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—THE—

CANADIAN ARCHITECT AND BUILDER,

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The Manufacture of Paving Brick.

THE rate at which brick for pavements is growing in favor in Toronto can be gauged by the fact that the local paving brick factory is unable to keep up with the demand. In consequence, the construction of brick pavements is at present at a standstill. It is understood that the manufacturers are taking steps to greatly increase the capacity of their works. If other cities and towns, following the example of Toronto, should adopt brick as a paving material, as doubtless they will, there will be room in Canada for several paving brick manufactories.

New Parks for Toronto.

THE Mayor of Toronto has recently announced the terms upon which additional park lands can be procured in the north-west and north-east sections of the city. Except in one instance, these terms would appear to be advantageous. The one exception is the offer by Mr. Manning of land on Palmerston avenue. A park in this locality is no doubt desirable, but not at the price of $5,000 per year for the land alone, to which must be added the cost of tree planting, fencing and other improvements. If such an expenditure is contemplated, it might with much greater advantage be made on the purchase and improvement of the proposed Victoria Square, at Queen and Bay streets, opposite the new city hall. A square in the heart of the business district is certainly the city's greatest need in the way of extended park area.

Public Bathing Facilities.

AMONG the many public improvements which are being undertaken and carried out in Toronto at present, none are more urgently necessary than public baths. Many years ago Mr. Erastus Wiman erected, at the eastern extremity of Toronto Island, public bath houses, which he presented to the city. For some reason, probably the inconvenience and expense of getting to that part of the Island at that period, these baths after a time fell into disuse. Since then the Island has been made a very attractive resort, and the facilities for transport to and from the city greatly improved. There is no doubt whatever that if public bath houses were now to be erected and properly maintained on the Island, they would be largely used, especially by the poorer classes. In Great Britain these institutions are made self-supporting, and under proper management they would no doubt in a short time become so here. A very slight fee —so small as not to be in any degree prohibitory—would

suffice to cover cost of maintenance and perhaps interest on invested capital as well. When the street railway company's lines shall be extended to the Island, the cost of reaching the public bath houses would only be four cents, the price of a car ticket, from any part of the city. The sand bar on the west side would probably be the most desirable and convenient location. The City Council have this summer shown their recognition of the necessity of public bathing facilities by allowing boys under sixteen years of age to bath at this sand bar and providing boats for their free transportation to and from the city. This by no means fills the requirements. Proper facilities should next season be provided for all who may desire to avail themselves of them. The health of the citizens who are obliged through force of circumstances to spend the summer within the confines of the city demands that public bathing places should be provided.

Form of Contract.

WE print in this number a form of contract prepared and in use by Messrs. Hewitt & MacLaren, architects, of Brantford, Ont. This contract is the outcome of considerable attention bestowed by these gentlemen and their solicitor on the subject of forms of contract. No new features of importance are claimed, but in the opinion of the framers this form embodies many of the most valuable features of American and foreign building contracts, and such as are believed to be best adapted to building contractors in Canada. As there are few subjects of greater importance to architects and builders than the construction of forms of agreement, we trust that the one to which we now call attention will receive critical perusal. Any criticisms which our readers may be disposed to make concerning it will be welcomed as well by ourselves as the compilers. A general expression of opinion on this important subject would be appreciated and would be certain to have a beneficial result.

Employment of Canadian Plant.

WHILE the injustice of employing foreign workmen on works of contruction built by Canadian capital has received much attention of late, there is another important consideration which has been almost entirely overlooked, viz., the employment of plant of home manufacture. Particularly in the case of Government work, for which the capital is provided by the general public, should this matter be carefully watched, and a stipulation provided in the contract that, wherever possible, materials and plant of Canadian manufacture be used. In the construction of the Crow's Nest Pass railway, it is stated that Canadian labor has been given the preference, but on the other hand, the claim is made that a large portion of the plant being used on the work was manufactured in the United States. Some years ago it may have been necessary for contractors to purchase foreign plant, but with the improvements which have been made in manufacturing in Canada in recent years, this necessity has to a large extent been removed, and to-day we can compete favorably with the United States both in quality and price.

The eighteen year old son of Mr. J. Turner, plumber, of Winnipeg, was drowned in the Red river while bathing.

The master plumbers of Montreal recently closed their establishments on the occasion of the annual pic-nic of the Journeymen Union of Steamfitters and Plumbers.

REGULATION OF WAGES ON GOVERNMENT CONTRACTS.

A SELECT committee of the British parliament has had under consideration for more than a year the working of a resolution passed in February, 1891, to secure the payment of a fair rate of wages on government contracts, and its administration by the various government departments. The committee have prepared two draft reports, and are about to determine which of these should be taken as the basis for discussion. The chairman of the committee, the Home Secretary, has framed one of these reports, the other having been prepared by Mr. Sydney Buxton. The chairman has come to the conclusion that the departments, as a whole, have loyally endeavored to interpret and carry out the provisions of the resolution; but he does not deny that, in certain quarters there exists a great lack of confidence in the ability or in the desire of some of the departments to enforce its spirit and letter. Whilst, however, he does not consider this lack of confidence well founded, he thinks it important that the feeling should be removed, and to this he invites the committee to express the opinion that in some ways there is room for improvement, and that there might be greater promptitude and uniformity in the working of the resolution.

As regards such questions as how the current rate of wages of the district is to be discovered, how the area of a district is to be defined, under what conditions a contractor is entitled to ignore the district rate, the Home Secretary advises the committee not to lay down hard and fast rules, his suggestion being that each case should be decided on its merits by the exercise of common sense after careful inquiry. He does not overlook, however, the objects which the House of Commons had in view in adopting the resolution; and he asks the committee to endorse the recommendation of the Labor Commission that any agreements tending to regulate the rate of wages or the conditions of employment as between masters and men should be, as far as possible, encouraged and recognized. Other recommendations proposed by the chairman are that, where a sub-contract is allowed, the principal contractor should, as regards the carrying out of the fair wages resolution, be held responsible for his agent; that a list of the Government contractors, with the nature of their contracts, should from time to time be published; that contractors should in all cases be required to give no preference as between "unionists" and "non-unionists."

The alternative report prepared by Mr. Buxton recommends that there should be a uniform fair wages clause in all Government contracts; that every such clause should specify that the wages paid in the execution of the contract shall be those generally accepted as current in each trade for competent workmen in the district in which the work is carried out; that every such clause should state that, in the engagement and employment of workmen and others required for the execution of the work, no preference should be given as between "unionists" and "non-unionists;" that, when tenders are invited, a notice should be issued in every case drawing the attention of those who desire to tender to the fair wages clause in Government contracts; and stating that the department concerned will enforce the contracting firms to conform to the spirit and intention of this clause; and that any firm wilfully disregarding its provisions will render itself liable to be disquali-

fied for further government employment; that all sub-contracting without the leave of the department concerned should be prohibited; that sub-contracting should only be permitted where such sub-contracting is customary in the trade, and for work which the contractor in question does not himself perform in the ordinary course of his trade; that where a sub-contractor is allowed, the principal contractor should, as regards the fair wages clause, be held responsible for his agent; that a money penalty for breach should be attached to to the fair wages clause; that (where practicable) the text of the fair wages clause should be conspicuously affixed to the work in progress under the contract; that all cases of dispute in reference to the "current rate," and conditions of employment, and whether a particular contractor was or was not carrying out the terms of the fair wages clause in spirit and in letter, should be referred to the Labour Department of the Board of Trade for inquiry and for report to the Department concerned; and that a list of Government contractors, together with the nature and amount of their contracts, should be from time to time laid before Parliament and published.

ILLUSTRATIONS.

TERRACE OF DWELLING HOUSES AT PETERBOROUGH, ONT., FOR SIR SANDFORD FLEMING.—BOND & SMITH, ARCHITECTS, MONTREAL.

These houses are to be built on the new street that Sir Sandford Fleming is opening up through his Peterborough property. Each house will contain eight rooms irrespective of the attic. The first storey in front will be built with dark red common brick; above this will be shingles stained a light red in gables and elsewhere a yellowish buff. The woodwork will all be painted white.

The houses will be heated by warm air, lighted by electricity and gas, and have thorough sanitary arrangements; all pipes exposed and in bath-rooms nickel-plated.

THE DINEEN BUILDING, CORNER YONGE AND TEMPERANCE STREETS, TORONTO.—F. H. HERBERT, ARCHITECT.

The size of this building, which is being erected on one of the most important commercial street corners in Toronto, is 28 ft. 2 in. by 100 ft., four stories and basement. It is built of cream pressed brick with Ohio stone trimmings. Messrs. Dineen will occupy all Yonge and Temperance street frontage, including high basement, with two-story showroom and workshops in the rear. The upper three stories of main building will be sub-divided into twenty convenient offices. The building will be steam heated throughout and wired for incandescent lighting. The entrance to offices will be on the Temperance street side, and means of access will be provided by a modern electric elevator built by the Sprague Elevator Co., of New York. The entrances, halls, doorways, etc., will be laid with Venetian mosaic in suitable designs, and the sidewalks on both streets out to curbs, and all fanlights, will be glazed with Luxfer prisms. The finish throughout will be in natural hardwood.

CHURCH OF THE MOHAWKS, BRANTFORD, ONT., ERECTED 1874, AND COMMUNION SERVICE PRESENTED BY QUEEN ANNE.

This is claimed to be the oldest church in the province of Ontario, and is therefore a subject of archæological interest. It is situated two miles from the city of Brantford, and is built of wood, with the exception of a recently constructed brick chimney. The body of the church is covered on the outside with clapboards an inch thick, which accounts for its excellent preservation. The entrance is through a square tower, on one side of which is the vestry and on the other a vacant room of equal dimensions. Above this tower rises a graceful shingled spire with iron finial. The inside of the structure is very plain and is seated with high backed benches.

The communion plate, which appears in the illustration, bears on its rim the following inscription: "The gift of Her Majesty, Anne, by the grace of God of Great Britain, France and Ireland, and of her plantations in North America, Queen, to Her Indian Chappel of the Mohawks."

THE HISCOX BUILDING, LONDON, ONT.—MCBRIDE & FARNCOMBE, ARCHITECTS.

The building has a stone foundation up to ground level, the basement containing the steam and hot water heating apparatus, lavatories, store rooms, &c. The ground floor is built of Berea stone and contains the Bank of Toronto offices, with entrance at corner. The banking rooms and manager's office are finished with birch fittings and panelled wainscot, furnished by the Canadian Office and School Furniture Co., of Preston, Ont., tile floor, laid on terra cotta arches and steel girders. The ceiling on this floor is executed in staff, being panelled with moulded and panelled beams, dividing the panelling. The mouldings, corbels, &c., are enriched, and the whole decorated to give an old ivory effect. The walls are also finished in colors to correspond with the other finish. The other portion of this floor is divided into two offices, main entrance, staircase and elevator space to upper floors. The first, second and third floors are divided in offices, with vault accommodation for each floor. These floors are also finished in birch and the outside walls constructed of Beamsville pressed brick with terra cotta trimmings; a copper cornice completes the top portion of the building. The third floor contains, besides offices, lavatories for ladies and gentlemen, and all offices are reached by an electric passenger elevator, built by Leitch & Turnbull, of Hamilton.

The ceilings throughout are of embossed steel from the Metallic Roofing Company's works, Toronto.

The Bank of Toronto portion is heated by hot water, and the remainder of building by steam, the contractors being the John Ritchie Heating Co., of Toronto. The other contractors were: Martyn & Hammell, brickwork; A. Burnett & Son, cut stone; Wm. Tyller, carpenter work; Pritchell & Calhoun, plastering; H. & C. Colerick, painting and glazing; Wm. Stevely & Son, copper work; James Greenaway, plumbing.

The Roentgen rays have been employed with success in Germany to prove the authenticity of a painting attributed to Albrecht Duerer. It was a head of Christ painted on the wood, and supposed to have been executed in 1521; very dingy with age and probably "restored" more or less. After several efforts a photograph was successfully taken by means of the Roentgen rays, which revealed the features of the thorn-crowned Jesus, and the drapery about the shoulders, and the hands which grasped the latter, more distinctly than in the painting. There also came to light a Latin inscription in quaint Gothic characters, the monogram of some grand duke (for whom, perhaps, the picture was painted), the artist's initials and the date "1524," which date was accepted as the correct one. The photograph reveals the grain of the wood and the fibre of a silk handkerchief stretched on it.

THE USE OF STEEL IN THE CONSTRUCTION OF DAMS AND RESERVOIRS.

By John S. Fielding, C. E.

Tensile strength is required in nearly all materials used by engineers, and the utility of the article is in the majority of instances determined by this standard. In the members of a Pratt truss bridge the tensile strains predominate, and numerically about 60 per cent. of them are subject to direct tension, and 40 per cent. to compression. And yet, the compression members, while not being subject to tensile stress, nevertheless develop tensile stress in themselves, while engaged in transmitting stress of an opposite kind.

Even in stone work, such as a bridge abutment, it is necessary to have tensile strength, as the work of carrying the bridge and resisting the pressure of the bank or the current, although practically all compression, nevertheless develops tensile power through unequal loading, and a stone that is deficient in tensile strength is liable to prove to be a bad investment, by cracking and allowing unequal settlement or bulging of the wall.

In a stone dam of the usual construction, with a vertical face toward the pressure of the water, the tensile strength of the material determines the thickness of the wall and the shape of the structure unless the structure is made so excessively heavy as to resist by sheer inertia of its mass. But an engineer would be severely criticized who built everything so heavy as to ensure permanency by the great size and strength of the structure compared with the forces which could come against it and the work which it had to do. He must not waste material and money in any such scheme for the furtherance of his own credit for building for permanency. If he should do so his reputation would suffer, and his pocket also, for he would be seldom employed.

Great and small engineering undertakings are dependent upon an item that is not engineering, but is closely allied to it. I refer now to rate of interest upon investment; and, just as the money lenders of Europe can prevent nations going to war by withholding from them loans of money, so does the rate of interest which can be expected upon an engineer's contemplated expenditure, have the deciding voice as to whether he shall or shall not proceed with the undertaking.

In this way the engineer is beholden to look about him for a material or materials that will enable him to perform certain work in a way that will fulfill the duties required of it, and at the same time satisfy the chief clerk of the works, viz., rate of interest upon investment, that a proper return can be got out of the use of the article.

Stability and permanency are necessary to do this with any degree of success, so that as a general rule the best materials at hand are the most economical, and if any saving is to be effected, it can best be done by the efficient use of good material. In this connection we are brought back to the opinion expressed at the beginning of this letter, viz., that a good material for engineering purposes is usually one possessing tensile strength in a high degree.

Timber is a more useful article to an engineer than stone or concrete because it can be used where great tensile strength is required, and stone or concrete cannot be so used. If concrete could be made that would develop a tensile strength of thousands of pounds per square inch instead of only hundreds, it would be a much more valuable and reliable article for the uses of the engineer. The material par excellence for the engineer is undoubtedly "open hearth" or "Bessemer steel," and after some years' use of, and reliance upon this material, one gets to feel that no matter what work he may have in hand, if this material could be used, he would be able to estimate just what to expect from it, and to say exactly what it would cost to construct.

It is probably with such feelings actuating me that I have accepted the idea that steel is the proper material with which to construct a dam or reservoir. One objection that may be urged against this is the fact that water is very antagonistic to steel, through developing corrosion, but there cannot be as much in this as appears at first sight, for why use iron water mains or steel bridge piers or even steel ships, steel lighthouses, steel piles, such as have been used at Brighton Pier and other places on the sea coast in England and America.

If, then, water and steel may be allowed to meet, we may discuss the designs.

First, for a reservoir—Reservoirs are simply a means of impounding water at a point or situation where natural means are wanting upon two or more sides, and probably all four sides, being different from a dam which impounds water upon one side and holds back a body of water with the assistance of natural walls upon other sides.

It this way it is like a bowl or basin, and why can it not be built like such, and of a material that will exert tensile strains? A bowl or basin of circular form filled with liquid can have no strains caused by unequal loading, since water transmits pressure equally in all directions.

An earthen reservoir depends upon its thrusting strength to hold back the water, but this strength is about nil if water gets under its bearing surfaces, which may occur if the inner coating of asphaltum or other material admits of the slightest leakage. When this occurs the earthen dam is like the man pushing a weight with a banana peeling under his shoe. The stone dam is in a similar category, because neither of them can exert material tensile strength and their strength is not self-contained, but is dependent upon outside conditions.

But consider a reservoir built with a steel circle or rib running horizontally, on a level with the top of the water, another rib in a horizontal plane five feet below it, another five feet below No. 2, and each one describing a smaller circle—these horizontal ribs to be connected by means of curved ribs in a vertical plane, and the whole being a skeleton frame of the bowl, to be filled in with a wall of concrete. Would not such a reservoir be of such strength that its stability could be depended upon, and its strength determined without reference to outside conditions, such as the action of moles, muskrats, frost or soakage.

In regard to cost, it would appear that any size of reservoir could be built with a very thin wall of concrete if the concrete were bound with such steel bands, and the thickness of the concrete would not he increased materially for even a deep reservoir—the amount of steel being varied to suit the stresses caused by the volume and head of water, the thickness of the concrete being made to suit the spacing of the steel bands only.

Such great care would not have to be exercised to keep this basin tight, as its strength would not be dependent upon this. Soakage through the concrete would have to be taken care of by providing underdrains to carry it away.

Now, in the case of having to build a dam, it seems to me a strange thing for the engineer to have the choice of a great many different formulæ for the strength of the wall he intends using or for the size of wall he should use; also a great many different co-efficients (all by prominent authorities) for the friction of earth upon earth, stone upon stone, or stone upon earth, etc., etc., and these changing constantly upon the assumed conditions being changed. It is easy to imagine an engineer pondering over what row of decimals he should use for safety, and which row of decimals would bring the cost out to an amount that would admit of the work going on; then, in the end doing as was done recently for an important work, make miniature models and subject them to miniature freshets, and go on from there. It looks to me as if that sort of work cannot be called an exact science.

Take again the case of a recent partial failure of a dam, where large stones were moved, having let go at the cement joints—now that may appear to be all a case of weight and sliding friction as opposed to a pressure of rushing water, but I think it could more properly be ascribed to a weakness of tensile strength in the materials at the up stream face, or the outer fibres of the structure. The cement joints, being but partially set, gave way at a low tensile stress, and the water getting under the bed of the stone soon moved it. If there had been a tensile strength of 600 pounds instead of probably 200 pounds per square inch in the cement joints the wall would have undoubtedly stood; how much more secure then would it have been if the tensile strength were 6,000 pounds?

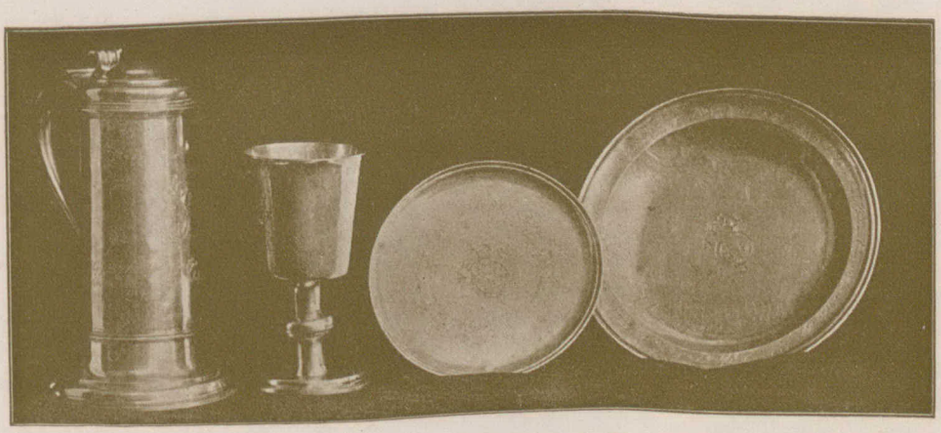
To get a tensile strength equal to this or even to be worth calling a tensile strength, we have to use metal, and steel is the best article.

A dam is not like a reservoir, for it may be subject to unequal loads. During flood time a greater depth of water at one point or a concentrated blow by a log, or even the increased velocity at centre of the stream, will all cause unequal loading. If the nature of the foundation subsoil varies, so as to give a better co-efficient of friction at one point than at another, and the putting together of the stones is more carefully done in one part than in another, we have then only to assume the defects in strength named, and the increase in pressure named to be merged in one point to have a case of very unequal loading, and, it appears to me, that in the case of a wall not having a large factor of safety over and above what would be required at the point of the greatest stress, move-

THE DINEEN BUILDING, COR. YONGE & TEMPERANCE STS., TORONTO.

F. H. HERBERT, ARCHITECT, TORONTO.

CHURCH OF THE MOHAWKS, BRANTFORD, ONT.—ERECTED 1784.



SILVER COMMUNION SERVICE PRESENTED BY QUEEN ANNE TO THE CHURCH OF THE MOHAWKS, BRANTFORD, ONT.

ment of some amount would take place, and if any movement took place the wall would be permanently weakened.

Now, assume that at the point named the stress approaches the limit of strength—the only thing that can help that point will be tensile strength on one face acting in conjunction with compressive strength on the opposite face, transmitting part of its load along the portions of the wall that may not be so hard pressed by the current, and may be stronger and better bedded. It is hard to see where tensile strength sufficient for this purpose can be got without recourse to metal.

A great deal could be said in regard to this matter of unequal loading, but I will simply state that I would consider a dam to be the same as unequally loaded, even if the pressure along its face were uniform, if its power of resistance varied, and this condition becomes dangerous if the variation in power of resistance is considerable.

In regard to a steel dam, let us assume a structure placed upon a river bed of hard impervious clay. By the use of steel this can be made to be practically all of one piece, being precisely the same as if we could get one of the huge trees of the western coast, and after hewing it to a size of say 30 square feet and the full length of the dam, say 120 feet, we could lay it across in the bed of clay and attach it to either bank in a thorough manner, and thus impound the water. It is quite evident that this dam would not break, but would have to be carried away bodily before it would yield. Its strength can be in two directions, viz., refusal to change its shape in a horizontal plane, and refusal to change its shape in a vertical plane. If it is anchored in such a way as to prevent its rising, or is made of such a shape that the water will help to hold it down, it will have stability. Now, let us place a steel truss upon the bed of the river, with its greatest strength in a horizontal plane and imbed it thoroughly with clay and concrete, and upon this truss erect another one on its centre, then complete these by sloping sides vertically, as shown in diagram 1.

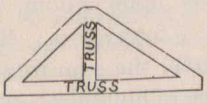


DIAGRAM 1.

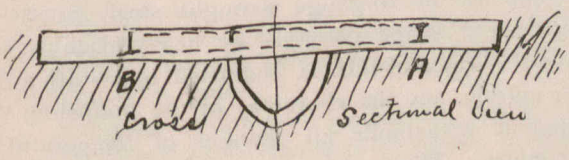


DIAGRAM 2.

Plank over the tops of these slopes, having first filled in on top of concrete base with stone or earth to any height desired. There would then be a dam that could not fail from any action of musk-rats or moles, or from the starting of a small leak carrying away a part, and then more and more until it collapsed entirely and let go all the water.

A dam such as this, so well provided with strength in tension planes, could only be pushed bodily from its position. The problem then becomes one of head and force of water as against inertia given to the dam in the simple design of its dimensions, resulting in a certain total weight of materials and the friction upon the clay. The weight of the shore cribs up and down stream would also be available in this sum since the dam itself would be attached securely to them.

It is my belief that a dam so constructed would be permanent beyond any doubt, and if the shore cribs were carried the proper distance up stream and the usual precautions taken to puddle behind them and under the whole structure, so that it would always be tight, an extraordinary freshet would have no more effect upon it than an ordinary one. This dam could have a row of piles at intervals of 20 feet apart, to be anchored to, at what would be practically the panel points of the flat truss, so that if the assumed co-efficient friction of the mass in the clay should not be correct the piles would hold it. But an ideal dam would be one that could be examined at intervals and a positive opinion obtained as to whether it was absolutely tight or not, and if leaking on the up stream face the water should be intercepted before it could get underneath all of the dam. Thus a good co-efficient of stability could be relied upon for the lower portion at least. To do this lay down a truss and imbed it on the clay and fill in with concrete, leaving a trench down the centre. (See diagram 2.)

This trench could be lined with porous material, and if the upper portion of the dam A leaked, it would intercept the water. Now, upon this erect two concrete walls, one over A and one over B, and imbed a light system of vertical and diagonal bracing in each, these to connect with the flat imbedded truss, and also to a similar truss at the top. We would then have a section like diagram 3.

Now, we may also connect B D and A C with light diagonal bracing and put in cross walls of concrete E E. The space can now be filled in with earth, and the top planked over with earth or paved with concrete.

There should be a layer of silt or gravel extending completely across the inside filling leading to tile drains and emptying outside the wall on down stream side, m n x, so as to intercept any water getting over the top of the dam at flood time, or soaking down during rain falls. All that remains to be done is to build suitable abutment walls in either bank and connect to them in a way to give maximum strength, provide spillways, etc., and then carry the main drain M to any suitable point where it can always be ascertained if water enters. To ensure a small quantity finding its way to the extreme end the lower portion of this drain should be of iron, and it should be given a fall.

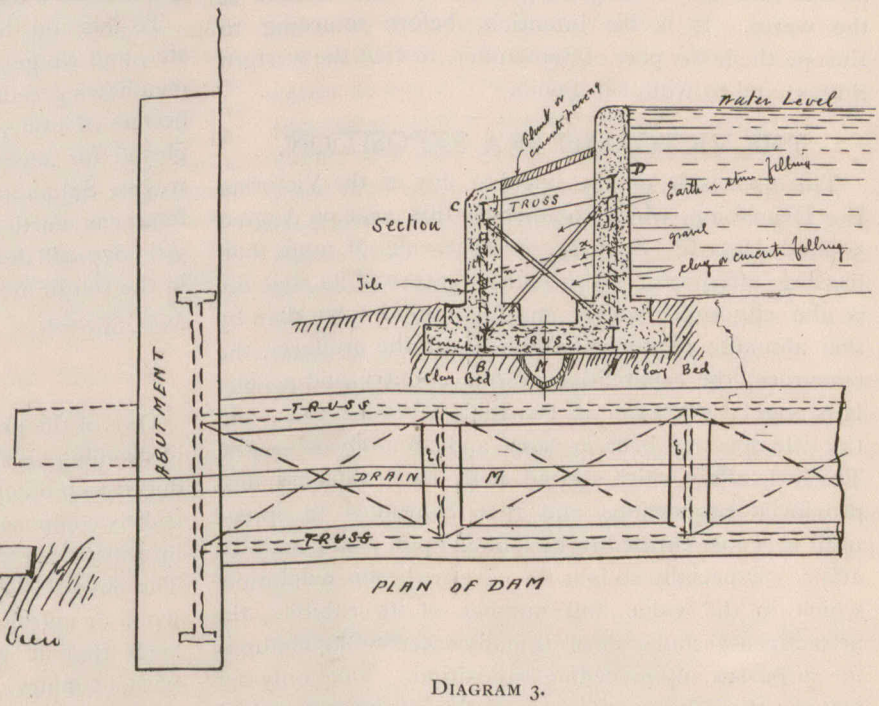


DIAGRAM 3.

If it is found that water enters, we will know then that the co-efficient of friction for portion of wall A is at the minimum, but that for B will be a maximum until the water rises to the top of the drain. This could be prevented by pumping or providing drainage to some lower point. If it should get full, however, it would be a signal for lowering the head of water and thus reducing the pressure on the foundations of the dam.

This design of dam could be used for any height required, also for any length. To go into all the rules or assumptions that would be best to adopt for different cases would take up too much space for this article. I would say, however, that this construction should not cost any more than a masonry or earthen dam of usual strength, and should be more reliable and stronger than could possibly be obtained in masonry or earth, and the one feature of possessing tensile strength in a high degree should recommend it to the theoretical and practical engineer alike.

Messrs. Clare Bros. & Co., of Preston, Ont., have issued a catalogue of their new hot water heating system, containing descriptions and illustrations of the Preston boiler and patent steel radiators. Persons interested in heating apparatus should write the company for a copy.

IMPRESSIONS OF A VISITOR.

Mr. Edward Swales, architect, of Doncaster, England, some of whose charming sketches appeared in the pages of this journal a few months ago, is at present on a visit to the United States and Canada. He has expressed himself as being pleased with much of what he has seen of Canada and Canadian architecture. The latter impresses him as being more substantial in character than that of the United States. The new city buildings, now nearing completion in Toronto, and several of the large modern buildings, elicited his praise. He referred in complimentary terms to the pleasing effect stone produced by carving in low relief which is characteristic of American architecture, in contradistinction to the style of heavy undercutting and high relief which obtains in Europe. On the other hand he found ground for criticism in the total disregard of scale exhibited in the design of many of our buildings, the finials on which were a source of amusement, owing to the abrupt manner in which they are made to terminate in a flattened knob, or spread out to huge dimensions. Mr. Swales remarked that thus far he had seen very little good gothic work on this side of the water. It is his intention, before returning to Europe the latter part of September, to visit the western States, and to winter in Spain.

THE VICTORIAN ERA EXPOSITION.

The approach of the opening day of the Victorian Era Exposition, which commences this year on August 30 and lasts till Sept 11, is deserving of more than passing attention. By no other feature of its civic life is the city more widely and favorably known than by this annually recurring exhibition of the products, the resources, the capabilities of our country and people. It is popularly known as Canada's Greatest Fair, and the title does not belie its scope and comprehensiveness. The little affair which started with local aims assumed provincial proportions and then continued to spread until it is now entitled to be looked upon as a Dominion affair. Especially so is it the case with this exhibition, which in the value and number of its exhibits, the attractiveness and scale of its many entertaining features, far surpasses any preceding exposition. Take only one feature, the Jubilee parade, a replica of the scene which took place in London. Everything will be exactly the same as in London on June 22. The escort of colonial and British troops, the Indian Princes, the Princes and Princesses of the royal family, Queen Victoria, her carriage, state trumpeters—everything will be an exact reproduction of the London pageant. An idea of the scale upon which this feature will be presented can be gathered from the fact that the frame work and structure of St. Paul's Cathedral and Buckingham Palace is over 650 feet in length and runs up to 80 feet in height. Take again the tableaux of historical events during her majesty's reign ; they cover hundreds of feet in area. These features are more than entertaining, they are educational. They enable Canadians to grasp the immense size of the British Empire, and great variety of races bound together by the same ties of loyalty to the one institution. They also give a vivid idea of the might and pomp of the empire and well illustrate the meaning of that phrase, "Hands across the Sea," words which in this Jubilee year possess so much significance to the people of the Anglo-Saxon race. Add to these the great variety of the objects displayed, from the minerals of British Columbia to those of Nova Scotia, from the products of the west to those of the east. Visited in a proper spirit the fair is more than an exhibition, it is a source of instruction, for there one can see and appreciate in a short time the great extent, value and variety of Canada's resources.

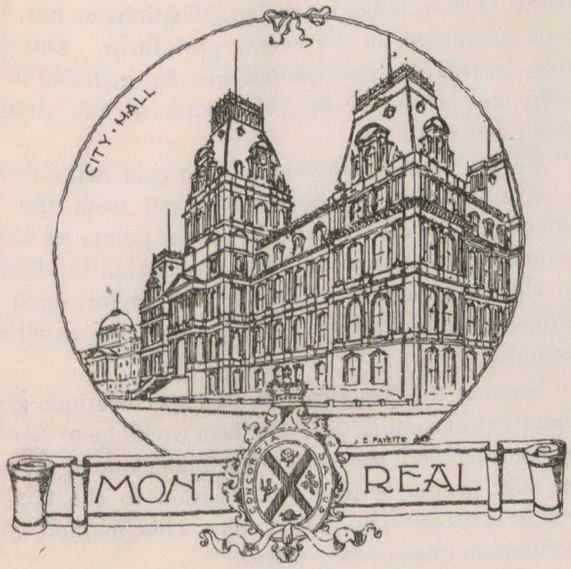
COST OF SOLOMON'S TEMPLE.

Few people, even in these days of palmy extravagance and millionaire display, have any adequate impression of the gigantic cost of the great temple of Solomon. According to Villalpandus, the "talents" of gold, silver, and brass were equal to the enormous sum of £6,879,822,000. The worth of the jewels is generally placed at a figure equally as high. The vessels of gold, according to Josephus, were valued at 140,000 talents, which reduced to English money (as has been shown by Chapel's reduction tables), was equal to £575,296,203. The vessels of silver, according to the same authorities, were still more valuable, being set down as worth £646,344,000. Priests' vestments and robes of singers, £2,010,000 ; trumpets, £200,000.

To this add the expense of building materials, labour, etc., and we get some wonderful figures. Ten thousand men hewing cedars, 60,000 bearers of burdens, 80,000 hewers of stone, 3,300 overseers, all of which were employed for seven years, and upon whom, beside their wages, Solomon bestowed £6,733,970. If their daily food was worth 50 cents each, the sum total for all was £63,877,088 during the time of building. The materials in the rough are estimated as having been worth £2,545,337,000.

STEEL MANTELS.

One of the newest improvements in the construction of dwellings is the steel mantel, which is just being introduced to builders. In these all the surface below the slab is composed of 20-gauge wrought steel, pressed into any desired shape or style by heavy machinery. The outside surface of this is enameled to imitate any wood or marble, and the character of the enameling is such that it withstands all changes of temperature without injury. Many advantages are claimed for these mantels besides their economy. First is the decreased weight, as compared with slate or marble mantels, which they take the place of. One of these weighs 400 pounds, while one of steel weighs only 100, which includes 70 pounds for the slate slab, which is supplied with the metal mantel-pieces. When these are set up and backed with sand or ashes the difference is more difficult to detect, as tapping it with the finger or hammer makes the same noise as solid stone or wood. These mantels hold their shape as a house settles, as there are no joints to part. They are also recommended from a sanitary standpoint, as they harbor no dirt or vermin, and they even act as a radiator of the heat instead of absorbing it. The fact that they are fireproof is also an argument in favor of the steel mantel's use. In order to secure fancy effects uprights are sometimes demanded on either side to support the mantel seat. In this case they are made of wood, and these posts, as well as the slate slabs, are subject to the same process which the metal work has undergone, so that the tone of the wood, metal and the material which enters into the construction of these mantels are all the same.



(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

COMPETITIONS.

THE importance of inviting competitive designs for public buildings is not recognized to the extent desired, as evidenced in the case of the Longue Pointe asylum and the proposed new civic building. Regarding the latter, a protest against the manner in which the design was obtained has been entered by the Province of Quebec Association of Architects, and is now before the city council. A system of competition among qualified architects is uudoubtedly the most satisfactory, and the beneficial results obtained by the employment of the best artistic skill should not be underestimated. Public buildings are the property of the citizens, and should be open to public competition. Such competitions, however, should be conducted under proper conditions, and only persons of unquestionable ability appointed to act as judges. Then will the superiority of architecture predominate and the standing of architecture be raised to its proper level.

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

The semi-annual examinations for admission to study of architecture and for registration were held on the 28th, 29th and 30th of July last, in the rooms of the Province of Quebec Association of Architects, New York Life Building, at 10 o'clock in the forenoon each day. Only one candidate, Mr. W. A. Gagnon, of Westmount, presented himself for examination, he being successful. The examiners were Messrs. A. T. Taylor, Alex. C. Hutchison and Jos. Venne.

Although the date is not yet definitely decided, it is probable that the next annual meeting of the Quebec Association of Architects will be held about the end of September. The scheme for a Dominion Association, which has been pending for some time, will be discussed, also methods for the guidance of open competitions and several other subjects of importance.

ARCHITECTURE AT MCGILL UNIVERSITY.

McGill University has issued its programme of classes for the season of 1897-98. The architectural department, as is well known, was endowed by Mr. W. C. McDonald, the founder, with a very complete equipment. A special architectural department has been added to the faculty library, for the use of students. In addition to a number of new works a collection of architectural photographs is being formed, also a complete series of lantern slides for the illustration of the historical courses. Models, specimens of materials, and fittings for use in the course on building construction, materials, sanitation, etc., heve been obtained. The museum of the engineering building possesses a large collection of sculpture casts.

The architectural department is under the supervision of Mr. Stewart Heubert Capper, M. A., A. R. I. B. A., A. R. C. A., as professor, and Mr. H. F. Armstrong as lecturer.

On recommendation of the faculty, the architectural and modelling classes will be open to women students.

Mr. A. T. Taylor, F. R. I. B. A., R. C. A., has given to the students of the architectural course a prize of $25, and Mr. A. C. Hutchison, R. C. A., three prizes of $12, $8 and $5, to be awarded to the three undergraduates taking the highest standing in the freehand drawing of the first year.

THE DIGNITY OF TRADE.

ON this subject Mr. Andrew Carnegie, the successful iron manufacturer, of Pittsburgh, Pa., says:

"If a young man does not find romance in his business, it is not the fault of the business, but the fault of the young man. Business is not all dollars, these are but the shell—the kernel lies within, and is to be enjoyed later, as the higher faculties of the business man, so constantly called into play, develop and mature.

The old prejudice against trade has gone even from the strongholds in Europe. This change has come because trade itself has changed. In old days every branch of business was conducted upon the smallest retail scale, and small dealings in small affairs breed small men; besides, every man had to be occupied with the details, and, indeed, each man manufactured or traded for himself. The higher qualities of organization and of enterprise, of broad views and of executive ability, were not brought into play. In our day business in all its branches is conducted upon so gigantic a scale that partners of a huge concern are rulers over a domain. The large employer of labor sometimes has more men in his industrial army than the petty German kings had under their banners.

I can, with confidence, recommend the business career as one in which there is abundant room for the exercise of man's highest powers, and of every good quality in human nature. I believe the career of the great merchant or banker or captain of industry to be favorable to the development of the powers of the mind, and to the ripening of the judgment upon a wide range of general subjects, to freedom from prejudice, and the keeping of an open mind. And I do know that permanent success is not obtainable except by fair and honorable dealing, by irreproachable habits and correct living, by the display of good sense and rare judgment in all the relations of human life, for credit and confidence fly from the business man foolish in word and deed, or irregular in habits, or even suspected of sharp practice. The business career is thus a stern school of all the virtues.

FOREIGN MARKET FOR CANADIAN BUILDING STONE.

MR. E. Odlum, writing to the Toronto Globe on the further development of the foreign trade of Canada, says: "As granite, marble and various ornamental stone are imported from many countries, and as Canada is rich in numerous varieties of high grade stone, there would seem to be an opening for trade along this line. The fact that Canada imports stone need not prevent an earnest, systematic, persistent attempt to export similar articles. I know many excellent granites, marbles and free stones in Conada that could be exported as ballast. In bulky, light cargoes ballast is required, and if well managed that very ballast might be used as valuable building and ornamental stone."

An Ottawa contractor named Stubbs is said to have taken his departure for parts unknown.

The end of the famous suit between the Great Northwest Central Railway Company and its contractor, Alphonse Charlebois, came with the recent decision of the privy council. The judgment of the privy council reverses that of the supreme court of Canada, and declares that the consent judgment for $622,000 given to Charlebois by the railway company is invalid. This consent judgment was secured by Charlebois, presumably for work done on the road, for which he was the contractor, and of which he had been one of the directors.

FORMS OF CONTRACT.

REGARDING the subjoined form of contract, the compilers, Messrs. Hewitt & Maclaren, architects, Brantford, Ont., write as follows :

"With the numerous forms of contract extant, it seems superfluous to add another to the already long list. In our practice some slight modifications were deemed necessary to suit all classes of owners and contractors. The points to which we more especially call attention are the following, namely : The completion of the work of all trades before any contractor can receive his drawback ; the itemized schedule of time limit showing when each contractor will complete his work. This list saves the contractor the trouble of coming to the architect's office to ascertain when one of the other tradesmen's time for completion is up.

"It is customary to only allow money payments when the materials have been fixed in the building. The delivery of a large quantity of lumber, bricks or other material on the owner's lot should entitle the builder to the same contract percentage as if it were established in the works, provided that the goods are intended for that structure.

"When the architect is receiving preliminary instructions care should be taken to have a carefully prepared skeleton list of the client's suggestions and requirements. This would overcome in a measure the much dreaded extras. When extras are ordered the architect should give a letter in writing stating the amount to be paid, and the extension of time if needed, or allow the contractor to submit a tender for these additional items and have the former countersigned by the owner and the tender countersigned by both architect and owner. In winding up the accounts the orders will be produced by contractor, and what would otherwise take hours to adjust could be certified to in a few moments. Another benefit from these orders is the fact that the architect cannot make the owner pay for more than his signature is attached to. Some clients are desirous of knowing how their money is being expended. In the commencement they willingly pay thousands of dollars for their work with but a casual inspection of the specifications, yet if called upon to settle for two or three hundred dollars of additional work, which the architect thought trivial, will make as a rule more fuss over the lesser amount than the former, although the value may have been greater and the comforts derived absolutely necessary to the completion of the building.

"Through the inability of the contractor to readily finance material or men, his creditors for their own protection institute liens. By reason of this shortsightedness it seems hardly just that the owner should be called upon to pay their law bills, hence the clause indemnifying the owner against liens.

"It frequently occurs and is convenient to employ two contractors of the same trade on one building. The original contractor deems it a hardship to have a brother tradesman doing what might have been his job, although the tenders gave the last contractor the work by fair valuation. The clause permitting the employment of other contractors may not always be exercised, but is for the architect a beneficial one.

"A debate nearly always arises on the question, who shall pay for and maintain the builder's risk and hold the policy. When the insurance is specified, a price is included for it in the contract. If anything is said about it, it is naturally presumed the owner buys. Whether it is included in the specifications or not, it is certain the owner, in any event, pays for it. Our contention is, that this item should not be included in the tender, but arranged by the owner at the time of signing contract.

"The architect in drawing his own contract, either on his private forms or those purchased from the law stationers, embodies therein the special points he wishes to emphasize. There could be no objection to allowing the client's solicitors to peruse and advise upon the documents and make such changes as their experience warrants.

"Some of the American printed specifications give a printed list of conditions. Our idea would be to combine the contract and the conditions under one agreement, and refer in the written specification to the fact that form of contract would be used. This method would avoid much unnecessary work.

"We cannot understand why the arbitration clause cannot be wholly eliminated. When disputes arise, the architect's opinion has been given—why not let the disputants place their grievances in the hands of their lawyers, where that class of trouble usually belongs and receives attention ?"

ONTARIO BUILDERS' CONTRACT.

This indenture, made this day of , one thousand eight hundred and ninety
By and between,
of the of , in the county of and province of Ontario (hereinafter called the contractor), of the one part,
and
of the of , in the county of and province of Ontario (hereinafter called the proprietor), of the other part.

Except where the context may require a different construction, the words "contractor" and "proprietor" respectively shall include and mean the executors, administrators and assigns of the parties respectively, and the words "the architect" shall include and mean any architect who may be substituted for the architect herein named, by notice in writing given by the proprietor to the contractor.

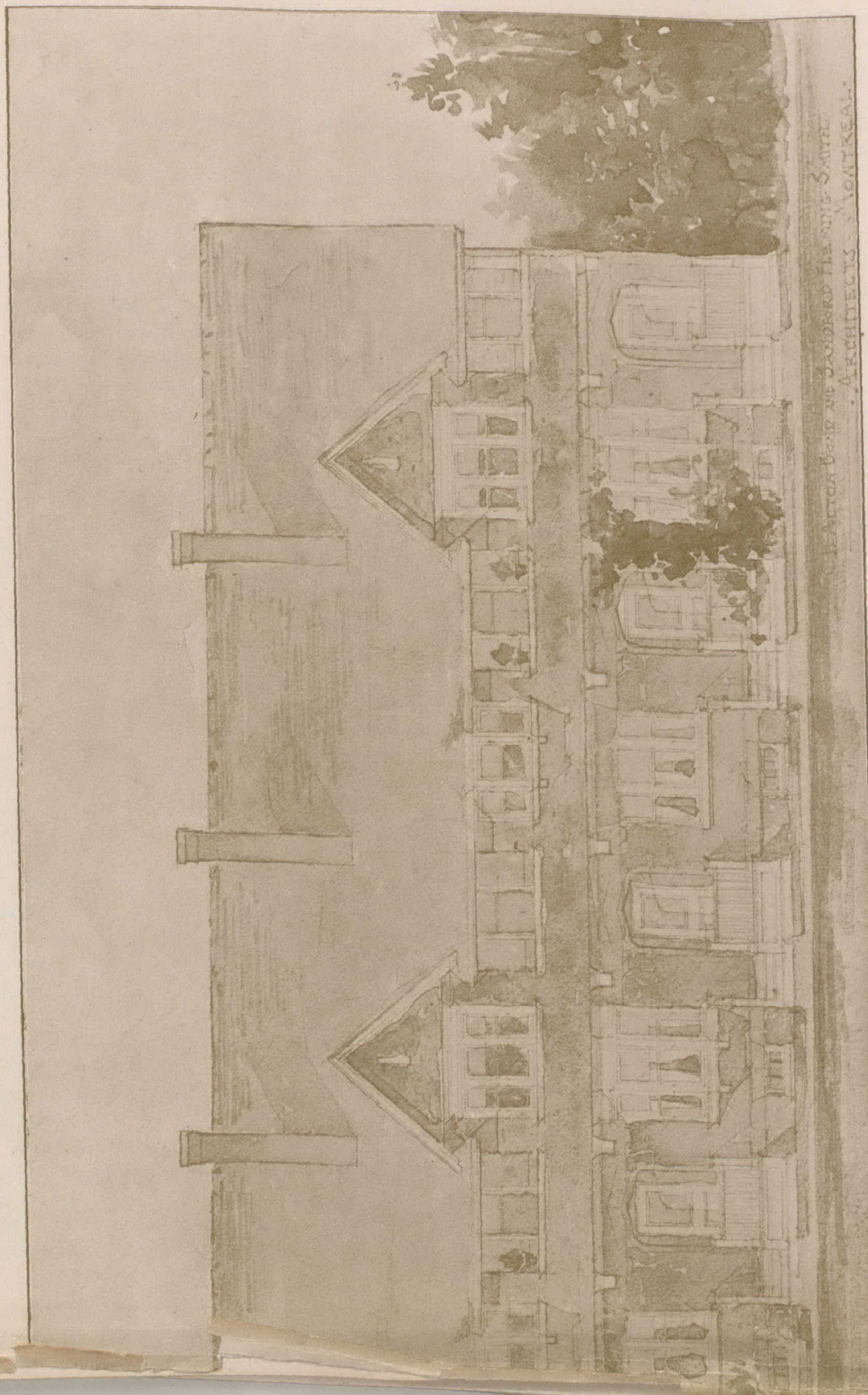
Witnesseth : That the said contractor, in consideration of the sum of $ dollars to be paid to him, doth hereby covenant and agree with the proprietor as follows :

First : That the said contractor shall and will, on or before the time and times hereinafter mentioned, in the year one thousand eight hundred and ninety , now next (18), well and sufficiently execute and perform, in a true, perfect and thorough workmanlike manner, the work of every kind required in the erection and completion of
for the proprietor, on lands and premises situate on street, in the of , in the county of , in the province of Ontario, agreeably to the plans, drawings and specifications prepared for the said works by , architect, and under the direction and personal superintendence of , architect, hereinafter called the architect, and will find and provide such good, proper and sufficient materials of all kinds whatsoever as shall be proper and sufficient for the completing and finishing of all the aforesaid works.

SCHEDULE OF TIME.

That the contractor or contractors will each and every one carry on his or their work with due diligence, so that the building may be handed over to the proprietor on or before the day of (18) complete in all respects, the following is the time allowed each trade respectively in which to carry out the work :

Excavation completed by.....
Stone walls ready for the ground floor joists.....
Brick walls ready for wall plate of roof rafters.....
The building to be enclosed.....
Roof shingled or slated and corniced.....
The building to be ready for lathing on.....
Plastering to be finished throughout.....
The gas-fitting, plumbing, electric wiring, heating apparatus, etc., to work from time to time as required by other trades and complete within the schedule time.....
Joiners' work finished.....
Painting, etc., completely finished.....



ONT., FOR SIR SANFORD FLEMING

SMITH, ARCHITECTS, MONTREAL.

SKETCH FOR HOUSES AT PETERBORO

C. H. Acton Bond and Sanford Fl

The slater, felt roofer, tinsmith, bell-hanger, painter or other tradesmen must have their different work done at such times as will not cause delay in having the work done as above ; and if delay does occur through the failure of any of the above to carry out his or their work, the damages for time so lost must be paid by him or them for causing same.

Second: The said proprietor doth hereby covenant, promise and agree to and with the said contractor, that the said proprietor, in consideration of the covenants and agreements herein contained on the part of the contractor, being strictly executed, kept and performed by the said contractor, will well and truly pay or cause to be paid unto the contractor the sum of ($) dollars of lawful money of Canada in the following manner : per cent. to be paid fortnightly from time to time on account of the contract, and all additional work and all materials actually delivered on the ground or adjoining thereto for the purpose of said works, though not yet placed therein (to be property of the proprietor until the work shall be completed, and shall not be removed without the written consent of the architect), as the work shall proceed on the value of the same. The balance of the contract and all additional work (if any) to be paid within thirty days from the completion of the said works, according to the final certificate of the architect as hereinafter provided.

And it is further understood, that in case of several contractors being employed on the building, the work of no one trade is to be considered complete till that to be done by the contractor and workmen of the other several trades shall have been completed.

The contractor shall not be entitled to any fortnightly payment without a certificate from the architect to the effect that the work done and the materials they bring upon the said premises for the purpose of said works are in strict accordance with drawings and specifications, and that he considers the payment properly due ; said certificate in no way exonerating the total and final responsibility of the contractor, neither shall it exempt the contractor from liability to replace work if it be afterwards discovered to have been improperly done, or to pay all damages for work imperfectly done which the architects shall decide to leave in the building, or damages owing to the use of inferior materials.

And the said contractor covenant with the proprietor that, provided the payments are from time to time duly made in pursuance of the terms and conditions hereof, that no mechanics lien shall or will be filed or registered against the said building or the lands occupied thereby or engaged therewith by the said contractor or by any person or persons who in privity with him may be entitled or claim to be entitled to register such mechanics lien. And the contractor hereby agree to indemnify the said proprietor and his (house) building and lands against all and every such claim or lien and against all loss, costs, charges and damages which may be sustained by reason thereof.

And provided further, that on or before the said thirtieth day after the completion of the said work a final certificate shall be obtained from and signed by the architect, certifying to the balance due to the contractor on the said contract and for all extras in respect thereof. But if after demand thereof such final certificate is not obtained or the giving of the same is refused by the architect, the contractor shall nevertheless, after the expiration of the said thirty days, be entitled to proceed at law to enforce payment of the balance due to under the said contract and for all extra work in respect thereof.

Third: The contractor, at his own proper costs and charges, is to provide all manner of labor, material, apparatus, scaffolding, utensils and cartage of every description needful to the due performance of the several works, and render all due and sufficient facilities to the architect, superintendent or clerk of the works for the proper inspection of the works and materials, which are to be under their control; and they may require the contractor to dismiss any workman or workmen who may be incompetent ; the workmen and contractors being only admitted to the grounds for the purpose of the proper execution of the works, and the contractor or his foreman for each trade shall and will, during the whole time of the building, give due personal attendance upon the execution of all the works aforesaid, and take effectual care that the same be carried on, executed and performed with such expedition and despatch to be in every case completed by the day provided for the completion thereof, subject only to such provision for an extension of time as herein provided. The contractor shall deliver up the works to the proprietor in perfect repair, clean and in good condition when completed, but will not hold himself responsible for any damage done to his work by other trades.

The contractor shall not sublet the works or assign the contract or any part thereof without consent in writing from the architect.

Fourth: In case it should appear that the contractor cannot finish his contract within the time above specified, or in case the said works are not carried on with such material and workmanship or expedition as the architect, superintendent or clerk of the works may deem proper, then, with the written consent of the proprietor, the architect shall be at liberty to give the contractor days' notice in writing to supply such additional material or force as in the opinion of the said architect is necessary ; and the contractor failing to supply the same, it shall be lawful for the said proprietor (at the expiration of days after the expiry of such former notice) to dismiss the said contractor and to employ other persons to finish the works in such a way as the architect may direct, and in accordance with plans and specifications ; and all payments made in respect thereof shall be deemed payments on account of the contract, but without prejudice to the right to recover from the contractor any money in excess of the contract price which may be paid for so finishing the works, or any other damages caused by the breach of this contract, and the residue of the money payable hereunder, if any, after deducting such payments and damages, shall belong to the contractor.

Fifth: All work and materials as delivered on the premises or adjoining thereto, for the purpose of forming part of the works, to be considered the property of the proprietor until the works shall be completed, and are not to be removed without the written consent of the architect ; but the contractor shall have the right to remove all surplus material after he has completed the works herein contracted for.

Sixth: And it is hereby further agreed by and between the said parties as follows, this is to say :

(a(That the specifications and drawings are intended to co-operate, so that the works shown in the drawings and not mentioned in the specifications, or vice versa, are to be executed as if work was both shown and specified to the true intent and meaning of the said drawings and specifications.

(b) In case of any discrepancy, all written or figured dimensions in drawings shall supercede and prevail over the measurement by scale.

(c) Should any dispute arise respecting the true construction or meaning of the drawings or specifications, or the true value of the works omitted by the contractor, or extra work or alterations ordered by the proprietor or architect, the same shall be decided by the architect, whose decision shall be final and conclusive.

(d) Should the proprietor or architect at any time during the progress of said works require any alterations of, or deviations from, additions to, or omissions in the said plans and specifications, he shall have the right and power to make such change or changes, and the same will in no wise affect to make void the contract, but the value of work omitted (if exceeding five dollars) shall be deducted from the amount of the contract by a fair and reasonable valuation, and for additional work required in or alterations, the amount to be paid thereof shall be agreed upon before commencing additions or alterations.

(e) The architect shall be at liberty, by written orders countersigned by the proprietor, to direct any of the intended work to be omitted or additional work to be done to the building. Such agreement shall state also the extension of time (if any) which is to be granted by reason thereof, provided that in estimating of the value of such additions or alterations regard shall be had to any loss, outlay or damage necessarily and reasonably sustained by the contractor in the preparations to comply with the original drawings and specifications.

Seventh: The contractor shall be responsible for and will make good any loss or damage that may happen to the said works, and for any injury to workmen or other persons, and any damage to property, public or private, caused by reason of the manner of performing these works, against all which injuries and damages the contractor shall properly guard.

Eighth: The owner, during the progress of the work, shall pay for and maintain full insurance on said work, in his own name and in the name of the contractor, against loss or damage by fire. The policies shall cover all work incorporated in the building, and all materials for the same in or about the premises, and shall be made payable to the parties hereto, as their interest may appear.

Ninth: In the event of any additions or alterations being made that will necessitate an extension of time for the completion of the work beyond the time mentioned in the contract between the proprietor and the contractors, or in the event of delay in the completion of the work by reason of extraordinary inclement weather, or by reason of general strikes of any or all of the trades

the architect may have full power to extend the time for the completion of the works to such an extent as may seem to be reasonable and just, but no contractor or contractors shall in any way hold the proprietor liable for any delay or loss occasioned by any other contractor or contractors engaged on the works.

Tenth: Should the contractor fail to furnish the work at or before the time agreed upon, he shall pay to or allow the proprietor the sum of $ dollars per week, as liquidated or ascertained damages for each and every week during which the said works shall remain incomplete, due allowance to be made for extension of time for additional work or alterations as laid down in clause number of this agreement.

Eleventh: And it is further agreed that the proprietor may employ any other contractor or workmen, who may enter upon the premises or building, to do any work not mentioned in the specifications or shown on the plans.

Twelfth: It shall be mutually understood and agreed that all sketches, plans, drawings and specifications are, and remain, the property of the architect, and shall be returned on the issue of final certificate.

In witness thereof the said parties to these presents have hereunto set their hands and seals, the day of the year first above mentioned.

Signed, sealed and delivered in the presence of :— .....
.....
.....

PERSONAL.

Mr. C. de B. Leprohen, C.E., of the city surveyor's staff, Montreal, has lately returned from a trip to Europe. While in France he inspected the principal cement works, and is said to have obtained much valuable information.

Mr. J. W. H. Watts, architect, of the Public Works Department, who was for twenty-three years in the Government service, has been dismissed. Mr. Watts was not a permanent clerk, although employed in the department nearly a quarter of a century.

Mr. Henry P. Smith, late with W. Newlands, architect, Kingston, has opened an office in the Anchor Building, Brock street, Kingston, and is preparing plans for a fine new stone building for the Sisters of Notre Dame Convent, to cost about $10,000. He would be pleased to receive catalogues and samples.

Much regret has been occasioned by the recent death of Major Perley, who was formerly chief engineer of the Department of Railways and Canals at Ottawa. Major Perley was engaged by the Dominion Government to supervise the erection of the Canadian Building at Bisley, and while so employed succumbed to an attack of bronchitis.

Wm. W. H. Gairns, who had been connected with the Bennett & Wright Company, of Toronto, for twenty-three years, died at his residence on Chicora Avenue a fortnight ago. As foreman for the company he took charge and successfully completed some of the largest work in the Dominion, including the Parliament Buildings at Victoria, B.C.

Mr. Peter McMichael, who for many years has been connected with the James Robertson Company at Toronto, has been promoted to the management of the branch at St. John, N.B. Before leaving, his business confreres evidenced the esteem in which he was held by presenting him with a diamond ring, accompanied by an illuminated address. Those who assembled at the Rossin House on the occasion were: Representatives of the Booth Copper Company, Limited; the Goderich Organ Company; the Miln, Bingham Printing Company; the Montreal Roller Mills Company; the James Morrison Brass Manufacfuring Company; the John Ritchie Plumbing Company; the Toronto Foundry Company; the Toronto Radiator Company; the Toronto Hardware Company; the Toronto Steel Clad Bath Company; the Standard Manufacturing Company; the Gurney Foundry Company, and others.

The celebrated red granite of the Bay of Fundy region is capable of withstanding a pressure of 11,812 pounds to the cubic inch.

The development which has taken place in recent years in the use of metal as a covering material for the exterior or interior of buildings is well illustrated by a handsome catalogue recently published by the Metallic Roofing Co., of Toronto. In this catalogue are shown a variety of patterns of metal covering material adopted for roofs, outer and inner walls, ceilings, wainscoting, dadoes, etc. Photographic reproductions are given of a number of prominent public, business and residental buildings in various parts of Canada in which this material has been thus employed.

MANUFACTURES AND MATERIALS

MANUFACTURE OF MOSAIC FLOORS.

The Yale Scientific Monthly describes a new process of manufacturing mosaic floors. Small particles of wood, such as saw-dust, wood, flour and fine shavings, are treated first with a mixture of shellac and alcohol, and with them a cement made of curd and slaked lime, and while this mixture is still damp it is put into hot moulds of the desired shape and size and placed under pressure; the joint action of the heat and pressure unites the wood most thoroughly with both the shellac and the cement, and after a few minutes the compound is taken out of the moulds and completely cooled and hardened. Great care is necessary that no foreign substance, especially of an oily nature, be present, as this would prevent the cement from being absorbed into the pores of the wood. In making different colored mosaic the natural color of the woods used is taken into account, then the wood itself is dyed, and lastly dyes dissolved in alcohol are mixed with the shellac. The process is then performed as before. It is said that notwithstanding its hardness, this compound possesses all the perfection of wood, thus rendering it of particular adaptation for use as a floor covering in the case of living rooms and private dwellings, and the important advantage is claimed for it of being unaffected by any changes of temperature.

ASBESTIC PLASTER.

A VERY satisfactory test of asbestic plaster was recently made in the United States Treasury Department Building. In the court was placed a structure representing a miniature house, the roof of which was about four feet high, the interior being plastered with "asbestic," the name by which this new wall plaster is known. Around the structure were piled kindling wood, shavings and paper enough to make a bon-fire to celebrate a great political victory. After being ignited the light structure was immediately enveloped in flames, which burned fiercely and furiously, but to no avail, as they had found a master. After being subjected to the fire for half an hour an important test was made. A stream of water, through a one and a half inch nozzle, was poured on the plaster attached to the sides and roof without any effect. It is said that the plaster did not drop or crack, but was intact, demonstrating conclusively that it was fire-proof.

Gen. Wm. Sooy Smith, of Chicago, says of asbetic plaster: "Fire-proofing, to be worthy of the name, must resist the combined action of heat and water, and be a non-conductor of heat. In trying to find a material that would serve the required purpose I first tried talc, which is a good non-conductor and very refractory. Soapstone is an impure talc. By mixing this in a pulverized condition with hydraulic cement and other substances I succeeded in making a good fire-proofing material. While conducting these experiments I heard of a material in the great asbestos mine near Montreal, Canada. There is found in that quarry serpentine rock carrying a large percentage of asbestos. This rock, pulverized and mixed with good cementing material, makes by far the most perfect fire-proofing yet discovered. It may be heated to 1,100 degrees Fahrenheit (red heat) without harming its durability. Nails may be driven into it and it will not crack. When the nail is removed nothing but a small hole remains, which may be readily filled with putty or any other substance in order to restore the finish of the wall. Struck with a hammer, there is no breakage only the indentations showing. Then, again, the material is elastic. If the building settles or sinks, it stretches, and the plastering is not marred. Another point is that it will take decoration equal to canvas without danger of the picture being destroyed should the walls settle."

E. G. Scott, Quebec; M. J. Butler, Napanee; F. G. B. Allan, Napanee Mills; R. C. Carter, Kingston; S. Rathbun, Desoronto, and James N. Greenshields, Montreal, are applying for incorporation as the St. Lawrence Portland Cement Co., with a capital of $25,000.

THE HISCOX BUILDING, LONDON, ONT.

McBRIDE & FARNCOMBE, ARCHITECTS.

THE LITTLE CHURCH OF ST. MARTIN.*

By Fred. T. Hodgson.

(Concluded.)

In the transept of the Martyrdom, a small, square stone marks the spot where Becket was murdered; but nothing now remains of the magnificent shrine that was erected to his memory. In the sixteenth century, when crafty Henry the 8th sat on the throne, he issued a proclamation abolishing all high festivals in the month of July, his plea being that holidays during that month interfered with the harvesting, but his real object was to suppress the pilgrimages that went to Canterbury, and to strike a blow at the Church. Henry's next step was to destroy all the Becket relics and to scatter all of the mortal remains left of the saint to the four winds. This was followed by confiscation of all the gold and jewels that had been offered up at the murdered bishop's shrine. It is recorded that two large coffers were filled with gold and precious stones, and that it required eight men to carry them out of the church, and that twenty-six carts were loaded with the other spoils, among which were many works of art in metal, tapestry and other valuable works. "The Regale of France," the most costly jewel in Europe at that time, was worn by the king on his thumb for a long time, and was last heard of among the precious stones of his daughter Mary, "Bloody Mary."

Following Langdon came a number of able archbishops, who added much to the cathedral. Chicheley in 1414-1443; Morton, 1449-1517, with their priors, Goldstene and Chillenden, who were architects and builders. These men finished many portions of the work that was previously incomplete, made restorations, added art treasures of many kinds and left an impress for good on many portions of the venerable structure.

It will be impossible for me in a single paper to either name the long line of archbishops who have governed here, or to mention, ever so briefly, the many points of interest, or describe the art features connected with the building. I may say, however, that although the soldiers under Cromwell made a barracks of the building for a time, and actually stabled their horses in it, it contained some things that commanded their respect and veneration. The tomb of the Black Prince, in which sleeps all that is mortal of the brightest flower of English chivalry, was left untouched, but many of the most beautiful painted windows on the Island were smashed by the Puritans, and as their captian "Blue Dick" remarked, they had a good time "smashing Beckett's glassy bones." Several of the old windows were left, however, among them one containing a picture of King Edward the 5th and his brother the Duke of York. These windows are the admiration of the whole world, for their beauty of color, accuracy of outline and prefection of workmanship. They were made and put together in the city of Canterbury, and remain an evidence of the high artistic abilities of the native painters and glass workers.

So far this paper has dealt with matters historical, and I may be pardoned if I now somewhat digress and say a few words on the æsthetic character of Christ Church and the influence this quality had on English art.

As we have no knowledge of the style or the fitness of the first building erected by the Romans where the cathedral now stands, only what we can gather from the few remaining portions left in the foundation walls, and but little knowledge of the more recent buildings down to the time of the Norman invasian, I am not in a position to give any opinion as to the influence those early structures may have obtained over contemporary art and artists.

Whatever may have been the faults of the fire-eating Normans, they had the quality of being devoted to their Mother Church, and every possible sacrifice was made to advance her interests and strengthen her position, and it is not surprising to find William, who was one of the most superstitious men of that superstitious age, putting forth his efforts to benefit the Church for the assistance he imagined he had received from her in placing him on the throne of England.

Canterbury, the second city in the realm, the seat of the primate, as acknowledged by Rome, received his attention at once, and his ablest churchman, Lanfranc, was made archbishop and primate, and money was appropriated for the re-building and enlargement of the cathedral, and a large Norman building rose upon the ashes of the old Saxon one, that became the example for hundreds of other churches and domestic buildings. It would perhaps be out of place to describe the peculiarities that belong exclusively to the Norman style of architecture. Its main features, however, put tersely, were semi-circular arches, massiveness, large openings for doorways, windows and entrances. Another peculiarity is the richness of the entrance arches, while their columns, walls and jambs were usually plain. The interior of their churches, while not so massive as the Anglo-Saxon, gave the appearance of great strength, and the ceilings being low, had the effect of giving a fort-like aspect to the buildings. Indeed, their castles and their churches were somewhat similar in appearance. In details, however, the Normans excelled the Saxons very much, and gave to their work a finer and a more artistic finish, and the best artists in England during the reigns of the 1st and 2nd Williams, Henry, Stephen, Henry 2nd, and Richard 1st were trained in Canterbury. With the partial destruction of the church by fire in 1174, a new departure in the style of the building took place, and Gothic, as we now know it, was introduced, and the cathedral became a new example. At this time the cathedrals of Rochester, Winchester, Norwich, Peterborough, Durham and several others, along with York Minster, West Minster, St. Pauls, and dozens of abbeys and monastries, were either nearly completed or well on their way. When the new and more appropriate style of architecture was introduced, work on those buildings was suspended, changes were made, and the new style was adopted, as if by order of the king or primate. It was this sudden change of style that has given to a number of English cathedrals and dozens of parish churches that peculiar quaintness and delightful piquancy that makes them so dear to the hearts of all who love the beautiful in architectural art.

The difficulties of solving these problems were wrestled with, to make those changes in the half completed buildings, to dovetail the new into the old style, and evolve from their admixture the gems those old builders have left us, can only be understood by those who have wrestled on a smaller scale with problems somewhat similar. During the Canterbury pilgrimages, the cathedral became rich in money, in patronage and in the

*A paper read before the Collingwood Fortnightly Club.

‡ The paper was illustrated by lime-light views of the Church of St. Martin, and of the great cathedral.

most costly artistic productions of all lands. In fact, the church became a veritable museum of art. No young man was supposed to have finished his education until he could say he had "sojourned" in the "Holy City of Canterbury," for a twelvemonths at least.

As stated before, the best glass painters in Europe acquired their art in that city, and the fragments of windows still left in the church that were the work of the 12th, 13th and 14th centuries have no equals in Chrisendom, and to this day artists from France, Spain, Germany and Italy visit Canterbury for the sole purpose of seeing and examining these painted windows. Religious art died in Canterbury when the Reformation made its advent. From the day of the separation of England from the Roman church, the doom of religious art was sealed for a time. Like a second black plague, Henry's infamous emissaries swept over England, leaving desolation behind them. The people rose in valiant defence of their supposed guides and protectors, the monks and friars, but their struggles were in vain. Abbeys and monasteries, cathedrals and churches, shrines and tombs, fell a prey to the kings mercenaries. Desecration took the place of consecration. Churches were no longer built but destroyed; religious art, which is the foundation of all art, was scoffed at, and things of beauty, if connected with the Church, were jeered at, and when possible destroyed. Abbeys and convents and monasteries, once centres of religious education, charity and benevolence, were blasted by fire or turned over to conscienceless followers, and the country was studded with ruins—ecclesiastical art, in all of its branches, came to an end. It had died a violent death, not a death from decay or exhaustion; and the great church of Canterbury, being the centre of Ecclesiasticism, suffered most; and its interior was robbed of almost everything the great Harry could turn into money.

What the people lost, however, in ecclesiastical art by the Reformation, they gained in freedom of thought, material wealth and domestic art. Men and artists who had been employed their whole lives in the building and decoration of great religious temples, were employed by the enriched adherents of the king in building, enlarging and beautifying the domestic castles and halls that have made England a land of "stately homes," and gave to Eliza Cook an opportunity to exhibit her beautiful poem, "Those Stately Homes of England." It was during the latter part of King Henry's reign and the early part of Mary's that Hatfield House, the present home of the Salisbury's, "Speke Hall," and many other noted domestic buildings on the Island, had their beginnings.

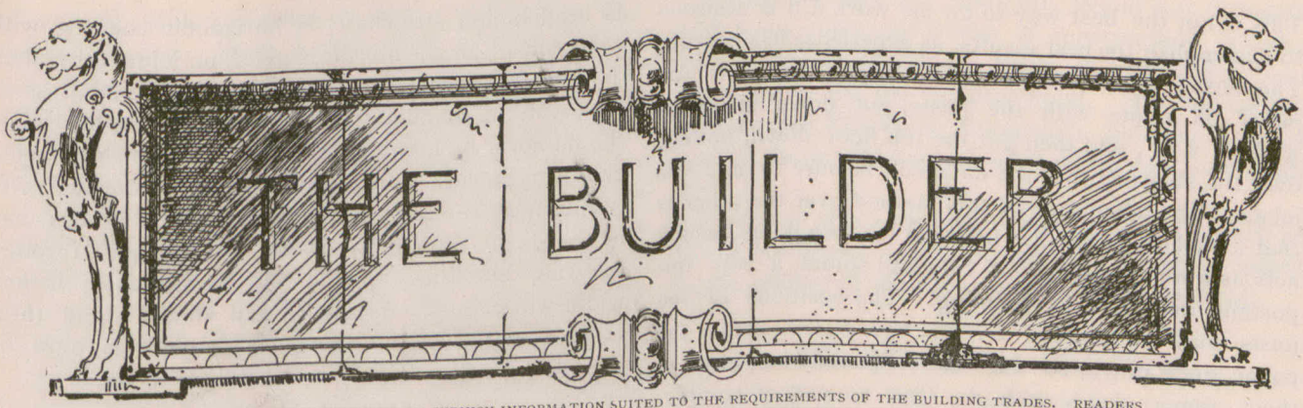
What Henry left undone in the way of destroying art work in the churches, the Puritans finished. They went much further than Henry, and with less reason. It is to them that is due the destruction of the most beautiful glass-work the world ever produced. Canterbury, York, Durham, Chester and Westminster suffered severely from the vandalism of Cromwell's fanatics. Nearly all images and statuary of a religious kind had been removed and mostly destroyed by Henry's order, but the Puritans defaced the buildings proper, breaking the figures in the walls, on the capitals and in the exterior niches, and mutilating the tombs, destroying memorial brasses and tearing down reredos and screens because they had in their combination symbols of the Christian faith. Notwithstanding all its misfortunes and disasters, the noble structure still exerts an influence on religious architecture in England, and with the revival of religious activity in the latter part of the last century, the Renaissance methods fed largely on the various styles, as embodied in Canterbury, when applied to the new temples demanded by the new-born fever. The building as left us by William of Sens, the Saxon William, Chicheley and the two Goldstenes is yet a power for good in the world of religious architecture. In closing, I may say that a number of kings and queens, some 25 archbishops, several noted warriors and statesmen, are buried inside of the church. The last archbishop interred under the roof was the Cardinal Archbishop Pole, who died 1558. During the reign of Queen Elizabeth, the crypt under the cathedral was allowed to be used by the Hugonots, who brought with them from France many of the useful arts, and the spinning and weaving of silk, an industry unknown at the time in England. For a time Canterbury became the centre of the silk trade, but eventually branches of it were taken to other cities—the ribbon trade to Coventry, velvets, plushes, etc., to other places. And now Canterbury, once the most important city in England, is not even a third-rate place, if population and wealth are considered, but as a place full of glorious memories—a shrine, where religious or patriotic devotees may visit with gratification and profit—no other town or city in the "tight little isle" offers the same opportunities. The influence radiating from the little Church of St. Martin, having their beginnings with the baptism of Ethelbert, are still active, not only in the narrow limits that form Great Britain and Ireland, but over an area greater than Ethelbert supposed the world to be, and the two hundred millions of people speaking the language whose rootlets were planted by this early king, and enriched by the auther of "The Canterbury Tales," and rounded up by the immortal bard of Avon, still feel that influence; and by their unsurpassed energy, their incomparable governmental methods, and love of justice, will continue to spread, by good example, and by giving equal rights to all mankind, the benefits inherited by the conversion of the brave Ethelbert, and his baptism in the little Church of St. Martin. And in conclusion let me add that all this was brought about by the love and wisdom of the gentle Bertha.

What an heritage then is this little church, coming down to us from the time when Rome was mistriss of the world, and in which Roman soldiers had worshipped. It survived its builders, and saw the Roman legions leave the land forever; it witnessed its own desecration by Saxon and by Dane, and its final triumph over the Scandinavian gods, and its settlement down to peace and glory and reverence under the Normans, to again be governed by the race, whom by the help of Bertha, made it the first Saxon christian church on the British Island.

PUBLICATIONS.

The American Monthly Review of Reviews for August devotes itself with accustomed thoroughness to the new tariff.

We are indebted to Mr. Chas. Baillairge, C. E., for a copy of the transactions of the Geographical Society of Quebec. It contains a frontispiece, a portrait of the Hon. N. S. Parent, Minister of Agriculture of the Province of Quebec, and patron of the society, also a portrait of Mr. Frank D. Tenis, president of the society, and of several ex-presidents and explorers, together with exploration maps and photographic reproductions of scenery in the extreme north.



[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.]

Nails Required.

In estimating the cost of work it is necessary that an approximate amount of nails required to complete the work should be known. Since the introduction of the wire nail, the number of nails required to do a given piece of work is not the same as when the barbarous "cut nail" was in vogue; therefore, the rules given for the latter will not apply to the former. The table given herewith is nearly correct, and is based on experience:

For 1000 lath, it takes 5¾ lbs wire lath nails.
For 1000 shingles, 5" to weather, 5 lbs shingle nails.
For 1000 feet 6" sidings, 18 lbs 2½" wire nails.
For 1000 feet common boarding, 20 lbs 2¾" wire nails.
For 1000 feet rough boarding, 22 lbs 3" wire nails.
For 1000 feet square edge 1" flooring, 36 lbs 3" wire nails.
For 1000 feet square edged 2" flooring, 40 lbs 4" wire nails.
For 1000 feet matched flooring, blind nailed, 31 lbs 3" wire nails.
For 1000 feet burring, 1"x3", 42 lbs 3" wire nails.
For 1000 feet burring, 1"x2", 60 lbs 3" wire nails.
For 1000 feet pine finish, 26 lbs 2½" wire nails.
For 1000 feet hardwood finish, 20 lbs 2¼" wire nails.
For 1000 feet studding in walls, 10 lb 3" wire nails.
For 1000 feet rafters, cellar beams, 8 lbs 3" wire nails.
For 1000 feet common fencing. 12 lbs 3" wire nails.
For 1000 feet pantry fittings, shelves, hook strips, and similar work, about 5 lbs 2" wire nails.

These figures are very nearly correct, sufficiently so to answer the purpose of the estimator. Of course, if the sizes of the nails are changed—larger or smaller—the figures must be changed to suit.

House Designing.

One of the faults of the country builder when he designs a frame house or village cottage, is that he makes but little provision for closet room, and none whatever for the proper distribution of furniture. Every bed-room should have a closet attached in some convenient place, where the door will not interfere with a proper arrangement of beds and other furniture. Wall space between windows and doors should be left for all the furniture, and, when possible, the bed should stand nearly in the middle of the room, with the head against the outer wall, and ample space should be left in other parts of the room for a dressing stand, a toilet stand, a table and a few chairs. By proper management, this may easily be accomplished in a medium sized room having two windows, a closet and an entrance door. The problem is not a difficult one if a little thought and judgment is used while planning. Sometimes, however, conditions are such that the designer has but little option in the matter, but it is possible that with the available opportunity at his command, he can do much towards getting such wall space, by placing the doors and windows in the best possible places, as may give to the room a comfortable and tasteful appearance. It is astonishing how much more convenient a room may be made by a display of judgment than if laid out without thought.

Strength of Built Up Timbers.

It has been stated that a built up beam is stronger than a solid beam of the same dimensions. This assertion will strike the novice as exceedingly absurd, yet most carpenters and millwrights have been taught to believe it, and the reasons for its being so have been advanced so often that they are almost threadbare. Most timbers, it is said, have knots in them, or are sawed at an angle to the grain, so that they will split diagonally under a comparatively light load. In a built up timber no large knots can weaken the beam except so much of it as is composed of one joist, and joists whose grain runs diagonally to the outside cut will be braced and strengthened by the other pieces being spiked to it and having the grain running in a different direction. To some extent this reasoning is true, but the quality and strength of timber being variable, the rule does not hold good in all cases. In fact, by experiments made by Hatfield in New York, and Kidder in the Tecnological Institute, Boston, results showed that, all things being equal, a built up beam with butt joints is not as strong as a solid one of the same dimensions by from 20 to 30 per cent. Beams built up, and having no butt joints, quality of material being the same, are from five to eight per cent. weaker than solid ones of like dimensions. In most cases where the work is being done outside the larger cities, the timbers specified are generally sufficiently large to cover any defects or weakness in them, so that there is little danger of serious results following the use of the timber specified, even if they are "built-up."

Laying Floors.

In this country, particularly that portion laying north of Lake Huron, Manitoba and the Northwest Territories, great care should be taken in putting down floors in order to make them warm. Floors should be double, with a layer of thick paper between them; and this should be done on all floors, no matter how many stories there may be. The floor should be laid tight—it would be better if it was matched—but it need not be of good quality; if it is sound it is not essential that it be free from knots. The paper and upper floor should not be laid down until the plasterers and plumbers have done their work, and all the base and wainscot should be put down before the top floor is laid. It is usual to put down the paper and then lay the floor close over it.

This is not the best way to do the work if it is desirous to accomplish the best results, as experience has proven. The better way is to lay down the paper, then over the paper, on a line with the joists, put down strips of wood 2″ x ⅜″, and then put the top floor down, nailing over the strips so that the nails will be sure to find the joists. The advantage of this method over the other is that a cushion of air lies between the two floors, which acts as a non-conductor of cold and sound, a very important matter in a building. The positions of the joists may be marked on the base-boards before the paper goes down, so that the strips may be placed in their proper places with the least amount of trouble. The writer has found that the best results are obtained by making use of felt paper, the softer and more spongy the better. Tarred paper is objectionable, for several reasons : it is not a strong paper, and it is impossible to get rid of the smell which is sure to work its way into the room when the latter is heated, and causing disagreeable sensations. Four or five layers of newspapers do very well, but where good, suitable paper can be obtained newspapers should not be employed.

Boulder Foundations.

In many rural districts the obtaining of quarried stone is difficult and expensive, and hard burned bricks suitable for the purpose of laying foundations, as a rule, cannot be secured. The use of boulders or field stone for the purpose may be adopted with success if the mason doing the work knows his business. In some sections of Ontario the use of boulders is quite common in the construction of foundations, outbuildings, fences and similar work. In the town and district of Parry Sound the use of boulders, whole and broken, is quite common, and some of the work done is quite creditable, particularly in walls above ground, where the stones have been selected with regard to size and color, with a fine taste for harmony and fitness. The "pointing" of the mortar joints, too, in many cases, evinces much skill and judgment on the part of the workman. In order to make a good solid foundation much will depend on the stone. In some places the surface or field stones are tolerably regular in shape, and make a good wall without breaking or dressing, while elsewhere they are more rounded boulders. With rounded boulders alone, the main strength of the wall depends much on the mortar used, which, in such cases, should be the very best and carefully applied. The wall should be built to two faces to look well, whatever may be the allowable projection of the outside stones beyond the mortar joints. Usually the outside joints are scraped out at the pointing to give the proper effect of projection. The best appearance is obtained by mixing large and small stones indiscriminately together, but if there is much difference in size the inequality of settlement will cause cracks, and it is safer to have the stones in the courses of approximately the same height. Especially should the use of large stones for the corners be avoided. The corner-stones should be long, to tie the angle, but not thick, or there will be cracks near them if the super-imposed building is a heavy one. If there are openings of any size in the wall, these should be faced with stones having a flat surface, and if these are not obtainable, use the best common bricks at hand, seeing they are well bonded in the wall. In England, Switzerland and Germany, where much boulder work is done, bricks are sometimes used here and there in the wall as headers and stretchers, in horizontal courses, with good effect. If the mortar is good, no joints other than those at the corners and openings need to be dressed, even with the rounded stones. Walls built of field stone should never be less than two feet thick for low walls, and thirty inches or three feet for walls from twelve to twenty-four feet high. Almost any size of stones may be used, only such as go nearly but not quite through the wall, but these may be laid as stretchers if their width will permit. A boulder wall should stand three or four weeks before the superstructure is built on it. This gives a chance for the mortar to set.

Built-up Timbers.

It often happens that the carpenter can not get timbers of sufficient length to make bearing beams, bressummers, or such other timbers as the work in hand demands ; under such circumstances the method of "building up timbers" or splicing short beams must be resorted to. The method of building up timbers is known to nearly every carpenter in the land, but will not lose any of its merits by being described here. Let us suppose we want a beam 12″ x 12″, 48 feet long, and we have no means of getting it, but have on hand a lot of joists 2″ x 12″, and of various lengths—say 12 feet and 16 feet long. Lay down on a good, level basis three 16 ft. joists, 2″ x 12″, "end on," with good joints at the butts and one edge to "a line." Three sixteens make 48, so that the three joists placed end to end will make 48 feet. On these place four joists 12 feet long, keeping the edges fair with the under tier. See that your butt joints are snug and close, then nail well with 3½″ wire nails, taking care to double-nail at every joint. This being done, cut a 16-foot joist in two, and lay one of the halves—8 feet long—on one end, keeping the upper edge even with the courses already down ; then lay down two joists 16 feet long, and finish with the other half joist. Nail same as before, only with longer nails. Now we have a beam 6″ x 12″ which is nearly as strong as a solid beam of the same dimensions. Continue to lay on joists and nail, until the required size is obtained, making sure that no two joints are over each other. It is always better, in making built up timbers, to run the joists through the planer ; but in many places in the country this cannot be done, so then the workman should pick out his stuff so as to have joists of the same thickness in each tier ; if not, the inequalities will prevent the joists from lying close together, which will be bad work.

Chimneys and Flues.

In building chimneys there should be no stringings exhibited, the flues should not be stinted as regards area, and there should be ample of them. In no case should two pipes go into the same flue, and no two flues should open into one another. There should at least be the thickness of a brick on edge between every flue. All flues, no matter whether they are intended for smoke flues or for ventilation flues, should be parged with good mortar their entire length, the parging to be made smooth. If a few dollars' expense is not minded, it is a good plan to have an 8 inch drain tile placed in the flue, from top to bottom. This may be easily done if the tiles are put in in lengths as the flue is being built. The joints may be made tight by filling them up with mortar as the tiles are put together. A flue made this way is sure to give good satisfaction ; it will rarely get

dirty with soot, and when it does get dirty it is very easily cleaned. Have a spare flue in each chimney which may be used for ventilating if so desired. Arrange for a soot drawer in every flue; this may be done by leaving out one stretcher brick four or five courses below the stove pipe hole. If it is intended at any time to pipe the house for water, gas, or heating, the breast of the chimney may be extended in breadth, and a "pocket" eight or ten inches wide by the size of the projection of brickwork in the room may be left the whole height of the room. This pocket may be formed by either running a four inch brick wall, flush from the face of chimney breast, with hollow space behind or it may be formed with studding, lathed and plastered on the front, and left open on the side so that a moulded board can be screwed over the opening in order that the piping can be put, and to get at the pipes for repairs or otherwise, after they are in place. Chimneys should be built high enough above all ridges or chestings to prevent the eddies of wind caused by these ridges and crestings to make a down draft. It is a question not yet settled as to how high a chimney top should be above the ridges so as the avoid these eddies. The writer has learned from experience that it is not always safe to have the top less than twelve inches above the highest point of the building. Do not narrow or contract the flue at the top. This practice, which is too common, often leads to serious trouble, as many a chimney smokes because of the flue being contracted at its delivery.

THE LATE THOMAS WAND.

In the death of the late Thomas Wand the city of Montreal has lost one of its best known contractors and a leading citizen. The whole life of the deceased was spent in Montreal, where he was born 78 years

The Late Thomas Wand.

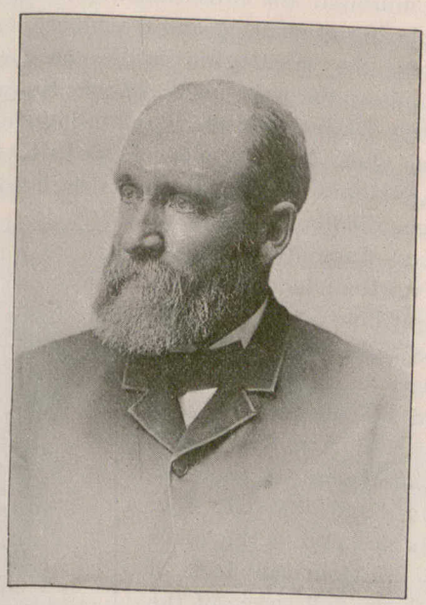
ago. He commenced life in a very humble capacity, but eventually achieved a leading position in the business community. In partnership with Mr. Moir Wand the deceased was engaged in many public works, and under the firm name of Phillips & Wand erected many of the public and private buildings in the city. Mr. Wand, however, retired a few years ago from active operations. His death was due to a heavy cold contracted two months ago, from which he never entirely recovered.

During the past fifty years Mr. Wand was connected with many important works of construction, including Trinity church, Mechanics' Bank, church of St. James the Apostle, and the Windsor hotel. His last contract was the Bell Telephone Company's building at Westmount, during the execution of which his health failed him.

Deceased was a member of the Episcopal church and of the Mechanics' Institute, and took an active interest in the welfare of the community in which he lived.

MR. GEORGE H. PROCTOR.

The subject of the accompanying portrait, a well-known builder and contractor at Sarnia, Ont., was borne in the township of Moore, Lambton County,



Mr. George H. Proctor.

November, 1842, and has since constantly resided in the locality.

After leaving school Mr. Proctor chose the carpenter's trade, at which he served the usual apprenticeship term. At its termination he entered into business as a contractor on his own account, in the townships of Moore, Sarnia and Sombra, and in 1876 removed to Sarnia.

Among the more important buildings erected by Mr. Proctor may be mentioned the Collegiate Institute, general hospital, G. T. R. railway station, the summer hotel at Stag's Island, River St. Clair, C. M. Garvey's residence and several large stores.

Mr. Proctor has been a member of the public school board and town council of Sarnia for many years. In the latter body he was elected deputy reeve and reeve, and to his efforts was largely due the erection in Sarnia of the Lambton County house of industry.

Mr. Proctor has also taken considerable interest in friendly societies, such as the Oddfellows, A. O. U. W. and I. O. O. F.

Mr. J. Mason, builder, Brampton, is completing the remodelling of a fine brick residence for Mr. H. Dale.

Messrs. Carter & Co., Elora lime kiln proprietors, state their business is showing a very satisfactory increase. The firm now control the output of four kilns.

If you have to paint ironwork that is to be subjected to heat, do not attempt to mix it yourself. You will require a specially made paint. Such are on the market and are made in all colors for funnels of steamboats, etc., and in white for reflectors over gas jets.

PROMINENT CANADIAN CONTRACTORS.

VI.

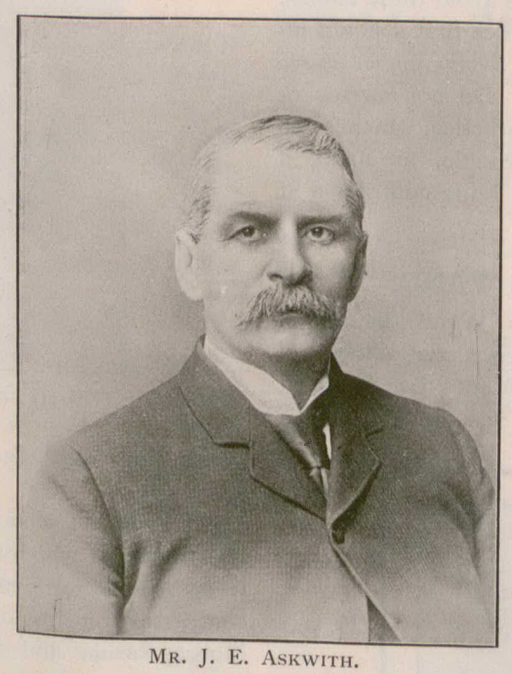
MR. J. E. ASKWITH.

The name of Mr. J. E. Askwith, of Ottawa, is familiarly known throughout Ontario and the eastern provinces, he being a contractor of wide and varied experience. He was born in the city of Ottawa on January 28th, 1841, was educated in the common schools, and served his apprenticeship in the carpenter and millwright trades. In the year 1872 he engaged in the sawn lumber business, and commenced contracting three years later.

The mention of some of the most important contracts executed by Mr. Askwith will serve as an indication of his success. In the vicinity of Ottawa he built the Geological museum, the Government printing bureau, including placing of shafting and machinery, a number of residences, the Wellington bridge on the Rideau river, and piling the west bank of the Rideau canal. The outside work included the Quarantine Hospital at Grosse Isle, Que, Marpeth pier, Lake Erie, Stratford post office, Niagara Falls post office, Peterborough post office and custom house, Chatham post office, Cape Bauld light house, Newfoundland, Notawasaga light house and the Colchester reef light house.

The latter work was a dangerous and difficult piece of construction, and American engineers declared that it was impossible to build it. The light house was situated seven miles from land in fourteen feet of water, with the full sweep of the lake.

Mr. Askwith was also a member of a firm that constructed a section of the C. P. R. short line through the state of Maine. He is now engaged in building one of the largest armories in the Dominion, at Halifax, N. S., the cost of which will be $200,000.



MR. J. E. ASKWITH.

For seventeen years Mr. Askwith was councillor and school trustee in New Edinburgh before that village was annexed to Ottawa. After its annexation he was elected alderman for the city of Ottawa for four successive years, and was chairman of the Board of Health for three years. He is now a member of the Park Commissioners of Ottawa.

CONSTRUCTION OF BRICKS.

IN a paper on "Brickwork," read before the Architectural Association of London, Eng., Mr. John Toomey gave the following suggestions regarding methods of using different materials:

SAND.—I have often found that the quality of the sand used for building purposes does not receive the attention it deserves. A clean, sharp sand is essential to the making of good mortar, whether mixed with lime or cement. The many impurities to be found in sand must act injuriously and tend to detract from the strength of the mortar. The best way to avoid this is to wash the sand, but the expense attached to this process prevents its general adoption. But I have used a "Medway" sand and one from the neighborhood of Hatfield, good in quality, being both sharp and clean. Where a mortar-mill is used the "clinkers" from a dust-destructor mixed in reasonable quantities with sand and lime or cement make a good mortar. But it is always an important point to see that a proper proportion of lime or cement is used, which is not always done.

BRICKS.—The question of the qualities of bricks is such a large one that I shall only be able to speak of a few kinds. The numerous kinds of bricks that are now in the market show that greater attention is being paid to their production, chiefly in facing bricks (external). They may be divided into two classes, viz., the "sand" brick and the "pressed" brick. The different processes of manufacture of the two bricks being so different, the sand brick being moulded, whilst the materials are of a dough-like consistency, and the other being "pressed," while the ingredients are nearly dry, must tend to make the pressed brick squarer and more regular in shape and size. But a brick, like terra-cotta, must be well burnt to be durable, and in burning it loses in shapeliness what it gains in durability.

METHODS OF BEDDING BRICKS.—I think it is essential (except during the winter months) that bricks should be well wetted before being laid. This is all the more necessary where cement mortar is used. The only possible way to secure strong work is to "grout" each course of brickwork, and this is where the advantage of "washed" or well screened sharp sand is seen, as it will more readily fill the open joints of the brickwork. The plastering of mortar on the top of each course will not do. But the fact that wet bricks make bricklayers' fingers sore may have something to do with the neglect of wetting bricks. In work that is to be pointed after the building is erected, the joints should be raked out half an inch deep, and well brushed off with a hard broom to clear away all loose mortar, and the pointing should be well pressed or "ironed" in the joints. In glazed or enamelled work it may be often noticed that after a time the "glaze" flakes off and the defective part appears black. This is very often due to using chipped or defective bricks, but it is also due sometimes to another cause, viz. the mode of bedding them. The bricks having two deep "frogs," and generally being laid in a close joint, care is not always taken that sufficient mortar is spread to insure the frogs of the brick being solidly filled so that when the weight comes on the wall the pressure is largely on the outer edge of the brick, and causes the "glaze" to fly.

One way to obviate this is to fill the "frogs" before laying the bricks. Another way is to "joggle" either the end or side of the brick before bedding, and fill or "grout" them up with liquid mortar.

The conditions of present-day building often compel builders and others to carry on their works in sections. Very often walls are built with a vertical "toothing." If this cannot be avoided, I think the connection or making good to such toothing should be done with cement.

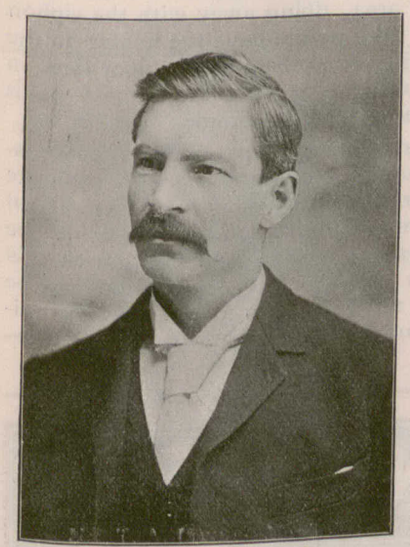
NATIONAL ASSOCIATION OF MASTER PLUMBERS.

We hoped to present in this number portraits of the vice-presidents elected at the recent convention of the Dominion Master Plumbers' Association to represent the different provinces, but up to the time of going to press those of Messrs. Doody and Borton, as representing New Brunswick and Nova Scotia respectively, had not come to hand. Portraits of the vice-presidents of Ontario, Quebec and Manitoba appear below.

Mr. T. A. Irvine, vice-president for Manitoba, is the senior member of the well-known plumbing firm of T. A. Irvine & Co., of Winnipeg, and an ardent association worker.

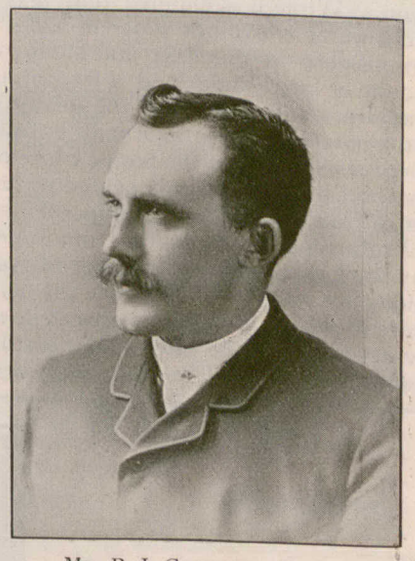
In Mr. John McKinley, Ontario vice-president, the association have a valued officer of much ability and keen forethought. He was born in Montreal forty-two years ago, served his apprenticeship with Garth & Co., of that city, and is now a member of the firm of McKinley & Northwood, of Ottawa. His firm have several large heating and plumbing contracts on hand at present, including the Victoria Hotel at Aylmer, new wing to the Protestant Hospital, and St. Mary's school in Hull. Mr. McKinley has been for the last two years president of the local association at Ottawa.

Mr. P. J. Carroll, vice-president for Quebec, is a popular member of the trade. He was born in Ireland 37 years ago, coming to Canada at the age of four years and serving his apprenticeship with John Burns & Company. Twelve years ago he and his brother established the firm of Carroll Bros., and since the decease of his brother ten years ago, Mr. P. J. Carroll has continued the business under the old name.



Mr. T. A. Irvine—Manitoba.

Mr. John McKinley—Ontario.



Mr. P. J. Carroll—Quebec.

VICE-PRESIDENTS OF THE NATIONAL ASSOCIATION OF MASTER PLUMBERS.

Mr. Ralph Hodgins, of Shawville, Que., has recently added a tile machine to his brick manufacturing plant. The machine is steam power and capable of turning out 600 tiles per hour.

The Canadian Locomotive & Engine Company, of Kingston, Ont., will probably engage in the manufacture of steel pipe, under patents granted to F. A. Williams, of Wolverhampton, England.

One of the most successful of the many "new process" white leads is that in which the basic carbonate of lead is made direct from litharge. The process takes about as many days to complete as the Dutch process takes months.

ARRANGEMENT OF MAINS IN HOT WATER HEATING APPARATUS.*

By W. M. Mackay.

Considerable interest is manifested in the proper placing of the hot water pipe heating system, judging from the many and varied questions on this subject which have been handed in to the society by the members from year to year for discussion, and as the success of a hot water heating apparatus is largely dependent on and affected by the arrangement, size, and grade of the flow and return mains and their connections, I will endeavor to present such information as to results as I have gathered on this subject, being my own experience in planning and placing this system in different classes of buildings, my observations of the results obtained by others, and such descriptions of earlier systems as I have been able to obtain. While much has been done and said to popularize and increase the use of this system during the past twenty years in this country, Canada, and Europe, the origin of this system seems shrouded in doubt and dates back further than the earliest writers on this subject have been able to determine. Many of the so-called improved applications of the system which have been presented during the past few years as new discoveries in the art have been found to be but a revival of older ideas and an accurate description of apparatus which actually existed, in some cases, years before the modern inventors and patentees were born, and being what some of our present writers would term obsolete or antiquated.

The arrangement of mains which is most largely used in an ordinary installation of hot water heating apparatus at the present time is a number of flow mains rising from the source of supply to the farthest point to be reached, with a corresponding number of returns of the same size on the same grade falling back to the heater. Some engineers contend that this is wrong and that the radiation would be better and more uniformly supplied with a single flow and return main in the same way, but this statement should always be qualified and the existing conditions considered before it is made, for even a novice will admit that if the heater is placed at a central point to supply radiation in four different directions and this system of mains be em-

*Abstract of paper read bofore the American Society of Heating and Ventilating Engineers, Jan., 1897.

ployed it would be better supplied by four separate flow and return mains from the heater than by a single main, and while it is true that when the radiation is located in one direction from the heater it is often possible and practical to supply it with a single main, there is a limit in size or diameter beyond which it is not safe or wise to go, and after reaching this limit it is an advantage to use two or more mains rather than to increase the size of a single main. While larger mains have been used and recommended, I have always found it best to place the limit at from eight to ten inches in diameter, depending on conditions, my objection to a larger main being the large body of water it contains, the difference in temperature between the top and bottom of the main causing unequal expansion, and the possibility of an internal circulation interfering with the general or desired circulation.

I have in mind a large building that was heated by hot water some years ago; in one section of it, about 60 by 40 feet, the main was carried from the heaters to the outside wall and continuously around it back to within 20 feet of the heaters, making this single main about 180 feet long. The circulation in this main has never been uniform, and with a low temperature of water the far end of it for about 80 or 90 feet is almost cold, whereas if two mains of a smaller size had been used each of them would have been 90 feet long and they would have given an apparently uniform circulation. While it is claimed that it is impossible to hold cold water above hot water in a hot water system, it is impossible in this case and in any case where, on account of large main, and a free circulation through the radiators and risers near the heater, the water is allowed to enter the return main near the heater at, say, five to ten degrees lower than the temperature of the flow main; the natrual tendency of this heated water in the return main is to travel towards the upper end of the main instead of returning to the heater, and under these conditions, as soon as a sufficient number of radiators and connections are circulated to relieve the heater at the temperature at which it may be operated, the two columns of water at about the same temperature travelling or attempting to travel in the same direction hold the balance of the system in check and keep it cold. As it is often necessary to arrange mains in this way and sometimes impossible to arrange them in any other way, it is very desirable that there should be a remedy for this trouble, and I have found that the best and surest preventive was to take the connections for the near radiators, or for all the radiators and connections, from the side instead of from the top of the flow and return mains, thus retarding the flow through the near connections, assisting the flow to the extreme end, and making a uniform circulation through the entire main and system.

I designed an apparatus in this way some time ago where the main was over 300 feet long, and with the water at the heater at 130 degrees F., the temperature of the water at the extreme end was 120 degrees, while with a higher temperature of water at the heater the difference was less, until at 180 degrees the difference was only five degrees. I mention this to show that with a prpoer arrangement of branch connections and a suitable size of main it is possible to circulate water through a continuously rising horizontal main for long distances at a comparatively uniform temperature.

Where this system of mains is used and it is found desirable or necessary to supply indirect radiation or to locate radiation in the basement I have found it to be an advantage to use a separate main, either arranged with a siphon extending to the ceiling of the first floor or by increasing it in area, doing away with the siphon and dropping from a high point above the heater to the radiation and returning at or below the floor line, in either case carrying an air pipe from the highest point to the expansion pipe or expansion tank.

The overhead system, where practical or permissible, has some advantages, doing away with separate return risers and permitting the use of a smaller area of main for a given amount of radiation, and while the temperature of the water on the lower floors with this system is lower than on those above, radiation can be figured uniformly on any floor with a certainty of a uniform temperature and a positive knowledge as to results.

To Make Strong Tracing Paper.—Dampen a piece of ordinary thick paper with perfectly distilled benzine, and trace on your design with pencil or ink. When the benzine evaporates, the paper will resume its whiteness and opacity. If the evaporation takes place before the design is finished, dampen anew.

There is a plumber in a certain city who is at present suffering from a severe stroke of paralysis, for which, it seems, a lady resident is responsible. One day recently, the drains of the house becoming clogged, she sent for him. He went up, and after removing four rats, the hired girl's autograph album, part of a loaf of bread, the baby's rattle and Jimmie's fur cap, he cleaned the pipe and got the drainage system in working order.

NEW ARCH CENTRES.

In the construction of masonry arches and vaults, it is not always possible to erect ordinary centres, as when the arch is near the surface of water. A writer in the Annales des Ponts et Chaussies illustrates two kinds of false-work, which have special features, and have been used at Bordeaux. The contractors supported the masonry upon a cylindrical platform or lagging of iron plates about 3¼ in. thick, suspended from three pairs of lattice arched girders above, and clear of the arch of masonry. At equal distances on panel points, 2 in. suspended rods ran down through the vault lagging and cross beams, supported from screw nuts on plates across the tops of girders. These rods passed through holes cut in the arch stones, normal to the intrados. The centres were easily removed by unscrewing the nuts from the lower end of the suspending rods. The Engineering Record, which describes this system of centering, illustrates the plan by elevations and cross-sections of the plan. Another method is also illustrated, in which the intrados of the arch of masonry are carried by iron lattice-girders below the soffit in the usual position of centres. Six girders were framed together, though each acted as a simple truss instead of an arch. The two trusses at each end were connected and incased by iron plates, and formed two four-sided or rectangular watertight caissons of cylindrical curve to suit the arch. These floated the whole false-work into position at high water. They, in fact, formed two caissons of the depth of the arch, and of its whole width, segmental in form, corresponding to the arch, connected together, and having between them the other trusses. The straight iron girders were inserted in the masonry piers, and the trusses were landed upon them and made stable by admitting water through valves. The vault was then built, and the centres were afterwards struck by slacking the screws in the usual way. The first-described method is really an overhead centre, by means of which the real masonry arch is suspended, while the second plan is really a floating centre below the arch to be constructed, the ends being floated into position, and the centering and lagging constructed between them. Both plans are ingenious methods of forming centres for bridge vaults which are too close to the water surface to admit of the usual plan being used.

PAGES

MISSING