victoria Hall, Cobourg, in 1857, after competition. In 1855-56-57 Mr. Tully, with Col. R. B. Mason, C.E., of Chicago, as consulting engineer, made the survey of the Toronto and Georgian Bay Ship Canal, and the report was published in 1858, the estimated cost being $22,170,000. In succession to the above the Ontario Ship Railway Company was granted a charter by the Ontario Legislature in 1892, for the construction of a railway to carry ships of 5,000 tons from Georgian Bay to some point on Lake Ontario, to cost $16,000. Mr. Tully was appointed chief engineer with E. L. Corthell, C.E., of Chicago, as consulting engineer, and Mr. David Blain, managing director.

In March, 1853, Mr. Tully was appointed engineer by the Toronto Harbor Commissioners, an office which he still holds with the consent of the Government. On the 22nd of March, 1856, the visiting commissioners of the Asylum for Insane, Toronto, appointed Mr. Tully architect to the asylum, which was afterwards confirmed by His Excellency, the Governor-General, and he has been enrolled as a civil servant since that time. Early in March, 1866, contracts were entered into for the erection of the wings and hospitals of the Asylum for Insane, Toronto, in accordance with his designs, Mr. Tully, by order of the visiting commissioners, having inspected several insane asylums in the United States in the autumn of 1865. The wings, etc., were completed and occupied in 1870—three years after Confederation. In January, 1868, Mr. Tully was transferred to the Department of Public Works, Ontario, the Hon. John Carling being the first Commissioner, and the building of the wings and hospitals was continued under the Commissioner of Public Works. The act organizing the department, which was prepared by Mr. Tully, was not passed until the 23rd of January, 1869. Under that act Mr. Tully was appointed architect and engineer and chief officer and performed the duties as such until 1874, when the act was amended appointing a separate engineer. At the change of Government in 1871, the Hon. Mr. McKellar was sworn in as Commissioner of Public Works, and acted as such until March, 1874, when the Hon. C. F. Fraser was sworn in as Commissioner, and he has continued to act until the present time, a period of upwards of twenty years.

From the year 1856 to the present time, a period of 40 years, the principal public buildings belonging to the province, representing an expenditure of about $7,000,000, were erected under his superintendence and directions.

Mr. Tully has also served the public as a member of the Board of Public School Trustees of Toronto from 1854 to 1858 inclusive.

GUILD OF SCULPTURE OF ONTARIO.

In response to an invitation made by the Council of the above Guild, which has been formed for the encouragement and training in sculpture, and its allied crafts, a numerously attended meeting of representative artists and workers in the various branches of the plastic arts, including practitioners in marble, stone, wood, metals, art pottery and decorative plaster, was held on Friday last at the studio of Mr. Hamilton MacCarthy, R.C.A.

The object of the meeting was to organize an associate membership, and formulate the basis for holding the first exhibition of the combined plastic arts, which, it was decided to inaugurate in the fall. From the enthusiasm shown at the meeting the project promises every success, and from the well-known talents of the ladies and gentlemen, both professional and amateur, who have thrown themselves into the movement, public interest and advantage cannot fail to result when the exhibition takes place. Ontario has already become the home of many artists of the brush, whose works have done honor to the country, both at home and abroad, and some excellent public monuments, the work of Canadian sculptors, adorn a number of our Canadian cities, and it is of equal importance, not only from an artistic point of view, but also from a merchantile point of view, that both our sculptors and craft-workers should attain excellence in the subsidiary branches of the sculptors' art which go to affect architecture, decoration, design and manufactures.

In several branches of the sculptors' art Canada is still in its infancy; for instance, in metal work, in the goldsmiths' art, in which the Italians in the time of Cellini became so famous in the designing and chasing of trophies, racing cups, and other ornaments in metal.

The work of the hammer in iron, associated with the name of Guinton Matsys, we are glad to see has come into vogue, also the production and treatment of bronze, forming, perhaps, the most beautiful medium, as well as the most endurable material for the work of the sculptor.

In carving in stone our artists have attained much proficiency in Gothic and Romanesque, but little has been done in the human figure. Carving in wood is making some progress in ornament and low relief, yet as in stone much remains to be done in the higher branches.

There is also a field open for a Canadian art pottery. In Europe and the United States national schools of art pottery have been established wiith great success, and with the many fine clays we possess in this country, there is no reason why a Canadian faience should not come into repute both for home and export, and give employment for ladies and gentlemen of taste and skill. We may further mention the desirability of attaining excellence in designing and modelling of interior decorations in plaster of paris. Terra cotta is also one of the best materials for expressing the conceptions of the sculptor in the figure from the fact of the clay retaining the original impress and touch of the artist's handiwork.

The formation of a society, having for its object the cultivation, training, and encouragement of the plastic arts exclusively, is not only a novelty, but will be an acquisition to our art cults, and we have no doubt, when the exhibition is held, it will be, not only interesting and instructive, but a revelation to the public.

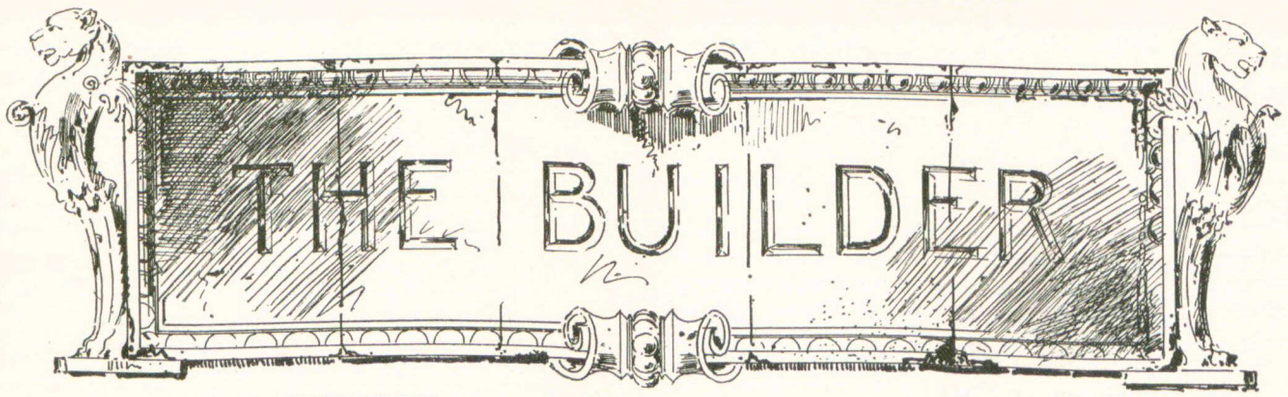
Mr. L. R. O'Brien, R. C. A., an artist who has taken a lively interest in every branch of the fine arts, is president of the Guild, and the Council include several of our best known sculptors and architects.

The membership of the Guild contains a large number of prominent citizens who have taken an active interest in the success of the Guild. The associate members will be exclusively composed of practical art workers in some branch of sculpture. An art union in connection with the Guild has been formed, and two beautiful busts of Canadian heros, General Sir Isaac Brock and Tecumseh, have been prepared in terra cotta for distribution to subscribers, specimens of which may be seen at Messrs. Matthews Bros., Yonge street.

The Guild feels sure that the public may look forward to the coming exhibition with great interest.

C. A. & B. STUDENTS' COMPETITION.

Several drawings have been received in the Students' Competition for a cover design for the next New Year number of the Canadian Architect and Builder, but there has not been time for the judges to make their report thereon. The result will be made known in our July number.



"THE BUILDER."

We have occasionally been met with the complaint on the part of contractors in the building trades that the Canadian Architect and Builder contained too little information adapted to the requirements of the master builder and contractor. Recognizing the justice in some measure of this complaint, the size of the journal has with the present number been increased to an extent sufficient to admit of the establishing of this department and the publication therein of a large amount of matter suited to the needs of contractors in the various trades as well as of the country builder who requires to be possessed of some knowledge of every department of building work.

Contractors are invited to ask through this department for any required information which they do not find appearing therein, when every effort will be made to supply it. They are also requested to contribute through this department for the general benefit, anything of value on the line of improved methods of carrying out work, the nature and use of materials, etc. Country builders who have not the same opportunity as their city brethren of becoming acquainted with new materials and methods, should not hesitate to avail themselves of the privilege of asking questions.

If those for whose benefit this department has been especially provided will assist in promoting a free interchange of ideas and experiences on the line of their every-day work, a great deal of helpful information will be the outcome.

BUILDING AND SANITARY CONSTRUCTION.

The following extracts are taken from a lecture on the above subject to students and clerks of works at Carpenters' Hall, London, Eng., by Professor Banister Fletcher, professor of architecture at King's College:

We call it sanitary building. Why might we not call it, as our forefathers did, simply good, sound building? The first subject is bricks. Nearly all buildings are of brick, or of brick faced with stone.

The essential qualities of a good brick are hardness, not absorbing more than one-sixth its weight of water, well burnt, free from flaws, having a good ring when struck, the surfaces level, neither hollow nor round, except the frog, and the surfaces not too smooth, or the mortar will not adhere. A very highly vitrified brick will only absorb from one-thirteenth to one sixteenth its own weight. The softer stock brick will absorb 1 lb. 1 oz. of water; the harder brick about 9 oz. It must be remembered this result is obtained when we have all the surfaces exposed to the water by immersion in a pail for twenty-four hours. In a recent case it was contended by council that a brick in a building absorbed the same quantity as it did when thus immersed—a strong example of the weakness of theory without practice. A practical man knows that only one face is exposed to the weather; if it is a stretcher, then we have only one-fifth of the entire surface exposed, and if a header then still less by one-half. The wall in question had a dust-bin outside, and, it was alleged, was too damp for habitation. As a practical test a brick was taken out just behind the skirting; the painting of the skirting was not injured or blistered in any way, as it would naturally be by the action of damp, and the brick behind was perfectly dry. I cite this to show that theory requires a knowledge of practise to make it of value. An imperfectly burnt brick must be bad because it becomes sodden with water and is easily damaged by frost; it causes also the wall to be cold and damp. If chalk is present imperfectly ground, the brick is liable to serious flakings. The burning turns the chalk into lime, water reaches it, and the brick is blown, or disintegrated, by the action of the water on the lime. The frog gives a key for the mortar, and keeps the brick in position.

Stone.—Durability is the most important item. The most powerful agencies in the destruction of stone are nitric acid, carbonic acid, and the moisture of the atmosphere. Stone in the country ought practically to stand for ever. But in towns it is exposed to the influences of sulphur and hydrochloric acid. Carbonic acid and water causes a great amount of decomposition. The use of porous stone should be specially avoided in facades exposed to the south, south-west or west winds, because from these quarters we get the driving wind and rain. The decomposing gases in the air are driven further in by the rain. Frost increases the bulk of the water and blows out the stone. One way of testing stone is to weigh when dry and after immersion in water, in the same way as the test for brick already mentioned. If you find that the stone does not absorb half a gallon per cubic foot, you may consider it a good building stone. Another test is that of two stones having similar qualities; that which has the greatest density or specific gravity is the best.

Some of you hereafter may probably be sent down to examine stone at a quarry. To assist you in deciding on the merits of the stone, examine the old buildings in the neigborhood; the tool-marks should still show on a good stone. Finding the stone in the old building good is not in itself satisfactory. It is necessary further to inquire about the bed from which the stone was quarried; it may be the bed is exhausted, and beds of stone in the same quarry differ very much. See also that your stone is seasoned. Wren, during the building of St. Paul's, would have no stone used that had not been quarried for three years. The result of this care is that no stone shows signs of decay. A further proof of the necessity of thus getting stone free from sap was

given by a recent experience with St. Martin's-in-the-Fields. A portion of the stonework was decaying, and an examination brought out the curious fact that the whole of the faulty stones were stones that had been put there some twenty years before. At that time the mason had ascertained what stones were required, sent off the sizes to the quarry, and with the desire to get the scaffold down the stones had been put in full of quarry sap. The result was that they required renewal in twenty years. This term quarry sap is one that some people are startled at, but it is really no more than the natural sap in timber. It is simply water in the stone and a normal condition for all stone while in its natural bed. You may see when travelling in the west of England large quantities of stone drying where the quarries are near the railway. It is a rule at most quarries to send no stone to London from which the quarry sap has not been dried out. It is sometimes found more economical to have the stone cut and moulded at the quarry, because of the labor being cheaper. Against this has to be set the liability to damage in transit.

TIMBER should be got from the heart of a sound tree. The sap should be removed; it should be uniform in substance, free from large or dead knots or blemishes, sonorous when struck; the annular rings should be regular in form and color; the dust when freshly cut should smell sweet; the surface should not be woolly in texture nor clog the teeth of the saw, and it should be firm and bright with a silky texture when planed. A wood having a disagreeable smell and a dull chalky appearance, and which gives out a heavy sound when struck, is not a good wood. To mature wood it must be kept constantly dry and free from the influence of damp walls or damp earth. Remember, however good your timber may be, that the best can be destroyed. Allow air to pass all round it; it should be utterly free from resting on walls; all wall timbers should rest on corbels. If your timber does decay there is then no disturbance of the walls.

MORTAR, LIMES AND CEMENT.—You cannot have sanitary building if the mortar is bad. With bad mortar you get open and decaying joints, and water is allowed to pass through. It has been alleged that bad building is peculiarly a modern achievement, but it may be a cheering refutation of this to be reminded that very early in the Christian era Virtuvius was complaining of bad building.

Mortar is used to bind bricks or stones together, and to give an even bed. We have in ancient buildings, notably in Greek work, some fine examples where no cementing material is used. The stones are large and so nicely fitted that none is needed.

What is our mortar to be composed of? Well-slacked lime and clean sharp sand in the proportion of one to three. The sand must be free from salt; salt attracts and holds water, and if present in the mortar, water would pass from the outer to the inner surface, and you cannot keep it back.

Where you have to build in damp and wet soils, no doubt Portland cement is the best to use. Roman cement sets quicker, but has not the same power of sustaining weight.

BOND.—English bond should always be used unless you want prettiness of effect. English bond is alternate courses of headers and stretchers, and is invariably used for warehouses and all structures where strength is necessary. Bond is of the utmost importance. The lowest course must be properly laid. The first course governs the whole building, even if it is 80 feet high. Bond is a breaking of joint on the face of the wall and in the thickness of the wall throughout. We break it by a smaller brick called a closer. Never put closer next stretcher; always put it next to header; the smaller size of the closer is not then so prominent.

Flemish bond is alternate header and stretcher, and is certainly prettier, but it is not so strong, and it lends itself to the abominable practice of using bats, which are not always half-bricks, but any part of a brick.

Bricks must be of such a size that two headers, with the joint, equal one stretcher. It sometimes occurs on a building that bricks become short; you may be sent to the center brick-fields to obtain more. If so, it is well to take one of the bricks used on the building with you, otherwise you may not get them exactly the same size, and your building may show an unpleasant break in its lines which will always be a source of worry. Take three bricks; lay one as stretcher; then see if two laid as headers just leave room for the mortar joint.

A perfect wall should be so thick as to prevent damp penetrating. Dampness may arise from the bottom. This is prevented by a damp-course. Various methods are employed—asphalt, tar and lime, slate, or hollow stoneware blocks. Asphalt is best. In the event of a settlement it is not easily broken.

Damp from above is prevented by brick on edge or in the form of a ridge, or in what is known as the saddle-back form (the best), or by a plain stone covering or a stone having a feather edge. Damp is prevented from passing through in some cases by means of hollow walls. It does not matter what quantity of water goes into the outer wall as long as you keep it from the inner. It is necessary to provide means for carrying off water at the bottom of the hollow part of a wall and ventilating openings at the top. Formerly the inner portion of a wall might be of less thickness; now the law requires the inner portion of a wall must be the same thickness as if there were no outer wall forming with it a hollow wall. This makes it improbable that many will use it. As an alternative, 1 inch of asphalt can be put against the wall.

After referring to diagram showing the pitch generally used for the various roofing materials and referring the students to the by-laws on plasterer's work, the lecturer said a roof is best described by a bow and a string. The tie beam is the string: the timbers form the bow. Set your lines out within this form. It is a mistake to think it is held up by the king post. The roof is really held up by the tie beam.

Lastly, in all construction, if you have two methods given you, take that which has the simplest parts. Test for yourselves everything you hear. Never rashly adopt new inventions. A new invention probably solves one special need, and in doing so gives you several others to solve. Take as example the old wash-out closet. Every sanitary authority praised and recommended it. Now, it is not permitted anywhere.

TORONTO BUILDERS' EXCHANGE.

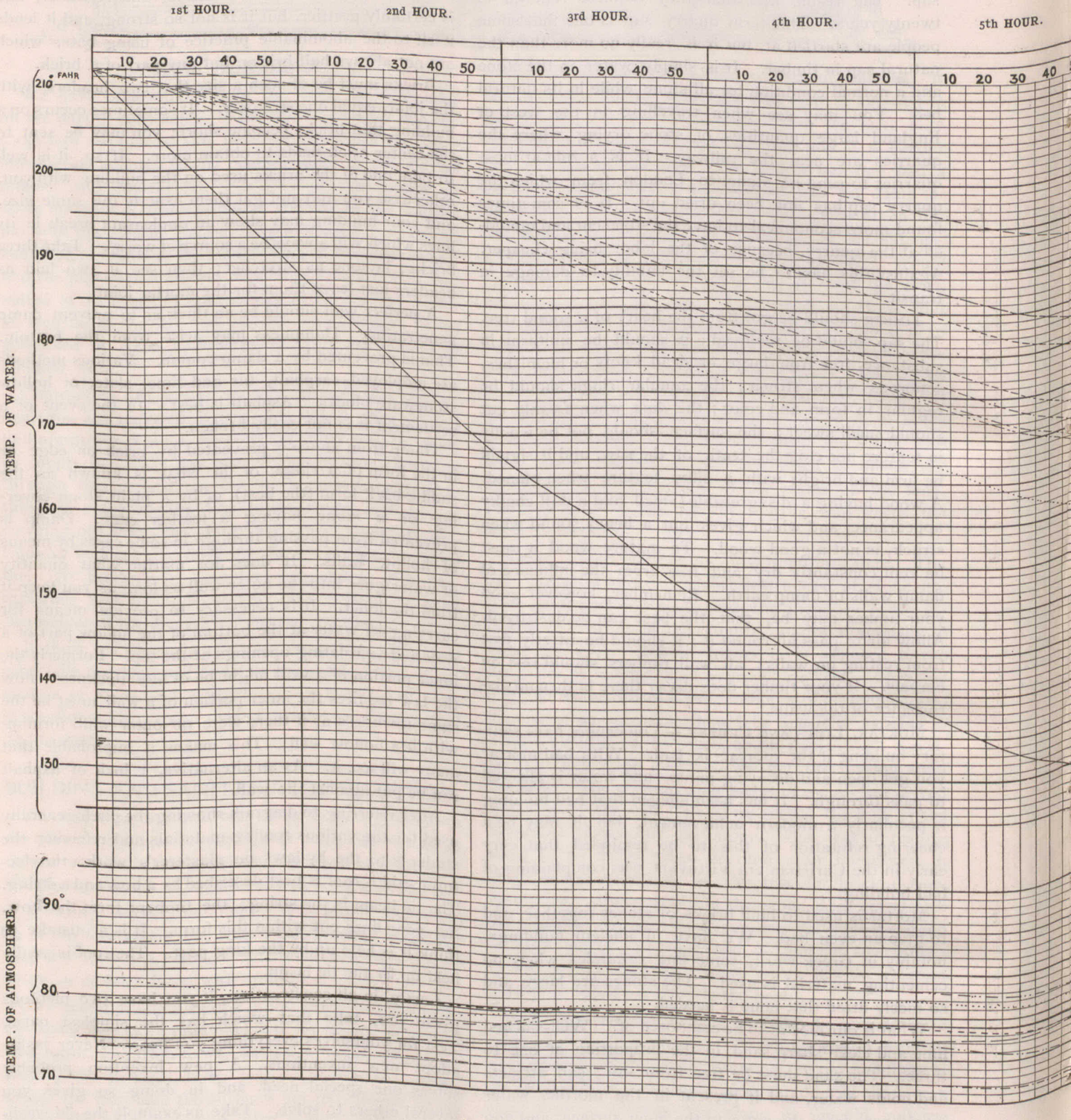
THE annual excursion of the members of the Toronto Builders' Exchange and their friends will take place, as usual, to Wilson Park, N. Y., per steamer Tymon, on the 11th of July. This excursion has in past years proven to be a most enjoyable one, and, if the weather should prove favorable, those who may take part in the event this year are assured of a pleasant outing. As usual, an attractive list of athletic sports will be a feature of the programme.

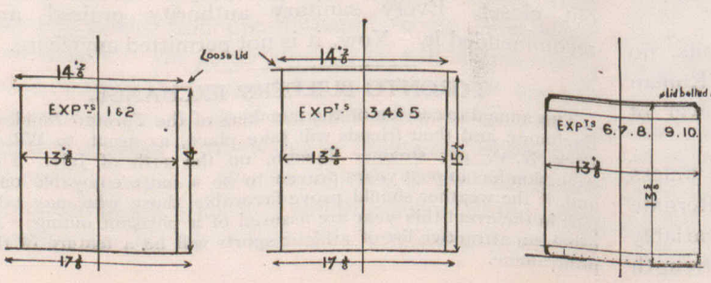
CANADIAN PACIFIC RAILWAY

MECHANICAL DEPARTMENT

DIAGRAM OF EXPERIMENTS WITH BOILER COVERINGS.

(Reproduced from Canadian Pacific Railway Company's Chart.)





The order in which the experiments were made, and the materials tested were as follows :—

1st Expt. Tank uncovered.....

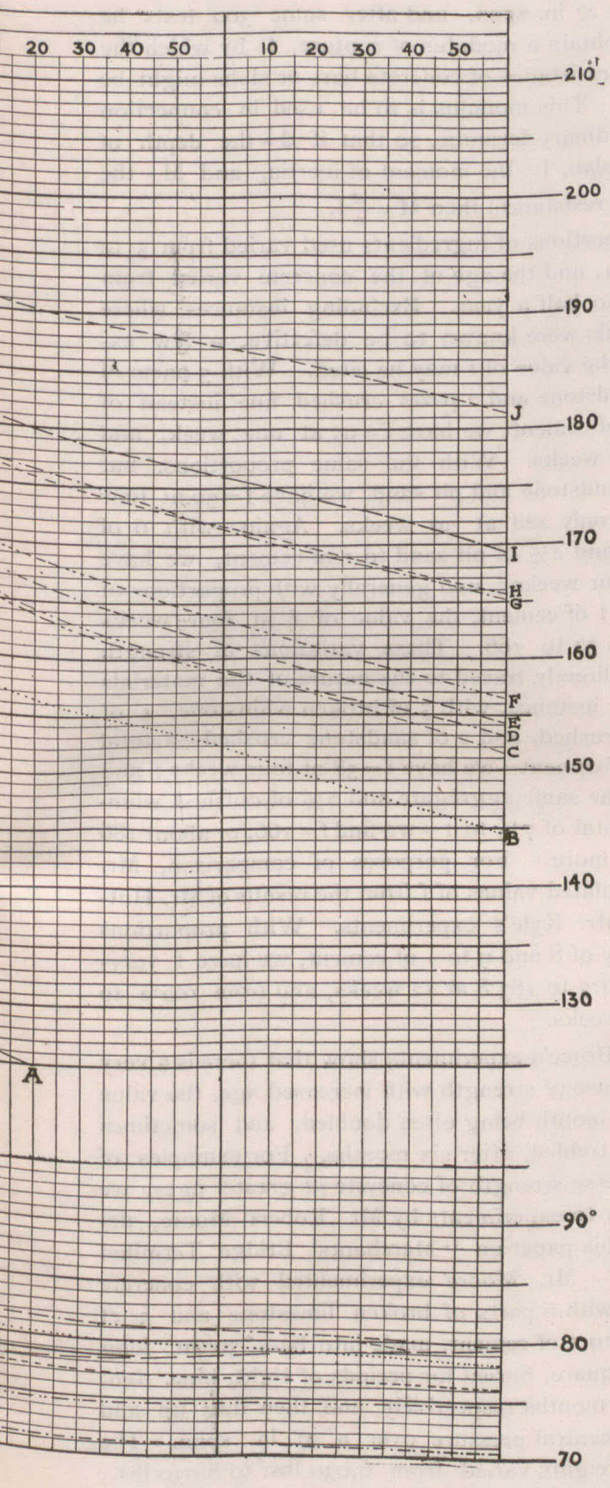
2nd " " with air-s, ace of ⅞ in. next tank, wood lagging ⅞ in. thick, and outer coat of Russian iron ..... H

3rd " " same as in 2nd Expt., but with Asbestos woven cloth ¾ in. thick, inserted in the ⅞ in. space, and placed next tank..... I

4th " " covered with Plastic Asbestos Compound, and outer coat Russian iron Comp. 1½ in. thick .....

5th " " covered with Sectional Magnesia Blocks, and outer coat Russian iron Comp. 1½ in. thick ..... G

R. Atkinson
Mech'l Supt.



Expt. Tank covered with Patent Mineral Composition, and outer coat Russian iron Comp. 1½ in. thick..... C
" " covered with Plastic Asbestos, taken off C. P. R. Boilers, and outer coat Russian iron Comp. 1½ in. thick..... B
" " with air-space of 1⅜ in. next tank, air-tight iron coat 1/16 in. full thick and outer coat Russian iron Comp. 1½ thick ..... E
" " covered with Patent Mineral Composition...Comp. 1½ in. thick F
" " " Mica Boiler Covering..... " 1⅛ " J

The position of the various coverings on the chart be found by the corresponding letters.

EXPERIMENTS WITH BOILER COVERINGS.

THE accompanying chart is a reproduction of a diagram of experiments with boiler coverings made by the Canadian Pacific Railway Co. to test the values of various compounds as non-conductors of heat.

It will be seen that water at 212° was used, the relative value of the coverings as non-conductors being determined by the number of degrees of heat which escaped through the different substances and the consequent cooling of the water in a given time. A reference to the chart shows that ten experiments were made. It will not be necessary, however, to refer to all of them, as the results of some were so unimportant, as in experiments 4, 6 and 9, as to render them of little interest or value. It is only necessary to say that the trials were made under as nearly similar conditions as possible, as will be seen by the diagram of the atmospheric temperatures during the tests. The readings were taken from thermometers passed through the coverings and down into the body of the water.

The chart shows the loss of heat in the uncovered tank up to the 5th hour only, and to make a fair comparison the others should be taken for same time. The temperature at beginning of each test was 212°, and the following table shows the temperature at end of fifth hour, the loss in five hours, and the loss in the fifth hour :—

	Loss in 5 hours.	Temp. at end of 5th hour.	Loss in 5th hour
Bare tank.....	84°	128°	11°
Asbestos compound.....	53°	159°	9°
Sectional magnesia blocks....	33¾°	178¼°	7°
Wood lagging and air space	"	"	"
Asbestos and wood.....	30°	182°	6°
Mica.....	20°	192°	5°

The mean temperature of the surrounding atmosphere during the 5th hour may be taken as having been 78°.

The fairest comparison of the merits of the coverings is made by considering the loss of heat in one hour per degree of difference of temperature between the tank and its surrounding atmosphere.

The following table shows this worked out :—

	Mean temp. during 5th hour.	Difference between tank and atmosphere.	Loss in 5th hour.	Loss in 5th hour per degree of difference of temperature.
Bare tank.....	133½°	55½°	11°	.198
Asbestos comp.....	163½°	85½°	9°	.105
Sectional Magnesia blocks..	181¾°	103¾°	7°	.0674
Wood lagging and air space	181¾°	103¾°	7°	.0674
Asbestos and wood.....	185°	107°	6°	.056
Mica.....	194½°	116½°	5°	.0428

The following table shows the value of the coverings as compared with the bare tank.

Amount of heat which escapes from the bare tank was
1.88 times greater than through the Asbestos compound.
2.92 " " " " " Sectional Magnesia blocks.
2.92 " " " " " Wood lagging and air space.
3.53 " " " " " Asbestos and wood.
4.62 " " " " " Mica.

Mica shows by far the best result as a non-conductor of heat, and saved
245 per cent as much heat as the Asbestos compound.
157 " " " " Sectional Magnesia blocks.
157 " " " " Wood lagging and air space.
130 " " " " Asbestos and wood.

It will be seen from the diagram that the loss by radiation through "sectional magnesia blocks" and "wood and air space" was practically the same, there being less than ½° Fht. between them at the expiration of the test.

It will be seen that asbestos cement, which is in very

general use, particularly on marine boilers, showed infinitely the worst results. There seems no room for doubt that this is largely attributable to the fact that it is a solid composition, and lacks one of the most vital requirements of successful non-conductivity, i. e., "diffused air." That the air must be diffused or separated into minute cells is strikingly illustrated in experiments 2 and 3. In the first, wood and air space of ⅞ inch next to the tank, as used on locomotive boilers, the loss per degree of difference of temperature was .0674°. When the same air space was filled or packed with asbestos fibre the loss dropped to .056°. In the case of mica, the air theory appears to have been carried to the furthest possible extent, the whole covering forming a veritable air cushion, each leaf or film of mica being separated from the next by minute corrugations, the whole mat presenting the appearance of a porous flexible quilt. The value of this ingenious arrangement was amply proved in the experiments in question, when the loss per degree in difference of temperature was only .0428°. That this is one of the most important qualities of a covering has long been recognized, and a large number of patents have been granted for devices intended to obtain it. But in nearly every instance it has been at the expense of the material. The great differences in the value of the coverings tested by the C.P.R. is due largely to the manner in which the valuable properties of diffused air as a non-conductor have been utilized.

The following table will give some idea of what the loss of power has been found to be from uncovered steam-pipes with the steam at 75 lb. gauge pressure:—

2 inch pipe..	1	horse power loss for every				132	feet long.
4 "	1	"	"	"		75	"
6 "	1	"	"	"		46	"
8 "	1	"	"	"		40	"
12 "	1	"	"	"		26	"

About 90 per cent. of this waste is easily prevented by a proper covering of the pipes. When it is considered that this loss occurs at the comparatively low pressure of 75 lbs., it is apparent that with steam at 130 lbs. and 140 lbs. and higher, the loss becomes very serious, and the necessity for preventing as much of it as possible is a matter of urgent importance.

The accompanying diagram very clearly demonstrates what can be done in this direction by the use of various compositions, as it clearly shows the qualities and capabilities of each. It is possible that the question might arise as to whether the great differences between these substances would still be found had the trials of the C. P. R. Company been made with higher temperature than 212°.

It appears, however, from published reports of trials made some months ago by the engineers of the Boiler Inspection and Insurance Company of Canada that these differences did exist; that company subsequently issued a special circular on the whole matter, as one of particular interest to steam users. It is stated further that the Grand Trunk Railway Company have lately concluded a series of trials, on a large scale and under high steam pressure, of a number of boiler coverings, including the best of those tested by the C.P.R. and the Boiler Inspection Company, the difference between them being even more marked. As no data, however, is as yet available of these trials, it is impossible to speak of them with accuracy. It is encouraging to notice the increasing attention the whole subject is receiving, in view of the imperative necessity for observing the strictest economy in power and coal and the prevention of all unnecessary waste.

CONCRETE FLOORS.

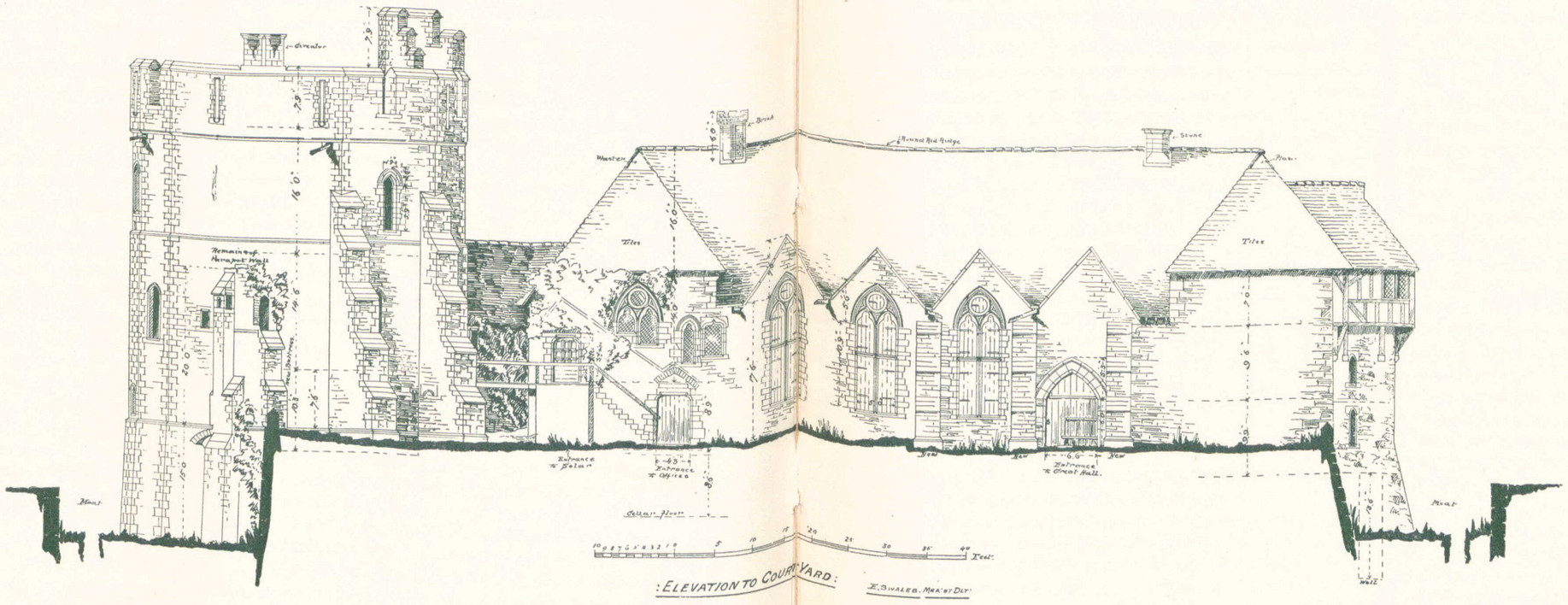
THE most complete set of experiments upon the transverse strength of concrete, writes Mr. Geo. H. Blagrove in the Contract Journal, appear to be those of Mr. A. Fairlie Bruce, previously referred to. Mr. Bruce used bars 30 in. long by 4 in. square, broken by central pressure over a 27 in. span, and after some 300 tests he sought to obtain a modulus of rupture, f, by which the transverse resistance of concrete bars or slabs might be calculated. This modulus is to be used in connection with the ordinary formulæ, so that if d = the depth of the bar or slab, I = the moment of inertia, and M = the moment of resistance, then $M = \frac{2f}{d} I$.

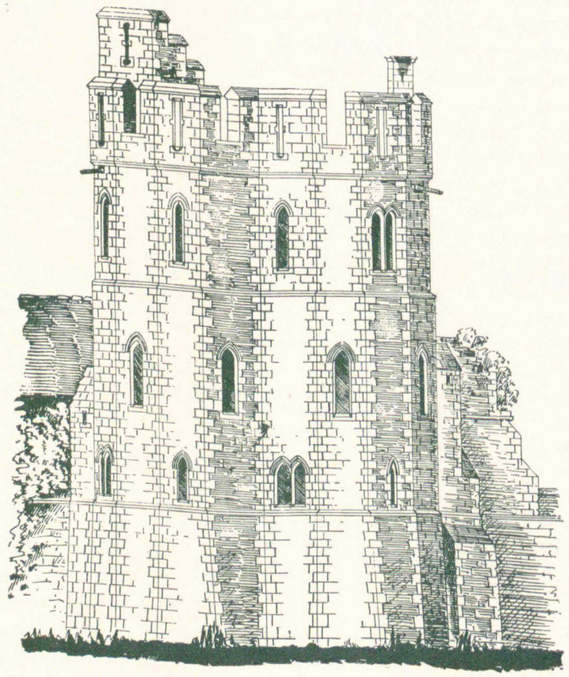
The proportions of ingredients used varied from 5 to 1 to 12 to 1, and the age of the concrete varied from one week to half a year. Excluding instances where the materials were known to be defective, a few examples of the value of f may be cited. With 3 parts of broken sandstone and 2 parts crushed fine instead of sand to 1 of cement, we have f = 95 at one week, and 222 at four weeks. With the same proportions, but with red sandstone and pit sand, we have f = 30 at four weeks and only 228 at 39 weeks. Again, with 6 of sandstone and 2½ of pit sand to 1 of cement, we have f = 73 at four weeks; and generally with proportions of about 8 to 1 of cement, the value of f at four weeks varies from 57 to 166. These variations of strength cannot be directly traced to the nature of the materials used. For instance, with 5 of broken whinstone, 1 of the same crushed, and 2 of sandstone crushed—a total of 8 to 1 of cement—we have f = 58 at four weeks; and with 5 of the same aggregate and 2½ of crushed whinstone—a total of 7½ to 1—we find f = 166, or about 186 per cent. more. For purposes of comparison, Mr. Bruce calculated values of f from the results of Mr. Hutton's and Mr. Kyle's experiments. With proportions respectively of 8 and 9 to 1 of cement, we have f varying from 51·7 to 183·8 at 12 weeks, and from 102·2 to 316 at 20 weeks.

All Mr. Bruce's experiments show that there is a very great increase of strength with increased age, the value of f at one month being often doubled, and sometimes more than trebled, after six months. For examples of the transverse srrength of concrete at greater ages, we would refer to experiments by Mr. Robert Moore, described in his paper on "Merchants' Bridge Terminal Railway."* Mr. Moore experimented with concrete composed with 6 parts of broken limestone and 3 of river sand to 1 of cement, made into bars 30 in. long and 9 in. square, buried for periods of eight, nine, ten, and eleven months respectively, and then dug up and broken by central pressure over a 27 in. span. The breaking weights varied from 6,030 lbs. to 8,030 lbs., and the values of f which we deduce from these results vary from 335 to 446.

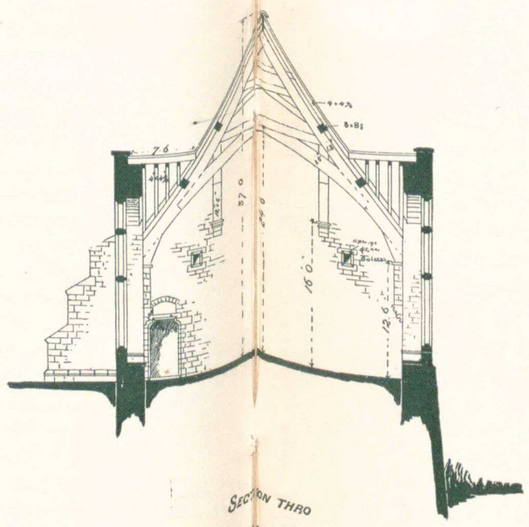
Mr. Bruce has employed a formula for calculating the growth of strength in concrete, the data for which are of course deduced from experiments. Sometimes the calculated and observed values of f agree fairly well, but in many cases there are startling discrepancies. For instance, with concrete made with 5 parts of whinstone

* See Transactions Amer. Soc. C. E., vol. xxxi., 1894.

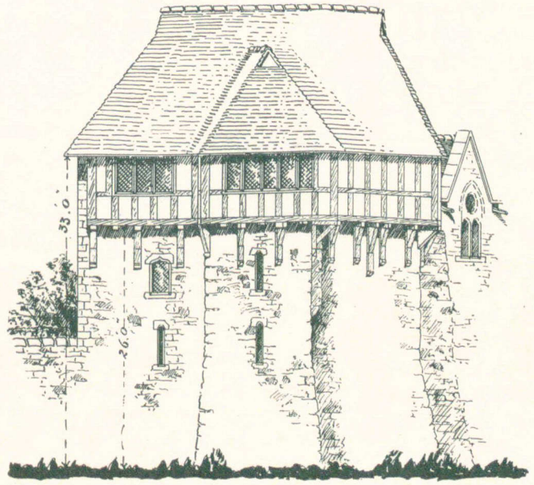




ELEVATION OF SOUTH TOWER



E. SWALES : MEA et DLT :



ELEVATION OF NORTH TOWER

STOKESAY CASTLE—DRAWN BY EDWARD SWALES.

and 3 of pit sand, we have the calculated value of f at eight weeks = 104, and the observed value = 63; then with the same concrete we have the calculated value at 26 weeks = 141, and the observed value = 204. Such variations in results should suffice to shake our confidence in calculations of this kind.

PRACTICAL RULES FOR TRANSVERSE STRENGTH.

There is often some considerable difference between the quality of work specially prepared for purposes of experiment and that which is executed in large quantities with only a general supervision, which cannot take note of every possible source of weakness due to imperfections of workmanship. Bearing this in mind, it would be rash to assume that the degrees of strength revealed in the experiments to which we have referred can be expected to apply in general practice when the conditions are nominally the same. Two things must, therefore, be done in selecting values of f for practical use. First, the lowest values revealed in the experiments must be taken, because there is no certainty that the strength will rise above these in any given case. The custom followed by some writers of taking the average results of experiments is one that may lead to serious error. Next, a deduction must be made from these lowest values to allow for the difference in quality between ordinary work and samples made for testing.

It is probable that large slabs of concrete would show a higher proportionate degree of strength than the isolated bars used in the experiments, since these latter are devoid of that lateral support which any section of a slab derives from the contiguous portions; and this is a consideration that must influence us in fixing values of f for adoption in practice. Looking generally at the records of the experiments mentioned, and proceeding upon the assumption that our concrete is to consist of about 3 or 4 parts of coarse aggregate and 2 parts of sand to 1 of cement, we suggest the following values for f:

With concrete	1	week	old	f = 30
" "	4	"	"	f = 58
" "	8	"	"	f = 100
" "	12	"	"	f = 140
" "	6	months	"	f = 200
" "	1	year	"	f = 300

These are rough approximate values, and it is pretty evident that any attempt at closer accuracy would be useless. The following table shows the strength of concrete floors for various spans, calculated according to the above figures:

CALCULATED STRENGTH OF FLAT CONCRETE FLOORS.

Thickness in inches.	Span, in inches.	Breaking weight distributed in pounds per square foot for concrete of the undermentioned ages.					
		1 week.	4 weeks.	8 weeks.	12 weeks.	26 weeks.	52 weeks.
4	24	160	309	532	744	1,065	1,597
5	30	160	309	532	744	1,065	1,597
6	30	228	444	766	1,071	1,533	2,300
6	36	160	309	532	764	1,065	1,597
7	36	216	420	724	1,014	1,449	2,173
8	36	282	549	946	1,323	1,893	2,840
8	40	228	444	766	1,071	1,533	2,300
8	48	160	309	532	744	1,065	1,597
9	48	201	390	675	945	1,350	2,025
9	54	156	303	526	735	1,053	1,580
9	60	130	249	432	603	864	1,296

The safe load should under no circumstances exceed one-third of the breaking weight, and one-quarter or one-fifth is preferable for moving loads.

LONDON MASTER PLUMBERS' BANQUET.

The Master Plumbers' Association of London, Ont., celebrated its inauguration on the 19th of May by a banquet at the Grigg House, at which about fifty persons were present. There were noticed, among others, Mr. Stephens, J. Haslett, jun., Mr. Allen, James Haslett, sen., W. Skelly, jun., Wm. Joanes, John Law, C. W. Walker, Robert H. Geldart, Armon W. Irwin, G. Craddock, Herbert Mathews, Wm. Smith, Wm. Skelly, sen., Frank Bickley, Chas. Williamson, Thos. L. Partridge, E. Holland, A. Millan, C. Needham and Mr. Coleman, all of London. The guests from outside places were President W. J. Burroughes, vice-president Alex Fiddes, and Messrs. Andrew Mann and William Mansell, of the Toronto Master Plumbers' Association, and Mr. Flaherty, of St. Thomas. The city was represented by Ald. Skinner, Dr. Hutchison, Medical Health Officer, and Ald. Armstrong.

An efficient chairman was found in the person of the president, Mr. R. J. Haslett.

After the menu had received proper attention, the President made his opening remarks and proposed the toast of "The Queen," which was followed by that of "The Governor-General" and "Canada, Our Home," all of which were fittingly responded to.

The toast of "The Mayor and Corporation of London" was replied to by Ald. Skinner and Armstrong, who urged the necessity of sanitary improvement.

The other toasts were: "Master Plumbers' Association," responded to by Messrs. Burroughes, Mansell, Smith and Fiddes; "Board of Health," acknowledged by Dr. Hutchison and Ald. Skinner; "The Manufacturers and Wholesale Supply Men," which brought responses from Messrs. Mann, Allen, Stephens and Coleman; and "Our Guests," to which was coupled the names of Messrs. Matthews and Craddock.

The members of the Association were well pleased with the success of their initiatory dinner, which it is hoped will become an annual affair. The local officers are:—President, R. J. Haslett; Vice-President, W. Smith; Second Vice-President, W. Skelly; Treasurer, T. Partridge; Secretary, W. Skelly, jr.; Master at Arms, C. W. Walker. Members: J. R. Haslett, C. Needham, A. Milne, W. H. Heard, F. Bickley and E. Holland.

The Association is making arrangements for the appointment of an inspector of plumbing.

THE cubical outline gives the most volume and floor space for a given amount of material and expense. A floor 30x30 gives 900 square feet of area to 120 feet of wall; the same amount of wall arranged in an ell of 30x30x15 give only three-fourths as much area, or 675 square feet. The cubical form can be worked up artistically by giving grouped windows, and by making the eaves, chimneys and roof bold and striking.

Brick walls should be well bonded. The "English bond," in which courses of headers alternate with courses of stretchers, is probably the strongest. Tarred bricks soon blister and wash, and mortar does not take hold of them. Rough bricks, if laid with red or black mortar joists, are very picturesque. Stone trimmings for red brick walls should be of some warm color, as brown, red, buff or green. Terra cotta makes admirable trimmings for brick walls. The foundation stones should lie on their "natural beds," and they will be stronger therefor.

REVISED ENGLISH WORKING RULES.

THE following revised working rules for bricklayers, approved by the Association of Master Builders and the Operative Bricklayers' Society of London, Eng., will doubtless be of interest to Canadian master builders :

There are to be fifty working hours during forty weeks, forty-seven hours during six weeks and forty-four hours during six weeks. Overtime when worked at the request of employers, but not otherwise, shall be paid at the following rates, namely, from leaving-off time until 8 p. m., time and a quarter ; from 8 p. m. to 10 p.m., time and a half ; after 10 p. m., double time. No overtime shall be reckoned until each full day has been made, except where time is lost by stress of weather. On Saturday the pay for overtime, from noon to 4 p. m., shall be time and a half, and after 4 p. m., and Sunday, double time. Christmas Day shall be paid for the same as Sunday. Workmen engaged on a night gang shall be paid one penny per hour in addition to the ordinary rate of wages. One hour's notice to be given or one hour's time be paid by either side, on determining an engagement. All wages due to be paid at the expiration of such notice, or walking time if sent to yard. In the event of more than 10 per cent. of the workmen of the trade employed at the job giving notice to leave during any one day (except Saturday), they are not to be entitled to receive their money until noon on the following day. Men who are sent from the shop or job, including those engaged in London and sent to the country, are to be allowed as expenses 6d. per day for any distance over six miles from the shop or job, exclusive of travelling expenses, time occupied in travelling and lodging money. Payment of wages is to commence at noon or as soon thereafter as practicable on Saturday, and be paid on the job. But if otherwise arranged, walking time at the rate of three miles per hour to be allowed to get to the pay-table at twelve noon. Employers are to provide where practicable and reasonable a suitable place for the workmen to have their meals on the works, with a laborer to assist in preparing them. Wages earned after leaving-off time on Friday and Saturday only shall be kept in hand as back time. If application be made to any employer by the central committee of the Operative Bricklayers' Society to discharge any workman on the ground that such workman is obnoxious, and the employer refuses to accede, no strike shall be sanctioned, but the question shall be referred to the decision of the Board of Conciliation. But no such application shall be made in consequence of such workman belong or not belonging to any trade society. Six months' notice on either side shall terminate the foregoing rules.

Small Leaks.

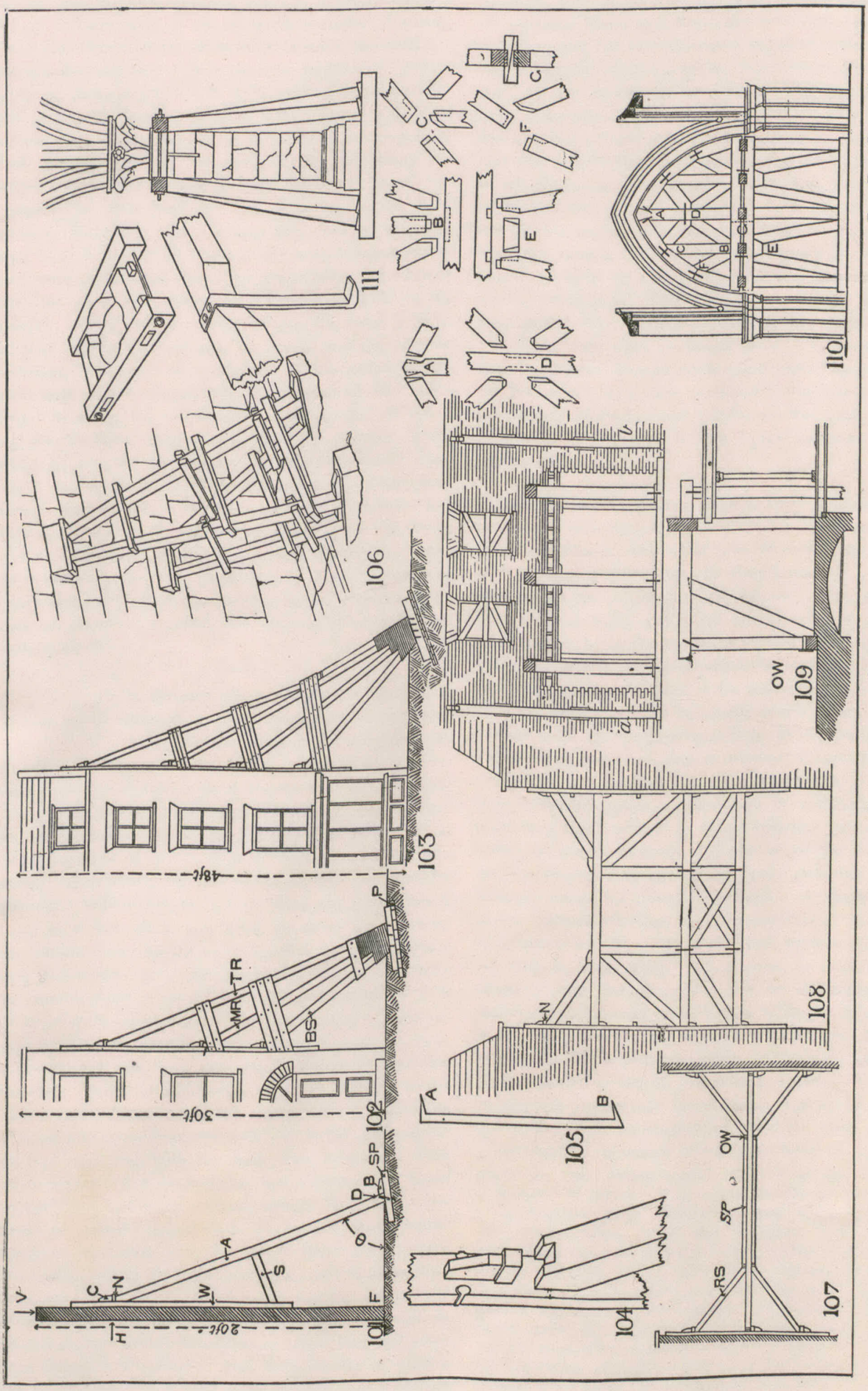
MUCH of the loss suffered on contracts is due frequently to the carelessness of the foreman of works or to the men employed in not taking proper care of the materials left in their charge previous to their being put in place. In the loading and unloading of bricks many dollars may be lost or saved by handling. A careful handler will gather up the bricks with due attention and place them in piles without making unsaleable "bats" of an undue percentage of them, whereas a careless man will destroy in a day, while handling and piling bricks, more than would pay his day's wages, and this loss, on a building containing two or three hundred thousands of bricks, would make serious inroads in the profit percentage. When bricks are to be stacked up before being laid in the wall, a good solid and level foundation should be prepared, and laid over with rough plank or boards, and the bricks should then be placed on the boards in regular courses "headers and stretchers," breaking joints as though placed in the wall. By this means the pile or stack will be made solid and insured against falling. It is a good plan to scatter a thin layer of straw on every fourth or fifth course ; it has a tendency to keep the courses even and prevent them crushing the lower courses, and the straw also acts as a bond and ties the stack together.

Care of Lumber.

PERHAPS the biggest "leak" in a contract will be found in the lumber bill. From experience we know that a much larger percentage of loss usually occurs in the construction of a building than is generally provided for, and this loss is not due to actual and necessary waste, but rather to bad calculation and careless handling. Finished stuff, such as flooring, wainscotting, base mouldings and door and window trimmings, are carted to the building, thrown down carelessly into a hall room, or perhaps left outside, and for hours, and sometimes days or weeks, is tramped over by the workmen before being used, or as is often the case, left outside of the building, or some place where it is exposed to the weather and rendered unfit to work. The trampling over splits, breaks, fills with sand or disfigures a lot of good material, either rendering it unfit for use or making it necessary to expend a lot of work upon it to make it serve its purpose, all of which could be avoided if proper care was taken in "housing" the material the moment it arrives at the works. Trimmings, doors, mouldings, wainscottings and ornamental wood-work of any sort, ought never to go into a building until all the walls have been plastered complete, and thoroughly dry. The practice of trimming doors and windows immediately after the "putty coat" is applied to the walls cannot be too much deprecated. The custom is an evil one and often causes a great deal of trouble in both doors and windows, as the "trim" by expansion is apt to crowd the jambs, causing the sashes to bind and stick, and forcing the door jambs out of shape, causing trouble with the locks and often leaving a defect that can never be remedied. Where time is an important factor, it may be permissible to "put" down base, or even to plant "matched" wainscot, but neither time nor conditions should force the contractor to put on his trimming while the plaster is yet damp, if he values his reputation as a good and careful workman.

Concerning Floors.

IN the matter of floors contractors may add to their profits or increase their losses more rapidly than in any other class of work about a building. A careful workman will see that his joists are properly sized before being placed on the wall, and that the "crowning edge" is above, and he will endeavour when "bridging" to give all his joists a crowning edge and have them all on one plane so that his flooring will touch each joist without being forced down or sprung. This is an important matter, inasmuch as if the joists are at irregular heights, it will cause a great deal of trouble in laying the floor and result in a big loss of time, which is loss of money. In driving flooring together some care should be taken, and the tongues of the boards should not unnecessarily be broken off or "mashed" in driving



SHORING AND STRUTTING.

FROM THE "BUILDER"

101, Raking Shore; simplest form, 102, Raking Shore; most frequently used. 103, Raking Shore; adapted for very high buildings. 104, Detail showing notching of head to needle. 105, Correct and Incorrect Form of Dog. 106, Strong Combined Shore. 107, Flying Shore, 108, System of Flying Shores. 109, Needling required to support a wall. 110, Special form of Shoring used at Grosmont Church, Ill.; Shoring used to support Cap of a Cylindrical Column.

the stuff together. If any difficulty arises in getting down the floor on account of the machine work, the flooring should be discarded at once, as it is the height of folly to wrestle with a lot of badly matched flooring. It will pay two or three times over to have the stuff run through the machine again than to fool away time in trying to make a good job with impossible materials. Well matched flooring should "lay down" with ease and the edge joints should be invisible. In tongue or blind nailing there is no necessity for breaking the tongue where each nail is driven, neither is there any necessity for the mark of the hammer to be seen wherever there is a nail. A man who will persistently leave "his X mark," engraved with a claw-hammer, on every joint of flooring, should be taken from the work at once and given something to do more suitable to his capacity. By a proper cutting of lengths, from 5 to 15 per cent. of the material may be saved, and the shrewd workman, who has the interest of his employer at heart, will always manage the disposition of his "butt joints" so as to have a minimum of waste. When a man fills a room with sheet ends of flooring while laying, he may be put down as an extravagant floor layer. It may be he can lay more surface in a day than another man who does not have so many butt ends, but as a matter of fact, the man who puts down the lesser surface of floor and makes less waste, is often the more profitable man for the contractor. The slasher and rusher who gets in a lot of work each day at an extra waste of material, is profitable only to those who use kindling wood.

Lime and Mortar.

In country places where lime has to be hauled a long distance, proper provision should be made for its preservation when it arrives at the works. In a damp atmosphere a cartage of ten or twelve miles may cause a load of lime to be partly slaked before it reaches its destination, and in cases of that kind, it would be better when possible, to run it in the bed at once and finish the slaking; then nearly the full virtue of the lime may be captured. When this can not be done the lime should be put in a dry place and used as soon as possible. Lime should never be stored in a cellar or in any place where it is damp, as it will lose half its virtue in a very short time in such a place, and the mortar made with it will never give satisfaction. Good live sand is a necessary requisite for making good mortar, and the contractor should see to it that such is furnished to the plasterer. Dead sand, while easy to work, never makes a good job, and mortar made with it soon rots and crumbles away from the wall. It is the silica in the sand that combines with the lime, that forms the hard solid mortar we find on some of our old houses. Good long hair that has been washed, should be used in the mortar in proper proportions to insure good work. Plasterers, as a rule, stint the hair in their mortar as a matter of economy, but this is wrong, and in a measure dishonest. To insure good and lasting work, the mortar should not be used until it has been made at least ten days. It will be better to stand fourteen days if conditions will permit. The best results in plaster work are obtained with well made mortar that has been made one month or more before being used.

Much carelessness, and consequently much loss, are connected with the piling up of rough lumber preparatory to being used in a building. We have frequently seen joists, studding, rafters, roof-boarding and rough sheeting, thrown off a wagon or sleigh pell-mell without any attempt made to prevent the breaking, splitting or warping, and left in an open pile, exposed to the weather, and perhaps in such a position that it would be trampled over by the workmen or others. The breaking of a joist, a stud or a rafter, or the splitting of a board, or the warping or twisting of any of them out of shape, is loss that will be felt at the wind-up of the work, and the multiplication of these breaks, splits and twists, often make invisible gaps in the profits, and the shrewd contractor will insist on having all his stuff properly and carefully piled in the grounds, and covered with rough boards to keep out the weather, or will otherwise protect his materials. More money is made by giving prompt attention to little matters of this sort, than in "rushing" the work in undue haste. A careful workman must have time to make good work, and a careful workman will, as a rule, save to his employer in material whatever it costs in extra time to do the work; besides producing work that brings honor to employer and workman.

No good house, frame, brick or stone, should be without one or two fire-places in it, and in the country villages and towns, where the contractor has much to do with designing the house, he should make it a point to impress on the owner the importance of having open fire-places of some sort in the house. When only one of these can be in the house, it should be in the dining-room, as that is the room where the family will be the most of the time they are in the house together. If two or more fire-places can be placed in the house, then one should be in the dining-room, one in the parlor, and a third in the bed-room that is oftenest occupied. If the fire-place is intended for wood altogether, it may be built without a grate, as fire-dogs or andirons may be used on a thick cement or brick hearth. It would be better, however, to build in grates in all the fire-places, as then the opening would be less, and the chimney draught could be better regulated. A good English grate, with tile facings, can be purchased for $15 or $16, and it can be made to do good service with wood as well as with coal. Of course, in our Canadian climate, open fire-places can not be depended on for heating during midwinter, but in spring and fall, when stoves are taken down, or heating by steam, hot-water or hot-air, is discontinued, they do the work effectually. They also act as health preservers, as no device yet put in practice in domestic architecture, can equal the open grate as a mode of ventilation. Where cost is not a great obsticle, it would be better to have an open fire-place in the dining-room without grate, having a "basket" in place. These baskets cost about as much as an English grate—perhaps a little more if damper, etc., are included. And the fire-place will require a little more work to make it suited to the basket. The whole chimney heart may be of exposed brick work. The upper portion above the shelf may drop back four inches, and a neat plain cornice may project from the heart under the shelf, forming a finish, with the shelf (which should be of hardwood) of a mantel. The skilful bricklayer should be able to make a handsome brick mantel if he picks his stock, rubs their faces, lays in fine mortar, and lines up his joints. In a mantel of this kind there is a big opportunity for the bricklayer to display his skill. This makes a mantel without wood, save and excepting the shelf, which may or may not have a moulded edge to suit the brickwork.

TRUTH IN ARCHITECTURE.

By W. E. Doran, Architect, Montreal.

(Concluded from May Number.)

There is no such thing as human perfection, yet the law says his work must be perfect—not only his own work, but he is obliged to see that the work of every cheap Jack whom the cupidity of his client obliges him to employ shall be perfect; he must be omniscient; he must know beforehand the nature of every soil, its powers of sustaining weight, the nature of every kind of material used in construction, its power of resistance to strains of every description, to time and to weather, the nature and strength of all cements and mortars, the value of all paints and pigments, he must be proficient in sanitary science, in all manners and fads of heating and ventilation, in all the details of electrical appliances. In a word, he must be master of all the arts and sciences to a certain extent, and then his powers of observation must be limitless; he must foresee against all possible flaws in materials, all willful or unintentional delinquencies on the part of builders; as a consequence he is not profound, his knowledge is encyclopedic and smattering—he can belong to no particular school; in fact we can hardly recognize any such thing as a school in architecture to-day.

Again national characteristics have almost ceased to exist. In the olden times, when travel was rare, national characteristics were developed by isolation from the rest of the world; a pupil followed exactly in his master's footsteps and improved thereon as far as in him lay. If he did travel, what he sought was to improve his own knowledge, and to graft on his own style anything his taste would find congenial to it, not for the introduction of absolutely new and startling effects. He worked in supreme disdain of the multitude; to-day he must please the popular fancy, he must show himself original, even if he must copy from semi-barbarians to appear so.

The multiplication of the process of illustrations also makes us familiar with the work of the world, hence the almost unconscious plagiarism exhibited by the architects of the world, mutually borrowing from each other until we hardly know which is original—at least it looks as if there was a common stock of ideas and designs—the only really original productions of this age being crystal palaces and the tall office buildings, and perhaps I should add the great hotels and the plutocrats' dwellings. When I speak of crystal palaces I include as such the large retail stores—the skeletons which frame the plate glass that displays the wealth of merchandise. These necessitated metal construction, and the progress seemed fair enough till greed and the desire to make the most use of land regardless of the right of neighbors to light and air called into existence the monstrosities of seventeen and twenty stories, now promising to reach out to thirty. Dryden, writing of the column of London, said, "like a tall bully it lifts its head and lies." Now this was a libel on the column; it was the inscription which was at fault; but it can be truly said of the modern building that it is in itself a series of lies—the very perspective which the architect makes is taken from a point about half way up. They surely do not imagine the spectator is going on the roof of a moderate sized building or to hang on to one of the cornices of a sister monstrosity in order to view the building. Lie No. 1. Again, the eyes sees piers of brickwork extending skywards ostensibly to support the building which we instinctively know could not support its own weight; we are told the skeleton construction inside of this is all right, the steel work supports the pier, the pier protects the steel and the whole is fireproof. Lie No. 2. Lie No. 3. The whole frame work depends, for retaining its perpendicular upon being tied together in all its parts. The destruction of a few rivets may mean the toppling over of the whole mass. It is a construction requiring, as in bridges, care and supervision, and sometimes renewal of parts, which, enclosed with brick and cement, it can not have. Liable to corrosion, the damp of water services and waste pipes everywhere will hasten the inevitable work of time; the multitude of wires for electrical purposes adds the danger of electrolysis. Granting such a building may survive its designer, has any man a right to commit murder on the unborn? Have we a right to build to-day that which in after years will probably collapse without warning.

It is true that when we build we are not bound to insure permanency, but we are bound in the name of humanity and morality to build in such a way that our structures shall give timely warning of their decay. Truth requires it. I do not wish to be understood as decrying the use of iron and steel in buildings, but what I do advocate is that this construction be tested by the principles of truth, and that the material be protected by coating with copper or other metals which if it cannot prevent decay, will at least retard it, and further will leave any defects that may come, and, which inevitably do appear in all human work, visible to those who might suffer therefrom. There is no such thing as simplicity. This use of exposed iron or steel would therefore lead to an architecture special to itself, and proportions suitable to such construction.

The other two forms of construction, the grand hotel, and the private mansion of the wealthy man, naturally seek the renaissance in their outward form of expression. The renaissance affords the best opportunity of doing this; it lends itself readily, and is universally, and I think rightly, so employed.

Will architecture emancipate itself from these conditions and how? It will take its proper place in modern history when architects adopt modern methods, and the most prominent of these is specialism. In any part specialism is founded upon the principles of its professors being themselves truthful, that is being prepared to admit that while having some knowledge of all the branches of their art or profession, they excel in one or possibly more than one, at all events in a limited number only, and that while claiming pre-eminence in these only, they will call in the aid and assistance of others in relation to branches for which they have neither the inclination nor the time to devote themselves so fully—and these others in their turn would in a similar way consult the former on their specialties and profit by their advice and assistance. Unless a movement of this kind become general it is almost impossible to have it, as naturally A will not consult B on one point if B be not prepared to consult A on another, as this would be an admission of inferiority on A's part; neither will A and B be prepared to openly consult each other whilst C D E and all others pretend to universal knowledge, and the public, their clients, believe them. The first step must be the formation of partnerships, each member of the firm having his particular forte and confining his attention to it.

This will educate the public to the necessity for specialism in architecture as well as in medicine. In the meantime what can individual architects do towards improving the condition of things, and what course can we recommend to our students? Shall we recommend them to neglect all branches except the one they feel they excel in. By no means, but what I should recommend is that while following the general practice of the all round man in its most useful and ordinary branches, they should develop some point in which they know they can and will excel, for the day of the specialist is coming, and soon the all round man will be regarded as a quack. In the meantime every architect, and everyone aspiring to be such, should follow Carlyle's advice, "Avoid shams," and if there is anything in him, produce it.

Of course in cases where circumstances require a certain style to be followed the architect must try and work out his plans so that they will lend themselves as much as possible to it, but when the architect is at liberty in the choice of style it seems to me that the plan should be first developed and studied to a certain extent, and its peculiarities should in a minor degree govern the choice of style, the major consideration being always suitability to the purposes for which the building is intended. If the building be of such a character that no particular style be indicated or required, I think it much preferable to proceed on one's own judgment, and not attempt any labored work when only simplicity is demanded. But if a certain style be chosen, I think the architect should adhere strictly to it as nearly as possible provided he has chosen to follow the period in which that style has reached its zenith.

If, on the contrary, he has chosen an early transitional period, or one in which the style has shown deterioration, he certainly has the same liberty as had the workers of the period which he has chosen to follow in making changes, but these should always tend to bring his work nearer to the best ideal rather than to still further draw it away. While circumstances may sometimes require the use of transitional or debased styles, I think nothing can justify an architect in adopting for the sake of picturesqueness anything that was originally done merely in imitation of better work by men who were ignorant or untrained. On the other hand for the sake of constructive truth, no one should for the sake of strict adherence to style resort to deception.

There is such a thing as conventional truth, and this should never be violated. It makes one shudder to see in an otherwise pleasing building, a long lintel seemingly composed of a number of stones not only hanging in the air, but supporting sometimes an important pier of the superstructure.

Again we see a rounded corner of a building with a lintel which

we know could not carry of itself, or a stone bay window corbelled out in seeming violation of all principles of the centre of gravity. How much better would it not be in the first place to show the steel beam with an appropriate treatment and painted to match the stone with a slight difference of shade just to show that it is not pretended to be stone; and secondly, what an improvement an oblique arch would be whilst in the last no amount of tieing in with steel work to the interior construction can justify the unnatural projection in the front.

Speaking of truth naturally raises the question, should materials ever be counterfeited, i.e., should an inferior material be made to look like a superior one? I would say, yes, but it must be conventionally true, that is the richer material if preferable must be such as would naturally be in that place; for instance, I see no objection to marbling a column, providing you do not make a monolith such as is not to be found in the world, or if found, could not be quarried, and provided again that a marble column itself would be suitable in the position of the imitation one. We must remember that art is the imitation of nature, and all that is required of it is that it be conventionally true, but a flimsy material should never be placed instead of a solid one where the solid one only would suit; how ridiculous a tin battlement looks on a house. In the first place a street front in the castellated style is out of place; although the law says every man's house is his castle, they are not made to stand a siege of snowballs, about the only use the mock battlements could be put to.

I have touched on some of these details not in a spirit of criticism, but merely to illustrate the fact that in small things as well as great, there is merit in consistency. We cannot always work in great things or in the channels to which our ambition would lead us, but we can take care that what we do shall be conscientiously and carefully done.

MODERN ORNAMENT.

From time to time attempts have been made to develop and foster new schools of ornamentation, and to throw off the tendency to copy older forms and to substitute new and presumably original designs. Although written more than thirty years ago, the following portion of the concluding chapter of Owen Jones' Grammar of Ornament contains much sound thought upon this subject, especially in view of the extending application of Art to household work.

"Although ornament is most properly only an accessory to architecture, and should never be allowed to usurp the place of structural features, or to overload or disguise them, it is in all cases the very soul of architectural monument.

By the ornament of a building, we can judge more truly of the creative power which has been brought to bear upon the work. The general proportions of the building may be good, the mouldings may be more or less accurately copied from the most approved models, but the very instant that ornament is attempted, we see how far the architect is at the same time an artist. It is the best measure of care and refinement bestowed upon the work. To put ornament in the right place is not easy; to render the ornament at the same time a superadded beauty and an expression of the intention of the whole work, is still more difficult.

Unfortunately it has been too much the practice in our time to abandon to hands most unfitted for the task the adornment of the structural features of buildings, and more especially their interior decorations.

The fatal facility of manufacturing ornament which the revived use of acanthus leaf has given, has tended very much to this result, and deadened the creative instinct in artist minds. What could so readily be done by another they have left that other to do; and have so far abdicated their high position, the head and chief.

How, then, is this universal desire for progress to be satisfied—how is any new style of ornament to be invented or developed? Some will say, a new style of architecture must be found, and we should be beginning at the wrong end to commence with ornament.

We do not think so. We have already shown that the desire for works of ornament is coexistent with the earliest attempts of civilization of every people; and that architecture adopts ornament, does not create it.

The chief features of a building which form a style, are first, the means of support; secondly, the means of spanning space between support, and thirdly, the formation of the roof. It is the decoration of these structural features which gives the characteristics of style, and they all follow so naturally one from the other, that the invention of one will command the rest.

It would appear at first sight that the means of varying these structural features had been exhausted, and that we have nothing left but to use one or the other of the systems which have already run their course. Let us not despair; the world has not seen, most assuredly, the last of the architectural systems. If we are now passing through an age of copying, and architecture with us exhibits a want of vitality, the world has passed through similar periods before. From the present chaos there will arise, undoubtedly, (it may not be in our time) an architecture which will be worthy of the high advance which man has made in every other direction towards the possession of the tree of knowledge.

To return to the subject, how is any new style of art or of ornament to be formed, or even attempted to be formed? In the first place, we have little hope that we are destined to see more than the commencement of the change; the architectural profession is at present too much under the influence of past education on the one hand, and too much influenced by an ill-formed public opinion on the other; but the rising generation in both classes are born under happier auspices, and it is to them we look for hope in the future. It is for their use that we have gathered together these works of the past; not that they should be slavishly copied, but that artists should, by an attentive examination of the principles which pervade all the works of the past, and which have excited universal admiration, be led to the creation of new forms equally beautiful.

We believe that if a student in the arts, earnest in his search after knowledge, will only lay aside all temptation to indolence, will examine for himself the works of the past, compare them with the works of nature, bend his mind to a thorough appreciation of the principles which reign in each, he cannot himself fail to be a creator, and to individualize new forms, instead of reproducing the forms of the past. We think it impossible that a student fully impressed with the law of the universal fitness of things in nature, with the wonderful variety of form, yet all arranged around some few fixed laws, the proportionate distribution of areas, the tangential curvature of lines, and the radiation of a parent stem, whatever type he may borrow from nature, if he will dismiss from his mind the desire to imitate it, but will only seek to follow still the path which it so plainly shows him, we doubt not that new forms of beauty will more readily arise under his hand. than can ever follow from a continuation in the prevailing fashion of resting only on the works of the past for present inspiration. It will require but a few minds to give the first impulse: the way once pointed out, others will follow, readily improving, till another culminating point of Art shall be again reached to subside into decline and disorder. For the present, however, we are far enough removed from either stage."

MANUFACTURES AND MATERIALS

GRANITE FOR THE UNITED STATES.

The granite quaries of Messrs Tayte, Meating & Co., at St. george, N. B., from which the red granite is being obtained for the American Museum of Natural History on Manhattan Square, New York, presents an active scene. There have already been shipped 3,500 feet, while other vessels will shortly go forward with further consignments.

Between 55 and 60 men are employed in the quarry getting out the stone and conveying it to the station for shipment. The firm are said to be doing the work which they have in hand in an eminently satisfactory manner. Extra machinery will be put in at once and the output considerably increased. The architect at New York and the port comimssioners have approved of the granite, and it is probable further orders will be placed with the company for the American market.

SLATES AND SLATING.

THE best and most substantial roof known to the architects at present is the slate roof, having at least a square pitch. Such a roof weighs considerably more than a shingle roof, and it also costs a little more, but it is many times more durable.

Some technical terms are used in connection with slating. In England names are used to indicate the size of slate. One 10 × 13 inches being known as a double. Smaller slates are called small doubles. The next larger size is known as plantations; the next size is called viscountess. Sizes ranging from 8 × 12 inches to 10 × 16 inches are called ladies; from 10 × 20 inches are called countesses; up to 14 × 24 inches, which are known as princesses. There are slates that run through all the title of nobility, marchioness, duchess, imperial, and then comes what is probably a poor man's slate, under the delicate title of rags. The noble titles are again resumed, and run queens, empresses, and end with princesses.

In American practice the slates run simply by inches, from 7 × 14 up to 17 × 24 inches. The thickness of slates ranges from 0.125 to 0.3215 of an inch, and their weight varies from two to four and a half pounds per square foot. A square of slating is rated as any other roofing equal to 100 square feet, the gauge is the distance between the courses, while lap is counted as the distance which each slate overlaps the slate lengthwise next below but one. Lap varies from two inches to four inches, and a standard lap about three inches. As above stated, a good slate roof should have about square pitch, but slates should never be put upon a roof which pitches less than one foot in four feet. When it is desired to compute the surface of a slate when laid and the number of squares of slating, subtract the lap from the length of a slate, which is taken as distance from nail hole to tail, and one half the remainder will give length of surface exposed; this, when multiplied by width of slate, will give the surface required.

To ascertain the number of slates required for a square, divide 14,400, which is the area of one square in inches, by the surface obtained above, and the quotient will give the number of slates required for one square. For an example, take a slate 12 × 24 inches; taking a standard lap three inches, the number required for a square will be found by subtracting three from twenty-four, equal to twenty-one, and twenty-one divided by two equals ten and a half inches, which, multiplied by twelve, equals 126 inches, 14,400, the total area to be covered, divided by 126, which equals the area of one slate, gives 114.29 slates required for the square.

Slate weighs from 165 pounds to 180 pounds per cubic foot, and in consequence of lap, it requires an average of two and a half square feet of slate to make one inch of slating. When slate 0.125 inch thick is laid on laths, it weighs 4.75 pounds per cubic foot; when the same is laid on one inch boards, it weighs 7.75 pounds per cubic foot. Slate 0.1,875 inch thick on laths and boards weighs seven and nine pounds respectively. A 0.25 inch slate weighs 9.15 and 11.25 pounds respectively. The thickest kind, gauging 0.3,210 inch, weighs 11.15 pounds and 14.10 pounds on laths and boards.

A slate roof composed of 6 × 13 inch slate weighs 1,680 pounds per square, and requires 480 slates. A 10 × 20 inch weighs 6,720 pounds, and requires 171 slates per square. A 12 × 24 inch slating requires 125 slates, and weighs 4,480 pounds.—Stone.

ROOFING TILES OF WOOD PULP.

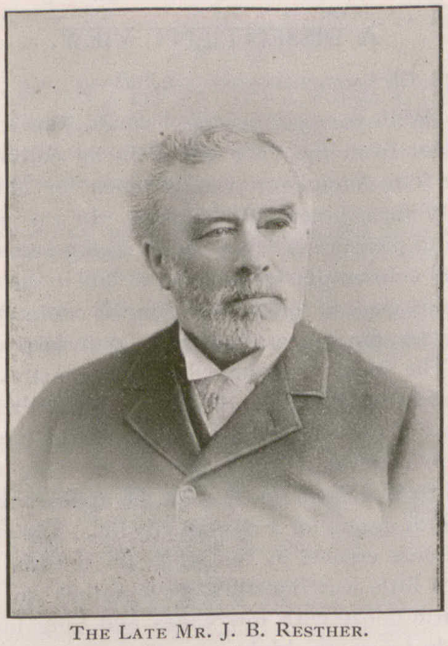
ONE of the latest things in the way of roofing tile is made of wood pulp, the goods being turned out by an enterprising Norwegian firm doing business in Christiania. The roofing material is known as Norway tiles, the pulp under high pressure being formed into thin cakes of sizes similar to ordinary roofing slate. After a chemical treatment, which is the inventor's secret, the tiles become hard like brick, and attain a deep black appearance, which lends itself admirably to give a soft tone to houses with prominent roofs and gables. It is claimed for the Norway tiles that they possess every advantage of the best slate in the market; their composition makes them light and durable, and they are not so liable to breakage as ordinary slate. They are not subject to any expansion or contraction, and when a roof is once covered with this material, it will stand for a good many years without any repairs whatever. Prominent architects in Norway who have had the opportunity to examine the tiles pronounce them superior as to quality, appearance and price, and the insurance companies seem to regard them as a very desirable and safe roofing material.

The town of St. Johns, Que., has granted a bonus of $20,000 to "La Societe Anonyme des Fainciers du Canada," of France. This is the company which has been negotiating for the St. Johns Stone Chinaware Company's potteries, the granting of the bonus practically closing the deal. The terms of the bonus are $2,000 per annum for ten years, conditionally upon the company employing not less than 150 hands for 11 months in the year, with a pay roll of not less than $40,000 a year. It is understood that possession of the property in St. Johns will be taken almost immediately, and that these potteries will shortly be operated on a large scale. The new concern is made up of wealthy and practical men, and their intention is to manufacture, not only ordinary crockery, but a fine class of porcelain ware on a large scale.

The striking carpenters in Buffalo have given information that contractors were importing alien labor from Canada, and the authorities are taking steps to prosecute the offenders.

THE LATE MR. J. B. RESTHER.

THE late Jean Baptiste Resther, architect, of Montreal, Que., whose death on the 14th ult., at the age of 66 years, was briefly noted in our May issue, was born in Montreal, July 17th, 1830. He was the son of the late John Ignace Resther, a contractor of that city, and brother of the Rev. Father Resther, of the Jesuit Order. He received his education in the Christian Brothers school and under private tutors. Mr. Resther, after spending a short time as dry goods clerk, commenced with his father as Clerk of Works for the construction of the Bonsecours Market in 1847. In 1849 he left Montreal for St. Hyacinthe, where he was contractor for the college. He subsequently took a contract for the building of all the stations for the G. T. R., from St. Thomas



THE LATE MR. J. B. RESTHER.

down to Riviere du Loup. While in St. Hyacinthe he was for several years a member of the Council. In 1867 he returned to Montreal, and opened an office as architect, arbitrator and valuator, in which profession he had a large practice. He erected a large number of private and public buildings in and around Montreal, the Exhibition Buildings among others. In 1884 Mr. Resther was chosen first vice-president of the St. Jean Baptiste Association, in which he had always taken a deep interest. He was a leading member of the Architects' Association of the Province of Quebec. He was connected with many important cases of arbitration for the government, railway corporations, etc., in which he distinguished himself.

CHIPS.

A consignment of slates of excellent quality has recently been received in England from Canada.

The organization of a master plumbers' association in Hamilton has been effected. The officers are: Wm. Fairley, president; W. J. Walsh, vice-president; Hugh Wallace, secretary; Adam Clarke, treasurer; Wm. Smith, sentinel.

The president of the Carpenters' and Joiners' Union of British North America recently interviewed the Controller of Customs urging the necessity of reducing the duty upon certain tools used by carpenters and joiners. Some special classes of tools cannot be obtained in Canada, and on these purchasers are obliged to pay a large duty.

At a recent meeting of the local Board of Health at Toronto, the Medical Health Officer informed the board that he intended exercising a personal supervision of the inspection of plumbing, and with that end in view he had given instructions that all applications for inspection must be made at the office, and would be attended to in order of priority. He promised that there should not be any delay in the work, and requested that, if there is any, the matter be reported to him at once.

The old lodge at the west corner of Queen street and University avenue, Toronto, the only survival of four similar structures placed at different entrances to the University and Queen's Park, has been demolished within the past fortnight. It was built by Mr. J. G. Howard, architect and civil engineer, in the year 1832. Its companion, formerly situated on the opposite corner, was torn down some 12 years ago. These two lodges were occupied respectively by Mark Fitzpatrick and George Stacey, who acted as caretakers and gatekeepers at the two entrances.

PERSONAL.

Mr. F. H. Herbert, architect, Toronto, has removed to new offices in York Chambers, 9 Toronto street.

Mr. W. H. Carrick, vice-president of the Gurney Foundry Co., of Toronto, sailed on the steamer Umbria for Great Britain.

Mr. R. C. J. Dunn, architect, St. John, N. B., has removed to new quarters in the Vaughan building on Prince William street.

Mr. Joseph Simmons, builder, of London, Ont., is incapacitated from his duties by a sprained wrist, the result of a fall from his waggon.

Mr. Eugene C. Larose, architect, formerly in the employ of Mr. James R. Brown, architect, of Montreal, has taken up his residence in Ottawa.

Miss Laura Cooper, daughter of Mr. Jos. Cooper, contractor, of Ottawa, was recently married to Mr. Wm. Dewar, of the Canada Atlantic Railway.

Mr. Louis Champeau, a well-known contractor of Montreal, died at Cote des Neiges on the 4th inst., at the age of 72 years. He was taking a rest at his summer cottage.

The wedding is announced of Miss Bertha Wright, of Ottawa, and Mr. Robert Carr Harris, C. E., professor of civil engineering and architecture at the Royal Military College, Kingston.

Mr. C. M. Robertson, secretary-treasurer of the James Robertson Co., Ltd., Toronto, is receiving the congratulations of his friends upon his recent marriage. The bride is Miss West, of the same city.

Messrs. W. J. Burroughes, A. Fiddes and Joseph Wright will look after the interests of the master plumbers of Toronto and the west at the approaching convention in Montreal to organize a Dominion Association.

Mr. James Sinclair, contractor, of Toronto, with his wife and family, have left for an extended tour in Europe. Mr. Sinclair is a native of Sutherlandshire, Scotland, where his presence will by welcomed by his many friends.

A visitor to Winnipeg recently was Mr. J. E. Murphy, of Owen Sound, Ont., vice-president of the Owen Sound Portland Cement Company. His purpose was to introduce his material amongst architects and builders.

While Mr. John Dryan, contractor, of London, was driving on Clarence street, his rig collided with a trolley car, by which he was thrown out upon the pavement. He was rendered unconscious, although not seriously injured.

Mr. John Allen, the well-known contractor of Montreal, has accepted the invitation to represent St. Antoine ward in the City Council, to succeed Hon. A. W. Atwater, who resigned when he accepted the portfolio of Provincial Treasurer. Mr. Allen is an enterprising business man, and has executed many large contracts.

A well-known builder in the person of Mr. James Edgar, of Toronto, is dead. Mr. Edgar had suffered for some time from inflammatory rheumatism, which resulted in this death at the age of 75 years. Mr. Edgar was foreman under Mr. John Worthington at the building of St. James' Cathedral, University College and the forts at Quebec.

A worthy citizen and prominent contractor of Toronto was removed i the death of Mr. Robert Rennie, which occurred towards the close of the month of May. The deceased was born in Aberdeen, Scotland, on March 7th, 1822. In the year 1854 he came out to Montreal, where he lived for a few months and then removed to Toronto, where he has resided ever since. On settling in Toronto he entered into partnership with Mr. G. Duthie, caarrying on business as roofers. After being in business with Mr. Duthie for a few years they dissolved partnership, and Mr. Rennie commenced business in the same line on his own account. About ten years ago his son, Robert B., was taken into partnership, under the name of Robert Rennie & Son. The firm remained in business until about two years ago, when he retired, leaving the business in the hands of his son, who still continues it under the old firm name. Mr. Rennie was noted for his upright business dealings and punctuality. He was a Presbyterian in religion, and a staunch Reformer in politics.

Frank Dean, jr., of Hamilton, Ont., is applying for patents on a brick kiln to burn all hard brick with soft coal. Formerly they have been burned with wood, and in consequence a great many soft brick have to be used in the construction of buildings, soaking up a great deal of dampness as a result.

An Alexandria exchange says that Mr. Borque, the contractor for the new Dominion Reformatory, has commenced the work of laying the walls. A boom derrick for horse power has been erected, and another one is about completed. It is, we believe, intended to dress the stone at the quarry, so that it will be ready for use when laid down at the site of the building.

DOMINION MASTER PLUMBERS' ASSOCIATION.

On July 2nd next there will be held in the city of Montreal a convention of master plumbers of the Dominion, with the main object of forming a Dominion Association. At present local Associations exist at Montreal, Toronto, Halifax, St. John, London, Quebec and other points, the former being the only one incorporated by the government, and capable of entering and defending legal suits as an Association.

The existing Association in Montreal was formed in August, 1884. Previous to that time there existed an Association which was amalgamated with the Contractors' Association as a branch. In the following year an Association was formed in Toronto. These two branches can justly be said to be the father of the present movement for the formation of an Association representing the Dominion, and it is pleasing to know that the promoters have received every encouragement and hope that their efforts will be crowned with success.

All the preliminaries in connection with the convention have not yet been arranged, but from a number of cities and towns word has been received that delegates will be sent. The local Associations will be maintained as at present, and where possible new ones organized, by whom all local questions will be considered.

The Dominion organization will grapple with such questions as affect the trade generally, and by its means it is hoped to accomplish many needed reforms in the plumbing by-laws of the various cities which will ultimately result beneficially to the public at large.

It is the intention to amalgamate with the Master Plumbers' Association of the United States.

It is claimed that too often the persons who comprise the Board of Health in our cities are men entirely unfitted for the position, with little knowledge of the duties which they are called upon to perform.

Such being the case, the plumber is often called upon to execute work in a manner which he knows to be defective, but which he is, nevertheless, obliged to carry out.

It is hoped the master plumbers will be successful in organizing a strong Association which will be the means of raising the status of the trade and also prove a benefit to the public at large.

A DISSENTIENT VIEW.

To the Editor of the CANADIAN ARCHITECT AND BUILDER.

SIR,—With your permission I would like to express my dissent from the view stated in an editorial paragraph in THE ARCHITECT AND BUILDER for May on the subject of farm house architecture. In the paragraph referred to pleasure is expressed at seeing pressed brick, plate and colored glass employed of late in the construction of this class of buildings. On the contrary, I think it a matter for regret that such materials should be used. The ideal farm house is one constructed with local materials and in a style as far removed as possible from that of the city residence. It should have an air of homely comfort. Nothing is to my mind more out of place than a farm house with the appearance of having been designed for a 25-foot city lot. I have in mind such a house erected by the M. P. for a rural constituency. A little way distant from it stands an old fashioned farm house with low eaves and long facade and verandahs facing the highway. The contrast is strongly in favor of the older house. The practice of importing city houses into the country should be discouraged.

CITY ARCHITECT.

PAGES

MISSING