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The Canadian
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Toronto NOVEMBER, 1907 Montreal

CHANGE OF OWNERSHIP.

WITH this issue of THE CANADIAN ARCHITECT AND BUILDER it devolves upon the publishers to announce a change of ownership. For the past twenty years this journal has been owned by the C. H. Mortimer Publishing Company. The entire interests and good-will of this company were recently purchased by Mr. Hugh C. MacLean, under whose direction the publication of THE ARCHITECT AND BUILDER will hereafter be continued.

Since its inception THE ARCHITECT AND BUILDER has aimed to promote the true interests of the important profession it represents and to present at all times as complete a history as possible of matters bearing on the architectural and building crafts of Canada. That it has satisfactorily discharged its mission is indicated by a large clientele of advertisers and subscribers, whose numbers are steadily increasing.

What has been accomplished in the past is but an inspiration for future effort. A determined policy of improvement, designed to produce the best architectural journal in America, will be pursued by the new management. These changes cannot be undertaken in a day or a month; they must necessarily be brought about as a process of evolution. Every issue, we hope, will plainly reflect improvement in the reading matter, the advertisements, the illustrations and in typographical appearance.

From advertisers and subscribers we solicit and anticipate a continuance of the support and co-operation which have been so generously extended in the past, and to them we promise our best services.

HUGH C. MACLEAN, LIMITED.

FAREWELL.

IN saying a farewell word to subscribers and advertisers of this journal, the undersigned desires to express appreciation of the kindness and support received at their hands, and to wish them health and prosperity in the future.

C. H. MORTIMER.

ALTHOUGH there are evidences of activity still to be seen in some of the architects' offices throughout the country, it must be admitted that leisure moments are not in the distant future for the profession as a whole. The past summer was extremely promising for late fall work and seemed to imply an interesting period of preparation for the summer of 1908. For the moment, however, these prospects are somewhat obscured by the financial stringency that has affected almost all branches of Canadian industry and compelled prospective builders to deliberate before embarking on undertakings not absolutely essential.

UNFORTUNATELY, many of the larger centres, such as Montreal and Toronto, have of late had an unusual influx of Old Country draughtsmen, for whom there is no work at present, and but little prospect for the future. Many of these have come to Canada, apparently in ignorance of the fact that with the approach of winter the demand for draughting assistance lessens. Consequently, nothing remains for these but to accept such work as is obtainable at the moment. Instances are not unusual where draughtsmen, who are now out of employment, refused earlier in the season to accept yearly contracts, assuming that a long era of good times was in prospect.

INTEREST in the proposed act of incorporation of the Institute of Architects of Canada grows apace and more or less thorough discussion of the favorable and unfavorable features of the project as outlined have now enabled the architects of this country to come to some sort of conclusion as to the probable effect upon the welfare of the craft of the legalization of the act. That the scheme is in the main good and desirable scarcely an architect in the Dominion will deny. It is the outcome of a commendable desire on the part of the Canadian profession to secure in a legally recognized form certain rights which all architects in any country should possess. It aims to make of a scattered and loose body a compact and unified fraternity and to raise the educational and cultural status of a profession which has ever included in its scope men of the very highest intellectual powers of all generations. These broad, tolerant and legitimate claims are perfectly in keeping with the magnanimity which ought always to characterize the architectural profession. Moreover, no government could long stand against them, backed as they would be by the claims of right and justice. But there must be no narrow partizanship, no forcing of the hand of time, no petty selfishness to secure a monopoly of rights, the value of which is questionable and liable sooner or later to lead to discord. It is immaterial who calls himself a doctor, a professor, an artist, an architect. To some men in a mere name there is a rare smack of prestige, but in our enlightened, if commercial, age the insignia of office count for little in comparison with intrinsic merit.

IT is a mistake on the part of those who are in the forefront of the agitation for the incorporation act to spoil what otherwise would be good legislation, and thereby deprive the act of the unanimous support of the Canadian profession, by attempting to prohibit the use of the title "architect," except in the narrowest sense. No fear need be felt by any competent member of the profession that the free assumption of the title by men of inferior training or capacity can be in the slightest degree detrimental to the general body of architects. The public is too well educated to be deceived by charlatans or humbugs in such important matters as the planning of modern buildings. The growing agitation for competent building inspection in towns big and small, which will never be satisfied till a national building by-law is compiled and put into force, will be far more effectual in raising the standard of the architectural profession than any petty agitation for limiting the name "architect" can possibly be. No one thinks of classing the gifted portrait painter or landscape artist with the ordinary journeyman brush hand of the ladder and scaffold brigade. It is not a distinction of terms that is essential; it is that recognition which inevitably comes as the natural right of superior mental endowment.

MOREOVER, compulsory examination by a board of architects is a precarious policy, and the imposition thereby on incoming members of the profession of unworthy and really unnecessary restrictions is a point about which much bitterness will centre. The subject of written examinations is one which in the educational world has probably been the source of more dissatisfaction than any other single phase of that great problem. Written examinations are never a fair test and often are extremely unsatisfactory, even in ordinary academic circles. In architecture they would be a source of endless dissatisfaction as an entrance qualification, and extremely distasteful to a really artistic temperament. Instances come to mind where architects with seemingly little educational advantage have risen superior to circumstances and have given to the world masterpieces of architectural design. Could these men have passed an examination in the heating and sanitation of buildings, the theory of stress or strength of materials? If not, then they would, according to the wording of the proposed act, have been forever ostracized from communication with the select body of Canadian architects, a privilege which is theirs by inherent right and of which the failure to pass an examination should never be permitted to deprive them.

HERE arises a further question. The examination as proposed would turn out—not architects—but building inspectors. Is that what the Canadian architectural profession requires? By no means. Architecture presents three phases, commercial, scientific and artistic. The first two are the primary requisites for the successful building inspector, his knowledge of which an examination can reasonably be expected to test. The last no written test can gauge. It can manifest itself only under inspiration and develop solely by self-criticism and ceaseless striving after the ideal. It is beyond the realm of the mechanical. The artistic mind is not begotten by much study. True, like all else in human nature, it is born in imperfection and must needs be improved by slow processes of self-examination and imitation of the best that the great minds of the past have produced. In our large cities the city architect or building inspector approves all plans before a permit to build is granted. Moreover, during the process of erection the building is constantly under the oversight of the inspector and the architect is thereby afforded assistance in that from which, in many cases, he is glad to be relieved. For the architecture, however, the architect alone is responsible, and in his estimation it is the appearance of the finished building that looms large. There are scores of architects who don't care a straw for the mathematical or scientific aspect of their profession, and who, if it were not for the fact that they are allied with men of practical rather than artistic endowments, could not possibly grapple with the minutiae of material stress and strain. Moreover, it is a question, even if such men cared to apply themselves to the distasteful work of preparing for an examination in mathematical or scientific subjects, whether they would succeed in taking anything like a satisfactory standing. The profession is limitless in its possibilities, and for that reason no narrow check should be placed upon the eligibility for admission of any who might bring into it the inspiration of their genius.

THE great powers which the architectural profession is asking for itself in this act of incorporation are as yet imperfectly understood. The Institute of Architects of Canada, if granted its demands, will have the power of admitting or rejecting candidates and in a measure of deciding who shall be deemed competent to provide for the public safety in matters structural. It is not to a body of his fellow-craftsmen that the architect should be responsible, so much as to a government inspector, who in his turn is guided by a national or international building by-law that would relegate to the realm of the impossible such disasters as have during the past year filled the public mind with distrust of modern building methods. No man, however competent he may appear, should be irresponsible. The very fact of his freedom from oversight is in many cases a man's excuse for carelessness and negligence, and architects should be the last to claim dispensation from criticism or responsibility.

EMMANUEL CHURCH, MONTREAL, QUE.

Saxe & Archibald, Montreal, Architects.

Owing to the growth of the business section in Montreal several congregations have found it more convenient to move from their present localities to more convenient sites in the residential sections. Among this number are the Emmanuel congregation, who are now occupying a very handsome building on Drummond street.

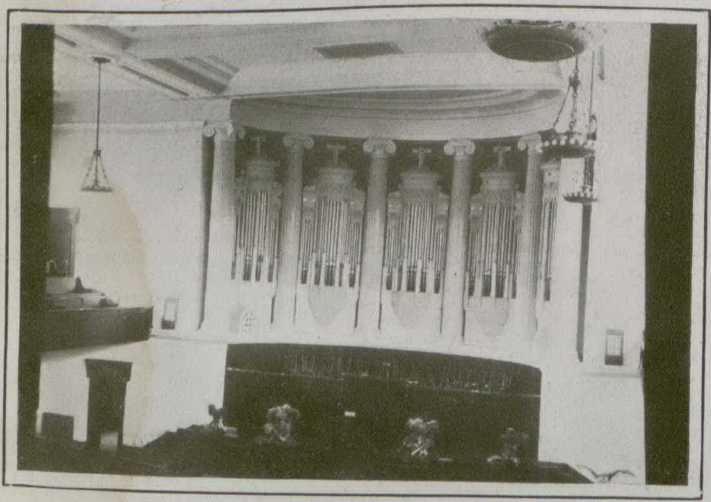
The building operations were begun a year ago last June, the edifice having been occupied since last May. The formal opening, however, took place on Sunday, October 20th. Messrs. Saxe & Archibald, the architects, have given a very successful design in the Greek Ionic class of architecture, the materials being Indiana limestone and a greyish pressed brick, the combination proving a very happy one. The main auditorium of the church has seating accommodation for about seven hundred on the main floor and from three hundred and fifty to four hundred in the gallery, which extends around three sides of the auditorium. The main floor is entered through a large vestibule from three large entrances, the vestibule being furnished in Phillipsburg marble, with paneled plaster ceiling. The woodwork throughout the building is birch stained and polished a dark mahogany. In the interior of the church the same style as the exterior has been successfully carried out.

The main architectural feature of the auditorium is the arrangement of the pulpit, choir and organ case behind. The organ case has been specially designed to harmonize with the architecture of the building and is semi-circular in form, fitting in between the six Ionic columns, which support the ceiling over the choir alcove. The ceiling of the auditorium is treated in a flat manner and divided into large panels with plaster beams. The church proper is well lighted from large windows on each side and artificially by means of ten ceiling lights, each with a cluster of twenty-four lamps, and a series of wall brackets. All the electric fixtures are designed after Greek models and finished in Pompeiin green.

Immediately behind the auditorium is the Sunday School, capable of seating from three hundred and fifty

Emmanuel Church, Montreal, Que.

to four hundred people. To the south of the school is a one storey wing, containing the pastor's study, ladies' parlor, kitchen, coat rooms, etc., while on the north side is a similar wing containing a young men's room, Chinese class room, coat rooms, etc. Accommodation for the managers' library is arranged for in the main building on either side of the choir, and above are two rooms for the use of the choir. The cost of the building is between $90,000 and $100,000.



Choir and Organ Loft, Emmanuel Church, Montreal, Que.

OAK FINISH TO MAHOGANY.

In a case where it was desired to change oak that had been filled and varnished in the natural to mahogany, a recent issue of the 'Painters' Magazine'' presents the following comments in reply to a correspondent, who says that he realizes that the best way is to clean off the old finish and then stain in imitation of mahogany, but that at the same time a good mahogany imitation cannot be had on oak, because of the difference in the grain.

The best effect could be obtained by sandpapering down the old finish, then apply mahogany ground color, and grain in imitation of mahogany, finished with varnish. Still, if this method is too expensive and if the veining of mahogany is not an essential feature, we should say that the old finish should be well cleaned down, using various grades of sandpaper or steel wool. A fair imitation of mahogany could be obtained by using a strong stain, which may be made from Bismarck brown, dissolved in denatured alcohol, to which a little shellac varnish must be added for binder, or it may be made up as a water stain, by mixing colors ground in water, thinning same with stale ale or beer. The proportions are about 16 parts by weight of burnt sienna, 3 parts rose pink and 1 quart madder lake. Still another quick drying stain may be made by mixing 2 pounds of burnt sienna in japan and 1-2 pound rose pink in japan, thinning the mixture with pure spirits of turpentine and a few tablespoonful of rubbing varnish. The last named stain would perhaps work best in your case, as it would most effectively hide the oak grain and by working deftly you may be able to come closer to the mahogany effect than by any other means.

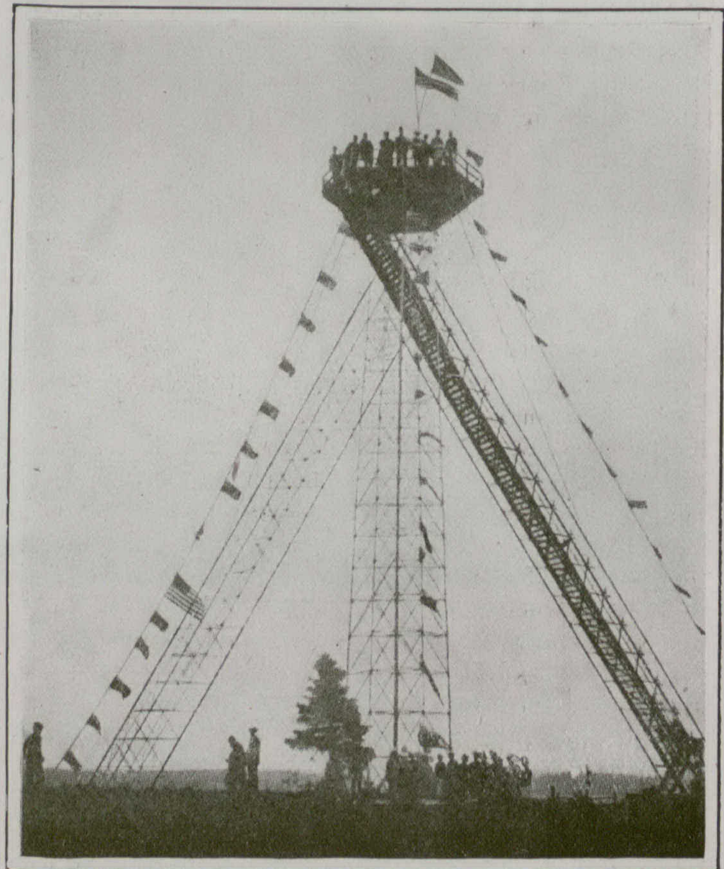
A NEW PRINCIPLE IN ENGINEERING CONSTRUCTION.

A structure built up of tetrahedrons has been used in the erection of a lookout by Alexander Graham Bell, the inventor of the telephone. Such a structure, we are told by T. W. Baldwin, who describes it in the "Scientific American" (New York, October 5), is a departure from ordinary engineering practice, from its general appearance down to the minutest details. We read:

"Dr. Bell has used the tetrahedral principle in the construction of his man-lifting kites for some time, finding that it gives a perfectly braced structure of great strength and lightness. It occurred to Dr. Bell that this system might be used to advantage in engineering work on a large scale, and this tower is the first iron structure built on this principle.

"The unit cell, which is the basis of the whole terahedral system, is the framework or outline of a solid having four sides, as the word tetrahedron implies. The solution of an old trick of making four triangles out of six matches may serve to impress the idea on the minds of some. This is an impossibility if the attempt be made to get them all in one plane, but the moment it occurs to one to make a triangle first and then a tripod of the three others above it is very simple indeed.

"The resultant structure, if the sticks are fastened at



The Completed Tower on the Opening Day.

the four corners, gives a regular tetrahedral cell, which is the unit of construction analogous to the brick in ordinary building. This miniature truss, made of four triangles in different planes, gives a framework of wonderful stiffness and strength. It also lends itself easily to combinations having the same good qualities to a remarkable extent.

"Utilizing this principle, the cells used in the tower were made of ordinary half inch galvanized iron piping, secured at the four junction points by cast iron corner pieces, into which they screwed. The piping was cut into lengths of 44 3-4 inches, allowing 5-8 inch thread in each casting, when the cell measured exactly 48 inches from tip to tip of the castings. One of these cells was subjected to a compressional strain of 4,000 pounds without showing the least sign of failure."

Tetrahedral Units from which the Tower was Built.

The tower, we are informed, is built up of 260 of these cells, and rises about 70 feet above the ground. It rests on three concrete foundations 72 feet apart in the form of a triangle. The method of erecting the large tripod structure above them illustrates a distinct and useful feature of the tetrahedral system. Mr. Baldwin writes:

"Employing ordinary methods, its erection would have been very expensive, necessitating an immense amount of staging and falsework; but upon the cellular system of construction it was very simple, and no staging or falsework of any kind whatsoever was required. Practically all the work was done on the ground, the workmen having all the advantages of terra firma until the last section was completed.

"The plan of erection was a simple one. The leg containing the stair and one of the other legs were first built along the ground, forming a large V. In this position the foot of each leg was securely fastened by a hinge to its foundation; the hinge forming an axis, about which it was free to turn if raised at the junction of the two legs (which corresponds to the point of the V., and was directly above the third foundation). A system of jackscrews was used to do this, and the third leg was built up section by section."

A few of the distinctive advantages of this method of construction are thus stated:

"First.—The rigidity of the structure was remarkable. This was well demonstrated by testing the two legs which were built along the ground as a beam. In a position very slightly inclined to the horizontal, 72 feet between supports, the structure showed a deflection of only about 3-8 inches.

"Second.—The whole tower is less than five tons in weight, and is surprisingly strong for the material employed, due to the support afforded to the compression members every four feet throughout their length. A very long through member may thus be safely treated as a comparatively short post.

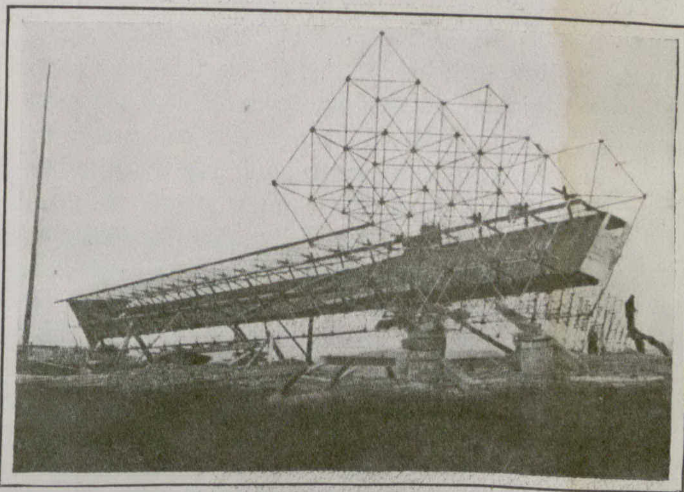
"Third.—The inspection or even complete renewal of such a structure could be easily acomplished, as no one member is indispensable to its support.

"Fourth.—The material can be rapidly assembled, offering special advantages for temporary structures of various kinds.

"Fifth.—The method of construction reduces the amount of falsework, and in some cases would eliminate its use altogether.

"Sixth.—A very small amount of skilled labor is necessary for good work.

"These points appear to be some of the chief ones which make the application of the tetrahedral principle



Two Legs Completed and Ready for Lifting.

of construction to engineering work on a large scale well worth the consideration of all interested in the subject."

MODELS OF OLD LONDON.

What is likely to prove a very interesting special exhibition is in preparation for the Franco-English exhibition next year. This is being prepared by a London architect, Mr. J. B. Thorp, and is to include models of Old London Bridge, Old St. Paul's, the entrance to the Fleet River, Westiminster Hall and other restorations in model form; these are to be placed in a series of compartments under special lighting, and thus form a series of illustrations of some of the original features of mediæval London. The model of Old London Bridge, which is completed except for one or two slight modifications, is made to a scale of 1-8 inch to a foot, and has been admirably done. The models are being built up in parts, in a solid wooden construction, so as to admit of being packed up and exhibited at different places. It is hoped that they may be interesting, especially to Colonial visitors, as illustrations of the mother-city from which all our Colonial development has sprung.

GREEK TEMPLES AND PILE DWELLINGS.

That the Doric temple of ancient Greece derived its form from the still more ancient pile dwelling inhabited by the lake dwellers of Central Europe, is an interesting theory advanced by Dr. Paul Sarasin, of the Berlin Anthropological Society, in a recent issue of the ZEITSCHRIFT FUR ETHNOLOGIE. Our quotations, below, are from a review by Prof. Alexander F. Chamberlain, of Clark University, in "The Popular Science Monthly" (New York, November). It has been suggested more than once that the Greek temple, once regarded as absolutely unique and original, is really a glorified imitation of some previously existing wooden structure. According to Professor Fuchs, this is the house of the rich cattle breeders of the Central European plateau. Professor Chamberlain, while entertaining no doubt that the marble temple had a wooden prototype inclines rather to the less local theory advanced by Sarasin, which he sets forth as follows:

"According to Sarasin, the Greek temple with columns 'is a highly idealized and conventionalized expression of the original pile dwelling'—the columns are the piles, the ornamented superstructure the dwelling fixed upon them, the triglyphs the window strips, the metope the partition, etc. In order to fully appreciate the merits of Sarasin's theory one must bring up before the mind the wooden forerunner of the Doric peripteros: 'The columns were wooden pillars, the architraves wooden beams, the triglyphs wooden strips, the metopes boards with carved ornament; the wooden roof was covered with mud-thatch, and the wooden ridge ended in a bird made of cut boards (the acroterion).' Reducing the height of the columns a little, and increasing somewhat that of the superstructure, one has a building strikingly similar to, and in many respects identical with, the pile dwelling. The figures of the temple of Poseidon at Paestum and a pile dwelling in Central Celebes show this very clearly. And it should be said that the pile dwellings of Indonesia, occurring on land as well as in water, represent better a 'pile dwelling period' than the 'reconstructed' lake dwellings of Switzerland. During the later stone age and the bronze age, Dr. Sarasin thinks, moreover, pile dwellings of a sort comparable with those to be met with in Celebes were found over a considerable portion of Europe, not merely in lakes, rivers, etc., but also in swamps and on the dry land . . . In Greece and many other parts of the then known world, the original human dwelling was the house on piles, which, therefore, was also the first dwelling of the gods, and the first temple—the orthodox temple, as Sarasin phrases it—was a pile dwelling.

The basis of the Ionic and Corinthian columns, Professor Sarasin thinks, is to be seen in the stones placed under the piles to prevent decay. The so-called echinus, the lower, round portion of the capital, corresponds to a similar dish of stone or wood placed on the piles as a protection against rats, etc. The abacus is a rest piece for the beams on the middle of the disc. The so-called proto-Doric columns of Egypt which lack the echinus, go back, Sarasin suggests, to a pile dwelling without such protective discs. The perpendicularity of Ionic and Corinthian columns, as well as the slight upper inclination of the Doric, are referred to the various conditions of piles and their arrangement. To quote further:

"The so-called aedicula, according to Sarasin, is derived, not from the tent, as some have supposed, but from the small shade roof seen in front of many Celebean pile dwellings, under which the occupants sit protected from sun and rain. The 'wall temples' and the cellae are easily developed from the open space under the dwelling in the pile houses by building in between the columns—the prototypes are seen in the Celebean houses. The transformation of the upper part of the pile dwelling, when no longer used for habitation, into the superstructure of the Greek temple with its ornamentation (the frieze has its forerunner in the pile dwellng's wooden carvings, etc.) was easily possible with an artistically minded people. The substitution of stone for wood, Dr. Sarasin thinks, may have been an Egyptian invention.

"If the present writer may be permitted to add to the ideas set forth by Dr. Sarasin, he would like to suggest the possibility of the existence of pile dwellings in caves (such have been reported from prehistoric Sicily) having had something to do with the development of the original wooden pile dwelling into the stone temple.

"The theory of Sarasin has the advantage of proposing as the original prototype of the Greek temple something that was more or less cosmopolitan, a building that was common and natural over a large portion of the prehistoric world, and not some merely 'local' model. As Dr. Sarasin points out, the pile dwelling served also as a prototype of the Chinese and Japanese temples (in this case, since they are mostly constructed of wood, the likeness is even more striking); likewise in farther India, Hindustan, Arabia, Asia Minor, Egypt, etc., and even in prehistoric America. Moreover, not merely the 'long temple' but the 'round temple' goes back to the pile house, as may be seen from the round pile dwellings ascribed to the land of Punt, in Egyptian pictures dating from about 1500 B.C., which are practically identical in shape, etc., with pile dwellings still to be seen in the Nicobar Islands and in certain parts of Africa.

"Taken altogether, Sarasin's essay is one of the most interesting and suggestive contributions to the literature of the evolution of architecture that have appeared in a generation, and it illustrates the way in which the anthropological investigator can assist in the solution of many puzzling problems, which meet with no successful interpretation at the hands of the closet student or the biased classicist. Dr. Sarasin has given but another proof of the fact that the highest genius of the ancient Greeks lay not in inventing great or beautiful things out-of-hand, but in idealizing, beautifying, and harmonizing what had already long existed in common and widespread forms and fashions. And to that great art no human race is utterly a stranger; and many of them are much nearer the Greeks than most of us believe."

THE OTTAWA GOVERNMENT BUILDING COMPETITION

Designs Submitted by Sproatt and Rolph, Toronto.

Much favorable comment has been passed upon the designs submitted by Messrs. Sproatt & Rolph, Toronto, in the recent Ottawa competition, and we consider that a study of these will be of interest to many of the craft in Toronto. The designs are executed entirely in ink and are particularly striking in appearance. The plans on page 18 can be understood only by reference to the cross section design on page 16, which is the key to the floor scheme of the Departmental Building. The bridge sketch is a particularly tasty bit of work. Accompanying the designs was the following description:

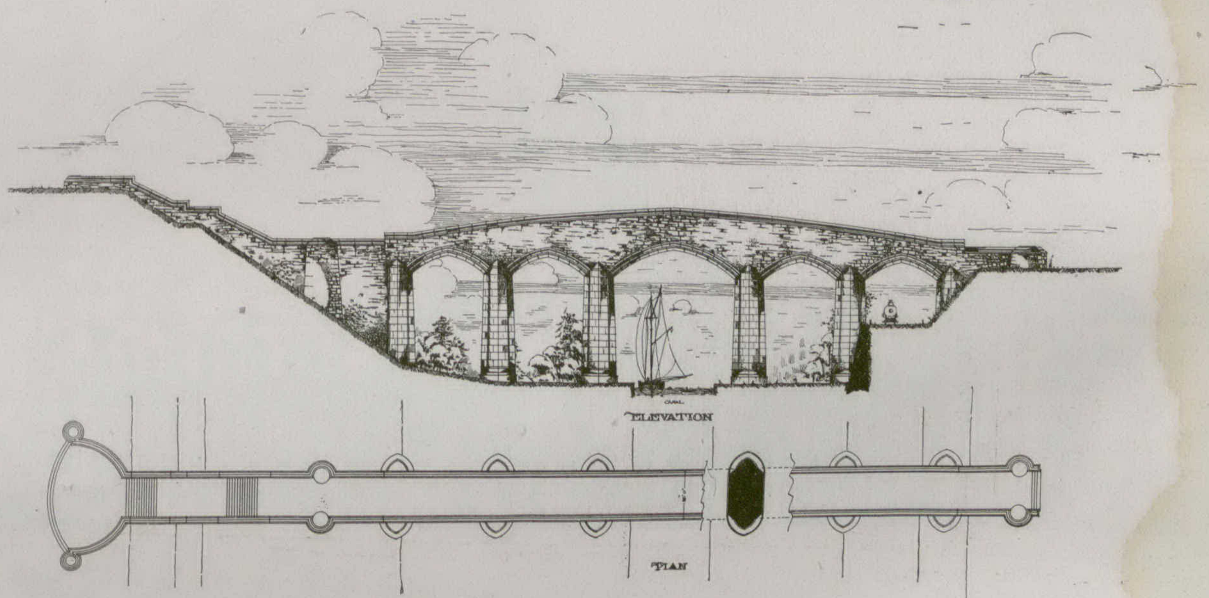
We consider that we have taken unique advantage of the location of the buildings on the property. The view of these from Major's Hill at once justifies the plan. In all cases the short axis of design is a corridor or passage through the building from front to front. In the Departmental Building, the plan is such that each floor plan can be divided into separate departments if required. In the Justice Building the arrangement of the Supreme and Exchequer Courts is such that there can be no confliction or confusion, and the library is placed central. We have made only a few general remarks (here attached) upon the plans. The elevations have purposely been kept simple and dignified. We consider the detail and materials to be handled will give all the effect of richness, etc., desired.

Construction.—The general construction of the buildings throughout wil lbe what is known as fireproof, including floors, walls, partitions, roofs, etc., the system of construction to be of steel, armored with terra cotta, and the floors of either concrete or terra cotta lumber. In all electric work, all wires to be run in steel conduit, and every care taken in all trades for best results, viz., heating, ventilation, plumbing, etc.

External Appearance of Buildings.—The idea of the whole plan is to have a color scheme harmonizing with the present buildings, while all are to be built of Nepean or a similar native stone, and with all the trimmings and all cut stone work out of a grey lime or sandstone. Platform and steps will be of grey granite.

Location of Buildings.—Both buildings as shown on block plan are on the large allotment, the north lot not being used. The location of the bridge is also shown. The result is in appearance a uniformity of height viewing the building from either Major's Hill or Wellington street. The retaining wall, shown at north and west of the Departmental Building, will add to the appearance and serve the purpose of giving a level plateau and making the character of the building strong from the approaches instead of showing weakness, which would be apparent if ground and building fell away from the level.

Style of Building.—Both the Justice and Departmental Buildings are of the same style, perpendicular Gothic, though there is a considerable difference in their character. We believe the same to be an advantage, with which in view the whole design has been carefully studied. We also consider that Gothic is the only style of architecture that can be used to finish the work for the amount of the appropriation, and that in Classic or Renaissance the problem would be impossible.

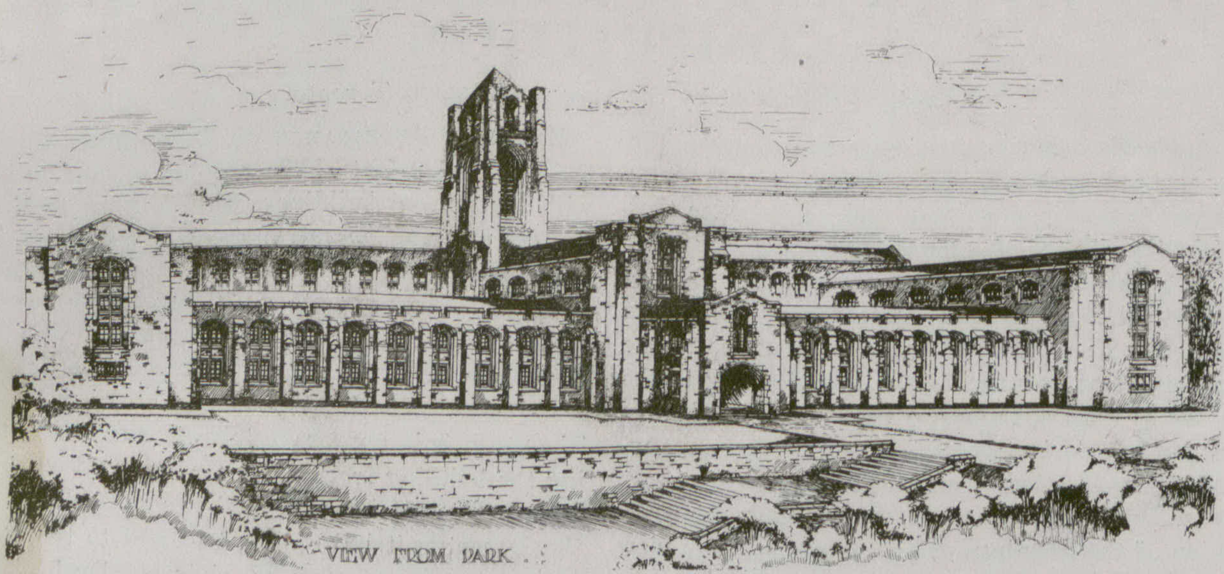


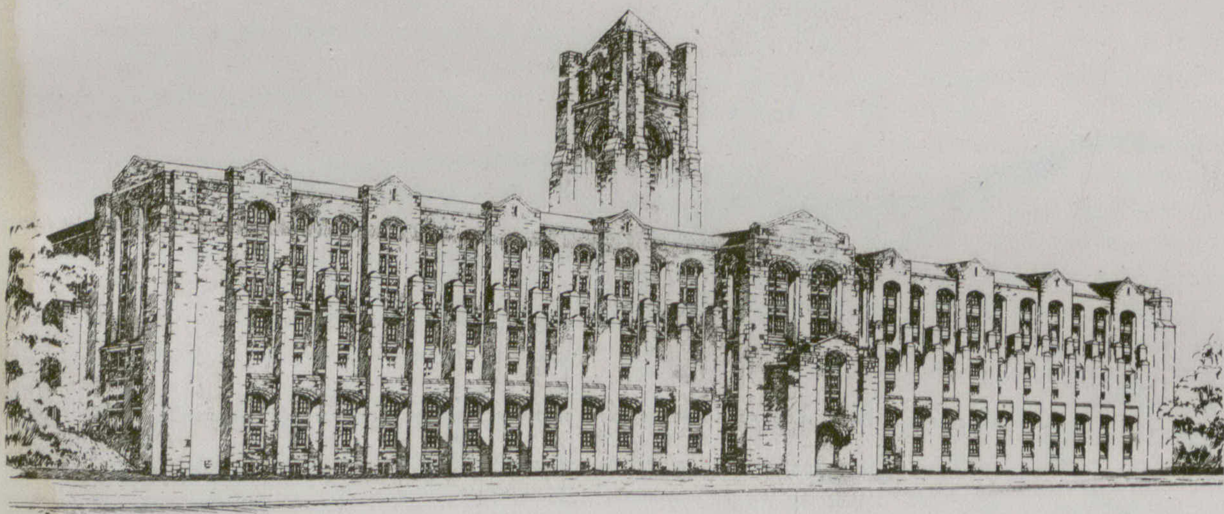
Design for Bridge, Sproatt and Rolph, Architects.

JUSTICE BUILDING.

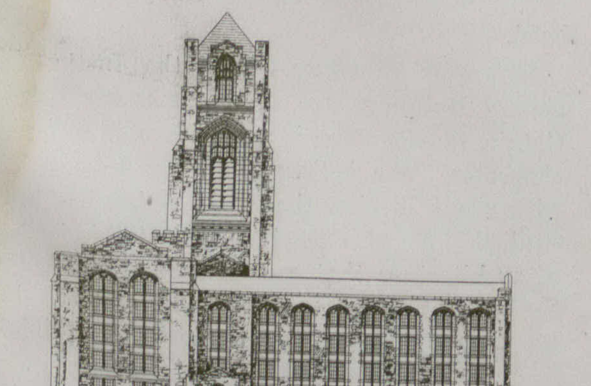
Basement.—Given over for storage and heating systems, etc., with the exception of the portion taken up by the Sussex street entrance and stairs to the main floor.

Ground Flour.—The whole occupied by the Ministers' Department. There is here the 20,000 square feet

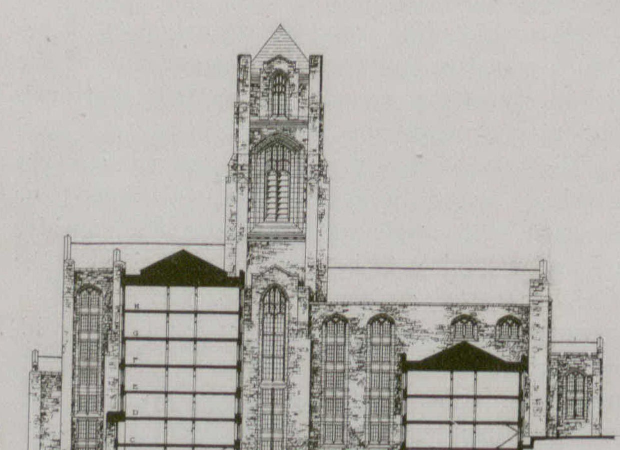




PERSPECTIVE VIEW FROM SUSSEX STREET.

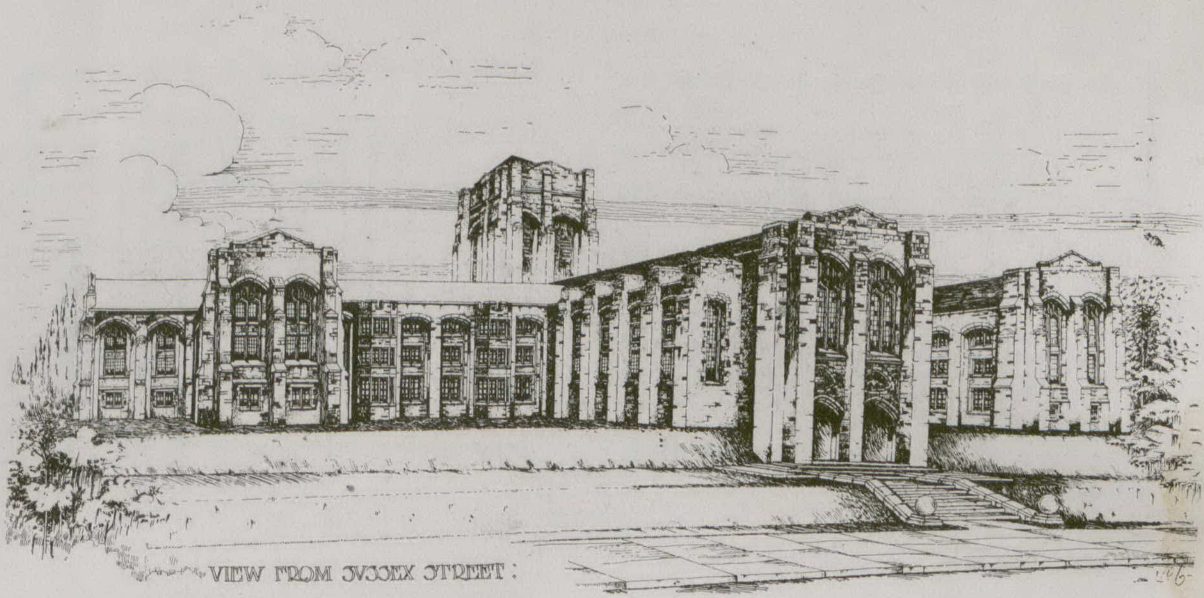


END ELEVATION.

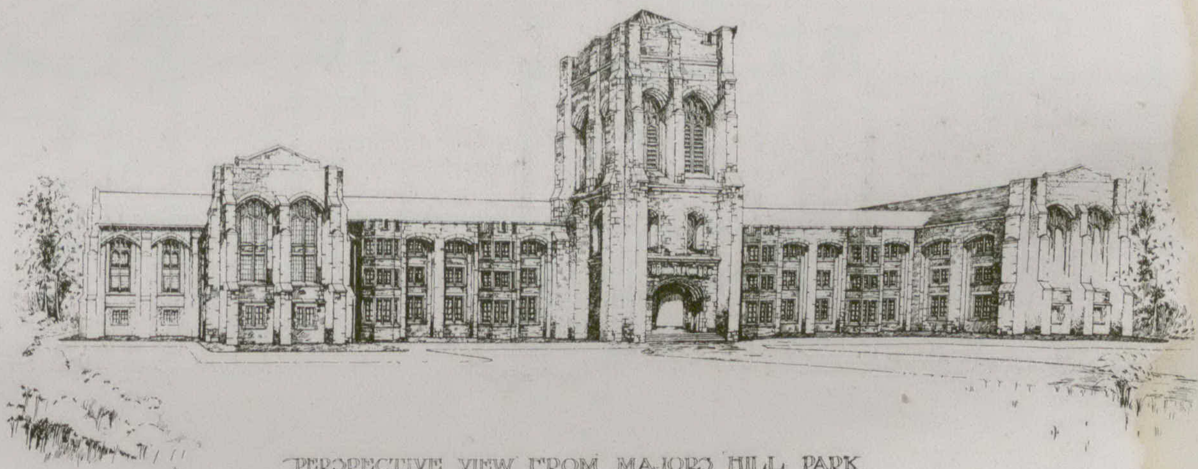


CROSS SECTION.

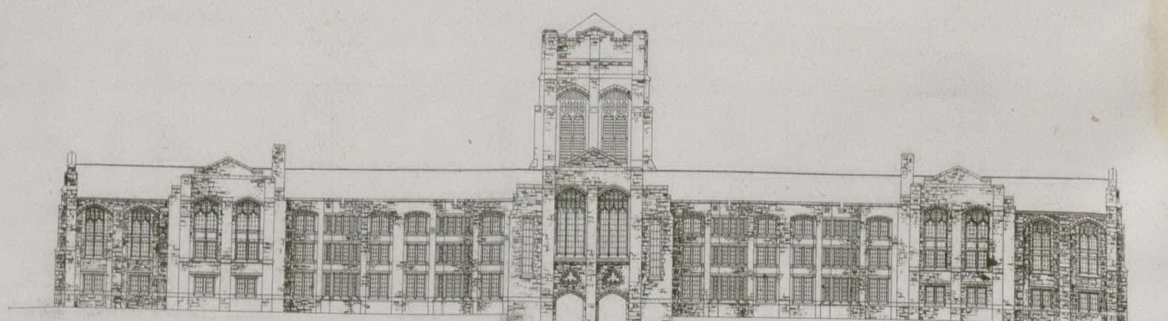
Departmental Building—Elevations. Sproatt & Rolph, Architects.



VIEW FROM SUSSEX STREET.

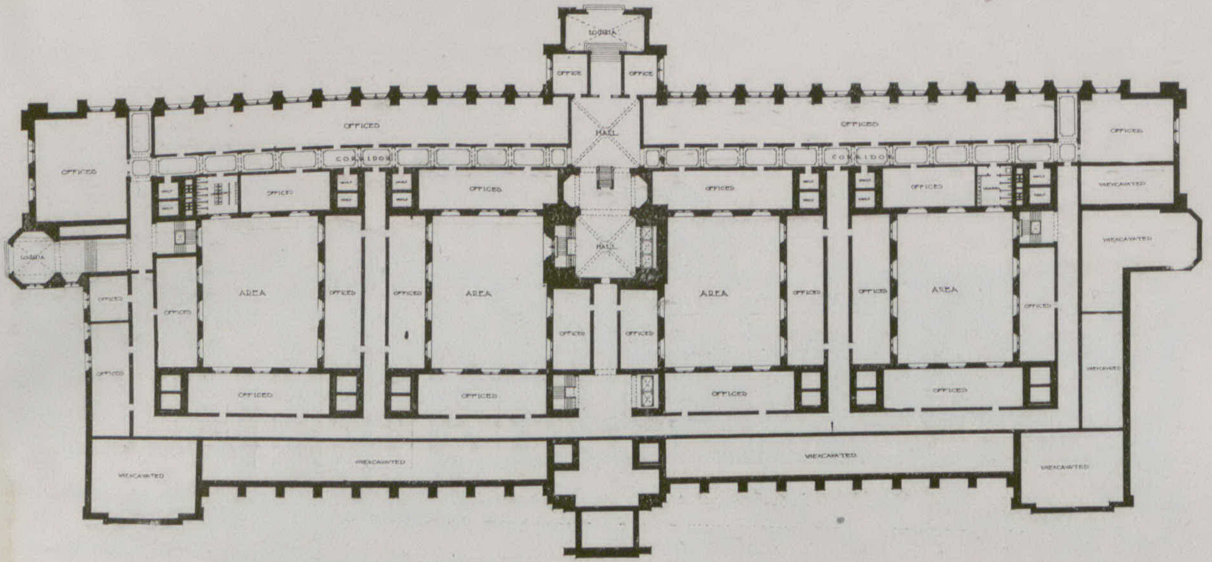


PERSPECTIVE VIEW FROM MAJORS HILL PARK

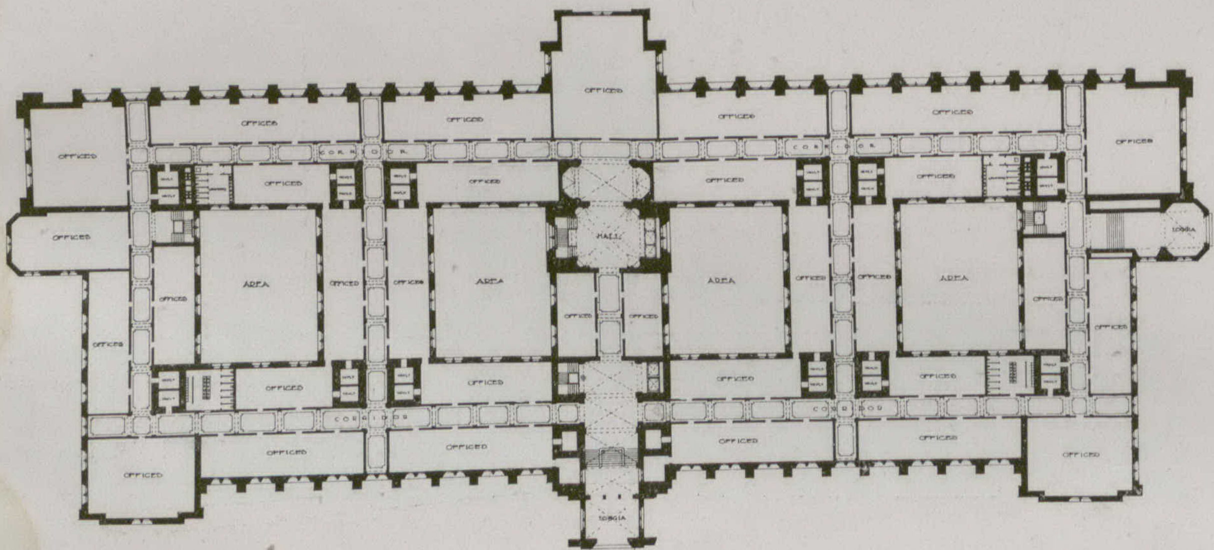


ELEVATION TOWARDS SUSSEX STREET.

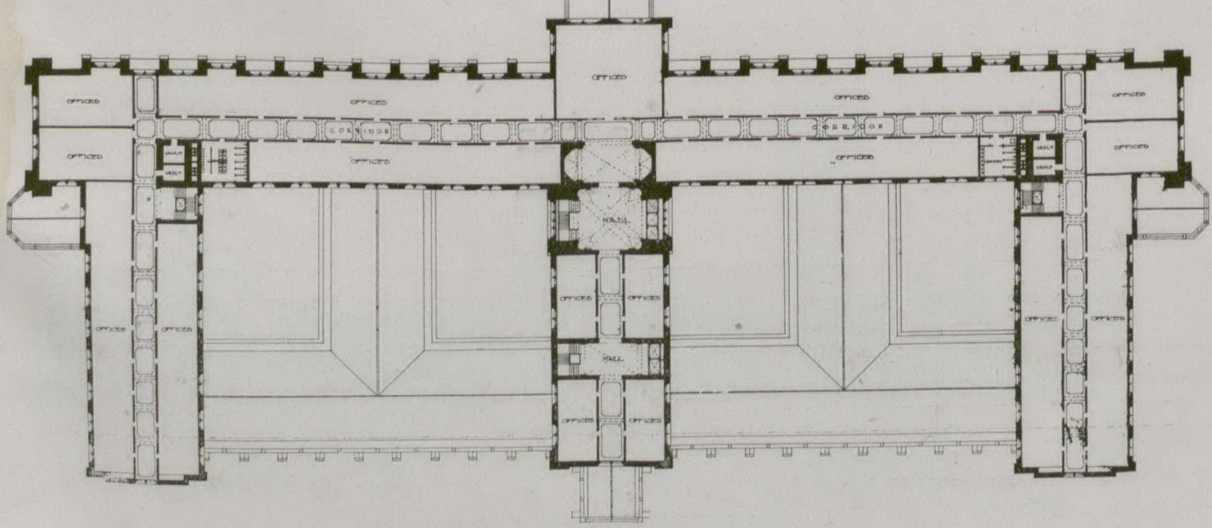
Justice Building—Elevations. Sproatt & Rolph, Architects.



PLAN AT B.

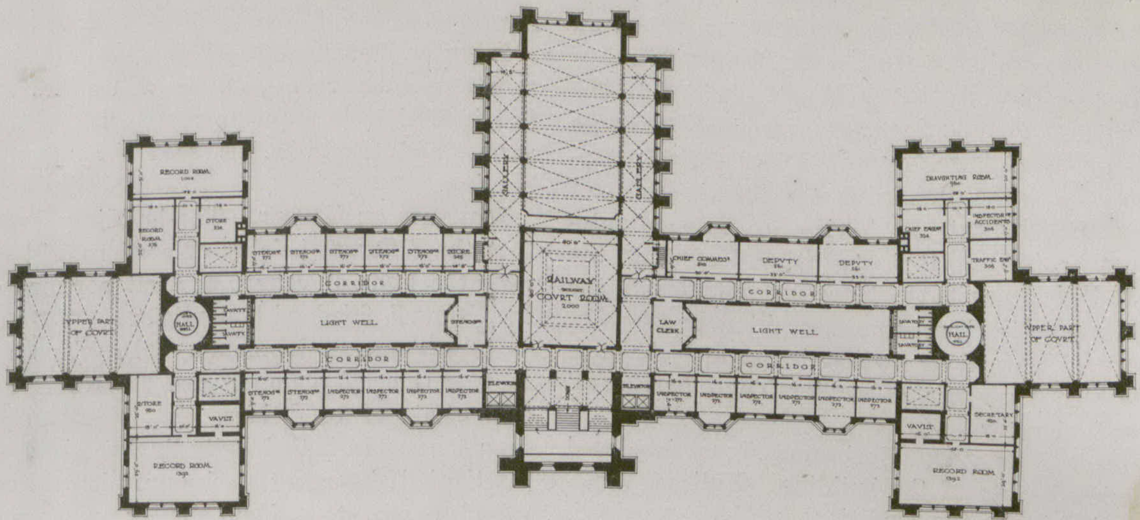


PLAN AT D.

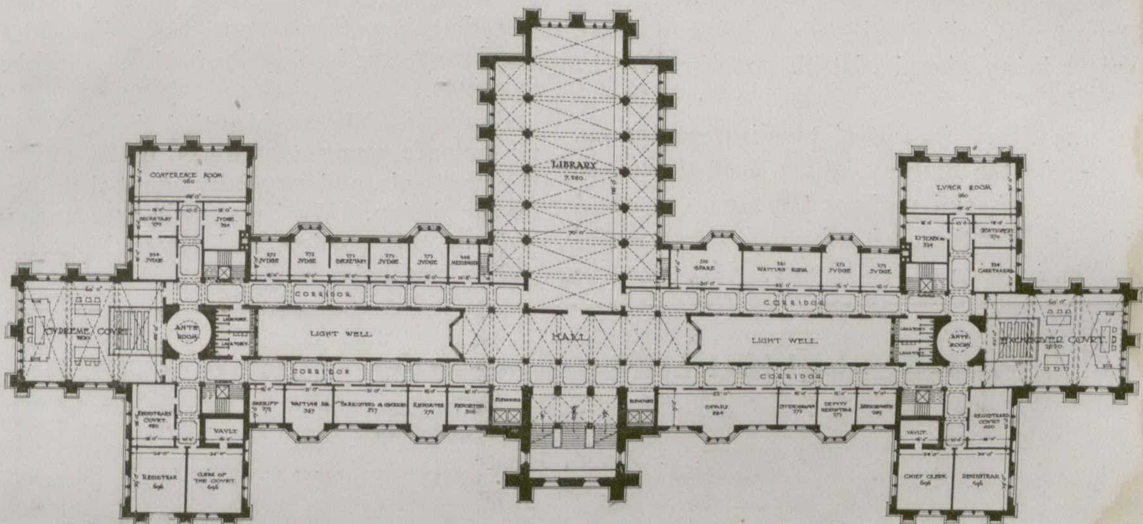


PLAN AT F.

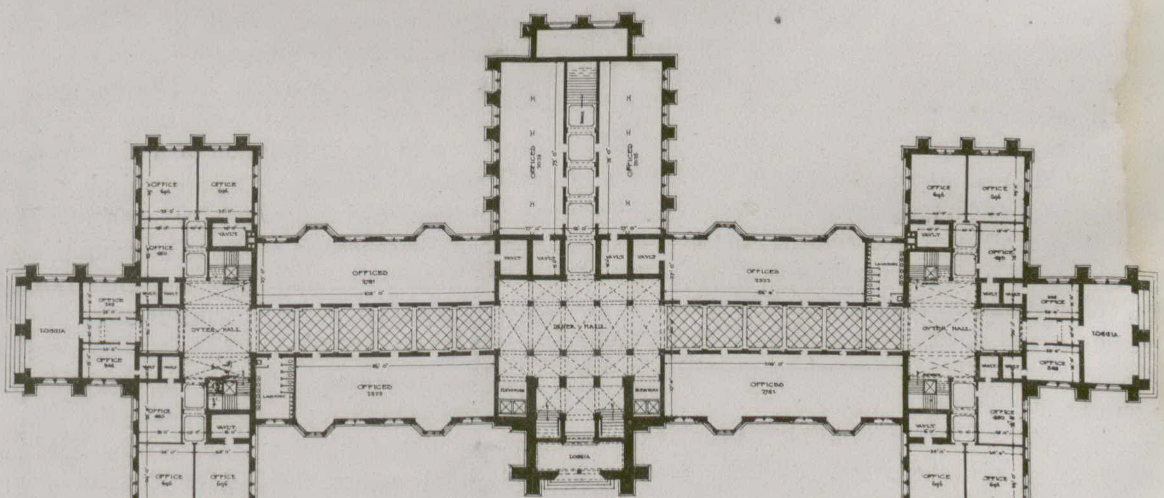
Departmental Building—Floor Plans. Scale 1-16 inch = 1 foot.



SECOND FLOOR PLAN.



FIRST FLOOR PLAN.



GROUND FLOOR PLAN.

Justice Building—Floor Plan. Scale 1-16 inch = 1 foot.

of floor area required by the conditions. The longitudinal corridors are lighted by skylight, as shown on section and side elevation of Justice Building (see cuts).

FIRST FFOOR.—The Supreme Court is planned in the left-hand wing of the building, and is so placed that the Judges' Department is self-contained and entirely separate from either the Public or the Barristers' and Councillors' Department, all having a common anteroom placed centrally. It is to be noticed that the judges have their separate corridors and entrance to the court room, as also the barristers, councillors and public. The judges also have their own staircase and elevator. The public would use the councillors' and barristers' staircase and elevator.

EXCHEQUER COURT.—The Exchequer Court is placed in the righ-hand wing of the building. Full accommodation as called for in the conditions has been provided, also stationery store and caretaker's rooms in addition. Owing to the symmetery of the plan, spare rooms are compulsory and four are shown.

SECOND FLOOR.—The second floor is occupied by the Railway Department, all requirements being covered, the court room being placed central, opposite to the library.

LIBRARY.—The libary is central to all Departments, and is accessible by the Railway Department at the gallery level. A special, and perhaps the most important architectural feature of the whole scheme, is the proposed treatment of the interior of the library. The possibilities must be obvious to the judges. The area of the library floor is 7,300 square feet without the galleries.

INTERIOR TREATMENT.—The interior treatment of all corridors, court rooms, library and offices will be dignified in design as requisite to the use of the individual rooms, and the materials used throughout will be in keeping.

LIGHTING OF COURTS.—The buildings are designed so that the different heights of sections will not interfere with the light of courts, and all portions of buildings will be well filled with daylight.

DEPARTMENTAL BUILDING.—The plans and sections show scheme of planning and the result covers the requirements of conditions, viz., 300,000 square feet of floor space. In both longitudinal sections of this building the half basement stories are planned only for caretaker's rooms, storage and similar purposes.

BRIDGE.—The bridge is simple, dignified and monumental, as called for in the conditions, and is in keeping with the rest of the designs. Special attention has been given to the existing slopes of the ground, steps being placed at the entrance from the Parliament Hill side, going down to the level of the bridge, as will be seen by the drawings.

GROUNDS.—We consider that the north portion of the present arrangement of walks, paths, etc., is suitable as it now stands, and especially adapted to the character of Gothic design. We have made as few changes as possible of this portion, and have planned the southerly end to harmonize.

McDonald Agricultural College, Saint Anne de Bellevue, Que.

HUTCHESON & WOOD, Montreal, Architects.

The large MacDonald College at Saint Anne de Bellevue, the architects of which are Messrs. Hutcheson & Wood, is now in working order. The college overlooks the Ottawa river, 20 miles west of Montreal, and comprises 561 acres, which have been arranged to form three main areas: First, a campus with plots for illustration and research in grains, grasses and flowers, comprising in all 74 acres; second, a small cultural farm of 100 acres for horticulture and poultry keeping, and thirdly, the live stock and grain farm of 387 acres.

MACDONALD COLLEGE.

The buildings on the campus are of fireproof construction. The walls are of brick and cement; the beams and rafters being of steel and the partition walls of rows of terra cotta. The roofs, as well as the floors, are of reinforced concrete and covered with tiles. The arrangement of the buildings allows of spacious courts between them also on the front, sides and rear, so that every room has abundance of light. Every building is provided with a complete system of ventilation, whereby fresh air (warmed in winter) is furnished to every room. The buildings are heated with steam, lighted with electricity and supplied with water from the college power house.

MAIN BUILDING.

The grouping of the college buildings makes this the centre, as around it stand the residences for men and for women and the laboratories for the sciences. In a northerly annex of the main building, and leading off the main hall on the ground floor, are the reading room and library, which are admirably adapted for study. Above these is the Assembly Hall, where every day students will gather at the noon hour. The library has stack room accommodation for about 13,000 volumes.

The assembly hall has a seating capacity of about 650 persons, and the installation of a pipe organ will make it well adapted for concerts and recitals. In this building are also included the school for teachers and the school of household science, as well as the administration offices.

The Biology-Bacteriology Building lies to the northeast of the Main Building, and is connected by a covered corridor. It is 172 feet long, and from 72 to 86 feet wide and two storeys high. The department of Biology occupies half of the building. On the first floor are the physiological laboratory, 48 feet by 28 feet; the histological laboratory, 42 feet by 28 feet. On the second are the elementary entomological laboratory, 33 feet by 26 feet; the advance entomological laboratory, 28 feet by 28 feet; the office for the lecturer, two research rooms, a store room, a large lecture room, a museum and rooms of photography.

The department of Bacteriology occupies about one-half of the building. The rooms have high ceilings and are well ventilated and lighted. The windows of the rooms in which microscopes are used are furnished with a lower sash of ground glass, in order to afford an even illumination.

The floors of most rooms are of maple, but those in which water is used are of colored cement.

On the first floor are an office and private laboratory for the professor of bacteriology, and a large elementary laboratory seating fifty students. A large preparation room opens off this laboratory. A fully equipped autopsy room adjoins the animal house.

Dairy and soil laboratories, each about 30 feet square, are well equipped for instruction and research along the lines mentioned.

On the second floor there is a well equipped laboratory for twenty advanced students, and, adjoining it, are all necessary offices, etc. A suite of three rooms for photographic use, including studio, lighted overhead, a large room for museum purposes and a lecture amphitheatre, seating 180, are used in common with the department of biology.

The Chemistry and Physics Building is a two storey structure, 172 feet long by 72 to 82 feet wide, lying to the northwest of the Main Building and connected by a covered corridor. The basement is well lighted and ventilated, and is sub-divided into large rooms, which may be used for laboratories as required. A large amphitheatre lecture room on the second floor is used by the two departments in common and has seats for 175 students. Adjoining the theatre are rooms for the preparation of lecture experiments and for storage. The department of Chemistry occupies about half of the building. On the main floor are the professor's office and private laboratory, supply room for apparatus, etc. The elementary laboratory is a spacious room, 40 feet square, with desk accommodation for 75 and hood accommodation for 40 students.

The dairy laboratory has accommodation for 24 workers, while the advance laboratory will hold about the same number when necessary.

On the second floor, in addition to the lecture room and preparation rooms, are smaller class room laboratories for organic chemistry and food chemistry and the office of the assistant professor, etc.

The other half of the building is occupied by the department of Physics. On the first floor are a soil laboratory, 48 feet by 28 feet; a mechanics' and apparatus room, 42 feet by 28 feet, and an office for the professor and his private laboratory. On the second floor are an elementary laboratory, 60 feet by 28 feet, an advanced laboratory, 40 feet by 26 feet, an office for an assistant, two research rooms and a large lecture room.

The Agricultural and Horticultural Building occupies a prominent position to the northeast of the Biology and Main Buildings. It faces the west and has a frontage of 194 feet. The north wing is given over to home dairying, the south wing to horticulture and the central portion to agriculture, livestock, cereal husbandry and farm machinery.

In connection with the department of live stock there is a large octagonal judging pavilion, 92 feet by 44 feet.

The Poultry Building lies to the north of the Agriculture-Horticulure Building. The main portion, 70 feet by 40 feet, is two storied and has a roomy basement. The western annex furnishes the brooder house and the eastern annex a series of pens for the chief breeds of fowl.

The women's residence has accommodation for 225 women. It contains also reception rooms, a music room, a large college dining hall, 100 feet by 60 feet; a gymnasium, 100 feet by 60 feet; a swimming pool, 60 feet by 27 feet, bath rooms and lavatories. It is connected to the Main Building by a covered corridor. It also contains kitchens, bakery, refrigerator rooms, serving pantries and servants' quarters.

The men's residence corresponds in architecture and in plan of rooms to the women's residence, and is on the opposite side of the campus. It has accommodation for 175 men, also reception rooms, bath rooms and lavatories, a gymnasium and a swimming pool.

The main farm comprises about 387 acres, and is in a good state of cultivation, well drained and provided with well built roads. The cattle stables have room for over 80 milch cows and 100 young animals.

The small cultivation farm consists of about 100 acres, devoted to productive works, etc. On this farm is a commodious brick barn for storage purposes.

The most imposing view of the college is from the riverside, and the architecture, being of a free type, harmonizes well with the surrounding countryside. It has been a large problem and seems to fulfil its purpose admirably.

MONTREAL NOTES.

So far the volume of business done this year in Montreal has been very satisfactory, and the aggregate is quite up to that of last year.

The demand for building material has kept dealers busy and fully supplied the mills and factories with work. In some cases increases in price have caused inconvenience, while in some instances actual losses have been sustained. It is expected that for next year a general readjustment will have to take place.

The increase in the cost of living has created a demand for more wages, but during the year Montreal and district have been almost free from strikes and labor disputes.

Branch banks continue to spring up in the city and vicinity, one of the latest being for the Royal Bank of Canada at the corner of Sherbrooke street and Victoria avenue, Westmount. The two elevations are treated in a simple way, the banking room on the ground floor being emphasized with large windows between small pilasters, while above the entablature is a small attic, containing apartments for the use of the manager. The exterior is built entirely of Roman stone. The composition is good, although perhaps appearing a little stunted owing to its resting on a very small base. Besides the main hall there is a ladies' room as well as the manger's, and other necessary offices. The safes are situated in the basement, together with a large book room and lavatories. The main entrance is on Sherbrooke street and leads directly into the banking hall. Mr. H. C. Stone is the architect. The contractors were Messrs. John Stewart & Company, the fittings being supplied by the Canada Office & School Furniture Company. The building is heated with hot water, and lighted by electric light.

Down town the number of new banks is notable, so much so that we hope to publish soon illustrations and details of the chief ones.

The new branch post-office on St. Catherine street is certainly a striking addition to the architecture of the thoroughfare. It is situated near University street, and is a most convenient place for the growing number of business premises in the locality. It has a frontage of fifty-one feet and a depth of ninety feet, and is three storeys in height. The base of the building is of granite and the rest of the front of Nova Scotia sandstone of a very pleasing shade. On the ground floor are two entrances, one for the public and one for the offices on the other floors. The second and third floor windows are spaced between four Greek Ionic columns and generally the whole facade is treated in the same classic manner, making an imposing building. The ground floor is to be used entirely for public purposes and working rooms, while the two upper floors will be occupied by the postmaster. The construction is steel with terra cotta partitions and floors, the interior being finished in oak and plaster. The architect is Mr. Maurice Perrault, acting jointly with Mr. D. Ewart, chief architect of public works at Ottawa.

OBITUARY.

By the accidental upsetting of a canoe in Lower Darnforth Lake, Freedom, N.H., on September 22, resulting in the unfortunate death by drowning of Mr. Ernest A. Machado, of Ottawa, a very promising architectural career has been cut short. Mr. Machado was born in Manchester, Mass., on June 30, 1868, the son of Juan F. Machado, of Puerto Principe, Island of Cuba, and Elizabeth Frances, daughter of Beniah Jones, of Methuen, Mass. His father's family was one of the oldest and best known families of Cuba, having been identified with its affairs and history from the time of Ferdinand and Isabella. On his mother's side his family was similarly identified with Massachusetts from the time of its settlement, and was related to the Bradfords, Websters, Belknaps and other families prominent in New England's history.

The Late E. A. Machado, Ottawa.

Mr. Machado was educated at the Salem (Mass.) High School and at the Massachusetts Institute of Technology, graduating from the Architectural Department of the latter in 1890. While in the Institute Mr. Machado received several prizes for architectural drawings and designs, as well as for artistic skill in photography. Some of his work formed part of the exhibit of the Institute at the World's Fair in Paris in 1890.

After graduation from the Institute of Technology, Mr. Machado began active work in his profession in Boston, gaining experience in several good offices, finally entering the office of Shepley, Rutan & Coolidge, the successors of the great Architect Richardson. Here Mr. Machado's talent began to be recognized and many important pieces of work were entrusted to him. Among the important buildings which he designed in whole or in part during this period were: The Art Institute, Public Library, and Oddfellows' Building, Chicago; the Malinchord Building, St. Louis; railway stations on the Boston & Albany Railroad, and the North Union Station, Boston; buildings in connection with Leland Stamford, California, and Harvard Universities, besides public libraries and public buildings in several cities.

Mr. Machado subsequently accepted a position with a well known Boston firm, and during the four years he was with them had a part in the designing, planning and execution of much important work.

For the past nine years Mr. Machado had been in business on his own account, with offices in Salem and Boston. During this latter period he designed a large number of city and country houses, ranging in size from modest dwellings to large country seats, palatial in size and furnishings, as well as a large number of other buildings.

A short time ago he had also opened an office in Ottawa, Ont., in partnership with Mr. A. L. Weeks, of St. John, N.B.

All of Mr. Machado's work was conspicuous for simplicity, directness and great beauty of proportion. He combined in a rare degree artistic talent of a high order with a thorough knowledge and grasp of practical details. He was particularly fond of the New England colonial style of architecture, and has left many beautiful examples of this type of work.

There occurred at Kingston, Ont., on Nov. 19, the death of Mr. Adam Clark Williamson a well-known retired building contractor. Mr. Williamson was born in Shetland, Scotland, in 1837 and when 20 years of age emigrated to Canada. For the past 50 years he had resided and done business in Kingston. As carpenter and builder, he was thorough master of his craft, having an intimate knowledge of structural operations down to the minutest detail of carved woodwork. For many years and until the failure of his health most of the highclass handwork done in the city was from his design and executed under his personal supervision.

The Late A. C. Williamson, Kingston.

Four sons, all college graduates, survive. They are: Dr. Archibald and George H., in Kingston, the former in medical practice and a professor in Queen's University, the latter, a journalist and city editor of the British Whig; Edward, (Ph. D.), professor of Moderns in Geneva College, New York State, and Dr. Harold, practising medicine in Port Arthur.

INSTITUTE OF ARCHITECTS OF CANADA.

Toronto, November 15, 1907.

Editor, CANADIAN ARCHITECT AND BUILDER.

Dear Sir,—Since my last communication I have examined the "Project of an Act to Incorporate the 'Institute of Architects of Canada,'" and have been struck with the fact that there is not a single reason given, from the standpoint of the people of Canada, why the use of the "title of architect" or the right "to act or practice as architect" should be the special privilege of members of the I.A.C.

While there can be no difference of opinion among architects as to the desirability, from their own point of view, in having the very highest possible standard for entrance to an architectural organization, there at once arises a positive difference of opinion when one group of men wrongly claim that this carries with it the conclusion that any architectural organization, be their proposed standard of membership never so high, should have the powers asked for in the proposed act. It is to the interest both of architecture as a Fine Art and for the general benefit of the people of Canada that they should not have it. And there is nothing contained in the various tests set forth in their act which ought to carry with it any other privilege than the privilege of entering into full membership in an architectural organization.

The fact that the I.A.C. have in their application for incorporation given no reason why a citizen of the Dominion, who has qualified himself to act or practise as an architect, should be prohibited from doing so if he preferred to belong to an architectural society which in his opinion had higher ideals, and was therefore built on a more solid and permanent architectural foundation than that formulated for the I.A.C., leads one to suppose the leaders of the I.A.C. have come to the conclusion that no adequate reason can be given why they should ask this special and improper legislation.

I can conceive of only two reasons why an architectural organization might think they ought to get this power: The first is they might imagine, though erroneously, that the quality of architecture in the Dominion might be improved by this sort of paternal oversight of the profession, instead of letting Art have her free course as she has had from time immemorial. The second reason might be they may imagine, though quite erroneously, as in the first case, that a set of plans and specifications of some building project might not need to be subjected to examination by a duly authorized and qualified government inspector, municipal or otherwise, before a permit was given for its execution, vainly imagining all that was necessary to guarantee its safe erection being that the originator of the project was accepted by their society as an individual competent to practise architecture.

There is a third reason (advanced during the last week by a member of the council of the O. A. A.), viz., the benefit of the profession.

It is evident on the face of it that none of these reasons are in any degree a sufficient reason why the prayers of the petitioners should be granted. For while it is desirable that all assistance possible should be given to the rising generation of architects by architectural societies, it is not only equally important but more so that no individual architectural society should have entire oversight of the whole of the younger members of the profession any more than in painting the "school" of impressionalists and the school of realists should control all artists, or one group of authors should say who would be permitted to express his thoughts in prose or poetry. Such attempts by cliques have never helped the cause of the arts. Furthermore, not all the architectural societies of Canada combined should have the right to interfere with any citizen of the Dominion practising his profession according to the building by-laws of that place in which his client may wish him to carry out some architectural project of his.

The second reason can be strikingly answered by the Quebec bridge incident. If the government had appointed a commission to enquire into the details of its construction and have the oversight of its erection, it is more than likely it would not have been necessary to appoint a commission to enquire into the cause of its destruction.

As to the third reason advocated: It is enough to say the good of architecture ought to be the greatest good for which the profession can labor; and "the good of the profession ought not to be obtained by a sacrifice of the rights of the public, as the public are surely entitled to employ any architect who may show himself to be qualified to carry out an architectural project in accordance with the building laws of the community. It will be evident to all that the best method of deciding whether an architect is qualified to practice as architect is to put him to a continuous test by examining minutely all his projects during the whole of his practice, instead of subjecting him at the beginning of his practice to a preliminary examination on some theoretical problems never intended to be carried out.

I think the I. A. C. when they propose such sweeping propositions affecting the rights and privileges of certain citizens of the Dominion owe it to the people of Canada and the members of the profession to say on what ground they think they should have these special privileges, so that the matter might be thoroughly debated pro and con, instead of attempting to obtain what is really a "snap verdict" on the case; though as a matter of fact I feel sure the only possible chance of such a petition being granted by the government lies in the fact that the true intent, meaning and outcome of the act is, by its wording, most artfully concealed from those who are not thoroughly familiar with the arguments for and against granting such powers to an architectural organization.

Yours truly,

J. C. B. HORWOOD.

HOW TO CLEAN SET CEMENT FROM TILE.

By C. J. Fox, Ph. D.

Cement is a silicate of lime and as such is far too hard to remove by ordinary scouring with sharp sand or other gritty material. Consequently, after a tile floor or wall has been grouted and it is necessary to remove the superfluous cement from the surface, the wall or floor is washed with muriatic acid. This acid is a volatile gas dissolved in water. It attacks the cement and forms a soluble lime salt, which can be readily removed by washing with ordinary water. Muriatic acid, however, casts off fumes, which in physical laboratories, fine dynamo rooms or other places containing delicate metal instruments, such as galvanometers, ohmmeters, etc., injures the metal by corrosion.

In these places diluted sulphuric acid may be used. It is not volatile and consequently does not injure metal work. However, it does not form with the cement a soluble lime salt, but a phosphate of lime, which is the same as plaster of paris. This is much softer than the original Portland cement, so that by using dilute sulphuric acid and scouring hard with sand it is in most cases possible to clean the tile floor or wall.

The best medium for dissolving cement is citric acid. This is a clear solid substance which can be bought from any druggist. It dissolves readily in water, and will attack set Portland cement quite as well as will muriatic acid, because it forms with the cement a perfectly soluble nitrate of lime. Its only objectionable feature is its cost, which is several times greater than that of muriatic acid. Ordinary lemon juice is a solution of citric acid, but as the latter is made in a wholesale way in the tropics it is cheaper than lemon juice.

A cheaper substitute for citric acid is tartaric acid, much used in making lemonade. This also can be obtained at any drug store. It forms with the cement a tartrate of lime. It is not as soluble as citrate of lime and consequently its use in cleaning tiled floors has disadvantages similar to those met with in using sulphuric acid. The tartrate of lime is, however, somewhat easier to remove than sulphate of lime. Consequently, although a tile surface which has been treated with tartaric acid requires considerable sand scouring to remove the cement, the operation is nevertheless easier than when sulphuric acid has been used.

Muriatic acid is the most usual and most feasible medium for cleaning cement from tile floors. When, however, its fumes are likely to corrode delicate metal instruments, either sulphuric, citric or tartaric acid must be used in its place. The citric acid is most effective. Sulphuric and tartaric acid change the cement into sulphate or tartrate of lime, which requires considerable scouring with hard sharp sand, but is, nevertheless, far softer and more easily removed than silicate of lime, which is the original form of the cement.

The Montreal Builder's Exchange will hold their annual banquet on December 12 next, when the speaker of the evening will be the Hon. Lomer Gouin, Premier of Quebec.

BOOK REVIEW.

Students of architecture and the allied professions will find a reading of "Principles of Reinforced Concrete Construction," by F. E. Turneaure, Dean of the College of Engineering, University of Wisconsin, and E. R. Maurer, Professor of Mechanicas of the same university, at once profitable and interesting. In the first six chapters of the work the theoretical and experimental sides of the subject are carefully and clearly expounded, the remaining four chapters being devoted to an explanation of the various applications of concrete.

The volume is attractively bound and is published by John Wiley & Sons, New York. Price $3 net.

"Sanitation of Public Buildings" is the title of a well written book by Wm. Paul Gerhard, C.E., also published by John Wiley & Sons, New York. In his prefatory remarks the author points out that this work is, in some sense, a continuation of "Sanitary Engineering of Buildings," and we are quite sure that this fact alone renders any recommendation from us quite unnecessary. The book consists of 262 pages and is divided into sections, each dealing with the general subject as it pertains to the sanitation of hospitals, theatres, churches, schools, markets and abattoirs.

The American School of Correspondence, Chicago, has sent us an excellent treatise upon "Building Superintendence," by Edward Nichols, architect, of Boston, Mass. Some particularly good cuts and drawings are introduced into this volume, which comprises two hundred pages of profitable reading, neatly bound and printed in good type. The price of this work is $1.50.

From the same publishers we have received "Strength of Materials," by E. R. Maurer, of Wisconsin University. To all connected with construction work this volume will prove a most useful and practical guide, particularly suitable for ready reference, owing to the absence of long technical terms, and the omission of any matter that could be termed irrelevant. Price $1.

ANNUAL BUILDERS' EXHIBITION.

Inspired by the success which attended their inaugural exhibition held in Montreal last August, the directorate of the Canadian Builders' Show (acting under the auspices of the Builders' Exchange of that city) have decided to make the event, if possible, an annual one. In accordance with this idea a prospectus has just been issued for the second exhibition, which will be held at the Coliseum, Dorchester street, Montreal, beginning April 20 next.

The value of such an exhibition, not merely to the general public, but to the exhibitors also, is no longer a matter of doubt, as was amply proved by the success of the affair of last August. The one now in contemplation will embrace the latest up-to-date ideas in labor-saving devices, home-building economies and household comfort, from the various standpoints of heating, ventilation, plumbing, flooring, roofing, interior decoration and fireproof methods in building construction.

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REINFORCED CONCRETE COLUMNS.

Concrete columns with longitudinal rods imbedded in them are not efficient and are not rational design, for the following reasons:

(1) The column is a composite of steel and concrete, and not a true reinforced concrete column, as the steel must be chiefly in compression.

(2) There is no way to determine, even approximately, the respective amounts of the load that the steel and the concrete will bear. The use of the moduli of elasticity of the two materials is no aid, on account of the fact that the concrete tends to shrink and shorten, leaving the steel rods longer than the normal unstressed concrete.

(3) If the rods are near the surface of the concrete, they can more easily break out under the bowing action of direct compression or the bulging action of diagonal shear.

(4) If the rods are near the center of column, they will be of no aid to resist flexural stresses due to horizontal forces or to eccentric loading.

(5) Longitudinal rods offer little or no resistance to longitudinal splitting or bulging of the column.

(6) The rods cannot take diagonal shear without overstressing the concrete.

The assumption that they can take shear, in amounts of anywhere near the capacity of steel to carry shear, is simply untenable and absurd, in spite of recognition in building codes and regulations. If, for example, we assume a shear of 12,000 pounds in a rod 1 inch square, there must, of necessity, be a bending moment in the rod. Now the square rod, at 24,000 pounds extreme fiber stress, would take a bending moment of 4,000 inch-pounds. The lever arm of the 12,000 would then have to be only 1-3 inch. The force of 12,000 pounds applied on the side of a square rod in a length of 1-3 inch, or on several times this length, is beyond the power of concrete to withstand.

(7) A plane of cleavage, especially if it be a sloping one, such as a joint left where pouring of concrete ceases for a while, will leave a weak section and vitiate to a large extent the factor of safety.

Compression of a reinforced concrete column with a steel column as a basis of design is misleading, because of the fact that steel is very strong in tension and, therefore, capable of resisting bending stresses. Cast-iron columns were formerly proportioned on the basis of 11,300 pounds per square inch (reduced for length). Full-size tests made some years ago showed this unit to be too high and that a proper unit is about 7,600 pounds, reduced for length of column. The compressive strength of cast iron in short blocks is about 100,000 pounds per square inch, but on account of the low tensile strength, and consequent low shearing strength, the safe unit in columns has but a remote relation to the compressive strength in short test pieces. An exactly similar condition exists in columns of plain concrete or of concrete that is not reinforced, with a view of relieving it of all tensile strains and of excessive shearing strains.

Practical experience has proven the inability of concrete columns in which small rods are imbedded to carry heavy loads. The practical experience referred to is the failure of buildings that have recently occurred.

It follows, then, that rational design of reinforced concrete columns demands not only longitudinal reinforcement to take flexure stresses, but circular reinforcement to take the bursting or bulging force due to diagonal shear. Columns so designed have proven under test to be the strongest of all known forms of reinforced concrete columns.

A good and efficient column is made by reinforcing a round or an octagonal column with a coil made of a square rod and with 8 longitudinal square rods wired to the same, just inside of the coil. The purpose of the longitudinal rods is to take flexural stresses—that is, to relieve the concrete of longitudinal tensile stresses due to any side force or any tendency to bow at the middle of the height of the column. The steel thus used is rationally employed, as it takes tension that would otherwise come on the concrete. These steel rods should not be counted upon to take any of the direct load of the column, because of the fact that tests show that such rods alone in a concrete column offer little or no assistance to the concrete.

When a concrete column is under compression, its length is diminished and its diameter increased somewhat. The steel coils come into play by this tendency of the columns to increase in diameter and are, therefore, in tension.

If we assume a safe load of 550 pounds per square inch and a lateral pressure of 10-48 of this in intensity, we have a basis for the determination of the tension on a coil. Let the pitch of the coil be 1-8 of the diameter of the column, and let

D=diameter of column in inches;

d=diameter of square steel rod in the coil, in inches.

Equating the equivalent fluid pressure on the rod to its tension at 12,500 pounds per square inch, we have

$$550 \times \frac{10}{48} \times \frac{D}{2} \times \frac{D}{8} = 12{,}500d^2$$

Solving we find

$$d = \frac{D}{42}$$

If we make the diameter of the coil 7-8 of that of the column, and the diameter of the square rod of which the coil is made 1-40 of the diameter of the column, we shall have close to 12,500 pounds per square inch on the steel.

For the 8 rods which run the length of the column we may assume the same lateral pressure and proportion the rods to take that pressure. Assuming that they would act to resist the outward pressure of the disintegrated concrete, at the ultimate strength of the column, we can make the rods of a diameter that they would take the stresses in bending, at a safe unit, due to a lateral pressure of 10-48 of 550 or 115 pounds per square inch. The outward force per inch in the length of rod is $115 \times {}^{n} \times D \div 8$. The clear span is 1-8 of D less 1-4 of D = 1-10 of D. As the rods are fixed ended, the bending moment is 1-12 of $W l^2$, or

$$M = \frac{115\,{}^{n}D}{8} \times \frac{D^2}{100} \times \frac{1}{12}$$

Equating this to

$$12{,}500S^3 \div 6$$

(Concluded on page 30.)

the resisting moment of a square rod whose side is s, we obtain

$$s = \frac{D}{38}$$

As this is close to 1-40 of the diameter of the column, we may use the same size of square rod as that used in the coil.

It is recommended, therefore, that reinforced concrete columns be made round or octagonal and that the entire area of the circle or octagon be considered as taking the load; also that the reinforcement be made of a coil of square steel rod of a diameter one-fortieth that of the column; also that just inside of this coil eight rods of the same diameter be wired to the coil. At the end of a coil the rod shoud lap a half circle, as this would be about 55 diameters.

The unit of 550 pounds per square inch would be used for lengths up to 10 diameters. Between 10 and 25 diameters the allowed unit pressure would be found by the following formula:

$$P = 670 - 12 \frac{l}{D}$$

where p = allowed pressure per square inch,
l = length in inches,
D = diameter in inches.

Columns more slender than 1-25 of their length should be avoided. The same reinforcement should be used in all columns of a given diameter, so that flexural and eccentric stresses will be taken care of in long columns.

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