

PAGES

MISSING

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TO ADVERTISERS.

For the benefit of Advertisers, a copy of this Journal is mailed each week to persons mentioned in the CONTRACT RECORD reports as intending to build, with a request to consult our advertisement pages and write advertisers for material, machinery, etc.

At the convention of the National Association of Master Plumbers of the United States, held last month at Philadelphia, Mr. John Date, of Montreal, was introduced as the representative of the Montreal Master Plumbers' Association, and a communication from the Montreal Association was read expressing a desire for affiliation with the American organization. Mr. Date was cordially received, and there is no doubt but that his presence at the convention will tend to promote good feeling between the master plumbers of the United States and of this country. Mr. Date will also no doubt have gathered some information which can be used to advantage in the work of the Canadian organization. At the convention referred to, a resolution was passed requesting manufacturers to discontinue the practice of selling goods to persons who are not legitimately in the business. The definition of a "Master Plumber" agreed to by the Association was: "An individual who represents the industry of plumbing in its most complete state, that is to say, that he must be the proprietor of a plumbing establishment who deals in the merchandise used in the various branches of the business; who engages in trade with the public generally; who hires a requisite number of men, for the purpose of practically constructing plumbing systems in buildings everywhere, and is himself responsible for the work accomplished."

DOUBTS of a serious nature are obtruding themselves into some minds concerning the value of asphalt as a material for permanent street pavements. The city of Toronto has spent upwards of a million dollars on asphalt pavements within the last five years. Some of the pavements thus recently constructed are already full of cracks and holes. This is especially true of those on streets traversed by the street railway. The constantly recurring vibration from the passing cars appears to result in disintegrating the asphalt covering, patches of which become separated from the concrete foundation, leaving here and there ugly appearing and dangerous ruts. Even on streets where there are no street car tracks the pavements show numerous cracks and depressions. It is noticeable that in the first pavements of this character laid in Toronto eight or ten years ago, these defects are not to be seen, which is regarded as evidence that either greater skill or care was exercised in their construction. The statement has recently been made that the frequent sprinkling of the pavement in summer causes it to become rotten and greatly tends to shorten its life. As to the correctness of this statement we do not presume to speak. If it is well founded, then in deciding upon the extensive use of this pavement one of the most important requirements was overlooked. While in appearance and in several other particulars asphalt is the ideal of what a pavement should be, unless it can be made more durable than it gives evidence of being on some of the streets in Toronto, it will not repay its cost. At London, Ont., where a considerable amount of paving is to be done, this question appears to be receiving the careful attention which its importance demands. It is by no means certain that a well constructed macadam roadway will not eventually supersede some of the pavements which have recently come into favor.

THE difference between the estimates for the year of the appropriation required by the Boston Public Library and the amount voted for this institution by the City Council, is such that after expenses and salaries are paid nothing will be left for the purchase of books. This suggests the question as to how much in our public libraries is spent for the mere amusement of the public in the purchase of novels. We think that in the interest of the city, for the education of its inhabitants, for the study of those who earn their living within the city, a very small proportion of the sums expended on books should go to the purchase of "light literature." Professional associations often have their own libraries, but not always, and it is very seldom that the mechanic is able to obtain at his own cost the books he requires for the necessary theoretical knowledge. Such people's needs ought to be the first consideration, and the purchase of novels a very secondary one.

THE rights of "adjoining owners" to support from abutting buildings or even from the soil of the adjoining vacant lot is a matter of more or less consequence to everyone connected with building. It is most important for the owner of the buildings to be torn down, or of the vacant lot in which it is intended to excavate for foundations, to ascertain for his own satisfaction what rights, if any, the adjoining owner possesses, and in all cases where such rights exist he must give ample notice to his neighbor so as to allow of his shoring up his premises if necessary, but it devolves upon the adjoining owner to prove his claim to support. In the absence of any right of support, if on receiving notice he fails to protect his own building from injury, and reasonable time is afforded him for doing so, he cannot claim damages for injury if they occur. In the same way, should the owner of the vacant lot desire to excavate below the foundation of his neighbor's wall, the neighbor must see to his own protection. If the wall is a party wall, the adjoining owner undoubtedly possesses right to support as far as the half wall and the soil supporting it is concerned. The position of the architect or the builder depends very much upon the nature of their employment; to be free from consequences it is often less costly to them to give the notices themselves, or to have an understanding with their employer that he takes all responsibility himself, and that they are acting only and entirely on his instructions. Where they are acting as agents of the employer, the employer is of course responsible for their failure to notify the adjoining owner, but it might be very difficult for them to free themselves if he took action against them to recover the damages paid by him.

THE case of the Dominion Government against Mr. St. Louis, the contractor for the labor supplied in connection with the building of the Lachine bridges, has dragged on its course through different trials in such a way as to mystify the ordinary observer. The case will form a precedent and carries many lessons with it. But the principal point is the further evidence adduced in reference to day labor as opposed to contracts, and it will now undoubtedly be generally admitted that the system of day labor leaves so much latitude for fraudulent transactions that it is hardly wise to resort to it, when it is at all possible to have the work done under contract. The Government was not aware of any negligence on the part of the contractors until the works were far advanced, but the moment it felt its ground sure, it took very decided action. The engineers were dismissed; \$60,000 claimed by Mr. St. Louis on account of the works was refused; suit was entered for the return of money said to be already overpaid, while Mr. St. Louis himself was prosecuted for false pretences. The Government was successful in withholding the \$60,000, but it failed in the criminal prosecution, and the further case for the return of the over-payments came abruptly to an end by the action of the grand jurors in bringing in "no bill." Sufficient evidence was adduced in the criminal trial to show that an enormously unnecessary force of men was employed, that pay was drawn for men who did not work at all, while many other men who were also paid in full were proved to have done very little for their money. A typical case was that of one witness who actually worked 30 hours and was paid \$6.00. In the pay lists, however, his name appeared as having done 320 hours' work, but as many carters had more than one rig and the drivers were careless about giving their correct names or

numbers, it was very difficult to trace payments, and hence the decision of the Magistrate that all the fault did not lie with Mr. St. Louis.

IT is not uninteresting to note the arrangements made for the safety of the public in the event of fire in the Albert Hall, London—the greatest concert hall in the world—and to compare them with more modern plans. It was stated in a paper on the construction of the Albert Hall, that was read before the Royal Institute of British Architects many years ago, by Major-General Scott, the engineer of the design, that the corridors that surround the hall, with the crush rooms and staircases, together afford sufficient space for all the people which the auditorium and orchestra will contain, to be in movement at once without jostling each other. The central seating capacity of the hall is given at 8,365, which includes the orchestra and the "picture gallery" that runs round the hall over the corridors and at the back of and above the "balcony." The sum of the widths of the external doors for these 8,365 persons is divided between twenty-five entrances, of which one is 16 ft. wide and all the others 4 ft. 6 in., being one foot to every 64 persons. The capacity of the "picture gallery" is put down at 2,000, but on "great nights" there have been as many as 3,000 persons up there, although only two rows of chairs are provided against the balustrade that overlooks the hall—those who cannot obtain a seat promenading, without being able to see down on to the stage. On such occasions there would be from 10,000 to 11,000 present in the hall, and then the calculations for the 8,365 are naturally found insufficient; and although every person could leave the hall and be accommodated in the corridors, the pace at which one went down the stairs was, roughly speaking, about one step in three minutes. Nowadays, doors for exit, even though there are twenty-five, only 4 ft. 6 in. wide, would be deemed a decided error, for in a panic the public usually follow the leaders like sheep, and all would make for one 4 ft. 6 in. doorway. There are sixteen staircases 6 ft. 6 in. wide, and two 4 ft. 6 in. wide, open to the same objections as the narrow doors. The calculation is one staircase for each 200 persons from the boxes and arena, and for the balcony and picture gallery one for each 500. The amphitheatre has one exit for every 250 persons, each 9 ft. wide.

CRUSHED GLASS AS BUILDERS' SAND.

COMMENTING upon the suggestion of a correspondent that crushed glass should answer as a satisfactory substitute for builders' sand, the London Builder says:—"The suggestion is not altogether novel. In the United States refuse from glass works is sometimes used both for mortar and cement, though we believe its employment is being restricted. In Germany and Switzerland various proposals have been put forward from time to time to employ glass refuse for building purposes, but they do not seem to have come to much for reasons that will presently be seen. There can be no question as to ground or crushed glass being suitable for mortar. Judging from the sample sent us, the small fragments are angulate, and from the mechanical point of view, they leave nothing to be desired. From the chemical standpoint also there is practically nothing detrimental in the material, though it cannot be quite as durable as pure quartz sand. The chemical composition of black bottle glass varies exceedingly within certain limits, but it may generally be regarded as being from 50 to 65 per cent. of silica, 20 to 25 of lime, 6 to 9 of potash or soda, and from 4 to 7 of iron—depending on the manufacturer and the class of bottle. Ordinary bottles would have about 54 per cent. of silica, 20 of lime, etc. In any case large proportions of lime, soda and potash are present, though the bulk of the glass is silica. From the state in which these ingredients exist in the glass, there is very little likelihood of their being able to materially influence the action of the mortar in any way. We cannot see therefore why glass sand should not be employed in the manner suggested; it would be purely a question of cost. The reason it has not been adopted to any extent abroad—and this is a point for our correspondent to note—is because with very little preparation it makes a good brick for use in chemical works, as the material is so little attacked by acids. Bricks thus produced have a specific gravity of only 1.5, and are very strong though somewhat brittle. A glass brick, in the shape of a flask, has been manufactured in Switzerland for some years, and slag bricks are well known."

THE BYSTANDER.

As a back ground to the most esthetic callings is found after all a strong scent of shop. Agassiz, the famous naturalist, once rebuked a friend of material tendencies, who thought he might turn his tastes to better money-making account, by saying that he had no time to make money. Everyone will admire the devotion of this great man to his calling; but, whilst artist and naturalist, or one engaged in any vocation, may have chosen such because of the love of the work, and do their work from day to day because they love it, yet it is true there is danger of the edge being taken off this devotion, if the calling does not also prove a means of providing bread and butter. The artist who finds no market for his work of brush or pencil is apt to lose much of that inspiration and enthusiasm that is one of the first elements of success in art. So, there is nothing remarkable in the statement of the Bystander, that in moving around among those engaged in architectural pursuits he finds them ready to discuss the business side of the situation, equally as much as the esthetic. That they possess a strong business instinct the Bystander has sometimes thought has been a help to their success. In the architect must necessarily be combined the taste of the artist and the skill and shrewdness of the business man. Designs prepared for the finest buildings must go into the hands of contractors and be put into execution, ere the work of the architect is shown to its fullest advantage. And this will not be done properly unless he has that business instinct that enables him to deal in a business way with contractors and others.

x x x x

Talking the other day with Secretary Phillips, of the Builders' Exchange, Toronto, the Bystander formed the impression that the past month has taken on strength in building directions. Work is getting better forward in many of the large buildings replacing those recently destroyed by fire. Additional to these, Mr. Phillips said, the fact that contracts are now out for the work sanctioned by the Public School Board, as also for the erection of the new building of the Toronto Lithograph Co. and others that might be named, has given a fresh zest to building operations. Queried as to the discontent in labor circles, he said that there was no change in the situation within the month. Apparently contractors, as work has increased, were able to secure all the labor that was required, and each was going on the basis of making his own arrangements with bricklayers and other workmen. That this open arrangement will in the end operate against the interests of labor seems more than likely. When trade slacks off it seems to the Bystander, workmen will see the mistake made in not coming to a reasonable arrangement with employers, based on the conditions of the business and labor world as it exists today. But the more thoroughly one looks into this question, at least this has been the result of observation and study by the Bystander, the clearer does it become that few classes of the community are more short sighted and constantly stand against their own advancement than the average workman. He has always a grievance, and is constantly in a ferment; at the same time he is seldom in a position to listen to reason and recognize that conditions change from season to season, and year to year, in the labor world as they do in the economy of nature and elsewhere.

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Were the erection of tall buildings, or, as they are familiarly known, sky scrapers, as common in Canada as in the country to the south of us, there would be more interest felt in the remarkable advance that has been made this season in the cost of structural steel. "Where other building materials are somewhat depressed," remarked Mr. Edmund Burke to the Bystander, "steel is going up in leaps and bounds." Perhaps the only building of consequence in Toronto, where a large amount of steel will be used, is that of Mr. R. Simpson, Toronto, with less or more used in the Globe building and some others; but contracts for the steel in these cases were fixed before the present large advance took place. The time will come, no doubt, when there will be many more of these steel buildings erected in Canada. Where they have their disadvantages, and some of these have been brought home closely to the people of Toronto, there is also much to be said in their favor. And the close study that is being given to this class of work is an

evidence that steel structures will become an institution of all large cities in the near future. The best architects and knowing builders, it is said, now see that every piece of steel is carefully tested and if not up to the standard they are thrown aside. Experts are hired and controlled frequently by the architect at the cost of those who put up the building. So exacting has this work become that two concerns in Pittsburg are making a specialty of furnishing experts to supervise and are doing the principal work of this character in the country. The Builders' Gazette, of Pittsburg, Pa., summarizing some comments on this subject, has this to say: "In steel frame construction the skeleton of the building is generally erected first, before the masonry is started. Under the old method the iron and masonry were used together in the building of each story. Where bolts were used largely in the last mentioned form, the steel sections are riveted almost wholly in the first. A steel thus riveted can be compared to an inverted bridge, for in fact the modern building is built on the bridge plan, and it is riveted in such a manner to make it, to all intents and purposes, one piece of steel from top to bottom. Thus any strain which may be put upon the building will be shared by the structure as a whole and not confined to any one spot, as in the ordinary building." As the Simpson building advances, and the Bystander understands that the erection of the steel pillars and girders will commence at once, no doubt progress will be watched closely by everyone interested in building operations, as features of construction, that will be to some extent new to our people, will be developed.

x x x x

The Bystander has been pleased to observe, in the interests of the lumber trade of Canada, that the yellow pine of the southern states, which at one time appeared to be securing a good foothold in building operations here is losing in favor. This change has been brought about, in part, by the action of Canadian lumbermen, after the recent big fires in Toronto, when the attention of all concerned, and the insurance companies in particular, was drawn to the fact that because of the resinous nature of this wood, it was more inflammable than Canadian white pine, and was therefore less desirable for building purposes. One result of this enquiry has been that yellow pine does not occupy the same place in the specifications of architects; and in large buildings now being erected in Toronto, Canadian dimension timber will be almost entirely used. An Ottawa dispatch to the Canada Lumberman also carries some information on this point. It is there stated that an Ottawa firm made the experiment of bringing southern pine into that city, but discovered that although they were not at any loss, yet they did not consider that there was anything gained and have decided to stick to home manufacture for the future. Where the products of the forest are one of the richest resources of the country, there ought to be a pride taken in giving Canadian woods a preference in every case, unless there is some remarkably strong reason for an adverse course.

ILLUSTRATIONS.

MASONIC TEMPLE.—R. MACKAY FRIPP, F.R.I.B.A., ARCHITECT,
VANCOUVER, B. C.

INSANE ASYLUM BUILDINGS, BROCKVILLE, ONT.—KIVAS
TULLY, C. E., ARCHITECT.

FOREMAN AND WORKMAN'S HOUSE TO BE ERECTED ON THE
COLDSTREAM ESTATE, NEAR VERNON, B. C., FOR HIS
EXCELLENCY THE GOVERNOR GENERAL OF
CANADA.—R. MACKAY FRIPP, F.R.I.B.A.,
ARCHITECT, VANCOUVER, B. C.

A judgment has been rendered at Montreal, in the case of Mrs. Thomas vs. the estate of the late Duncan McIntyre, awarding the plaintiff the sum of \$1,400. The widow of the late Mr. Thomas, architect, of Montreal, sued to recover some \$38,000 for services rendered by her husband to the late Mr. McIntyre. There were six items, one for \$60, three for \$2,800 each in connection with a proposed house on Peel street, one for plans for stable, and another item for services in connection with a house on Drummond street. The judge fixed the amount at \$1,000 for the Peel street house and \$400 for the stable, dismissing the other claims.

CHARACTER SKETCH.

E. H. KEATING,
CITY ENGINEER OF TORONTO.

"We put too much faith in systems, and look too little to men."—B. Disraeli.

PERFECT as may be the plans laid and the system under which work is performed, without men of character and determination to carry out the work, failure is very likely to follow. Many an important undertaking has been spoiled because the man in charge has lacked, not so much the knowledge, but the administrative talent enabling him to bring it to a successful issue. And as one views the administration of municipalities and governments, this seems to be a marked weakness.

These were conditions that were widely discussed, when in 1892 the citizens of Toronto found it necessary to appoint a City Engineer in succession to Mr. William Jennings, who had resigned from this position. The experience of the past three years would lead to the conclusion that in fixing a choice on Mr. E. H. Keating, no mistake had been made, and the weaknesses that in some respects had been feared are not likely to develop in this appointment.

Mr. Keating is a Nova Scotian by birth, and some of the circumstances that influenced him to leave Duluth, Minn., and accept the office of City Engineer of Toronto, furnished evidence that he was possessed of a strong Canadian sentiment, and that love of country to no small extent induced him to return again to the country of his birth. Mr. Keating was born in Halifax, N. S., in 1844. He was a school-mate of the late Sir John Thompson at the Common School, and later at the Free Church Academy. He completed his education at Dalhousie College, entering shortly after that into the calling that he had chosen, serving for some time under George Wightman, the government engineer.

Railroad building in Canada has proven a useful field of education for many of our best civil engineers. Mr. Keating's predecessor, Mr. Wm. Jennings, owed no little of the success he has attained in after life to the opportunities for development in his profession that were offered during his connection with the Canadian Pacific Railway. Mr. Keating took part in the survey of the Pictou Railway in 1867, under that famous engineer, Sandford Fleming. A little later he was appointed assistant engineer of the Intercolonial, then in process of survey. For a short time he was draughtsman on the Windsor and Annapolis, and then he returned to the Intercolonial during the construction period.

In 1870, when the work of surveying was entered into on the highlands between Hudson Bay and Lake Superior, for the Canadian Pacific, he again engaged under Mr. Sandford Fleming, and did good service in this particular work. In the same year the position of City Engineer of Halifax was offered him and accepted. This position he held from 1871 to 1890, having charge of the construction of many important civic works, particularly the water-works and the Halifax graving dock. These years were useful in obtaining a knowledge of civic management that stood him in good stead in positions of a similar kind, though of an enlarged character, that he held in after years. His arrangement with the City of Halifax enabled him to engage in other work aside from the city practice, and evidence of his skill and ability in engineering directions is scattered throughout the province of Nova Scotia.

In 1890 the people of Duluth were in want of a City Engineer, and the position was offered to Mr. Keating entirely without solicitation. He accepted it, remaining there until July, 1892, when he became City Engineer of Toronto. The reluctance with which the citizens of Duluth severed the official connection was a high compliment to his sterling worth and splendid abilities.

Mr. Keating's work in Toronto during these three years is before the people. Some of the most important undertakings en-

tered into by the city have been completed within this period, under Mr. Keating's direction. The changing of the street railway system to electricity and remodelling the water-works department take a first place among these. It has called for vigorous watching to see that the arrangements between the Street Railway Company and the city have been faithfully carried out, but Mr. Keating has been equal to the occasion. The water-works plans have not really reached the ideal that the Engineer has before him. He believes that a tunnel, such as was described with some detail in the ARCHITECT AND BUILDER two months ago, is necessary to the success of the system. The citizens by their votes have declared against this, though there is no reason to suppose from any want of confidence in the Engineer, but rather because of the heavy burden of taxation that is being borne by them at the present time, and, perhaps, not without some misgivings, though they believe the Engineer to be a strong man, that his municipal advisers are not all possessed of the same measure of back-bone.

As the executive head of the most important department of civic management, Mr. Keating has shown himself possessed of that tact and diplomacy necessary to one occupying a place of this kind. He has also proven himself eminently successful in dealing with his subordinates. "The great art of commanding," said Napier, "is to take a fair share of the work," and Mr. Keating's success as a commander is due, no doubt, in a good degree, to the readiness with which he himself takes hold of the work of the office.

Personally the City Engineer is a very agreeable gentleman. Not given to much talking, he is at the same time always approachable and pleasant. With Wellington he can say that his watchword is "Duty," and to the faithful carrying out of this, other matters must be subordinate.



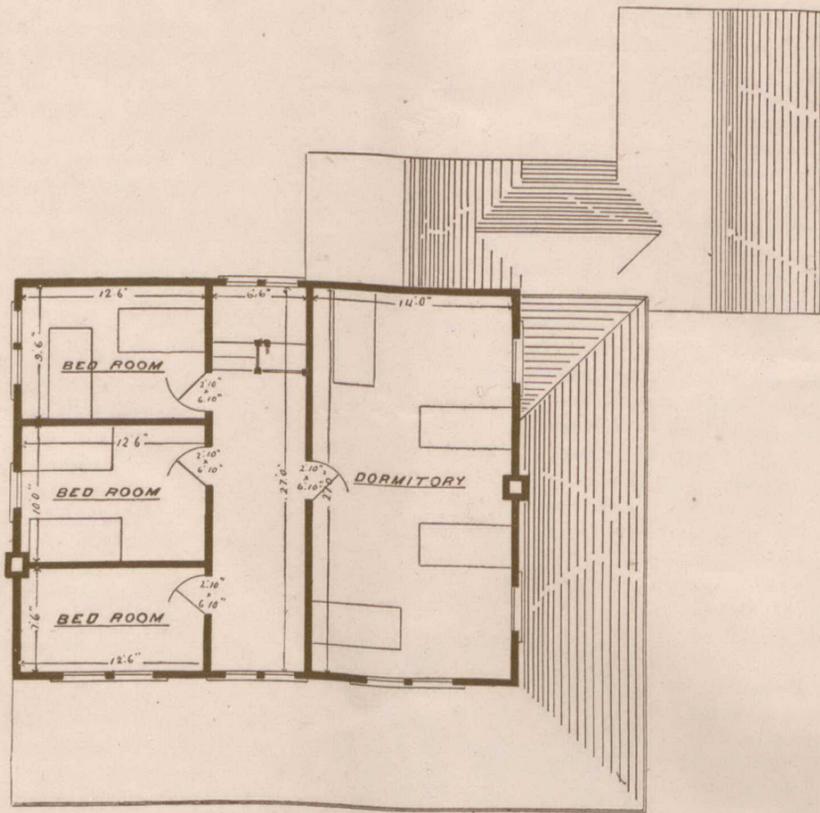
E. H. KEATING,
CITY ENGINEER OF TORONTO.

THE ESSENTIALS OF GOOD PORTLAND CEMENT.

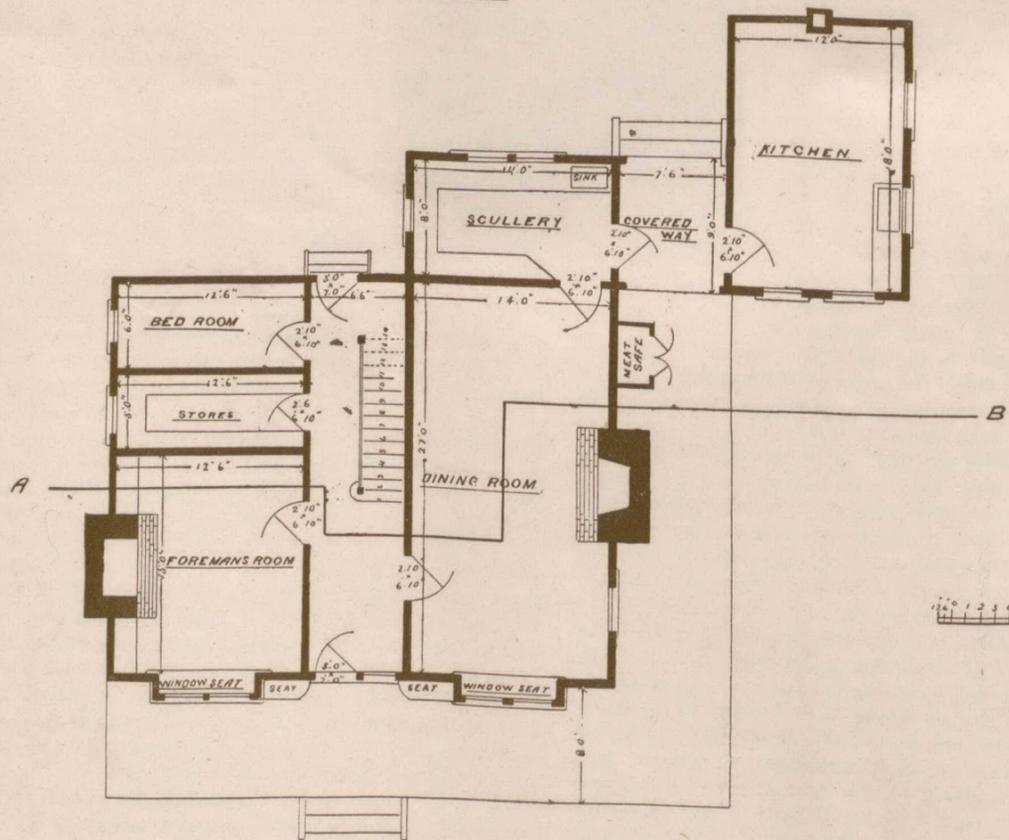
At a recent meeting of the Society of Engineers a paper on Portland cement was read by Mr. D. B. Butler. The author stated that the chief chemical components of a good cement ranged as follows:—Silica, from 20 to 28 per cent., average 24 per cent.; oxide of iron and alumina, from 8 to 14 per cent., average 11 per cent.; lime, 58 to 65 per cent., average 61.5 per cent. These ingredients constituted about 96 per cent. of the

whole, the remainder being made up of small proportions of magnesia, sulphuric acid, alkalis, &c. With respect to soundness, the usual test is the moulding of a thin pat with a minimum of water. This pat is allowed to harden on a glass slab, which it should do without cracking. This, the author says, is not altogether reliable, as he had known cases where, though the pat remained sound at the end of seven days, it went to pieces later on. He therefore advocated Mr. Fajja's test, which consisted essentially of subjecting a freshly-gauged pat to a moist heat of 100 deg. Fahr. until set, and then placing it in warm water at 115 deg. Fahr. for 24 hours. A pat which stood this test without blowing showed a reliable cement. The edge-runner mills, which were now being largely substituted for stones, did not, he considered, give so large a proportion of the impalpable powder, which is the essential part of the cement, so that a cement ground by stones, and leaving a 10 per cent. residue on a 50 by 50 sieve, was equal in cementitious value to one ground in an edge-runner mill, leaving but half as much residue on the same sieve. From a number of experiments Mr. Butler concludes that the time of setting is less the higher the temperature. Some of the samples tried, when mixed at 80 deg. Fahr. set in half the time required at 40 deg. Fahr., and with other specimens the difference was even greater, and the result was of the same character whether the specimens were tested for initial set or for set hard.

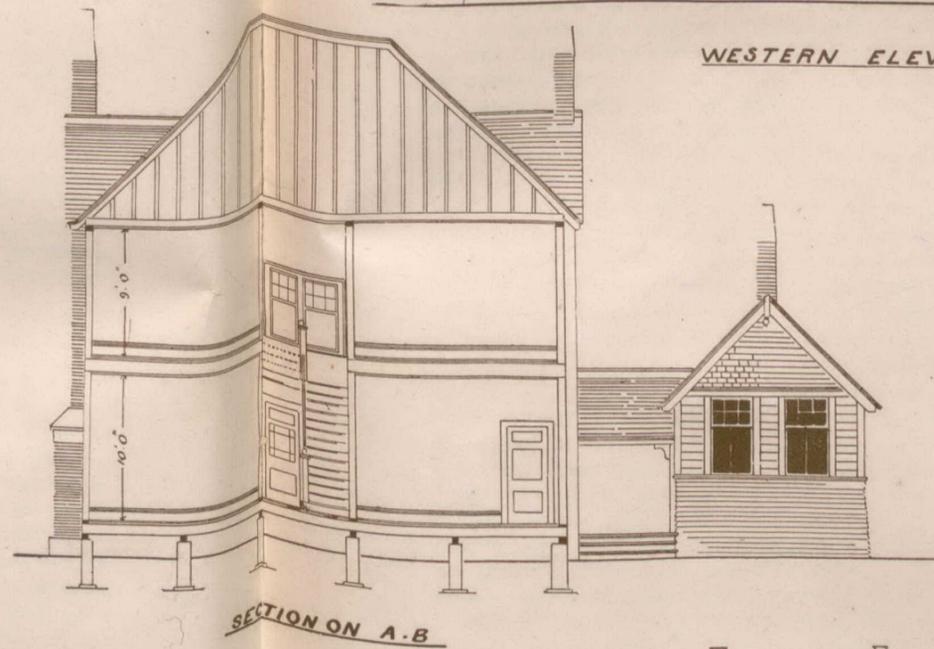
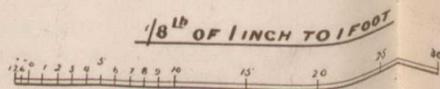
The Canadian Granolithic Company, Ottawa, are putting down a granolithic sidewalk on Clarence and Wellington streets, Kingston.



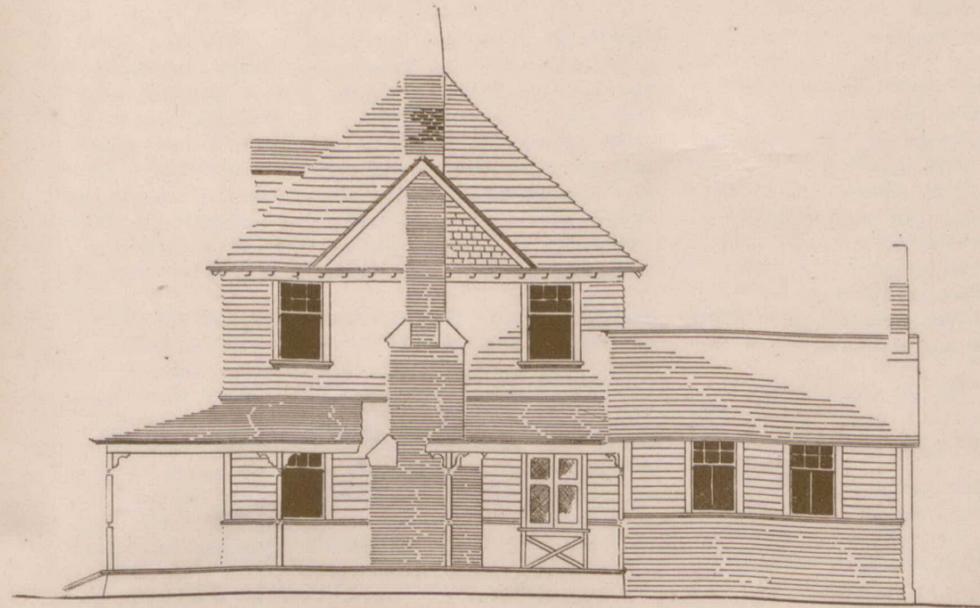
CHAMBER PLAN



GROUND FLOOR PLAN



SECTION ON A-B



WESTERN ELEVATION

FOREMAN AND WORKMANS HOUSE
 TO BE ERECTED ON THE COLDSTREAM
 ESTATE NEAR VERNON B.C.
 FOR

HIS EXCELLENCY
 THE GOVERNOR-GENERAL OF CANADA
 R. MACKAY FRIPP FRIBA
 ARCHITECT
 VANCOUVER, B.C.



ELEVATION TO NORTH

THE AGE OF BRICK.

DURING the early Christian period, and away down through the middle ages, the majority of public and ecclesiastic buildings were mostly constructed of stone, which in the mild climates of Greece and Italy have not wholly disintegrated, particularly when the stone work has been backed up with bricks. Many of the finest structures of early Christian architecture, that were built of stone, have disappeared altogether, while many of those formed of brick and stone together have come down to us almost in their entirety, while not a single one of the great buildings composed of bricks altogether is known to have disappeared.

In fact, the most perfect buildings that have come down to us from the earliest days, are built of bricks, and we have evidence in a thousand and one instances of the superior lasting properties of bricks over all other known building materials. The Pantheon, the building of which dates back more than a century beyond our era, is built of bricks backed up with concrete, and despite the bandit and barbarian, and the tooth of time, it still remains almost entire, as an object lesson in the use of bricks. The great Gothic Church of San Stefano, Venice, though badly designed and worse constructed, shows the bricks of which it is built to be as sound and shapely as when first laid, though held together by a very inferior mortar.

The Triumphal Arch erected at Rimini in honor of Augustus, is partly constructed of bricks, and partly of marble; but while the marble is nearly rotten and dropping to pieces, the despised bricks remain perfect, and hold together the whole structure and its decaying aristocratic veneering.

By far the oldest Pyramid is of brick, the one of Sakkara, said to have been erected more than a thousand years before Jacob wandered into Egypt. It still holds together and gives promise of being a thing of mystery for a few thousands of years more. Indeed, we believe the Pyramid of Sakkara is supposed to be the oldest structure known. The Temple of Thebes, and the great Pyramids of Ghira, are modern by comparison.

For many reasons brick seems to be the best and most natural of building materials. It is easily handled, materials for its manufacture are abundant and readily obtained, no extra skill for the manufacture of the plainer sort is necessary, it can be moulded to any shape, it is better than stone inasmuch as it is a better non-conductor of heat or cold, it is drier, weathers better, will resist the action of frost and fire better, is lighter, and when well made will resist nearly as much strain as our best building stones. It can be carved if necessary, with a definiteness almost equal to most of our stones, and its economy places it within the reach of medium-sized purses.

Recent improvements in the manufacture of pressed bricks give the modern architect and builder a decided advantage over their predecessors in many ways. In olden times the architect was obliged to have all his moulded and ornamental bricks made by inexperienced workmen, under his own supervision. In the construction of a large building of brick, the brick-maker was one of the architect's staff, and made his bricks to the order of his superior. His appliances for making and burning were of the crudest sort, and, as we know from examination of old bricks, they were often badly made and badly burned. To-day the architect may choose his bricks from catalogues, making his own choice of shape, quality and color, and can rely on getting what he orders; and he can order to suit his design, whereas the old builders were obliged in almost every case to make their designs to suit the materials available.

Canada—Ontario at all events—is well equipped so far as modern bricks are concerned, and speaking from a knowledge born of long experience under several flags, the province named produces a brick that has no superior, and few equals on this continent. Specimens of bricks now before me, made on the Don, near Toronto, from Credit Valley, from the yards at Milton and Beamsville, are fully up to all required standards, and while they vary somewhat among themselves, both as to quality and color, any one of them is superior to the bricks of our granddaddies.

That the coming cities and towns of this great Dominion will be made of brick, goes without saying; even the streets hereafter will be of brick, and it is within the range of possibility that some method will ere long be discovered or invented by which strong slabs of brick or terra-cotta will be made that can be ser-

viceable for sidewalks. This is an "age of brick," and the possibilities of the fertile art are beyond the comprehension of ordinary mortals.

One thing before closing. Some steps should be taken by brick-makers to have one uniform size throughout the whole Dominion. I find, in comparing different makes, quite a difference in sizes: in length, width and thickness. One-eighth of an inch difference counts up in a large building, and frequently confuses an estimator, particularly if he figures closely. Again, the bricklayer finds it difficult to work in pressed bricks with common ones, as the latter are nearly always larger than the former. A standard size would be a boon to all builders, and should be of importance enough to warrant legislation, if the brick-makers themselves do not agree upon a uniform size.

F. T. H.

Collingwood, July 3rd, 1895.

THE PROPER SHAPE OF CHIMNEYS AND FLUES.

THIS question has been considered by a man of a wide and successful experience, and answered very positively as follows:

"Having an idea that it was not all uphill work in a chimney, I concluded to investigate the operation of the one in my house, to see if there were any down currents in it, as I heard frequently asserted. I took light tissue paper and made some small light balls of it. I was particular not to crush them tight and make them heavy, and also was careful to keep them round. With these I went to the top, and balls that were dropped into the center of the chimney were invariably blown out. Those dropped into the corners in a majority of cases went to the bottom, where I found them on taking out the pipe to look for them. Those that did not go down, I think, struck some projection, and were thrown into the central up current and were blown out. This settled in my mind that rectangular flues were wrong, and while the area of a round flue of the same diameter might be less, it was equal in air carrying capacity, as it had only one up pressure, with no corners for friction and tendency toward a vacuum. This led me to making the ends of my partition hot-air flues round, and, while they are easier to make and cheaper, they are equally as effective as if they had square corners, satisfying me that all flues should be round."

From another experienced source comes this idea: "I believe that the house with round flues can be heated satisfactorily for the six months necessary with at least a ton of coal less, where the house with square flues would not be as comfortably warmed."

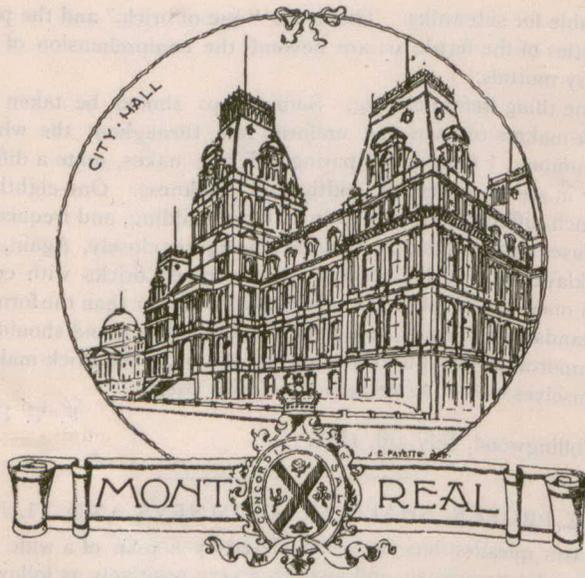
COLORING ARCHITECTURAL TERRA-COTTA.

THERE is no device resorted to by the clay-worker that is alike so inartistic and so ineffectual, says the British Clay-Worker, as attempting to give to architectural terra-cotta blocks a finer color than they naturally possess. The coating of such blocks with pigments or washes, or the staining of their surfaces, is never of a lasting nature; it soon wears off under the combined action of rain, smoke, frost, and other influences of an atmospheric nature.

"Then what are we to do if our clay will not yield a good color?" some may say. Well, the only course open is to determine whether it is admissible to use chemicals in the composition of the blocks, so that increased tone of color shall be due not to a superficial film, but to the mass itself. Obviously, this will be governed entirely by (1) the cost of the chemicals, (2) the facility with which they can be applied; and these conditions, again, will be governed by the price which can be got for the goods.

If the selling price warrants the expenditure of labor and chemicals, by all means color the mass throughout; but if, on the other hand, the extra labor and expense would not be recouped, it is clear that the best course to adopt is to abandon the manufacture of the blocks, for which the particular clay is obviously unsuited, and exploit the clay for other purposes.

Washes and stains, however, are never permanent, and permanence is the first quality that is demanded in architectural facings. If these principles were more often present in the minds of clay-workers, we should not see so many ghastly failures in our streets, failures which only tend to bring our industry into disrepute.



(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

MONTREAL may be called with some appropriateness, in a few years from now, the City of Monuments, if their number continues to grow out in the same proportion they have been during the last few years.

Two of these monuments having been unveiled recently, the readers of the CANADIAN ARCHITECT AND BUILDER will forgive me if I take advantage of the actuality of the subject to bring the same before their notice.

Amongst the monuments and memorials the Maisonneuve Monument stands foremost and unrivalled by anything yet erected in the city. It is not that it is the tallest or the most costly, as it is not these alone that are capable of producing a work of art, but it is the refinement of the whole, the agreeableness of the outline and the elegance of the details, which are yet very simple.

The statue stands on a pedestal of granite, having a low buttress at each of its four corners, on which are placed groups of figures, representing Closse accompanied by his dog, and Lemoine, two early settlers of the Ville Marie; Jaune Mauce represented while attending a wounded young Indian, and an Indian of the tribe of the Iroquois, with which Maisonneuve often had trouble. On each of the four sides of the pedestal are bas-reliefs, the one facing Notre Dame Church representing the signature of the act constituting the foundation of Ville Marie, the one facing the Ontario Bank the exploit of Place d'Armes, the one facing the Bank of Montreal the heroic death of Dollard at the Long Sault, and the side facing the New York Life building the celebration of the first religious service on the island.

The cost of the monument has been about \$25,000, nearly half of which has been subscribed by the municipal government and the balance by citizens of the city.

The Macdonald Memorial unveiled shortly before the Maisonneuve Monument, might no doubt be comparable, in respect to its sculpture, to the Place d'Armes monument, but from an architectural point of view it utterly fails to provoke that agreeable sensation and satisfaction one feels when passing by the down-town monument.

The aspect of the whole is of a triumphal arch, standing on a high pedestal, with its two side doorways omitted, and as an architect of some note remarked to me a few days ago, crowned by a candlestick holder. The memorial bears no inscriptions of any kind, with the exception of the name of the great statesman honored by its erection.

The roof is crowned by four lions, and over these by allegorical figures representing the seven provinces of the Dominion, holding a shield bearing the coat of arms of each of the Provinces. The total cost of the memorial was about \$35,000.

Another of the monuments also recently erected is a granite obelisk, measuring about 35 feet heavenward, on Foundling street, near Place Royale, in commemoration of the founders of Montreal. The obelisk is perfectly plain, with no sculpture or bronze work, with the exception of the plates bearing the inscriptions, one of which reads as follows:

Le XVIII Mai MDCCCXCIII
Ce Monument a ete erige
par
La Societe Historique de Montreal
a la memoire
Des genereux fondateurs de cette ville
et
des premiers colons arrives ici
en
MDCXLII.

The Historical Society of Montreal is an institution deserving encouragement from all citizens and true patriots, for it is a noble task that it is pursuing. Although the field is not vast in a comparatively young country as ours, we should not lose sight of the great good derived from similar institutions in Europe, and especially in France.

Another monument, and the last I have to chronicle here, is Dr. Chenier's Monument, one of the agitators of 1837-38, which is now in course of erection in Viger Gardens. The foundations are now level with the ground, and it is expected to have it completed this summer.

MONTREAL MASTER PLUMBERS' ASSOCIATION.

The regular meeting of the above association was held on the 20th of June, the President, Mr. Lamarche, in the chair. Among those present were: J. W. Hughes, John Dete, P. C. Ogilvie, J. A. Sadler, W. A. Stephenson, D. Gordon, H. Patton, Thos. Christie, W. M. Briggs, D. Sexton, J. Marien, J. Creed, John Watson, F. Horton and G. Denham.

The Secretary read a reply from the Toronto and Quebec associations, regretting inability to send delegates to the convention of the National Association of Plumbers of the United States, held in Philadelphia recently, after which Mr. John Date was called upon to give an account of his visit to the convention. He was courteously received by the American brethren, and found their meetings interesting. About 397 delegates were present, as well as a number of visitors. It was moved by Mr. Gordon, seconded by Mr. Sexton, that the thanks of the association be conveyed to Mr. Date for his services, which was carried unanimously.

After considerable discussion among the members, it was resolved to suspend the regular meetings of the association until September, leaving to the Executive Committee all business arising during the interval, but should it be found necessary, a special meeting may be called at any time.

The hope of those engaged in the building trades has been deceived, for although the outlook last spring for this season's work was satisfactory enough, it appears that, notwithstanding the improvement recorded in trade in general, speculators and money investors are more cautious and prudent than previously, and do not wish to launch themselves in any undertaking of importance until the complete revival of business is assured.

The only buildings of any importance being built this year number only two, the Canada Life building at the corner of St. Peter and St. James streets, which has now reached its third story, and the Bell Telephone Co.'s building, at the corner of Notre Dame and St. John streets, which has just been commenced.

PERSONAL.

We regret to announce the death, on the 10th inst., of Mr. Warden King, senior member of the firm of Warden King & Son, Montreal, and one of the most prominent business men of that city. He had been in somewhat delicate health for some time past, but serious results were not anticipated until a short time previous to his death. Mr. King was born in Scotland in 1823, being 72 years of age at the time of his death. In 1852 he entered into business with the late Mr. Rogers, as hardware manufacturers and iron founders, the firm being known as Rogers & King. After Mr. Rogers' death, Mr. Jas. C. King became a partner, and under the name of Warden King & Son the business has since been successfully carried on, the Chanteloup estate being recently purchased by them. In religion Mr. King was a Presbyterian, being the oldest elder in Erskine church, and one of the founders of the Y. M. C. A. He was a Conservative, but took no prominent part in politics.

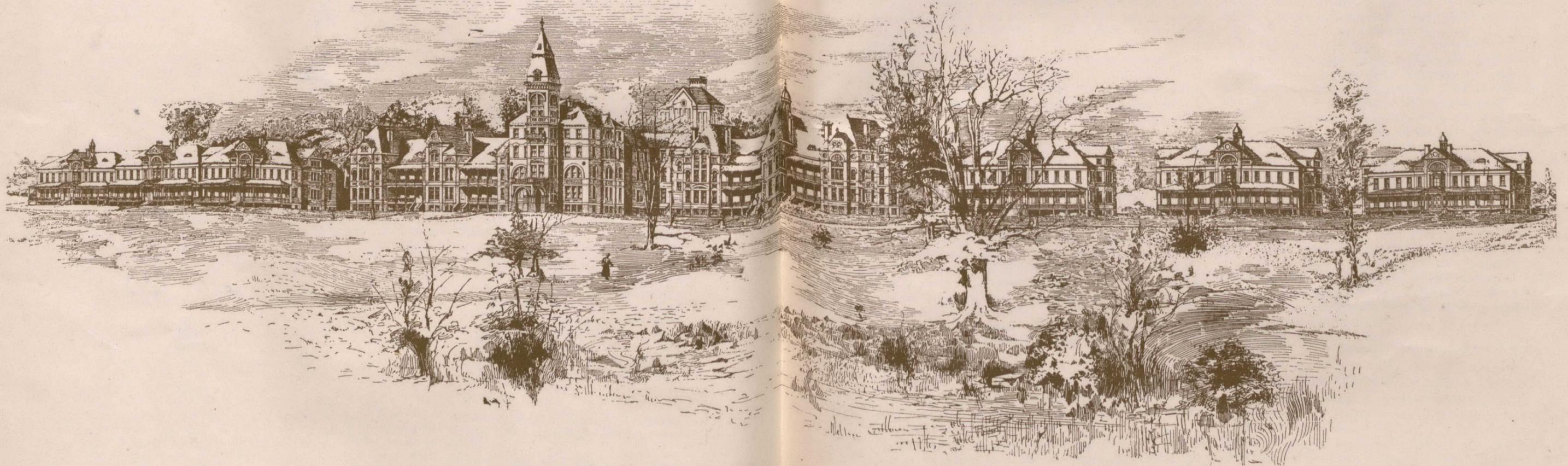
USEFUL HINTS.

White lead and zinc whites are valued according to their whiteness, fineness and opacity or density. Blacks according to their tone, lustre, density and staining capacity.

In the manufacture of cement mortar about eight parts of furnace ashes, slag, or coke, four parts of slaked lime, and one of clay, are taken and mixed dry so as to form a cement, which, on mixing with water, sets in the ordinary way. The proportions of the materials may be varied so as to produce either an aerial or hydraulic cement.

French polish, as used in France, is made as follows:—A solution of gum acacia and the whites of two eggs is made by beating these ingredients in a mortar until they amalgamate; then half-a-pint of raw linseed oil, the same quantity of the best vinegar, eight ounces of methylated spirits of wine, one ounce of hydrochloric acid, and two ounces muriate of antimony are added.

A writer in one of the English architectural papers gives what he terms "a very simple method of rendering a wood factory building of greater resistance to fire." It consists in filling the spaces between the studding with "a grout made of sand, lime and a large proportion of sawdust, mixed with water to flow slowly. It becomes quite hard; is a poor conductor of heat, and will not ignite, though it is charred by exposure to an intense fire. This applies to a building already constructed, where it would be a difficult task to remove the sheathing or lath and plaster already on the inside walls. Where the studding is already exposed on the inner side, the space is frequently filled with brick, masonry, or large tiles made for such purposes.



INSANE ASYLUM BUILDINGS, BROCKVILLE, ONT.

MR. KIVAS TULLY, C.E., ARCHITECT.

CODE OF PRACTICE FOR SUB-ESTIMATING AND SUB-CONTRACTING.*

THE Master Builders' Association of the City of Boston, recognizing the importance of defining the rights and obligations of Principal and Sub-Contractors for Building Work, in their relations to each other in estimating, contracting for, and carrying on work, hereby approves and adopts the following Code of Practice as a declaration of what it will recognize as honorable methods in the conduct of business.

ARTICLE ONE.—Obligation of Principal Contractor to Sub-Contractor.—A principal contractor is under obligations to treat upon an equal basis all estimates which he "received," prior to putting in his own bid. Estimates must be considered as "received" when they come into a principal contractor's possession, either by his direct solicitation or by being accepted by him. The opening of a bid, knowing it to be such, constitutes receipt of the same.

A principal contractor is under no obligation to use a bid which he has not solicited, accepted, or received, but if he does not wish to use the estimate of a sub-bidder he should decline it, if proffered personally, or should return it unopened if sent to him by mail or otherwise. The retention of a bid should be constructed as a receipt of the same.

All bids should be considered "confidential," and a principal contractor revealing any bid received by him to any person whomsoever, without consent of the sub-bidder, will be liable to complaint and discipline under Article X of the By-laws of this Association.

A principal contractor, when making up his estimate, is not entitled to receive bids from sub-contractors if he is at the same time making himself their competitor by figuring their portion of the contemplated work. It is legitimate for a principal contractor to figure all proportions of work, depending upon no one for what are usually known as sub-estimates, but it is not legitimate for him to receive bids from others for sub-work if he is himself figuring those portions independently.

ARTICLE TWO.—Award of Sub-Contracts.—The principal contractor having been awarded a general contract, should immediately award the sub-contracts to the lowest bidder in each branch.

ARTICLE THREE.—Penalty for Not Awarding Contracts to Lowest Sub-Bidder.—A principal contractor, failing to award a sub-contract to the lowest sub-bidder to whom he is under obligation as previously provided, should be liable to pay damages to the said lowest bidder, in amount not less than ten per cent. of the amount of the estimate.

Payment of such damages will not relieve the principal contractor from liability to discipline under provisions of Article X of the By-laws of this Association.

ARTICLE FOUR.—Contracts with Sub-Contractors.—The principal contractor, immediately after executing a general contract with the owner, should, for his own protection as well as the protection of the sub-bidder, execute some satisfactory form of contract or agreement with each lowest sub-bidder.

ARTICLE FIVE.—Payments to Sub-Contractors.—Unless the contracts made with sub-contractors otherwise provide, payments during the progress of the work should be made by the principal contractor to the sub-contractors upon the same basis of payment, in relation to the amount of work performed, as is prescribed in the contract made by the principal contractor with the owner.

Final payment to a sub-contractor should be considered as due at the expiration of thirty days after the completion of his work and its approval by the architect or owner, unless otherwise provided by the sub-contract or agreement.

ARTICLE SIX.—Submission of Bids by Sub-Contractors.—Sub-contractors in submitting bids to principal contractors should enclose them in the envelopes prepared by this Association and kept on hand for the use of sub-bidders, or should endorse the envelopes in which they are enclosed in such manner that principal contractors may know whom the bids are from, what portion of the work they comprehend, and the particular building they apply to.

Sub-contractors who fail to so enclose and endorse their bids

cannot claim protection or redress under the first article of this Code.

ARTICLE SEVEN.—Obligation of Sub-Contractor to Principal Contractor.—Should a sub-contractor refuse to contract at the amount of the estimate he has given to a principal contractor who had used the said estimate in good faith, he then should be liable to the said principal contractor for damages in amount not less than the difference between the amount of the estimate which was submitted by him and the amount at which the principal contractor may be obliged to contract the work.

Payment of such damages will not relieve the sub-contractor from liability to discipline under provisions of Article X of the By-laws of this Association.

ARTICLE EIGHT.—Obligations of Sub-Contractors to Each Other.—Any sub-contractor suspected of unfair treatment of his fellow sub-contractors will be liable to complaint and discipline under Article X of the By-laws of this Association.

ARTICLE NINE.—Trading Sub-Bids.—Trading upon sub-bids will be considered sufficient cause for complaint and discipline as provided by Article X of the By-laws of this Association.

ARTICLE TEN.—Bids to Architects or Owners.—When bids for separate departments of work on a building are solicited by the architect or the owner, they should be submitted with the understanding that they are direct estimates, for which direct contracts are to be made by the owner with the lowest bidder, and no other disposition of such bids should be permitted without consent of the bidder submitting the same.

Sub-bids should be given only to the principal contractors who are estimating the work in question, and should not be left with architects or owners for the inspection and information of principal contractors. Sub-contractors must understand that bids thus left with architects or owners are in great danger of losing their confidential character, and that if they so leave them they cannot claim protection or redress under the first article of this Code.

SUGGESTIONS.—Members of this Association having sub-contracts to let or material to buy should, as far as may be consistent with business principles, deal only with members of the Association, or at all events give their fellow-members an opportunity to compete, and then give them the preference, other things being equal.

All bidders should take cognizance of the danger they may be subject to through the practice, so prevalent in some architects' offices, of making changes in plans or specifications, or in both, during the progress of estimating. Correction of this pernicious practice can only be obtained through refusal by contractors to estimate under such conditions.

[A true copy.]

Attest : WM. H. SAYWARD, Secretary, M. B. A.

GLASS COLORING IN GERMANY.

THE beautiful coloring of certain varieties of glass, now produced in Germany, and which is said to far excel some of the most noted French specimens, is an art practiced by the glass blower at the furnace, by means of an apparatus consisting of a sheet iron cylinder, twenty inches long and eight inches diameter, standing vertically, and having a similar cylinder riveted across the top. Kuhlow's German Trade Review says that in the lower cylinder is an opening into which an iron ladle can pass, and the horizontal cylinder is provided with doors at either end, the one nearest the operator being so arranged that the blowpipes can be supported, when the door is closed, in a horizontal split running to its middle, the object to be treated being held inside. While the glassblower is reheating his work for the last time in the furnace, an attendant takes the long-handled iron ladle, which has been heated red hot, shakes into it about a spoonful of a specially prepared chemical mixture, and places the bowl of the ladle quickly in the opening provided for it in the vertical cylinder. The mixture immediately gives off vapor, which rises to the horizontal cylinders, where, meanwhile, the blower has placed his work, supported by the blowpipe and heated to an even red, turning it rapidly in the vapor. In a short time the object is covered with a changeable lustre, is removed from the pipe and tempered like other ware in an ordinary oven, then cut, engraved, painted, or gilded as desired.

The corner stone of a new English church has been laid at Fergus, Ont.

* [In adopting the Code the Association acknowledges its obligation to the National Association of Builders for valuable suggestions in relation to this important matter.] Adopted August 2, 1894.

THE ABUSE OF CEMENT.*

BY D. B. BUTLER.

THE treatment which cement sometimes has to undergo at the hands of inexperienced users, makes it a matter for wonder that failures are not more frequent. One of the most prolific causes of failure is insufficient attention to the setting properties of the cement under treatment. In very hot weather it is no uncommon thing for a cement to have a very quick initial set, and in using such a cement, therefore, in order to obtain its full strength, it must be mixed and in its allotted position within a very few minutes of adding the water. This often entails the mixing of very small quantities at a time, and if due precautions are not taken, a larger quantity is mixed than can be manipulated before setting commences. This generally results in the use of additional water, and the serious detriment, if not total destruction, of the setting properties of the cement. Many cases of failure have occurred in which the cement being a good quality, though somewhat quick setting, point strongly to over-manipulation or "killing."

Another frequent cause of unsatisfactory work is a dirty and unsuitable aggregate. The admixture of a very small proportion of dirt or loam is quite sufficient to materially deteriorate the strength of a concrete, and too much stress cannot be laid upon the necessity for seeing that all aggregates are free from any foreign dirty matter. A case of structural failure came under the notice of the author a short time back, in which the cement used was perfectly good, but the finer portions of the aggregate consisted of very fine sand, so fine that 60 per cent. passed through a sieve having 70 holes per lineal inch, and 80 per cent. through a sieve having 50 holes per lineal inch. The structure of which it formed part had to bear a considerable thrust, and to aggravate matters, instead of this sand being properly mixed, large patches occurred in which there was no cement at all. In addition to this, the sand contained a considerable portion of loam or foreign matter, and it is not to be wondered at that failure resulted.

The neglect of the proper cooling or aeration of a cement is a frequent cause of trouble, and to ensure satisfactory work, proper cooling cannot be too strongly insisted upon. Of course cement may give good results when used hot from the mill, and the author has manufactured cement which has turned out satisfactorily under these conditions, but to use cement in this state is to court failure. It is sometimes specified that the manufacturer shall store the cement in his warehouse at a stated thickness of say 3 ft., for a certain period, and have it turned over three or four times at regular intervals before being supplied for use, but if this had to be done with the entire output of every factory, it would necessitate an enormous increase in warehouse room, to cover the first cost of which would entail a largely increased price to the consumer. It is therefore advisable, where cement is being used in considerable quantities, to construct temporary cooling sheds, with a good, dry, boarded floor, where the cement can be turned out in sacks or barrels and thoroughly aerated before use. It is sometimes contended that the cement, even if shipped hot, cools sufficiently during transit. Although it undoubtedly cools to a certain extent, it is doubtful if, when tightly packed in barrels, or closely stowed in sacks, it cools sufficiently to allow of its being immediately used with safety.

The exposure to extremes of temperature has perhaps more to answer for in the shape of unsatisfactory work than is generally recognized. If exposed to a summer sun immediately after being gauged, naturally a great deal of the necessary moisture is evaporated, leaving the cement without sufficient to complete the crystallization already set up. The result frequently is that the work crumbles, and shows signs of failure. On the other hand, exposure to frost acts on the water, and by expansion destroys the surrounding concrete. The author once had occasion to investigate a case of failure in which frost was the undoubted cause of the mischief, as there was no fault to be found either with the cement, aggregate, or manner of manipulation. The concrete flooring of an outhouse in some new farm buildings was commenced late in December, and left partly completed owing to the Christmas holiday. As frost set in with unusual severity during the interval, the work was not revisited until the return of milder weather, three or four weeks afterwards, when it was found that that portion which was laid immediately before the

frost, was utterly destroyed, while the proportion previously laid, which had sufficiently hardened to prevent total destruction, showed signs of flaking on the top where it had been floated or trowelled. In this case the cement had to bear the blame, although the destroyed portions, afterwards relaid with the same materials, gave perfectly satisfactory results. During severe weather, therefore, proper precautions should be taken to protect freshly laid concrete from the effects of frost.

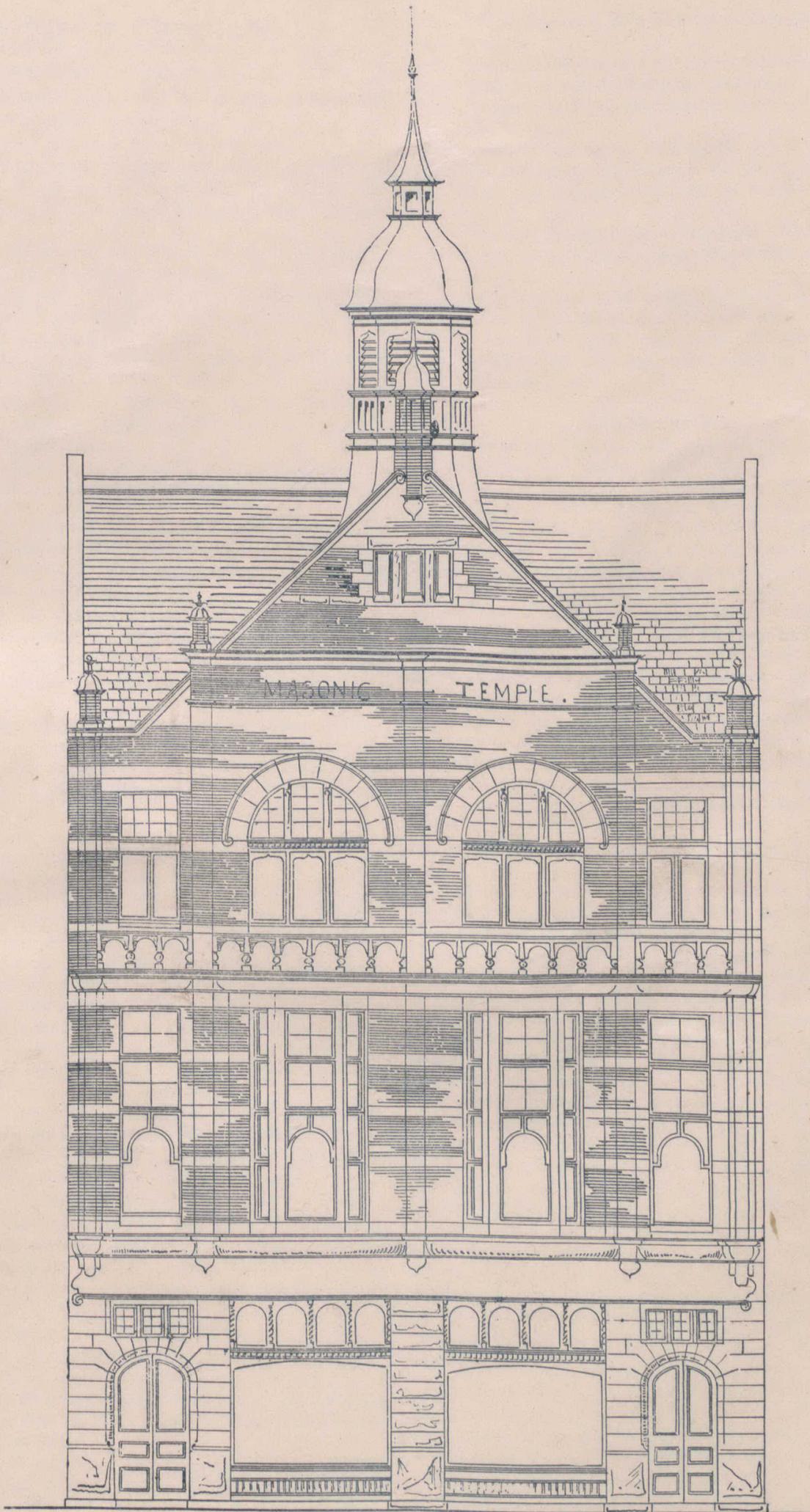
To summarize the preceding remarks, the chief points requiring attention in the use of cement, in order to obtain the best results, are the following:—(1) Sound, well ground cement, of steadily increasing strength. (2) Due attention to the setting properties of the cement. (3) Clean, well-proportioned aggregate. (4) Proper maturing of the cement before use. (5) Protection from extremes of temperature. If these points always received the amount of attention due to their importance, failures in cement work, apart from defective design, would very rarely be heard of.

APPROXIMATE ESTIMATES.

WE have devoted much space in our columns, says *The Building News*, to estimating buildings, and to the methods in use for taking out quantities; but for the architect's purposes a more expeditious mode of calculation for obtaining approximate estimates is necessary. The ordinary cubing process is open to some objections. The pricing of the voids or spaces with the solid portions is not altogether satisfactory; indeed, without some attention to the proportion between the two, and the character of the building, it is eminently unscientific. Every architect is aware that the open spaces of rooms very materially affect the estimate. A building like a large hall or a place of worship, inclosing one large room, and a building of the same dimensions divided into small rooms, give very different results, and if cubed at a price that would be fair for the first, would be disproportionately inadequate for the latter. It is true that the practical man may so regulate the price per foot in each case as not to go far wrong; but this knowledge requires a large and varied experience. In buildings like hospitals and barracks the proportion of the voids to the solid structure ought to be ascertained before the ordinary price per foot can be arrived at. The author of a paper on this subject, Mr. S. Alcock, surveyor of the Royal Engineer Civil Service, has written some sensible remarks on the question worthy of attention, his remarks bearing more particularly on barracks. He shows that if the cubical contents of the rooms were deducted from the contents of the whole structure, the remainder would represent the cube contents of the actual building materials in the walls, floors, ceilings, and roofs, and a price per cubic foot on this remainder would be a much closer and more reliable approximation to the cost; but as these several parts vary considerably in price, as, for instance, the walls being less per cube foot than the floors, this plan still leaves much to be desired. He suggests a method that has been used by some, that "a much more reliable approximate estimate of the cost might be made by pricing the enclosures or envelopes to the rooms or apartments at so much per hundred square feet, taking the walls according to their thickness and manner of finishing each face, including all digging, concrete footings, plastering, papering, coloring, lime-whiting, etc., in fact, all work and material expended on the walls; and for the dimensions (1) the length, and (2) the height from the bottom of foundations to the eaves if the wall maintains the same thickness throughout, or to the change in thickness if the thickness is changed, and making no deductions for doors, windows, or other similar openings." The floors are similarly to be taken by the square of 100 ft., including all joists, boarding, bridging, hearths, the upper floors to include lathing and plastering, and the ground floor dwarf walls and any concrete to the ground under the boarded floor. The roof covering should include not only the slate or tile, but leadwork, rafters, boarding, trusses, skylights, etc.

This mode of estimating the constructional envelope, instead of taking solids and voids together, is much more reasonable, as it takes into account the materials and labor in a more precise and definite form. By using a schedule of prices calculated for each of these main superficies—namely, for the walls, the floors, and the roof—we can obtain a very approximate idea of the total cost.

*From a paper read before the Society of Engineers.



MASONIC TEMPLE.

R. MACKAY FRIPP, F.R.I.B.A., ARCHITECT, VANCOUVER, B.C.

STUDENTS' DEPARTMENT.

STUDENTS' EXAMINATIONS.

FOLLOWING are the subjects for the students' examinations of the Ontario Association of Architects for 1896:

FIRST INTERMEDIATE EXAMINATION.

Every candidate must, at least one week prior to the date fixed for the examinations, send to the Registrar the following drawings, which must be certified by his principal to be his own work:

Five sheets of drawings, one of each of the Roman orders. One sheet of the mouldings and ornaments of those orders drawn to a larger scale. (Each sheet to be of the size of a half sheet of Whatman's Double Elephant paper, i.e., 20 in. by 26 in.)

The subjects for examination will be:

ELEMENTS OF CONSTRUCTION.—Text book: Mitchell's Building Construction.

MATHEMATICS.—Euclid: Books I, II and III. Plane Trigonometry: Including the solution of plane triangles. Algebra: Including quadratic equations.

TECHNICAL TERMS.—A knowledge of the terms necessary to understand the description of a monumental building and its parts.

HISTORY OF ARCHITECTURE.—To the close of the Roman period. Books recommended: Stevenson's House Architecture, Vol. I, as an introduction; Rosengarten's Architectural Styles; Fergusson's History of Architecture.

SECOND INTERMEDIATE EXAMINATION.

Every candidate must, at least one week prior to the date fixed for the examination, send to the Registrar the following drawings, which must be certified by his principal to be his own work:

One sheet of Romanesque architecture; two sheets of Gothic architecture; one sheet of drawings measured from existing examples; one sheet of constructional details. (Each sheet to be of the size of a half sheet of Whatman's Double Elephant paper, i.e., 20 in. by 26 in.)

The subjects for examination will be:

STATICS, GRAPHICAL AND ANALYTICAL.

STRENGTH OF MATERIALS.—Text book for both the above heads: Lessons in Applied Mechanics, by Cotterill & Slade; Part II.

PRACTICAL KNOWLEDGE OF BUILDING TRADES.—Masonry (excluding cut stone work), Brickwork and Plaster. Text book: Mitchell's Building Construction; advanced course.

STRUCTURAL IRON WORK.—The candidate will be required to draw details of the forms of iron construction in use in ordinary practice, viz.: the construction of columns and girders, and the framing of beams and trusses. Text book: Mitchell's Building Construction; advanced course.

HISTORY OF ARCHITECTURE.—From the close of the Roman period to the present time. Text books recommended: Fergusson's History of Architecture; Rosengarten's Architectural Styles; Parker's Introduction to Gothic Architecture.

FINAL EXAMINATION.

Every candidate must, at least one week prior to the date fixed for the examination, send to the Registrar a perspective drawing which must be certified to be his own work. Drawings to be on a sheet of paper, 20 in. by 26 in., and not mounted on cardboard.

The subjects for final examinations will be:

HISTORY OF ARCHITECTURE.—The candidate will be expected to know the history of the development of Architecture.

MOULDINGS, FEATURES AND ORNAMENTS.—The candidate must be able to draw the characteristic mouldings, features and ornaments of any style.

DESIGN.—As illustrated by drawings for a building of moderate dimensions, from particulars given, with details of construction and ornament.

NATURE AND PROPERTIES OF MATERIALS.—Limes, cement, stones, bricks, timber. Text book: South Kensington Notes on Building Construction.

FOUNDATIONS.—Text book: Foundations, by George T. Powell.

ARCHITECTURAL JURISPRUDENCE.—Text book: The law re-

lating to Civil Engineers, Architects and Contractors, by Macassey & Strachan.

PRACTICAL KNOWLEDGE OF BUILDING TRADES.—Sufficient for the purposes of ordinary building. Text book: South Kensington Notes on Building Construction; Building Superintendence, by T. M. Clark.

STRENGTH OF MATERIALS.—Designing structures of an ordinary kind from data, with computation of the strains involved. Text book: South Kensington Notes on Building Construction.

HEATING AND VENTILATION.—Text books: Ventilation and Heating, by John S. Billings; Steam Heating for Buildings, by Wm. J. Baldwin.

SANITARY SCIENCE.—Text books: Gerhard's House Drainage; Bayles' House Drainage and Water Supply.

STEEL AND IRON CONSTRUCTION AND PROTECTION.—Text book recommended: Skeleton Construction in Buildings, by W. H. Birkmire.

PLASTER CASTS.

PLASTER of Paris may be hardened so as to bear a more perfect polish than ordinary stucco-work, and not be very readily scratched. This is effected, says the Builders' Reporter, by the addition of certain saline substances, such as alum, borax, silicate of potash, or soluble glass. If an object in plaster, such as a bust, be soaked for a month in a solution of alum in twelve to thirteen parts of water, and then wiped and allowed to dry fully in the air, it will become so hard that it can no longer be scratched with the nail, and will lose much of the brittleness of ordinary plaster casts. Casts treated in this way become stained, and are always liable to attract moisture from the atmosphere. If baked gypsum be moistened with a solution of alum, or raw powdered gypsum be well mixed up with a similar solution and exposed to a red heat, a mass will be obtained of a dull milk-white, or more usually a slight cream color, which may be readily pulverized, and will set quite as well as ordinary gypsum, especially if a weak solution of alum be employed in making the paste. Casts prepared of the compound thus formed, although taking a longer time to dry, are unusually hard. They may be exposed to the weather for some time and may be washed with a sponge without injury, and even immersed in boiling water without diminishing their hardness. Those prepared by steeping in a solution of alum, on the contrary, will become quite soft; so much so as to receive the impression of the fingers if soaked for a few hours in cold water. Keen's cement is a plaster prepared in this way. If carbonate of potash or pearl-ash be mixed with the alum, so as to form a basic alum, we have Martin's cement; and if for the alum we substitute borax, we have Parian cement. Common plaster of Paris casts resemble, in many respects, the dense gypsum from which a good deal of the plaster of commerce is made; and as this differs from alabaster only in its molecular structure, many persons have imagined that it might be possible to convert plaster into a material resembling that beautiful substance. The nearest approach which has yet been made to the solution of this important problem is Cheverton's invention of the so-called protean stone or plastic ivory. This substance, which is well adapted for carvings in imitation of ivory and the manufacture of various ornaments, is made by exposing the plaster cast or block of the same substance to a temperature varying from 250 deg. to 350 deg. Fahr., during twenty-four hours, by which the whole of the water combined with the sulphate of lime is driven off, and the material reduced to the condition of plaster of Paris. After undergoing this operation it still retains its form, but is exceedingly friable.

The following makes a good gasfitter's cement:—Take $\frac{3}{4}$ parts by weight of resin, 1 part of beeswax, and 3 parts of Venetian red. Melt the resin and wax together, then stir in the red pigment, and pour the mixture into moulds made of oiled paper or iron.

BRICK-DUST MORTAR.—The use of brick-dust mortar as a substitute for hydraulic cement is now recommended on the best Spanish engineering authority, experiments made with mixtures of brick-dust and quicklime showing that blocks of one half inch in thickness, after immersion in water for four months, bore without crushing, crumbling, or splitting, a pressure of 1,500 lb. per sq. in. The use of brick-dust mixed with lime and sand is said to be generally and successfully practised in the Spanish dominions, and is stated to be in all respects superior to the best cement in the construction of culverts, drains, tanks, or cisterns.

SOME EXPERIMENTS WITH MORTARS.

It is a common belief amongst builders, especially amongst bricklayers and foremen, that it is much more advantageous to mix lime-mortar some days before it is wanted, rather than to mix it immediately before the bricks have to be laid.

To test this popular superstition—if we may be forgiven the expression—says the British Clay-Worker, samples of mortar have recently been taken on successive days from two separate heaps of larger size. Small cubes of bricks were moulded from these samples, and set aside for a definite period of weeks, and then broken, in order to estimate their tensile strength.

The following were the results :—

Sample	Days in heap after mixing.	Days exposed to air as a small brick.	Average breaking stress in lbs. per sq. in.
Mortar No. 1	3	50	34.6
" "	4	49	38.6
" "	6	48	38.1
" "	7	46	39.3
Mortar No. 2	4	48	36.0
" "	5	47	38.0
" "	6	46	41.2
" "	7	45	41.5

The amount of calcium silicate formed was found to be exceedingly small, even after very long intervals of time.

Another notion which is very common amongst those who have to deal with the building of bricks into brickwork is that sugar and blood are very good things to mix with the mortars, especially with hydraulic mortars. Consequently, experiments were undertaken to test these views.

Hydraulic mortar tempered with sugar and water, at the rate of half a pound of sugar to a gallon, was found to be considerably stronger than the same mortar tempered with water alone. This was found to be true only if the mortar were allowed to harden exposed freely to the atmosphere. If the mortar were used for sub-squares brickwork, no advantage was found to follow upon making the extra expenditure and taking the extra trouble with sugar.

The same mortar was also tempered with bullock's blood, diluted with one-third of its volume of water. The mortar was then moulded in a brick mould, and was found to set somewhat more quickly. It also showed a considerable increase in strength, both when exposed to the air as well as when laid under water.

Here are some experimental data :—

	lbs. per sq. in.
1. Tempered with water alone	63.00
2. " " sugar solution, and exposed to water during 38 days	62.75
3. " " sugar solution, and exposed to air during 38 days	65.4
4. " " diluted blood, and exposed to water during 37 days	68.3
5. " " diluted blood, and exposed to air during 37 days	69.8

So it seems that there is some truth in these old notions ; and those who hold them will now be able to give scientific reasons for their faith.

HOW TO PREPARE MORTAR.

MR. Edward Wolff writes on the above subject to Engineering, New York, showing defective methods of mortar making employed by builders, and giving the proper method of slacking lime, preserving it in good condition after slacking, and preparing from it strong, adhesive mortar :—

"The slacking operation should be done in a water-tight box made of boards, and so much water should be mixed in that the contents will never get dry, and a sheet of water will remain on top to prevent access of air. If the box will not hold the entire quantity of lime required, the contents may be emptied into a cavity made in the ground close to the pan, and this process may be repeated. This should be done at least two weeks before sand is added, or before the mortar is prepared for use. Slacked lime prepared and kept as stated has been found free of carbonic acid after many years, air and gas having not been able to find access. Instead of following the procedure in slacking lime recommended above, we see in this country, or at least in the neighborhood of New York, a faulty process adopted, which consists in loosely mixing the sand with the slacking lime immediately after water has been added, and forming a dry heap on the surface of the ground, which is left lying there several weeks to give time for complete slacking before the sand

is worked in evenly and the mortar considered ready for use. This heap arrangement is perfectly adapted to circulating air through a material which should be guarded against contact with air. The sun heats the surface of it, makes the air escape after it has given up its share of carbonic acid gas, while at the base of the heap and at the shady side, a fresh supply enters to fill up the vacuum after it has circulated through the heap and has been robbed of its share of carbonic acid gas. That this procedure really happens in such a heap we can easily see when we place a lump of freshly slacked lime in a wineglass, and in another glass place a small quantity of material taken from a heap such as described, and which has been prepared a few days before ; fill both glasses nearly up with water, and add a few drops of muriatic or sulphuric acid to each. In the first glass nothing can be observed, while in the second glass we will see in the shape of small bubbles the carbonic acid escape, which has been absorbed by the lime from the atmospheric air circulating in the heap."

THE TROUBLES OF INEXPERIENCED CONTRACTORS.

HERE in this northern country, writes Mr. Fred. T. Hodgson, of Collingwood, in the Brickbuilder, the winters are long and severe, and bricklayers and masons have necessarily a long spell of idleness, and of course when spring does set in they are anxious to go to work at the earliest moment possible, and in their anxiety frequently contract for work much below its actual value. A case in point has just come under the writer's notice, one of a great number, and was as follows : A strong company in town desired to erect a large brick building for a sort of annex to their extensive meat-curing factory. Plans and specifications were prepared during the winter, and the contracts were advertised to be let about May 1. Nearly all the legitimate contractors tendered for the work, and a bricklayer who had never had any experience with large contracts tendered also. His figures were so low that the company, who thought the regular contractors wanted to swindle them, gave him the work. Everybody knew, who knew anything about such work, that if the successful tenderer went on with the work it would ruin him. He commenced operations, however, engaged his men, and purchased some of his material, when all at once it dawned upon him that he had taken the work too low. Fortunately the papers had not been completed, and he threw the job up. The company tried to keep him to his bargain, and at last offered him a big sum more if he would go on with the work. He concluded to try it again, did so, this time under the knowledge that he was tied down on paper to complete the work. He discovered the other day that even with the additional sum allowed him he would lose money, so abandoned the work a second time. The company was obliged to have the work done, so were compelled to fall back on the regular contractors, who now command the situation, and the owners have to pay the piper. The first contractor has now got into trouble that may sweep away a lot of money, and he has missed several smaller jobs that were within his capacity as a contractor.

This is one of many like cases that I have met with in my forty years' experience. Men are too anxious to become contractors, and fail to recognize the fact that special qualities are required in a man to make a successful contractor.

PUBLICATIONS.

THE frontispiece of the June Review of Reviews—"Prince Bismarck in His Home"—is a striking representation of the family group at Friedrichsruhe.

"Property" is the title of a new monthly publication, the first number of which has reached us. It is declared to be published in the interests of investors in all lines. The publisher is Mr. H. Bragg, Montreal.

The Laughlin-Hough Drawing Table Co. has recently been formed in Guelph, Ont., with a capital stock of \$55,000, to manufacture patent drawing tables and boards for architects. The company have just completed arrangements for manufacturing, and the goods will shortly be placed on the market.

An association has been organized by the master painters and decorators of Montreal, with officers as follows : president, John Murphy ; French vice-president, A. Laurin ; English vice-president, J. B. Owens ; treasurer, C. T. Charlebois ; English secretary, W. T. Castle ; French secretary, F. E. Meloche.

PAGES

MISSING