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CONSTRUCTION

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ENGINEERING · AND · CONTRACTING
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KAHN SYSTEM

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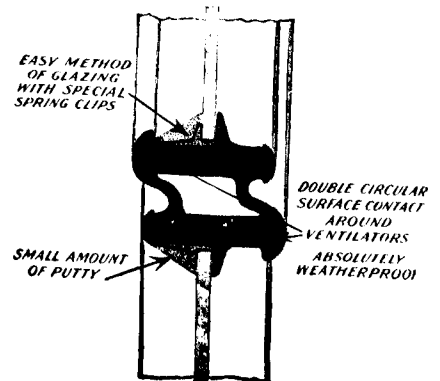
UNITED STEEL SASH are made of specially rolled steel sections, which are combined by powerful presses into sash of maximum strength, and attractive appearance.

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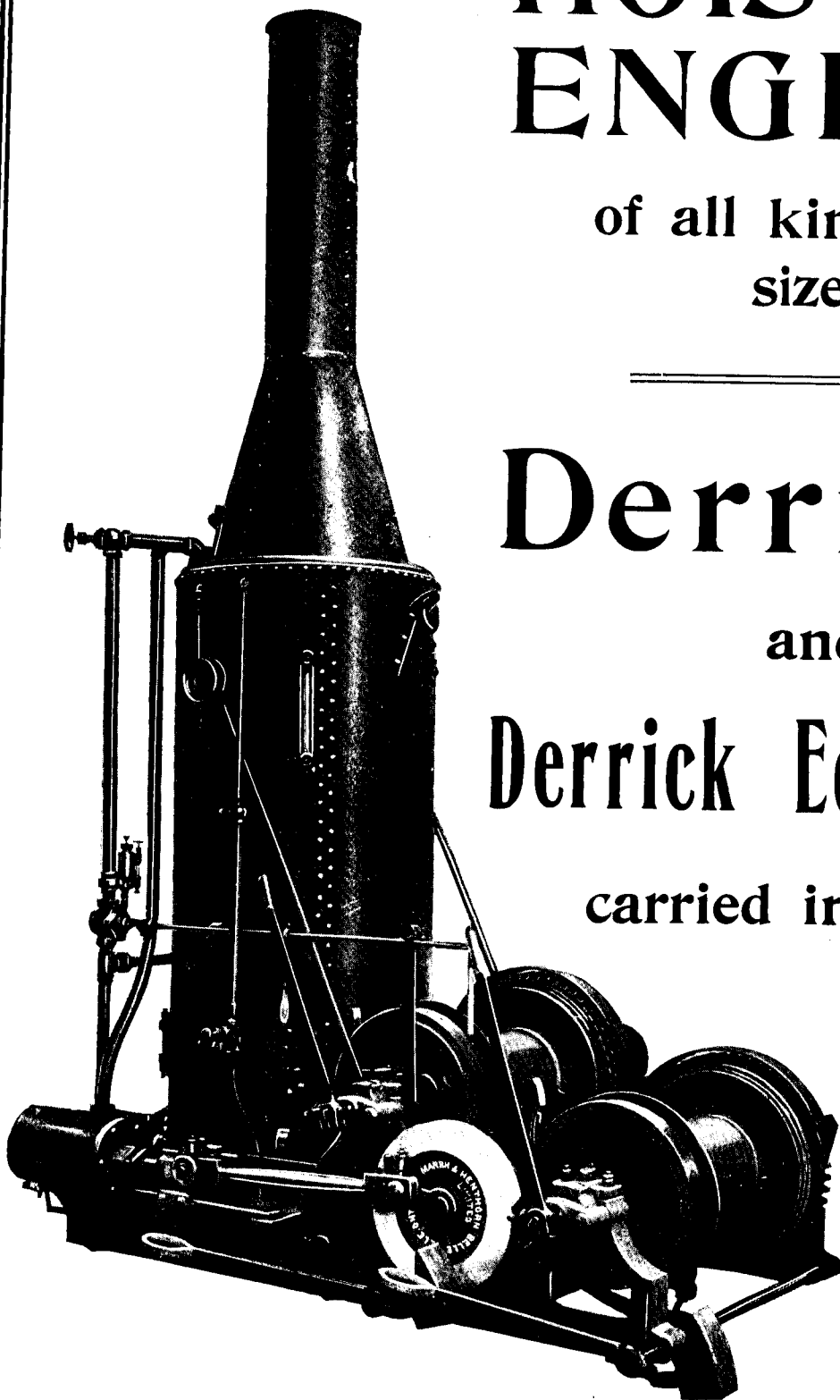
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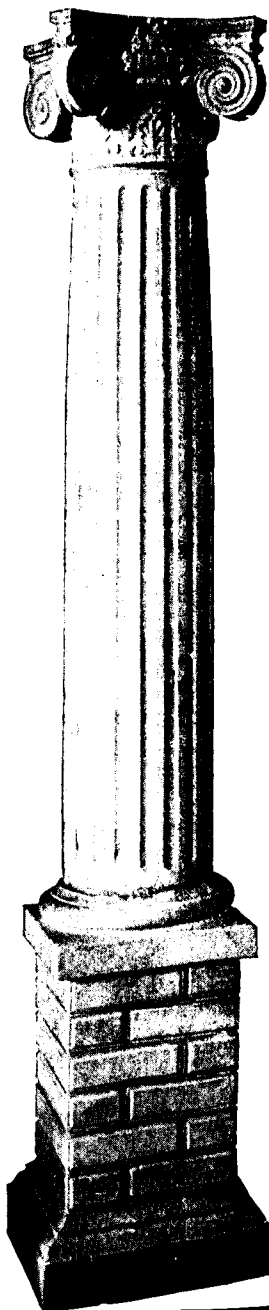
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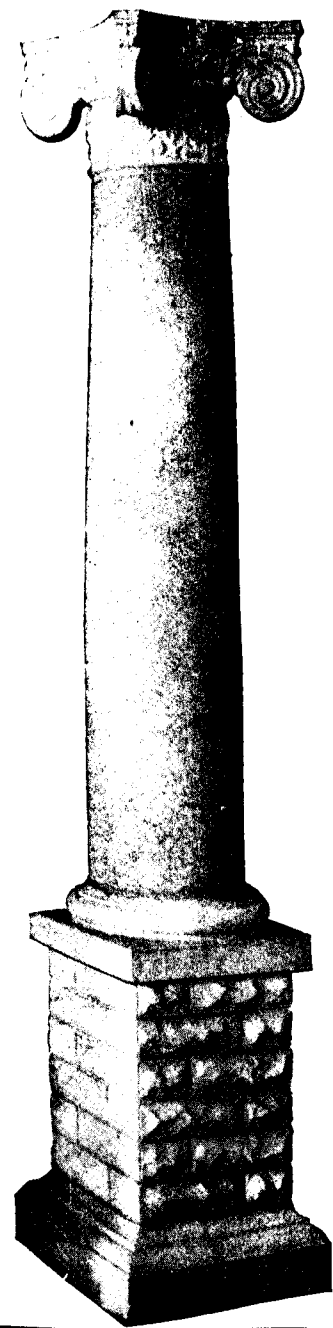


Broken Ashlar Effect, Paisley, Scotland.

No! This isn't a Picture of a Stone House. It is an "Ideal" Concrete House and Wall.



- ¶ All the material for walls, chimneys and windows was made on an "Ideal" Block Machine.
- ¶ So was the wall around the house—while the top, trimmings and bases were made on the "Ideal" Sill-Lentil and Dimension Stone Machine and Ideal Ornamental Molds.
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- ¶ See the possibilities—the time-saving, the money-making, the contract-winning possibilities—of "IDEAL" CONCRETE MACHINES?
- ¶ See how you can compete with stone and brick—and get the contract every time? See how you can guarantee every job—and make good on it every time?
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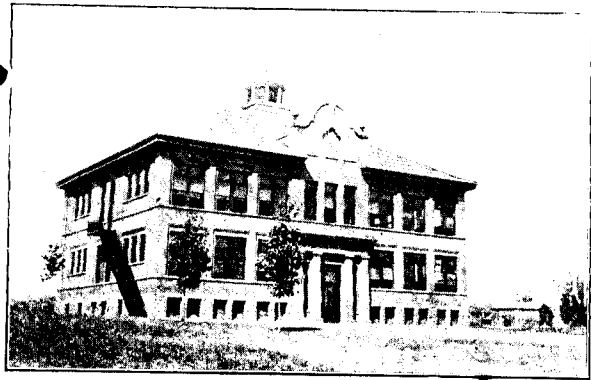


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A ROOF THAT OUTLASTS THE BUILDING

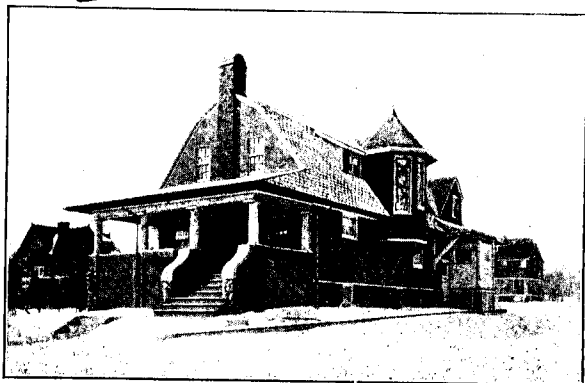
No one knows how many centuries Asbestos has been exposed to the elements without deterioration. And Cement and Stone (concrete) construction, dates back to the time of the Romans, many of whose works are still in perfect preservation after a test of nearly 2,000 years. Both Asbestos and Portland Cement are practically everlasting.

J-M Transite Asbestos Shingles are composed of these **Indestructible** minerals. They are made by moulding pure Asbestos Fibre and Portland Cement into one homogeneous mass under hydraulic pressure. There are no layers or laminations to separate in



Baraga High School, Baraga, Mich., covered with J-M Asbestos Shingles.

J-M Transite Asbestos Fire-proof Shingles



Residence of Mr. F. R. Austin, Montclair, N.J., covered with J-M Asbestos Shingles.

These Asbestos or stone shingles are not affected by acids, gases or chemical fumes. Continued weather changes have no effect on them. Freezing and thawing hasten the setting of the binding material. The more severe the weather conditions, the stronger and harder these shingles become. They never rot or decay; never warp or split. Do not break like slate and are at least 15 per cent. stronger than laminated asbestos shingles. Are absolutely fireproof. And like all stone, they never need paint or protection of any kind to preserve them. Come in sizes and shapes to meet all conditions, and in colors of natural gray and Indian red.

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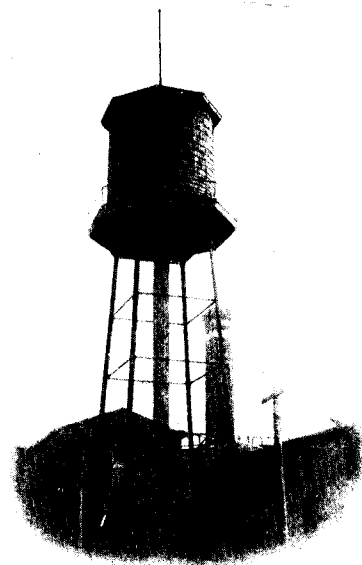
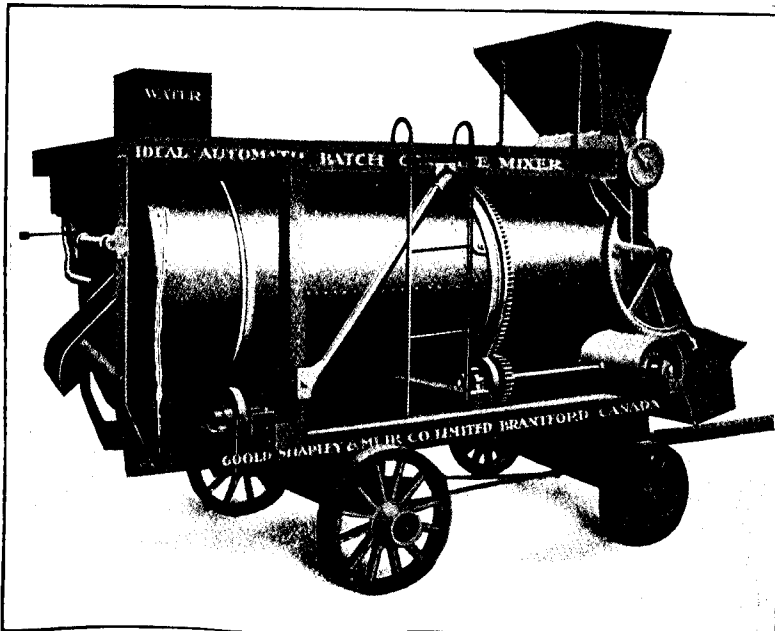
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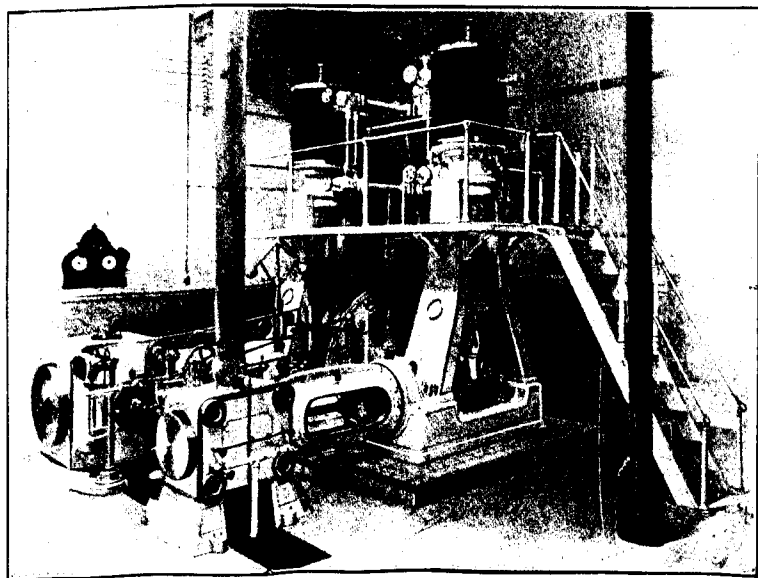
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 are easily kept in sanitary and hygienic condition

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Ice Making and Refrigeration Machinery



Vertical Single Acting Compressor Driven by Compound Steam Engine

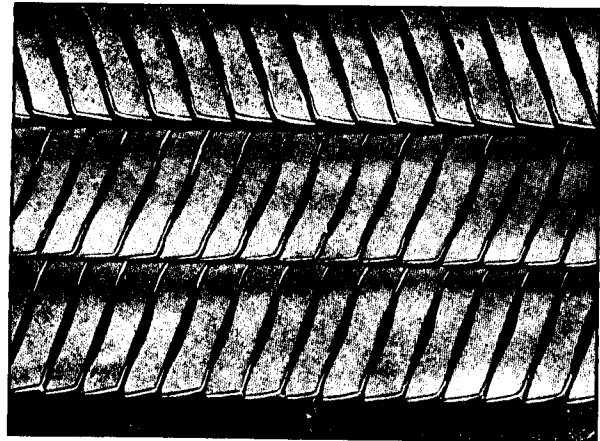
Q SUPPLIED AND INSTALLED on the New York Manufacturing Company systems for Ice-Making Plants, Cold Stores, Abattoirs, Packing Houses, Breweries, Dairies, Hotels, Apartment Houses, etc.—We make a specialty of *Small Machines for Small Plants*, suitable for Butchers, Dairies, Fish and Game Dealers, etc.—We supply Horizontal and Vertical Compression Plants and Absorption Plants.—Ammonia Fittings and Supplies kept in Stock.—*Catalogues sent on request.*

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Your best structures are your monuments. Why not use perfect materials?

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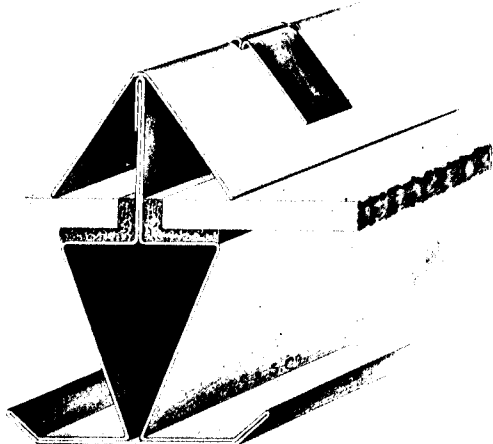


FIG. "E"

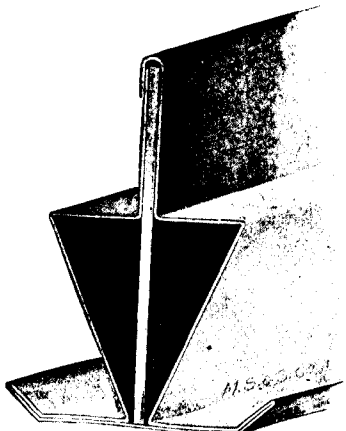


FIG. "C"

SKYLIGHTS

"Acorn" System of Skylight Construction

Patented March 28th, 1907

In any test of Strength and Efficiency, our "ACORN" Bar has no competitors. A single bar like "E" over a

Six foot span, will carry one thousand pounds (1,000 lbs.)

Will be pleased to send a sample bar for testing purposes. Where bars are exceptionally long we reinforce them, like figure "C."

Note Construction—All one piece, no parts to give way or slip; also note large gutter for condensation.

We can win any job on M-E-R-I-T, and our Prices are Competitive.

Blue-prints of complete "ACORN" construction mailed on request.

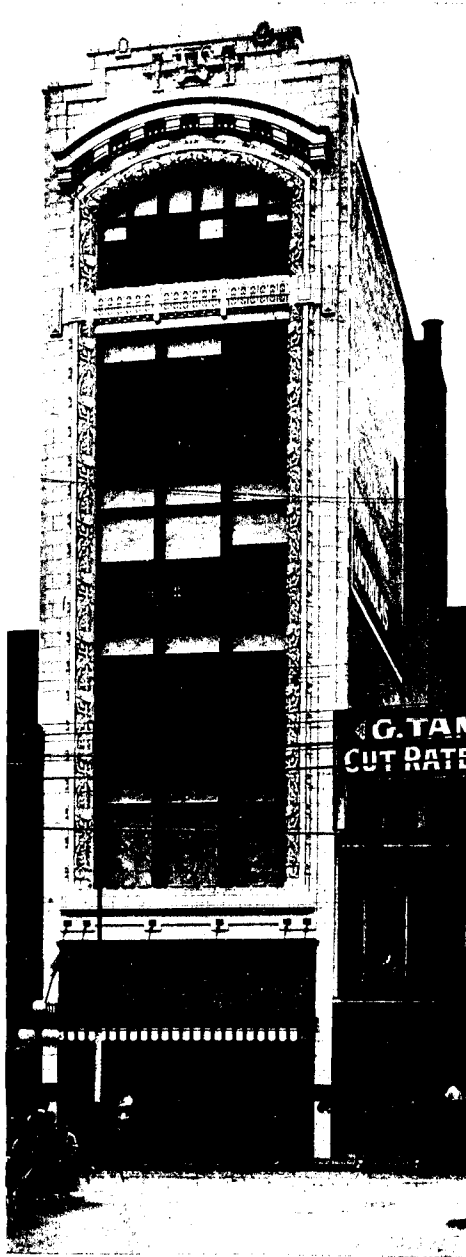
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- MONTREAL, QUE.

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Mason & Risch Piano Co. Bldg., Toronto Bond & Smith, Architects.

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- | Electric Traction Passenger Elevator,
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Concrete Pipes for New Trunk Sewer, Toronto.
Made by Jennings & Ross, Toronto—under the system of the Reinforced Concrete Pipe Co.



This Brand marks the Canadian standard for purity. Look for it. For every class of work, uniformly reliable.

Uniformly Pure, Suited

THE only difference which can exist between different brands of cement is that one can be pure, and of a higher quality than another; so, for any class of work, the purest cement that can be obtained is the one that will give the best results.

The photographs reproduced here are of concrete pipes to be used for the new Trunk Sewer in Toronto, a work that will be a most rigid test of the adaptability of concrete for this class of work.

The REINFORCED CONCRETE PIPE COMPANY, of JACKSON, MICH., (under whose system the pipes shown here were made,) are large manufacturers of concrete pipe, both in the United States and Canada. They have made extensive tests of the various brands of cement on the market, and realizing that on the success attending the present work would depend the future of concrete sewer construction in Canada, they chose "Canada" Cement as the brand that could be relied on to maintain a high,

Pipes in Course of Construction.



Canada Cement

Montreal

Toronto



Concrete Pipes for New Trunk Sewer, Toronto.
Note the Relative Size of These Pipes, Compared With Men and Horses.

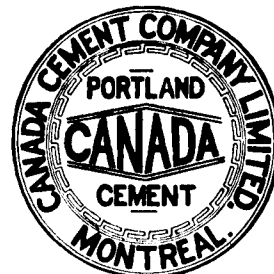
to All Classes of Work

regular standard of purity throughout. In all their work they use "Canada" Cement—and they have good reason for this preference. Over 24,000 lineal feet of pipe has been made this year in Hamilton and Toronto, and the cement used, "Canada" Cement, was of such a uniform high quality that the contractors *could not see any difference between the first and the last bag.*

That cement was *made and delivered from no less than five of our mills.*

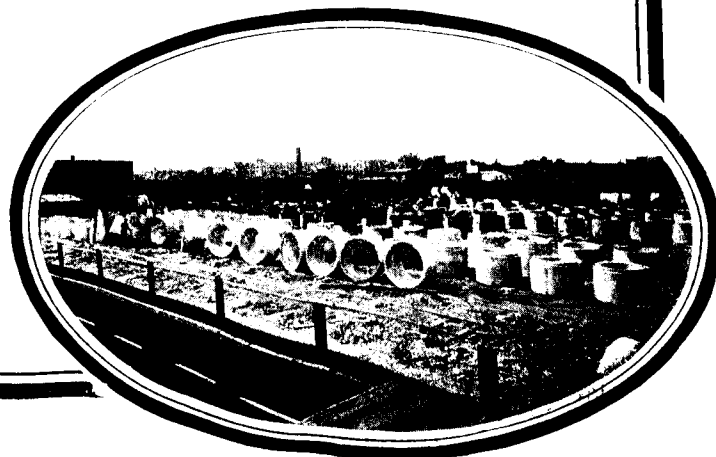
That's uniformity! That's the standard every bag of cement must meet before it leaves our mills. That's the reason why "Canada" Cement, whether purchased in Halifax or Vancouver, meets *every* requirement of *any* class of concrete work.

We have but One Brand—One Quality—"Absolutely Pure." Whatever the class of work under consideration, you take no chance, run no risk, when you specify "Canada" Cement.



One Brand, One Quality, and that quality maintained at every mill which puts the "Canada" stamp on its product.

Pipes Ready to be Laid.



Company, Limited

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The Varnish that has Proven Itself and Here's the Proof

We have in mind a suite of elegant offices that were finished 21 years ago with Murphy Transparent Wood Finish. They are still in perfect condition, having lost none of the original brightness and lustre. Twenty-one years is a long time, almost a life-time, and any varnish that will stand the racket of an office for that period without loss of lustre or brightness, should be satisfactory for any purpose.

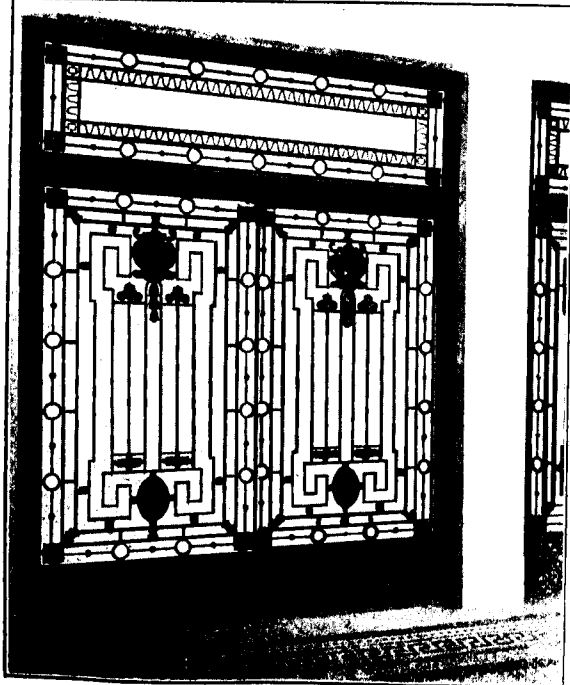
We have a book entitled "Quality and Economy in Varnish and Varnishing" that has proved helpful to many. Write for your copy to-day.

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No Longer Confined to the
Construction of the
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THAT concrete is now not only adaptable but preferable to other forms of construction for residences and smaller buildings, is becoming more and more evident every day. Since leading architects have begun to realize the possibilities that concrete affords for artistic effects, combined with absolute safety from fire, enormous strides have been made towards making it the standard for buildings of all sorts, and it is being used wherever possible.

Rogers Portland Cement

meets every requirement of architect, engineer and contractor. It is becoming known as a brand significant of greatest strength, absolute purity and wonderful uniformity. That is why our cement is so generally the brand specified for concrete work, requiring a high factor of safety. It is important in the use of such a material to secure work that may be depended on—for the greatest asset of a concrete structure is its great durability, and the contractor doesn't see who can do good

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SERVICE is another important consideration—here also we are in a position to merit your orders. Our facilities for prompt shipping are well known, and we are prepared to go to great lengths to co-operate with our customers in the meeting of any kind of specifications.

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Wire Cuts and Repressed Wire Cuts and Pressed Brick

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WE HAVE NOW ONE OF THE FINEST PLANTS IN EVERY PARTICULAR IN AMERICA

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"When completed the plant will be one of the largest and best arranged plants in America, and anyone who desires to see a modern, well built and well designed plant in operation, a trip to the location would not be amiss."

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Hard Builders for Cellar Work. Second-Class Brick for Inside Work**

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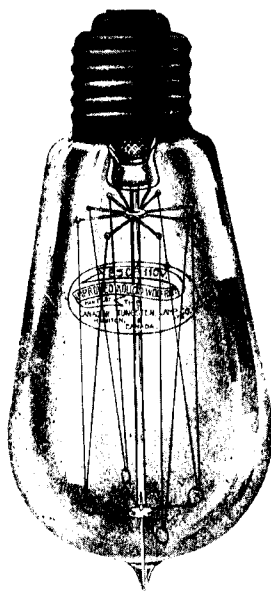
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"Kolloid Wolfram" Tungsten Lamps

Can be handled as roughly
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**Increased
Life!**

Note our patent auto-
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Blackening of bulb is
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**Increased
Efficiency!**

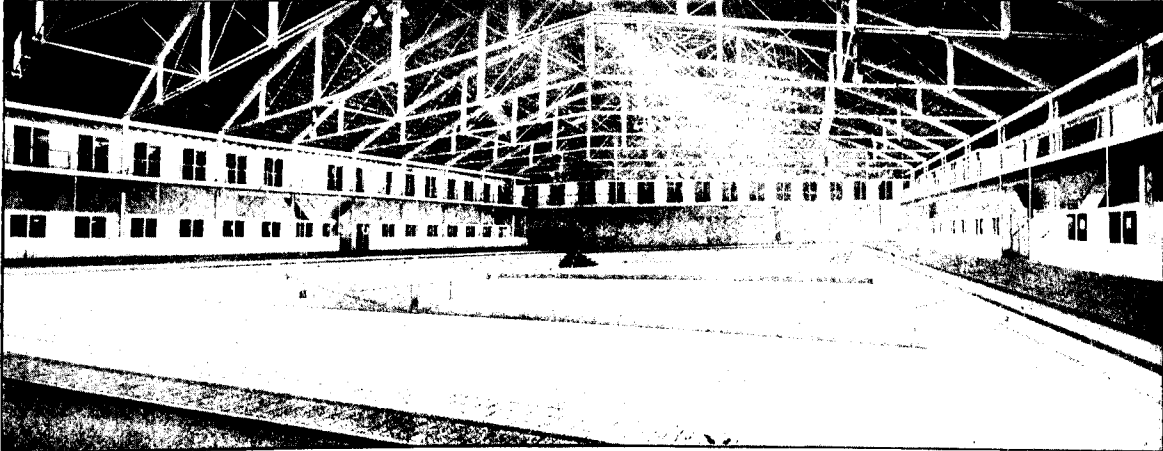
Read our new pamphlet.
Will burn at any angle

The Canadian Tungsten Lamp Co., Limited
HAMILTON, ONT.

"Medusa" Waterproof Compound

makes Concrete Impervious to Water, Prevents Discoloration and Efflorescence

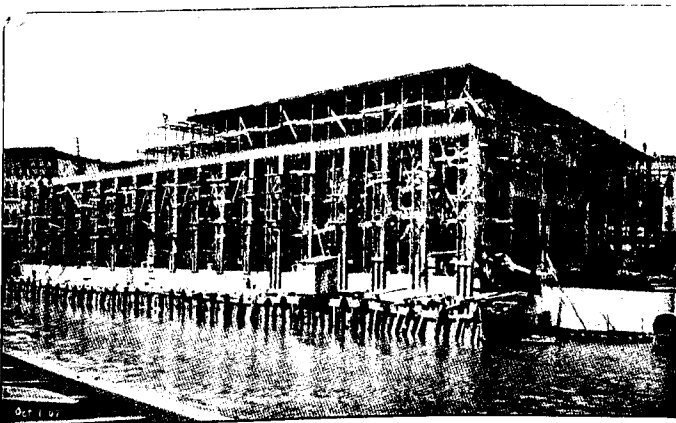
"MEDUSA" has been used on all kinds of engineering works for years, and stood the test.



Let us help you on your Waterproofing Problems. Write us for particulars.

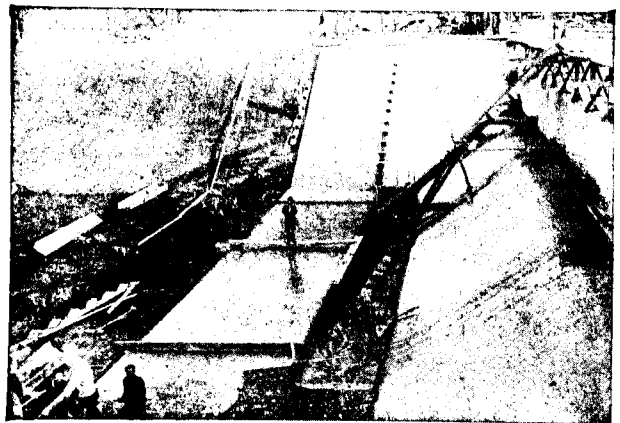
St. Louis Auditorium, the largest swimming pool in the world, contains over one million gallons of water. "Medusa" Waterproofing used throughout.

"MEDUSA" gives absolutely permanent results. Will not affect strength, setting or color of Portland Cement. It is a dry powder, to be thoroughly mixed with dry cement before sand and water are added, thus becoming an inseparable part of the concrete.



Bostwick-Brown Hardware Co. Building, Toledo, Ohio. Walls and floor are 20 ft. below water level. "Medusa" Waterproofing used in basements.

Made
in
Canada



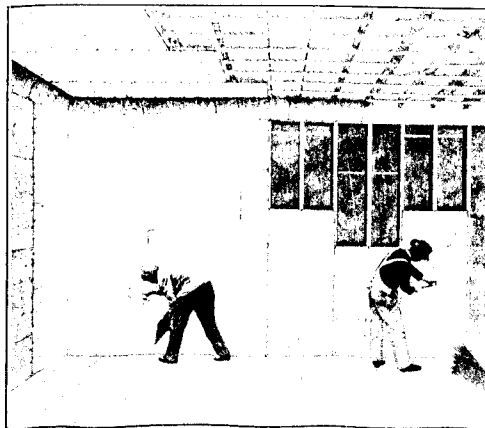
Oil City Works Reservoir, being waterproofed throughout with "Medusa" Waterproofing.

Sackett's Plaster Board

An economical and efficient Fireproofing in place of inflammable wood.

Superior to Wood or Metal Lath in the construction of Plastered Walls and Ceilings.

Sackett Plaster Board is stamped "Sackett" for your protection and ours.



Sackett Plaster Board instead of Lath.

is not a new material ; it has been manufactured for 15 years, and has stood all the test it has been put to.

We believe in personal service and co-operation. Sackett Plaster Board will always be sold at a fair price.

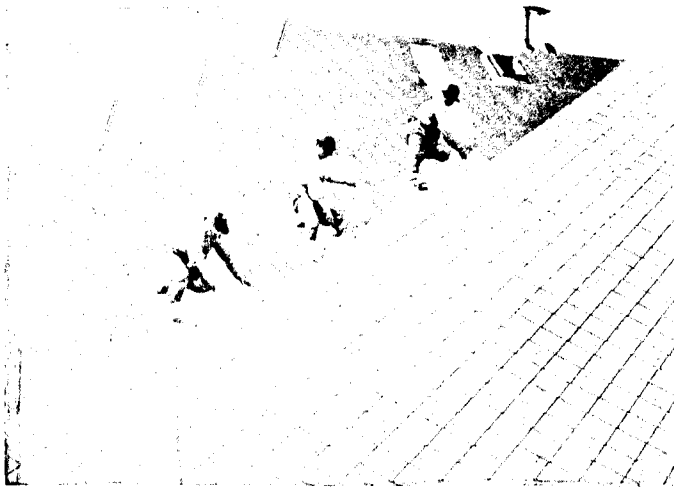
Write us for particulars.

Stinson - Reeb Builders' Supply Co., Limited

10th Floor Eastern Townships Bank Building

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Asbestos Cement Slate



"This is practically indestructible by atmospheric influences, so that maintenance expenses for roofs covered with this material are excluded.

"For a period of three months the asbestos cement slate absorbs, and assimilates moisture in exactly the same ratio as the best natural slate. After that time the absorption ceases altogether, and the material becomes impervious, indestructible, and as hard as iron. The stringy asbestos fibres, which by the characteristic peculiarity of a patented process, are embedded cross-wise in the cement paste, have exactly the same effect as concrete-steel constructions. They impart to the asbestos slate extremely high physical strength, indifference to blow and shock, and great elasticity; which properties are of the same importance to conveyance, and the laying of the asbestos slates, as they are to their durability and length of service.

"The insulating capability of asbestos when brought to bear either upon heat or cold, imparts an increased importance to asbestos cement slate, not only in its suitability for the tropics—where it is commonly used as a substitute for corrugated iron; but also for the continental climate, where it is economically used in workshops, in dwelling rooms, and particularly in garrets, which, with other roof coverings, would have to remain unoccupied.

"The fireproof quality of asbestos renders asbestos cement slate, a thoroughly fireproof material, which, owing to its strictly scientific manufacture, can not become either cracked, rent or scaled in case of fire."—EXTRACT FROM REPORT OF MR. FRITZ CIRKEL, M.E., ON "CHRYSONILE-ASBESTOS," ISSUED BY DEPARTMENT OF MINES, OTTAWA.

We are the only manufacturers of ASBESTOS SHINGLES or SLATES in the Dominion of Canada.

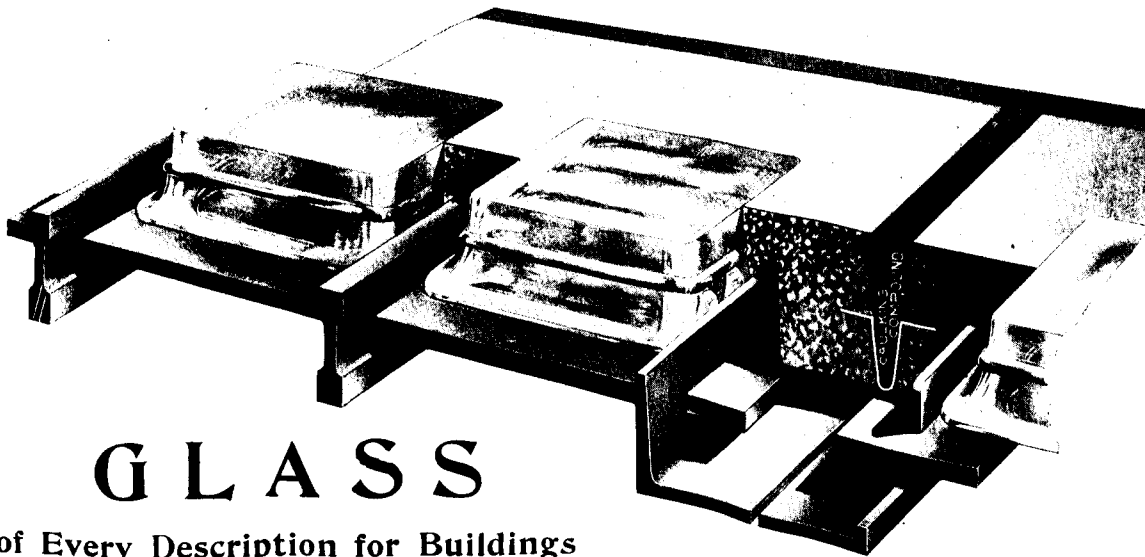
Asbestos Manufacturing Company, Limited

706 Eastern Townships Building, Montreal, Canada.

Factory at Lachine, P.Q.

3 Way Sidewalk Prisms

Special catalogue dealing exclusively with Daylight Buildings sent on request.



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of Every Description for Buildings

HOBBS MANUFACTURING CO., LIMITED

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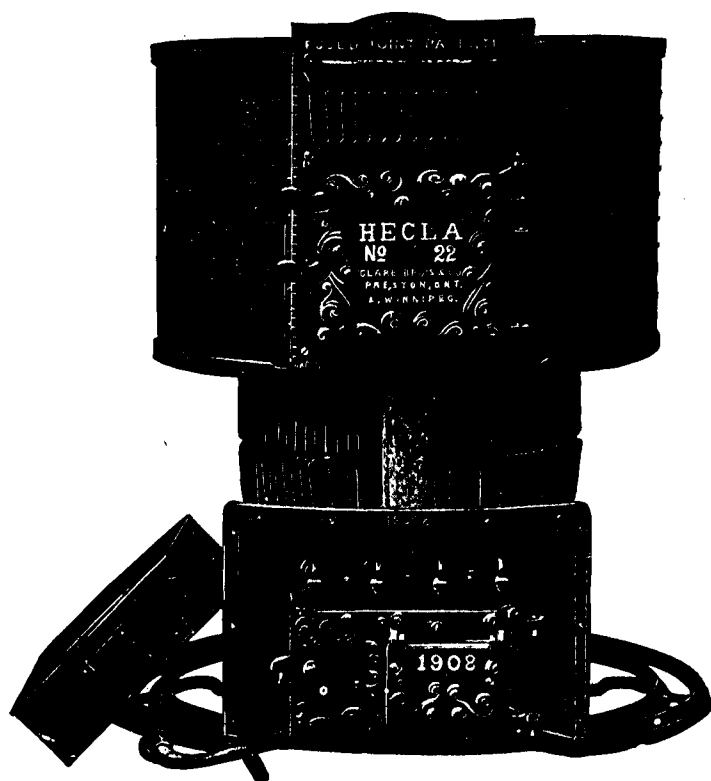
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"Steelcrete" **Diamond-Mesh Lath** is a miniature reproduction of "Steelcrete" Reinforcement, made by the same process, and with the same care and precision—hence, is flat and straight. The first metal lath made in Canada and still the most widely used.

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STEEL AND RAD

"Fenestra" the Strong Fire-proof Sash

The Problem of Sufficient Light Combined with Strength and Fire-Resistance.

WHY "FENESTRA"

To obtain sufficient light and at the same time have a sash strong enough to withstand the constant vibration and wind pressure is the problem of the architect in planning a modern industrial building.

The demands of the modern factory call for a wall that is practically all lighting surface. To obtain this, the sash must be indestructible by fire or weather exposure. To acquire the requisite strength the joints must be as strong as the solid cross-bars and the weight of the metal must be accurately gauged to the strain it will have to withstand.

A solid steel sash, then, is the only one that will fulfill all these requirements, and until the advent of "Fenestra" no sash sufficiently strong, light and durable could be obtained.

"Fenestra" specially rolled, solid steel sections are smaller and lighter than any other steel sash bars and offer from 25 to 40 per cent. less obstruction to the light than wood sash.

THE SECRET OF FENESTRA'S STRENGTH

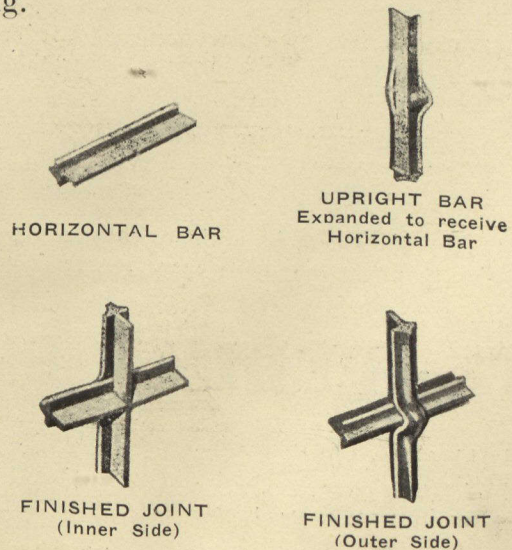
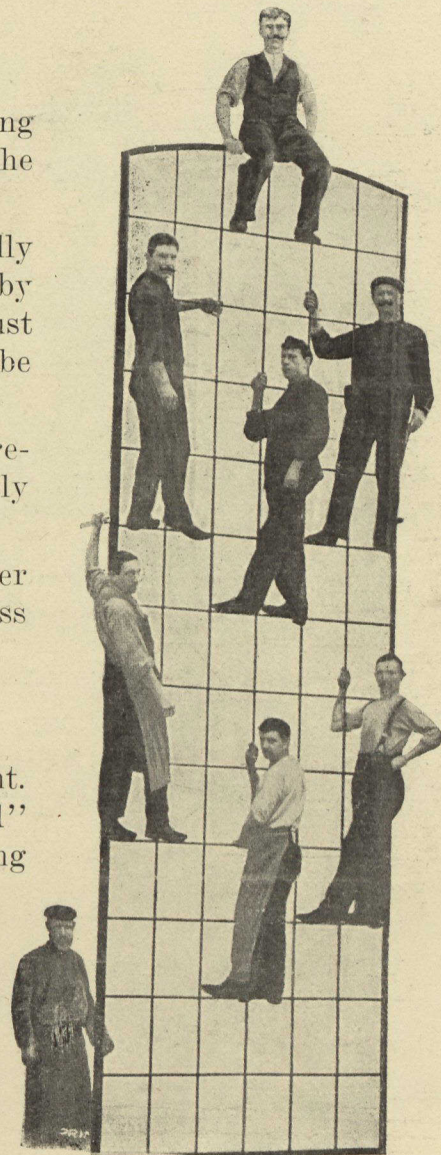
lies in the construction of the patented, cold-worked, inter-locking joint. Not only is it several times as strong as any mitered or so-called "welded" joint, but it is also much more fireproof and burglar-proof. An opening expanded in the vertical bar allows the horizontal bar to intersect and forms a joint actually stronger than the plain bar. The moulded portion is then pressed out so as to fold closely around the moulded portion of the horizontal bar. A small notch in the horizontal bar acts as a lock and this is all the metal removed in making the joint.

"Fenestra" Sash lends itself readily to any system of ventilation. The whole window or any part thereof being constructed to swing to suit any requirements. The ventilator may take in one or several panes, and can be side hinged, central pivoted, top or bottom hung.

HERE, THEN, ARE THE ADVANTAGES OF "FENESTRA"

It is fireproof. It is permanent. It is the strongest sash made. It admits the maximum amount of light through an opening. It allows ventilation in any volume desired at any season, winter or summer, rain or shine. It cuts down light bills by prolonging daylight. It has a handsome, workmanlike appearance that looks well in any building. It is adapted to any building where light is vitally essential: Factories, Schools, Public Buildings, Offices. A modern steel sash.

Our catalogue, "F-2," tells all about "Fenestra" and deserves a place in your files.



ATION, LIMITED



Store of Henry Birks & Sons, Limited, Montreal. Hutchinson, Wood & Miller, Architects.

What a Fire Did—and Didn't!

SOME years ago, Henry Birks & Sons, Limited, of Montreal, built a big addition to their magnificent jewelry establishment.

Downstairs they were pretty particular about the materials used; the fact that Pedlar Metal Lath was used in the ceiling of the ground floor shows just how particular they were.

But upstairs they weren't quite so particular; in fact, they "economized" a little and used ordinary wood lath for the ceilings and partitions.

Shortly before Christmas—just when everything was ready for the biggest business season of the year—the inevitable fire occurred. It broke out somewhere upstairs and gutted everything above the first floor.

The Montreal Fire Department poured in tons of water, every gallon of which, seeking its own level, ran down to the ceiling of the first floor.

In addition to its ordinary capacity of some 50 lbs. to the square foot, every square foot of that

ceiling must have carried some 300 or 400 lbs. additional weight in water.

Then the firemen chopped some holes and allowed the overflow to drain away.

After the fire and in spite of the complete devastation of the upper floors of the building, the ground floor was left in such excellent condition that Henry Birks & Sons, Limited, were able to go right ahead and do without a hitch the big Christmas business they had anticipated.

Some three weeks later the architects were called in and a careful examination was made of that first floor ceiling that had been put up on Pedlar Metal Lath.

Except for the few holes that had been cut to let the water out, the ceiling was pronounced perfectly sound. The holes were patched.

That fire occurred some years ago, and to-day Henry Birks & Sons, Limited, are still doing business under the same ceiling that was put up on Pedlar Metal Lath, and was subject to so severe a test by fire and water.

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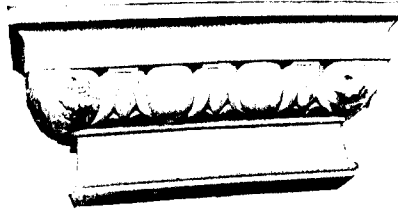


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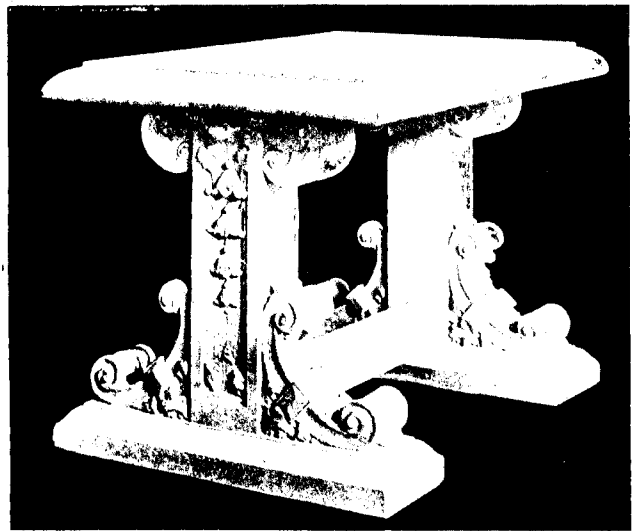
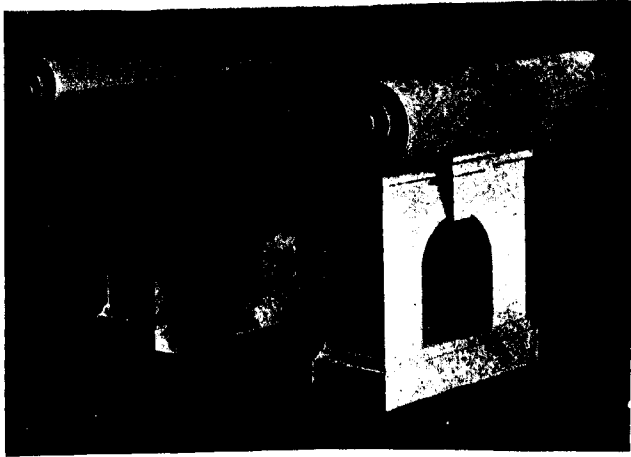


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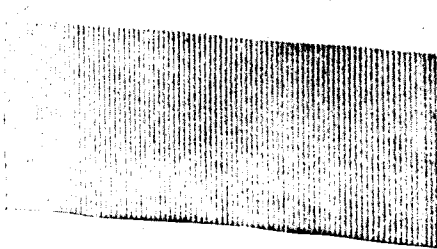
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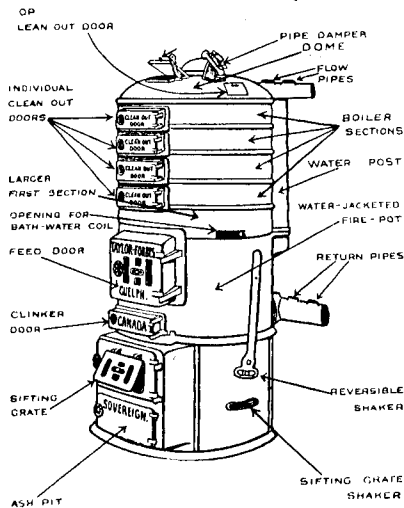
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"Sovereign" Hot Water Boilers and Radiators are sold and installed by the Heating and Plumbing Trades throughout Canada, and specified by leading architects. Have the "Sovereign" installed in your new house. It costs no more than other boilers—and will uniformly prove more satisfactory.

A Page From "The Dictionary of Heating"

BOILER: The Heating and Plumbing Trade have applied the name "boiler" to what might more properly be called a "furnace for supplying Heat by Radiation from Hot Water." A hot water boiler is not a "boiler" in the sense that it boils water to generate steam. This is the very thing the "Sovereign" boiler does not do, as is explained in the note under "Larger First Section."

BREAKAGES: An accident involving danger or the destruction of property or material is physically impossible with a "Sovereign" hot water boiler. When the air is let out of the Radiators, the fire kept going and the system kept filled with water so that a depth of three inches is shown on the gauge glass of the Expansion Tank, no interruption to the heating system can possibly occur. If there is too much, or too little water in the system, the heating capacity of the boiler will be lessened, but neither of these conditions can cause the slightest damage. If through any mishap, or carelessness, a breakage should occur to a "Sovereign," the injured part, even to the extent of an entire section, may be replaced without dismantling the boiler, or having to leave it stand cold until the replacement is made. This is the advantage of the Unit Principle of Construction as demonstrated in the "Sovereign."

CIRCULATION: The success of every hot water heating system depends altogether upon the freedom and rapidity with which the hot water flows through the Radiators and returns to the boiler again, to be recharged with more heat units, to be again expended in a radiation. This process is automatic and occurs through the operation of the well known laws of gravitation and the expansion and contraction of liquids under the action of heat or cold.

When the water in a "Sovereign" boiler comes in contact with the heated walls of the Fire Pot, or the heated surfaces of the boiler sections, it becomes less dense, i.e., of a lighter specific gravity—and it rises upwards through the boiler and thence in the Flow Pipe and into the Radiators. This natural process is further accelerated by a syphoning force, set up by the weight of the descending volume of colder water from the Radiators, which has already radiated its heat and so taken on a greater density.

The process of Circulation is more free and rapid in the "Sovereign" than in any other boiler made, because all cramped and narrow connections have been avoided, as is explained in the paragraphs dealing with "Radiator Nipples," "Water Post," and "Larger First Section." The "Air Circuit" permits of the ready escape of any air that might retard circulation.

CLEAN-OUT DOORS: As the course of Fire-Travel, in a hot water boiler, is through and between the Boiler Sections in which the water is heated, ready access must be had to the surface of these sections to keep them clear of the deposit of soot and fine ashes which lodges upon and adheres to the metal. Soot is heat-resisting, and if it is allowed to accumulate between the Boiler Sections it will deaden the effect of the fire. The sections should therefore be cleaned frequently with the scraper and brush provided for the purpose.

In cleaning the "Sovereign," open only one door at a time and close it as soon as that section is cleaned. Leaving the Clean-Out Door open admits a current of cold air between the sections which reduces the temperature of the heating medium. The "Sovereign" is the only boiler equipped with Individual Clean-Out Doors, so that frequent and thorough cleaning is possible without loss of heat.



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Cleaners
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CARTER'S TILES, MOSAIC and FAIENCÉ



Very few, if any, of the readers of "CONSTRUCTION" were able to visit the Building Trades Exhibition which took place in London last May. The above photograph will serve to give some idea of the comprehensive nature of an exhibit of Tiles, Mosaic, Faience, Fireplaces, etc.

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BITUNAMEL DOES PREVENT CORROSION

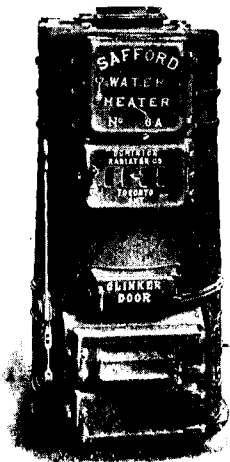
THE accompanying illustration is a photographic reproduction of a solid piece of steel treated with BITUNAMEL that was buried in Winnipeg for over one year—to be exact, one year and three weeks. On being taken from the soil it was found to be in perfect condition, showing absolutely no indication of rust or deterioration. The ground in this particular locality contains an unusually large amount of alkali and moisture, but the BITUNAMEL COATING proved to be a highly efficient resistive to this condition, thus affording every protection to the piece of steel in question. Furthermore, on removal of the steel from the ground the BITUNAMEL COATING was found to be as hard, impervious and unimpaired as when first applied. The fact that other pieces of steel treated with ordinary paint and coatings showed early signs of corrosion and disintegration, allowed of a comparison which amply attests to the splendid quality and value of BITUNAMEL for protecting works of this character. Ordinary paint does not protect steel in the ground. BITUNAMEL does, and it is because of its superiority in this respect that it is being specified by architects and engineers in their more important works.

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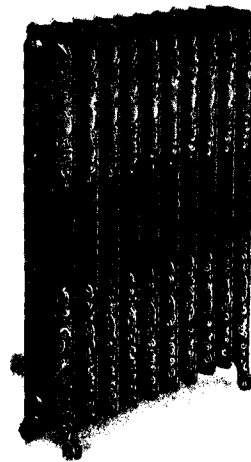


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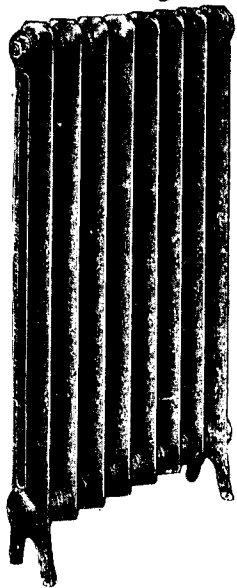


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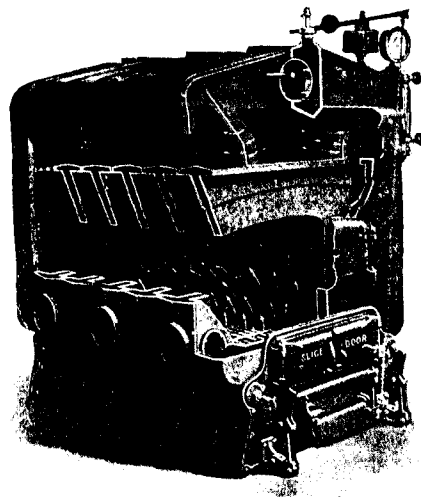


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General view of the present state of the buildings under course of construction—Toronto General Hospital, taken from an elevated point of view on Spadina Avenue, south of College Street. Reference to the perspective shown on the opposite page will give an idea as to the location of the various buildings and how the group will appear when the work is completed. The walls, with their panels, window arching, quoins, etc., all built in Don Valley J.A.P. Semi-Fitreous Brick, present a most charming effect. Darling and Pearson, Architects.

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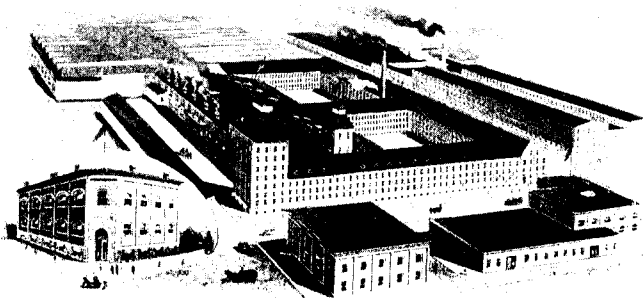


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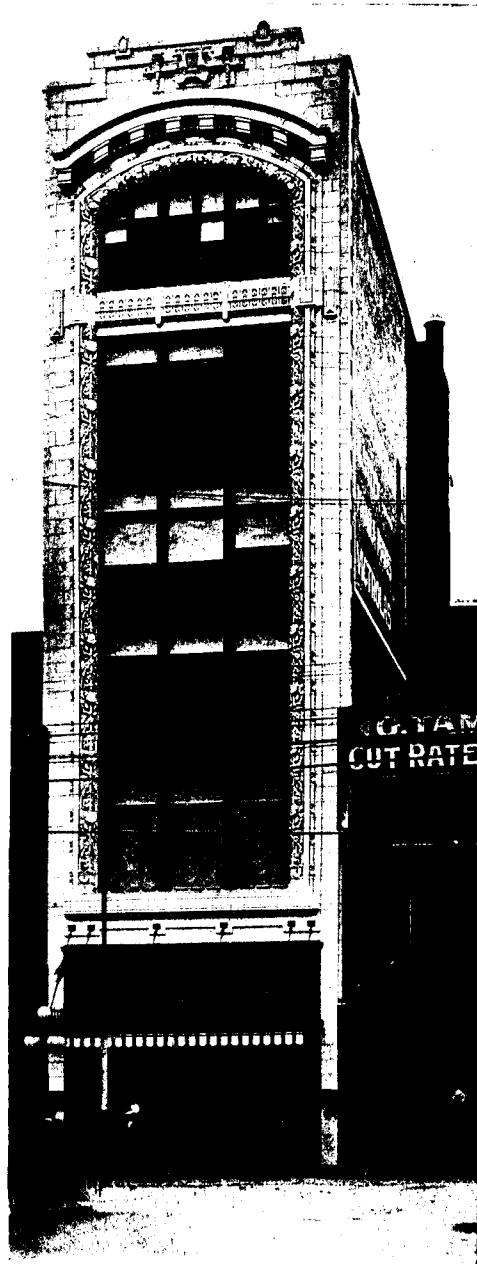
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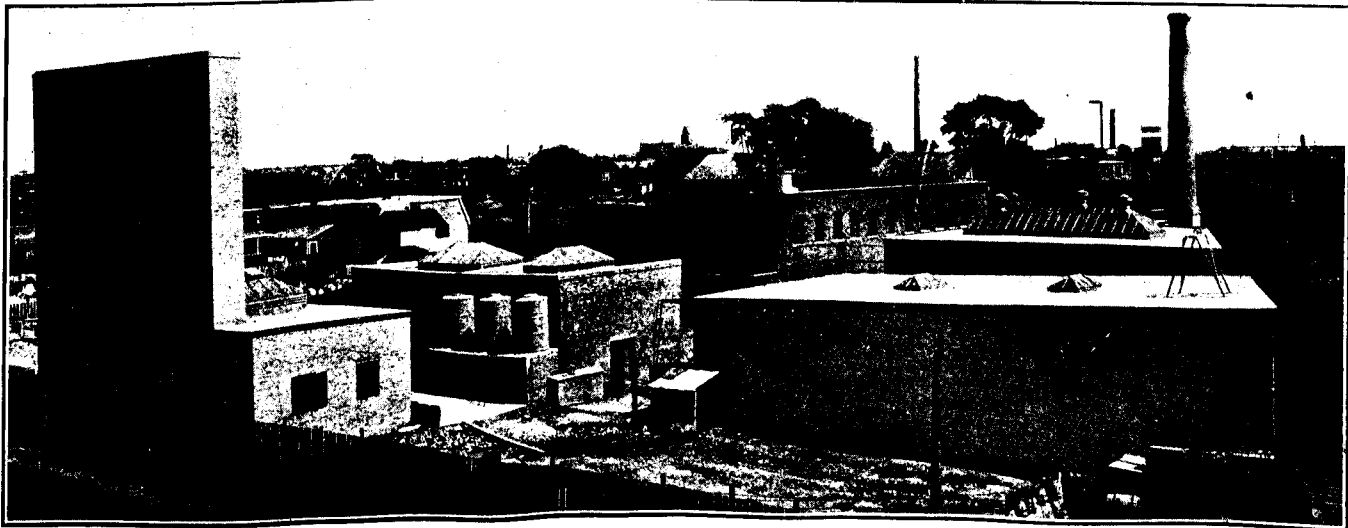
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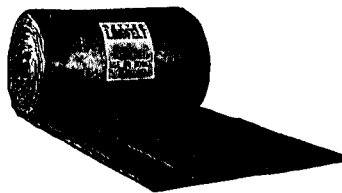
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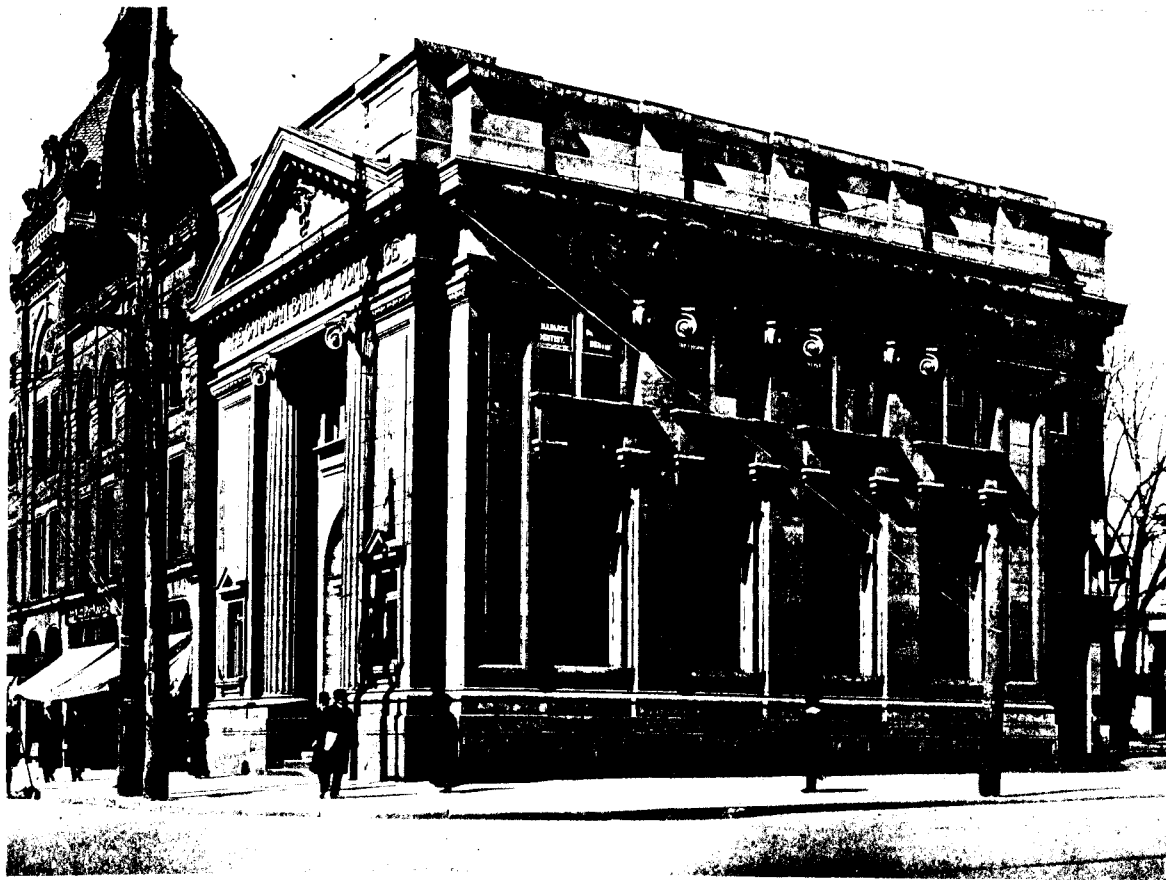
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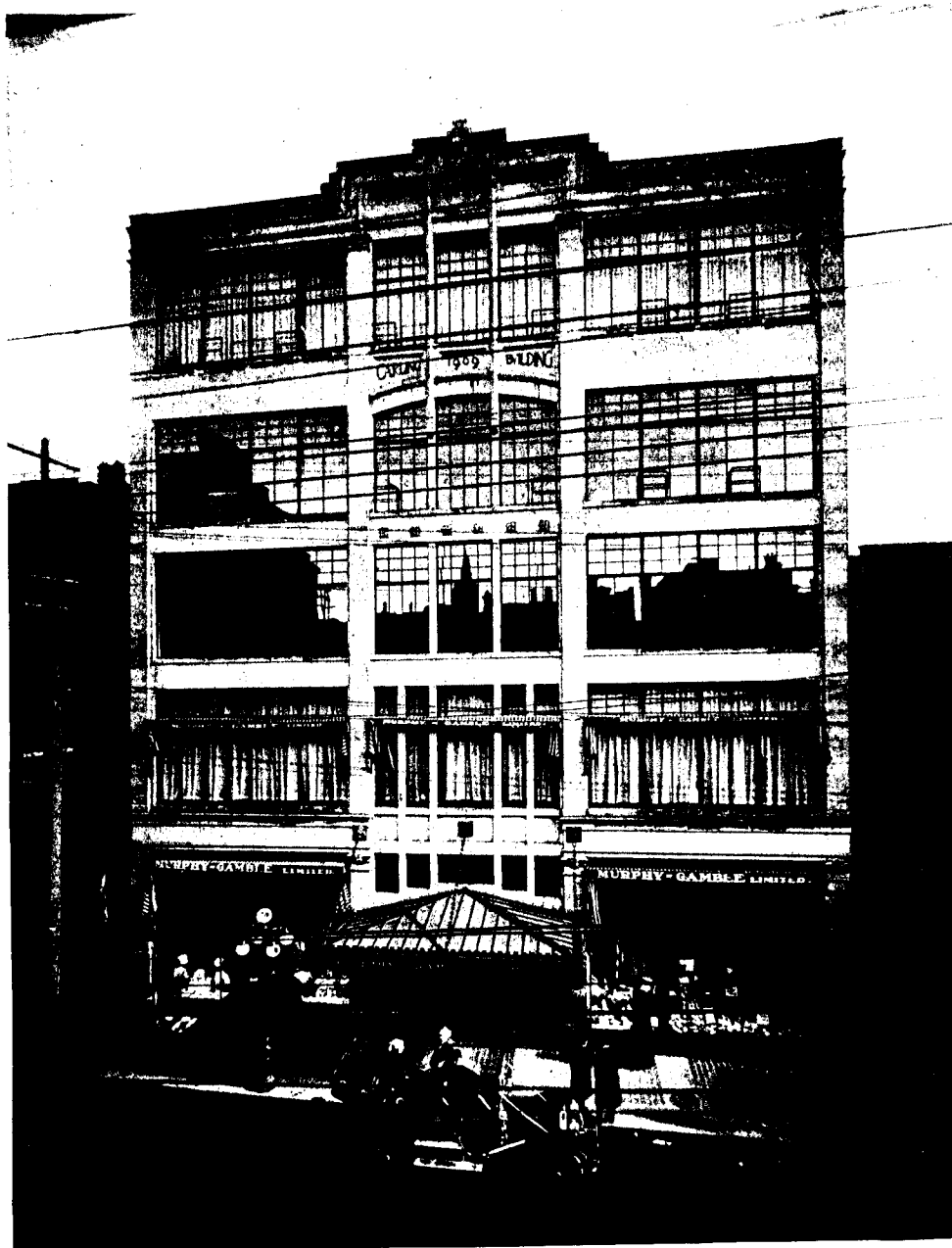
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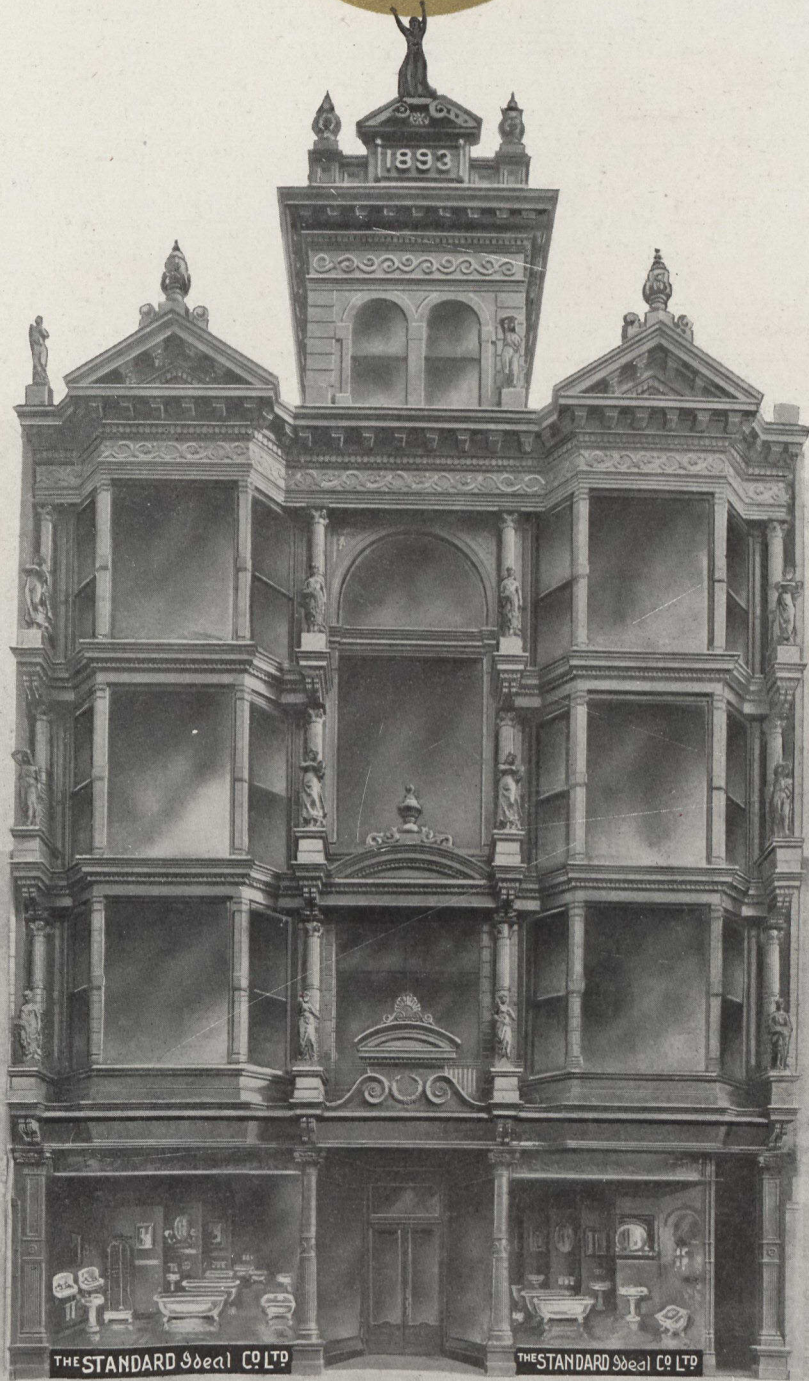
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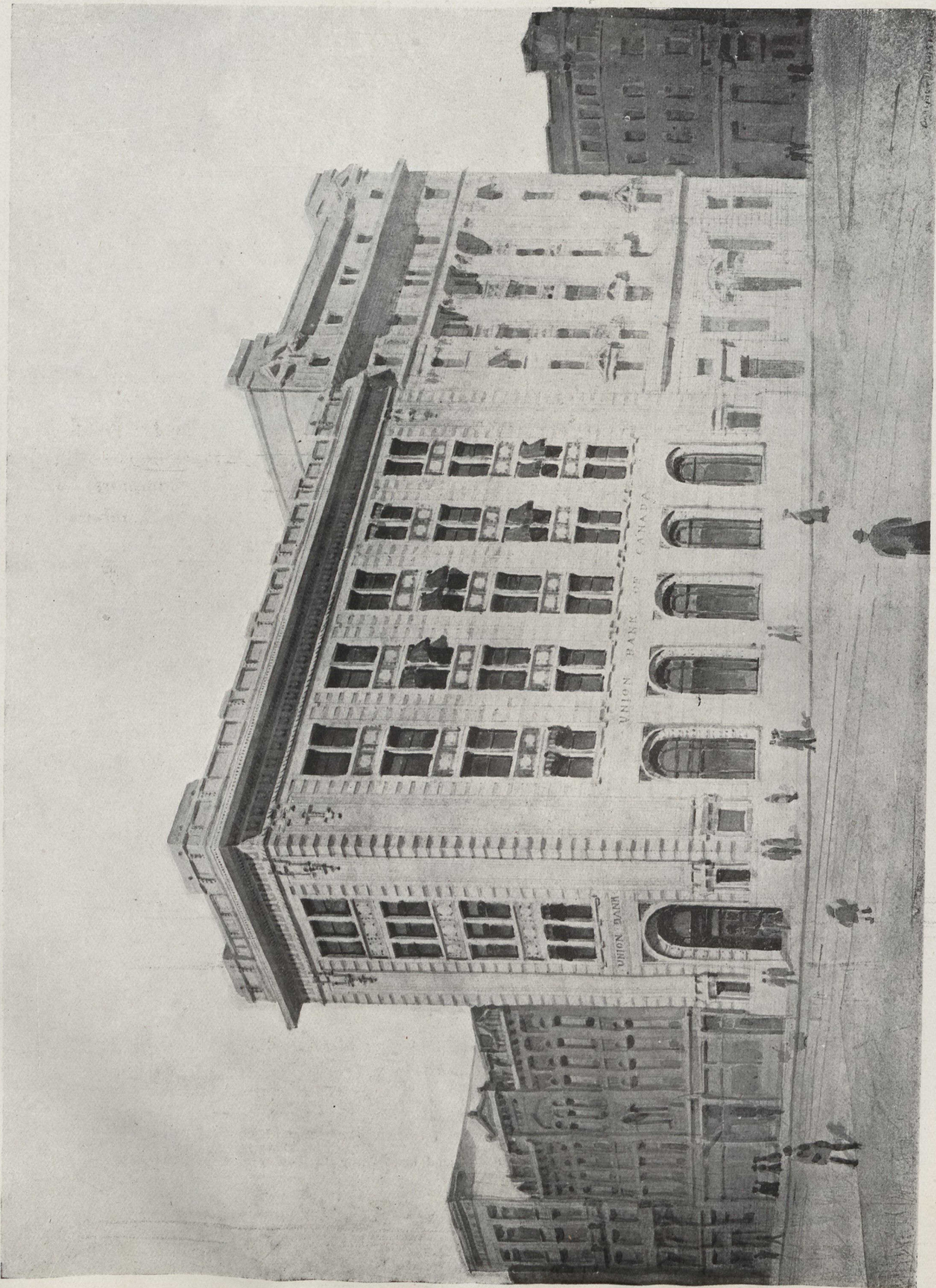
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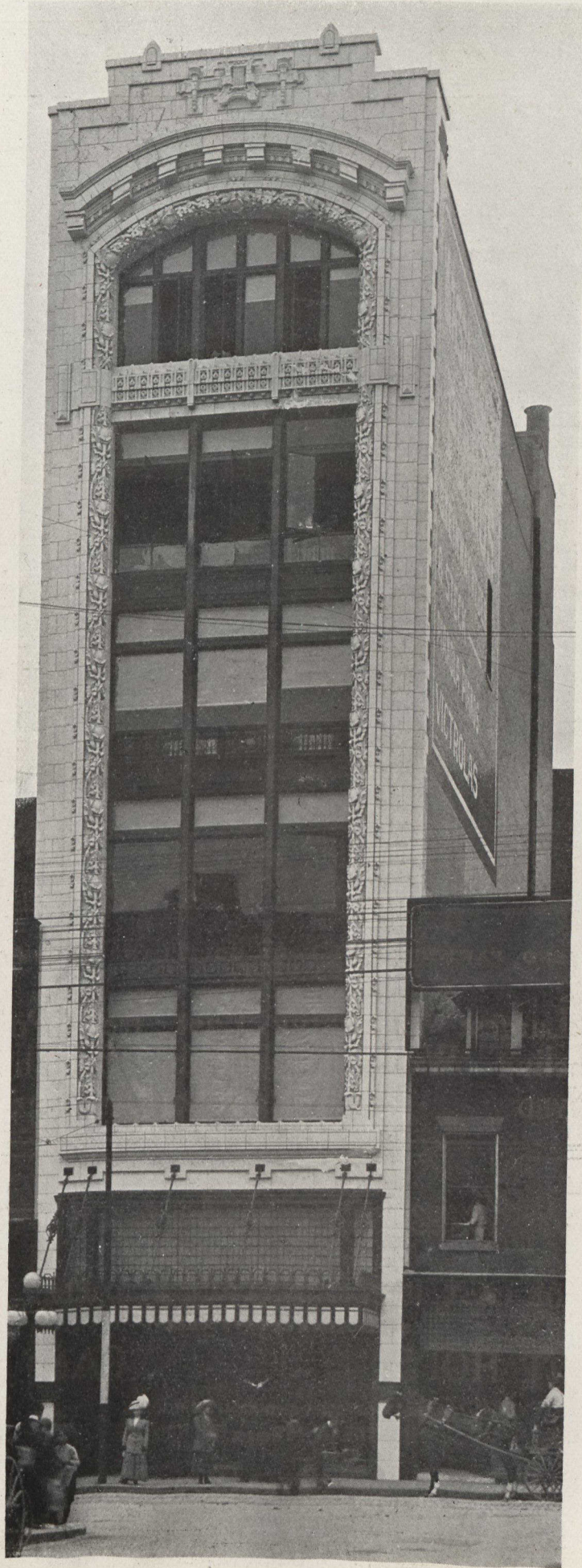


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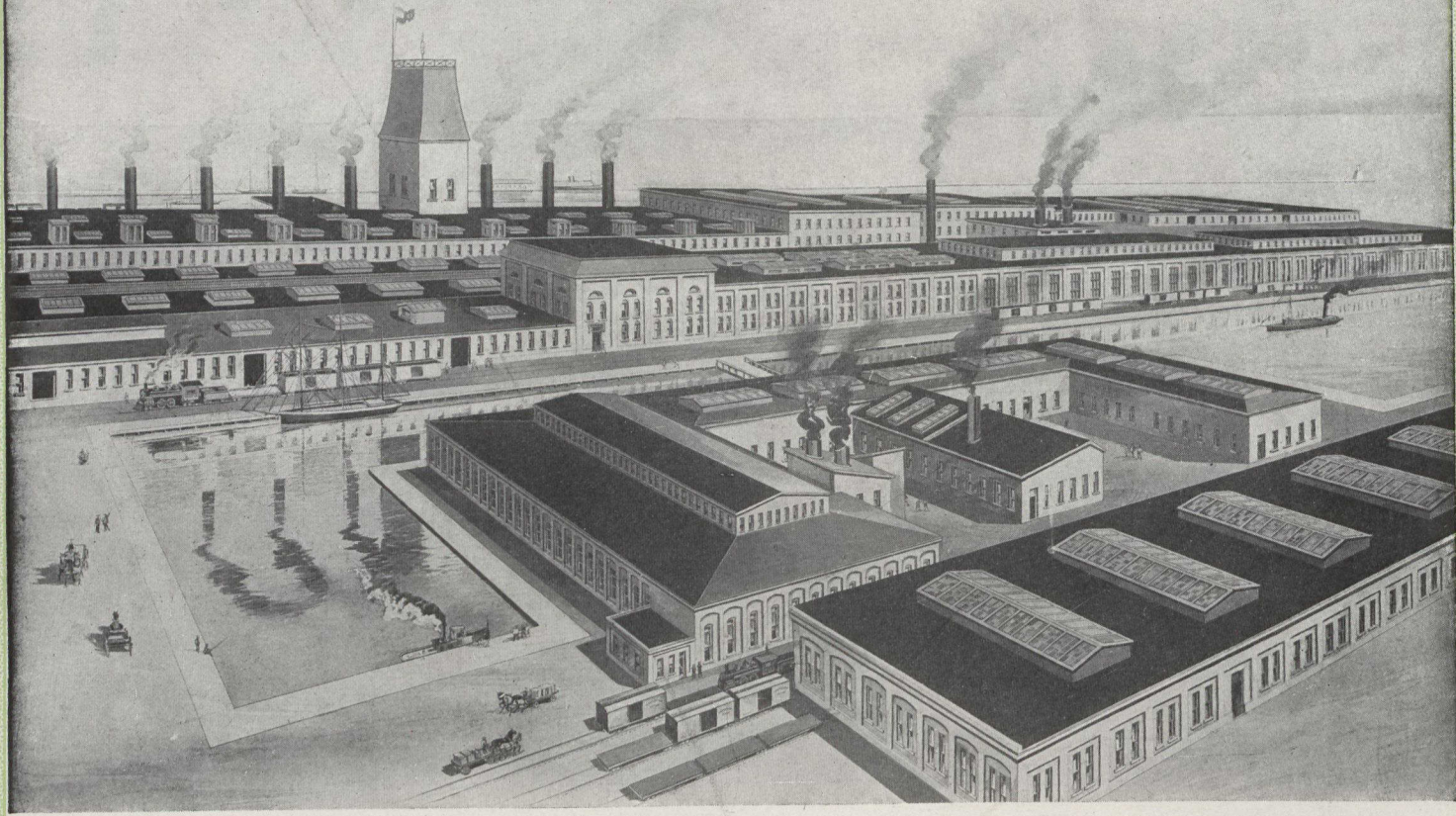
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CONSTRUCTION

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Vol. 4

TORONTO, OCTOBER, 1911.

No. 11

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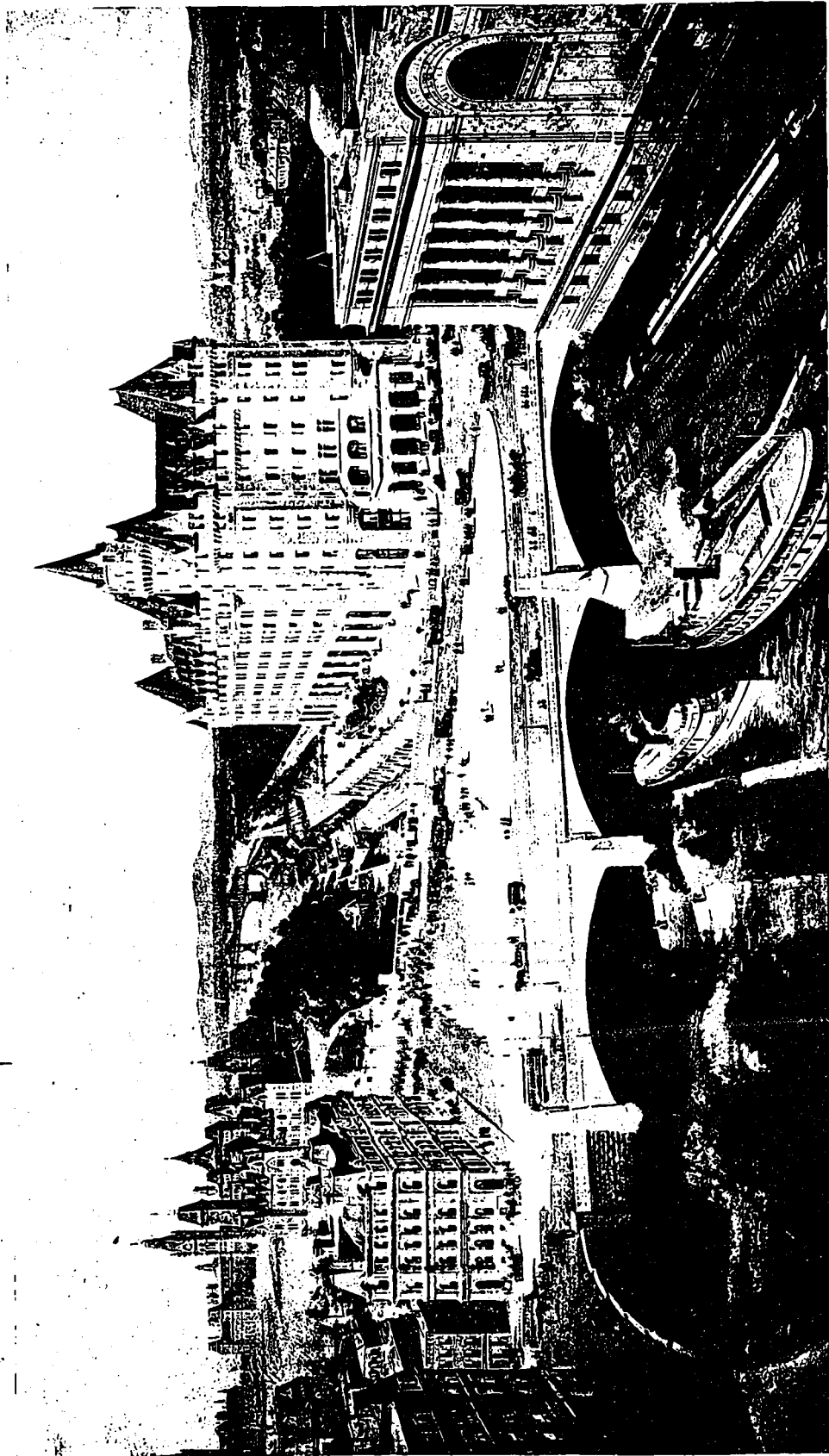
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THE PROPRIETORS OF "CONSTRUCTION" HAVE PLEASURE IN ANNOUNCING THE APPOINTMENT OF MR. ROBERT CRAIK McLEAN AS EDITOR-IN-CHIEF.

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Quebec and Boston open practical trade schools, the beginning of concerted movement in Canada and the United States toward trade education.

It is in solution of this by giving him an opportunity to receive a trade school education and in a practical way lay a foundation for his future career, that these schools have been established. There is no greater philanthropy than to aid in the establishment of such schools; there is no greater political wisdom than in their establishment. It is the long-sought solution for the ever great and rapidly increasing problem of the proletariat.

QThe development of reinforced concrete construction from a rigid mass to an æsthetically attractive composition, one of the certainties in architectural practice.

THAT DECORATION and its development is an integral part of constructive art forms the last word in architectural form and expression. The Greeks, and following them, the Romans, did not acknowledge this interpretation, and it remained for Gothic art to reduce it to a working principle. Here, perhaps, there was no reasoning upon logical lines, but an expression of the feeling of the artist builder given expression in permanent material. The reason why the United States Government and conservative architects in the United States will not use concrete except in the supporting of quiescent loads, is principally because in testing in individual parts it cannot be reduced to a unit of strength. But beyond that there seems to be that very lack of mobility that makes for artistic expression in the constructed mass. This view is only temporary, for we believe that with its development in the hands of artists reinforced concrete has possibilities beyond those of stone, and that its development from a purely constructive agency to a union with the highest decorative principles is only a matter of time and necessity. This latter feature is the most important because only the direct need for its use will force the architect-designer away from trodden paths of materials to this new and probably, for many purposes, better material that is found in concrete. The scarcity of wood will lead to its universal use in the small house and the suburban buildings where fire limits are unknown. The growing scarcity of iron will call for the use of concrete to take its place, and even stone and brick will feel the competition as soon as the architects of the world are forced by the call for additional permanency in structures to turn to rein-

THE MOVEMENT TOWARD establishing technical schools in Canada is fully abreast with the United States. Both countries are beginning to realize in mass what has long been felt by individuals, that too much attention has been given to the education of youth along professional lines and too little in preparing them for industrial work. In the United States the faithful and continuous work of such men as Anthony Illner, of St. Louis; John J. Tucker, of New York; Stevens, Watson, McCleissey and others at Philadelphia, and William H. Sayward at Boston, and an equally earnest group in Canada has resulted in the establishment of real trade schools where the rudiments of the trades are taught and those already engaged in them can find further instruction. In this department of human endeavor and simultaneous in point of time, Boston and Quebec are opening such institutions. At Boston the Wentworth Institute aims to furnish practical education in the mechanical arts to all who may apply at rates within the easy reach of workmen, especially in carpentering and building. At Quebec, the Quebec Technical School, founded by the Provincial Government in 1907, is now completed and will be formally opened on October 2nd. It has, also, the same object, that of giving instruction in the mechanical arts to both apprentices and journeymen in the lines of pattern-making, carpentering, molding, forging, wood-trimming and drawing. In both, the founders realize that to the young man who ends his studies in the grammar school the problem of what to do for a living presents itself.

forced concrete to obtain it. Its æsthetic treatment will follow, but its development will be slow, and its permanent quality will perpetuate many defective designs. It has also in this generation, where the movement of cities is rapid, the objection of permanency when the change in character of a street demands the removal of the structure to give place for buildings devoted to the newer use. Much harm has been done the structural concrete industry by undue haste, but that is likely to correct itself. The manufacturer of the block machine no longer tells the farmer boy that all he has to do to gain wealth is to get a machine and set it up behind the barn, and shovel the material from the nearest sand-pit. The facing with brick in a concrete structure to give it architectural color and form will not be necessary when the designer understands that here is a material that is most plastic and yet has been used rigidly, and that it only needs an artistic hand that has sufficient restraint to be simple, in a bridge or a bungalow, to have that expression of strength, of grace and of beauty of line that we call art.

The Architectural Exhibit of the Ontario Association of Architects presents interesting designs and drawings at the National Exposition of 1911 in Toronto.

THE ARCHITECTURAL presentation at the Toronto Exhibition, that was hung under the auspices of the Ontario Association of Architects, was interesting in variety and in individual and instructive subjects, but the advance either in quality or quantity upon the exhibits of previous years was not as marked as either the standing of the Association or the importance of the Exhibition warranted. It is with no desire to be censorious that we say that the Exhibition of drawings failed to present that representative character that both the high calling of the architectural profession and the character of the Canadian National Exhibition would warrant and the general public expect. There were some well-drawn and colored sketches of residence work, a sprinkling of more ambitious public work, and an incomplete assortment of competition drawings, but some of the best work of the year by the best men in the profession was not in evidence, and in one case the premiated design in a competition that the public was much interested in was absent from the collection.

It is hard to say that this failure on the part of the profession to take advantage of this great opportunity of the year to place before the public instructive examples of the work of the architect, lies with any one individual or committee. It lies further back in the failure of the profession to feel the importance of public instruction in the detail work of the architect. The profession has always labored under public misapprehension. To the man on the street the architect is largely a picture maker and a dreamer of dreams. To him it is the man with the capital to pay and the mason with his trowel to build who

is the important factor in the erection of a building. The architect, he dimly comprehends, has a place between the two, but his knowledge of where it is is small. Besides this selfish reason for showing by drawings the importance of the design, construction and plan of the architect and the paramount position he occupies in the erection of any structure, there should be the general one of giving the public an adequate idea of the many intricate problems that must be worked out accurately on paper by the architect before the stakes can be driven for the measured excavation. This in its general aspect the Exhibition of this year failed to do.

It is always the rule with such exhibitions that the indifference of the profession, or rather its neglect of the opportunity, must be systematically met by the faithful work of a few individuals. These as individuals must call upon the profession and collect the drawings and by their personal solicitations secure them for the Exhibition. There is no other way to make such an assured success. It is incomprehensible why the artistic pride or the business acumen of the architect is not roused when he receives the committee's circular asking for drawings. Perhaps it is, but the majority will forget to collect and send them and the result is a most misrepresentative exhibit. In the Exhibition under discussion half a dozen offices in Toronto alone could have covered the entire wall space with interesting work, not only to the profession, but to the public, who might not thoroughly understand them in detail, but to which the mass and subject would give a comprehensive idea of the work of the architect.

In strong contrast with the excellent exhibition of last year the only foreign representation was by Sir Edgar George, of London, who sent an etching of the Ponte Vecchio at Florence and three water colors, street sketches, of Amiens and Genoa, and the Rialto Bridge at Venice. These were a delight to the eye and gave an artistic tone to the entire exhibition. It is hoped that next year the artist architects of Canada will be represented as they should be by designs, and that these will be supplemented by the working drawings and plans of the phenomenally large quantity of notable buildings that are now being erected throughout the Dominion. Canada has in the profession many who are the peers of those both of the United States and of foreign countries, and at this National Exhibition of the country's arts and industries they should be adequately represented.

TSome pertinent and at the same time laudatory observations on the civic aspect of London, by Arnold W. Brunner, of New York.

THE CARELESSNESS with which England views her architectural growth of centuries and permits what would be termed vandalism in France or Germany, evidenced in the proposed "skyscraper" hotel at Hyde Park Corner, should receive some check from the observations

made by Arnold W. Brunner, of New York, recently. Mr. Brunner is one of the commissioners for the civic development of Cleveland, is connected with the commission in charge of improvements at Baltimore, and is at present at work on a design for the Foreign Office building for the United States Government at Washington. In an interview in London, Mr. Brunner touched many of the points that closeness of vision causes the Londoner to overlook, but to his interested and critical eye is most apparent. In speaking of his visit, Mr. Brunner said:

"Inspiration is what I really want, and I know of no better place to find it than here. I have traveled in many countries and made many sketches of beautiful buildings, but I frankly confess that London beats the world in architecture, because it is so individual, so distinctly national in its expression. It tells the story of the strength and solidity of the British Empire as nothing else does, for it reveals the character of the people from which that Empire has sprung. It even shows the iron consistency of the English race, but in architecture that is a virtue rather than a fault. I have visited London frequently, and each time I come I see changes for the better. In her slow, dignified way London is being transformed. Streets and approaches have been widened both for artistic as well as practical purposes, impressive arches and monuments erected, and vistas extended. No finer example of architectural landscape treatment than the Thames Embankment can be found anywhere, while the residential squares of London are a treat to the eye, as also are such buildings as the National Art Gallery and the Foreign Office. Of course, I speak from the point of view of an architect. They are serious, massive, and imposing outside, and equally impressive inside. It is true that much of their exterior beauty of outline and treatment is lost beneath a coating of grime that seems to be a necessary evil of all large cities; but I deplore the almost criminal resort to fresh paint that is so prevalent here. Paint may be clean and hygienic enough, but when applied to stone finally makes them look tawdry. We have a system of hydraulic cleaning in America that is both better and cheaper. The spirit of evolution is at work, and even that will come to pass. You might have a few more trees in your streets. The new Mall is something for Londoners to be proud of, and when its trees are more mature it will be one of the finest driveways I have ever seen. A few more such avenues and London will be the city beautiful of the world. It would be a crime, for instance, to erect the proposed hotel at Hyde Park Corner. If you have any law to cover it, the authorities should interfere and stop it. A skyscraper in London would be an abomination and a discord. In America, especially in New York, the skyscraper was a necessity, but it has robbed our architecture of all beauty. Indeed, our country is still so new, and hampered by abnormal growth in a material sense, that we may have not developed an individual architecture of our own as yet. The nearest approach to it is our 'Colonial' style, which is really beautiful and impressive in its simplicity, but that is a mild adaptation of the English Georgian style, and consequently not original. However, we are becoming steadily more serious in our tastes and some of our newest public buildings are really worthy examples of architecture."

Mr. Brunner is not an enthusiast or a biased admirer of England or the English. He is one of the foremost architects of the United States, who has

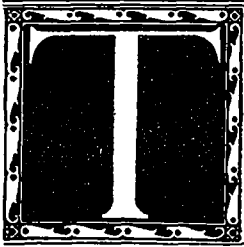
designed on extensive lines, travelled, and studied deeply, and while his conclusions refer to London, his deductions can be applied to all large progressive cities where the commercial spirit is apt to control and ruin the future chances for artistic greatness.

Q *The admirable plan of Australia for securing design for a capital city liable to defeat in its inception through defects in the competition programme.*

ONE OF THE MOST attractive projects ever placed before the architectural profession of the world is that for the capital city of Australia, for which a world's competition is announced. The taking up of a tract of country and planning and building a capital city thereon, without limit of cost, is certainly attractive to the dreamer of dreams as well as the man of concrete ideas. It is upon this attractiveness that the commissioners seem to rely when they ask architects to compete, because, while the winner in the competition will receive the work as a prize, the remainder of the competitors will largely have the enthusiastic effort for their pains, as the total amount of the three prizes is but fifteen thousand dollars. In a project of this kind the shop cost of the drawings will probably amount to several thousand dollars, and architects have become so practical that they are apt to think that even the attractiveness of the problem will hardly compensate them for the outlay in money and the loss of commissions involved while the work of city planning is on the boards. In the United States and Canada there are at the most but four or five capable through practical experience, of making an adequate plan for the capital city required by Australia. Any one of these would demand a much larger sum than that offered in prizes to even present preliminary sketches. As these architects are constantly engaged in large undertakings, it is safe to say that none of them will be found in the list of competitors. Outside of D. H. Burnham, Cass Gilbert, Arnold W. Brunner, F. W. Fitzpatrick and Frank Miles Day, we know of no architect who has had the practical experience required, though there are many who have given more or less study to city planning. The prize, then, must be given to one of these or to some young and talented draftsman who has seized the opportunity to place his dream on paper and to whom it may come true, as it is plain this competition is not for the men who know, but the man who has everything to win and nothing to lose. The original scheme of the Australian commissioners of selecting an architect for the work was much better than this high-sounding world's competition, the success of which we wish for as much as we are skeptical regarding its result, particularly as there seems to be no adequate provision for expert adjudication of the competitive drawings, which fact alone will bar out the best professional men of Canada and the United States.



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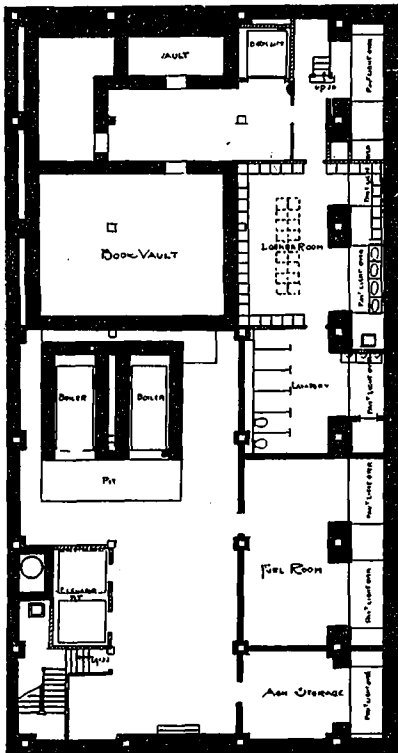
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Carefully studied business structure at King and Jordan Streets which is successfully planned to meet modern banking house requirements.

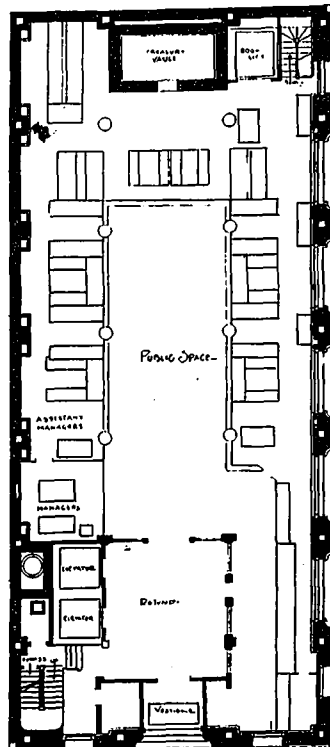
THE NEW PREMISES of the Standard Bank of Canada, corner of King and Jordan streets, is the first structure to reach completion of several imposing buildings that will shortly effect a marked change in the architectural aspect of what might be termed Toronto's financial district. Aside from this it can lay claim to the distinction of being the first important office building in Toronto, introducing on an extensive scale the use of terra cotta in its external scheme. For apart from the two lower stories, which consist of hammered granite from the Stanstead quarries, the entire exterior, including the deep cornice enclosing the roof, is carried out in this material. From an architectural standpoint, the building presents a modern scheme worked out with simple lines and decorated with classic ornament. In order to relieve the greyish-white tone of the general mass, the architects have adopted green terra cotta for the panelling occupying the horizontal space between the windows. This panelling, which is possibly the first

colored terra cotta work seen in Canada, is also intended to accentuate the continuity of the vertical lines which give to the design a simple grace and dignity that stands out in distinction to the massive effect so general in the average building of this type.

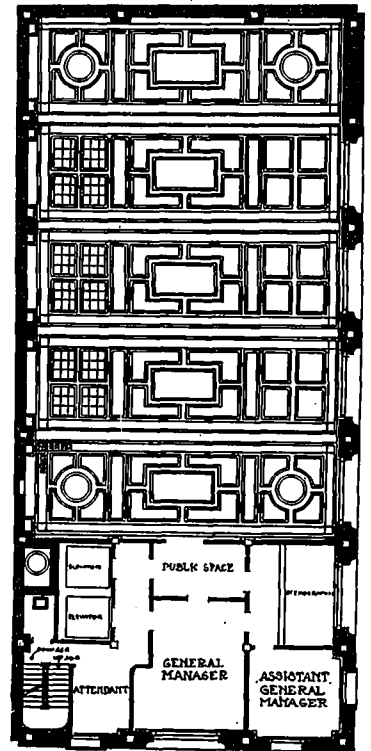
On the interior the arrangement is well calculated to give in every way accommodations that are admirably suited for both office and banking purposes. The entrance and the rotunda, which gives direct access to all parts of the building, are both carried out in Laurentian marble and mahogany woodwork, with bronze metal grilles enclosing the elevators. To the left, in a convenient position to the entrance, is the savings department, while directly opposite the door is the main banking room, rising to a height of two stories and taking up the entire remaining portion of the ground floor. The public space, which is 25 x 70 feet, is enclosed with counters in Laurentian marble marked off with octagonal columns in a variegated marble of Bancroft green, which termin-



Basement.



Ground Floor.



Mezzanine.

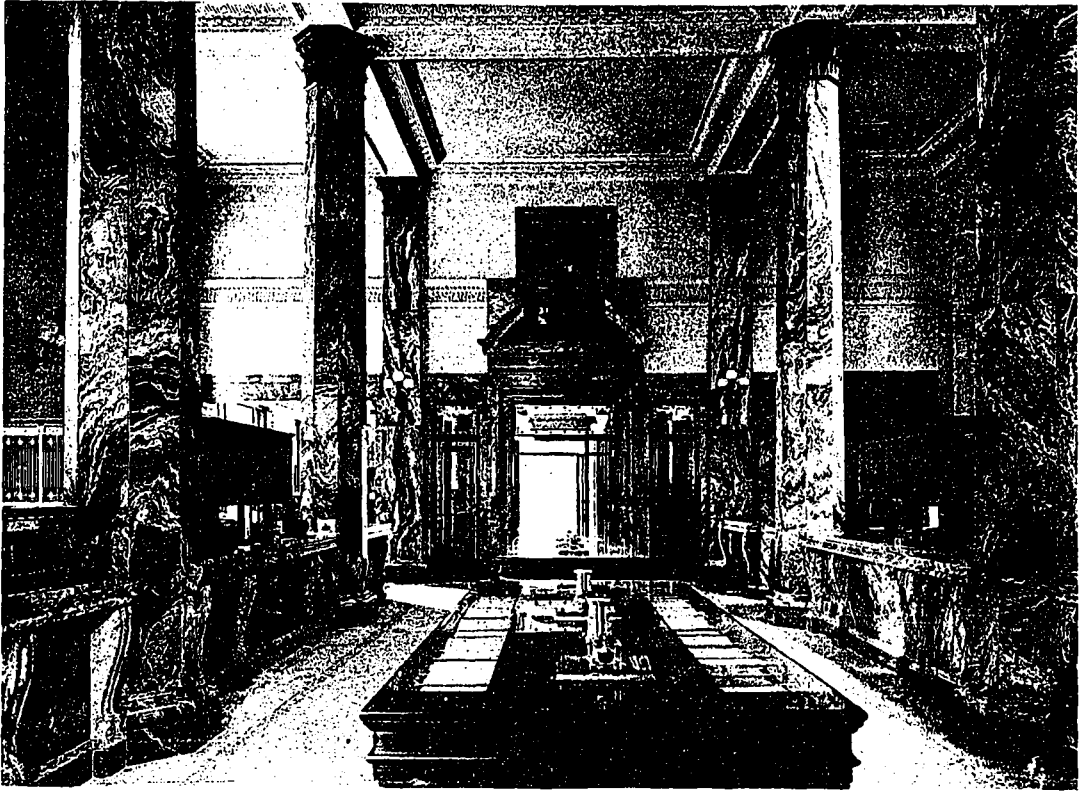
Lower Floor Arrangement, New Premises of the Standard Bank of Canada, King and Jordan Streets, Toronto. Darling & Pearson, Architects.



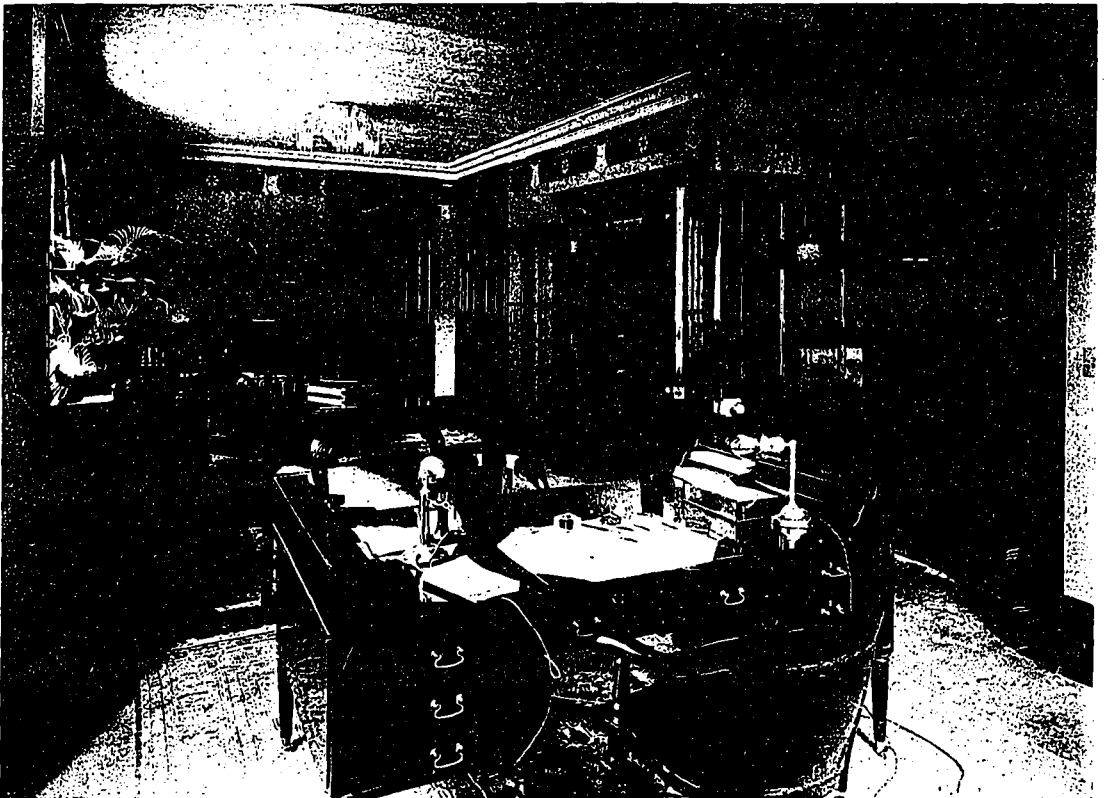
Rotunda, New Premises of the Standard Bank, Toronto, Showing Savings Department to the Left. Darling & Pearson, Architects.



Banking Room, New Premises of the Standard Bank of Canada, Toronto, Looking Toward the Rear. Darling & Pearson, Architects.



Banking Room, New Premises of the Standard Bank of Canada, Toronto, Looking Toward the Rear. Darling & Pearson, Architects.



Manager's Suite, New Premises of the Standard Bank of Canada, Toronto. Darling & Pearson, Architects.

ate in plastic caps treated with the bronze finish, and support a coffered ceiling having a simple plaster enrichment. Forming a feature at the rear is the treasury vault, which, in keeping with the counter scheme, is also in Laurentian marble, the clock over its door having a black marble dial with polished brass hands and numerals. The lighting is by large west windows and a series of ceiling lights extending north and south the entire east side of the room; the arrangement in this respect being such as to provide an evenly diffused light and to display to advantage the rich effect of the marble and general scheme. The floor here and in the rotunda is in Tennessee marble tile with a light field, red band and light border. Both as regards the utility in plan and decorative detail, the scheme in general shows an interesting consideration. The clerks' space, which provides for a roomy working arrangement, is fitted up with modern equipment both as regards desks and cages; the furniture and the woodwork throughout being of polished mahogany.

Mahogany furniture and woodwork are also used in the scheme of the General Manager's suite, which is situated immediately over the rotunda. Here the walls are hand-painted, while a feature of the plan is a room for business visitors overlooking the main banking room. Aside from the suite and the space devoted to the head office on the third floor, the entire upper portion of the building is taken up with modern offices. These offices open on to well-lighted spacious corridors with tiled floors, and are finished in oak with burlap-pannelled walls.

Constructively, the building is of steel frame type with concrete floors and hollow tiled partitions. It has a frontage of 50 feet by a depth of 107 feet, the superstructure resting on concrete caissons extending down many feet below the sidewalk level. In every particular the type of construction is fire-resisting, the steel work being fully protected in every part, and the windows throughout being of the metal sash and wire glass type. One special feature of the exterior treatment, which is not in evidence in the accompanying view, is the pent-house, usually unsightly on the modern building, which in this case has been given architectural consideration. The basement of the building is divided into two parts, each of which is served by a separate staircase, the engineers' department consisting of four rooms occupying the front portion, while the rear is taken up by wardrobes and toilet accommodations for the banking staff. Modernly equipped toilet rooms in Italian marble are also provided on the fourth, sixth and eighth floors. The building was designed by Messrs. Darling & Pearson, Toronto, and the following firms were connected with the various branches of the work: Masonry, Fussell & Thomas; granite, Robert Gullett; steel work, elevator enclosures and counter grills, Canada Foundry Co.; woodwork, Globe Furniture Co.; marble work, Hoidge Marble Co.; plastering, W. J. Hynes; plumbing, W. J. McGuire, Ltd.; heating, Jos. Harrison; painting and decorating, Thornton-Smith Co.; electric wiring, Hudson Electrical Co.; electric fixtures, Oxley-Enos Co., Ltd.—all of Toronto.

"Carrara" terra cotta furnished by Chillas & Black is used for the exterior.

IN AN ARTICLE dealing with the effect of ivy and other climbing plants on masonry walls, an English publication states that in many cases the unchecked growth of ivy and other chance-sown plants is not merely concealing our old ruins, but destroying them. Ivy is not inevitably destructive to masonry over which it clammers; and it would be not much less unreasonable to demand that every stem of ivy should be stripped from all old buildings than to leave them totally neglected in its clutches. It is very doubtful whether any real harm is done by the younger and thinner shoots, even though they may cover a large expanse of wall, and appear to be eating into it with their fringing rootlets or suckers. The damage is done to old walls when the ivy plant becomes a veritable tree, driving its sinuous stems, as thick as a man's arm or leg, into the joints and interstices of the masonry. The stems then act as living wedges, prising the wall asunder as they continue to grow. Although in some cases the plant may for a time counteract its own disruptive action by binding the loosened masses together with other cords, the wall, once split, must almost inevitably fall asunder in course of years, when the ivy perishes, or its strain changes direction in the course of growth. The splitting force of the stems is greatly increased in storms by the pressure of the wind on the massive crowns-of-foilage; and it is generally after a high wind that portions of an ivy-covered ruin are flung earthward or are seen to be hanging detached. Even greater damage may be done by trees which spring on the wall from bird-sown or wind-blown seeds, or gain a foothold in the soil near its base. On old, mouldering walls, yews, ashes, and other trees will often grow to a considerable size, so that the power of their roots in a high wind becomes very destructive. Worst of all is the swaying action of tall, slender trees, such as elms, poplars, or pines, when their roots undermine an old wall at its base. Large trees should never be allowed to stand close to any wall, or sooner or later cracks will almost certainly appear. But the growth of ivy and of smaller plants and bushes about the building may be permitted without anxiety up to a certain limit, if they are kept under observation and not allowed to grow large and woody. An excellent example of the intelligent utilization of climbing plants upon ancient ruins was given recently by a Rome correspondent in his account of the replanting of the Forum under the direction of Commendatore Boni. Ivy and flowering plants have been used to beautify bare corners and to conceal the supports and buttresses of new masonry which it has been necessary to insert in various places. On the other hand, nothing is allowed to grow where it can either hide or injure any existing feature of interest, or might impede further excavation at any likely point. It is to be wished that all our own famous architectural sites were watched over with equal providence and good taste.

CONSTRUCTION

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Robert Craik McLean Editor.

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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 duly returned.

Vol. 4 Toronto, October, 1911 No. 11

CURRENT TOPICS

CONTRACTS ARE BEING LET for a private hospital at Saskatoon, designed by Architect Fortin of Regina. It will cost \$100,000.

* * *

TWO STRUCTURES in Saskatoon for which Thompson, Daniel & Colthurst are architects, the St. John's Parish Church, and the new four-story Y.M.C.A., indicates the character of buildings that progressive city is erecting.

* * *

WORK IS NOW IN PROGRESS at a point in the Boise River canyon twenty-two miles northeast of Boise, Idaho, on the highest dam in the world. It will be 350 feet high, or 24 feet higher than the Shoshone dam at Cody, Wyoming. The structure is to be of concrete and rubble masonry, and cost in the neighborhood of \$600,000. It will have a storage capacity of 200,000 area feet.

* * *

THE NEW METHODIST COLLEGE which is now being erected at Regina at a cost of \$275,000 is shortly to be supplemented by a Woman's Building to be built from a sum of \$100,000 donated for this purpose by the Massey estate. The building will be similar in architectural scheme to the main structure and will be the second of an imposing group that will ultimately enclose a large open quadrangle.

FROM PRESENT INDICATIONS the city of Brantford will build a number of new school buildings in the near future. Brantford is a most progressive city and will probably engage architects of ability in the line of school design and plan to give them model school buildings.

* * *

AMONG THE MORE IMPORTANT building undertakings in South America, is a reinforced concrete cathedral which is being erected at Valparaiso, Chili, from the design of a native architect. The building, which is now nearing the stage of completion, is 195 feet long and 162½ feet wide, and has a large central dome rising to a height of 130 feet.

* * *

SASKATOON has a church competition, St. John's Church accepting the plans awarded first place by Thompson, Daniel & Colthurst, architects. The award was made by Mr. Allan Richardson, Bachelor of Architects, McGill University, assisted by Mr. Blackwood. Other architects who stood high in the competition were R. W. Thompson, J. H. Noel, and Clemesha & Coltman of Regina.

* * *

SO FAR AS IS KNOWN, the largest oak tree in the world, or at least in America, is the Sir Joseph Hooker Oak, at Chico, in the Sacramento Valley, California. It is 105 feet high, and its trunk has a circumference of 23 feet 1 inch. It is the California white or valley oak (*Quercus lobata*) that is peculiar to California, though it bears a close resemblance to the English oak. It is not only a large tree, but a beautiful one, its branches being very symmetrical.

* * *

IT SEEMS POSSIBLE that Hetty Green, who has been notable only because she is called "the richest woman in the world," and also because she was never known to improve or repair a piece of property, will yet do something for her country. In conjunction with Countess Annie Leary, also reputed rich, she is reported to have undertaken the work of founding a great university on Staten Island, New York, in memory of Christopher Columbus. If she goes Mr. Rockefeller one better and surpasses the Chicago University then her name will be blest in the land.

* * *

NO TIME IS TO BE LOST in carrying out the extension which the Dominion Government will make to the Intercolonial Railway terminal at Halifax. Preliminary operations have already been started, and it is expected that the Nova Scotia Construction Company, which has the contract, will shortly have a large force of men engaged on the project. The work which will cost \$914,600, will consist of the construction of a reinforced concrete wharf 800 feet long and 250 feet wide, together with a large addition to the existing shed. The wharf will be the first of four piers to be built at Halifax according to plans submitted by Engineer John Kennedy of Montreal, and which will cost in all about \$3,000,000.

THE GRAND TRUNK PACIFIC terminal plans for Fort William, just given to the public, include elevators with a capacity of 60,000,000 bushels. They also show concrete docks and three great piers in the Mission River harbor, from which 75,000 bushels per hour can be dropped from the elevators into the lake boats, and cars can be unloaded at the rate of 2,400 cars every twenty-four hours. The buildings of this great terminal will be absolutely fireproof in construction and will be largely of reinforced concrete resting on concrete-capped wood piles. The plans of the Grand Trunk Pacific for its Fort William terminal are so great as to almost seem visionary when compared with similar terminals, but it is probable that as in other cases of Canada's most phenomenally rapid development, it will not be long before the full capacity will be reached.

* * *

AT A RECENT MEETING of the Executive Committee of the Canadian Cement and Concrete Association held at Montreal, August 22, in regard to the Cement Show this year, it was decided to communicate with the various manufacturers, particularly those of cement, and ascertain their answers to the following questions: "Are you in favor of the holding of a Cement Show by this Association during 1912? If so, have you any preference in the matter of the place where the show shall be held? Are you prepared to support such a show financially and with an exhibit?" While it was not definitely decided, it was apparently the temper of the meeting that unless satisfactory replies to these questions are received before the end of September, the proposal to hold a Cement Show will very likely be dropped and the energies of the Executive concentrated on securing as successful a convention as possible.

* * *

THE FOURTH GENERAL annual assembly of the Royal Architectural Institute of Canada will convene at Montreal on October 3 and 4, 1911. This assembly will be most important and it is hoped that members will take this opportunity of meeting their colleagues from every part of the Dominion. The headquarters of the Assembly will be in the rooms of the Royal Architectural Institute of Canada, No. 5 Beaver Hall Square. The general programme as laid out by the local committee of arrangements comprises the following items: Tuesday, 9.30 a.m., meeting of the Council; 10.30 a.m., inaugural session, and miscellaneous matters. At 2.30 a general conference on town-planning will be held. At 8 p.m. the annual dinner will be given at the St. Regis. On Wednesday the proceedings will include, at 11 o'clock, reception by His Worship the Mayor, drive to points of interest, visit to Montreal Technical School, and luncheon. At 2.30 there will be a business session; at 3.30 a conference of the P.Q.A.A. respecting proposed changes in the charter of the R.A.I.C. in view of a federation of the various Canadian architectural bodies. At 4.30 a meeting of the new Council will be held.

THE HIT OR MISS POLICY of the past in grouping University buildings, or rather the lack of attention paid to grouping, is not in evidence in the arrangement of the projected University buildings at Winnipeg. Frederick Law Olmstead, jr., son of the late landscape architect of that name, the most famous designer of landscape of his time, has been engaged to plat the grounds for this great University. Western Canada is to be congratulated upon starting this educational group right. It now remains for the trustees to see that architects of ability are secured so that the architecture of the buildings will have that harmony and dignity of design that is called for in this representative educational institution.

* * *

ARCHITECT E. D. PITT, of Niagara Falls, Ontario, has prepared designs, and the Bishop Construction Co. of Montreal and Toronto have the contract, for the erection of the \$100,000 factory to be established by the Yale and Towne Manufacturing Company at St. Catharines, Ontario. The builders' hardware department of the Yale and Towne Company commenced when in 1886 it made the bronze door plates and knobs from Root's special designs for the Rookery Building in Chicago, and from that commencement has grown to be the largest builders' hardware manufacturing concern in the United States. The establishment of the works in Canada will give to Canadian architects an opportunity to procure hardware that has the best of art and the most reliable material in its composition.

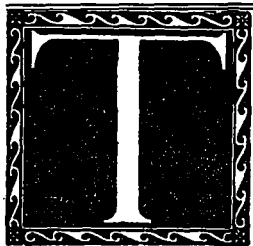
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THE "CEMENT GUN," a device for putting concrete in place by compressed air, such as was demonstrated at the Cement Show held at Toronto last March, is being used by the Quartermaster Department, United States Army, in the Hawaiian Island, and is proving of value in the construction of the ordnance shop at Fort Ruger. The nozzle originally furnished with the machine became worn and clogged easily after being used but a short time and was replaced by a rubber-lined nozzle invented by Captain Edwards, that has completely overcome the difficulty and is giving most eminent satisfaction. Tests are also being made by the Isthmian Canal Commission at Panama to determine the value of cement applied by this method as a preservative for iron plates. Twelve plates, 63.8 by 14 inches, have been coated with a 1 to 3 mixture of cement and sand, after they were cleaned to gray metal by the sand-blast process. Six of these have been covered with a half-inch coating, and the remaining six with a one-inch coat on one side, and a 1½-inch coat on the other. Three plates of each kind have been sent to Balboa, and three to Cristobal, where they will be kept immersed in salt water to test the mortar method of preventing corrosion.

A MISTAKE in the advertisement of the Standard Ideal Company last month names E. & W. S. Maxwell as the architects of the Bank of Toronto at Montreal. The architects of this building were Ross & McFarlane.



Roman Bridge over the Rhone, at Viviers, France.



THE STORY OF THE BRIDGE

By WALTER SHAW SPARROW

Abstract of a carefully prepared paper printed in the "Builder" in four parts. Part I. Primitive Bridges. Part II. The Roman Genius. Part III. Medieval. Part IV. In the Middle Ages.

I.—Primitive Bridges.

IT IS REASONABLE to suppose that prehistoric man owed his first timber bridge to a storm of wind, which hurled down a tall tree across a wide crevasse in a glacier of the Ice Age. Many a bridge of this accidental sort was probably used long before the period of the cavemen, during those mysterious times when a type of ape, growing tired of its own active life on all-fours, passed through its evolution from monkeyhood into manhood, leaving a great many of its kith and kin either stranded for ever at the halfway stations of gorilla-hood and chimpanzeeism, or hopelessly in the rear as little and agile tree-climbers. As man seems to have had for his ancestors a breed of apes born with a taste for experiment and discontent, it is not surprising to find that the earliest human efforts to pass from bad to better took hints from Nature and her marvels. Cave-lions and cave-bears were compelled to give up their homes to man; the fire stored in flint was discovered when the first human weapons were chipped to a point; clay was moulded into utensils, and the building methods of birds and beasts were patterns for imitation. We know, for instance, that man dug round pit-dwellings into which he crawled

on his stomach along a circular burrow, finding warmth and safety in the earth like many other animals. Later, encouraged by the example set by beavers in their dams and lodges, human craftsmanship evolved the lake-dwelling, and the round hut, using for the timber walls the same plaster of mud mixed with straw and loam that house martins have ever employed in their nest-building.

Well now, as soon as man had passed through that technical evolution to which he owed the solid foundation of his lake-homes he was a primitive architect, with knowledge enough to build a bridge of timber; and if we keep in mind the way in which he laid enduring foundations in a lake we may infer, without any great extravagance, that his wooden bridges were akin to those at Srinagar, the capital of Kishmir, a city founded in the 6th century, A.D., and justly famous for the quaint youth of its unchanging architecture. Seven bridges there span the River Jhelum, which is the Hydaspes of the Greek historians, and to study their construction is to feel oneself intimately in touch with a little Venice belonging to the long ago of primeval handicrafts. These have a superstructure of frail shops, partly held up by poles, the probable resemblance

to a lake-village is plain for us to see. The piers are made of beams laid criss-cross, and in one bridge there is no angular platform below the piers to break the force of the current after heavy rains, while the pier timbers in the other rest on foundations similar in shape to those that Colechurch and Isembert designed and made for the great Old London Bridge, with its romantic houses, its chapel, its defensive towers, and cellars in the thickness of the piers. Old London Bridge, finished in 1209, and destroyed in 1830-31, had the same lineage as the shop-bridges of Srinagar, the first ancestors being prehistoric huts built over lakes on artificial islands formed of logs, brushwood and peat, with upper layers of timber, and branches held in position by scores of little piles.

But, although the workmanship at Srinagar is very primitive, you will see that the piers have been influenced by the progress of art in India, for the horizontal beams, cut in varying lengths, are composed, and they suggest a rude arch between the piers. This evidence of progress, too, is more noteworthy in another bridge at Srinagar, a bridge of unmortared stone, with booths of timber, over the Marqual Canal. Here the arch is nearly triangular, suggesting a descent from that cone-shaped hut from which the beehive houses of stone inherited the inclined jambs to their doorways.

The bridges of Srinagar, again, are not all burdened with houses. Some have nothing more than a narrow footway of boards and parapets of simple latticework. A very attractive example, with six piers, crosses the Jhelum at Baramula, and beyond, but near to it, a primeval-looking village basks in the shade of the Himalaya Mountains. Here, if anywhere, we have a type of bridge similar to the prehistoric—if, as certainly seems probable, the art of the lake-dwellers left its sheltered moorings and adventured across rivers.

India is rich in primitive bridges, and I have now to speak of the suspension bridges of bamboo, near

Darjeeling, for instance, and also in the Bermulda Hills. Here, in the Buria Kol, bridge-ropes are made with the glossy and silky fibres of the Nilgiri nettle. As to the general look of the handicraft, it is like human spider-webbing, and its effective

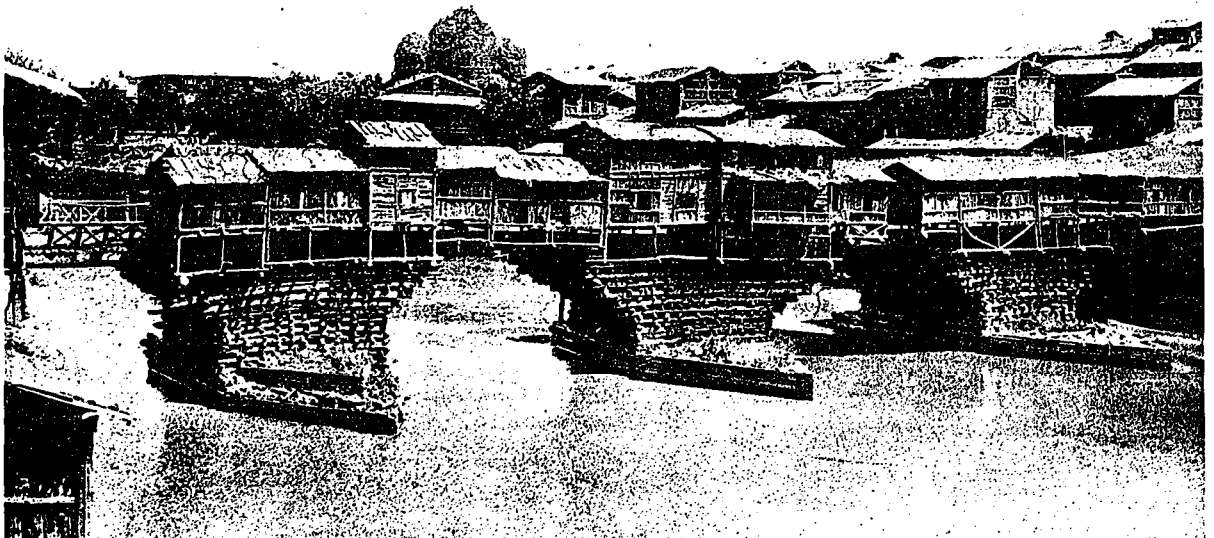


The Weaver's Bridge, Wycollar.

simplicity and strength ought to lessen the busy pride that engineers now take in metal suspension bridges having often a prodigal ungainliness.

Thus far we have taken a rapid glance at primitive work in wood and in cane. To this part of our subject several Roman bridges belong. The earliest bridge built at Rome was called the Bridge of Stakes, Pons Sublicius, built, it is said, by Ancus Martius, then reconstructed by the high priests, who thereupon became known as "Pontifices." An illustration of the Pons Sublicius, adapted from historical descriptions, will be found in Colonel Emy's "Traite de l'Art de la Charpenterie." The piles were driven into the river's bed, then straightened at the top with strong wind-braces; hurdle-like piers were formed in this way for the superstructure, which had latticed parapets. On this bridge Horatius Cocles passed for all time into the heroisms that beget their like.

The Pons Sublicius is believed to be the form of



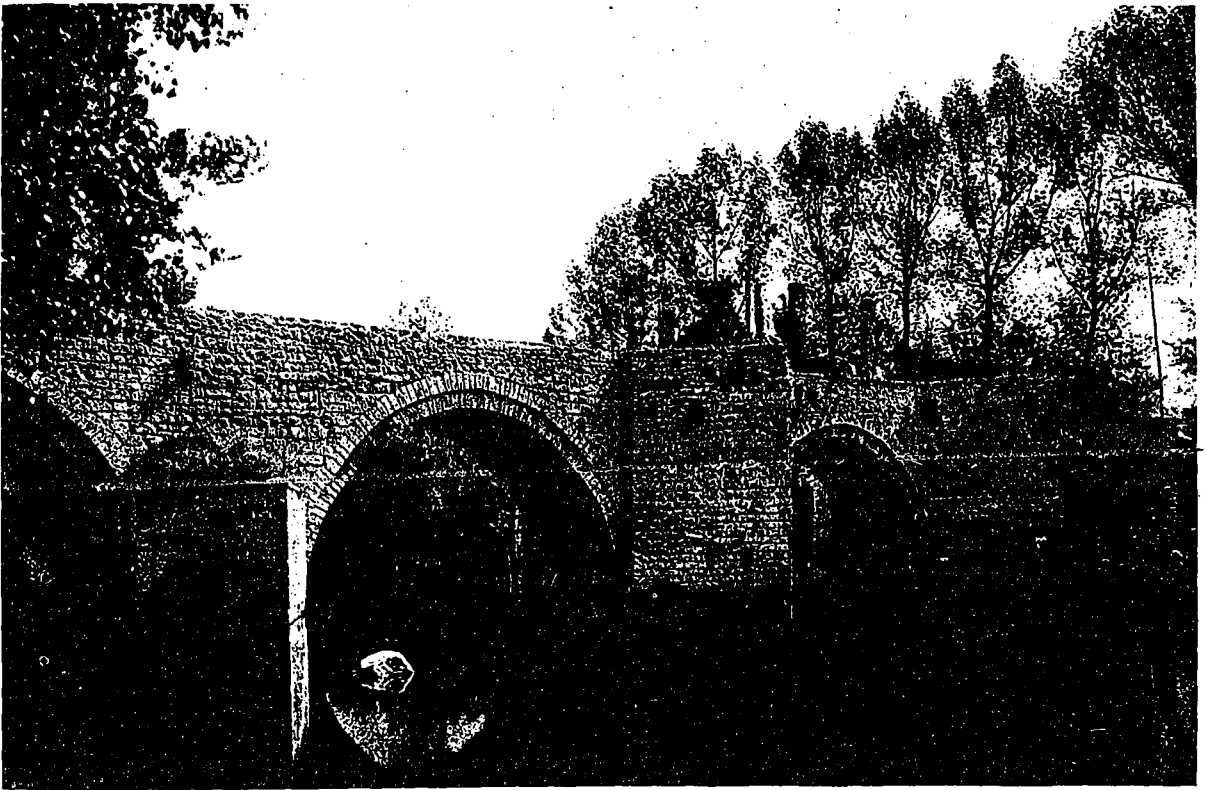
The Bridge of Shops, Srinagar, Kishmir.

bridge that the Romans used frequently in their colonies, and this belief is reasonable, particularly as regards England, for England was a land of forests, and if the Romans had built important bridges of stone some relics of them would have been found in our larger rivers. Timber bridges, too, belong to the traditions of English workmanship, and a good many of them were stake-and-pile bridges. There was one at Windsor in the 18th century, and its primitive craftsmanship contrasted oddly with the Castle.

But we turn now to another point. How were stone bridges evolved? This question belongs to the domain of speculative reasoning, but we can start out from definite facts. It is safe to believe that primi-

by Herodotus and Diodorus Siculus, had stone piers and a footway of movable planks, which were not left down at night. This bridge is ascribed by Herodotus to Nitocris, and by Siculus to Semiramis. It was easy to defend, and this good quality gave a long life to its central idea. A mediæval bridge with movable planking still exists in France. I have seen a photograph of it, but forget the name.

Very often the Romans used stone piers and a superstructure of wood, as in Trajan's magnificent bridge across the Danube, just below the rapids of the Iron Gate. This great achievement, dating from A.D. 104, and designed by Appollodorus of Damascus, was partly destroyed by Hadrian, who said that it made a passage along which the natives could make



Bridge over the Thouet, St. Generoux, France, 14th Century.

tive man must have used the stepping-stones across rivers that the hazards of Nature often placed in the waters. This was the earliest bridge of stones, but its value to man not only varied from day to day, but was of no use at all when it was needed particularly—that is to say, after heavy rains, when rivers became too rapid or too deep to be forded on foot. Primitive man could not fail to notice this fact, and would he not apply to it his ripening intelligence as a builder? Each stepping-stone was a foundation for other stones to rest upon, and a cluster of them, carried up to a given height above the surface of the river during a flood, would form a pier, across which logs or slabs of stone could be laid to another pier, just as they are to-day in the Pont-y-Pant, in the Lledr Valley, Wales.

One remembers, in this connection, that a famous bridge at Babylon, over the Euphrates, mentioned

raids to the injury of the Roman rule; as if a system of barriers and guards could not have held the great footway against all comers. Still, relics of thirteen piers remain to this day. Originally the bridge was about 1,300 yards long, with twenty arches of hewn stone, which, according to Dion Cassius, were 150 feet high, 60 feet wide, and 170 feet from each other. Here we have travelled far from the Pons Sublicius and the primitive bridge of planks or of stone slabs resting on stones. It is believed that in Trajan's bridge the piers were founded by sinking caissons, while during the building of the piers for the Babylon Bridge the Euphrates was diverted from its course. This happened also to the Thames when Old London Bridge was constructed, according to Stow.

Finally, which is the earliest type of stone bridge in Great Britain? If stepping-stones were ever de-

veloped into piers of loose boulders, we must expect to find some tradition of it in those parts of the country where descendants of the prehistoric inhabitants sheltered themselves from successive invasions. Ethnologists are now pretty well agreed that there are people in the British Isles whose lineage is probably as old as the Neolithic folk of England. They are dark, short, virile, and oval-headed; their features are small and their tempers quick; they are to be met with in Cornwall, Wales, the Isle of Man, Ireland, and the West of Scotland, as far north as the Orkneys. Well now, it is from Dartmoor that I choose for illustration a very primitive bridge made with granite slabs resting on granite piers. It stands at Postbridge on the East Dart. Locally it is called a "clapper" bridge, and its type is common in Cornwall. One is reminded at once of Stonehenge. This does not mean that the "clapper" bridges still extant belong to pre-Roman times. They are mediæval, but the principle of their structure is prehistoric. The same type, but with variations, is found also in Wales, and I note particularly the Pont-y-Pant, in the Lledr Valley, for its piers are loose fragments of rock, and the wooden footway is primitively rustic. Here is a bridge that belongs to what I venture to call the period of developed stepping-stones.

II.—The Roman Genius.

Roman Aqueducts and bridges, says an authority, "were really of a more engineering than architectural character, being in the main utilitarian." What does that mean? Was a Roman temple less utilitarian than a Roman aqueduct? Less needful as a part of the national life? But, when a lover of Greek art tries to write on the Roman genius, very absurd things are often uttered. Thus we are told by the same authority that the Pont du Gard, near Nîmes, in France, is built of "rough masonry." What next? Sandow, in comparison with a Tom Thumb, is a man of rough muscle and sinew, and if Tom Thumb is to be our standard of symmetry and grace, then Sandow is a masterful mistake in proportion and vitality. To describe the Pont du Gard as "rough" is to be a Tom Thumb in criticism.

When J. J. Rousseau visited the Pont du Gard he was awed into silence by the immensity of the three arcades. For the first time in his life he understood the grandeur of the Roman spirit in adventurous achievement. As he walked along each arcade the echo of his footsteps enabled him to hear the great voice of the builders. How had all the large stones been brought to this place, in a neighborhood where quarries seem to have been unknown? And whence came the art that piled them up into a silencing design? Each stone was laid in its allotted place quite dry; neither mortar nor cement was employed, except as a lining to the water-channel on the third tier. Rousseau spent hour after hour in meditation, and then he remembered a humorous fact. He had been warned against the beautiful girls of Montpellier, and here he was alone with the Pont du Gard, and completely fascinated!

A classic tradition says that the stones in the Pont du Gard were joined together by iron bands. Is that true? The iron clamps, if employed by the masons, were not left on the surface of the stones, for there's no reference to them in the writings of modern students and travellers. That the Romans did use iron bars bent at the ends and fastened into huge stones with molten lead is proved by the ruins of the Roman bridge over the North Tyne at Chollerford, near Hexham. This was probably a bridge with a wooden superstructure, as *vousoirs* have not been found among the debris of stones. You will find full information in Dr. Bruce's book on "The Roman Wall," and in "An Account of the Roman Antiquities preserved at Chesters, Northumberland," by E. A. Wallis Budge.

The Pont du Gard is immense, its height being not less than 47 metres and 20 centimeters. The first tier has six arches, the second has eleven, and the third thirty-five. The first tier is 20 m. 10 cm. high and 161 m. 80 cm. in length; while the middle tier is 19 m. 40 cm. in height, and 257 m. 90 cm. long. Note, too, that the architectural centre of the design is not the real centre; this was determined by the course of the River Gardon, and we find it on the north in the second arch of the first bridge, the arch under which the river flows. It has a span of 25 m. 30 cm., while the neighbor on each side is smaller and narrower, having a chord of 19 m. 20 cm. The other arches of the first tier dwindle to 15 m. 75 cm. in span. As to the centre of the second story, it corresponds with the first, for the largest vault is above the river; it carries four little arches of the third arcade, while the others support only three. Thus the symmetry of the whole work must be judged in its relation to these facts. Some critics see nothing more than the unequal size of the arcades, when the real point is to find the *milieu architectural*, whence the design radiates, majestic and imperious. Fergusson said very well that the topmost arches give to the structure the same finish and effect that an entablature and cornice give to a long range of columns.

We cannot put a date on the Pont du Gard because there are differences of opinion in this matter. The historian of Nîmes, M. Menard, attributes the work to Agrippa, son-in-law of Augustus, who is said to have ordered its construction in the nineteenth year B.C. The style belongs to the Tuscan order, and all the arcades are groined and semicircular. The curve of every arch springs from a ledge, an impost resembling a cyma, about 50 centimetres high, and as much in projection. There are four groins in the arches of the first tier, and three in the second, while the third tier has either one or two. The water channel, placed on top of the third arcade, is 1 m. 30 cm. wide and 1 m. 60 cm. high; has side walls with perpend stones, and these bonders, 0 m. 80 cm. in size, bear cemented flagstones, a metre wide and having a thickness of 0 m. 32 cm. The channel itself is nearly blocked up with a thick deposit of lime, but when this substance is detached antiquaries find on the side walls a deep layer of cement painted

red. The bed of the canal is a solid floor 0 m. 22 cm. in thickness, its component parts being small pebbles mixed with lime and gritty sand.

We pass on now to another Roman bridge, at Vaison in Vaucluse. It is a bridge of stone over the River Ouvèze, and its span measures 30 metres.

Another Roman bridge, not generally known, is found at Pollenza, in the island of Majorca. It has two arches. One is semicircular, and springs from the river-bed, while the other is a long segment arch stretching from an abutment wall on the bankside to the buttress guarding the pier. Above the buttress is a small archway to break the force of a flooding river. This is what the French call an *arche de decharge pour les hautes eaux*. To find it in a Roman bridge is interesting, for it gives a classic origin to the use of discharge arches in mediæval bridge-building.

Much larger and more impressive is the probable Roman bridge at Viviers, in France (*Ardeche*),

Note, too, with interest, that the timber piers are constructed like those at Srinagar, in Kishmir, which appeal to us as primeval carpentry in all likelihood developed from the log foundations of lake-dwellings. It is quite an easy thing to make a bridge in the Gaulish fashion. You choose a river with steep banks, just wide enough for a single span. On each bank you make a bed of flad boulders, and then begin to raise up your timber pieces, using tree-trunks laid in a criss-cross manner. In order that the footway from pier to pier may not be too long, and therefore unstable, you increase the length of your horizontal logs as the piers rise in height; and because these logs on each side jut farther and farther across the water a rude arch is suggested by them, not a perfect arch, since the timbering of the footway gives it a flattened head. The inconvenience of a long footway in a wooden bridge may have suggested this method of pier-building to prehistoric craftsmen. If so, how are we to think of it



Llangollen Bridge, 14th Century.

built mainly with pebbles and small stones. Photographs show clearly the workmanship, and I give here a view of the west side. Viviers is only a village to-day, with less than 2,000 inhabitants; but in the Middle Ages it was a cathedral city, with a pride much greater than its population, which numbered 15,000. The Roman name for it was *Alba Augusta*, but its Roman civilization was destroyed by the Vandals in the 5th century, and another type of society came to life amid the ruins, the old bridge remaining as a bond of distant union between past and present.

Viollet-le-Duc believed that the Romans in their colonies built few bridges of stone, preferring timber because it was always plentiful and easier to use. The old Gaulish methods of bridge-building has outlived the Roman domination by many centuries; it may be seen to this day in Savoy. Viollet-le-Duc drew attention to this circumstance, and said with truth that timber bridges in Savoy descended not merely from the workmanship described by Julius Cæsar, but from some remote age in prehistoric time.

in relation to the origin of arches? On the other hand, prehistoric timber piers may have had the same width all the way up; perhaps the progress of architecture in Roman and in Indian work suggested the use of longer logs to project over the water, and to make at last a jutting support under the timbers of a footway.

From the rarity of Roman bridges in Great Britain we learn that wood was the material used in early historic times. Do we possess even three or four Roman bridges with an authentic record? Here and there local traditions attribute a bridge to the Romans, but how many do you know having the support of distinguished antiquaries? A good many along the Roman roads have Romanesque traits, but I should like to find a true example of Roman craftsmanship.

Along the old Roman tracks in Lancashire there are many single-arch bridges having a Roman character, but without a stalwart air of authentic dignity. The one near Clitheroe looks genuine, while the others

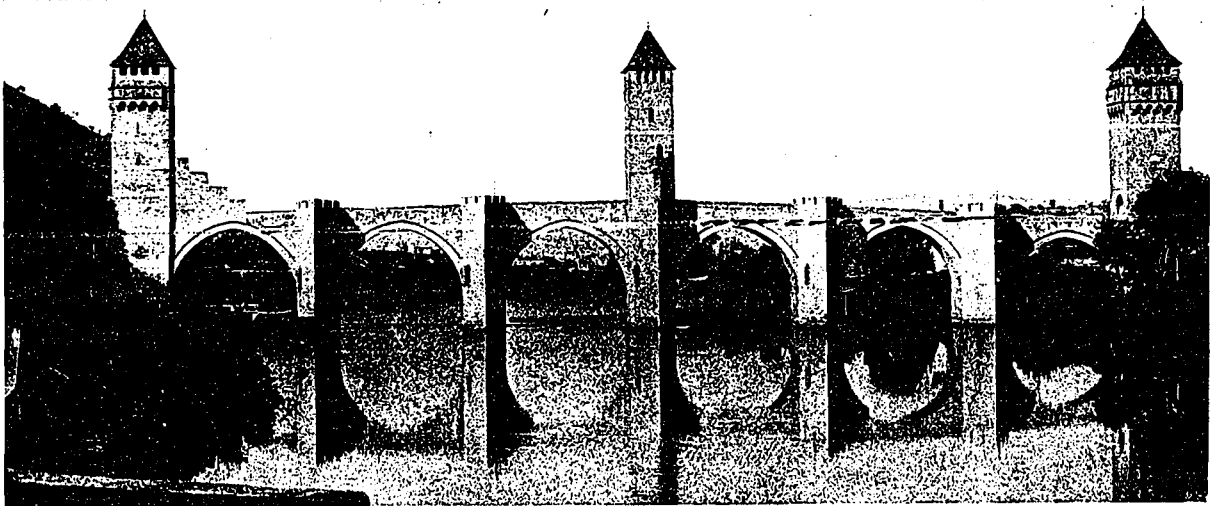
speak to me of a Roman tradition enfeebled in much later days by a different spirit in craftsmanship.

III.—Mediæval.

To encourage the making or the upkeep of bridges was counted as an act of piety in mediæval days, "a blessed besines," a charitable duty, essential to the safety of pilgrims and wayfarers; so bishops and abbots, to bring this matter home to lay minds, granted remissions of penance to those (and they were many) who forgot that the King's highways had to be kept in order by every landlord who owned property in their neighborhood.

By way of example I give the famous Llangollen Bridge, with its four unequal arches, and its look of bluff vigor in old age. It comes down to us—a little widened, thirty-three years ago—from John Trevor, Bishop of St. Asaph, who died in 1357, and whose workmen did not care a rap for uniformity of design. What they liked was a secure found-

certain beauty described as "faerie," a certain grace that aspired with an air of heroic life, as if it came into the common world from that enchanted time when King Arthur ruled. It is just this faerie magic that old English bridges lack. They are good pedestrian prose, often enough, but the great poetry of Gothic art, its easy triumph in upward flight, is absent as a rule. Here and there we come upon a half exception, like the ever-famous Twisel Bridge, Northumberland, which has changed but little since Lord Surrey threw his army across it to reach Flodden Field, turning the flank of the Scotch hosts. It is a graceful piece of architecture, alert and wide-awake; it has one strong arch, with a touch of the 13th century in its semi-circular span, which measures 90 ft. 7 in. from abutment to abutment. The parapet from its centre shelves downwards at each side, its greatest height from the waters of the Till being 46 ft. 2 in. I note too, that the arch is groined and ribbed, quite a common trait in me-



The Valentre Bridge at Cahors, France.

ation for each of their piers, and it saved time and expense to sound the river-bed and to build from the flattest pieces in slippery rock. The widest arch would have a span of 28 feet, and the two smaller ones would occupy the central position. But the main point, after all, was to do such work as would withstand the fury of a gathering flood. In this one matter the craftsmanship was a complete success. But there is no ambition, no imagination, in the design of Llangollen Bridge. It conquers the dangerous waters, but in a stubborn, dull fashion. It has the look of Hodge in armor, heavy and dogged, dauntless and lumbering. And this applies to many a British bridge having a long history. The one over the Nith at Dumfries, which was long considered the finest after Old London Bridge, is a damaged exception, dating from the 13th century. Formerly it has thirteen arches—an unlucky number, perhaps, for only seven are now in use. There used to be real aspiration in the design, a certain high triumph over difficulties and perils, and for this quality we have reason to be grateful. Old England used to speak with delight about a

diæval bridge-building, above all, in Poitou and in England. Viollet-le-Duc mentions this kind of arch, and says that the groins, separated from the bed of the road by a space filled with loose flagging, were *poses en rainure dans les piles en conservant une parfaite élasticité*. All rain water that found its way through the road passed with ease between the joints of the flagging, without leaving a deposit of saltpetre on the haunches of the arch; and, as the work was lighter than in other arches, there was less pressure on the piers. Moreover, this system of arch-building, which dates from the end of the 12th century, or from the beginning of the 13th, was more economical than any other, employing one-third less of keyed materials. The spandrels above those groined arches were of ashlar, and it was easy to repair them without interrupting traffic. Another distinguishing characteristic of mediæval bridges is what the French call the *dos d'ane*, the shelving parapet and roadway on either side from a point just above the keystone of the central arch. It is often supposed that this trait is European, yet it is found also in Chinese bridges, which are very

graceful at their best, pure and strong in design, and having fine arches in which the semicircle is prolonged without forming a true horseshoe. I have chosen a Chinese bridge as an illustration, and set it side by side with two Spanish examples, the Puente de San Juan de las Abadesas at Gerona, and the Puente Mayor over the Mino at Orense, Galacia, which, to my mind, is the most stately of all shelving bridges. The Moors left in Spain a peculiar grace of style which native architects often united to their own qualities, a haughty distinction and a lofty ambition. Consider the immense nave in the Gerona Cathedral, a glorious pointed vault measuring not less than 73 ft. from side to side, almost double the width of Westminster nave. It belongs to the 15th century, yet in the magic of its youthful hope it proves that its architect, Gullielmo Boffy, was a child of the 13th. And the great central arch of the Gerona bridge has in it some of the soaring courage that transcends all expectation in the cathedral nave.

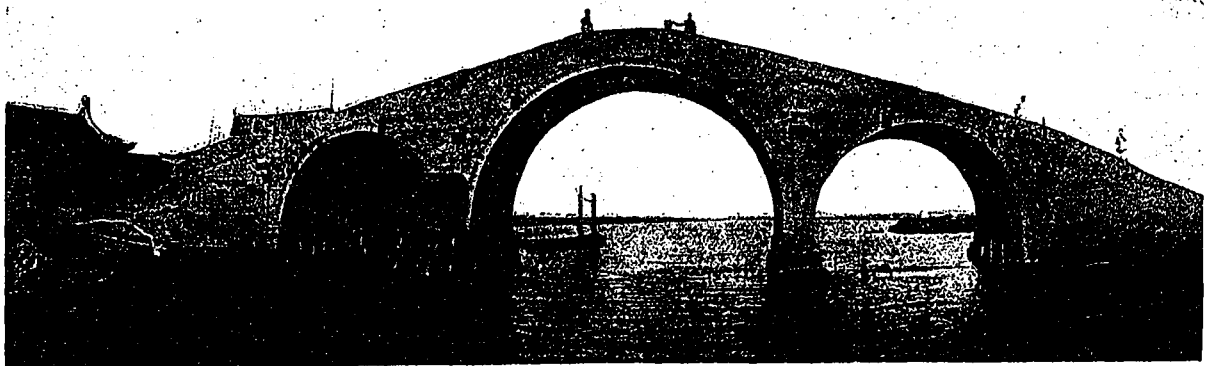
This bridge, with its look of battered antiquity, is certainly very fine, but less majestic than the masterpieces at Orense, a stone bridge of the 13th century, with seven elastic arches, all alertly dignified, and with a total length of more than 1,300 ft. The great central arch is 156 ft. wide between the piers, and its keystone is 135 ft. wide above the river-bed. "The Mino rises rapidly and to a great height," says Walter Wood, in "A Corner of Spain"; and it was with the object of safeguarding the bridge against the sudden inundations that the arch was made so high."

And this brings us to the origin of those bridges that shelve down at each side from a point in the centre of their parapets and footways. Two useful purposes were served by making the central arch wider and higher than the others, since there was greater space for navigation as well as for waters in flood; but when a bridge had only one arch, its up-and-down roadway was usually inconvenient, because the incline was not long and gradual, but short and steep. Take the Pont-y-Prydd, near Cardiff, built in the 18th century, and having a pathway so abrupt in its slope that laths of wood used to be stretched across as a foothold for horses. In frosty weather a shelving bridge was often a breakneck place; and there is evidence that architects at an

early date told each other that their departure from the Roman tradition of level bridges was undignified. It was a tradition not without exceptions, since the *dos d'ane* was used at times by Roman bridge-builders; but a level causeway was more typical of Roman craftsmanship, and it influenced mediæval architects and engineers. Among my illustrations is a good example, Le Pont des Consols over the Tarn at Montauban. It is a bridge entirely of brick, 250 metres 50 centimetres in length. The bricks are excellent in quality, and measure 5 centimetres in thickness, 40 centimetres in length, and 28 centimetres in width. The roadway is perfectly level, and its height above the level of the Tarn is 18 metres. There are seven pointed arches, having an average span, or chord, of 22 metres; and the six great piers with beaked buttresses are 5 m. 55 cm. in thickness, and note how they are pierced with high arched bays to facilitate the passage of water during floods. The defensive towers have gone, but the strongest one of all was built at the end facing the town. It was square in shape, and its summit was a platform with crenelles and machicolations. The other end tower was a weaker version of this one, while the central defence, built over the middle buttress on the side looking down the river, was triangular, and there was room enough in it for a chapel. A flight of winding steps went down to a postern pierced through the buttress at the water's level; and at the other side of the pier, just below the arched bay, hung a sort of see-saw that carried an iron cage in which blasphemers were put to be ducked in the river.

IV.—In the Middle Ages.

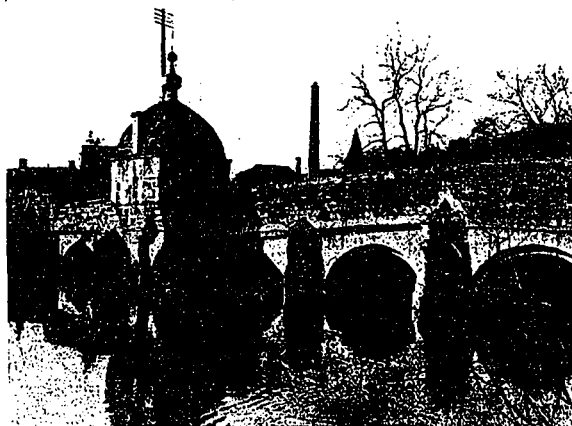
Mediæval England was a forestial country, and in woods along many roads and byways footpads and bandits lay in wait, as ready to cut a throat as to broach a tun of wine. Rivers were feared then by pilgrims and horsemen, not only because fords were very common, but because thieves knew that an ambush near a ford was particularly unpleasant to anyone who had to make his way through it. Till the 14th century, and even later, fords were in vogue at and near many towns of the lesser sort. And the life and limb tax claimed by rivers was not the only trouble. The keepers of a ford knew no pity, but got their toll in relentless ways, taking



Chinese Bridge.

bread from the beggar's wallet, and "a hood or a girdel" from "the pore penyles." Pretty often, again, great woods encircled little riverside towns and manors, so that outlaws after dark could steal up close to the houses and the bridge; it was then that pilgrims and wayfarers welcomed with the greatest relief the cresset-lights that glimmered from some friendly building on the bridge—a chapel, a defensive gateway, a small bickering windmill, or a good house buttressed up against a pier and rising above the parapet.

Some defensive bridges in Old England had an important look as late as the reign of George III. Thus the Welsh Bridge at Shrewsbury has quite a noble air in engravings of that period. At the present time our gateway and towered bridges are plain specimens of this mediæval tradition. One at Warkworth, Northumberland, belongs to the 14th century. It has a squat tower with plenty of stonework above the gateway, but the gateway itself is so low and narrow that a gipsy's caravan cannot pass through it. As to the bridge, its simple dogged architecture has points worth noting. There is the roadway, which has a pleasant line dipping towards the gateway, and having a triangular recess for the convenience of travellers in the great central pier. The gateway is at some distance from the abutment, and the wall that unites them has a curve that repeats in two places, but in a modified manner, the line of parapet formed by the recess. Although the pier midstream is triangular, an attempt has been made to mask the false principle involved in this type of cut-water; that is to say, the mason tried to thrust into the oncoming river a larger bulk of masonry



Bridge Chapel, Bradford-on-Avon, Wilts.

than was usual in sharp-beaked piers and buttresses. It is odd, but mediæval bridge builders very often believed that a pier, however substantial in bulk, ought to cut water like a knife, instead of presenting a bold surface to the swift current, a surface having weight and resistance, as in those occasional piers in French bridges of the Limousin, whose sectional form is similar in shape to a Gothic drop arch, or else to an arch which is formed on an equilateral triangle. It is clear that a section of this kind has

a greater surface than that of a triangle, and consequently greater power and opposition.

As a fair type of the defensive bridge in Great Britain, I have chosen for illustration the Monnow Bridge at Monmouth. The bluff old tower has rounded ends facing the river, and one arrow-hole can be seen in my photograph. There are machicolations above the gateway, flanked by arrow-slits,



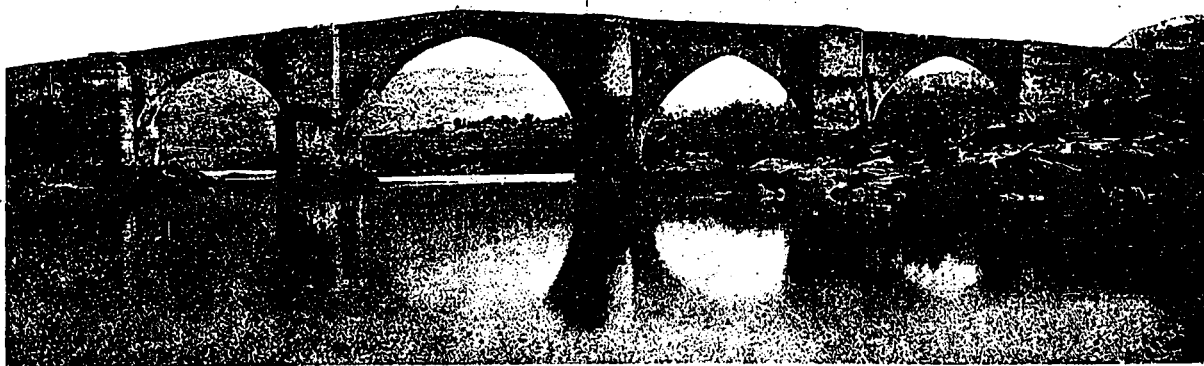
The Monnow Bridge, Monmouth.

and just below the roof is another aperture through which stones could be hurled or molten lead poured. Horatius Cocles would have been glad of a tower like this on the Pons Sublicius. It was not till much later times that the Romans, by building triumphal arches on the roadways of important bridges, created a tradition that passed through the Middle Ages onward to our own time and to contemporary work. The arches in the Monnow Bridge are round, and note that they are *arcs doubleaux*, as the French describe those vaults in which at certain intervals a concentric arch is supposed, or the vault itself at certain places is of double or greater thickness than at others, so that bold ribs project from the belly of arches. *Arcs doubleaux* are common in old English bridges, and some of the most interesting are Elizabethan, notably in the beautiful Wilton Bridge across the Wye, near Ross, in Herefordshire, built of reddish sandstone in 1599. In the Wilton Bridge the voussoirs are notched or joggled into each other in accord with that Norman fashion which left a history of itself in such work as the fireplaces in Fountains Abbey. Many students of the evolution of bridges give insufficient care to the ring of arch stones. In the Monnow Bridge at Monmouth a slight tentative effect has been made to give the arch stones some freedom from the oscillation sent through the spandrels when a great weight passes over an arch. A slight tentative effect, I repeat, because the voussoirs have not been made independent from the spandrels. To find arches of this type we must go to the noble Valentre Bridge at Cahors, dating from the 13th century. Five acute-angled piers rise from the water to a high parapet, forming crenelated recesses on each side of the roadway; and the voussoirs of the six principal arches, gracefully pointed, are, as Viollet-le-Duc says, *extradoses*, like the round arches in the best Roman bridges. This

makes the ring of each arch independent from the construction of the spandrels, so that they keep their elasticity, and cannot pass on through the rest of the bridge any tremor sent down from the roadway into the spandrels. On the other hand, when arch stones are unequal, thicker in their haunches than in their crown, oscillating movements go along the full length of a bridge, causing undue fatigue to the piers, and sometimes a very noticeable trembling, as in the bridge by Inigo Jones at Llanrwst. Perronet, the great French engineer of the 18th century, forgot this effect of repercussion when he designed and built Le Pont Louis XV. at Paris; and in the hope that he would remedy his mistake he clamped his arch stones together with iron all along the soffit, as if metal fastened into stone could never in the course of time become a destructive agent.

The architect of Valentre Bridge was wiser than Perronet, every arch in his work being an elastic bow that is able to move between two piers without conveying its oscillation beyond those supports. To our modern eyes, no doubt, there are too many arches across the River Lot at Cahors, but this was necessary in the Middle Ages, and for two reasons. It was a necessity of defence, because narrow arches were easier than broad ones to protect from the roadway if an enemy wished to assemble boats under a bridge; and since in the frequent wars of those days a bridge had often to be cut as a final resource against defeat, it was essential that the destruction of one arch should not upset its neighboring piers by the withdrawal of a counterbalancing thrust from one side of the piers. Many piers of a large size were essential, above all, when the greater lateral thrust of round arches had to be considered in its relation to a bridge cut in a single place. Further, bridges in the Middle Ages were built very slowly, bit by bit, their construction lasting from ten to twenty years; and as war at any moment might stop the masons, there was a great need that every arch should have for their support such strong piers as would be equal to the stress and strain of all eventualities. From this standpoint, then, as well as from the militant strategy of bridge-building, many powerful piers were necessary, and a bridge gained very much in value when its pointed arches had in their voussoirs the characteristic which all authorities praise in the Valentre Bridge at Cahors.

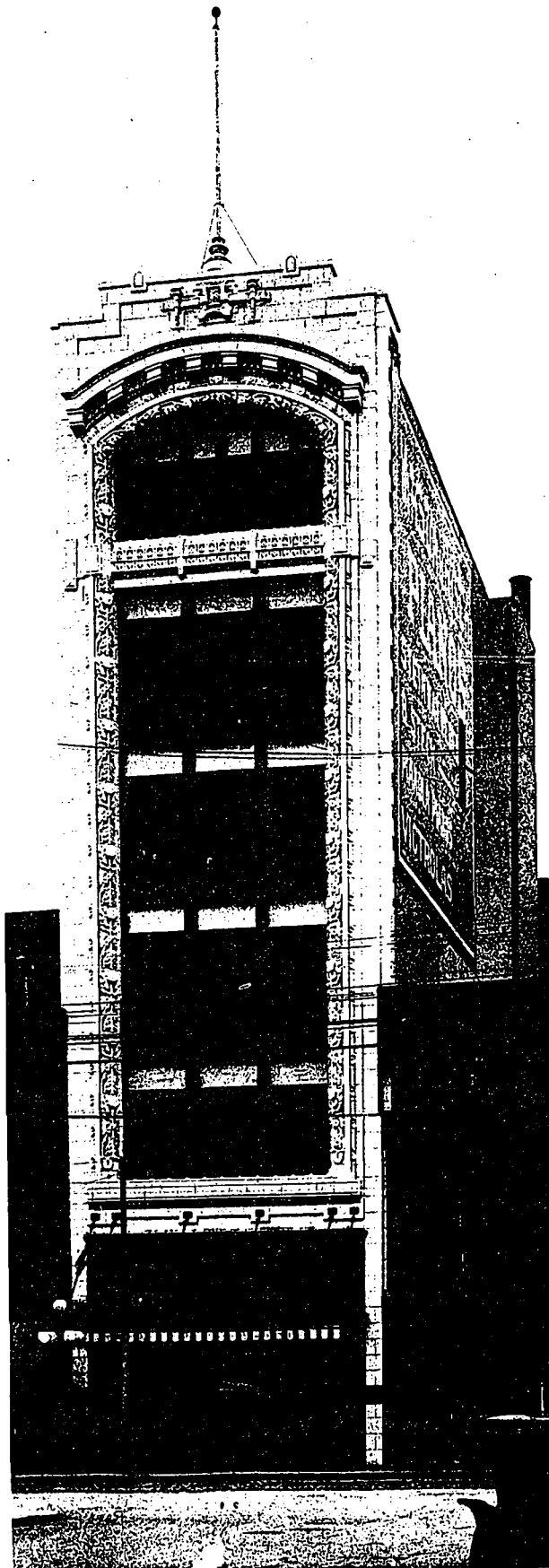
But it is time now to say a few words about bridges with chapels. These became common in the 14th century, and in most cases they were built up against their bridges from the water-level so as to be like extra piers in times of flood. We are fortunate enough to possess four examples at the present time, despite the vandalism which followed the suppression of monastic houses by Henry VIII. The chantry on Wakefield Bridge suffered greatly in those days, and its desecration continued till the year 1847, when its beautiful architecture, dating from the time of Edward III., was restored at a cost exceeding £2,000. Some authorities believe that the style belongs to Edward II.'s time, but the endowment was certainly made by Edward III. in a charter written at Wakefield; he settled £10 per annum on William Kaye and William Bull and their successors for ever to perform divine service in a chapel of St. Mary newly built on the bridge at Wakefield." There has been much controversy over this bridge chapel, so I refer you to C. A. Buckler's "Remarks upon Wayside Chapels," and to N. Scatcherd's "The Chapel of Edward III. on Wakefield Bridge." Perhaps the precise date of the charter of endowment may have been 1362, a jubilee year, in honor of the fiftieth birthday of our third Edward. This king did much to protect the wool trade, and Wakefield was dependent upon woollen handicrafts, and an ancient tradition says that the chapel on Calder Bridge was built by the inhabitants of Wakefield. Another endowment seems to have been made by the fourth Edward, in memory of his father Richard, Duke of York, killed at the battle of Wakefield in 1460. It is certain, I believe, that the chantry was much visited by local pilgrims who came to do honor to a statue of the Virgin. Yorkshire owns another chapelled bridge, the one at Rotherham, first built in 1483, but it has less charm than that which belongs to the little dovecot chantry on the picturesque bridge at Bradford-on-Avon, Wiltshire. Do we possess a bridge buttressed by a watermill? Bridge and mill are often close together, but not so near as they are in some French examples. In the Middle Ages they often formed but one construction, built entirely of wood. A good example survived at Meux, in Brie, till 1835, having weathered storms since the 15th century.

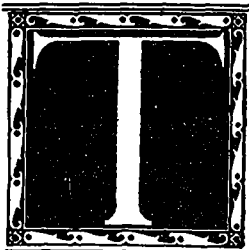


The Puente Mayor over the Mino, Orense, Spain.

Mason & Risch Building
Toronto

Bond & Smith
Architects





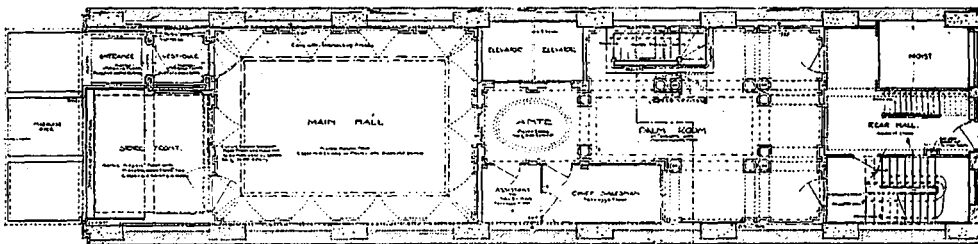
THE MASON & RISCH COMPANY'S NEW PREMISES, TORONTO

Handsomely appointed structure designed for the display of piano and other musical accessories. Description of its plan and features of decoration.

NO WORD IN THE BOOK of adjectives more aptly describes the new Mason and Risch building, Toronto, than the much misused term "unique," for apart from representing the solution of an unusually interesting constructive problem, it has the features of plan and decoration which rightfully entitles it to this attributive. Without obscuring the purpose for which the building is intended, the architectural scheme, nevertheless, departs from the conventional arrangement and decorative character of the average music house to an extent which induces one to regard it more as a metropolitan conservatory, incorporating in its plan a series of artistically appointed music chambers, than a building designed for the display and sale of pianos and other musical accessories. This im-

pression prevails immediately upon entering, for there is little to suggest a commercial institution, such as the large windows of the exterior indicate. The reception room, which is entered from a richly panelled vestibule, is designed in Italian Renaissance with hand-carved walls of Circassian walnut, and an enriched ceiling decorated in tints of green and brown. The lighting, which is by artificial means, is effected by wall pendants executed in bronze and having alabaster bowls carved from the architect's design at the quarries in Italy; and also by hidden lights above, which send their rays through alabaster slabs forming the panels of the ceiling. Above the wall panels are the names of

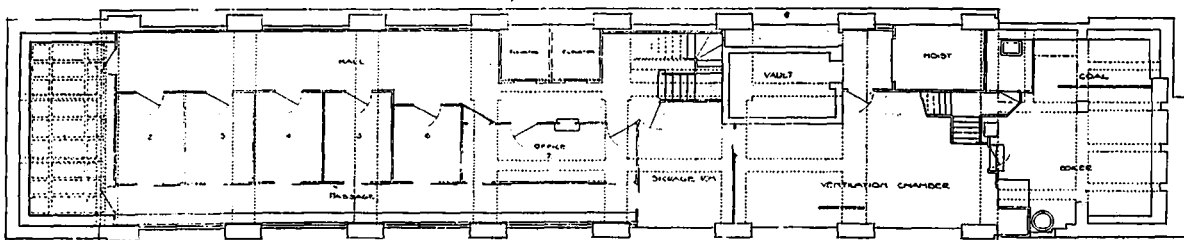
the great composers forming a part of the carved decoration. The floor is in Italian marble mosaic, while special furniture, a Turkish rug, and a large palm which spreads its branches from an Italian sculptured vase, complete the adornment and enhance the richness of the scheme. At the rear is a small hall giving access to the elevators, and the palm room or Roman court which adjoins. This latter room, which is in Roman-Doric style, is carried out entirely in English semi-glazed terra cotta. Here the lighting fixtures consist of alabaster bowls resting on bronze tripods, while well proportioned columns support a mezzanine or gallery floor, provided with desks and chairs, where customers may rest and talk over articles which they contemplate purchasing.



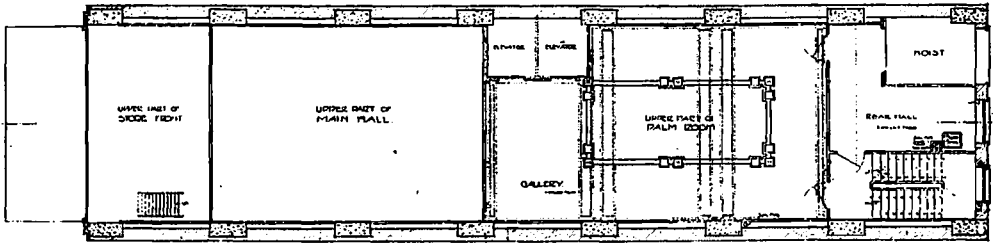
Ground Floor Plan, Mason & Risch Building, Toronto. Bond & Smith, Architects.

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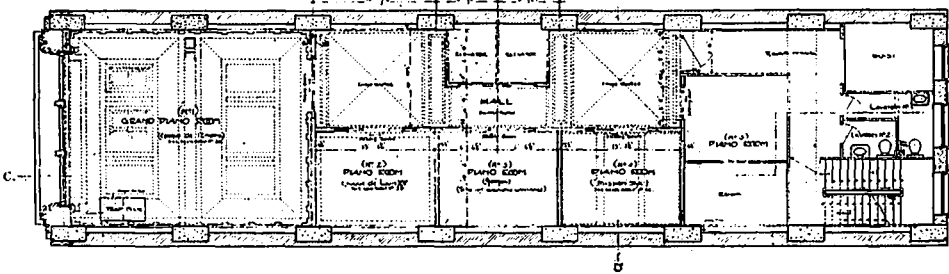
It might be mentioned in this connection that there are no two floors that are typical in arrangement, nor any two rooms that are identical in decorative detail; yet the effect throughout, both as regards line adjustment and color is one of exquisite harmony. For instance, the second floor, or art floor, as it is designated, is taken up by rooms representing various periods, the principle one being the large Empire room for the display of high grade pianos, which is carried out in a tone of soft amber, the walls and ceiling being both hand carved and hand painted, with medallions of great musicians above the panels, and chandeliers in bronze and English gift of Empire design. In addition to this room, the



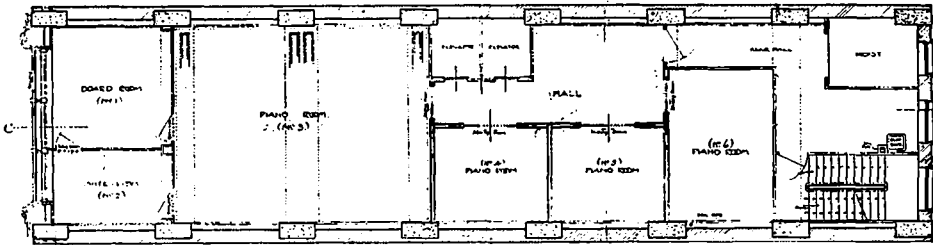
Basement Plan, Mason & Risch Building, Toronto. Bond & Smith, Architects.



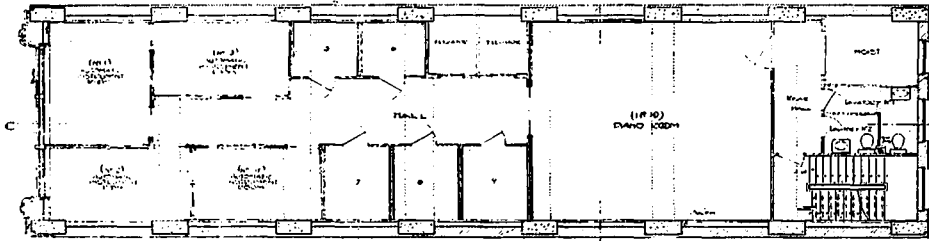
Mezzanine Between First and Second Floor.



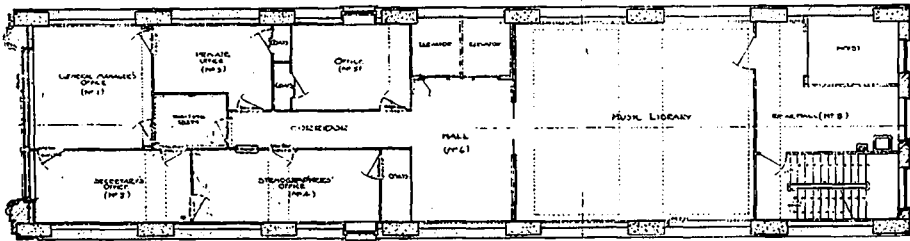
Second Floor.



Third Floor.



Fourth Floor.



Fifth Floor

General Floor Arrangement, Mason & Risch Building, Toronto. Bond & Smith, Architects.

suite includes a Louis XV. interior; a Georgian room with Ionic pilasters and Sheffield silver sconces and chandeliers; a Mission room with instruments to correspond, and an organ chamber which is finished in white enamel. When the organ is playing the sound will be conducted through an ingenious arrangement of grilles opening onto the mezzanine and



Detail of Entrance, Mason & Risch Building, Toronto. Bond & Smith, Architects.

thence through the court into the reception room, the sound gradually diminishing in volume, and the notes on striking the ear at the entrance producing a soft and low effect like distant music.

On the third floor is another large piano room, together with a tuning compartment, and three sound proof interiors furnished similar to drawing room with hardwood floor and rugs. The president's office and board room at the front are two interesting rooms, decorated with soft brown wall effect and furnished with mahogany furniture and rich, soft rugs.

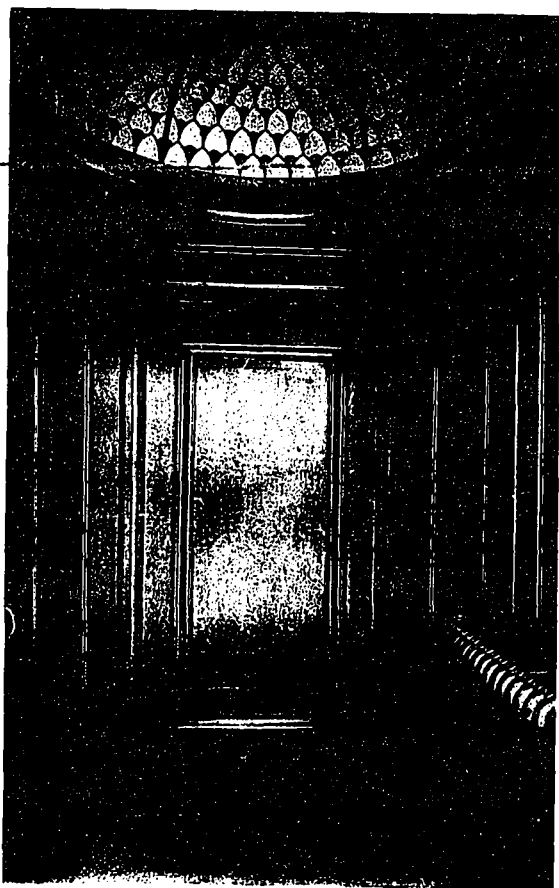
The fourth floor comprises the player piano department. Four front rooms panelled in leather effects are designed to advantageously display these instruments. In addition, this floor has several sound proof "try" rooms for demonstration purposes, as well as a large room for exchange and second-hand pianos. While some few rooms in the building are similar in certain features of design, the color effects or wall patterns vary, so that each interior has a scheme that differs from the others.

The executive suite is on the fifth floor, the general

manager's office and that of the secretary, being furnished with mahogany and Turkish rugs. On the walls Japanese grass cloth in tones of blue, old rose or brown, serves to effectively individualize the various rooms. Adjoining are the stenographer's quarters, while a large room at the rear, houses the circulating library of musical records which are exchanged by the patrons like books.

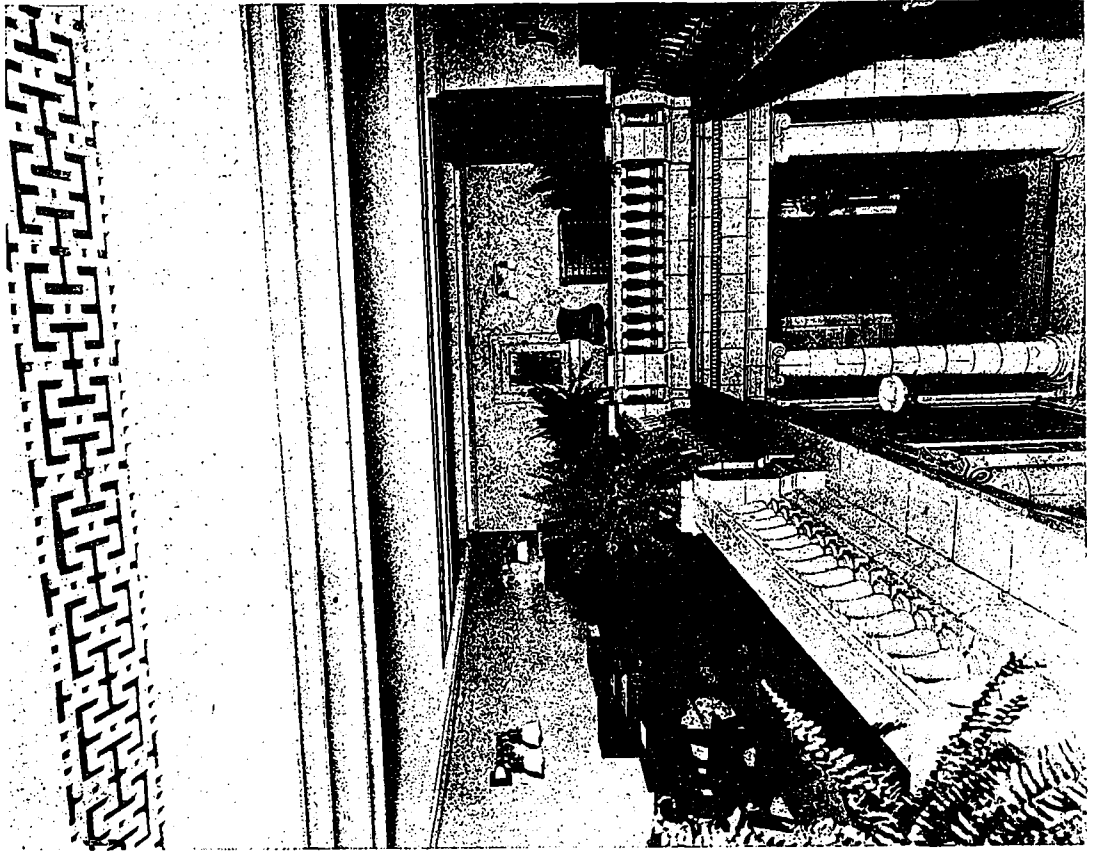
The sixth floor is finished in green stained cypress, and is occupied by the firm's general offices which are well lighted and arranged, and have large well ventilated coat rooms and modern lavatories adjoining for the accommodation of the general staff.

All the floors including the basement are served by two passenger and one freight electrically operated elevators. One of the passenger elevators is of the traction type, having a speed of 300 ft. per minute, and is equipped with safety slow-down and stopping switches in the hatchway, and oil cushion buffers in the pit for both car and counter-balance. The other car is an automatic lift, intended mainly for the use of employees. It is brought to the floor where its use is required by push buttons on the outside of

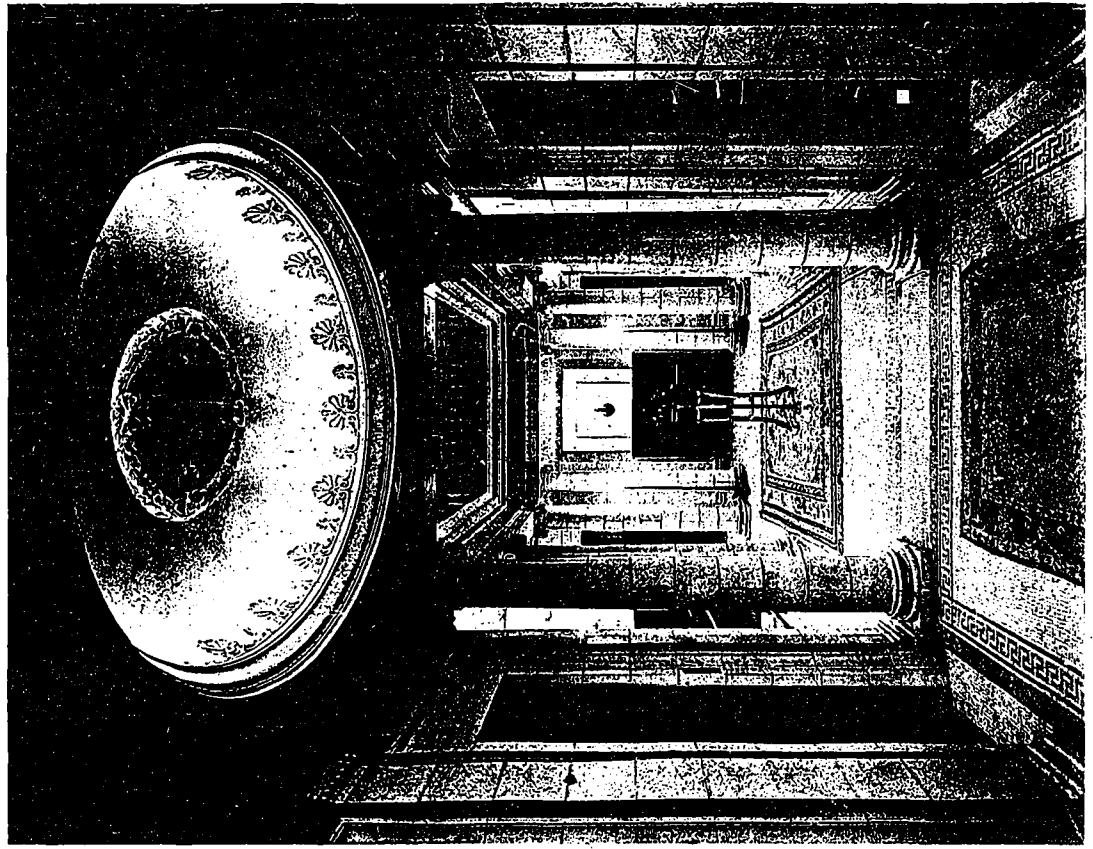


Detail of Vestibule, Mason & Risch Building, Toronto. Bond & Smith, Architects.

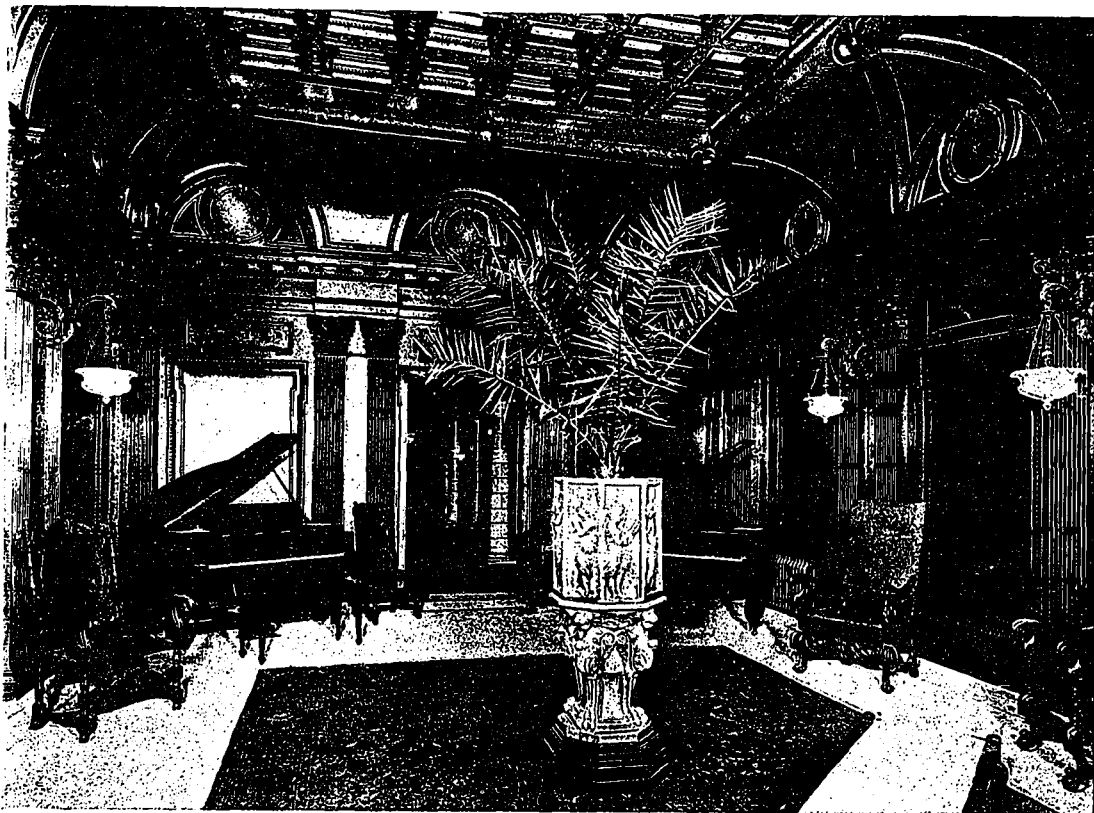
each doorway. After closing the door the passenger presses a button corresponding to the floor which he desires to reach. No door can be opened except at the floor where the car stops, and as long as the door remains open the car cannot be started. While the car is running it cannot be interfered with by any of the floor push buttons, but if the passen-



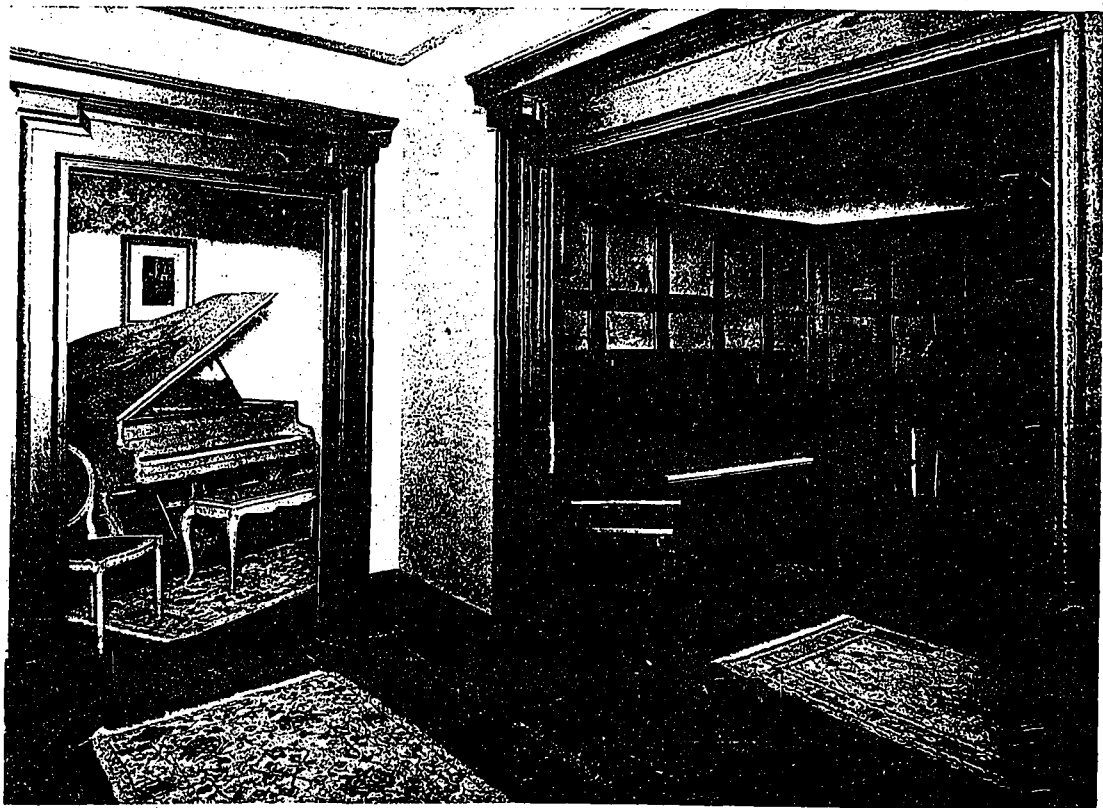
Mezzanine or Gallery Overlooking Palm Room, Mason & Risch Building, Toronto—Showing Grille in Ceiling Beneath Organ Chamber, Bond & Smith, Architects.



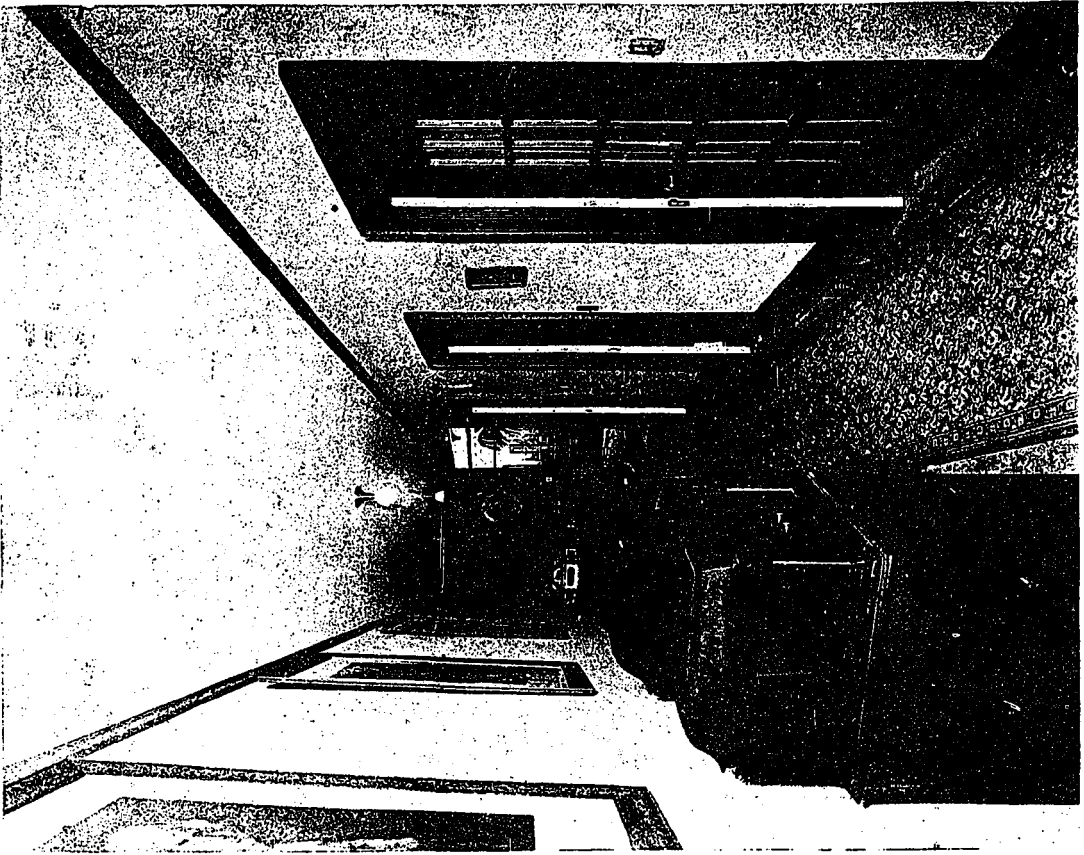
Palm Room, Ground Floor, Mason & Risch Building, Toronto—Designed in Roman-Doric Style and Finished in White Glazed Terra Cotta with Mosaic Floor. Bond & Smith, Architects.



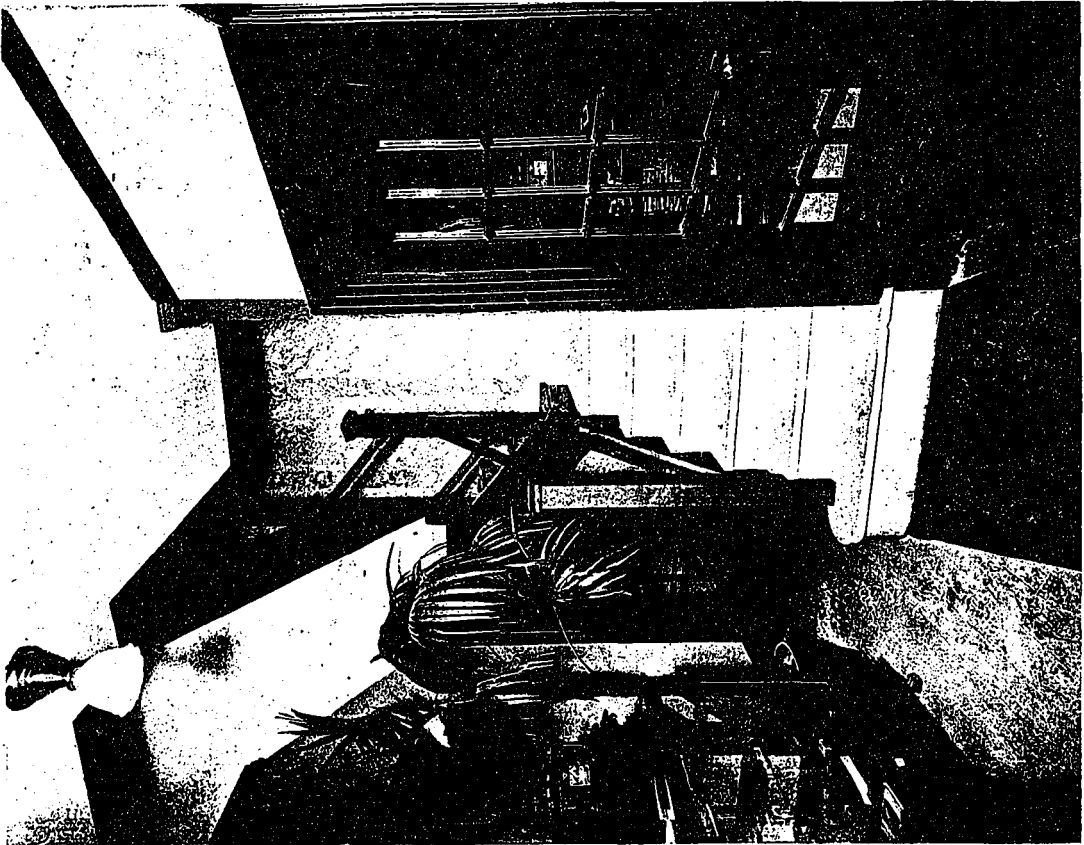
Reception Room, Mason & Risch Building, Toronto, Looking from Entrance Toward Palm Room. The Wall Scheme is in Hand Carved Circassian Walnut and the Lighting Fixtures are in Bronze with Alabaster Bowls Carved from Special Design at the Quarries in Italy. Bond & Smith, Architects.



Period Rooms, Second Floor, Mason & Risch Building, Toronto. Bond & Smith, Architects.



Hall, Scheme of Phonograph Section in Basement, Mason & Risch Building, Toronto. Bond & Smith, Architects.



Staircase and End of Basement Corridor, Mason & Risch Building, Toronto. Bond & Smith, Architects.



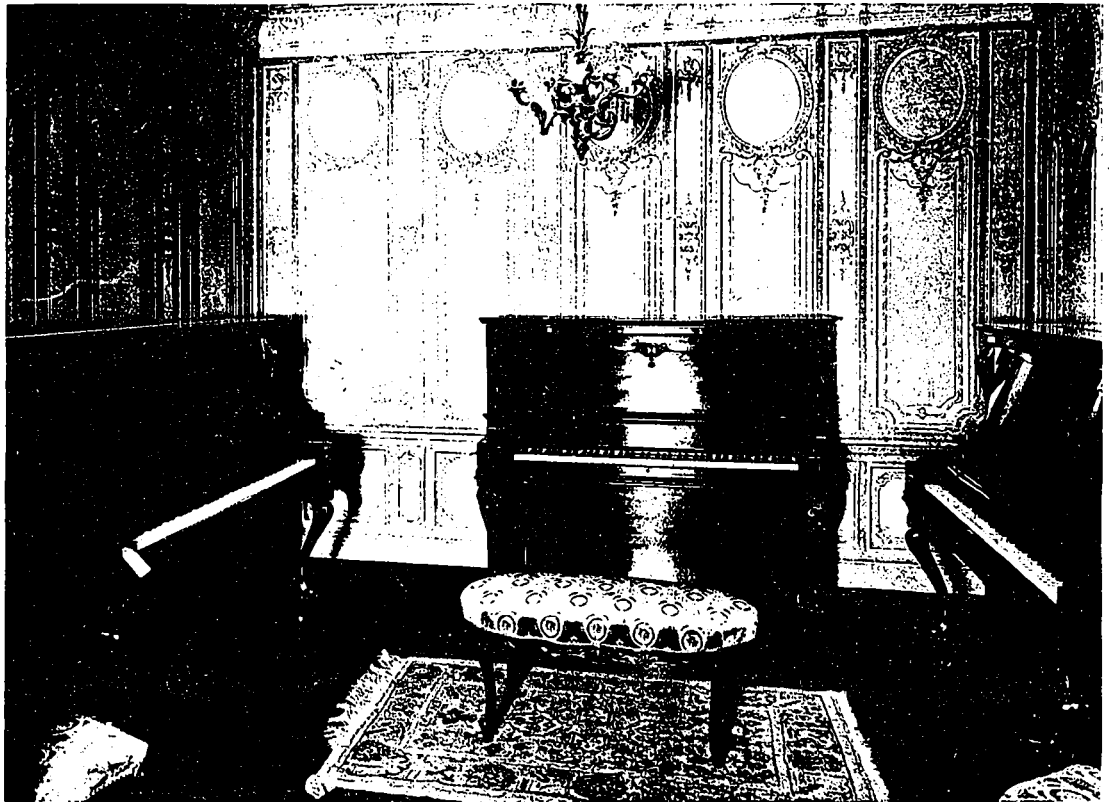
Board Room, Third Floor, Mason & Risch Building, Toronto — Finished in Mahogany with Soft Brown Wall Effects
Bond & Smith, Architects.



Large Piano Room, Third Floor, Mason & Risch Building, Toronto. Bond & Smith, Architects.



Empire Room, Second Floor, Mason and Risch Building, Toronto. Bond & Smith, Architects.



Louis XV. Room, Second Floor, Mason and Risch Building, Toronto. Bond & Smith, Architects.

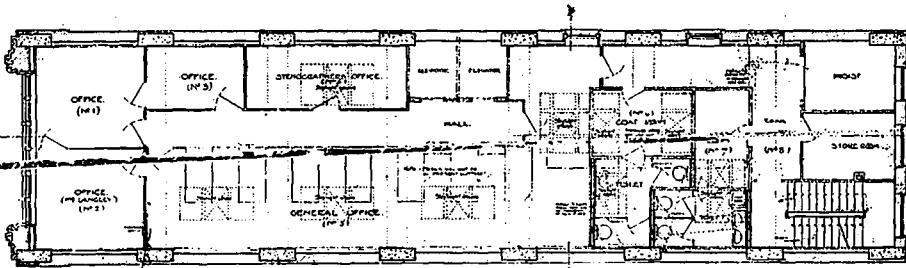
ger wants to stop the car this can be done by merely pressing a special button in the car. This system makes the elevator perfectly safe against accidents. These elevators are equipped with plate glass mirrors on all sides, and lighted by overhead clusters of five frosted lamps. The car grille and fixtures are specially designed and are finished to harmonize with the general scheme. The elevator doors are of the kalameined type in verde antique with polished wire plate glass panels arranged to give a two-thirds opening. These doors correspond with the type of fireproof doors used throughout the building.

In the basement, which is occupied by the phonograph department, is the largest record rack in Canada. Here there are several rooms for demonstrating purposes, one finished in white and gold, and the others in mahogany with Japanese grass cloth covering the walls. At the rear is a staircase of Canadian marble and a door leading to one of the most modernly equipped engine rooms to be found in Canada.

The construction of the building, which was described in detail in the March issue of "CONSTRUCTION," is of skeleton reinforced concrete with floors

panels forming the overhead scheme. The soft effect produced by this arrangement is further added to by the well placed bracket lights, which are beautifully designed, and also by the extreme height of the room. From here throughout the entire building the lighting units are of distinctive design, thoroughly in keeping with the periods represented in the decorative scheme of the several rooms. The fixtures in the Empire, Louis XV. and Georgian rooms are particularly noteworthy, while the simplicity of the lighting unit employed in the Mission room, as well as the ornate and simple character of the Classic units used in the balance of the rooms, suggest a consideration such as details of this nature seldom receive. A novel feature of the show window lighting is the elimination of any direct glare and the shadowless results that are produced, while an unique arrangement of electric light transmitted through leaded glass is found in the vestibule, where a beautifully colored dome forms an attractive feature.

The architects of the building were Messrs. Bond & Smith, and the contractors for the structure itself were the Bishop Construction Co., of Toronto and Montreal, who carried out the work in record time.



Sixth Floor Plan, Mason & Risch Building, Toronto. Bond & Smith, Architects.

of hollow-tiled blocks 12 x 12 x 8 inches. These blocks are placed end to end between the beams in rows at 16 inch centres, (allowing a 4 inch joist between), and covered with two inches of concrete which in turn carries a two inch strip of cinder concrete fill, having two inch wooden strips to which the flooring is nailed. This construction gives a floor that is not only light in itself, but sound proof and resonant, which feature is an important consideration in a building of this character. The concrete used throughout is a 1 : 2 : 4 mix; the Kahn system of reinforcement being used, and the work in general being carried out according to the specifications of the Trussed Concrete Steel Company.

The exterior of the building is in glazed terra cotta with verde antique metal window frames and marquise of similar metal over the entrance; the treatment of the facade being particularly meritorious. The building rests on concrete caissons carried on to bedrock 48 feet below the sidewalk level.

A brief reference might be made here to the electric lighting scheme, which may well be considered as representative of the possibilities which lie in modern illuminating engineering, and how the application of artificial light to modern requirements has been reduced to a scientific basis. In the reception room, as previously mentioned, the general illumination is accomplished principally by concealed ceiling lights, the light rays being filtered through sixty white Alba

Other concerns connected with the erection of the building are: Joiner work, R. J. Kirby; plumbing and heating, John Ritchie Plumbing and Heating Co.; plastering, W. J. Hynes; roofing, W. E. Dillon & Co.; interior hardwood, Charles Rogers; elevators, Turnbull Elevator Co.; cast-iron window frames, Canadian Ornamental Iron Works; painting and decorating, E. J. Linington; fireproof doors, A. B. Ormsby, Ltd.; lighting system and fixtures, Tungstolier Company of Canada, Ltd.; electric fixtures, the Sterling Bronze Co.; sidewalk lights, mosaic flooring, Luxfer Prism Co.; steel sash and hardware, Aikenhead Hardware Co.; metal lath, Trussed Concrete Steel Co.; alba glass, Macbeth Evans Glass Co.; bronze store front, marquise, and interior stairs, Canada Foundry Co. The exterior terra cotta work was set in place by Elgie & Page, and was furnished by the Eadie-Douglas Co., which firm also supplied the interior terra cotta and marble work.

A REPORT from St. John, N.B., states that there is an increasing demand for modern hotel and apartment house accommodations and that in all likelihood several important buildings of this type will be erected in the near future. At the present the nearest approach to an apartment house is a remodelled hotel in which the suites rent from \$35 to \$50 a month.



MEMBERS OF O. A. A. CONVENE AT OTTAWA

Proceedings of the twenty-fourth general annual meeting of the Ontario Association of Architects, held at Ottawa on September 13, 14 and 15, 1911.

PROCEEDINGS of the twenty-fourth annual convention of the Ontario Association of Architects were conducted by a fairly representative number of Association members. The business meetings occupied the mornings of the first two days. The officers elected for the year are: President, A. Frank Wickson; Secretary, Herbert E. Moore; First Vice-president, Jules F. Wegman; Second Vice-president, Colborne Meredith; Treasurer, Grant Helliwell. The Council consists of A. F. Wickson, Jules F. Wegman, Colborne Meredith, Grant Helliwell, Professor C. H. C. Wright, J. Power, A. E. Nicholson, J. A. Ewart, and Herbert E. Moore. The three new members who were elected to the Council are Messrs. Meredith, Power and Moore. The general business which occupied the first session of the convention may be summed up in the President's address and the reports of officers and committees.

President A. Frank Wickson's Address.

To the Members of the Ontario Association of Architects:

It was with much pleasure that our Council accepted the invitation of the Ottawa Chapter to hold our twenty-fourth annual convention in the Capital, and we are indebted to the Chairman, Mr. Nofke, and members of the Chapter, for arranging for most of the interesting features of the programme.

Last year's convention was somewhat unusual, owing to the transference of all business from January, 1910, to this year's meeting, all members of the Council holding office until that date. The convention, however, was by no means devoid of interest. One part of the programme was an excursion to the historical Brock's Monument and the inspection of the Electrical Development Company's plant at Niagara Falls, and those who joined in it will not soon forget the pleasure of the occasion.

A special general meeting was held in January, 1911, at which, as referred to in the Registrar's report, the important question of federation with the Royal Architectural Institute of Canada was considered, and the joint report of the Committee of the Quebec Association and the Ontario Association was adopted. The portion of the evening which is well worth repeating, was the attempt to have subjects of a very practical nature and of everyday occurrence, presented in a manner that would be useful in one's actual office work, such as the short illustrated descriptions of the design, construction,

difficulties and experiences in connection with several large buildings. It was the kind of meeting that the Chapter might well have quite frequently.

At the last convention, the Council was instructed to take a plebiscite on the question of applying to the Legislature for certain changes in our charter, but on finding that there was a large section of our members opposed to the application, we deemed it inadvisable to even take such a plebiscite until at least it was reported back to another convention.

The Council has given considerable time and attention to the admission of new members, both as regards those taking examinations and those applying on other grounds, and as a result has refused membership to quite a number of applicants, almost in every instance because the character of the designing was not considered satisfactory, and in the future there will likely be more refused admission than in the past for the same reason. In the case of a student, however well one may pass the examinations in technical subjects, until he can design, he should not be a member of our Association in full standing, and the final word in connection with any person's application should be as to his ability to design, rather than construct, though, of course, construction cannot by any means be minimized.

The usefulness of our Association can be infinitely increased by having for its members only men with ability to do real good work, because in this way only can we prove that we have a right to obtain the work; skilful designing and a strict adherence to the higher ideas in connection with all business matters and professional ethics, if persisted in, are bound to tell.

Architects who have only their own personal and financial advantage in view are not the ones who are a source of strength to the Association. Applicants for membership in any Association such as ours, who strive to obtain admission not from the sense of honor of belonging, nor because of their professional fitness for membership, for the advancement of the cause, nor because of what they can do, but rather for the standing they would get if admitted, are a detriment instead of a help.

The greatest aim of our Association should be the improvement of architecture in our own country, both by education for the coming generation and by continual effort to improve our own work. I could almost implore the individual members to this end to make it the greatest ambition of their lives to do good work. No decent man is honest simply be-

cause he considers it pays, but nevertheless an honest man who plugs away at his work, living a life of strict uprightness because he believes it is the proper way to live, usually finds in the long run that it does pay, and in a similar manner the architect who works and studies and worries over his designing, often thinking it a waste of time financially, but believing it to be the only way to practice, ultimately finds that it has paid him well. I mention this because in spite of any mistakes we have made and opportunities we have lost, our organization is now fairly universally recognized, and with the standing that is already obtained I am positive it lies with us to become a powerful influence in the Province. More legislation might or might not accomplish much for us, but with more legislation, less legislation, or in spite of what we already have, our members can, by persistent efforts along the lines above referred to, give us a still more desirable professional position.

It is astonishing, as one looks around the cities and towns of our own country and of the United States, to see the amount of average ability or less displayed and in consequence the really meritorious works are quite conspicuous instead of being quite usual. Of course every architect cannot be a genius, but all can try to design logically and all can study good example. The reading of desirable books, even if some of them seem to belong to the amateur class, is often a good reminder of some of the essentials of architecture. I believe the study of good books to be of almost more importance than that of the current periodicals, although the latter should not be neglected. An architect is too old to practice just as soon as he is too old to read on architecture.

To practice one's profession under the conditions above referred to, the architect must be reasonably remunerated, and while many years ago the habit of doing work cheaply was not unknown, it now gives one almost a shock to be informed of an architect accepting commissions at far less than the accustomed percentage. Our Association is not a combine nor a trades union, and it does not attempt to control members in their charges, but nevertheless, in this connection, I should like to emphasize the fact that no architect can do his work honestly and make a decent living at less than the accepted rates as outlined by our schedule; either he neglects his work or loses money, and by neglecting work I do not mean necessarily the leaving of his office unattended or the lack of inspection, but I do mean these and the rushing of drawings through without the study that is necessary to make the best of the problem he has in hand. We have no right to criticize a member for doing work for cost or even less if he chooses, but he is open to the most severe criticism if he does not make it plain to his clients that he is not charging a reasonable and honest fee for his work. One might deliberately lose money on work for some ulterior motive such as prospects of future larger work, or he might do it for purely philanthropic motives, but to neglect to make it plain to one's client that the charges thus made are not in any sense an indication of the value of the services

rendered is to leave all other architects in the false position of apparently overcharging for their work, and is to that extent dishonest. In respect to the general trend of work, there are indications that a move in the right direction has been made in regard to the planning and designing of churches, many of the most recent ones conforming to the Gothic plan, as well as the exterior design. Houses, too, are in many instances being designed in a simplified way. We, and the Americans also, have at last learned that the English know how to plan, to design and to live, and their influence is certainly being felt on this continent with good results to our domestic architecture.

It may seem like a superfluous suggestion to plead for some harmony in contiguous buildings, but generally speaking, it is a matter almost entirely overlooked. A refreshing instance has been given in Toronto, where two buildings to be erected side by side were glaringly inharmonious, and through the intervention of the Guild of Civic Art attention was drawn to the incongruity. As a result one building was raised a story in height and the other was made of a material of a color much more suitable. The question for us is, should not this have originated with the architects interested in the two buildings?

The question of competitions has, as usual, been prominently to the fore, and we have to record one satisfactory instance, viz., that of the new Knox College, in which the conditions were of such a character as to encourage good architects to take an interest in it. The others were those for the Hamilton Library, the Goderich Town Hall, and the Government House, Toronto, and the less said about these the better. It is to the credit of the Association that, however much they would have liked to participate in some of these, many declined to be drawn into anything so unsatisfactory as these promised to be and ultimately turned out to be, and some of those who did enter would not have done so, in one instance at least, but for a misunderstanding as to the conditions being revised. In regard to the Government House, it is stated in one of the dailies that the work is now being principally done by a New York architect. As many architects are constantly receiving inquiries about competitions and invitations to enter them, it might be well for our Association to have some new printed matter relating fully to the subject and describing the different ways in which competitions might properly be held, then one of these folders could be sent to any inquirer.

The Toronto Industrial Exhibition two years ago established an architectural department which is most heartily commended to the attention of all our members. It is one of the opportunities to have a large public become acquainted with works of merit and we cannot hammer away too insistently at the educational side of our work. The English examples, when we can obtain them, should be a source of great pleasure as well as profit.

We have had many occasions in the past to be dissatisfied with the giving of large works to American architects, and there are still too many cases of dis-

crimination against our own countrymen. It therefore gives pleasure to be able to record the fact that the Hudson's Bay Company's departmental store at Calgary is in the hands of a Canadian firm, also the new C.P.R. office building in Toronto.

One of the ways by which Canadian architects can commend themselves and our Association to the public is to be careful in giving estimates for work, so that the tenders when taken do not belie the figures. Backbone enough to tell clients what a building is really likely to cost not only saves trouble, but in the end engenders a respect that has much to do with confidence in local men.

The homely character of this may seem almost unworthy of an annual address, but owing to the frailties of our human nature, we seem to need frequent reminders of the most ordinary principles, and I have felt so strongly on the subjects referred to that I have taken chances of being considered very ordinary.

In closing, I wish to express my appreciation to those members of the Council who have done so much of the work, and to the Registrar for the efficiency and persistence with which he has carried on his end of our Council's proceedings.

Registrar's Report.

The Registrar's report for 1910-1911 of the Ontario Association of Architects, was read by Registrar Herbert E. Moore, as follows:

Membership: The present membership of the Association is 104, of which three are honorary members and 101 regular members, from the following points:

Toronto	60	Port Arthur	1
Ottawa	18	Fort William	1
London	4	Peterborough	1
Hamilton	2	Collingwood	1
St. Catharines	1	Chatham	1
Guelph	1	Kingston	1
Pembroke	1	Winnipeg	2
Barrie	1	Montreal	1
Paris	1	Regina	1
United States	2		

The present membership represents an increase of 17 since January of 1910. Of this number 7 were admitted by examination, 8 were admitted through acceptance of application for membership, and 2 were reinstated in good standing. Of the present membership, it is probable that at least three will be crossed from the books, due to either intended resignation or non-payment of fees.

Council: From January 12th, 1910, (Winter convention) to August 31st, 1910 (Summer convention), the Council held eleven meetings with an average attendance of six. From August 31, 1910, to September 13, 1911 (annual convention), the Council held fourteen meetings with an average attendance of five. The personal attendance of the members during these two terms, consisting in all of twenty-five meetings, is as follows: Wickson (President), 24; Wright (First Vice-president), 10; Sproatt (Second Vice-president), 14; Helliwell

(Treasurer), 22; White (Toronto member), 20; Brown (Toronto member), 16; Wegman (Toronto member), 19; Nicholson (St. Catharines), 8; Ewart (Ottawa), 0; Moore (Registrar), 25.

Students' Examinations: Examinations were held in April, 1910, and in May, 1911. In April, 1910, 20 students came up, including 6 supplementals in the final year, of which 6 passed the first, 3 passed the second, and 7 passed the third. One student in the final was allowed a supplemental in Design, which he passed, and one student was allowed a supplemental in Architectural Jurisprudence. In 1911, 13 students came up, of which none passed the first, 5 the second, and none the third, although two out of three will be allowed a supplemental in Design. Regarding the subject of Design, the showing has been so poor, both as to students and applicants for membership, that the Council, appreciating the fact that Design is the basis of architecture, deemed it necessary in the best interests of the Association to raise the standard and maintain a policy of admitting to membership only those who are in all respects properly qualified.

Guild Fund: No award has been made for the past two terms from the Guild Fund, which now consists of a \$400 debenture and savings account balance of \$106.75.

Proceedings: The tenth annual Volume of Proceedings was printed in June, 1910, and about 1,100 copies have been distributed. This volume contained an innovation in the way of a series of plates of various buildings erected by members of the Association.

Architectural Exhibitions: During the past two years very creditable architectural exhibitions have been held in connection with the Canadian National Exhibition in Toronto, and under the auspices of the Association. This has resulted in considerable additional work for the Council, and it is hoped the results will warrant the co-operation of every member of the Association.

Report of Board of Examiners.

Edmund Burke, Chairman of the Board of Examiners, Ontario Association of Architects, for the years 1910 and 1911, made the following report:

The following report deals only with the applicants for membership who desire to be admitted without passing the prescribed examinations. They are, as a rule, men already in practice and too far on in life to take up the work of preparing for examination.

During the past two years your Board of Examiners has considered and reported on twenty-one applications for membership, eight of which were passed and admitted to membership in the O.A.A. by Council, five were rejected, while the eight remaining applicants failed to appear before the Board after being notified to do so.

It is the practice for the Council to refer all applications of the kind above referred to, to the Board for a report, and the applicant is required to appear personally for examination, submitting drawings and

credentials, or to forward, if non-resident, drawings, credentials and such information concerning his ability and character as may be required. The report and drawings are then forwarded to Council for consideration and decision.

While the ability of the men passed upon by the Board and accepted for membership has been, in the main, of a satisfactory nature, the status of those rejected has been unsatisfactory chiefly from the standpoint of design.

In making its reports, the Board has been careful to adopt a policy tempered with leniency and due appreciation of the conditions and the facilities for obtaining an architectural education, but at the same time to preserve a standard, commensurate with the architecture and requirements of the times, and bearing in mind that the business prosperity and growth of the country have resulted in raising the standard in all educational institutions as well as in all professions.

As to professional ethics, the applicants as a rule seemed earnest in their expressed desire to respect and uphold the aims and objects of the Association, and such deserve to be given every encouragement, while there also are those who would, apparently, desire to merely further personal commercial interests in their endeavor to become members of the Association. Your Board begs to express the opinion that we must ever bear in mind that it is only by maintaining a high standard that our Association will be made a force for public and professional good and preserve it as a body to which it is an honor to belong.

Report of Toronto Chapter.

Gordon M. West, the Hon. Secretary-Treasurer of Toronto Chapter of the Ontario Association of Architects, reported for his Chapter as follows:

The Chapter has with success continued its fortnightly luncheons with an average attendance of slightly over sixteen for the season. The younger members of the Chapter have been particularly well represented.

During the course of the year a committee of three was elected as part of the general citizens' committee appointed to make a memorial to the municipal authorities with a view to securing a revision of the city building by-law. The Chapter has also undertaken its share of the financial burden in this respect.

A committee was appointed to act with the Council of the Association towards securing exhibits for the Canadian National Exhibition, and Messrs. Watson and West were appointed a committee to meet the Council of the Association in connection with the proposed instruction or classes in Design in Toronto this winter.

During the latter part of the season the stereopticon purchased by the Association has been used considerably, notably to view a number of slides kindly loaned by the Department of Architecture at the University. One or two interesting talks were also delivered by Mr. C. Q. Cole, consulting engineer, and Mr. McConnell of the University.

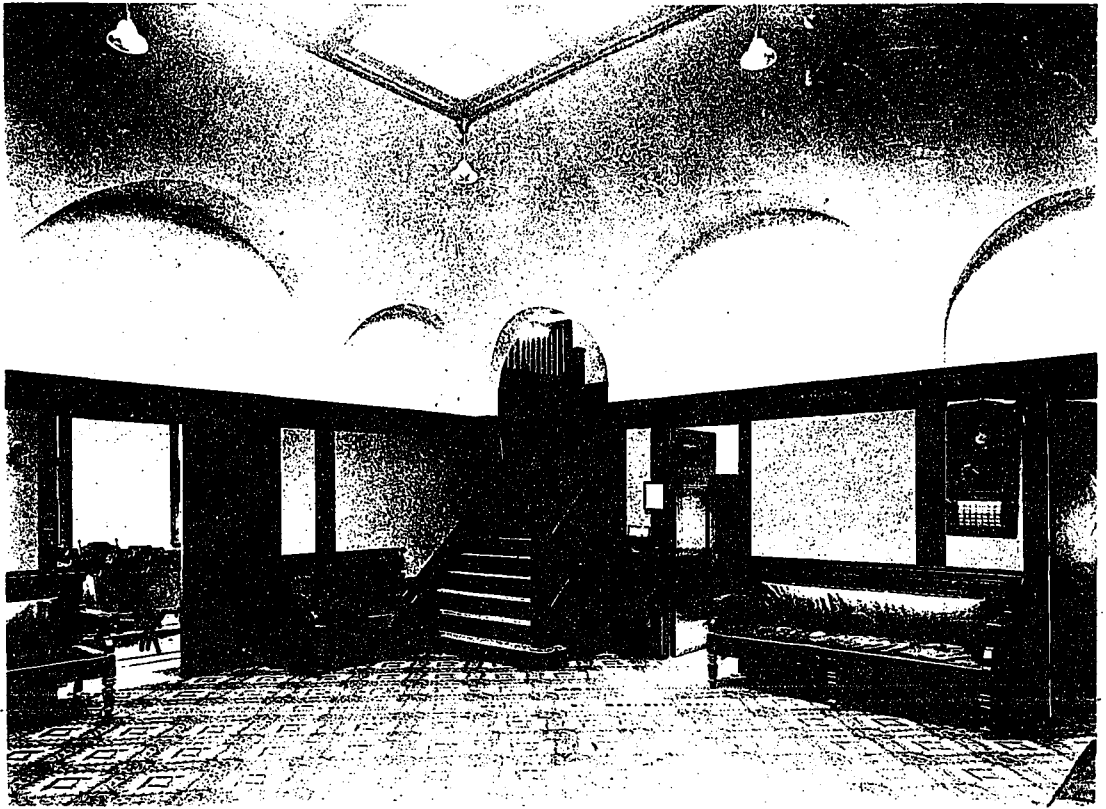
It is the intention of the Chapter to continue along similar lines during the coming season, when even better use may be made of the stereopticon and some interesting and instructive evening meetings may be held.

Treasurer's Report.

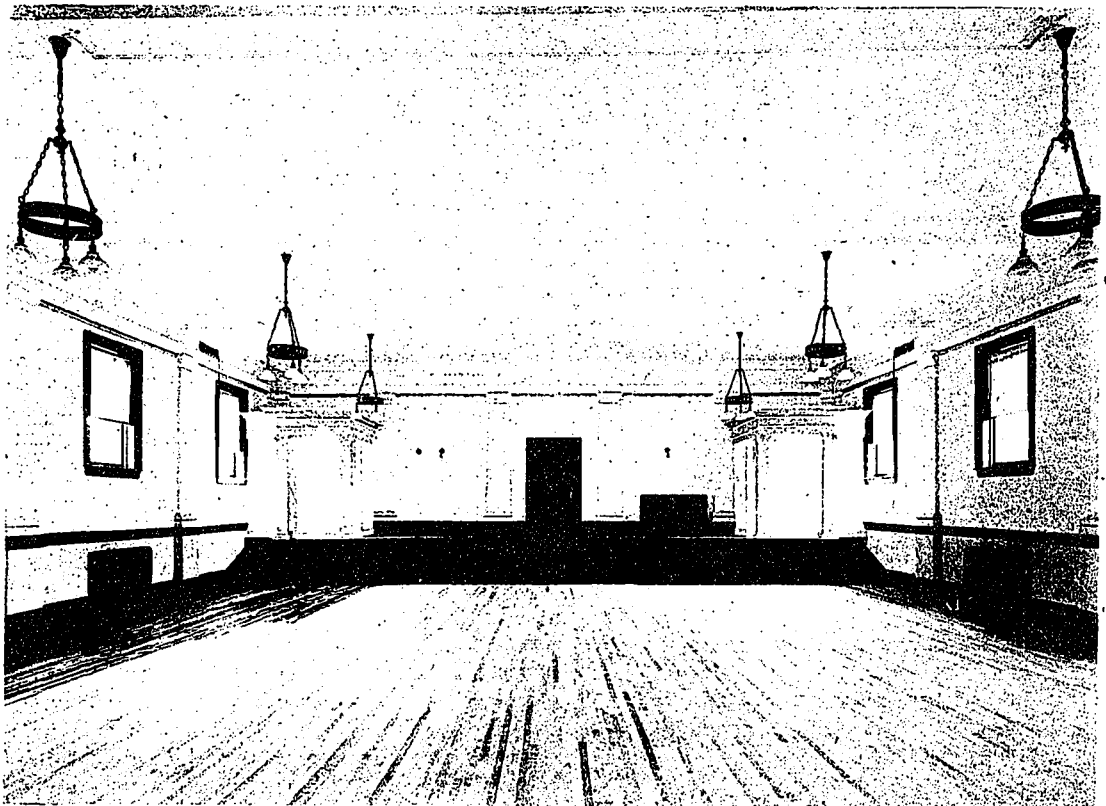
Treasurer Grant Helliwell made a detailed financial statement covering from July 31, 1910, to July 31, 1911, and for the seven months from January 1 to July 31, 1910, which showed the Association to be in excellent financial condition. The business-like character of this report and the close attention to the financial details of the Association that it evidences, should win the appreciation of the Association. An interesting paper by Professor Charles Currelley, of Toronto University, on the Architecture of the Egyptians in relation to Archiology, with discussions upon this, and the various reports, closed the business of the convention.

THE "YOUNG CHICAGO" ASPECT OF FORT WILLIAM.

THE EXTRAORDINARY, it might almost be said ridiculously, high price of real estate at Fort William, Ontario, has a good excuse in the great promise of that rapidly growing city. The terminal of three great transcontinental lines, which make it with Port Arthur the greatest port on Lake Superior, and its wide, deep river, causes the observer to remark, "a young Chicago." In fact the situation and topography of the two cities are very similar, and the same causes that have made Chicago great in population and commercial importance are found in this northern city. The Canadian Pacific Railway at Fort William and the Canadian Northern at Port Arthur, have already built terminals, docks and elevators that are among the largest and best in Canada. The great territory reserved by the Grand Trunk Pacific bids fair to equal both in extent, while for shipping, with a river of sufficient depth for the largest steamers and a natural width of four hundred feet that can easily be increased, the shipping facilities will be commensurate with the railway freight demands. Great transfer warehouses are being built on the river front. The one most in evidence at the present time, the foundations being excavated, is that of the International Harvester Company. It will be built in three sections and when fully completed will have a frontage of six hundred feet. It will be one hundred feet wide and five stories high and a capacity of fifteen hundred car-loads. In plan the cities of Port Arthur and Fort William are similar to that of Duluth and Superior, though they will from natural causes become much larger cities. Port Arthur, with its high terraced situation overlooking Thunder Bay, is an ideal residence city, but the business and mass of population will gather on the Chicago-like low, flat alluvial deposit that forms the many square miles of site that spread out on both sides of the river, for Fort William's warehouses, docks, railway yards and the homes of those who are employed in them.



Lounging Room, Freemasons' Hall, Toronto. Edwards & Saunders, Architects.



Auditorium, Freemasons' Hall, Toronto. Edwards & Saunders, Architects.



NEW HALL
OF FREE MASONRY
AT TORONTO

Devoted to the uses of St. George, Occident, Alpha, Zeta and University lodges, Occident Chapter and Cyrene Receptory.

THE MASONIC ORDER in Canada is one of its most basic institutions, and its structures, both in Canada and the United States, lend dignity to the streets they occupy. It should be remembered that it was the Masonic Order that promoted the erection of the "highest building in the world" when the Masonic Temple was designed by John W. Root and built in Chicago in 1886, the commencement of the "skyscraper" epoch in architectural history. The Masonic Hall at Philadelphia up to this time was the largest Masonic building. These are the most prominent cases where the Masons have gone out into the investment field and built structures that, outside of the needs of the Order, furnished general offices to the public as a source of revenue for the local organizations.

In most cases the Masonic Hall is designed to meet the special requirements of the local body, and in each case the designer seeks to express in his design something of the strength, dignity and high purpose of the Masonic fraternity.

The Freemasons' Hall, the new building on College street, Toronto, designed by Architects Edwards & Saunders, which is here illustrated, is an example of this expression. In its exterior it has the lines of strength in its massive stone work that typifies the long heritage of Mason builder traditions from which the Order sprung and even on this modern street it stands as a Masonry monument to the builders of other times and epochs. It is situated on the south side of College street between Palmerston and Euclid avenues, and is the largest Freemasons' Temple under the auspices of St. George's Lodge. It is not a "one lodge" temple, as it will be the home of St. George's, Occident,

Alpha, Zeta, and University Lodges, Occident Chapter, and Cyrene Preceptory. The building is forty-six feet and a half by one hundred and thirteen feet, is three stories and basement in height.

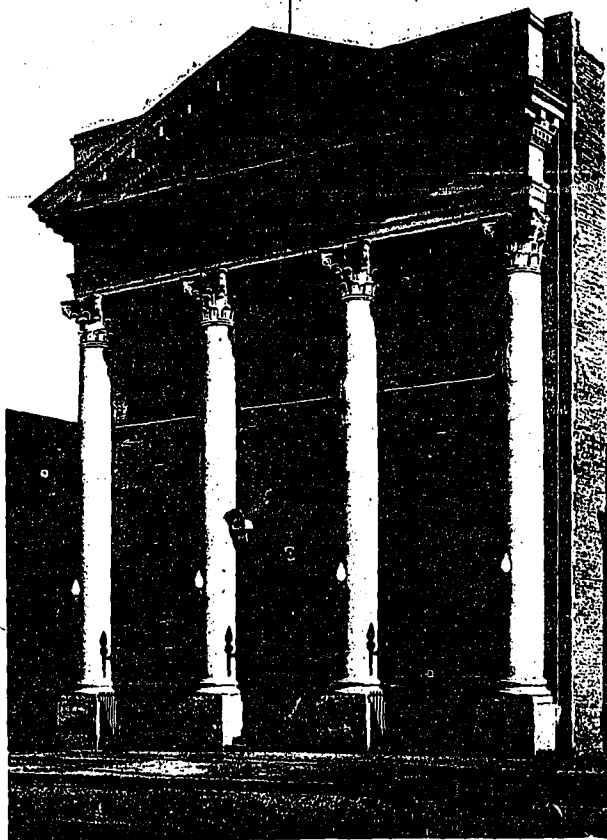
The facade is of white sandstone. The Corinthian columns are three feet in diameter and thirty-three feet in height. Each column bears a bronze lamp of special design. An illuminated keystone is placed above the main entrance, and above in the gable is an illuminated medallion bearing the symbolic G.

The interior is well and in some cases ingeniously designed for the purposes of the several lodges, as is noted in the arrangement of stairs and doors, which obviate any interruption by several committees meeting at the same time. In the basement is

a supper room, forty-two by fifty-seven feet, having a seating capacity of four hundred. This is for large banquets. The front portion of the basement is devoted to a buffet and luncheon room for use in conjunction with entertainments, and may be approached through different entrances. The first floor arrangement includes an auditorium, forty-two by fifty-seven feet in dimensions, a commodious and luxurious smoking-room, and a large committee room for the general purposes of the various lodges which meet in the new Temple. The ceiling of the auditorium is supported by eighteen-inch steel beams forty-four feet long. The lodge room on the second floor is forty-two by fifty-seven feet. The woodwork is mahogany, including the chairs and the case of the pipe organ, which is a feature in the rear of the room.

In the front of this floor is a small supper room and a lounging room, with a coat-room on the mezzanine floor. The lighting fixtures were specially designed, and there are all the conveniences which modern architecture can suggest.

Freemasons' Hall is the result of many years of earnest effort on the part of Frank Saunders, its architect, a Past Master of St. George's Lodge, to have a central temple for the Masonic lodges of Toronto, and in designing the building and in its construction has endeavored to give to his lodge a structure as near perfect as workmanship could make it.



Freemasons' Hall, College Street, near Palmerston Avenue, Toronto. Edwards & Saunders, Architects.

THE LESSON OF TATTERSALL CASTLE

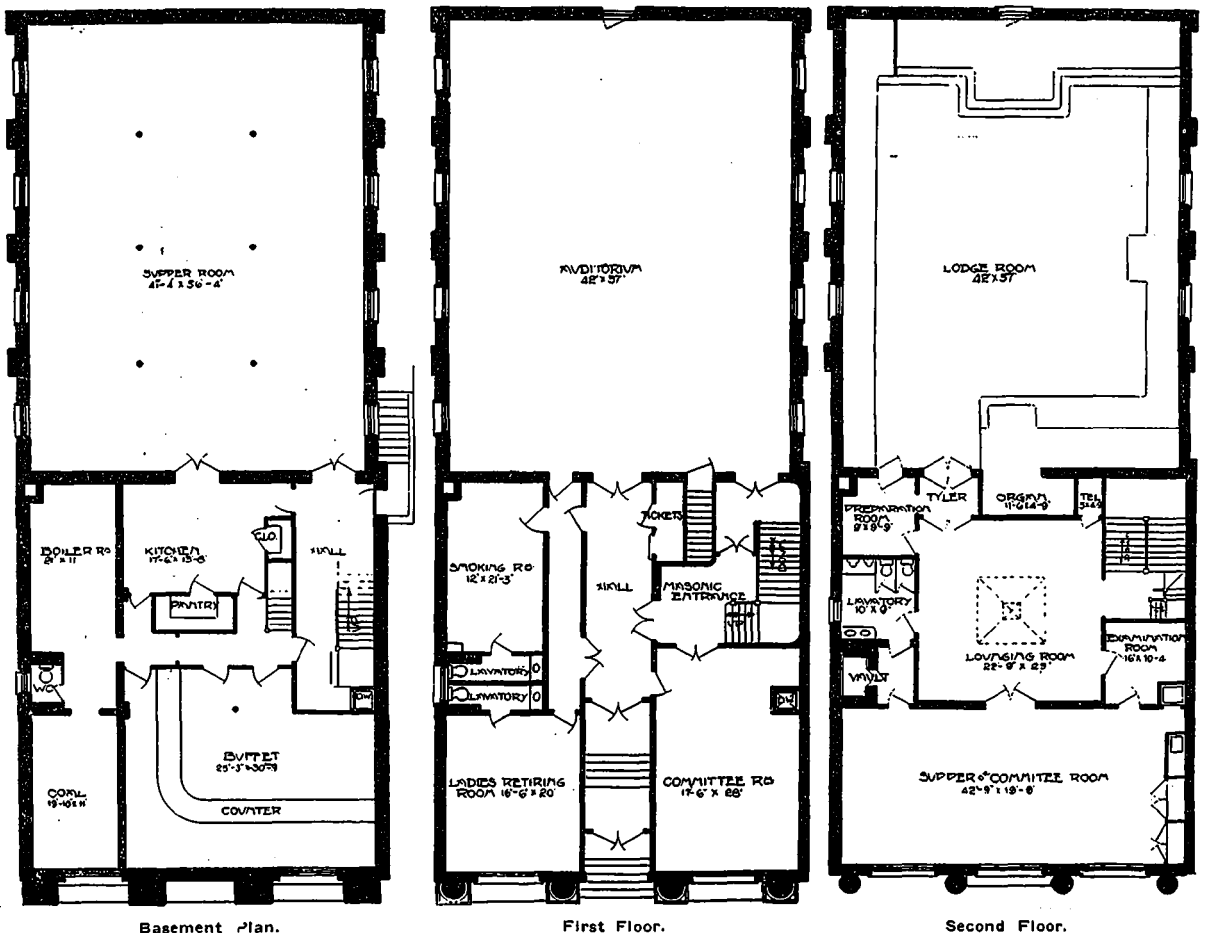
CONSIDERABLE INDIGNATION has been provoked amongst the inhabitants of the little Lincolnshire town of Tattersall by the extraordinary and incredible mutilation that the 15th century castle, in which they take so much pride, is suffering at the hands of its most recent purchasers. The secrecy in which the whole transaction has been veiled, says *The Builder*, indicates that its perpetrators, whosoever they may be, realize its discreditable nature; but the visible progress of the work is a sufficient exposure of its barbarism and folly. The first of the four wonderful stone chimney pieces to be torn out from the walls has proved by its shattered fragments (as everyone familiar with them anticipated) that their beauty and preservation depended on the support of the brickwork in which they were structurally incorporated. The whole series forms so complete an heraldic illustration of nearly four centuries of family and memorial history that their re-erection elsewhere will be an incongruous absurdity, the very falsehood of which will rob their art of all that beauty which consists in fitness. All the antiquarian societies, national and local, are keenly striving to arrest or repair such gross vandalism, but their task is a difficult one.

This is but one more example of the urgent need of Government control over our national monuments. However well informed and energetic our voluntary

societies may be, it is impossible for them to take the place of, and act as efficiently as, a properly constituted authority for the purpose of protecting works of artistic or archæological value, and the other features of interest such as typical scenes of natural beauty and the haunts of wild life.

All these matters would fall within the province of a Minister of Fine Arts when we get him appointed. Our readers are doubtless aware that steps have been taken towards scheduling buildings of special value up to the end of the 17th century, and that considerable progress has already been made in the preparation of this list. But, important as is the work of the Royal Commission so engaged, it by no means covers the ground necessary to include all that it is desirable to preserve. For one thing, it is limited to structures from the hand of man and does not extend to objects for the beauties of which we are indebted to the workings of Nature; besides, why should the period be arbitrarily limited by the date 1700; surely there is much that we should be sorry to lose belonging to more recent periods?

We would urge our legislators to take some such step pending the years that must elapse before a full list is prepared. Other nations have long been in advance of us in this respect, and we must endeavor to make up the leeway in the most expeditious manner, even if we have to discard the claims of strictly logical procedure in so doing.



Floor Plans, Freemasons' Hall, Toronto. Edwards & Saunders, Architects.



Bungalow for E. C. Jury, North Toronto. Curry & Sparling, Architects.
View from South-east.

RESIDENCE IN NORTH TORONTO FOR E. C. JURY, ESQ.

An attractive and well proportioned design in boulder stones and paving brick, which will be still more effective when decorated with ivy and shrubbery around the base of the walls.

THERE ARE QUITE A FEW people who think that they can build a residence, or for that matter any kind of a building, without the services of an architect. We will grant that this is the case, that there are a few who can build something fairly respectable, but at the same time there are very few who can produce something that will show the hall marks of an architect. The general lines are bad, or else the work carried out worse, probably both. This is where some would speak up and say that the architects are often at fault themselves, but they little remember that the architects are not always given a free hand to carry out their original ideas. Sometimes, for the reason of expense, other times for some particular idea of the client's.

Thus the most successful residences are found where the client and architect have worked together, the client retaining the architect as he would a lawyer or doctor, giving him all the information possible regarding the kind of house in design and plan that he thinks he wants, and leaving the architect in perfect freedom to work out the problem and

produce the building. Such a house meets the approbation of the architectural critic and gives comfort and joy to those who live in it.

In the E. C. Jury bungalow, here illustrated (Curry & Sparling, Architects), this rule has been carried out, and in this particular case the architects and client have produced one of the most artistic country homes on the outskirts of Toronto. The house is situated overlooking a ravine in private grounds consisting of about eight or nine acres, with several clumps of pine trees and shrubbery.

The residence and outbuildings are built with field stones interspersed with a few clusters of clinker bricks. The roofing material is of asbestos cement shingles. The vestibule leads into one large living-room out of which leads the stairway, dining-room, kitchen and sun room. The sun room also has an entrance into the front verandah. On the other side of the dining-room there is situated a large conservatory with access to the basement. Under the main stairway there is a stairway to the large billiard room in the basement. As seen from the plans, it is possible to go to the stable and outbuildings without being exposed to the weather, the house being connected to the stables by a large driving-shed. The stable is up-to-date in every respect with accommodation for cow, horses, etc. Back of the stable is situated a large henery.

To make this place as up-to-date as possible, hot water heating was installed, with an up-to-date bathroom equipped with a septic tank in the ravine. Soft water is supplied throughout from a cistern installed to receive all the rain water.



View from North-east.



View from South.
Bungalow for E. C. Jury, North Toronto. Curry & Sparling, Architects.

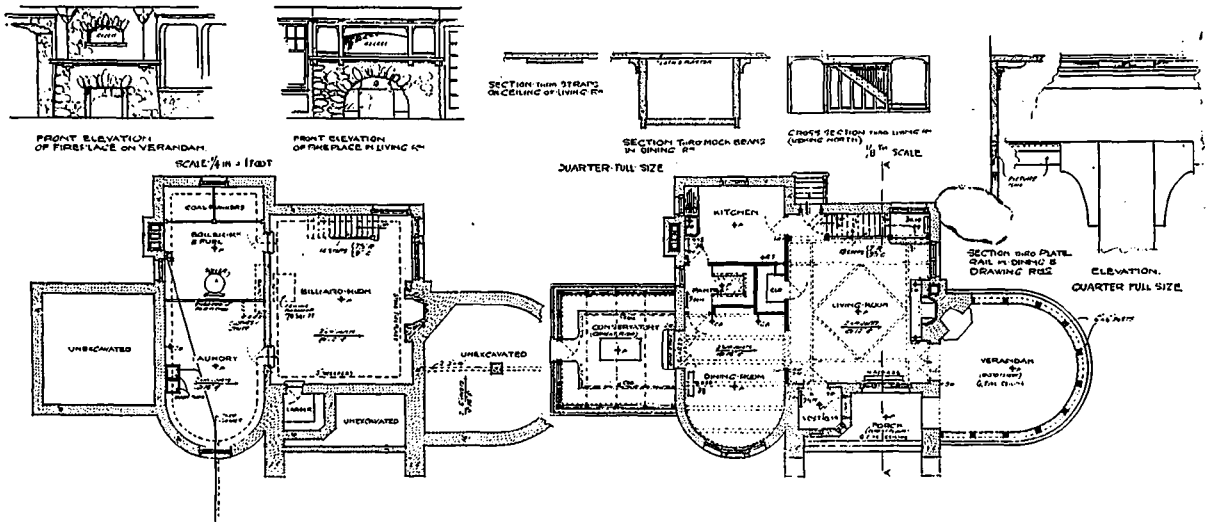


Dining Room.

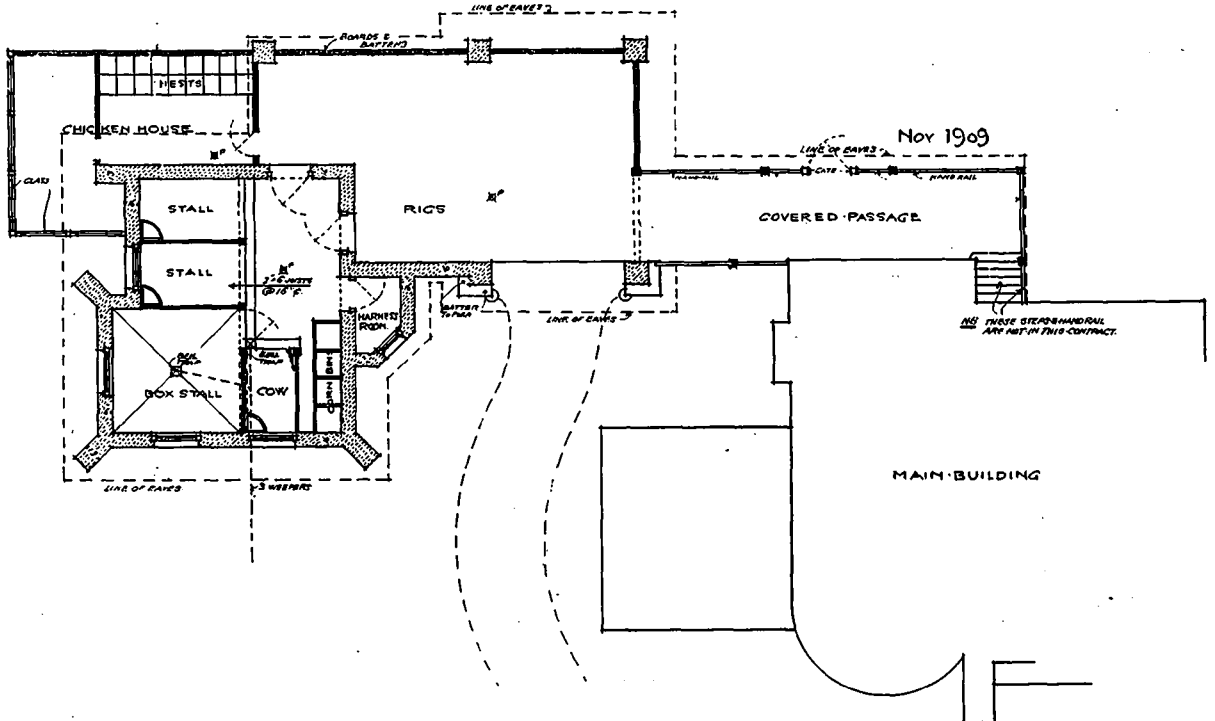
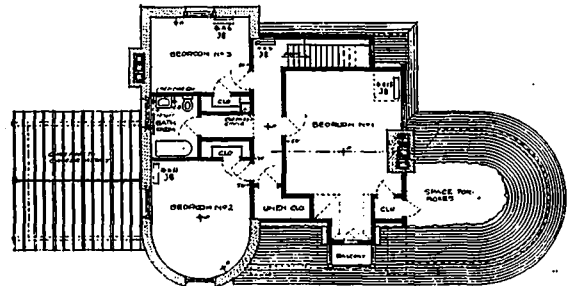


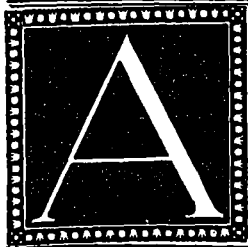
Living Room.

Bungalow for E. C. Jury, North Toronto. Curry & Sparling, Architects.



BUNGALOW FOR E. C. JURY,
NORTH TORONTO.
CURRY & SPARLING,
ARCHITECTS.





ARTIFICIAL LIGHTING OF HOSPITALS

Abstract of a paper read at the Congress of the Royal Sanitary Institute at Belfast, by Mr. John Darch. On the Subject of Proper illumination.

NO ONE WHO HAS HAD any insight whatever into the work of modern hospitals could do otherwise than feel the greatest admiration for the splendid service and effective equipment that characterize those institutions; and yet it must be said that models of elegance and hygienic forethought as they are their elegance is usually marred by the engrafting thereon of systems of artificial lighting that would justify a repetition of Miss Nightingale's trenchant observation that "the very first requirement in a hospital is that it should do the sick no harm."

In visiting the principal London and other hospitals I have been keenly struck with the universal want of discrimination in lighting; there is a kind of trade orthodoxy which cherishes certain forms and fittings, and decrees their use often in defiance of common sense. Take, for example, the ubiquitous plain 10-inch opal shape pendant that does duty with equal impertinency in ward, kitchen, operating theatre, corridor, and consulting room. It would be difficult to find a more irrational, inefficient, and indefensible fitting for most of the purposes to which it is applied, while it can hardly lay claim to be a thing of beauty. The shade affords no protection to the eyes of patients or nurses against the sting of the glowing filament, and from the fact that thousands of cardboard "eye-screens" have been sold to patch up this so-called "shade" for the necessary protection of the eyes of the healthy and vigorous in office and shop, it must be obvious that it is unsuited to a hospital. Again, the shade darkens the ceiling, and, by preventing reflection from its large white surface, practically darkens the room.

Another token of orthodoxy is the swan-neck bracket, which, with its popular form of "shade" that shades nothing, and its bare light, has been described as "nothing less than an instrument of torture." In some hospital wards the brackets have been mercifully placed lower and closer to the walls. Much more might be said to show the need of reform. It is not so much a question of gas v. electric or any other illuminant as that of the art of illumination which regulates the arrangement of the lighting units after they are brought into the room. I do not propose, therefore, to enter into a comparison of the merits of the various lighting media, although some plain statements from one unbiassed by any of the conflicting commercial interests might prove useful. I will only say that whether electricity, coal gas,

acetylene, petrol-air gas, or even oil lamps be employed, it should be possible to successfully illuminate every department of a hospital with either. Light (and in that term radiation both visible and invisible must be included), like any other form of power, may become an agent of destruction or a minister of health and blessing precisely in accordance with the wisdom shown in its application; and it is the duty of the professional adviser, be he architect or engineer, to understand all that pertains thereto before he can pretend to satisfactorily invest his buildings with the instruments of such a force.

There are to be avoided, on the one hand, the evils of glare, and particularly that which, in a ward patient, would enter the lower part of the eye; the evils of excessive brilliancy, of violent contrasts of light and shade, and of the injurious and troublesome rays of heat and actinism; there is also to be avoided the risk of eye strain consequent upon insufficient light or upon the effort to see in the face of misplaced lights. On the other hand, there is to be sought the comfort of a soft and well-diffused light so arranged that vision may be both easy and pleasant, which, after all, is the proper object of lighting. The value of illumination depends not on the amount of light that is shed throughout a room, but on that which is reflected from visible objects. An essential part, therefore, of any scheme of illumination is the coloring of walls and ceilings, the strength of which must be properly balanced with the amount of light available. Dark colors eat up the light, and are, therefore, wasteful. White ceilings, cornices and friezes not glossy, with pale tinted walls and slightly darker dados, will best serve the hospital and its inmates.

Let us proceed to consider some practical methods of dealing with the subject, and begin with

The Hospital Ward.

The average ward unit—of, say, twenty beds—should be provided with two kinds of illumination, viz. (1) general, and (2) local.

1. The general lighting need be no more than enough to see clearly about the room, say, 0.5 foot-candle.

No sources of light, nor any illuminated surfaces exceeding 0.1 candle-power per square inch (14 c.p. per sq. ft.) should be exposed to the patients' or nurses' eyes; whereas the intrinsic brilliancy of the

Gas mantle averages	30 c.p. per sq. in.
Acetylene flame	40 " "
Electric carbon filament	400 " "
Electric metallic filament	1,000 " "

Direct illumination, therefore, useful enough in the lofty outpatients' hall or elsewhere, is quite unsuited to a hospital ward.

Direct lighting lamps may, however, be used if provided with proper shades, but everything depends upon that word "proper." Glass shades and all transparencies are inadmissible, nor should any partial translucency exceed the above-named limit of brightness, while any shade that is used should effectually screen the eyes without materially darkening the room. If bracket lights are used for general lighting, a half circle shade should be used so as to illuminate the wall. The practical result of all this is a soft all-over illumination which is very pleasing.

High placed ceiling lights will prove equally successful with a carefully calculated shading.

Indirect lighting by means of the inverted electric arc is deservedly gaining favor, but although it would serve well in many parts of a hospital, I could not recommend it for the ward, as the ceiling would be too dazzling for those who have to lie on their backs. A happy effect may, however, be obtained from indirect lighting, with tungsten or other metallic filament lamps, placed inside a shallow metal bowl, white on the inside. To obtain the best effect they should be hung as low as convenient, nor should the lamp be set too low in the bowl.

Excepting in the winter, artificial lighting is little needed in the ward, for hospital economy favors very early hours, but some sort of subdued lighting is necessary during the night watch all the year round. With gas or acetylene a small burner, shaded, on a bye-pass would do. In electric lighting, several expedients have been adopted, but a 2 c.p. shaded lamp is the most economical. An excellent arrangement is indirect lighting from an 8 c.p. lamp in a small bowl. This is employed, for night purposes only, at Tooting Bec Asylum.

2. Local lighting: The sisters' and nurses' tables should each have a well-shaded lamp, that is adjustable in height, so that any desired intensity may be obtained. A comfortable illumination for reading is 4-foot candles, but 10-foot c. is not too much for some purposes. A good form of shade is a deep cone of dark green opal, with the lamp entirely recessed. A more cheerful form would be one with a rose silk flounce with white lining, deep enough to hide the lamp, and for cleanliness the top should be of white opal glass, and the flounce easily removable. The patients' lights are best placed one at the head of each bed, hidden in a dark green opal shade and somewhat to the left, so as not to radiate heat on the patient's head, and to avoid gloss in reading. An illumination of four candle feet should be available. This lamp will be useful for examination, and should illuminate the patient's chart. Near this there should be a plug for a hand or standard lamp.

If gas is the lighting medium, a "bijou" inverted

mantle similarly shaded would be suitable for both patients and nurses. If acetylene, a small flame burner.

Steadiness is an essential condition of good sanitary illumination, for fluctuation and flicker are not only very disturbing, but may amount to permanent injury. This trouble may arise (a) from the glow lamp when used on an alternating current whose frequencies are below, say, 35 per second; (b) from an arc lamp when the light varies in intensity and color, due to unsuitable or impure carbons, or when it "pumps," due to defective feed mechanism; (c) from the gas mantle, due to an ill-regulated air supply, accumulated condensation in pipes or the wind from the open windows of the ward; and (d) from all flame burners by the two last-mentioned causes.

Gloss is frequently as troublesome as bare lights, and yet the majority of hospital wards have shiny ceilings. There should be no difficulty in getting a diffusive or dead surface as sanitary as that of the objectionable gloss.

The Operating Theatre.

The operating theatre needs good artificial light, and plenty of it, for there is a large proportion of surgical work done after dark. It should have a separate general illumination with screened lamps over the sinks and sterilizers. The ceilings and walls should be completely reflective, and are best lined with close-jointed white glazed tiles or opalite, with a little relief in the form of a pale green or grey dado.

The illumination of the operating table is, of course, the leading consideration. The light should approximate to the color, the perfect diffusion and the high intensity of broad daylight; both the nuisance of overhead heat and the septic risks of dust collection should be avoided, and the fittings and glass employed should be plain, smooth and easily cleansable.

It is important that the lights should not all be clustered together, forming deep and troublesome shadows, nor be situated directly over the table to worry the surgeon with the shadows of his own head and hands, or that would necessitate the frequent shifting of the table. Yet these are the arrangements most commonly met with.

Every hospital has its own pattern of operating light (scarcely two are alike), while many of them are very curiously contrived. The following may be taken as typical of the more usual arrangements:

1. One or more plain shade pendants of the common type, sometimes with a dust-raising counterweight and pulley.
2. A cluster of from two to twenty glow lamps under a large opal shade.
3. Rectangular trough 4 feet long with opal sides, full of lamps, and sometimes with a sheet of opal glass underneath; this gives an excellent light, but the heat is intolerable.
4. A four or six-light electrolier, each arm with a separate lamp and opal or aluminum bell shades. Either of the foregoing may depend from the ceiling

or from the end of long swing brackets. Glow lamps should have metallic filaments; tungsten is said to give the whitest light. Gas burners are sometimes attached.

At Charing Cross the drawback of concentration is well met by distributing the light over the long arms of four brackets and round the gallery front.

The London Hospital and that at Ryde are fitted with Marshall's operating light, consisting of a fixed central 100 c.p. lamp under an opal reflector, with four hinged arms, each with a 60 c.p. Nernst lamp in a condenser tube projecting the light to any desired spot.

Electric arc lamps are employed in some Continental theatres.

Direct lighting with ordinary arc lamps is out of the question on account of the unavoidable shadows; excepting, perhaps, for general lighting. But where there is a large skylight a splendid direct illumination may be obtained from white flame arc lamps, which have a remarkably high efficiency, and throw most of their light downwards. Four of these may be suspended over, but not too close to, the ceiling light, which should be of clear fluted glass to spread the light. They may be fixed, or may move on rollers worked by cords in the room. Questions of dust and the intrusion of lamp trimmers are thus eliminated.

Indirect arc lighting, particularly where there is no skylight, is eminently suitable. Four 10-ampere open arcs, properly placed and reflecting directly against a white ceiling, would give a brilliant illumination, with all the advantages of daylight.

Professor Siedentopf has invented an ingenious arrangement for lighting the operating table by means of isolated beams of light, which are not only ample but entirely avoid the dust question. There are two forms of it:

1. The single, in which a 20-ampere projector, or search light, is placed outside the theatre, and about 7 feet 6 inches high, from which a parallel beam of light is directed through a hole to a small mirror, thence to the table, or through a second mirror to the table. This beam is controlled by an iris diaphragm and smoked glass. It is best suited to the gynaecological and throat theatres. It is necessary to have good general lighting.

2. The compound form is more satisfactory. A projector lamp as before, but of 25 to 30 amperes, directs the light through an aperture to a thin metal disc, on which are placed small distributing mirrors which divide the main beam into a number of smaller ones, and which are separately projected to receiving mirrors placed around the room. These mirrors re-unite the light on the table in a many-sided form, free from shadows.

Electric fuse wires have a knack of "going" at most inopportune moments, while a breakdown on the part of a supply company is not unknown. It is, therefore, essential to have a reserve for such an emergency. The fusing trouble is more common on branch circuits; one excellent precaution, therefore

will be found in wiring glow lamp fittings from two separate main branches, either of which failing, enough light may be left to work by.

To provide against failures on the main there are two methods:

1. A gas lamp with an inverted mantle, as at the West London Hospital, which should be lit during operations.

2. An electric accumulator, from which a small emergency lamp should be kept alight during operations, and in connection with which it should be possible to immediately switch on sufficient light from the accumulator to complete an operation. Separate lamps would be required for this purpose unless it would be convenient to have the voltage of the accumulator equal to that of the circuit.

Some hospitals keep oil lamps ready to hand.

Hand and standard electric lamps of a variety of patterns are to be found in every operating theatre.

The Dispensary

is usually the worst served of any department. It is in London, frequently to be found in the basement or in some other part of the building lacking daylight, while the artificial illumination is commonly so inadequate that it sometimes becomes a difficulty and a worry to read the prescriptions.

A properly shaded light yielding four or five foot candles is required to each man on the dispensing benches. The shelves should be illuminated with screened lights to facilitate visual acuity; in fact, no bare lights should be visible. Undoubtedly, the inverted arc lamp with a white ceiling would afford the best illumination, while the running cost of it should compare favorably with that of glow lamps. Where is the dispensary or laboratory that provides facilities for reading the graduated measuring glasses? Nothing is more productive of eye strain than the effort to decipher any kind of graduated scale, but with the faint lines of a glass measure in the twilight of the average dispensary held up to a patchwork background of bottles the strain is increased. It would save time and afford comfort if small white screens were fitted up, one in front of each man, adjusted to catch the chief incident rays from a skylight or window at such an angle that they reflected towards the dispenser. The same screen could be used under an artificial light or in a permanently dark situation, or there should be an illuminated panel of either reflected or transmitted light.

THE HIGHWAYS DEPARTMENT of the city of Leeds has recently treated portions of a macadam roadway with granular calcium chloride to combat the dust. Solutions of the same had previously been tried at greater cost and without such satisfactory results. The road is first well swept and two applications of the chloride are made on successive evenings, of about one-half pound per yard, at a cost of about \$0.008 per square yard.

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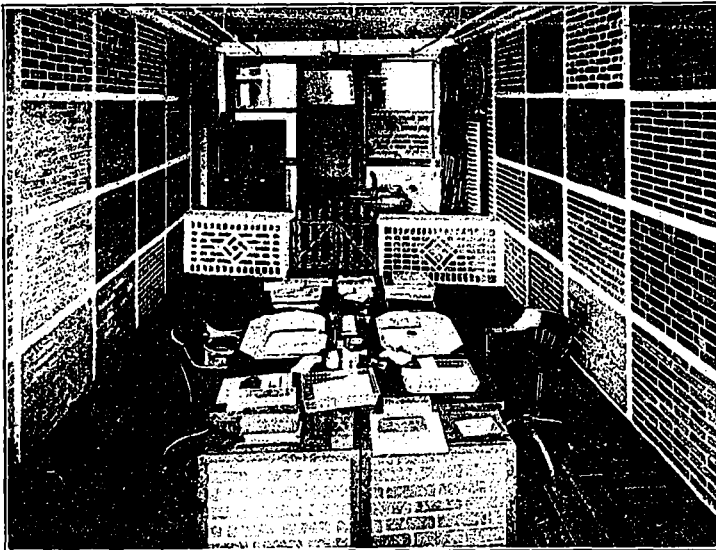
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HOW SERIOUS THE GREAT PLAN for a ship-building dock at Sydney, N.S., may be is open to conjecture, but it is certainly laid on practical lines, and will, if carried out, give to Canada a maritime supremacy that is equal in national importance with the Panama Canal. In its exterior the plant proposed by the British Canadian Shipbuilding and Dock Company covers a half mile square with room for further extension and ten million dollars is an estimated cost.

BATHROOMS IN SOUTHERN EUROPE

THE VALUE OF BATHROOMS is receiving somewhat extended recognition in the principal cities of Southern Europe, these conveniences being installed in most of the large buildings constructed for domiciles and being added to many old ones. The fixtures and their arrangement, in appearance or utility, are not equal to similar fixtures made on this continent. Generally speaking, the water-closet fixtures are poor and inefficient, and are installed regardless of artistic and sanitary requirements. The practical exhibition of an American bathroom and water-closet, both separately and together, in the large cities of Europe, would furnish business for the manufacturer who would install the exhibitions. Agencies should be established in this way. Correspondence and illustrated literature printed in English will be as profitless as pouring water in a sieve.



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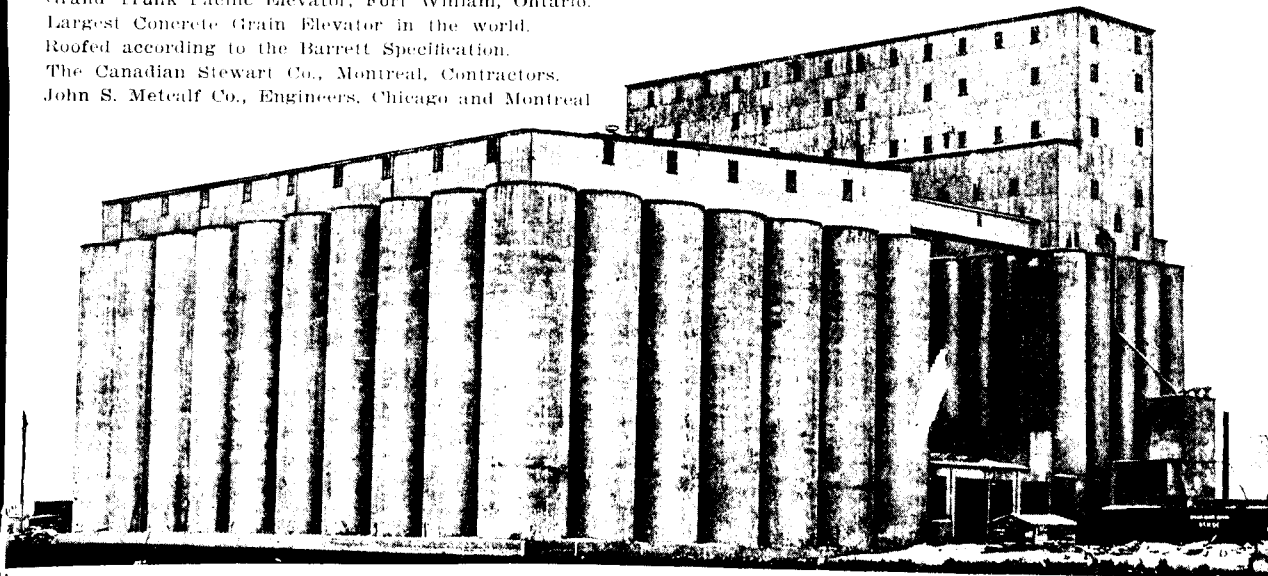
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maintenance expense may be said to be nothing.

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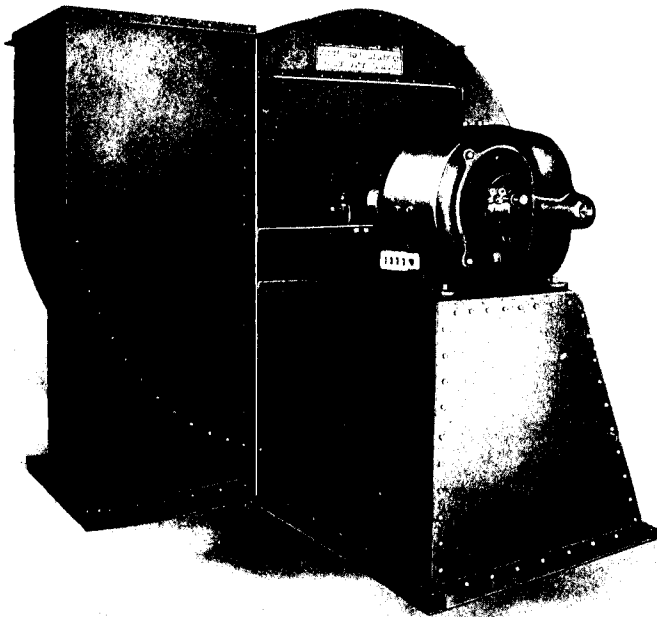
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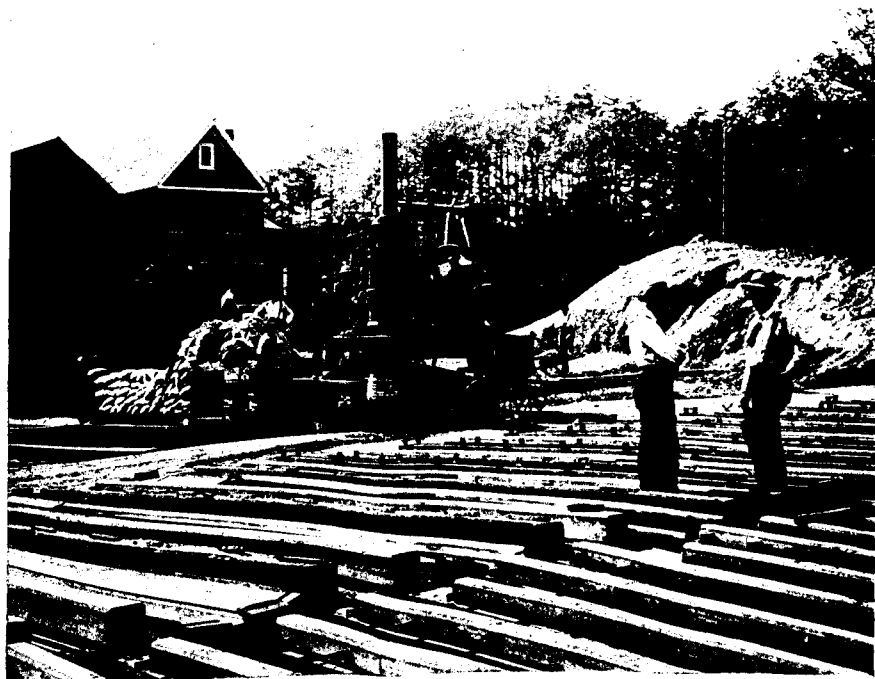
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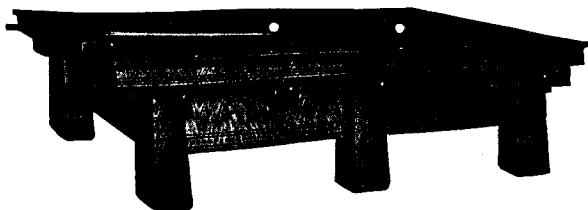
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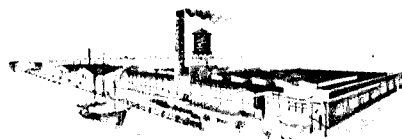
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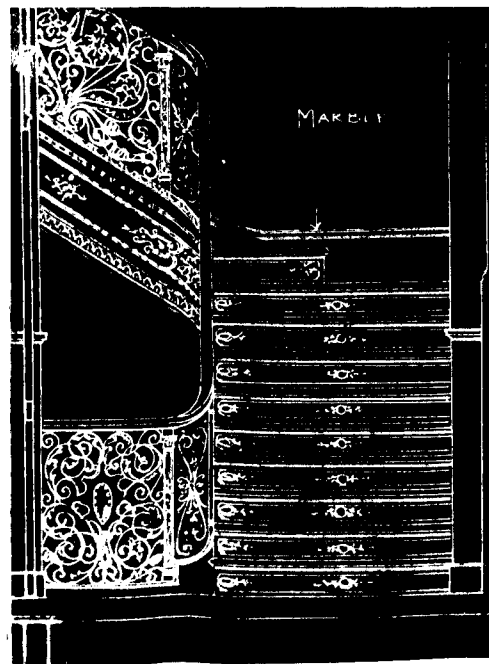
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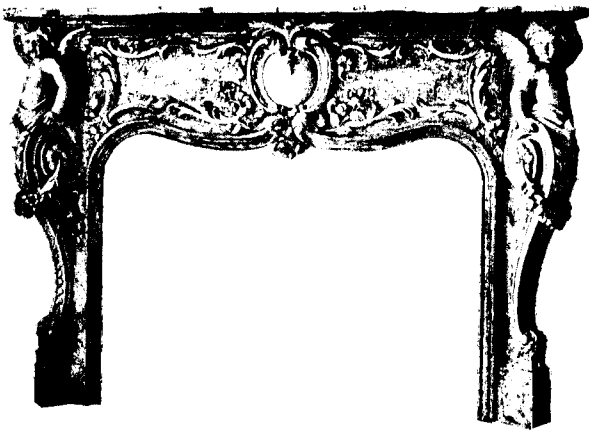
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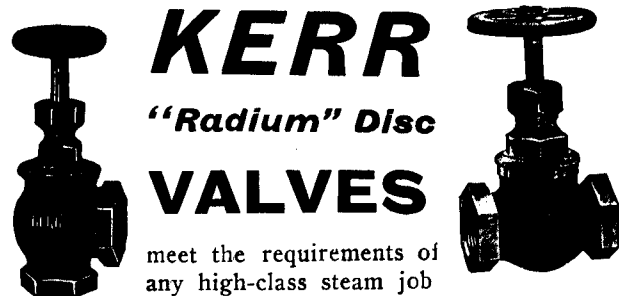
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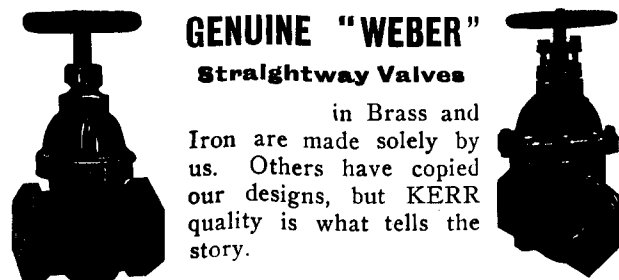
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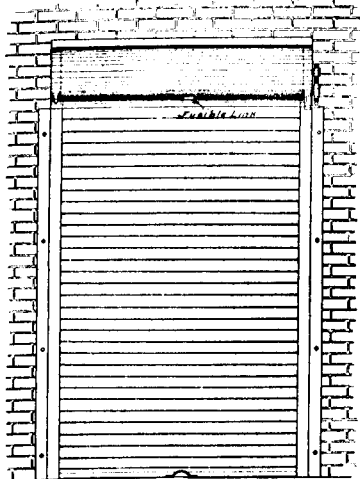
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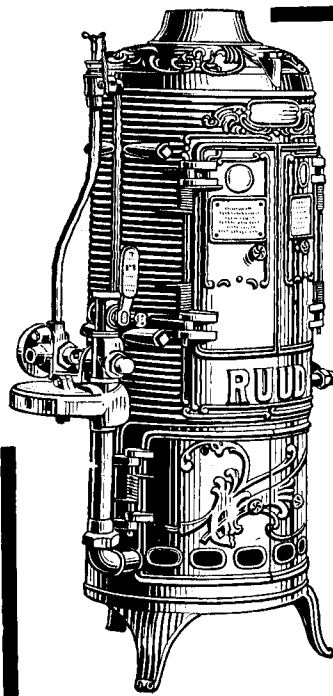
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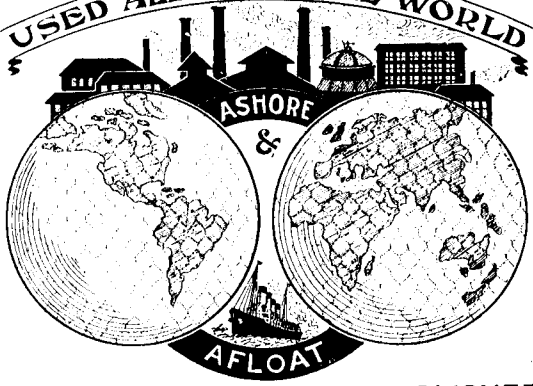
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