INDEX TO ADVERTISEMENTS

How Does It Strike You ?

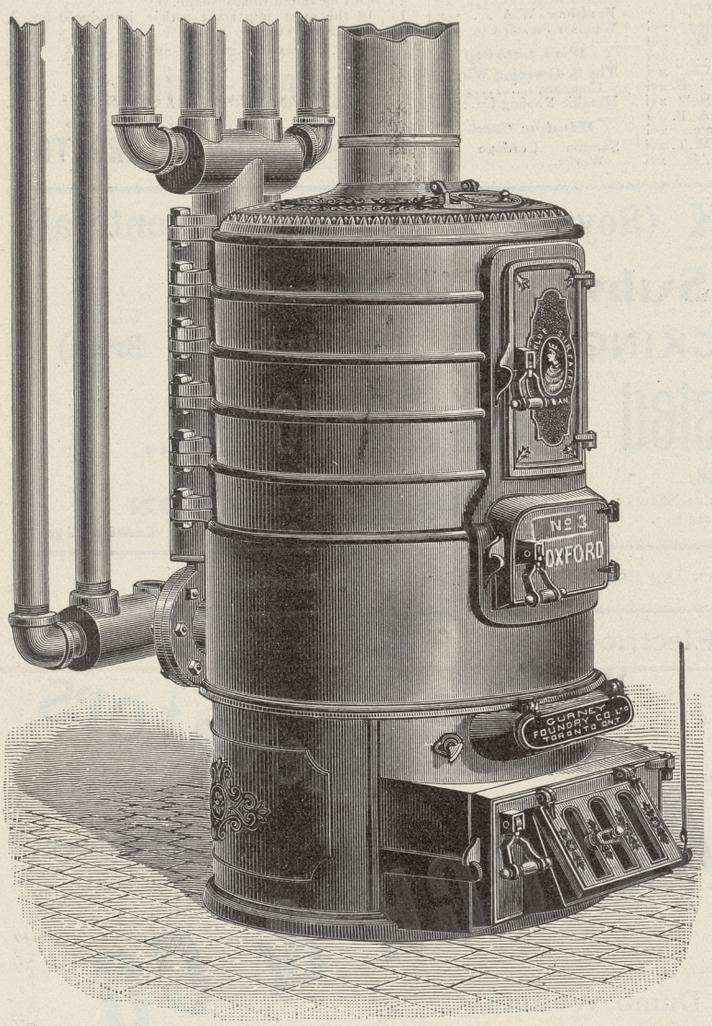
Isn't it reasonable to assume that a casting which is strong and of even thickness throughout, and has no weak spots, will wear longer than other kinds ?

And isn't it equally reasonable to assume that a Heater made throughout of uch castings will prove unusually durable ?

This is where the long life of . . .

Gurney Heaters

"Bright Idea" **"Oxford"** **"Doric"**



GURNEY OXFORD BOILER.

Comes in—our strongest efforts have been directed along this line, and we can freely announce that for durability economical fuel consumption and ease of operation, our Heaters are unrivalled. Made in sizes to suit all capacities for either hot water or steam. Investigate their merits and form your own conclusions. Our Booklet will interest you.

THE GURNEY FOUNDRY CO., Limited

Toronto, Winnipeg, Vancouver.

THE GURNEY-MASSEY CO., LIMITED

Montreal

The "Doric Capital" usually is made up of the abacus, plain and square in shape, and the echinos which is round. Sometimes it will be found to be painted, and often the decorations are carved on, such as the egg and dart, or bands of leaves. The shaft is usually plain, and tapering towards the top.

The Canadian Architect and Builder

VOL. XIV.—NO. 167. NOVEMBER, 1901.

ILLUSTRATIONS ON SHEET.

Residence, Toronto.—Messrs. Symons & Rae, Architects.

ADDITIONAL ILLUSTRATIONS IN ARCHITECTS' EDITION.

House in Rosedale, Toronto.—Mr. A. Frank Wickson, Architect.
Town Hall, Windsor, N. S.—Messrs. Elliott & Hopson, Architects.
Photogravure Plate.—Canadian Bank of Commerce, Winnipeg, Man.—Messrs. Darling & Pearson, Architects.
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PROF. S. H. CAPPER, R.C.A., Department of Architecture, McGill University, Montreal.
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" S. H. TOWNSEND, " "
" FREDERICK G. TODD, Landscape Architect, Montreal.
" R. A. L. GRAY, Electrical Engineer, Toronto.
" W. H. ELLIOTT, of Messrs. Elliott & Son Co., Toronto.
" J. C. B. HORWOOD, Architect, Toronto.
" A. F. DUNLOP, R.C.A., Architect, Montrea

Safety of Elevators.

An elevator in one of the principal office buildings in Toronto, dropped twelve or fifteen feet the other day. The suspension cables became detached from their fastenings at the top of the shaft and fell in a heap on the cage. The passengers fortunately escaped injury, but as may be imagined, were badly frightened. Rumors are abroad of similar happenings at some of the great departmental stores of which no mention has appeared in the papers. A system of elevator inspection is supposed to be in force in Toronto, but these accidents would seem to indicate that its efficiency might and should be improved.

Methods of Designating Floors.

So much confusion exists regarding the order in which the different floors of a building should be named that some leading Canadian architects have decided to fall in line with American practice and the ideas of the majority of their clients by numbering the different floors one, two, three, etc., beginning with the ground floor as number one. The practice here and in England has been to name as the first floor the one first above the ground floor. It is claimed, however, that probably 75 per cent. of architects' clients regard the ground floor as being the first floor. The result is frequent misunderstandings between architects and clients, requiring frequent explanations, and leading to delays where matters have to be arranged by correspondence. It is thought by some that the difficulty would be overcome by adopting the American instead of the English method. Where there are basements, the floor would be designated as the "basement floor," and the floor above as the "first floor," counting from the fron of the building. Local architects are by no means unanimous in opinion regarding the advisability of changing the method which has been in vogue until the present. The subject is an interesting one and of considerable importance to the profession, and might profitably receive discussian at the Annual Conventions of the Architectural Societies.

W rkmen's Compensation Acts.

The Workkmen's Compensation Acts of Canada, fashioned after the law of Great Britain, are found to be not less difficult of interpretation. In Great Britain all sorts of interpretations have been given by the Judges of the various courts, resulting in such a legal muddle, that there appears to be no certainty in the mind of anybody as to what an employer's liability under the act really is. As evidence that the meaning of the Canadian law is equally obscure, it might be mentioned that the partners of a well-known legal firm not long ago spent half a day in discussing the interpretation of a particular clause. Much unnecessary litigation as well as injustice seems certain to be the result of the operation of this important law simply because proper care was not exercised in its construction.

The Designing of Factories.

Architects and persons interested in architecture outside of the profession, will rejoice to observe the more or less successful attempts that are being made to give a character and interest to the design of factory buildings. Such buildings need not necessarily look like huge packing boxes. They may be well adapted to their purpose,

and kept within moderate cost, while at the same time showing character in design which will make them attractive and interesting to the beholder. In striving to secure this result, however, architects should be careful to see that the purpose which the building is intended to serve is expressed in the design. No doubt the reader has seen, as we have, factories which looked like public libraries and water works, pumping stations that had the appearance of banks.

A Prosperous Season. The building season now drawing to a close has in most localities, and particularly in Toronto, been marked by unusual activity. From Winnipeg in the west to Sydney in the east, building improvement has been advancing rapidly and on a large scale. This activity is the reflex of the commercial prosperity which is at present everywhere visible, and which it is gratifying to know shows no signs of abatement. The building industry, which so intimately depends upon sound financial conditions, seems likely to enjoy a further period of prosperity. The rapid growth of our manufacturing industries has necessitated the erection of many new factories throughout the country, and these have resulted in improvements in other directions. For example, as the result of the introduction of beet growing and beet sugar factories, land in some towns in Western Ontario is reported to have doubled in price, and many new buildings will be the outcome of the increased stimulus which these towns have received. In Toronto, in addition to the large new hotel on King street, several new banks and insurance buildings have been erected and a large amount of residency work of good character has been done. With few exceptions the architects have had their hands full of work, and in some instances have found great difficulty in procuring office assistants, which, as already stated, indicates that the season has been an unusually busy one all over the Dominion and continent. The increase of population in Toronto has wiped out the effects of the overbuilding done a few years ago, so that houses are in steady and urgent demand. Desirable office accommodation is also at a premium, and the coming year is likely to witness the erection of one or more large office buildings.

Heating Methods. Great improvements have been effected in recent years in apparatus and methods of heating buildings. By means of various present day systems it is possible to maintain an equable temperature of say 70 degrees throughout all parts of a building with the outside temperature at zero, thus ensuring a high degree of comfort in winter even in a cold climate. The ideal condition will not have been reached, however, while coal continues to be employed as fuel, involving as it does so much labor. The inroads which electricity has made as a competitor of gas for interior lighting, has induced the gas companies to encourage the use of gas for cooking purposes. So profitable have been the results in this direction that the loss of a large lighting business is regarded with a degree of complacency. It is to be hoped that the gas companies will go a step further and furnish the means whereby gas could be used instead of coal for the heating of buildings. At present every building is a gas works on a small scale, having in the basement a furnace and system of pipes and a pile of coal with which to produce heat. How much better it would be to have the gas produced and supplied ready for use from a central station, as in the case of illuminating gas. In view of the constant reduction in demand for illuminating gas, it may eventually be that the gas companies will supply gas of a lower grade for heating and cooking purposes, which by means of apparatus on the premises can be so enriched as to be also adapted for lighting when required.

The Gommercial Age Commercialism is stamped upon almost everything to-day, This age will probably be known in history as the Commercial Age. The people generally are so engrossed in money-making that the accomplishment of great things in other lines is scarcely to be expected. Almost every article used or worn is made by machinery, much of it by automatic machinery designed to produce the greatest quantity with the least expenditure of time and cost. The occupation of the skilled workman is to a large extent gone. Young men with original ability to make good carpenters are put to feed a machine, and as a natural result in time themselves become machines without the ability to devise or execute any work requiring the use of either brains or skill. May we not expect that after two or three generations of such men shall have passed the standard of intelligence and ability will have sunk to a deplorable level? Already complaint is heard from architects and builders of the difficulty of securing skilled workmen capable of doing the finer and more important features of their work. One after another the older workmen trained in Europe are dropping out of the ranks, and none are found qualified to succeed them. Opportunity is no longer afforded youths of acquiring knowledge of a trade. In the shops and factories of to-day the work is specialized to the greatest possible degree, and machinery employed wherever possible. Everything is sacrificed to cheapness of production and individuality, ambition and skill on the part of the workman finds little encouragement. Is it any wonder that there is so much that is not genuine in the construction and finishing of modern buildings? The stores are filled with shoddy goods; for example furniture, which is a cheap and nasty imitation of honest wood and covering which could not be sold for double the price. The taste of the masses of the people is being perverted, and they are encouraged by means of these cheap and showy wares to enter into foolish and ridiculous competition in mode of living with their neighbors and people with larger resources. Out of this competition has sprung the instalment plan stores, which are the worst offenders against frugal and common-sense living. It is undoubtedly true that the cheapened cost of production of many articles due to the increased use of labor-saving machinery has placed these articles within reach of and added to the comfort of the masses. Against this, however, must be placed the degeneracy of the artizan and the perversion of taste already referred to.

Mr. Andrew Carnegie is said to have given away up to date the sum of $11,254,500 towards the erection of public libraries.

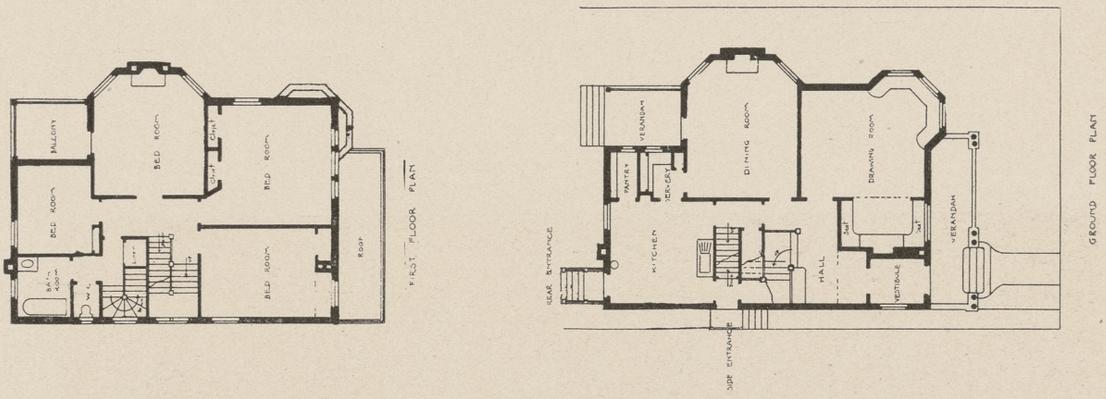
The funny man of the Toronto Star rises to remark that those new elevators in the parliament building will be used when they wish to give a measure the six months' hoist.

Mr. Thos. M. Morgan, whose cement works at Longue Point, Que., were recently damaged by fire, claims that the concrete walls built two years ago came out of the fire almost intact.

MODERATE COST HOUSE IN TORONTO.

MESSRS. SYMONS & RAE, ARCHITECTS.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
NOVEMBER, 1901



House on Huron Street, Toronto.

Messrs. Symons & Rae, Architects.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER.
NOVEMBER, 1901

NOTES OF A VISIT TO BOSTON AND NEW YORK.

My journey had no professional motive ; but, where there are so many good buildings, one cannot fail to have noticed something worth reporting in notes such as the Editor wishes me to make.

I broke the journey at Albany both going and returning. Besides other reasons, there are two points about Albany that make it interesting to a Toronto person. It is situated on a hill and it is built in rows. To sit at breakfast in my hotel and look out upon a steeply ascending street, with all the variation that this implies in base and sky lines, was in itself a treat to one accustomed to see everything on a dead level, but in the streets themselves, closed at the bottom with a view of the hills across the Hudson and crowned with the State Capitol, the beauty of a city set on a hill was still more apparent. As to buildings in rows, I must confess to a liking for it. A city is a city when it is built solid, and dignity is so much more easily attained. When there is only one front, the expense of good material is compassable. Even with plain material success is easy. Then the convenience ! There are no distances. The best residences are from five to ten minutes from the shops, and the best shops are all together in a block or two. One can do in Albany in less than an hour what would take a morning to accomplish in Toronto. The Capitol is five minutes from the railway station, the Park fifteen ; there is nothing beyond, and one includes the shops on the way to the Capitol. Yet Albany has a population of 95,000. So much for compactness in a city.

This note is not without application in a city which, like Toronto has grown so far beyond the limits of convenience that a consolidation of residences within the region of the Belt Line would be a great gain.

There are many interesting things in Albany. The Capitol and City Hall are well-known, but one hears less of the cathedral; yet it will probably, when complete, hold its own in point of design with either of these buildings and is far more interesting both from its nature and as a remarkable example of how to build a large church that cannot be completed in one generation. It has been usual to build one end, the chancel or little more—to put up, with contracted floor space, that is to say, and spend resources in completing it vertically. Bishop Doane has adopted the more satisfactory plan of enclosing his whole floor area and limiting his building in height. It sounds unpleasing, but is carried out so that there is no sense of loss in height. The stonework is complete up to the sill course of the triforium. The triforium wall will be double, consisting of an inner half of stone to show in the church, and an outer half of brick, which will be hidden in the aisle roof. This latter portion is built now and, by putting the temporary aisle roof below it instead of above it, the brick triforium wall is converted into a temporary clerestory of brick. From this the temporary roof of rough timber springs, as the vaulting will ultimately spring ; and, as the lines of the roof follow very much the lines the vaulting will take, and the roof rises to the same height, the proportions of the interior are perfect now. This is the principal thing. The eye is satisfied with a sense of sufficient height, without desiring to penetrate the comparative gloom of the roof. At its natural level all is complete : carving stained glass, stone pulpit, wrought iron screen, choir stalls, altar and reredos. And, what is more important than these details, the plan is complete ; so that the whole effect of aisle and ambulatory arcades with their pillars, (seven feet across the greatest diameter) is there. There can hardly be a nobler church in the country, although there is work yet to be done which is estimated at over $300,000.

The way in which the work has been done is also instructive. A church building is especially susceptible of division into parts and of estimation by parts. By subdivision of the work in this way every pillar, column, window' portal, and of course the furnishings and accessories, have been provided by separate hands, by gift or collection of the cost and many Albany families have in this way become provided with an enduring memorial, duly carved upon the stone as a portion of its decoration. A list of the remaining works hangs in the porch, with the estimated cost set opposite, so that anyone, who has money to give or to bequeath,can take his choice of works, ranging in cost from $1,500 for a buttress to $70,000 for the towers and spire

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Boston is a beautiful city ; there is no doubt about that. It always had beautiful suburbs and a beautiful nucleus, in the Common ; now they have connected the suburbs with the Common by continuous drives ; all of which is well known to the readers of this journal. But what struck us as an extra to our expectations was the extreme neatness of everything. This was an essential part of the city's beauty, and an aim in this direction has evidently got to go hand in hand with the aspirations, of which we usually hear most, in the direction of parks and squares and statues. New York is squalid beside Boston, because of its dirt. Fifth avenue was filthy. There may be extenuating circumstances in the near neighborhood of the excavations for the Fourth avenue subway ; but whether regarded as temporary or permanent, the untidiness of the streets detracted very much from one's sense of pleasure in viewing the buildings. A city is very like a horse, it must be well groomed to look its best.

Another essential part of the beauty of Boston is the absence of vulgar bustle. Once upon a time there was a continuous procession of street cars along two sides of the Common. Now there is not a street car to be seen in that neighborhood ; yet, by entering a small, unobtrusive building at the corner of the Common next to the business streets; and going down a flight of steps, one can take his choice of direction. Cars for all parts of the city, which have already discharged at another platform, draw up for passengers and depart continuously. In the streets above there is peace and quietness ; and this is another important factor in the beauty of Boston. The " City Beautiful " cannot have tram cars moving through its streets.

Boston has an additional advantage in the way in which its districts are massed, so that business has one solid quarter to itself, and beauty, as represented by the best residences, another. And the outer fringe of the residence quarter is in touch with the park system, so that the rich suburban resident can drive all the way from home to within a block or so of his place of business without mingling with commercial traffic. It is partly on this account that one receives so unbroken an impression of Boston as a beautiful city. When we took a trip into the old town to see Christ church—one of those delusive investigations of historical scenes,

by which the picture of the imagination, true in conception however unlike in minor details, is forever dissipated by an intrusive recollection of the present scene, to which time has usually brought a change which is at variance with its former state. In the case of Salem street, Boston, along which Peter Faneuil and other distinguished colonials once went to church in silk truffles, the place now swarms with Jews, and the street seemed to be inches deep in a litter of paper. If such districts adjoined the beauty part in Boston as they do in many towns, so that one was conscious of their neighborhood, it could not but disturb the impression of elegance, which in Boston is unbroken. But it is only the English tourist who finds his way to the old town (though Christ church is well worth seeing). A person with an office near the Common, and a home in the Back Bay or the suburbs beyond, may live from one end of the year to the other, if he wishes, without contact with ugliness or uncleanness. If that is the end that is desired in the present agitation for beautiful cities, the general plan of Boston may be taken as an illustration of the truth that a city, like a house, if it is to be perfect, must have its working parts combined by themselves, and its living parts combined by themselves, as broadly as possible and in contact only where necessary.

It is remarkable how Richardson's pre-eminence has been challenged by the general advance in architecture. The solidity and excellence of workmanship, for which he was once so conspicuous, have now become ordinary, and his refinement, which was real, but in the large way—the refinement of "an oiled and curled Assyrian bull"—is surpassed, in the work of his descendants, by a refinement more in scale with modern life. In a great work like Trinity he still shows up in his greatness. It is a pity that the porch was not built at the same time as the church, when Richardson was young and developing his style, instead of when he was old (in growth if not in years) and his work was passing into the period, which comes to all original art, when development is at an end and degeneracy begins. The porch of Trinity is an offshoot, not of Richardson's growth but of his success, and more than anything in his own work resembles, though in a better way, the work of his imitators.

It is worth noting how the interior has been injured by the gloom into which it has been thrown by the use of Tiffany glass. The transmission of light appears to be a secondary consideration with the American stained glass worker. As long as the window is sufficiently translucent to show its color he seems to ask no more. The result in Trinity church is a loss greater than the gain of the windows which, from their unreligious character, is in any case doubtful.

One cannot conclude the notes of a tour in the big cities in the United States without some reference to the high development of the hotels. Bathrooms and fixed basins in connection with the bedrooms is an old story now, but still the greatest comfort. The latest invention appears to be directed to means of communication between the bedroems and the office. In one hotel we found on the wall a long list of possible requirements with a moveable pointer attached. Anybody or anything, from the manager to a glass of ice water, if one simply pointed at its name, forwith came knocking at the door. The simplest and best arrangement was a telephone in each room. One had only to "speak in an ordinary tone of voice" for what one wanted. The best of such an arrangement is the ease with which a party of travellers can communicate with one another. There is nothing to prevent an early morning explorer speaking from a telephone exchange a mile away to the rest of his party, in their bedrooms, about breakfast.

No invention will, however, make an American hotel comfortable until the one great invention has been made by which it will be made impossible for the heat to rise above a certain point. A procession of marble halls are of small comfort to the traveller as long as they are heated so that he is driven from his hotel to walk the street, a houseless wanderer.

W. A. Langton.

BY THE WAY.

I was pleased to observe the protests made in the Toronto press recently against the advertising signs which this year began to make their appearance in Muskoka. Among the offenders of good taste in this direction was a prominent Toronto jewelry firm. Every visitor to the Muskoka Lakes should join in this protest against the commercial enterprise which in the pursuit of gain would destroy the beauty of one of Nature's masterpieces. The violators should be made to feel that the placarding of this beauty spot is calculated to alienate rather than attract customers.

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The British architectural journals contain references to a series of tests of ventilating cowles by a committee of the Sanitary Institute. A singular feature in connection with these tests is the fact that they are said to be a continuation of tests made under the same authority twenty-five years ago. Why they were not completed when originally begun, and why so long a period was allowed to elapse before they were revived, are matters regarding which no explanation is given. It is also singular that even now the tests are criticized as being of little real value owing to wrong methods of procedure and the failure of the committee to include cowles and ventilators of modern design.

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Old London Bridge, around which so many historical incidents and associations linger, is to be widened by 12 feet, to accommodate the ever-growing traffic. Statistics show that more than 100,000 persons and 22,000 vehicles pass over this bridge each day. It is proposed to devote 9 feet of the extra width to the use of foot passengers. The bridge rests on the wooden piles of an older bridge, and soon after it was reared, in the 'thirties of last century, the foundations made an unequal settlement. The defect was put right, and the present architects are confident that the new burden can be safely added. The alteration is expected to occupy three years and to cost £100,000.

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In company with an architect I was examining and admiring a photograph the other day. My companion remarked that the excellent shading in the picture was largely due to the use of white paint on parts of the building. Out of this arose a conversation on the sudden revival of white paint for exteriors. This revival came as a natural accompaniment of the return to favor of the Colonial style in architecture. Its appro-

priateness to buildings designed in this particular style, is as clearly apparent as is its misapplication to buildings of every class. The man who paints white his gothic fronted house on the strength of the pleasing impression made upon him by the effect of white paint on the broad overhanging eaves of his neighbor's residence, will suffer a severe disappointment. Like many other good things white paint is "all right" when put in the right place, but is "all wrong" when placed otherwise. Just here comes in the difference between the trained and the untrained architect or painter—the one knows with certainty what materials and methods will secure a pleasing and satisfactory result, the other guesses at it, and misses more often than hits the mark at which he has aimed.

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Mr. Harry Hems, the well known sculptor, of Exeter, who was in South Africa last year, contributes to the British Architect some impressions of the building materials and methods in use in that country. Under this head he says :—"The bricks at Cape Town were the most rotten things I ever saw in my life, and the building, for that matter, more particularly outside the actual capital, is precisely as bad. Buildings appear to be carried up rough, cheap, and very nasty, the wretched bricks being laid in clay mortar, and then their faces slobbered over with plaster. Foundations are built of stone rubble ; also with so-called mortar, which is, pure and simply, clay. Stores and large business places are carried up with the same horrible bricks just as roughly as humbler edifices, the walls afterwards being covered over with red plaster, and then pointed down to imitate proper brickwork—all artificial and a sham ! There appears to be no recognised Building Act or by-laws. The municipal authorities have a few simple regulations and rules, but they are practically totally ignored. Fiar clay, I am told, is to be found on the Cape Flats and the kaolin in the Cape district, but I confess to never having seen it. On the other hand, in Natal—'the Garden Colony'——splendid red bricks are to be seen in many parts. At Pietermarizburg I was much struck with the excellence of the bricks and the capital manner in which they appear, almost invariably, to be laid. At Mafeking, in Bechuanaland, I found the bricks mostly in use to be simply sun-dried—made of a mixture much like Devonshire "cob"—and each measuring about two feet by one foot by one foot. The Post Office, for instance, at that gallant little place is built of these big unburnt bricks. As one gets farther north the cost of building materials naturally increases. At Bulawayo, at the time I refer to, fair bricks could be procured for 70s. a thousand ; whilst at Gwelo, rather more than 100 miles further on towards Salisbury, the same kind of brick cost £6 a thousand."

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Scientists connected with the Dominion Department of Agriculture have been working upon what promises to be a very interesting discovery, namely, that all objects in nature are covered with a very thin coating of liquid air. It appears, according to this idea, that the walls of houses, the furniture of rooms and the ground over which persons walk are all spread over with a thin film of air in this highly concentrated state. The basis of this theory is the fact that any solid has the property of condensing upon its surface gases or the vapors of liquids, such as the water vapor of the atmosphere. If the wall of the room is touched with the finger it encounters, not the wall itself, but a film of gas that covers it. This film is not composed of one gas however, but of several, the molecules of which have adhered to the surface of the wall. In addition to the water vapor there are oxygen, nitrogen and carbonic acid gases. Taking them all together they go to make up something which would probably, if one could analyze it, be indistinguishable from liquid air. These gases, together with more or less water vapor, say the scientists compose the air of the room. The molecules are darting about in every direction, and as they come in contact with the wall some of them adhere to it. Countless numbers of them together, it is held, form the thin film described. To get rid of the thin film of liquid air, it is stated, one may employ heat, and by raising the temperature of the wall the coating of gas may be thinned gradually until it is entirely driven off.

THE NECESSITY OF CARE IN EXCAVATING.

The importance of careful work in excavating and reinforcing old foundations and preventing all chance of undermining them when disturbed is demonstrated, says the Engineering Record, by a recent accident to a building on East Thirty-fifth Street, New York. A new cellar was being carried down about 10 feet below the rubble foundations of the brick side wall of a four-storey brown stone front residence. The excavation was made up to a vertical plane in the face of the existing wall through very soft rotten stone which could be crumbled in the fingers. No sheeting or underpinning was attempted, and no support was given to the building except by some horizontal cross-braces between its side wall and the adjacent building on the next lot, reaching across the excavation, and some of them bearing against the middle of the wall between floors. The side of the excavation caved in, leaving a sloping bank with a steep angle running back several feet into the basement of the house and carrying out about 20 feet of the footing and a section of the wall above, about 10 feet high in the middle. Fortunately the wall was of such good construction that the bricks arched and carried the upper part over the opening without causing the collapse of the whole building. Pairs of long steel I-beams were immediately set as needle-beams to carry the wall above the break, and were supported on vertical wedged shores from the bottom of the excavation and on jackscrews set on longitudinal sills on the basement floor 10 feet or more back from the wall so as to be beyond the crumbling edge of the bank. The wall was thus held until underpinned.

TORONTO ENGINEERS' CLUB.

The Club has resumed its weekly luncheons and has changed the day from Saturday to Monday. At the regular meeting on December 5th a discussion will be held on "Wireless Telegraphy" introduced by Mr. T. R. Rosebrugh, of the School of Practical Science. At the meeting on the 19th of December, Mr. W. H. Tatton, Chief of the Railway Signal Service, will give a paper on "Interlocking Railway Signals."

ONTARIO ASSOCIATION OF ARCHITECTS.

A water color class has been organized under the direction of Mr. C. M. Manly, the well known water color artist. The class will meet in the Association rooms every Saturday afternoon at 2 o'clock. Quite a number of persons have already joined. The first meeting was held on the 23rd inst.

The weekly luncheons in the Association rooms every Tuesday have been successfully continuod throughout the summer, and since the close of the vacation season, the attendance has steadily increased.

PRESERVATION OF STEEL STRUCTURES.*

BY W. CHAMBERS, C.E.

In speaking of engineering structures our thoughts naturally turn to those Titanic erections spanning the rivers and estuaries round our coasts, supporting a flying freight of human life and valuable merchandise, of which the most notable example is the great Forth Bridge ; and we have to bear in mind that in every steel structure, be it of lesser or greater magnitude, corrosive forces are at work to weaken and even to endanger its stability, and it may truly be said of steel that as the "force of gravity never sleeps" so "corrosion never ceases." It behoves us then to see that proper measures are adopted to counteract this evil.

The object in applying paint is twofold ; first to protect, and incidentally beautify. The medium in general use, namely, white lead, in its pure state contains 70 per cent. carbonate of lead and 30 per cent. hydrate of lead, and is manufactured by subjecting metallic lead to the corrosive influence of vinegar and the fermentation of tan bark. Being frequently adulterated with carbonate and sulphate of lime, it can be tested in a simple manner by placing some of the powder on a piece of charcoal, when by applying a flame from an ordinary blowpipe, it is, if pure, soon reduced to a metallic mass ; if adulterated, however it forms a black cinder-like substance, and even small quantities of an adulterant can be detected in this manner.

White lead is not a very stable body, and, when exposed to sulphurous fumes, is changed from a carbonate to sulphide of lead ; and it has been proved by long experience that when mixed with oxide of zinc, it has increased durability, improved spreading power, easier working qualities, and greater permanency.

Red lead is obtained by calcining and oxidising white lead. It is of considerable specific gravity, and forms the basis of a durable paint. To test its purity it should be dissolved in dilute nitric acid, when any deleterious matter will remain as a sediment.

Ferric oxide does not take a high rank as a protective agent, although its cheapness and good colour give it an intrinsic value. One authority on oxide of iron as a pigment for coating metal says it is actually dangerous for that purpose, as it only combines with oil in a mechanical way, and is adversely affected by the sulphurous fumes from locomotive smoke. To test ferric oxide paint, a small quantity should be heated and ignited to burn off volatile matter ; if the residue is placed in hydrochloric acid the ferric oxide is dissolved, leaving any solid matter as showing the extent of adulteration.

As already stated, the object in providing a covering for metal is to exclude moisture and to protect it from the atmosphere, which is always damp.

Linseed oil is a component part of ordinary paint, but cannot be used without a pigment, as when drying it becomes very porous, and under the microscope resembles the honeycomb appearance of a piece of tripe.

Raw linseed oil contains 5 to 8 per cent. water, also impurities called "mucosities," composed of vegetable albumen and mucilage, which prevent drying. The raw oil requires 5 to 6 times as long to dry as does the same oil after it has been boiled. The heat then evaporates the water, and throws down the impurities that would otherwise decay and generate acids that would attack the oil in the paint. The changes that occur when boiling linseed oil are complicated, and have not been clearly defined by chemists. We know, however, that during the boiling process, by the addition of sulphate of zinc, muscosities are thrown down to a notable amount ; also that the counteracting effects of other oxidisable substances, such as umber, litharge, oxide of lead, and peroxide of manganese, when added, increase the oxygen-absorbing power of the oil. The addition of about 1 per cent. of the above elements, and injecting a current of air when boiling, evaporates the water, precipitates impurities, and evolves fumes that otherwise would become injurious to metal surfaces. Where paint is used as a protective medium several coats have to be applied, each to fill up the porosity of the previous coat.

The necessity of only employing pure pigments is manifest, as thousands of tons of deletrious matter are annually sold, such as burnt ore containing an appreciable percentage of copper salts and free sulphuric acid, such as is obtained from burning iron pyrites. To counteract their acid tendencies chalk is added, also Spanish white—which is another chalk preparation—and Spanish brown, an earthy substance, principally clay.

Other materials of a harder nature, such as silica, graphite, barytes, ground slate, brick-dust and kindred substances do not combine with the oil, and form only a mechanical mixture with it, and after its bi ding effect has become dissipated by atmospheric influence, nothing but dust remains, which is readily dispersed, leaving the metal wholly unprotected.

So much depends upon the proper application of any protective coating that an ill-important element is to have the surfaces, in the first instance, clean and free from rust. Where rust spots are deep seated, heat from a painter's torch should be applied, when in a few seconds the rust is converted by the heat into peroxide of iron, and can be readily dusted off. No coating of any kind will properly adhere to greasy, rusty, or dirty surfaces. These should be either burnt, to remove old or blotchy paint, or scraped and washed with soda lye to remove grease or dirt, and all mill scale carefully removed.

After repeated examination of several materials, I have ultimately found a coating that answers all modern requirements. It is dense, i.e., non-porous, elastic and durable ; not affected by extreme heat, is easily applied, and presents a good, even and smooth finish. Its covering power is considerable, 1 gal. being sufficient to cover 1,000 square feet. It is known as "Carbonising Coating," and has powerful adhesive qualities that ensure absolute protection to the metal. It is unaffected by sulphur fumes, acids, and ammonia, successfully withstands high temperatures, and cannot be readily removed by abrasion.

As an indication of durability, it is being adopted by the Indian Government for the preservation of buildings exposed to the heat and damp of tropical climates. This material should prove invaluable for preserving intact such steel structures as may be carefully coated with it ; also for maintaining intact the scantling of the beams and girders now largely incorporated into building construction, and so secure their durability and stability by ensuring them against rust and decay.

The great Forth Bridge has an exposed area of 145 acres, requiring 100 tons of paint to afford only one coat. When completed, three different kinds of paint were tried—one on each cantilever ; and as an indication of their shortcomings as protective coatings, it is stated that 90 men are permanently engaged in scraping and painting the immense structure, and that the work cannot be done with fewer hands, thus indicating in a striking manner that the selection of a suitable protective medium is not the trivial detail that many suppose it to be.

*Abstract of a Paper read before the Belfast Engineering Association.

INTERCOMMUNICATION.

[Communications sent to this department must be addressed to the editor with the name and address of the sender attached not necessarily for publication. The editor does not hold himself responsible for the expressions or opinions of correspondents, but w ll, nevertheless, endeavor to secure correct replies to queries sent in. We do not guarantee answers to all queries, neither do we undertake to answer questons in the issue following their appearance.]

From " Young Contractor " :—I have three or four houses to build in a small town, and the owner has not quite made up his mind about the kind of roof to put on. He hesitates between a shingle roof and a flat roof covered with galvanized iron. I maintain the flat roof is nearly as economic as a shingle roof and for street houses, is much better. Am I right?

ANS. :—The cost of a good shingle roof covered with No. 1 white pine, with mortar on asbestos paper under the shingles, at the present time is very high, and when we take into consideration the fact that a shingle roof no matter what the pitch may be—covers a greater surface than a flat roof, the comparative cost per square is no criterion to go by. A good shingle roof completed including roofing boards, rafters, ridges and cornice, will cost on an average, $6.50 per square, while a good galvanized iron roof, including timbers, matched deck paper under iron flashings and finishing, will cost about $12 00 per square. But, it must be remembered, that a shingle roof will measure from one and a half to one and three quarters more squares than the iron roof would, which would make a considerable difference. Then again, there are no gables required for a flat roof, while a shingle roof, unless it is a hip-roof must have two or more gables, which adds materially to the cost of the shingled roof. In practice we believe, that for town houses, it is considered about as cheap to make flat roofs as to build shingle ones, and the flat roof has many advantages over the saddle back, or the hip-roof.

From N. P. K. :—How many 1⅜ inch panel doors should a good man fit and hang in a day of nine hours? Also, how many mortice locks ought a man to fit and adjust to the same kind of doors, in a day of nine hours?

ANS. :—We do not know of any standard number of doors a man ought to hang in a day. Situations has something to do in the matter. If the doors are near together, and of the ordinary size, say 2-10 x 6-10 or thereabouts, a man will hang more than if he has to run all over a building hanging a door here and another some distance away. Experience has taught us that, on an average, it takes an hour or an hour and a quarter to fit and hang a door properly. From this it will be seen that from seven to eight doors will be as many as a man can possibly hang well in a day of nine hours. So far as putting on a mortice lock, and trimming it complete is concened on inquiry, we find that it takes from 25 to 40 minutes, providing the workman has the proper tools to do the work with. Estimators generally allow 75 cents for hanging and trimming an inside door, and $1.00 for outside doors. This covers profit and labor.

From "Dauber" :—I agreed to do a certain amount of painting for a gentlemen, and as there was nothing said as to what kinds of paint I should use, I supplied "ready-made paints," such as is in common use in this neighborhood, and during the work he found no fault, though he knew the kind of paints I was using; now he declines to pay me in full because I did not use white lead and linseed oil, and mix them myself. Have I not a just claim for the whole amount as specified in our agreement?

ANS. :—If you have filled the contract honestly and the owner had no other fault to find than that you used mixed paints, and if this color was of a reputable brand, we are inclined to think you have a just claim and can recover by law.

From " Owen Sound " :—Please inform me of a good method of mounting blue-prints?

ANS. :—Get fine book board same as used by bookbinders, cut to size with a hand saw, sand-paper the edges, mix powdered paste in cold water to the consistency of cream, which can be readily done with the fingers. Let the print soak in water for a few minutes, after which place it face downwards on glass and with blotting paper remove all surplus water. Apply the paste with the fingers making sure the entire surface is thoroughly covered with a thin film only. Lift the print by grasping the ends by thumbs and fore-fingers, reverse print and let it settle quietly on the mount by a catenary curve, then bring down ends with a piece of paper under the palm of the hand, remove all air spaces by pressure from the centre to the edges. Allow the mounted print to dry slowly with weights on the edges to prevent excessive warping. When dry, apply two thin coats of white shellac varnish.

From O. I. T. G. :—I have a house to build that contains 12 windows having transom lights in them, and I would like a ready way of making frames for same. The building is a baloon frame, boarded, papered and sided outside, and lathed and plastered inside. The sashes are double hung, the transom lights are hinged at the top. A sketch showing an economic way of making the frame will be appreciated.

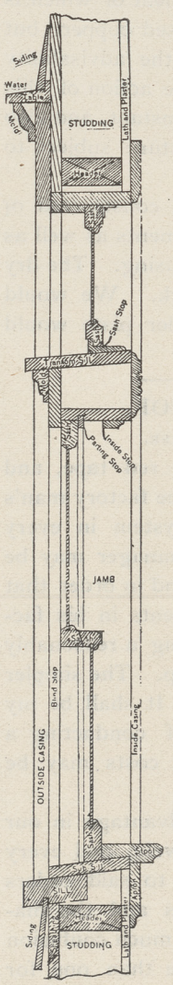


FIG. 1.

ANS. :—The method shown in the annexed sketches is about as quick a one as we know of compatible with efficiency. Fig. 1 exhibits a vertical section of the frame and sash in place, showing the mode of construction throughout, the transom being made of thin stuff nailed together. It would be better if the transom was made solid, and mouldings worked on it, but these would cost more perhaps than you would wish. The box for weights may be built up similar to the transom, or it may be built up after the manner shown in examples given in this journal some time ago. The window stud may be left as a backing for the frame, thus saving the back lining.

From W. B. T. :—In making out an estimate, is it the better way to first reckon up amount of material required, and then add cost of labor, or to estimate on labor and material together?

ANS. :—This will depend altogether on the character of the work. In wood-work it is always best to get the quantities and their cost, then add cost of labor. This mode is necessary, because of difference in quality both of material and labor. The same rule obtains to some extent with the work of the tinsmith and the plumber, but with the mason, the bricklayer, the plasterer and the painter it is usual to estimate labor and materials as going together, as the mason will charge by the cubic foot or the cord, or perch as the case may be. The bricklayer has his rate per 1,000 bricks, the plasterer and the painter charge by the yard super. which rates include material and labor. There are, of course, some cases where all these tradesmen charge for material only, and for labor only, but the rule is that their prices include everything.

From J. V. :—In laying hearth tiles is it proper to commence in centre of hearth? I am aware that in laying down tiles over large areas it is the correct thing to start in the centre and work to the edges.

ANS. :—If the tiles for hearth have an ornamental centre, it will be best to begin laying in the centre; if tiles are plain, it may be best to start on the edges providing the space takes in the tiles without cutting.

H. H., London, Ont., writes :—Could you kindly tell me what effect hot water will have on cement? We are constructing a shallow tank about 8 ft. x 15 ft. and about 8 in. deep. There is no water in the tank except such as is obtained by condensation or sweating of pipes, but it contains steam pipes, the heat of which is constantly varying. Hitherto I have used copper, but would like to have your opinion, as to the advisability of using a thin layer of cement and the action of this cement under dry heat which is not constant, and also the action of the cement under moisture subject to intermittent heat?

ANS. :—It is our opinion that a tank constructed of cement would not answer your requirements as well as the copper tank which you are now using. The dry heat would cause the cement to crack. We would suggest that a tank constructed of boiler plate would be most durable and satisfactory.

METHOD IN THE SHOP.

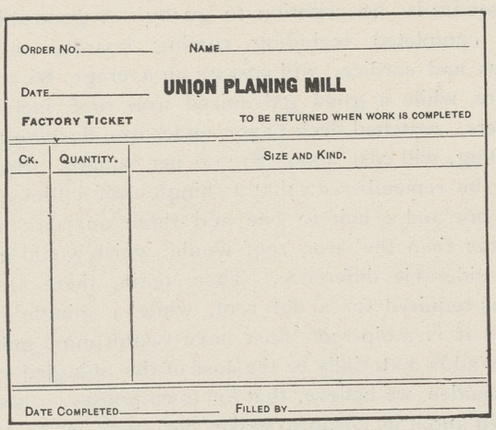
BY H. T. G., IN THE WOOD-WORKER.

We all have a natural antipathy to red tape, and justly so. Red tape is the bane of the factory man's existence ; and yet we must have system in every well-conducted business, so that the manager may be manager in fact as well as in name, and in order that he may know how the various departments in his factory are being conducted, besides having a reasonably clear idea of the profits of such shop. The simpler the plan, the better for all concerned. It shall be my purpose to outline a simple system of conducting a wood-working establishment, so that costs may be figured and work indexed for reference.

1. We have found it of great advantage in our factory to number all orders consecutively, and every order ticket or shipping slip referring to said orders bears the same number. The saw bills and the material also are numbered, thus avoiding much confusion of orders, especially when there is more than one for the same customer. Another advantage is found in keeping the time and materials and in checking up invoices, the order number explaining what job the material is used on. It is very convenient to index the order book for reference to back orders, and the time thus employed is well spent.

2. Have all order slips returned to the office as soon as any piece of work is finished, so that shipping orders may be in the hands of the shipping clerk as soon as possible. This prevents delays and enables the one in charge to keep the work well under control. The shipping ticket, if marked so as to indicate by name of shop or the workman's initial, where the various articles may be found, will facilitate shipping and avoid numerous questions.

3. The shipper should each night return all slips for goods delivered during the day, and the orders be checked up and priced for billing the next day. Have a place on the slips where the name of teamster and date are filled in, so that if any claim of shortage or error


ORDER NO._____ NAME_____

DATE_____ **UNION PLANING MILL**

FACTORY TICKET TO BE RETURNED WHEN WORK IS COMPLETED

CK.	QUANTITY.	SIZE AND KIND.

DATE COMPLETED_____ FILLED BY_____

SHOP ORDER SLIP.

should come in there is a record of when the goods were sent and by whom. The driver also has a trip ticket, which he requires the consignee to receipt for his material ; that is, when anybody is on the job to give receipt. These trip tickets are filed away as they are returned, and help to settle many a dispute.

4. It is well in consequence to assort and file all old factory and shipping tickets, and preserve for about a year, as there are often notations or sketches on them that are not found in the order book, and they prove helpful in duplicating an order or investigating a shipment. The advantages of slips over shop order books is evident in the method of filing, the returning of slips to the office, and the convenience of handling small orders ; besides, it avoids confusion to have orders accompany the goods. In shipping house trim, the shipper can check the goods from the factory ticket and avoid the possibility of part being forgotten.

The expense of such a system is light, as no elaborate style or quality of ticket is needed. The time saved by obviating the waiting for, or running back and forth after order books, and the convenience of making out orders at any time without delaying any one, more than pays for the slight cost of the tickets. Indeed, it is a question whether the cost of good, durable books would not equal that of the slips. After having used this system it would be hard to persuade one to go back to the books again. Herewith is a copy of the order ticket, which is of tough manilla paper, about 7 inches long and 5 inches wide. Shipping slips are ruled the same, but on white instead of buff paper, to avoid confusion.

RITES AND CEREMONIES CONNECTED WITH BUILDING.

All about us, in the present enlightened age, are customs and ceremonials connected with building that had their origin in the far back pagan days, says the Architectural Record. They have been handed down from generation to generation like the unwritten rituals of a great secret order. When our public buildings are dedicated and public functionaries lay the corner-stone with silver trowels, we are simply following out the customs of our forefathers, with such modifications as the advance of civilization has made necessary.

The study of the customs which have attended building in the various ages is a most attractive one. Mr. Lewis Dayton Burdick has recently published an extremely interesting book on "Foundation Rites, with Some Kindred Ceremonies ; a Contribution to the Study of Beliefs, Customs and Legends connected with Buildings, Locations, Landmarks, &c.

HUMAN FOUNDATION SACRIFICES.

In Alaska, before the United States began to govern it without its consent, human foundation sacrifices were common. Among the Dyaks of Borneo, when a house was to be built a big hole was dug for the first post, which was suspended over it. A slave girl was dropped into the hole and crushed to death. The kings of Burmah buried four human beings alive at the corners of their capital, that their spirits might keep watch and ward off invasion. In the Japan of the seventeenth century, when a great wall was to be built a slave would voluntarily lie down in the trench and be crushed to death by great stones lowered upon him. Many times in Asia there have been popular panics caused by the fear that the old foundation customs were to be revived. As the Siberian railroad drew near the Chinese frontier, there was a great hullabaloo in Pekin. It was rumored that the Russian Ambassador had asked her Humanity, the present Chinese Empress, for a couple of thousand children to bury under the rails. There was a similar scare in Calcutta when the Hoogly Bridge was building. The natives got it into their heads that after long refusal Mamma Ganges had agreed to be bridged on condition that each pier should rest on a layer of children's heads.

Ultimately animals and animal and vegetable products were offered instead of human beings. That Naples is built on an egg is known to all readers of the mediæval legends about the great enchanter, Virgil. A tallow candle was built into the wall of St. Osyth's, Essex. A chicken, cock, lamb or something else takes the place of a slave or other human victim. There is a Russian folk-belief that the first person to enter a new house will die within the year unless an animal is killed and buried when the first stone is laid.

CURIOUS CUSTOMS.

"In modern Greece," Mr. J. G. Frazer tells us, "sometimes, instead of killing an animal, the builder entices a man to the foundation-stone, secretly measures his body or a part of it or his shadow, and buries the measure under the foundation-stone ; or he lays the foundation-stone upon the man's shadow. It is believed that the man will die within the year. In the island of Lesbos it is deemed enough if the builder merely casts a stone at the shadow of a passer-by ; the man whose shadow is thus struck will die, but the building will be solid. A Bulgarian mason measures the shadow of a man with a string, places the string in a box, and then builds the box into the wall of the edifice. Within forty days thereafter the man whose shadow was measured will be dead and his soul will be in the box beside the string, but often it will come forth and appear in its former shape to persons who were born on a Saturday." In these cases the shadow is the life, soul or strength, according to a common article of primitive faith no harder to believe, perhaps, than most other things are.

A ROUMANIAN FOLK-TALE.

But let us borrow a Roumanian folk-tale from Mr. Burdick. Radu the Black had promised Manoli and the other masons gold in piles and titles to burn if they would build him the fairest palace ever seen ; but if it was not up to specifications, he swore that the bunglers should be walled-up in his monastery. Four days the masons worked, there being no union to prevent them. Four nights all that they had built tumbled down—toppled over, we may believe, by the walking delegates of the devil. On the fourth Manoli had a dream of dread. A voice had sounded in his ear that every night would undo the toil of the day if the masons did not build, living, into the wall the first woman that should come upon them. Manoli told his dream to his fellow workmen. All took oath to obey the voice. The next morning Manoli, full of black presentiment, stood upon the scaffold and watched the country round about. His wife, Flora the beautiful, was coming with his breakfast. He held her in his arms while the wall of death was rising around her. When she could be seen no more he could just hear her moaning faintly : "Manoli, Manoli, the wall is pressing on me and my life is dying out." And now the palace stood solid. Soon it was finished, magnificent, a wonder of the world. The masons stood upon the scaffolding awaiting Radu and the glorious wage.

By the prince's command the props of the scaffolding were knocked away and the masons dashed to death. Manoli clutched a projecting carving and would have saved his life had he not heard just then from beneath the wall the feeble moaning voice : "Manoli, Manoli ! the cold wall is pressing on me ; my body is crushed ; my life in dying out." So down among the dead men let him lie ; and serve him right.

There are some ceremonials still followed in building that it would be worth while to study closely. Such, for instance is the custom of fastening up the "roof-tree" when the framework of the roof is finally in place. We have heard it said that the symbolic meaning of this ceremonial is that the framework of the house is supposed to have made use of the trunk of the tree, and consequently the topmost crown of the tree itself is hoisted up to occupy its old place once more. If this was the origin of the custom, it was doubtless a rite of propitiation. In this prosaic age, however, the purpose of the ceremonial is evident. It is an invitation from the builders to the owner to recognize (by a donation of liquor or cigars) the progress that has been made. A particularly interesting feature of this ceremonial is the modification that has come about,

with changed conditions in building. The "roof-tree" is not confined to wooden houses, but it is changed into a flag for other buildings.

WORKMEN AND LIQUOR.

In this connection it is interesting to note the important part that donations of liquor have played in building in the American colonies, especially in those which had a large proportion of Dutch settlers. It was long a standing complaint that the most onerous part of the expense in church-building was the enormous bill for "drinks" for the workmen. A detailed example is found in the bills for the erection of the first stone house in Albany, in 1656. This was a government house or fort, and it cost about £700. When the old wooden fort on the site was torn down, a ton of strong beer was furnished to the workmen. When the first stone of the new edifice was laid, 33 quarts of brandy and 32 guilders' worth of other liquor were called for by the workmen and duly served. So much as a start for the masons. The turn of the carpenters came when the cellar beams were laid. They were satisfied with two barrels of strong beer three cases of brandy and a barrel of beer. There was no chance for dry rot to attack these beams, for they had all been "wet" previous to laying. They were stacked up without the walls and were brought inside one by one by eight men, as they were wanted. For each beam carried these men were given half a barrel of beer and there were thirty-three beams in all! All of the teamsters, wood-carriers, carpenters, stone-cutters and masons had a gill of brandy and three pints of beer apiece at dinner, besides special treats. This did not satisfy them, however, and they "struck" for another daily pint of beer. When the roof-tree was set in place, the carpenters were satisfied with a half barrel of beer, surely a most modest demand. Under the name of "tiles beer" a half barrel went to the tile setters. A winding staircase was a feature of the fort, and when this was finished five guilders' worth of liquor gave the workmen the necessary winding gait to test it.

One-eighteenth of the cost of the building went down the throats of the workmen! Fortunately, the building customs have changed from those strenuous times, or only brewers would be able to build houses.

ACID RESISTING COMPOSITIONS.

1. A composition for lining pipes or tanks, which resists nitric and sulphuric acids, both strong and dilute, consists of a paste, not made too thick, of silicate of potash of 30 deg. B, and powdered pumice. This also forms an excellent cement for glass.

2. A mixture resisting strong acids can be made by making 2 lbs. of powdered asbestos and 1 lb. of barytes, first thoroughly mixed into a paste with silicate of soda of 50 deg. B. For weak acids the silicate of soda is used of 30 deg. B strength.

3. A composition which will stand hot strong nitric acid can be prepared by making a mixture of 2 lbs. of the finest and purest sand and 2 lbs. of asbestos (finely powdered) into a paste, with 4 lbs. silicate of soda.

4. A mixture obtained by fusing together equal weights of gutta-percha and solid Paraffin, over a gentle fire, resists both acids and alkalies, even when concentrated.

5. To resist strong boiling sulphuric acid fuse together 100 lbs. of caoutchouc and 8 lbs. of tallow, adding enough slaked lime to make a moderately stiff paste, and then adding 20 lbs. of vermilion to every 100 lbs. of the paste, to hasten the drying of the composition.

6. Soaking wood with hot fused solid paraffin, if thoroughly done, makes it proof to cold acids and alkalies, even when they are concentrated, but a still better application for wood consists of a mixture of 8 lbs. of colophony and 2 lbs. of gutta-percha, fused together with a little boiled oil. The wood is repeatedly coated with this and thoroughly dried before use.

7. Another coating consists of a paste of 2 lbs. of gutta-percha scraps, got by fusing them with 6 lbs. of finely powdered pumice. When the mixture is still hot 12 lbs. of Burgundy pitch are added to it. This mixture will not resist cyanides.

WOOD DRIED BY ELECTRICITY.

The following description of a new method of quickly drying wood for building and manufacturing purposes is described by United States Consul Mahin, of Reichenberg, Austria: The green wood is placed in a large wooden trough, whose bottom is covered with a lead plate, which is connected with the positive pole of an electric battery. Covering the wood is the second lead plate, which forms the negative pole. The wood is then subjected to a bath in a solution composed of 10 per cent. rosin and 75 per cent. soda. Under the influence of the electric current the sap is drawn out of the wood and rises to the surface, the solution being absorbed by the wood. The operation requires from five to eight hours. The wood is then allowed to dry for about two weeks, when it is ready for use; or the drying can be done artificially in a much shorter time.

NEW WAY TO MAKE LIME.

Scientific men have just completed at Rockland, Me., an investigation of a new process of burning lime, which, it is asserted, will revolutionize Rockland's chief industry, in that it will reduce the price of making lime from 50 to 75 per cent. Prof. Carleton Ellis, of the Massachusetts Institute of Technology; William O. Webber, a Boston expert, and John C. Combs, of Boston, have been there conducting tests at the kilns of Bryant & Kent. At the conclusion of their work they expressed themselves as entirely satisfied with the results obtained. By the new method, which is known as the "Eldred process," a cheap grade of coal is used, where heretofore wood has been necessary to to get the best lime. It is said to be a new discovery in the science of thermodynamics by which the volume and temperature of combustion are controlled. A flame of low heat intensity, thirty feet long, is produced, by which a cask of lime is made with thirty pounds of coal.

THE PAINTING OF SHINGLE ROOFS.

More shingle roofs are painted now than ever before in the history of building in this country, says an exchange. It is mostly seen in cities and suburban towns, although in the country it is by no means rare. Considerable inquiry has led to the conclusion that many have their roofs painted to add to their appearance, which in many cases it certainly does, while others labor under the impression that the paint acts as a preservative to the shingles. The latter are probably right, provided the paint is renewed as often as it

needs to be. If the roof is allowed to remain with the paint partly worn off, the shingles will retain more moisture, and consequently decay sooner than they would were they not painted at all. On the score of durability little can be gained in cost by painting. A good shingle roof unpainted will last a great many years, and the expense of painting a few times would replace it. One painter, who had painted the roof of his own house, when questioned, used good logic from his standpoint. He thought that painting a roof would add somewhat to its length of life. "You see," he said, "that have painted mine. I do for myself what I desire to do for others. If I did not, the influence would be bad."

THE WIRE SAW IN QUARRYING.

Within the past few months says Stone, there has been a general revival of interest in England, as well as in this country in the subject of quarrying by the wire saw. An effort is being made to put on the market here the latest improvement in wire saw quarrying—the penetrating pulley. A trial of this device is now in process at one of the big Vermont marble quarries. Efforts are also being made to form a company for the manufacture of wire saws under the Clark patent.

The English trade papers within the past few months have had a number of articles on the wire saw, which is now being placed on the market in that country. In the last report of Dr. C. LeNeve Foster to the English Home Office, there is an extended illustrated article "On the Use of the Wire Saw for Quarrying Slate," by G. J. Williams, His Majesty's Assistant Inspector of Mines. Mr. Williams was sent to the Continent in order to study the methods of quarrying by the wire saw, and he investigated the results that were obtained in both open and underground slate quarrying in the Pyrenees. No attempt, whatever, has been made in this country as yet to apply the wire saw to the quarrying of slate, although it would seem to lend itself particularly to this work.

DEMOLISHING A BUILDING BY BIOGRAPH.

All who have seen the biograph have wondered at some of its realisms and its adaptability to all sorts of uses, says the Building Trades Association Bulletin. The biograph men in casting about for a novelty decided to make a picture showing the destruction of the Star Theatre, at Thirtieth street and Broadway. The contractors stated that it would take fourteen days of ten hours each to tear down the old Star.

The ordinary biograph picture shows a scene by means of 1,800 separate and destinct photographs a minute taken on a continuous film in that period of time. A machine was rigged to take pictures on film at the rate of twenty per minute, instead of 30 per second. It was placed in a window overlooking the Star Theatre and connected with an electric wire, the current from which operated the mechanism of the machine. Beginning with the first brick loosened from the top of the old theatre, in the process of its destruction, the camera shutter opened and a picture was taken. From that moment until the space the ugly old brick edifice formerly occupied was a level patch of unincumbered ground the camera worked ten hours every day. Every three minutes a picture was snapped of the state of the building in the course of its destruction. Twenty pictures an hour, 200 pictures a day, 1,400 pictures a week, 2,800 pictures in two weeks, all on one continuous band of film.

The film was four hundred and eighty feet long, and it took a little over a minute and a half to run it through the biograph. It took two weeks to take this picture, but it was shown to the eye, as the eye sees the occurrences of a minute and a half. And behold! Beginning from the top, the great brick building melted as a house of snow. Figures in the shape of men toiled with lightning-like rapidity. The workmen seemed to be tearing like demons at the brick and timber. Showers of rubbish rattled down, wagons dashed away at express train speed bearing the shattered material. Faster and faster melted the walls. Signs, windows, beams, chimneys sunk down, down. Another moment and the last wagon was gone with the last scraps of brick, wood and iron; there was a barren spot of ground in the city's heart.

TESTING OF STONES USED IN CONSTRUCTION.

The testing of all materials suitable for constructive purposes and employed therein is one of the prominent signs that mark the gradual progress and advancement of architectural and engineering science and technology. Petrean monoliths of sizes and dimensions hitherto unsurpassed were used in bygone days in positions and situations which must have exposed them to nearly every known species of stress, without any preliminary trial or experiment respecting their capabilities to withstand the same. Natural stones, as distinguished from those produced by more modern artificial manufacture, were, in those times, when the means of transport were few, tedious, and frequeutly non-existent, taken on their own merits. Their qualities, properties, and fitness for the work required of them were gauged by the very practical standard of the manner in which similar examples and specimens had performed their duty in structures previously erected. In the present day says the Building News, these conditions are very materially altered. Building stones are now brought from very great distances, and their strength, powers of resistance, durability, and other indispensable qualifications can no longer be taken on trust. Besides new quarries are continually being opened, and experience has abundantly proved that however valuable and excellent the stone of one quarry may be, it furnishes no guarantee that the product of another, although adjacent to it, will be equally serviceable. The first acknowledgement of the necessity of instituting some test with regard to the properties possessed by building stones was in evidence only a few years ago, when experiments were conducted with the object of determining at least two of their qualities—viz., their specific gravity or density and their resistance to crushing. It was not until subsequently that it became fully recognised that, in addition to ascertaining the general characters of different stones, it was equally essential that their epecial fitness for the particular kind of work they were put to should be carefully investigated.

As a rule, the specific gravity, or the weight of a building stone is a fairly good indication and criterion of its value as a constructive material; that is, the heavier the specimen the better. Tests conducted for this purpose are of great importance, insomuch as they are closely connected with the weathering, which is almost synonymous with the durability of stones, which, after

all, is the qualification which is the most prized by the architect and the builder. Wherever practicable, it will be advisable to examine any old structures which may have been built of the description of stone proposed to be used. Ths hardness of stones affects their use in various ways, and there are several means of determining this property, which includes tests for the resistance of stones to friction or to ordinary wear and tear—when, for instance, they act as paving stones. Under the same heading is comprised the resistance to shock and impact, to boring, and the attacks of the chisel. When freshly quarried, stones are generally rather softer aud more tractable under the tool than when, some time afterwards, they have got rid of their quarry water. Although the chemical composition of building stones is not, per se, of any great practical value, yet the aid of chemical analysis—or, in other words, a chemical test—is required in order to discover the existence of foreign substances, which are to be found in all stones, and also the proportions of silica alkalis, and lime they may contain. For instance, if there should be too large a percentage of clay in stones, they should not be exposed to sudden and frequent changes of alternate damp and dryness, since they rapidly disintergrate under such changes. Stones also which, similar to the dolomites, contain a certain amount of magnesia, are seriously deteriorated by the action of sulphur, which, in the state of sulphurous and sulphuric acid, exists in abundance in both the atmosphere and the soil. Equally, if not more, important than the chemical test, is that performed by the aid of the microscope, which reveals the manner in which the constituent particles or ingredients of the material are mixed together and incorporated. It may not perhaps be generally known that some descriptions of stones which are of excellent quality when quarried in summer, are worth little or nothing when taken from the quarries in winter time. Limestone and marble are particularly liable to this uncongruous defect.

Another property of building stones which is desirable to investigate is that of absorption, which is approximately proportional to its porosity or permeability. This demands another trial, which may be termed the porous test, and is one of considerable utility. The best stones absorb the least proportion of water or of other fluid, which is an important consideration, when they are exposed to the influence of the gases and acids held in rain, with which they frequently become strongly impregnated. If we now pass on to the action of frost upon stones, it will be at once apparent that another test must be called for. Certain specimens behave in one manner, and others in another, when acted upon by exceptionally low temperatures for any length of time. Some gradually and slowly disintergrate, go to pieces, and break up. Others develop a process of superficial peeling off by the formation of scales, while others, again, suddenly fly into fragments in precisely the same manner as if they had been blown up by dynamite or other powerful explosive. One of the difficulties attending the successful application of a freezing test is the impossibility of assimilating the condition of the experiments with those obtaining under the natural phenomenon of congelation. Various methods have been employed to imitate the operation of freezing. One may be mentioned which consists in immersing the specimen in a highly concentrated solution of sulphate soda. As the compound forms into crystals it causes a partial disruption of the stone, by breaking off pieces of different sizes. Although this method affords some indications of what may be the effect of natural frost upon building stones, not much reliance can be placed upon it. Recently apparatus have been employed which subject the stones to a cold equal to 30 deg. below freezing point. A few concluding remarks will accentuate those already made, which unmistakably indicate the necessity for the tests to which we have already drawn the attention of our readers.

It is well known that our information respecting the transverse, tensile, and shearing strength of different stones used in the constructive arts is not nearly as full as it ought to be, and that our records of what has been ascertained regarding those properties are exceedingly meagre and incomplete. The results of experiments conducted with regard to the crushing resistance, demonstrate that there is a wide difference of strength per square unit, even in the same descriptions of stone. The varying results are due to the fact that the circumstances were far from being identical in the individual tests. Some of the samples, which were mostly in the form of cubes, were left rough on the sides and beds, and others were dressed and sometimes polished. The last mentioned bore six tons more than the first, per same unit of area. Our want of accurate knowledge—which is fortunately in the course of being supplied—regarding the tensile strength and the transverse resistance of stones, has not been productive of any great damage or injury. Nevertheless, that is no reason why we should not make ourselves thoroughly up-to-date in everything that has been accomplishad towards elucidating and placing on a better and more scientific basis the details of a subject so important.

GALVANISED IRON.

Writing on the eminent suitability of galvanized corrugated iron for the rapid erection of fireproof and weather-proof temporary buildings, Mr. Martin mentions that galvanised iron sheets are always fixed overlapping horizontally as well as vertically; hence the joints are as watertight as the sheets themselves. The term "galvanised" as applied to the iron sheets under consideration is incorrect, in view of the fact that no galvanic action is necessary to coat iron with zinc. A sheet of iron, the surface of which has been chemically cleaned, will when dipped in molten zinc take up enough of that metal to afford an efficient protection against the weather for years. Hence the iron is really "zinced" and not "galvanised." In dry air at ordinary temperatures iron will not rust. When heated to redness, however, black scales of iron oxide are formed, and when at a white heat the whole metal is gradually converted into the same substance. Pure water, which is free from carbonic and free oxygen, will not tarnish polished iron, but if water contains these substances it attacks it vigorously, especially in presence of acid vapours of any kind. Zinc which is used to coat the iron sheets, is also found in combination with carbon and orygen, in which condition it is known as calamine, the ore from which it is extracted for commercial purposes. Exposed to the atmosphere, zinc oxidises slowly, and since it is insoluble in water a zinc coating affords an effectual protection to the underlying metal as long as it lasts. Acids will dissolve the zinc oxide as well as the zinc itself, however, so

that buildings covered with zinced iron should not be exposed to the action of acid fumes or water holding any trace of acids in solution. It follows, therefore, that the life of a sheet of zinced iron is that of the zinc which covers it.

Another point to be considered is that two metals placed in contact and exposed to atmospheric influences invariably give rise to some form of galvanic action, which facilitates their combination with carbon and oxygen. a process utterly destructive of their value as covering materials. Old wrought-iron railings leaded into stone are found eaten away where the lead and iron come in contact, and lead-lined cisterns or soldered sheet lead traps invariably fail at the junction of lead and solder. In every modern house iron, copper, lead, tin and zinc are found in the same circuit, forming circulating and other water systems; the leakage of taps and other parts of such plumbers' work, as well as the failure of iron railings and lead cisterns, can be traced to this galvanic action, which would seem to be never taken into account by builders or sanitary plumbers. This action apart from ordinary oxidation by the atmosphere, has much to do with the premature destruction of the zinced iron sheets used in temporary buildings. Zinced (or "galvanized") corrugated iron is extensively used in the erection of churches, schools, hospitals, cottages, stables, workshops, sheds, barns, and other buildings, and it will be found that for all such erections the employment of specialists in this class of work has an immense advantage in point of economy over that of ordinary skilled or unskilled workmen, who are not accustomed to handle and work in this material.

As a pound of paint will go much farther on iron than on wood or brick, painting an iron building is a cheap way of adding to its durability. It is not wise to purchase a second hand iron building for re-erection, because the sheets are always more or less damaged in taking down and removal, aud when rusting once sets in it proceeds rapidly.

REAL ECONOMY IN CONSTRUCTION.

From time to time all of us notice the construction of buildings, so ponderous in their formation, so irrational in their construction and so elaborate in detail, that they can have no justification in construction from a business standpoint.

It is true that any building which has more of material, be it brick, steel, stone, or iron, or more of decoration, than is necessary for its dignity or character, will be a relative business failure. An excess of cost which results in extravagance of this kind is a permanent fixed charge upon such investments, and those who make such investments are sure to suffer therefrom during the life of the property. The time has come when manufacturers and those who occupy offices and apartments demand permanency, convenience, safety and the proper regard for the external appearance of the structures which surround them. Anything which goes beyond this is extravagant and deadening.

The primary thing to consider in the erection of any building is the cost of insurance, not altogether in relation to this fixed charge, but because the cost of insurance emphasizes and fixes the character of the building. Any building which is entitled to a low rate of insurance must necessarily be a well constructed building; after this comes the question of appearance, dignity and character. There is no reason why any building should be ugly. A beautiful detail costs no more than an ugly detail. Good proportion is as cheap as bad proportion. When the world realizes this, well-built buildings and good buildings will be the rule and not the exception.

PORTLAND CEMENT IN COLOURS.

A new process has been discovered for colouring cement which, it is claimed, will greatly enhance its value for slab making as it ensures uniformity throughout the artificial stone, a result that cannot be effected with the use of ordinary cement. The process consists in the addition of chloride of lime in the proportions of 1 per cent. to 5 per cent., according to the intensity of shade desired, to the raw material; sometimes with the aid of a little oxide of iron. The chemical action due to addition of chloride of lime is as follows:—The chloride of lime oxidises the iron combinations in the raw stone to the extreme limit, thus producing colours from green to black. The flaws (spots) so common in artificial stone prepared with ordinary cement result from a variety of combinations of the sulphides of iron and calcium that are produced. But with the addition of chloride of lime volatile sulphuric chloride combinations result which obviate the sulphur combinations that produce the spots. The editor of Thonindustrie says that practice may establish the theory of the inventor, but holds that chloride of lime will not work as described during burning. Iron and calcium sulphides are not obviated by an addition of chloride of lime. To add 1 per cent. to the raw stone adds at least 13s to the cost of cement per wagon. The action of chloride of lime can only be effective on moist limestone, for at 122° Fah. it decomposes.

STRENGTH OF IRON TANK.

In answer to a correspondent who wishes to know how to calculate the weight on the sides of a cistern 20ft. by 10 ft. by 6ft., and the strength of iron sides, &c. Prof. Henry Adams gives the following answer in the London Builders' Record:—There is much more in designing the tank than finding the pressure on the sides and the thickness of the plates. The designing of large tanks is work for a specialist, or at least for one with experience in designing or manufacturing them; so many points require minute attention, as witness the disastrous failures that have occurred at St. George's Hospital, the Crystal Palace, the West Ham Workhouse, &c. The pressure on the side of any cistern or tank containing water is—

$$\text{Area side, sq. ft.} \times \tfrac{1}{2} \text{ depth ft.} \times 62{\cdot}5 \div 2{,}240 = \text{tons}$$

and with any intermediate portion such as the area supported by a stay, area X depth of its centre of gravity from surface X weight of a cubic foot of water = pressure in lbs. The centre of pressure is two-thirds of the depth from the surface, but this has no particular importance in tank designing. The writer's rule for thickness of plates in cast-iron is to make the top row ½in. thick and the bottom row by the formula—

$$t = \frac{d\sqrt{D}}{192}$$

where t = thickness of plate in inches; d = depth of plate in inches; and D = depth of lower edge from surface of water in feet; intermediate tiers to be graduated between these thicknesses and all plates to be properly stiffenec by ribs, feathered flanges, and tie-bolts. In important cases the result should be checked by other formulæ. In the present case with a depth of 6ft. there would be two rows of plates, the top row ½in. thick, and the bottom row—

$$\frac{36 \times \sqrt{6}}{192} = \frac{36 \times 2{\cdot}45}{192} = .45$$ which, being less than ½in., is to be increased to ½in. thick.

FIRE DOORS AND SHUTTERS.

Owing to the vital importance of good fire doors and shutters to the business of fire underwriting, the writer has given the subject much consideration for a number of years.

The value of a fire door can only be realized when we stop to consider that it is always placed at an opening in a brick wall separating at times enormous values, and that it must, when so placed, prove in event of fire the equivalent of the bricks it replaces. This is expecting much of a divice constructed of wood covered with tin, and of thickness no greater than 3 inches ; or of iron not exceeding 3-16 of an inch in thickness. Yet in the standard requirements contained in this issue we believe we are specifying such fire doors and rely with great confidence upon their ability to protect when properly installed.

In the matter ot fire protection devices the tendency has always been toward better and more uniform standards, and there is no exception in the case of fire doors and shutters.

The evolution of the fire door from a comparatively worthless pattern to the present standard which was adopted by the National Fire Protection Association at its third annual meeting held in Boston, June, 1899, and since printed and officially authorized for general use by the National Board of Fire Underwriters, is about as follows :

First, the ordinary wooden door, sheathed with sheet-iron or tin on the side more severely exposed ; then the same door metal-clad on both sides : then the double door, or 2-inch door covered with tin. In the above cases the doors were usually hung to metal-covered strips of wood, spiked to the wall, and frequently with cast-iron hinges or hangers, the sills also being in most cases of wood and sometimes metal covered.

Experience showed that a better door and a more substantial method of hanging were necessary. The first Underwriters Association to adopt and print a standard for tin-clad doors worthy of imitation was the Philadelphia Board, in September, 1899. This standard called for stone sills, all hanging hardware exclusively of wrought-iron and tin covering applied to the door in the manner as now described in the National Standard.

The transition from the primitive door to the present standard should not be lost sight of, as the improvement is quite as marked. All that has been said in reference to the fire door is equally applicable to the fire shutter.

In the summarizing, I would like to impress upon readers of the specifications the following special points of merit :

TIN CLAD DOORS.

(1) The method of applying the tin, whereby all edges are not only nailed to the door, but nailed together, which positively prevents a single sheet of tin from getting away. With the old method no edges were nailed together.

(2) All cast-iron hangings discarded and only wrought steel or malleable iron allowed.

(3) Doors are hung directly to masonry without any wood trim.

IRON DOORS.

The specific points of merit in these doors are the rigid angle iron frame, the increased thickness of plate iron used and the three or more hinges with a latch opposite each hinge.—W. S. Lanon in Insurance Engineering.

PRACTICAL HINTS.

NAILING FLOOR TO CONCRETE.—Wood flooring should not be nailed down direct to the concrete, as there is a danger of rot setting in. This is more especially the case in cellars, and where the floors are often damp. The case of wood-block flooring is entirely different, being in small pieces, mostly laid on end, and tarred on the underside. The concrete should be trowelled off with neat cement and tarred, and the underside of the boards tarred also. The floor should not be covered wtith linoleum or a similar non-porous substance.

PLUMBERS' SOIL.—A package of lampblack is mixed with water into a mortar ; a kettle containing about a quart of water and a tablespoonful of good glue is heated until the glue is melted, when the liquid is poured into the lampblack mortar and the whole well stirred for about an hour while it is boiling. When cold, the soil should be of about the consistency of gelatine.

FILLING FOR NAIL HOLES.—The following method of filling up nail holes in wood is not only simple, but said to be effectual : Take fine sawdust and mix into a thick paste with glue, pound it into the hole, and when dry it will make the wood as good as new. Frank Christian, jr., in Stoves and Hardware, says he has followed this for thirty years, with unvarying success in repairing bellows, which is the most severe test known. Often by frequent attachment of new leather to the old bellows frames, the wood becomes so perforated that there is no space to drive the nails, and even if there were, the remaining holes would allow the air to escape. A treatment with glue and sawdust paste invariably does the work, while lead, putty and other remedies always fail.

USEFUL MEMS ABOUT PAINTING.—Spon's Tables gives the following :—Lead Paint.—First coat.—One pound covers about 4½ yards super, following coats 6½ yards super : painter's day's work—first coat of paint on wood 60 yards super ; following coats 70 yards super ; varnish takes about 1 gallon to 60 yards ; painter's day's work—laying on varnish 40 to 50 yards. In protective properties one coat of Velure is equal to at least two coats of lead or zinc paint and one of varnish ; one gallon will cover 90 yards super if carefully applied on a good groundwork of ordinary paint. The following comparative estimate based on these particulars speaks for itself :—Cost of painting 90 yards super.—When using (a) lead paint and varnish.—Lead paint at 4d. per lb.—20 lbs. cover 90 yards super—first coat, 6s. 8d. ; labour, 1½ days (60 yards per day) at 6s. per day, 9s. ; lead paint—two following coats, say 14 lbs. each—28 lbs. at 4d., 9s. 4d. ; labour—two following coats, at 7s. 9d. per coat, 15s. 6d. ; varnish—one coat, 1½ gallons at (say) 8s. per gallon, 12s. ; labour applying same—40 to 50 yards der day, say 12s. ; total cost, 3 coats lead paint and 1 coat varnish, £3 4s. 6d. When using (b) velure.—Lead paint, 6s. 8d. ; labour, 9s. ; Velure, 1 gal., 19s. . labour, 12s. , total cost, £2 6s. 8d. Total saving, 17s. 10d.

WHITEWASH FOR OUTSIDE USE.—Take a clean watertight cask and put in half-bushel of lime. Slake it by pouring boiling water over it to cover it 5 in. deep, stirring briskly meanwhile. When slaked, dissolve 2 lb. sulphate of zinc and 1 lb. common salt in water, and add the lime solutlon. By adding 3 lb. yellow ochre, the wash may be made of a delicate cream colour. Apply with ordinary whitewash brush. Very durable, and of excellent appearance.

MEASURING INTERNAL PLASTERED WORK.—Measure between skirtings and ceiling, or, if rendered behind skirtings, measure all in from floor to ceiling. The correct way is to deduct from the ceiling the projection of cornice at one side and end, but this is generally neglected unless the cornice is unusually large, say, of 24 in. girth. Cornices of not more than 12 in. girth are taken by the foot run ; if larger than this, by the foot super. If they do not exceed 12 in. in girth the length of walls will be sufficiently exact for length of cornice ; but when the girth is more take the mean length. Number all mitres, stopped ends, mitred and returned ends, stating girth of cornice, and circular corners, stating girth of corner and cornice. Plastering in small quantities is kept separate from the rest and measured by the supert foot instead of by the yard. No deductions are usually made for chimney openings, this being considered equal to making good, but if deducted add for making good.

Mr. J. Keith Fisher, of the Pacific Coast Portland Cement Company, which, it will be recalled, is about to erect a large plant at Vancouver, B. C., for the manufacture of Portland cement, has recently returned from Europe. It is stated that the plant called for in the orignal plans will be considerably enlarged.

PROCESS OF MANUFACTURE OF STAINED GLASS WINDOWS.

A stained glass window is more properly described says a writer in The Architects' Magazine, as one of coloured glass, for it is on such a glass that the artist paints—in monochrome it is true—his design, and the staining of the glass, if resorted to at all, plays but a very insignificant part in the decorative scheme. Perhaps one may be excused for describing the leading as the most important part of a stained glass window, for the very good reason that without the leading it would be necessary to paint a window in one piece. It is the lead which renders it possible to make up a composition of any number of pieces of coloured glass, and thus gives the artist an almost unlimited range.

In tracing a stained glass window from its inception it should be stated that the artist first makes a small colour sketch to scale, and from this he produces a cartoon in black and white of the exact size of the window space to be filled. The cartoon is now given to the workman, who produces what is called a "cut line" on tracing cloth; that is, he makes a tracing of the principal lines of the artist's picture, showing how the glass is to be cut to meet the needs of the colour scheme. Next is the turn of the master glass-cutter, who, in association with the artist, chooses the glass to be used in reproducing his picture, and when the choice has been made the glazier's skill is brought to bear in cutting the glass according to the indications given by the tracing. The glazier having completed his work, the pieces are put together in form on a sheet of plate glass placed over the cut line or tracing. Any portion of the coloured glass which has showing through it a principal part of the design, such as a head, a hand, or a piece of drapery, has traced on it so much of the artist's work in the pigment—brown being the colour, made up of black, red and umber. The pieces of glass are so placed as to show between them the black lines of the tracing—the outlines of the figures, &c., and every part where different colours are to be arranged in juxtaposition—and it is where the black lines are revealed that the lead subsequently assumes its appointed position.

Thus disposed in perfect scheme so far as colour is concerned, the "stained glass" is waxed into position on the slab of plate glass and then lifted on to an easel, where the task of painting is completed with all the care the artist can bestow on his work. It should be borne in mind that the painting is carried out solely in the monochrome already mentioned, and that it is the coloured glass showing through the brown pigment which produces such wonderful and, of course, almost imperishable effects. It has been mentioned that coloured and not stained glass is the correct term to apply to the principal medium of "stained glass" windows, and here it may be said that practically the only staining resorted to is in the production of gold colour. This is rendered possible by silver staining on white glass, a pretty effect very common nowadays in house decoration. It is really opalescent, but against the light a fine golden colour is shown. When the artist has finished his painting on the easel the pieces of glass are again separated and are fired in a kiln, being placed therein on iron trays. Heat having done its part in burning the pigment picture on to the glass the whole thing is waxed up again and retouching is resorted to, if necessary, with, of course, in that event, refining. Finally comes the glazing with what are termed culms of lead—long strips, grooved on both sides, to carry the glass. All the joins are soldered, and when the window is placed in position, iron bars from three-quarters to an inch in thickness are forced on to the mullion to support the picture, wire being soldered on to the lead, which holds all the portions of the colour scheme in position, and bound round the transversing iron.

CORRESPONDENCE.

CANADA FIRST (?)

To the Editor of the CANADIAN ARCHITECT AND BUILDER.

SIR,—During the last year or two a number of new bank buildings have been erected in Toronto at considerable cost. In these buildings the most expensive kind of materials have been employed, including a large quantity of wrought iron grilles, etc. Probably not less than $25,000 worth of this last mentioned material has been purchased, and so far as I know scarcely any of it was made in Canada, the material having all been imported from the United States. As one of the manufacturers in this line, I have never been asked to submit a tender for this material, although I have successfully filled orders for prominent Canadian architects in Montreal and other cities outside of Toronto. It would be a satisfaction to learn on what ground so much money has been paid to foreign manufacturers by Canadian architects. Is it because satisfactory material cannot be obtained from Canadian manufacturers, or is the price of the imported material less than that of the Canadian made article? As a Canadian manufacturer I do not expect to be given any preference, but think I am entitled to be asked to tender for this kind of material on equal terms with the foreign manufacturer. Canadian architects rightly object to commissions for important Canadian buildings being given to foreign architects. To be consistent they should, as far as possible, employ Canadian materials, and thus assist in the development of home industries.

Yours truly,

MANUFACTURER.

PUBLICATIONS.

LINEAR DRAWING AND LETTERING (for Beginnsrs.)—By J. C. L. Fish, Asso'. M. Am. Soc. C. E., Associate Professor of Civil Engineering in the Leland Stanford Junior University. Published by the author. Palo Alto, California. 7 x 10½, oblong. V + 65 pp. 46 figures Limp cloth, $1.00 post-paid.

The opening chapter of the book gives instruction regarding the proper care and use of instruments. This is followed by courses in linear drawing and lettering and an introductory chapter on drafting.

"Blank Book for Lettering," by the same author, is designed to be used with "Linear Drawing and Lettering." Price, 25c.

Messrs. Houghton, Miffiin & Co., of Boston and New York, have just published a new book on "Applied Perspective for Architects and Painters," by Wm. P. P. Longfellow. Following an interesting introduction on perspective in Nature, are a series of problems to show the application in art and architecture of what may be seen in Nature. These problems deal with a variety of matters essential to the training of artists and draughtsmen. The book comprises 120 4to pages, with 108 illustrations. The price is $3 00 net.

PERSONAL.

Mr. W. E. Doran, architect, of Montreal, is again mentioned as a probable candidate for the mayor's chair in that city.

Mr. Lewis Maxwell, a pupil in the office of Gouinlock & Baker, architects, Toronto, who has recently been indisposed through lung trouble, is now sojourning at the Gravenhurst Sanitarium. His many friends will be pleased to learn that he is getting along satisfactorily.

The six most lofty structures in Europe are the towers of Cologne Cathedral, now 516 feet, 9 inches high; the towers of Rouen Cathedral, 491 feet, 8 inches; the tower of St. Nicholas, at Hamburg, 473 feet, 1 inch; tower of Anvers Cathedral, 472 feet; cupola of St. Peter's, Rome, 469 feet, 2 inches, and the cathedral spire at Strasburg, 465 feet, 2 inches.

—THE—

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John Goettsche, of British Columbia, is investigating the clay deposits in South Dakota with the view of erecting an extensive brick works in that state. Tests are being made of the clays in the vicinity of Brookings, and if the results are satisfactory a plant may be erected at that place.

A Small Sewage Disposal Plant of considerable interest is described in a recent issue of "Indian Engineering." It was designed by Mr. C. C. James for a leper asylum with 400 inmates near Bombay, where the sewage originally drained into two large cesspools. These became a nuisance, so a disposal farm was laid out with settling tanks for liming the raw sewage, but the lime injured some of the crops and it had to be abandoned. Finally the land became "sick," and the septic system was introduced preliminary to the land treatment. This has been successful, and the sale of the farm crops yielded last year a profit of 21 per cent. above working expenses. The septic tanks have a capacity of about 19,000 imperial gallons, and the sewage passes through them at a rate of about 20 feet an hour. The leathery scum on the surface is 1 to 3 inches thick and there is some sludge at the bottom. The septic effluent has been used in experiments with a number of filters. One which gave a good result was made with pieces of coal. Another filter which received raw sewage, was made of pieces of brick with pipes to distribute air through it in accordance with the principles advocated by Colonel Ducat. The sewage was 45 minutes in passing this filter and was well purified by the process.

STUDENTS' DEPARTMENT.

PROTECTING BLUE PRINTS FROM MOISTURE.

If blue prints are liable to discoloration by rain or dropping water they can be protected by applying paraffin. The best way of applying it is to dip a number of cloths about one foot square in melted paraffin until saturated, in which condition the cloths can be stored. Then transfer the paraffin to the blue print by spreading a waxed cloth on a smooth surface, nonabsorbent preferred, putting the blue print on this, and a second paraffined cloth on top. Use a moderately hot flatiron to melt the wax and cause the paper to absorb it. The lines of the drawing are intensified, the paper does not shrink or become distorted, while at the same time it is translucent and water proof.

ARCHITECTURAL EDUCATION IN DUBLIN.

A novel scheme of practical education for intending architects has recently been inaugurated by the Architectural Association of Ireland, says a late issue of the Irish Builder. The scheme is one of technical demonstrations, to be held each Friday at the workshop of some leading firm connected with the building and decorating trades. Each trade will be taken in rotation, commencing with the bricklayer and finishing with the glazier, and at these demonstrations the craftsman will be seen at work, and experiments will be conducted on the various materials used by him. Such practical instruction will be of great value to the student when practising his profession in later years. It is to the credit of this young Dublin society that it has drawn up so advantageous a scheme for its members on lines which have never been so broadly tried on the other side, and also of the manufacturers and builders who have readily placed their time and plant at the association's disposal.

CHANGING THE COLOR OF BLUE PRINTS.

Anthony's Bulletin gives the following practical method of turning blue prints to a rich brown color: A piece of caustic soda about the size of a bean is dissolved in 5 ounces of water and the blue print immersed in it, in which it will take on an orange yellow color. When the blue has entirely left the print it should be washed thoroughly and immersed in a bath composed of 8 ounces of water, in which has been dissolved a heaping teaspoonful of tannic acid. The prints in this bath will assume a brown color that may be carried to almost any tone, after which they must again be thoroughly washed and allowed to dry.

Mr. J. J. Woolnough, a well known young architect of Toronto, has been elected on the executive committee of the Toronto Camera Club.

In Germany and elsewhere they line wells very often with "concrete bricks," moulded so as to form complete members of a series. Curved bricks are nearly as cheaply made as straight ones, and the best bricks for the purpose are as non-porous as can be. When the diameter of the well is known, there is no difficulty whatever in setting out the curvature of the bricks for the moulds, provided the shrinkage of the clay, etc., is properly allowed for.

OBITUARY.

We regret to chronicle the death from a stroke of paralysis of Mr. Alexander Fiddes, treasurer of the Toronto Master Plumbers' Association. Mr. Fiddes was born and served his apprenticeship in Scotland. For some time after coming to Toronto he was employed as journeyman. In 1879 he organized the firm of Fiddes & Hogarth, of which he was senior partner until the time of his death. His valuable services were recognized at the last convention of the National Plumbers' Association by the presentation to him of a Masonic ring. He was an active member of the Presbyterian church and the Caledonian society, and widely esteemed in business and social circles.

VALUE OF TRADE JOURNALS.

The trade journal is an advertising medium distinctly different from any other. It is read exclusively, or practically so, by people who are interested in the trade which it represents. The manufacturer who places an advertisement in a trade journal has the assurance that every copy is seen by people who could use his goods and who might become customers.—Current Advertising.

Cassidy—Oi want a wreath av flowers, an' put on it "He Rests in Pieces." Florist—Don't you mean: "He Rests in Peace"? Cassidy—I mane phwat Oi sed. "Tis fur Casey, that was blowed up in the quarry.—Philadelphia Press.

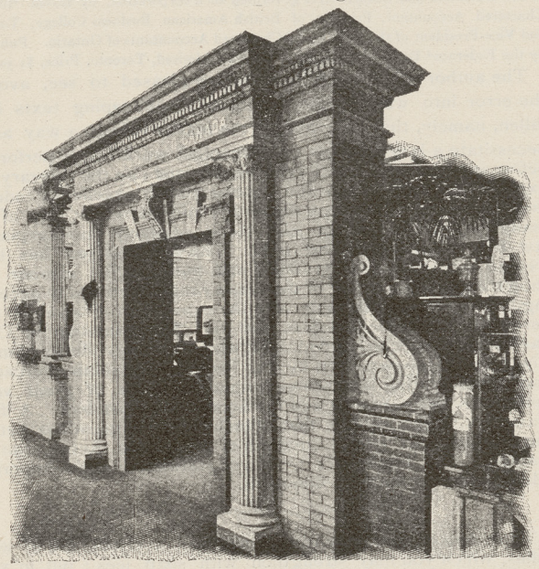
At the annual convention of the Canadian Manufacturers' Association held recently in Montreal, Mr. C. S. Osman, of the Albert Manufacturing Co., Hillsborough, N. B., was elected vice-president for New Brunswick.

Rapid progress is being made with the erection of the works of the National Portland Cement Co., at Durham, Ont. The buildings will be of steel, with walls of cement and will be fireproof. Contracts for the machinery have been awarded, and the plant is arriving daily. The works will be operated by electricity, and will have a capacity of 1,000 barrels per day.

Skill in Building, according to Professor Aitchison's second lecture on St. Peter's recently delivered before the Royal Academy, is commonly reckoned by the ratio of the points of support to the whole area of the building. Gwilt gives the ratio in the Pantheon at Rome as 0.232, and those of five other cathedrals are, St. Peter's at Rome, 0.261 ; St. Sophia at Constantinople, 0.217 ; Florence Cathedral, 0.201 ; St. Paul's at London, 0.170 ; St. Genevieve at Paris, 0.154. All have large domes. The area of the points of support of St. Peter's is 59,308 square feet, while the whole area of the Pantheon is but 34,328 feet, which affords some idea of the relative magnitude of the two structures.

A CANADIAN EXHIBIT AT THE PAN-AMERICAN.

The accompanying engraving shows the exhibit of the Milton Pressed Brick Co. in the mines building at the Pan-American



A CANADIAN EXHIBIT AT THE PAN-AMERICAN EXPOSITION.

Exhibition. It is an arch framed on both sides with light coloured pressed brick and terra cotta. On each side of the door are fluted terra cotta columns. The top of the doorway has three pieces and the top of the arch is covered with terra cotta. Across the front in letters of gold is the title of the company. The exhibit has been awarded a silver medal.

A house built on the octagonal plan is described by a Philadelphia newspaper, whose correspondent vouches for some special advantages in a building of this shape. It is, it is claimed, more compact and more readily heated than the oblong houses now generally built. Through the middle of the house, from the ground floor to the roof, is a stairway, and the rooms are built around this. There are four chambers, which are square or very nearly so, and sandwiched among these are four smaller and irregularly-shaped rooms, which are available for playrooms, servants' room, sewing-rooms, and similar purposes. The heater in the cellar is located directly in the middle of the house, and the pipes radiating from it in no case extend more than four or five feet, where they take an upward turn and are carried through the upper floors through an interior wall following the general lines of the outer wall. These pipes go directly by the shortest line to the rooms which they are intended to heat, and therefore very little of the heat is lost in the process of delivery. The occupant of the house says that his coal bill was less than half that of his neighbor who occupies a stone house rectangular in shape. In the summer time it has a like advantage. No matter from which direction the wind blows a fine current of air can always be found there. By throwing open the windows of a cupola on the top of the house and opening the doors and windows at that side from which the wind is blowing a strong draught is immediately experienced, the walls acting like a chimney.

STOPPING THE SUCTION IN PLASTERED WALLS.

Where glue size will not stop the suction in walls or ceilings, a varnish size is the best remedy. Take good hard oil finish of copal varniah and thin it down with an equal measure of turpentine, or if this be too heavy, use use two measures of turps to one of varnish. The condition of the surface must guide you in preparing the size. It must be so thin that it will dry flat, or very nearly flat. You must also see that the size is dry and hard before applying the paint, otherwise it may crawl or crack. See our answer in these columns to O. L. P. on the subject of a size for plastered walls, which may guide you in the matter of applying the glue size at the proper time and stop suction more effectively.

For painting over tarred surfaces or timber which has been treated with cresote, mix the pigments with as follows. If the tarred or creosoted work is to be painted white, procure 14 pounds of pure zinc white in paste and mix with it 1½ pints of boiled linseed oil, ½ pint of deodorised or coal tar naptha, and ¼ pint of cheap oak varnish. Mix well, and apply two coats in the same way as ordinary paint. Any patnt may be prepared in a similar manner by using the above proportions of materials, omitting the zinc weite and replacing with a strong staining paint ground to a paste in oil.

BOOKKEEPING FOR JOINT STOCK COMPANIES.—A practical and comprehensive reatise on the organization forms and bookkeeping entries required to meet the varying conditions of Joint Stock Companies of all kinds, together with an analysis of the Dominion and Ontario Acts governing such corporation, by David Hoskins, Chartered Accountant, Principal of British American Business College, Toronto, and Vice-President of the Institute of Chartered Accountants of Ontario. Published by the Federated Business Colleges of Ontario, Limited, Toronto, Price, $1.50.

The author of this work has, we are pleased to see, avoided the error into which most writers of bookkeeping texts have fallen, namely, that of arranging the matter in such a way as to necessitate a large amount of mechanical work being performed before any practical benefits can be obtained; on the contrary, his explanations are so clear and concise and so excellently indexed that the busiest of men can obtain full information on any of the many technical points of joint stock company bookkeeping or law, in a surprisingly short time. The whole subject has been treated in a thoroughly practical and business-like manner and shows a masterful grasp of the entire range of company accounting. The chapters dealing with the conversion of business concerns into Limited companies and the Amalgamation of Companies are particularly good ones, while the many illustrations of Financial Statements used by the leading Canadian mercantile and manufacturing institutions cannot fail to be of great value both to the business man and the accountancy student. A first-class idea, in this book is that of including the questions set on the examinations of the Institute of Chartered Accountants of Ontario. Mr. Hoskins is to be congratulated on his important addition to accountancy literature.

To relacquer old brasswork, first boil a strong lye of wood ashes, which you may strengthen with soap lees; put in your brasswork, and the lacquer will immediately come off, then have ready a pickle of aquafortis and water strong enough to take off the dirt, dip in the article, and wash it immediately after in clean water; dry it well, and lacquer it.

The Standard White Lime Co., Toronto, has been incorporated with a capital of $300,000, to manufacture lime, sandstone cement, etc. The proviucial directors include D. D. Christie and R. E. Nelson, both of Guelph, Ont., and Thos. Christie, Toronto.

RECESSES IN ROOMS,

Several circumstances belong to recesses which tend to modify their character. Besides those of plan, elevation and section there are others, one of which is that of relative size, as compared with the rest of the plan. Ordinary shallow recesses—which kind might be distinguished by the name of blank recesses, since they are little more than breaks in the wall and do not at all affect the general plan of a room—hardly belong to the subject, since they admit of scarcely any variety. By recesses we here mean those which come under the denomination of exhedræ, tribunes, alcoves, and afford considerable additional space. In plan these may be either curved or rectilinear—that is semi-circular (like the tribune of a Roman basilica)—or segmental or else polygonal or rectangular, in which latter case the plan may be either a parallelogram or so deep as to be a perfect square. Neither are these the only varieties of plan, for in each instance a recess may be either simple or expanded, or even wider within than the breadth of the corner towards the room. If the plan be curved it is usual to make the elevation in the form of an arch, either plain or decorated, in which latter case it is sometimes the practice either to continue the archivolt without any impost or to make it rest upon the entablature or capitals of pilasters. Elevations of this class, however, are only astylar; it is when columns come to be introduced into them that alcoves admit of so many combinations and so much variety of design. The usual mode is merely to separate the recessed part of the plan from the rest by a single line of columns, or rather by only two columns, forming a distyle in antis —that number being seldom exceeded, but is by introducing columns behind and within—by extending the recess either literally or in its background—by admitting light into it from above—that novel and scenic effects may here be produced almost without number. As regards utility and convenience, it is unnecessary to point out the advantage attending a deep alcove for the sideboard in a dining-room, communicatiug immediately with a staircase for the attendants, but alcoves and recesses add also to the commodiousness of other apartments—libraries, drawing rooms, etc., —affording nooks for study or conversation apart, similarly to the spacious bays and recesses of that kind in Gothic mansions.

Once a shrewd contractor found himself at the same inn with a rival who always trod close on his heels. He was followed about and questioned incessantly and gave vague answers. Within half an hour of sending in the prices for the job to be contracted for he went into the coffee-room and sat himself down in a corner where his rival could not overlook him. There and then he filled up his tender, and as he rose from the table left behind him the paper on which he had blotted it. As he left the room his rival caught up the blotting paper, and with the exulting glee of a consciously successful business man, read the amount backwards. "Done this time," was the mental thought, as he filled up his own tender £5 lower, and hastened todeposit it. To his utter surprise the next day, he found that he had lost the contract, and complainingly asked his rival how it was, for he had tendered below him. "How did you know you were below me?" "Because I found your blotting-paper." "I thought so. I left it on purpose for you, and wrote another tender in my bedroom. You had better make your own calculations next time."

NOTES.

Mr. Robert Munro, managing director of the Canada Paint Co., of Montreal, has been elected president of the Canadian Manufacturers' Association.

The Dominion Radiator Company, Limited, have begun in this Journal the publication of a series of announcements enclosed within specially drawn designs illustrative of the various styles and orders of architecture.

Action has been brought in the Toronto courts by the Pulp Plaster Co., of that city, to recover $20,000 from M. E. Loose, of Napoleon, Ohio, and Thomas E. Baird, of Toledo, Ohio, for alleged breach of contract in connection with a patent assigned by them through a Toronto man to the plaintiffs. The Pulp Plaster Co. are being sued for infringement of patent by Thomas A. Robinson, of Lima, Ohio.

The sand blast was recently used in cleaning the metal work of the Pont de l'Europe of the Western Railway in Paris. The bridge was last cleaned ten years ago, according to "Engineering," the work being done with scratch brushes and the like, and fifteen months were occupied on the task. With the sand blast the total time required for the work was but three months and the cleaning was more thorough.

Messrs. Hilners' Sons, Phi adelphia, Pa., have been awarded the contract for the wrecking of the Pan-American Exposition. They propose to remove all of the buildings and restore the grounds to their original condition and to pay the Exposition company $33,364 50, the wreckers to have all of the building material. The specifications provide that all of the machinery is to be removed and stored for the company by the wreckers and that the grounds are to be put back in their original con lition by July 1, 1902.

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