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A New Danger.

THE theory has been propounded, and from its reasonableness, has met with considerable favor, that the settlement of the east wall of the Masonic Temple building at Chicago is due to the jar caused by frequent and abrupt stopping of the elevators, sixteen in number, which are ranged along the greater part of the extent of this wall. It is contended that these elevators, more particularly when descending, act as weights suddenly applied. This action in the case of a building of extreme height, erected on defective soil like that of Chicago, would seem to be likely to have an injurious effect upon the construction.

Disintegration of Surface of Brick.

IT is quite a common thing to see the appearance of brickwork marred by scaling of parts of the surface of the bricks. In northern climates such as that of Canada, this scaling is often the result of expansion due to the action of frost—especially in the case of porous, soft-burned bricks, which easily absorb water. Other causes assigned are: Lime in the clay of which the brick is composed; want of care on the part of the manufacturer in connection with the damp course, resulting in the accumulation of moisture behind the surface of the brick; and the presence in the brick of hard pellets, the rate of expansion of which differs materially from that of the other constituents. If the clay is properly pugged while in course of manufacture, few of these mischief-working pellets will find their way into the finished article.

Architectural Competitions.

REFERRING to the expose', in our last issue, of the methods which are being adopted by public bodies in Canada to secure from architects plans for public buildings at a fraction of their legitimate cost, we observe that a case of much interest to architects is now before the American Courts. A competition was instituted for designs for a county court house at Passaic, New Jersey. The building committee obtained the services of Professor Ware as expert adviser, and owing to this fact a large number of architects of good standing entered the competition. The committee, evidently with the object of favoring local architects, disregarded the recommendation of their adviser and awarded prizes to competitors whose designs were not considered by Professor Ware to be entitled to rank above the second or third class. The architects whose designs were selected by Professor Ware have entered a joint action for damages in the

Courts, and it is probable that should an adverse decision be given in the lower Courts, the case will be carried by appeal to the Court of highest resort. The architectural societies of the United States are very properly being urged to support the architects who have entered this action and contribute to the costs, in order that the rights of architects in competitions may be legally established.

Retirement of Mr. Thos. Fuller.

THE news of the retirement of Mr. Thos. Fuller from the position of chief architect of the Public Works Department, was received with regret by all who enjoy that gentleman's acquaintance. This regret is intensified by the fact that his superannuation allowance has been fixed at a much smaller sum than he is entitled to receive. When Mr. Fuller accepted the position of chief architect, it was with the understanding that whenever he should be superannuated, ten years would be added to the period of his occupancy of the position, and his allowance calculated accordingly. This agreement was made in accordance with section 4 of appendix No. 2 of the Act respecting the superannuation of persons employed in the civil service of Canada, which reads as follows :—

"The governor in council may, in the case of any person who entered the civil service after the age of thirty years, as being possessed of some peculiar professional or other qualifications or attainments required for the office to which he was appointed, and not ordinarily to be acquired in the public service, add to the actual number of years' service of such person, such further number of years not exceeding ten as is considered equitable for reasons stated in the order-in-council made in the case ; and such additional number of years shall be taken as part of the term of service on which the superannuation allowance of such person shall be computed ; and the order-in-council in any such case shall be laid before Parliament at its then current or next insuing session. 46 V. c. 8, s. 3."

Unfortunately for Mr. Fuller, no written or printed record was preserved of this condition of his agreement, and notwithstanding the fact that Sir Hector Langevin, who was Minister of Public Works at the time the appointment was made, has written a letter vouching for the fact that such was the nature of the understanding between Mr. Fuller and the government of that day, the present authorities refuse to recognize the agreement. Under these circumstances Mr. Fuller will be forced to bring the matter up in Parliament, where it is to be hoped the justice of his claim will be recognized.

A New Method of Cleaning Iron.

IN New York and at the Brooklyn Navy Yard, tests have recently been made of the application of the sand blast for the purpose of cleaning iron prior to painting. The apparatus used consisted of a Blake blowing engine and receiver for compressed air and a sand mixer with flexible pipes connecting to the receiver and a working nozzle. The engine was operated at 100 lbs. pressure from the boiler of a road rolling machine. The gauge showed a pressure of from 18 to 20 lbs. of air. The air at this pressure was forced through the mixer and, taking up the fine natural sand therein contained, forced it through a 2½-inch hose thirty feet in length and ¾-inch nozzle upon the surface of the iron at a distance of about six inches from the iron. By this method a steel column was cleaned at the rate of nearly two square feet per minute, one-tenth of a cubic foot of sand being used per square foot of surface cleaned. By the same method 25 square feet of the bottom of an iron vessel in the Brooklyn Navy Yard was cleaned in about six minutes. The estimated cost in the case of the New York test, on a viaduct, was from three-quarters of a cent to one cent per square foot. It is thought that this might be considerably reduced by reducing the amount of scaffolding. The sand blast is said to remove paint, etc., without having any appreciable effect on the solid steel, the surface treated being cleaned of every particle of paint, rust, grease, etc., and the metal being left bright and clear, exposing even the cavities, irregularities and pitting, and edges of cracks and joints being penetrated beyond the limit of accessibility by the brush. The method is said, however, to be very destructive to stone, brick, cast iron, or other crystalline substances.

Canadian Cement.

WE are pleased to observe that the Dominion government recently awarded a contract for 20,000 barrels of Canadian native cement. The quality of both the native and Portland cement manufactured in Canada has been proved beyond question, consequently no satisfactory reason can be given for the large yearly purchases of foreign cement which have hitherto been made by the government for use in Dominion public works. Because of the partiality thus shown for the foreign article, the Canadian cement manufacturing industry has to a large extent languished and proved unprofitable. An English contemporary, the Builders' Reporter, in discussing this subject in a recent issue, has obtained an entirely wrong view of the situation, and in consequence, makes improper deductions, as follows : "Canada has to depend mainly on imported cement. During the year 1895, out of 255,000 casks which were used no less than 223,000 casks were imports. England supplies about 45 per cent. and Belgium 25 per cent. Up to March, 1866, the duty was 20 per cent. of the value, now it ranges from 33 to 52 per cent. In some cases the duty is found to exceed the cost of the cement. In consequence, an immense quantity of inferior cement is employed in Canada, and ordinary mortar is substituted for cement. Protection may have its advantages in a country like Canada, but if within a few years bridges on railways and roads and other public works can no longer exhibit sound masonry, the cost of repairs will be more than an equivalent for any gain derived from an excessive tariff. If Canada cannot produce cement there is no native industry to be protected, and therefore, for the sake of a fiction, the country is saddled with the expense of upholding a kind of construction that would not be tolerated in Great Britain." Our contemporary is entitled to pardon for having assumed that the large importations of foreign cement were due to the fact that Canadians did not know how to manufacture the article in a satisfactory manner. The large extent to which foreign cement has been used in our public works would naturally convey this impression to the mind of an outsider. There is, however, no ground for the conclusion—on the contrary, recent tests have shown the home-manufactured article to be superior in some instances to the imported one. We are pleased to see that the present Dominion government has shown a disposition to recognize this fact. There is abundance of the requisite material in Canada for the manufacture of both native and Portland cement. As the result of experiments carried on for a number of years, the requisite knowledge of methods has been gained, and if assured that the merits of the home article will in future receive fair consideration, we have no doubt that the number and capacity of

the Canadian manufactories in this line would be increased to the extent necessary to meet all the demands of the market. This, in turn, would lead to further investments of capital in the industry, larger employment of skilled and unskilled labor, and the circulation at home of the large sums of money which have hitherto been yearly sent abroad to purchase the product of foreign manufactories.

The Canadian Architects' Bill.

THE Select Committee of the Legislature to whom was referred the Bill to amend the Ontario Architects' Act, have reported thereon as follows: "The Committee have carefully considered the Bill to them referred, and having heard the opinions of several persons for and against the Bill, feel compelled to report against its provisions. Several suggestions were made by way of amendment to the Bill, looking towards elevating the educational standards of the Architects' profession without increasing the present powers of exclusion, and looking rather to an adoption by Collegiate or Governmental machinery of a curriculum and examination for admission. The Committee desires to express no opinion on these subjects, deeming the session to be too far advanced for their proper treatment, but prefer to leave the whole subject, so far as the educational side is concerned, wholly unprejudiced by the present action of the Committee, which has relation only to the Bill as it stands." The Architects' Bill is coming to be regarded as an educational measure, which it precisely is, and on this ground it received the support of the Trades and Labor Council of Toronto. It is possible that the government may see fit to submit a measure of this character at the next session of the Legislature, but there is at present no foundation for a definite statement as to future action on the part of anybody in the direction of endeavoring to improve the educational standards of the coming generations of architects. The Ontario Association of Architects have certainly labored long and earnestly for this object, and earned the thanks of the students, whose welfare was the mainspring of their efforts.

AYLSWORTH VS. ROWAN.

THE suit of Aylsworth vs. Rowan, which recently came before the County Court at Toronto, possesses some points of interest for architects. To give the facts of the case without printing the evidence in full would be somewhat difficult, and might inflict injury upon one or both parties to the suit. We will therefore refer briefly to some of the principal points brought out. The suit was entered by Mr. M. B. Aylsworth to recover from Mr. T. A. Rowan the sum of $200 for the preparation of preliminary sketches for a pair of houses. The parties to the suit were brought closely together by business dealings, and the evidence submitted by the plaintiff was that he had prepared sketches at the solicitation of Mr. Rowan, who intended to build in the near future, but who at the time had no property. These sketches remained in Mr. Rowan's office for some time, but were finally returned to Mr. Aylsworth. It was claimed on the part of the defence that Mr. Aylsworth prepared the sketches entirely on his own responsibility, with the hope that they would be adopted in case Mr. Rowan decided to build. In support of this claim it was argued that defendant was not at the time in a position to build, and, not having any property, would not authorize an architect to make plans for a house. The evidence was somewhat contradictory, and the jury returned a verdict against the plaintiff. A strange ruling in connection with the case was that the court refused to accept the entries which Mr. Aylsworth had made in his books regarding the work—in fact, he was not permitted to refer to them in any way. The judge, in his address to the jury, while not recognizing the tariff of fees as adopted by the Ontario Association of Architects, nevertheless based the sum to be charged for the work thereupon, and instructed the jury, in case the decision was in favor of the plaintiff, to bring in a verdict for the amount asked. The evidence submitted proved beyond any reasonable doubt that the practice of preparing plans without any definite understanding as to payment therefor was altogether too prevalent in the architectural profession, and also that of late years it has become the custom of some architects to submit sketches on speculation without solicitation, in the hope of inducing persons to build and to adopt the same. This latter fact rather prejudiced the case of the plaintiff in the above action. Some years ago, in case of a dispute between architect and client, the production of the plans was usually considered ample proof that the architect had received instructions to draw the same, but these conditions have now been changed by the keen competition to obtain commissions. In view of the above facts, we cannot too strongly urge upon architects the wisdom of obtaining written instructions before proceeding with the preparation of plans, thereby removing the possibility of a dispute or misunderstanding. The desire of architects to obtain work has no doubt in the past caused them to evade as far as possible the mention of terms to their client, fearing that by so doing they might lessen their chances of being employed. As every architect expects to receive remuneration for his services, he should have the courage to state in a business-like manner the sum to be charged for the work. The method adopted by some architects, and which we commend to the consideration of all, is, after receiving instructions to prepare plans for a certain building, to write a letter to the client indicating the sum to be charged under different conditions—for instance, a fixed sum for carrying out the entire work, and in case the building is not erected, the charge for preliminary sketches, plans, specifications, etc. By this means legal suits might be avoided, which are unprofitable to the participants and disparaging to the profession.

The Toronto Guild of Civic Art has been incorporated by the Ontario government, with a capital stock of $2,000. The object of the guild is to promote and encourage art, to arrange for the execution of works of art by competent artists to be chosen by competition or otherwise, and to hold exhibitions of architectural and stained glass designs, mural decoration, etc. Among the promoters are Messrs. Frank Darling and W. A. Langton.

In India a composition is often employed for protecting the stucco and plaster work exposed to the weather, consisting of 3 parts of linseed oil boiled, one-sixth of its weight of litharge, and 1 part of bees' wax. The surface to be treated must be perfectly dry and clean before the mixture is applied, which should be laid on hot with a brush.

"CERAMIC STONE."—The name of "Ceramic Stone" has been given by M. Garchey, a French inventor, to a new building stone obtained by him from broken glass. The glass—broken bottles, window panes, etc.—is reduced to powder, different kinds are mixed if a variegated color is desired, and the pulverized material is devitrified by passing successively through two furnaces, the second one being of high temperature. The pasty mass is then passed under a press, which gives it shape and consistence.

GOTHIC ARCHITECTURE IN NORTHERN ITALY.*

By A. C. Hutchison.

To understand Gothic architecture as practised in Northern Italy during the thirteenth and fourteenth centuries, and to be able to judge of its successes and failures when compared with the architecture of the same period as practised north of the Alps, it is essential that we understand the architectural environment of the Italian people.

As early as the latter half of the seventh century a style of architecture made its appearance at Pavia and elsewhere in which features of construction and design mark it as distinct from the debased Roman architecture previously practised.

Owing to the disturbed condition of the country during the dark ages the new style made little progress, and it was not until the eleventh century that buildings of importance in the style were erected, but during the eleventh and twelfth centuries it held complete sway in every part of Northern Italy except in Venice, which, from its insulated position and intimate commercial intercourse with Constantinople, sought its architectural inspiration from the east rather than from the west.

One other exception to the universal practice of the style is the Church of San Miniato in Florence, and in some other buildings in that locality, where we find a return to a more classical style.

As this style was the immediate predecessor of the Gothic, and as some of its features were adopted by the Gothic architects, it will assist us in our study of the Gothic style of Italy if we briefly glance at some of its more prominent characteristics.

Before the advent of the Gothic style all the architecture practised, not only in Northern Italy but also north of the Alps, was characterized by the use of the round or semi-circular arch, but though this important feature was common to the architecture of Italy, France, Germany, England and Scotland, each country employed it in such manner and in conjunction with other features, as to give to it more or less of a national character. The national character of this round arched architecture, while strongly marked, particularly in Germany and England, was, if possible, more marked in Italy, where it was practised in a style entirely different from the contemporary style as found on the north of the Alps.

The round arched style which prevailed throughout Northern Italy before the introduction of the pointed arch, is known as Lombard architecture, not that the Lombards who had established themselves in the land about the end of the sixth century had any architecture or produced any style of their own. They were, however, great builders, and there is little doubt that in the erection of their earlier buildings they employed native workmen who, knowing no other style than debased Roman architecture, would work in that style; but gradually under Lombard influence new features were introduced which in course of time produced the style to which their name is given.

During their sway, which extended over a period of about two centuries, the land was studded with churches and baptistries erected under the auspices of their kings and queens.

Nearly all the buildings erected by them during the seventh and eighth centuries have disappeared; a few, however, remain as examples of their work, the more notable being San Michele of Pavia, San Friediano of Lucca, and San Ambrogia of Milan.

The Baptistry of Florence, it is claimed, was erected during the Lombard dynasty, but if this was the case it does not possess the characteristics of the style that marks the buildings I have named.

From the few examples of the early Lombard style which remain to the present day, we can see the change in the proportions of columns and piers; the introduction of wild and grotesque imagery in their ornamentation of capitals and walls, that mark the style as distinct from the Roman.

During the two centuries which followed the rule of the Lombards, Italy was in such a disturbed and unsettled condition that little or no progress in art was made, the erection of churches ceased and only buildings required for defence were undertaken. During this period Genoa and Venice, somewhat apart from the scene of strife and rising in importance as maritime powers, were able to proceed with erection of buildings. In Venice, towards the end of the tenth century, the erection of the well-known St. Mark's was begun. Owing to the intimate commercial relations with the East, Greek architects were employed, with the result that in this city of the sea we have an independent development in architecture of a complex character that marks it as distinct from that of Italy.

* Paper read before the Province of Quebec Association of Architects.

As the development of the early architecture of Venice is foreign to my subject, I will pass it by, and returning to the mainland we find that the darkness which had enveloped the land during the ninth and tenth centuries began to break and give place to a new era of activity in building. During the eleventh and twelfth centuries a number of buildings were erected superior in size and skill in construction to any that were built during the time of the Lombard rule. These buildings are marked by the leading features which characterized the early Lombard buildings, but in addition we find new features introduced that gave the style a step in advance and prepared it for the advent of the Gothic.

An examination of the work of this period will show that the uncouth and grotesque carvings which characterized the early Lombard buildings has given place to figures and groups in low relief of somewhat better workmanship but still crude in design.

The most conspicuous feature that marks the buildings of this period is one that stamps the Italian character upon the round arched style as practised in Italy, and serving to separate it distinctly from the contemporary architecture north of the Alps. This distinctive feature of Italian buildings was the piling of tier upon tier of decorated arches differing from each other in design, and occupying the whole facade of the building to its very summit. The most notable examples of this arrangement are to be found in the churches of Lucca, but one that is better known to most travellers is the facade of the Duomo of Pisa.

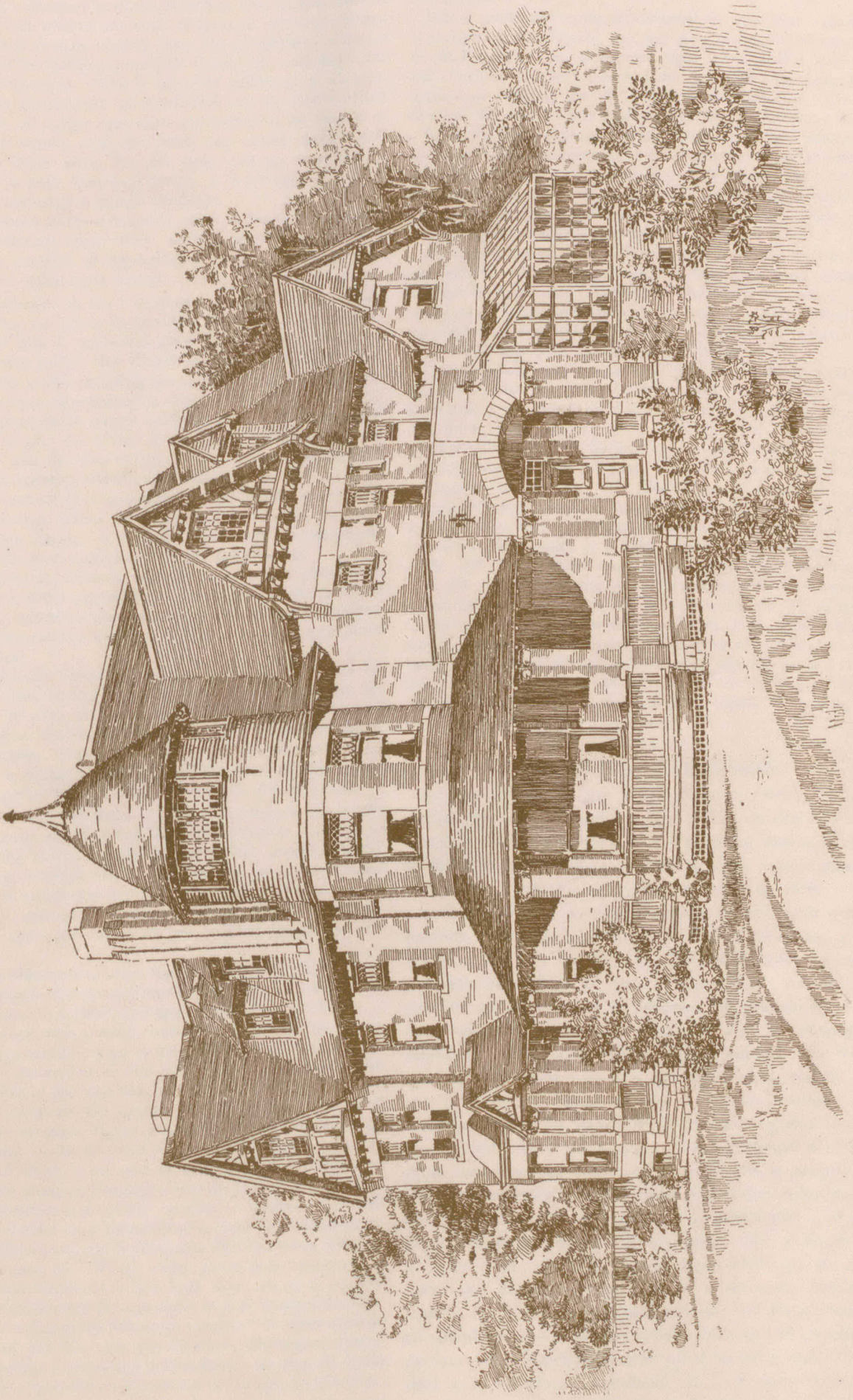
Another feature introduced at this period, which always found favor with the Italians, and which they continued to practice during the whole of the Gothic period, was the use of material of different colors in the construction of the walls and piers; sometimes it was applied to the outside of the building, sometimes to the inside, and sometimes to both outside and inside. Usually the polychromatic effect sought for was obtained by the use of marbles or stones of different colors arranged in alternate courses.

I might mention other features that characterized the later Lombard buildings, and which, adopted by the Gothic architects, influenced them in their designs. These features I will be better able to describe when the views of the buildings are projected on the screen. It was not until the first quarter of the thirteenth century had passed away that the pointed or Gothic style made its appearance in Italy, and when it did make its appearance in the first building erected in the new style—that of San Francesco at Assisi—we find it complete in its forms and details as then practised in the North. It appears that when the erection of the building to receive the mortal remains of the great St. Francis was determined upon, there was no architect of celebrity in Italy, and Elias, the favorite disciple of St. Francis, to whom the work was entrusted, obtained the assistance of a German architect named Jacobus. It was only natural that he should recommend and use the style of architecture then practised in his own country, with the result that in the crypt and in the interior of the upper church we have a style of architecture quite distinct from anything that preceded it in Italy. It is true that long before this time the pointed form of arch was frequently used as a constructive feature in the architecture of Sicily; its use there was no doubt owing to the influence of Saracenic art, which, along with Byzantine and Norman architecture, produced a strange combination that gives so much interest to the mediæval buildings of that island. Though the pointed arch was thus used in Sicily, it did not in any way affect the architecture of Northern Italy; as I have already shown, it was introduced from north of the Alps. As soon, however, as it obtained a footing in Italy, it supplanted the earlier round arched styles, and the Italian architects were obliged to conform to the new style.

From the fact that it was an importation from a foreign country, and was in a sense imposed upon the Italians whose love for the round arched styles was deeply rooted, it follows that we cannot in Italian buildings trace the gradual development from the round to the pointed arch as we can in France and Germany, aud more particularly in England, where in many buildings we may mark the first use of the pointed arch in conjunction with the round arch. The struggle for supremacy between the old round arch and the new pointed arch in England was protracted, with the result that between Norman Architecture characterized by the use of the round arch and the massive proportions of its piers and arches, and the Early English period when the pointed style was supreme, we have a well defined transitional period that affords a most interesting study.

In Italian architecture there is no such transition period; when the Gothic was introduced it at one supplanted the Lombard style, and though the Italian architects never hesitated to use the

CLUB HOUSE OF THE VICTORIA YACHT CLUB, HAMILTON, ONT.
A. W. PEENE, ARCHITECT.



RESIDENCE AT MONTREAL.—R. FINDLAY, ARCHITECT.

round arch in connection with the pointed when it suited their purpose to do so, there is no building that I know of in which the change from one style to the other is defined as it is in buildings in the north.

As already remarked Gothic architecture was an importation; the pointed arch which is the basis of the style was not an Italian invention, and though used by them, the possibilities of its use (except in a few buildings) were not developed as we find in the buildings of the north. This is not to be wondered at when we consider the environment of the architects of the Gothic period in Italy—on all hands they were surrounded by the remains of Roman architecture, with the result that classic thought and design was never dead, but only slept, and was ever ready to assert itself in some feature or design, or in the appropriation of ready-made materials of ancient buildings.

The designers of the cathedrals north of the Alps were under no such influence—they knew nothing of classic art, and pursued the practice of the Gothic, working on without a suspicion that any other style existed.

As an illustration of this, I remember some years ago examining some fine old glass in Litchfield Cathedral; in one of the panels there was a representation of the building of Solomon's Temple; in this picture the Temple is shown as a great Gothic cathedral, the artists who designed it probably never suspecting that it might have been in another style.

The vital principle of classic architecture is horizontal, that of Gothic is vertical; one is that of the column and lintel involving the idea of rest, the other is that of the arch, the flying buttress and pinnacle, involving the idea of life and motion.

The two ideas are directly opposed to each other; the moment classic architecture admits the arch it ceases to be true to itself in any real artistic sense; on the other hand if it refuses to use the arch it confines itself within limitations of construction.

Unfettered by any classical restraint the architects of the north carried the use of the pointed arch to its highest perfections, and in their great cathedrals have left us examples of skill in scientific and artistic construction which, though often imitated, have never been surpassed.

Italian architects on the other hand were always under restraint, and while forced by the fashion of the time to use the pointed form of arch, they were never able, except in a few instances, to do so with the boldness and skill of their contemporaries of the north. They often employed it for mere ornament, and in many instances in so faulty a manner that the arches had to be held together with iron ties from the day of construction.

While the Italians here failed to produce buildings in the Gothic style of the purity of design and skill in construction that are to be found in the north, they have, nevertheless, executed many noble buildings in which we can study their successes and failures in dealing with a style that was not indigenous to the country and in which they endeavoured to reconcile the principles of two styles that are far apart, and which we are inclined to consider unreconcilable.

Besides the influences to which I have already referred, there are other two which we find more or less strongly marked in mediaeval work—these are, first, local, and second, personal influences.

Local influence was a natural result of the division of the Italian people into two hostile camps of the Guelfs and Ghibelines; the adherence to one faction or the other not only kept the cities apart, but often at war one with the other. When we consider the disturbed condition the country was in, in consequence of these quarrels, we might expect to find art retarded and incapable of development—on the contrary, however, we find that progress was made, but owing to the lack of community and freedom of intercourse, the principal cities developed the Lombard and Gothic styles of architecture in a manner peculiar to themselves. Thus we have well defined local characteristics of the Lombard style at Pisa and neighborhood, and of the Gothic style in Venice, Verona, Bologna, Florence, etc. These cities, along with others which might be named, became at a later date local centres or schools of painting, each marked by treatment of their subjects peculiar to the great masters of the respective schools. We thus have in the domain of the fine arts the Venetian, Florentine, Pisan, Milanese and other schools, and in like manner we have the local characteristics of the respective cities marked in their architecture.

The personal influence exerted by individual architects is more marked in Italian buildings than in those north of the Alps. In the great cathedrals of France and England the names of the designers is in most cases unknown, but in Italian architecture individual names are brought prominently before us.

Among the more prominent I may mention Arnolfo, son of the German architect whom I have already referred to as giving the design for the first Gothic building in Italy. Arnolfo's name is associated with the great duomo and the church of Santa Croce in Florence.

Pisa, a celebrated centre of mediaeval art, sent forth a number of sculptors and architects, but her most distinguished son was Nicola Pisano, whose sculptures adorn the cathedral at Sieana and Orovietto, and who furnished the design for San Antonio at Padua and probably for the cathedral at Orovietto. His son Giovana was scarcely less distinguished than his father.

In the following century Giotto, distinguished as a painter as well as an architect, constructed buildings in the Gothic style of which the campanile of the duomo is, at Florence, the most distinguished example. These men, with others I might mention, not only impressed their individuality upon their works, but formed centres or schools of design.

Apart from the local types of the Gothic style and the personal influences to which I have alluded, we have occasional buildings in which local influence is not evident and where the design is so unlike other Italian buildings as to suggest foreign influence; the most notable example of this influence is found in the greatest of all Italian buildings, the Cathedral of Milan.

I might go on to mention in detail features of Italian buildings that attract the attention of the traveller who has previously visited the great cathedrals of the north, and who at once realizes that he is in a different art atmosphere. He will notice the absence of buttresses on the flanks of the buildings, the absence of flying buttresses, the small size of the windows and the absence or meagerness of tracery with which they are ornamented, the absence of colored glass, the absence of triforiums over the nave arches and the meanness of the clerestories. He will notice how columns are used singly or in pairs—and the use of colour on the walls. Of these details time forbids me to speak, but before closing I will mention one material used in the construction of Italian buildings that meets us at every stage in our study of Gothic architecture, that is bricks and terra cotta. Italian brickwork is remarkable for the skill shown in the use of what we are inclined to deem an inferior material in the elaboration of arches, tracery, cornices and mouldings, but as this is a subject somewhat foreign to this paper, and one that requires an evening for itself, I only refer to it.

STRENGTH OF COLUMNS.

If the fibres in any material body were exactly rectilinear, so that a rod being placed on one end in a vertical position, no one of the particles were opposite to the intervals between any two in a transverse section below it, it might be conceived that no force compressing the rod in the direction of its length would produce any other effect than that of diminishing its length. But as we find that all bodies when so compressed may be bent and finally broken, such a disposition of the particles is destitute of probability. In fact, when a pillar is compressed by a great weight above it, either the fibres already curved have their curvature increased so that the whole pillar bends, or the particles in some of the transverse sections are forced outwards by lateral pressures arising from those above and below their intervals being thrust between them, and then the pillar swells on its whole periphery. The consequence in either case is that the cohesion of longitudinal fibres is impaired or destroyed, and the pillar is at length broken or crushed. The strength of a pillar when so compressed must evidently depend upon the number of particles in a transverse section, that is, upon the area of such section, but since besides the displacement of those particles from the longitudinal pressure their lateral cohesion must be overcome before they can be thrust outwards, it is evident that the strength is not proportional to the area simply, but to some function of that area. No law on which any dependence can be placed has yet been discovered for the strength of a pillar in such circumstances.

THE BUILDING OUTLOOK.

INFLUENCED by the general depression in business, the building trade in Canada has for some years been in a state of inactivity, and much below what might be expected in a young and vigorous country. As each year passed by, it was hoped that the worst had been encountered, yet the season of 1896 proved to be one of the least prosperous. The unsettled condition of the country politically, and the uncertainty with regard to the tariff both in Canada and the United States, had a depressing effect, and many buildings which would otherwise have been erected still remain in a embryo state until the action of the government is made known. The low rentals obtainable in many of the larger cities offered little inducement to speculators, and consequently a few office buildings constituted the major portion of construction.

With the object of learning as far as possible the conditions likely to prevail in the building trades during the approaching season, letters were dispatched by the publisher of the ARCHITECT AND BUILDER to architects in the different cities, asking their opinion of the outlook. The replies received, although pointing out that many projected works are yet in an unsettled state, and may or may not be proceeded with, afford some degree of encouragement. It is generally conceded that little change will be made in the tariff by the government, and the official announcement of this fact will be certain to stimulate building operations and restore confidence to business in general.

In Toronto, the new building at the north-west corner of Yonge and King streets is perhaps the largest yet arranged for; the plans are being prepared by Messrs. Darling & Pearson. A large hotel and several other buildings of some prominence are spoken of, but are not yet regarded as certainties. The renovation and remodelling of office buildings is likely to account for a considerable expenditure, as the owners will be compelled to improve their properties in order to retain their tenants. Montreal architects report the season to be opening up somewhat brighter than last year, with several undertakings hanging in the balance. The towns adjacent to Montreal are apparently more prosperous. In the city of Ottawa the prospects for building operations are decidedly encouraging, a number of recent fires having assisted in this direction. The rebuilding of the departmental block and the new building of the C. Ross Company are the most important works now under construction. The addition to the Protestant hospital and a proposed opera house will reach in value $100,000, while other buildings equally costly are either under way or contemplated. In western Ontario architects do not take a discouraging view of the future. A $60,000 hospital is talked of at London, and two buildings of good size will be erected in Hamilton. The bulk of the work in the latter city, however, will consist of residences and alterations to existing buildings. In the vicinity of Stratford a fair amount of building is reported, and at Owen Sound elevator and flour shed extensions comprise the main work.

Very few large buildings are likely to be erected this year in Manitoba and British Columbia. A large university building will probably be built at Winnipeg, at a cost of $60,000. In the Pacific coast province the cheaper class of buildings promise to predominate particularly in the vicinity of mining operations. From the maritime provinces favorable reports are received.

No small amount of material and labor promises to be utilized in 1897 in government work, the appropriation made by the Dominion parliament for canals alone reaching five million dollars. Comparing the situation with past years, we think there is a fair prospect of an improvement in building during the present season.

BY THE WAY.

AN interesting decision was given by the Court of Appeal at Montreal the other day. A stone cutter named Jacques Perrault sought to recover damages from the Stonecutters' Union, alleging that he had been deprived of his employment by reason of the refusal of the officers and members of the Union to work with him. At the first hearing the case was dismissed, but the Court of Review, on appeal, awarded the plaintiff damages in the sum of $137. This decision has now been reversed by the Court of Appeal, thus affirming the right of the members of the union to refuse to work with a non-union workman. It should be mentioned, however, that the decision was not concurred in by two of the judges before whom the appeal was argued.

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FROM the past and present condition of some of the gaol buildings in Canada, it might be inferred that the county authorities are of the opinion that the health of a prisoner is a matter of little or no consequence—in other words that anything should be good enough for a "gaol bird." Many persons regard the matter in a different light, however, and properly maintain that neglect to provide conditions conducive to health should not form part of the punishment meted out to prisoners. Holding strongly to this view, I note with pleasure that the Inspector of Gaols, Prisons and Reformatories for the Province of Ontario reports that considerable improvement has been made by many of the County Councils throughout the province in remodelling, repairing and furnishing gaols during the past year, and greater attention has been given to their ventilation, drainage, heating, lighting and water supply. The inspector adds that much yet remains to be done in this direction, and intimates that some of the derelict counties are financially well able to remodel or rebuild their buildings.

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IN Scripture we are told that no sensible man commences the erection of a building until after he has first counted the cost and carefully considered the condition of his bank account. Some individuals and public bodies overlook this very necessary preliminary procedure, and plunge right into the enterprise, trusting to chance or Providence to help them out. Such persons bring ridicule upon themselves by their lack of sound judgment. Public bodies seem to make blunders of this character quite as frequently as private individuals, and their undertakings being a rule on a larger scale, their mistakes are more conspicuous. In France, we are told, owing to the state of the national finances, many public buildings stand in an uncompleted condition, and so surrounded by scaffolding as to be almost concealed from view. The Arc de Triomphe, in Paris, was thus obscured, until the recent visit of the Czar, when the sense of national pride caused the scaffolding to be removed. Some years ago it was discovered that the statues which adorned the

upper part of the second court of the Palais-Royal were in danger of falling, and it was decided to repair them, for as the works of Pagou and Gerard they are worthy of preservation. Apparently there is no money to pay for cement, and in consequence the timbers are decaying. In the United States and Canada we are quite as ready as Europeans to undertake beyond our means, but our method of doing things is somewhat different. Instead of stopping the work on a public structure until funds are available for its completion, we go ahead and finish the work with borrowed money, for which we pledge the credit of future generations, thereby escaping the ridicule which would come upon us were we to follow the French practice.

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SINCE the microbe theory became an accepted fact in medical science, we have learned to believe that we are beset on every hand by unseen dangers. It is undoubtedly matter for regret that there are so many intelligent persons who refuse to recognize a danger which is not discernible to the naked eye. The recognition of the germ theory, for example, would lead to more careful attention to health requirements in the matter of plumbing, ventilation, etc. On the other hand, one cannot but feel in a measure thankful that people are not easily frightened by hidden causes of danger; if it were otherwise many nervously constituted persons would be in a state of continual worry in their efforts to shield their health and that of friends against invisible foes. Notwithstanding the numerous quarters from which we have been lead to expect an attack from these foes, it is somewhat surprising to be told that recent examinations in Germany prove that bacteria flourish exceedingly in certain building stones—even those which are non-porous in character. In consequence of this discovery it is recommended that only non-porous stone, such as granite, should be used in hospital construction. I do not imagine that the publication of this item will seriously affect the stone market, notwithstanding that the alleged discovery comes from Germany.

ILLUSTRATIONS.

RESIDENCE AT MONTREAL.—R. FINDLAY, ARCHITECT.

COTTAGE FOR MR. F. W. LENT, ELMVALE, ONT.—KENNEDY & CO., ARCHITECTS.

EMERALD STREET METHODIST CHURCH, HAMILTON, ONT.—A. W. PEENE, ARCHITECT.

CLUB HOUSE OF THE VICTORIA YACHT CLUB, HAMILTON, ONT.—A. W. PEENE, ARCHITECT.

ADDITION TO LIBRARY AT OSGOODE HALL.—BURKE & HORWOOD, ARCHITECTS.

THE addition illustrated in this number is an annex to the main library and is situated to the west of the same, entered by a door to the south of the chimney-piece.

As it was necessary to place it between the walls of other portions of the building, almost the whole source of light is from the roof, two small windows being available to the north for purposes of ventilation.

The instructions given the architects were to provide the maximum of wall space, discarding all features which would occupy space needed for books.

The space available and the requirements dictated a two-storey arrangement of shelves, access to the upper range being gained by a narrow gallery and spiral staircase.

The shelving, and interior finish generally, is of quarter-cut oak, the flooring is of parquetry, and the cove of the ceiling is executed in staff, the work being specially modelled from the architects' designs.

The artificial light is entirely by electricity.

CORRECTION.—The illustration of the Nordheimer building in our last issue should have been marked Colborne street, instead of King street. Siddall & Baker, architects.

STUDENTS' DEPARTMENT.

THE ETHICS OF THE SKETCH BOOK.

IN an article addressed to students of the R. I. B. A., and published in the Journal of the Society, Mr. Paul Waterhouse writes as follows on the above subject:—

Here, then, we face the questions, what is the need of sketching, and what is the good of travel? The bookshelves of any good office, or failing them the Library at Conduit street, will afford you the opportunity of studying, comparing, and committing to memory any building of importance in any country or of any age; why, then, should one travel a few hundred miles to make an inferior copy in one's own sketch-book or to study these things under less comfortable circumstances? The man who could seriously ask this question could never arrive at, could never understand, the answer. It is of course the fact that our many and accessible records have made study a thousand times easier, and have rendered possible as never before the science of comparative archæology. Nay further, these ready helps have made it no unlikely thing that a man should become even expert in the architecture of a country he has never visited; certainly it is possible for a student to have knowledge, and real knowledge, of more than he can ever even attempt to see with his own eyes and draw in his own sketch-book. But is the sketch-book therefore to die? Never, and for these reasons: Primarily, because in architecture the pencil works with the brain, and the brain with the pencil. To draw is to learn. It is impossible to learn architecture without drawing; it is impossible to draw architecture without learning. You can draw from engravings and photographs of course, but that is a lifeless sport at which Nature revolts, and you have to reckon with human nature even in an architect's fibre. Again, there are more things in a building than the best book can give you. We are saved the necessity of visiting all buildings, but we must visit some at least and we must draw some. The resources of other men's labors, engravings, lithographs and photographs have brought us much; they have taken away the need of sketching as a means of essential record, but they have not killed the sketch-book—rather they have given the sketcher a new scope and a glorious liberty—a liberty which no man should abuse. So long as you draw—and draw you must—you may now draw what you will. Some of the necessity has gone, but none of the duty; and duty has its laws. Here are some of the guiding lines: Never draw to make a pretty sketch-book—Burges taught us that. Of two subjects never choose the easier because it is the easier. Draw what you think you cannot remember rather than what you can. Never be timid, and, above all, draw whatever you admire. Such are the rules we glean from the direct teaching and still more from the indirect example of those who have been and are the great masters of that magnificent and most modest art, the art of keeping an architectural note-book.

When using transfer graining paper, the surface to be grained simply requires painting the ground color of the wood to be imitated. Of course, this must be quite dry. Then cut a piece of the transfer paper a trifle larger than the surface to be grained, and laying it smoothly on the table, damp the back slightly with a sponge, but do not soak it, and a few minutes after apply the face side to the work, taking care that every part is in contact, and do not smudge it. After about two minutes peel off the paper, when a perfect grain will be left on the wood.

ELECTRO-CHROMATIC REVOLVING FOUNTAIN.

We illustrate herewith an electro-chromatic fountain, designed and patented by Mr. Chas. Baillarge', architect and C.E., Quebec.

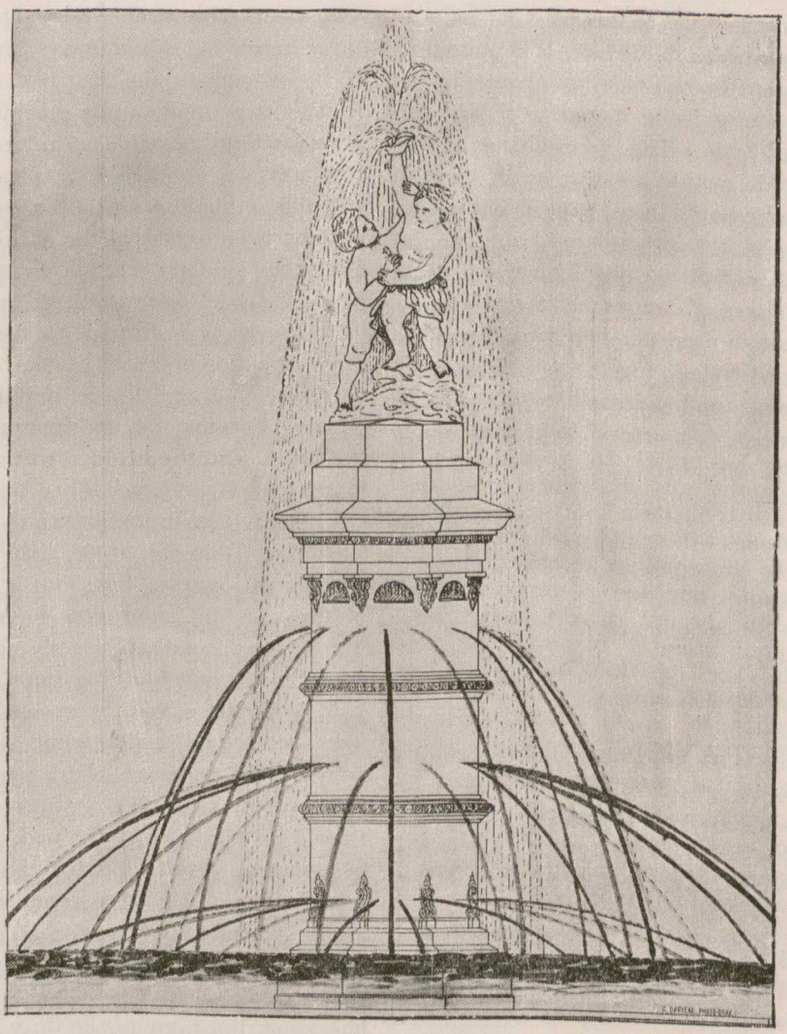
Everyone has seen the beautiful laboratory experiment of electro-lighting a jet of water issuing from a fountain, where the light, instead of passing through the jet into the surrounding air, is, on account of its parallelism to the initial portion of the parabola described by the jet, reflected from point to point along its upper surface and follows the jet down to the very reservoir, cistern or basin into which it falls, thus illuminating the jet and also for several inches the water in the basin itself around the point where the jet impinges on its surface.

The jet, by the interposition between it and the light of a colored lens in the inner skin of the fountain, may be made to assume any hue, as that of ruby, emerald, topaz, etc., or that of a jet of molten silver, gold, or any other liquid or fluid substance. Or the lens may be white or uncolored, and the same effect produced by the interposition of a piece of colored or stained glass between it and the light.

Now, if there be a series of plates of vari-colored glass made to move by clockwork opposite the lens, the jet will change its hue or tint accordingly and produce an almost magic effect. This, during Mr. Baillarge"s lessons in physics at the Laval University, was most beautifully illustrated by Professor Laflamme during one of his lectures on the reflection of light. And that light can be made to follow such a curved path is also illustrated in the larynoscope —a small tube having on its upper surface a series of tiny mirrors, by which, when the tube is introduced through the mouth into the stomach, and a ray of light thrown into it, the interior of the same may be lighted up and reflected back by means of the same mirrors to the operator's eye.

Suppose now, as in the design here given in photogravure, that, around a cylindrical fountain with an electric arc light in the centre, there be a series of such jets issuing from its outer skin, with a lens opposite each jet, all on exactly the same level, and vari-colored glasses opposite each lens, it is evident that every one of the jets will be simultaneously illuminated and colored, and if by clock machinery a little tramway carrying the stained glasses be made to revolve, the effect will be charming indeed.

But to render the illusion more fairy-like, the inventor proposes, as seen by the illustration, that there be three such horizontal series of jets. Let there be, for instance, as in the model, three series of 12 jets each, spaced so as to divide the circuit into 36 angular spaces of 10° each, and opposite each series a separate central arc light, aluminum, oxy-hydrogen, acetylene, or any other brilliant source of light—three tiers of lenses, three tiers of tiny coloring tramways—and while the central tier remains a fixture, let one of the tramways be made to revolve to the right, the other to the left. It will thus be seen that the continuous change of colors in the jets must and will give them the appearance of playing at leap-frog, the one with the other.



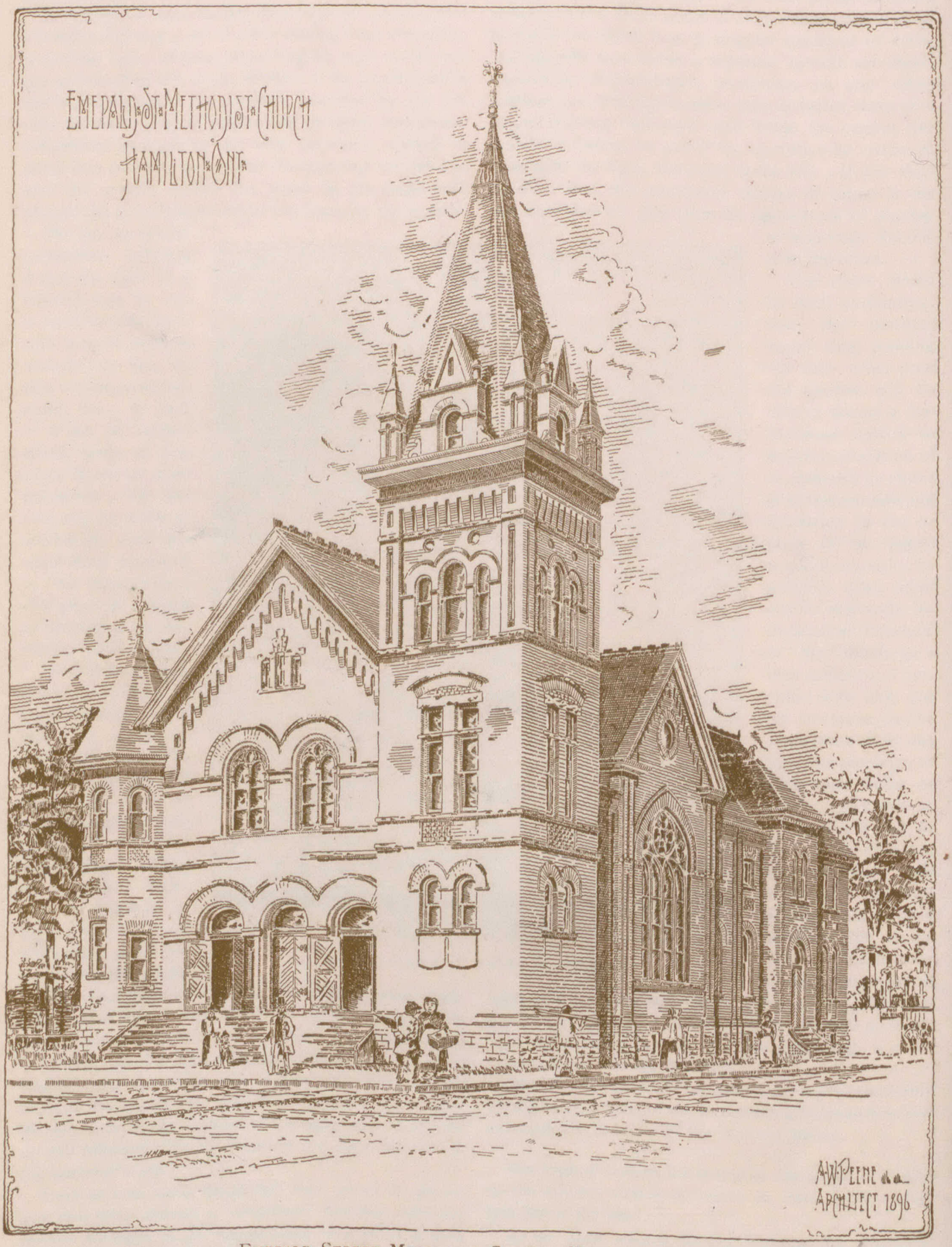
Electro-Chromatic Revolving Fountain.

The effect would be most enchanting, and the inventor hopes that, pending the time when poor old Quebec will be able to devote a few thousand dollars to the consummation of so desirable an object of ornamentation and attraction in one or more of its public squares, or parks, or gardens, some other city or well-to-do individual will take hold of Mr. Baillarge"s idea and carry it out, either with only one jet, or more on the same level, lit by one light for economy, or with two, three or more than three series of jets and as many lights as series, and on any scale whatever; for it is evident that instead of one light at the centre, if the interior of the fountain be of such diameter as to allow of it, there may be, where expense is no object, a separate light opposite each jet, with a reflector behind it, thus producing a more brilliantly illuminated fountain.

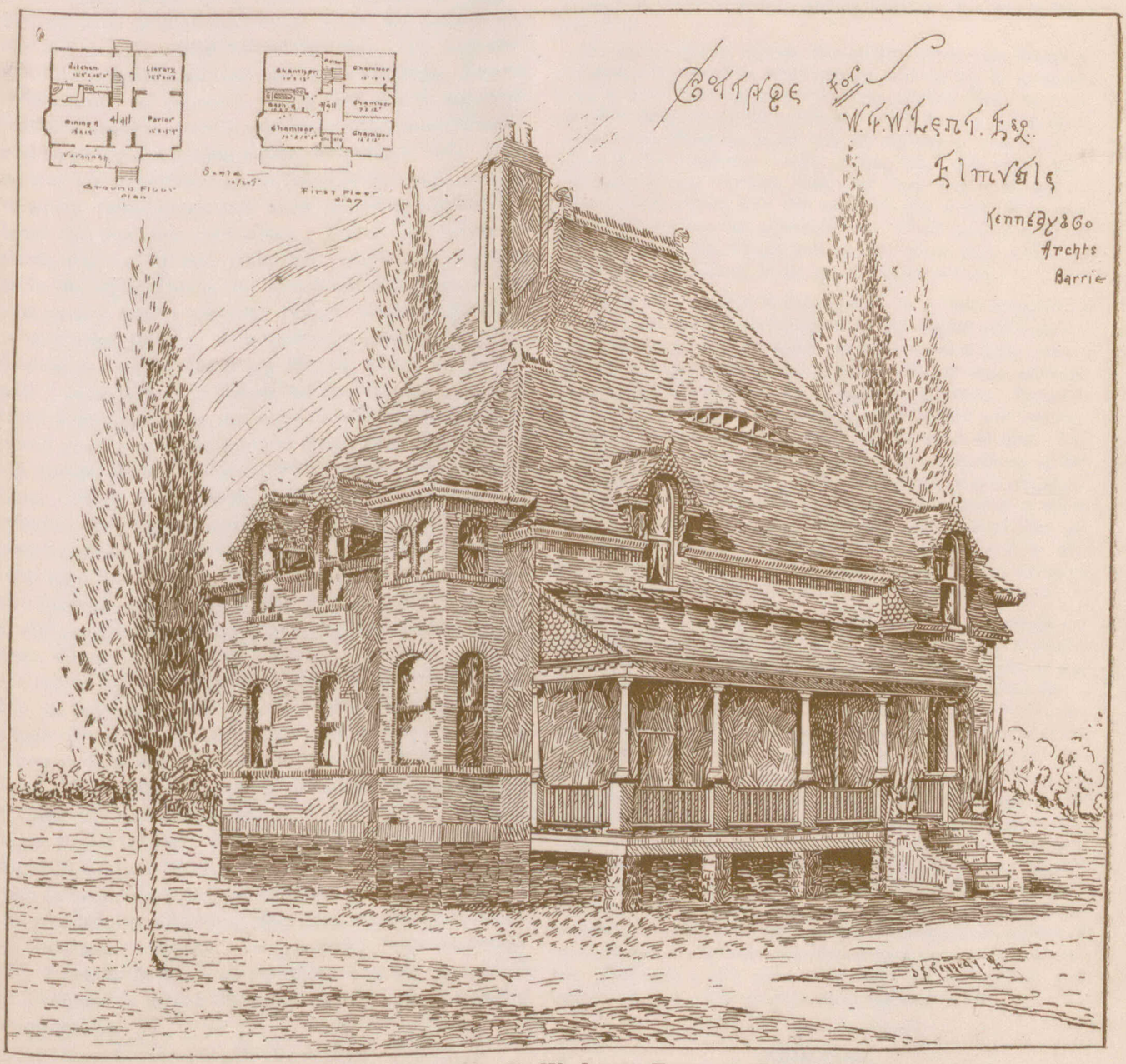
Nothing could well be conceived more admirably suited to give eclat to the forthcoming illuminations and pyrotechnics in honor of the Victoria jubilee.

The highest human habitation in the world is said to be the railroad station at Galera, in Peru, lying 15,635 feet above the sea.

At an open session of the Toronto Art Students' League held last month there was a large attendance of the members and their friends. An interesting address was delivered by the president, Mr. Holmes, on "Symbols as they Appear in Art and Architecture," followed by luncheon served by the ladies of the League.



EMERALD STREET METHODIST CHURCH, HAMILTON, ONT.
A. W. PEENE, ARCHITECT.



COTTAGE FOR MR. F. W. LENT, ELMVALE, ONT.

KENNEDY & CO., ARCHITECTS.

BEAUTY IN COLOR AND FORM.

Mr. John Aldam Heaton, of London, delivered a lecture to the members of the Leeds and Yorkshire Architectural Society, a short time ago, on "Beauty in Color and Form." He said that false color and false form were mere exaggerations, distortions, excesses of good color and good form. What we wanted, therefore, above all things, was temperance. Nature was always temperate. A student of color soon found out that beauty of color began with graduation—that the loveliness of graduated color was so great that, relatively, level color was not beautiful. But he also found that there was no such thing as level color in nature; natural color was always in a state of gradation. Nature teemed with gradations; even when she played high she did so with a splendid moderation. He had made careful studies of many beautiful colored things—flowers, irridescence on pigeon's necks and shells, peacock's feathers, fresh mackerel, and many other such things—and he never came upon a piece of brilliant color where he was not bewildered and puzzled by the complex ways in which harmonious and even opposing colors interlaced and died into each other. Not a few people desired, above all things, that their surroundings should be in the highest taste, and who were nervously anxious and uneasy as to whether things would "go with" sundry other things. In gathering a posy one gathered flowers as a rule without any idea of what would "go with" each other, but simply the flowers that happened to be blooming and of the right dimensions for the proposed posy, and in ninety-nine times out of a hundred the flowers gathered "went with" each other delightfully. Why, then, should people be so nervous as to whether the proposed carpet would "go with" the proposed curtains? Clearly because the color of one or both was bad—crude, violent, or without gradation; and because, while the posy was well mingled with green and gray and neutral tints, the carpet and curtains were wholly or partially deficient in these. If one wanted to try whether this practically was so, let him buy or borrow a real fine old Persian carpet, which would probably contain blues and greens, reds and yellows; in fact almost as many colors as the garden posy. He would find that the chances were enormously in favor of its looking well in any room in which he might throw it down, with an entire disregard of what might be already there. Let them take care that each color in each article they bought was soft and graduated and free from crudity, and then they might set them all together and be happy. As gradation was the condition of beauty in color, so curvature was the ground of all loveliness in form; but temperance, again, was the ruling power.

PUBLICATIONS.

"Public Work Directly Performed," is the title of an interesting article, by Sylvester Baxter, in the April number of the Review of Reviews. The co-operative contract system in vogue in New Zealand is described and also advocated, as likely to provide a method whereby direct employment by the government would be consistent with a full return for the money expended.

We are indebted to Mr. E. M. Renouf, 2238 St. Catharine St., Montreal, for a copy of an Annotated Bibliography of Fine Art—embracing painting, sculpture, architecture, arts of decoration and illustration—by Russell Sturgis, architect, and Henry Edward Krehbiel, musical author and critic. The book is published by the American Library Association, and sells at $1.00 per copy in cloth covers.

WORKS OF CONSTRUCTION.

The Ziegler-Hinch Company, of Guelph, Ont., have lately fitted up a new dry goods store in that city. The heating is by steam, of the one-pipe system, and was put in by Messrs. Feek & Phillips. The hydraulic elevator was furnished by the Fensom Elevator Co., of Toronto.

The new pathological museum and bone-room in connection with McGill University, Montreal, is nearing completion. The work has been carried out under the supervision of the University architect, Mr. A. T. Taylor. Galleries extend around both rooms, and large cases have been placed around the walls for pathological specimens. In the museum a small office for the janitor has been constructed immediately beneath one of the galleries. Both rooms are painted in a delicate shade of cream, the backs of the cases being finished in green. The ceiling is of robin's-egg color. A novel idea has been carried out in the frieze, which is so constructed as to contain diagrams of various peculiar diseases.

The new bridge to replace the railway suspension bridge at Niagara Falls, which is now nearing completion, is 1,100 feet long, and the highest part of the arch is 226 feet above the river, the arch being 550 feet of a stretch. It will have a double deck, one over the other, the upper one for railway purposes and the lower one for carriages, trolley tracks, etc. The main arch is composed of steel four feet thick and three feet wide, and the total amount of steel that will compose the bridge when completed will be over six million pounds. It will carry a weight of 3,500 pounds to the square foot on the upper deck and at the same time 3,000 pounds to the foot on the lower deck.

The firm of Gordon & Keith, Halifax, N. S., have completed a palatial brick building on the corner of Barrington and Granville streets in that city. The floors are of cement, and the western part of the basement is lighted by prism lights set in the sidewalk, the glass in these lights being six inches in thickness. The heating is done by two "Daisy" heaters of the largest size manufactured. The floor of the entrance is laid in tinted tiles. The show-room is 120 feet long and 40 feet wide. The offices, 25 feet in length, are divided by a partition of quartered oak and glass, with grille lattices. The flats above are so arranged as to utilize all the floor space to the best advantage. The electric elevator was furnished by Leitch & Turnbull, of Hamilton, and Mr. McArthur was the general contractor. The plans were prepared and the work constructed by Mr. W. F. Whiteway, architect.

The Ottawa Trusts and Deposits Company have just completed at the corner of Sparks and Elgin streets, Ottawa, extensive vaults and offices. In the main office is a circular counter of mahogany, richly carved and artistically panelled, the chief clerk's office being enclosed in a canopy of oxidized brass. The wainscotting is composed of solid Tennessee marble, relieved at regular intervals by blocks of onyx stone. The window sills are also of white marble. The flooring is mosaic pavement made of Italian marble, executed by Mr. Robert Reid, of Montreal. The business office is separated from the vaults by a partition of steel bars, extending from the floor to the ceiling and arranged in a semi-circular form. The vault proper is 7½ feet wide, 12½ feet long and 8 feet high, lined throughout with solid chrome steel. The deposit vault contains two sets of deposit boxes, with 246 in each set. To the rear of this vault is a storage vault, separated by a polished steel grate made of steel bars two inches in diameter. The main guard room is of steel, six inches thick, and weighs 5½ tons. The weight of the hinges is 700 lbs.

PERSONAL.

Messrs. Rogers & McFarlane, architects, have opened an office in the Fleming Block, Windsor.

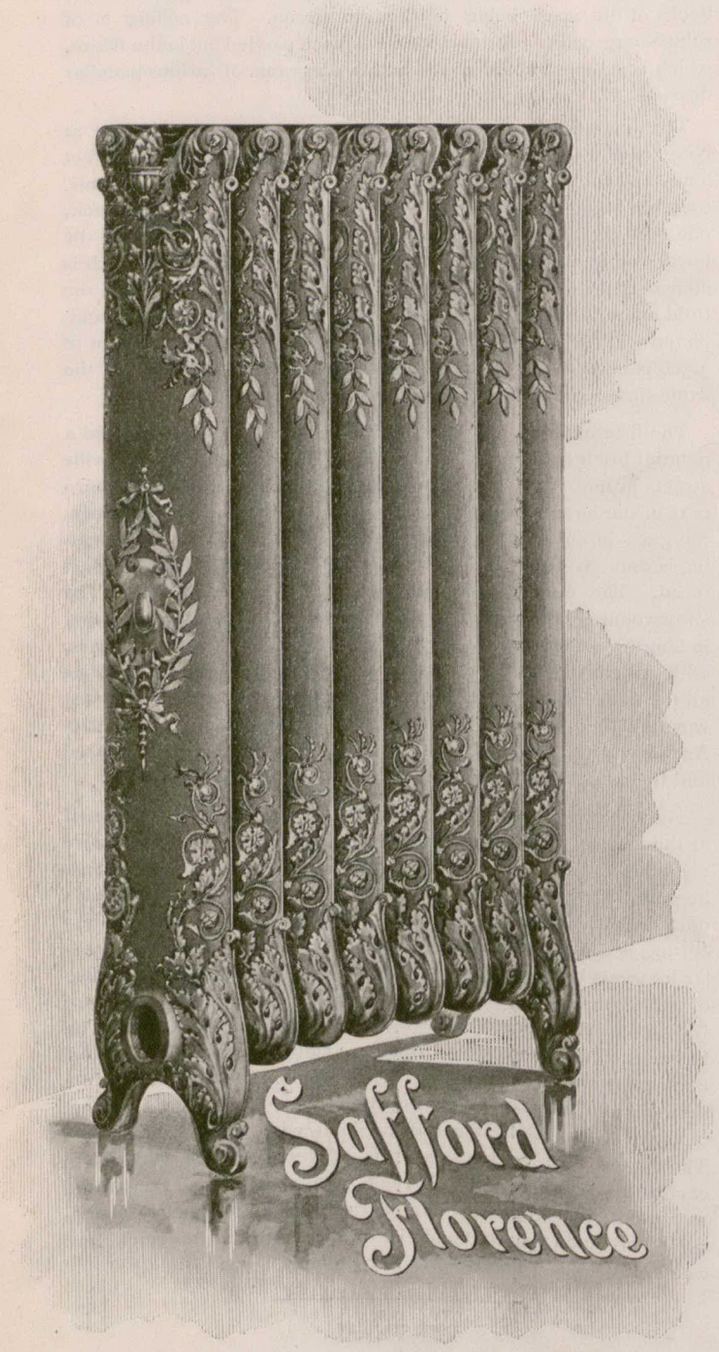
Mr. Wm. McNally, cement merchant, of Montreal, has returned from England, after an extended visit.

Mr. J. H. Balderson, secretary of the Department of Railways and Canals for the Dominion, has been superannuated, owing to the abolition of the office.

Mr. Philip C. Palin, a clever young architect of Toronto, has recently commenced the practice of his profession at Rat Portage, Ont. If the reports which have reached us recently of activity in building operations at Rat Portage are well founded, Mr. Palin has made a wise choice of location, and in selecting as his field of effort a new and rapidly developing part of the province rather than the older districts, his judgment is to be commended.

CANADIAN HEATING APPARATUS AND METHODS.

In view of the fact that the climate of Canada in winter is at times somewhat severe, it is not surprising that the subject of artificial heating has here received much consideration, and as a result, heating apparatus and methods have been brought to the highest standard yet achieved in any country. In the early half of the century this subject received little or no attention. The open fireplace was the means employed both for cooking and heating. Then followed wood stoves, which, after



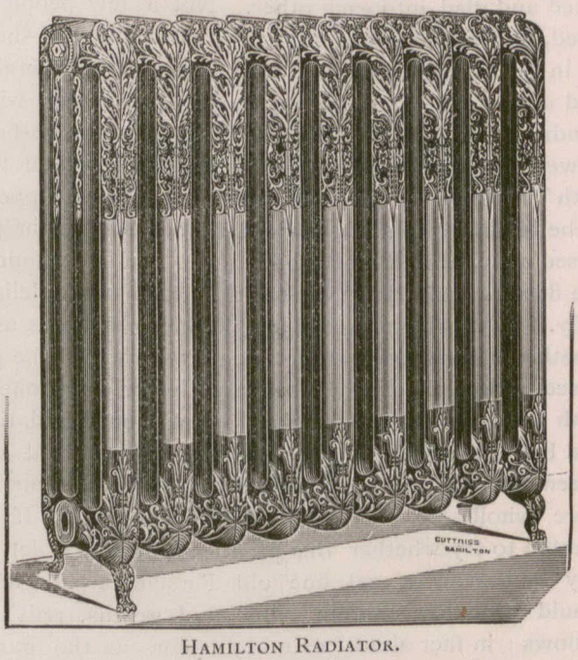
a considerable period of service, gave place to coal ranges for cooking and base burners for heating. With the advent of the latter the acme of method was believed to have been reached.

About twenty-five years ago the founders of the present firm of Warden King & Son, of Montreal, first introduced into Canada the method of heating by hot water. No better means could be found of rightly estimating the wonderful development which has since taken place in this direction than by placing side by side the old square "Spence" boiler first manufactured by the above-named company with the well-known "Daisy" boiler of which they are the makers at the present day.

In Ontario, where the climate is less severe than in the province of Quebec, improvement for many years took place on the line of heating by means of hot air furnaces, a system which, owing to its efficiency and cleanliness as compared with stoves, is still largely in use.

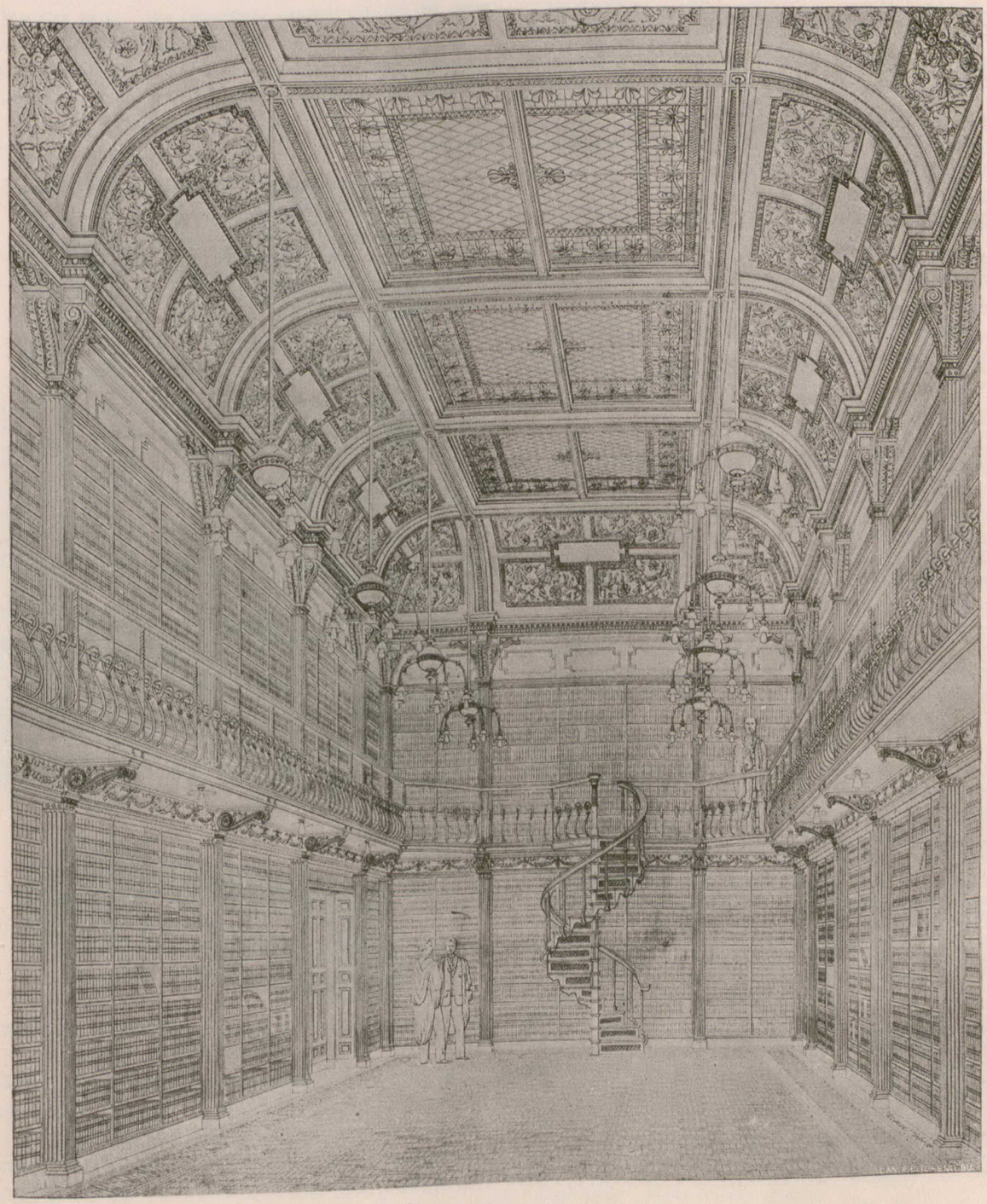
About fifteen years ago hot water heating was introduced in Ontario by the Gurney Company, who have since been in the front rank of inventors and manufacturers in this field. As a matter of course they were not long without competitors, and at the present time there are probably not less than twenty firms engaged in the manufacture of boilers, furnaces and radiators throughout Canada.

The number of manufacturers, however, is small compared with the number and variety of apparatus manufactured. As the manufacturers in this line increased, the law of self-preservation compelled each one to give the closest study to the scientific principles of heating and the devising of apparatus by which the largest amount of heat could be obtained and transmitted with the least expenditure of fuel. At the



HAMILTON RADIATOR.

present time the principles underlying the generation and transmission of heat and the means of putting them in operation are so well understood that there is no place on the market for poorly designed and inefficient apparatus. A recent visit to several of the leading manufactories revealed the fact that, notwithstanding the degree of perfection which has been achieved, there is a constant striving after improvement, and apparatus embodying new features in design and construction is constantly being placed on the market. In this connection mention may be made of the following new apparatus: The Doric hot water boiler, operated by both the gravity and pressure systems, introduced last year by the Gurney Foundry Company, and which by reason of its low cost and efficiency is reported to have met with a gratifying degree of favor; the new down-draught Economy school heater put on the market last autumn by the Pease Furnace Co., Toronto. This furnace is designed to burn wood or coal screenings, and in the case of a public school building near Toronto, is credited with having, by the use of screenings, cut the coal bill in half. The Pease Company are also preparing to introduce a hot water boiler which is said to embody some new features in design and construction.



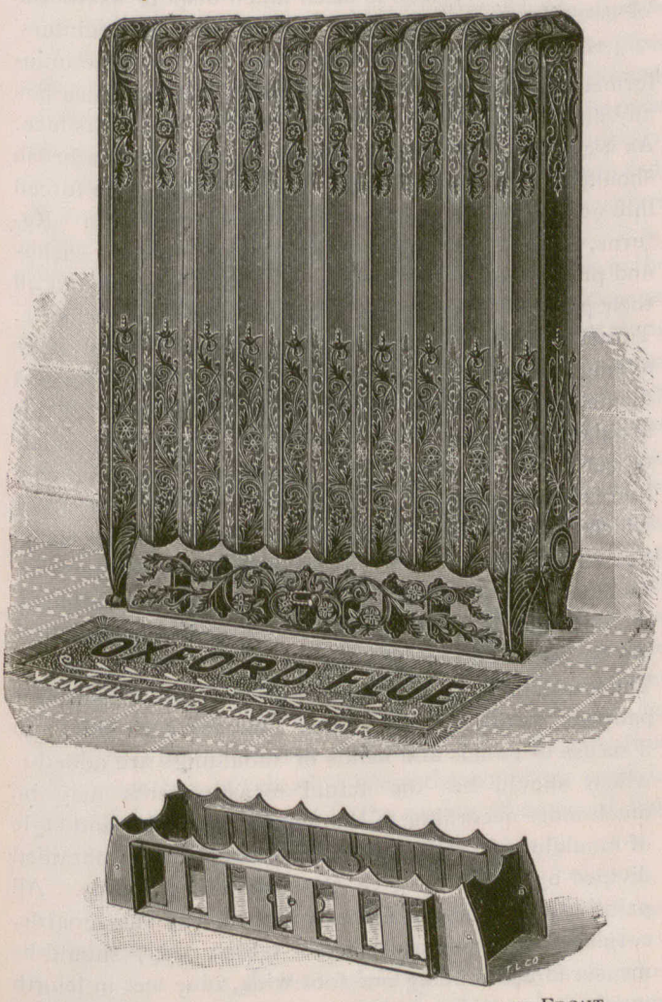
ADDITION TO LIBRARY, OSGOODE HALL, TORONTO.

BURKE & HORWOOD, ARCHITECTS.

The James Smart Manufacturing Co., of Brockville, introduced in the Canadian market last year, the "Kelsey" warm air generator, which is said to embrace a number of special and advantageous features, such as large radiating surface, sectional fire pot, and a patent attachment designed to prevent the short pipes from robbing the long ones. This furnace is said to have met with a satisfactory sale.

It is the writer's opinion that if the same degree of thought and care that have been devoted to the invention and construction of heating apparatus were to be exercised by the persons entrusted with the work of installing the same, the operative results would be more satisfactory than they now are.

In pace with the development of hot water and steam heating boilers has come improvements in radiators. The Toronto Radiator Manufacturing Company and the Gurney Foundry Company of Toronto, who are



BOX BASE, SHOWING BACK DAMPER OPEN AND FRONT DAMPER CLOSED.

the pioneers in this line have recently been joined by the Gurney-Tilden Co., of Hamilton, one of whose radiators is shown on the preceding page, and a third company is in process of organization in Toronto for the purpose of engaging in this branch of manufacture. Radiators are now made in Canada in such a large variety of styles as to be adapted to almost every conceivable situation, from my lady's boudoir to the deck of a war ship—one of Her Majesty's ironclads having been fitted by the Toronto Radiator Co. last winter, while lying in Halifax harbor. The accompanying illustrations show the perfection to which this branch of a modern heating system has been brought. The Florence radiator is the latest product of the Toronto Radiator Company's skill, and is herewith illustrated for the first time. The illustration on this page shows an Oxford ventilating flue box base radiator, recently placed on the market by the Gurney Foundry Co. By means of a register damper shown in the engraving, cold air can be taken in at the bottom of the radiator, either from the room or from outside, conducted up between the coils of the radiator, becoming warmed thereby, and discharged into the atmosphere of the room from the top of the radiator. By this method the objection sometimes raised to hot water heating that it makes no provision for ventilation, is removed. This is a feature which is likely to commend Canadian radiators to European buyers, who are possessed of very advanced ideas on the subject of ventilation.

A Toronto company has made an entirely new departure in this line by manufacturing radiators for heating by electricity. These radiators are made of Canada Plate, and are about 3 inches in diameter. They are arranged horizontally like steam coils, and are intended to be supplied with current from the electric light company's mains. So far as we are aware none of these radiators have as yet been installed. The possibility that the cost of heating by this method can be reduced to present standards is extremely doubtful, for which reason, as well as the fact that the method is to a large extent an untried one, the company who are seeking to introduce it are likely to meet with great difficulty.

MONTREAL.

[Correspondence of the CANADIAN ARCHITECT AND BUILDER.]

P. Q. A. A. DINNER.

THE Quebec Association of Architects held their second and last dinner for the season on the 16th of March. The attendance was good, and the occasion proved both interesting and instructive. The president, Mr. A. T. Taylor, occupied the chair. The association will, it is hoped, continue these dinners next year, as the benefits derived therefrom in the promotion of cordial relations between the members are quite apparent. Much of the success which these gatherings have attained in the past may be said to be due to the efforts of the presiding officer and the committee in charge.

ROYAL CANADIAN ACADEMY EXHIBITION.

THE seventeenth annual spring exhibition of the Royal Canadian Academy opened on April 1st at the Art Gallery, Phillips Square. A large assembly of members filled the galleries, refreshments were served and an excellent programme carried out.

As a whole the exhibition, although perhaps not quite so good as its predecessors, possessed much work of good quality.

Among the best exhibits may be mentioned those of Messrs. R. Harris, Alp. Jongers, E. Dyonnet, Maurice Cullen, M. Robertson Mr. Frairchere, Mr. Brymner, A. Patterson, J. Hammond, J. Pinlsey, Suzor Cote, and others having their respective merits.

The portrait of "A Lady" also that of Colonel Jeffrey Burland, by Alp. Jongers are worthy of mention. Mr. Dickson Patterson exhibited a well rendered portrait of Prof. Chapman, and Mr. Dyonnet showed some landscape studies which are very good.

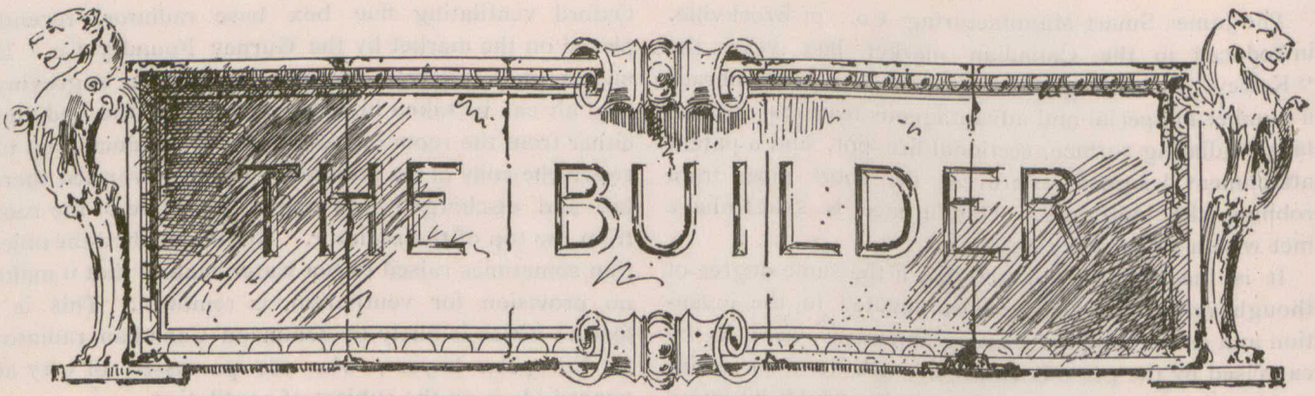
Mr. Pinhey's "La Penserosa" is well treated. Mr. Robert Harris exhibited some splendid portraits. Mr. Brymner's "Gray Girl" is certainly one of the best pictures in water color. The Canadian landscape studies, by Mr. Maurice Cullen, are much admired.

The sculpture department is small, but of good quality. Mr. Hill's portrait and bas relief are treated in a very decorative way.

Mr. Hebert's portraits in bronze are splendid. The group "Convoitise" is a fine piece of art.

STRIKE OF BRICKLAYERS.

A strike of short duration was commenced last week by the bricklayers of the city. The members of the Bricklayers' Union have been receiving 30 cents an hour for ten hours per day, but demanded that the scale of wages should be increased to 35 cents an hour, and that nine hours should constitute a day's work. At first neither side showed any inclination to yield, but through negotiations conducted in an amicable spirit, an agreement has been reached, fixing the rate of wages at 35 cents an hour for nine hours a day, and providing that union bricklayers shall be given employment in preference to others. The agreement dates from April 1st, and is for one year, four months before the expiration of which a conference is to be held to consider future relations. It is a matter of congratulation that an early settlement of the trouble has been effected.



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

Studded Partitions.

THERE is too much looseness in this country in the construction of studded partitions, both as to the manner of finishing up, and as to the dimensions of material used. It is not good construction to run up a partition in a ten-foot ceiling with 2″ x 4″ scantling. Anything over nine foot in height should be studded with scantling not less than 2″ x 6″, and these should be made parallel and straight. At all door or other openings, the studs should be doubled, the two thicknesses spiked well together. This method is better than having the door studs 4″ x 6″ as the larger timber is more apt to shrink, check and cripple, conditions which may injure the plaster much, and interfere with the fine working of the door more. There should be cross tracing over the head of each doorway if the plastering is to be kept intact, and lines of tracing should be drawn from the center of the room to the side walls wherever possible, to assist in transferring the weight of partition from the joists to foundation walls direct. Trimmers should be "cut" in snug between studs to make the wall solid, about half the height of the ceiling, if ten feet or less, but if a ceiling is more than ten feet, there ought to be not less than two lines of trimmers in the wall. These trimmers should be the full width of the studding—in fact, they should be cut from stuff the same dimensions as the studding itself. It is not a good plan to run the studding to the floor and nail them to it. It is better always to put down on the floor a piece of dimension stuff and plant the studding on it. Doorways and other openings may be cut out after the partition is firmly secured in place. The same rules hold good for partitions formed of 2″ x 4″ scantling, only in the latter more care should be observed in tracing and cutting in trimmers, and making the whole solid and firm. Nothing destroys plastering more than the vibration of a wall caused by the slamming of a door or the jar caused by some body suddenly coming in contact with it. A wall should be firm enough to stand the sudden closing of a door without jarring. When a wall shakes from any of the usual everday causes, the end of the plastering on that wall is within measurable distance. In estimating for studding when the lathing is to go directly on to them, it is well to allow one stud for each running foot to be studded, whether it is for partitions or outside walls. This will allow for doubling studs at windows and doors, and will leave stuff enough to "cut in" trimmers and braces and ribbon pieces for the floors. Studding, when possible, should be put up in lower floors first, and if it can be done, a slight crowning should be given to the floors above, and as much of the weight as possible should be discharged on the side walls. A little attention to these rules will insure good lasting work, when their being neglected would lead to everlasting trouble and discomfort.

Painter's Measurement.

THERE is often much dispute as to the proper way to measure up painters' work, owing to the fact that the uninformed do not think that a moulding or a return has any more surface on it than the distance across its face. As a matter of fact, every portion touched with a brush should be measured, and a tape line should be forced into every curve, quirk and corner of the work. Returns, panels, mouldings, architraves, heads, sashes and projections, should have the line bent around all their parts in order to get the exact surface measure. Turned work should have the line bent around it at its average diameter, but, if beaded or moulded, the largest diameter should be girdled and the stretchout of this should be multiplied by the length of the turned article to get the dimensions. In grille work, the usual custom is to measure one surface and multiply it by four, which will give the surface of the whole grille nearly. For doors, shutters and iron fencing add one inch for each panel, and one inch extra for each ½ inch bar in the railing; add thickness of doors, and when calculating length of door or shutter, add thickness to length. Thus, a door 2 in. thick and 3 x 7 ft., will measure for painters' work, 3 ft. 2 in. x 7 ft. 2 in. for each side, and if recess of panels and bends of mouldings are added—which should be—the actual measurements may be much more according to the number of panels and style of mouldings in the door. The number of feet obtained divided by nine will give the number of yards. All painting under twelve inches wide, such as base-boards, cornices, corner-boards, water-tables, etc., should be measured up as being one foot wide, nine feet in length making one yard. Gutters, conductor pipes and similar work are charged double their outside measurement. Sashes are painted by the piece according to the number of lights; the same for glazing them. Work requiring a ladder must be charged extra. It requires about one-third more time to paint from a ladder than from the ground. Brackets, etc., are charged by the piece; if in place and a ladder is required to get at them, then add double price to what the cost would be if the work was done in the shop. Outside work should be painted every five years and inside work every seven years at least. Grained out-door work should be varnished every two years to save fresh painting. Inside grained work may run four or five years without being re-varnished. Hard finish should be re-touched every few years if it is desired to have it look fresh. It flattens and dulls in five or six years.

Talks on Plumbing.

MANY times the plumber is put to his wits' end when making repairs or putting new work into old buildings. Frequently injured pipes and other fixtures that never give satisfaction have been so placed that they are continually out of order, and no amount of repairs can ever make them give entire satisfaction. Misplacement, in fact, is the most common cause of the mischief. An undue exposure to cold, or a too close fitting to range or stove, or else being placed where they are subject to jars or violence, are the most prevalent causes of pipe and joint disruptions. The danger from frost may be avoided by suitably disposing the pipes with relation to the heating apparatus, or by placing them at least in the farthest interior of the house. Direct contact with or close proximity to the outer wall of the building should be carefully avoided. The danger from heat comes from the common practice of crowding together hot and cold water pipes within the limits of a narrow chase or enclosure built in the house-wall. The pipes frequently get overheated and expand their legitimate dimensions, often straining the couplings and otherwise doing serious injury, causing leaks and disruptions. Into this same enclosure other pipes are often crowded, and coming in contact with lead or other pipes, injure them in process of time by mechanical pressure. It is, therefore, advisable that these chases, or recesses in the wall, should be more spacious than is ordinarily deemed necessary, or that separate provision should be made for carrying the water pipes alone. For convenience in the making of repairs, and in order that less injury to the house may be incident thereto, the chase or recess may be very fitly built upon the inner side of the walls, instead of within them, and sufficiently decorated to lessen its possibly obtrusive appearance. At all events, some provision should be made so that in case anything got wrong with the pipes, they could be got at without being obliged to cut into the wall or break through the plaster-work. In all cases where horizontal pipes are laid under the floors and across the joists, a strip of flooring over the pipe should be laid so that it can be taken up without trouble if desired. A little attention paid to matters of this kind when the plumbing work is being planned, will result in the saving of many a dollar and much inconvenience and chagrin.

Mitre Joints.

THERE are "mitres and mitres," as every workman knows, and though as a general rule it is not difficult to make a good mitre joint, there are some instances that seem to baffle the best of workmen. In these cases, however, it is safe to say that it is not the mitre that is to blame, if the mitre has been cut in a true box, but the conditions. Often a mitre is made and cut to fit some angle that is not a right-angled one, and while the truth may not be discovered by the workman he may waste a great deal of time—and patience—in trying to make a fit, when a true mitre is impossible. A great deal of the rule o' thumb business is practiced on square corners that are "not square." The workman should in all cases find out if the corner into, or around, which he is to make his mitre, is square, or at right angles; if so, well and good, his mitre-box will do the rest for him if he gets his proper lengths, and if the work is of such a character that a mitre-box cannot be used, he may apply one of the many methods for obtaining the lines of a mitre, and finish his work in accordance. If his angles are not square, then he must allow for the difference and work accordingly, which he can do satisfactorily if he possesses a fair knowledge of his trade. In the making of a perfect mitre joint, each piece should fit close to the other at all points, and not simply at the upper edge, or at the edge which meets the eye. Such a mitre as this has no strength in itself, and cannot be depended upon. It holds itself together because the moulding, or whatever the part mitred may be, is firmly fixed, and not because of any strength in the mitre itself. The larger the mitre, in case of mouldings especially, the more careful the workman ought to be in making the joint quite true at all points, so that when fixed together, the mitre may be glued, and so better able to stand and remain intact. One thing in connection with mitres the workman should never lose sight of; all the material used should be dry and well seasoned. If the wood be not quite dry, then the mitres will never remain as perfect as they should be, for no matter how well they may be made in the first instance, the shrinking and possible warping of the wood, after the work has stood for some time, upsets all calculations and destroys at once all possibilities of good and perfect workmanship being maintained, and the work becomes weakened inasmuch as the glue breaks and leaves the joint open and helpless. Sometimes, when strength is required, a "feather" may be inserted in the mitre; this may be done by making a saw-kerf in the angle and slipping in the kerf a thin piece of tough wood, smearing the piece or "feather" with glue before inserting it in the kerf. For internal angles, it is much better to "cope" than to mitre, especially so if the work relates to putting down baseboards or similar work, and in a future issue we will discuss "copeing and "scribing."

About Tools.

A CARPENTER without tools is little more than a cipher, and like a cipher he must depend on his fellow-workmen for value, for standing alone he is almost worthless as a mechanic; he may handle joists, carry timber, or do the work of a laboring man, but as a mechanic he is N. G. In these days of combination tools and sash and door factories, mechanics do not need as many tools as the old-time carpenter did. It is but a few decades since a workman had to have a large chest, and sometimes two, and carry around with him enough tools to stock a modern hardware store; now all that is changed, and the best of mechanics can get along with tools that he can carry on his shoulder. In former days it was an ordinary event to see a good workman possessing tools worth from one to two hundred and fifty dollars; now fifty or sixty dollars wisely invested will supply the best of our workmen with all the tools he may ever require in his regular occupation. A mechanic needs no better recommendation than a good "kit" of tools, well kept and in good working order. It is said that "a workman is known by his chips," and it might have been better said that "a good workman is recognized by his good tools," for they tell more plainly than any written "character" or "testimonial," what their owner is. He may tell you one thing, and yet be something quite the opposite; but a look into his tool chest will betray him. A man who has worked long enough at a certain kind of work to be able to call himself skilled therein, should have acquired all the tools that are necessary, and a man who claims many years' ex-

perience, yet can show but few or inferior tools, should be looked at closely before his statements are accepted as true. Many young men who are working at their trades as apprentices or learners, are unable to purchase tools while in their present position, but they should, if their wages will permit, buy an odd tool now and again. Another way is to lay aside a small amount from each week's wages for the purpose of buying books, trade journals and tools. Divide equally between books and tools, as one is just as necessary as the other; and make a list of what is needed, then purchase the first on the list, as soon as the allotted cash amounts to the sum required. A little judgment will be necessary in the purchase of both books and tools, and it will be well to consult some old workman in whom perfect confidence can be placed. One thing, however, it will always be right to subscribe for, is the journal representing the trade followed, that is published in your own district, province or country; then, if it can be afforded, other current journals may be added. As regards books, there are so many now devoted to the building branches—many of which are first class—that there will be no trouble in making a selection. By following these suggestions a young man will soon own a good "kit" of tools and a valuable and instructive library. Another thing, too, he will have the habit of saving a little money, a habit that will have as much value as his tools.

Staff.

MANY plasterers and others who visited the Columbian Exposition in Chicago, were struck with the appearance of the marble-like buildings, and no doubt wondered how the fine white effect was obtained. The material used to accomplish this effect is a peculiar mixture called "staff," but which is little known in America. It is chiefly composed of plaster of Paris and a small percentage of cement, into which are introduced fibres of hemp, jute, sisal grass or other similar substance, to give it toughness, so that it may be bent, sawn, nailed or bored. It is cast in moulds like ordinary plaster; after being wet to the consistency of thick cream or batter, a layer is spread in the well lubricated mould. Next follows a layer of the long tough fibres; over this is poured another coating of the liquid plaster, then another layer of long fibre, and so on until the mould is properly filled to the required depth. In case of statues and statuary groups, the models are first fashioned in clay and coated with staff. Most of the workmen employed on the works of the White City were German, French and Italian, the art and practice of staff-making being understood by but a few people in Canada or the United States. The composition hardens sufficiently to be handled in about ten minutes after it is formed, a quality that is often of great advantage. "Staff" is fire-proof, and, to a considerable extent, water-proof. If kept painted it will withstand the weather for a number of years. If it cracks or crumbles off, it can be readily repaired with a brush or trowel, from a tub of the liquid mixture. For inside decoration it possesses superior qualities and ought to be better known and used in Canada than it is. The ordinary plasterer who is expert in casting ornamental plaster work will find no difficulty in making and manipulating "staff," and the more substantial results will more than repay him for his extra care and trouble. There are a thousand uses to which it may be applied with advantage.

Rights of Canadian Contractors.

A RECENT despatch from Montreal to the Toronto World draws attention to an injustice which it is claimed is inflicted upon Canadian contractors in connection with the awarding of contracts by the Dominion government. It is correctly pointed out, that in past years many of the largest contracts have been given to American firms who have no interest whatever in Canada except to enrich themselves by the profits realized from public contracts. On the other hand, Canadian contractors are not only prevented from obtaining United States government contracts by a law which provides that only full-fledged Americans be allowed to tender, but by the alien labor law Canadians are restricted from even obtaining employment without first taking out naturalization papers. A few years ago Major McLennan, M. P. for Glengarry, introduced a bill in the Dominion Parliament to prevent contracts from being awarded to any but Canadian contractors, thereby placing contractors in both countries on the same footing, but he was turned aside in his purpose by the promise of an ex-Minister that he would stipulate that American contractors must employ only Canadian labor. This was not regarded as satisfactory by our own contractors, who hoped for some relief upon the return to power of the present government. This, however is apparently not to be obtained, if we may judge by the provisions governing work for which tenders were recently asked. In the case of the deepening of the St. Lawrence canals, the tenders for each section were to be accompanied by a marked cheque ranging from $75,000 to $150,000. This sum, it is claimed, is beyond all reason, and is the means of greatly reducing competition. Apart from the injustice done to contractors who are perfectly capable of executing the contracts, the country is likely to be called upon to pay higher prices for the work than would be the case were the conditions governing the tenders less stringent. It is urgently to be hoped that the future policy of the present government will be in the direction of fairer dealing with Canadian contractors.

USEFUL HINTS.

PAINT FOR IRON WORK.—The following is quoted by Walter G. Berg in an article in the Engineering News, as being the formula recommended by Dr. C. B. Dudley, of the Pennsylvania Railroad: French ochre, 39 pounds; lamp black, 1 pound; raw lindseed oil, 54 pounds; Japan, 6 pounds.

Ebonising for floors can be easily done says the Plumber and Decorator, by boiling logwood chips in water—one pound of chips to one pound of water—till the liquid is well coloured. Apply this to the floor evenly and carefully, giving a second application if the boards are close textured. When this is quite dry, apply in a similar way a strong solution of sulphate of iron in water. A good chemical ink-like black will be the result, which, after sizing, may be varnished like any other stain, or preferable it may be polished with beeswax and turpentine. The duller surface so given is better, artistically speaking, than the glaring, shining surface given by a varnish, at any rate where a black stain is used.

FRESH CEMENT, TO PAINT OVER.—A contributor to Painting and Decorating recommends that the wall be washed with dilute sulphuric acid several days before painting. This will change the surplus caustic lime to sulphate of lime or gypsum. The acid should be about one-half chamber acid and one half water, but if quick action is wanted 66% acid will answer. This should be repeated before painting, and a coat of raw linseed oil flowed on freely should be given for the first coat. While this cannot be always guaranteed as effectual for making the paint hold, it is the best method our correspondeut has heard of for the purpose, and is worth trying when it is absolutely necessary to paint over fresh cement.

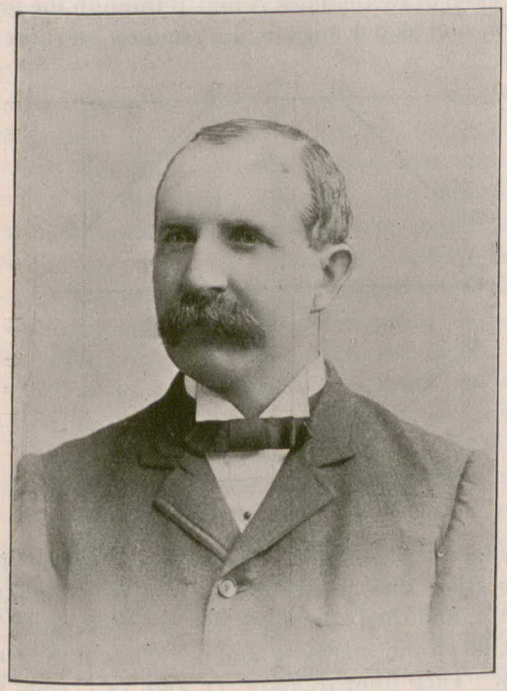
PROMINENT CANADIAN CONTRACTORS.

II.

MR. GEORGE E. MILLS.

THE presentation of a portrait and brief biography of Mr. George E. Mills, the well-known contractor of Hamilton, Ont., fittingly serves to continue our series of sketches of Canadian contractors. Mr. Mills has for many years been prominentiy connected with the building trade in Hamilton. He was born in Iron Acton, Gloucestershire, England, on the 25th of June, 1849, and commenced work with his father and two brothers, who conducted business as tilers, plasterers, masons and bricklayers combined. In 1868 he removed to Aymesbury, where he worked for two years as journeyman, at the end of which time he formed a partnership with his elder brother as contracting plasterers. The arrangement, however, proved unsatisfactory, and the subject of our sketch resolved to seek his fortune in America.

Arriving in Hamilton on August 3rd, 1871, Mr. Mills obtained employment for a time as mason with Mr. John Taylor. A year later, when Mr. J. Beer



MR. GEORGE E. MILLS.

commenced contracting, he was engaged with him as an improver at bricklaying, and afterwards as foreman for the late Mr. Andrew Tindall. From 1874 to 1891 he had full charge and management of Mr. Beer's business, and upon his death in the latter year assumed the business himself.

Among the principal buildings with which Mr. Mills was connected in earlier years may be mentioned the Hamilton Hub Works, Copp Bros.' four story building, the Cannon, Hess and Queen Victoria schools, the Wesley, Gore, Simcoe and Hannah street Methodist churches, opera house, hospital, the Y.M.C.A. and the Free Library buildings. Since contracting on his own account, he has built, among other works, the Hamilton power house, Wood, Vallance & Co.'s warehouse, the Sophia street school, Toronto, Hamilton & Buffalo railway station, the power house at the Beach, addition to St. Joseph's hospital and convent, and remodelled the cotton mills. He has now in course of construction the Grand Trunk car shops at London, for which he was given the entire contract, estimated at $100,000, sub-letting the carpenter work, plumbing, painting, galvanized iron and slating. Work was commenced on the first of October last, and nearly the whole building is now ready for the roof.

MANAGEMENT OF WATER BACKING THROUGH HOUSE DRAINS.

WE illustrate herewith an arrangement for the management of water backing through house drains into cellars, which is liable to occur in low and flat towns, and to generate an intolerable nuisance. The method was designed and carried out in Croydon, England, by Mr. T. Walker, an engineer of that town. The description of it was first printed in The Surveyor, London, whence it has been copied into Domestic Engineering, (October). The method seems simple and feasible, and worthy of a place among appliances for the sanitation of dwellings.

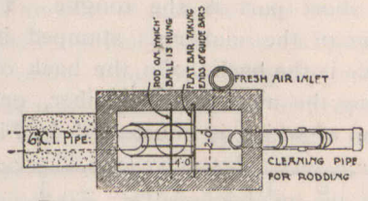


FIG. 1. PLAN OF MAN HOLE.

Fig. 1 shows the plan and Fig. 2 the sectional elevation of a man-hole chamber receiving the drainage of four houses through a 6-inch cast iron pipe, delivering downwards; it is arranged to receive a stout rubber ball, fastened to a chain and arranged so as to

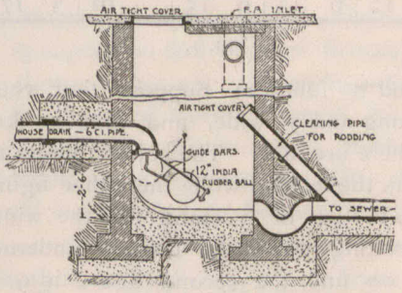


FIG. 2. SECTION OF MAN HOLE.

find a seat at the mouth of the trap when water backs up through the sewer. The ball is lifted by the water and forced by guide bars to its seat. These guide bars are shown in detail in Fig. 3. Fig. 4 shows the position of

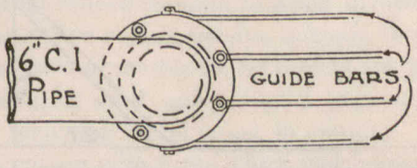


FIG. 3. DETAIL OF GUIDE BARS.

the ball when raised. No further description is needed to explain the action. The chamber receives all the back water, while the drainage acquiring a small head in the house drain will force its way past the rubber

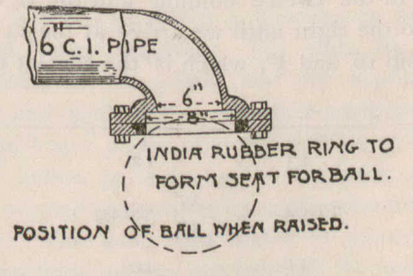


FIG. 4. SHOWING THE BALL RAISED.

ball valve and into the chamber, passing thence into the sewer. Of course proper care must be exercised in constructing the chamber or cistern, which should be proof against leaking; otherwise there will simply be the substitution of one nuisance for another.

WHAT THE FIGURES ON A CARPENTER'S SQUARE MEAN.

THE following question and answer take rather too much space for the regular department of queries, and we therefore print it as a separate article.

H. S. F., New Decatur, ———, writes: "On a carpenters' square that I have there are certain figures located between those which represent inches, but I do not understand what they mean, nor do I know anyone that does. Will you please explain them?"

ANSWER.—We do not know just what kind of a square you have, but will explain one that may be like it. The large part of the square two feet long is the body and the short part is the tongue. The side on which the name of the maker is stamped is the face, the reverse side is the back. On the back of the body is a table giving the measure of lumber, or boards 1" thick, a section of which is illustrated in Fig. 1. To

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6	9	7	6	8	3	9		9	9	10	6
7	6	8	4	9	2	10		10	10	11	8
8	3	9	2	10	1	11		11	11	12	10
9	9	10	10	11	11	13		14	1	15	5
10	6	11	8	12	10	14		15	2	16	4
11	3	12	6	13	9	15		16	3	17	6

FIG. 1.

use it proceed as follows: Suppose that you have a a board 2' long and 9" wide, and wish to know how many feet there are in it. The column under the figure 12 represents the length, while the other figures to the right and to the left of it stand for the width of the board. Looking down the column underneath the figure 12, we find the second figure is 9, and as 2 represents the width of it, we find it one column to the left Then with our pencil we begin at the 9 and follow

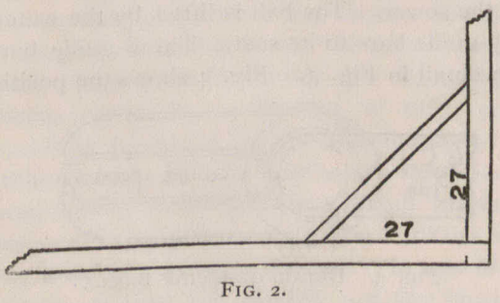


FIG. 2.

the space until we arrive at the 2 column, where we find 8' and 3", which is the number of feet in the board.

Again, suppose that we have a board 14' long and 14" wide. In the twelve column find the 14 and pass the pencil to the right until we arrive at the 14 column, where we find 16' and 4", which is the correct measurement.

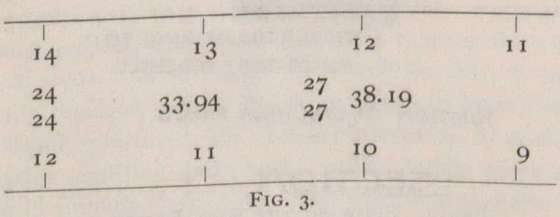


FIG. 3.

On the back of the tongue may be found what is called "brace measure." It is used as follows: Suppose that you have a horizontal timber into which you wish to frame an upright post. You expect to put the brace 27" from the angle on the post, and also 27" on the horizontal timber. See Fig. 2. It is desired to know the length of the brace. Refer to the brace measure, a section of which is shown in Fig. 3, and to the right of 27 you will find 38.19, which is the length

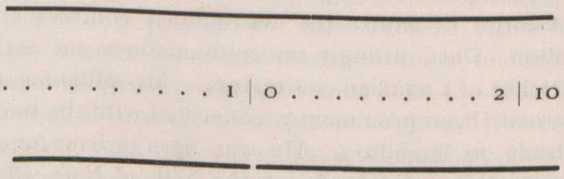


FIG. 4.

of brace. It may be proved as follows: Square each of the given distances, add them together and extract the square root of the sum.

Thus, $\sqrt{27^2+27^2}=38.19$.

Again, on the face of the tongue may be found some spaces and figures, a part of which are illustrated on Fig. 4. Only every tenth space is numbered. These are given for the purpose of showing how to cut an octagon stick of timber out of a square one. Suppose that we have a stick that is 12" square, as shown in Fig. 5. We draw the lines A and B through the centre as shown, and as our stick is 12" square we take our

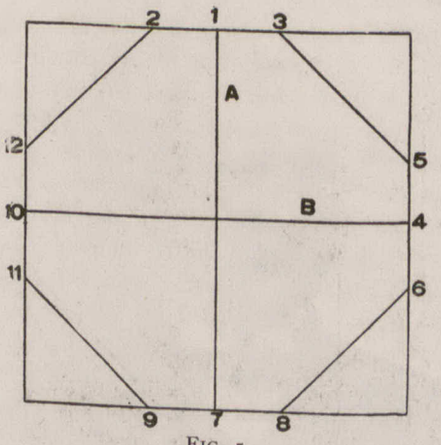


FIG. 5.

dividers and measure off 12 spaces on our scale, Fig. 4. Then putting one point of them on 1 we make the mark at 2, and then the mark at 3. Next start at 4 and put down the marks 5 and 6. Then from 7 mark 8 and 9. Then from 10 mark 11 and 12. Now when we have drawn the lines shown, it tells us just how much to cut off to make the 12" stick an octagon.

LABOR UNION SUED.

An action involving the right of a labor union to suspend a member and boycot him has been entered at Ottawa. The plaintiff is R. Beaulieu, stonecutter. His action is to recover $2,000 damages from the officers of the Rockland branch of the Stonecutters' Union for alleged illegal suspension from that branch. Beaulieu's suspension took place about two years ago during a strike among the stonecutters at Rockland. The strike arose over trouble with the contractor, Mr. Arch. Stewart, of Ottawa, over an apprentice who was set to work with Beaulieu. The workingmen claimed that more than the right number of apprentices were at work, and when the contractor refused to remove the young man Larocque, the men, including Beaulieu, went on strike. The trouble extended over a few days, and was finally settled, but in the meantime Beaulieu was accused by the union of treachery and connivance with the contractor to keep Larocque at work, and at a meeting of the union a fine of $150 was placed on Beaulieu. Until this was paid he was placed under suspension. He did not pay the amount. His case was published in all the craft papers, and he has since been prevented from obtaining work in any union towns. Beaulieu asserts that he acted during the strike like an upright union man, and that there was not the least reason for his suspension. Damages to the amount of $3,000 are asked.

WORKING IN STONE.

THE quarrying and working of stone is one of the earliest industries in which men engaged, and very little experience would make known the fact that certain stones possessed rich colouring and veining, which was made apparent when surfaces were rubbed smooth; and so the first work in marble would be produced.

The introduction of the mallet, the chisel, and the drill is lost in antiquity. These tools were in use at the most remote period of which we have any record. The sculptures of Egypt are the oldest which the world possesses, dating as far back as 3,000 B.C. Many of these were not only shaped by the chisel, but they were polished with great care. The rude limestone blocks which now form the steps of the Great Pyramid were at one time concealed from view by a casing of polished marble, which must have given the great pile an appearance of dazzling brightness.

We learn from Herodotus that it was built in steps, every step forming the scaffold for the next until the top was reached ; then the finishing process was commenced from the top downwards by fitting in angular blocks of marble and polishing the surface to a perfect level.

Saws without teeth, fed by hand with sand and water, were used to cut the slabs with which the walls of the palace of Mausolus at Halicarnassus were lined. Pliny describes the saws and the kind of sand with which the slabs were sawn, and speaks of the palace as being encrusted, or veneered throughout, with marble. It was built 350 years before the Christian era. Saw mills for sawing stone, driven by water power, were in use on the River Roer in Germany in the fourth century. Very little progress appears to have been made in this direction, because we find as lately as the early part of the sixteenth century that one of the inventions of Leonardo Da Vinci was a marble saw, which consisted of a frame in which two or more blades of iron were stretched, thus forming a gang. A copy of Leonardo's original design was published in Scribner's Monthly Magazine some few years ago. According to an English building journal the honor of first establishing in Great Britain mills for the sawing of marble by means of water power, and on an extensive scale, belongs to Mr. William Colles, of Kilkenny. About the year 1730 he tried a model in a small stream, and finding it succeed, took a perpetual lease of a marble quarry in the neighborhood, and set up a mill, which is still in existence, and worked by his descendants. A few years afterwards (in 1748) machinery for sawing and polishing marble by means of water power was established at the village of Ashford, near Bakewell, in Derbyshire. Since that time a great many improvements in the details of sawing machinery have been introduced, but the arrangement sketched out by Leonardo Da Vinci remains practically the same, and is in general use to-day. The principal improvements have been : An arrangement by which sand and water has been fed to the saws automatically, and variations of a clock-work mechanism, by which the saws are gradually lowered into the cut, and which can be made to work faster or slower, according to the hardness of the stone to be sawn. Perhaps the best sawing machine for general purposes is that invented by Mr. Richard Cox. The great objection to the ordinary type of machine is that it takes up too much room ; a long shaft is employed to connect the frame with the crank, and this, together with the length of the saw frame itself, takes up a space which can sometimes be ill afforded. In Cox's machine the connections are fixed to the centre of the frame, instead of at one end of it, and the whole of the driving gear is fixed to the machine itself, so that there is no thrust, and no vibration. The whole of the mechanism of the saw being contained in one framing, the weight of the block of stone to be sawn is ingeniously brought into service, and keeps the machine perfectly steady while it is in work.

An altogether different principle had its origin in Belgium. The machine is called the Helicoidal saw, and is said to produce the most wonderful results. It consists of an endless metallic cord made of three steel wires twisted together to a particular pitch. The cord is carried round two grooved pulleys and is drawn through the cut. It is supplied with sand and water, as in the ordinary saw. Besides the running movement the cord receives a rotary motion which continuously throws the mud produced by the sawing out of the cut. The result of the simultaneous running and rotary movement of the cord is that the sand is rapidly carried along the line and over every point in the cord made by the twisted wires. This combination joined to the continuous movement gives great rapidity of work. The machine has sawn through a surface of 150 superficial feet of white Carrara marble in twelve hours, and through 15 superficial feet of hard Brittany granite in the same time. It has not yet been introduced into this country, but if actual working proves the truth of the experiments made by the inventors, it should not be long in coming into active service. It has already found employment in several of the Belgian quarries.

When marble comes from the saw the surface has yet to be smoothed and polished. It is first rubbed with fine sand, then gritted or pumiced, and finally polished by means of a block on which putty powder or lead has been laid. The machines employed in Italy for surface rubbing are of very rude construction. A bed of thick marble slabs is first laid down in a circular form, and a large wheel-shaped framing of wood divided by spokes into four or five compartments, is made to revolve over it. The slabs of marble to be rubbed are placed in the compartments, sand and water is thrown on the bed, and the revolving wheel is set in motion. As it goes round it carries with it the slabs, which are thus rubbed on those below, until the requisite fineness of surface is produced.

The rubbing bed principally in use in this country is of cast iron. A plate of this material, some 2 inches or 3 inches in thickness, and 8 feet to 10 feet in diameter is made to revolve quickly, and carries on its surface the sand and water required. The slabs are placed face downwards on the plate, and the required work is speedily and easily done. Another machine for rubbing large and heavy pieces of stone consists of a heavy iron plate 8 inches to 12 inches in diameter pierced with holes, and made to revolve by connection with a vertical shafting. The sand and water is placed inside the plate, and finds its way out through the holes upon the work below ; the weight of the revolving plate does the rest.

Numerous plans and all sorts of extraordinary materials have been used and recommended for speedily polishing the sanded surface of marble. Practical experience proves that nothing in this process will take the place of good, honest, hard rubbing. This can be best

applied by means of a very simply contrived machine. A crank is connected with a fly wheel, and works an iron framing backwards and forwards, forming a rocker. To the rocker is fastened a shaft, which is connected to a large block covered with felt, on which putty powder or rouge and water has been sprinkled. The block is dragged backwards and forwards over the surface of the marble, and in no other way can a good lasting polish be produced. Acids are frequently employed to get up a superficial polish, but this method is utterly destructive in its results. A very short space of time is required for the acid to eat away into the surface of the marble and a dull speckly appearance is produced. No acid should be brought into contact with marble in the working, on any pretence whatever.

Numerous machines have been invented for the purpose of carving; but as far as carving in the round is concerned, their history has been nothing but a history of failures. All of them seem to have been on much the same principle. Two or more points were fixed in a frame, which could be moved in every direction. One point was fixed; the others were made to revolve at a high degree of speed. They were all so arranged in the frame that the position of each was always the same in relation to the other. The manipulator placed a piece of finished carving under the stationary point, and as many rough blocks of stone as he wished to make into copies, one under each of the revolving points or chisels. As the stationary point was passed over the surface of the finished carving, and raised, or lowered, as it was brought into contact with each portion of it, so the revolving chisels followed the position of the stationary point over the model, and cut away the stone placed underneath them into a corresponding shape. In some of these machines the table itself moved as well as the frame, but in all of them some modification of the same plan was adopted.

Mr. Gerald Lomer, 43 St. Sacrament street, Montreal, has recently received the Canadian agency for Otis Bros. & Co.'s elevators, Richey, Brown & McDonald, Brooklyn, Ornamental Iron Workers, and Dexter Bros., Boston, shingle stains.

The Fort Erie Jockey Club are about to constrnct a large track and grand stand at Fort Erie, Ont., the contracts for which have recently been let. The grand stand will be 311 feet long by 115 wide. There will be eighteen terraces of seats with folding chairs. In the front of the stand there will be twents-four boxes, each containing eight chairs. The buffet will be forty-five by fifty feet, and the restaurant thirty-six by fifty feet. The house of the superintendent of the track will contain eight rooms. Underneath the stand will be the betting ring, whlch will be two hundred and ten feet long by sixty-eight feet wide. This will have an arched roof, thus doing away with columns.

REPAIRING FRESCO PAINTINGS.—The old fresco paintings are to be washed off with clean water. If this does not remove the dirt sufficiently, a little hydrochloric acid should be added to the wash water, but it is better to rinse off two, three and even four times with water containing too little of the acid than to spoil the picture altogether by using too much acid. After washing off with the hydrochloric acid water, the painting should be rinsed off twice with clear water. If it has to be painted over in places, only lime-proof colors should be used. These are ground in lime-milk diluted and mixed with finely powered sharp sand immediately before use, and should not be applied too thin upon the wall, which is moistened previously. The wall, upon which the painting has been done, should also be kept moist for some time yet, for only as long as the mixture is wet, the lime will enter into an intimate combination with the sand. For this purpose a wooden frame is made around the picture, upon which, in a little distance from the picture, firm sack cloth is stretched, preferably double, before the whole picture, so that no air can strike the picture directly. The sack cloth should be kept quite moist for two to four days.

NEW PLUMBERS' ASSOCIATIONS.

THE master plumbers of Stratford and vicinity have shown themselves to be in accord with the objects of the Dominion Master Plumbers' Association, and on March 3rd a meeting was called by Mr. Wm. Smith, vice-president of Ontario, for the purpose of organizing a local association for that district. The following were enrolled as members: J. A. Castlake, A. Ward, A. Smith, F. Sylvester, and McDonald Bros., of Mitchell. The officers elected were: President, J. A. Castlake; 1st vice-president, A. Ward; 2nd vice-president, A. McDonald; secretary-treasurer, A. Smith; sergeant-at-arms, F. Sylvester.

The master plumbers of Winnipeg, Man., met on the 20th of March and organized a local branch, to be known as the Master Plumbers' Association of Winnipeg. It comprises eight out of the nine established plumbing firms doing business in the city, and starts out with good prospects of becoming an active and useful organization. Officers were elected as follows: President, T. A. Irvine, of T. A. Irvine & Co.; vice-president, T. Cotter, of Cotter Bros.; recording secretary, Jos. Turner, of the Manitoba Plumbing Co.; treasurer, W. Stephenson, of Stephenson & Co. Committees on arbitration, legislation, sanitation and auditing were also appointed, and the constitution of the Montreal Association was adopted, with the necessary changes to apply to the city of Winnipeg. A meeting will be held shortly, when a regular meeting night will be arranged.

The officers of the new association at St. Catharines, Ont., the organization of which was briefly mentioned in our March number, are as follows: A. Chalfield, president; A. Riddell, 1st vice-president; S. P. Gourlay, 2nd vice-president; T. Parnell, treasurer; C. Beard, secretary; T. Patrick, sergeant-at-arms; H. Bald, associate member on committee.

L. H. Gaudry has started business in the city of Quebec as a dealer in plumbers' supplies.

Mr. J. W. Hughes, of Montreal, who was one of the promoters of the Dominion Master Plumbers' Association, was, at the last meeting of the American Public Health Association, appointed chairman of a new committee on "Sanitation, with special reference to drainage, plumbing and ventilation of public and private buildings." Mr. Hughes has always taken an active interest in sanitary matters, and fully deserves the honor conferred upon him.

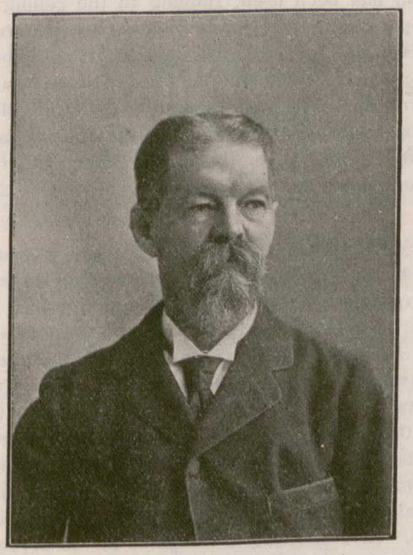
SALT IN SAND.—A writer in one of the London architectural papers presents some interesting remarks relative to methods by which salt may be detected in sand. He says that if the sand is not contaminated with decaying organic matter the easiest way is undoubtedly to put a few grains in the mouth, or to taste the water in which some of the sand has been stirred. If this test is objected to put some of the sand in a wine-glass, cover with distilled water, and, after agitating for some time, dip a piece of clean platinum wire into the water and hold it in a colorless Bunsen gas flame. A persistent deep yellow color imparted to the flame will indicate the presence of sodium. Another method is filter off the water from the sand by means of blotting paper, and to the liquid add one drop of silver nitrate solution. A curdy white precipitate will at once betray the presence of common salt. In ascertaining the presence of salt in sand, it is assumed that the object is to discover any tendency to absorb moisture, and consequently to cause damp walls. This could be equally well ascertained by drying some of the sand for some hours at a temperature of 212° F. Its weight should then be accurately taken and the sand exposed for some days to a moist atmosphere. Any increase in weight at the end of the period would be due to water absorbed from the air, probably owing to the presence of common salt.

PRESIDENTS OF CANADIAN PLUMBERS' ASSOCIATIONS.

MR. R. SAMPSON.

THE ancient city of Quebec has quite an active plumbers' association, of which Mr. R. Sampson, whose countenance is herewith portrayed, is president. Mr. Sampson's father was a Devonshire man, who arrived in Quebec in 1832 to accept a position as master armorer in charge of the small arms department and citadel armory, in connection with which there were many interesting associations, such as the rebellion of 1837, the coming and going of the troops, etc. He occupied this position for forty years, and died at the honorable age of 85.

The subject of our sketch is 57 years of age, and was apprenticed to learn the brass trade with C. Pardie when thirteen years old. At the death of Mr. Pardie five years later, he secured employment with the late John Pye, well-known to the older plumbers of the province. That was the time of big margins, when plumbers were regarded as superior to ordinary mortals



MR. R. SAMPSON,
President Quebec Master Plumbers' Association.

and feared for their ability—to make bills and collect them. Then there was no trouble with the apprentice question, as there was always some hand work to give them employment between times, and better opportunities were afforded to become lead workers than at present, with our superior machine-made lead work. By casting on sand tables many tons of sheet lead were manufactured, from which soil pipe, traps, bends, etc., were made in a manner unknown to the present trade.

In 1866 Mr. Sampson went to New York, were he was employed for one year at brasswork and plumbing. Returning to Quebec, he commenced business on his own account in 1868, and has continued ever since. He has spent much of his time in working on patent models for different clients, which has given a great variety of work. In his business he is ably assisted by his son, who has charge of the brass shop, while his daughter assumes the responsibility of the office work. Mr. Sampson has accumulated considerable wealth by strict attention to business, but has nevertheless found time to participate in an occasional hunting and fishing tour.

Upon the formation of the local plumbers' association two years ago, Mr. Sampson was chosen president, a position which he still occupies. He reports the association to be in a good condition, and although some of the local firms have not yet joined, it is hoped they will be induced to follow in the footsteps of the majority.

LONDON PLUMBERS' ASSOCIATION.

MR. W. Heard, president, sends the following encouraging report of the local plumbers' association at London :

I can report the London Association to be in first class working order. All the members are fully alive to the benefits of their connection with the National Association of Master Plumbers, and the manufacturers and wholesale dealers are realizing the benefit that comes to them by standing true to the association.

The plumbing trade here, for the last four months, has been very dull, but there are indications of an improvement. The local association membership has been increased by the addition of Messrs. Noble & Rich, who have lately commenced business here, and being well-known, practical men, will get their share of the trade.

A decided improvement is noticeable in the feeling of the individual members of the trade, one to the other, since the association has been formed, the old-time jealousy being displaced by frankness and fair dealing. That augurs a new era.

An invitation has been received from ex-President Haslett, to celebrate the birthday of the local associa- and a pleasant time is anticipated.

MANUFACTURES AND MATERIALS

ROOFING TILES AND THEIR MANUFACTURE.*

BY C. W. CRAWFORD.

Tilemaking, next to brickmaking, is the greatest of the clay industries in other countries than this. The roofs are universal in all of Continental Europe, and are much used in the British Isles, where slates are so plentiful. All of the known varieties may be found in any of the old cities, from that resembling a drain tile split in two, or that having a reverse curve like a letter S, or the flat shingle tile, among the older styles, to the modern interlocking tile now in exclusive use. The fashions in these tiles vary so greatly that the idea of a patent tile in this country is absurd. The tribe is so numerous and so venerable that it is difficult to conceive of any new thing on this side that is not in use on the other. The underlying principle of them all is the same—that of a tongue and groove, arranged with the groove facing upward and the tongue of the opposite tile fitting loosely into it. This is the single lock, and is the more common. But some are made with two tongues and two grooves, called a double lock. This latter plan is more secure against wind and fine snow, but having greater lap, they are necessarily heavier, but both kinds are water tight if of good quality. No tile roof is air tight, and the ample ventilation they admit of is considered an advantage in making the house cooler in summer without being colder in winter. Some of the old pan tiles of S shape are laid with cement, and are fairly tight, but the expansion and contraction must inevitably crack the cement. It is the common practice now to lay tiles as they come from the factory, without cement, except in fitting ridge tiles and hip rolls.

Tiles are held on the roof mainly by gravity, by being

* Abstract of paper read before the Ohio Clayworkers' Association.

made with a nib on the under side that hooks over the slat on which it rests. These nibs are usually punched for nails while the tile is soft in such a way that the nails are driven into the upper edge of the slat. Some tiles have no nail holes, but, instead, a nib on the bottom, near the lower end, punched for a wire, and it is not considered necessary to wire every tile, but only a few scattering ones. Some are made with nibs to hook on the slats, but none for wires and no nail holes, depending upon gravity alone to keep them in place. It is not necessary to use solid sheeting, but only slats three inches wide. But in the case of an old roof already sheeted, solid narrow slats, one-half inch thick, are nailed on top of the sheeting on which to hang the tiles.

Almost any clay that will make good brick or drain tiles will make good roofing tiles, but it is essential that it shall dry straight and without cracking. Most kinds of clay will do, but there are kinds that appear to be first-class that cannot be dried without going to pieces. A specimen of such clay was sent to our firm for trial from Minnesota, from which we never got a whole tile, but the pieces burned to a fairly good red. Other specimens we have had that would dry over the boiler or anywhere. Common surface clay is more liable to crack than others, but when mixed with, say, 20 per cent. of shale or fire clay it generally works well and dries almost anywhere, and may be considered an ideal clay for tile-making. The admixture of shale reduces the usual red color, which is its only fault. Pure fire clay or potter's clay makes excellent tiles as far as quality goes, but the color is bad. These are good if treated with a slip of some kind or with pigment ground in the clay. Anyway, fire clay can be relied on not to warp or crack, and to stand a very high heat, which shyle or surface clay will not. For bluesmoking almost any clay can be used, but the better the clay the better the tile, and hence fire clay or some mixture of it will make better blue tiles than any other, and the danger of over-burning is a small factor. Bluesmoking is an excellent means of disguising under-burned tiles, they all come out one color, and the bad ones look as well as the good ones, but that need not mitigate against the process, which is an excellent one if the ware is burned properly. In preparing the clay for tilemaking it is important that it shall be ground and screened finely, using a No. 20 or 24 screen, and thoroughly pugged and worked through an auger mill into slabs a little less in area than the tile—say one inch less at each side, one-half inch less at each end, and thick enough to contain a little more clay than the tile. The surplus overflows, and a fin is left around the edges that must be trimmed off. The pressure is not necessarily very great, and as the press runs almost idle during its revolution, except at the point of greatest pressure, it will be seen that very little power is required.

The Queenston Quarry Co., of St. David's, Ont., is seeking incorporation, with a capital stock of $50,000.

The works of the Standard Drain Pipe Company at St. John's Que., have been closed down pending a decision by the government regarding the duty on drain pipes.

Steps are being taken to form a joint stock company to carry on the business of manufacturing sanitary goods hitherto conducted by Messrs. Dakin & Co., at Iberville, Que.

A very simple remedy to remove rain spots, or such caused by water soaking through ceilings, has been employed with good results. Take unslaked white lime, dilute with alcohol, and paint the spots with it. When the spots are dry—which ensues quickly, as the alcohol evaporates and the lime forms a sort of insulating layer—one can proceed painting with size color, and the spots will not show through again.

In a recent decorated library, the walls have been wainscoted about five feet high, where the low, open bookcases do not occupy the wall space, and all the oak woodwork has been stained a forest green. Above this a damask pattern paper, in two shades of dark green, has been used, running to the ceiling without a frieze, and separated from it simply by a narrow picture molding. The ceiling is a pale green, with stenciled Empire border in a slightly darker shade. The hangings are of green figured denim, and the Smyrna rug on the floor carries out the same color scheme. Relief is afforded by the bright colors of the Liberty velvets that have been used to upholster the quaint-shaped chairs, and the bright cushions that are piled upon a divan in the window seat.

Screws in Stone Walls.—A Dusseldorf engineer, knowing from experience that wooden dowels for the purpose of securing screws in stone are apt to weaken the walls and do not afford the desired solidity, has devised an ingenious method of obtaining a firm anchorage. For this purpose a wire of suitable thickness is coiled onto the screw, so as to follow the threads of the same and to form a kind of screw nut. The coiling may commence near the head or thick end of the bolt and proceed toward the point by laying the wire into or between the threads, so as to touch the bottom of the same, the section of each screw thread being perfectly triangular or trapezoidal and the core of the screw conical (similar to a wood screw). After arriving at the point of the screw, the wire may be wound backward over the helix already wound on, but with a steeper pitch, so as to leave wider interstices between consecutive convolutions of the wire. After the wire has been laid on so as to form a nut, and then the screw withdrawn, the nut or wire coil is introduced into a hole which has been drilled or otherwise formed in the wall for this purpose, and which is slightly wider than the diameter of the nut measured over the outer layer of the wire, after which the interstices are filled up with plaster of Paris cement, or similar binding material in a plastic condition. When the said binding material has become sufficiently hard and firm, the screw bolt which has served as a core, or another screw bolt having the same diameter and pitch; is screwed into the wire coil, and may now be screwed out and in repeatedly without damaging the wall, because the wire serves as a screw nut, which is secured to the stone or wall by the cement or other binding material.—Philadelphia Record.

PAGES

MISSING