THE INTERCEPTING TRAP—A SYMPOSIUM, IN THIS NUMBER.

# CANADIAN ARCHITECT AND BUILDER

Mechanical & Industrial Arts
Decoration & Furnishing
Construction Sanitation
Engineering

VOL. XIII.—No 8. AUGUST, 1900 { PRICE 20 CENTS $2.00 PER YEAR.

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In the "Canadian Architect and Builder."

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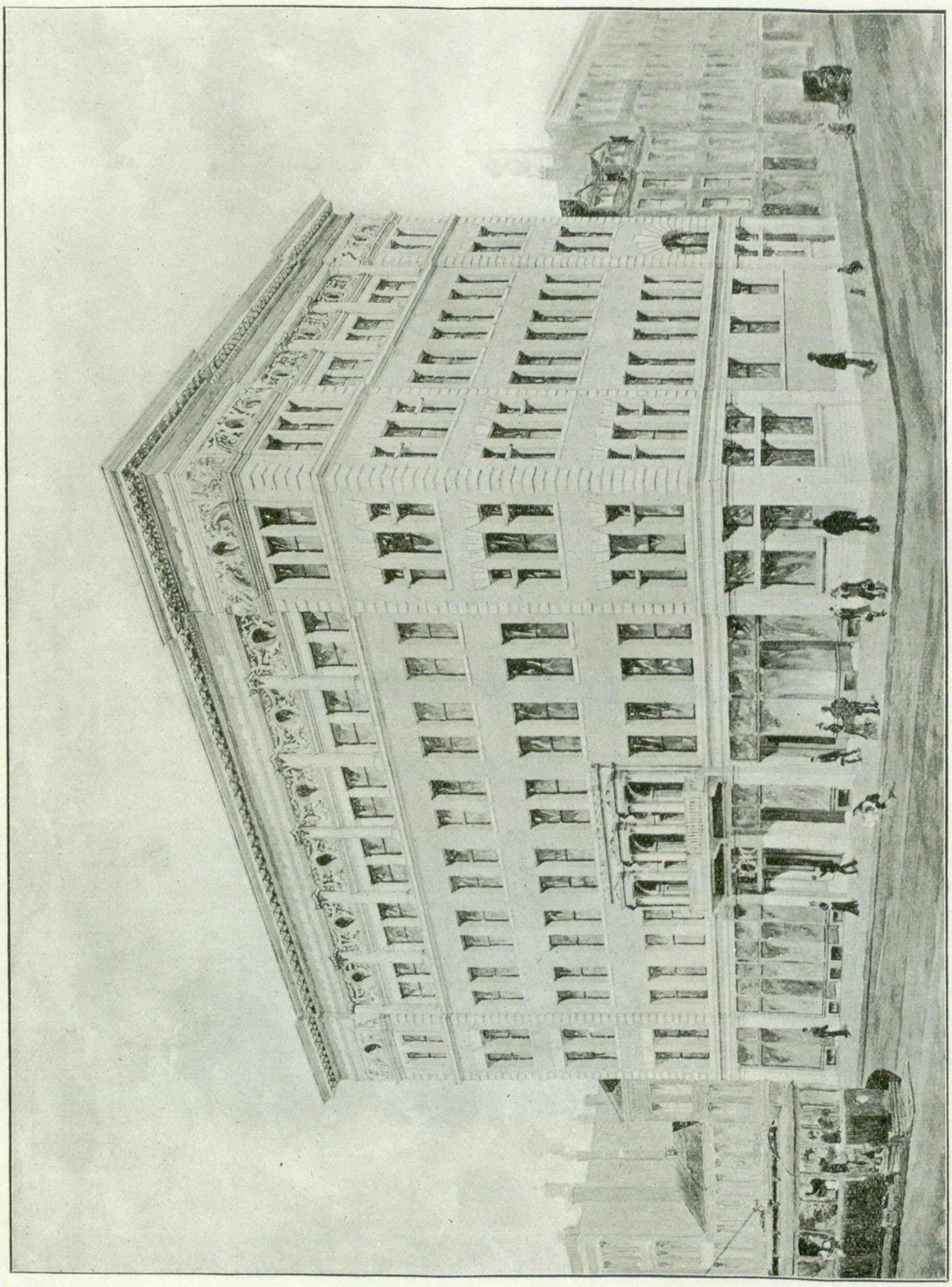
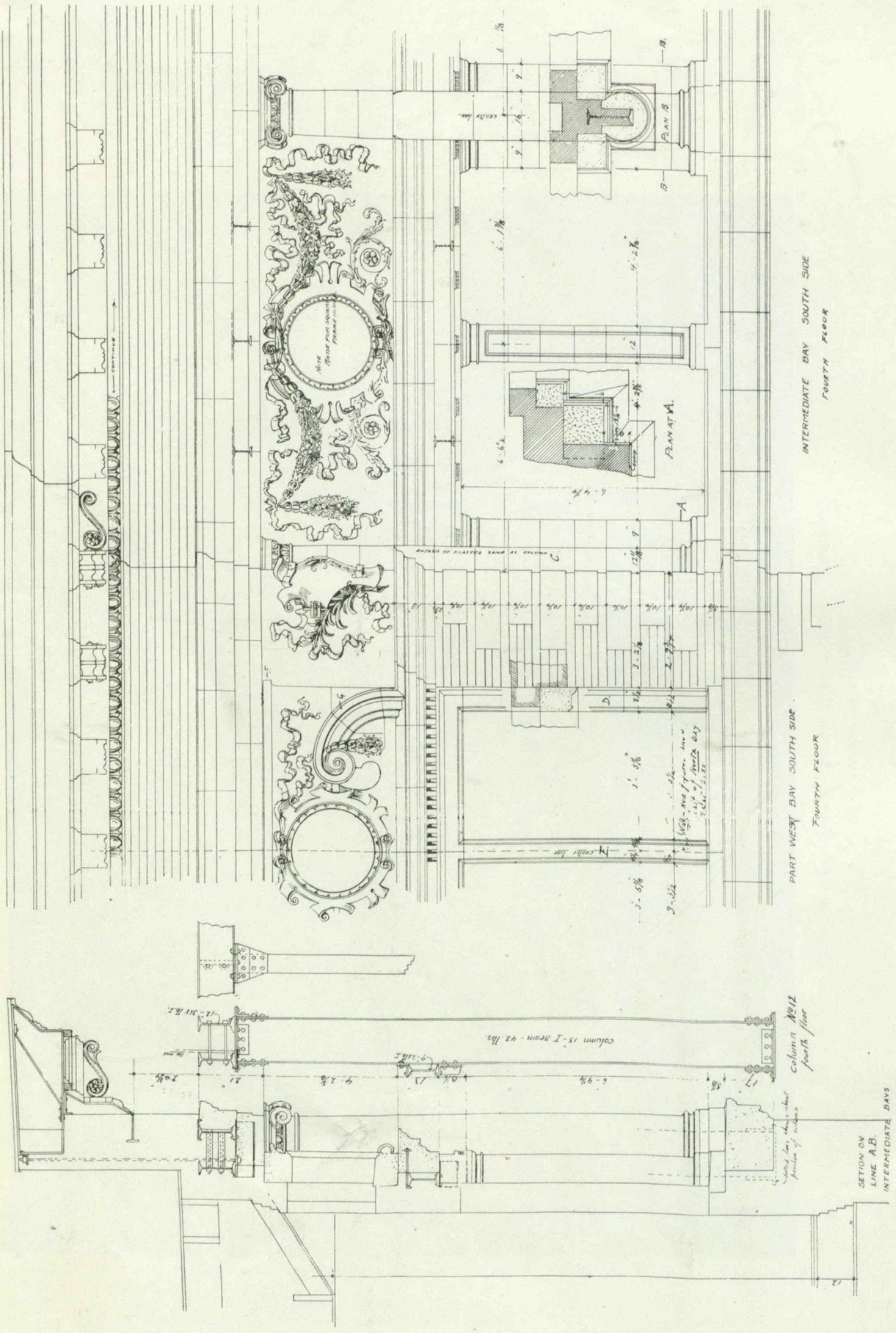


MANNING CHAMBERS, QUEEN STREET WEST, TORONTO.
E. J. LENNOX, ARCHITECT.

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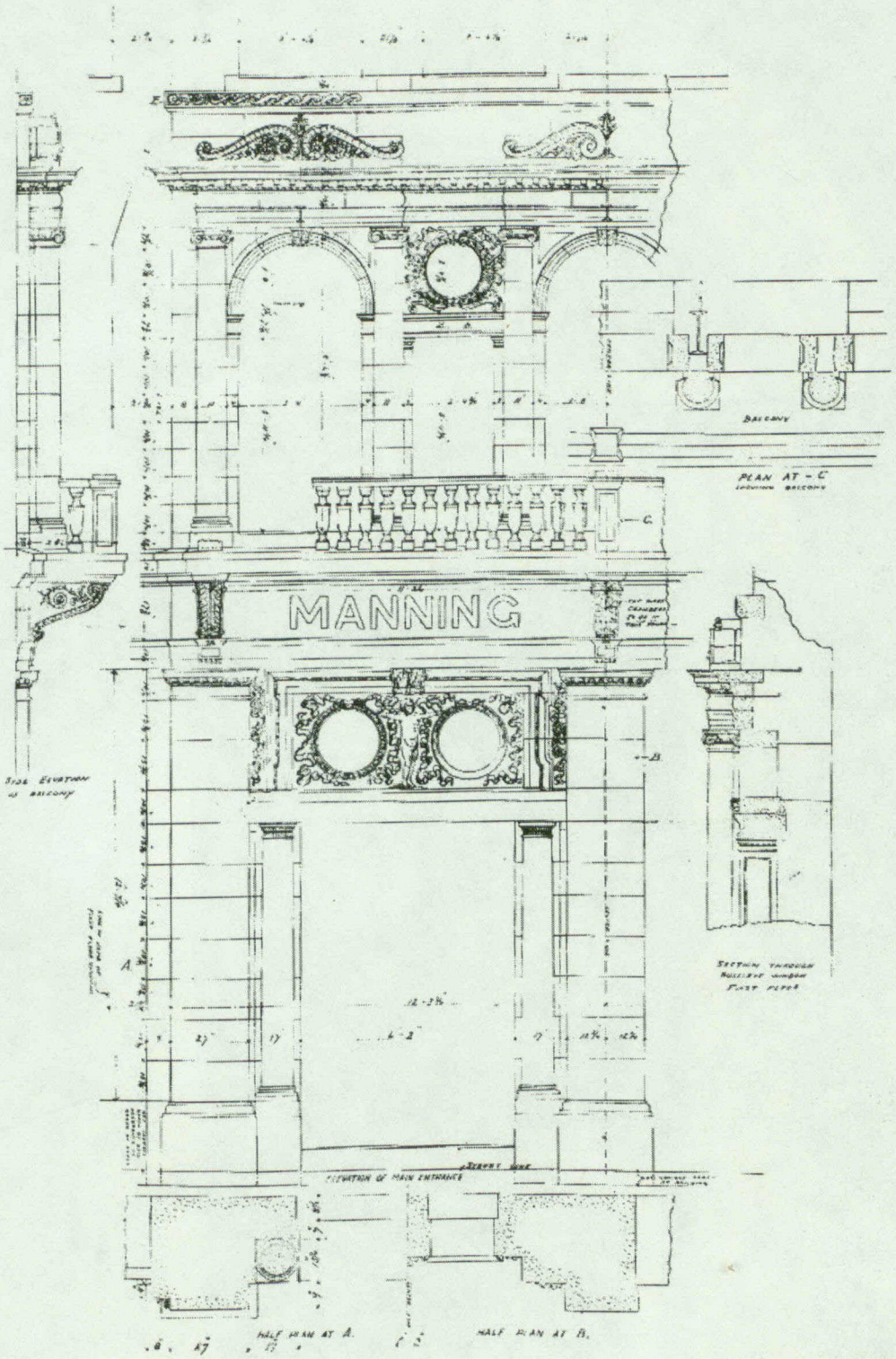
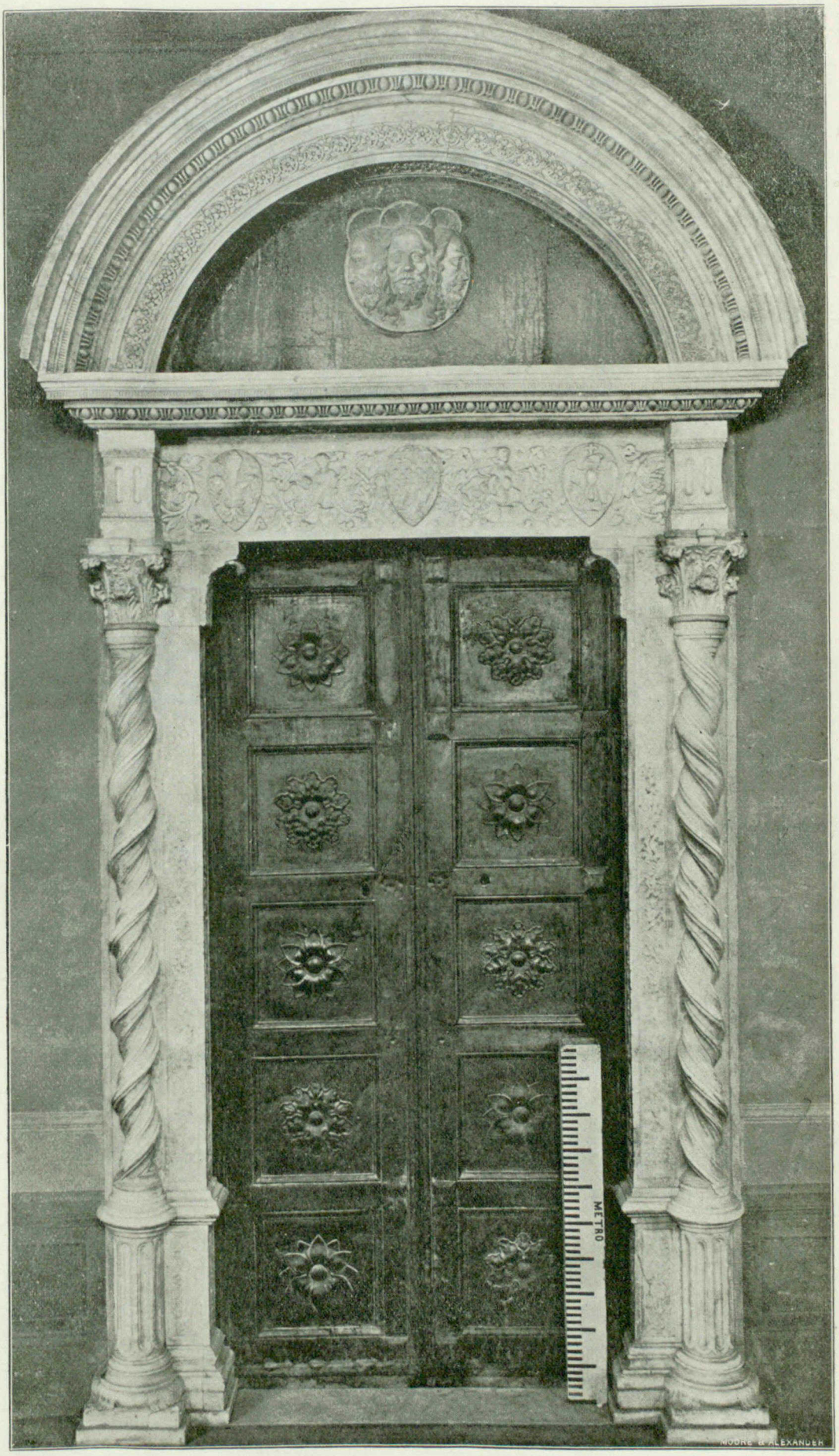



WEST, TORONTO.—E. J. LENNON, ARCHITECT.

CHITECTS' EIGHTEEN CLUB).




DOOR IN THE PALAZZO VECCHIO, FLORENCE.

(ILLUSTRATING ARTICLE IN THIS NUMBER, BY MR. W. A. LANGTON, ON "SHEET-METAL AS SHEATHING").


NATIONAL TRUST COMPANY'S BUILDING, KING STREET EAST, TORONTO.

GEO. W. GOUINLOCK, ARCHITECT.

# CANADIAN ARCHITECT AND BUILDER.

VOL. XIII.—No. 8. AUGUST, 1900 { PRICE 20 CENTS. $2.00 PER YEAR.

—THE—

## CANADIAN ARCHITECT AND BUILDER,

*A Monthly Journal of Modern Constructive Methods,*

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

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

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

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**Architectural Excursions.**

An effort was made to induce a number of architects of Toronto to pay a visit to Buffalo on Dominion Day. They were to have been met on arrival by members of the Buffalo chapter A. I. A. and shown the most interesting of the buildings of the city. Unfortunately, the project had to be abandoned because a sufficient number of the members of the profession in Toronto did not respond to the invitation. In view of the nearness of Toronto to a number of large American cities, it is to be regretted that the members of the Ontario Association of Architects do not organize and carry out every year an excursion such as the one proposed. It might be made a benefit to the members individually and to the Association as a body. There is required, however, a greater disposition than has been shown by members of the Association in the past to serve the interests of the profession as a whole at the cost of individual convenience.

**The Heating and Ventilation of Schools.**

A special committee of the Toronto Public School Board was recently appointed to collect data and report upon the best method of warming and ventilating school buildings, in order that the information might be available for use in the construction of a number of new schools now in course of erection. The committee communicated on the subject with the representatives of school boards in twenty-one cities in Canada and the United States, and invited opinions from several sanitary experts. In every instance replies were received. These show 13 systems in use in 525 buildings. The number of buildings in which each system is used is as follows: Smead, 115; hot air furnaces, 111; steam, direct, 80;

stoves, 80 ; steam, indirect, 80 ; steam, direct-indirect, 27 ; ruttan, 26 ; steam, indirect with fans, 9 ; steam, direct with mechanical ventilation, 6 ; hot water, 5 ; Peck & Williams, 4 ; steam, with hot blast fan, 2 ; hot air furnace with fan, 1. Ten cities reported in favor of steam heating direct and indirect ; four in favor of the Smead system ; one in favor of hot water, and one in favor of stoves. Nine cities reported in favor of steam systems, direct and indirect, for ventilation ; five in favor of the Smead system ; one in favor of stoves, and one in favor of hot air gravity. The average cost per room for all kinds of steam apparatus is given as $543.-74 ; the Smead system, $215 ; hot air, $198.61 ; hot water, $450 ; fan system, from $280 to $389. The committee recommend that in schools that are to be enlarged, where the Smead system is already installed, the furnaces be enlarged and evaporating pans introduced ; that one of the new schools be heated with steam with fans and one with steam without fans. The recommendation is made that in the additions to schools where the Smead system is installed, flues be arranged for the introduction of steam at a future date. This seems to signify that the committee are prepared to discard the Smead system in favor of steam as soon as circumstances will permit the change to be effected.

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**Why Ontario Bricks are not used in Manitoba.**

The fact was mentioned by our Winnipeg correspondent last month that owing to the excessive freight charges imposed by the Canadian Pacific Railway, pressed and ornamental bricks manufactured in Ontario cannot be sold in Manitoba in competition with American bricks. Enquiry of the manufacturing companies in Ontario confirms this statement. Most of the material used in Manitoba is imported from St. Louis. That city is nearer by about three hundred miles to Winnipeg than is Toronto, but this should not account for the great difference in the freight rate, which is 45 cents per cwt. from Toronto as against 27½ cents per cwt. from St. Louis. This disproportion is so great that, after paying a 20 per cent. ad valorem duty, the Americans have an advantage over the Ontario manufacturer of $7 per thousand. But for the prohibitive tariff imposed by the C. P. R. a superior article both as to quality and color could be supplied by our manufacturers to the architects and builders of the northwest, who would prefer to use Canadian material. The Ontario manufacturers made an effort to have the carrying charges reduced, but were told by the railway authorities that they could not afford to quote a lower rate. We had supposed that the C. P. R. was managed and equipped in such a manner as would enable it to compete with the American roads. Indeed, our recollection is that on one or two occasions the company fell foul of the American Traffic Association for having cut below the prevailing rates. It would therefore seem to be not so much a question of ability as of willingness to meet the rate granted by the Burlington and Northern Pacific to St. Louis shippers. Perhaps the company can get plenty of other classes of freight to carry at more profitable prices. Whatever the cause, it is to be regretted that our manufacturers should be deprived of entrance to the growing western market.

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The Albert Manufacturing Company, of Hillsboro, N. B., have been awarded a silver medal for their exhibit of rock wall plaster, etc., at the Paris Exposition. Milne, Coutts & Company, granite manufacturers, of St. George, N. B., are also winners of a silver medal.

## SHEET METAL AS SHEATHING.

When architectural writers dwell upon the beauty of details in old work, declaring them to be as endlessly nteresting to pore and ponder over as Nature's own work, and define such art as "the expression of the pleasure the workman took in his work," the Canadian architect can only feel that such writings do not describe the sort of work he can expect to have done. We do not deal with workmen, but with machines. The day for details which one can pore and ponder over is, if not gone for ever, yet not here now. The execution of our work is mechanical, and the beauty we must aim at is only such beauty as is independent of a "loving" hand ; presenting qualities that the monotony of machine work cannot spoil.

The first and essential quality is of course composition of parts to which detail is only as the punctuation to a sentence. The second is feeling for material. A well composed building with its material showing itself to the best advantage is, even when the material is not of the most beautiful kind, a work in which we always take pleasure.

There is no material that has not been used in building with good effect; "gold, silver, costly stones, wood hay, stubble" are all there ; the one condition of acceptance has been that every material shall be used in a manner suitable to its character and shall exhibit its characteristic qualities. There is no reason to suppose that any material should not be used now, whereever it is wanted, if it is used under these conditions ; in other words these seem to be the conditions of acceptability. It will perhaps be profitable to see how these conditions apply to ordinary sheet metal, a material which has great claims upon our attention as a durable and fire resisting finish.

The trouble that meets us at the outset is that the ordinary material, steel plate, must have some sort of finish to protect its surface and to render it presentable, so that we are at once off the safe ground of a natural surface left to the improvement of time and the atmosphere. However, we do not expect purity in metals ; and there are so many "finishes" devised for hardware that we need not reckon it beyond the limits of ordinary outlay to have steel plate work finished in any suitable tone, if there is a demand created by architects for such work.

We start then with the idea of a surface showing a metal finish. It is a substance which lends itself to repousse work, and it is not only a matter of course in these days, but seems reasonable, that this work should be done by a machine. We cover walls with machine printed paper which is, when it is well designed, a perfectly satisfactory form of decoration, and there is no reason why machine stamped metal should not be satisfactory also if it is well designed. What constitutes good design is more easily recognized than defined, indeed it is rather a matter for development than for definition. But it is safe to say that the best design is that which is most easily produced, that the key to it is to be found in the facilities of the material, and the power of the machine should not be used to force upon the material effects that would not be attempted by hand. The effect of such work is the play of light upon a modelled surface, and this a point to be remembered, not only in inventing patterns but in adapting old forms, like the egg and dart, from a carved o plastic example in which the effect is one of light and

shade. Anything approaching the sharpness of stone or plaster is foreign to the natural conditions of the material.

There is a peculiarity of all stock designs for metallic walls and ceilings which seems to be not only not necessary but injurious, producing a monotonous effect; this is the system of interlocking joints concealed by making them part of the pattern. It would probably be an improvement if the joints were recognizable as joints. Joints are no injury to tiled surfaces but rather an improvement, even when there is a pattern extending through several tiles. In fact this is a commonplace of decoration that construction lines are not a hindrance but a help. Why then not recognize this in the application of sheet metal by taking no pains to conceal the joints, but on the other hand, making something of them by fastening up the sheets of metal with nails having large or ornamental heads. We know that metal must be handled in small sheets and the mind is satisfied as well as the eye by a manner of applying that admits this fact. The standard size, 2x4 feet, either as it comes or cut into two pieces, should be about right for most purposes, and a single embossed form in the centre of each piece would be sufficient decoration. Enough variety of pattern could be obtained from manufacturers to relieve monotony. It will be noticed that, in the illustration given of a door from the Palazzo Vecchio at Florence, there are only two patterns but there is no appearance of monotony. These forms, though not done by machinery, are evidently made mechanically, and are so much the more an example that resembles work done under our own conditions.

If the embossed design extends beyond the area of a single plate it ought to be pleasanter to let the pattern extend itself without regard to the jointing, and the jointing attend to business without regard to the pattern. But it is not necessary to always have an embossed design. Plain or severe work will be all the better for having merely the metal surface well knobbed by the fastening nails. Why should there not be a coloured stencil applied upon the metal ground? Or one metal cut upon another? Or a metal surface combined with plastic details?

There is more likely to be development in the direction of variety if there is recognition and enjoyment of the characteristics of the material, when it looks like itself, than if it is chiefly valued for the facility with which it can be machine worked or built up to look like something else. There is no real variety in the various forms in which (to turn for a moment to external applications) sheet metal is made to appear. The representations of brick surface, rock faced stone surface, tiles, (to speak only of surfaces) have an unfailing bond of union in the inextinguishable and ever distinguishable appearance of being sheet metal and nothing else. There is no disguising it, and to try and do so only produces ugliness where there might be all the beauty of suitability and something more perhaps, if the designer is determined to regard his material as something to be made the best of on its own conditions.

The architectural possibilities of sheet steel as an exterior sheathing are not very promising, yet the plain tin roof of a plain stone house in Quebec has a genuinely architectural quality. We also recognize both ancient lead roofs and modern copper roofs as right and proper, however plain and straightforward; and copper is used thankfully by architects as a sheathing for oriel windows and other small vertical surfaces. There is evidently nothing wrong with metal, as metal, for covering external surfaces within limits. The real trouble with sheet steel for exterior as for interior work, is that its "patina" is neither ornamental nor preservative. In the latter condition is, in this case especially, the refuge; for, inasmuch as the sheathing cannot be put upon the market without some kind of protective coating, there is a possibility of giving, by means of the coating, an architectonic colour and tone that are lacking to the natural surface. If the manufacturers of sheet steel sheathing would divert ingenuity and expense from the endeavour to imitate constructive materials to experiment in search of a good plain or metallic lacquer they would, it seems likely, be doing the best thing to push their material to the full extent of its proper limit in architecture.

W. A. LANGTON.

## BY THE WAY.

Conspicously posted on the front of a new residence in course of construction in one of the principal thoroughfares of Toronto, is a board on which is painted in bold letters the name of the architect. The public are privileged to regard the placard as a straight out advertisement on the part of the architect, or an intimation that he thinks his work has sufficient merit to warrant him in thus publicly claiming credit for its authorship. In either event I think straightforward procedure of this character is preferable to the round about methods adopted by some architects to secure public advertisement.

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Few people have any idea when they sign themselves "yours sincerely," that this phrase has any connection whatever with the building trade, says Brick. In the days when Rome was mistress of the world, marble and alabaster were enteasively used for building purposes, and the value of a marble block was in proportion to its freedom from flaws and chips. The jerrybuilders of those days (by-the-by they did not die childless) used up the defective blocks in erecting residences to sell at reducee rates and covered up the defects with a cement, of which white wax formed the chief ingredient. They looked just as stately as the others till an exceptionally hot sun melted the wax and revealed the fraud. Hence a perfect building was said to be "sine cera," or "without wax," and a friendship perfected by the trial of the fire of adversity was said to be "without wax." The signature "sine sera" as a symbol of genuine affection and probity has been used ever since, and many perpetuate it without knowing its origin and its import.

## THE ONTARIO ASSOCIATION OF ARCHITECTS.

The Council of the Ontario Association of Architects has passed the following resolution:

"Whereas the Association is endeavoring, during the current year, to establish conditions of new activity and usefulness, and certain architects are in consequence desirous of becoming members of the Association without passing the examinations prescribed for students, be it therefore resolved that:—Architects who have not registered, nor passed the examinations prescribed by the Association, but who otherwise satisfy the requirements of the "Ontario Architects' Act," and who apply before December 31st, 1900, may be admitted without passing the examinations prescribed for students, if the Council after taking such steps as may be necessary to satisfy themselves of the qualifications of applicants, are agreed as to their fitness."

## SOME ESSENTIALS TO HEALTH AND THE DUTY OF ARCHITECTS.*

By H. C. Lander.

The medical profession has done noble service in discovering and emphasizing the real safeguards against disease which are summed up in the word "cleanliness"—clean air, clean water, clean food, clean bodies, clean houses, clean habits—and in showing that a due allowance of sunshine and light and of all the other gifts of Nature are absolutely necessary for the proper development of human life and the prevention of disease. I have referred to what I may call this pioneer work of the doctors because I think there is an opening for similar work in the architectural profession.

The architect's influence may be felt in either or both of the two ways; first, in the particular buildings he erects and in his personal contact with his client; and, second, in a wider sense, in his power as a specialist to educate public opinion. The public are much more ready to accept a statement upon any subject made by a specialist than by anyone else. If any particular conclusion upon some point in relation to healthy dwellings was arrived at and insisted upon by any considerable number of architects, such opinion would carry very great weight.

But to return to his first sphere of influence. The architect has it in his power, either by bad planning and ignorance of sound principle in sanitation, or, on the other hand, by knowledge and skill in design, to influence very directly for good or evil the lives and the health of those who live or work in the buildings which he erects. The effects of bad planning are felt in the want of light and air and sunshine into living-rooms, schools and workshops; want of proper ventilation; in dampness arising from the ground; in placing the rooms with the wrong aspect; in dangers arising from the undesirable position of the sanitary fittings, as well as from the fittings themselves and the drains, together with the absorbent or otherwise insanitary nature of the materials of which the building is composed.

The great bulk of our lives is spent within doors, far too much time if health were the only point to be considered. We are born, bred and educated within doors, we eat and sleep and to a great extent earn our living and take our recreation within doors. The nature of the buildings in which we spend such a large proportion of our lives must have a very distinct influence upon the public health. Insanitary buildings—that is, those which by their construction or fittings in any way interfere with the needs of a natural and healthy life—are a source of public danger, and must be dealt with accordingly, whether they be public buildings or private houses. There are none better qualified than architects themselves to undertake this aggressive sanitary reform as applied to buildings, as doctors have undertaken similar work in the sphere of medicine.

The architect's duty does not consist merely in supplying the demands of the public or of commercial or other requirements; such a conception is degrading and narrow, and, if followed, would convert the architect into an ordinary commission agent. The architect is the professional adviser of his client, but he is something more even than that, or should be, as the medical man has a duty beyond merely attending to the needs of his own little circle of patients. Every true doctor has the public health at heart and the alleviation of the pain and suffering of humanity, and every true architect should have an interest in the public health outside and beyond the interest he takes in providing his own particular client with a healthy home or a well-ventilated church. The forward movement in the prevention of disease was not in answer to any public demand, but was undertaken upon their own initiation by the medical profession, and, in one sense, against their own private interests, since doctors live by curing disease, not by preventing it, and if architects are to take their share in assisting the movement, the initiative must come from within; at all events, I think we shall agree that this would be the more dignified course rather than to wait until such reforms in building regulations and customs as are necessary are demanded by the public or thrust upon us from without.

It is the right and the duty of the architect to use his influence by every means in his power to promote the public health in all those matters which come within the knowledge and scope of his work. If public prejudice is against him, he must seek to educate public opinion; if by-laws or other restrictions act prejudically in the interest of the public health, or if they need amending or abolishing, he must agitate and bring pressure to bear upon the proper authorities until such enactments are repealed, amended, or remodelled; and if private profit stand in the way of reform, he must uphold the principle that the greatest good to the individual is attained only through the well-being of the many, and that the maintenance of a high standard of public health is the best, and indeed the only, protection for the individual.

If we as architects were as much in earnest about raising the standard of public health as are the members of the sister profession of medicine, the progress made would be much more rapid than it is, and the influence of the architect would be much greater, both as adviser to the client in each particular case, and as an advocate for improvement in all sanitary legislation.

In these days when so many things are said and done in the name of patriotism which had better have been left undone and unsaid, we need not remind ourselves that true prosperity comes only through the dignity and happiness of the lives of the people, aud that those conditions which promote the fullest and most vigorous life amongst the greatest possible number are the only true bulwarks of a country's greatness, and that any ideas of power founded upon a basis which places the life or health of its citizens in a position of secondary importance is a standing danger to any country far greater than any possible combination of external forces.

In lowering the death rate and in raising the standard of health and physique, of manliness and endurance, amongst the sons of the nation, we are doing no mean service, and yet these things are to a great extent possible only under conditions which come within the scope of an architect's work and knowledge, and upon which he should, therefore, surely have something to say.

* Abstract from a paper read before the Discussion Section of the Architectural Association, May 18th, 1900.

### PERSONAL.

Mr. Wm. Rae, architect, of Toronto, was united in marriage last month to Miss Georgina Leaycroft, of Quebec. The ceremony took place in the chapel of St. John's Church, Toronto. Following the wedding reception Mr. Rae and his bride crossed to Niagara en route to the United States, where the honeymoon was spent.

## THE INTERCEPTING TRAP.

The frequency with which infectious diseases enter dwellings in the so-called choice residential districts of some of our cities, is calculated to weaken public confidence in the efficiency of the intercepting trap as a means of preventing the entrance of sewer gas into the house drainage system. Some of our most experienced and progressive sanitarians have openly proclaimed their belief that the intercepting trap is a humbug that ought to be abolished. The important bearing of this question upon the public health has led us to solicit the views of a number of well-known architects, engineers, plumbers and physicians, some of whose opinions are printed herewith, and others will appear in future numbers. In this way we hope to see the subject thoroughly ventilated, and the value or uselessness of the intercepting trap established.

TORONTO, Aug. 7th, 1900.

DEAR SIRS,—The entire absence of a trap in house drains is the ideal system. There are two difficulties in the way, however; the first is that the great majority of drain connections are now trapped; the second is that houses vary very much in height, so much so that the top of the soil pipe in one house might be below the level of the upper story windows in the adjoining house.

This would be a source of danger in the case of the wind blowing towards the higher house, and the danger would be especially great if but few houses were trapless, as the bulk of the sewer air would then pass through the drains and soil pipes of these houses, concentrating the sewer air in that certain locality.

If legislation could be obtained and abolish all traps and make the tops of all soil pipes extend above any window or future window, the scheme might be feasible.

Of course it would be very unsightly to have a tall outlet upon the roof of a low house, and we doubt if such a thing could be carried out.

Yours truly,
BURKE & HORWOOD.

TORONTO, CANADA, Aug. 9th, 1900.

DEAR SIRS,—Your circular letter of August 4th requesting my opinion on the subject of main traps on house sewer connections, duly received.

In a properly designed sewerage system, main traps are not necessary, and I am now, after several years residence in Toronto, of the opinion that in the combined sewerage systems the main traps should be abolished.

The so-called "breathers" which are so prominent a feature in the front lawns of Toronto and in many other places that have followed Toronto's example, are in my opinion a menace to the health of the citizens. The only practical method of properly ventilating street sewers is through the house soil pipes, each of which should have a free opening from the main sewer to a point above the roofs of the buildings.

In 1888 I advocated the abolition of main traps on house sewers, and I succeeded in inducing the town of Brockville to adopt my recommendation, although at that time I believe I was the only engineer in Canada who advocated so radical a departure from the old method. The Brockville system has now been in operation for twelve years and has proven entirely satisfactory. The sewer system is well ventilated by means of the house sewers notwithstanding the fact that the manholes are completely closed over by ice and snow during the winter months.

The Brockville system was followed at Brantford, Barrie, Berlin, Waterloo, Toronto Junction, Renfrew and some other places in Ontario, and there can be no question now as to the merits of this method of ventilating sewers and house drains.

In the Toronto system neither the house drains nor the main sewers are ventilated. Manhole gratings cannot ventilate a sewer system, neither will stacks or chimneys built along the line of sewer.

The so-called sewer gas should not be produced in a properly constructed and properly ventilated sewerage system, and the foul smells so offensive in many of the cities are unknown in Brockville, Brantford, and other places where the separate system has been adopted and main traps on house drains omitted.

You will see from the foregoing letter that the omission of the main traps is nothing new, having been omitted for the last twelve years.

Truly yours,
WILLIS CHIPMAN.

TORONTO, Aug. 9, 1900.

GENTLEMEN,—In reply to yours of the 4th inst. regarding the question of ventilating sewers through the private houses by the omission of the main trap, I think a great deal can be said in favor of this scheme, under proper restrictions. I am of opinion that it would be necessary to have all of the pipe inside the street line of iron, and laid very carefully under rigid inspection. Under these conditions a portion of the sewer gas would probably find its way out through the ventilating pipe at the top of the houses, but the greater portion would probably still follow the lines of least resistance, and pass in or out of the manhole gratings in the centre of the street. As, however, the private drains of this city are practically all laid and are very numerous, it is not practical to make the change at this date, especially as the sentiments of the people would probably be against having a direct ventilation of the sewer through their houses, no matter how well it may be done and no matter how safe it may actually be.

Yours truly,
C. H. RUST,
C.B.S. City Engineer.

TORONTO, Aug. 9th, 1900.

SIRS,—In response to your request I am glad to express my opinion as to the advisability of omitting the trap from private drains at connection with street sewers.

On all work done in accordance with modern usage that trap, with its hideous "breather," is not only useless to the house plumbing, but an evil to the street sewer, in retaining gases which would harmlessly escape through the thousands of soil-pipes if permitted.

You refer to the suggestion as new, but I beg to remind you that for many years I have been its earnest advocate, and have practised as I preached. In each case I have to repeat the same arguments with plumbers, drain men and owners, but always prevail, and never use the trap.

In former years I have interviewed the mayor, aldermen and city engineer, and have published my views in the daily press and your excellent journal.

On the whole, our by-laws are thorough, but on this one point we are behind other cities whose more recent by-laws prohibit the trap, but of course require the iron soil pipe continued to outside of building.

In the old days of putty joints, no break syphons, and sheet metal or no vent pipes, the trap was a needed though only partial safeguard; in some cities better than here because of having a back vent pipe carried to the roof. But now that we insist on perfect plumbing, with a back vented trap on every fixture, the old danger is avoided, and every soil pipe should help to ventilate the sewer. Then there would be no confined sewer gas, because the fresh air would enter by the street gratings, and, being warmed, would freely escape out of the high soil pipes. At present the confined air becomes poison-laden, rises to the higher parts of the city and escapes by the only outlets, the street gratings, over which children may be seen playing, and to which I would trace the outbreak of diphtheria in those localities a few years ago.

High chimneys have been proposed as a relief at certain points, but why add expense and ugliness when the thousands of soilpipes are available gratis?

At a recent convention of sanitary engineers here an able paper was read advocating the omission of the trap, but I failed to note its unanimous endorsation at the time.

Trusting that your efforts may result in complete reform,

I am, respectfully yours,
M. B. AYLESWORTH.

24 SULLIVAN ST., TORONTO, Aug. 14, 1900.

DEAR SIRS,—In answer to your letter of August 4th, if you mean all traps I don't think it is worth considering; if you mean the main trap only there might be some arguments in its favor, such as better ventilation of main sewer, for without main trap the current of air would be down manhole and out through soil pipe terminus. This is about the only argument in its favor,

while against it you have sewers too large, for if this was to be adopted we should have two sewers, one for sewage and one for storm water. Chances of sewer air to enter houses and buildings from various causes, some of which are: traps of fixtures becoming unsealed by evaporotion, capillary attraction, defects in material of trap, or in some cases owners running water to protect them against frost while building is vacant, or should some break-syphon become choked and allow trap to syphon.

Allowing that some of the traps have become unsealed and soil pipe terminus becomes choked from hoar frost, sewer air must enter the house as it cannot escape otherwise. Then again, when buildings are of uneven height, one soil pipe of a low building may be discharging sewer air under a window of a tall building, and it would be useless to run long lengths of pipe above the roof as they would close up with hoar frost. These and many other reasons might be called disadvantages, and the one or two in its favor called advantages—should they be placed in the scales, the omission of main trap would not be in it. Even allowing that some of the beforementioned disadvantages might be present when main trap is in drain, you would only have your own sewage to contend with, and should building become vacant there would be no sewage, and storm water would keep main trap sealed. Some people claim that main trap becomes foul; this should not be if trap is made and set properly, for there is the same amount and sometimes more water to keep it clean than keeps the drain clean. All things considered, I think it very bad policy under the circumstances, to omit main trap.

W. H. MEADOWS,
Plumbing Inspector.

MONTREAL, Aug. 13th, 1900.

DEAR SIR,—In answer to your enquiry re the advisability of placing a trap at the entrance of the drain or soil pipe into the building I would say that it is desirable as a preventative from sewer gas entering the house through any leak in the joints of the soil pipe. Of course there must at all times be an air inlet on the house side of the trap so as to allow a free flow of air through the soil pipe and thus procure ventilation of the pipe.

If all soil pipes of a town run through the roof and have all their joints secure the trap can be dispensed with and thereby procure ventilation of the sewers over the housetops and also save the cost of the trap. There is also no doubt that the simpler the drainage system is made the better and more efficient it is, and less chance of syphonage, provided that it is sanitary.

In the event of the trap being done away with I would suggest that all drainage be placed under a compulsory pressure test, as neither the smoke or peppermint test are altogether satisfactory in my opinion.

Yours truly,
J. RAWSON GARDINER.

MONTREAL, Aug. 13th, 1900.

DEAR SIRS,—I have always insisted very strongly on the necessity of an intercepting trap between the house and the main sewer and then thoroughly aerating the house system by fresh air inlets and the house soil pipe, carried the full diameter, up to three or four feet above the top of roof. I do not object to water and illuminating gas being laid on to the houses, but I decidedly object to lay on sewer gas also.

If the main drainage system was properly and sufficiently ventilated there would not be so much need of the intercepting trap, but I know of no system which does this perfectly, and we certainly have not got it in Montreal.

Very truly yours,
ANDREW T. TAYLOR.

Mr. J. W. Hughes, the well-known plumber of Montreal, refers us to his views on this subject expressed, as chairman of a committee on sanitation, in a report to the American Health Association. This report, which deals with the subject in a clear and comprehensive manner, is as follows:—

SEWER VENTILATION.

Any of the special subjects mentioned in the foregoing title of a special committee appointed at the last annual meeting of the American Public Health Association are of sufficient importance to merit the attention of a special committee, but they are at the same time so intimately connected one with another that they cannot well be separated, as plumbing calls for drainage and both for ventilation. An exhaustive treatment of any one of the combined subjects would require a volume and be unsuited to the purpose of our convention; therefore I will confine myself to one portion, namely, the ventilation of the plumbing system of a building, or more correctly, that part of a plumbing system that serves for the conveyance of the house wastes known as sewage and that are to be finally disposed of as far as any particular building is concerned, when they reach the public sewer.

It has for some time been accepted as an imperative requirement of a properly planned plumbing system that provision be made for a free circulation of air at all times through not only the main internal sewer of a building but also through the smaller branches known as the waste pipes; in other words, that there be no dead ends, but that each and every part of a properly planned system of sewers for a building be constantly swept by a current of air, and carrying out this principle, provisions are made in the planning of up-to-date public sewerage systems for the ventilation of same. The private sewers and waste pipes of a building, forming as they do but a part of the general system should, in my opinion, be treated as a part of the whole, and the attempt to cut them off as is done by fitting what is known as the intercepting trap is a mistake. First, because it interferes with the basic principle of the water carriage system for the disposal of sewage, which is that the sewage should, in the most rapid manner possible and without obstruction, be carried from its source to its destination, yet the advocates of the intercepting trap place an obstruction (in other words a miniature cesspool) just at the point where it will do the greatest possible injury, and obstruct the rapid carrying away of the sewage, and defeat at the start the main principle on which the system is based, namely, the rapid removal of sewage and its carriage, by an ample supply of water, to its destination.

The advocates of the intercepting trap claim that the improved forms of this cesspool offer very little obstruction to the flow. Such a contention is absurd, as if they did not obstruct the flow, catch and hold the sewage, they would not be traps. Again it is claimed that the improved traps are continually washed out or scoured. To a certain extent this is true as compared with the older forms, but let any one who has had occasion to open the cleaning eye of one of these traps, that has been for some time in use, speak of the conditions found, and he must tell of stored up putridity, sickening odors, and a condition of things unsanitary, not to be found even in the main sewers of the streets, and certainly not to be found in any other portion of the pipes in a building where the sewage has had an unobstructed flow. My second charge is, that it completely defeats any effectual general system of sewer ventilation by preventing free circulation of air through the whole system of main sewers, and that part of them consisting of the building sewers. To offset this in part, what is known is the fresh air inlet is placed between the intercepting trap and the building. This is a pipe brought to the surface and fitted with a suitable terminal. The proper name of this pipe is a "stink outlet," as when a fixture is used, the rush of water from it must force a portion of air out of the air inlet, and then it of necessity becomes a stink outlet, and as a rule in cities this pipe must be so placed as to make it a dangerous nuisance either to the wayfarer, or if at a distance from the footwalk, to the inmates of the building with which it is connected, as the foul air escaping from it gains access to the building it is proposed to protect, through doors and windows. "But," says the advocate of the intercepting trap, "would you advise arranging pipes so that the air of the street sewers would have free passage through the pipes in a building?" To this my reply is, yes. And there is no other safe plan. People who live in populous districts must bear, each and every one, his part of the risks as well as share the benefits of the whole. No one living under the conditions imposed by the concentration of large masses of people on a limited area can escape, and the principle of the greatest good to the greatest number must apply. The advocates of the intercepting trap do not deny the necessity of sewer ventilation, but they attempt to provide for it in detail instead of as a whole, and so defeat the object they wish to attain. They will tell you that the street sewers must be ventilated by having perforated manhole covers placed at regular intervals along the line of street sewers—that is, cut off the house from the street-sewers, by means of the trap, but let the main sewers have free and open connection with the street.

Now as the streets of a town are the sources from which the buildings derive their greatest supply of fresh air, my claim is that such a course is wrong and insanitary. Given pure air in the streets and there must be pure air in the buildings—local cause of air pollution being, of course, excepted. Do away with the trap on the private sewers; continue the interior sewers

of the building full size through the roof, carrying them to a sufficient height to be well above adjacent windows, then there will be a natural circulation of air through the entire system of both public and private sewers, and the outlet from the sewers which is acknowledged to be a necessity, will be above the general line of the house tops and not at the street level as is the case when the intercepting trap is adopted. The higher temperature of the pipes passing through the building, especially in the cold season, will insure this circulation at the time when it is most required. Of course there are exceptions to all rules, and there are no doubt in all cities certain places where the local conditions would call for the placing of a trap in the private sewer; such cases call for the exercise of the skill and experience of the practical plumber and sanitary engineer. It is no more possible to lay down a rule covering every possible contingency called for in scientific plumbing and ventilating, than it is to apply fixed rules to the practice of medicine. If it were there would be little need of skilled and experienced physicians. The principles of scientific medicine and plumbing are fixed, but the application of these principles calls for the intelligence acquired by education and developed by practice.

Much injury has been done by attempting to frame plumbing by-laws that would apply to every case. The conditions vary in almost every building, and to adapt the principles to the special requirements requires not only practical but scientific knowledge. If the American Public Health Association would make a study of the general principles covering this question and embody them in a code having its endorsation, leaving the practical application of these principles to those whose special duty it is to apply them, much good would result. In conclusion, conditions exist in northern climates during that portion of the year when snow is on the ground that completely neutralize the effect of the perforated man hole covers over the street sewers, and during such time, in cities where the intercepting trap is in general use, the main sewers are without ventilation, and a serious condition of affairs exists, as the buildings being heated to a greater degree than the outer air has a cupping action, and draws the air from the sewers into them, beneath the frozen and almost impervious top soil and paved roadways where the soil is porous. This is sure to occur, even when the buildings are situated a considerable distance away from the main sewers.

Sewers breathe! Under certain conditions the air will rush into them, again it is being expelled with considerable force. Atmospheric conditions partly account for this, but the varying quantities of solid and liquid matter constantly entering and leaving them has an important bearing on the question. Such being the case proper breathing places must be provided, and any attempt to bottle up the sewer air will end in failure, and what place so suitable as above the roofs of the buildings, where the wind will disperse the foul gases and the light and air disinfect them.

## LEGAL.

THE ASBESTOS AND THE ASBESTIC COMPANY VS. THE W. SCLATER CO., LIMITED.—The petitioner alleged that it acquired from the Danville Asbestos and Slate Company, and are owners of, asbestos mines, situate in the township of Shipton; that on the 5th July, 1899, the company transferred and assigned to the petitioners a trade mark obtained by the former and registered on the 3rd February, 1896, which trade mark has the words Asbestic Wall Plaster surmounting a trowel, on which was inscribed the letter A; that the respondents have been, and are, in violation of law, using the words of the trade mark, and are selling what purports to be an asbestic wall plaster stamped and labelled as such; that respondents thereby induce the public to believe that they are buying a product of the petitioners; that petitioners have extensively advertised their product and have established a large and lucrative business in selling asbestic wall plaster and have acquired a right of property in said words. The petitioners prayed for an injunction to restrain the respondents, and their agents from further selling any goods or materials under the name of asbestos wall plaster, and that the respondents be condemned to pay $1,000 damages. The plea was to the effect that the petitioners, could not by the said alleged trade mark, obtain the use of the works asbestic wall plaster, and the Government of Canada could not give petitioners the sole right to use said words; that respondents had sold asbestic wall plaster long previous to the 3rd February, 1896, and since, and have the right to make use of the works "asbestic wall plaster," the word asbestic being merely an indication and description of the article sold by respondents. The plea was maintained and the action dismissed by the Superior Court of Montreal.

KELLY VS. SUTHERLAND.—The plaintiff brought action in the courts at Montreal, for $910 balance alleged to be due for work done by the plaintiff for defendant in connection with the construction and alteration of a building upon a property belonging to the latter, under a contract of date 8th October, 1897, which work the plaintiff alleged was completed and accepted on the 20th December, 1897, at which date there was due to him a balance of $1,000, for which sum he, on the 15th January, 1898, registered, with defendant's consent, a builder's privilege upon the property whereon the building was erected, viz., on the northeast portion of lot 791, St. Lawrence ward. The plaintiff in consequence, besides praying for a personal condemnation against the defendant, concluded hypothecarily tor the abandonment of the property. The defendant pleaded denying his alleged ownership of the property in question, or possession of it as owner, denying, further, that plaintiff finished the work under the contract alleged, or that the defendant at any time owed him anything, and alleging that under the contract the plaintiff was paid from time to time as the work progressed; that up to the 20th December, 1897, he had been paid $925, and up to the 15th January, 1898, $1,300.39, which sums much exceeded the value of the work done up to that date; that the privilege alleged was registered with defendant's consent, but merely as a means of enabling him to borrow money, he at the time owing the plaintiff nothing; that about the 18th April, 1898, the plaintiff having then done work under the contract not exceeding in value $1,250, and having received $1,590.69 in cash, besides $132.62 in goods, making in all $1,723.31, refused to proceed with and complete the work thereunder, and the defendant was compelled to complete it himself at a cost of $515.96, making a total expenditure by the defendant over and above the contract price of $289.27; that, moreover, any claim that plaintiff could have was compensated by the sum of $132.62 due by him to the defendant for goods sold; that plaintiff's work was not acceptable, but done in an unskillful and unworkmanlike manner, and would as to a large part, have to be renewed at great expense, for which the defendant reserved his recourse. To this plea the plaintiff answered, denying its allegations, and alleging that he only abandoned the works in question because the defendant, though duly protested, refused to pay him in accordance with the contract; that any goods he ever bought, he bought not from the defendant, but from A. Sutherland & Co., and paid for them in cash; that when plaintiff abandoned the work, it was in good order and condition, and there remained to be done work not exceeding in value $150. The court proceeded to appreciate the evidence as to the different items of the plaintiff's claim, and came to the conclusion that the plaintiff had established his demand to the extent of $235.75, tor which amount judgment was entered in favor of the plaintiff, and the privilege was maintained.

## FOLIATED ARCHES.

From the invention of the arch to the middle of the eleventh century no other form of it was used except the semi-circular and segmental. About this period license was taken to alter the forms of arches; the pointed arch was introduced, and with it a variety of other forms, as ogees, horseshoes and ellipses. At the same time there came in the practice of foiling arches—that is, of uniting a series of three or more by their bases so as to form one, which is termed a trefoil, quartrefoil, cinquefoil, and so on, according to the number of its component arches or foils, as they may be termed. These foils may be either of the same or different forms, but are generally of an odd number, with one in the centre and the rest disposed in similar pairs on each side of it. They are often all circular or all pointed, and sometimes all ogees. An ogee or pointed between two circular foils is a very common arrangement; the lower pair are commonly imperfect semi-circles, from their being continued downwards to form the sides of the arch, but in some of the earlier examples are made complete semi-circles. The pointed arch, from its united strength and convenience, of course, assumed the prominent place, and was used in all the larger and essential parts of the fabric, while the other forms were reserved for the decorative arcades, the galleries, doors and windows. These arches when at first introduced were treated in composition exactly in the same manner as the circular arches had been, and were mixed with them. The other characteristics of the Pointed style were invented before or after their introduction, and may be traced from their first imperfect germs to their final perfection entirely amongst European buildings, so that the notion of the Pointed style being introduced complete is at any rate erroneous.


Branch Office of the CANADIAN ARCHITECT AND BUILDER, Imperial Building.

MONTREAL, August 15, 1900.

ARCHITECTURAL INSTRUCTION AT McGILL UNIVERSITY.

The annual calendar of McGill University, Montreal, states that during the session of 1900-1901 special courses of lectures will be given in connection with the Architectural Department, by Messrs. E.E.S. Mattice, B.A. Sc. (McGill), and M.C.J. Beullac, R. Sc. (University of France), of the Dominion Bridge Works, on the following subjects :

1. Building materials ; the history, properties, tests and uses of all materials of construction.

2. Specifications and professional practice:The dlfferent methods of preparing specifications for estimates, instructions to bidders, and rules to be observed in writing specifications,general clauses, law of contracts.

3. Building Construction : (a) Carpentry ; frames, joints, framing of floors and roofs, partitions, bridging, furring, etc ; (b) Slow burning construction ; (c) Masonry.

4. Hygiene (a) Plumbing ; (b) Disposal of household refuse ; (c) Heating : (d) Ventilation.

5. Steel frame buildings : Design, millwork, steel and cast iron columns and connections, beams and girders, framing and wind bracing.

Special designs will be prepared in the drawing-room illustrating the several subjects of the lectures.

A course of lectures on "The Elements of Building Construction and Foundations" will be given by Professors Capper and Lea, in connection with the course in civil engineering and applied mechanics. These lectures will treat of : (a) Brick and stone masonry ; (b) Timber framing—flooring, beams, columns, centering, etc ; (c) Iron and steel framing—girders, columns, etc ; (d) Fireproof and slow burning construction ; (e) The bearing power of the various soils, rocks, etc., as they occur in nature ; (f) The stability and character of the underlying material at any given site, taking into account the effect of frost, erosion, etc ; (g) The construction of different kinds of foundations, both on land and in water, by piling, dredging, coffer dams, open and pneumatic caissons, freezing, etc.

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

The half-yearly examinations of the P. Q. A. A. were held at the Association's rooms, 112 Mansfield St., Montreal, July 18, 19 and 20, 1900.

The following candidates came up for their final examinations : Edward B. Staveley, Quebec ; G. W. Northwood, Ottawa ; Frank Peden, Montreal ; O. Huvt, Montreal ; also for preliminary examinations : L. Auger, Levis, Que ; Geo. L. Rapolle, Quebec; J. Scott, Montreal ; Eug. Lalonde, Montreal ; Louis Labelle, Montreal; Michael Levesque, Montreal; Jas. E. Boyne, Montreal; Geo. H. Wilkins, Montreal.

The results of the examinations have not been given as yet, but will be printed in the next issue of this paper. The next examination will be held in Quebec city January 16, 17 and 18, 1901.

The annual meeting of the P.Q.A.A. will be held in Montreal on the 3rd and 4th of September. Arrangements are being made to hold an architectural exhibition in connection with the convention.

The Association have adopted and had printed the following schedule of charges :

No. 1.—Schedule of charges to be made by members of the Association shall be as follows :

No. 2.—For plans, specifications, working drawings, and superintendence, on all classes of buildings, except such as are hereinafter excepted, a commission of 5 per cent. (5%) on the total cost of the work.

No. 3.—On three houses of similar design and on single stores and warehouses, four per cent. (4%).

No. 4.—On four or more houses or two or more stores or warehouses of similar design and on all factories, three per cent (3%).

No. 5.—Partial charges to be as follows :

I.—For preliminary studies, sketches, one-fifth (1/5) of the above charges.

II.—For complete plans and specifications, including the preliminary studies, one-half (½) of the above charges.

III.—For details, one-fifth (1/5) of the above charges.

IV.—For superintendence of works when drawings are not furnished, two and one half per cent (2½%) on the cost of the works.

No. 6.—For work in alteration of premises, the amount of commission to be seven and one-half (7½%).

No. 7.—For work in which the expenditure is mainly for skilled labor, namely : For monumental work, fittings and furniture, and for decorative work, stained glass and such like, the commission to be ten per cent. (10%) on the outlay.

No. 8.—Travelling expenses, including time lost in travelling, to be paid by the client, if the work is executed at a distance.

No. 9.—Valuations of property requiring measurements and a detailed estimate, where the value does not exceed $5,000, one and one-half per cent. (1½%). Where the value exceeds $5,000 the commission to be one and one-half per cent. (1½%) on the first $5,000, and one per cent. (1%) on the remainder.

No. 10.—All works, studies, consultations and proceedings that are not covered by this tariff shall be remunerated according to the "qnantum meruit."

No. 11.—Drawings and specifications are the property of the architect, who only lends the drawings and specifications.

FOUNDATION AND EARLY HISTORY OF M'GILL UNIVERSITY.

McGill University has a special interest for architects and engineers because of its splendidly equipped Architectural and Engineering Departments. The accompaning concise description and early history of this now famous institution is reprinted from the Annual Calendar :

"Almost alone in this respect among Canadian colleges and universities, McGill University owes its origin to a private endowment. Its founder, the Hon. James McGill, from whom the University takes its name, was born on the 6th October, 1744, in Glasgow, Scotland, where he received his early education and training. Emigrating to Canada before the American Revolution he engaged in the North-West fur trade, then one of the leading branches of business in Canada. Subsequently he settled in Montreal, and, in partnership with his brother, Andrew McGill, became one of its leading merchants, distinguished for his public spirit and his exertions for the advancement of the city. He was lieutenant-colonel and subsequently colonel of the Montreal City Militia ; and, in his old age, on the breaking out of the American war of 1812, he became brigadier-general, and was prepared to take the field in defence of his country. He also represented the West Ward of Montreal in the Provincial Legislature, and was afterwards a member of the Legislative and Executive Councils. Cultlvating and enjoying the society of the few men of learning then in the colony, he took a special interest in the establishment of an educational system in the Province of Quebec. By his will, bearing date the 8th January, 1811, more than two years before his death, which happened on the 19th December, 1813, he bequeathed his property of Burnside and a sum of £10,000 in money to found a college in a provincial university, the erection of which had already been provided for by the generosity of the British Government. Three leading citizens of Montreal were appointed trustees under the will, and were directed to convey the subject property of the bequest to the Royal Institution for the Advancement of Learning, a body which, in 1802, had been incorporated by the Legislature "for the establishment of Free Schools, and the Advancement of Learning," in the Province of Quebec. The conditions upon which the property was to be transferred to the Royal Institution for the Advancement o Learning were, mainly,that the Institution should,within ten years after the testator's decease, erect and establish on his Burnside estate "an University or College, for the purposes of education and the advancement of learning in this Province," and that the college, or one of the colleges, in the University, if established,

should "be named and perpetually be known and distinguished by the appellation of McGill College." Owing to persistent opposition by the leaders of one section of the people to any system of governmental education and to the refusal by the Legislature to make the grants of land and money which had been promised, the proposed establishment of the provincial university by the British Government was abandoned.

"In so far as the McGill College was concerned, however, the Royal Institution at once took action by applying for a Royal Charter. Such a charter was granted in 1821, and the Royal Institution prepared to take possession of the estate. But, owing to protracted litigation, this was not surrendered to them till 1829. Commencing then the work of teaching with two faculties, Arts and Medicine, the record of the first thirty years of the University's existence is an unbroken tale of financial embarrassment and administrative difficulties. The charter was cumbrous and unwieldy, and unsuited to a small college in the circumstances of this country, and the University, with the exception of its medical faculty, became almost extinct. But after thirty years the citizens of Montreal awoke to the value of the institution which was struggling in its midst. Several gentlemen undertook the responsibility of its renovation, and in 1852, an amended charter was secured. The Governor-General of Canada for the time being, Sir Edmund Head, became interested in its fortunes, and in 1855, with the advent of a new Principal, an era of progress and prosperity began."

## HARMONY AND CONTRAST IN COLORS.

THE Upholsterer gives the following list of colors which contrast and harmonize:—

White contrasts with black and harmonizes with grey.
White contrasts with brown and harmonizes with buff.
White contrasts with blue and harmonizes with sky bue.
White contrasts with purple and harmonizes with rose.
White contrasts with green and harmonizes with pea green.
Cold greens contrast with crimson and harmonize with olive.
Cold greens contrast with purple and harmonize with citrine.
Cold greens contrast with white and harmonize with blues.
Cold greens contrast with pink and harmonize with brown.
Cold greens contrast with gold and harmonize with black.
Cold greens contrast with orange and harmonize with grey.
Warm greens contrast with crimson and harmonize with yellow.
Warm greens contrast with maroons and harmonize with orange.
Warm greens contrast with purple and harmonize with citrine.
Warm greens contrast with red and harmonize with sky blue.
Warm greens contrast with pink and harmonize with grey.
Warm greens contrast with white and harmonize with white.
Warm greens contrast with black and harmonize with brown.
Warm greens contrast with lavender and harmonize with buff.
Greens contrast with colors containing red and harmonize with colors containing yellow or blue.
Orange contrasts with purple and harmonizes with yellow.
Orange contrasts with blue and harmonizes with red.
Orange contrasts with black and harmonizes with red.
Orange contrasts with black and harmonizes with warm green.
Orange contrasts with olive and harmonizes with warm brown.
Orange contrasts with crimson and harmonizes with white.
Orange contrasts with grey and harmonizes with buff.
Orange requires blue, black, purple, or dark colors for contrasts and warm colors for harmony.
Citrine contrasts with purple and harmonizes with yellows.
Citrine contrasts with blue and harmonizes with orange.
Citrine contrasts with black and harmonizes with white.
Citrine contrasts with brown and harmonizes with green.
Citrine contrasts with crimson and harmonizes with buff.
Russet contrasts with green and harmonizes with red.
Russet contrasts with black and harmonizes with yellow.
Russet contrasts with olive and harmonizes with orange.
Russet contrasts with grey and harmonizes with brown.
Olive contrasts with orange and harmonizes with green.
Olive contrasts with red and harmonizes with blue.
Olive contrasts with white and harmonizes with black.
Olive contrasts with maroon and harmonizes with brown.
Gold contrasts with any dark color, but looks richer with purple, green, blue, black and brown than with the other colors. It harmonizes with all light colors, but least with yellow. The best harmony is with white.

Concrete impervious to water can be obtained by paying careful attention to three conditions. These are fine grinding of the cement, balanced broken stone or gravel and thorough mixing so as to eliminate all voids, it being assumed that the proportions are such as to permit the latter condition to be reached.

## EDUCATIONAL WORK OF THE ONTARIO ASSOCIATION OF ARCHITECTS.

Special interest attaches to the report of the Committee on Education, which has been presented to the Council. In this report it is recommended that students be required to pass matriculation before entering an architect's office and to be then articled for a period of five years. As an alternative, students may take the full architectural course (three years) at the School of Practical Science, and will then be required to serve only three years in an architect's office, one of which years may be served during the vacations of said school.

The report also recommends that the course of study for students include three distinct branches. The first of these, the scientific course, would embrace the scientific subjects included in the regular three years' architectural course at the School of Science.

For the students who are articled for five years, a plan has been arranged by which the necessary lectures may be spread over the five years of their studentship and may be attended by obtaining leave of absence from office work, for an average of eight hours a week during the school term. Of course, this plan is practicable only for students in Toronto; for those at a distance the regular three years' course at the school is recommended.

The second branch of study represents the business or craft training. This includes those subjects in which the student may be expected to become proficient in the course of his regular office work, supplemented by the study of technical books as recommended.

The third branch comprises the course of study in design. For this it is recommended that the "Atelier" or studio system, which has proved so successful elsewhere, be adopted, and that a three years' studio course be instituted, occupying three months in each year. This studio work is to be under the supervision of practising architects.

The following is the outline of the full five years course as recommended by the committee. The subjects marked "A" are the scientific subjects; "B" the business course, and "C" the studio course. It is proposed to hold examinations each year in courses "A" and "B," and in the studio work a progression by members will be required.

I Year.—"A." Analytical geometry, euclid, trigonometry, algebra, history of architecture, chemistry.

II Year.—"A." Calculus, history of architecture, dynamics, statics, descriptive geometry. "B." Elements of construction, technical terms (as applied to practical architecture), practical knowledge of building trades.

III Year.—"A." Descriptive geometry, heat and optics, strength of materials, applied chemistry. "B." Practical knowledge of building trades, foundations, structural iron work. "C." Preliminary studio work (drawing of classic detail and shadows).

IV Year.—"A." Hydrostatics, mineralogy and geology, constructive design. "B." Steel and iron construction, nature and properties of materials. "C." Studio work.

V Year.—"A." Hydraulics, compound stress, mineralogy and geology, applied chemistry, sanitary science. "B." Architectural jurisprudence, practical heat and ventilation, practical sanitary science. "C." Studio work.

This report has been received by the Council and the general trend of it approved. But it is not finally adopted, and in the meantime the regular curriculum is to be adhered to by registered students. One of its most important features, the studio work, it is proposed to inaugurate at once by starting classes in the new Association rooms in September or October. It is also hoped that an arrangement will be made with the Schoo

of Science authorities, under which, students desiring to do so, who are at present engaged in architects' offices, may attend the lectures as suggested in the report.

It may be said that these new features in the Association work will be in the nature of an experiment, to see how far they meet with the approval of architects and students and it is sincerely hoped that the efforts now being made to raise the standard of student education may be generally endorsed by the profession.

## HOUSE DRAINAGE AND INSPECTION.*

By H. C. Bascombe.

I should wish to place before you the gist of 25 golden sanitary rules which I had the honor to assist in preparing prior to my commencing life as a public sanitary officer, and during a pupilage of seven years under the well-known sanitarian, the late Henry Masters, architect and surveyor, of Bristol :—

1.—Let it be remembered that foul air from drains or pipes, or damp walls, will, sooner or later, promote disease.

2.—If you discover that rats have gained access to premises, rest assured that sewer gas follows in their track.

3.—If it is found that the drains from a house are connected with the sewer or cesspool, the chances are that, upon examination, you will discover that foul air from the sewer or cesspool passes into the house through some defect existing in connection with such drains.

4.—If you discover that a main trap exists between the house and the cesspool or sewer, be sure that the fitting is so ventilated that any foul air from the cesspool or sewer (if it is forced or otherwise passed through the waterseal of the trap) be not drawn into the system of your house drains.

5.—On visiting premises, be very suspicious of the drains. If the pipes are too large to be readily flushed by the water at command, recollect that a bucket of water suddenly discharged into the drain has more effect in cleansing it than the ordinary water tap running the whole day.

6.—Never allow a drain to be laid under a house if you can possibly keep it outside the four walls.

7.—Ascertain that the well or underground water tank gives the drains a very wide berth.

8.—Beware of an unventilated sewer or underground water tank.

9.—Beware of having in or about the house a drain, cesspool or water tank that is hermetically sealed.

10.—If you find a drain trap in the cellar or dark room, rest assured that, sooner or later, the water seal will evaporate, and foul air escape through the trap into the house.

11.—If you find a pipe in or about the house for conveying soil or water in the form of a syphon, you may depend that at times such pipe will be affected by syphonic action ; the trap water will pass down its long leg, and thus foul air will gain access to the house through the broken water seal.

12.—Recollect that, in the act of discharging a closet, bath or lavatory, the descending waste water has a tendency to suck or force out the water seal of some other fitting.

13.—Bear in mind that every pipe discharging into the open is a duct for the admission of air into the house, and that such air is made foul by contact with the inside of such pipe, all waste pipes being coated inside with foul slime.

14.—Prevent all tanks used for the storage of water being fixed in a cellar, over a sink, or in a dark or inaccessible place.

15.—Ascertain that a current of air does not pass between the underside of the seat and the w.c. apparatus.

16.—Remember that the fats contained in the greasy water used for washing up dishes congeal in passing down the drain. Instruct the tenant, therefore, to discharge plenty of hot water into the sinks, especially the scullery fitting. In some cases it may be desirable to recommend a fat interceptor.

17.—Recollect that air in passing through a pipe is retarded by friction. Ascertain, therefore, that all pipes are of adequate size, and fixed without bend or angle, unless absolutely necessary.

18.—Don't forget that food in the process of cooling absorbs air, be that air good or bad. Ascertain, therefore, that the food supply is stored in pantries or larders free of air currents from polluted or doubtful sources.

19.—Ashes and vegetable matter, if mixed produce offensive odors. Instruct all tenants to deposit waste matter as far as possible from the dwelling, and to bank their fires during the latter portion of each day with all vegetable refuse produced upon the premises.

20.—If a gurgling sound is heard in a lavatory, sink or bath waste pipe, the chances are that foul air will shortly pass into the house by that particular fitting.

12.—Observe that the tendency of air is to pass into a house by way of doors, windows, cracks, and crannies. Ascertain, therefore, that the surroundings of a dwelling are free from offensive deposits or possible pollution of any description.

22.—If a w.c. is found to admit a foul odour, the sooner you recommend the owner to substitute a self-cleaning apparatus, the better for the health of the inmates.

23.—Instruct the tenants to caution their domestic servants to carefully discharge all slop water into the w.c. apparatus, in order to prevent the fouling of the floor or space beneath the seat and basin.

24.—Remember that, in drainage especially, "Nature abhors a vacuum."

25,—Bear in mind that "Cleanliness is next to Godliness."

*From a paper read before the Royal Institute of Public Health Congress at Blackpool, Eng., 1899.

## ILLUSTRATIONS.

MANNING CHAMBERS, QUEEN STREET WEST, TORONTO.—E. J. LENNOX, ARCHITECT.

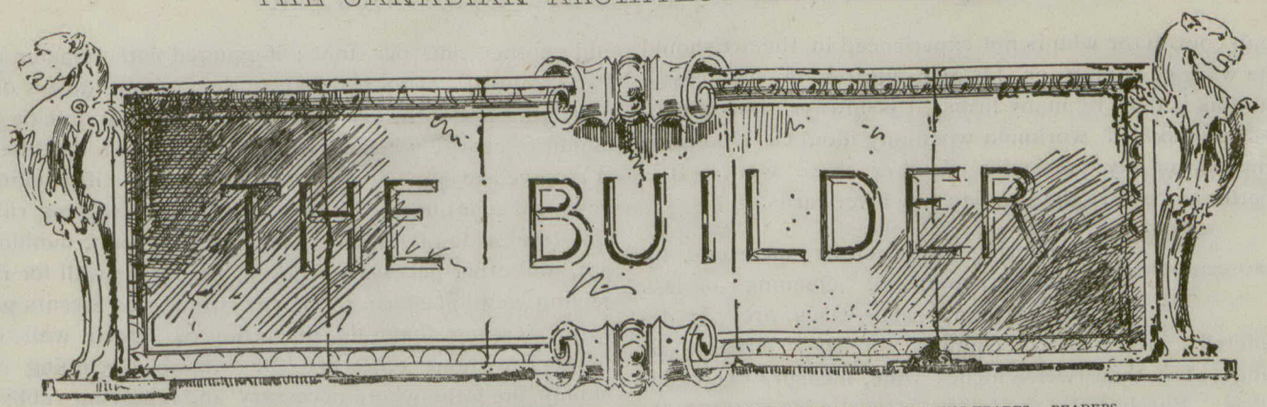
NATIONAL TRUST COMPANY'S BUILDING, KING STREET EAST, TORONTO.—GEO. W. GOUINLOCK, ARCHITECT.

DOOR IN THE PALAZZO VECCHIO, FLORENCE—(ILLUSTRATING ARTICLE IN THIS NUMBER, BY MR. W. A. LANGTON, ON "SHEET METAL AS SHEATHING.")

DETAILS OF MANNING CHAMBERS, QUEEN STREET WEST, TORONTO—E. J. LENNOX, ARCHITECT—(CHAS. LENNEX, MEMBER OF ARCHITECTS' EIGHTEEN CLUB).

## CLEANING TRACING CLOTH.

Very few engineers or draftsmen, says a contemporary, seem to know that tracing cloth can be very quickly and easily cleaned, and pencil marks removed, by the use of benzine, which is applied with a cotton swab. It may be rubbed freely over the tracing without injury to lines drawn in ink, or even in water color, but the pencil marks and dirt will immediately disappear. The benzine evaporates almost immediately, leaving the tracing unharmed. It must, however, be borne in mind that the surface has been softened, and must be rubbed down with talc or some similar substance before drawing any more ink lines.




[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.]

**Estimating Mason Work.**

In making estimates for wrought stone-work, or stone-work in the wall, the following conditions must be considered. For plain ashlar walling and paxwint walling, the measurement must be super, net, for stuff and labor, the kind of face and average sizes of stones, and bed considered, and allowance made where square blocks must be cut to suit shape of openings, moulded or ramped to form curves. Reveals are always measured extra. Rubble walling up to 18 in. in thickness is generally measured superficial, or it may be measured cubic, as all over that thickness is. Other masonry is usually measured as described, labor and materials being kept separately, or when conducing to a better understanding of the work, as in strings and similar work, labor and material may be "figured" up by the running foot, making due allowance for work and number of joints, counting the ends, quoins and mitres. Work on chimneys, cornices, towers, spires, etc., requiring special appliances for hoisting, or at any considerable heights, or of extra dimensions, to be kept separate so far as material, hoisting, and setting are concerned, the labor of cutting being added whether being done by the day or by piece work. The cost of cutting and finishing mortising for lewis, bolts, etc., can only be estimated when the style of work and character of stone is known. The use of hoisting appliances of any kind must be charged for, according to the cost of such machines and the expense of running them, whether by hand, horse-power or steam. When measuring drawings for stone-work ample allowance must be made for cutting, so that each stone will exceed net dimensions from one to three inches in all its dimensions. This is an important item. In estimating for labor alone, the beds and joints of each block should be measured and accounted for, and where courses are similar, one accounting will serve for all. Where a number of window or door openings are alike, the figures for one window or one door opening will answer for all similar windows or doors. The various styles of work should be classified under different heads, and charged for accordingly, whether it be borted, tooled or polished, sunk, moulded, weathered, sunk and weathered, straight, raking, single or double curved, raised or sunk panelled, or plain. All circular work should have the material charged up as square blocks having sides equal to diameter of the work if such are columns, capitals, finials or other similar work. Segment work will require square blocks as large as the plan and section of the segment. Work to be paid for by "face measurement" should be girthed with a tape-line taking in all projections and indentations, and all corners should be taken at their greatest dimensions. Where a wall has two faces, that is, both sides finished, extra allowance must be made, if wall is built per cubic foot; if built by "face measurement," then both sides of wall must count. Holes left for flues or for timbers of any kind should be charged for, as much time is spent in laying off and building in. The setting of window and door frames with the bedding thereof must be considerad, and charged up in accordance with their size, style, and position in the building. Window and door sills vary in size and style, and this must be seen to, the actual size and style ascertained before price is determined, when each kind may be figured on separately. Tracery or other intricate work should be considered separately, as the labor on such work nearly always exceeds the cost of material and requires more costly skill to execute each piece or class should be estimated by itself, independent of its surroundings. Columns should be girthed for circular work, with or without entasis, as the case may be, the latter being more costly than if parallel or straight taper, and flutes, for the labor, should be measured lineal, and number of stops counted and charged for; if of an extra length, an additional percentage must be added to the cost. Cramps and dowels must be charged up, with average size and weight when of metal, and for labor and material if of wood or cement. Copings, when worked out of flags or thin stones may be measured lineal, or net when in place, including labor, cement, material and setting. Stairs or stone steps, with newels, balusters, and rail may be counted as complete, or they may be counted at so much per step, with rail, newel and balusters included, and all labor and material included. The cost, will of course, depend very much on the style and character of the work, which the estimator must consider. Landings, half or quarter spaces, or rests of any kind in stairs, may be measured per cubic foot which may include all joints worked, edges, soffits, mouldings, bases, plinths or other work, or they may be measured super with extra amount added to cover foundations, and other hidden work. It is better perhaps, to measure cubic and charge per foot. Mason work generally requires very minute sub-division in taking measurements for estimating, and an intimate knowledge of the various methods of working stone, in order to get at anything like a fair estimate of the cost of any piece of work that is enriched in any way. Each necessary operation of the workman should be taken into account, although it may appear that the same surface as in panelled and carved work, has to be measured more than once for different descriptions of work. The correctness of an estimate for stone work where there is much enrichment, will depend altogether on the knowledge of masonry possessed by the estimator, and

any contractor who is not experienced in the art should be wary of relying on his own figures in such cases, and as is done by many firms, it is always wise to consult the skilled workman when any doubt exists as to the cost of any particular piece of stone work. It is better to be sure than to be sorry afterwards.

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**Estimating Plastering.**

Plastering is generally measured by the yard superficial. Openings of less extent than seven yards are not deducted. Returns of chimney breasts, pilasters or angles less than twelve inches wide, measure twelve inches. Baseboards, six or less inches wide are not deducted. In closets, add one-half to the measurement. Circular or elliptical work, charge two prices, and for domes or groined ceilings three prices. For each twelve feet in height add six per cent. extra. Cornices and centre-pieces in buildings more than eighteen feet high in the first story, should have five per cent. added to cover scaffolding and extra labor and time in getting material up. Centre-pieces, panelling and extra stucco work must be charged the regular prices for such work put in similar positions. Plaster brackets, consoles, rosettes, strap-work or other similar productions must be charged at current rates. Rough-casting on brick or stone in lime and fine gravel in two coats, should be charged at the rate of from 16 to 20 cents per yard, according to cost of materials and labor. Rough-casting on frame buildings, including all materials and lathing, two coat work, lathing diagonal double, should be charged up at the rate of from 26 to 30 cents per square yard. Plain cornices and mouldings, per inch girth and foot running, from 2 to 3 cents for each inch girth, so that a plain cornice measuring 15 inches girth must be charged from 30 to 45 cents per running foot, according to cost of material and rate of wages. This price also includes the dubbing out and putting up rough brackets wherever they are necessary and the extra lathing. All mitres over four in number, are to be charged each at the price of a foot running of moulding, except in halls or small rooms under 14x16 feet, then all mitres should be paid for extra. Lathing alone, laths and nails included, should not be charged less than 10 cents per yard super. Lath and plaster one coat material included, 17 cents per yard. The same set with fine stuff, 22 cents per yard. For two coat work, floated, 26 cents per yard. For two coat work, gauged in plaster of Paris, 30 cents per yard. If done in Portland cement, one of cement and three of lime mortar, charge 26 cents per yard for one coat work ; if two coat work, charge 32 cents per yard. For rendering on brick wall, one coat with common mortar, charge 10 cents per yard ; for two coats and set with fine stuff, charge 25 cents per yard. For coloured finish in stone, buff, salmon color, French grey, blue or lemon color, add 4 cents per yard to above prices. For lime washing in one coat, charge per one square (100 feet) 10 cents, if twice done, 20 cents per square ; with whiting and size in one coat, 11 cents per square, for two coats, 21 cents per square. Scraping off old whitewash and stopping old walls to receive new wash, charge 15 cents per square. If the plaster is much broken, extra for putting on new plaster must be charged, and for this work about 3 cents per foot super must be charged for repairs of walls, and if color is to be matched, 4 cents per foot. For repairing ceilings, hacking off old plaster and putting in new, including scaffolding and material, from 4 to 6 cents per foot should be charged. If coloured to match ceiling, add another cent per foot ; if gauged with plaster of Paris, add 1½ cents per foot. For taking down old plastering and lath, and removing rubbish to outside of building, charge 7 cents per yard, and extra if rubbish is removed to some distance from building. For taking down old scantling or rough casting and removing rubbish to outside of building, including wetting, dubbing out, and other necessary work in preparing wall for receiving new plastering, charge from 7 to 8 cents per yard. Taking down old plastering or lathed walls or ceilings without renewing the lathing, including renailing the laths where necessary and removing rubbish to outside of building, charge 6 cents per yard. Walls which are warped or out of line should be screeded by applying horizontal strips of plaster mortar 8 or 10 inches wide and 3 or 4 feet apart all over the surface. These screeds should be made to project out from the first coat and form gauges or working guides to fill up the hollow portions of the wall to. They must be taken out of wind and be plumb with the walls, then a straight edge reaching from one to another will show the defects in the wall, which must be corrected by the workman. All this labor and material must be charged up in estimating independent of the regular measurement per yard. This, of course, only relates to old walls. Pugging is the term employed to denote the method of lining in the spaces between floor joists, which is usually done with coarse stuff, and is intended to prevent the passage of sound from one story to another. This is also termed "deafening with mortar." This may be charged by the yard or by the lump; if by the yard, which is the proper way, it is worth from 3 to 5 cents per yard, the lower price for the lower stories, and the larger price for the upper stories. Mortar laid on roof boards under shingles, one half inch in thickness, is worth from 1½ to 2 cents per yard, according to ths quality of the mortar, and the height of the roof. This price, of course, includes labor and all materials.

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The Board of Examiners appointed in connection with the new plumbing by-law of Halifax, printed in this number, consists of the City Engineer (chairman), City Plumbing Inspector, and one representative from the Master Plumbers' Association and the Journeyman Plumbers' Union.

Screws used in soft wood are sometimes driven in with a hammer and given a turn or two with a screw-driver to bring them flush. A manufacturer has brought out a new screw which is adapted for driving, and which enters the wood without tearing the grain, as the ordinary screw does. The gimlet point is dispensed with and a cone point substituted. The thread has a pitch that it drives in barb fashion, offering no resistance on entering, but firmly resisting all attempts to withdraw it except by turning it with a screw-driver.

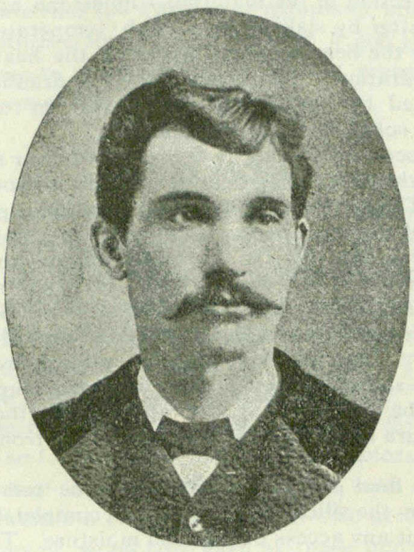
When inserted at the bottom of air shafts, gas jets establish active air currents which withdraw the vitiated air, and may be made especially useful on occasion when apartments are unusually crowded. It has been proved by experiment that 1 cubic foot of illuminating gas can be utilized so as to cause the discharge of 1,000 cubic feet of air ; and as a common gas burner will consume 3 feet of gas per hour, it would extract from an apartment 3,000 cubic feet of contaminated air during that period, By suitable contrivances also, the gas lights which are usually such active causes of deterioration, may not only become self ventilating and carry off their own impurities, but also aid materially in keeping pure the air of inhabited apartments.

## REASONS IN FAVOUR OF THE AWARDING OF CONTRACTS ON THE SCHEDULE PRINCIPLE.

By W. Fraser.

This system does not interfere with the letting of all departments to one individual or firm, nor with the letting of the several departments to separate contractors. It serves its purpose in either case.

In the primitive mode of tendering and accepting tenders the plans and specifications are the only two writ-



Mr. M. J. Barr,
President Vancouver, B.C., Master Plumbers' Association.

ten witnesses to the contract. If a case of litigation occurs it generally becomes very complicated, and seldom will either judge or jury decide without an expensive and lengthy arbitration.

The schedule of quantities becomes a third witness to the contract and the most powerful of the three. Indeed it being so demonstrative, it has the effect of deterring men from entering into litigation. The chief object in the business of quantity surveying is the drawing of such an instrument as will produce such favourable results. The system commends itself to business men in the same manner as does receiving of a consignment of goods conforming to an itemized invoice instead of the advice of the cost by simply a knowledge of the lump sum.

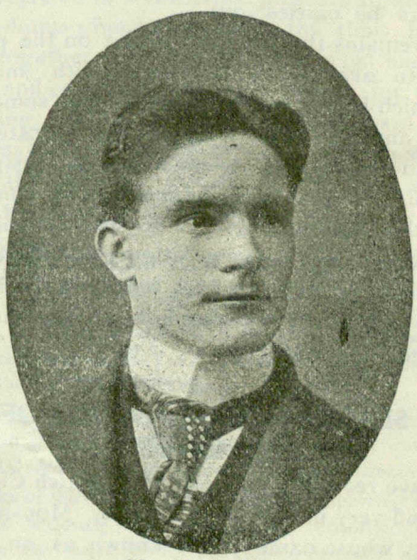
There are three parties connected with the building contract, viz., the owner, the architect and the contractor. The architect employs the quantity surveyor for the owner and he becomes their assistant. Of the three parties interested in the contract, it must be allowed that the interest of the owner is the most deserving of protection because he is the money spirit of the enterprise, and this principle does protect him in many ways; particularly it insures him against having to pay for more value than he actually receives, and that at itemized prices established previous to his entering the contract. To detail the amount of assistance given the architect would be lengthy, but in particular the schedule gives him the knowledge (which is his right to have) of the expense of the different component parts of the building which he has designed. It enables him with little trouble to accurately ascertain the progress values of a contract from time to time as the work proceeds. It also relieves him of much unpleasantness in adjusting accounts, which business, in duty to his client, sometimes becomes very disagreeable. It commends itself especially to the junior architect, because it provides him with a school of experience in a short period of time, that following the primitive mode, takes half a life time to acquire.

It may be said that the schedule principle operates more in favor of the owner than in that of the contractor, but it commends itself forcibly to the straightforward man, because it protects his just rights throughout the progress of the contract. It saves his time and fatigue of mind in tendering, and removes any doubts he may have in getting his prices down to the lowest basis. Also it inspires a feeling of confidence in the parties all round, hence gives rise to the production of a better class of work.

There are two classes of contractors who look rather askance at the schedule system. The first is the man of the old school. He clings to the non-exposure of his prices pro rata with a tenacity sufficient to render his motives questionable. It would seem that in the course of his experience in business he had run up against some man whom he thought had done him an injustice at settlement, and therefore he is desirous to keep himself in future prepared for a like emergency, forgetting that in such a case the schedule is his stubborn friend. The other man is the extras grabber, the man who intentionally tenders at under value, in the first instance, with a view to exercising his policy during the progress of the work. Of course he has no use for the schedule, and he has good reasons, because it shuts out his policy.

The practice of this system in England for so many years is the strongest proof of its utility and its sound principle in the matter of fair dealing. Not only has it been practiced in the large cities, but it has gradually branched out into the provincial towns and still continues to enlarge its sphere.

The man who taught the writer the general and vital principles of the business of quantity surveyor branched out from the city of Glasgow to a small town in the



Mr. M. S. Rose,
Secretary Vancouver, B.C., Master Plumbers' Association.

north of Scotland in which there were four architects. Of these four only one readily adopted the system in its entirety. This architect was the junior both in years and business. His career, well known to the writer, gives an example of success. He was a man who saw his opportunities, employed all the assistance (quantity surveyor, engineer, clerk of works, etc.) necessary to enable him to prosecute his profession while he

severely maintained his prestige. The result was that not only did his local patronage increase rapidly, but his high qualifications displayed themselves, and he was found sturdily contesting for precedence with the names of Street, Scott and Burgess in circumstances known to the readers of the "Builder" or "Building News" of the period.

It may be said that the schedule system, except by engineers, is not practised in Canada nor in the United States. The answer is plain. There was a time when it was not practised in England, and it may be that there is a slight prejudice against English methods of business, no matter how much they may commend themselves in the matter of fair dealing. An opposing reason is sometimes given that the system leads into complications. This may happen when blank schedules without quantities are priced by contractors and measurements made from the building after work has been executed. This method should not be followed. It is not followed in England, except in cases of urgency to save time. All measurements should be made from the plans. Quantities should be prepared therefrom unless in case of additional work or deductions, and then the original schedule if properly drawn will clear away all complications.

It can be noticed that a desire manifests itself at times on the part of contractors of certain departments to introduce a schedule or third witness to the bargain. Plans and specification may be shown them by the architect and a desire expressed for their tender to conform to the same. But in return it will be found along with their tender they also furnish a schedule prepared by themselves, and sometimes also drawings or sketches showing their interpretation of the specification and plans. This is not quite as it should be. The architect loses his prestige, and in a court of law the contractor's instrument would doubtless operate against him. The architect should issue his proposals under his own authority and thereby retain his prestige in the works he carries out.

There remains the primitive desire on the part of the owners to overburden architects with multifarious duties which belong to contractors and some to their foremen, and the owners should be educated on this point. In this age of specialities and business rush, when design is becoming important and contracts extensive, the architect ought to pursue that policy which will reduce his own personal fatigue, and thereby be the better able to produce the best results in the interest of his client and in the advancement of his name in his honourable profession.

## THE SLAKING AND STORAGE OF LIME AND CEMENT.

We have recently read, says the British Clayworker, a long and very important memoir by Monsieur H. Le Chatelier, whose name is well known as an authority on pyrometry. This memoir details the results of numerous experiments which Le Chatelier has made regarding the slaking and storing of lime and cement. We give the following condensation in which will be found the main results which have been obtained. The rate of slaking in lime varies with the compactness of the product, the porous lime obtained by the calcination of calcium carbonate at a comparatively low temperature (900° C.), becoming at once completely hydrated when brought into contact with some water, whilst the more compact form, prepared by decomposing a fusible lime salt, e.g., the nitrate, requires from 24 to 48 hours. The presence of fusible substances, e.g., silicates, aluminates, etc., retards the operation; as does also magnesia, but this influence is counteracted by increasing the temperature of the water employed for hydration, or by the admixture therewith of about two per cent. of calcium chloride.

In the case of hydraulic lime, the proportion of free lime should be reduced to a minimum, since when hydrated it contributes nothing to the hardening of the mass, and when unslaked tends to reduce the setting power. In practice, the former evil is obviated by a proper selection of the materials—limestone and fuel—and the latter by slaking at a high temperature, i.e., arranging the heap so as to preserve the heat evolved during hydration. In the laboratory, hydraulic lime is best slaked by immersing the vessel in a boiling saturated solution of calcium chloride.

The process of slaking is divisible into four stages in practice, the first being one of simple absorption of water. The mixture being then shovelled up against the face of the main heap, is warmed in contact, and also evolves heat by the chemical action going on; thus a portion of the added water is evaporated. In the third stage the mass cools, and moisture is fixed by the silicates, although some of the free lime still remains unslaked. That this is so may be proved by quickly heating a sample to 150° C. in a tube, whereupon moisture will be deposited at the upper end, though the temperature is too low to eliminate water from calcium hydrate.

In the final stage the unslaked lime removes this water from the silicates, and becomes completely hydrated without any access of external moisture. The operation is simple, the interstitial atmosphere of the heap containing aqueous vapor at a tension equal to that of the dissociation of the hydrated silicates present; the lime continually absorbs this moisture, which is replaced by a fresh quantity released by the silicates, the speed of the operation varying directly with the temperature.

These necessary stages are frequently curtailed in practice to the detriment of the product, a sufficient time being essential to enable hydraulic lime of good composition to slack properly, whilst that which becomes quickly and thoroughly hydrated is sure to be of poor quality.

To enable cement to attain the requisite degree of hydration of the free lime, storage—preferably in silos—is indispensable. The changes it then undergoes correspond to the fourth stage in the slacking of hydraulic lime, thought they are accomplished more gradual by reason of the lower temperature prevailing. The absorption of moisture from the atmosphere being precluded, the addition of a sufficiency of water is necessary to produce the maximum benefit from the process.

The successive crushings employed in grinding hydraulic cement, result in the pulverising of the more completely hydrated portions first, and thereby give rise to difference in the quality of the product. This defect is avoided by a certain addition of water previous to crushing.

By maintaining the stored cement at higher than the ordinary temperatures, say 100° C., the time of storage could be reduced to about 14 days. Such a course would facilitate the manufacture of natural cements—free from aluminates, and therefore less fusible and more easy to kiln. Such cements, although in the absence of aluminates the combination of silica and lime does not ensue, may, when devoid of free lime, have greater powers of resistance than Portland cement. Consequently, proper storage, by tending to eliminate this element of weakness, affords a means of reviving the said industry.

The presence or absence of free lime may be determined as follows:—The sample is made up into a strong paste with water, and left to set, being moistened to prevent dessication. Then, within 24 hours, the block is placed in water and heated to boiling point in less than four hours, the distension produced being measured by the aid of a divided mould or other suitable means.

# MANUFACTURES AND MATERIALS

## GREEK MARBLE.

As the ancient marble quarries of Pentelicon, in Greece, are about to be developed on a large scale with the aid of modern appliances by an English company, it will not be out of place to mention that these famous sources of the material employed in the finest art and architecture that the world ever witnessed, after remaining undisturbed for a period of over 1,500 years, were drawn upon to some extent during the present century in the construction of modern Athens.

## WOOD MOSAIC.

Mosiac work in a variety of forms is always pleasing when well done. Although its origin is obscure, yet for centuries it has been one of the most favored mediums of decoration. In one of the southern counties of England there is still plied a quaint inlaid wood industry which is a modern example of this art. This inlaid woodwork, known as "tonbridge ware"—a name suggestive of pottery—consists of views, flowers, borders and so forth, in all their natural colors, with minute pieces of variously colored woods, each measuring about a twentieth of an inch square. So accurately are these pieces of wood cut, even at these minute dimensions, and so neatly and closely are they glued together, that they resemble one solid piece of wood with the design painted upon it. Curiously enough it was painted drawings upon white wood that originally suggested and subsequently evolved into the present craft.

The principal woods employed in the art, says the Scientific American, are American birch, mahogany, tustic, walnut—American and Spanish—plum tree, tulip—with its beautiful fruit—red grain, cocus, snake wood, nutmeg, rosewood, mulberry, luburnum, box, peach, acacia, maple and Hungarian ash, with its charming silky lustre and moire grain. In short, no wood is useless for the craft so long as it does not contain too great a quantity of sap, although a remedy is found in the case of one or two necessary woods, such as the holly, which is boiled for several hours, an operation not only removing all the sap, but bleaching the wood considerably as well. There is one color, however, which has always puzzled the artist. Up to the present no tree has been discovered the hue of whose wood is gray, and to supply this deficiency birds' eye maple and Hungarian ash are steeped for several weeks in the indigenous chalybeate waters, which convert the yellowish whiteness of these two woods into a soft steel gray.

When it is proposed to inlay a certain view, border or collocation of flowers in wood, a colored design is first of all prepared upon a piece of paper divided into squares of about the eighth of an inch in measurement. The design prepared, the workman proceeds to set it up in wood. This entails great labor and care, for in addition to being a skilled mechanic some artistic sense is absolutely essential in the judicious selection and composition of the different colored woods to obtain the necessary realistic effect. On all sides of him, within an arm's length, are ranged little piles of thin, narrow slips of wood, each slip measuring about an inch broad and varying from a twentieth to a twelfth of an inch in thickness. The workman begins at the bottom left hand corner of the squared design and takes the first set of squares and works across the drawing in a vertical direction. Suppose, for instance, he has to make a boquet of flowers. He refers to the bouttom left hand corner square of the pattern and finds that it forms part of the ground work of the design; that is to say, no portion of the drawing encroaches upon that square. As the ground work is invariably white, he selects a slip of white wood from one of the little piles and lays it flat down upon his bench. Then he proceeds to the next square above. This occupies a portion of the design—the end of a petal or a leaf. This is green, and he therefore selects a piece of wood of the correct greenish shade and places this piece upon the former slip and proceeds to the next square above, and so on until he has worked his way right across the design, taking each square one by one and superposing their corresponding colored slips of wood, in their order of sequence in a little pile by his side. He then glues and presses these little slips tightly together in a little block, three and a half inches long, one inch wide and two or three inches in thickness, composed of thin little strips of variegated wood. He labels this "number one," and proceeds to set up the second line of squares upon the drawing in a similar manner, which he afterwards glues up and consecutively numbers; and so on until he has so constructed the whole design. If the drawing is a very large one, he may have as many as two hundred of these blocks of glued strips of wood. A thin veneer about the twentieth of an inch thick is now longitudinally cut from block number one. As he has now cut the reverse way of the wood, this veneer consists of a number of little frail sticks, three and a half inches in length and about a twentieth of an inch square, firmly held together by the glue. He lays this upon his bench, cuts a similar veneer from each of the other blocks, and glues them together in the regular order. This block is now subjected to tremendous pressure to drive out all the superfluous glue and to unite the thin, frail pieces of wood together. In this block the artist has obtained an exact and complete facsimile, square for square, of the drawing. When thoroughly dry, veneers are again longitudinally cut from this block, and each veneer is a replica of the pattern. Out of a block three and a half inches in thickness it is possible to obtain as many as thirty veneers.

## NOTES.

Mr. F. J. D. Smith, who holds a mortage on the works of the Toronto Pressed Brick & Terra Cotta Co., at Milton, Ont., has applied to the courts to grant him an absolute title.

The Gurney Foundry Co., Limited, of Toronto, have recently published an attractive and interesting illustrated catalogue and price list of Oxford warm air and combination furnaces.

The works of the Toronto Plate Glass & Importing Co., in Toronto, were seriously damaged by fire recently. This is the second time that these works have been partially destroyed by fire. The present loss is partially covered by insurance.

The National Wall Paper Company, of the United States, capitalized at $38,000,000 will be dissolved by unanimous consent of the stockholders. The company was formed in 1892 by the absorption of twenty-four separate companies. Outside competition and the demands of the trade for goods identified with individual manufacturers forced the abandonment of the combination.

Vancouver bricklayers, who were on strike for 56½ cents per hour, have accepted the 50 cents per hour offered by the contractors and returned to work.

## VISIT OF THE LONDON BUILDERS TO CLEVELAND.

We are indebted to Mr. Geo. S. Gould, secretary of the London Builders' Exchange, for the following interesting account of the recent visit of the members to Cleveland, as the guests of the Cleveland Exchange. :

Last year the Builder's Exchange of Cleveland held an excursion to Port Stanley. The London Exchange invited them to London for noon-day lunch and a drive through the city, and then returned with them to Port for the balance of the day, where they gave us a splendid afternoon's sport, and a banquet in the evening at the Fraser House. The only amends we could make at that time was to give them a lesson in the art of base ball. They demanded satisfaction, and obtained from us a promise to visit them this year, so on the 24th of July last about 70 of our members with 60 ladies left Port Stanley at 11 p.m. on the steamer Urania for Cleveland, arriving there the next morning at 6 a.m. Their committee met us at the wharf and escorted our party to the Weddell House for breakfast. From there we visited their Exchange rooms in the Chamber of Commerce building, where they occupy the whole of the third floor, and have utilized every inch to the best advantage. For Exchange purposes it would be simply impossible to improve their lay out or furnishing. There need be no delay in reaching their rooms, as they have four elevators, and in a very few seconds you are landed in their corridor; from there you obtain entrance into the main room. This immense floor space is divided into sections, large or small as desired, and rented to manufacturers, who place their wares there as exhibits, and architects and proprietors make a practice of coming there and making their selections for building purposes. Here we have sample brick of all kinds as well as laid up work, terra cotta, beautiful displays of marbles, fancy iron work, builders' hardware, wood mantels, grills, parquet floors, etc., in fact there is almost everything to be found there that is used in the construction and ornamentation of buildings. There are also a number of small spaces rented by the members and fitted up by them as offices where they transact their business during the day. They have also private rooms where plans are figured on, consulting room, a board room, president's private office, secretaries' office, lavatories and telephone room. They keep two secretaries permanently employed, and a page boy in livery. On the ground floor of the building is a large auditorium where they hold their banquets. After we had inspected the rooms and registered they placed us on cars for a trip to one of their parks about 9 miles east. On our return to the rooms again we were tendered a formal reception and luncheon by the Exchange. At 1 p.m. we all took cars again for Scenic Park, where a programme of sports was participated in by the members of the two Exchanges. We would like to forget all about the baseball match, but—well, they had their revenge. The tug of war heavy team they won. The tug of war light team we won, and the rest of the honors were about evenly divided.

The Cleveland Builders' Exchange Committee consisted of Arthur Bradley, W. J. Warden, W. B. Green, C. C. Duschel, W. H. Gick.

The London Exchange Committee was composed of : Samuel Stevely, chairman ; Thos. Jones, secretary ; Ed. Martyn, John Hutkins, H. Stratfold, Wm. Smith, Geo. Everett and the President.

On returning to the city we were taken to the Hotel Stilson, where a sumptuous banquet had been prepared. About 300 sat down at the well filled tables. Between the courses several patriotic and other songs were ably rendered by Ruthven McDonald, of London. After ample justice had been done to the viands the acting president of the Cleveland Exchange who was in the chair, in introducing an appropriate toast list, gave expression to the great pleasure afforded their Exchange in meeting so many of the London members and their ladies in Cleveland.

When the London Builders' Exchange was toasted, Mr. Samuel Stevely, chairman of the general committee, called Mr. Arthur Bradley, past-president of the Cleveland Exchange, and Mr. Wm. Tytler, president of the London Exchange, to the front, and in an appropriate speech presented them each with a handsome gold medal, the gift of ex-mayor J. D. Wilson. of London, (who was unavoidably detained from being present) given as souvenirs of the very pleasant reunions held in Canada last year and in Cleveland this year. The recipients feelingly responded. After the postmaster of Cleveland had responded to the toast of the ladies in a glowing tribute to their worth, we had to retire in haste as the boat was waiting. So terminated one of the pleasantest days' outing we have ever enjoyed. Accompanying our party as the guests of the Cleveland Exchange were the Mayor and Col. Culver, the U. S. consul of this city, and Ald. McCulloch, of St. Thomas.

## NEW PLUMBING REGULATIONS OF HALIFAX, N. S.

The City Health Board of Halifax, Nova Scotia, have recently revised and amended in many important particulars the regulations governing plumbing work in that city. These amendments, which are now before the govenor-in-council for approval before coming law, are as follows :

Sections 33 to 52 both inclusive of the rules of the city board of health hereby amended, as also the rules previously amending the said sections, are hereby repealed and the following substituted therefor :

33. A board of plumbing examiners is hereby constituted, to consist of the City Engineer and the city inspector of plumbing. The board shall be called together by the City Engineer (who shall be chairman of the board) at such times as the board of health may direct.

34. No person shall do or perform any plumbing work as a master plumber in the city of Halifax unless he is duly licensed to perform the same and is registered as such in the office of the board of works for said city, and the person obtaining such liscense shall be known as a "Master Plumber" and shall pay for said license to the Board of Works the sum of ten dollars.

35. To entitle any person to a license under the next preceding section he shall be of the full age of twenty-one years and have a place of business as a plumber in the city of Halifax, and shall furnish to the board of plumbing examiners sufficient evidence that he is himself a practical and expeirenced plumber, and his license as a master plumber when issued shall be kept in a conspicuous place in his place of business.

36. Every person before doing any plumbing work or business in the said city for or on account of himself or any master plumber shall be a practical and expeirenced plumber and furnish the board of plumbing examiners sufficient evidence that he is capable of properly doing and performing plumbing work in said city, and if the said board is satisfied of his competency to perform said work they shall cause his name to be registered in the said office of the board of works and give him a certificate of competency as a journeyman plumber, after which he shall be at liberty to do such plumbing work, but not before.

37. Every person desiring a license as a master plumber or as journeyman plumber shall file a petition in writing with the clerk of works, giving the name of the applicant, and if the applicant is

applying for a master plumber's license he shall state in his petition his age and place of business in said city, and said petition shall be accompanied with the bond hereinafter referred to.

38. Any change in the location of the business of a master plumber shall be promptly reported to the said clerk of works.

39. Any journeyman plumber desiring to become a master plumber shall first comply with these rules and regulations as to master plumbers and no journeyman plumber shall do business as a master plumber until he has obtained a master plumber's license, notwithstanding anything in these rules and regulations.

40. Any master plnmber or journeyman plumber who furnishes satisfactory evidence to the board of plumbing examiners that he has carried on the business as a practical and experienced master or journeyman plumber in the city of Halifax for not less than four (4) years next previous to November 29, 1897, shall be entitled to receive a license or registration without examination.

41. All licensed master plumbers shall be held responsible for all acts of their employees for work done in connection with their plumbing business in respect to which such license is granted.

42. Every licensed master plumber shall on the first day of every month report to the City Engineer upon printed forms to be supplied at the City Engineer's office, the number, nature and extent of all new plumbing fixtures placed by him or his journeyman plumber in any building in said city, but they shall not be required to make returns of any old fixtures renewed except water-closets and urinals.

43. Every master plumber shall only employ journeymen plumbers to do said plumbing work, but said work may be done and performed by any any practical plumber under the guidance and direction of a journeyman plumber or master plumber then present directing the work.

44. Every master plumber before obtaining a master plumber's license shall file a bond with the Clerk of Works in the penal sum of two hundred dollars conditioned for the faithful performance of his duty as a master plumber and for his not permitting or allowing any plumbing work that he may be called upon to do to be performed by any person in his employ except by such persons as may be authorized to do plumbing work under these rules and regulations and for his not violating any of the terms and conditions of said rules and regulations or any other rules or regulations in force in the city respecting plumbing, drainage, sanitary matters and the city waterworks.

45. No person shall carry on business in the said city as a master plumber unless he is the holder of a license herein mentioned, nor shall any journeyman plumber do or perform any plumbing work until he has obtained his certificate under these rules and regulations.

46. No person shall be allowed, without having first obtained a permit from the city engineer to open or shut off, the street stop-cock connected with the service supplying any premises or buildings, unless in case of urgent necessity to prevent loss or damage from flooding, and shall in every such case leave the stop-cock as he found the same,and any person who shall commit any damage or injury to any stop.cock in the service pipes of the department shall be liable for the amount of any such damage in addition to any penalty imposed for the violation of these rules.

47. When any old fixture or plumbing requires renewal the work shall be done in accordance with these rules and regulations as far as they apply, but it shall not be necessary to take out any old work which, in the opinion of the plumbing inspector, is in good sanitary condition. In every case where in the opinion of the city engineer and plumbing inspector the enforcement of any rule or rules respecting plumbing is impracticable or inadvisable they shall have power to modify or suspend any such rule or rules to meet the exigencies of the particular case.

48. The city engineer, the foreman of waterworks, or any inspector appointed for that purpose, shall have the right at proper hours of the day and upon reasonable notice given and request made upon the owners, to enter upon and have free access to all parts of any building in the city of Halifax in which water from the city waterworks is delivered or consumed.

49. The City Health Board shall have the power at any time to cancel any master plumber's license or any journeyman plumber's certificate for cause, and thereupon all rights of said master plumber or journeyman plumber to do any plumbing work under these rules or regulations shall cease and determine.

50. The license to master plumbers shall expire on the 31st day of December in each and every year, but they may be renewed by the City Board of Health on the recommendation of the Board of Plumbing Examiners, and master plumbers shall pay one dollar for each and every renewal.

51. The City Health Board shall from time to time as occasion may require, on the nomination of the city engineer, appoint such inspectors of plumbing as may be found necessary, but no person shall be eligible for such appointment who has not passed a satisfactory examination for proficiency in both practice and theory of plumbing and drainage before the Board of Plumbing Examiners.

52. Such inspector or inspectors shall be under the supervision of the city engineer, and shall be attached to the office of the said city engineer, and shall be paid such salary as the city council determines.

53. All work contemplated in these regulations shall be done by a licensed master plumber or by a certificated journeyman plumber in the employ of such licensed master plumber or as provided in rule 43, and shall be subject to the inspection, supervision and approval of the city engineer or an inspector appointed by the city health board for that purpose, and all faulty or defective work which is at any time discovered shall be made satisfactory to the said engineer or inspector, as the case may be, and when found satisfactory the certificate shall issue to the plumber at the expiration of thirty days from date of inspection, unless in the meantime such work has become faulty or defective.

54. Hereafter no person or member of any company or employee or apprentice of such person or company shall do or perform any work authorized by these rules, nor shall any such person or member of any corporation direct or instruct any employee or apprentice to do or perform any such work until the owner or his agent shall have first obtained the permit and filed the plan and specification mentioned in rules 27 to 31, both inclusive, of the rules hereby amended.

55. Every person violating any of the rules and regulations of the board of health shall be liable to a penalty of not less than five dollars nor more than eighty dollars for each offence on summary conviction before the stipendiary magistrate, and in default of payment to imprisonment in the city prison for a term not to exceed ninety days.

Sec. 1, Sub-section. It is hereby repealed and the following substituted: No trap vent pipe shall be less than three inches in diameter where it passes through the roof, and all vent pipes after leaving the trap must continue to rise above the bottom of any fixtures vented before being connected with or to any other vent, and vent pipes must pass out through the roof or be connected with the soil pipe.

Section 4. The first sentence is struck out and the following substituted: Every connection between lead and cast iron pipe shall be made with brass ferrules properly gasketted, leaded and caulked into the soil pipe, and every connection between lead and wrough iron pipe shall be made with brass soldering nipples having properly wiped joints.

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## SOME MISTAKES OF CONTRACTORS.

Contractors often make mistakes in assuming responsibilities without proper compensation and in taking unnecessary risks, says F. E. Kidder, the well-known consulting architect, in a late issue of the Brickbuilder. Not a few contractors will estimate on a hazardous piece of work on the basis that everything will proceed favorably, and if any mishap occurs they have no provisions for meeting the expense invariably occasioned. The contracting business necessarily involves the taking of some chances, as in the rise in price of materials or labor, but when unusual chances are to be taken, as in remodeling, underpinning, or supporting old buildings, or in the case of uncertain foundations, the contractor should protect himself by estimating so that in case unexpected, although possible, difficulties are encountered he will not lose more than his profit. It is much better to let some one else have the job than to take it at a figure which will allow a profiit only under the most favorable conditions.

Then many contractors are careless about allowing their work to be damaged by other workmen or through orders of the owner or architect. For instance, a

mason contractor has built a cellar or basement wall, and the excavator wishes to fill against it on the outside before there is sufficient weight on the wall to insure its stability, or perhaps he may be directed to do so by the architect or owner. If the excavating is under the control of the mason, he can forbid the filling until such time as it may be done with safety, but if he has no control over it, he should protect himself by notifying the owner in writing that if the filling is done it must be at his, the owner's risk, otherwise if the wall springs or falls the mason contractor will be expected to make it good.

Similar risks or chances of injury frequently arise in connection with other portions of the building, especially when the work is done under several contracts, and the wise contractor will protect himself as far as possible from damage that may happen to his work through the ignorance or carelessness of others. If a contractor executes a given piece of work in conformity with the plans and specifications, and it is injured through the fault of persons working under another contract with the owner, it is evident that the first contractor should not be made to suffer from the damage ; but it is the experience of all who have had charge of building operations that, unless some unusual precautions are taken, it is difficult for the contractor to collect damages for repairing his work, and he must leave it in good condition before it will be accepted.

Contractors also occasionally run a risk in attempting to execute work that is not properly designed or has not sufficient strength. For example a stone lintel may be shown on the drawings with a span so great that it is doubtful if the stone will support its own weight and that of the load upon it. Now, if the contractor goes ahead and puts in the lintel without comment, and it breaks, the chances are ten to one that the architect or owner will insist on his putting in another stone or remedying the defect in some way, at his, the contractor's, expense. The same thing may happen in the case of an arch without sufficient abutment, or of a flat arch with no support under it. It is therefore the business of the contractor to carefully consider all of the constructive features of the building bnfore he commences work on them, and if he believes that any part of the work cannot be safely executed, as shown by the plans, he should call the attention of the architect to it and try and have it changed, or extra provisions made to give the necessary strength, so that there will be no risk of failure. In case the architect declines to make any change, the contractor should serve a written notice on the owner that he will not be responsible if the work fails, and at the same time he should take care to see that the work is executed in the best manner, and in strict conformity with the plans and specifications, so that in case it does fail there will be no opportunity to show defective work as a cause. Generally it will pay the contractor to go to some extra expense himself to insure the safety of the work rather than to run any risk of a dispute or possible lawsuit. The writer has known a number of instances where contractors have suffered considerable loss from carelessness or negligence in this respect.

Occasionaly a contractor permits himself to be imposed upon by the architect in the way of details. Not a few architects have the fault of showing much more work on their details than is implied by the scale drawings, and of expecting the contractor to carry out whatever they may choose to draw. Of course, if the details are made before the contract is awarded, and the contractors have an opportunity to examine them, it makes no especial difference it the drawings do not exactly correspond, as the details would determine the character of the work to be done, and the tender would, or should, be based on them. When the details are made after the contract is signed, however, the contractor is not obliged to adhere to them if they show more expensive work than is reasonably implied by the scale drawings and specifications. Thus, for illustration, where carving or dentils are put on the detail drawings, but are neither shown in the original scale drawings nor mentioned in the specifications, the contractor may claim an extra price for the extra work, or refuse to execute it. A claim for extra remuneration, however, would probably not be allowed unless made in writing before commencing the work, and acknowledged by the architect. It is, therefore, best, in such cases, for the contractor to politely call the attention of the architect to the discrepancy and show him that the work cannot be done for the price which the original work was figured. If he is then unwilling to either allow an extra price for the work, or to change the details, the contractor must choose between omitting the extra work or putting it in at his own expense. If to carry out the details means a loss on the contract, it will probably be best to refuse to do more than the contract drawings call for, but if only a small amount is involved, it may pay the contractor to retain the good will of the architect by doing the work. Very often such extra work is put on the detail drawing by draftsmen without the knowledge of the architect, and when his attention is respectfully called to it he will have the details revised.

In conclusion, the writer suggests that while the main object of a contractor is to make a profit from his business, or, in other words, to make a success of it, such success depends upon the exercise of a considerable degree of intelligence and tact, and that a successful contractor must have in mind the interests of the owner and architect as well as of his own ; also that a successful business does not necessarily imply that a profit must be made from every piece of work. Not a few successful contractors owe their success in a considerable degree to the fact that they have carried out their unprofitable contracts with the same thouroughness with which they have executed their profitable ones.

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Mr. John M. Burnett, contractor, of London, Ont., was severely injured by falling from the upper story of the new Masonic Temple now in course of erection in that city.

## NORMAL BUILDING SAND.

An important feature in connection with the use of mortars and cements in masonry structures is the nature of the sand used in the mixture; yet in nearly all tests the cement is the main object under consideration, the sand being often rather neglected. It is this fact which gives especial interest and value to the tests, of so-called normal sands selected from various countries, recently conducted by Herr M. Gary at the Berlin Testing Laboratory. From the Mitt. aus den Kgl. Technischen Versuchsanstalten, in which the full report appeared, the following abstract of the work is given. It is well that attention has been directed to so fundamental an element in building construction.

Ten different varieties of sand were tested, and in order that there might be no doubt as to the high quality and character of the samples, care was taken to have them selected by experts of acknowledged reputation in the various countries from which they were obtained.

Two varieties from Germany were treated, one being a crushed quartz from Freienwalde in Prussia, and the other the sand obtained from the Rhine by dredging. Single samples of standard sand were obtained from Austria, Switzerland, Russia, Norway, England, and the United States, and two samples from France, one of these being from Leucate, a natural sand brought down by the mountain streams of the Pyrenees, and the other a crushed quartz from Cherbourg.

The tests of the ten varieties of sand consisted in a chemical analysis, and a measurement of the loss of weight at red heat, as well as a determination of specific gravity, and size of grains, after which briquettes were made with Portland cement and subjected to tension tests after seven, twenty-eight, and ninety days hardening under water. Two sets of briquettes were made with each kind of sand, one set containing one part by weight of cement to three of sand, and the other one part of cement to five of sand. The former proportion represents the usual practise in nearly all countries; the latter was used to the extent to which the addition of a greater proportion of sand affects the strength. Very interesting microphotographs were made of the samples of sand, and the difference in the character of the grains were in some cases very marked.

It is impossible to go into the details of these interesting tests which are fully tabulated and illustrated with diagrams in the original report, but some of the conclusions are here given.

Among other points it was found that the very sharp crushed quartz sand, which under the microscope showed an angular structure, gave a high tension test and a low compression test, while the natural sand, with rather rounded grains gave proportinately better results in compression, Thus for the American sand, a crushed quartz from Masachusetts, the ratio between the tension and compression tests was 1:2.7, while for the English sand, which, under the microscope showed round smooth grains, the ratio was 1:10.

The resistance to tension for the mixture of three of sand to one of cement was, for the English and American sands, respectively 424 pounds and 451 pounds per square inch, while for compression the figures were 4,300 pounds and 2,660 pounds. The American sand stood among the highest in the tension tests, being equalled only by that from Switzerland, but in the compression tests it was much lower than any other, the next higher being 3,500 pounds per square inch. On the other hand the only sand which equalled the English sample in compression was that dredged from the Rhine, which also showed a similar rounded constitution. This feature is one which is worthy of further investigation, as, if it is possible to obtain high tension tests for a cement by the use of a sharp sand, while at the same time its resistance, while applied in practice with similar sand under compression, is diminished, these facts should be taken into consideration, or else, more properly, both tension and compression tests should be required.

Tests made with mixtures of sands of coarse and fine grains showed inferior results to those obtained with sands uniform in size of grain.

## QUESTIONS AND ANSWERS.

J. M., a Montreal, subscriber, writes: Referring to a recent article in the Builder's department of your journal, please explain to me more fully the brace measure, which I do not rightly understand.

ANSWER.—The brace rule figured off on the steel square is so arranged that the third set of figures indicate the length of the brace from point to point, required to reach diagonally the two points indicated by the two first set of figures. Thus, $\frac{27}{27}$ in the example given would require a line 38, 19 to reach diagonally the joints named, the angle being a right angle. Now, if we make the figures represent inches; then, we run 27 inches along the gist of a piece of framing, and 27 inches down the post, and the brace required to reach the two joints must be 38 inches and 19 hundredths of an inch in length. Nineteen hundredths of an inch is a trifle less than 1/5 of an inch, which is near enough in timber framing. The exact nineteen hundredths can be taken from the diagonal scale, which is engraved on all good squares. In Hodgson's book, "The Steel Square and Its Uses," this question of scales is exhaustively discussed and made quite clear.

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It is said that the addition of even so small a proportion as one-tenth of as much brick dust as of sand to ordinary mortars is preventive of the disintegration so often characterizing mortars used in the masonry of public works. The use of such dust mixed with lime and sand is said to be generally and successfully practised in the Spanish dominions, and is stated to be, in all essential points, superior to some of the best imported hydraulic cements for the construction of culverts, drains, tanks or cisterns, and even for roofs, whether for setting flat tiles or for making the usual flat tropical roof.

## USEFUL HINTS.

A suggestion for pale green woodwork might be: Deep green walls, a greenish grey with silver on frieze, a cornice of grey and silver, and the ceiling the same. A good effect is given by having upholsterings in similar colors, relieved by old rose, the draperies being of grey.

Nearly all natural colors of good quality, that are well washed and prepared, are inert and well adapted for staining outside paint. All colors that are artificial, or chemically prepared, are more or less active, as shown by their fleeting properties when exposed to the atmosphere.

Method of cross-sectioning tracings: A method of cross-sectioning tracings is described by a writer, who says that he never sections the original accurately, but merely indicates the sectioning roughly. After the tracing is ready for sectioning, he slips a piece of cross section paper, which is ruled about $\frac{1}{16}$ in. apart, under the tracing paper, and traces the required sectioning. If the sectioning is to be fine, every line is traced; but of course, only alternate lines are traced, or every third for very coarse work.

Hues are modifications of color by other colors; tints are produced by adding white to colors or hues; while shades are produced in like manner by adding black. Tones signify colors or hues mixed with varying proportions of either white or black. White weakens or reduces the tones while black dulls them.

To fix chalk drawings: Good black paper coated with resin in following manner: Common resin (colophonium) and shellac are dissolved in strong alcohol, and the solution applied to the black paper with a broad brush a number of times, each coating being allowed to dry perfectly before another is applied. The paper becomes matte and dull, but acquires a gloss when warmed. Chalk drawings made on this paper can be made permanent by covering it with another sheet of well-sized paper over the face of the drawing, and passing a hot smoothing iron over it. The extra sheet is carefully removed when cool, and the drawing can then be rolled up without injury.

The original St. George's Anglican church at Kingston, Ont., built in 1792, was demolished only a couple of months ago.

The remarkable growth in popularity of metal for building purposes is well illustrated by the new catalogue of 150 pages just published by the Metallic Roofing Co. of Canada, Toronto. This catalogue, which is handsomely printed and substantially bound, illustrates and describes metal ceilings, friezes, caps, mouldings, ridge and hip cups, steel clapboards, corrugated iron siding, curved corrugated iron for fireproof ceilings and awnings, fireproof metal covered doors and shutters, metal lath and so forth, ad infinitum. In the introductory chapter the company state that they were the pioneers in this line of manufacture, having started sixteen years ago by manufacturing only one line of metal shingles.

## THE GREAT TORONTO FAIR.

As there seems to be a feeling of general prosperity throughout the country this year, the attendance of visitors at the Toronto Exhibition, which opens a few days hence, on the 28th inst., promises to exceed that of any previous year. Many who have never been to this great fair before are talking of going, and those who have been before are going again. The entries in all departments, especially that of live stock, are the largest in its history, and this is a pretty good indication that the exhibition will score another great success. Although some of the manufacturers of reapers and mowers have decided not to exhibit at any fair in future, there will still be a good exhibit of other farming implements at this exhibition. The special attractions, which will to a great extent be of a patriotic character and up to date, promise to be most interesting, including, among other things, a representation of the siege and relief of Mafeking, in the present South African war. Many interesting trophies, brought back by the returned members of the Canadian contingent, will be on exhibition. It is astonishing the great interest that is taken in the Toronto Fair throughout the country, and the approaching one is no exception. The usual cheap excursions will be given on all the railways.

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