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PAGES

MISSING

# The Canadian Architect and Builder

VOL. XVII.—NO. 204. DECEMBER, 1904.

## ILLUSTRATIONS ON SHEETS.

House in Roxborough Street, Toronto—Messrs. Sproatt & Rolph, Architects.

## ADDITIONAL ILLUSTRATIONS IN ARCHITECTS' EDITION.

Santa Croce, Florence—Looking East.
House in New Hampshire.

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## SPECIAL CONTRIBUTORS.

MR. W. A. LANGTON, Architect, Toronto.
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**Sir Aston Webb.**

Honours bestowed on the occasion of the King's birthday, last month, included knighthood for Mr. Aston Webb, R. A., the late President of the Royal Institute of British Architects. He makes the fifth Knight in the profession in England. There is also a Baronet.

**A Skyline of Tanks.**

Toronto, since the fire, has come to the conclusion that there is nothing so satisfactory for the business part of a city as a general use of sprinklers. That is agreed. But how about the tanks which crown the buildings thus equipped. The cooper's art is one of our few surviving handicrafts, and it is right we should exalt it—but abstractly. This elevation of a monstrous vat to roost on every building is grotesque; fine in its way, but not in the way in which the town aims at being fine. If we had mill design as well as mill construction the ensemble would be perfect, but we are in the grip of the Renaissance and must be Renaissance all through. Fortunately, though a Renaissance tank would tax the resources of Vignola, a Renaissance tower is easy, and, if clients require precedent for a tower on their buildings, there is one at home in the Canada Life Building. The low tower which is the making of that building has for its *raison d'etre* the elevation of a water tank to supply pressure to hydraulic elevators. The Canada Life tower was carried out on a scale beyond absolute requirement, but it suggests, on whatever scale, the architectonic solution, for, though, a sky line of tanks is absurd, a sky line of towers would be quite another thing.

**Engineers for Fire Chiefs.**

One more department of modern life is about to get into the hands of the engineers. The case of the Flett-Lowndes' building in Toronto, where, after the fire which started the sprinklers was extinguished, 20,000 gallons of water were sprinkled on the goods, because the firemen could not find the valves which controlled the service, points to new conditions that have to be met. In the first place the headmen of every district must be (and in fact are) informed of the position of the valves of every automatic service in their district. But they must remember where the valves are, or have a note of it in such form that they can refresh their memory in a moment; and, as the simplest form of note and the most quickly read is a plan, there should be a plan of every automatic system in a given district filed at the district fire-station. And the station-boss should take the plans with him to every call in his own district, to guide not only himself but the chief. Secondly the firemen must be familiar with the mechanism of all such contrivances. At the Flett-Lowndes fire they appear to have wasted time in experiments from want of a clear understanding of the functions of the pipes connected with the sprinkler system. And an insurance man declares that, when h

attempted to explain a system newly installed to some members of the fire-brigade, he could not get them to understand it. So the brigade, or at any rate the bosses, have some new ideas to get hold of ; which no doubt they will do by practice. But amid the fire appliances. the preventive appliances, and the construction and mechanical equipment of buildings, the chief wants a good deal of technical knowledge, and public opinion is turning in the direction of an engineering qualification for this office. Among the deductions of Mr, Edwin O. Sachs from the reports on the Baltimore fire (discussed in another column), is "The necessity of officers in charge of fire-brigades having a technical, i.e. either constructional or engineering education of a high standard."

**Censorship of Buildings.**

Mr. John Belcher, in his opening address as President of the Royal Institute of British Architects, advocates the establishment of public censorship of buildings. He would have the First Commissioner of Works act as a minister of fine art with the aid of an advisory committee, and possess despotic power to decide what may and what may not be done in the treatment of public places and the spaces and buildings around public institutions, in the formation of new thoroughfares and in the question of buildings har monizing with an existing or determined genera scheme. A building act, Mr. Belcher says, can determine heights and so on, but no act of Parliament can define the subtle qualities and delicate *nuances* which make the difference between art and lack of art.

This is very true, and in England it is possible to find not only First Commissioners of cultivated taste but also an advisory committee which may be trusted to be as expert as the expert whose work is in question ; so that on the whole there is a greater safety in giving authority to a combination of this sort than in giving free sway to individual indifference or extravagance or even to individual good taste ; for a standing commission would be the means of maintaining what is the greatest deficiency in modern streets—unity of style. The greatest thing in a street architect is harmony. A high level of taste in one manner (we are assuming a high level) is better than a jumble of motives, even if here and there (and it would be only here and there) it touched perfection. Mr. Belcher seems to derive support from the United States, where, he says, "some such exercise of authority has been found necessary." If this means the municipal Art Commissions, they hardly go as far as Mr. Belcher proposes, but to judge from some newspaper utterances they are a success as far as they go. Their power is only one of veto, but this is a great power ; for no one, whose work has to come before the Commission, wishes to run the chance of crowning his labors with a veto. He does some wholesome vetoing himself as the work progresses. This, which is the process of all good design, is thus forced upon aspirants for municipal work who, before the appointment of an independent commission might have trusted to political influence to carry them through.

**Models in Staff.**

Anxieties about the result of altering the east front of the Capitol at Washington have drawn from the Mr. W. S. Eames, President of the American Institute of Architects, a suggestion that a full-size model of the proposed alteration should be erected. The cost is estimated at $100,000, and it is thought worth while to go to this expense although the scheme of the architectural committee's advisors, Messrs. Carrère & Hastings, is presented in the form of a model and there is another scheme of which a model is also provided. The contention is that a small size model is so completely grasped by the eye that it may mislead as to the actual effect in the case of a large building or one with a limited range of distance for points of view. All architects, no doubt, meet occasionally with unpleasant surprises in their executed work, but the conditions under which the work is done have much to do with that. In the case of the Capitol the conditions—a complete model to show the design, an existing building to help the eye of the imagination in judging the effect when completed, a stereotyped style which has few surprises for any architect and can have none for the firm advising the committee—all these conditions make so much for certainty in the present case that it gives an emphasis to this public confession of architects (for Mr. Eames fills a representative place) that the only result of the high development of architecture during recent years in the United States is to make the profession tread with fear where an earlier generation went confidently on. It is not a stimulating position. Is it really so impossible to conceive the effect of a design from the usual aids—drawing, modelling to scale, helped occasionally by a full size model of a leading feature set up in place—that we must consider it necessary in work of unusual importance to resort to the study of a full size model of the whole, or at any rate of the whole front? One thing is certain—that however much the frequent use of full size models may increase perfection it is pretty sure to decrease power. To do without such aids is a struggle for the imagination, but it is exercise that makes it strong. The strain to conceive a design "in the round," the practice of visualizing it by the help of other buildings that have little in common with it but similar bulk, the consideration of detail by criticizing existing examples, the study of one's own earlier work in the light of new experience—this habit of brooding over a design, engendered by the very uncertainties it involves, is far more educative and developing than the pottering process of altering a model.

## CANADIAN PAVILION AT LIEGE, BELGIUM.

When Hon. Sydney Fisher returns to the Capitol he will decide upon the purchase of a site for the Canadian pavilion which is to be erected at Liege Exposition. Liege is a great centre in Belgium and any display which Canada makes there will be brought prominently before a large consuming population. The cost of Canadian building, including the site, may run to $45,000.

## FOR THIRTY DWELLINGS.

The section of land purchased recently by Professor Goldwin Smith, on Gerrard street, east of the Don, as sites for attizans' dwellings, will be handed over to the Artizans' Dwelling Company. The land secured will provide sites for thirty dwellings.

## PRACTICAL LESSONS FROM THE BALTIMORE FIRE

At last we have got a report upon the Baltimore fire which is of undoubted value, coming from a disinterested and authoritative source, the British Fire Preventive Committee. This body is publishing a quarterly journal* of which Number I. is occupied entirely by the special subject of the Baltimore fire. This utterance, which is called a Record of the Baltimore Conflagration is the work of Mr. Edwin O. Sachs, who is the chairman of the five Prevention Committee. It is a compilation from American documents and a summary of his own opinions. The remarkable thing is that out of the enormous crop of published utterances, supplemented apparently by a flood of information, opinions and theories from correspondents in the United States, he has been able to select only three reports that he considered honest. These are :—I. The report of Capt. Sewel, of the Corps of Military Engineers at Washington, which may be called the official report of the U. S. A. Government upon the catastrophe. 2. The Report of the Boston Mutual Experiment Station, called the Insurance Engineering Experiment Station, which is under the direction of Mr. Edward Atkinson, the first mover in the Field of Fire Prevention. The report is by Professor Charles Norton who is in charge of the Station and is approved by Mr. Jos. P. Gray, consulting Engineer. 3. The Report of a Special Committee of the National Fire Protection Association of the United States. Of the rest, some reports are said to be the wilfully distorted accounts of local officials on their defence, of local architects and contractors interested in the various buildings affected, of purveyors of fire-resisting materials desirous of proving the value of their wares, of Commissions and Commissioners with a specific purpose and that in the interest of some party or parties financially concerned in the fire, such as, for instance commissions of the Insurance Companies who had to keep an eye on the reduction of claims made against them and were inclined to take an optimistic view of damage done. Even experts of high standing Mr. Sachs finds are turned into special pleaders by " those far-reaching financial influences that appear to dominate every thing American." "The extraordinary power" he says "of certain sections of the so-called "fire-proofing' trade of America is an extraordinary factor that has to be considered when dealing with the Baltimore fire, for that specialist trade stands in very close relation to the great contracting companies, and these again are in close business relationship with the great financial corporations, insurance, and other institutions that have money to place in real estate, and may thus be said to be directly or indirectly in touch with parties with whom relations would seem very unlikely in this country."

These comments on the nature of most of the conflagration literature explain the smallness of the portion of it that Mr. Sachs has taken for his record. They are also worth noting for the consideration of readers of fireproofing literature in general.

The reports included in the record and Mr. Sach's summary, deduced from his whole studies of the subject, come to conclusions so much in agreement and mutually supplementary that it will be useful to bring these conclusions together under subject heads, first to consider the evidence given of the behaviour of different building materials in the fire, and secondly, to consider more generally how the planning and construction of buildings can be made to contribute to their safety if attacked by fire.

### MATERIALS.

Hollow Terra Cotta Tile.—As a protective covering this has proved unsatisfactory in every situation. The principal trouble is that it breaks. It breaks in a heat less than that in which it was baked originally so that this cannot be due to chemical change in the material. The explanation given is the difference of expansion between the part exposed to the fire, (which is constantly called the web in these reports) and that which runs in at right angles to the field of exposure and has one side adjacent to the dead air within the block. The consequence is a rupture at the junction, and the outer web, (the protecting flange) drops off. In the case of column coverings and partitions, the resulting instability appears to be sufficient to destroy the further usefulness of the protective covering and complete its ruin. Good work and good mortar in the first place would greatly increase the stability of this material and its value as a protection. The reports lay emphasis upon the extent of the losses in the Baltimore fire which are really due to bad work manship.

The cure suggested is greater thickness of the "web". It it is not the material which is at fault so much as its form. The web is now rarely more than 5/8 in. thick and soon gets red hot. Prof. Norton questions " whether any floor, containing so little material on its outer faces as did these hollow blocks, could remain sufficiently cool in this fire to avoid serious injury by expansion." Capt. Sewell suggests that the web should have a minimum thickness of 1½ in. (Mr. Sachs says 2 in.) "So that the entire variation in the temperature would occur within the thickness of the exposed web." Then he thinks "if made porous and "of good clay "the material "would probably be about equal to brickwork."

In the case of floor construction of this material Prof Norton thinks the rupture of the protecting flange is hastened by the constructive form—a segmental arch, expanding on its lower surface and crushing the members of that surface. The National Fire Protection Association give another reason for preferring flat arches to segmental ; viz. that the lower face is further removed from the strain-curve of the arch, and the breaking of the lower face will not impair the strength of the arch, as it would if the arch were segmental.

All coverings for the lower flanges of beams and girders appear to have failed under intense heat ; flange tiles held by the skew-backs of tile arches broke, as did shoe tiles for girders ; sheet metal clips failed ; tile which was only held in position by mortar dropped off. In some instances the failure of the shoe-tile also permitted the tile protection to the web plates of the girders to fall off.

The National Fire Protection Association adds to the floor question the following "conclusions" :—"The space between the floor and the floor arch should be filled with concrete of a good quality. It is important that common cinders without any cement should not be used for this purpose. It has been found that, due to lack of a hard permanent filling for this space, large safes have fallen a distance of about six inches before striking the arch. This gives them some momentum, which adds to the shock which the arch is called upon to sustain."

Brickwork.—For an efficient fire resisting and protective material it is agreed there is nothing like well burned ordinary brick of good quality not vitrified, and well laid—in cement mortar for perfection. This Capt. Sewell says, will stand the application of both fire and water many times without damage to itself.

The 4 in. brick protection used on exterior columns and also on interior columns was without exception practically intact and as firm as before the fire. This coincides with the experience in former fires. Brickwork combines rigid construction and the necessary fire-resistive qualities.

As an external facing, where the question of appearance is involved, brickwork is not free from chipping ; but it is in pressed brick facing that this was most noticeable. As a preventive of spalling, Capt. Sewell recommends round corners.

Prof. Norton found no fault with red bricks but says "where brickwork of a lighter colour, ornamented with terra cotta, was used, considerably more damage was noticeable, especially after the slight snow storms of the week following the fire."

*Journal of the British Fire Prevention Committee, 1 Waterloo Place, London, S. W. Single numbers 5 shillings. Annual subscription for the four numbers of the journal and occasional supplements 15 shillings (post free).

It is essential that brick facings should be properly bonded to the wall with headers. Metal ties and corner brick bonding (American bond) were proved inefficient. Capt. Sewell says "face bricks laid up without other bond than metal ties were stripped bodily from the wall in large areas. This is a new and strong argument against a very prevalent pernicious practice, and it is to be hoped it will be the beginning of the end."

ARCHITECTURAL TERRA COTTA.—Captain Sewell says, "there are records enough of hollow terra-cotta failing under expansion strains when heated. Still, it was thought that architectural terra-cotta was reasonably fire proof when used in external walls. Its behavior in Baltimore is a distinct disappointment, for it can no longer be classed as a fire proof materal." It suffered worse than stone, for while all building stones spalled and chipped "the terra-cotta cracked and fell to pieces, and in some cases its color was changed and the heat seemed to have destroyed its texture so as to render the material soft and friable," and "highly ornamental terra-cotta suffered notably worse than that which was relatively plain." He suggested that "in the case of ornamental terra-cotta, it is possible that filling all the cavities with concrete might improve its fire-resisting qualities by preventing the exposed parts getting so hot as they do when backed by a dead air space, yet I saw some pieces of the Maryland Trust Building which had been filled with mortar, but which failed nevertheless."

STONE.—No building stone can be used for protection against fire. It is unsuitable from this point of view, both for construction and finish.

The exterior stone facing of walls was usually badly broken. Marble and granite are especially susceptible to damage. Interior marble finish was practically all destroyed. Marble not only spalls like granite, though not so badly, but calcines under long continued heat. Capt. Sewell found that stone with projecting parts of any kind suffered more than similar stones entirely flush with the wall. The reason is similar to that which causes the damage to terra-cotta ; the projection of parts exposes a relatively small mass of the stone to sudden changes in temperature, while the body of the same stone remains relatively cool. This is true not only of mouldings and other ornament which projects beyond tne ashlar face, but of variations in the ashlar face itself ; it is the spalled face of the Custom House which furnished him with the text of this part of his discourse, as he found this damage "aggravated by the fact that most of the ashlar was cut with raised panels in the centre."

PLASTER.—The National Fire Protection Association makes the conclusion that "plaster blocks and plaster on metal lath are unsatisfactory for use as a fire-protective covering for columns or other structural metal work."

Plaster blocks, used to protect the columns in the Equitable Building, crumbled away from the columns and fell on the floor.

Plaster on metal lath had been previously found to be unreliable. It is especially susceptible to damage by hose streams. In this fire, Capt. Sewell says, "metal lath and plaster failed everywhere." Yet, though plaster is not sufficient in itself for a fireproof covering it is not without value in a fire. "Applied to other fireproof coverings," Capt. Sewell says, "it will in itself resist fire a long time and thus lessen the severity of the test for the material behind it."

CONCRETE.—All the reports speak well of concrete, though it does not appear in the conclusions of the National Fire Protection Association. Mr. Sachis wants concrete or composite metal and concrete floors in all business premises of the shop, warehouse, and factory class. He will admit terra-cotta for iron protection if nowhere thinner than two inches, and brick for partitions, but mentions concrete first.

Capt. Sewell's opinion is—"Concrete undergoes more or less molecular change in fire ; subject to some spalling. Molecular change very slow. Calcined material does not spall off badly except at exposed square corners. Efficiency, on the whole, is high. Preferable to commercial hollow tiles for both floor arches or slabs, and column and girder coverings. In form of reinforced concrete columns, beams, girders, and floor slabs, at least as desirable as steelwork protected with the best commercial hollow tiles. Stone concrete spalls worse than any other kind, because the pieces of stone contain air and moisture cavities, and the contents of these rupture the stone when hot. Gravel is stone that has had most of these cavities eliminated by splitting through them during loug ages of exposure to the weather. It is therefore better for fire-resisting concrete than stone. Broken bricks, broken slag, ashes and clinker all make good fire-resisting concrete. Cinders containing much partly-bnrned coal are unsafe, because these particles actually burn out and weaken the concrete. Locomotive cinders kill the cement, besides being combustible. On the whole, cinder concrete is safe only when subject to the most rigid and intelligent supervision ; when made properly, of proper materials, however, it is doubtful whether even brickwork is much superior to it in fire-resisting qualities, and nothing is superior to it in lightness, other things being equal."

One building in the Baltimore fire, No. 111 E. German Street, which was constructed throughout—columns, beams and floor arches—of reinforced concrete on the Hennebique system, had a severe test, as it was surrounded by non-fireproof buildings. Capt. Sewell reports of this building that in the lower storeys the concrete was absolutely unimpaired, though the contents of the building were all burned out. In the upper storeys where the heat was intense, (Prof. Norton found evidences of temperatures up to the softening point of iron) the concrete was calcined to a depth of ¼ to ¾ in., but it showed no tendency to spall except at exposed corners. The exposed corners of columns and girders were cracked and spalled, showing a tendency to round off to a curve of about 3 in. radius. Capt. Sewell takes from this a hint to round such corners to a radius of 3 in. in the first place, as a preventive of cracking and spalling, saying it would "add much to the resistance" not only of concrete, but "of all materials used in masonry, whether bricks, stone, concrete or terra-cotta—if they are exposed to fire." On wide flat surfaces the calcined material—which was here at the minimum of ¼ inch.—showed no tendency to come off, and Prof. Norton finds in this an additional protection against fire. He says :—"When brick or terra-cotta are heated no chemical action occurs, but when concrete is carried up to about 1000 degrees Fahrenheit its surface becomes decomposed, dehydration occurs and water is driven off. This process takes a relatively great amount of heat. It would take about as much heat to drive the water out of this outer quarter-inch of the concrete partition as it would to raise that quarter-inch to 1000 degrees Fahrenheit. Now a second action begins. After dehydration the concrete is much improved as a non-conductor, and yet through this layer of non-conducting material must pass all the heat to dehydrate and raise the temperature of the layers below, a process which cannot proceed with great speed."

Prof. Norton could find little difference in the action of the fire on stone concrete and on cinder concrete. He considers that the burning of bits of coal in poor cinder concrete is often balanced by the splitting of the stones in the stone concrete. He notes, however, that, owing to its density, stone concrete takes longer to heat through.

(A second article upon this subject will deal with lessons relating to planning and construction.)

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A French architect, M. Pénin, who has recently been building on the site of the Hotel Mascani of Paris, an old mansion dated 1678, has nothing good to say of its construction. The floors, he says, sank by their own weight. In general, there was little where there onght to be much, and much where there ought to be little. To this decline, from the perfection of French construction in the Gothic centuries, some clue is given by M. Pénin's account of a flue which was carried of small—and presumably of reduced—girth through the middle of the floor beams. An architectural conception thrust upon the plan instead of proceeding from it falsified construction all through.

## OUR ILLUSTRATIONS.

### HOUSE IN NEW HAMPSHIRE.

The walls of this house are apparently of brick plastered white. The window shutters are not distinguished in colour, the sash bars carry the same colour across the openings and the roof is either silvered or stained with a silver gray. It is a strong case of simplicity and illustrates its power. There is however a scheme of decoration by climbing plants which owes its value partly to the simplicity of the background and partly to the extension of the trellis over the whole front, in lines which run with the horizontal lines of the openings and are in scale with the building. The nature of the trellis work is seen in the view of the doorway below. Its effect at a little distance, as seen in the general view is much more architectonic than the small diagonal lattice which we are accustomed to see. It adds to the character of the wall ; and indeed the inventive designer may see in its apparent unity with the

DOORWAY OF HOUSE IN NEW HAMPSHIRE.

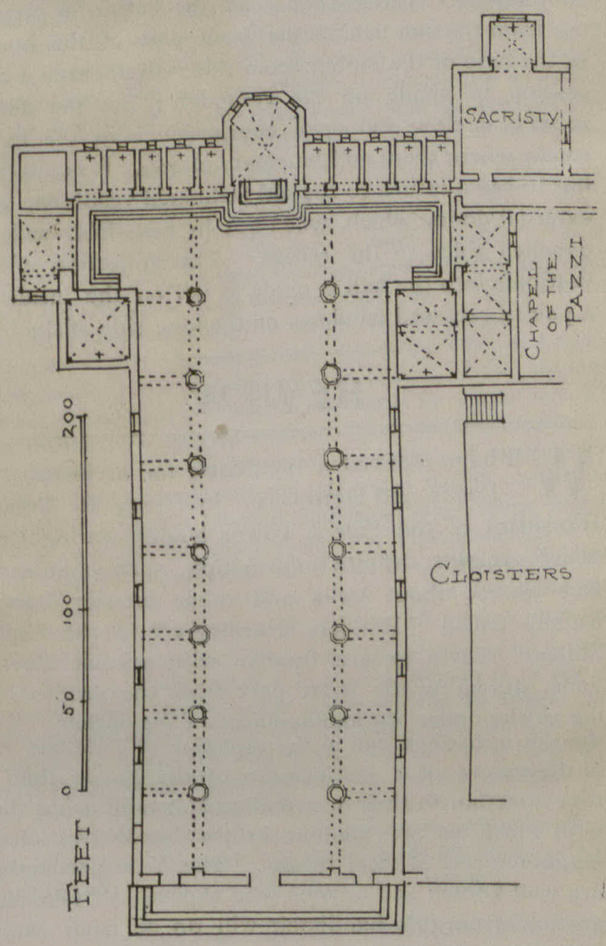
wall a suggestion for enriching the surface of a concrete wall by fillets formed in the course of its erection.

### THE CHURCH OF SANTA CROCE, FLORENCE.

The Franciscans, for whom Santa Croce was built by Arnolfo di Lapo, were a preaching order and a poor one. They wanted a big plain church for little money ; so that we have in Santa Croce an example of the thirteenth century treatment of a cheap job.

With the exception of the east end, it is as simple as a barn, but is nevertheless the most impressive church in Florence. Size has something to do with it but also the constructional vigour of its design. The nave arcade and aisle arches are 65 feet to the apex, and the plate of the main roof cannot be less than 90 feet above the floor. It is this great roof of king post trusses that is so impressive, partly from its height and partly from the frequency of the principals—about 12 feet on centres. This, in a perspective of 350 feet gives an apparent closeness, which produces a beam effect upon a magnificent scale.

The apse of the east end does not occupy the width of the nave. Its relation is, as suits the T shaped




cross of the plan, rather with the ten chapels, two of which appear with it in the view up the nave shown on on the illustration sheet. It will be noticed that the windows on either side of the apse are not in the same plane; the lower range being at the back of the chapels.

The aisles are roofed by a series of gables pitched from the backs of the aisle arches, which have, therefore, each a valley above. The timbering of these roofs shows within. This arrangement (which even in Italy must require some attention) was made for the sake of strength, and gives, much more than a sloping roof, an appearance of stability to the exterior.

### HOUSE ON ROXBOROUGH STREET, TORONTO. — MESSRS. SPROATT AND ROLPH, ARCHITECTS.

The drawings on the illustration sheets are reduced to a scale of 8 feet to an inch. The house faces south. The main construction is simple and rectangular, but the plan is interesting from a variety of effect, due to recessing the windows on the south side, and to a difference of level between the drawing room and the living room, which appears again in the hall in the way of a pair of landings to reach the same level, for access from the hall to the dining room and to the kitchen department, which is, for the purpose of service, on the same level as the dining room. The first characteristic of the plan is, however, spaciousness, without which the variations in level would fail in effect and the recessed windows cease to have their present contrast with plain wall surface. The hall and living room placed end on to one another give the

house as much extension as possible on the south. The smaller size and different disposition of the drawing room make a change which relieves the interior—and also the front—from monotony. The dining room and kitchen arrangement is naturally made as compact as possible. The kitchen is all the better for retreating from the sun behind the front part of the house. In the case of the dining room this retirement is a concession to shade on the verandah ; but the dining room is in close and open connection with the living room, where there will be plenty of sun. It is interesting to see a return to the old fashioned vestibule, with external doors which, when not in use, fold back as panelled sides to the recess. The projection of the vestibule into the hall is made to tell on the inside as a pair of recessed windows on the long side of the hall.

## REVIEW

WE have received a handbook for architects, on Locks and Hardware,* by Henry R. Towne, (President of the Yale & Towne Manufacturing Co.), which contains definite information, such as an architect wants, about locks and other interior fittings, usually called "Builders Hardware" in the United States. It is a general treatise with special illustrations, drawn for the most part from the products of the works under the management of the author. This though a distinct lead in the direction of Yale has less of the nature of a justification of the goods than of that direction to their use and guidance in using them with which we are familiar in the handbooks of the manufacturers of steel beams. The Yale productions are well known and anyone who chooses to take suggestions from this handbook will do so from choice, knowing beforehand the standard of quality and looking only for information as to what will suit his requirements. The information he will find is as follows, divided into ten Parts :—

Part I. History, the development of lock making and "Art Metal Working" in America ; chiefly a reprint of articles published at different times ; one by Montgomery Schuyler on Artistic Hardware.

Part II. The Mechanics of Hardware. A valuable section, explaining, by the help of illustrations, the construction and mechanical characteristics of locks and other articles. A knowledge of this is essential for a proper selection and application of hardware finish.

Part III. Art Metal Work & Ornament. This consists chiefly of historical studies of all the Schools of Ornament (thirty four of them, beginning with the Cave Dwellers and ending with the Colonial School), by W. W. Kent. There are a great many illustrations showing characteristic examples of the Schools and, when the Yale & Towne Co. have produced hardware in one of these styles, illustrations are appended, with page numbers for their identification in the classified lists given later in the volume. This part concludes with a section on metals and their finishes and one on the obscure subject of the momenclature of the finishes.

Parts IV. to VIII. give Classified Lists of Yale hardware ; Locks and Latches, Locks in Sets, Plain Hardware, Hardware Groups and Cabinet Hardware. All articles illustrated from photographs, all priced on a system which gives the relative value of different sets, materials, finishes, etc., and their absolute value near enough for the purpose of a preliminary estimate.

Part IX. Specifications and Forms of Contract.

Part X. Miscellaneous Information ; among other things a useful hint about drawing for hardware and some illustrations of different types of casement window construction. There is a glossory of terms, at the beginning of the book, with the motto at the top—"Accuracy in Language promotes Accuracy in Business." The promotion of accuracy is the purpose of the book and constitutes its value.

*Locks and Builders' Hardware, by Henry R. Towne. Profusely illustrated. John Wiley & Sons, 43 to 45 E. Nineteenth Street, New York. $3.00.

## CORRESPONDENCE

QUEBEC, December 3, 1904.

Editor CANADIAN ARCHITECT & BUILDER :

Sir,—Among the usual number of pertinent articles in your last issue, I find "Suggestions from New Zealand as to escape from theatres in case of fire or panic."

The suggestions are all excellent ; but would prove to be useless after a very short season of probation, as no theatre lessee could ever be made to carry them out on account of the curtailing of his profits by as much as it would cost nightly and yearly to pay men to attend to so many entrances and exits and especially in a climate like this, where, if emergency issues were provided with doors opening outward on to iron landings and stairs the same would have to be attended to night and day after every fall of snow or because of ice and sleet offering an obstacle to the outward opening of the doors.

We have had a terrible example of this in the case of the Paris Charity Bazaar, where, though seven emergency doors had been provided, and were at hand to do the needful ; the wealthy promoters of the bazaar would not incur the expense of as many men as doors, with instructions not to leave their posts on any pretence and to throw open the doors immedlately on the very or mere suspicion of a fire or panic of any kind.

Had this been done, not a single life would havs been lost, though of course the inmates would have been the worse of a singed head and burnt shoulders from the burning and falling draperies from above, but all of which would have been restored, hair regrown, scars have disappeared within a few months after the occurrence.

The most instructive lesson in the way of escape from danget in the case of the burning of a theatre, was admittedly that of the latest Chicago horror, where during the conflagration of a new theatre, more than 700 persons lost their lives.

The commissioners named to report on the cause of the catastrophe, arrived at the conclusions which, had they been arrived at and carried out before the fire occurred, would likely have reduced the fire to one without loss of life and have saved half the edifice, the auditorium side, from destruction.

In this case there was on the auditorium side of the building a large ventilator or opening extending from the auditorium ceiling to and through the roof of the building. This, as its name implies, was for the purpose of ventilation—while over the stage end of the theatre there was no ventilator or opening of any kind. Now, say the commissioners, it is especially on the stage side of the edifice that such an opening should have been provided, extending from the stage ceiling to and through the roof.

The tendency of heated air and gases is, as must be well known, to rise vertically and seek an issue into the atmosphere. The hot air and smoke would thus have no tendency to rush, as it did, towards and into the auditorium through the proscenium arch to gain an exit by the auditorium ventilator.

The proscenium was provided with a fire-proof curtain or screen of asbestos. This curtain was not a rolling one ; but slid or moved up and down bodily, its ends being armed with slides which were confined by vertical guides for the purpose.

An attempt was of course made to lower this curtain or screen down to the stage floor, which would have effectually cut off the flames from reaching the auditorium side of the building ; but all attempts were unavailable to move the screen further down than to within fourteen feet of the floor of the stage ; due to the pressure which the current of heated gases from the stage end, where the fire occurred (and always does occur), pressing the curtain slides so tightly against the outer side or auditorium side of the

guides, that no force would move it beyond the point it had reached.

The smoke and hot air therefore having no issue from above the stage, continued to pour through the proscenium arch into the auditorium side of the building where it is probable and consoling to think that the audience were asphyxiated before the flames had time to reach them.

The commissioners insist that had there been over the stage end of the building a proper exit for the heated gases, they would have risen vertically to egress through the same without any tendency to invade the auditorium to seek an exit on that side of the procenium wall or wall of separation between the stage and auditory.

This then, of all the possible solutions of probable escape with one's life from a theatre where the stage is on fire (and there is not the least tendency of the fire starting on the anditorium side of the curtain) the true and only one—independently of all other facilities of exit as recommended by the New Zealand architect—is the existence, above the stage, of such an opening as would allow of the smoke and gases passing out direct into the atmosphere, without any tendency whatever to take any other direction.

Of course the opening in the roof, and especially in such a climate as Canada, must be closed to keep the cold out and prevent loss of heat; but this could easily be managed by topping it with a ridge roof of such an acute angle (say 60° at apex) as to cause snow to fall off it, and the opposite flaps or shutters of which would be worked from the stage floor level of the building by wire ropes or even by hempen ones passing down along the walls through iron conductor tubes to prevent the possibility of the ropes themselves being burned by the burning scenery.

In 1854, when the writer designed the Quebec theatre "Academy of Music," asbestos was, so to say, unknown, and there was to have been a solid screen of iron, for raising which bodily there had been provided sufficient height in the rooting above the stage.

This screen or curtain, to disguise or dissimulate it, was to have been covered with mirror in vertical strips of say 3 to 5 ft. in width held in position by silvered sash base riveted to the body of the screen.

Such a curtain reflecting, when down, the whole audience, would have had a fine effect, and at any rate, of whatever nature, such a cut-fire screen should be at hand in all theatres and a cut-fire wall extending from the very foundations to above roof of building, with no other opening than the proscenium arch, or iron doors to other openings through it, if indispensible.

In conclusion, as any additional precaution can never be "*de trop*" and on this head, it may be remarked that in rebuilding the theatre at Antwerp, Belgium, destroyed by fire some 10 or more years ago, a recommendation made by the writer in a paper of his read before the Society of Architects of Canada in 1888, was carried out, and each of the five tiers of surrounding galleries above dress circle level was provided with exterior iron balconies and some 25 doors or exits, 125 in all, leading thereto with outer iron stairs from each tier down to ground level; this allowing of emptying the building of its inmates in less than half a minute of time; while, of couse, the stage end of the edifice is also amply provided with issues to the same effect.

CHAS. BAILLARGÉ.

Mr. Baillarge's suggestion strikes at the root of the danger in theatres. The difficulty of a large opening which must be kept closed and yet must be thrown open in an instant is no doubt as susceptible of solution by automatic action as is the operation of the ordinary fire door. No matter how heavy the doors of the opening may be, if they are hung on pivots it is but a little weight that would make the difference between the balance that keeps them shut and the balance that throws them open.—ED. CANADIAN ARCHITECT AND BUILDER.

## A QUESTION OF FEES.

An Ontario architect writes as follows:

The writer wishes to obtain a recognised schedule in pamphlet or book form of the fees that architects are entitled to for full and partial services as architects. Also wish to ask what is usually understood by the profession as full professional services. Does it mean constant attendance at the building during construction, if not, how often would any representative of the firm be required to visit the works to comply with the term full professional services to their client, in the absence of any special agreement.....A large portion of the proposed scheme was abandoned. Are the architects entitled to collect the usual proportion of fees for plans, specifications, details, surveys and measurements. Also the obtaining of proposals from contractors for the same. In this locality the custom has been to collect 50% of the full fees customary.

Answer.—In reply to your letter of November 24, asking for information about architects fees and services: The only Ontario tariff is that of the Ontario Association of Architects, which we cannot very well procure for you if you are not a member of the Association, and indeed it would be of no service to you unless you are. The only scale of charges recognizable by a court of law in a case of a disputed fee, where there has been no preliminary agreement, is the scale which has been in use by the architect or the body to which he belongs; the presumption being that there was a tacit acceptance by both parties of what is customary in that neighbourhood or known to be the previous custom of the architect. You have a right therefore to claim for your work what you have been accustomed to charge; or, in case of discontinued work, for that proportion of the fee which you have been accustomed to charge for the proportion of the work done. On this head the schedule of the Ontario Association reads: "For partial service or in case of the abandonment or suspension of the work, the charge for partial service is as follows: Preliminary studies, 1-5 of the full commission. Preliminary studies and general drawings and specifications sufficient for estimate and contract, 1-2 of the full commission. Preliminary studies, general drawings, specifications and details, 4-5 of the full commission. For superintendence alone, 2-5 of the full commission for the work to be superintended." This is generally considered to divide the fee into parts fairly proportionate to the amount of work set off against each part.

As to superintendence there is no way of measuring it except by efficiency. The intention in superintendence is to see that a work is being carried out in conformity with the design, specifications and directions, so that the work is as suitable for its purpose as it was intended to be; and to watch its progress with a view to certifying correctly the payments that are due as the work progresses. The architect, in the absence of a more definite arrangement, is supposed to judge for himself when and how often visits should be made for these purposes, and the only proof of his neglect will be in results.

## A QUESTION ABOUT VENTILATION.

A correspondent asks for information as to recent methods of ventilation:

Answer.—A reply to your request for information as to recent methods of ventilation is a matter far beyond the scope of a letter. There can hardly be said to be new methods, only new contrivances for carrying out the one old and only method—the application of power to move the air. Of these contrivances the simplest is heat, and, inasmuch as ventilation is usually required during the winter months, the application of heat is within the compass of everybody building in this country. Ventilation and heating should be studied together as one scheme, calculated in mutual relation; but this requires science, and to that end study, for which purpose an excellent book is Heating and Ventilation by Professor Carpenter of Cornell University. It is published by John Wiley & Sons, New York, and the catalogue price is $4.00.

## AN ENGINEERING FAMILY.

The City of Quebec has appointed Mr. W. D. Baillargé to the office of City Engineer; the place his father, Mr. Charles Baillargé, filled, with so much distinction, for 33 years.

The United States Government through the Bureau of Foresty is carrying on some interesting experiments in order to determine the rate at which different kinds of timber will season. Certain kinds of timber, it is known, are improved by being soaked in water for different periods of time, but the chemical or physical changes which occur are not fully understood, with the result that the best economic usage of timber is largely a matter of accident. The enquiry referred to may prove highly valuable in discovering means for the arrest of decay, the best utilization of certain parts of the tree, and so forth.

## AFFAIRS IN TORONTO.

THE site of the new building for the Toronto Public Library is not settled. As far as users are concerned, there seems to be good arguments for both down-town and up-town sites ; but the balance is in favour of an up-town site for the permanent and valuable part of the library, which will be used by students, and a lending branch in the city. The site chosen is the Perkins estate on College street, where the building will be in close association with the university group and on a thoroughfare which, from this association and from other accidents in its course, has more possibilities for the creation of beauty than is usual in the streets of Toronto. It is impossible, however, from the point of view of advantage to the neighbourhood in which the building is placed, not to regret the loss of an occasion given, if the site adjacent to the City Hall had been found desirable, to make the proposition include the whole block of land between the City Hall and Osgoode Hall. The argument would have been that, if we house valuable books and unique documents in the middle of a great-risk fire district, the building that contains them should be isolated ; the result would have been the redemption of that part of Queen Street.

THE air of Toronto is heavy with building projects. The Union station is an actuality. Messrs. Darling & Pearson, E. J. Lennox and A. H. Chapman, (the latter associated, for this purpose, with Messrs. Sproatt & Rolph) are understood to be retained as competitors for the new building, if they are not as yet actually engaged upon it. Its erection will mean the transformation of Front street between Yonge and York streets.

THE EXHIBITION BOARD will soon be applying for a grant from the city. They are talking of new buildings. There was also some mention of a plan of the grounds, but not in the same breath ; not at any rate with the same amount of breath. If, however, their request for a grant is to be supported by anything definite, it should include a definite plan of the grounds. The success of the Exhibition appears to be such as to justify the City Council in taking a hand in its extension and improvement, but, though the money given is given for building, the value of the buildings, as a means of making the Fair attractive, depends so much upon their disposition upon the grounds that it is a plan of the grounds that chiefly concerns the custodians of the public purse.

THE UNIVERSITY is about to begin the Convocation Hall, for which plans have been prepared for some time, and the Ontario Government will expend, on a new building for the department of Physics, the $180,000 received from the Grand Trunk Railway as the purchase price for the old Parliament Buildings on Front street. It is understood that the position of this building in relation to the other University buildings has already been considered. If it is anywhere within grouping distance of the main building, it is to be hoped that it will fulfil the obligation—difficult, but possible—of harmony without imitiation. The great want in the University set of buildings is of a plain type that will harmonize with the ornate main building. This has been done at Columbia. The scientific buildings are machine shops and the library is a monument, but they harmonize.

A UNIVERSITY RESIDENCE is being talked of. Mr. E. C. Whitney, of Ottawa, has given, to the trustees of the University, $15,000 to be the nucleus of such a residence. A good deal more will have to be got before anything can be done, but the sum ultimately aimed at need not all be got at once. A good suggestion was made, in the newspaper account of the presentation of the gift, that the proposed residence should be a composition of units which could be built separately ; the whole when completed enclosing a quadrangle. Each house would hold fifty or sixty men who would be under the general direction of a member of the faculty in charge of the house. University men are, like other men, but children of a larger growth, and the growth is not only less large but comes upon them rather suddenly, when they leave the restraints of school for a freedom such as they never had before, nor indeed, it may be said, are likely ever to have again. Personal influence of the right kind is even more important than rule in making the most of the double opportunity—the opportunity for studious seclusion, and, at the same time, for constant association with equal minds—which makes the charm and is the advantage of college residence life. And this influence is most effective where the field is not too large. Houses for 50 or 60 making the sides of a common central space, quadrangular or otherwise, would make an excellent system of formation for a residence or a series of residences at the University. It can be built, a unit at a time, as funds come in. If the University had succeeded in selling its land to the north of Hoskin avenue it might now have the funds for such a residence but it would not have the land. Now, in consequence of that fortunate failure, it has the land and, as the province is on the bound, there may be, now or soon, other people who have the funds.

THE HOUSING QUESTION has, with the approach of winter, become more acutely felt to be a serious matter. Inconvenience is felt by all classes, but the poor are suffering. It is an expensive matter for a whole family to board. Poor people must have a domicile of some kind, and the shifts they have been put to are sometimes startling. Homes are made in stables, sheds, old street cars, tar-paper shacks, etc. ; all duly visited by a local reporter with the freedom of a friend of the family ; and the willingness shown, by those he visited, to talk about their affairs is a symptom of the strain they are feeling. The occasion has roused Mr. Goldwin Smith to try to organize a joint-stock company to build workmen's houses and rent them on the basis of a fair profit for the capital invested. This is a large-minded and truly philanthropic scheme. To apply money where the public good requires it, and, while asking for a fair profit, to ask for nothing more, is a conception of the use of capital, which, if it obtained generally, would bring about happiness on the earth without failure and without delay. It is to be hoped that this scheme will work without failure, and also—as the need for it is pressing—without delay.

## MONTREAL.

THE YEARS CHANGES IN THE CITY.

Of city buildings which are likely permanently to enhance or detract from the beauty of the town, the greatest number during the past year has been erected in St. James street. There the banks congregate and it is these institutions which have easily held the lead in building operations not only by the number and extent but also by the costly and substantial character of their enterprises. As a rule too they have set excellent examples in erecting buildings of good fireproof character—the system of cased steel work with flat terra cotta arching for the floors being adhered to in almost every instance.

The 'armed cement' construction usually adopted for the roof of this class of buildings suggests the favorite French method of fireproofing ; but though now being advertised here we do not know of any examples where a "beton armé" system has been thoroughly applied in Canada. Apart from banks, we still see too many commercial buildings being built with little or no attempt at fireproofing. That this should be done by private firms is not, perhaps, very suprising, but it is wholly so to find the new wing of the law courts setting the example of wocden joisted floors at this time of day.

We have formerly spoken at some length about the head office of the Bank of Montreal—easily the first in architectural merit of all the buildings in the city. The works which have been in progress there are now nearing completion and the 87th annual meeting of the bank was held in its new chambers on the 5th December.

Of the other banks in St. James Street, the Bank of Ottawa building nearly completed and that of the Sovereign Bank, now hastening to get its steel skeleton clothed in more comfortable materials, both have soared to the full height permissible by the city bye-laws. Both belong to a type of design derived from the high buildings of American cities. That is to say, they endeavor to present a building of extremely high narrow proportion and to preserve unity of effect by strongly emphasing a storey or two at the bottom to provide an architectural base, again strongly modelling the top as a crowning member, leaving the intermediate storeys plain as a contrasting body. These are from the designs of Mr. H. C. Stone.

On the opposite side of the street the Metropolitan Bank designed by Messrs. Finley & Spence shows on a smaller scale a similar general treatment and it is here very palpable that the smaller bulk bringing the whole building more within the compass of the eye is more suited to carry a scale of detail which can be refined without losing strength and interest.

For the Imperial Bank, the large building at the south end of Victoria Square, which was gutted by fire a couple of years ago, has been remodelled under the direction of Mr. A. T. Taylor, whose departure for England makes an important change in the ranks of the Architects of Montreal.

The Royal Bank of Canada's new building in St. Catharine Street and also the small branch of the Bank of Montreal in Greene Avenne close by were referred to last month. Farther east in St. Catharine Street, Mr. A. H. Lapierre has erected a three storey building of Quebec limestone for the City and District Savings Bank, the exterior of which is now completed.

Outside of St. James Street, the "down town" streets present few important changes. A new building is now being erected at the corner of Notre Dame Street and Cote St. Lambert—the result of expropriation changes. The principal improvement in Craig Street has been the recent thinning of the forest of telegraph poles, which helps to make that locality so picturesque. Some of the finest giants have lately been felled in pursuance, we understand, of the intention to have the wires generally placed underground.

As regards stores nothing of first-class importance has been carried out during 1904. Perhaps the greatest number of new works of this class is in St. Catharine Street. W. H. Scroggie Limited have completed the structural work of an addition to their store which, if not rising to architectual magnificence, at least completes the block from street to street in a uniform and tidy manner. The Renouf building, almost opposite, was completed early in the year, and in Union Avenue, not many yards away, a new store built and elaborately finished for a fashionable tailor exhibits much careful ingenuity of design.

In some of these buildings one may observe a rather pleasant introduction of delicately modelled broad metal frames around the store windows. If this treatment does not compensate for the architectural defect inherent in the slenderness of support that shopkeepers demand, it has, at any rate, the merit of giving interest and emphasizing the metallic nature of the supports.

In St. Denis street, not far from the corner of St. Catherine street, the Polytechnic School has recently been completed. This excellent building, from the office of Mr. E. Vanier, is one that has an agreeable air of appropriateness to its purpose. Designed without undue ambition its well understood and wholesome detail raises it well above the commonplace.

The building for the McGill Young Men's Christian Association in Sherbrooke street has now almost attained its full height and the Montreal Amateur Athletic Association premises in Peel street, referred to in a previous issue, are being completed internally. At a similar stage, or rather less advanced, is the new Maternity hospital at the corner of St. Urbain and Prince Arthur streets.

Of dwellings large numbers have been built during the year, mostly of a humble class in the poorer outskirts. A striking feature in the better localities is the number of apartment houses which have appeared ; some of them new, but many the result of a transformation of private dwellings which have been swelled out in all their dimensions to contain as many apartments as possible. In these it need hardly be said the money making purpose is more obvious than the architectural excellence. They are, however, eloquent witnesses to a particular feature in the life of the citizens. Montreal becomes more and more markedly a city where one half of the population makes its living by keeping house for the other half, and the people with a private home life of their own are becoming a smaller and smaller proportion of the whole.

For next season's operations they are now getting in the foundations for a large hardware store in Bleury street, near Craig street, Mr. H. C. Stone being the architect, and a new seven-storey fireproof store is advertised as about to take the place of some of the older buildings on the south side of St. Catherine street, a little west of Peel street. The McGill Students' Union building and the new club house of the Mount Royal Club, both in Sherbrooke street, give signs of being prepared to spring up with the coming of spring. Next year should also see substantial progress made with the new Notre Dame hospital and the Fever hospital at Point St. Charles. The erection of the latter has been delayed, we understand, owing to certain preliminary financial difficulties.

CONCORDIA SALUS.

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## THE NEW PEACE PALACE AT THE HAGUE.

Every one who has visited Brnssels, the beautiful capital of Belgium, will remember the splendid pile of the Palace of Justice which forms such a striking feature in the modern architecture of that city. That building has been decided upon as the model for the new Peace Palace at The Hague, which is to be erected through the gift of Mr. Andrew Carnegie, and which, on a smaller scale, will be exactly similar to it. The new palace will cost $1,640,000, and will be a superbly beautiful building. The main audience-room, where the sessions of the Court of Arbitration will be held, will be 270 feet long by 120 feet wide, and will cover no less than 12,000 square feet in area. In addition, there will be a committee room, and on the second floor two spacious rooms, one for the president and the other for the secretary of the permanent Court of Arbitration. The dome surmounting the palace will be supported by two galleries, the lower square shaped, the upper, round, flanked by great bronze statues of Clemency, Justice, Law and Strength.

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## A PLUMBING EXHIBIT.

PROVINCIAL BOARD OF HEALTH PLANS UNIQUE DEMONSTRATION

The Provincial Board of Health is providing space for an exhibition of specimens of plumbing work and fixtures, ancient and modern, to demonstrate in a practical way the great advance which has been made in the manufacture and installation of the same. Mr. M. J. Quinn, for twenty years mechanical superintendent of the Public Works Department, is making the collection for the board. The specimens will not only be exhibited, but lectures and practical talks will be given to all interested, with a view to implanting and cultivatiug a correct idea of the intimate relations between proper hygienic conditions and sanitary plumbing.

## TWO PAPERS ON REINFORCED CONCRETE CONSTRUCTION.

These papers were read at a regular meeting of the Royal Institute of British Architects on November 21 last.

The first paper, by Mr. William Dunn was as follows:—

### CONSTRUCTION AND STRENGTH OF REINFORCED CONCRETE.

Owing to many unpleasant experiences, there was, he remarked, a feeling among many architects and builders that concrete was a treacherous and unreliable material. In all such experiences there was something mysterious; the cement came from a maker of established repute, it had been specified "Best London" Portland cement, the sand and gravel looked clean, and the builder was an honest man. Nevertheless, it failed to set, it cracked, it thrust out the walls, and generally led to a great deal of trouble. To make good concrete much care in the selection of the materials and in the mixing was required. The cement was the most important ingredient, and the only way to get good cement was to constantly test it and reject that which was faulty. If the fact that it is frequently tested becomes known to the merchants, it will be found that bad cement would be less and less frequently sent. When floors, walls, roofs, or pillars are made of concrete, a bad cement is really dangerous to life. It would be an excellent plan if the Institute, the Builders' Institute, and the cement makers could agree upon a standard suitable for architectural work. But until such a standard was fixed, architects must describe it themselves in their specification. Many cement experts had given model specifications, but there are some points in cement specification required for building work which a cement expert scarcely values.

#### FINENESS OF GRINDING

Is all important, as only the very fine particles have cementitious value. Foreign makers were much ahead of us a year or two ago; now we can get an English cement which will all pass a 76 by 76 and leave only 18 per cent. on a 180 by 180 sieve. This is a very fine cement, and perhaps too good for ordinary cement. All, however, should pass 50 by 50 and leave only 5 per cent. on a 120 by 120 sieve. A good cement is economical; we make a stronger mortar or concrete with much less of it, so that the extra cost is more than repaid. The particles which are retained on a 50 by 50 sieve are practically so much sand. The auther strongly urged the use of a slow-setting cement. Pats made with the minimum quantity of water should set in not less than five hours when the temperature is at 34° Fahr., and in not less than twenty minutes when the temperature is at 75°, and proportionately in time when the temperature is between these points.

#### SIMPLE TESTS.

Soundness or constancy of volume is one of the most important qualities a cement should have. Tests without elaborate apparatus are fortunately available. Make two cement pats on small pieces of glass, tap them out to a circular shape, about 3in. diameter, ¼in. thick in the centre, and with thin edges; keep one under water and one in air for several days. The cement should then show no cracks, change of shape, or tendency to curl off the glass, if sound. The author described other methods of testing, and strongly urged architects to test their cements by one and all of them as often as they could; it would save many after troubles. Tensile strength he regarded as the least important; it is the test on which the most varied results may be got by different observers according to the method employed in filling the briquettes. A strength of 400lb. per square inch at seven days, and 25 per cent. increase in twenty-eight days, is usually asked for and easily attained; many briquettes he had found go up to nearly 1,000lb. at seven days.

#### FREE LIME IN CEMENT.

It is not unusual to specify that sufficient cement should be delivered on the works at starting, kept stored in a dry weather-proof shed to a depth of not more than 2ft., and turned over daily for a fortnight before use. It is found that makers send out the cement hot from the mills, and (unless it is very high-class cement) it is much improved by air slaking. Aëration seems to improve an inferior cement by the slaking of the free lime, which if it took place in the work would be dangerous. A thoroughly sound cement should have no free lime in it, and is not improved by air slaking; it rather suffers. Cement in which there is no free lime can be produced by the maker, but it requires much care in the making, and is consequently expensive. As regards the

#### AGGREGATE,

the strongest concrete is made with gravel; the size should vary from large sand to small stones, passing a ¼in. or ½in. mesh, for floors or walls, to 1½in. or even more for foundations. The cleanness of the aggregate and the water is most important, as is also the cleanness and sharpness of the sand. Small sand, such as would run in an hour-glass, is utterly useless—the sand must be fairly large and sharp; it should vary in size: the more uneven the sizes the smaller the voids. The finer the sand the less the strength. There should never be more than three of sand to one of cement.

#### MIXING THE MATERIAL.

The author described the process of mixing concrete, which should always be done under supervision. Concrete mixing machines are much used in America and on the Continent, producing very good and uniform results. These machines are rarely seen here. One has frequently seen on a building a lot of concrete mixed up, and left for an hour or so before being set in place. If too stiff more water was added. Such treatment of the material invites disaster; initial set begins very quickly, and the concrete should be put in position as soon as mixed, and without a moment's delay. When the concrete is eventually laid on the centring, or put in the moulds, it is put in in thin layers 2in. to 3in. thick, and beaten down with iron beaters very carefully all over. This is essential in order to prevent the formation of voids, and to increase the resistance of the concrete.

#### STRENGTH OF CONCRETE IN PLACE.

Mr. Dunn then treated in considerable detail of the strength of the material in place, describing various tests of cement made by eminent scientists, and illustrating by diagrams and mathematical calculations. For further mathematical investigation of the subject, he referred those interested to Professor Perry's "Applied Mechanics" (p. 345), and to M. Considère's experiments, the results of which were communicated to the French Académie des Sciences in a note of March 18 last—an abstract of his communication appears in the *Genie Civil* for April 30. These writers base their discussion on "Rankine's Ellipse" of Stress, which, as given in Rankine's own words, is not easy to grasp. In Alexander and Thompson's "Elementary Applied Mechanics," however, the ellipse of stress is fully explained, and a preliminary reading of part of the last-named book should enable anyone to follow Considère's or Perry's reasoning. The resistance to the swelling and bursting action to which columns in concrete alone would be subject can be produced by binding the columns with iron or steel wire. Makers of concrete columns do so bind these according as the effect to be combated is more or less clearly understood. What is done in the Hennebique column is done by other concrete specialists. In all there is first the concrete; second, vertical bars of metal, iron, or steel; third, bindings of sheet-metal or wire.

#### THE METHOD OF CONSTRUCTION

is very simple. A wooden box or mould is made in which the rods are set upright; one of the bindings is then put in, and about 6 in. or 12

in. of concrete well rammed down; another of the bindings is put in, and the process repeated. The special functions of the vertical rods are (*a*) to aid the concrete in resisting the compression due to the load; (*b*) to resist any tensile stress which may be set up in the concrete by unequal loading or by any want of homogeneity in the material itself, which tensile stresses cannot be safely left to the concrete to overcome. Almost all the makers of reinforced concrete constructions put their trust in the vertical rods of metal, as the special element adding strength to the concrete, if we may judge by the large proportion of metal so used, and by the rules employed to fix the safe load, which rules take no account of the binding.

INITIAL INTERNAL STRESSES.

If there were no initial stresses in the combination the load would be carried by the two materials on the inverse proportion of their rigidities—that is to say, if the concrete were ten times as easily compressed as the iron or steel, the iron or steel would be carrying ten times as much per square inch as the concrete. But the question is not so simple. Concrete setting in air shrinks, while concrete setting in water expands. Columns for buildings always set in air, and consequently the concrete shrinks. As the concrete adheres rigidly to the metal, the concrete is put in tension and the metal in compression—into a state of internal initial stress—before the load comes on. So strong is this action that the concrete may be at the limit of its tensile strength, and the metal at its elastic limit. No formula has so far been devised which takes this initial stress into proper account. The function of the bindings is to prevent lateral swelling and bursting. M. Considère's, was the first to give this its proper consideration and importance. In almost all columns, except M. Considère's, these bindings are usually about 6in. to 12in. apart, showing that the true use of the metal is not yet fully recognised. The author gave the results of some

EXPERIMENTS ON CONCRETE IN COMPRESSION,

armoured and unarmoured, referring to those carried out by Professor Gætana Lanza, and reported in the *Transactions* of the American Society of Civil Engineers" (1903, p. 487); by M. Gary, of the Ecole Polytechnique, at Charlottenburg; by the Commission des Voûtes de la Société des Ingénieurs et Architectes Autrichiens, reported on in 1901; and others by M. Considère described in his papers on "Resistance à la Compression du Béton Armé et du Béton Fretté," in *Le Genie Civil* (November and December, 1902). Reference was also made to the test of a column made by Messrs. Cubitt and Co., and tested at Messrs. Kirkaldy's Testing Works in June, 1904. As regards

FIRE-RESISTING PROPERTIES,

from all the reports on the Baltimore fire, where as intense heat was experienced as will ever occur, the armoured concrete constructions appear to have stood best. Concrete and iron or steel expand at about the same rate under changes in temperature, and the permanence of the concrete covering in fires is no doubt due to this. There is now no doubt that iron or steel buried in ordinary concrete remains uninjured by rust for generations. When an architect decides upon adopting reinforced concrete for a structure, or part of it, he will probably put the work in the hands of a concrete specialist, who makes his own calculations for the strength of the members, and arranges the details of the construction according to his own ideas. But as the responsibility must always in some measure lie with the architect, he will naturally want to check the specialist's work, particularly when the contract has been let in competition, and there is an object in the specialist endeavouring to reduce cost to a minimum.

Mr. L. G. MOUCHEL followed with a paper, illustrated with lantern slides, entitled

"MONOLITHIC CONSTRUCTIONS IN HENNEBIQUE FERRO-CONCRETE."

It had, he said, been his fate to be the pioneer of the new material in Great Britain. Having explained in detail the general principles of Hennebique ferro-concrete construction, Mr. Mouchel said that it was to its great simplicity, to the common-sense which had presided at its conception, that it owed its startling success. Any labourer of ordinary intelligence could be made an apt workman in the material in a few days. He himself had had to form his own gangs of men when he introduced ferro-concrete into this country, and it took him very little time to drill them in the practice of arranging the various parts of a work in which robustness was combined with simplicity. Respecting the theory of the system of construction, it was evident that the laws, formulæ, and methods of calculation used for ordinary materials could not be applied in structures composed of such heterogeneous substances as concrete and steel. It had been objected that their formulæ for ferro-concrete was empirical. It was not so, because they had not started their work on formulæ. It was only after many years' patient observation of the results obtained that they deduced the formulæ which were the bases of all their work in this absolutely novel material. Ferro-concrete was

AN ABSOLUTELY NEW MATERIAL,

which has come in its time to enrich the engineering world. It could not be treated as a combination of steel and concrete in which the properties of the component elements could be considered and treated separately. It had its own laws of deformation. Experiment demonstrated that a rectangular bar of concrete, when subjected to tension, showed an elongation at rupture, of, say, 1/10 inch; a bar of ferro-concrete, of the same external dimensions and made of the same concrete, showed at rupture an elongation of 1 inch; that is to say, ten times greater, before showing any crack or trace of disintegration, than in the first case. The elasticity of the new material was well known; it varied in notable proportions with the distribution of the steel in the mass of concrete. The so-called Hennebique's empirical methods could be relied upon with absolute confidence; for they had been the basis upon which over 12,000 different works had been constructed, and which, in almost every case, had been subjected to severe tests, the results of which had been carefully recorded.

TESTS.

As regards tests, the age of a piece of concrete is a most important element. Good concrete goes on increasing in quality year after year. It is not advisable to test to destruction samples a few weeks or a few months old. No two results will ever be alike, even on two samples of the same age, unless they are composed exactly of the same materials, mixed in identical proportions and by the same operator. The adherence of concrete to steel increases with the age of the work. Unlike construction in ordinary materials, which, if left to itself, will deteriorate, ferro-concrete construction goes on improving endlessly in quality with age. Tests must be made on the structures themselves. The Hennebique practice is always to test their structures within a very few weeks after completion with loads 50 per cent. in excess of the calculated load. When the load is removed, it is found that the floor, owing to the elastricity of ferro-concrete, regains its former level, or, at any rate, that the deflection, if any, will be quite inappreciable. It could not be otherwise, for any stress applied to any part of a well-made ferro-concrete floor affects not merely the part under the load, but also a very large area of the floor surrounding the part under observation. This is due to the absolute monolithism of the work. Besides static tests, there should be severe dynamic tests; without these the trials of a structure in which concrete and steel are combined are incomplete. The great security offered by ferro-concrete construction arises from the fact that it never collapses suddenly, but always gives, long beforehand, unmistakable warnings. The author described a test on a Hennebique beam which he had had carried out at Bermondsey. The beam was placed on two common concrete supports. Thirty tons—i. e..

five times the calculated load—was put by degrees on the beam, when the operations had to be stopped, the pillars being crushed and having taken a slanting position, which caused the beam to twist badly. The load was then discharged. The deflection was measured at that point, and the following morning it was found that the floor had sprung back by 1in. The beam was cracked, but loading might have been continued for some time before complete destruction had not the supports given way.

THE VALUE OF MONOLITHISM.

Buildings of Hennebique construction have been subjected to very unforseen tests. At Lens, in the north of France, coal silos had been constructed of ferro-concrete 40ft. high, to contain 1,200 tons of coal. The silos were supported on fourteen pillars. One day, when they were quite full to the brim, a train of coal trolleys came into contact with one of the legs and broke it. The corner of the silo structure was thrown suddenly in cantilever ; but owing to the monolithism of the whole building, no injury resulted to the silos themselves, nor to the other three pillars of the silo so affected. They merely had to reconstruct the broken pillar. A carshed of Hennebique construction at Le Mans was divided in two spans of 21ft. by a central line of ferro-concrete pillars. One of the cars coming down a gradient got out of control, ran off the metals, and dashed into the central pillar at the entrance of the shed and broke it. The span instantly became 42ft. instead of 21ft. ; but notwithstanding this, the beams supported by that pillar held perfectly, and did not show the least trace of strain—another proof of the safety due to the monolithism of the ferro-concrete construction. The construction of

FERRO-CONCRETE PILES

the author described as one of the finest, most startling, and most useful applications of ferro-concrete. Their cost is little more than that of a timber pile, and they can bear safely a weight so much in excess of timber piles that a very considerable economy can be affected on the total cost of a foundation. At the present moment a foundation was being constructed in which the use of ferro-concrete piles procured a saving of over £12,000, as compared with the original estimate for timber piles. Judicious distribution of steel in ferro-concrete is at the root of success, whether it is in a beam, in a pillar, or in a floor—but, above all, in a pile.

THE ABSENCE OF VIBRATION.

Owing to the absolute monolithism of Hennebique constructions, they are far less liable to vibrations than ordinary constructions. One of the things which strike one most when entering a factory constructed entirely of ferro-concrete, where heavy machinery is at work, is the absence of vibrations and of noise. It is an everyday practice to attach shafting direct to the Hennebique pillars, which consequently have to sustain powerful lateral pulls. Heavy machinery—such as disintegrators grinding heavy materials, dynamos, and dynamo-motors—is also fixed direct on the Hennebique floors ; and, after years of that treatment, the quality of the concrete has been found not to have suffered in the least.

FREEDOM FROM RUST.

Indisputable proofs have been given that the very best material to protect steel is concrete itself. Oxide of iron cannot exist in contact with concrete ; rusted iron bars imbedded in concrete will, in the course of a month or so, be as bright as new. Concrete used in ferro-concrete is markedly different from ordinary concrete, both in its composition, in its make, and in the way it is employed. It is composed of materials of small volume (¾in. maximum for the gravel or stone), and the materials used are very clean. The proportions of sand and stone are always adjusted so as to give a concrete quite full—it is used in small quantities at a time, and so vigorously rammed that no cavities or porosity are possible. As regards the

ADHERENCE OF CONCRETE TO STEEL,

its value is such that it justifies the practice of some ferro-concrete builders who only reckon on concrete to make the junction between the different metallic parts of a structure. Experiments have demonstrated its surprising resistance to high temperature and sudden cooling. After the most destructive fires, Hennebique constructions have been found as strong as ever. As regards

ORNAMENTATION,

there is no reason why ferro-concrete buildings should not be made as artistic as constructions in ordinary materials. There is none that lends itself better—and more economically, too—than ferro-concrete to any shape that one may wish to give to it. To show the ease with which the material lends itself to ornamentation, a photograph was exhibited of the main reception-room in the extension recently carried out at the French Embassy in London. Except the external walls, the whole of the building is in ferro-concrete.

PROHIBITIVE LONDON BUILDING REGULATIONS.

In his concluding observations, the author referred to the mischief of the building by-laws in force in London. London enjoyed the unique privilege of being the only city in the civilized world where ferro-concrete constructions are actually prohibited. Building regulations of nearly every other city in the United Kingdom did not, read strictly, permit of the use of ferro-concrete ; but, after intelligent and impartial investigation by the various authorities, Hennebique construction had been allowed. Such buildings have been erected in London, but only on ground belonging to railway and dock companies. These facts have been brought to the attention of the London County Council when they had been applied to for permission to erect similar buildings on ground within their jurisdiction ; but in vain. They always met with the same reply :—"The Act Stipulates a certain thickness for walls. If you give your walls that thickness you can build." But to give ferro-concrete walls that thickness would be financially an impossibility and, practically speaking, an absurdity, since the comparatively thin walls of ferro-concrete are many times stronger and safer than those stipulated in the Act. He trusted that when the new London Building Act was framed, ferro-concrete construction would no longer be excluded. Ferro-concrete construction is absolutely safe ; it cannot lend itself to the malpractices of the jerry-builder. Trickery is impossible with it. Should the contractor try to cheat, try to escape the specification, detection will not occur months or years after, but at once.

On account of the lateness of the hour at which the second paper concluded, 10.20 p.m., the Chairman suggested that any discussion should be postponed till the next meeting of the Institute, on Monday, Dec. 5.

## ONTARIO HAS MARBLE.

Marble quarries of good quality are numerous in Ontario, although only two of them are being worked, says Inspector Carter, of the Bureau of Mines. One of the two in operation is near Renfrew, and the other at Halley Station, a short distance east. There are a number of unworked quarries in the counties of Hastings and Frontenac, and also in Algoma. The reason that there is so little marble quarried in Ontario is that Tennessee marble has gained the market, but that there is no reason why this state of affairs should continue, is shown by the interior of the Ottawa Parliament Buildings which is all Renfrew stone.

## CARDINAL GIBBONS ON THE RIGHTS OF LABOR.

His opinion is as follows :—"The right of a non-union laborer to make his own contract freely, and perform it without hindrance, is so essential to civil liberty that it must be defended by the whole power of this Government."

## MR. JOSEPH CONNOLLY.

Mr. Connolly's death, on Dec. 13, closes what was, until the last two or three years, a very active architectural career in Ontario. Mr. Connolly was in his 65th year. He was born in Limerick, but passed most of his life in this country. He was a member of the Irish Royal Institute of Architects, and was one of the most accomplished of Canadian architects. He was trained in the office of Mr. McCarthy, of Dublin, who held a similar position among Irish architects to that occupied by Sir Gilbert Scott in England. After serving for a time as Mr. McCarthy's chief assistant, and subsequently making a tour upon the continent for the sake of study, Mr. Connolly began practice in Limerick. He did not, however, remain long there, but came to Canada, and soon acquired the special practice for the Roman Catholic church which was his life's work, and which enabled him to continue always (excepting upon one or two occasions) to design in the style in which he was trained and in which he worked with freedom and originality. Besides a great deal in the way of alterations, additions and improvements to Roman Catholic churches and institutions, including the additions to St. Michael's Cathedral, in Toronto, and its decorations, the following buildings were his work :—

In Toronto : The Chapel of St. Joseph's Convent.
The south wing and Chapel of the House of Providence.
St. Paul's Church (Italian Romanesque.)
The Sunnyside Orphanage.
Some Roman Catholic Schools.
St. Mary's Church (his last work.)

In Kingston : The new front and tower of the Cathedral and several churches.

In Hamilton : The remodeling of St. Mary's Cathedral.
St. Patrick's Church.
The James Street Baptist Church.

In London : St. Peter's Cathedral and many Roman Catholic churches in the diocese.

The Franciscan Church in Chatham.

The Jesuit Church in Guelph.

Churches in Prescott, Kemptville, Tweed, Kincora, Formosa, Sault Ste Marie, Caledon, Arthur and many others, including St. Michael's church in Belleville, the destruction of which the other day was the cause of so many lamentations in Belleville.

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An American Forest Congress will be held at Washington on Jan. 2-6, 1905, under the auspices of the American Forestry Association. Its purpose will be to establish a broader understanding of the forest in its relation to the great industries depending on it ; to advance the conservative use of forest resources for both the present and the future need of these industries ; and to stimulate and unite all efforts to perpetuate the forest as a permanent resource of the nation. This purpose is one which deserves the hearty support of engineers and architects, for the increasing cost of timber indicates that the time is soon at hand when forestry will become one of the most imperatively needed callings in the country. Anything that can be done to spread an appreciation of its importance deserves hearty support. The secretary of the Congress is Mr. W. L. Hall, Atlantic Building, Washington.

## MOVING AND ERECTING LARGE GRANITE COLUMNS.

Around the altar of the Cathedral of St. John the Divine in New York, there is to be a semicircular row of eight granite columns 6 ft. in diameter and 54 ft. in height. Each column is made in two pieces, the lower one being 36 ft. long and weighing 90 tons. The upper one is seated without doweling on its flat top, has a length of 18 ft. and weighs 40 tons. The columns were quarried and cut at the Bodwell Granite Co.'s Fox Island quarries at Vinalhaven, Me. At first it was intended to make them monolithic and no special difficulty was experienced in quarrying full-length slabs from a stratum of about the required thickness. These were hand-dressed approximately cylindrical and the first one was successfully turned in the lathe but broke while being polished. The break was attributed to torsion and for the second column power was applied at both ends of the lathe. Notwithstanding this arrangement, the column broke during the roughing. It was then suggested that the trouble lay with the excessive bending stresses due to the very long unsupported length and a center support was provided for the third column. This column broke more quickly than either of its predecessors and the attempt to make them monolithic was then abandoned.

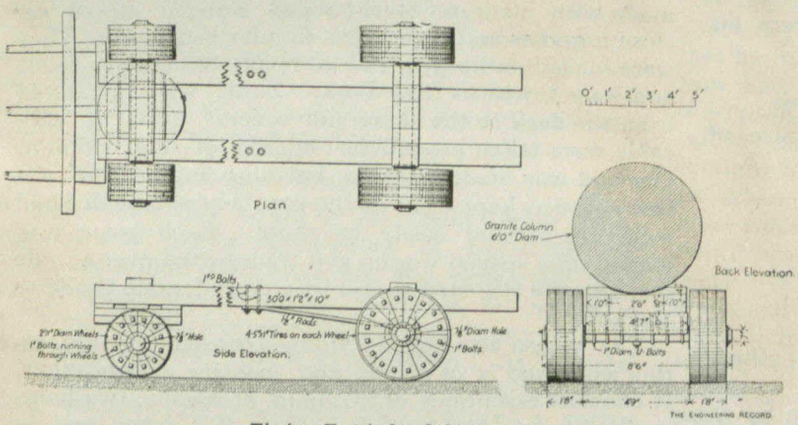
The shorter pieces were turned and polished without difficulty and were then enclosed in cylindrical cases made with 3 x 4 in. steel-hooped wooden staves set close together and secured to circular end pieces. They were loaded on barges, two complete columns to each, and were towed to New York. Skids were arranged from the deck to the shore and several turns of wire cable were taken around the middle of the column. One end was made fast to a hoisting engine and the free end was kept tight as the rope was overhauled and rolled the column easily to shore. Each piece was loaded on a special wagon and transported over a mile through the city streets and up a considerable grade to the site.

The wagon was built in Maine expressly for use on this work and is of simple and massive construction. It consists essentially of two pairs of wheels, two longitudinal beams and two cradles on the axles, and is built entirely of wood except the axles, tires and a few bolts and small braces. The 10 x 12-in. longitudinal timbers are 30 ft. long, are 3½ ft. apart on centers and overhang the front and rear axles about 2 ft. and 5 ft., respectively. The 8 x 8-in. rear axle and the 7 x 7-in. front axle each has six U-bolts fastening a solid 10 x 14-in wooden bolster to the upper side. On the front axle the bolster supports a horizontal wooden turntable platform or fifth wheel, on which the longitudinal timbers are seated. At the rear end they are seated directly on the bolster. Solid fillers are put on the axles between and above the longitudinals and are concaved on the upper surface to a radius of 3 ft. to receive the columns which are thus supported about 4 ft. clear of the pavement.

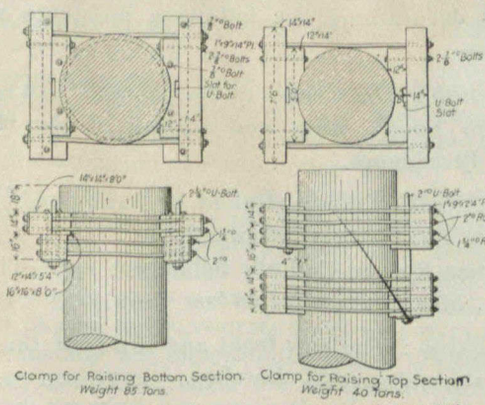
The rear wheels are about 4 ft. and the front wheels about 3 ft. in diameter, all of them being 20 in. thick and made with seven thicknesses of planed white oak plank. Each thickness is made of sixteen sectors in the large wheel and twelve sectors in the small wheel, bolted tog ther and breaking joints in adjacent thicknesses. A steel disc is bolted to the center of the wheel on each side and through it and the solid planks a hole was bored to fit the axle, so that the bearing of the latter was on the ends of the fibers. The tires consist of four 5 x 1-in. welded rings sunk on each wheel. The rear wheels are provided with a break shoe operated by a screw, but it was seldom necessary use this, most purposes being served by a transverse timber chained to the axle and dragging on the ground close to the wheels, but clear of them so long as the wagon advances. If the wagon tends to move backwards, the timber immediately serves to chock the wheels.

The wagon was hauled by a six-part manilla rope tackle which had a clevis attachment to a sheave set in

the bight of a steel cable, one end of which was attached to the center of each axle, thus distributing the traction stress equally on both axles. The forward block in the tackle was attached to a 1½-in. wire rope anchored in front and the fall line was operated by the drum of a Lidgerwood hoisting engine. The hoisting engine was chained to a pair of bent hooks with their points turned vertically downwards in holes about 6 ft. apart which were made by the removal of single Belgian blocks from the pavements. The shanks of the hooks lay horizontal on the surface of the undisturbed pavement underneath a heavy transverse beam on which a traction engine was seated and furnished steam to operate the hoisting engine. This provided a very strong and simple anchorage which was shifted with ease and rapidity and involved no excavating or counterweights. The 1½-in. wire cable was made with several 50-ft. lengths each corresponding to the extended length of the tackle. When the tackle was pulled up so that the blocks nearly jammed, it was disengaged from the cable and a whip line attached to the forward block was reeved through a sheave hooked into the next joint of the cable and the free end was brought back to the capstan of the hoisting engine and wound up there so as to rapidly overhaul the tackle. The last length of the cable was disengaged, the tackle hooked on in its place and the cycle of operations repeated and so on, thus moving the column with very little loss of time. When the wagon was hauled up




Timber Truck for Columns.




Friction Clamps for Top of Column Sections.

close to the hoisting engine, the latter was pulled forward the full length of the cable by means of the traction engine and these operations were repeated until the columns arrived at the site.

The system worked satisfactorily and the wagon did not cause any injury to the pavement. The progress was absolutely steady and smooth on an up grade, but on a level or down grade it was noticed that the irregularities of the pavement caused slight deflections in he progress of the wagon, due to the twisting of the forward axle. The first column-section was drawn from the pier to the site in nineteen days. Some of the others were drawn in seven days each. The eight columns were transported in about six months with a force of four men and a superintendent.

At the site the column sections were revolved into vertical positions and hoisted by three tackles forming a thirty-part system suspended from a shear legs or breast derrick made with two Oregon pine timbers 98 ft. long hewed 2 ft. square for the lower 50 ft. and tapered thence to a diameter of 20 in. at the top, where they are capped with an oak timber. From this timber were suspended a pair of ten-part tackles and a single six-part tackle in the center, all of them reeved with ¾-in. steel rope. The center tackle was an independent one operated by a separate hoisting engine. The two side tackles were reeved with a single line common to both so as to equalize the stress between them and carry through single top and bottom sheaves so as to make up the thirty parts and lead each end to a separate Lidgerwood hoisting engine. By this arrangement equilibrium was maintained between all parts of the tackles and the stresses were equalized no matter whether the engines were working uniformly or simultaneously or not. It was considered that the eccentric stress in revolving the column from the horizontal to the vertical position would be dangerous for lewis bolts, and a special device was adopted for attaching the tackles to the upper ends of the columns during this part of the operation.

The 90-ton bottom sections of the columns were turned and polished up to a distance of 18 in. from the end, where a rough shoulder of a diameter of about 10 in. greater than the shaft was left to form a collar. On the under side of this collar a pair of concaved yoke pieces were bolted to and took bearing against it. Through each side was set a 2¾ in. U-bolt to which a sling was attached to receive the tackles. The lower end of the column was lifted and placed on rollers, tackles were attached to the upper end and operated to drag the column forward and lift it into a vertical position, when it was seated on the permanent base. The yokes were then removed and the enlarged upper end of the column was scabbed off by hand and the surface was dressed perfectly horizontal to a line marked by a diamond on the polished surface of the shaft.

The 40-ton upper sections of the columns were handled by a different method. No collar was left on the end of the shaft which was dressed to the exact dimensions. Two clamps made with pairs of solid oak yokes connected by two 1¾ in. and two 2-in. screw rods at each end were fitted to the top of the column about 16 in. apart and screwed up as tight as possible so as to develop a large amount of friction. A U-bolt of 2-in. iron was attached to one side of the upper yoke and a similar one was attached to the other side of the lower yoke, passing freely through a slot in the upper yoke. The hoisting sling was connected to these U-bolts and thus developed balanced eccentric stresses in both yokes, tending to cramp each one against the column and increase the friction, but maintaining equilibrium between themselves. This connection sufficed to revolve the column into a vertical position and it was temporily seated on the lower end, the yokes removed and a lewis bolt inserted in the top. The tackles were connected to the lewis bolt and lifted the column and seated it on the top of the lower section in its permanent position.

It required about one month to set up both sections of the column and prepare for the setting of the next column, but when everything was in readiness, the actual hoisting of the column occupied a very few minutes. Five of the columns have been erected and it is expected that two more will be erected this fall and the remaining one next spring. The total cost of the eight columns is about $155,000. Two years were required to quarry and cut them and about two years more will have been required to transport and set them. Messrs. Heins & La Farge are the architects of the cathedral and the columns have been made, transported and erected by Mr. John Peirce, contractor ; Mr. Emil Diebitsch, chief engineer.

## SANITARY REPORT ISSUED.

Dr. Louis Laberge, health officer for the City of Montreal, has just issued his thirty-first report, which contains some very interesting statitistics on the sanitary condition of Montreal city.

## LEGAL.

A legal decision of both interest and importance to all concerned in the building trade and its allied professions was given last week by Mr. Justice Ridley, sitting without a jury. The question was apparently a simple one: If an architect and surveyor makes plans, drawings, specifications for an employer and is paid therefor, has the architect (in the absence of any special condition) the property in these documents? To that question some business men of experience would give a confident affirmative answer, while others would reply with a very emphatic negative. To state briefly the facts of this case (Gibbon *v* Pease), the plaintiff owned some property at Bayswater which he wished to convert into flats, and for that purpose he employed the defendant as his architect and surveyor, and an agreement was entered into by a firm of contractors, that they should execute the necessary work under the directions of the defendant. The local water company would not pass defendant's plans, whereupon Gibbon, the plaintiff, instructed a firm of plumbers to smooth over the difficulty, and to do that part of the work to the satisfaction of the water company. The defendant, not having any notice of this arrangement, expressed his annoyance that a professional slight had been put upon him. However, the work proceeded and was in due time finished, and upon its completion plaintiff asked his architect for his charges and paid them without demur. Gibbons thereafter asked Pease for the plans and other documents referring to the property, but Pease absolutely declined to hand them over, alleging that, beyond a *lien* for his charges, he had the absolute property in the documents according to a universal and well-known custom in the trade. Hence the action to compel defendant to hand them over. In the schedule of the Royal Institute of British Architects, paragraph 16 reads: "In respect of the ownership of drawings and specifications, it has hitherto been the general custom for the architect to be paid for their use only, *those documents remaining his property* . . . No authoritative decision in the courts of law has yet been given on the subject; it is therefore desirable, that for the present at least, that the architect should have a distinct understanding with his employer on this point."

Against this two strong opinions may be pitted. First, in his "Book on Buildings," Lord Grimthorpe sets out in full the standing form of agreement with an architect in use by the Commissioners of Works. There paragraph 6 runs: "The plans and the documents relating to the work shall be the property of the Commissioners—*i.e.*, at once; not merely after the work is done—and the architect shall make at his own expense all copies of them necessary for the conduct of the work." Secondly, paragraph 17 of the same is as follows: "No rules of the Royal Institute of British Architects or any other society to be held binding on the Commissioners."

It should be added that the decisions on the point under discussion are so uncertain and conflicting, that Mr. Justice Ridley felt himself compelled to take his own, and he entered judgment for the plaintiff, with stay of execution for three weeks pending an appeal. The matter will certainly go to the Court of Appeal, and we shall at last have a definite settlement of what has been for a long time a too-much-vexed question.—The (London) Contract Journal.

HOPEWELL V. KENNEDY.—Judgment by Chief Justice Meredith, in the Divisional Court, Toronto, on appeal by defendant from an order of the Judge of the County of Carleton, sitting at Ottawa Spring Assizes, for the Assize Judge. The action is for libel and being called for trial and before the empanelling of a jury, plaintiff's counsel moved for order to strike out certain paragraphs of defence and defendant's counterclaim. The order was made with leave to defendant to amend. The plaintiff, an Alderman of the city of Ottawa, and a member of the Building Committee of the Public Library, for the stonework and masonry of which defendant was contractor, made certain criticisms in committee in respect of work done by defendant upon the building. The libel complained of was embodied in a letter by defendant published in The Ottawa Evening Journal, 23rd October, 1903, in answer to plaintiff's criticisms. The point involved in the appeal is whether the defendant's statements were privileged. Held, that the plaintiff made no appeal to the public in offering his criticisms at a committee meeting, and that it was not open to defendant to enlarge the constituency created by the plaintiff and claim a privileged occasion. Some of the paragraphs are deemed admissible in mitigation of damages, and limited to that purpose, may be so pleaded. As to the counter-claim, held, that the reference therein to the charges as set forth in the statement of defence, and the further allegations that such charges were falsely and maliciously spoken by plaintiff, are quite sufficient to make the counter-claim in its present form a good pleading within rule 268. Appeal allowed as regards counter-claim and dismissed as regards statement of defence. Defendant may amend within five days. No costs of appeal on order appealed from. H. M. Mowat, K.C., for defendant. No one for plaintiff.

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The new Union station at Toronto will cost $3,000,000 The architects who have been asked to prepare plans are Messrs. Darling & Pearson, Mr. E. J. Lennox, and Mr. A. H. Chapman.

Definite announcement is made of a new union depot for Emerson, Manitoba. Four of the five railroads entering the town vis., the Canadian Pacific, Great Northern, Canadian Northern, and Minneapolis, St. Paul & S. S. Marie Railway, will construct a new international union depot on the border where the four lines intersect. Owing to the fact that two of the companies interested are American and two Canadian a like portion of the depot will be placed on each side of the international line.

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(French Builders' Exchange.)

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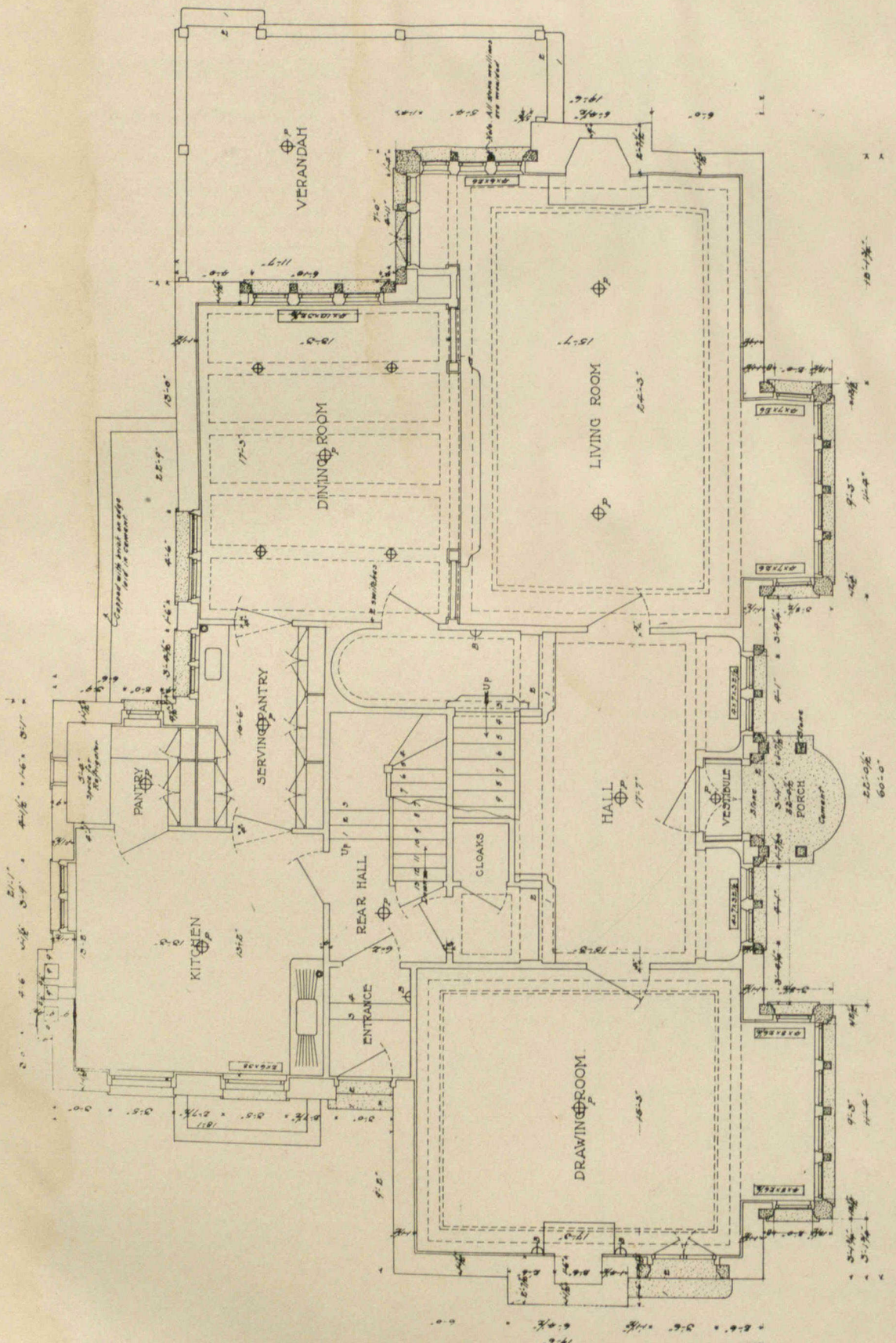
## NOTES.

We regret to record the death of Mr. John Hillock, a well known figure among the builders of Toronto. Mr. Hillock, when making a Thanksgiving Day visit to his daughter, the wife of Dr. Addison, of Penetanguishene, caught a cold from which pneumonia developed. He was born in Toronto in 1834 and had lived there all his life. He is survived by four daughters, three of whom reside in Toronto.

Mr. John Moser, a well-known American architect, died at the age of seventy-two, at Atlanta. In early life he practised in Ohio and in Canada, but in his later years he settled in Alabama and Georgia, after having filled the place of a designer in the office of the Supervising Architect, under Mr. M. E. Bell. Amongst the buildings designed by Mr. Moser may be named the Cotton Exchange at Galveston, Tex., and St. Philip's Episcopal Cathedral in Atlanta, Ga., the latter being carried out in association with Mr. E. G. Lind.

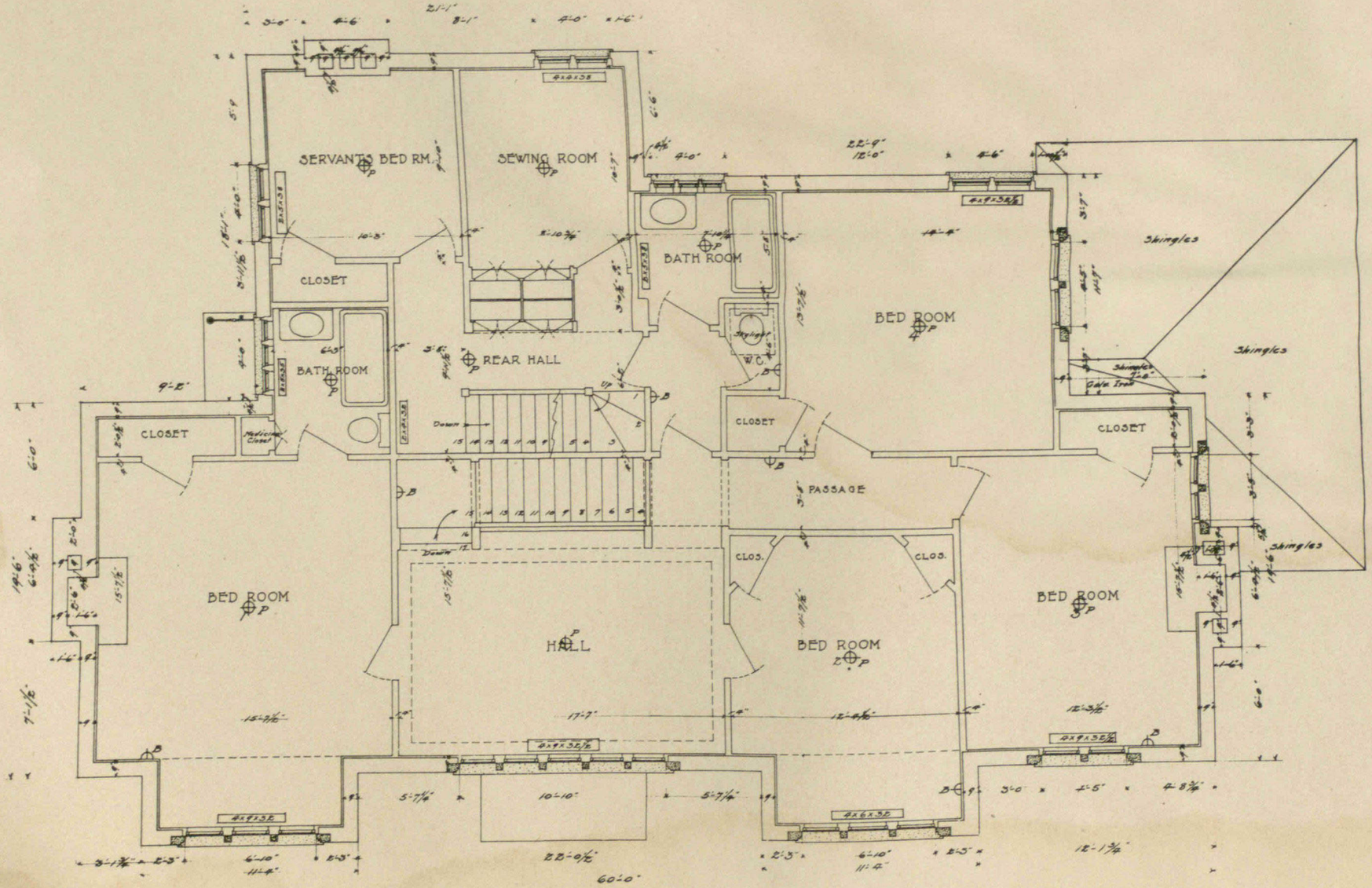



HOUSE IN ROXBOROUGH STREET, TORONTO.

MESSRS. SPROATT & ROLPH, ARCHITECTS.

GROUND FLOOR PLAN.

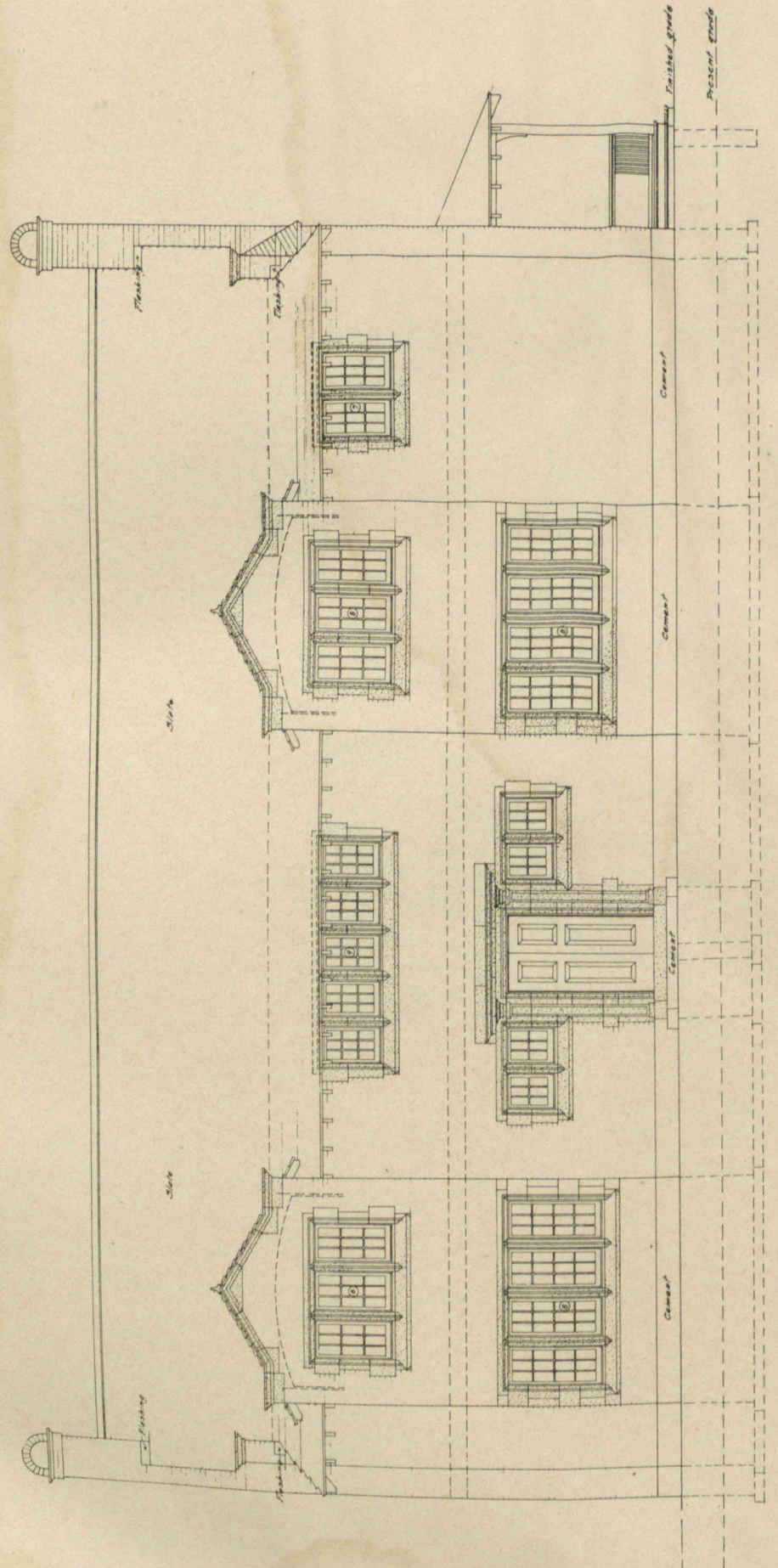
SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
DECEMBER, 1904




HOUSE IN ROXBOROUGH STREET, TORONTO.

MESSRS. SPROATT & ROLPH, ARCHITECTS.

FIRST FLOOR PLAN.

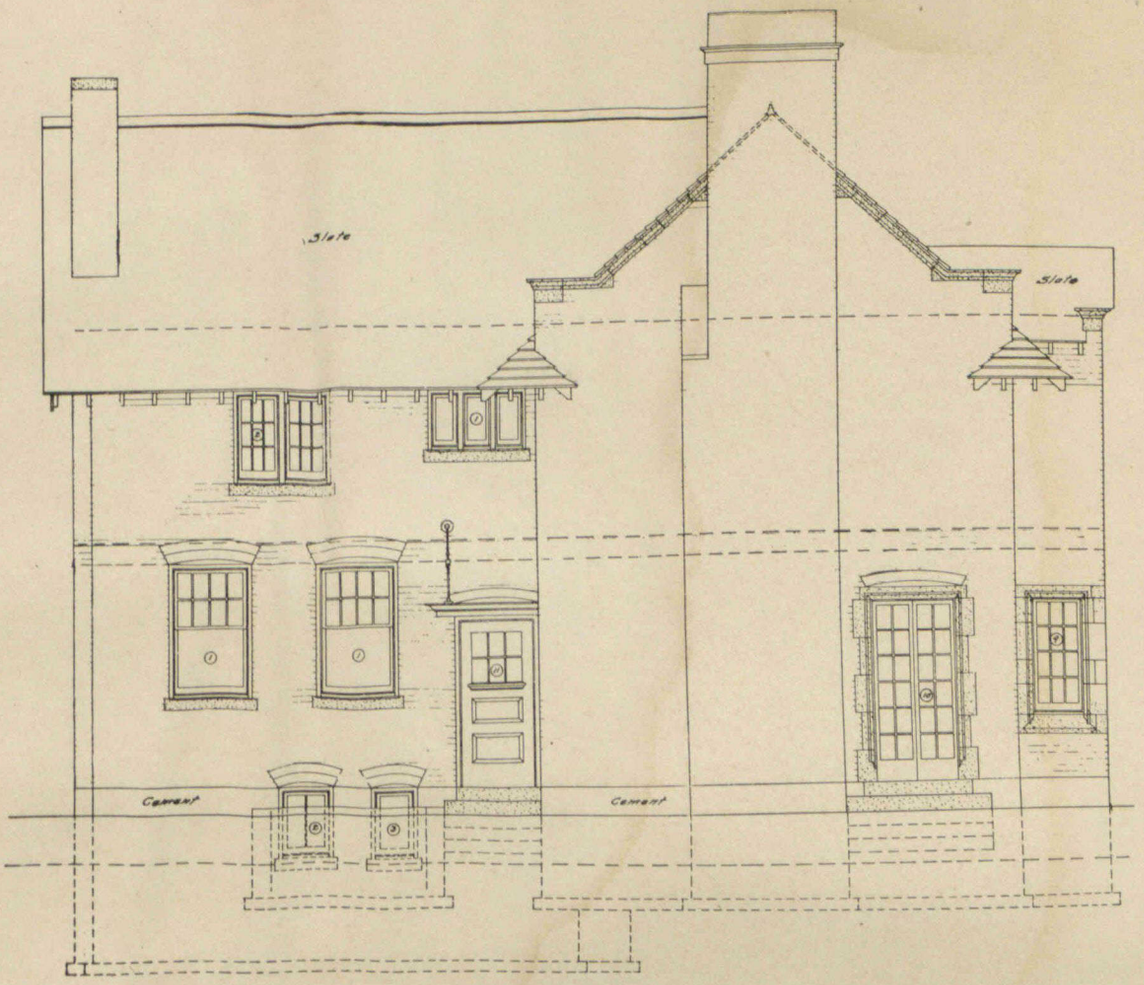



HOUSE IN ROXBOROUGH STREET, TORONTO.

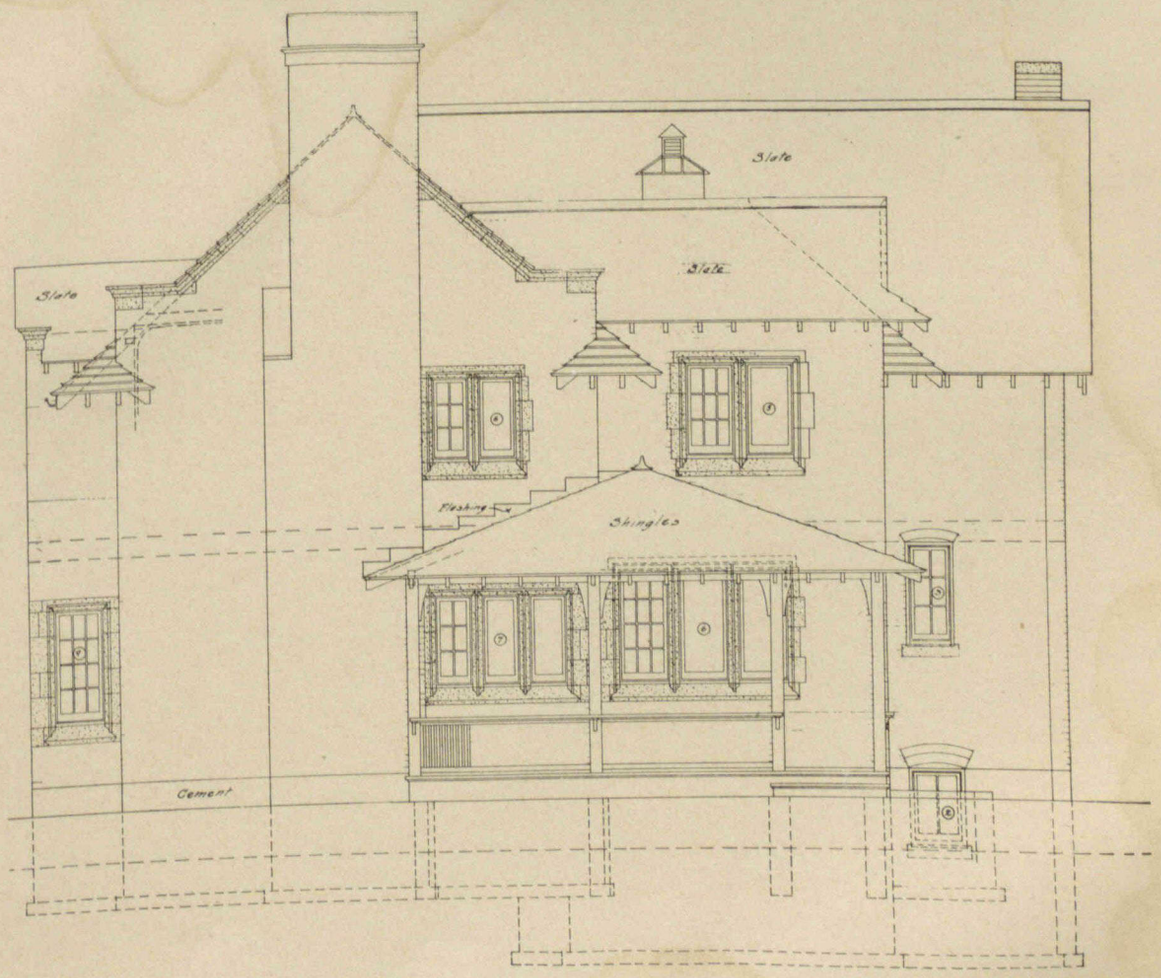
MESSRS. SPROATT & ROLPH, ARCHITECTS.

SOUTH ELEVATION.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
DECEMBER, 1904




WEST ELEVATION.




EAST ELEVATION.

HOUSE IN ROXBOROUGH STREET, TORONTO.

MESSRS. SPROATT & ROLPH, ARCHITECTS.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
DECEMBER, 1904

SANTA CROCE, FLORENCE.

LOOKING EAST.

SUPPLEMENT TO
DIAN ARCHITECT AND BUILDER
DECEMBER, 1904

HOUSE IN NEW HAMPSHIRE.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
DECEMBER, 1904

## THE RAPID CONSTRUCTION OF AN OFFICE BUILDING.

The rapidity with which high office buildings are sometimes erected is a source of wonder to many people, and it really is not surprising that such is the case. A recent example is that of the 15-story building now nearing completion at the south-west corner of State and Madison streets, Chicago, known as the Chicago Savings Bank Building. In the erection of the steel frame the figure 17 is rather prominent. It did not, however, prove itself an unlucky number for either the contractors for the work or for the owner. In all there are 17 floors, and in the construction of the framework 1,700 tons of steel were used. This was erected in just 17 days, or an average of 100 tons of material were used each day.

No special means were employed to rush the work. The speed with which the steel was put together was due largely to the systematic methods with which the work was carried out. There were, however, no delays because of lack of material, the steel being delivered as fast as it could be used.

The completion of the exterior of the building has been carried out with the same rapidity as was that of the framework. The setting of the tile floor was accomplished at the rate of five floors a week. The plumbing, heating, electric wiring, plastering and other portions of the work followed as closely as the state of the building would permit, so that at the present time, in less than three months after the first steel was set, the building is well along towards completion.—Engineering Record.

To this account should be added the following extract from the report of Capt. Sewell on the Baltimore fire: "The modern building erected in record-breaking time is never a model of workmanship, and often it contains defects that reduce the factor of safety almost to unity. The standard of work that prevails in these hastily-erected structures would not be tolerated for a moment in general engineering works."—Ed.

## RATIONAL LABOR VIEWS.

Wisdom is evolved from experience, and as experience becomes known the world grows wiser. In a recent address, Mr. Terrance V. Powderly expressed the opinion that strikes were no longer useful to those who engaged in them. Statistics go far to sustain him in his opinion. Not ten per cent. of the strikes instituted during the past twenty years were successful from the workman's position, and where victory was achieved, it was gained at such dear cost and sacrifice that the instigators were virtually the losers. Another advocate of the adoption of rational measures to settle labor disputes is Rev. A. B. Mitchell, pastor of the First Methodist Episcopal Church, at Cleveland, Ohio. The church over which he presides is in the workingmen's district and the greater part of his congregation is composed of wage earners. Rev. Mr. Mitchell is a man endowed with a more than ordinary amount of ministerial common sense. His observation is not warped by prejudice nor blinded by self-interest. He has a remarkably clear conception of things and he gives utterance to his convictions in no uncertain language. On Labor day he delivered an address to his congregation, pertinent to the occasion. The gist of that address was that in this free country every man has the right to sell his labor to whom he pleases and for what he pleases ; that compulsory membership in a trades union, in order to procure employment, is un-American and intolerable ; that every employer should have the right to decide whom he shall employ and that the principle of the open shop should everywhere prevail ; that differences between employer and employe should be amicably settled by arbitration ; that both capital and labor should be organized for mutual benefit, and that labor should share with capital its profits and losses; that every man should be paid according to his earning capacity and not according to a uniform wage scale; that capital must recognize the right of labor to organize for its own protection and benefit and such laborers should not be discriminated against, so long as they do not interfere with the rights of others; that a workman cannot quit his job and hold it at the same time; he has no right to prevent another from taking up the task he has voluntarily laid down; that the principle of the boycott and sympathetic strike is to be condemned ; the effort to destroy another man's business is un-American and un-Christian; that employes who have taken the place of strikers have the right to be retained after the strike is settled, and finally that the basic principles of Christianity must be applied in all capital and labor relations. In the main Mr. Mitchell's deductions are correct, and while he has enunciated nothing new to the readers of the Journal, his views have value as emanating from a disinterested source. Concisely he supports the contention that capital has the right to go into the open market and purchase labor for what price labor is willing to sell and that labor is entitled to all it can get without coercion or obstructive methods.—Architects' and Builders' Journal.

## MOVING A BRICK OFFICE WHILE IN USE.

Although a large brick office of the Fred M. Prescott Steam Pump Co., West Allis, near Milwaukee, is being moved several hundred feet, occupants suffer no inconvenience and continue their labors uninterrupted. The building is being moved to Sixty-third and Greenfield avenues to make room for an extension of 100 feet to one of the machine shops. Steam heat is furnished to the building by means of a long hose. A cable from a near telephone pole keeps the telephone service intact and electric wires laid on the ground keep the building supplied with light. The large brick vault, containing a heavy safe, was lifted and taken with the building. A movable stairway, arranged like the gang plank of an ocean liner, is used to gain access to the building.

PAGES

MISSING

## PLATE CLASS COMBINE.

There are persistent reports of the formation of a plate glass combine in the States. One authority declares that a new combination of plate glass interests with a capital stock of $12,500,000 is being formed. Prominent holders of the issues of the Pittsburgh Plate Glass Company are said to be the financial power behind the new combination, and it is reported that C. B. McLean, president of the Lincoln National Bank, is securing the options on the various independent plants which will form the proposed combination.

While the holding company will only be capitalized at $12,500,000, after all negotiations of the merger have been concluded, it is believed the Pittsburgh Plate Glass Company will be taken in as the head of the new combine and that the stock of the big concern may be increased to $25,000,000, or perhaps double that amount.

After the proposed merger has been completed, it is the intention of those backing the combination to raise the price of plate glass 15 cents per square foot, making a total advance of over 50 per cent. above the present prices. The argument is advanced that plate glass is now being sold very low, and with the new combination working, the independent plants remaining out of the combination will have but a small chance of competing with the new corporation.



## ANNOUNCEMENT

George A. Ross and David H. Macfarlane announce that they have formed a partnership for the general practice of Architecture under the firm name of Ross & Macfarlane, Room 51, Bank of Ottawa Building, St. James Street, Montreal. Telephone Main 297. They will be pleased to receive samples and catalogues.

## CANADIAN CONTRACTORS' HAND-BOOK

The third edition of the Canadian Contractor's Hand-Book is now on sale. The book has been revised and enlarged to upwards of two hundred pags, and the title changed to the Canadian Contractor's Hand-Book and Estimator, considerable matter bearing on the cost of performing various kinds of work having been added.

The price of the third edition, mailed free, is $1.00 to subscribers of the CANADIAN ARCHITECT AND BUILDER, and $1.50 to non-subscribers. Order from the publishers,

*The C. H. Mortimer Publishing Co., of Toronto, Limited*

Confederation Life Bldg., Toronto.
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## WINNIPEG BUILDERS' EXCHANGE.

The annual meeting of the Winnipeg Builders' Exchange was held on the 5th inst. and was very largely attended, nearly sixty members being present. The following officers and directors were elected for 1905: President, G. W. Murray; 1st vice-president, A. J. Davidson; 2nd vice-president, Jos. Bourgeault; treasurer, T. D. Robinson; sergeant-at-arms, W. F. Lee; directors—term expiring December, 1907—J. G. Latimer, E. Cass, M. B. Martinson, Frank Powell; term expiring December, 1906, D. Cameron, V. L. Bouch, Wm. Alsip, C. H. Simpson; term expiring December, 1905, Jas. A. Payne, J. W. Morley, Thos. Cotter and J. A. Girvin; secretary, A. E. Porter.

A vote of thanks to E. Cass, the retiring president, was passed amid great applause, Mr. Cass responding in happily chosen terms.

The new president, the well-known proprietor of the Royal Planing Mills, addressed the meeting on being installed, thanking them for the trust reposed in him and expressing his intention of doing all in his power to further the interests of the Exchange.

Messrs. Mackenzie Bros. were admitted to membership.

Immediate steps will be taken to obtain a charter for the Association, also to appoint representatives to the Board of Trade.

New and much more commodious rooms have been secured in Robert Leckies' block at 218 McDermott street, and the Exchange will move into them on December 15th.

Two regular meetings will be held monthly hereafter, the next being held on January 3rd, 1905.

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E. J. Baber, lumber dealer, Boiestown, N. B., has secured an extension of time.

The contract has been awarded for the building of seven miles of railway from River Hebert, on the Joggins Railway, to Minudie. The work is to be completed by the 15th of June next, and will provide the Minudie Coal Company, as well as the Strathcona, Victoria and other coal areas in that region, with a shipping point by deep water at Minudie. The directors and a number of United States shareholders recently visited the property. The Atlantic Grindstone Company is owned by the same parties, and the quarries, which date back to the eighteenth century, are still turning our large quantities of the stone, which has become famous all over the continent.



## A NEW KIND OF CHIMNEY.

In the Stone Trades Journal a description is given of a chimney at Seelbach's New Hotel, Louisville, Ky., built entirely of cement, sand and steel, under the Weber patents, by the Weber steel-Concrete Chimney Co. The height of the chimney is 176 ft. 7 in., and inside diameter 4 ft. 6 in. Up to the offset the chimney consists of two separate shells, the outside being 6 in. thick, and the inner 4 in., separated by an air space of 4 in.—above the offset for a length of 94 ft., it consists of a single shell 5 in. thick. The steel reinforcement of the chimney consists of T steel bars of different sizes, and there are about 18,000 pounds of steel used in its construction, forming a vertical reinforcement by means of a heavier kind of these bars which are encircled again at short intervals by horizontal rings bent of T steel of a smaller size.

The steel reinforcement is designed to be strong enough to take up all the bending forces caused of wind pressure, and the chimney is guaranteed to withstand a pressure of 100 miles per hour—even at this pressure the factor of safety would be four—which indicates the structure would be safe in every respect. This style of chimney will, without doubt, in a short time replace brick and steel, almost entirely, says our contemporary, as its advantages are very great without the consideration of price which is said to be somewhat less than brick. Some of the advantages of these chimneys over those of brick are:—They take less room for erection, and space is money, especially in modern steel plants: they are practically indestructible—gaining in strength the longer they stand; they are perfectly smooth inside, and having a uniform inside diameter, are of the highest working capacity; they are absolutely air-tight and withstand a higher wind pressure; they need no painting or re-painting, and are practically everlasting. One of the remarkable features of this chimney is the proportion between the inside diameter and height, being 1 to 40.—The Architects' Magazine.