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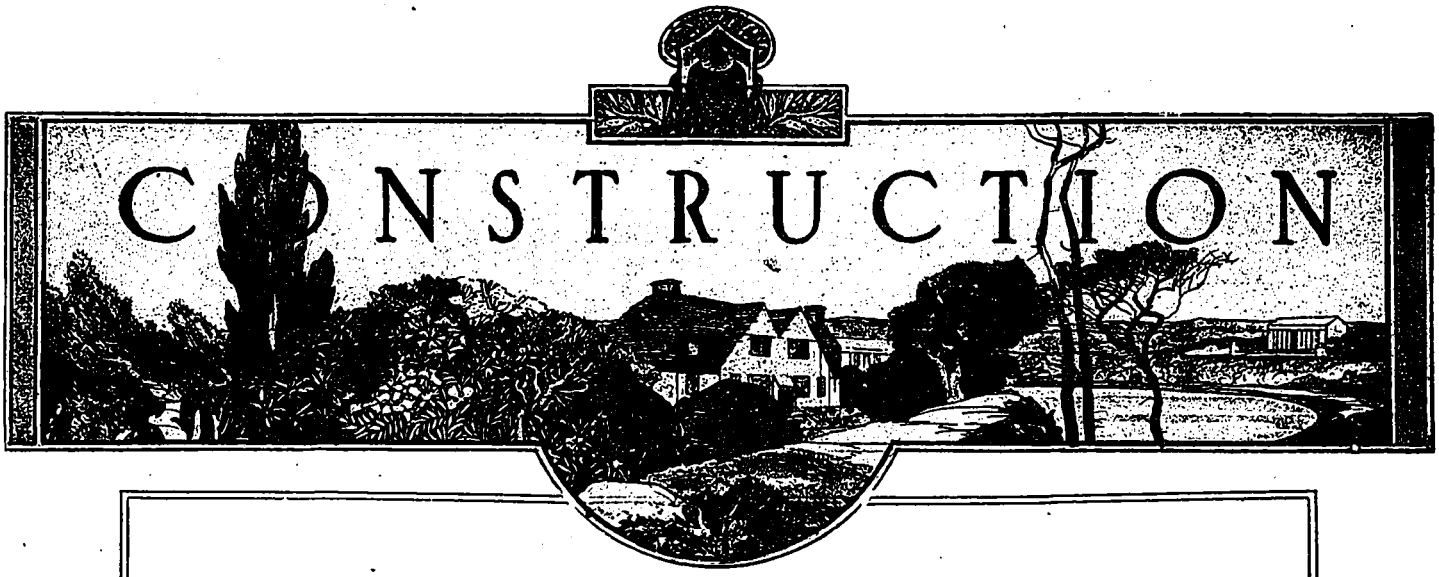

Toronto, December, 1920 Vol. XIII., No. 12

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Frontispiece

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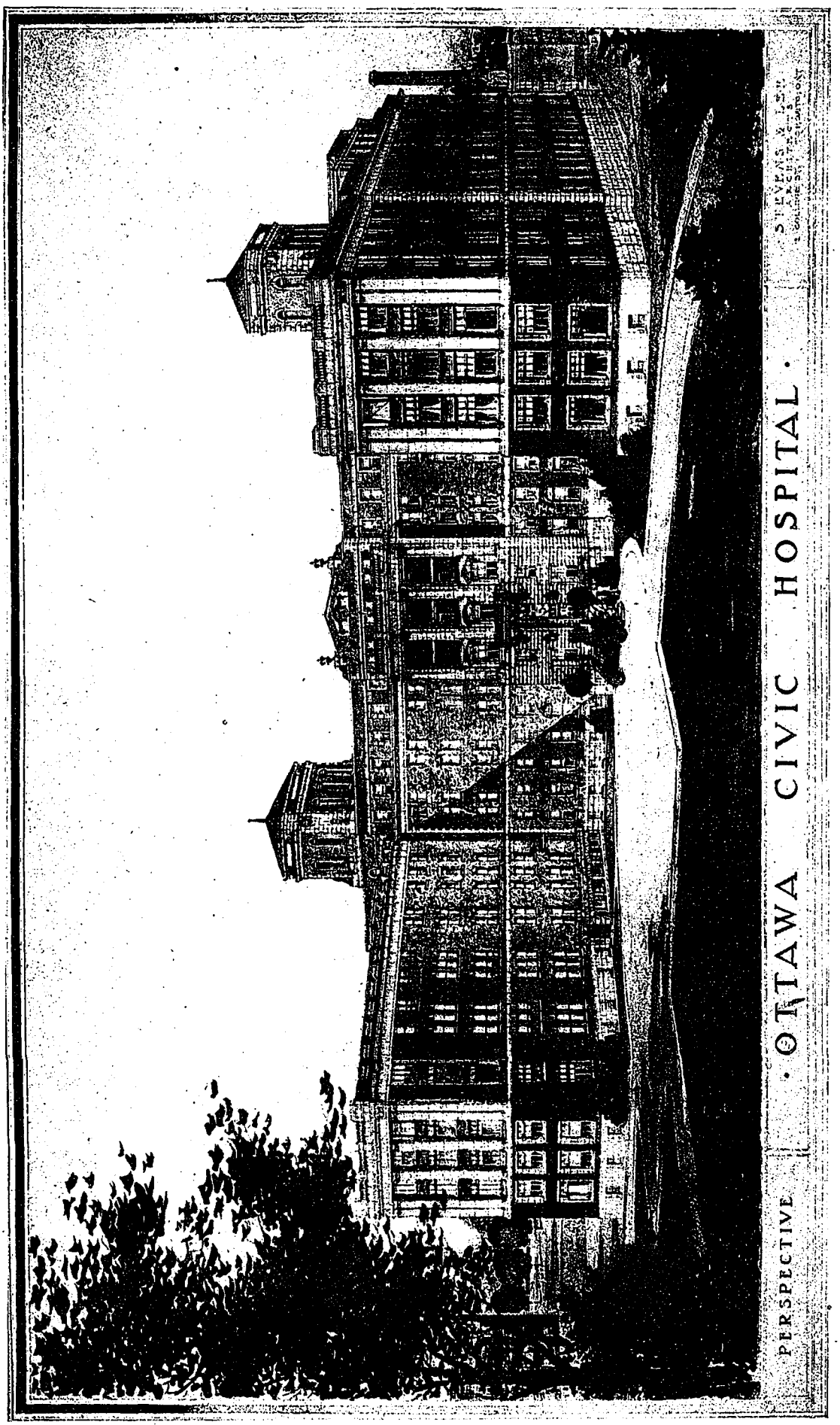


NEW CIVIC HOSPITAL, OTTAWA, NOW IN COURSE OF CONSTRUCTION.

STEVENS AND LEE, ARCHITECTS.

New Ottawa Civic Hospital

THE almalgamation of a number of smaller hospitals in one city and the pooling of interests, as it were, and then building one institution of sufficient size, enlarged equipment, and added facilities for research and diagnostic purposes, are noticeable in Canada's latest large hospital. The Protestant, General, St. Luke's, and the Maternity Hospitals of Ottawa have so gotten together, with the result that a larger and more comprehensive institution is now in process of construction, which is to be known as the Ottawa Civic Hospital.

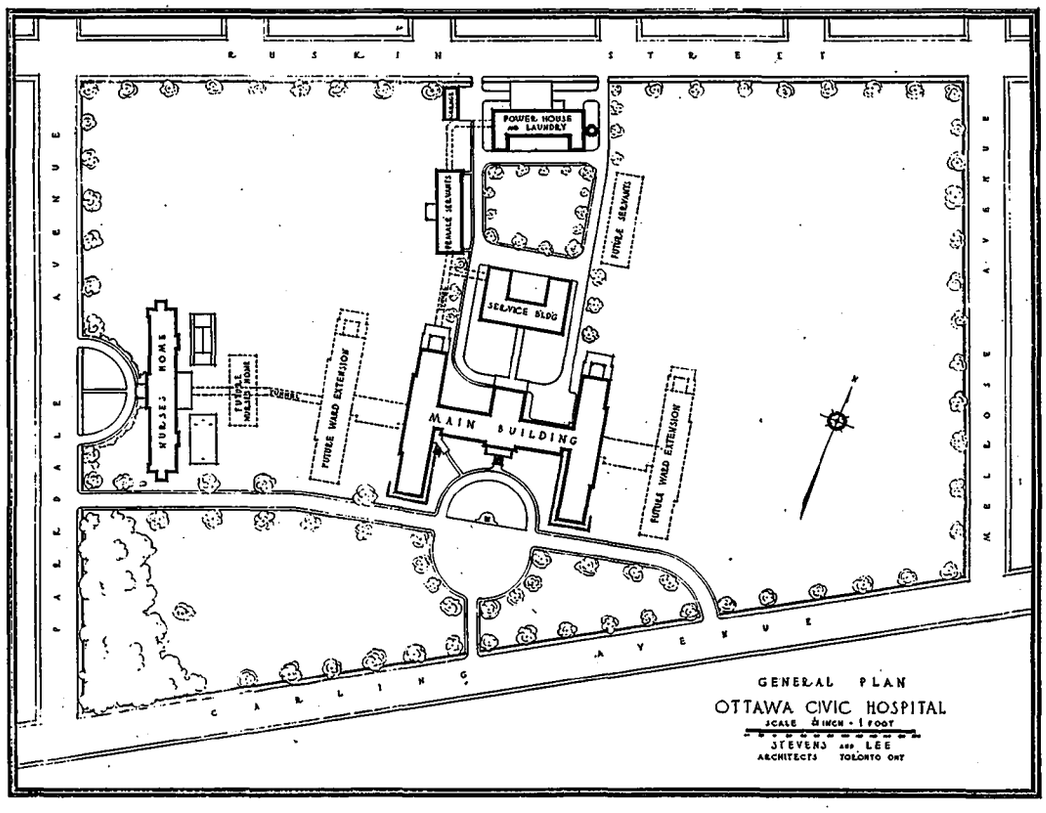
After the appointment of the architects, much time and care were given to the selection of a proper site. One location after another was considered, only to be rejected for one good reason or another; for it was necessary to have enough available land for the future growth of the institution and, at the same time, to have a location which would be available to the medical men as well as to patients and their friends. A site about two miles from the centre of the city, upon the highest land in Ottawa, was finally determined upon. On the south this faces the Dominion Experimental Farm, and on the north has an extended outlook to the Laurentian Mountains in the distance. This site, bought for the purpose of the Hospital, consists of about twenty-four acres of fairly level land, with natural drainage towards the north.

After careful consideration from every standpoint—economy of construction, economy of maintenance, and conservation of human energy—a multi-storied building, housing five hundred patients (the number to be accommodated) was determined upon, with separate buildings for nurses' residence, kitchens, laundry, heating plant, and the housing of domestics.

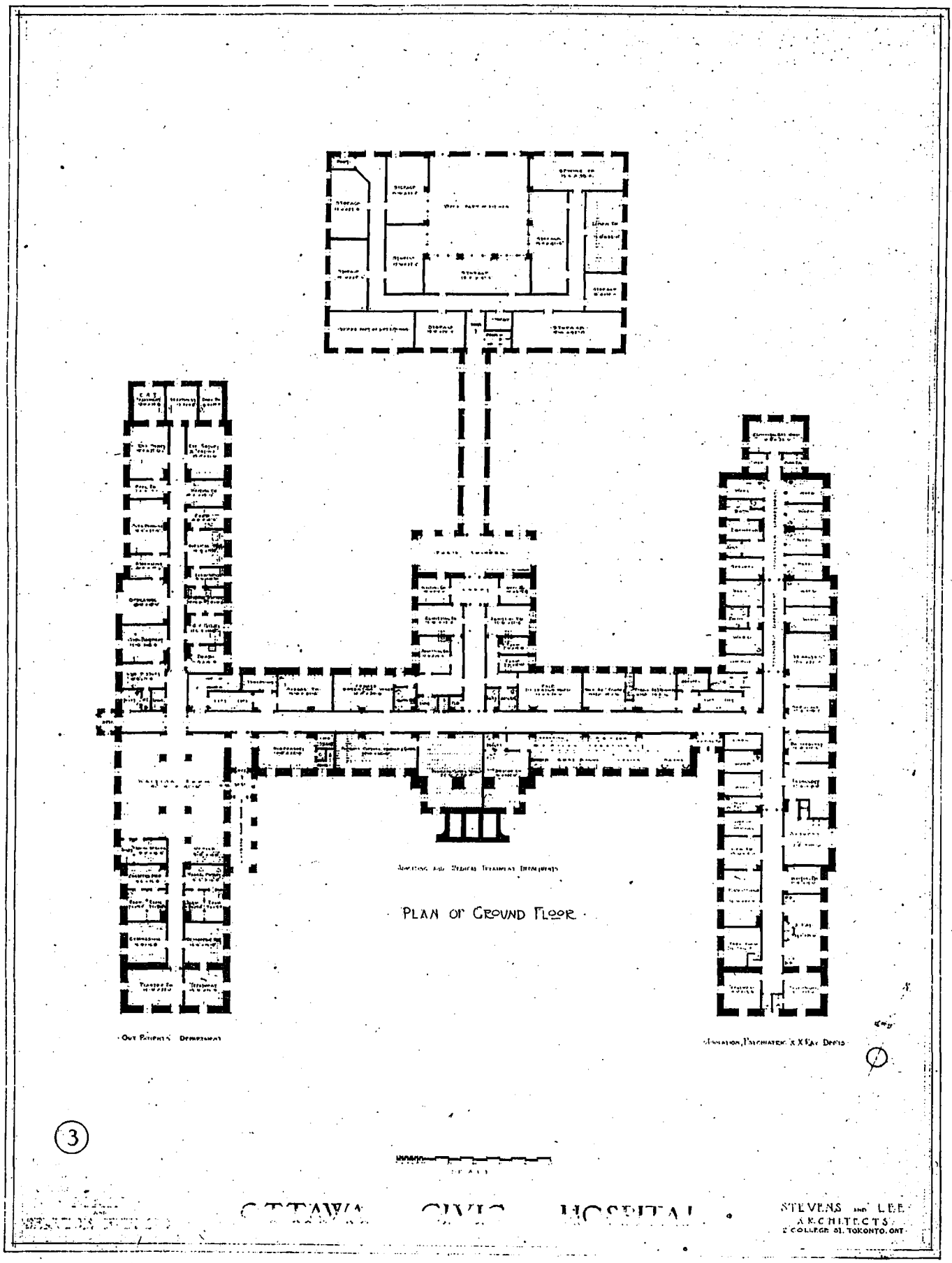
The main Patients' Building is designed in the form of an "H," with the open courts facing north and south. The service portion is located at the crossing of the main corridors, making three distinct units on each floor.

The administrative offices, instead of being located in a separate building, are placed on the first floor of the connecting pavilion and are approached by a drive from Carling avenue. From this first floor level, the dining and other rooms in the Service Building are reached by a connecting corridor which extends over the ambulance entrance, this ambulance entrance being at the ground floor level at the north.

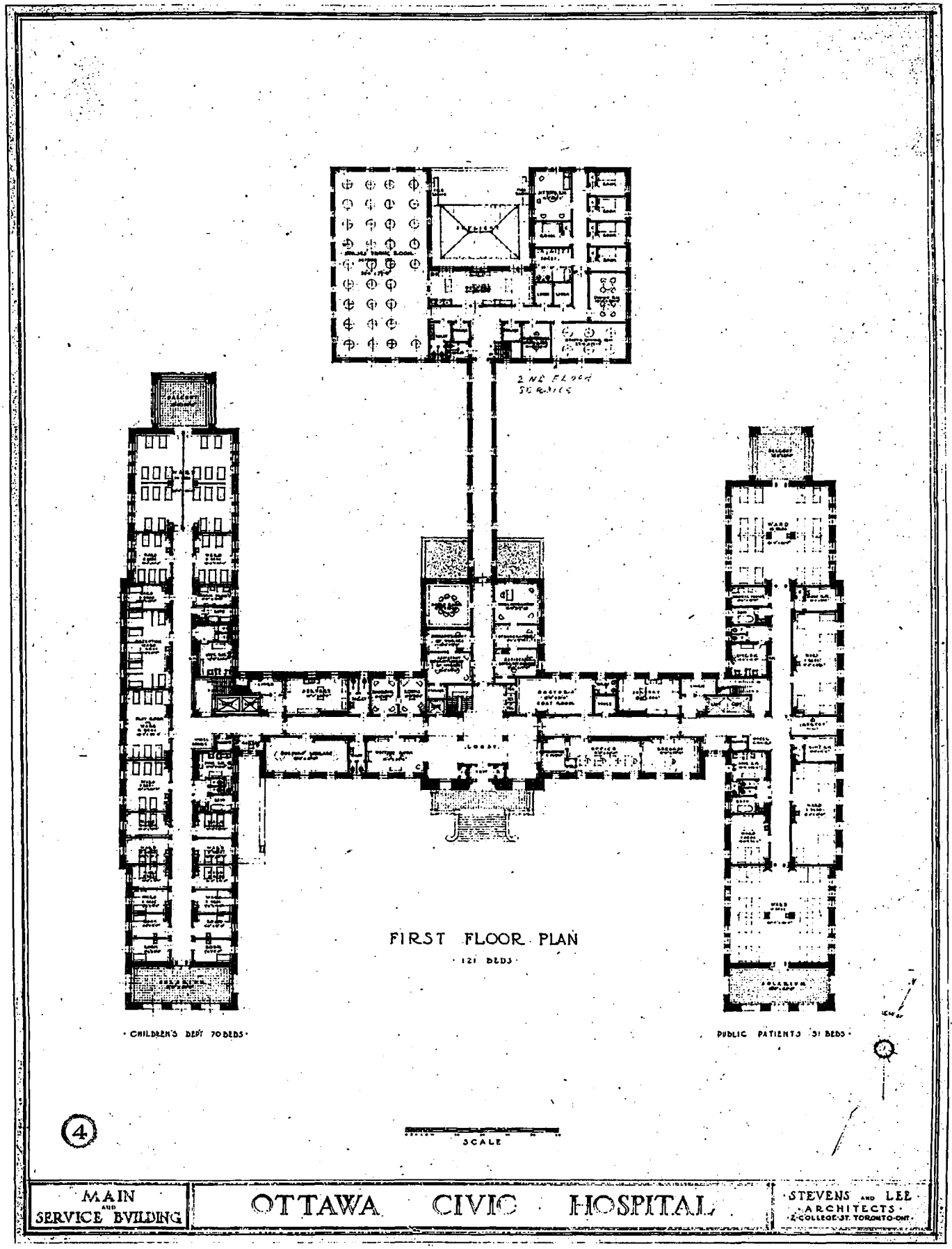
The Out-Patients' Department, with entrance from the front court, is located on the ground floor, and consists of the various sections for surgical and medical treatment. On this floor are located also the X-ray department, the isolation and psychiatric departments, and, at the centre, the admitting department for all patients. This department is reached through an enclosed porte-cochere, and consists of admitting rooms for male and female and a special



BLOCK PLAN.



CIVIC HOSPITAL, OTTAWA.
STEVENS & LEE, ARCHITECTS.



CIVIC HOSPITAL, OTTAWA.
STEVENS & LEE, ARCHITECTS.

admitting room for the maternity department, with special lift to the maternity floor.

Both ward and private patients are provided for in this main building, with separations by floors or horizontal divisions. The largest ward is planned for sixteen beds, subdivided on the so-called "Rigs" ward system—that is, with alcoves for four beds each, formed by low screens, affording a greater privacy and decreased danger from the spread of contagion.

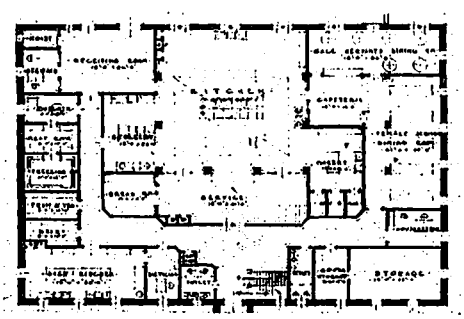
A separate section is set apart for the care of venereal diseases.

There is also provided a children's department, with special baths, playrooms, and airing balconies.

The Maternity Department, consisting of eighty beds, occupies one complete story and has separate delivery rooms and nurseries for the private and ward patients. With the two service units and the lateral subdivisions, the same results of separation and segregation are accomplished as might be obtained in separate pavilions.

One entire floor and a large portion of another floor are devoted to the care of private patients, with single rooms and rooms en suite. All rooms have separate hospital lavatories, and suites of rooms have toilets and baths.

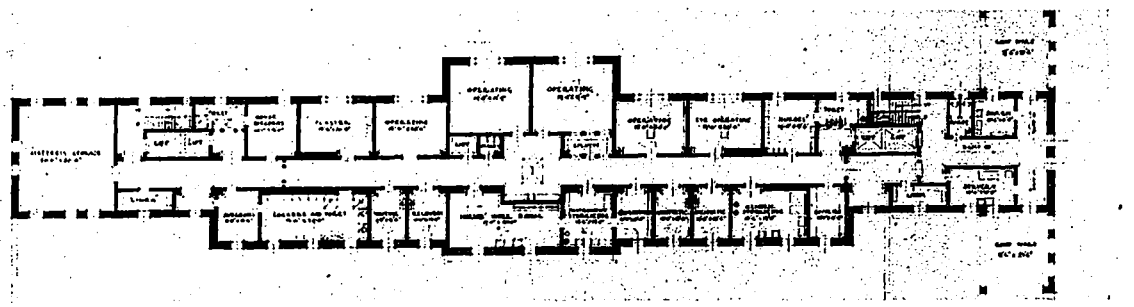
On each floor above the first, there are two solaria and large airing balconies, making it possible for all patients to be in the open air when desired.



SERVICE WING: OTTAWA CIVIC HOSPITAL.

The sixth or top story contains the operating and surgical department, consisting of four major operating rooms, an eye-operating room, and a plaster room, together with service, sterilizing, and work rooms. The natural lighting for operating rooms is by means of high vertical sash, making the cost of maintenance less than if the system of skylights were used, and making possible a simpler and more efficient means of heating.

In the towers are located the ventilating fans; also the plant for distilling the water used for surgical and drinking purposes throughout the building.



OPERATING SUITE: OTTAWA CIVIC HOSPITAL.

In the Service Building, directly north of the main building, are located the main kitchen for the entire group, the storage rooms for all hospital supplies, the dining-rooms for the staff, nurses and servants, and, on the upper floor, the home for the resident staff.

The Power House and Laundry, located to the north of the Service Building and connected by tunnel with the other buildings, contains the high pressure boilers for heating and other services, and the laundry, with rooms for men servants on the top floor.

The Nurses' Residence, located to the west of the main group and facing Parkdale avenue, provides not only single rooms for all the nurses, but also lecture and demonstration rooms, parlors, entertainment and living rooms. Connection to the main group is through an underground passage.

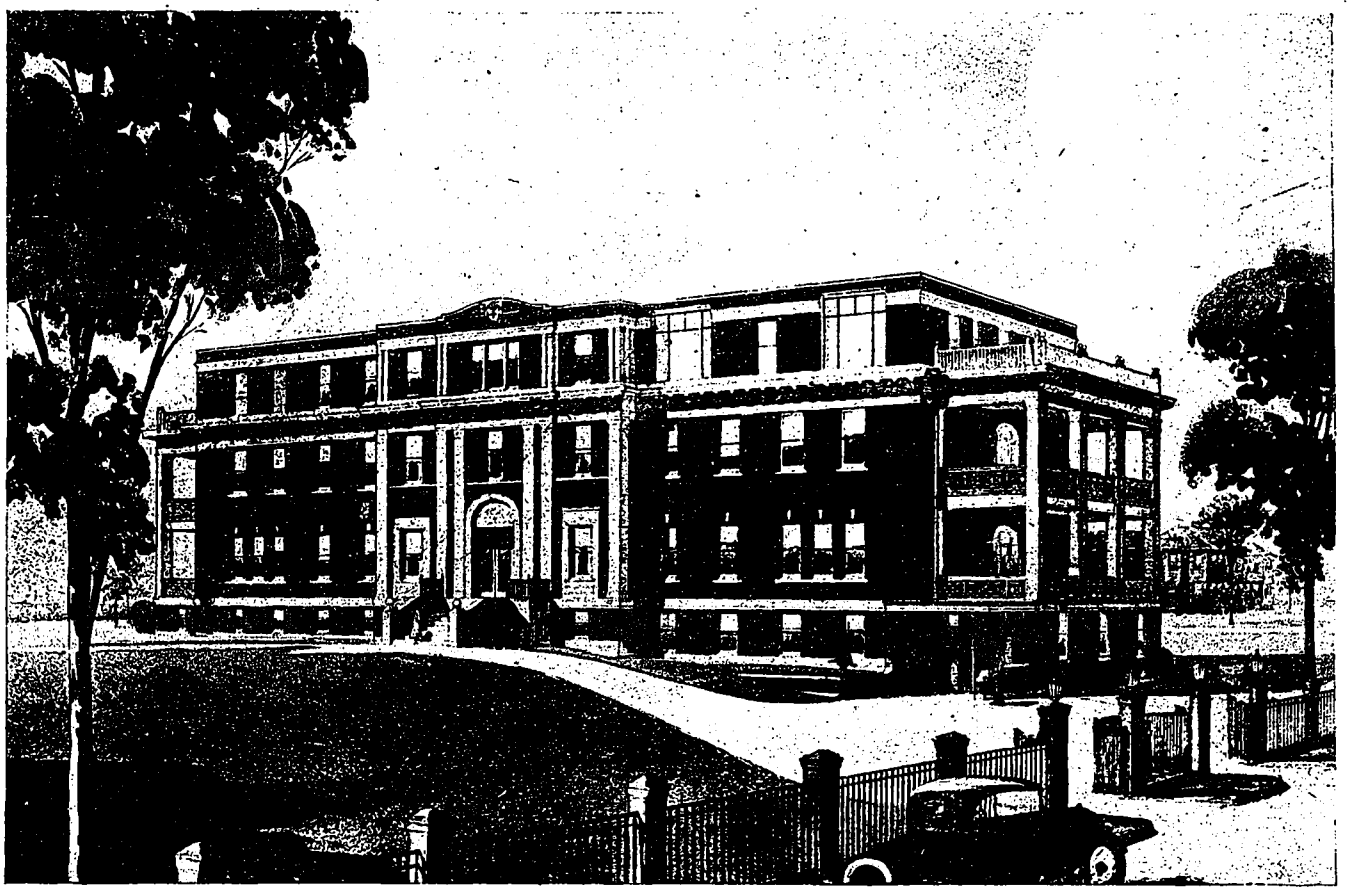
The exterior of the building, as will be noted in the accompanying illustration, is of red brick with stone trimmings, and presents a simple and substantial appearance without undue expense for ornamentation, but of sufficient dignity to conform to the needs of such an important institution.

Brandon General Hospital

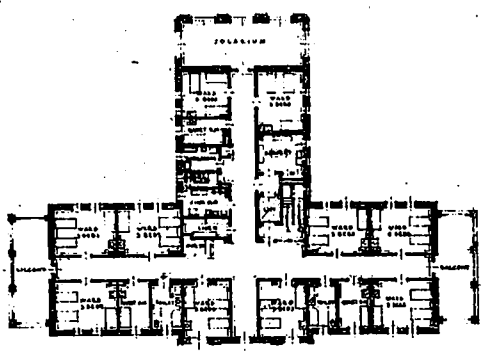
Owing to the inadequacy that has existed for a number of years in the present buildings and equipment of the Brandon General Hospital, it was decided by the Board of Trustees to add a Surgical Pavilion to meet the increased needs of the institution.

As the property on which the present hospital stands was more or less cramped by building, it was decided to build this across the street to the north.

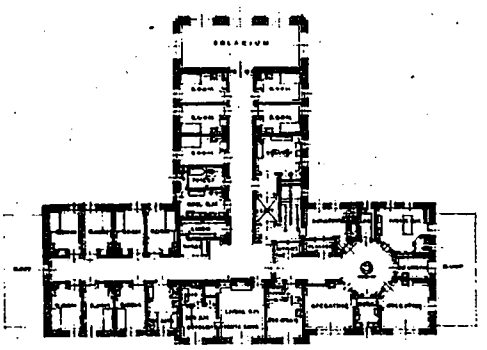
The new surgical pavilion will consist of four



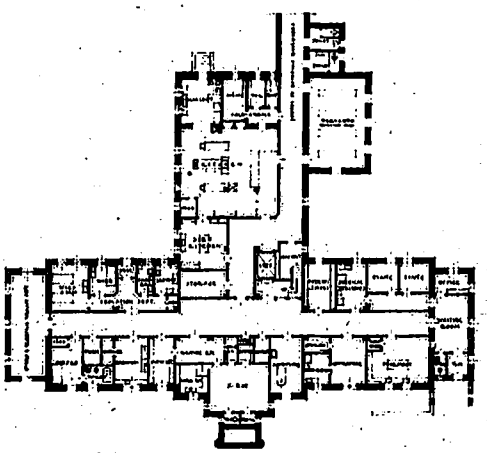
PERSPECTIVE.



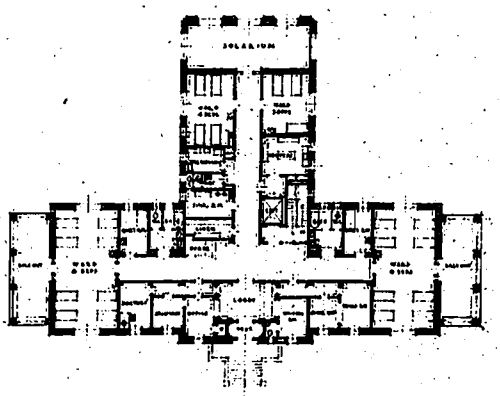
SECOND FLOOR.



THIRD FLOOR.



GROUND FLOOR.



FIRST FLOOR.

PROPOSED SURGICAL PAVILLION FOR GENERAL HOSPITAL, BRANDON, MANITOBA.

STEVENS & LEE, ARCHITECTS.

floors, the three upper floors for patients and the ground floor for different services in connection with the whole hospital, that is the kitchens, servants' dining room, admitting and out-patient department, the X-ray and hydrotherapeutic departments and a small isolation unit.

The first floor contains the administrative offices for the whole hospital and accommodation for public patients in small wards from eight beds down.

The second floor contains the rooms for semi-private patients, the average of these being three beds.

On the third floor are single rooms for private patients, the superintendent's rooms and the operating suite.

Each floor is provided with the necessary toilet, sink room and serving accommodation for the care of the patients as well as ample solarium and balcony space.

Food will be served in bulk from the main kitchen by elevator to the different floors as well as back through a tunnel to the older buildings and then by tray service to the different serving rooms.

The heating will be by hot water under forced circulation, steam being brought from the present power house to a point in this building, where will be located the heaters and pumps.

Ventilation will be by means of exhaust flues gathered together in a trunk in the roof space and connected to fans.

The exterior of the building will be of red brick and stone trimmings, only enough of the latter being used to give a sufficiently dignified approach to the whole institution.

Concrete in Alkali Soils and Waters*

A. S. Dawson, M.E.I.C., Chief Engineer, Department of Natural Resources, Canadian Pacific Railway.

THE action of alkali soils and alkali waters on concrete is not a recent development, and is one of extreme importance, not only to engineers and chemists, but to all governments, corporations, and individuals, whose money is being used in the construction of works in districts where certain conditions exist.

The question was studied some fifty years ago by members of an International Association of Testing Materials, on the coasts of France and Algiers. It has been discussed in the United States for some fifteen years by the American Society of Testing Materials, the American Society of Civil Engineers, the Bureau of Standards, and the United States Reclamation Service, as well as by some universities and engineers specializing in concrete work.

In Western Canada the subject is of still more recent birth, and has had the attention of many interested parties since about 1913.

The general effect of these investigations has not been to condemn concrete as a structural material, but in some measure to confine it to its proper field, and to prevent its mis-use. Concrete has been found so generally serviceable and beset with so few disadvantages, that its use has been generally recommended without any reservations.

Actual results have, however, proven conclusively that concrete has its limitations as a structural material, where certain ground and water conditions are known to exist.

In 1918, the subject received considerable attention at a Professional Meeting of the Western Branches of The Engineering Institute of Canada, at Saskatoon; and the writer then presented a paper on behalf of a Committee appointed by the Calgary Branch of The Institute. This paper is also written on behalf of that Committee.

CAUSES OF DISINTEGRATION OF CONCRETE.

The general usual causes of the disintegration of concrete may be summarized as follows:

(1) Bad workmanship.
(2) Poor and unsuitable materials; and badly graded and proportioned mixtures, including the amount of water used.
(3) Alternate wetting and drying out, and alternate freezing and thawing out.
(4) Destruction and removal of the protecting outer skin from various causes.
(5) The presence of an excess of alkali salts.

It is unnecessary to mention the effects of frost before setting, the erosion of the outer skin by excessive velocities and other mechanical agencies, which to a great extent can be provided against during construction and subsequently, by various well known methods.

This paper deals primarily with the effects on concrete of alkali soils and alkali waters.

ORIGIN OF ALKALI SALTS.

First, a brief summary of the origin of alkali salts will be of interest to members who may

* Read at the Western Professional Meeting of the Engineering Institute of Canada.

have forgotten some of their earlier knowledge of chemistry.

The "Alkalis" as they are called, are carried into the soil with the other elements which form its inorganic bulk by the pulverization of rocks and minerals; by the decomposition of inorganic sediment held in solution by water; by glacial action; seepage from rivers and numerous other sources.

Alkali in the popular sense is a term used to designate the soluble salts that have accumulated in the arid and semi-arid regions. In the humid districts these salts are leached out of the soil, and removed through natural drainage channels.

Oxygen acts on potash, soda, lime, and magnesia; and forms what are known as the "alkali bases."

Oxygen unites with potassium and forms potash.

Oxygen unites with sodium and forms soda.

Oxygen unites with calcium and forms lime.

Oxygen unites with magnesium and forms magnesia.

But—

Oxygen unites with silica and forms silicic acid.

Oxygen unites with carbon and forms carbonic acid.

Oxygen unites with phosphorus and forms phosphoric acid.

Oxygen unites with sulphur and forms sulphuric acid.

These acids, called metallic and mineral acids, have a great affinity for the alkali bases forming "salts"; and this is where the whole trouble with alkali soils begins.

These mineral or metallic acids attack the alkaline bases with the following results:

Silicic acid forms silicate of potash, soda, lime, and magnesia.

Sulphuric acid forms sulphate of potash, soda, lime, and magnesia.

Carbonic acid forms carbonate of potash, soda, lime, and magnesia.

Phosphoric acid forms phosphate of potash, soda, lime, and magnesia.

The salts usually present in greatest amounts in the soils and waters in the middle West, are the sulphates, carbonates, and chlorides of sodium, magnesium, and in a small degree the calciums.

It is the carbonate of soda, or what is commonly called sal-soda which forms what is generally termed "Black Alkali," and the sulphate of soda commonly called "Glauber Salt" which constitutes what is termed "White Alkali." Numerous other salts are of course formed by combining the alkali bases and the mineral acids, but these are not so important in this connection.

When water is brought into the question, the distribution of these salts is largely aided by the fact that the alkalis are extremely soluble in water. When these solutions are brought to the surface evaporation takes place, and an accumulation of alkali salts become evident.

IMPORTANCE OF SULPHATES AND CHLORIDES.

Chemists have as yet been unable to agree on the determination of the exact reactions which are the cause of the disintegration of concrete; but investigation has shown that the sulphates and chlorides appear to be by far the most active salts found—and it is generally now admitted that magnesium sulphate, magnesium chloride and sodium sulphate are the most active salts found in alkali soils and waters.

The magnesium sulphate acts on the calcium hydrate of the cement, forming calcium sulphate, and the latter combines with the alumina of the cement, forming calcium sulpho-aluminate, whose crystallization gives rise to swelling and cracking in the material, and a corresponding destruction of all cohesion. Similarly, sodium sulphate combines with the calcium hydroxide of the cement, forming soluble sodium hydroxide. This also brings up the question of the difference in the susceptibility of various cements to these destructive agencies.

ACTION OF GROUND WATER.

It has been determined by several chemists that the action of the ground water seems to be a chemical change—converting the lime of the cement into a sulphate and carbonate; accompanied by the removal of silicic acid, alumina, and lime, and totally destroying the cohesiveness of the concrete.

The formation of sulphates of lime and aluminates of lime, results in an immense increase of volume, and a corresponding total destruction of all cohesion.

To offset this, the magnesium hydrate may have a tendency to fill the pores of the concrete; and in this and other ways, may gradually become more impervious—thus checking somewhat the disintegrating effects.

A working theory generally now accepted, is as follows:

The chemical reaction of alkali that is destructive to cement work is a double decomposition between the various alkali salts and calcium hydroxide, the latter being an unavoidable constituent and probably the binding constituent of all set cement, whether the cement is classed as "Portland," "Natural," or "Slag." This reaction removes a greater or less amount of the calcium hydroxide, the amount depending upon the salts present, the concentration of the solution, the rate of percolation and imperviousness of the cement, and the solubility of the reaction products; and deposits in its place, in most

cases, a molecularly equivalent amount of other compounds, which have good cementing properties but occupy more space than the calcium hydroxide. This increase of space occupied disrupts the cement, causing it to bulge, crack, and crumble.

ANALYSIS OF ALKALI ACTION.

The following conclusions are now generally accepted:

I. The disintegration of cement by alkali salts is principally due to reactions between these salts and the calcium hydroxide necessarily present in set cement.

As a result of these reactions, relatively insoluble new compounds are formed in the body of the cement structures.

It has been shown that these new compounds have greater weight and require greater space than the calcium hydroxide replaced.

In order to obtain the necessary space the new compounds force apart the particles of the cement, thus weakening or breaking the binding material.

1. The compounds resulting from these reactions with the various destructive salts are as follows:

a. With sodium sulphate the resulting compounds are sodium hydroxide, which is soluble and therefore is removed by leaching; and gypsum, which is realtively insoluble and therefore accumulates in place of the calcium hydroxide.

b. With magnesium sulphate the resulting compounds are magnesium hydroxide and gypsum, both of which are insoluble and accumulate in place of the calcium hydroxide.

c. With sodium carbonate the soluble sodium hydroxide and the insoluble calcium carbonate are formed. In this case there is little increase in the space required, but the silicates and aluminates are also attacked and dissolved. This solvent action is especially marked upon the silica. This loss of silica must weaken the cement; but there is little, if any, crumbling due to expansion.

2. The additional material, requiring increased space, consists in part of dry matter and in part of combined water, which is taken up by the cement during its exposure to the alkali solutions.

a. This increase in dry matter is brought about by the formation of the sulphates, magnesium hydroxide, and carbonates, as shown by the reaction given in paragraph 1, a, b, and c.

b. Part of this increased amount of combined water is due to the fact that the new compounds, gypsum, magnesium, hydroxide, etc., require more water for crystallization than did the calcium hydroxide which they replaced. This further assists in the disruption of the cement.

c. A part of this increased amount of combined water is due merely to the continued action of water upon the incompletely hydrated cement. This amount should serve to set free more calcium hydroxide, and thus to a certain extent repair the damage due to loss of binding material and to expansion.

II. A certain weakening, not a disruption of the cement, is due to the loss of a portion of the binding material, crystallized calcium hydroxide, which is merely dissolved and removed in solution.

III. In order for destructive action to become marked, the alkali solutions must percolate through the cement work, or at least must penetrate beyond the surface.

IV. When the action is strictly confined to the surface, as when briquettes of neat cement are immersed in a still solution, the tensile strength may be increased. In such cases the expansive action closes up the pores, making thesurface more nearly impervious and preventing the alkali from penetrating further.

V. When cracks are started by the expansive action, due to alkali salts; wetting and drying, or freezing and thawing, will hasten the destruction of the cement, by extending the cracks already started.

PREVENTIVE MEASURES.

VI. Any measures that hinder the penetration of the alkali solutions into the interior of the cement will delay the destructive action. For this purpose both soap and aluminum sulphate have been tried, and have been found to afford some protection. The soap, however, in itself had a slightly injurious effect on the tensile strength of the cement.

The efficiency of these and of other waterproofings is being further studied, and results may be expected later.

The mixing of cement in weak solutions of sulphuric acid, di-sodium phosphate, magnesium fluoride, and oxalic acid has been shown by laboratory tests to increase the alkali-resisting qualities of concrete. The effects of most of the alkalis have also been shown to be less pronounced on neat cement briquettes than on sand cement briquettes, and in fact somewhat proportional to the amount of sand used.

CONDITIONS FOUND IN PRACTICE.

In practice, the worst conditions are generally found on types of structures whose design has nesessitated their being backfilled on one side, and subjected to ground water from the same direction—and at or below the original ground surface. These conditions seem to be aggravated where the structures are subjected to dry and wet surroundings—exposed to sun and shade during the winter months—and where alkali salts are most in evidence, and the ground

wet. The facts that the deterioration starts on the surface extending inwards, and that the water being carried by the structures has analytically been shown not to be responsible for the trouble, would indicate that the deterioration was primarily caused by the ground water and its effects on the concrete. These effects vary in a degree from the surface spalling off in what results in a pile of loose gravel below—to a condition where the mass becomes of a slimy consistency, like so much lime mortar, and mud. As a rule samples in what might be termed an intermediate stage get harder if permitted to dry out in the air—when they become coated with white powdery salts.

Either the disintegration is due to soluble compounds which are leached out of the concrete leaving it inert, or it is due to the disruption caused by the crystallization of the salts in the pores, or by chemical action of the substances in solution with the constituents of the concrete.

Any conditions which will tend to carry the salts from the soil, to the concrete, will hasten the disintegration action and lessen the percent. of alkali necessary to cause destruction.

A volume could be written on the chemical phases of this subject, and it would all be interesting; but as previously stated, this paper deals primarily with the experimental work done to date by a Committee of the Calgary Branch of The Institute.

EXPERIMENTAL WORK BY THE CONCRETE COMMITTEE.

In October, 1918, 270 concrete blocks and 180 cylinders were made at Calgary, under close supervision.

These blocks were moulded in wooden gang moulds, 10 inches x 10 inches x 30 inches long, and the cylinders in steel moulds, 8 inches in diameter and 16 inches long. Two hundred and sixteen blocks were made, using Western cement, and 54 from Owen Sound cement. All were carefully marked for identification purposes.

All materials used were analyzed physically and chemically.

The gravel was from what is known locally as the Carseland Pit, a well graded, bank-run material. The water was from a City of Calgary main. Samples of soil and ground water were procured from each hole in which a specimen was placed.

The blocks were made in three series.

(A) Screened, sized and washed. The sand was supposed to grade uniformly from fine to coarse—not to exceed 40 per cent. by weight, passing a No. 30 screen, and not more than 30 per cent. by weight, passing a No. 100 screen; and the voids were not to exceed 35 per cent.

The gravel was supposed to be uniformly graded in sizes from ¼ inch to 2 inches in diameter, and the voids not to exceed 40 per cent.

(B) Bank run material, washed.

Bank run material unwashed.

Each series of blocks were made in two mixes.

First, 1 — 2 — 4.

Second, 1 — 1½ — 3.

Of each mix, three blocks were plain.

Three were treated with two coats of soap and alum.

¾ lb. of castile soap, per gallon of water, heated to 180 deg. F.

2 oz. of alum to one gallon of water, heated to 100 deg. F.

1 coat of hot alum solution.

1 coat of hot soap solution.

1 coat of hot alum solution, after 24 hrs., all well brushed in.

Three were treated with water gas tar and coal gas tar as follows:

First coat, refined water gas tar of thin consistency.

Second coat, same, and immediately after the first.

Third coat, refined coal gas tar, applied hot, after coats one and two, were well soaked in.

Fourth coat, same as third, after third coat set.

The blocks were taken from the moulds in 48 hours and cured for 28 days, after which they were placed in the ground 22 inches, with 8 inches exposed, at the following points:

(1) On top of a high hill in Calgary, where no alkali conditions were likely to exist, and where there would be no ground water in contact with them.

(2) Near a sewer, in a low lying plot of ground, in Burns-land, Calgary, generally wet, and where alkali conditions had given evidence of being bad.

(3) At Strathmore, in a low lying plot, once a slough, where alkali conditions seemed bad, and where they would probably be wet most of the time.

(4) Near Brooks, in a low lying place, where the alkali conditions were apparently very bad, and where they would be wet most of the time from seepage water from an irrigation ditch.

The cylinders which were all made of Western cement, were buried at the foreging points, and 62 were placed in the Calgary City Hall Laboratory.

CONCLUSIONS TO DATE.

1st. Laboratory test cylinders are all relatively lower in strength than field tests because of the difficulty of maintaining a uniform degree of moisture.

2nd. The blocks and cylinders located in the Calgary district show no disintegration as yet because of the fact that the ground conditions were relatively much dryer than normal.

3rd. The blocks at Cassils show a much greater disintegration than those at other locations because of the greater concentration of soil solutions. Those of Strathmore show the next greatest degree of disintegration, because of less concentration of soil solutions and possible drying out at certain seasons.

4th. In a concrete of high density, where absorption of the alkali ground water appears to be mainly at the surface of the concrete, the action appears to be relatively slow and is largely in the nature of surface action, gradually extending to the interior.

In a concrete of low density and relatively high porosity the action is more rapid as it appears to take place simultaneously throughout the structure.

The more porous concrete is subject to the action of other disintegrating forces of a physical nature, such as frost action and the crystallization of salts in the pore space.

A dense concrete mixture, through some property not determined, such as low percentage of pore space or the character of this pore space, results in a greater resistance to the action of the alkali ground waters. Apparently this is true in either mixture 1 — 1½ — 3 or 1 — 2 — 4. Chemical action takes place over relatively small distances, direct contact of the reacting elements being necessary. The more porous concrete allows this more intimate contact throughout the structure; and consequently more rapid action takes place.

5th. The presence of alkali soil solutions does not retard the setting of the cement.

6th. The action is undoubtedly more rapid in weaker mixtures and mixtures of low density.

7th. No apparent difference in results was found in blocks and cylinders made of Eastern and Western cements.

CONTINUATION OF EXPERIMENTS.

The investigations are being continued in several lines that may give further information.

Blocks after approximately twenty months' curing in the Calgary district on which no alkali action has as yet become apparent, have been transferred to the Cassils location, and action of alkalis will be noted.

New blocks and cylinders are being prepared from gunite, and these after curing will be placed in the Cassils location and action noted.

Some tests are being made on waterproofing compounds at the present time.

The important practical phase of this matter is to have further investigation work carried on by competent chemists and engineers, working in close co-operation with one another; and in the meantime for all those concerned, to make use of the existing data, and take all possible precautions and remedial measures to prevent further deterioration to the existing works. In this connection the following points should be noted:

DESIRABLE FEATURES FOR CONCRETE IN ALKALI SOILS.

(1) Efforts should be made to get the densest possible mixture, and in this connection the smallest quantity of water consistent to good work should be used; in other words, a quaking mixture should be made of a workable mix, *i.e.*, to a consistency that will permit of the concrete flowing around the reinforcement with thorough pudding, and not so as to cause the finer particles to be carried to the top in suspension and the heavier ones to settle. About one gallon of water to each cubic foot of concrete in place is a fair average for a good mix.

(2) The best possible materials procurable should be used—and the best graded mixtures. All bank run material or river gravel should be screened out and remixed in proper proportions —based on proper tests made as to voids.

(3) It is desirable that all material should be washed, and it is almost essential that the sand should be washed; and in this connection it would be folly to assume that sands can be properly selected and passed on, without proper tests having been made on them.

(4) More care should be exercised in making field joints, using ½ inch of 1 to 2 grout on the junctions between the old and new work.

(5) Where chutes are used, they should be on easy slopes and kept down to the shortest possible length.

(6) The time of mixing is an important factor, and it is now generally conceded that the best results are obtained from machine mixing for a period of about 1½ to 2 minutes continuous revolving of the mixing drum.

(7) Backfilling with sand and gravel with the coarser material next to walls and plenty of weep holes are all extremely desirable, and particularly on such types of structures as have been previously mentioned, and are more easily subjected to alkali conditions.

(8) Closer supervision of all work done, by men who really *know* the concrete business is essential.

(9) Proper seasoning and protection from the elements, and not too early removal of the forms. It is important to remember that the methods and operations adopted in mixing concrete, are just as important factors affecting its density, strength and permanence, as are the qualities of the materials used.

(10) The use of gunite and gun driven asphalt at normal temperature or heated are being

tried out, and are both likely to prove effective methods—not only of damp-proofing and water-proofing, but of preventing the ill effects of alkali salts on concrete structures.

Extract from "Lime and Cements," second edition by Ernest A. Dancaster, B.Sc., A.I.C., London, Eng., 1920.

SUPER-CEMENT.

"A variety of Portland cement was introduced by Mr. J. F. Goddard in 1915 under the name of Super-cement. This cement is manufactured from Portland cement clinker by grinding in with it treated gypsum instead of the ordinary gypsum used for regulating the setting time. Super-cement was originally intended to be a waterproof Portland cement, that is to say, an ordinary Portland cement to which material was added in order to render it waterproof, thus obviating the disadvantage of having to entrust the mixing of the waterproofing compounds to possibly careless or ignorant workmen. It was soon found, however, that the cement prepared in this manner not only produced a waterproof mortar, but the latter was also much stronger than ordinary Portland cement mortar, thus differing from the usual waterproofing materials, which tend to weaken the cement with which they are used. The increase in strength is specially marked in the case of cement and sand mortar, and the difference increases with time. This cement requires more water to produce a paste of 'normal' consistency than does ordinary Portland cement, and the mortar is both denser and harder. It is too soon to say definitely in what manner this addition of the treated gypsum acts upon the cement, but it certainly is neither a mere water repellent nor a pore filler. The main effect appears to be to bring about a more complete hydration of the cement particles. A number of tests with this cement have been carried out by the author, and also by others, and it has been found that the same clinker invariably yields a stronger cement when ground with the treated gypsum than it does when ground in the ordinary way.

The following tensile and crushing results were obtained by Messrs. David Kirkaldy & Son. Both the Portland cement and the Super-cement were made from the clinker, but the former was ground with ordinary gypsum and the latter with the treated material.

SUMMARY OF TESTS.

Tensile Strength.

ORDINARY CEMENT.

Neat cement.	3 parts standard sand, 1 part cement.
Gauged with 23% water.	Gauged with 9% water.
Age 7 days..660 lbs.	Age 7 days..371 lbs.
" 28 " ..843 "	" 28 " ..425 "
" 90 " ..806 "	" 90 " ..453 "
" 6 mos...872 "	" 6 mos...845 "

SUPER-CEMENT.

Age 7 days..746 lbs.	Age 7 days..408 lbs.
" 28 " ..865 "	" 28 " ..471 "
" 90 " ..899 "	" 90 " ..501 "
" 6 mos...894 "	" 6 mos...511 "

Crushing Strength.

Ordinary cement. 1 and 3.	Super-cement. 1 and 3.
Age 7 days..3260 lbs.	Age 7 days..4030 lbs.
" 28 " ..4470 "	" 28 " ..5400 "
" 90 " ..5080 "	" 90 " ..6320 "
" 6 mos...6580 "	" 6 mos...7500 "

"The tensile tests given below were carried out by the author.

Tensile Strength.

ORDINARY PORTLAND CEMENT.

Neat cement.	3 parts standard sand, 1 part cement.
Gauged with 25% water	Gauged with 10% water
Age 7 days..592 lbs.	Age 7 days..263 lbs.
" 28 " ..661 "	" 28 " ..314 "
" 90 " ..698 "	" 90 " ..343 "

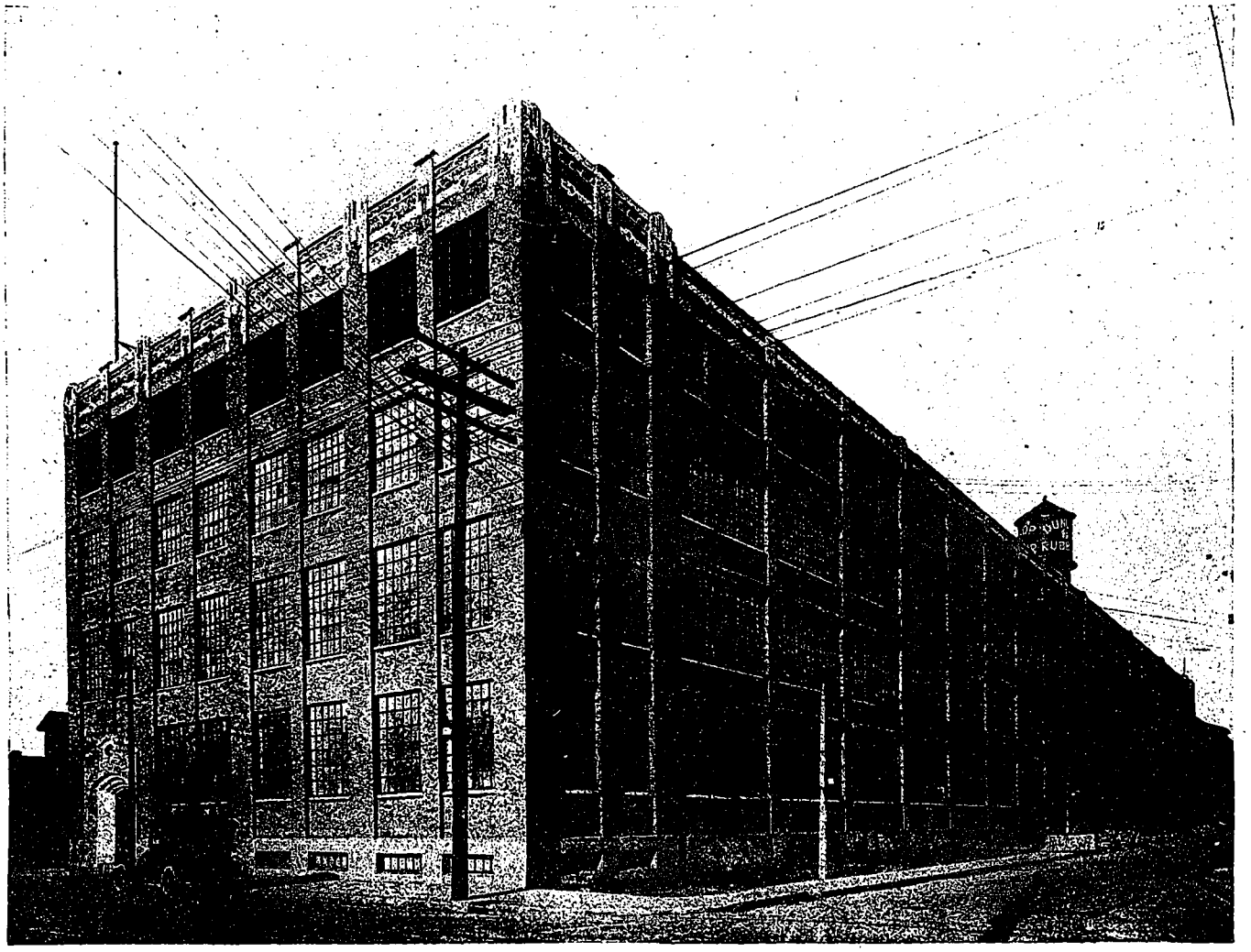
SUPER-CEMENT.

Age 7 days..703 lbs.	Age 7 days..398 lbs.
" 28 " ..776 "	" 28 " ..426 "
" 90 " ..814 "	" 90 " ..457 "

"This cement may truly be described as a waterproof cement. It is found that a slab one inch thick, made of a mortar composed of one part by weight of super-cement to one part of washed sand, will keep back water under a pressure of over 300 lbs. per square inch. The cement is also petrol proof, a similar slab having been found to keep back petrol under a pressure of 50 lbs. per square inch for 67 days. At the end of this period the test was stopped and the slab broken, when it was found that no penetration had taken place. Advantage has already been taken of this property, a number of storage tanks for petrol having been built with super-cement reinforced concrete at various aerodromes. It is probable that when this material becomes more widely known it will be not only universally used wherever waterproof cement work is required, but also in ordinary work where a high quality of reinforced concrete is desired."

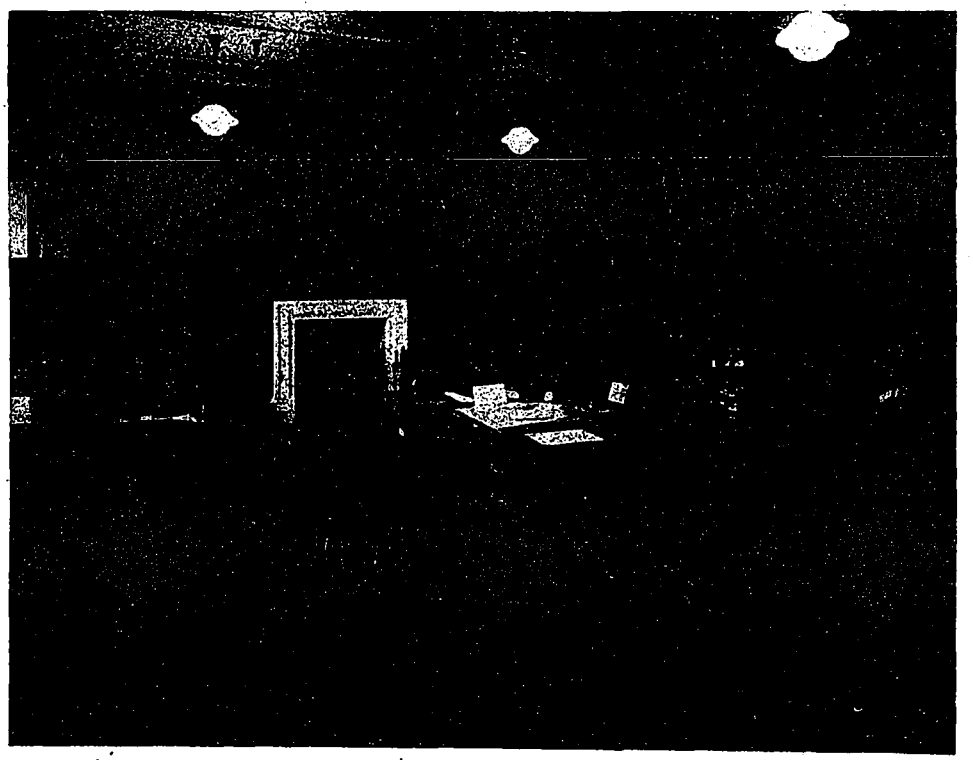
It is not the purpose of this paper to attempt to discourage in any way the rapidly growing use of cement in its manifold forms of application, but rather with the belief that "forewarned is forearmed" by calling attention to the dangers which exist, and the necessity of taking all possible steps to avert trouble and financial loss.

The whole question serves as an illustration of the inter-relation of chemistry and engineering which exists on many of the public works being carried on at the present date.



GENERAL EXTERIOR VIEW.

NEW FACTORY AND OFFICE ADDITION OF THE DUNLOP TIRE & RUBBER GOODS COMPANY, TORONTO.



GENERAL MANAGER'S OFFICE.

BERNARD H. PRACK, ARCHITECT AND ENGINEER.

Dunlop Tire & Rubber Goods Co. Addition

THE new four-storey reinforced concrete factory and office building of the Dunlop Tire & Rubber Goods Company, Limited, Toronto, which was opened on September 15th, marks the completion of a very attractive and substantial addition to the company's plant. Together with the present plant, it provides sufficient space for immediate needs, as well as permitting extensions to the west along Queen Street and the addition of a fifth storey when required.

The new building is 82 ft. 6 in. in width, 402 ft. 6 in. in length, comprising four storeys in height, the first storey being 15 ft. in height, the second 14 ft. and the third and fourth, 13 ft.

At the Queen Street end is a basement which is in the form of a tee, with a head towards Queen Street and the full width of the building and the arm extending back two centre bays in width and eight bays in length. The remaining portion of the first floor is without a basement, for the reason that the heavy equipment, which requires enormous foundations, could not be carried economically on a slab construction.

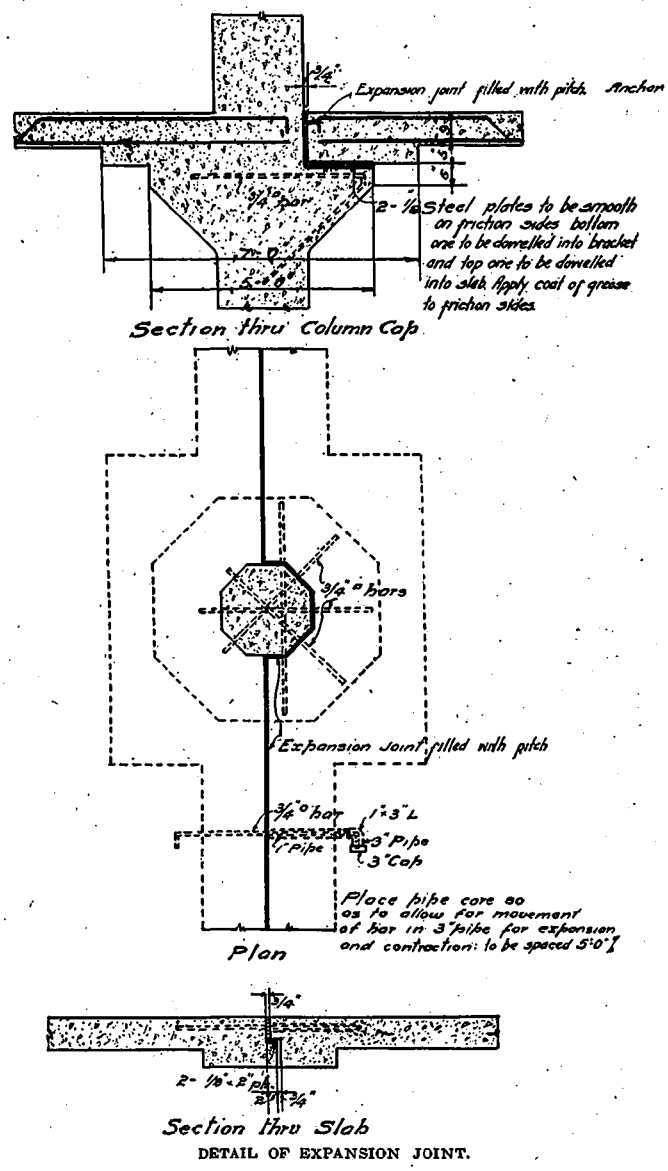
All of the floors throughout are of flat slab construction, employing the four-way system of reinforcement, and are designed for a live load of 250 pounds per square foot.

The general layout of the building was an important point, so as to get elevator facilities at the proper location and other communications such as stairs, chutes and other connec tions from floor to floor. The particular type of construction as well as the general arrangement of the building permits the spacing of the columns 20 ft. centres each way throughout. The floors throughout the building was another point which required a great deal of consideration, due to the fact that in certain places the heat in the building is at a high temperature and the wear and usage of the floor in many cases is heavy.

After considering the various floor variations, it was considered advisable to lay a creolite wood grooved block floor throughout the building where the highest temperatures are to be maintained and where the floors would receive the heaviest use and trucking. Throughout the tire building departments a mastic floor was installed, and throughout the warehouse and storage space a concrete finished floor was installed.

In treating the architectural design of the building, the function of the building was kept in mind, the usage of the building requiring much light and ventilation. No efforts were made to hide the features of a factory or the structural features, but mainly to secure a pleasing combination.

In providing for the future extension of a wing extending west along Queen Street, two courses were open with this type of construction, one to provide brackets on the columns to carry the future floor and the other a continuous ledge.



DETAIL OF EXPANSION JOINT.

Taking into consideration the profile of the wall and the probable length of time before the new extension would be added, and the prominent position to eastbound traffic on Queen Street, a decision was made in favor of the continuous ledge, which is cast on the spandrel beam from column to column on the lower edge of the beam and was designed to carry the future slab, haunched directly on it without the addition of any beams, and at the same time presenting no abrupt break to the eye. To bond the future extension to the present building, the direct transverse reinforcement was allowed to extend beyond the wall line.

TYPICAL FACTORY FLOOR.

the building will be occupied by calendar and mill lines.

The second floor of the building is given over to the tire-building machines and the space of the vulcanizers; the third storey is largely utilized for stock-rooms, and the entire fourth floor is occupied by the general offices, which include the executive offices as well as a cafeteria and kitchen.

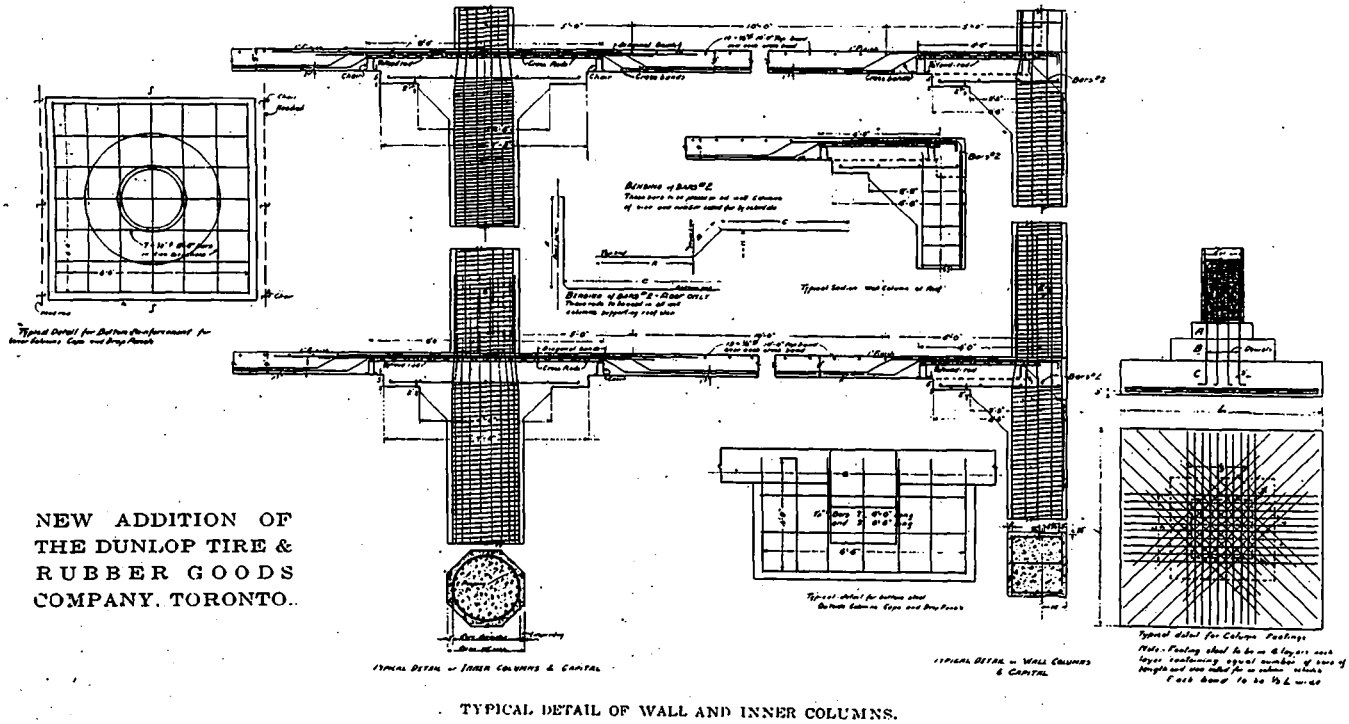
The various temperatures incidental to certain phases of the rubber industry, the variation of Toronto weather and the length of the building made it necessary to provide for expansion and contraction. The expansion and contraction joint consists of two parallel beams of the same depth as the drop panel, one fixed to the column and the other free.

To provide a suitable surface for movement, two contact plates were fixed in place, the upper one being dowelled to the bottom of the free beam and the lower to the bracket, with the contact surfaces polished and greased. Between the columns a 2 in. bracket was cast, with the beams and narrow plates attached. This bracket does not provide for bearing, but to prevent water and pitch penetrating to the ceiling below.

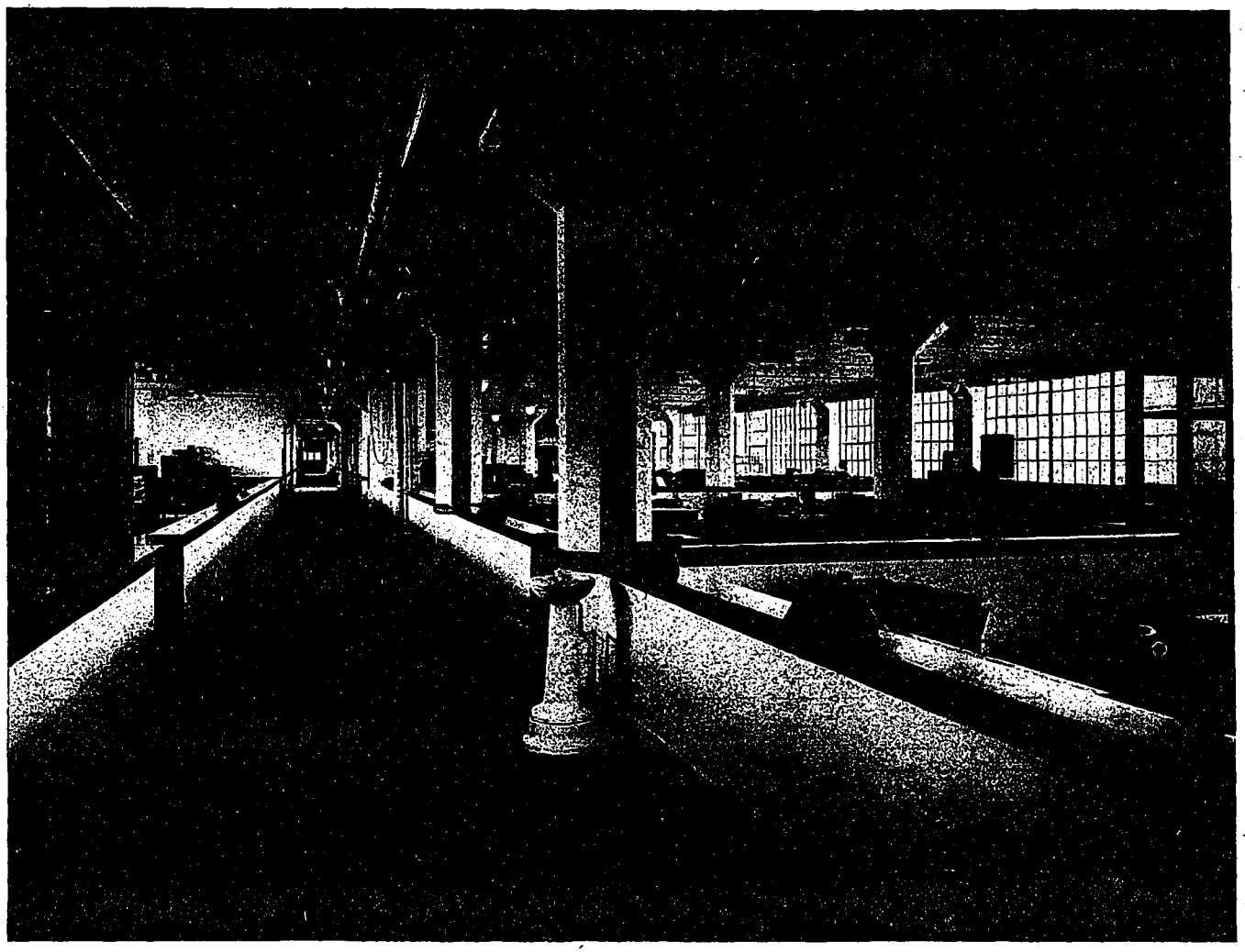
The arrangement of the building is quite a unique feature as regards up-to-date tire factory design, the basement being utilized for the storage of heavy cores, etc., and to provide for the hydraulic ram of the vulcanizers. The vulcanizers extend from the basement to the second floor and are located at the south end of the building.

The main office entrance is located on the south-west corner, with elevators and stairs running to the upper floors. At the rear end of the first floor will be the employment entrance, and the large floor space at this end of

NEW ADDITION OF THE DUNLOP TIRE & RUBBER GOODS COMPANY, TORONTO.



TYPICAL DETAIL OF WALL AND INNER COLUMNS.



VIEW OF FOURTH FLOOR SHOWING GENERAL OFFICES.

NEW ADDITION OF DUNLOP TIRE AND RUBBER GOODS COMPANY, TORONTO.

At the time of pouring the concrete, a joint of three-quarter inch was provided, which was filled with pitch to the bracket, but open from the bracket to ceiling.

The treatment in the wall columns is similar to the centre, except that, owing to the steel sash, it was not possible to provide a bracket for the spandrel beam, and bearing had to be taken care of by a six-inch slot in the column, with plates fixed as in the previous cases.

In order that the building might not be entirely separated, dowels were placed, fixing same in the concrete on the one side of the expansion joint and placing them in a gas pipe on the other side, which would permit a movement of three inches before the dowel would begin to act.

The building is equipped with the most modern and up-to-date mechanical equipments as regards plumbing, heating, sprinkler and electrical wiring for both light and power.

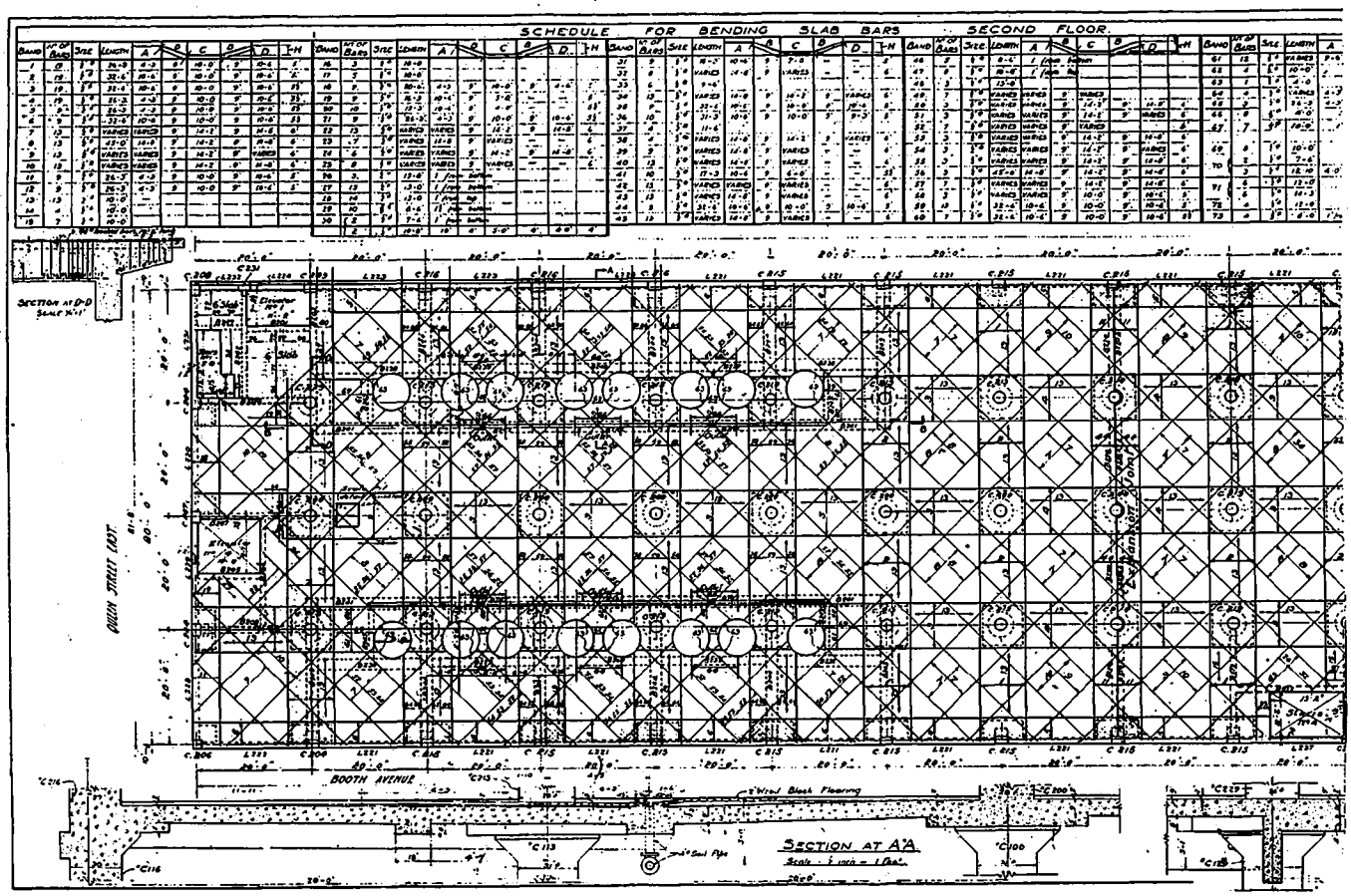
Electrical energy is used throughout as the power driving the rubber mills, calenders, tire-building, etc., there being some 2,000 h.p. used. The larger motors are fed by lead cables direct from the sub-station at 2,200 volts, while the smaller motors are fed by a 550-volt distribution system controlled by a seven-panel main switchboard centrally located in the building.

A considerable amount of direct current is used in these machines, requiring much variation in speed. The lighting system consists of five sub-feeders, running from the first floor to the top, each feeding a distribution panel on the respective floors.

The lighting panels are all of three-phase construction, and the lighting load is thus practically balanced on the three phases of a 2,000-volt line, feeding the lighting transformers located in a vault on the ground floor.

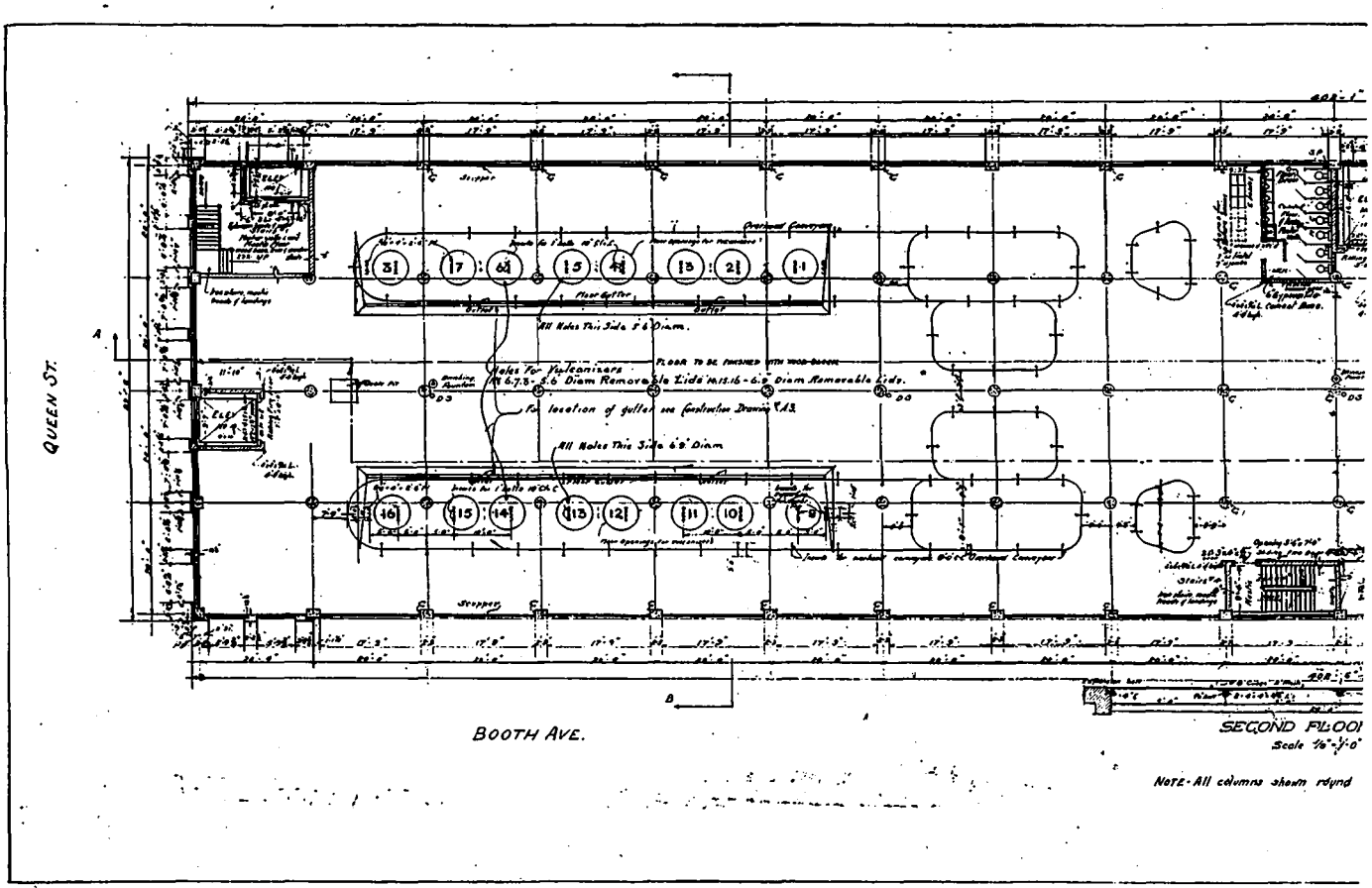
P. Q. A. A. Annual Meeting

The Province of Quebec Association of Architects will hold their annual meeting in the rooms of the association, 590 Union Avenue, Montreal, at 9 a.m., January 15th, next. Examination of candidates for membership and registration will be held on January 24th, on or before which date proofs of qualification must be submitted to the association by those who are seeking to take up practice in the profession.



SECOND FLOOR FRAMING PLAN.

(Continued on opposite page.)

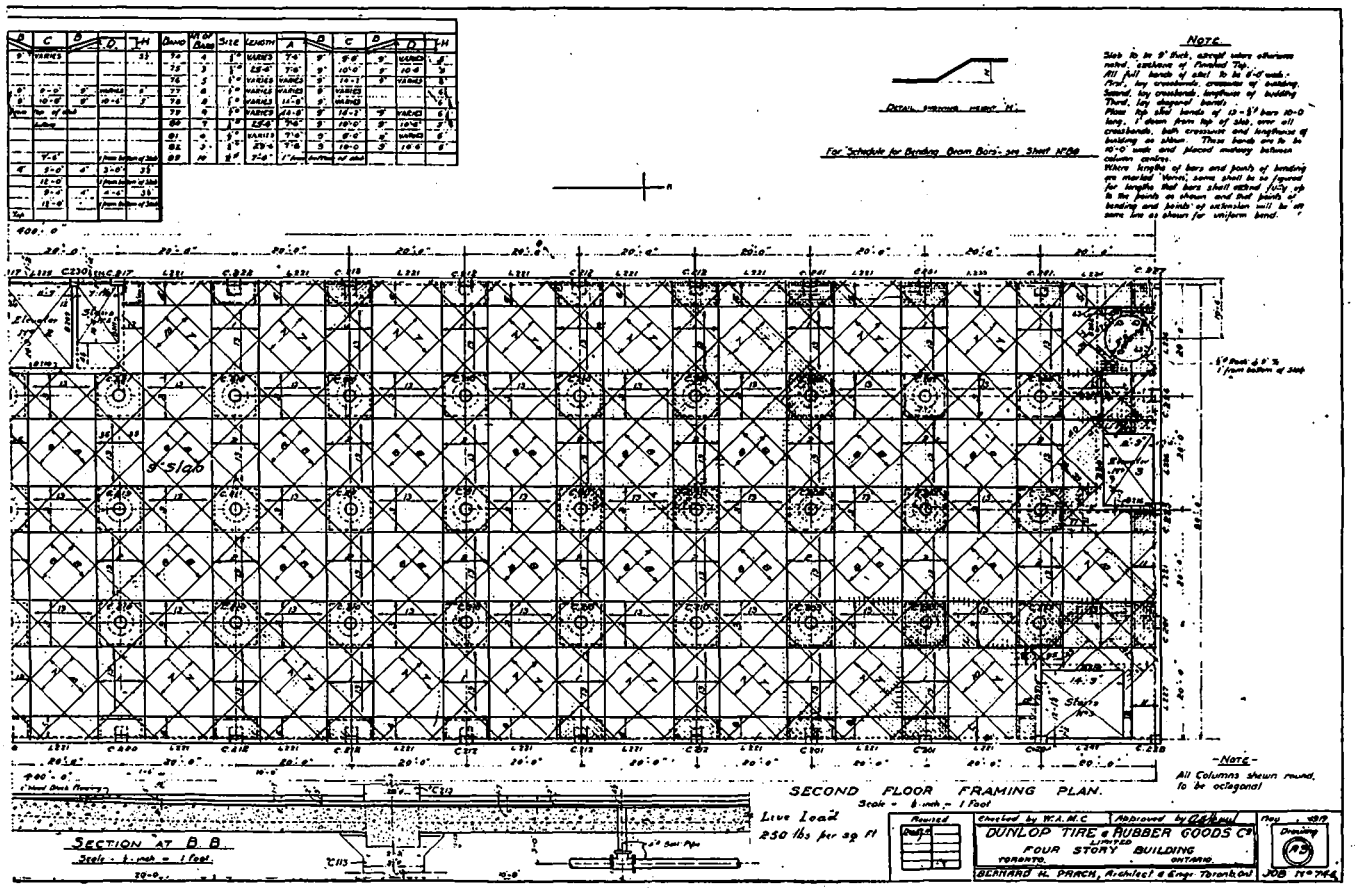


SECOND FLOOR PLAN.

(Continued on opposite page.)

NEW FACTORY AND OFFICE ADDITION, DUNLOP TIRE & RUBBER GOODS COMPANY, TORONTO.

BERNARD H. PRACK, ARCHITECT AND ENGINEER.



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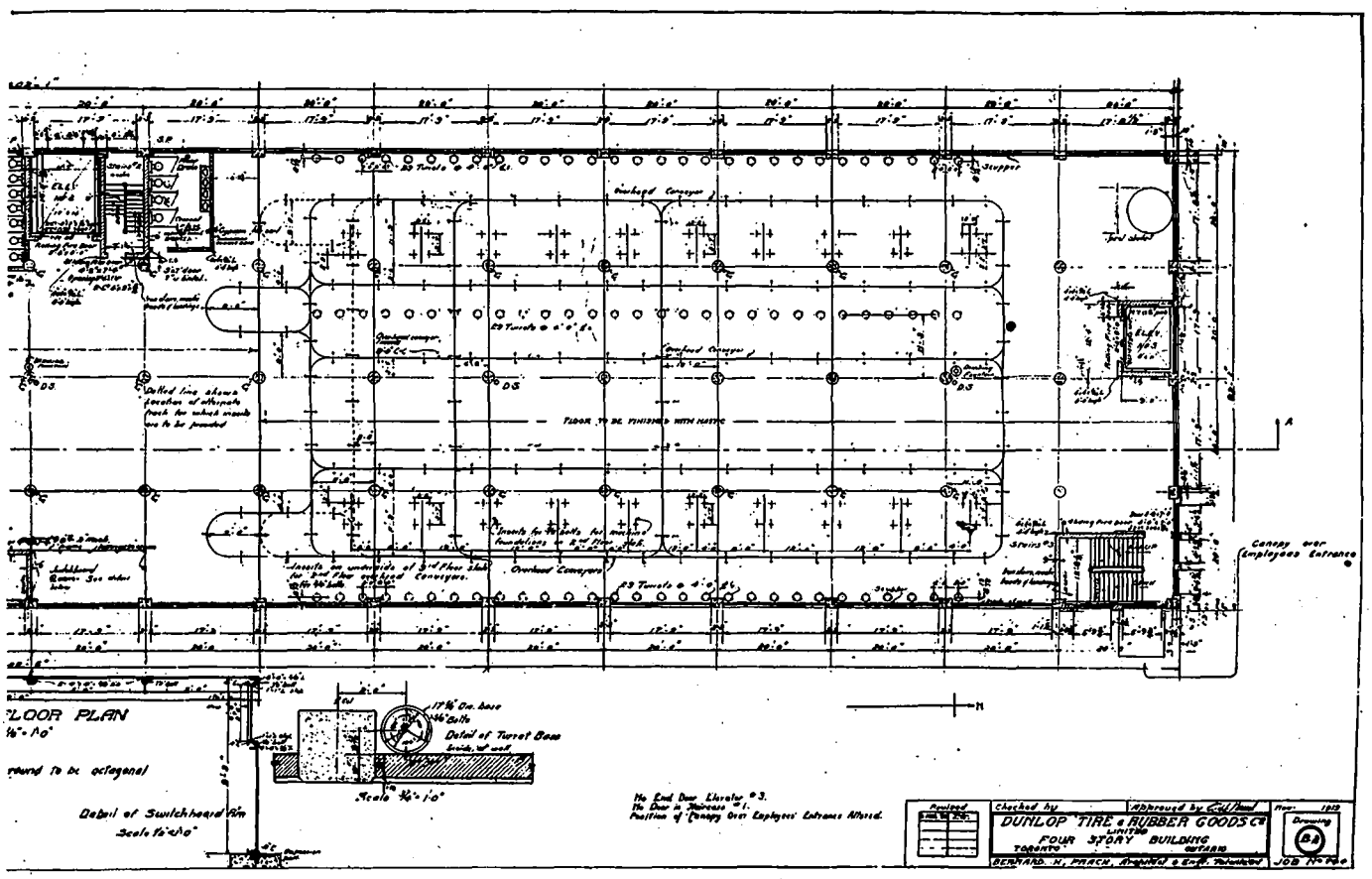
SECOND FLOOR FRAMING PLAN.



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SECOND FLOOR PLAN.

NEW FACTORY AND OFFICE ADDITION, DUNLOP TIRE & RUBBER GOODS COMPANY, TORONTO.

BERNARD H. PRACK, ARCHITECT AND ENGINEER.

Pan-American Architects' Resolutions

The Pan-American Congress of Architects, the first event of its kind, and to which the Royal Architectural Institute of Canada was invited to send delegates, was held this year at Montevideo, Uruguay. The object of the Congress is to contribute to the development of architecture and to give stimulas to the artistic and scientific studies of the profession. It is the intention to make the Congress a permanent institution and to hold meetings every third year in the capitol of some American country. At the Montevideo meeting the following resolutions were adopted:

I.—CITY IMPROVEMENTS.

1. That the Government and municipal authorities of all American countries should legislate in regard to the adoption of uniform plans for towns and cities, the present system of "squares" to be followed only in exceptional cases; the laying out of parks and gardens, and the choice of plants, shrubs, etc.; the selection of suitable sites for public buildings and monuments; and the framing of regulations complementary to the above.

2. That a special course of "city improvements" should be included in the curriculum of colleges and schools of architecture, and that free classes should be given by the architects' societies.

3. That leagues should be founded in every American city to arouse, direct, and stimulate Government initiative.

4. That a "Pan-American City League" should be founded.

II.—BUILDING MATERIALS.

That the Governments of American countries should direct the attention of their institutes and state laboratories to improving the method of production and exportation of building materials peculiar to each country, and that the use of such material should be encouraged in every way. That an account of such investigations should be published by an international institute. That the architects' societies should form exhibitions of building materials and effect an interchange of such materials.

III.—PROFESSION OF ARCHITECT.

That, in order to improve the aspect of towns and cities, to frame definite rules as to the conditions of dwelling houses which influence to so great an extent the people's moral and physical well-being, to insure the beauty, safety and hygiene of every kind of building, and generally to diffuse culture, the degree of architect must be recognized by the State, and the duties of the profession, which is the only one in a position to deal with the problems under discussion, established by law.

IV.—CHEAP DWELLING-HOUSES.

That the Government and municipal Authorities should be encouraged to co-operate in the construction of dwelling houses that shall be both cheap and hygienic. That the construction of detached houses in the neighborhood of industrial and manufacturing centres should be encouraged, as also the erection of tenements in densely populated centres. That, before granting permission to build, the ground on which such houses are to be erected shall be supplied with drainage system, light and pavement. That the municipalities and departments concerned shall be required to modify the building regulations at present in force, adapting them to the economic needs of such buildings, in order to effect a saving in the execution of the works without leaving anything undone pertaining to the hygiene, safety, and general aspect of such buildings. That attention should be drawn to the desirability of founding in each country a "National Bank for the building of cheap houses," to which employers, capitalists, and wealthy land-owners should contribute. That night-shelters for those unable to afford a cheap and decent lodging should be built.

V.—PUBLIC CULTURE.

That to educate the public appreciation of architecture, exhibitions of applied arts should be held periodically. That the authorities should form museums of casts of the works of famous sculptors and architects, and that free access to public buildings and monuments should be granted. That a yearly prize for the best conceived and executed building should be awarded, and that lectures on the subject should be given in the primary and secondary schools of each country.

VI.—PROFESSIONAL RESPONSIBILITY OF THE ARCHITECT.

That the Governments of American countries should frame laws clearly defining the responsibility of the architect and that of the contractor.

VII.—ARCHITECTURAL TRAINING.

That, for any progress to be made in the architecture of American countries, special schools or colleges of architecture should be founded, in which the necessary artistic, technical, and scientific training would be given.

VIII.—"PAN-AMERICAN CENTRE."

That a "Pan-American Centre" should be formed, and that an interchange of professors and students of architecture should be effected

between the various schools and America, thus creating a real professional solidarity.

IX.—BUILDING ACTIVITIES.

That the municipal authorities should be desired to study the modification of the system in force, with a view to increasing the tax on unoccupied sites. That all materials and machinery required for building purposes imported from abroad should be allowed to enter the country free of duty, and that the transport tariff should be revised in order to reduce freight rates. That the municipal authorities should be desired to modify the present regulations respecting the hygiene and safety of dwelling houses, with a view to transforming workmen's tenements into flats. That the public authorities should be urged to fight the trusts. That the training of competent workmen should be encouraged by the Government in their industrial schools, and that private concerns founded for the exploitation of any industry necessary to the building trade should be encouraged. That an improvement in the mortgage system should be studied, special mention being made of the system in force in the Argentine Mortgage Bank. That the laws of the country and the municipal regulations relative to building should be revised.

Cost Accounting and Efficiency

Stressing the fact that general cost systems cannot be bought to suit all circumstances, a writer in the BUILDER, London, states that the costing system should therefore be made to fit the job. Keeping this fact in mind, he declares, it would be well, however, to review several points of importance in cost accounting as applied to work of a civil character. The correct allocation of costs, the writer says, is very difficult to procure on any work with such a diversity factor as building and kindred work. But it will be found that the more work is organized for improved production the more easily will the details required to ensure correct allocation be obtained. Cost must show what has happened, not what might have happened, and it is a good idea to provide a set of costs which might be designated "inefficiency costs," into which all items of undoubted waste expenditure are placed, as such will enable the inefficiencies leading to the waste to be quickly located and steps taken to prevent recurrences.

Under this heading of Inefficiency Costs might be shown all idle plant, as it is no fault of the job in hand that there is a quantity of plant which it is not necessary to use on it. Therefore only the costs of using the actual plant on the job should be charged to the costs of such, and the maintenance and depreciation of the idle plant charged to the Inefficiency Costs. In the same way, any large sum spent on maintenance of workshops or plant must be prevented from creeping into the costs of any job which happens to be in hand, as this is a charge which affects the employer more as a property owner, and if allowed to come into the costs of the work in hand will be sure to confuse the issue on some future occasion when the costs of that particular job are referred to.

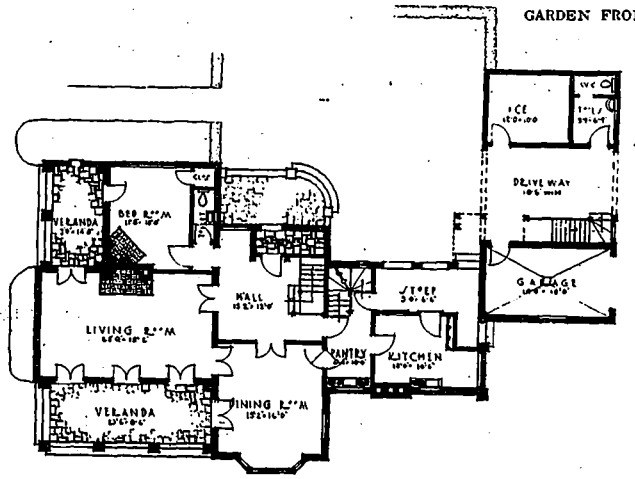
There are certain charges which costing clerks will persist in averaging as being the easiest way out of a difficult question. This should not be allowed, as with a little trouble and insistence, these can always be definitely allocated to the job, thus providing for definite accuracy. The best means of ensuring that the necessary information is rendered by those responsible is to ask that it be entered on a suitable space on the job card, work sheet or time sheet, as the case may be, which is afterwards made the basis of payment; so that until the costing clerk has obtained his information and franked the card to the pay clerk the individual's pay is delayed.

It should be a definite instruction that, unless an expenditure subserves efficiently in some way the work to which it is allocated, it is either an incorrect allocation or wasted expenditure. Overhead charges on unemployed plant or workshops show a state of things which should not exist and should be transferred to the inefficiency costs. Other items which might well find a resting place under this heading are: Waste of materials; unnecessary adjustments of plant; loss through accidents; extra payments for overtime where there is any question of the necessity for them. In this way direct attention is brought to bear on things which might otherwise escape notice in a general mass of costs.

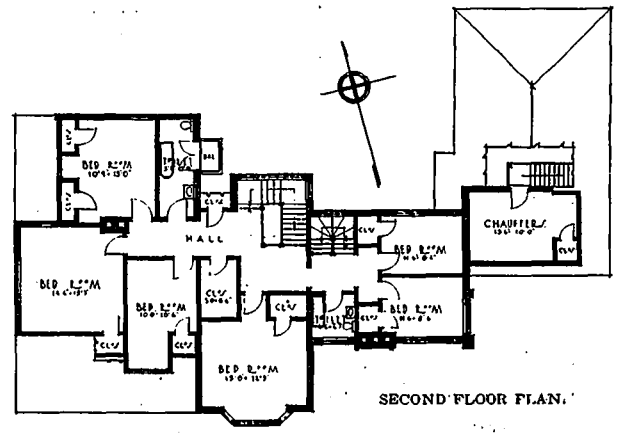
It is essential that each particular job should be made to bear its fair burden, and not, as is now often the case, be saddled with some heavy charge which tends to favor the future or some other inefficient job. On the other hand, all equitable charges must be brought in, and on no account carried forward, as that would favor the present-day job at the expense of the future.

It is obvious that such carefully collated costs must, in conjunction with the data obtained by time-study, provide such a collection of material as will enable estimates to be made out with such accuracy that the possibility of big discrepancies between the estimated and actual costs of a job cannot arise. The necessity for accurate costing is very clear, for it is by means of carefully-compiled data and a further accurate analysis of it that those responsible are enabled to set up definite standards and improved methods. But after they are set up it is essential to have carefully recorded costs to facilitate their useful application.

GARDEN FRONT FROM THE SOUTH.



GROUND FLOOR PLAN.



SECOND FLOOR PLAN.

HOUSE OF
H. H. MASON, ESQ.
NEAR ROCHES POINT
LAKE SIMCOE.

DRIVEWAY APPROACH TO ENTRANCE.

ARCHITECT.
F. H. MARANI,

Two Lake Simcoe Houses

Scarcely less important than the designing of a house is the planning of the grounds which surround it. Only too frequently we see attractive houses completely ruined by ill-considered incongruous settings. For instance the quiet dignity of a Georgian city residence may be entirely spoiled by grounds lacking that degree of formality which alone could bring them in harmony with the building. Or again, a country house of rambling picturesqueness may have its lawns disfigured by beds of Cannas and Salvia, such as are usually associated with a city park.

In designing a garden it should be borne in mind that it cannot be considered as a unit in itself. Since it is dominated by the house it must of necessity be subservient to it, therefore, that portion of the grounds which immediately surround it should conform to its architectural style. The most successful garden is the one which is planned at the same time as the house and in conjunction with it. In no other manner can such a harmonious result be produced. No rule of thumb methods can be adopted in the designing of gardens, each site suggests its own requirements and many a pre-conceived rule has to be abandoned in order to preserve existing features of value or to adjust the design to difficult topographical conditions.

In the case of Mr. H. H. Mason's property at Lake Simcoe, there were but few obstructions to be considered. The land which has a gentle slope from the main road to the lake was devoid of trees except at the fringe of the lake shore. In order to obtain a good view across the lake and at the same time take full advantage of a south aspect for the flower garden, the house was placed near the north boundary close to the lake front. The entrance to the property is at the northeast corner and the driveway follows irregularly the north boundary to the carriage court at the east end of the building.

In order to give the house the desired feeling of elevation and to minimize the appearance of the ground falling towards the building, the main flower garden on the south front has been sunk 2½ feet. The sunken garden when completed will be laid out with formal flower beds grouped round a lily pond. A pergola at the

LIVING ROOM.

FIREPLACE IN LIVING ROOM.

MASON HOUSE,

NEAR ROCHES POINT, LAKE SIMCOE.

VIEW FROM LAKE SHORE.

LIVING ROOM TOWARD HALL.

HOUSE OF H. H. MASON, NEAR ROCHES POINT, LAKE SIMCOE.

DETAIL OF ENTRANCE.

F. H. MARANI, ARCHITECT.

VIEW FROM ROAD.

east end will divide it from the kitchen and fruit garden, and a generous shrubbery plantation screens it from the adjacent property belonging to Mr. Baker. Herbaceous borders have been planted on the south terrace by the house and should give a pleasing note of color against the rough cast walls. The main herbaceous borders, however, run along the northern boundary of the property.

Unfortunately the only illustration in this article, showing a view of the garden, was taken when the grounds were still under construction and in a very incomplete condition.

DINING ROOM: MASON HOUSE.

In the planning of both the above properties the closest collaboration was maintained at all times between the Architect, Mr. F. H. Marani, and the Landscape Architects, Messrs. H. B. and L. A. Dunington-Grubb. The result has been that the greatest economies have been effected in the division of the property together with increased convenience, pleasure and comfort in the use of both house and grounds.

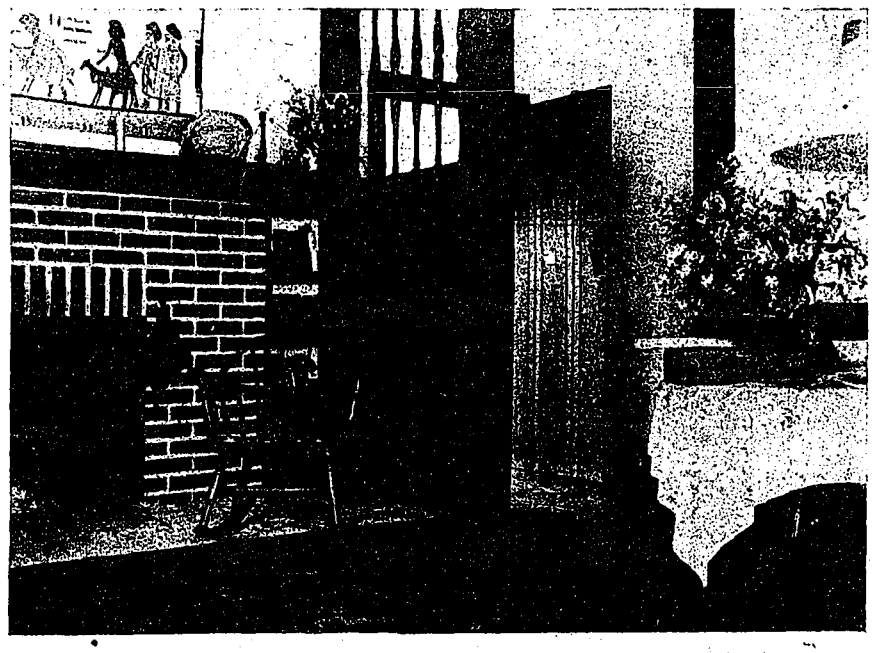
Both houses are planned so that the entrance front and the garden front are on different sides of the house.

In the Mason house, the garage, ice house, tool room and chauffeur's bedroom are grouped with the house, with an archway between the garage and ice house. This makes an interesting feature of the entrance, and gives a protected way from the house to the garage and ice house. It also provides shelter for an extra car if necessary.

The house is built of hollow tile, stuccoed, with the base, verandah posts and chimneys of dark red stock brick. The roof is covered with shingles dipped in Solignum.

The interior is finished in whitewood and birch and stained dark brown.

The Baker house is a frame house with stucco on metal lath to the tops of the ground floor windows, and above that wide clapboards stained with Solignum.



DETAIL OF FIREPLACE AND DOOR: BAKER HOUSE.

Hardening Concrete

Experiments by the United States Bureau of Standards to develop a method of accelerating the hardening of concrete, especially when it is to be used in wet or damp situations, have shown that 4 per cent. of calcium chloride added to the mixing water increases the strength of concrete at the age of one day 100 per cent. or more. In some cases in two days the strength equalled 75 per cent. or more of that normally attained in one month.

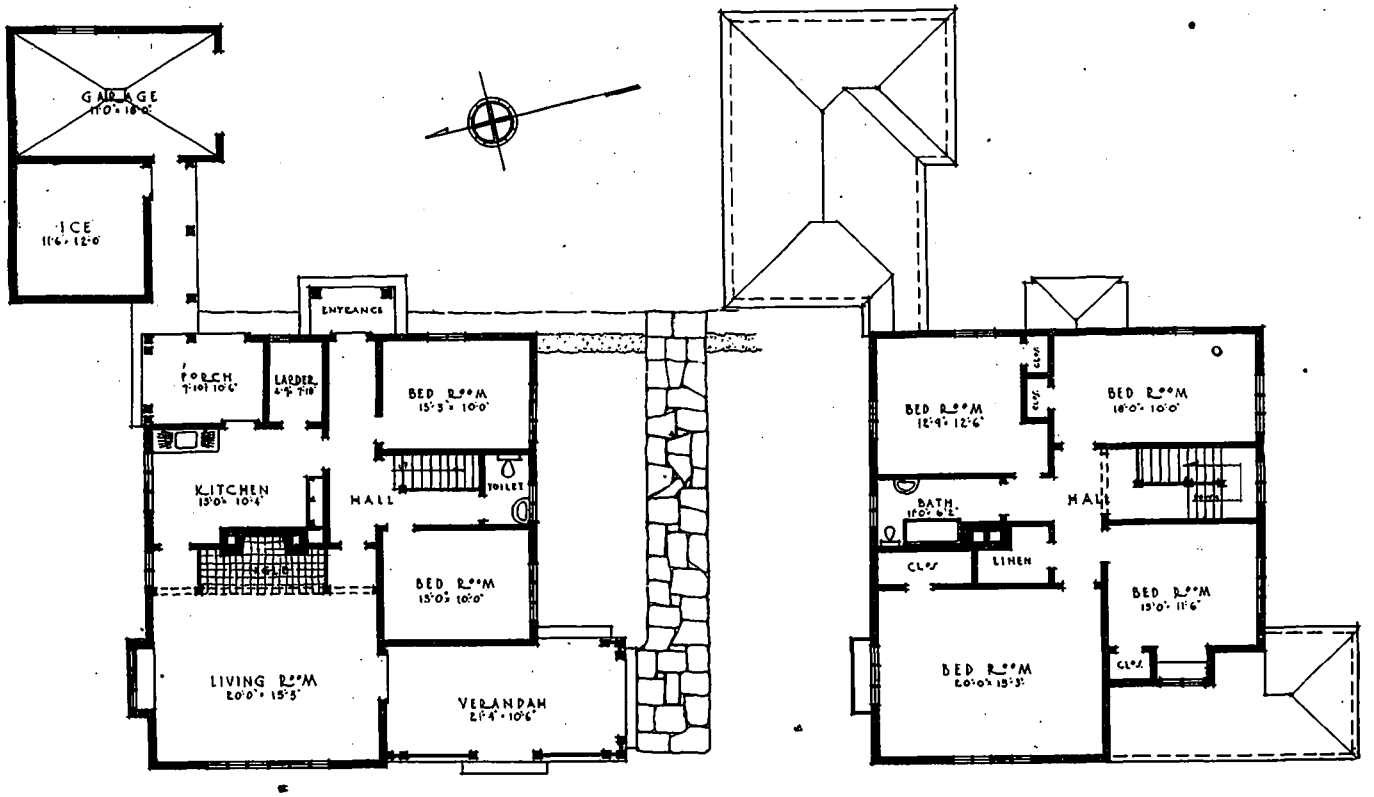
Preliminary work on the development of the Bridge River power site near Lillooet, B.C., is being carried on. The development will entail an expenditure of $30,000,000; the head will be 1,600 feet and 400,000 horse-power will be available.

Will meet in London

The Association of Contractors' of the United States and Canada, which recently met in convention at Detroit, Michigan, has voted to hold next year's meeting at London, Ont.

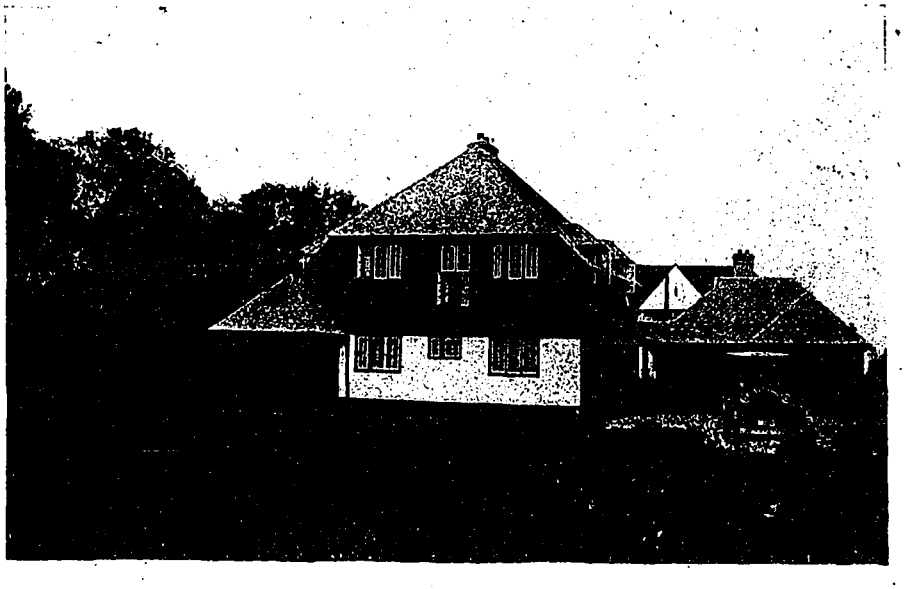
HOUSE OF E. G. BAKER, ESQ. NEAR ROCHES POINT, LAKE SIMCOE.

VIEW FROM LAKE SIDE.



FIRST FLOOR PLAN.

SECOND FLOOR PLAN.



VIEW FROM SOUTH.

F. H. MARANI, ARCHITECT.

The Flat Fee as a Measure of Equity

By John Lawrence Mauran.

(Reprinted from the Journal of the American Institute of Architects.)

ABOUT ten years ago one of our most loyal and important clients came to us with an alteration and remodelling problem involving a considerable expenditure compared to the result he was seeking. He was, as we well knew, a timid man in matters wherein architects feel they are on their home grounds, although bold enough in the financial and real estate field. The exigencies of time and the character of reconstruction led us, as a condition to fulfilling his wishes, to insist on the selection of a certain contractor on a cost plus basis, and in spite of the fact that in those good days now gone by the "cost plus" had a definite limit of liability of about two hundred thousand dollars, our client showed his timidity by hesitating over the indefinite amount of our fee of ten per cent. Although we could hardly fathom the causes of hesitancy, the inspiration of the moment led us to suggest that we would do the work—whatever it might cost—for a flat fee of twenty thousand dollars. With unmistakable relief he seized upon the suggestion, and everyone was happy even upon the day of completion a week ahead of time and with a saving of over seventeen thousand dollars. There is a psychology in it, for in spite of paying us some seventeen hundred dollars more than ten per cent., he had found security against the bugbear of increased costs involving increased architects' fees.

Now, every architect worthy of the name would hotly repudiate the implied suggestion of bad faith, but we must remember that often the client's mind visualizes added fees with any suggested betterment, no matter how high his confidence in the disinterested character of the suggestion.

From the deep impression left on us of the satisfaction of the owner, we profited a little later on when he retained us as architects for the first reinforced concrete building of any importance in St. Louis. It was an eight story wholesale building covering an entire city block, and at an early stage in the negotiations, we perceived symptoms which led us to repeat our offer of a flat all-inclusive fee.

Our attitude through both these experiences was a more or less passive acceptance of the state of mind of a client, but quite recently we caught again the same note in the comments of clients during preliminary conferences, sounding a vague alarm as to sky-rocketing of the fee in case of a pyrotechnic display in building costs.

This turned our thoughts to the two previous experiences, and changed our attitude from a passive one to an active advocacy of the fixed and all-inclusive fee, and late in 1919, when the material market had all the symptoms of an ascending escalator, we expressed our desire to fix in advance the *exact obligation of the client* for full architectural services including the fixed fees which we in turn agreed to pay the engineers engaged by us on work in their various branches.

Of course, the percentage system applied on the estimated cost furnished the basis for determining the fee named, but the fact that it was *fixed* gave our clients every assuarnce that their interests were paramount, and hence, while we were bending every endeavor to protect them against spectacular advances, there could be no possible ground for even the unformulated suspicion that we, too, were profiteering at their expense through the unpreventable increases in cost over the already high level of the moment.

While there was a certain amount of surprise expressed, there were unmistakable signs of appreciation of what commended itself to them as to us, as a businesslike co-operation insuring justice to all concerned, for the surprise centred about an unsuspected flexibility of the architect's mind in his methods of calculating his remuneration.

It may prove of interest to record the rather unusual method we adopted in the handling of these commissions under very unusual and very trying conditions. First of all, we urged the immediate *selection* of a contractor of proved ability in the particular type of work, of absolute integrity and whose conditions of other work in progress at the moment justified such a step.

We further assured our clients that they could engage such a cotnractor to perform the work at cost plus a *fixed fee.* We also pointed out that in the purchase of material long in advance of the preparation of plans and specifications, that the logical method of handling such an undertaking was through the functioning of a "committee of the whole," consisting of owner, architect, contractor, the owner's operating engineer or manager, and the archtect's engineers (structural mechanical, electrical, etc.) sitting together with one common purpose to discuss, decide and act on every matter whether of purchase or the choice of methods and materials.

Another phase of "all-inclusiveness" as pertaining to the architect's fee (however arrived at) is the oft-time unspoken objection in the

client's mind to the little understood separate payment of the clerk of the works, as well as the engineers. One of our clients voiced this feeling recently when he blurted out, "We paid for your superintendents on the last job." From our recent experiences I can vouch for the fact that while we have been fully reimbursed, our clients' satisfaction in the "all-inclusive fixed fee" has fully justified its adoption.

In looking back over the operation of the "committee system," the application of the "fixed fee" to sub-contractors as well as the general contractor, and especially to our own "all-inclusive fixed fee" for architectural and engineering services, there were many occasions which sprang to mind when we were thankful, indeed, not only because the disinterested character of our services excluded them from the often trying discussions over jumping prices, but more particularly because of the comfortable feeling that while we were being adequately paid for the service rendered, we were not profiting by the misfortunes of our clients, and so we feel that we can conscientiously commend to the profession and to our future clients, "the flat fee as a measure of equity."

Report of New York Architects on Housing

At a meeting on November 18th, the New York State Association of Architects adopted a report incorporating an analysis of the housing problem as affecting that State and embodying recommendations for legislation, which, in view of the subject, is of general interest, and from which the following is quoted in part:—

The housing problem is not a new nor a temporary problem. Rent legislation will not solve it. Offers of bounties to the speculative builders can only at the best serve to resurrect an incompetent system that in a wasteful manner has given a small proportion of us quite unsatisfactory dwelling places.

We can only hope to start the machinery of house production and to make it function for the good of the community by a charge in our attitude in regard to the part that must be played by credit, materials, labor, land, planning and the State.

The control of credit is mainly in the hands of a small group of men. These heads of the banks and insurance companies are responsible to their stock and bond holders to get the greatest possivle profit on their investment. Housing is risky. It does not pay as well as other investments. And so they will not lend money for investments. But the credit which they lend is based on the saving of working men and women. These same people are congested in a manner which endangers health and happiness while their money is used to build theatres and garages.

There is no solution of the housing problem until the control of credit becomes a public function. Credit for housing must be used where it is most needed and when it is most needed. This will be possible when the State lends its money or credit for housing at a low rate of interest and for long terms, or when the people finance the building of their own homes by forming credit unions for that purpose.

Material and building service, like money, are practically unattainable for housing. There has not been material or organized and trained labor enough for all purposes. Bricks have been used for loft building, not for houses; glass needed for homes has gone into automobiles. There is reason to believe that the scarcity of materials has, at least in part, been created by curtailment of supply for the purpose of keeping prices high enough to pay large profits. It is apparent that a stronger control by the public of the manufacturing and distribution of essential material is needed. But this alone will not suffice. All unnecessary waste and undue profit must go if we are to bring the cost of housing within the means of the more poorly paid half of the population.

Workers in the building trades are not giving their full effort. In part, this is due to the disorganization that has resulted from the war. But there are more deep-seated causes. Artisans and laborers are discontented, perhaps because they feel that their efforts will not so much serve to promote their own interests as to enrich speculators and landlords who may afterwards squeeze them without mercy. If they felt that buildings were erected for the purpose of serving the need of the workers and the public in general instead of for profit, it might be more possible to get a full and enthusiastic day's work from workers.

The cost of land alone, according to the housing report of the Reconstruction Commission, is "generally sufficient to prevent a large part of the workers from escaping from the slums." The value of land increases with the congestion of population. However, the individuals who are crowded together in our cities get none of the increase which results from their

being crowded together in insufficient quarters. The land increment is wasted in land speculation; it is ultimately added to the cost of houses. A means must be found to preserve this unearned increment for the use of the community.

Even if there were available and cheap enough credit, land, material and labor to build decent homes for all, the housing problem could not be solved without a proper plan. Planning is the function of the architect. Much progress has been made during the last decade in the design of individual houses and groups of dwelling places. But the housing problem of our large cities cannot be solved by more houses. The unrestrained and unguided growth of New York shows the waste that comes from lack of foresight in planning our communities. There is not room for the population to live comfortably, decently or healthfully near their work. Transportation cannot solve the problem. The subways are inhumanly packed. There are not streets enough to care for our traffic. New York has grown without plan to the point where it is choking its own growth. More houses—without a proper plan for their location—can only lead to more congestion and more expensive homes. All effort will be wasted if we further increase the size of our unhealthy and inefficient great cities. We should plan to decentralize our population by developing smaller, self-contained communities in which sufficient space is provided for agriculture, industry and organized social life. These should be small enough so that every family may have a garden and every worker may walk to and from his work, and large enough to allow efficient industrial organization and the social, educational and cultural activities that make city life attractive. They should be surrounded by a belt of land that should be restricted for all time to farming and recreation.

Governmental housing, though necessary as a temporary means of averting a crises, seems dangerous and unsafe as a permanent policy. Municipalities should be given whatever power, if necessary, including that of building homes, to avert the dangers that are threatened by the present lack of sufficient houses. But the permanent function of the State in regard to housing should be that of education and of guidance of the various agencies that must need cooperate to give us sufficient, adequate homes, properly placed in relation to work, recreation and food supply. For this purpose the State and local housing agencies are badly needed.

As a first step forward in the development of such a housing programme, we recommend the adoption by the State of the recommendations of the Reconstruction Committee:

1. That a law be enacted requiring the appointing of local housing boards in communities having a population of over 10,000 and the appointment of a central State housing agency for co-ordinating local effort.

2. That a constitutional amendment be enacted permitting extension of State credit on a large scale and at low rates to aid in the construction of moderate priced homes.

3. That an enabling act be passed permitting cities to acquire and hold or let adjoining vacant lands and, if necessary, to carry on housing.

New British Engineering Society

A new engineering society has been formed in Great Britain to encourage the study of the history of engineering and industrial technology. The founders claim that this field has been neglected and that the world does not appreciate how much it owes to the British and other engineers who have done greater service to the world than generals and politicians. Many distinguished British engineers have interested themselves in the formation of this body, which will be known as the Newcomen Society. Members will be sought in the British Colonies and Dominions, and also in other countries.

Physical Characteristics of Birch, Beech and Maple

Birch, beech and maple are very similar in appearance, and have approximately the same weight. Hence it is comparatively easy to mistake one of them for another. A method which anyone can use to distinguish them is suggested by the U.S. Forest Products Laboratory. The method makes use of the relative width of the pores and medullary rays in the three woods.

If the end grain of birch, beech or maple is cut smooth with a sharp knife and examined with a hand lens, the pores will be seen as tiny holes distributed fairly evenly over the surface, and the medullary rays will appear as narrow lines of a different shade running at right angles to the growth rings.

In beech some of the rays are very distinct even without a lens. The large rays are fully twice as wide as the largest pores.

In maple the rays are less distinct, and the largest are about the same width as the largest pores.

In birch the rays are very fine, invisible without a lens. The pores are several times larger than the rays, usually being visible to the unaided eye as minute holes on the end grain and as fine grooves on dressed faces of the board. The pores in birch are considerably larger than the pores in beech or maple.

Legs vs. Architects

Clarence Day, Jr.

I don't know how many persons who hate climbing there are in the world; there must be, by and large, a great number. I'm one, I know that. But whenever a building is erected for the use of the public the convenience and rights of such persons are wholly ignored.

I refer, of course, to the debonair habit which architects have of never designing an entrance that is easy to enter. Instead of leaving the entrance on the street level so that a man can walk in, they perch it on a flight of steps, so no one can get in without climbing.

The architect's defence is, it looks better. Looks better to whom? To architects, and possibly to tourists who never go into the building. It doesn't look better to the old or the lame, I can tell you; nor to people who are tired and have enough to do without climbing steps.

I admit there is a dignity and beauty in a long flight of steps. Let them be used, then, around statues and monuments, where we don't have to mount them. But they become a highly unwelcome form of beauty when they add, each day, to the exertions of everyone, and shut out some of the public completely.

Suppose that, in the eye of an architect, it made buildings more beautiful to erect them on poles, as the lake dwellers did, ages back. (It would be only a little more obsolete than putting them on top of high steps.) Would the public meekly submit to this standard and shinny up poles all their lives?

Let us take the situation of a citizen who is not a mountaineering enthusiast. He can command every modern convenience in most of his ways. But if he happens to need a book in the Public Libary what does he find? He finds that some architect has built the thing like a Greek temple. It is mounted on a long flight of steps, because the Greeks were all athletes. He tries the nearest university library. It has a flight that's still longer. He says to himself (at least I do), "Very well, then, I'll buy the damn book." He goes to the bookstores. They haven't it. It is out of stock, out of print. The only available copies are those in the libraries, where they are supposed to be ready for everyone's use; and would be, too, but for the architects and their effete barricades.

This very thing happened to me last winter. I needed a book. As I was too lame to get in the library myself, I asked one of my friends to go. He was a young man whose legs had not yet been worn out and ruined by architects. He reported that the book I wanted, being on the reference shelves, could not be taken out. I could go in there and read it, all I wished, but not take it away with me.

"Yes, but how am I going to get in?" I said. "My legs can't mount that rampart."

He said there was a side entrance. We went there, but there, too, we found steps.

"After you once get inside, there is an elevator," the doorkeeper said.

Isn't that just like an architect! To make everything inside as perfect as possible, and then keep you out!

I afterward thought of going in the back way, at the delivery entrance for trucks. My plan was to go in a packing-case, disguised as the "Memoirs of Josephine," and let them haul me upstairs before I revealed I was not. But they turn those cases upside down and every which way—it would be as bad as going over Niagara.

If there must be a test imposed on everyone who enters a library, make it a brain test that will keep out all readers who are weak in the head. No matter how good their legs are, if they haven't enough brains, keep 'em out. But, instead, we impose a leg test, every day of the year, on all comers, which lets in the brainless without any examination at all, and shuts out the most scholarly persons unless they have legs like an antelope's.

It is the same at the Metropolitan Museum, and at most of our clubs. Why, they are even beginning to build steps in front of our great railway stations, in order to make it that much more difficult for people to travel, and to discourage them and turn them back if possible at the start of their journey. And all this is done in the name of art. Why can't art be more practical?

The remedy is simple. No architect who had trouble with his own legs would be so inconsiderate. His trouble is, unfortunately, at the other end. Very well, break his legs. Whenever we citizens engage a new architect to put up a building, let it be stipulated in the contract that the board of aldermen shall break his legs first. The only objection I can think of is that his legs would soon get well. In that case, elect some more aldermen and break them again.—*Harper's Magazine.*

Anglin-Norcross, Limited, Hold Conference

The annual conference and banquet of Anglin-Norcross, Limited, attended by the headquarter and field executive staffs, was held in Montreal on November 29-30. In addition to staff meetings at which matters of organization and coordination were discussed, opportunity was also taken of the occasion to visit a number of city contracts, as well as the Food Specialists of Canada exhibit and the film exchange of the Canadian Amusement Company.

CONSTRUCTION

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CONTRIBUTIONS.—The Editor will be glad to consider contributions dealing with matters of general interest to the readers of this Journal. When payment is desired, this fact should be stated. We are always glad to receive the loan of photographs and plans of interesting Canadian work. The originals will be carefully preserved and returned.

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Vol. XIII. Toronto, Dec. 1920 No. 12

Materials and Prices

Despite unsettled conditions, Canada altogether has had a good building year. The volume of work carried out is estimated in published reports at approximately $245,000,000, as against $180,000,000 in 1919, and yet it must be said if half of the buildings planned, but held up, had gone ahead, the total would have been far in excess of the amount stated. Prices or rather the expectancy that prices will be lower has been mainly responsible for holding back a large number of projects; and while this expectancy has been realized in the case of a few materials, yet prices in general have remained for the most part constant. The reason for this is ascribed to the high cost of labor and the fact that in many lines of manufacture there is no great surplus of building materials. The opinion holds that building can be done for as low a cost within the next few months as it can within the next three years. It is maintained that prices will not show any decided drop until labor becomes more efficient and that the owner who builds now will have the use and advantage of an equity which will, to a large extent, offset any decrease which might subsequently follow. There is no question but what many buildings are badly needed and that the matter of housing is still an acute problem. The feeling is that considerable work of this character will go ahead and that a large number of deferred projects, in architectural and other offices, will be brought to a point of development. Altogether the outlook is not without its hopeful signs, and there is no doubt but that the next twelve months will witness an improvement in the total building volume over the year which is just coming to a close.

Battlefield Memorial Competition

Based on conditions as outlined in the article by Mr. Percy E. Nobbs, M.A., F.R.I.B.A., R.C.A., in the last issue of CONSTRUCTION, it is announced that the Dominion Government will shortly issue an advertisement notifying architects, artists and sculptors of the terms of the competition for the eight memorial monuments to be erected on the battlefields in France and Belgium.

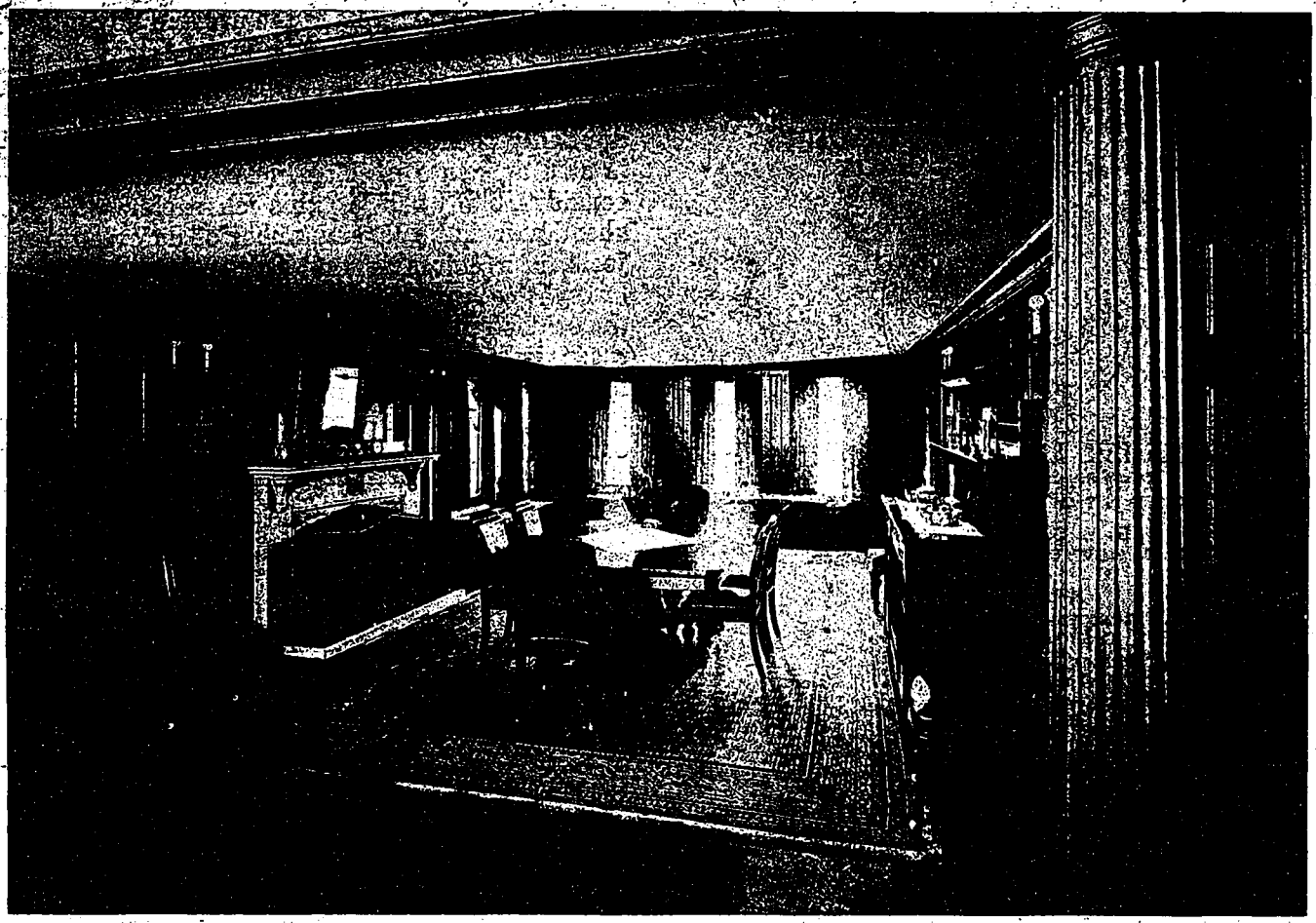
The competition is to be held in two stages: in the first, competitors will be required to submit only sketches which will be judged by the following board of assessors: Professor C. H. Reilly, representing the Royal Institute of British Architects; Paul F. Cret, representing the "Société Centrale des Architectes of France"; and Frank Darling, representing the Royal Architectural Institute of Canada.

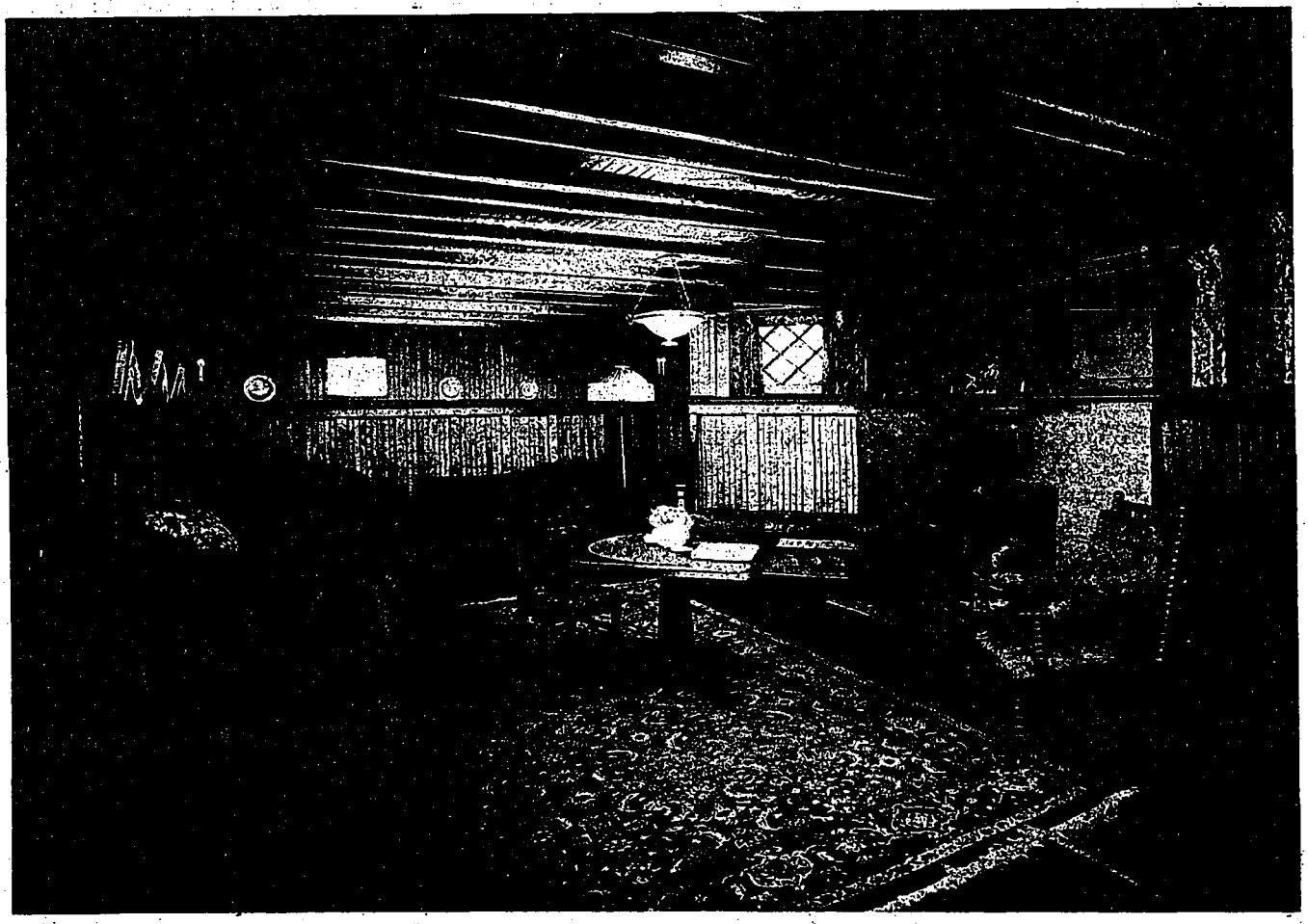
The judges will select the best designs, not to exceed twenty in number, and the persons submitting these will be eligible to enter the second stage, in which models of the designs will be required. The sum of $500 will be allowed to each contestant to cover the cost of models.

The competition will be limited to bona fide residents of Canada, and the date fixed for the submission of designs in the first competition is March 15, 1921. The award will be made almost at once, and conditions for the second stage probably issued about April 20.

Duties on Imported Plans

Representatives of the Royal Architectural Institute of Canada recently appeared before the Tariff Commission with a view to seeking more adequate protection in reference to competition from outside architects. The question is one which is involved with the economic development of the country, and one which it is hoped the Commission will thoroughly consider. In this connection, the architects are endeavoring to have a duty imposed on specifications coming into the country in addition to the 2 per cent. now levied on plans.





DINING ROOM

REMODELLED HOUSE OF J. N. GREENSHIELDS, DANVILLE, QUE.

HOGLE & DAVIS, ARCHITECTS.

(Exterior View and Billiard Room Illustrated in the July Issue.)

LIVING ROOM

CONSTRUCTION

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ILLUSTRATIONS—*Continued*

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(By Chas. Dolphin)

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ILLUSTRATIONS ACCORDING TO AUTHOR—*Continued*

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ARTICLES—*Continued*

EDITORIALS

Example of Carving and Metal Work

Through the munificence of the T. Eaton Company, Toronto, some seventeenth and eighteenth century furniture typical of the best work of that period in England, and which was secured by Dr. C. T. Currelly, the curator, on his recent trip abroad, is shortly to be added to the Royal Ontario Museum. The collection also contains a number of eighteenth century mantelpieces which are said to be of an extremely high degree of excellence, the carving in particular being of great delicacy and delightful design.

Another feature of interest is a room from a recently dismantled mansion built about 1740, which is being brought across the Atlantic and will be set up in the Museum as it stood in London. It is entirely of carved pine, and according to Dr. Currelly, represent a fine specimen of the grandeur and elaboration of that time, the carving being extraordinarily good, particularly over the alcove, for ornamental porcelains which were a characteristic feature of some of the early drawing rooms.

Besides this, the Museum has succeeded in obtaining a collection of decorative iron work—iron balconies, stairs, and many other important things from bank grilles to fences—lal valuable to the architectural student and craftsman. This latter gift, which was acquired at a considerable cost, was presented by Mr. Robert Mond of England, a recent visitor to Toronto, and who has been very generous to the Museum on previous occasions.

Other features of the added collection will include a number of sixteenth century plates from the artists of Italy, made in Feienza for the Medici family; some exquisite portrait plates from Castel Duranti; and various features of Savage ornament which are important in teaching design.