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CANADIAN ARCHITECT AND BUILDER.

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—THE—

CANADIAN ARCHITECT AND BUILDER,

A Monthly Journal of Modern Constructive Methods.

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

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

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

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THE tendency of modern architectural practice, as of many other pursuits, is towards centralization in the hands of the best organizers—men who have, with other necessary qualifications, the ability to secure business and to dispatch it with such facility as to leave them free to devote a large share of their time to securing business. Ability of his kind consists of a combination of talent and training for what may be called the business side of the profession. With some there is little development of this faculty. While with some the possibilities in this direction are extremely limited, with others they are neglected. Every architect's assistant who does not wish always to remain such, should be awake to the necessity of studying how to do business. The peculiarities of every transaction he has a chance to observe, should be carefully noted and analyzed. The study of human nature and the adaptation of onesself to his surroundings, so as to be in touch therewith, is most important for the purpose mentioned. Next to this, nothing is more helpful than a good knowledge of the best methods in general office work. A habit of independent thought and a reasonable degree of self confidence should be cultivated. Students and young architects should not be satisfied with learning how to design and build in an artistic and practical manner. To be successful they must learn to handle the necessary business transactions with promptness and good judgment.

THE 16th and 17th of January is the date fixed for the annual convention of the Ontario Association of Architects. This convention, the arrangements for which are already far advanced, gives promise of being one of the most interesting and important in the history of the Association. The advisability of again bringing forward at the approaching session of the Provincial Legislature the proposed Bill to amend the Act of Incorporation of the Association, will be fully considered at this meeting. The opinion largely prevails that no more favorable opportunity of pressing the measure is likely to be afforded during the term of the present House. It is proposed to exhibit at this convention by stereoptican drawings or photographic views of buildings designed by members of the Association with the purpose of eliciting an exchange of friendly criticism. An invitation has been extended to the members to contribute drawings and photographs of their work for this purpose. The result of this new departure will be eagerly awaited, and we cherish the expectation that it will prove to be a most valuable feature of this and future meetings. Papers are promised from Prof. Coleman, of the School of Practical Science, on Building Stones; from Mr. C. H. C. Wright, Lecturer in Architecture, School of Practical Science, on Cements, based on original tests; from Mr. John Langton, Electrical Engineer, on Electricity Applied to Buildings; from Mr. Hamilton McCarthy, Sculptor, on Sculpture, its Relation and Application to Architecture; an illustrated paper on Architectural Rendering, by a student of the School of Practical Science, and four short papers on subjects not yet specified, from members of the Association. From the foregoing it will be seen that a programme of unusual interest is being provided. In order that the convention may be an unqualified success, it is required that the members of the Association should support it by their presence.

MR. Richard A. Waite, of Buffalo, is reported to have said to a Montreal reporter that he had been requested to examine the Montreal Street Railway Company's new building and give expert testimony concerning the cause of its failure, but had declined on account of professional reasons. Mr. Waite and the profession are both to be congratulated on this refusal to reap a personal advantage by transgressing the ethics of the profession. What a pity that Mr. Waite was not as well grounded in professional ethics prior to the erection of the Ontario Legislative Buildings!

IN a reference last month to the importance to the contractor of a knowledge of concrete construction, the promise was given that some formulas for work of this character would be published in the present number. This promise is to a large extent fulfilled in the excellent paper on "Concrete Construction—its Practical Application," by Ernest L. Ransome, printed elsewhere in this issue. In this paper the treatment given the subject is more comprehensive and thorough than in any single treatise which has yet come under our attention. Notwithstanding there are some phases of the subject which are not touched upon, and which will be considered on a future occasion.

THE plastic character of terra cotta naturally makes it a favorite building material. A recent writer has pointed out that out of this fact threatens to spring its indiscriminate use. Before the stamp of the artist can be exhibited on stone or marble, skill and labor, in no small degree, is required, but "terra cotta leaps forward to the modeler and, meeting him almost half way, realizes at once the grandest and broadest conception with an ease equalled in no other material." The danger will be to overload with ornament, and the prediction is that if this tendency is permitted to grow that the good service that terra cotta may do in building construction will be seriously marred and a distaste may be created against it that will destroy its usefulness.

ARCHITECTS, and especially members of the Architectural Associations, who may be desirous of promoting a high standard of professional ethics and of seeing the profession held in public esteem, should endeavor to make it perfectly clear that unprofessional conduct, wherever found, will be discountenanced. The Associations should not hesitate, if necessary, to discipline their members. If commissions are accepted from supply men or contractors, if work is undertaken at cut rates, or if unfair means be used to secure it in competition or otherwise—if in short disreputable practices of any sort are resorted to, it should be made plain that the person practising them has no standing among his brother architects. If wrong methods are allowed to pass unnoticed by reputable members of the profession, the public cannot be expected to know who are the reliable architects or that there is any difference as between one architect and another until they learn the fact by some disagreeable and perhaps expensive personal experience. The same is true of contractors. They should make a clear distinction among themselves, as regards those who are entitled to be known and dealt with as competent and reliable contractors. Instance, the question of responsibility. The contractor who pays one hundred cents on the dollar and is responsible in case of liability through accident to an employee, often has to compete in tendering with men who have no financial responsibility whatever. If the Employer's Liabilities Act is a just measure, why should not contractors be licensed? Responsible contractors should likewise use every legitimate means to make supply firms feel the necessity of strict terms and restriction of credit within safer lines. In tendering it should be made a condition that no tender should be considered binding until the contractor making it has had opportunity of knowing whose are to be the other accepted tenders, as he knows to begin with who is to be the architect. By this means it could be made much more difficult for men who inflict a loss on almost everybody with whom they come into business relations to secure contracts.

IN another part of the present number is printed the plan of a proposed organization to be known as the "Chicago Municipal Improvement League." The purpose of this organization is to secure for the city of Chicago "such an arrangement, design and adornment of its public buildings and grounds, streets and boulevards and other public works as shall most contribute to the convenience and enjoyment of the public, shall stimulate an appreciation of art, and give to the city a fit expression of its greatness." These objects are identical with those mentioned by Mr. A. T. Taylor, F.R.I.B.A., of Montreal, in the paper which he recently presented to the Province of Quebec Association of Architects, wherein he advocated the appointment of a committee of artists, architects, etc., to supervise the erection of public monuments, the laying out of public squares, etc. Referring to the Chicago League, to which we directed his attention, Mr. Taylor, writes as follows: "My idea was a little more modest than the Chicago organization, at least to begin with, but which would ultimately expand to embrace the wider objects. If we could get this Advisory Art Committee appointed to which all city art matters would be referred by the city authorities in all the large towns and cities of the Dominion, it would be a great step in advance. I am in hopes of getting our Association here to petition the Council in favor of such a scheme for our city. ..... The Dominion is, I think, quite ripe now for an increased attention to the art side of its national life and progress, and looked at even from its lowest point of view—that of the dollars and cents aspect—it would pay, for whatever adds to the beauty and attractiveness of our cities and towns would tend to draw both people and money; but I prefer to put it on the higher ground of culture, art training and actual enjoyment of the people themselves." We are pleased to observe that since the above was written the Province of Quebec Association of Architects has adopted a resolution embodying Mr. Taylor's views. The Ontario Association of Architects might profitably we think give some consideration to this subject at its approaching annual convention, and it is to be hoped that the initiative taken by Montreal will be followed by Toronto and other principal cities and towns throughout the Dominion.

ONTARIO ASSOCIATION OF ARCHITECTS.

A GENERAL meeting of the Ontario Association of Architects was held in the Lecture Room of the Canadian Institute on Friday evening, Nov. 16th.

The programme consisted of a Lecture on Statics by Mr. C. H. C. Wright, B. A. Sc., of the School of Practical Science.

With the aid of some simple apparatus and a series of prepared diagrams a demonstration was given of all the fundamental principles involved in "Graphic Statics" and their direct application to framed structures such as architects constantly meet with in practice.

It was also shown, that by the use of drawing instruments alone, and an average knowledge of mathematics, that the stresses in even complex structures due to exterior loading, could be readily determined when once the leading principles were fully understood.

In the discussion that followed, some of the architects present illustrated how nearly theory and practice agree in this respect, by examples from their own work.

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

UNDER the title "A Gift to Quebec Architects," the Quebec Telegraph of recent date contained the following:

"Public attention is directed to the magnificent tableau or exhibition at Lavigne's music store, in Fabrique street. It is by Notman, of Montreal, and some three to four feet in length. It contains the portraits of some forty-seven of the architectural fraternity of the sister city and below each portrait is the name of the architect. The Quebec section of the Association of Architects of the Province of Quebec had last year or at a previous general meeting of the Association presented their confreres of Montreal with a similar tableau, photographed by Beaudry, of Quebec, but naturally of less dimensions, as it only contained the portraits of some twenty Quebec architects. The tableau at Lavigne's is as the French have it "*le retour du gateau*" and was presented by the Montreal section to the architects of Quebec, at the opening of the last general meeting of the Association at Montreal on the 5th of October last, when Mr. Baillairgé, of this city, was elected president of the Association for the ensuing year of 1894-95."

The works of the Owen Sound Portland Cement Co., at Shallow Lake, Ont., are again in operation, and are turning out 125 barrels of cement per day.

THE BYSTANDER.

GIVEN the opportunity recently of spending a pleasant hour with Mr. C. H. C. Wright, Lecturer in Architecture at the School of Practical Science, Toronto, the value of a technical course in education was impressively forced upon the Bystander. The high character of the school system of Ontario has long since passed into a proverb. Perhaps, sometimes, because of this excellence, the tendency is to overrate the system, or rather to forget that with its excellent features also come a few defects. Citizens who, like the writer, have little ones at school, are not without opportunity of seeing where these defects exist. However, it is not the intention of the Bystander to write an educational article. One of the encouraging features of the educational system of the present day, confined not alone to Ontario, but embraced by other provinces of the Dominion, is the growing attention given to the practical side of life. In a country where few are born with a silver spoon in their mouth, and work is the lot of the many, there is need that what the boys and girls learn at school should be of service to them in the everyday callings of life, and not something to be learned only to be forgotten. The School of Practical Science, so well domiciled and equipped between its walls of red brick in the Queen's Park, is doing its full share along these lines, as are also the Schools of Manual Training and Technology that have their place in other towns and cities in Ontario, Quebec, and elsewhere.

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The conversation with Mr. Wright took a "shop" turn, and in a direction in which, no doubt, many readers of the ARCHITECT AND BUILDER are interested. The Bystander had recently read with some care, and not without astonishment, an article written by Mr. Cecil B. Smith, one of the teachers in the technical building of McGill College, Montreal, on the question of Portland cements. The increasing uses of Portland cement makes this a subject of importance to architects and contractors. Mr. A. Blue, director of mines for the Ontario government, is authority for the statement that as between the years 1880-81 and 1892–3 the imports into Canada of Portland and Roman cements have shown an increase of nearly 600%, and as between 1880 and 1890 the number of establishments manufacturing cement in Canada have grown from 9 to 19, and on the basis of values the manufactured cement in Canada increased from $91,658 in 1880 to $251,175 in 1890. As Mr. Wright remarks, Portland cement is being used for many purposes to-day that would not have been dreamt of so much as a decade ago. Everyone is aware by ordinary observation of the extent to which cements are now used in road building. The intelligent agitation of late years, the country over, for good roads, must receive credit for a large proportion of this increase, though in this respect newer countries are only following the example shown in the construction of Roman roads in Europe 2000 years ago, where it was made an essential of road building that the foundations should be laid good and strong. Not only in roads, but for other purposes, where strong and durable foundations are required, concrete to-day holds a first place. Mr. Wright says that piers of bridges are now being constructed of concrete and are found to possess many advantages over masonry. The price, of course, is one consideration, but with this goes equal strength, and satisfaction to contractors in the work of construction. Taking a forward look from this standpoint it can be readily understood that the future must show a large development in the manufacture of cement, and this is good reason why care and attention should be given to a study of the question Mr. Smith's criticism is to be welcomed on this account, notwithstanding that it is at fault in important particulars.

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Mr. Smith takes the ingenious position of regretting that the Canadian government has recently contracted for 11,000 bbls. of Portland cement of foreign manufacture, intimating in the next sentence, however, that he does not well understand how, under existing conditions, the government could have pursued any other course. He is quite correct in stating that the Canadian output of Portland cement has been a long way short of meeting the demand in Canada, but this does not justify a protection government in deciding squarely against the home manufacturer. In the government specifications English cement is specially called for, a barrier at once to the Canadian manufacturer bringing his cement into competition with that of the foreign manufacturer in the construction of public works. The Bystander has been pleased to learn, however, that the government is likely, at an early date, to abandon this invidious distinction between the home and foreign article, and that before long in their specifications it will be an open matter, whether the one or the other cement shall be used. This fact of itself will have an influence in meeting the conditions that are bemoaned by Mr. Smith. Of course, it is true that the manufacturers of cement in Canada are yet unable to nearly meet the demand that exists for cements in this country, but time and fair play will remedy the difficulty. This is to be remembered, that the manufacture of Portland cement in the Dominion is of recent origin. The Rathbun Co., the Owen Sound Portland Cement Co., and the English Portland Cement Co., of Milbank, have spared no expense and care to perfect their equipment in order that, first of all they should satisfy themselves that they could manufacture a cement that would compare favorably with the imported article. This, as will be shown, the Bystander believes, further on, despite Mr. Smith's criticism to the contrary, has been accomplished, and the track is clear for a large development in the manufacture of Portland cements in Canada. Further, let it be remembered that Canadian manufacturers have not alone been compelled to meet a very great increase in demand within their own country, but also to keep pace with this demand during the initial days of manufacture.

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The gravamen of complaint from McGill College is that there is a manifest lack of uniformity in grinding and burning in Canadian cements, and Mr. Smith submits certain tests he has made in verification of this statement. He adds as a comment to a test of three samples of a No. 1 brand that had been selected: "That such a tremendous variation should exist is enough to cripple the industry until this is remedied." These, he says, are samples obtained, not from the manufacturer, but from dealers, taken from the article as placed on the market, which he argues is the only satisfactory test that can be applied. A snap verdict, where care has been taken to place the best specimens in the hands of the tester, cannot be accepted as a fair test of the general character of cements. "Let us grant," said Mr. Wright, "in discussing the point, that this is the proper method of arriving at the real character of the cement regularly in use by contractors. But what is the usual practice and experience? Mr. Smith writes as though this 'tremendous variation' was applicable only to Canadian cements, and the inference is that imported cements are not faulty in this respect. Ask some of the contractors and engineers, who have occasion to use the imported Portland cement, what is their experience. It is notoriously true that this variation exists in all cements, there being different conditions that seem to tend to this want of uniformity." It is only two years ago that a single shipment of some 4000 or 5000 bbls. of English cement was sent to this country, which, though bearing the brand of a reputable maker, was found to be of a very indifferent character. What was the history of this particular shipment? English manufacturers had been in the habit of making up large quantities of cement for shipment to South America, where the tests were not so severe. A financial crisis occurred in that country and manufacturers were left with heavy stocks of this grade of cement on hand. They had to dispose of these somehow, and part came to Canada. "Just take another illustration," continued Mr. Wright. "Let me draw your attention to the conditions set forth by an American concern in its specifications where Portland cement is called for." The Bystander was here shown the printed specifications in which it was directly stipulated that the cement to be used should be either White's English Portland cement or a French manufacture, but it was just as clearly stated in the conditions that these cements were not necessarily to be accepted without first undergoing certain tests. Evidently these people had learned that the particular label of a foreign manufacturer did not always insure a cement that was uniform in character. Only within the past month efforts have been made by English manufacturers of Portland cement to adopt means to prevent the placing on the market of certain qualities found to be exceedingly faulty in character.

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So far as Mr. Smith is desirous of having produced in Canada a cement of "uniform fineness and strength, which will answer severe specifications," he will have the support of all who wish

well to the manufacturing interests of the Dominion. "For my part," said Mr. Wright, "I am of one mind with my Montreal congener in this matter." But where does the fault in grinding rest to-day? Chiefly with the consumers, who are satisfied with a low grade of grinding, and in no inconsiderable degree the engineers of the country are blameworthy. The truth would seem to be, from the fact, perhaps, that Portland cement has only come into extensive use within a few years, that Canadian engineers have not any more than commenced to give this matter the study and care that it merits. Consumers are satisfied, in many cases, with a cement that will stand no higher than a 20% test of a No. 50 sieve. Nothing more than this is frequently called for in specifications from contractors and others. When the consumer is satisfied, the engineer is not likely to insist on a higher standard. Here it is that Mr. Smith and Mr. Wright believe that reform is necessary. And in this regard Canadian cement really takes a higher place than the imported article, perhaps sometimes to the prejudice of Canadian trade. Canadian manufacturers are ambitious to produce a good article, and will not, as is the case with some imported cements that come to this country, be satisfied with anything less than a high class test. A large proportion of English cements will not average a 10% test, where, from data of tests shown the Bystander by Mr. Wright, he is able to say that Canadian cements seldom fall below a 5% test, whilst he has seen those that have run as high as one per cent. and others 2½% and 3%. In a paper on concrete construction, read at the annual convention of the American Institute of Architects, and published in this month's ARCHITECT AND BUILDER, a similar view of the grinding of cements is held. The manufacturers of Canadian cements are evidently holding up the true ideal and it remains for the engineers, rather than the manufacturers, to see that the severer test is insisted upon in all cases.

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Many people are influenced by their environments and the Bystander has thought that, perhaps, the natural habit of the good people of Montreal of taking an English view of matters has colored Mr. Smith's diagnosis of Canadian cements and caused him to write in a severer tone than would otherwise have been the case. Then from a Montreal point of view there is the local influence that comes from the desire to maintain at its best the shipping interests of the metropolis, and it is well known that these obtain no inconsiderable share of trade through the importation of foreign cements. Let Canadians occupy the home field as manufacturers of cement, and this line of traffic will suffer. However this may be, it may be expected, as the subject is more fully entered into that Mr. Smith will see that there is little, if any, material difference between English and Canadian cements, while the advantage is really on the side of the former. Rapid strides have been made within the past ten years in this branch of manufacture in the Dominion and continued progress during the decade ahead is to be expected. Readers will be pleased to know that at the forthcoming annual meeting of the Ontario Association of Architects Mr. Wright will read a paper on cements and submit several tests.

BUILDING IN THE NORTHWEST.

IN a lecture delivered recently at the Y. M. C. A., Winnipeg, entitled "Architecture, or the Art and Science of Building." Mr. Geo. Browne, architect, of that city, thus refers to the improvement which is taking place in architecture and building methods in the Northwest:

"When I came to Manitoba in the spring of 1879, there were no buildings of any importance, and the wigwam of the Indian, and the log house of the pioneer were seen on every side, while the frame buildings were not numerous off Main street, and when I returned to the city in December, 1881, to reside, architecture was still in a primitive state. Architects and builders seemed to have little or no knowledge of the proper methods to pursue in order to erect buildings suitable for their purpose, the climate and the place. Since then, however, considerable knowledge has been gained, and progress made, both as to the proper methods of construction and design. Time and experience have taught the necessity of avoiding many things which in the early days were considered quite correct, or, to use the old phrase of the boom days, "good enough."

The now historical boom period did more than anything else to retard the erection here of improved and substantial buildings. Money flowed so freely that men lost their heads, and in the excitement of the hour gave no attention to their comfort or to the proper improvement of their habitations, imagining that their residence here would be brief, and as soon as they digested the numerous flies then buzzing around anxious to walk into their parlor, they would reverse the advice of Horace Greeley and go east. But when the boom burst they awoke to the fact that the flies had gone east instead of themselves, and left nothing but mortages to be paid off, and old, ricketty buildings to fix or pull down. The impression became general that a reform would have to be made in the methods of building then followed, and the result has been that the objectionable plan of setting large timbers on the ground for a foundation to receive the superstructure has been abandoned for the common sense stone foundation. At one time it was considered necessary for the safety of the building to build the foundations on piles, or two or three thicknesses of 2-inch plank laid cross ways or diagonally, and spiked together, but both have been found unnecessary and expensive, and only on rare occasions are resorted to, concrete and broad footing stones having been found quite sufficient to carry our heaviest buildings on the blue clay, provided the latter is properly drained. Footings of broad stones without concrete are sufficient enough to carry an ordinary building. Stone foundations should be coated well on the outside below the ground line with hot tar and pitch or Portland cement to keep the damp out of the wall and cellar, and where expense is not an object, the foundation wall should be lined on the inside with 4-inch brick with 2-inch air space.

I am frequently asked which I consider to be the warmest, a house of solid brick, a frame house or a brick-veneer house. I believe that the three kinds are equally warm if properly built and attention is paid to details, which seem but trifles to the average workman, but which play a very important part in adding to the comfort of the inmates. One is to build in properly the door and window frames so that when the wood of which they are constructed shrinks, they will be air-tight. Another one is, in the case of a veneer house, to fill in the space between the boarding and brickwork, solid with mortar, and in all houses to have two air spaces in the exterior walls, formed by putting on the inside of the walls 1 by 2 inch strapping, lathing and plastering one coat, commonly called back-plastering, which should go, in every case, from the ground floor joints up the walls and rafters and between the joints, practically making an air-tight jacket of plaster for the building.

If the house is to be heated with hot air, the cellar should not be less than 7 feet 6 inches in the clear, to allow the pipes to have a good incline. The furnace should be placed so that the pipes will be of equal length and as short as possible. Long pipes interfere with the proper working of the apparatus and are of little or no benefit to the rooms to which they lead. Return pipes are necessary to draw off the cold air from the rooms and create a vacuum for the hot air to fill.

People complain of the shrinkage that takes place in the woodwork of their houses, and attribute its cause to its not having been properly seasoned before being fixed in position, and while in some cases this may be the correct reason, in others it is owing to the wood absorbing the moisture from the plaster, for the wood finish is, as a rule, rushed on before the latter is dry, and by that time the chilly weather has set in, the furnaces started and a hot blast thrown on the wood work and severely testing it.

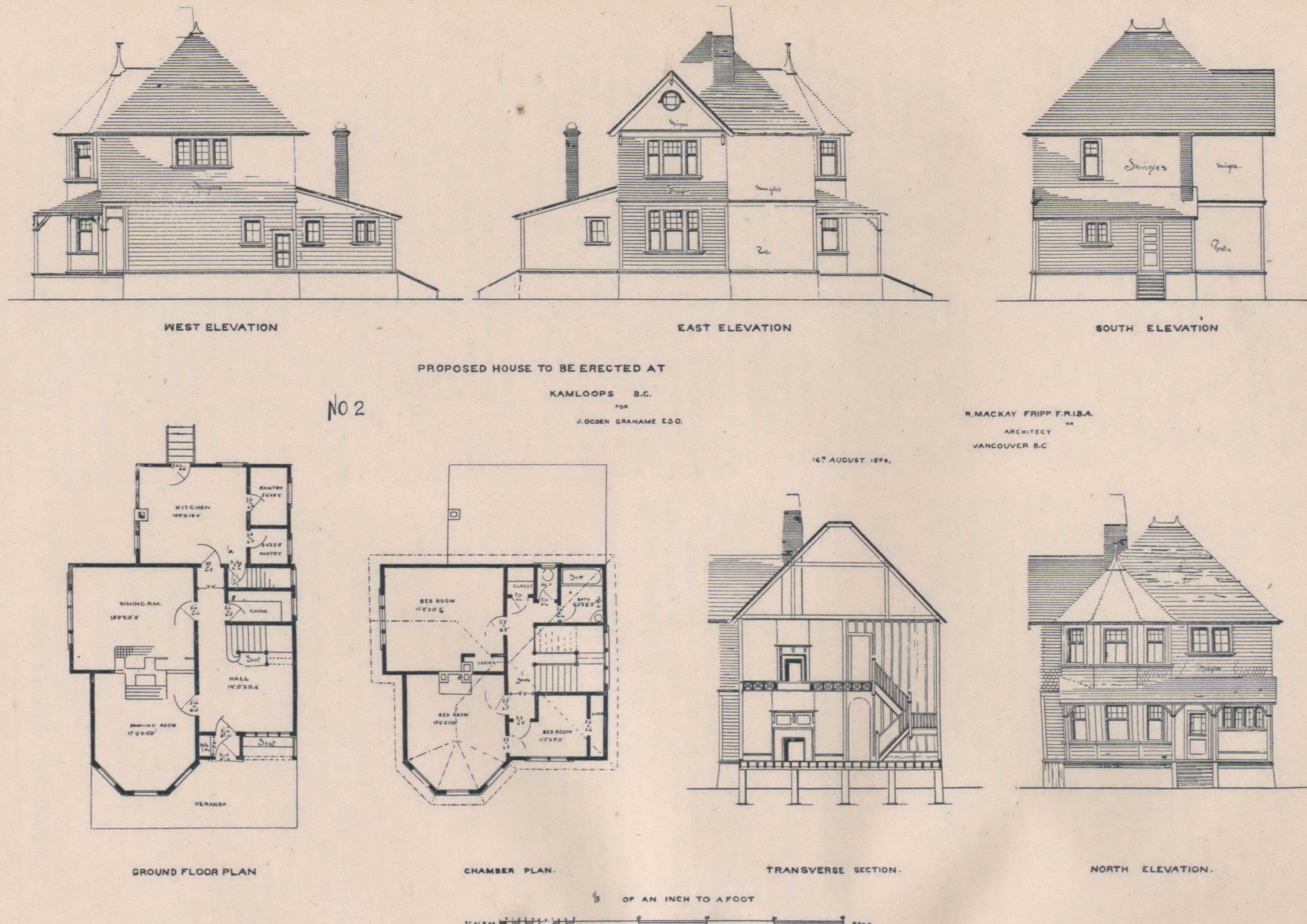
The unusual dryness of our climate is also responsible to a certain extent. I have known wood works, after having been in for two years in the east, to fall to pieces after being here only a short time.

Owing to this defect, which we cannot easily overcome, I never paint my interior work more than two coats the first year, leaving the third coat to be applied the following year, after the work has been rubbed down and the cracks and open points puttied up.

The architecture of our city is now in a transition state; the wood, brick-veneer and galvanized iron age is passing away, and is being succeeded by the stone, brick and copper age, our capitalists recognizing that it is poor economy not to build for the future as well as the present. As an illustration I will point to the building in course of erection for Wesley College, which shows a greater advance in architecture than any building yet erected in Manitoba. The college board are to be congratulated that their building can be viewed from every side with pleasure, and that they have avoided the common error of making the building Queen Ann in front and Mary Ann behind.

I sincerely trust that many months may not elapse before I shall have the pleasure of congratulating you on the completion of your new and permanent home. I think that citizens of Winnipeg, aud also their country cousins, should do their utmost to reward your efforts with a building worthy of the noble cause in which you are co-workers.

What is termed a "ventilating window" is now being adopted in some of the barracks and other public buildings in France. It consists in employing two panes of glass for one, with a space between them, and their length so curtailed, one on the lower side, the other on the upper, that the air comes from the outside, passes between the panes, and enters the room. Such a window is, of course, only required in one part of a room, preferably near the ceiling.


WEST ELEVATION
EAST ELEVATION
SOUTH ELEVATION
PROPOSED HOUSE TO BE ERECTED AT
KAMLOOPS B.C.
FOR
J. OGDEN GRAHAME ESQ.
NO 2
R. MACKAY FRIPP F.R.I.B.A.
ARCHITECT
VANCOUVER B.C
16th AUGUST 1894.
KITCHEN
PANTRY
DINING RM.
CHINA
HALL
DRAWING ROOM
VERANDA
BED ROOM
CLOSET
BATH
GROUND FLOOR PLAN
CHAMBER PLAN.
TRANSVERSE SECTION.
NORTH ELEVATION.
1/8 OF AN INCH TO A FOOT
SCALE OF FEET

STUDENTS' DEPARTMENT.

AN ENQUIRY.

TORONTO, Dec. 1st, 1894.

Editor CANADIAN ARCHITECT AND BUILDER.

SIR,—I am troubled in my mind about a house which is just about completed on Lowther ave., this city. The design, particularly the front elevation, is different from anything I have seen in a similar situation. I should therefore like to know something of the reasons for its peculiarity. Toward the street the windows are few and small, giving it an appearance far from cheerful. They are larger in the rear. I have read of houses of which it was necessary to understand the plan in order to appreciate the design. Perhaps this is an instance of that kind. I have seen it partially promised, or at least proposed, that the O. A. A. would hold open meetings with illustrations and friendly criticism and discussion of some works. I would be delighted to see and hear the subject referred to treated in this way. Is there any probability of such an opportunity being afforded during the present winter?

Yours faithfully,

INQUISITIVE STUDENT.

A WATER-COLOR CLASS FOR STUDENTS.

TORONTO, Dec. 11th, 1894.

Editor CANADIAN ARCHITECT AND BUILDER.

SIR,—The endeavor has recently been made to establish a water-color class for architectural students in this city, under the exellent instruction of the well-known artist, Mr. C. M. Manley. Notwithstanding the extremely moderate figure at which Mr. Manley consented to give his services, great difficulty was experienced in getting the half dozen members necessary to form the nucleus of the class.

In the spring of 1893 a water-color class numbering some eight or ten members, was formed, and made good progress, but most of the members upon whose energy its success depended are now in the United States. Sketch clubs have likewise been founded, with what success we all know. I think it is the deprivation of a few winter Saturday afternoons, including the foregoing of hockey-clubs and various other social attractions that keeps the majority of students from joining. As architectural students, choosing a profession in which not only the trades, but also the arts are involved, why should we hesitate for a moment in grasping every opportunity presented to us for self-improvement?

Sincerely yours,

STUDENT.

ARCHITECTURAL STUDENTS.

BOOK work and practical work are two of the relative factors in the student's life; but for some reason or other, says the Building News, they are generally divorced. Many a student thinks he can learn everything from books. The recent remarks of a medical authority to students in that profession are applicable to the architectural student. The elementary textbook ought to be used as the skeleton of his knowledge; the student ought to endow it with the tissues and life from his own personal observation, by practical school courses and visits to buildings. A mere dry study of textbooks is of little value, except to furnish the mind with names and definitions, and yet the ordinary student regards the textbook in the light of something to be read through, and committed to memory as quickly as possible. No wonder the pupil undervalues the textbook, and looks upon it much in the same manner as the schoolboy does his Murray or his Eaton Latin Grammar. They are looked upon as "dry as dust" manuals, and the more elementary they are the more difficult they are to grasp and comprehend. Instead of being used as a "skeleton of knowledge," which they simply are, to be clothed by his own experience, the student cannot see any use or value in them, as they do not supply his needs. But the student of a practical order of mind, who has served his time in an office, can utilize the elementary textbook; he reads into it his own experience, and he begins to read it with some interest. A good advice given by an eminent physician to his class is to write his own textbook by grafting his practical work on to an elementary manual, and to revise his knowledge before entering for an examination by the light of a first class textbook. Every student can do this; if he has any love for his work at all, he will take an interest in filling up the outlines and dates of a manual on styles with his own notes and sketches, and his scientific textbooks with remarks of his own derived from practical knowledge, or from other authors. The Institute rightly insists on the necessity of making reading thorough by supplementing it by the taking of notes and sketches, and by information under various heads from different authorities. The continuous use of a note book is enjoined on the student, in which he should write down, in his own words, the principal part of the books under study, and also supplement these notes by sketches from all available sources (notes on one page, sketches on the opposite page). The accurate sketching of old work in plan, elevation, construction, and detail from memory is equally valuable, thus bringing eye, brain and hand into exercise. In this way the student can be made to enter into the spirit of the art. The note and sketch book are the only true tests of the student's knowledge; they serve to indicate the extent of the knowledge he has made his own from lectures and reading and observation, and serve to mark him off from those who pursue the course-and-cram system, and desire to become architect in name only. We are inclined to think, despite the advice of teachers at official head-quarters, that the "course-and-cram" system is now most in favor amongst young men who desire to assume the *role* of architect or engineer. Like the clincial work of the medical student in the hospital wards, the practical work on building must go hand in hand with books and lectures.

Perhaps there is another distinction between the two aspirants we have been considering, and one that lies deeper than methods of study. The novice who is in such a hurry to take the name of architect is often a more receptive man than he who is in earnest to prove his qualifications and credentials. He learns by rote quickly, has a capital memory, and, with the help of a little "coaching," is sure to pass any examination. It has been pointed out by all authorities on teaching that the receptive man quickly learns and benefits by teaching, which only arouses opposition in the critical man, and this explains the reason why so many of those who have passed examinations with credit frequently fail to exhibit any talent in actual practice. In every profession there are examples of this fact; but in architecture we find designers of very feeble buildings able to go through their examination with conspicuous credit. Between the critical faculty necessary to select good forms and to arrange plans upon logical data, and the mere receptive ability to collect facts and work out formulæ, a great gulf is fixed. The one order is preceptive—it can discriminate between good and bad, can think out a problem of design, while the other can only gather and grope its way between conflicting opinions. The first can invent, the other only collect and classify; hence we find that copies and poor compilation of existing buildings are the rule rather that the exception.

CHARACTERISTIC FEATURES OF HOT-WATER HEATING.

FIRST. The ability to produce a gentle warmth with a low fire. The temperature of the water may be raised to 100 degrees for the chilly damp days of September and May, 140 degrees for the cold air of October and April, and 180 and 200 degrees for the cold winter months, the amount of heat being regulated from day to day as the season demands.

Second. Should the fire be unintentionally neglected, the water will continue to circulate and give off its heat as long as any fire remains in the boiler, or warm water in the pipes.

Third. Hot water may be regulated to meet any ordinary changes of temperature, and therefore there is no excuse for overheating on mild days. This point, however, may be urged for steam where the boiler is provided with modern automatic regulatiug appliances.

Fourth. The valve or radiator may be partly closed, which will retard the circulation and cool the radiator down to any desired temperature.

Fifth. The circulation of hot water is invariably noiseless, the pressure is uniform, the heat is clean, mild and delightful, and with intelligent management great uniformity of temperature may be obtained throughout the house.—Plumbers' Trade Journal.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

The Building Inspector has condemned the new St. Johns church in course of erection at the corner of St. Catehrine and Cadieux streets. The exterior wall, built of stone and faced with brick, are said to have been found to be so defective in workmanship, that for the safety of pedestrians, the architect, Mr. Geo. Mann, has been compelled by the Inspector to have them torn down. This is proving a difficult task for the workmen, as an effort is to be made to preserve the roof, which was already in position when the order to reconstruct the walls was issued.

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

At a general special meeting of the members of the Association held on Thursday, the 6th inst., to consider the proposed amendments to the by-laws, the following members amongst others were present :—Messrs. A. C. Hutchison, A. T. Taylor, J. Nelson, A. Raza, H. C. Nelson, J. Perrault, J. Venne, M. Perrault, J. Wright, J. Z. Resther, A. H. Lapierre, Geo. W. Wood and J. R. Gardiner. It was proposed, first : by Mr. A. C. Hutchison, seconded by Mr. J. Wright, that the following words in the third, fourth and fifth lines of section XI of the By-Laws, viz : "collect all funds and hand them to the Treasurer, taking his receipt for the same," be struck off and in line 8th of the same section to omit the words "receipt for them to the Secretary;" to add to section XI the words "the Treasurer shall also furnish to the Secretary at the close of each year. a list of the members whose subscriptions have been paid." To strike out the words "to" at the beginning of the 8th line and to substitute "to collect and." Carried.

Second—Proposed by Mr. W. E. Doran, seconded by Mr. Jas. Nelson, that section V of the By-laws be amended by inserting after the word "separately" of the fifth line of said section "the retiring president shall be the premier member of the Council", then after the word "the" actually following "separately," to add the words "other five" to read as follows : "The other five members of Council may be balloted for on one paper." Carried.

Third—Proposed by Mr. A. T. Taylor, seconded by Mr. J. Z. Resther, to change section VIII of the By-laws to make it read as follows : "The Council shall appoint each year a board of six examiners who shall," etc. Carried.

Lastly—It was proposed by Mr. J. Z. Resther, seconded by Mr. A. T. Taylor that the following be elected as honorary members of the Association : The Lieutenant Governor of the province, the Prime Minister and the Minister of Public Works of the province, the Mayors of Montreal and Quebec, the Honorable Sir Donald Smith, the Honorable J. A. Drummond and Mr. R. B. Angus. Carried.

It was resolved that the President of the Association be instructed to issue a circular to the members giving them notice of the above adopted amendments.

It was also proposed by Mr. A. T. Taylor, seconded by Mr. A. Raza, that the Association propose to the City Council to have a special committee formed for the embellishment of the city. Carried.

The first of the monthly dinners, for the winter, of the Association was held on Tuesday, the 11th inst., at the City Club. After the dinner the members met in their rooms, New York Life Building, when the following paper, prepared by the President, Mr. Charles Baillairgé, F. R. S. C., was read :

A QUICK AND EASY WAY OF GETTING AT THE WEIGHT OF IRON SCANTLINGS, GIRDERS, COLUMNS, ETC.

Bear in mind that a cubic foot of iron weighs 480 lbs, therefore an inch thick and foot square is 40 lbs., or one twelfth of the cube foot. Therefore also half an inch = 20 lbs., ¼in. = 10 lbs., ⅛in. = 5 lbs., 1-16in. = 2½ lbs., 1-32in. = 1¼ lbs. You need not try to remember these ; as by a quick mental process you can start with the foot or inch and in less time than it requires to write this, halve the inch, then halve the half inch, then the quarter and so on.

Now if your scantling be 3in.x1in. and as 1in. a foot square is 40 lbs., the 3in. bar will be 1-4 of 40 lbs. or 10 lbs. If your bar is 4in. wide or ⅓ of a foot, you will have ⅓ of 40 lbs. or 13⅓ lbs. For 1-2in. bar or 1-4in. or ⅛in., etc., the same process holds good. For instance, a bar 1-4in. thick and 2in. wide will be the 6th part of a square foot or the 6th part of 5 lbs., or 5-6 of a pound, since 5 lbs. x 6-30 sixths and 30 sixths divided by 6 gives 5 or 5-6 lbs., as just stated. Three inches by 1-4in. will be 1-4 of 5 lbs. or 1-4 lbs. and so on.

Now, take a bar 1 in. square, and since a foot inch is 40 lbs., the 1in. bar will be 1-12 of 40 lbs. or 3⅓ lbs., to the lineal foot. If the bar be 1 in. x 1 1-2 in., and as 1 1-2 is ⅛ of a foot, the bar will weigh 1 -8 of 40 lbs., or 5 lbs., since 8 into 40 gives 5 times. And if the bar be 1-2 in. x 1 1-2 in., it will be ⅛ of 20 lbs. or 2 1-2 lbs. If the bar be 3 in. by 1-4 in. it will be 1-4 of 10 lbs. or 2 1-2 lbs., and if 1-8 in. x 3 in., 1 1-4 lbs. or the quarter of 5 lbs.

Say now your bar is ⅞ in. square, and as an attempt to divide 12 inches or a foot by ⅞ in. would lead to a more difficult or lengthy process, do it this way :—spread it over mentally into eighths of an inch. Thus seven times seven eighths = 49 eighths or 6⅛ inches in width of ⅛in. thick iron. Now take for 6 in. (half a foot) the half of 5 lbs., or 2 1-2 lbs., but there is still ⅛in. x ⅛ in. unaccounted for, which being only 1-48 of the 2 1-2 lbs , may either be disregarded as a very small fraction of about 2 per cent., or if we wish to be more exact, and as it is mentally difficult, or even with pen or pencil to get at the 48th part of 2 1-2 lbs., reduce your 2 1-2 lbs. to ounces, giving 40 oz., and now you see that to the 2 1-2 lbs. arrived at as above, you have to add 0.83 of an ounce, or say 4-5 of an ounce, or even a whole ounce as, except for hundreds or thousands of lineal feet, the neglected fraction of an ounce would hardly cover the trouble of exact computation.

Apply now the process to iron 1 1-4 in. square; reduce the bar in imagination to 1-4 in. iron, when it will be 5-4 in. x 5 times, or 25 quarters of an inch in width, or 6 1-4 inches, or half a foot plus 1-24 of half a foot, and as 1-4 in. iron weighs 10 lbs. to the foot, the 6 in. in width will give 5 lbs., and as 5 lbs. = 80 oz., and as the 24th part of 80 oz. is 3⅓, (since 3 times 24=72 and 80 or ⅓ oz. over), therefore to the aforesaid 5 lbs. add 3⅓ oz., and the exact weight of the 1 1-4 in. square bar per lineal foot is 5 lbs. 3⅓ oz.

Again if the square bar be 1 1-8 in. or 9-8 in. and as 9 times 9-8 = 81 eights or 10 1-8 in., and as 10 in. is the 5-6 of 12, therefore the bar will weigh per lin. ft. the 5-6 or 5 lbs. or of 80 oz., or 66 2-3 oz., but there still remains 1-8 in. to be accounted for, which just gives 5-6 oz. more, forming together 67 1-2 oz. or 4 lbs. 3 1-2 oz., say 4 1-4 lbs. nearly.

This last example may be more easily and quickly computed by taking the bar as so much of a foot of iron 1⅛ in. thick, or 45 lbs. to the foot, when we get for 1 in. of it one-twelfth of 45 lbs., or 3¾ lbs., and for the ⅛ over add 1-8 of 3¾ lbs. or 1-8 of 60 oz. = 7 1-2 oz., together as before 4 lbs. 3 1-2 oz. or 4 1-4 lbs., nearly 3¾ lbs.

For computing the weight of sound bar iron or of solid posts or columns of circular section, the simplest way is to compute as square and then reduce. Well, geometry teaches that the area of a circle is .7854 of its circumf. scribing square, or that the area of any square is to be reduced to that of its inscribed circle by a multiplication of said area by the decimal fraction .7854, which is the area of a square of which the diameter is equal to one (1) or unity. These figures .7854 will be better understood as a percentage. Thus, the area of the circle is very slightly in excess of 78 1-2 per cent. of its corresponding square. Now, since decimal 76 is equivalent to three-quarters (3-4), we therefore have to take, to begin with, 3-4 of the weight of our square bar, which is best and quickest done by taking half of it and then half of that or a quarter of the whole. Now, there still remain to be added 3 1-2 per cent. to get at the full weight required. This 3 1-2 per cent., or more correctly $3\frac{54}{100}$ per cent., being multiplied by 7, we get (354 × 7) 2478, or very nearly 25 ; therefore the remaining figures 354 of the .7854 are almost exactly equal to 1-7 (one-seventh) of 25 ; therefore, by dividing the weight set opposite to the 25 per cent. or one-quarter of the weight of the square bar or scantling, we get the fraction to be added to the 75 per cent. already obtained to arrive at the comparative weight of the round scantling. Thus then we make unto ourselves the rule : to compute weight of round iron, calculate it as square, and then take one-half, plus one-quarter, plus one-seventh of one-quarter (1-2 + 1-4 + 1-7 of 1-4) of weight of square bar ; this process being far shorter or more concise than that of multiplying by .7854, which would further require a reduction of the ounces or fractional portions of the weight to a decimal to allow of such multiplication.

EXAMPLE.

Suppose the weight of one lineal foot of a bar of square iron to be 5 1-2 lbs. Thereby the rule, the corresponding weight of the round bar, or weight of a round bar of same size, will be the half of 5 1-2 plus the 1-7 of this last or 1-8 × 1-16 or 3-16 lbs., together 4 5-10 lbs., lbs., or 2¾ lbs., plus the half of this, or quarter of the whole, = 1 3-8 lbs. or 4 lbs. 5 oz.

Otherwise, reducing the 1-2 lbs. to a decimal,

we get	5. 5 lbs.	or reducing again the
1-2 of which	2. 75 "	fraction of a lb. to decimals
1-2 of this	1. 375 "	5. 5 lbs., and multiplying
1-7 of this	0. 1964 "	by 7854
	4. 3214	39270
		39270
		431970
		or 432 very nearly,

which shows that the fraction 1-7 for the remaining decimal 354 of the .7854 differs from it by little more than one-thousand $\frac{1}{1000}$ of a pound.

Now, for cast iron, it is true the weight of a cubic foot is only 450 lbs. instead of 480 lbs. for wrought iron ; but as it is always safe in estimating in advance to be on the safe side, to make up for any omitted trifling items, I generally use same figures as for wrought iron ; also because when contracted for by weight, the tendency is to give the casting as great a weight as possible, and even when the thickness asked for is not exceeded there is generally a slight allowance to be made for so much of the sand or core adhering forcibly to the casting and hard of removal.

Therefore for any straight work or rectangular, as for a girder, column

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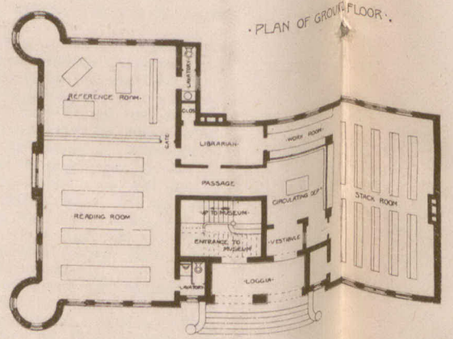

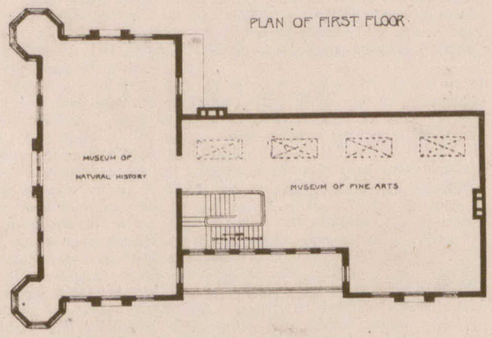

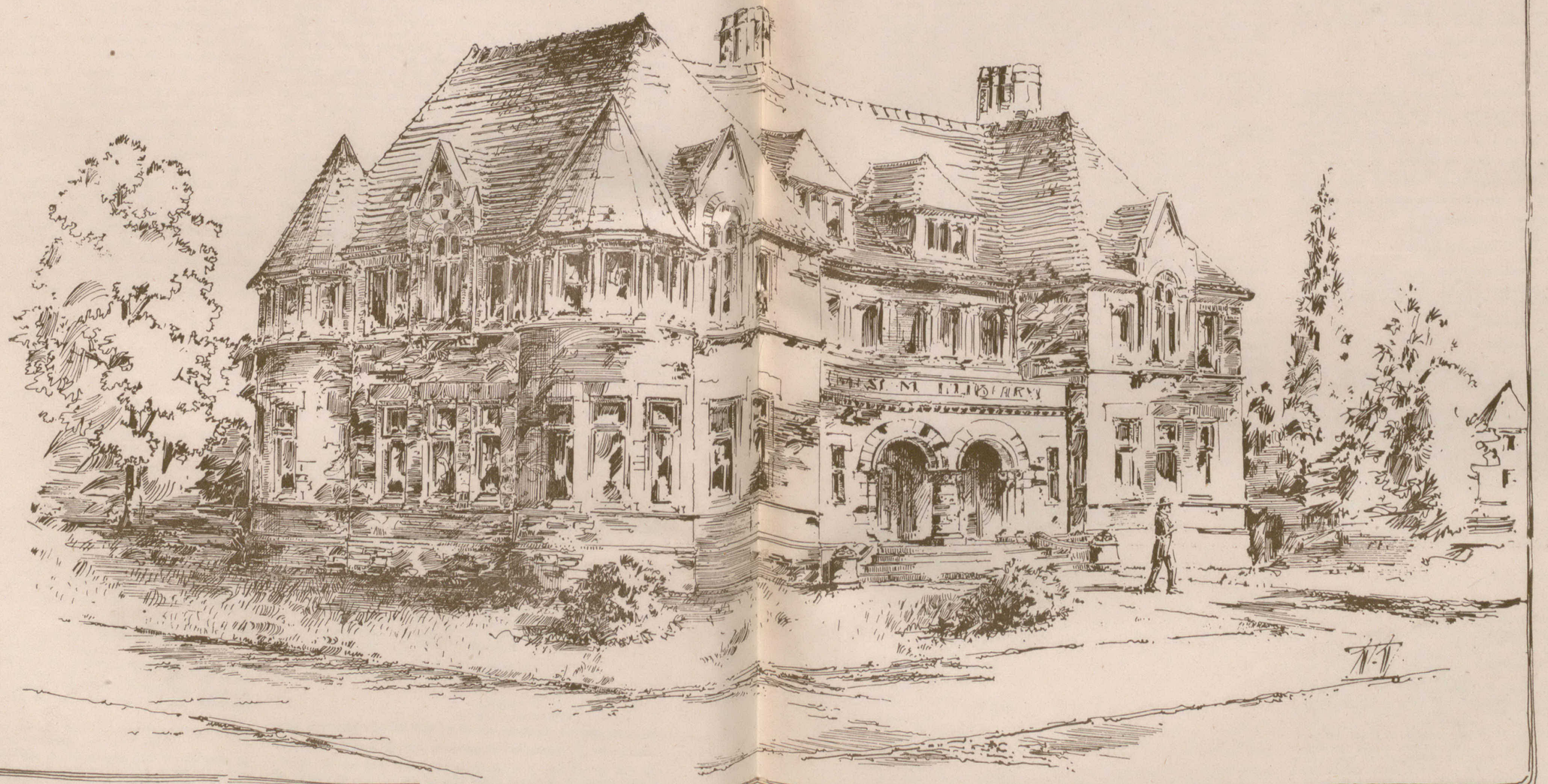

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HERBERT MATTHEWS, ARCHITECT, LONDON.

or stanchion of square, rectangular, crucial or cruciform or box-like cross section; estimating the elemental components and putting them together will give the weight of a lineal ft., which into the length or height of the column or girder will give its total weight.

With regard to circular work, as of a cast iron column, the inner diameter added to the thickness gives the mean diameter and this taken 3 and 1-7 times gives the mean circumference or girth, which into the weight of a lineal ft. of the column under consideration, and this last into the length in feet, will be the total weight of the column.

For example, say we have to compute the weight of a column of which the outer diameter is to be 8 in., and the metal 7.8 in. thick, therefore, the inner diameter or base will be 6 1-4 inches and the mean diameter 6 1-4 in. plus ⅞ in., or 7 1-8 in. (or which is the same thing, the mean diameter is similarly arrived at, as the outer-diameter 8 inches, less the thickness of 7-8 in. = 7 1-8).

Now, diameter 7 1-8 in. x 3 1-7 gives 21 in. 3-8 x 1-7 of 7 1-8 in. or say 1 in.; therefore mean circumference = 22 3-8 in., say 22 1-2 inches, or 1⅞ ft. superficial. Now iron ⅞ in. thick = ⅞ of 40 lbs. = 35 lbs. (or iron 1-8 in. thick = 5 lbs. and 7 times 5 lbs. = 35) and 35 lbs. into 1 ⅞ times gives 65 ⅝ lbs. for foot lineal.

If it be required to weigh any irregular form such as a statue or piece of carving or scroll work, of which the cubical contents are unknown, the latter may easily be had by immersion of the object in sand or water in a cylindrical or rectangular box or tub of quick and easy computation, and a mere comparison of the height when just covered by the sand or water with the height of depth of the auxiliary material after removal of the object. Thus if the box be a foot square in cross section and the filling stand 3 feet high or deep with the object in it, and 2 ft. 9 inches after the object is removed, the cubical contents arrived at are a foot square and 3 inches in height or 1-4 of a cubic ft., or 120 lbs. If the object be hollow, it must of course be inverted in the bath, so the sand or water may fill the hollow space.

Or the weight of an object to be cast of any metal may be made known in advance by weighing the model of it in wood or any other material and by simple rule of three, comparing their specific gravities. And in like manner when the weight is known of any object, its cubic contents may be arrived at by a mere inversion of the terms of their proportion.

Thus of a shapeless piece of stone or wood or metal, the ratio of its cubical contents to those of a cubic foot of the material, from a table of specific gravities, will be the same as that of the weight of a cubic foot of the material to that of the piece to be computed.

In the foregoing mode of obtaining the cubical contents of an irregular figure by immersion in a vessel, if the vessel instead of being cylindrical or rectangular, has tapering or splayed side, or be the frustrum of a cone or pyramid, the contents must of course be computed by the prismoidal formula, which consists in adding to the sum of the areas of the upper and lower bases of the tub or vat four times the middle area (of which the factors are arithmetic means between those of the end areas) and multiplying the result by one sixth part of the depth or height.

MASTER PLUMBERS' ASSOCIATION.

At the annnal meeting of the above Association held last week, the following officers were elected; President, J. Lamarche; vice-presidents, J. Date, A. Champagne and H. Paddon; secretary, W. Briggs; English corresponding secretary, W. Hughes; French corresponding secretary, J. Thibeau; financial secretary, J. C. Jacotel; treasurer, W. A. Stevenson; sanitary committee, J. W. Hughes, John Date, James Mattinson, A. Sigouin and J. C. Jacotel; arbitration committee, P. Carroll, A. Demers, G. Yon, G. Rosser and H. Baillie; auditing committee, J. Watson, A. Rousseau and Theo. Jacotel; legislation committee, F. Brunet, D. Gordon, J. Burns, T. Leclaire and W. Britton; apprenticeship committee, A. Demers, E. C. Mount, T. Jacotel, J. Bonhomme and J. Sadler.

THE NEW BUILDING BY-LAW.

The members of the Committee of the Province of Quebec Association of Architects to whom was referred the revision of the proposed city building by-law are finding their task an arduous one. They have held meetings regularly since last June, and now meet Tuesday and Friday in each week. Even though these meetings should be continued during the holidays, it is not probable that the work of the committee can be completed before the end of January. The members of the committee are: Messrs. A. C. Hutchison, A. T. Taylor, J. Nelson, A. Raza, W. E. Doran, Jos. Perrault, Jos. Venne, Victor Roy and J. Z. Resther.

MONTREAL STREET RAILWAY BUILDING COLLAPSE.

A lengthy investigation has taken place before a coroner's jury into the causes resulting in the accident to the Montreal Street Railway Company's new building, to which brief reference was made last month. A number of experts were called as witnesses, but as there was much diversity of opinion amongst them, we shall print only the conclusions of Mr. W. McLea Walbank, B.A.S., M. C. Soc. C. E., and Mr. Lacroix, the City Building Inspector, who made an examination of the building by direction of the Attorney-General for the Province of Quebec, and whose opinions, as embodied in the following report, we should regard as being impartial.

R. D. McGibbon, Esq., Q. C.,
Pro Attorney-General for Province of Quebec.

Dear Sir,

Acting under your instructions I, in company with Mr. Lacroix, City Building Inspector, have carefully examined the Street Railway Company's new building on the corner of Craig St. and Place des Arms Hill, in order to ascertain the cause of the recent collapse.

The result of my examinations, calculations and tests goes to prove that the collapse in question has been caused by the failure of the 12in. brick wall supporting the two columns in the north-east portion of the building.

In order to ascertain the crushing strength of the bricks used we had the same tested at McGill College Laboratory in our presence by Professor Bovey and Mr. C. B. Smith, the results of which have proved very conclusively that the strength of the brick depends almost wholly upon the manner in which the workmanship is performed in building same, viz, in using proper care to see that the bricks are properly wetted and thoroughly bedded in mortar.

We tested these bricks when bedded with cotton waste and cardboard and found that they failed as follows:—The first brick "A," bedded as above, failed at 395 lbs. to the square inch. This sample was bedded in Portland Cement also. "B" commenced cracking at 5 lbs., and failed at 428 lbs. "C" and "D" broke across the centre at 132 and 161 respectively. "E" cracked at 57 lbs. and failed at 393 lbs. "F" was bedded in Portland Cement on one side and loose sand on the top—commenced cracking at from 25 to 36 lbs., increased rapidly at 214 lbs., and failed at 625 lbs.

The above tests were with wet brick.

Dry Bricks: bedded with cotton waste and cardboard—No. 1 failed at 139 lbs. No. 2 failed at 89 lbs. No. 3 failed at 143 lbs. per sq. inch.

PROPER BEDDING.

Not being satisfied that the bricks if properly bedded would fail with the small loads above quoted, we procured additional samples of brick from the building and had the same very carefully and evenly bedded in plaster of Paris, with the following results:—

M, first crack at 1583 lbs., failed 2218 lbs.
N, first crack at 764 lbs., failed 885 lbs.
O, first crack at 417 lbs, failed 937 lbs.
P, first crack at 1385 lbs., failed 1959 lbs.
Q, first crack at 979 lbs., failed 1385 lbs.

R. This sample bedded on cardboard only, cracked at 85 lbs., fractured badly at 743 and failed at 946 lbs.

MORTAR.

A sample of the mortar is at present in the hands of Dr. Harrington, of McGill University, who will report on same about Thursday or Friday. I have also some samples of the mortar in my possession which I took from the building myself. I have made an estimate of the weight supported or concentrated on the 12in. wall at the foot of the column second from Craig Street and first from Place d'Armes Hill as follows: Area carried by top of column, 193.2. The weight of roof covering on roof composed of 11x3 joists at 2 ft. centres an inch board over same would be neglecting bridging on blocks equivalent to 9 lbs. per sq. foot.

IRON.

One 15in. eye beam,	50 lbs.,	21 ft.	long	1050	lbs.
One 12in. "	32 "	9 "		288	"
Six 7½in. "	14.7 "	10 "		882	"
One " "	" "	3'5 "		51	"
				2271	

This weight distributed over 193.2 of floor gives 11.75 lbs. per square foot.

TERRA COTTA.

I weighed a block of terra cotta which I found in the building and appeared to be a fair sample with cement on it and which I have still in my possession, and found same to weigh 20 lbs. The size of the block with cement was 4½ x 3. One of these blocks would give an area of 58 sq. inches, making the load about 50 lbs. to the sq. foot.

RECAPITULATION.

Wooden roof	91 lbs.
Iron	11.75 lbs.
Terra Cotta	50 lbs.
Total	70.75 lbs per sq.ft.

This load multiplied by 193.2 gives 13.669 lbs. approximately as the weight of the roof resting on top column.

Assuming that the fifth floor was similarly constructed, deducting the joists and roofing boards, the weight per sq. ft. of this floor would be 70.75, minus 9, equivalent to 61.75 lbs. per sq. ft.

193.2 multiplied by 61.75 gives 11930 lbs. as the load on the column supporting this floor in addition to the roof load.

Assuming that the fourth floor was similarly constructed to the fifth floor, there would be an additional 11930 lbs. for the wall supporting this column, to which should be added the weight of the columns themselves, which witnesses have stated to be 2400 lbs.

The total load therefore carried by the 12in. wall immediately under the column in question would be as follows:—

Weight of roof	13969	lbs.
5th floor	11930	"
4th floor	11930	"
Weight of columns	2400	"
Total	39929	" or 20 tons.

Size of bearing plate 12x18, equals 216 sq. inches.

Load per sq. inch was therefore 185 lbs.

The McGill University will send you a complete report of tests referred to and the bricks are still preserved and packed in a box at the College awaitng your instructions.

Yours faithfully,

(Signed) W. McLea Walbank,
Architect and Civil Engineer.

(Signed) P. Lacroix,
Building Inspector.

After having heard the testimony of the numerous witnesses, and listened to the coroner's charge thereupon, the jury returned the following verdict:

"We, the undersigned jurymen, after having heard the proof, declare that Regis Pauze, Adolph Leblanc and Joseph Marquis died in Montreal the 9th day of November, 1894, having been killed by the falling of a part of the building under construction for the Montreal Street Railway Company. We believe that the falling in was due to the fact that Ed. C. Hopkins, architect; Avila Gravel, engineer of the Dominion Bridge Company, and Joseph McLaughlin, foreman of the Dominion Bridge Company, failed to take reasonable precaution in the construction of the work, and that they cannot be excused for having neglected to fulfil this duty.

"We likewise believe it to be our duty to recommend to the municipal authorities that an amendment to the building laws be brought about, with a view to avoid such a catastrophe in the future."

Messrs. E. C. Hopkins, Avila Gravel and Joseph McLaughlin were thereupon arrested, but were subsequently released on giving bonds to appear when required to do so before the civil courts.

A SUCCESSFUL YOUNG CANADIAN.

Quebec, Dec. 1st, 1894.

Editor Canadian Architect and Builder.

Sir,—We translate from the French the following, which purports to be from "Le Canadian," of St. Paul, Minnesota, and which, while reflecting honorably on Canada, and Quebec in particular, is also to the credit of the Quebec section of the Province of Quebec Association of Architects, under whose auspices the young man was admitted to the practice of the profession. The article reads as follows:

"Minnesota, one of the wealthiest States of the Great Republic, has decided on erecting a capitol to cost as much as a million and a half of dollars. 56 sets of plans have been sent in. Those designed by René Lemay are among the worthiest and most perfect, if we can credit what the St. Paul Despatch says on the subject. We have the plans before our eyes while writing this, and in truth the design is superb. We regret not being able to reproduce the longitudinal and cross sections which go to complete the design, which is by R. P. Lemay, assistant of M. M. Kretz & Co., Architects.

Mr. Lemay is the son of Pamphile Lemay, the well known Canadian poet. After long and serious studies under apprenticeship with Mr. J. F. Peachy, of Quebec, architect and member of the P. of Q. Association of Architects, he was by the Quebec Board of Examiners admitted to practice, when with his diploma he entered the office of M. M. Kretz & Co., who were not slow in discovering the talent of their young assistant, and who confided to him the execution of a plan which was to compete with those of the best architects of the United States. His efforts were crowned with success, and everything leads to the belief that the Commission will adopt the plans and specifications of our young Canadian friend."—Com.

COLLINGWOOD MEAT CURING ESTABLISHMENT.

It may not be generally known that one of the largest meat curing and packing industries in the Dominion is located in the town of Collingwood, but such is the case, and in this paper I will endeavor to convey to your readers, as briefly as possible, some idea of the building, its fittings, and the purposes for which it is intended.

The building, or rather buildings, stand near the shore of Georgian Bay, a little west of Collingwood harbor, the foundations going down to the limestone rock, which at this point, is only a few feet from the surface. The main building is 200 feet long by 80 feet wide, two stories high, of 12 feet each, with spacious attic, and a cellar seven feet clear, under the whole building. On the north side—the building being longitudinally nearly east and west—there is an addition 12×48 feet, three stories high, divided with brick walls into three smoke chambers, and a two ton hoist. The smoke chambers contain gridiron shelving, whereon to place bacon, ham or beef, that is to be subjected to the smoking process. Smoldering fires will be kept below, on a level with the cellar floor and the smoke will ascend to the top of chambers and escape through louvres in the roof. On the north-east angle, slightly detached, stand the engine house, boiler room, cold generating rooms and chimney shaft. These buildings cover a space about 32 feet by 50 feet with walls as high as the main building.

The chimney shaft is 88 feet high, including footings, and is seven feet square at the base, tapering to 3 feet 6 inches at the top, with a two foot by two foot flue at both top and bottom.

The whole of the outer walls, and two dividing partition walls, are of hard burned pale red bricks, and are two feet in thickness, with a hollow space of four inches between the inner and outer walls; the two thicknesses being tied together every fifth course with connecting links. The hollow space is well parged on both walls and every joint in the brickwork is well flushed up with properly prepared mortar.

As the roof is a particularly heavy one there are strengthening buttresses under the seats of principal rafters; the buttresses being solid brickwork from foundation up. The cellar story is of random coursed quarried stone, and is three feet thick, with air space in centre, which is well parged with cement mortar.

The footings are formed of immense blocks of granite four feet wide and one foot thick and of various lengths, laid down in the best Portland cement. Piers for the support of floors, machinery, tanks and roof, are scattered over the cellar and are formed of white oak resting on massive stone plinths. The cellar floor is a marvel of perfection, and is as smooth as a skating rink; it is composed of a layer of five inches of broken stones, a layer of three inches of slag, which is intended to act as a non-conductor, well tamped down, then a layer of grout or concrete, and finished off with a thick layer of Dykerhoff portland cement used in proportion of two of sand and one of cement—the whole being trowelled off until it is as smooth as glass.

The main floor is divided into twelve compartments, five of which are for storage, two for cooling, one for shipping, one for cutting up, another for killing and dressing, with a small room attached, 14×28, for preparing tripe. Another room is devoted to the manufacture and packing of lard. On this floor is a large room where the blood, offal and viscera are transformed into transputable fertilizers, and for this purpose an ingenious set of apparatus is set up and worked by steam. A mammoth press for expressing lard from the fatty substances is also in this room. The facilities in the killing room are such that 1000 hogs can be disposed of in twelve hours under pressure. Overhead tracks, of which there are some 3500 feet, convey the carcass to any required spot in the building where it is dealt with by the cleaner, cutter, &c. It is then placed in the cooling or chilling room until it is wanted for curing or for shipment.

The second floor contains six cold storage rooms, 15×65 feet each, all having five tiers of overhead tracks and capable of holding over 175 hogs each. All these cold storage rooms are kept at a temperature a little above freezing point by the ammonia system of cooling. Twenty-eight thousand feet of two inch pipe is used in these cold storage rooms, and the whole system is worked by a 100 H. P. Wheelock engine, which, together with the cooling machine, is capable of making 35 tons of ice daily. The whole cooling system in the building is the work of the Wolfe Ice Machine Mfg Co. Chicago, so also is the engine of 50 H. P. used for supplementary purposes, lighting, pumping, chopping meat, running presses, hoists, etc. The building is lighted throughout with an incandescent system put in by the Canadian General Electric Co. Shafting, pulleys, lard tanks and minor machines were furnished by the Goldie & McCulloch Co., of Galt, Ont., and the pumps, which are of the Blake pattern, are from the shops of the Northey Mfg. Co., Toronto. On the second floor is the singeing machine, where hogs intended for export have all the bristles singed off them in less than half a minute. On this floor is also a scalding vat, wherein the dead hogs are dumped, the water being made and kept hot by superheated steam. There is a large cutting and salting room, 50×50 feet, also on this floor, and a sausage room 26×40, where sausages of every style are manufactured ready for export.

The full capacity of the building for killing, curing and preparing for export is about 5,000 hogs and 2,500 bullocks per week, and to manipulate this vast amount of material throughout its whole preparation will require an army of employees in and about the works, besides a large staff of buyers and agents. A thorough system of water-service, for fire and general purposes is provided on the spot, the water being taken from the lake.

In an article of this kind it is impossible to describe more than a few of the salient points connected with this enterprise, but I am persuaded the foregoing will give a fair average idea of the works.

The owners are Messrs. Thos. and J. Long, Frank and H. Telfer C. Stephens & Co., and G. Brown & Bro., to the latter of whom I am indebted for some of the figures given.

The Wilson Bros., of this town, designed and superintended the work, and the stone, brick and cement work, was executed under the supervision of Mr. Robert Burdett. At this writing the whole work is about completed, and killing will be commenced in a few days. A number of outside improvements are still going on, and will continue for some time yet. There has already been expended on these works about $80,000.

FRED. T. HODGSON
Collingwood, Ont.

LEGAL DECISIONS.

THE CITIZENS MILLING CO. VS. DEFOE.—A case of some interest to architects and builders, was decided by Mr. Justice Robertson and a jury about three weeks ago against the defendant. The merits of the case were about as follows: The defendant purchased a property on Adelaide street west which had been used as a billiard table manufactory. The building was of the ordinary type of such structures, built about twelve years ago. Dimensions about 114 feet long by 30 feet wide and four storeys high, including basement; good ordinary walls, centre beam running lengthways from end to end, 10″×12″ in basement and ground floor, 12″×8″ for the remainder, 12″ round cedar posts in basement, six in number, dividing beam into seven bays of about sixteen feet each. The pillars on ground floor were some of iron and some of wood, iron circular 6″ diameter, wooden ones 12″ circular. All the columns were capped with solid pine corbels 10″×6″, 4 feet long. The character of the remainder does not come into account. When the premises came into Mr. Defoe's hands in about 1891 he arranged it for a storage warehouse, putting in a power elevator, etc. The basement was used for heavy bulky articles, the ground floor for furniture, etc. The first and second floors were used by the Milling Co., mainly for the storage of flour in bags, and piled on the first floor seven bags high leaving narrow passages between the piles. Early in February of 1892 a portion of the floor carrying the heaviest load collapsed, the main beam broke and the greater portion of the contents of the various stories were precipitated into the cellar. On examination it was found that the main beam of the first floor where the greatest load was concentrated had become rotted, and the rot was traced to the action of steam from a steaming box which had been in use for years in the billiard factory previously there, but which presented no external indication of the weakness before the break. The jury decided that the safe load was exceeded and the verdict was against the defendant.

ILLUSTRATIONS.

PROPOSED RESIDENCE FOR MR. HUGH GRAHAM, CORNER OF SHERBROOKE AND STANLEY STREETS, MONTREAL, QUE.—A. F. DUNLOP AND J. C. A. HERIOT, ARCHITECTS, MONTREAL.

PROPOSED HOUSE TO BE ERECTED AT KAMLOOPS, B. C., FOR MR. J. OGDEN GRAHAME.

FREE LIBRARY BUILDING, LONDON, ONT.—HERBERT MATTHEWS, ARCHITECT.

The free library building at London, Ont., is now being built under the supervision of Mr. Herbert Matthews. The materials used are as follows: Credit Valley stone facing for basement; Milton red pressed brick for superstructure; Scotch red sandstone—cut stone; Berea stone steps, &c.; windows glazed with French plate glass; roof covered with red slate. The interior will be fitted up in the most modern manner, and it is expected that the library and museum in connection with it in their general arrangements and appointments will be a success.

PERSONAL.

Mr. J. W. Taylor, manager of the Toronto Radiator Mfg. Co., is passing through a severe illness.

We are pleased to learn that Mr. Eustace G. Bird, of Barrie, formerly of Toronto, has received the degree of A. R. I. B. A., having passed the examinations last March of the Royal Institute in London, and being elected an Associate last month.

A partnership has been formed between Mr. Eden Smith, of Toronto, and Mr. Eustace G. Bird, of Barrie, as architects, with offices at Toronto and Barrie. Mr. Bird has lately returned from England, where he was with the well-known architect, Mr. Colcutt, of London. Mr. Smith is well and favorably known.

Mr. Edmund Burke, architect, Toronto, has admitted to partnership Mr. J. C. B. Horwood. Mr. Horwood served the earlier years of his studentship in the office of Messrs. Langley & Burke, Toronto. He has since had the opportunity of gaining valuable experience in the offices of leading architects in New York city, and has recently spent some time in England and on the continent. Mr. Horwood will be a decided acquisition to the ranks of the profession in Toronto, and the partnership into which he has entered with Mr. Burke should prove to be mutually advantageous.

THE PRACTICE AND PROVINCE OF THE ARCHITECT.*

I VENTURE to draw your attention briefly to a few considerations affecting the practice and province of the architect. Foremost amongst the essential elements of architectural practice I would place what I may describe as an artistic sense—the faculty of recognizing and enjoying the beautiful in all things. And, more than this, an open vision to see, and wisdom to understand, the great underlying principles out of which all true beauty, whether in nature or art, grows. The direction of the student's work will depend much upon his tastes ; but a study of the best examples in Classic, Gothic, and Renaissance architecture is certainly desirable. The aim of such studies should be fundamental, not with the object of slavishly copying, but of learning the principles upon which the builders wrought ; and thus it will often be found that some of the principles are the same in widely differing styles. We are often twitted in this country with having no national style, but—as the Americans say of our weather—possessing "samples only." I take it we must admit the criticism. But may not this fact be due in some measure to the ofttimes wrong direction of our studies? It is scarcely a generation back since it was a common practice to regard ancient Classic examples as objects to be copied bodily —at least, as to elevation. The interior purpose of the new building might even be wholly different from those of the original, but convenience of plan had to succumb to an imposing façade. The Gothic revival only in a measure mended matters, for a time, for a somewhat slavish copying of detail, apart from a proper understanding of principles, became the fashion. This period, through which we have now happily passed, has doubtless had its uses, nor can we yet afford to set aside a careful study of Ancient and Mediæval art. It were indeed far better to copy bodily a good design than to invent a bad new one. But the evil is that buildings, like plants, are often indigenous to the soil, and ill-adapted for transplanting to another clime. Though the maxim is not a new one, we have perhaps not yet come fully to understand how a national style can scarcely exist, at least can only be good, as it grows out of, and fitly expresses national habits and characteristics. But when we speak of the "practice" of the architect, the word itself suggests that something more than the possession and efficient training of the artistic sense goes to the making of an architect. He must also undoubtedly possess not a little practical knowledge of several sciences. To the vexed question, whether an architect should be an artist or a theoretical mechanic, I would reply : In a measure he must be both, and a man of business too. An artist may be a thoroughly unpractical man, no man of business, and yet be a good artist ; an architect cannot. On the other hand, neither has the mere mechanic, or man of business, with perhaps little art sense, and no art training, any claim to call himself an architect. He may be well versed in the science of building, and able, most efficiently, to conduct the business of his client, but he cannot be a true architect unless he be a true artist. Lacking this, though his buildings be very ornamental, the ornamentation will probably be vicious, and though his work secure many admirers, it will inevitably be devoid of the elements of true beauty, and transgress at every point canons of good taste. Time will only permit of a brief mention of two features of the times which present special hindrances to architectural practice. The mania for cheapness thwarts us at every point, often curtailing expenditure below reasonable limits, and tempting to the improper use of materials made to imitate the functions of more costly substances. The multiplication of specialists' manufactures by way of fittings and decorative features, though it sometimes saves us trouble, tends to sameness of treatment and loss of originality, and often unhappily to the fostering of a vitiated taste for showiness and a wholesale destruction of true art. The qualifications for the practice of architecture are wide in their range, and certainly such as to make large demands upon the powers of most men. I think, however, you will be ready to admit that they are not unreasonable. But does not every consideration of the subject point again to the absolute need for a careful education and training for every architect?

Let us now turn from the qualifications for the practice of architecture and inquire what are its limitations. What is the province of an architect? One thing must be evident. Unless he become a specialist the variety of the buildings which an architect may be called upon to design will of itself present a wide scope for the exercise of his talents. He may be to-day designing a church, and to-morrow a dwelling house, school or factory. He need not, it is true, have a previous knowlege of all the technical requirements for which such buildings, for instance, as factories are needed ; but he must be able readily to grasp these requirements, to invent methods for overcoming difficulties, to guide and advise clients who often scarcely know their own needs, and to throw all into forms of beauty framed out of suitable and enduring materials. Such duties are not light, and surely a man with any amount of practice might find in their faithful exercise ample scope for time and genius. But what are the facts of the case, gentlemen? A study of local Directories would lead us to suppose that many architects must indeed be men of Herculean powers. In fact, architecture seems to have been tacked on as a light and pleasant pastime relieving the more serious occupations of house agency or upholstery. In these days of keen competition it becomes a matter for quite serious discussion what occupations, if any, beyond his evident sphere an architect may fitly engage in. It would often doubtless be to his pecuniary advantage to undertake house and estate agency. It must, however, always be to the detriment of his art; if such a combination can be justified at all, it should at least be by way of recognized partnership, the partner who has been trained as an architect having freedom to give his undivided attention to architectural work. It has always appeared to me perfectly legitimate, and sometimes advantageous, for an architect to take out his own quantities. He must know best his own intentions, and if he has a proper knowledge of the science, should be best able to make the quantities a true expression of those intentions. An architect in large practice will, however, not often have time for this. When the work is done by a surveyor, he should be working in full concert with the architect ; and whether the quantities form a part of the contract or not, it would be better if they were always recognised and paid for by the employer.

Land surveying, and the laying out and development of estates, is another large branch of work in which architects frequently engage. As regards the former it is certainly admissible for an architect to measure and level the sites for his own works, and he should at least be able to do this. In respect of the latter, it would doubtless be much to the advantage of the estates if an architect had at least some share in their planning. In this, as in other matters, very much must depend upon the time at his disposal. I cannot see that there is necessarily in the work itself anything inappropriate or injurious to the proper exercise of architectural art. Surveying for delapidations is another branch of work which, at least in the provinces, is always regarded as coming within an architect's practice. It is certainly one which his general experience specially fits him to perform judiciously. The question whether architects should advertise opens an oft-debated point. Much depends upon the manner of advertising. It cannot reasonably be denied to an architect to use some legitimate means of making himself known. But should not his works be his best advertisement, and why should he not place his name upon them in some modest spot, as an artist or sculptor does? There is something very different in this from the ordinary trade advertisement. For myself, I much doubt whether advertising in the ordinary trade sense is of any use to an architect ; but whether it be so or not, it is utterly repugnant to good taste. The following is an actual specimen of this kind of advertising, which fortunately has not yet become common amongst architects :— "Designs for chapels and schools. Pretty, inexpensive ; free from damp and echo. Upwards of eighty have been erected during the past eight years, and the demand is still increasing." And then follow paragraphs headed :—"Architectural Beauty, Echo, Damp, Ventilation, Extras and Disputes," &c., in all of which points the author claims exceptional success. The circular closes with an offer to forward photographs or lithographic views of chapels in various styles at a charge of 6d. each below 400 sittings, and 9d. each above. Comment is superfluous ! It is not always easy to stand against the fashions of such an advertising age in which literary men and even ecclesiastics are sometimes led into the stream. But to my mind all eulogistic comments upon the creation of one's own brain are out of place, and must so tend to lower one's higher sensibilities as to become reflectively injurious to our art. It behoves us, therefore, as a Society, very strenuously to set our face against such practices. Against the acceptance by architects of commissions from manufacturers and others, it is scarcely possible to utter words too strong. Architects are doubtless often put to much trouble in selection, and the unwillingness of clients to fairly remunerate for such work is strong inducement to them to seek their commission elsewhere. But the argument is specious and insufficient to uphold what can only be characterised as deception. My aim throughout has been to demand a high standard in the exercise of our art. With class distinctions of trade and profession I have little sympathy. A calling is honourable as it it exercised honorably. Every man who does his best, whether in art or craft, is worthy of respect. But assuredly all callings do not reguire the same degree of ability. And without any invidious comparison it may safely be averred that the practice of architecture ranks high amongst the professions, as one making large demands upon talent, study, and close application. It is on these grounds that I would urge the limitation of architectural practice as much as possible to what is certainly the main province of the architect, namely the designing and superintending the erection of buildings.

*From the inaugural address of the President of the Society of Architects.

The manufacturing business of the Chanteloup Estate, Montreal, has been purchased by the Chanteloup Mfg., Co., Ltd. The business will be conducted under the management of Mr. Wm. Robinson.

Messrs. B. L. Nowell & Co., of Montreal, have been appointed Canadian agents for the Royal Cement Plaster Co., of St. Louis. This cement plaster is mixed with good sharp sand in the proportion of 100 lbs. of the former to eight ordinary water buckets of the latter, and thoroughly tempered to a good stiff mortar.

To make canvas waterproof, it is usually first wetted, then coated with two coats of boiled oil, using very little turps and driers. When thoroughly dry, two coats of paint of the desired color, or better still, three coats are put on thin.

CONCRETE CONSTRUCTION—ITS PRACTICAL APPLICATION. *

By Ernest L. Ransome.

The practical application of concrete may be conveniently divided into four divisions, viz.: 1st. False work. 2d. Materials. 3d. Tools. 4th. Labor.

The second division can be usefully divided into four sections, viz.: A. Cement. B. Aggregates. C. Iron. D. Water.

Division 1.—*False Work.*—Concrete, in respect to false work, is unfortunate in comparison with other masonry because it not only needs more expensive centering whenever centering is necessary, but it also usually requires cribbing, whereas other masonry does not. This characteristic entirely prohibits its use in many cases where in all other respects it would be desirable, and it is therefore an obstacle to the more extended use of this valuable construction that should be miminized as much as possible. Of late years I have met with considerable success by adopting systems of standard centering and cribbing, which, while not of universal application, are of great use, permitting, as they have done, of the construction of floors and buildings that otherwise could not have been attained; but as this is of interest to the contractor rather than to the architect, I will not enter into a detail description thereof.

Great difficulties have often arisen from the swelling of the sheeting of the centering or cribbing, caused by the wood absorbing the moisture of the newly placed concrete. From this cause many arches have been lifted and broken, floors cracked and walls thrown out of line. By using sheeting boards of a moderate width, say six to eight inches, and beveling one edge slightly, the boards may be put close together and when expansion occurs the only effect will be to slightly crush the sharp outer edge of the bevel, without lifting or disturbing the concrete abutting or resting upon it, the widest side of such boards being of course placed facing the concrete.

This is a very inexpensive, simple and unfailing remedy that from its conception I have used in all cases, and since its use I have never had any trouble from swelling of the timber. Some such device as this is especially necessary in dry climates, also in light constructions, such as floors of but an inch or two in thickness, or hollow walls.

For standard centering or cribs, if of wood, it is advisable to make them of planed lumber. The surface of the wood should be thoroughly coated with common thick kerosene oil before it is used for the first time, and before each subsequent use it should be brushed over afresh with the oil, or else with a paste made of castile soap and water. Fish oil is objectionable as it is apt to injure the surface of the concrete, and linseed oil is generally too gummy for this purpose.

It may be accepted as a general rule that false work of light sheeting, well braced, is more economical than heavier planks with braces farther apart. I am aware that this is not the usual practice.

The ornamental effects can be much more cheaply produced by recessed than by projected work.

Materials.—Under this head cement, by reason of its greater cost and active qualities, stands out preëminent. I will limit my remarks under this subdivision to Portland cement, with the exception of the following observation, viz:

That where rapidity of construction is not a great object, and aggregates are unusually cheap, by the use of common lime, with or without some of the cheap native cements, properly handled, work of good quality and of astonishing cheapness can be made—one part of lime to forty parts of aggregates not being considered too little in some cases.

Portland cement, a giant from its birth, is striding rapidly along in the way of improvements in quality and price, so that formulas of tests that were thought severe a few years ago would not be considered sufficiently exacting at the present time to ensure as first-class the cement that would successfully pass them.

The current technical literature teems with methods of testing, so that we can hardly go astray in the selection of a good cement. The three principal requisites for a first class cement are as follows:

1st. That it sets or hardens without undue expansion or contraction.
2d. That it be sufficiently finely ground.
3d. That its tensile strength be high.

The usual methods of ascertaining these points are:

1st. The cake test. This test is so well known that a description of it here is unnecessary. When time is an object, by the use of hot water the test may be hastened. Under expert supervision the "boiling test" is by many considered superior to the cake test, but the difficulties in the way of carrying it out and some uncertainties in the results that yet linger about this new test, prevent me from advocating its substitution for the older test.

2d. The test for fineness. Ninety per cent. of the cement should pass through a hundred-mes screen having 10,000 holes to the inch. It would be better to use a yet finer screen for testing, but for the difficulty of obtaining finer screens. The practice of using coarser screens is to be condemned because they pass much that is inert. The screenings should feel soft and silky to the touch. The residue on the screen should be hard, black, angular grains. The economic importance of fine grinding has seldom been exaggerated. It is usually unduly disregarded, yet it has been established beyond reasonable doubt by repeated experiments that the sand-like grains of the cement are practically inert and useless. Still, unlike the first qualifications, this is an economic question, and the ill effects of coarse grinding, if not apparent in the first test, can be overcome by making due allowance for the coarse portion in proportioning the cement to the aggregate and then but little harm will follow the use of coarse ground cement in ordinary work.

3d. Tensile strength. This test is usually and best made by the aid of the ordinary testing machine. Several first-class cements will now develop tensile strength of 600 or 700 pounds per square inch in seven days, and while this may be too high a standard to insist upon, yet the cement that will not furnish a strength of 450 pounds in seven days ought not, in my judgment, to be graded as first-class, unless it is exceptionally fine ground.

With regard to the aggregates not so much has been published.

Sufficient interest is not usually taken in these inert materials, which, nevertheless, have a powerful influence upon the character of the concrete, so much so that a good aggregate with a poor cement will sometimes give better results than a good cement with a poor aggregate.

A first-class aggregate should be made of a hard, tough rock, free from clay or dirt and having a rough surface and sharp angles when broken; it should be so graded from the finest grains to the largest pieces admissible in the work it is for, as to give, while retaining the largest proportion of large sized pieces, the smallest proportion of voids.

If the aggregate is all of one material, the desired aggregation can be determined by weighing a given measure. That proportion which, while retaining the maximum amount of large pieces, weighs the most, is the best.

If, on the other hand, the aggregate is composed of different materials, then that proportion which in a given measure and under the same limitations as just given, will permit of the introduction into the filled measure of the least quantity of water is the best.

In making such tests the larger the measure the better; a round measure is better than a square box, and it should not contain less than two cubic feet. The material also ought to be shaken down into the measure. It is desirable, when time will permit, to make these tests with a mixture of one of cement to three of sand, but ordinarily with cements of equal fineness the relative strength of different brands will remain about the same as under the test with neat cement.

For fireproof work care should also be taken to avoid such aggregates as contain feldspar, and where the possibility of the concrete being subjected to a long continued red heat is sufficiently probable as to be worthy of precautions being taken to meet its effects, limestone also should be rejected from the aggregate.

To those who have studied the matter practically, it is evident that in thr large majority of cases the prejudice against the use of the dust and finee particles created in crushing brick or stone is unfounded, and the practice of prohibiting these and substituting therefor ordinary sand is strongly to be condemned. Lieut. Innes found that both limestone dust and ground, burnt clay, gave stronger results than the purest sands, and tests and works carried out under my supervision thoroughly corroborate this.

The largest stone does not necessarily make the best aggregate. For instance, finely crushed granite is for some purposes inferior to finely crushed limestone, although as a rule the granite is the harder of the two. One reason for this is not hard to seek: Owing to the brittle quality of granite, in crushing it is not only broken into small pieces, but many of these pieces are so bruised and contused that upon a little pressure being exerted upon them, such for instance as can be applied by the finger or thumb, they will crumble. With limestone and many other softer rocks, by reason of their greater toughness and elasticity, this is not the case.

Again, some stones, as quartz and the like, have surfaces of such smoothness that the adhesion of the cement thereto is not so good as that between cement and other stone, such as basaltic lava, sandstones and the like, which, when fractured, present a rough surface. Such stones as these latter usually make first-class aggregate. Broken stone, as a general thing, is a better aggregate than gravel. Sometimes a mixture of the two is preferable to either alone. Usually the use of one or the other has to be determined by the economic side of the question and the local supply. When from such causes gravel is selected, its quality can be greatly improved, at small cost, by running it through a crusher that will break the larger pieces as they pass.

The common practice of limiting the maximum size pieces so that they will pass through a three-inch ring is, I think, open to question. In massive work, stones much larger may advantageously be used, not, however, if the late fashionable practice of "dry concrete" be adhered to.

The experiments carried out by Mr. Elliott C. Clark tend to show that the presence of a small amount of clay in the concrete is no detriment to the strength of concrete, even with clay, as much as ten per cent. of the aggregates and cement combined.

In corroboration of this I would instance the Niagara gravel, which, whilst it contains a marked quantity of clay, yet makes most excellent concrete.

Having determined the aggregate, the next important question is, what is the proper proportion of cement to use for any given work?

When first-class materials, in round figures and within the limits of proportions between the cement and the aggregates of from 1 to 4, to 1 to 15, the crushing strength of concrete, when skillfully made, at a month old may be taken as follows in tons per square foot: Multiply the *constant* number 700 by the number representing the proportion of cement used, and divide it by the relative number representing the amount of aggregate used; for instance, a concrete composed of 1 part of cement to 14 parts of aggregates should, when properly seasoned, have a crushing strength of $\frac{700 \times 1}{14} = 50$ tons; when three months old the strength will have increased some twenty-five per cent., and when twelve months old it will have increased some fifty per cent.

Under this rule a concrete composed of 1 of cement to 14 of aggregate would be about on a par with good brick work when a month old, and be about fifty per cent. stronger when twelve months old. This rule reduces the strength of the concrete too much as the proportion of aggregate is increased, but it is reasonably correct and quite safe to act upon.

Section C.—*Iron.*—The tensile strength of concrete is comparatively little, and by reason of the gradual though slight shrinkage that takes place in all concrete structures that age in dry situations, should not be relied upon in any important work.

For giving tensile strength to concrete, all modern workers of note now use iron in some form or other.

Angular iron bars, cold-twisted, commend themselves in many ways, and on this continent they have been more largely used than any other form in concrete iron construction.

The advantages of this cold twisting are many; they may be summed up as follows:

1st. The tensile strength of iron is largely increased, viz., from 20 to 50 per cent., dependent upon quality of iron used.

2d. Its elongation under strain is considerably lessened, a very important advantage in concrete-iron construction.

3d. It forms a *continuous* key with the concrete, both longitudinally and also athwart the bar. The effect of the twist is to *grip* the concrete in every direction, and in fireproof flooring and other work where light construction is desired, the importance of this universal key is very great, for it counteracts the tendency which the bar otherwise would have to split the concrete along the line of tension.

4th. The cost of twisting is nominal, and the royalty for its use not prohibitory.

In placing these bars care should be exercised in putting them in position where they will best exert their strength. They should be straight and laid directly in the line of strain. Any deviation from this rule should be such that the tendency to straighten, which invariably occurs upon the application of the strain, will do little or no damage, such a deviation, for instance, as laying the bar of a floor beam with a slight sag in the centre. In such a case when the strain takes place the tendency to straighten would have the effect of thrusting the centre of the bar upward against the downward thrust of the load, and it would be harmless. If, on the other hand, the bar was laid crowning in the centre, upon the floor being loaded, the tendency of the bar to straighten would be in the same direction as that of the downward thrust of the floor load, and the consequences would be detrimental, if not fatal, to the integrity of the structure.

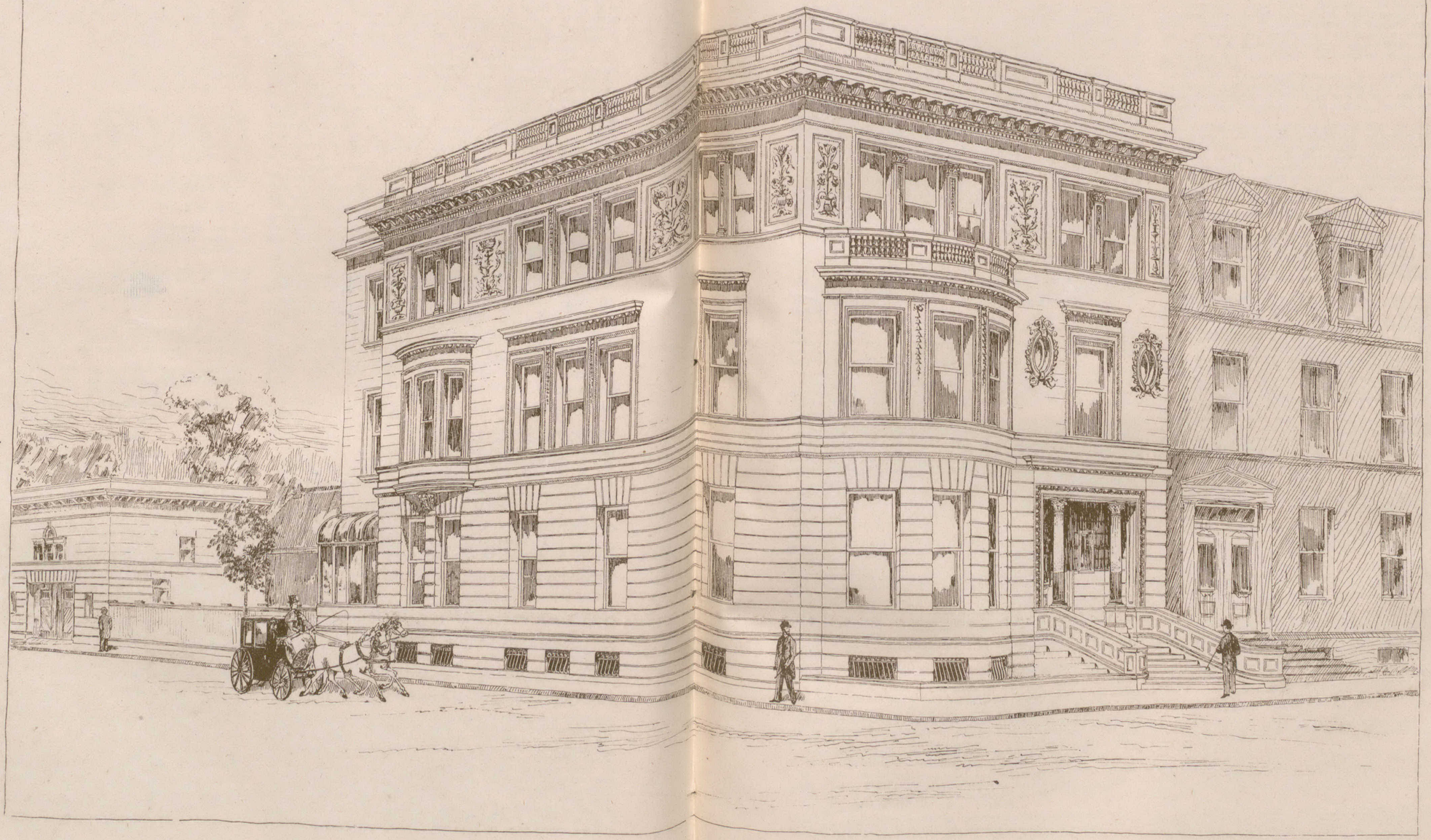
Concrete is an excellent conservator of iron. Von Emperger states that he knows of a case where iron rods were found perfectly rust free after having been imbedded in concrete below the water level for forty years. (T. A. V. C. E., Vol. XXXI., p. 447.)

W. G. Triest, Jr., states that a wrench that had been buried in concrete

* A paper read at the Twenty-eight Annual Convention of the Amerlean Institute of Architects, held at New York October, 15, 16 and 17, 1894.

PROPOSED RESIDENCE FOR M. GRAHAM, ESQ.
COR. SHERBROKE & STANLEY STS.
MONTREAL, P.Q.

A. F. DUNLOP & J. C. A. HERIOT
ARCHITECTS, MONTREAL.



twenty-two years had kept its black metallic surface. (T. A. V. C. E., Vol. XXXI., p. 467.)

Referring to some concrete foundations that I built about ten years ago, the president of Star & Co. writes, as follows, under date of December 30, 1893: "Though this foundation is on tide land and submerged in salt water more than half way up, there is no rusting or deterioration to the iron. We had occasion to cut through one of the arches and found the iron as stated." A long time ago I imbedded a dozen pieces of hoop iron in as many blocks of concrete, leaving one end of each piece of iron projecting from the surface. After years of exposure to sea air, all the exposed iron had rusted away, or so nearly as to leave but a few soft, jagged needles of rust that were readily removed by the hand. In all cases upon cutting into the blocks I found the iron almost as good as new, and from one to two inches from the surface it was invariably so.

SECTION D.—*Water.*—The water for mixing should be clear, and by preference soft. If it cannot be obtained of ordinary purity, then due allowance should be made for the impurities by an additional quantity of cement.

Sufficient water should be used to bring the mass when thoroughly mixed into a stiff, sticky, tenacious, viscuous condition. An error as to the amount of water that should be used in concrete some years ago crept into the professional practice both of engineers and architects, and with surprising rapidity permeated and revolutionized it. I allude to the erroneous theory that only sufficient water should be used to slightly moisten the mass, and hardly enough to render it cohesive in its uncompacted state.

An error seldom takes the hold this did upon a skilled body of men without some apparent justification. The only justification that I have been able to find after considerable research is the fact that, in making briquettes for testing purposes, the use of a minimum quantity of water gives the best results. From this one little isolated fact the generalization was made that, to produce the best results, concrete should be mixed in like manner. The fatal flaw in this deduction lies here, viz.: that a mixture of cement, or of cement and sand, with water, differs radically in conditions when to either of these gravel is added, and differs yet more when broken stone is used.

If cement, or cement and sand, is mixed with a large proportion of water, it cannot be compacted by blows or such pressure as can usually be brought to bear, for the mixture would flow from under the tamper. In the latter case, however, where gravel or broken stone is used, with a larger proportion of water, the concrete can be compacted more intimately and closely than with the minimum quantity, and under all ordinary conditions makes a much better concrete. The only exception to this is where smooth, rounded pebbles only are used with the mortar of the concrete, but this exception does not apply to ordinary gravel and never applies where broken rock is an ingredient. I allude to this at some length, because the error, although on the wane, is still widespread.

DIVISION 3.—*Tools.*—There is great advantage and economy in mill mixing. Mills can now be obtained at a reasonable figure and should always be used on large works. By their use the cement is more fully utilized, the cost of labor lessened and the work is more uniform and satisfactory in character.

An objection is often made to mill-mixed concrete, viz., that the concrete is injured by overmixing. What is "overmixing?" A very rare *distemper*, this. I have never once met with it, although I have been actively engaged in concrete construction for thirty-five years. It is never epidemic or fatal, but like vaccination, if present, it would prevent worse and more fatal ailments.

Mr. Spencer Newberry found that a mixture of one of cement to three of sand, which when worked for one minute with a trowel developed a tensile strength of 87 pounds in seven days, developed a strength of 240 pounds in same period after being worked with the trowel for five minutes; a remarkable result, surely, and well worthy of consideration.

Contrary to the almost universal opinion, Portland cement is improved by a delay between mixing and placing. I have experimented with several brands of Portland cement and find that they were invariably improved in tensile strength by a delay of from one to four hours between mixing and placing.

In placing concrete it is preferable to have it of one uniform consistency throughout the mass. In cases, however, where it is required that the face of the work should be of a finer grade, both grades should be carried on simultaneously, the face grade being placed up against the sheeting or mold a little in advance of the backing by means of a trowel or other convenient tool. In more careful work thin strips of iron about six inches wide and of any lengths convenient, may be set up on edge in the concrete parallel to and at any desirable distance from the face of the mold. The face concrete should then be inserted between the mold face and the iron while the backing is placed at the other side thereof. As each layer is put in the iron is drawn up a few inches, so that when the concrete is tamped the effect of the tamping is conveyed below the lower edge of the iron, and causes the two grades of concrete to become thoroughly united and monolithic.

The material should in ordinary cases be placed in thin layers, seldom greatly exceeding in depth the length of the largest aggregates used, and these layers should follow one after another sufficiently quickly so that one layer does not become stiff or partially set before the next is upon it.

Flat tampers should not be used for massive work except in the first and last layers of the day's work; thin or edge tampers should be employed. Wherever practicable the concrete should be compacted by rolling, in preference to tamping. It is cheaper and much more effective. I am not aware of its being done outside of my own practice, but it is certainly deserving of almost universal use. On large work steam rollers would be excellent.

It may be accepted as an axiom that concrete cannot be too thoroughly compacted, provided the action is not violent enough to bruise or crush the aggregate.

In massive or deep work, as it proceeds through the day, often the working surface becomes richer in mortar, when, and as often as this occurs, the mixture should be changed by adding thereto more of the larger aggregates free from fine dust, sand or gravel, until this fault is remedied. If on the contrary at any time the surface becomes open for lack of mortar, it should be immediately remedied by putting into the mixture a lesser quantity of the larger aggregates and not substituting anything in their place.

In a similar way the amount of water used in the mixings should be regulated, changing to more or less as the working surface appears too stiff or too watery. It should be firm under the tamper or roller and yet the mortar should be viscuous and unctuous to the touch.

The quantity required to produce this condition varies greatly, dependent upon the character of the aggregates, whether but slightly or very porous, and upon the age and character of the cement and weather.

Great care should be observed in joining the work of one day to that of the next. The last layer should be thoroughly compacted and left with a slight excess of mortar. It should be finished with a level surface, which, at proper time, as soon as sufficiently stiff, should be patted or stippled with a steel float so as to produce a surface studded thickly with little conical knobs. This surface should be kept wet throughout the night, and in the morning immediately before the application of the first layer of fresh concrete it should be covered with a wash consisting of a mixture of equal measures of Portland cement and air-slacked lime, mixed with water to the consistency of thick cream. This covering should be put on in excess and brushed thoroughly back and forth upon the surface so as to insure a close contact therewith, the excess being swept along just ahead of the fresh concrete until all the surface has been covered, when it should be removed.

When in place the concrete should be kept moist for as long a period of time as possible. When one bears in mind that the chemical action which causes the cement to harden can only take place in the presence of moisture, the importance of keeping the work wet is at once apparent.

In all concrete construction excepting subway and other works where the concrete remains permanently moist, provision should be made for the slow but certain shrinkage that takes place in the concrete as it becomes thoroughly dehydrated. The vertical shrinkage will take care of itself, as the weight of the building is in harmony with its movement. The horizontal shrinkage, however, is resisted by the inertia of the structure and the friction of its foundation. There are several ways to direct such shrinkage; that which I have found most feasible is to partially divide the wall at certain intervals, preferably over the windows where there are several in line, and to insert across the division a weathering strip of copper or lead.

Where the appearance of a straight division line on the face of the building would be objectionable, for instance a wall blocked off into ashlar face, I build this division straight and cause it to coincide with the line of the V recesses of the ashlar, marking in every other course, and I block out in the intermediate courses recesses opposite to the division line, and subsequently fill these recesses with concrete ashlars made and seasoned beforehand. By adopting the pattern of alternate long and short ashlars in every other course with long ashlars only in the immediate course meeting at the centre line of the short ashlars above and below them, there separate concrete ashlars may be made small, and the additional cost of their manufacture will be but trifling.

Apart from the question of appearance, some such division of the surface of a concrete wall is advisable for a two-fold reason: some defining line is needed at the juncture of each day's work at least, and by dividing up the surface by deep recesses into small sections, surface cracking is largely avoided.

In rerefence to this shrinkage of concrete, lest I should have unnecessarily alarmed you, I will state that in a building, the walls of which were 170 feet long and divided thus, it was nearly two years before any apparent shrinkage took place, and now it can hardly be observed by a minute examination of the division joints. No outsider, even though a careful observer, would be likely to perceive any effects of this slight shrinkage when thus controlled.

In situations where it is not possible to make shrinkage joints by a liberal use of twisted iron, shrinkage cracks can often be prevented.

THE RESISTANCE OF PORTLAND CEMENT CONCRETE TO THE DESTROYING ACTION OF FIRE.

By a misunderstanding, due to a windy interference (Mr. Stone tells me one of my letters was blown out of his office window), I find I am expected to speak on the protection concrete affords iron in case of fire.

There seems to be not so much data on this subject as one would desire. What little there is, however, seems to be in favor of concrete as a fire resistant.

It is generally understood that the artificial stone made with Portland cement concrete withstood the Chicago fire well. Some years ago the blacksmith's shop at the Bencia Arsenal, California, was burned out, leaving the outer walls standing. This was a brick building with granite door sills, free stone belt courses, with window caps and cornice of Portland cement concrete. I examined the ruins carefully. The granite was spoiled badly and broken into several pieces; the freestone was badly broken and injured; the brickwork was burnt out in the joints in many places, rendering the walls unsuitable, many of the bricks also being spoiled, whilst the concrete window heads, which had probably to bear the brunt of the fire on the outside, were but little injured; the surfaces had softened a little and were badly discolored, but they remained whole and strong.

Concrete bricks made of well-burnt clinker and lime by a process which converts the lime into a silicate of lime, thereby making it resemble a Portland cement in character, withstand the action of a hot fire and the subsequent sudden cooling by water better than any burnt brick, either common pressed or firebrick, that I could obtain in San Francisco, and I presume the same relative result would be obtained from most of the bricks of the several States.

I have repeatedly made the tests so severe that every burnt brick in the dozen or so tested at a time broke into two or more pieces, whilst under the same test the concrete bricks, beyond discoloring slightly, showed no change.

THE THERMIC EXPANSION OF PORTLAND CEMENT.

Bonnican Bonnicean is quoted as giving the expansion of Portland cement at 0,00000143 for 1 celsius, and iron is given at 0,00000145, which is practically the same.

Hyatt corroborates this in some careful experiments he made with loaded floors submitted to fire, in which the concrete-iron construction bore a red heat for several hours without injury.

Throughout Europe I believe hollow tile construction is almost unknown. Concrete floors are commonly used in fireproof buildings. The result of tests undertaken in Germany under Government supervision to ascertain the relative value of the ordinary building material, including brick work, places concrete at the head of the list as the best fine resistant.

If due regard is paid to the aggregate used, so that feldspar is avoided, and limestone also, where the structure is liable to prolonged hot fire, I think it will be found that Portland cement concrete is an excellent fire resistant.

PUBLICATIONS.

A new and artistic catalogue has just been issued by I. P. Frink, manufacturer of reflectors, New York, a copy of which will be sent on application to any of our readers.

"Industrial Agreements and Conciliation" are the tropics treated by the Hon. C. C. Kingston, Premier of South Australia, in the December of the Review of Reviews; the magazine is publishing a series of articles by leading Australian statesmen on questions of immediate interest to American readers.

The Pease Furnace Co., Toronto, have recently published an interesting catalogue, in which is fully described their heating system and the method of securing best results therefrom. Illustrations of public and private buildings heated by their system, and testimonials from persons having it in use, are likewise given.

Of the second edition of the Canadian Contractor's Hand-Book, Mr. Chas. Baillairgé, Architect and City Engineer, Quebec, expresses the following opinion: "A valuable work of most useful and suggestive memoranda and tables, and worthy of an analytical index—the Table of Contents" as given affording a very incomplete idea of the information conveyed."

PROPOSED ORGANIZATION OF LEAGUE FOR THE ADORNMENT OF THE CITY OF CHICAGO.

CONSTITUTION.

ARTICLE I.—The name of this organization shall be the "Chicago Municipal Improvement League."

ARTICLE II.—The purpose of this League shall be to secure for our city such an arrangement, design and adornment of our public buildings and grounds, streets, boulevards and other public works as shall most contribute to the convenience and enjoyment of the public; stimulate an appreciation of art and give to the city a fixed expression of its greatness.

ARTICLE III.—This League shall be a union of committees, of three each, elected or appointed by such organizations interested in the above objects, as shall respond to the invitation of this League. The following organizations are represented in the formation of this League and are hereby invited to continue their co-operation by making their committees standing committres for this purpose, viz: The Illinois Chapter of the American Institute of Architects, Western Society of Engineers, Chicago Society of Artists, Chicago Real Estate Board, Chicago Builders' and Traders' Exchange and the Civic Federation of Chicago. Other organizations may be invited to co-operate with this League by a two-thirds vote of the whole number of members.

ARTICLE IV.—Each committee of three, appointed by a co-operating organization, shall be a standing committee of this League on the subjects that come within the scope of the organization which it represents. Each committee will serve as a means of communication between this League and the organization which it represents. No action of this League is to be binding in any way upon the co-operating organizations, but is to be advisory only.

Each committee shall have a chairman elected by itself or the organization appointing it.

ARTICLE V.—The chairmen of the several standing committees shall constitute the Board of Directors.

ARTICLE VI.—The following officers shall be elected by the Board of Directors from their own number. A president, a vice-president, a secretary and a treasurer.

ARTICLE VII.—All officers shall be elected immediately after the annual meeting by a majority ballot vote of the directors present. Officers shall be elected for a term of one year and until their successors have qualified.

ARTICLE VIII.—It shall be the duty of the Board of Directors to have general charge of the work of the League; referring special investigations to the appropriate standing committees. All expenditures of money shall be under the control of the Board of Directors who shall devise and carry out means for raising the necessary funds.

ARTICLE IX.—The annual meeting shall be held on the second Tuesday of November, at which time the several committees shall announce their selection of members for the Board of Directors.

Other meetings may be held on the call of the President or the Board of Directors. The President shall call a meeting on the request of any five members. Co-operating organizations are requested to appoint their committees during the month of October, so that the change of membership may take place at the annual meeting, at which time reports shall be presented by all these committees. These reports shall be sent to all co-operating organizations.

ARTICLE X.—A majority of the League or any committee shall constitute a quorum.

ARTICLE XI.—This constitution may be amended at an annual meeting without previous notice, or at a special meeting upon notice of proposed amendments at least one week in advance, by a vote of two-thirds of the total number of members.

ARTICLE XII.—The officers elected at the organization of the League shall hold office until November, 1895.

A rule to determine the ready quantity of paint required to cover any structure, says the Plumber and Decorator, is as follows: Divide the number of square feet of surface by 200, the quotients will be the number of gallons of liquid paint required for two coats. Or, divide the area in square feet by 18, and the result is the number of pounds of pure white lead required to give three coats, where this pigment is permissible.

PAGES

MISSING