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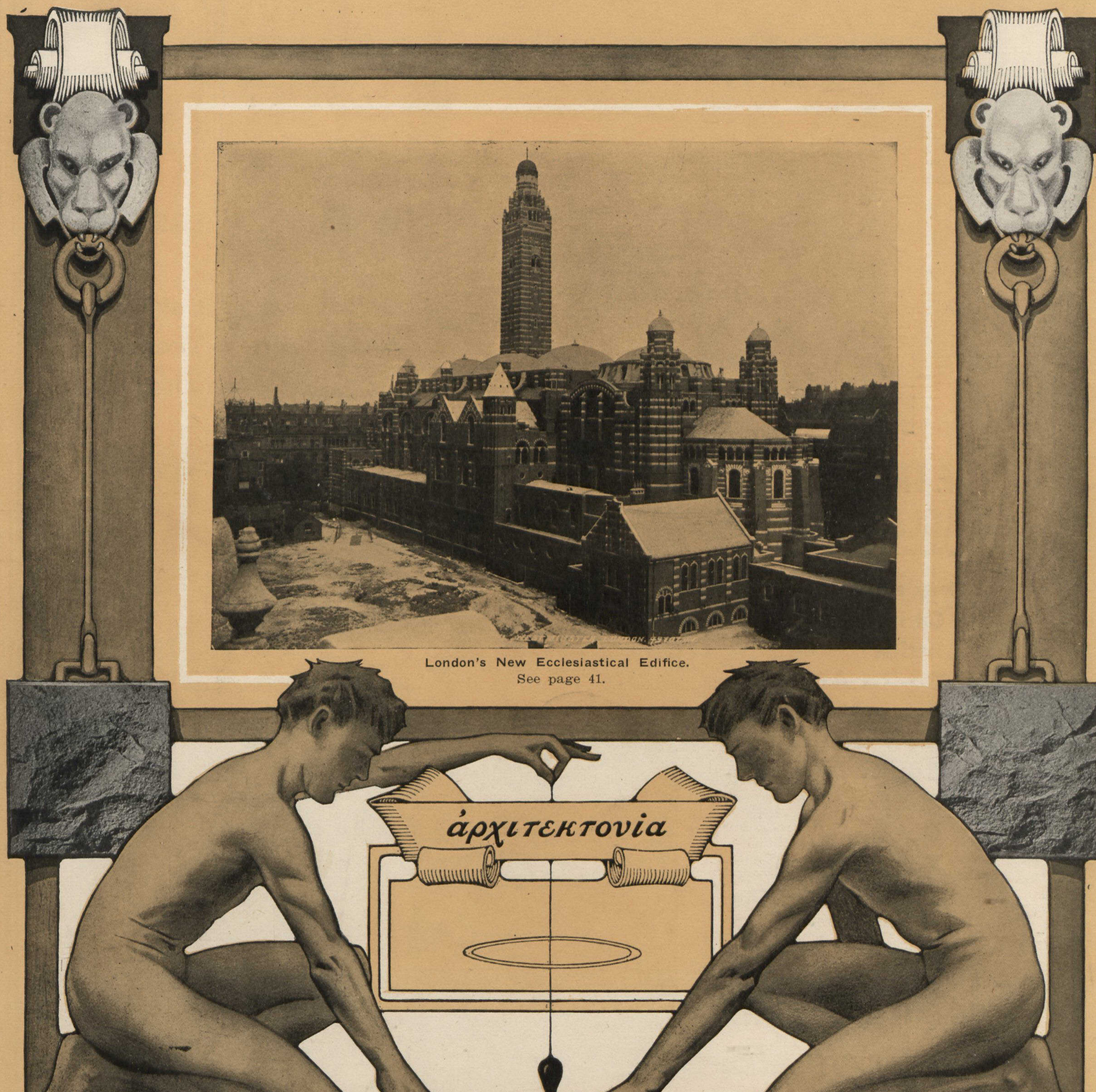
CONSTRUCTION

A JOURNAL FOR THE ARCHITECTURAL ENGINEERING AND CONTRACTING INTERESTS OF CANADA

Vol. 2, No. 9. | JULY, 1909 | $2.00 PER YEAR 25c. PER COPY



London's New Ecclesiastical Edifice.
See page 41.

- MONTREAL -

OFFICE OF PUBLICATION
'SATURDAY NIGHT' BUILDING,
TORONTO

- LONDON, ENG. -

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THE TAYLOR SAFE WORKS

Are Ever Progressive

We have just shipped this heavy Treasury Vault to Shanghai, China.

THE TAYLOR SAFES CIRCLE THE GLOBE

They are in use in
- China
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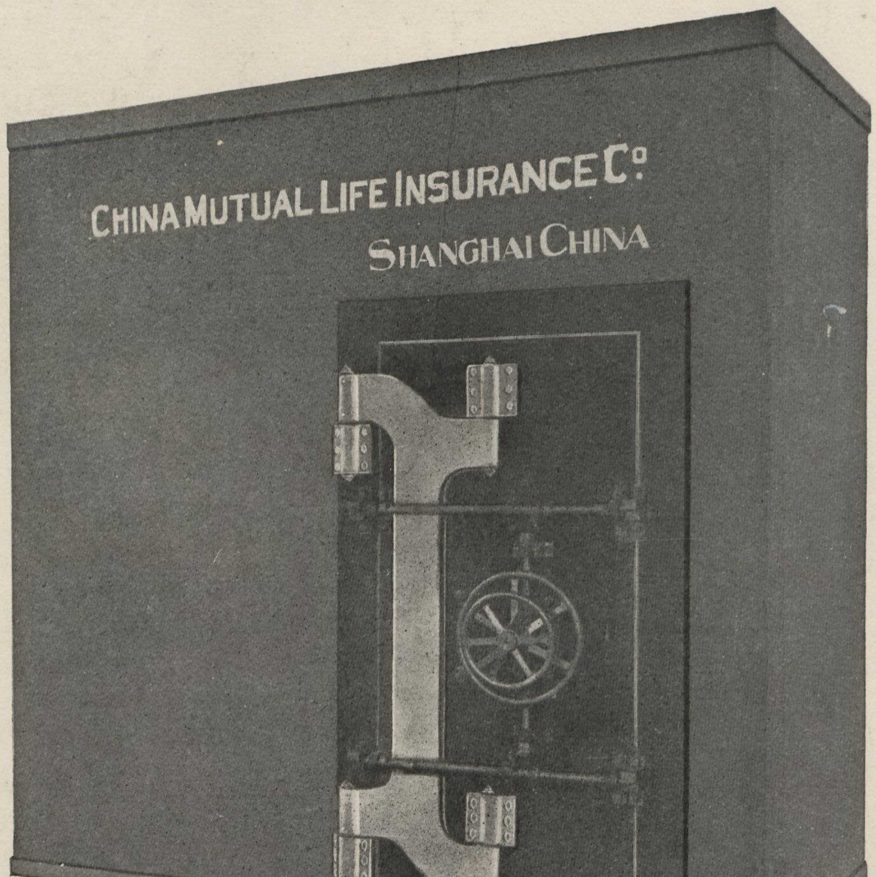
and throughout the civilized world



J. & J. Taylor

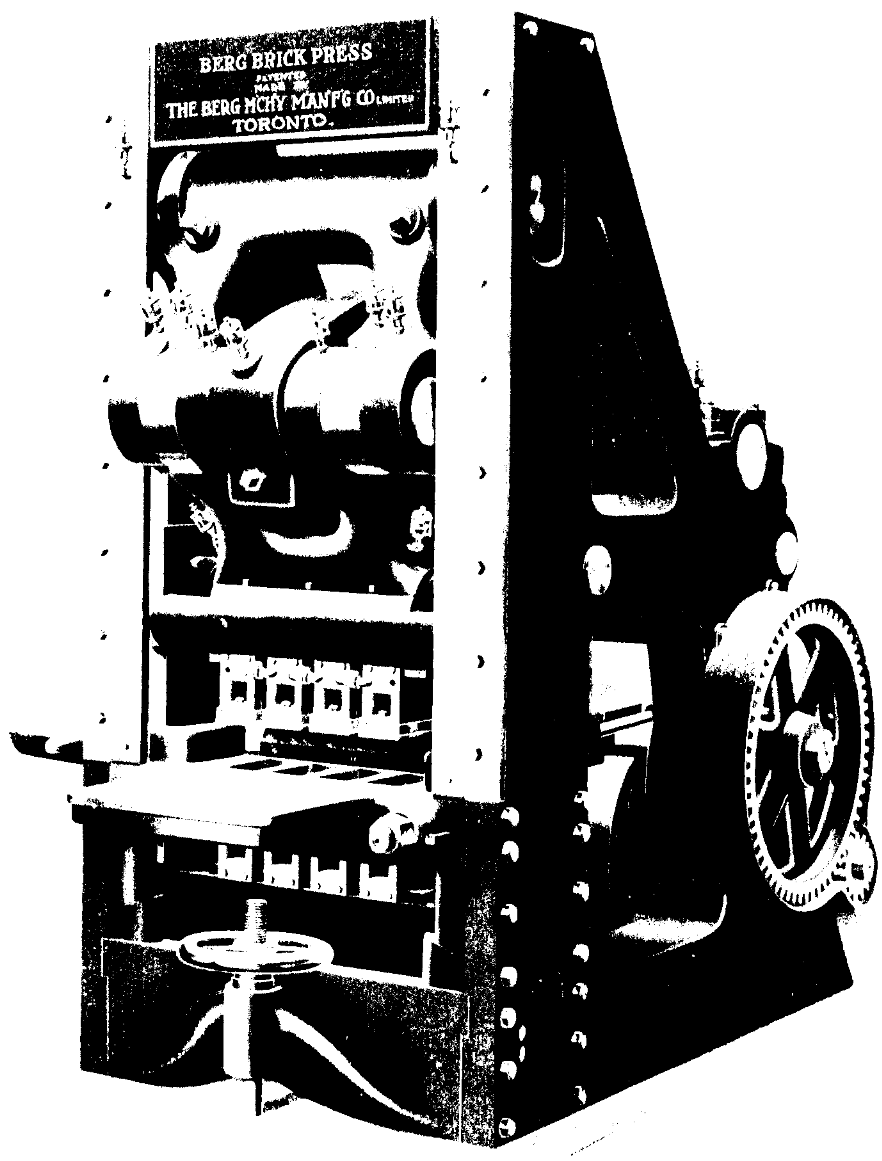
TORONTO SAFE WORKS

TORONTO, CANADA

What's in a Name...

SIMPLICITY STRENGTH DURABILITY | ACCESS TO ALL PARTS | GREATEST PRESSURE | BEST PRODUCT

The "Berg Press" is the Highest Development in the Art of Brick-making Machinery, so Pronounced by the U. S. Government



IMPROVED BERG BRICK PRESS

THE BERG PRESS EXCELS
for
Shale Pressed Brick
Clay Pressed Brick
Sand-Lime Pressed Brick
Sand-Cement Pressed Brick
Fire Brick

THE BERG PRESS
Gives THREE Distinct PRESSURES
Result is:
No Granulated Centers

THE BERG PRESS
HAS ALL WORKING PARTS ABOVE CLAY LINE

THE BERG PRESS
is fitted with "THE BERG PATENTED MOLD BOX" the DELIGHT of brickmakers, and which many others have tried to IMITATE

All Sizes and Shapes Can be Made
Molds Can be Changed in a Few Minutes
Owing to the SIMPLE MECHANICAL CONSTRUCTION

Cut Gearing, and many other steps forward in **Improvements**, and built of the **Highest Grade of Material and Workmanship. Fully Guaranteed** as to its **Success.**

Manufactured by its inventor in Toronto, Canada, exclusively. Also all equipments for Pressed Brick Plants to make **Sand-Lime Brick, Sand-Cement Brick, Shale Brick, Clay Brick and Fire Brick**

CORRESPONDENCE SOLICITED

The BERG MACHINERY MANUFACTURING CO., Limited

Office and Works: Bathurst and Niagara Sts., Toronto, Canada

"MONARCH"

PORTLAND CEMENT

Mills at Montreal, Que., and Lakefield, Ont.

ANNUAL CAPACITY ONE MILLION BARRELS

Unexcelled for Strength, Fineness, Color and Uniformity

Highest Quality--Fulfilling requirements of all standard specifications.

Sales and General Offices:

Ottawa Bank Building - Montreal, Que.

THE LAKEFIELD PORTLAND CEMENT CO.

"SAMSON"

CANADA'S OLDEST AND MOST RELIABLE BRAND

THE OWEN SOUND PORTLAND CEMENT CO.
LIMITED

OUTPUT 1,500 BARRELS PER DAY

SPECIAL FACILITIES FOR HANDLING LARGE ORDERS

Write for Quotations and Pamphlet, etc.

"CEMENT, HOW TO USE IT, WHERE TO BUY IT."

GENERAL SALES AND HEAD OFFICE, OWEN SOUND, ONTARIO

Concrete Church Buildings at Reasonable Cost

TWO SIZES:
Model "A," 16 inch Length.
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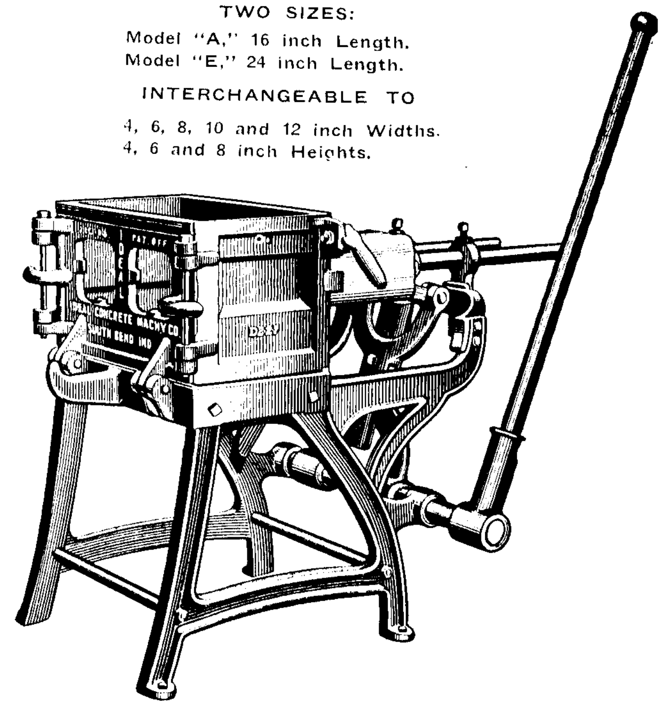
INTERCHANGEABLE TO
4, 6, 8, 10 and 12 inch Widths.
4, 6 and 8 inch Heights.



Concrete church buildings are coming more and more in evidence. Their imposing appearance and reasonable cost commend them to small congregations and those of moderate means. This field offers splendid opportunities to the contractor.

The illustration below shows a church built of concrete blocks made on the most reliable, satisfactory and profitable machine—

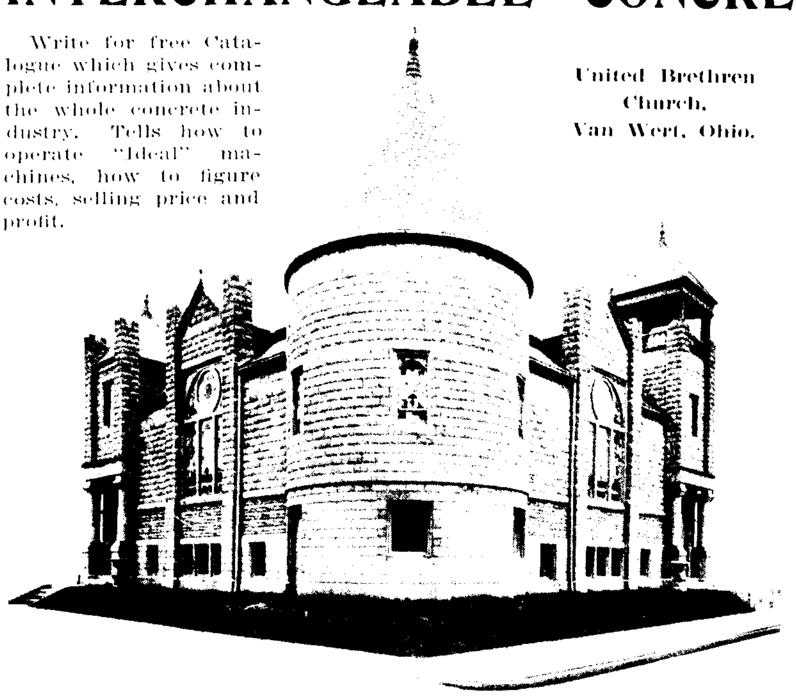
THE

IDEAL

(Face-Down)

INTERCHANGEABLE CONCRETE BLOCK MACHINE

Write for free Catalogue which gives complete information about the whole concrete industry. Tells how to operate "Ideal" machines, how to figure costs, selling price and profit.



United Brethren Church, Van Wert, Ohio.

The face-down feature alone puts it in a class by itself, for a rich facing material may be backed up with a coarser, cheaper, stronger mixture, making a better block, a better face at a smaller cost.

The only machine privileged by law to make use of this principle. The corner trim, short blocks, different faces and sizes used, were all formed in the same machine. Its parts being interchangeable, the Ideal makes blocks of any form, angle or face design, varying widths and any length within the limits of its capacity.

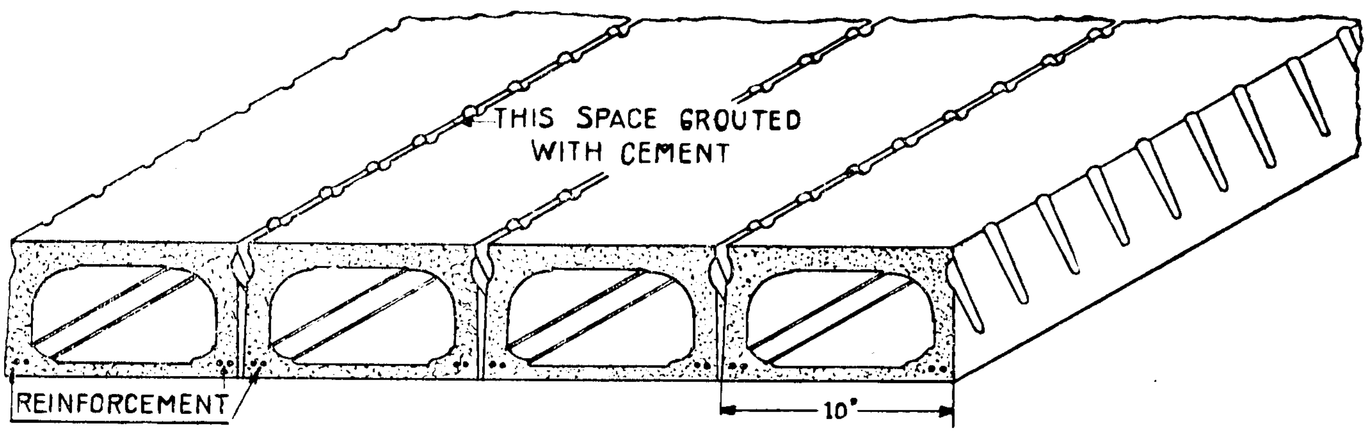
Other "Ideal" Machines are Mixers, Sill and Lintel Machines, Brick Machines, Automatic Tampers and Ornamental Moulds of all sorts.

Estimates for complete plants.

IDEAL CONCRETE MACHINERY CO., LTD.
221 KING STREET - - - - LONDON, ONTARIO
Canadian Sales Agents: MUSSENS LTD., Montreal, Toronto, Winnipeg, Vancouver

JUST ENOUGH TO INTEREST YOU---AND NO MORE

THE SIEGWART Fire-Proof Floor



VIEW SHOWING SECTION OF FLOOR.

Hollow Reinforced Concrete Beams from 4 Feet to 21 Feet Long

In use in Switzerland, Germany, Italy, Austria, Hungary, France, Belgium, Holland, Russia, Spain, England, Egypt, Argentine, Uruguay, Brazil, India, Canada and United States of America.

Some Advantages of the Siegwart Floor

1. Economical.
2. Highest Fire-Resisting qualities.
3. Soundproof and a bad conductor of temperature.
4. Requires no Centering.
5. "In-situ" operations reduced to a minimum, therefore great rapidity of construction.
6. A strong floor is obtained for working on immediately after laying the Beams.
7. The floor is perfectly dry, brings no dampness into the building, and the ceiling and floor finish may be applied at once.
8. Independence of the influences of temperature and weather during the building.
9. Adaptation to all circumstances, easy to cut holes and apply fixtures.
10. Thoroughly mixed concrete is used, and the reinforcement cannot fail to be in its proper position.

"LA COMPAGNIE ALPHA" (Incorp.)

Engineers and Contractors

17 Place D'Armes, Montreal — Works: Three Rivers, Que.

Passenger and Freight
ELEVATORS
Any Style and Capacity

Our Customers Talk. So Do Our Competitors.
But There's a Difference.

READ THIS LETTER:

Brantford, Nov. 23rd, 1908.

The Parkin Elevator Co., Limited,
Hespeler, Ont.

Dear Sirs,—

We received from you a horizontal Hydraulic Elevator about two years ago.

This machine is really working better to-day than ever before. We are thoroughly satisfied with same and it has never given us any trouble, and people who ride on it remark that we must have the best elevator in the City.

Any references required may be sent to me and you can be assured that they will get a good recommend.

Yours truly,
M. E. LONG.

We Also Manufacture

FIRE ESCAPES

See What Our Customers Say About Them:

THEY LIKE THE STYLE

Roman Catholic Separate School Board, Stratford.
Stratford, Ont., Sept. 29, 1908.

Messrs. The Parkin Elevator Co.,
Hespeler, Ont.

Gentlemen,—

The fire escapes that you have installed on the R. C. Separate School Building for us are very satisfactory. We like the style of fire escape, and we also desire to express our thorough satisfaction with the workmanship connected with the manufacture of them.

We consider that we have one of the finest fire escapes ever installed on any public building in Canada, and it will give us much pleasure to recommend your work to anyone who may be in need of a fire escape.

The Board are very much pleased that they placed the order with you, and wish you every success in your business.

Yours truly,
J. B. CAPITAIN,
Secretary.

The Parkin Elevator Co., Limited

Write Us For Catalogue and Prices. **HESPELER, CANADA**

ICE MAKING and REFRIGERATING MACHINERY

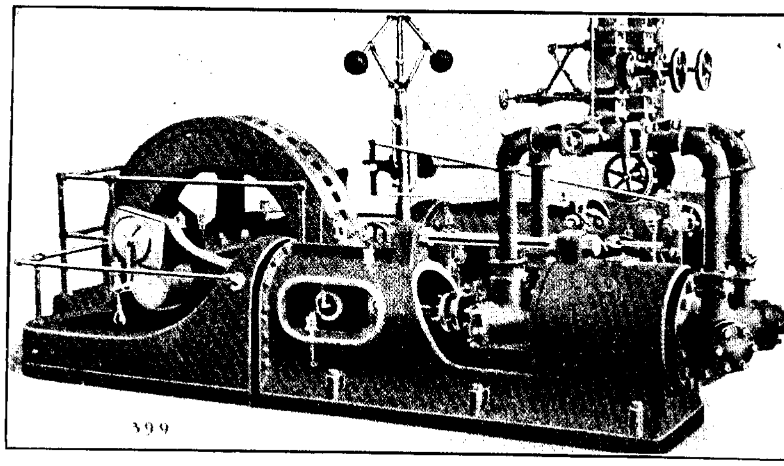
Supplied and Installed on

THE YORK MANUFACTURING CO. SYSTEMS

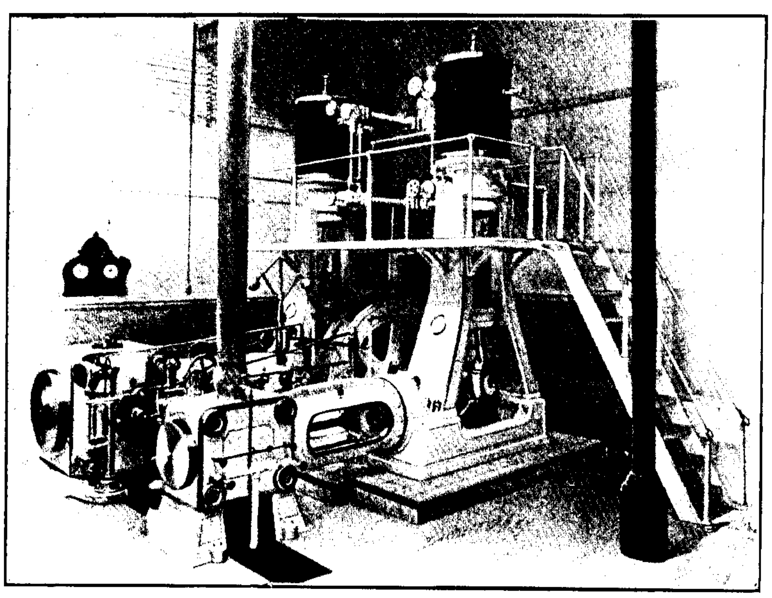
FOR

Ice-making Plants, Cold Stores, Abattoirs, Packing Houses, Breweries, Dairies, Hotels, Apartment Houses, etc.

Special Machines for Small Plants, suitable for Butchers, Dairies, Fish and Game Dealers, etc.



Horizontal Double Acting Compressor Steam Driven.



Vertical Single-acting Compressor Driven by Compound Steam Engine.

Horizontal and Vertical Compression Plants.

Absorption Plants.

Ammonia Fittings and Supplies kept in stock.

Catalogues sent on request.

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Insulation Department

Cork Board Insulation

Installed in hundreds of the most modern cold storage plants, packing-houses and breweries in the United States, Canada and Mexico.

No other Insulation meets these requirements

Write for Blueprint, showing details of construction and samples, also catalogue and list of Canadian purchasers of our Nonpareil Corkboard.

Acknowledged to be the very best and the only insulation approved by Board of Fire Underwriters.

Nonpareil Cork Floor Tiling

Made of pure compressed cork and is unequalled for ease and comfort in walking or standing.

Suitable for Banks, Hospitals, Halls, Bathrooms, Etc.

CANADIAN DISTRIBUTORS

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ROBERTSON'S MARBLE PUBLIC LAVATORIES

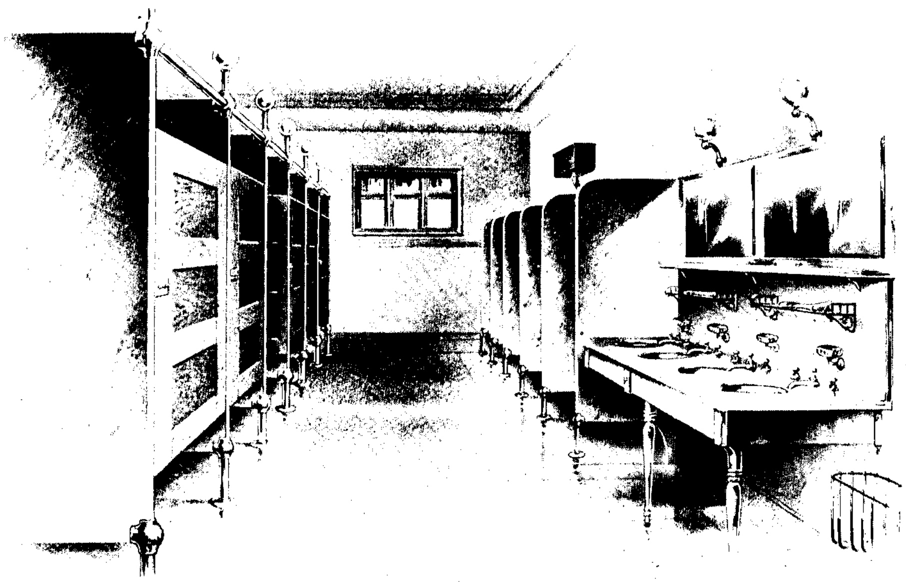


PLATE E—88.

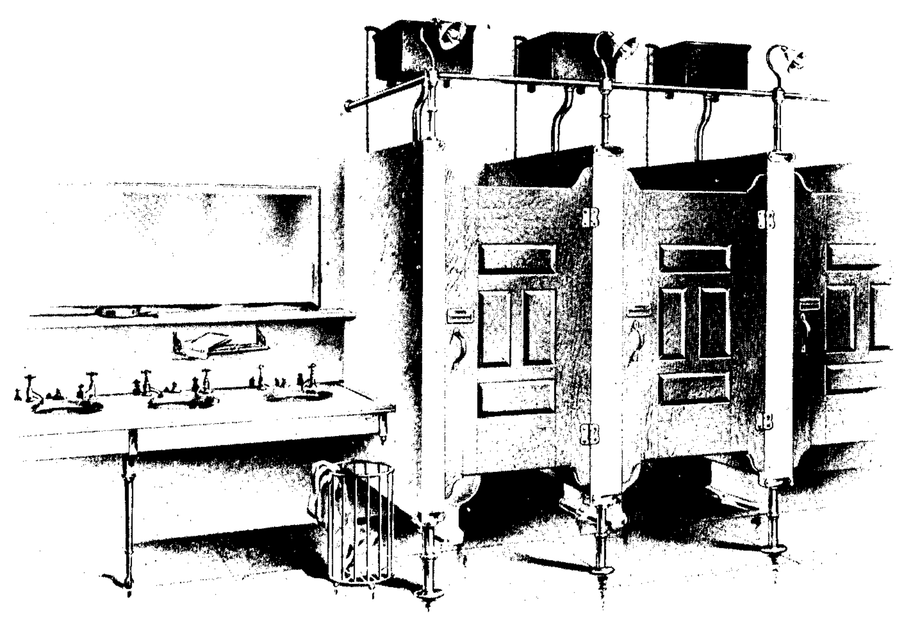


PLATE E—89

We show the above plates as suggestions for Marble Public Lavatories. Sanitary efficiency and handsome appearance are the paramount features in making these arrangements. Our facilities in marble manufacture enable us to furnish the most elaborate work at moderate figures.

Lavatories or Stalls of any kind of marble, any design or size made to order. Prices on application.

THE JAMES ROBERTSON CO., Limited

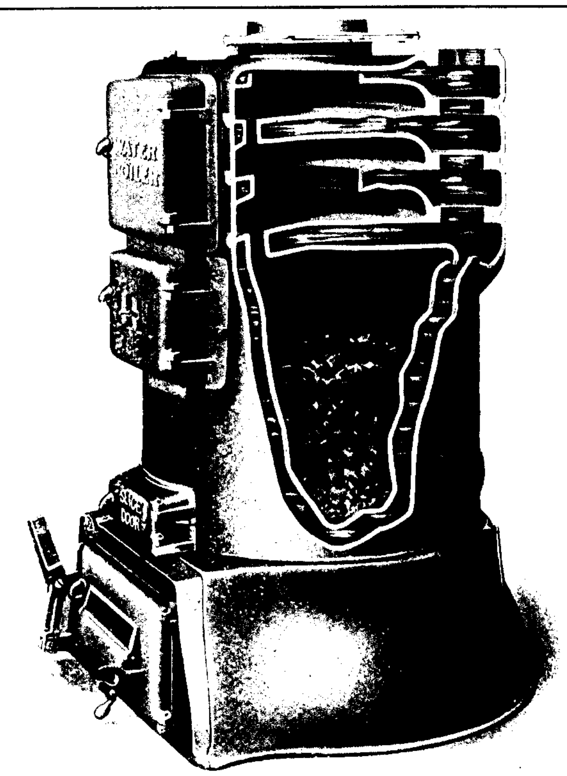
MONTREAL TORONTO WINNIPEG ST. JOHN, N.B.

THE SECRET

of the success of the Safford Boiler is plainly evidenced by a glance at this interior view. If you are still like the "gentleman from Missouri," we are here to show you.

The deep Fire Pot means added heating power, fuel economy, thoroughly burnt fuel, less attention.

The Cast Iron Nipple connection will last as long as the Boiler. No Rubber Gaskets to replace every few years



The absolutely even metal lines assures rapidity of circulation.

The wide flue openings and spaces lessen soot deposits, allow ease in cleaning and accelerates circulation in the upper sections as a result of higher temperatures in the gases.

Safford Boilers and Radiators

are absolutely guaranteed.

The Dominion Radiator Company Limited.

TORONTO MONTREAL WINNIPEG ST. JOHN, N. B.

TARRED BRAND BLACK DIAMOND REGD FELT

MEANS

INSULATION

WARM IN WINTER **COOL IN SUMMER**

Ten dollars' worth of Black Diamond Brand Tarred Felt will completely insulate an ordinary house. Lay it on the studding and make it fast with the lath, (metal, wood, or plaster board). In this way you provide a *non-conducting dead air space.*

We can show you by the actual experience of house owners where this simple and inexpensive precaution has effected *a saving of 30 per cent. on the winter's fuel bill,* to say nothing of the comfort of *coolness in summer,* where the *temperature is reduced by 12 to 18 degrees.* We have a lot more to tell you of this matter. If you are interested drop us a card.

ALEX. McARTHUR & CO., Limited

OFFICE: 82 McGILL STREET, MONTREAL

Roofing Felt Factory: Harbour and Logan Streets **Paper Mills: Joliette, Quebec**

Port Credit Brick

Wire Cuts and Repressed Wire Cuts

and PRESSED BRICK

Our plant has recently been enlarged in such a manner as to enable us to supply these lines to the very best advantage.

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

"Brick," the leading clay journal of the United States, in its January number, says of our plant:

"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."

Dark Face Red Pressed Brick, Light Face Brick, Special Dark Face Veneer Brick, Hard Builders for Cellar Work, Second-Class Brick for Inside Work

PRICES FURNISHED ON APPLICATION

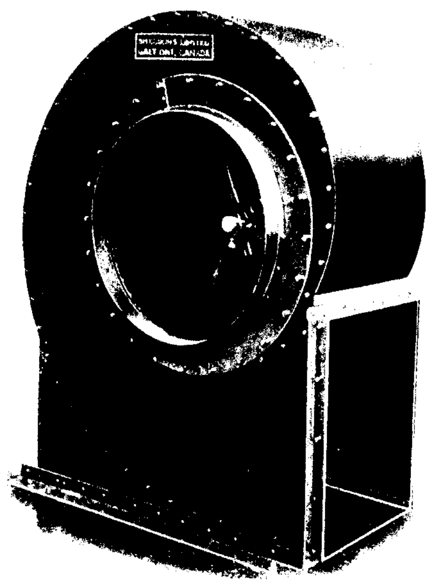
The Port Credit Brick Company, Limited

Office Phone, - M. 3167
Yards " Coll. 4853

HOME BANK BUILDING, 8 KING STREET W., TORONTO

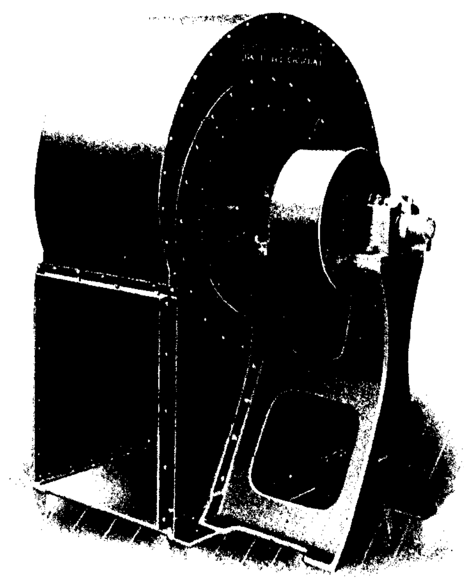
WORKS: PORT CREDIT, ONT.

SHELDON LARGE VOLUME AIR FANS



Inlet side, Bottom Horizontal Discharge.

The Canadian Blower with the Mammoth Capacity

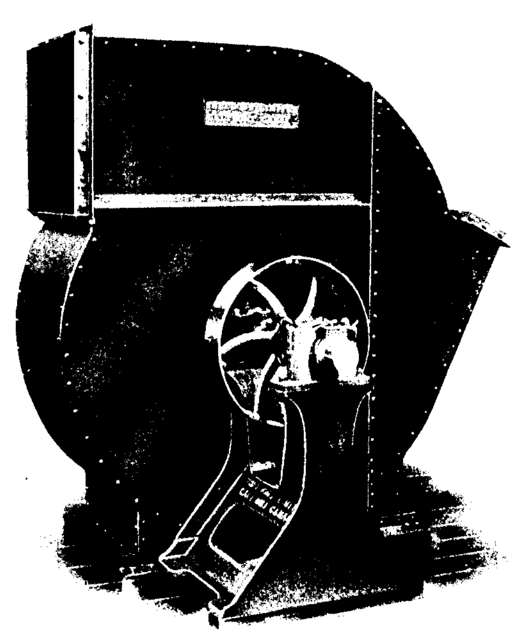


Pulley side, Bottom Horizontal Discharge.

The New Model Sheldon Air Fan Represents Absolutely the Latest Development in Steel Plate Fan Construction

FOR:

Ventilating
Heating
Cooling
Drying
Forced and Induced Draft
Etc.



Special Double Discharge, Pedestal Fan.

Worth Considering

Light but Exceptionally Rigid Construction

Greater Capacity

Less Power

Less Space

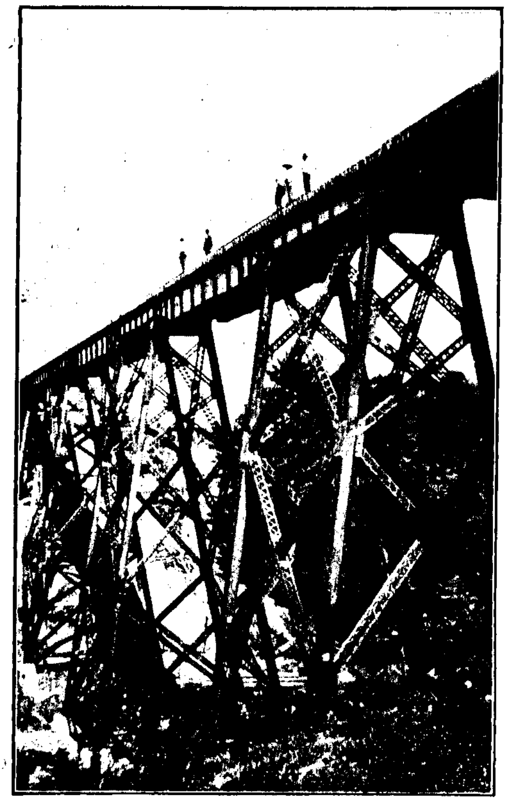
Less Weight

Operates Silently

SHELDONS LIMITED

GALT = = CANADA

HAMILTON BRIDGE WORKS
CO., LIMITED
HAMILTON - - - CANADA



Trestle on Canadian Pacific Ry., near Port Burwell, Ont.

Will be Glad to Furnish Estimates and Plans for

Steel Bridges and Buildings

ENGINEERS and BUILDERS of **Structural Steel Work**

5,000 Tons of Steel in Stock
Annual Capacity 18,000 Tons

Beams, Angles, Channels, Plates, Etc.

Any Size from 1 1/2 Inch to 24 Inches, and any Length up to 70 Feet

NOTE:—We advise that enquiries for any work in our line be sent at the earliest possible time, in order to arrange for reasonable delivery.

The Superior Stiffness of Herringbone Lath

CHOOSE YOURS

cannot be too often emphasized. It puts Herringbone in a class by itself. Ordinary metal lath cannot be used like wood lath. The walls must be especially prepared by adding furring strips to reduce the span. This preparation costs about nine cents per square yard. Herringbone lath spans sixteen inches and the walls therefore need no preparation. The lower cost of Herringbone construction brings it within the reach of thousands who could not otherwise use metal lath.

There's a reason. Did you ever examine the Herringbone rib?

CLARENCE W. NOBLE

General Sales Agent - - 117 Home Life Building, Toronto

METAL SHINGLE & SIDING CO., Manufacturers.

Hecla WARM AIR Furnace

FOR COAL OR WOOD

The requisite for a successful Warm Air Heating System is a good furnace; one that will not only supply an abundant quantity of pure warm air, but will, in addition, be economical in the consumption of fuel, easy to operate, safe from dust and smoke, and that will give the greatest length of service. Some cheap furnaces fulfil one or more of these conditions, but the furnace you want must fulfil all. That is what the HECLA does.

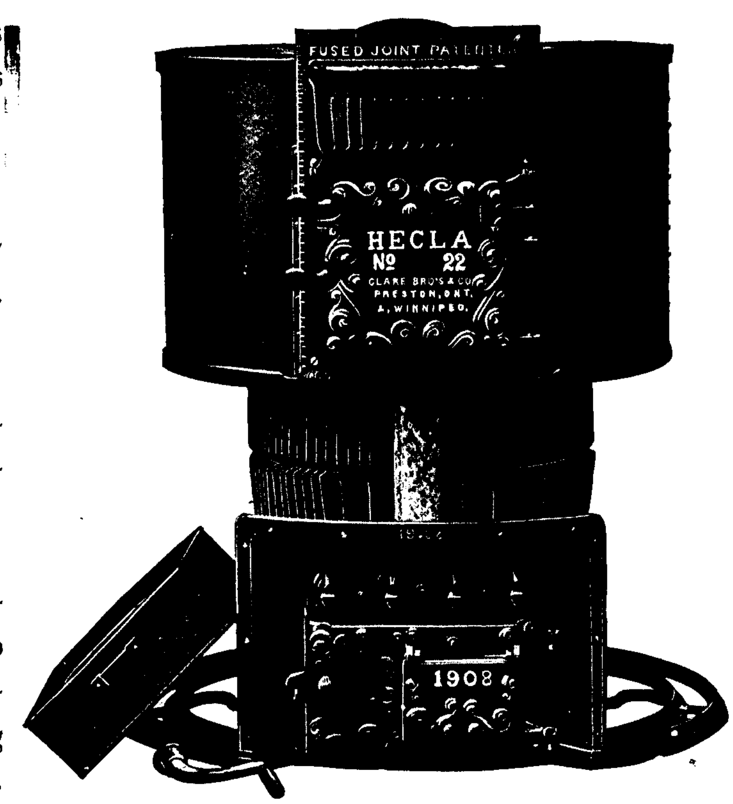
"HECLA" Features

Automatic Gas Damper prevents gas puffs.

Gravity Catch locks door every time you shut it.

Double Feed Door for convenience when burning wood.

Damper Regulator enables you to operate the dampers without going to the basement.



Dust Flue carries all the dust up the chimney.

Water Pan in the best position for effective service.

Large Ash Pan with handle.

Double Tin and Asbestos Lined Case to prevent the loss of heat in the cellar.

STEEL RIBBED FIRE POTS **PATENT FUSED JOINTS**
INDIVIDUAL GRATE BARS **CAST IRON COMBUSTION CHAMBER**

Clare Bros. & Co., Limited

PRESTON, ONTARIO

VANCOUVER **WINNIPEG**

The Open Door Danger

is entirely eliminated by the

RUDDICK ELEVATOR PROTECTIVE DEVICE

The Elevator cannot move until the door is securely locked

The Device is simple and cannot get out of order

It is in operation in a number of buildings in Canada and is rendering excellent service. It has absolutely removed the danger that results in 90 per cent. of elevator accidents.

May be attached to either Electric or Hydraulic Elevators

Write for Further Particulars

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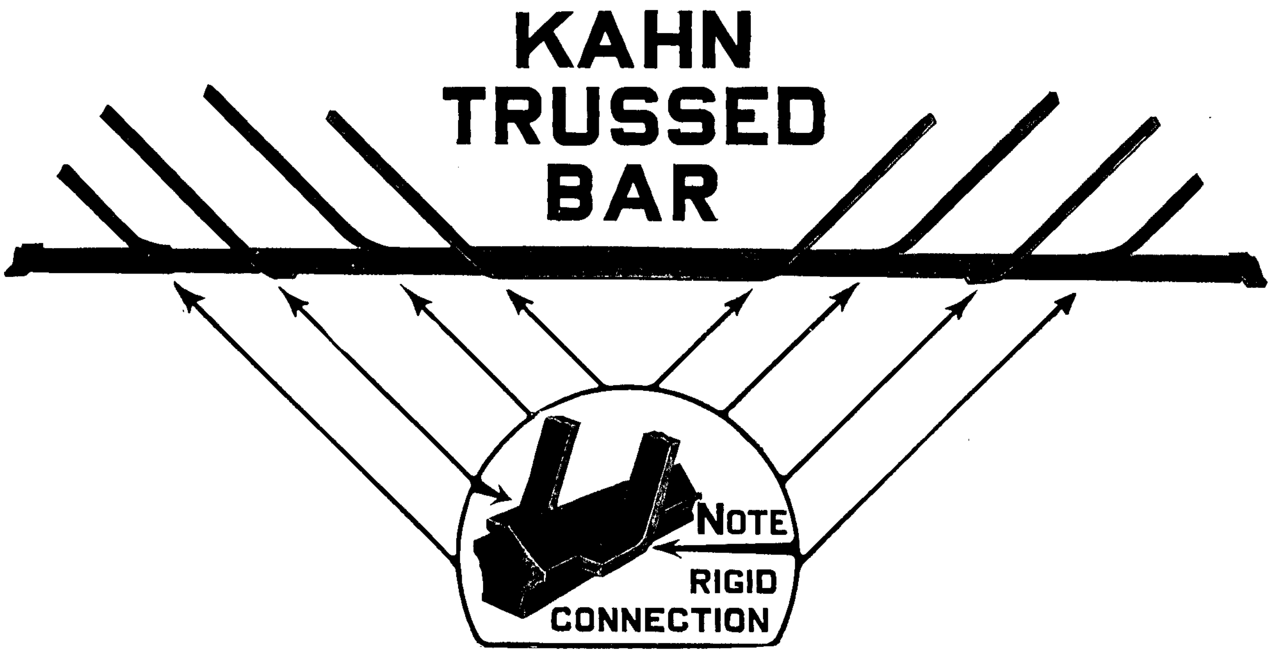

Concrete Beams "Hanging by a Thread"

This is the condition of concrete beams reinforced with straight bars and loose stirrups. The "thread" that holds up the beam is the adhesion between the concrete and the steel. The strength of the beam is lost if this adhesion is weakened.

Perfect adhesion can seldom be obtained in practical work and is destroyed in many ways,—for instance if the concrete is improperly placed so as to expose part of the steel—if a fire attacks the lower surface and weakens the concrete under the steel —or if vibrations of moving loads and machinery destroy the bond.

The only way you can be assured of fireproofness, shockproofness, durability and strength in concrete beam reinforcement is to insist on RIGIDLY CONNECTED DIAGONAL SHEAR MEMBERS. Deformed bars do not accomplish the required results as they merely transfer the weakness from the plane of the bar to the shearing plane along the outer edge of the deformations.

The fact that some such structures are standing up to-day is not evidence of their efficiency. The great steel Cantilever Bridge at Quebec was considered an engineering masterpiece the day before it collapsed.

RIGID CONNECTION OF DIAGONAL SHEAR MEMBERS, as exemplified in the KAHN TRUSSED BAR, means maximum economy in use of steel—doing away with the labor and expense of placing loose members—and absolute assurance of the accurate location of each reinforcing member.

These are some of the reasons why the KAHN TRUSSED BAR has been used in over 2,500 important structures in all parts of the world. Let us submit you suggestions and give you the benefit of this tremendous experience.

KAHN SYSTEM products cover the complete field of materials for reinforcing concrete and permanent building, and also include,—RIB METAL—CUP-BARS—HY-RIB—RIB-LATH—BUILDING SPECIALTIES—and TRUS-CON Chemical Products.

Write for catalogues of any of these products or of the particular type of structure in which you are interested.

TRUSSED CONCRETE STEEL COMPANY OF CANADA, LIMITED

Works and Executives Office, Walkerville. **Sales and Engineering Office, Toronto**

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Union Bank Bldg., Winnipeg, **Cor. St. James & Dalhousie** **Merchants Bank Bldg., Montreal**
Loo Building, Vancouver **Quebec** **132 Hollis St., Halifax**

KAHN SYSTEM

Interior Second National Bank. Cincinnati, Ohio.

A United States Building Finished with

Missisquoi Marble

Canadian architects who have been accustomed to specify imported marbles, should be interested in the fact that this very excellent Canadian product is being largely used in some of the finest structures in the United States, and has been in numerous instances specified by foreign architects when placed in competition with samples from the best quarries in the world.

THE MISSISQUOI MARBLE CO., Limited

Philipsburg, Quebec **Coristine Building, Montreal**

District Sales Agents: David McGill, Montreal; Eadie Douglas, Toronto; Wm. N. O'Neil & Co., Vancouver; C. N. Barclay, Winnipeg; General Contractors' Supply Co., Halifax.

Entrance, Royal Bank, Toronto. Carrere & Hastings and Eustace G. Bird, Associate Architects.

A Canadian Building Finished with

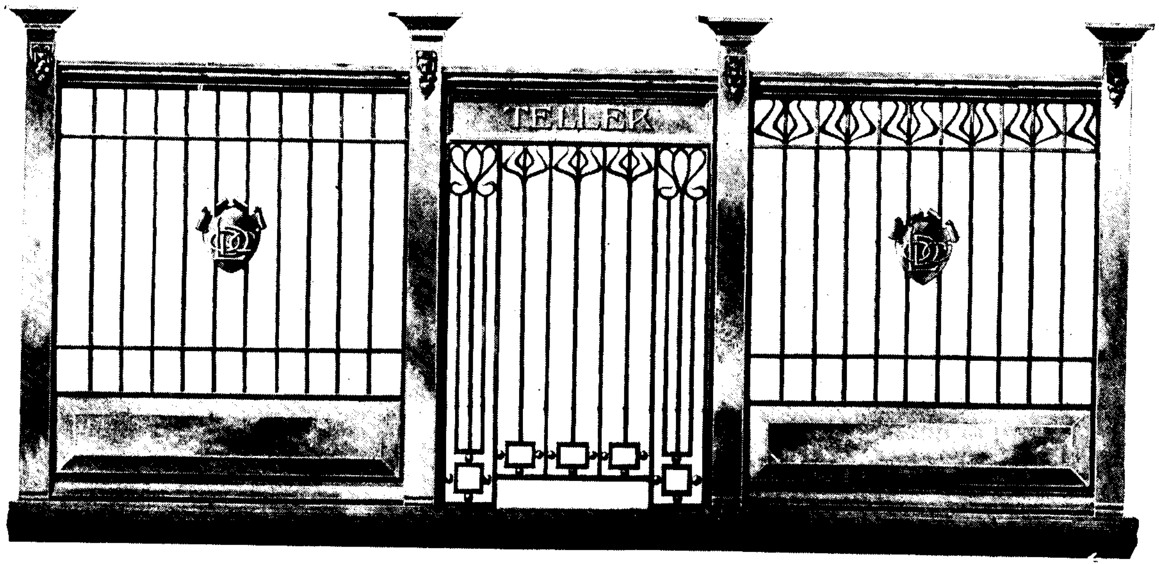
Missisquoi Marble

Missisquoi Marble is manufactured in Rough Blocks, Cut Building Stone, Slabs, polished and unpolished, Monuments, Stair Treads, Floor Tiles, etc., and the various shades in which it can be supplied adapt it to the working out of any color scheme desired. The shades include light grey, dark grey, green grey, cream with green vein, cream with mottle green, cloudy green and pink.

THE MISSISQUOI MARBLE CO., Limited

Philipsburg, Quebec **Coristine Building, Montreal**

District Sales Agents: David McGill, Montreal; Eadie Douglas, Toronto; Wm. N. O'Neil & Co., Vancouver; C. N Barclay, Winnipeg; General Contractors' Supply Co., Halifax.



Metal Grilles, Wickets, Tellers' Cages, Elevator Enclosures, Iron Stairs, Metal Lockers, Marquises, Fire Escapes, Etc.

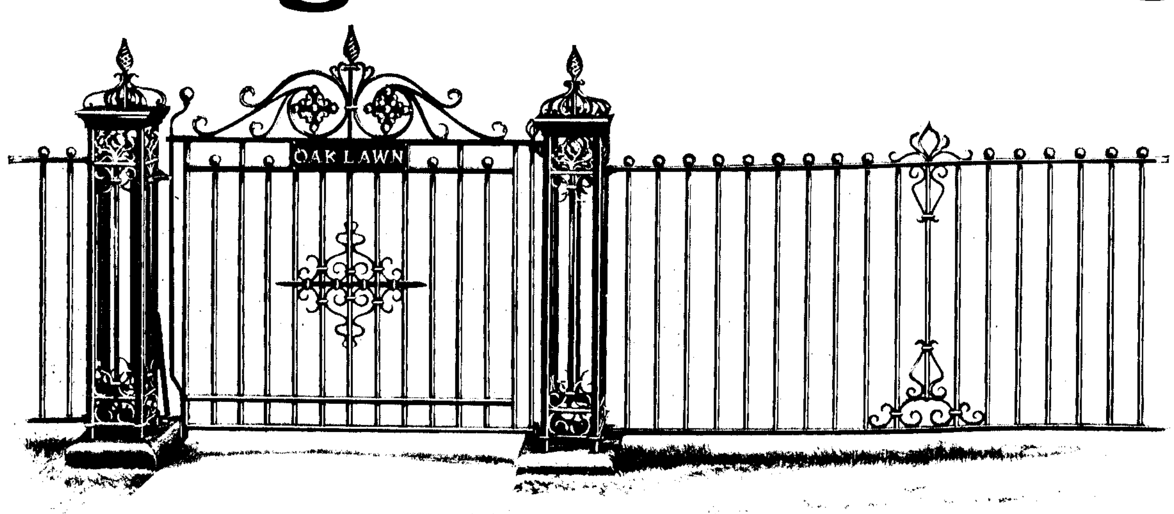
We have recently enlarged our plant and added considerably to our equipment and organization and are prepared to execute contracts of any size and to the most exacting specifications.

Let us figure on your ORNAMENTAL IRON and BRONZE.

DENNIS WIRE & IRON WORKS CO., Limited

Toronto Office, 103 Pacific Building **LONDON, ONTARIO**

Wrought Iron Fences



Iron Fences or Rails designed and built to suit the most difficult requirements. Let us have your specifications.

CANADA FOUNDRY COMPANY, LIMITED

Head Offices and Works, TORONTO, ONT.

District Offices: Montreal, Halifax, Ottawa, Cobalt, Winnipeg, Vancouver, Rossland

PEDLAR Expanded Metal Lathing

MADE BY IMPROVED PROCESS IN
EVERY STANDARD SIZE OF MESH

PAINTED
and Sold
IN THREE GAUGES:
26
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at
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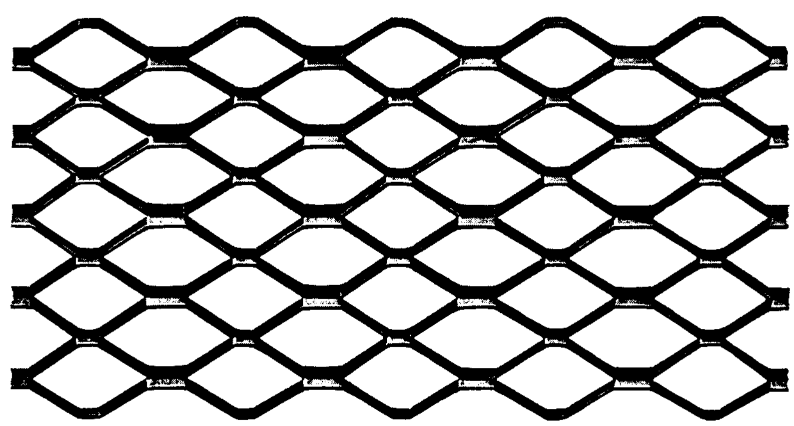
per sq. yard



The only lath that becomes thoroughly embedded in the plaster with the minimum consumption of material

GALVAN=IZED
and Sold
IN TWO GAUGES:
24
and
23
at
16 & 17 1-2c.
per sq. yard

Where Shall We Send Your Sample?

Our Galvanized Lath selected over all others, and used in the McGill Medical Building, Montreal, Que.

Brown & Vallance, Arcts. Peter Lyall & Son, Contractors

For Samples; Catalogues, Details or Discounts, write to the Nearest Office of

THE PEDLAR PEOPLE

Montreal, Toronto, Ottawa, London, Chatham, Quebec, St. John, N.B., Halifax, N.S., Port Arthur, Ont., Winnipeg, Regina, Calgary, Edmonton, Vancouver, B.C., Victoria, B.C.

Head Office & Factory at Oshawa, Ontario

Interior View of Banking Room Entrance, Royal Bank, Toronto. Carrere & Hastings and Eustace G. Bird, Associate Architects

AN EXAMPLE OF OUR INTERIOR WOODWORK.

Furniture and Fittings for Banks, Offices, Stores, Churches, Lodges, Schools.

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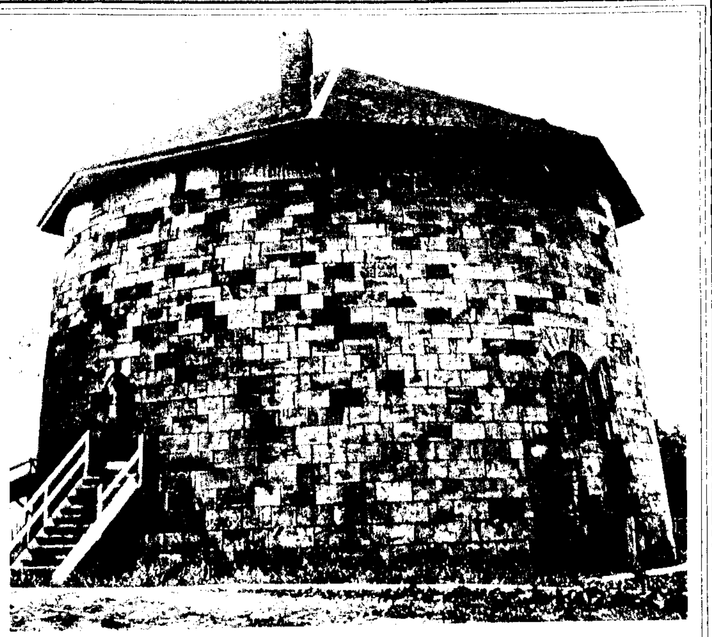

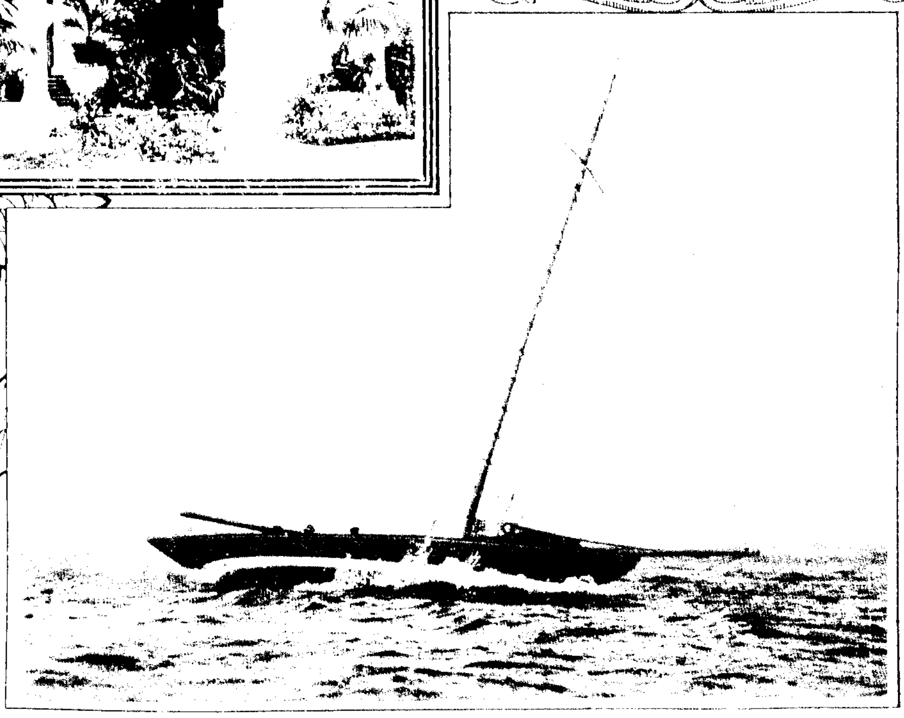

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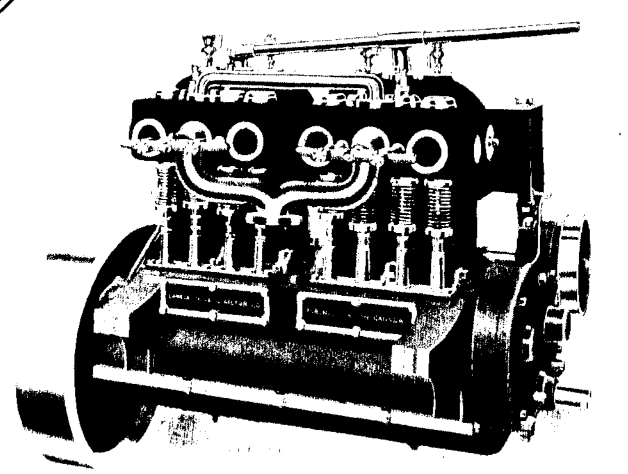

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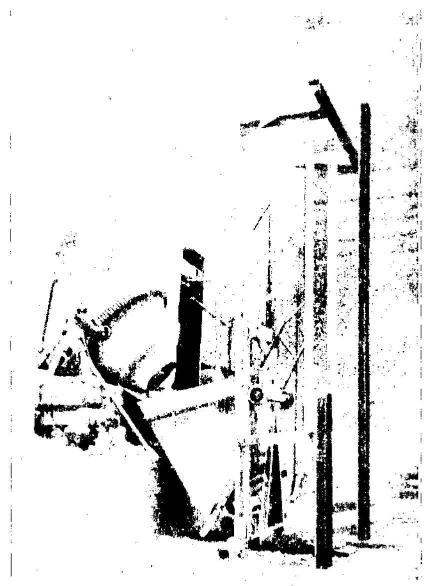

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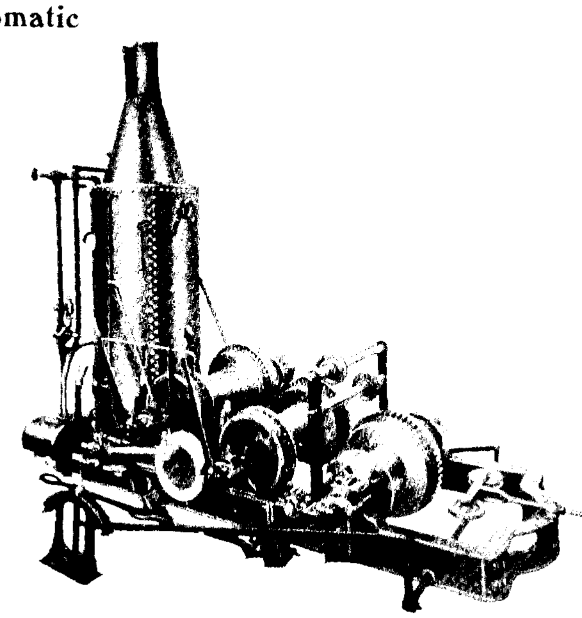

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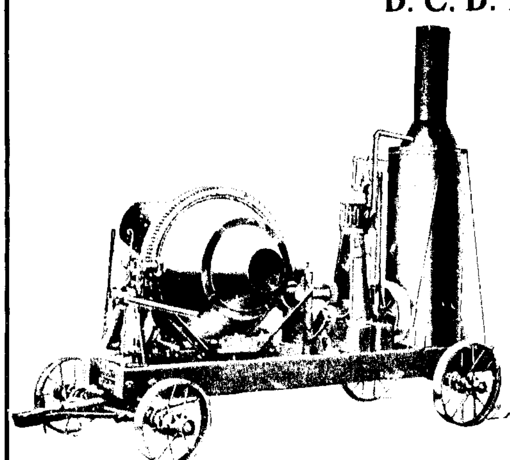

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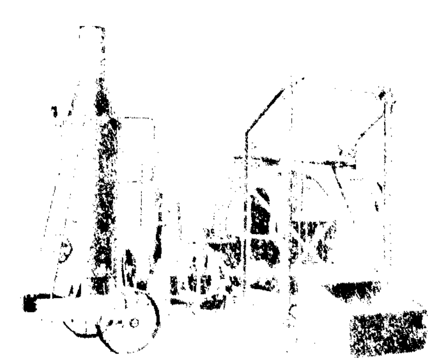

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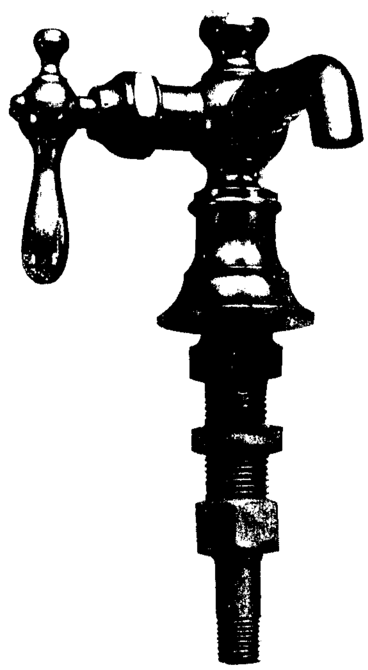

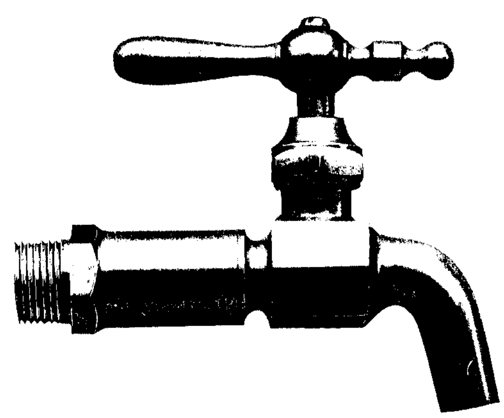

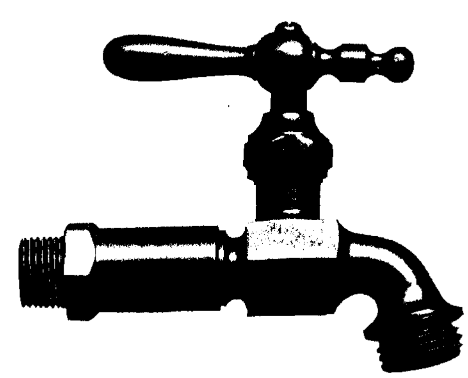

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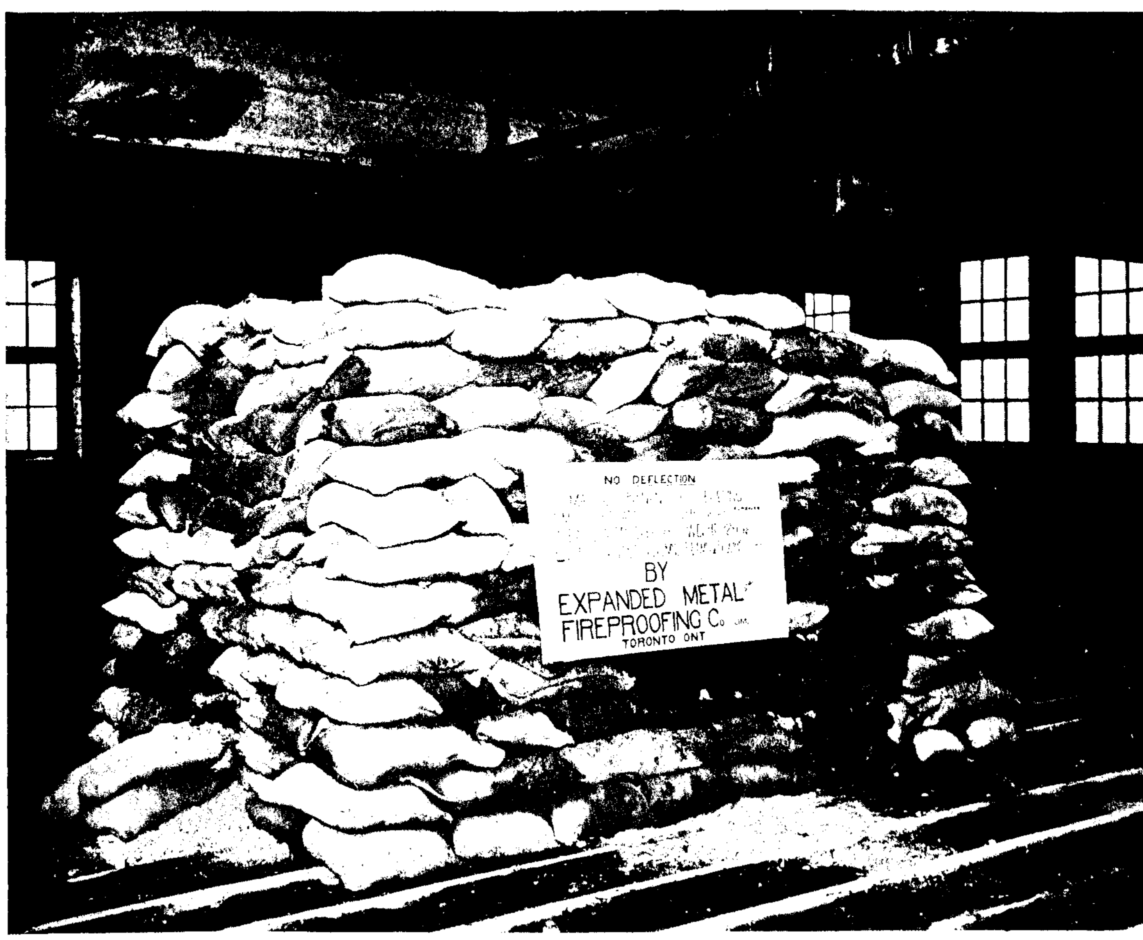

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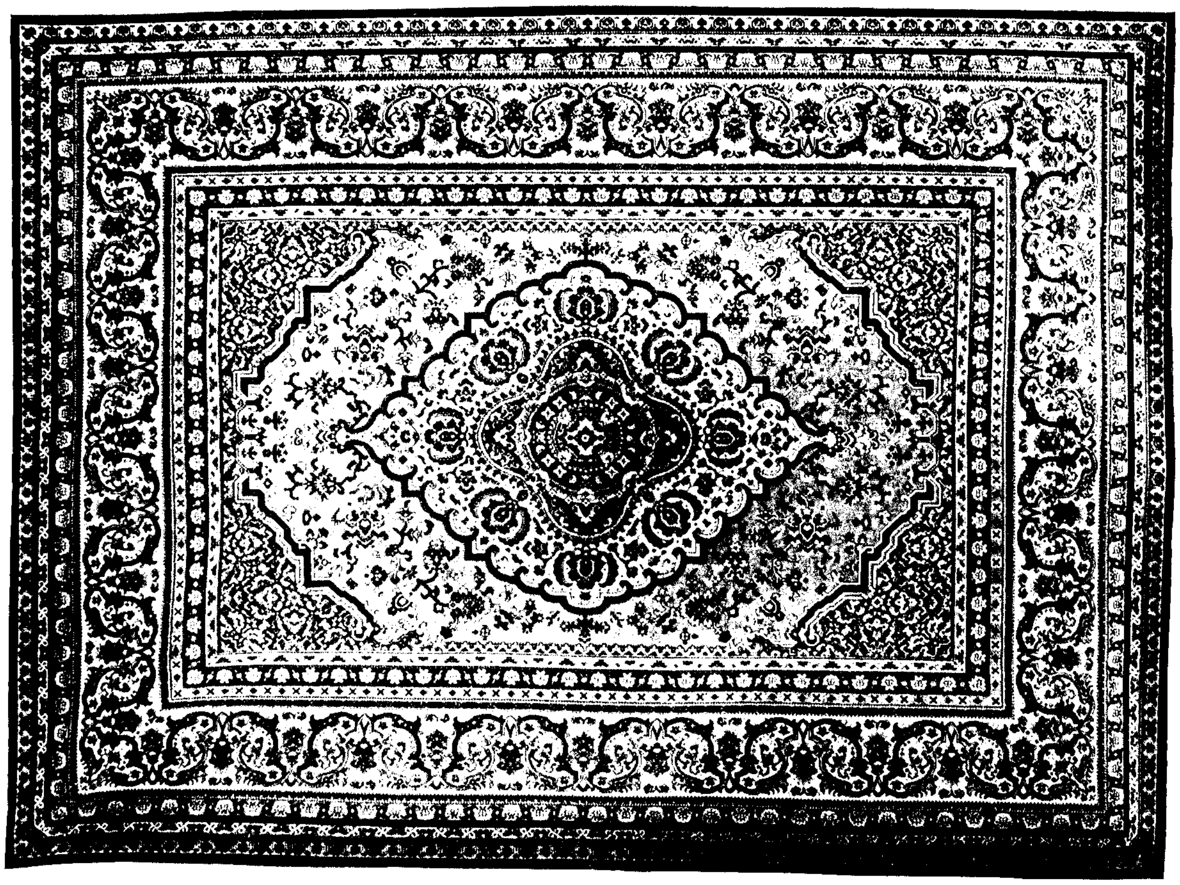

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CANADIAN LABOR UNIONS HELD WITHIN GRASP OF AMERICAN LABOR OCTOPUS—GLACE BAY STRIKE DEMONSTRATES THE AWFUL POSSIBILITIES OF THIS CONDITION. - - - - - - - - - - - - -

NEVER BEFORE in the history of strife between employer and employee in Canada, have we been brought to so fully realize that our labor is almost absolutely controlled from *headquarters* in the United States, and never before has anything so fully demonstrated the awful possibilities of such a condition as the present coal strike at Glace Bay. One after another, the Canadian Unions have gradually become affiliated with the great *headquarters* in the United States until, at present, there is possibly not one independent Canadian Union left in the west or middle east. Their dues go to the United States. If a strike is in progress there, they pay their share for its support. They cannot strike without permission from *headquarters,* and they must submit to the rules and regulations as laid down by *headquarters* or they are thrown out. If the conditions under which they work do not suit *headquarters,* or if, to facilitate the winning of a strike elsewhere, it matters not how well they may be satisfied themselves, when ordered they must strike.

In other words our whole industrial fabric has been honeycombed by American labor organizations. The backbone and sinew of our every industry is greatly in the control of foreigners. Our mechanics and laborers are under the dictation of foreign labor officials, and have not even control over their own actions.

There was a peaceful little corner up in the far north eastern portion of Canada, that had its own independent organization through which the members transacted business with their employers. The conditions under which they lived were satisfactory. They were contented with their hours and their wages. There was none of the underpaid and overworked cry that we heard of in Colorado or none of the poverty, want and destitution that we are told existed in the Scranton mines. It was a peaceful, happy, prosperous community that had been far enough away to escape the Yankee walking delegate. But the big coal strikes in the United States had developed a lot of well trained organizers and when things became all peace and quietness in the big coal centres there, there was no more work for them, unless they should hie to a virgin field and, as Cape Breton was the last great unbridled coal area, they chose it as their field of operation.

To those who understand the operations of these organizers, it is easy to realize how even in a peaceful community of satisfied workers, they can bring about strife, unrest and dissatisfaction. They are perfectly trained for their work, and the sowing of distrust and contempt for the employer, is just as much a profession with them, as is preparing plans with an architect.

They did not have wages or hours as a basis upon which to work. The P.W.A. had a satisfactory contract with the Coal Company, and the best of feeling existed between the miners and their employers. But these professional agitators are resourceful, they know every trait and weakness of the miner, they know how best to sow seeds of discontent in his untrained mind, and it is easy to conceive of how they proceeded to impress upon him the weakness of the P.W.A. and the greatness of the U.M.W. of A. They pointed out that while things might be satisfactory at present, if the company saw fit to throw them down, how helpless they would be in an attempt to fight for their rights with their provincial union and how strong they would be with the financial and commercial strength of the U.M.W. of A. with 130,000 members at their back.

Quietly and stealthfully did they work their subtle influence until they had succeeded in getting well organized with a goodly number of members in each locality until, eventually, the membership, with continued work, grew automatically through the influence of the newly enrolled converts.

Again the Dominion Steel and Coal decision, unquestionably gave these organizers much more capital with which to work. Can these walking delegates be imagined, going about endeavoring to make plain to these unsuspecting workmen, that when the contract with the P.W.A. expired in December next, in the dead of winter, the Coal Company would want to take a portion of their loss out of its employees, and that the P.W.A. would never be strong enough to put up a fight and that if they did not accept the company's terms, they would be thrown out of the company's houses in the snow, without work and with no possible chance to get work elsewhere? On the other hand they argued "if you come with us we will be strong enough to make the company make a contract with the U.M.W. of A. this summer, if they don't we will strike in warm weather; we have unlimited strike funds to fight with and will get you all back to work before the cold weather is here."

The result is well known. The U.M.W. of A. made a demand upon the Coal Company for recognition, with the result that the matter was brought before the Department of Labor; a Board of Arbitration was appointed and they gave their decision, which ruled that the P.W.A. had a contract with the Coal Company; that the men should stick by this contract and that there was no reason why the Company should break its contract with the P.W.A. in favor of an organization controlled at Indianapolis, Ind., the headquarters of U.M.W.A.

This decision, of course, the U.M.W.A. would not accept, and the strike that followed, showed how perfectly successful these foreign promoters of industrial strife had been, in sowing discontent and sedition in this once peaceful, contented little Canadian community of miners.

We relate these details only to show how easily our industrial equilibrium may be disturbed by Yankee organizers, *out of a job,* and to demonstrate how stealthfully this American labor octopus has gathered into its tentacles every labor organization in Canada, where it controls them at will.

Here is a once thriving, happy community of laborers thrown into a condition of wild disorder with 500 soldiers, to save life and property, camped on the ground, four thousand men out of work, and a great industry crippled by a band of professional Yankee trouble makers who want to take the seat of control from Sydney, C.B., to Indianapolis, Ind.

We do not question the right of labor to organize, for trade unions in many cases have had a tendency to improve the conditions under which men work. Men have a right, when they have a just grievance, to strike, and further are justified in using all peaceful and lawful means to gain their point. Every fair-minded man will concede that point.

But here are two countries, Canada and the United States, under two entirely different forms of government, each one striving to work out its own destiny. As nations, we have nothing more in common than has France and Germany, except that we speak the same tongue and there is no more reason why the United States should control our labor any more than there is a reason why they should control our customs tariff. But we have awakened, at last, to find that through our passive indifference or the unpatriotic spirit of our people, the control of our labor has passed into the hands of our industrial competitors; yes, to find that American labor officials have greater power over our workers than has our own government.

Could a condition be imagined whereby English labor officials would have control over the working bodies of the United States? No, the American is too independent and patriotic to permit of such a state of affairs.

It is argued that the Canadian Unions affiliate with those of the United States because it gives them greater strength. In the first place, that is a most un-Canadian contention. In other words, does the Canadian laborer wish to say to his employer, "You give me what I want or I'll bring force from the United States to make you give it to me." In the second place, Canadian labor is as strong, as compared with his employer, as the American is, as compared with his employer. The relative strength between the employer and the employee is the same.

We wish to reiterate that we are not opposed to properly conducted trade unions, they have become a very part of our industrial life, but this outside control of the very vertebra of our growth and prosperity, will not long hence become next to intolerable. Our legislators will be forced to find some solution of the problem, but in the meantime, *every American professional trouble maker who comes to Canada, for the sole purpose of sowing seeds of discontent and distrust among our workers, thereby crippling our industries and causing riot, disorder and ruin for the purpose of strengthening the American labor octopus, should be deported from the country as an undesirable.*

EDISON BELIEVES HE HAS OVERCOME THE OBJECTIONS OF THE CRITICS OF HIS FIRST ATTEMPT TO PRODUCE A $1,200 *POURED CONCRETE HOUSE.* - - - - - -

WIDE SPREAD INTEREST was created about a year ago by Mr. Thomas A. Edison's announcement that he had completed a model of a cement house which he proposed to erect by pouring thin concrete into a great set of iron molds. This house he maintained could be built in a day, and would cost but $1,200.

Had a man with a reputation less known made such a startling statement, the scientific world would have laughed. But when Edison, "the Wizard," the man who had made men sing and talk after they were dead, made this extraordinary announcement, engineers and architects looked at one another in bewildered amazement and wondered if the great Edison's mind was starting to fail, or had it really produced another phenomena.

The model, with description, was published broadcast, and it was plain to be seen that it was not the product of the brain of an old man grown childish; but, while not perfect, it was a marvellous creation of a genius.

After the engineering and architectural professions had time to give some thought to Mr. Edison's problem, criticism came from all sides. The architects maintained the design was anything but artistic, and that the idea was impracticable because several houses would have to be erected in one locality, and that the uniformity of design would be most objectionable.

The engineers first maintained it would be impossible to pour the concrete down through the molds, so that the mixture would be uniform at the time of setting, and that it would be impossible to fill the complete set of molds when fastened together, and thus insure a perfect structure. Another objection was that the cost of transportation of the molds and the cost of equipment, would be so great that the house could not be erected for much less than twice the amount claimed by Mr. Edison. The objections were many and varied. In CONSTRUCTION (May, 1908), we published an illustrated description of this first attempt, with criticisms by Mr. E. S. Larned, of Boston, an eminent cement engineer.

However, Mr. Edison was not daunted. He was determined to make possible a $1,200 solid concrete workman's house, moulded as it were in one solid monolithic form. One that would be everlasting, fireproof and vermin-proof.

To this end he has completed another model, guided, to a great extent, by the suggestions thrown out in the criticisms of his first attempt. This model, with descriptions, we publish elsewhere in this issue, and it looks almost as though Mr. Edison has broken the back of his problem.

The design, for a small cement house, is a good one, and if, as Mr. Edison says, he can produce six different designs of houses from the one set of molds by a simple manipulation of the several parts, he has overcome the principal objection of the architects. It may still be argued, however, that even with six different designs, there will be a lack of individuality such as would be required to make a picturesque community, but it must be remembered that these are simply to be workingmen's houses, and all will agree that there are few workingmen's communities that would, in any point of comparison, come up to a section built up with houses of the character Mr. Edison proposes.

Mr. Edison has found further, that it will take fourteen days instead of one, in which to complete a house. This, we believe, sounds more plausible.

Whatever defective points his present scheme may have, it is a fact beyond dispute that Mr. Edison seems to be working along the proper lines to produce a livable, sanitary, and fireproof house for the workingman, and, if he solves this problem, he will have given modern day civilization an invention that for actual utility and breadth of usefulness will equal, if not exceed, any of all his wonderful accomplishments.

Y.M.C.A. GIVE PREFERENCE TO UNITED STATES ARCHITECTS, MATERIALS AND APPARATUS IN THE ERECTION OF THEIR BUILDINGS — MONEY CONTRIBUTED BY CANADIANS SENT ABROAD. - - - - - -

THOUSANDS OF DOLLARS have recently been subscribed by Canadians, in various parts of the Dominion, for the erection of Y. M. C. A. buildings. These vast sums of money have been donated, principally by large manufacturers and merchants in our larger cities, with a liberality best shown by the fact that more than $300,000 was raised in Montreal within an exceptionally short period of time. In Hamilton a few days ago, $55,000 was raised, and we understand that similar campaigns are contemplated in several other Canadian centres where new Y. M. C. A. structures are to be built.

The Y. M. C. A. cause is a good one and worthy the patronage and support of every Canadian citizen, who is in sympathy with the work they are doing. No one will gainsay the fact that the clean, wholesome conditions, under which thousands of young men are permitted to congregate in well-appointed quarters where every care is being exercised to uplift and develop them, both physically and mentally, should be encouraged and supported.

But would it not seem reasonable, if these structures are made possible through the liberality of Canadians, that in their erection, as much money as possible should be spent with Canadians? Or is it right, is it fair, or is it honorable to cart this money, these contributions of Canadians and Canadian institutions, over to the United States to be spent in channels recommended by the great headquarters there—the same channels in which they have been accustomed to spend the money used in the erection of their buildings across the border?

All the recently erected and proposed Y. M. C. A. structures in Canada have been planned by an American architectural firm, and the appparatus, appliances and fixtures have, in most cases, come from the United States.

One instance recently came to our notice where a manufacturer who had been a liberal contributor to the Y. M. C. A. for many years, was unsuccessful in getting even consideration for his product, a product that has been installed in some of the largest buildings in Canada, and has given excellent service. But the United States architect had been accustomed to specifying an American made product and, as a simple matter of course, would consider nothing else. This, we maintain, is absolutely wrong, and should not be tolerated by so worthy an institution as the Y. M. C. A.

It may be true that there are architects in the United States who have had more experience in erecting Y. M. C. A. structures, than our Canadian architects have, but it would be foolish to say that we have not architects who are equal to the task of planning buildings that involve intricate problems of infinitely greater magnitude than do Y. M. C. A. structures. More than this, suppose it were true that a trifle better plan could be obtained from an outside architect, suppose that a trifle superior equipment could be obtained in the United States, should not some consideration be given to the manner in which the money was obtained and the source from which it came? Does the Y. M. C. A., supported by Canadian contributions for the benefit of the Canadian young man, require a better building than we can build?

He who seeks charity should be charitable. He who profits by the generosity of others, should himself be generous. He who would appeal to the sentiment of others should himself permit his actions to be tempered by sentiment. He who preaches that "it is more blessed to give than to receive," should show himself worthy of some of these showers of blessing.

Let it be understood that we wish in no way to detract from the great work being done by this organization, nor do we believe that it is unworthy of the greatest suppport it can be given, but we do maintain that an institution that has been treated so liberally by our newspapers, our manufacturers, our business and professional men, should be more considerate of their benefactors.

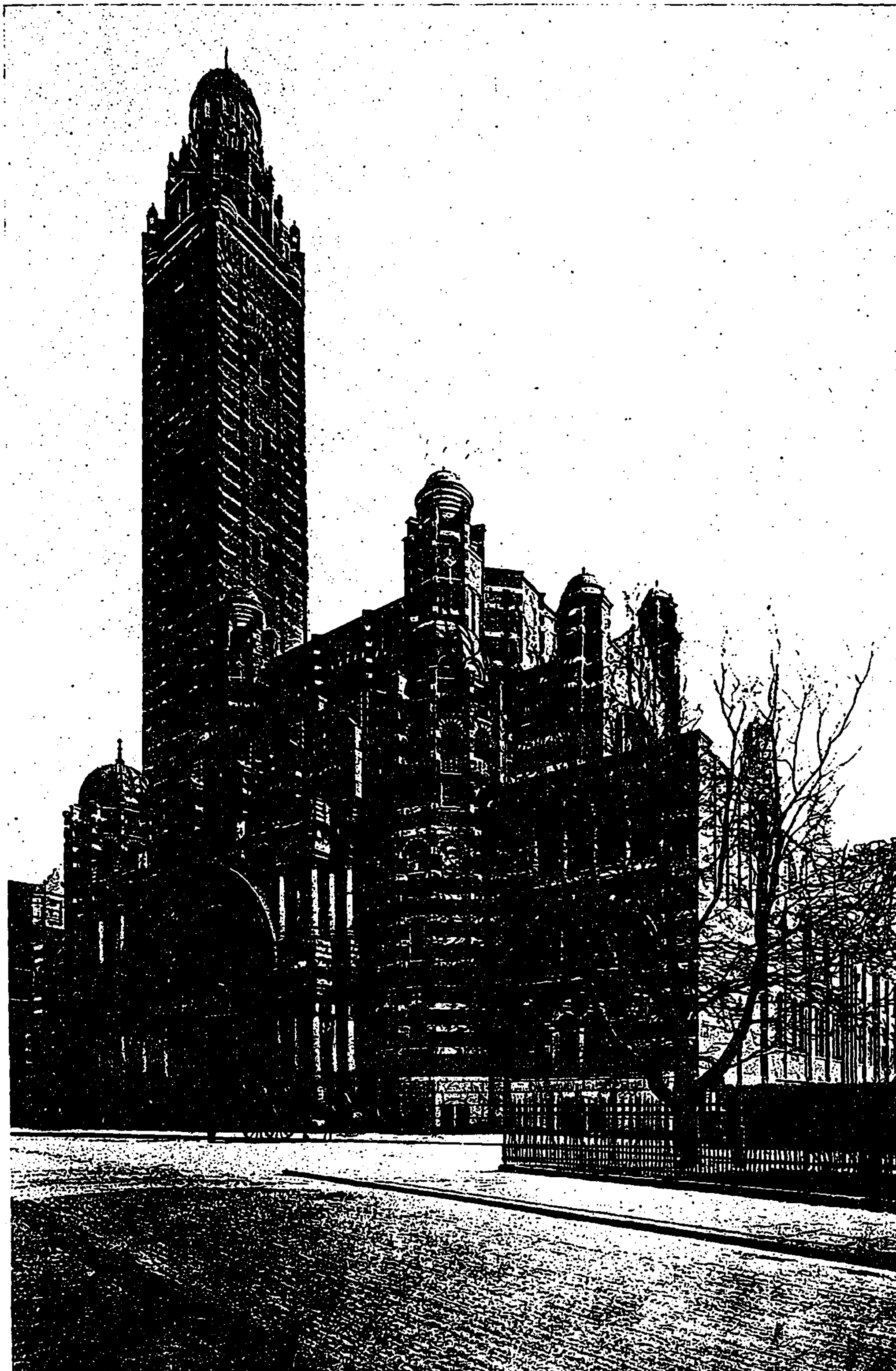
RELATIVE COST OF BUILDING TO-DAY AND TEN YEARS AGO—APPLICATION OF SCIENTIFIC METHODS OFFSETS INCREASED COST OF LABOR AND MATERIALS. - - - - - - - - - - - - -

WHETHER architect, builder or owner, the natural answer to the question as to the relative cost of buildings to-day, as compared with ten years ago, would be that they were very materially higher; but a careful consideration of the subject leads inevitably to a modification of this view. If by reason of more stringent laws the accommodations of a certain class of buildings are made more expensive, it does not necessarily follow that the cost of the building has been increased through an increase in the price of materials or the cost of labor; if the man earning from $3,000 to $5,000 a year demands in his dwelling two good bathrooms and steam heat, where he was formerly content with a hot air furnace, one toilet and a tin bathtub, that increase is not chargeable to the increased cost of labor or materials; if by reason of insufficient renting space in a given locality the rentals per square foot for offices increase 25 per cent. and owners lavish marble, cooled distilled drinking water, and other things to attract tenants to new buildings, requiring an additional outlay, that is not chargeable to the increased cost of labor and materials.

On the other hand, in both the architecture and engineering of buildings, the last ten years has seen a vast improvement—designs are very much simpler and better, architecture is more truly the science of ornamented construction, the economical use of the materials of construction has greatly advanced, and engineering knowledge of limiting economic conditions has been greatly extended. Building problems are receiving ten times the study that they received ten years ago at the very lowest estimate, and these influences have combined to decrease the amount of material and labor required to secure given accommodations.

After having made a comparison of costs of a number of buildings erected ten years or more ago with similar buildings erected recently, a prominent engineer states that he found that by the application of intelligent, enlightened design the building of to-day to accommodate a given number of guests, if it be an hotel, or to give a certain number of square feet of rental floor space, if it be an office or loft building, costs practically but little more than the corresponding building of ten years ago. While it is true that the wages paid to labor have materially increased in amount, it is also true that labor, when unhampered by union restrictions as to the amount to be accomplished, will do enough work to make the unit cost for labor no greater than it ever was.

It was further stated by this engineer that in making the comparison above spoken of he found greater differences in cost between practically exactly similar buildings (by which is meant buildings renting the same utilities for the same gross amount) than existed between similar buildings erected ten years apart, but both intelligently designed, thus showing that it is incumbent on the owner, more to-day than ever before, to choose his designer, whether it be engineer or architect, wisely.



The West Front, New Catholic Cathedral at Westminster, London. A striking facade essentially Byzantine in character. Note the enormous arch, wider than that of St. Marks, Venice, and the somewhat excessive detail and decoration. Restrictions of "Ancient Lights" limited the architect to a low elevation, increasing the difficulties of treatment. Mr. John Francis Bentley, Architect.

LONDON'S NEW ECCLESIASTICAL EDIFICE.—Catholic Cathedral Erected at Westminster a Striking Example of the Early Byzantine Style.—Interior Rich in Beautiful Marbles and Mosiacs.—Absence of Colored Glass in Windows.

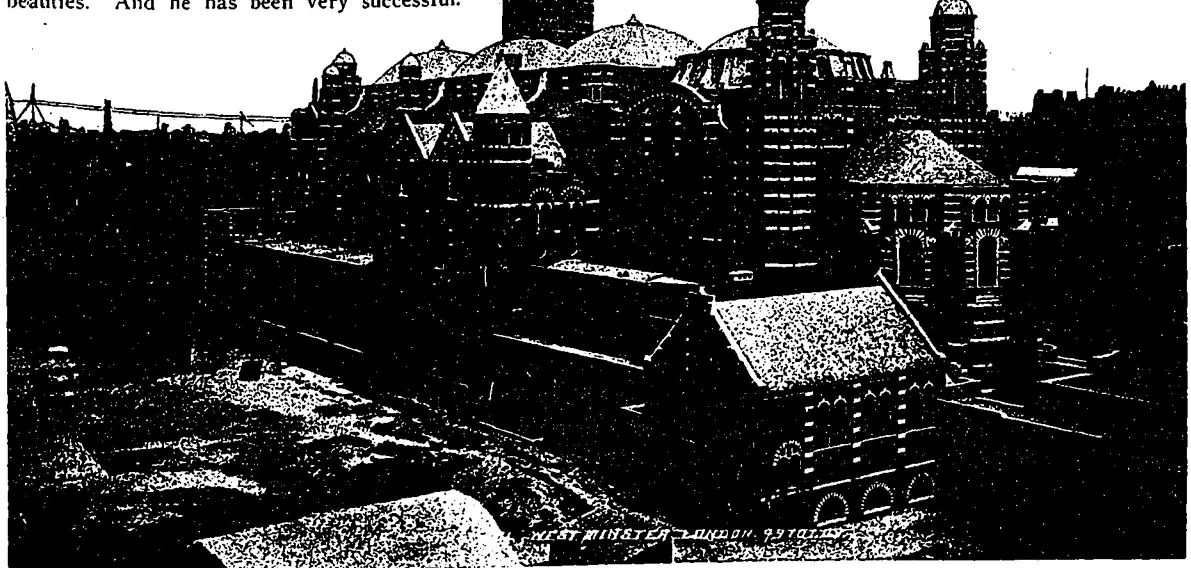
By HERBERT M. CLARK

THE CREATION of a building worthy to represent fully the cosmopolitan faith of the Catholic Church in "the immense capital of a world-wide empire of power and influence." Such was the dream of Cardinal Wiseman, who, shortly before his death in 1865, expressed the hope that a Cathedral might be erected for the Metropolitan See of Westminster. The same year, the Catholic body, presided over by his successor, Cardinal Manning, pledged itself to build a Metropolitan Cathedral as a memorial to Cardinal Wiseman, a project which obtained the approbation and special blessing of His Holiness Pope Pius IX. Cardinal Manning labored to further the work; first, however, providing Catholic schools and institutions for the poor children in the diocese and raising funds for the acquisition of the site. Before his death the site now occupied by the Cathedral, which lies a little back from Victoria street, and is the site of the old Tothill Prison, was purchased after various preliminaries, at a cost of £55,000. The late Cardinal Vaughan, who succeeded him, brought the project another step towards materialization when, on June 29, 1895, he laid the foundation stone of the Westminster Cathedral. The contrast between the humble chapel of the beginning of the nineteenth century and the magnificent cathedral to-day structurally complete, affords a remarkable illustration of the expansion of the Catholic Church in Great Britain.

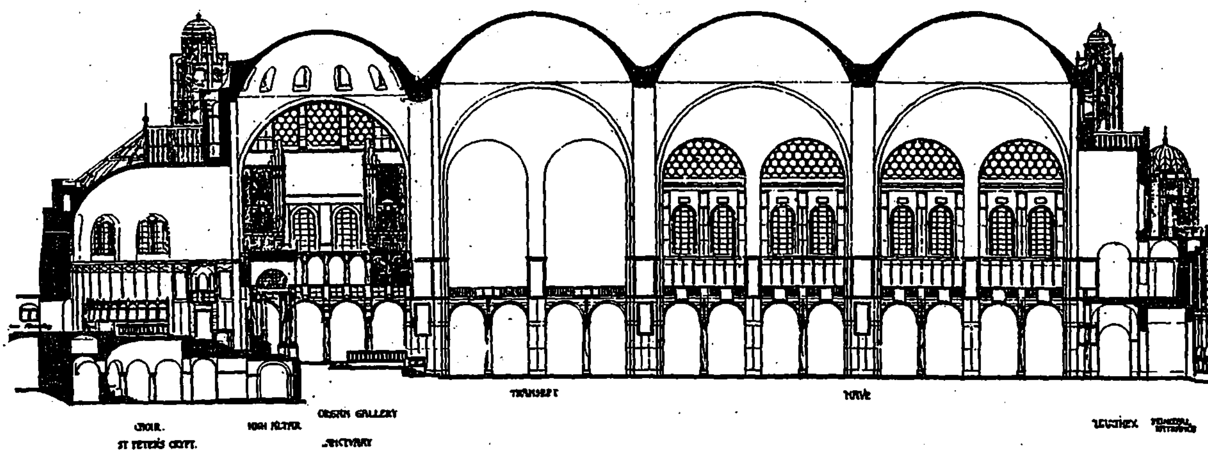
As to the style of the architecture, there had been much divergent opinion, Cardinal Vaughan favoring early Byzantine, and few will doubt the peculiar fitness of the selection of this style, for Byzantine Art was the first distinctly Christian Art; moreover, the possibilities of Byzantine had never been demonstrated in Great Britain on so vast a scale. The architect, the late John Francis Bentley, who came of Scottish family, and who, it may be mentioned, had originally favored a Gothic Cathedral, was hitherto untried in the Byzantine style, and, before preliminary plans, he went abroad to study its subtleties and steep himself in its beauties. And he has been very successful. His task was difficult. A great cathedral was to be built, the site was within a stone's throw of Westminster Abbey, and something to show, something striking, was expected of him. He might have made certain changes had time permitted reflection, or had some modifying influence been brought to bear on his designs, but his patron, Cardinal Vaughan, gave him sole charge. The speed with which this enormous structure was completed, in less than eight years, is one of its features. That there is no sign of rush or haste, no useless expenditure on the rectification of errors, but in every part an exquisite finish to even the minutest detail, is a tribute to the thoroughness of the architect. A study of the ground plan and sectional elevation and a consideration of the "shut in" nature of the site, reveal the difficulties besetting the designer and the boldness of his conception.

The length of the building is 360 feet and the greatest breadth 156 feet. With such vast surfaces of brick, one is tempted to think that a simpler design might have been more impressive, especially as one is compelled to view the building from nearby (the exigencies of space render this a necessity, as apartment houses, etc., surround the site closely). A distant view, were it possible, would perhap give the lines more beauty than is apparent at close quarters. When examined from the south-east corner, which point affords the most open view, the lines appear broken up and dispersed. The cupolas of the nave, the gables of the transept, the roofs of the chapels, and a multiplicity of detail everywhere, produce a restless, almost a gay effect, which does not convey a feeling of solemnity, whilst the all-pervading layers of stone which stripe the brick, add to the freshness of the general coloring. This showy effect will doubtless be toned down somewhat when the brick is "weathered" by the tempering London atmosphere. Nevertheless, the view of the whole structure from any point is striking.

The main front is very ornate, perhaps too ornate, the lavishness of detail being accentuated by the "stripes"



The Cathedral as seen from the south-east. This view well illustrates the vast dimensions of the building, which is 360 feet in length and 156 feet in breadth. The cupolas, gables and windows produce a busy effect. Note the windowed dome over the Sanctuary. The south wall of the Sacristy projects beyond the Cathedral walls.

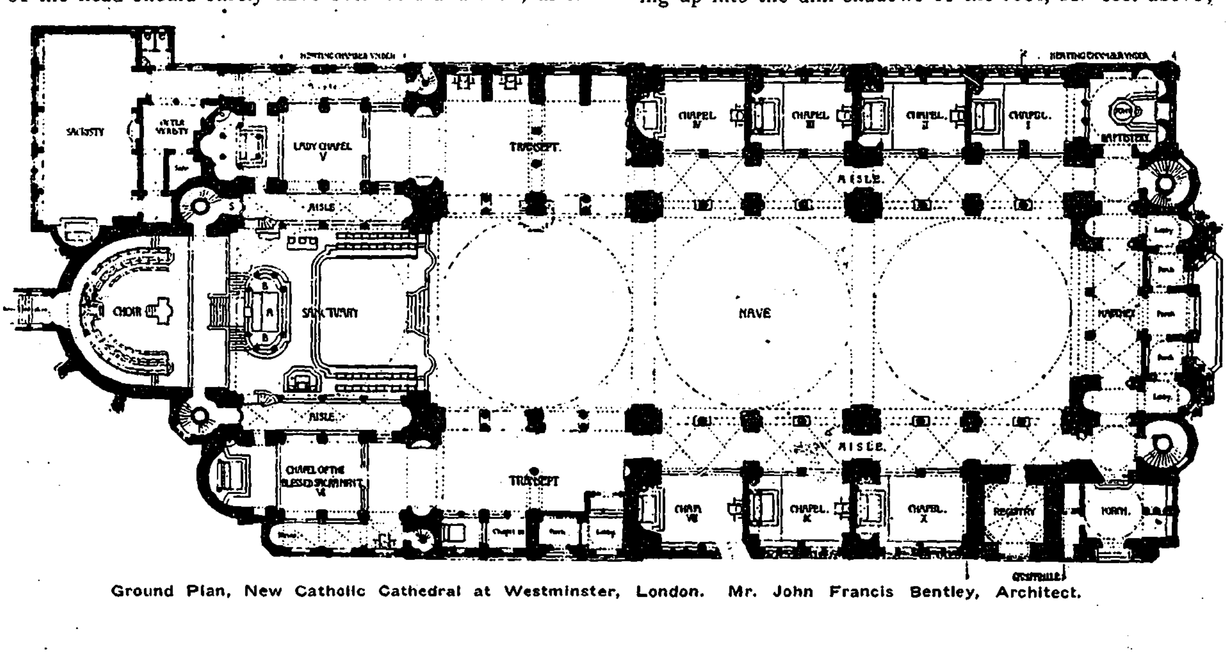


Longitudinal Section, New Catholic Cathedral, Westminster, London. Mr. John Francis Bentley, Architect.

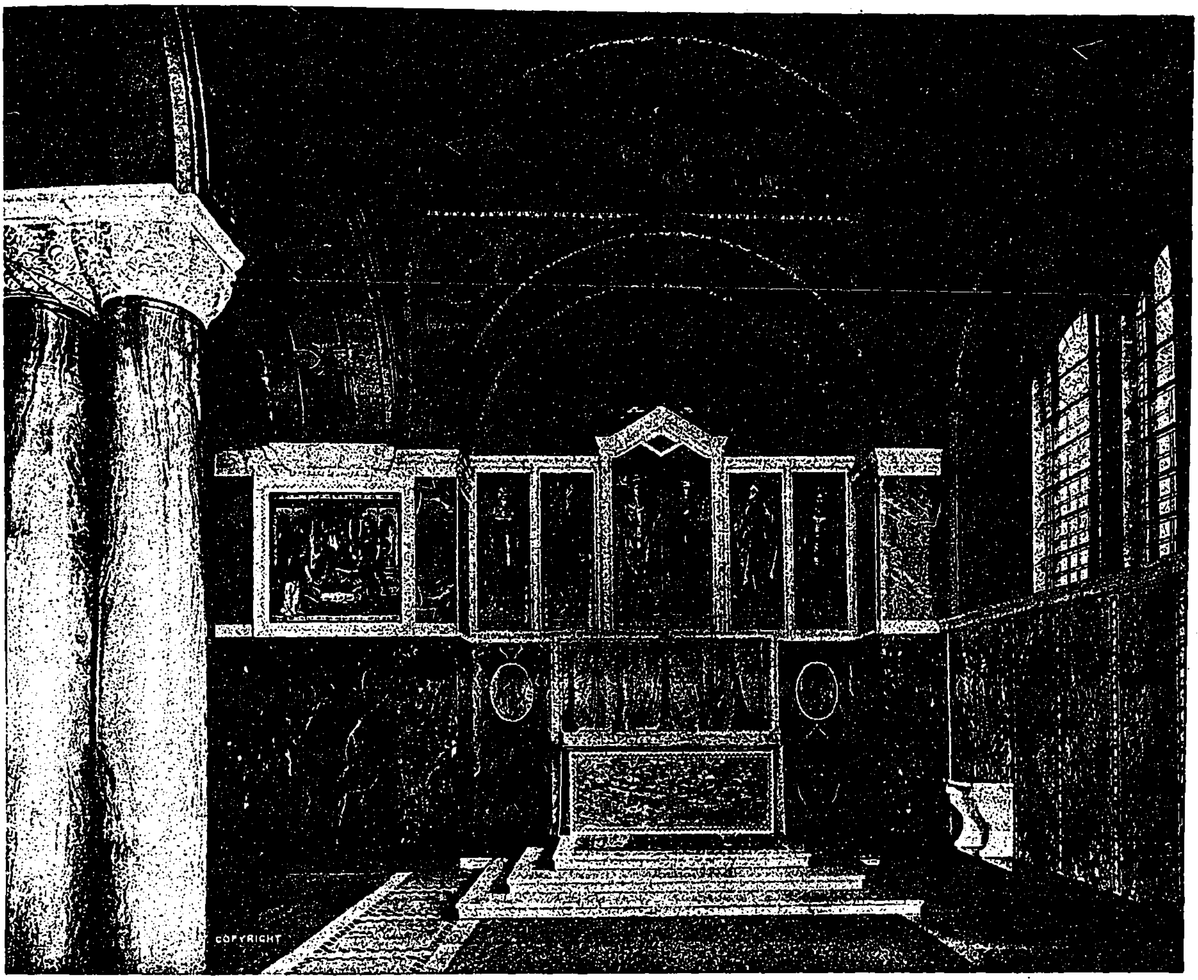
which are in great evidence. Indeed the excess of detail has a distinctly marring effect here. The medallions on the pillars of the arch might well have been omitted, as the effect of "crowding" which they produce on the pillars of the lower tier detracts from the balance of the whole arch. Observe in the illustration, this arch, which encloses the three entrances. Its enormous size leads one to picture it supporting some towering mass, instead of which it carrie but a course or two of stone and brick, for which such vast dimensions are not structurally essential. Further, the series of mouldings which form the arch project from the wall, thus demonstrating the arch to be purely ornamental. It must, however, be remembered that here perhaps more than anywhere, the architect was hampered by such restrictions as "Ancient Lights." A glance at the longitudinal sectional elevation shows the nave to be considerably higher than the west front, the reduced height of the latter being necessary in order to conform with the requirements of the law. Above the arch is the inscription "Domine Jesu Rex et Redemptor per Sanguinem Tuum Salves nos."

At the north-west corner stands the much criticized Campanile, or St. Edward's Tower. The usual purpose of the Italian campanile is to hold a bell. This tower, however, when viewed from a distance, seems far too delicate for such a purpose. Again, when seen from nearby, the courses of stone and brick crossing horizontally, break the vertical lines and detract considerably from the effect of lightness and height. At such a height, too, the treatment of the head should surely have been bold and free; as it is, the detail is lost and at a distance one sees an attenuated tower, the top of which is apparently merely rounded. Possibly it was designed solely to draw attention to the Cathedral at its base. In this it is successful. Rising high above the surrounding buildings, it dominates the city about it, symbolic perhaps of the militant spirit of the Catholic Church, and assuredly an achievement for that church in a Protestant country. In passing it may be remarked that the Campanile, 280 feet high, though 40 feet shorter than the nearby Westminster clock tower, appears higher owing to its "thinness."

The voice of criticism may be heard without, but it is silent within. The interior is magnificent, the predominant impression being the overwhelming effect of space. This is due to simplicity of treatment and a masterly disposition of the lighting. The nave consists of a series of gigantic piers, which rise until they curve into stately arches, subdivided by smaller ones. The depth of these arches is immense and the lines are everywhere simple and dignified. The gallery is supported on open arches and columns; from these spring the long arched windows, and above them are the lunette windows, the whole being contained within one of the deep arches above mentinond. The lighting is a triumph. There is no "colored" glass; instead the artist-architect has given delicate green cathedral glass, and through it filters a silvery light, which, combined with skillful window-grouping, gives light and shade in exquisite proportion. Standing at the west end of the nave, one sees the wall of concrete and brick towering up into the dim shadows of the roof, 117 feet above;



Ground Plan, New Catholic Cathedral at Westminster, London. Mr. John Francis Bentley, Architect.

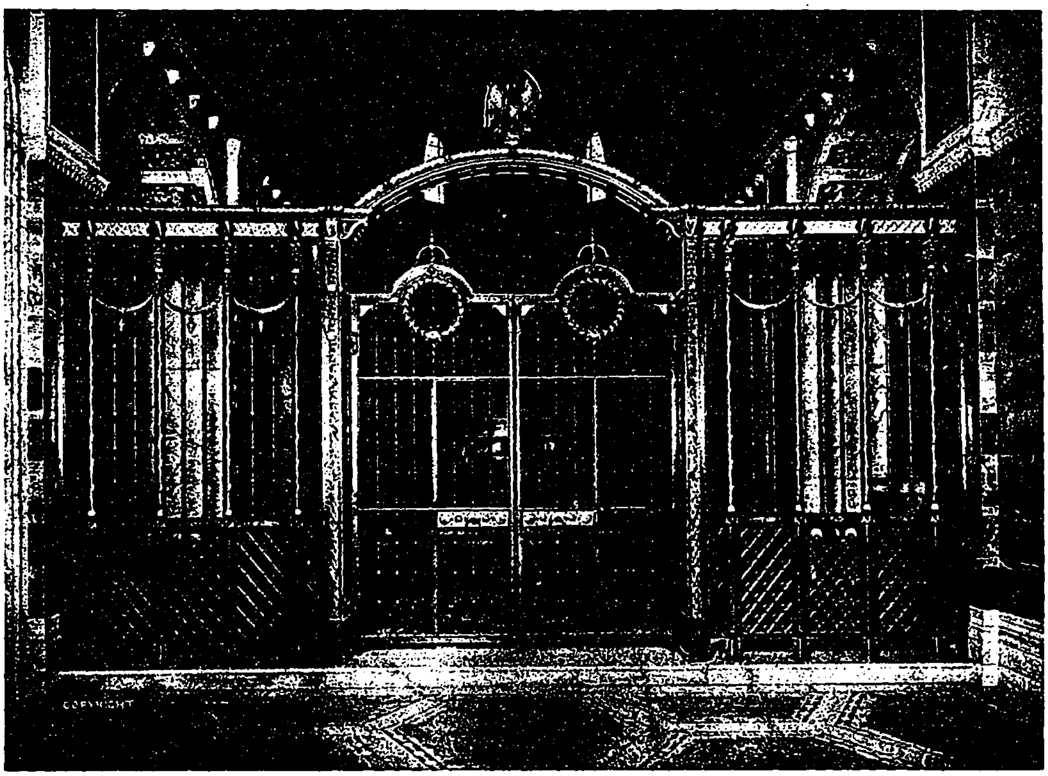


St. George's Chapel, East End View, New Catholic Cathedral at Westminster, London. This interior is remarkable for beautiful mosaic work and different colored marbles. Note the simplicity of the altar, the lines of panelling, and dado of marble. Mr. John Francis Bentley, Architect.

and then the gaze is carried to the east end, where, the dome over the sanctuary being "windowed," the baldachino is flooded with light. The whole effect is solemn and impressive to a degree. There is one harsh note. An enormous cross, thirty feet in length by twenty-two feet in breadth, is suspended in the nave. One associates one's ideas of the dimensions of the cross, with the dimensions of the human body, and with these dimensions in mind, a

The Font, New Catholic Cathedral at Westminster, London. Composed of various marbles, panelled and inlaid. Note that the panels bearing the Cross are of similar design to the lower lights of Baptistry window. This harmony of detail is continued throughout the whole building. Mr. John Francis Bentley, Architect.

St. George's Chapel (West End) and Baptistry, New Catholic Cathedral at Westminster, London. A most successful treatment, the beautifully proportioned arch of white marble giving a highly satisfactory view of the Baptistry. Note the excellent windows and disposition of lead and glass lights, which are well designed and proportioned. Mr. John Francis Bentley, Architect.



Chapel of Blessed Sacrament, New Catholic Cathedral at Westminster, London, showing the Screen and Gates. A fine example of modern metal work, the design being beautiful and the execution perfect. Mr. John Francis Bentley, Architect.

comparison of the size of this cross and of its immediate surroundings, is inevitably made, which naturally diminishes the proportions of the whole interior. The idea of the cross in this most prominent position is excellent, but how much more effective would have been a cross of normal size.

A magnificent double colonnade or ambulatory runs all round. West of the transept on the south side are the baptistry and four chapels, and on the north an entrance porch and three chapels, the space of the fourth being occupied by the base of the tower. East of the transept there are also two chapels, north and south, and still further east, flanking the apse, the outer sacristy and sacristy. The south wall of the latter projects beyond that of the cathedral.

A study of the plan, or better, of the building itself, sufficient view of the baptistry. The baptistry window is a good example of the beautiful window work throughout the cathedral. It may be studied with advantage. Not only are the lights well designed and proporioned, but the disposition of lead and glass in each light is most satisfactory. The decoration of the font includes crosses on marble panels of the same design as these lower lights.

In the chapel of the Holy Souls, above the altar, the lines of which are again simple and very effective, is a splendid example of marble panel work, and above this again are symbollic illustrations in mosaic of the "Triumph of Life Over Death." The treatment of the dado and flooring is worth careful attention, indeed, the whole chapel demonstartes the decorative possibilities of marbles. The chapel of the Blessed Sacrament, which lies on the north side of the choir. is fronted by a screen

Chapel of Holy Souls, New Catholic Cathedral at Westminster, London. An example of the decorative possibilities of marble. Note the effective designs of floor and dado, and the unique treatment of Altar, a splendid piece of marble panel work surmounted by mosaic work illustrating the "Triumph of Life Over Death." Mr. John Francis Bentley, Architect.

shows the excellent proportions obtained in all parts, ground space being economized without any resultant crowding. Note that the heating chambers are placed on the south, which is the more exposed side.

The decoration of three of the chapels is practically complete. The designs reveal a fine appreciation of the values of line and color. Notice in the illustration the really exquisite mosaic work in St. Gregory's chapel, the simplicity of the altar, and the beautiful effects obtained with the different colored marbles. The treatment of the west end of the same chapel (illustrated) is most successful; the lines of the white marble screen are simple and the whole scheme is perfectly proportioned to permit a and gates of great beauty. Artist and metal-worker have rarely produced finer work than this.

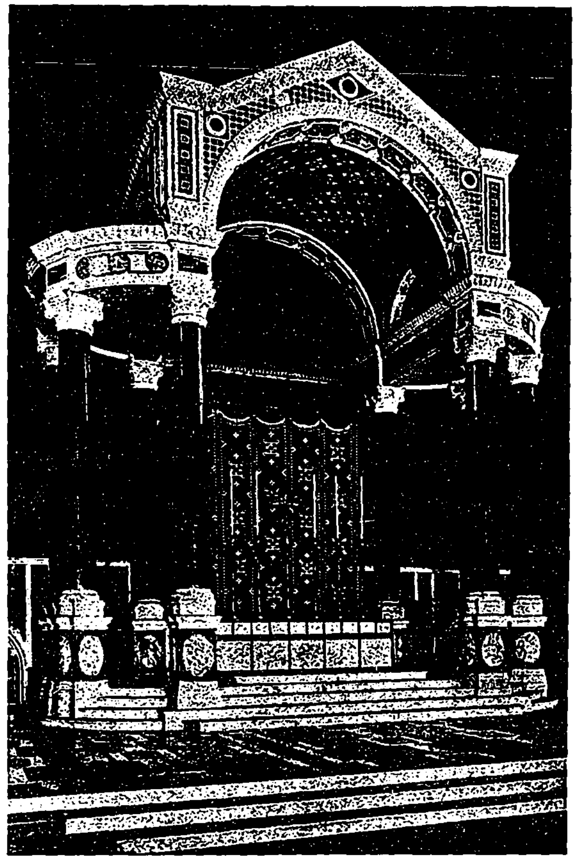
The altar is a solid block of polished gray Cornish granite, weighing fourteen tons; the baldachino surmounting it is an exquisite piece of work, with his designs for which the architect was especially satisfied. It is of white marble, carved, panelled and richly inlaid with lapis-lazuli and supported by eight monolith marble columns of dark color and wonderful polish. With the light from the southern windows streaming upon it, the effect is extraordinary. Probably in no other building in Europe have so many exquisite marbles been assembled, or such care bestowed upon their selection. The grain and texture indicate the many different sources of their origin. In the Byzantine Church of Sancta Sofia at Constantinople, Mr. Bentley had seen some marble columns which fulfilled his exacting requirements, but all trace of the quarry whence they came had been lost for centuries. Chance revealed a description of this quarry, which was located and reopened, and produced many of the beautiful monoliths in the building, that compel admiration by their high polish and delicate bloom-like coloring. During building operations all marble columns were coated with wax to preserve the polish.

A stone flooring was provided in the plans and was laid according to design in the northex. It was not, however, completed in the nave, where a floor of hardwood, more suitable to the cold northern climate, was laid, which harmonizes well with the brick walls in their present state. Eventually the wall surface of the whole interior is to be faced with marble, painting and mosaic First a dado of paneled marbles forty feet in height, and above this, mosaic. Mr. Bentley's scheme for this latter decoration provides for a history of the church. A century will doubtless elapse before all this is completed. The cost of such work is heavy and the executio 1 slow, since competent workers in mosaic are few. Indeed, Mr. Bridge, who had charge of the mosaic work, actually organized a school of women art students for mosaic. Much of this wall decoration has been completed in the sanctuary and it affords some measure of the ultimate appearance of the interior.

The Nave, New Catholic Cathedral at Westminster, London, with its extraordinary effect of space and vastness. Simplicity of treatment and excellent lighting are two of its principal features. The piers and arches are gigantic, but perfectly balanced. Note the effect of the light on the Baldachino from the dome of the Sanctuary. The Cross mars somewhat by excessive size. Mr. John Francis Bentley, Architect.

A critical analysis of this building would specify, as its gravest fault, the style of the architecture; for Christian though it be, the Byzantine style, evolved in a land of sunshine and strong lights and shadows, is least effective in a dull, northern climate. Picture the exterior of this cathedral, distant, in the shimmering heat of a southern sky, and you have the natural atmosphere. This knowledge increased the difficulties of the architect, who has, nevertheless, created a beautiful monument. The thoroughness of his work is apparent throughout, from the cross at the top of the campanile to the well lighted crypt chapel beneath the choir.

The Westminster Cathedral is the most important



The Baldachino, New Catholic Cathedral at Westminster, London. An exquisite canopy of white marble, carved, panelled and inlaid with lapis-lazuli, and supported by eight monolith marble columns. The Altar beneath is a solid block of granite weighing fourteen tons. Every marble column in the building is a monolith. Mr. John Francis Bentley, Architect.

work of the Catholic Church in England since the Reformat'on and, architecturally, the greatest ecclesiastical production for centuries.

THE VALUE OF PICTURE POSTALS to an engineer (and this may also apply to the architect) may not appear very marked at first thought, but in a paper before the Municipal Engineers of the City of New York on improvements of the appearance of municipalities, Mr. Charles W. Leavitt, Jr., stated that many valuable hints as to the design of structures from the aesthetic point of view might be gained at a very small expense from a study of the French, Italian and Austrian postals. He advised all engineers engaged in the design of public works to form a collection of these cards, on account of their information regarding harmonious and pleasing design. While in Paris he obtained several thousand cards showing views of the French streets, parks, lamp-posts, bridges, buildings, drinking-fountains and other structures which help to make or mar a city's appearance, and these cards have been of considerable assistance to him in his practice in this country by furnishing suggestions for the treatment of public works.—ENGINEERING RECORD.

REINFORCED CONCRETE IN BUILDING CONSTRUCTION.*
—Early and Modern Cements.—European and American Systems.—A General Treatise on the Principles and Methods of Construction as Applied to Various Work.

By EMILE G. PERROT, Assoc. A.I.A., Mem. A S.C.E.

THE OLD TIME-WORN ADAGE "There is nothing new under the sun," has never found a better application than in the revival of concrete construction. It is now an old story with us as to the use the Romans made of concrete in their aqueducts, bridges and buildings. Of course, the modern use of concrete differs from that of the Roman just as modern engineering science has outstepped the ancient. Hence, we must expect to see numerous innovations in the application of concrete, especially in its latest development as reinforced concrete.

Violet-le-'Duc, in his dictionary of Architecture, gives illustrations of the early application of concrete, not only by the Romans, but also by latter civilizations, notably in France, where he shows the use of concrete for window lintels in a chateau at Carcassonne, built at the end of the eleventh century.

Plain concrete is nothing more than a kind of masonry. Ordinarly rubble masonry composed of small stones and concrete composed of large stones may come under the class of either masonry or concrete. The concrete employed by the Romans in many cases, especially for buildings, was veneered, sometimes with brick, sometimes with stone. Our modern Roman shaped brick owes its origin to the Roman protolype, which was a long, thin brick like our modern one, but with one side pointed so as to better bond with the concrete backing.

EARLY AND MODERN CEMENTS.

The important constituent, however, of both the rubble and concrete, is the binding agent or cement. The Romans used a natural cement, while in modern practice, we use Portland Cement, and it was not until the manufacture of cement in Belgium, France and Germany, in about the year 1860, that reinforced concrete was attempted.

The use of lime as a binding agent for stone, brick and other materials was known in very early times. How long this preceded the use of natural cement, or when the latter was introduced is unknown. It is known, however, that over 4,000 years ago the Egyptians made natural cement having decided hydraulic properties, and over 2,000 years ago the Romans made a similar cement of excellent quality, which they used for foundations, piers, sewers, water pipes, etc. Prior to this an aqueduct was built at Carthage over 70 miles long, and which at one point crossed a valley where natural cement arches over 100 feet high were used. Some of these are still standing, a testimony to the high quality of cement manufactured at that date.

In Peru and Mexico, walls have been found so old that the rock has been worn away, leaving the cement mortar projecting from the joints. The time of their construction is only a matter of conjecture.

The beginning of the modern practice of cement making is ascribed to John Smeaton, the engineer who constructed the Eddystone Lighthouse in the English Channel. While looking for a mortar for that purpose, he discovered, in 1756, that impure limestones containing a certain amount of argillaceous matter possessed decided hydraulic properties when calcined.

The discovery grew out of the necessity of securing a strong mortar that would withstand the influence of sea water and also the mechanical action of the violent storms to which the lighthouse was exposed. The problem was successfully solved by Smeaton, who, after testing the various limestones of England, established the principle that a limestone that, when dissolved in hydrochloric acid, yields a residue of from 15 to 25 per cent. of solids, will, when mixed with sand, harden under water. This residue, which is mostly silica and alumina, practically represents the chemical constituents of the Roman pozzuolana.

As a result of Smeaton's discovery, search was made all over England for hydraulic limestones, and among others found were liver-colored lumps or nodules of natural cement rock, discovered by Parker in 1796. From these the first natural cement known to commerce was produced, and the name of Roman cement was given to it, because its chemical composition was about the same as that which had become famous among the Romans. This cement very much resembles the Rosendale and other natural common cements found in the United States. This discoverer of natural cement involved a very simple process of manufacture, and is still adopted in the production of many thousands of barrels of light-burned hydraulic cement made in the United States to-day.

The first Portland cement made in America was by the Coplay Cement Company, at Coplay, Pennsylvania. David O. Saylor, the president, conceived the idea of making Portland cement from the argillaceous limestone from which they were making natural cement. Early in the seventies, he produced a cement that showed a tensile strength equal to the imported, but which, after a time disintegrated. Saylor's work was of the experimental and practical order, and realizing the necessity for a study of the chemical composition of his materials, he employed John W. Eckert, a graduate of Lehigh University, and to him is due the credit of demonstrating the adaptibility of this new kind of material to Portland cement manufacture. This marked the beginning of the Portland cement industry, and from the hundred of acres of this material in the Lehigh Valley and New Jersey district, thousand of barrels of cement are being made daily. Portland cement is also made in other parts of the United States, but of different materials.

INVENTION OF REINFORCED CONCRETE.

With the growing favor of plain concrete in construction, and the knowledge of its constitutional infirmities, it is but natural that the recent rapid development of concrete reinforced with bars of metal distributed throughout the material should have been employed to overcome these weaknesses. So successfully has this been attained, that the introduction of reinforced concrete marks a new epoch in the history of building, the possibilities of which seem unlimited.

The invention of reinforced concrete is generally attributed to J. Monier, a French gardener, who, in 1868, constructed flower pots with concrete strengthened with a metal network in order to reduce their thickness. This modest beginning was the starting point of numerous other applications.

At the Paris Exposition of 1855, however, there was exhibited a boat constructed on this system by Mr. Lambot. In America the first example of this construction was in the year of 1875, when W. E. Ward constructed

*Paper read at Toronto before first annual convention of Canadian Cement and Concrete Association.

a house of concrete in which the floors were reinforced with bars; but it is to E. L. Ransome that we owe the use of reinforced concrete on this continent.

PRINCIPLE OF CONSTRUCTION.

The principle of this construction as used for supporting members in buildings, is based on the following facts:

Every simple beam, loaded either uniformly over its length or concentrated at any point thereof, is in compression at the top and in tension at the bottom.

By using steel rods of the proper area and at the proper location to resist the tensile stresses, and arranging the concrete so as to resist the compression, the beam will be in equilibrium, as the resistance of concrete in compression is so much greater than it is in tension, the latter being of a low value, no dependence is placed upon the concrete to resist the tensile forces, sufficient area of steel being introduced to resist these strains. The force of adhesion between the concrete and the steel is, however, sufficient to transmit the internal stresses across the section of the beam, so that the fundamental principle of the theory of the beam is applicable to this system of construction the same as to a beam composed of a homogeneous material.

EUROPEAN SYSTEMS.

Of the European Systems, the Monier System was the first to be used on a large scale. The slabs are reinforced in both directions and supported upon iron beams. The Cottancin System was patented in 1889 in France; and consists of wover wire.

The Hennebique System dates from 1879 and is used for beams, slabs and columns. This system was not brought out until 1892. Mr. Hennebique was one of the first to introduce the reinforced concrete beam, although Coignet and Cottancin in France, Moller in Germany and Ransome in America introduced this method at about the same time.

The Moller System, brought out by Professor Moller of the Polytechnic School of Brunswick in 1894, is used for floors and bridges. In this system use is made of a fish-bellied beam supporting a slab reinforced with rolled beams.

The Bonne System, introduced by M. Bonne of Paris in 1893, is used in the manufacture of pipes, special iron sections are used made in form of a Latin Cross. Bridges are also constructed on this system.

The Bordenave System, used in 1887, is confined to the construction of pipes, sewers, reservoirs. The Boussiron and Garric System is used for slabs and beams in buildings, etc. The rods are located in the bottom of the beam with V-shaped stirrup projecting upwards.

The Matrai System was invented by a Hungarian engineer. This system uses steel beams with cables running at right angles to the beams and in a diagonal direction. In the Locher System, the reinforced consists of layers of flat bars some of which run the entire length of the beam, while others stop off at various points along the beam, being turned up at the ends forming stirrups. In the De Valliere System the stirrups are twisted and have an eye for the bars to pass through.

Francois Coignet was the first to point out the advantages that would result from the combination of metal and concrete, in 1861. His son communicated his theories to the French Society of Civil Engineers in 1894.

AMERICAN SYSTEMS.

In 1876 Mr. Thaddeus Hyatt made many experimental beams with iron introduced in a great variety of ways, as straight ties with and without anchors and washers, truss rods in various forms, flat pieces of iron set vertically and laid flat and anchored at intervals along the entire length. These experimental beams were tested and broken by David Kirkaldy of London. In the year 1877, Mr. Hyatt published a work entitled, "An account of some experiments with Portland cement combined with Iron as a Building Material," which contains a description of these tests and dicussion of the results obtained. This is the oldest American System, and was used principally for slabs. Flat bars on edge punched, with round rods threaded through them, was the system employed for reinforcement. Mr. Jackson afterwards applied this principle to beams in 1877.

The Ransome System was invented by Mr. Earnest L. Ransome, who operated in San Francisco. His improvement was patented in 1884, and consisted of square twisted bars used in beams. He was the first in America to use reinforced concrete on a large scale. At the present time numerous systems and bars are on the market but it is not in the provence of this paper to go into details of each one.

We see from the above that the early use of reinforced concrete was for tanks, reservoirs, pipes, bridges and like structures, and the application to buildings was gradual, first being used in connection with rolled beams as a filling or slab. This was the manner in which the Monier System was first employed in France. As the use of the material became more general, reinforced concrete beams, as well as slabs, were used. Then reinforced concrete columns were introduced, and finally whole buildings were constructed of this material.

As the possibility of making an economical and thoroughly fireproof structure in reinforced concrete became evident, progressive manufacturers seized the opportunity to erect buildings of this material. In Europe manufactories were erected in which the entire structural members were of reinforced concrete, the walls being brick paned or filled in between columns with brick spandrels and windows. This construction is used to this day, and makes a very economical method of building.

The next step to brick paning was to make the entire exterior of concrete, omitting the brickwork entirely. This is done by constructing the walls with columns under the girders and filling in between with a lighter construction of concrete, or making the entire wall one thickness, in the same manner as is usual to build a brick wall. Of course, numerous variations of these several main methods of construction have been employed, and as the art progresses we find some interesting combinations of construction which were not dreamed of in the early days. We even have Edison, the wizard of Menlo Park, startling the world with his twenty-four hours concrete house made in cast iron moulds.

METHODS OF CONSTRUCTION.

One of the common methods of using concrete is to build the exterior and bearing walls of brick, and to make the interior columns, girders, beams and slabs of reinforced concrete. Of late buildings constructed entirely of reinforced concrete have become very common, but as the manner of finishing the exterior concrete is in a rather unsettled condition, some persons prefer to use brick walls, simply using the concrete in lieu of what would ordinarily be built in wood, or possibly steel and terra cotta. One of the most satisfactory ways of using reinforced concrete is to make a concrete cage similar to a steel cage and surround the cage with brick or terra cotta.

Where brick walls are not desired, reinforced concrete wall columns, as mentioned above, make an ideal method of construction, as there is in this system the least amount of concrete poured as part of the monolith, thus reducing the danger from errors showing in the finished work. The paning or filling between columns can be done after the forms are removed from the wall columns, and with a different material if so desired; solid plaster partitions or wire lath and channel iron studs can be used if desired. This cheapens the construction of the walls a considerable amount, as the costly item of concrete walls is usually the forms. In order to present a respectable appearance, the forms must be accurately and neatly made, and this feature usually adds to the cost.

Continuous walls of concrete are usually used where an abundance of light is not desired and the openings are few; in this case the thickness of the wall can be materially reduced from that usual in brick. The Philadelphia Building Regulations permit reinforced concrete walls to be made two-thirds the thickness of brick. Concrete blocks used for piers make an excellent construction provided the voids in the blocks are filled solid with cement grout and steel rods and ties introduced.

BEAMS, GIRDERS AND REINFORCING BARS.

As reinforced concrete beams became more and more popular, various attempts were made to introduce systems of floor construction that would be different from those in previous use. As most of the systems were patented, it was necessary to deviate from what had been done heretofore. This has led to a number of modifications in building floors, which, while appearing on the surface to be radically different from each other, can be classed under three main divisions, varying from each other in some fundamental.

The first group consists of loose bar systems in which the reinforcing elements are separate bars or rods, whether plain or deformed.

The second group consists of built-up frames making a number of bars into a unit and placing them in the mould as such.

The third group consists of moulding the beams and girders in advance on the ground, permitting them to harden and then to erect them in much the same manner as steel or wooden beams are erected. This last system has not been very widely employed. The Edison Portland Cement Co. has used this system in a building, built for themselves. They call the system "Separately Moulded Members."

It is seen that the shape of the bar in the above classification does not influence the grouping of the system. It is the writer's belief that the use of the word "system" has been abused by being applied to a form of bars instead of to a method of applying bars for the purpose of reinforced concrete.

Each of the above classes or groups can be sub-divided into variations from the general type; also, there are combinations of structural steel shapes with concrete which could be classed in a separate group, but it was thought best not to confuse strictly reinforced concrete system with any combination of the two.

The use of plain bars for reinforcing concrete seems to have found favor in Europe to the exclusion of almost any other type, principally on acocunt of the universal rolling of round and square rods, which make them more readily obtainable and in general answer the purpose. Their use, in the writer's opinion, should be restricted to such work where the loads are quiescent, as there is danger of the bond between the concrete and steel being broken if the construction is subjected to shocks. In important members, hook ends should be used on the bars to assist in preventing slipping of the bars; also, when plain bars are used, they should lap much further than if deformed bars are used.

In the United States, practice seems to favor the use of deformed bars. There are a number of patented bars on the market calculated to increase the bond between the steel and the concrete. In figuring the area of these bars, net sections should only be considered, as it is very seldom that the projections add to the area of the bars. Cold twisted square bars are much used and constitute one of the best forms of bars. High carbon steel bars are being made from original billets used for reinforced concrete, and if deformed make excellent reinforcing bars, but on account of their brittleness should only be used in sizes of one inch and under and where sharp bends occur, they should be made hot.

The trussed or Kahn bars has the double feature of being a deformed bar, as well as providing some stirrup for the web reinforcement of the beam.

The use of expanded metal and a webbing or fabric consisting of main wires and secondary wires at right angles to the principal ones are, in effect, deformed bars, the difference being that there are a number of them assembled together.

In girder frames with the stirrups shrunk on or otherwise rigidly attached to the main bars, the adhesion is so much increased as to bring this type under the head of deformed bars.

The use of cables for reinforcing beams and girders is not considered practical, although there is one system on the market which advocated its use. The writer cannot see any advantage gained in the use of cables for beams and girders, and a decided disadvantage is apparent, as the cable to be effective should be drawn up tight, which is not practicable in beam and girder construction. For slabs in connection with a webbing, cables may be successfully used, but they will be of little value unless drawn up tight.

STAIR CONSTRUCTION.

We have seen how reinforced concrete is applied to walls and floors. We will review briefly its use in connection with the various adjuncts of a building, such as stairs, chimneys, footings, partitions, reservoirs, etc., also the various methods adopted for waterproofing concrete.

The practice of making stairs of incombustible materials, even in non-fireproof buildings, is not new; the use of cast iron strings, horses and risers with slate or marble treads is very common. Hence, it is only natural that in a fireproof concrete building the same precaution should be taken, and as a matter of fact, we find a ready application of reinforced concrete to stairs.

In buildings of the factory type, the stairs are usually enclosed by a wall or fireproof partition and sometimes the stairs are of the return type, having two runs between stories with a half-pace or landing. If this is the case, each run forms an element for treatment by itself, having the header beams carried on the enclosing walls, which are usually constructed at the same time the stairs are built if the walls are of concrete. If the enclosing walls are of brick (supported on the concrete floor and columns), the stairs may be built first and the brick walls around the stairs afterwards.

However, the building of the brick wall first, leaving pockets for the ends of the beams and slabs where half-paces and landings occur, is to be preferred, as then the concrete can be made to flow into the pockets and grooves left in the brickwork, thus solidly filling the entire space; while if the walls are built after the stairs are constructed, underpinning the ends of beams and slab is necessary to secure a firm job. The usual method of building the stairs of the type mentioned is to consider one run or flight as an inclined slab having the step cast thereon, resting at the top and bottom of the runs on beams or headers. This involves only a simple calculation to determine the thickness of the concrete under the step and the size of the reinforcing steel.

Sometimes, by reason of there being a large well in the stairs and consequently no means of supporting the interior corner of the quarter-pace or landing, it is necessary to run a string around the well of the stairs. This string acts as a beam and is heavily reinforced. Sometimes in double threaded stairs in which there are two flights or runs over each other to the story, in order to save head room no header beam is used, but the stairs are carried on the side walls having the main reinforcing steel running parallel to each riser in the bottom of the soffit.

If no special finish is desired, the treads and risers are finished with a 1 to 2 cement and sand top coat, the same as for sidewalks. The edge of the step and soffit of the stairs are finished smooth with a cement coat brushed on, unles the stairway is plastered, then the soffits and edges are plastered with the rest of the work. If a rich finish is used, the rough concrete stairs can be covered with marble treads and risers with an ornamental balustrade to match, as shown in the illustration.

CHIMNEYS.

Much discussion has been given in the technical press to the construction of the reinforced concrete chimneys. This has been brought about largely owing to the fact that some of them have collapsed. My own experience in this matter is that while reinforced concrete chimneys can be, and are, constructed on perfectly safe lines, there does not seem to be the same necessity to use concrete for this part of a building, since there are other materials possibly better adapted for this purpose than reinforced concrete. I refer to the hollow tile chimney. However, if it is desired to use a reinforced concrete chimney so that the exterior effect of the building as a whole will not be destroyed by using two dissimilar materials on one operation, a strictly safe and durable chimney can be constructed of reinforced concrete.

In designing such a chimney, it should be borne in mind that an inner shell or lining, built separate and distinct from the outside or supporting shell, is necessary. This need not extend the entire height of the chimney; furthermore, it should be constructed so that any needed repairs can be made to this inner shell without in any way affecting the main outer shell.

We have had three chimneys constructed of reinforced concrete for buildings designed by our firm, two of which have such a lining, while the third is without any lining, although the owners intend to have one put in.

My reason for recommending an inner lining is not that the concrete is injured by the heat such as is found in an ordinary chimney, but to prevent any disintegration taking place inside the chimney due to injurious gases discharged by the boilers. Should a chimney not be lined and disintegration take place, it might not be noticed in time to repair the damage before a collapse would occur. A very simple way of lining a concrete chimney is by a 1 1-2 inch or 2 inch coat of asbestos cement plaster, applied over wire lath, which is secured to the inside of the outer shell by expansion bolts, this wire lath being set about 1 inch from the shell to make an air space. If such a lining is used and in course of time becomes damaged, the wire lath can be replastered without removing any reinforcing metal; whereas, if a reinforced concrete inner shell 4 or 6 inches thick is employed, then when repairs are necessary, this inner shell must be, in whole or part, removed, and either new concrete placed to take its place or plastering must be resorted to. The former method is by far the cheaper and is just as effective. Furthermore, if the wire lath and plaster method is adopted, the outer shell can be erected perfectly plumb and in a straight line from top to bottom, thus doing away with the dangerous offset which has been common in the type of chimney where the inner core is of thick reinforced concrete and does not run the full height.

With the monolithic method, the concrete used in the chimney must be made very dry so that the forms can be shifted in a day and thus permit of their re-use in the section above. This concrete is not as dense as a concrete made wet, and consequently is more porous and not as suitable for reinforced concrete.

PIER AND COLUMN FOOTINGS.

The most common use of reinforced concrete is for large spread footing under piers and columns, as well as under continuous walls. The use of steel beams for this purpose is much older than reinforced concrete, but the cost of the beams made the use of this type of footing expensive, since the concrete that enveloped the steel beam grillage was not counted upon to take up any stress, only being used as a protection to the steel beams. However, in a reinforced concrete footing, the rods are introduced to reinforce the concrete; that is, to take up the tensile stresses, while the concrete resists the compressive stresses. In the case of piers the rods may be run at right angles parallel to the sides of the footing or diagonally. In the case of continuous footing having a uniform load per running foot, the main rods run across the footing, secondary rods being run parallel to the wall to bond the concrete together. If the load is not continuous on the footing, then a second layer of main reinforcing bars must be used in the top of the footing. Stirrups are not usually necessary in footing.

CONCRETE PILES.

There are three methods of constructing concrete piles, namely, separately moulded piles; piles moulded in a shell or pipe, which shell or pipe is withdrawn; and piles moulded in a light metal shell or mould sunk in the ground and permitted to remain therein. For foundations where water is encountered considerable money and time is saved over pier construction and the permanency of a concrete pile makes it more desirable than a wooden pile.

Reinforced concrete partitions, if made monolithic, can best be constructed by building the forms of matched boards run horizontally and securely fastened to suitable uprights; these forms are kept the proper distance apart by separately moulded separator cement blocks about 4 inches square, of a length equal to the thickness of the partition, having a 5-8 inch hole cast the length of the block through the centre. These blocks act as spreaders between the two sides of the forms, and should be spaced about one block to every 9 square feet of wall, according to the height of the partition, with 1-2 inch bolts passed through the forms and blocks to hold the forms in position. After the concrete has hardened and the forms are removed, these bolt holes are filled up with cement mortar flush with the face of the partition.

TANKS AND RESERVOIRS.

There seems to be no better use for concrete than for tanks and reservoirs. There are three general methods of watreproofing concrete: First, by adding some ingredient to make it waterproof, either in the form of a dry powder or a liquid, or the use of powdered hydrate of lime.

Second, the concrete after being placed can be waterproofed on the surface with either asphalt, pitch and paper, hydrex or some similar material; this is usually held in place by a second layer of concrete or a brick wall.

Third, concrete can be made waterproof by so grading the aggregates, sand and stone, so that the mixture becomes very dense thus preventing the percolation through the material, this latter method is the least reliable, but has been used with very good results in special cases.

RETAINING WALLS.

The use of reinforced concrete for retaining walls has become more general with the development of the material, and can be used in place of heavy masonry wall at a somewhat less cost. By providing a wide spread base and making use of the back material to add to the weight of the wall, a very economical wall can be built of reinforced concrete, and a number of such walls have been built. For a vault or cellar, walls to resist earth pressure, a reinforced makes an admirable construction.

Concluded on page 55.

BONDS, MORTAR JOINTS, COLORS AND PATTERNS.—Elements Which are Factors of Composition in Artistic Brick Wall Surfaces.—The Opportunities Which They Afford the Designer for Character and Individuality of Treatment.—Some Interesting Examples.

A DIVERSITY OF OPINION seems to exist among certain members of the architectural profession, as to what should constitute the proper thickness for mortar joints in brick work, in order to obtain the most satisfactory and artistic results in exterior walls of brick surfaces. Some are inclined to adhere rigidly to 3-16 to 3-8 inch gauge, allowing but a fraction over this, as the extreme thickness; while others are, in theory if not so much in practice, leaning towards the adoption of a joint of a greater and more pronounced thickness, as being structurally correct and more effective from an architectural viewpoint.

In discussing the subject recently, a well known practitioner said: "As to what is the proper thickness for mortar joints in brick exterior surfaces, must be determined by the architect. His success depends, to a large extent, on his appreciation of the individual piece of work in hand, the character of bond which is employed, and the extent of the wall area to be treated. A joint which would be highly satisfactory architecturally, in one instance, would be found utterly lacking in another. Individuality in surface work, as in the design and plan of a building, rests solely with the architect's power of conception and ability to create. Mortar joints, bonds, contrasts, and the graduations of colors are the elements of composition, and these are found to be extremely elastic in the hands of the clever designer."

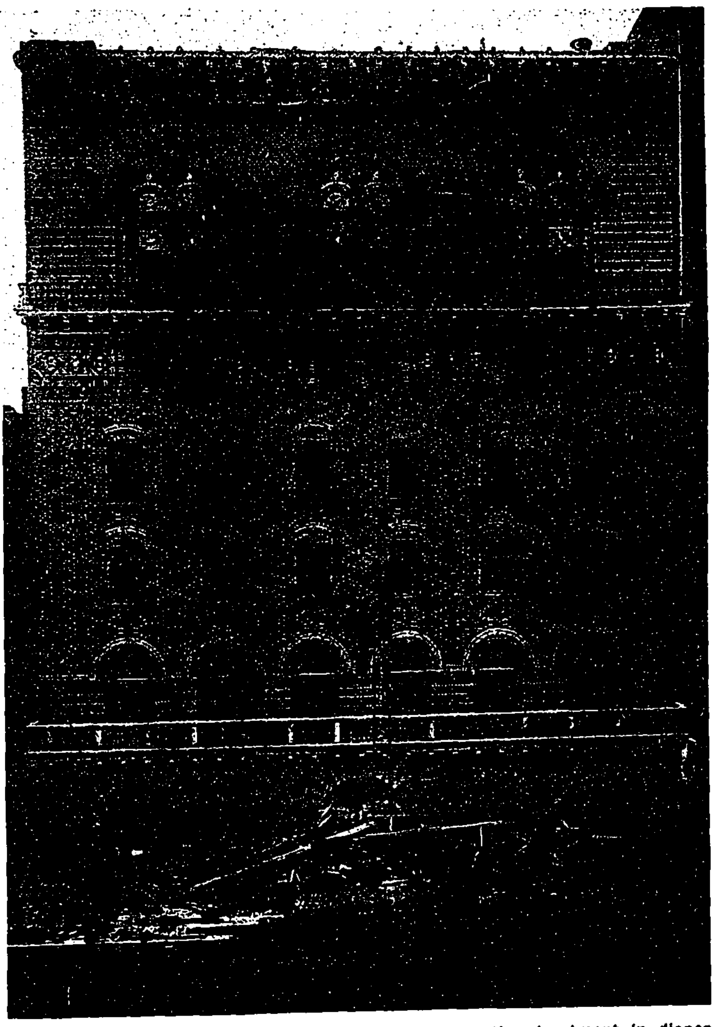


Fig. 1.—Facade of Club Building, showing an interesting treatment in diaper work. The bricks, 12 x 2½ x 4 inches in size, and of a rough texture, are laid up with a gray raked mortar joint, three-quarters of an inch in thickness, the bond being of a special character. The color tones are a soft warm gray tinged with brown, and white headers and special moulded bricks, on a smooth brown ground.

Kidder's treatise on Masons' Work, specifies the thickness for mortar joints, for common brick at 3-16 inch and not more than 3-18 of an inch, stipulating that every joint and space in a wall, not occupied by other materials, should be filled with mortar. Pressed brick, being usually quite true and smooth, can be laid with 1-8 inch joints, and they are often so specified. A 3-16 inch thickness, however, is probably stronger, as it permits a more thorough filling of the joint. It is impossible to completely fill 1-8 or 3-16 inch joints with mortar, and numerous small holes admit driving rain in streams and efflorescence and disintegration can in many cases be traced to holes in the facing.

According to the same authority, very little first-class work is now being done with fine joints. The general tendency is more towards wall surfaces with character and texture. The joints should be thick enough to bring the facings to an even bed with the backings and to allow them to be bonded with the headers. They may be from 1-4 of an inch to an inch in thickness. Frequently the joints are recessed from 1-8 to 3-8 of an inch, and sometimes the horizontal joints are recessed with the vertical joints flush, or vice versa.

A new style of brick work, introducing a somewhat radical departure from the conventional method of laying pressed brick, was conceived and evolved by a firm of Detroit, Mich., Architects, a little over a year ago. Since its inauguration, this style has steadily grown in favor, being adopted by a number of other architectural firms of that city in the erection of buildings during the past season. Its principal feature is in the joints which are usually of black mortar. These are made three-eighths of an inch deep and raked out to a considerable extent, thus leaving the wall with rather a unique appearance. The general custom had been to make the mortar for pressed brick, at the best, not more than one-quarter of an inch thick; and, while there was some doubt expressed by the mason who first undertook this method, as to the safety of the work, it was soon demonstrated that this treatment resulted in walls possessing both beauty and stability. This style is adapted to office buildings only and not for residences and small structures. One drawback is that it necessitates a procedure of carrying out the work, that is somewhat slower than the regular

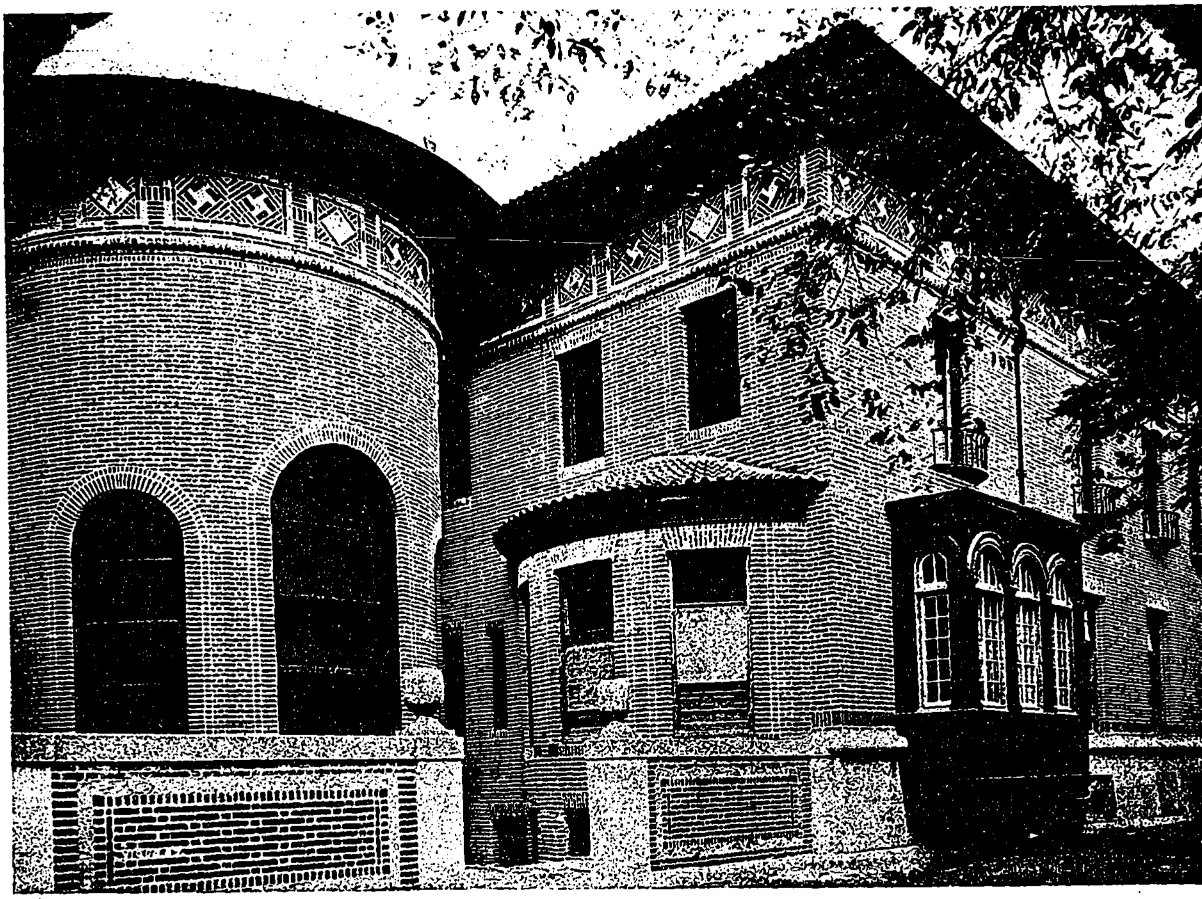


Fig. 2.—Brick residence in which the effect of the double stretcher Flemish bond and large horizontal mortar joints can be seen. The size of the bricks, which are of medium and dark shades, are 8¾ x 1⅞ x 3½ inches, and the vertical joints are narrower than those which run horizontally, the latter being 1/8 inch in thickness. The pattern of belt course beneath the eaves is particularly noteworthy.

method. Not more than four or five courses of brick can be laid at one time and the work must be done entirely around the building before the next series of courses can be begun.

With diaper work or surface patterns there seems to be unlimited possibilities for giving variety to plain wall space. It affords an excellent opportunity for the designer to display his originality in the treatment of brick surfaces. Great care and thought, however, are essential at all times. The exterior walls should not be so marked as to make the pattern insistent and thus interfere with other features of the building. Taste and discrimination are important factors, and especially so where different colors, tones, or shades are employed. One of the best opportunities for the use of colors lies in the direction of pattern work for freize-courses and band courses. Surface decorations, it must be understood, are by no means confined only to varying shades or colors of the brick. Sometimes an exquisite design results solely from the adoption of some particular bond, and the use of colored mortar. Again, a pattern owes the charm of its expression to the combination of colored brick and the nature of the bond. Proportions and sizes of designs can be materially changed by the use of headers, and very often in the latter case, the bond, in order to show the pattern work to advantage, is of a mixed character, and can, therefore, be termed as being *sui generis*.

It is the latitude given the architect in this respect that enables him to give a variety of expression to surfaces which would otherwise be decidedly plain. Much excellent work of this character is common in the brick buildings in European countries, and with a growing appreciation of the results to be obtained, the average architect on this continent is coming to regard the consider-

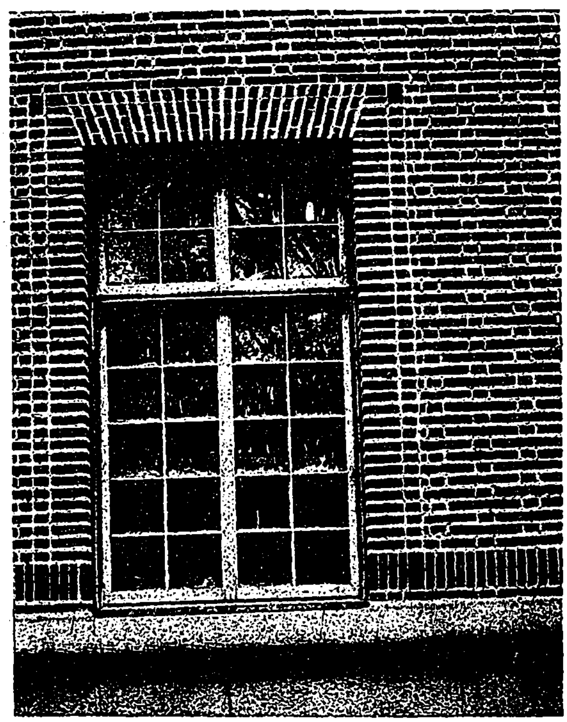


Fig. 3.—Detail of window of house illustrated in Fig. 2, showing the uniform manner in which the brick work flanks the window on either side.

ation of diaper work, bonds and mortar joints, as being quite as much with the function of architecture, as is the design and plan of a building itself.

An interesting example of diaper work is to be seen in the club building illustrated herewith and designated as Fig. 1. The surface treatment shows a variety of patterns which results in a very commendable exterior. The bond is of a special character, and the bricks used are of a rough texture, 12 by 2 1-2 by 4 inches in dimensions, and laid up with a gray raked, mortar joint, three-quarters of an inch in thickness. The color tones are a soft, warm gray tinged with brown, and white headers and special moulded bricks, on a smooth brown ground. Both the treatment beneath the upper cornice and the band course below the balcony are unique and effective, while the entire facade suggests unlimited possibilities in work of this kind.

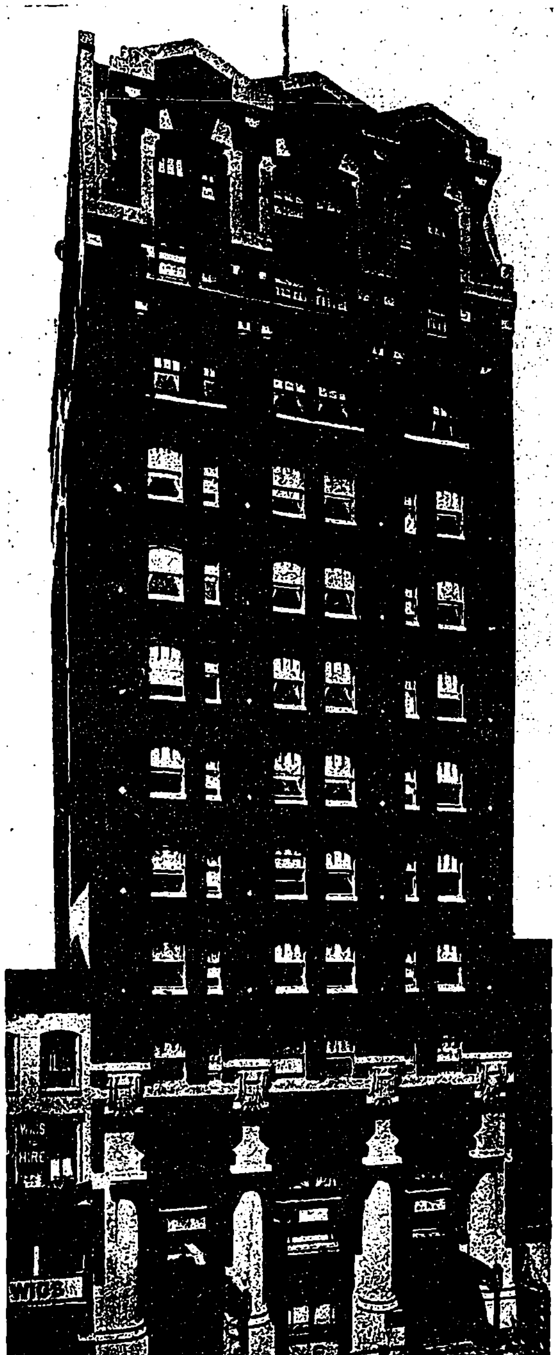


Fig. 4.—Hotel building of attractive design, the facade of which is built of red pressed brick with blue toned bricks for trimmings. These are laid up in the ordinary Flemish bond with white raked-out mortar joints of an appropriate thickness.

In Fig. 2, an illustration of a residence of a somewhat unusual design, in that a portion of the house is circular in plan, simple brick work is shown, with a decorated pattern or belt course extending around the building beneath the eaves. Here the effect of large horizontal mortar joints can readily be seen. The brick which is of the Indian tapestry variety, rough in texture, and of mixed medium and dark shades, is laid up in a double stretcher Flemish bond. The size of the brick is 8 3-4 by 1 7-8 by 3 1-2 inches, and the vertical joints are narrower than those which run horizontally, the latter being 1 1-8 inch in thickness, or a trifle over half the thickness of the brick itself. The mortar used is of a grey color, rough in texture and cut flush at surface. A very pleasing design is to be noted in the band course, in which the panel borders and nearly all center figures consist of mortar, the centres of some of the smaller panels

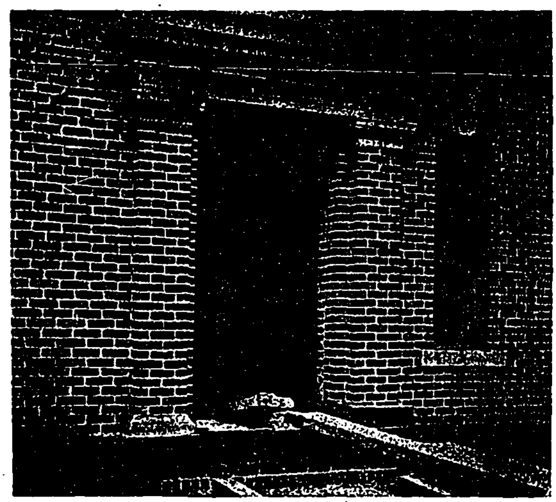


Fig. 5.—Detail of doorway of boiler house, illustrating the running or plumb bond, a bond common in a large number of buildings throughout the country. The bricks used in the structure are of varying shades, and the joints are half an inch thick, of gray color, cut rough and flush.

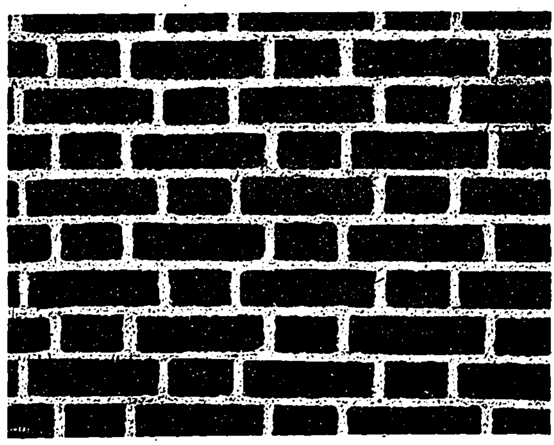


Fig. 6.—A wall of "tapestry" brick, 8 x 2½ x 3¾ inches in size, in Flemish bond and five-eighths of an inch struck mortar joints of white. All stretchers are of dark blue, while the headers are of medium red, to overcome the non-actinic properties of red and blue. This effect is a reversal of what is apparently the darker brick into the lighter, and vice versa.

being of scagliola. Fig. 3 is a detail of window of the same house, showing how the brick is laid in order to uniformly flank the window on either side.

In the hotel building shown in Fig. 4, a very commendably designed structure, the facade is built of red pressed bricks with blue toned bricks for trimmings. These are laid up in the ordinary Flemish bond, with white raked-out mortar joints of an appropriate thickness.

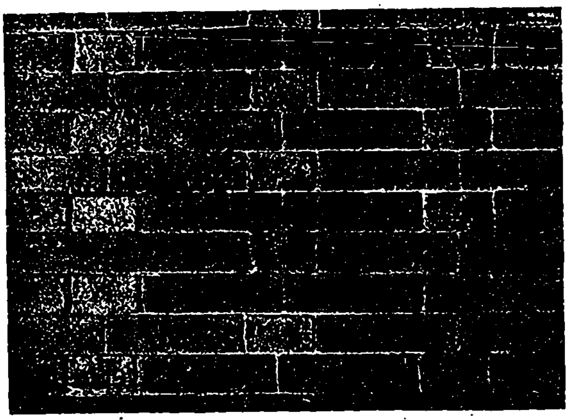


Fig. 7.—Another example of the double stretcher Flemish bond, only here the mortar joints are much thinner, being but one-eighth of an inch in thickness and slightly raked-out. The bricks used are 8 x 2½ x 3¾ inches in size, and of a rough texture; the stretchers being of dark clear red, and the headers of a brown blue color.

The running or plumb bond, is illustrated in Fig. 5, showing detail of doorway of boiler house recently erected for a large educational institution. This bond is quite common and can be found in a large number of buildings throughout the country. In this particular job, however, the walls have been greatly improved in appearance, by the adoption of brick of slight varying shades. The mortar joints are one-half an inch thick, of grey color, cut rough and flush.

A rather unusual piece of brick work, particularly so as regards the colors employed and the rough texture and quality of the brick itself, is shown in Fig. 6. This character of brick is known as the "tapestry" kind. The style of bond is Flemish; the bricks, which are 8 by 2 1-2 by 3 3-4 inches in size, being laid up in white struck mortar joints, 5-8 of an inch in thickness. All strechers are of dark blue, while the headers are of a medium red, so as to overcome the non-actinic properties of red and blue. This effect is a reversal of what is apparently the darker brick into the lighter and vice-versa.

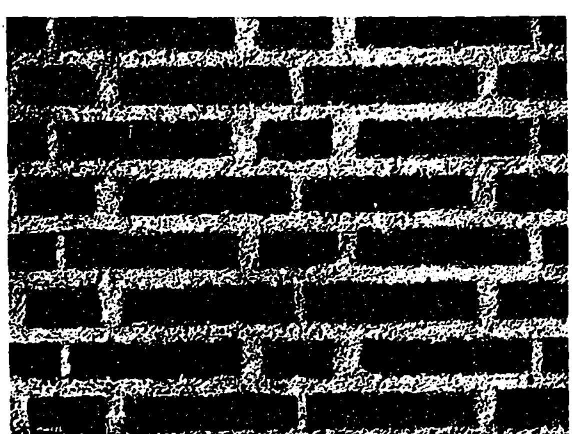


Fig. 8.—Although the bond is identical with that shown in the preceding illustration, in this case the joints, which are white and cut rough and flush, are 1¼ inches in thickness; while the brick itself is 9 x 2 x 3¾ inches in dimensions. Here the stretchers are gray and light brown, while the headers vary from gray and light to dark brown.

Possibly of equal interest, is the brick work seen in Fig. 7. As with Fig. 3, the double stretcher Flemish bond is employed, only the mortar joints are much thinner, being but 1-8 inch in thickness and slightly raked out. The bricks used are 8 by 2 1-2 by 3 3-4 inches in size, and of rough texture; the stretchers being of dark clear red, and the headers of a brown-blue color.

Another example of double-stretcher Flemish bond work is illustrated in Fig. 8, but in this case the mortar joints which are white and cut rough and flush, are one and one-quarter inches in thickness; while the brick itself. is 9 by 2 by 3 3-4 inches in dimensions. Here the stretchers are gray and light brown, while the headers vary from gray and light to dark brown.

Fig. 9 shows a wall of bricks of an ordinary size, laid up in a running bond, with the conventional 3-8 inch, raked, white joints. The texture and color scheme are, however, noteworthy, the effect being produced with bricks of clear red, and reds with flushed edges.

Of late years, we are coming to see considerable brick used for interior work, the trend in this direction being more particularly noticeable in some of the recent ecclesiastical edifices and public institutions. The average student of architecture is well acquainted with the efforts of the early Byzantines and how admirably they expressed their ideas of interior work in brick, marble and mosaics. How it was possible for the use of brick to decline in this respect, can perhaps only be ascribed to one of the periodic retrogressions which art has suffered. It is said that everything moves in cycles, and it is quite probable that we are about to witness a revival in the use of brick for interior work, that will make the architecture of this age notable for its achievement along this line. Fig. 10 shows the interior of a modern church in which brick forms the principal element of the decorative scheme. The side walls and sprandrels of the arches are of a smooth buff brick, laid up in a running bond with a 1-4 inch, white, struck, mortar joint. The ceilings of the arches and upper portion of the walls consist of much larger sized bricks, semi-glazed and varying in shades, arranged in sort of a herringbone fashion.

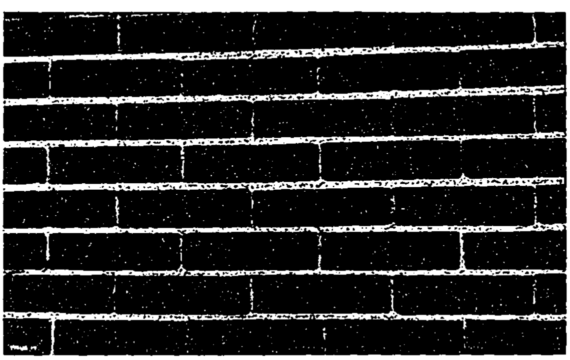


Fig. 9.—A wall of brick of ordinary size, laid up in a running bond with the conventional ⅜ inch, raked, white joints. The color scheme, however, is noteworthy, the effect being produced with bricks of clear red, and reds with finished edges.

The limitation of the possibilities of brick work in plain surfaces is by no means encompassed by the views of bonds, mortar joints, and patterns shown in this article. They simply show a variety of effects which suggest to what extent work of this character can be developed, and equally as good results can be obtained from bricks of other textures, different bonds and mortar joints, much depending on the nature and extent of the surface to be treated. It is quite plain, however, that the study of these elements is quite within the designer's cur-

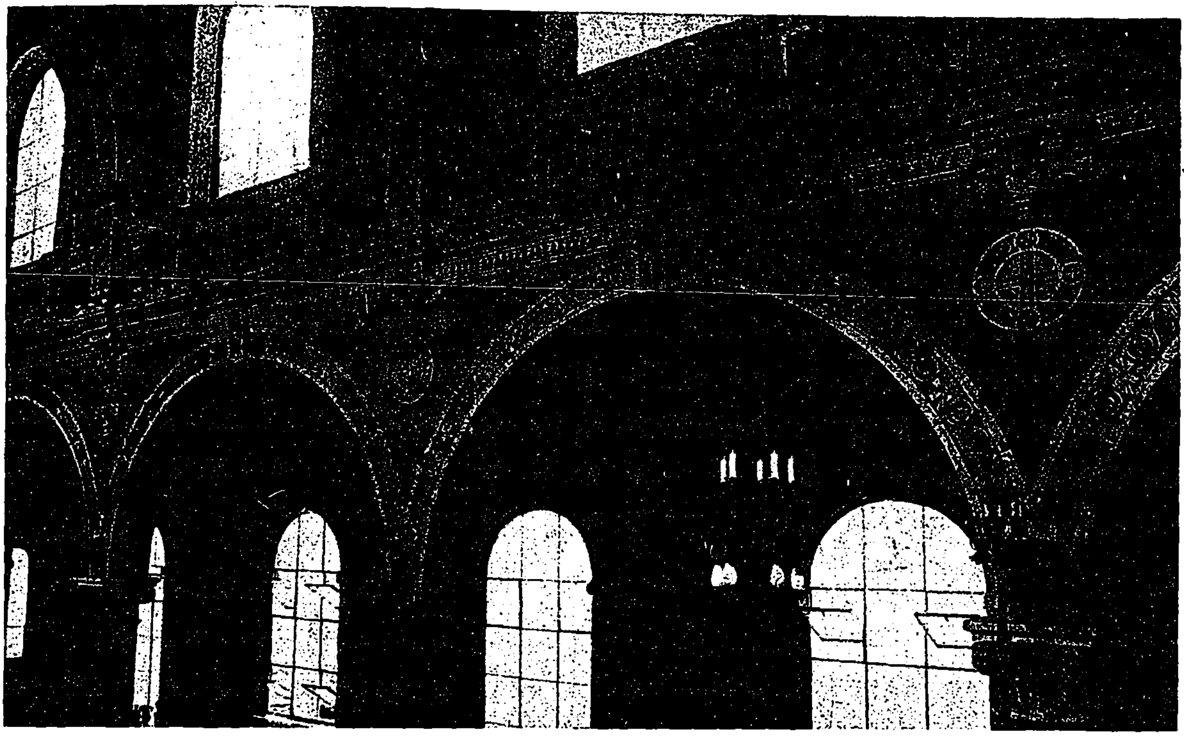


Fig.10. Interior of modern church in which brick is essentially an element of the decorative scheme. The side walls and spandrels of the arches are of a smooth buff brick with quarter-inch struck joints of white mortar. The ceilings of the arches and upper portion of walls consist of much larger sized br:cks, semi-glazed and vary'ng in shades, arranged in a sort of herringbone fashion.

riculum, and his success greatly depends on the degree to which he appreciates this fact.

The photographs used to illustrate this article were kindly loaned CONSTRUCTION by Mr. E. F. Dartnell, of Montreal.

REINFORCED CONCRETE IN BUILDING CONSTRUCTION.—Continued from Page 50.

We have seen how successfully reinforced concrete has been used as a structural material; how in the engineering world it has taken its place in the fore ranks of the materials used for construction purposes. It remains now for us to consider its adaptability as a material susceptible of decorative treatment, as well as artistic expression.

I will give you an idea of the fundamental basis governing the use of the material for decorative purposes when applied to building construction. The architect's means of expression is by the use of the materials of construction, which must be so moulded and shaped as to give the appearance of solidity; that is, that the building is a concrete reality, that it is solid and substantial in addition to being a thing of beauty. Hence the various shapes that enter into the design must be such as are suitable for the material out of which the part is to be moulded or shaped; it is here that the ability of the skilful designer is shown, since a shape or design that is suitable for one material is very frequently unsuitable for another. We all know that wrought iron can be bent and twisted into all manner of shapes and have a delicacy impossible in a less ductile material, as wood or stone; hence, a suitable design for a wrought iron grille is unsuitable for wood or stone. Now concrete is a plastic material, and its composition can be varied to obtain any desired result in the finished structure, hence, apart from the form it takes, the finish should be expression of the material.

This brings us to the pith of the subject, and at once suggests how we should treat our exposed surfaces to meet this principle of art. The customary plaster finish on concrete, even if the natural result of the process of moulding, is not a true finish, in so far as truth of expression in art is concerned, since the appearance of a smooth concrete wall is almost the same as a plastered brick wall and gives no suggestion as to the ingredients composing the body of the wall. Hence this character of finish cannto be said as rightly belonging to concrete.

The finishes in which the method of moulding the concrete is apparent, and also the one which exposes the aggregates entering into the composition of the concrete, should be the ones used when the true expressive character of the material is desired.

Apart from the expression of the inherent quality of a material, the effect which it is desired to obtain in any material is paramount to the material itself. So that if the feeling of lightness or heaviness is sought for in a design, the texture of the wall surface should harmonize with this idea. Concrete, being an artificial material, is, therefore, more susceptible to finer shadings of treatment if the aggregate is changed than many natural materials, and the cost is much less.

This phase of the artistic development of concrete is, I might say, still in its infancy, and much remains to be done to develop a real style in concrete. A very satisfactory method of exposing the aggregates of the concrete is to tool the surface, after the concrete has hardened, thus removing the thin film of neat cement and make a coarse picked surface with the stone or aggregate showing. If the stone is selected for size and color, any effect desired can be obtained.

AN ELECTRICAL PLANT to cost $5,000,000 is to be constructed at Grand Falls on the St. John River in New Brunswick, where there is a natural water fall of 135 feet. The plant, the contract for which was recently awarded, will develop an energy of 120,000 horse power, and power will be furnished to numerous towns in New Brunswick and Maine. It is expected that this enterprise will result in the establishing of many new manufactories, including a large pulp and paper mill.

BUILT-IN FURNITURE.—Designs, Descriptions and Methods of Construction.—Suggestions of Artistic and Useful Appointments in Interior Decorative Work.

BUILT-IN FURNITURE forms an integral part of the consistently appointed small or medium sized house, furniture designed to become a very part of the interior decorative scheme. We herewith reproduce from the CRAFTSMAN some creditable designs, with descriptions, and, in some cases, plans and details, showing method of construction, that will be found interesting to designers of economically and artistically built and decorated moderate priced dwellings.

Furniture of this type has a peculiarly interesting and homelike charm in the smaller residential structures, such as the craftsman houses which appeared in the last (June) number of CONSTRUCTION under the heading of "Selected Designs for Bungalows and Cottages," and it is becoming more and more a requirement of the architect to consider essentials of this character when designing and planning domestic work.

KITCHEN CUPBOARD.

Figure I. is a design for a large kitchen cupboard, and is meant to be a part of the construction of the house, as is evidenced by the casement window and wall section that appear between the two high cabinets. It is an easy matter, however, to modify the construction so that it can be made as a separate piece, and in that case the window would be better replaced by two or three shelves, which might be curtained if desired. Also, the section of the wall which shows in the centre, and which is made of wide boards V-

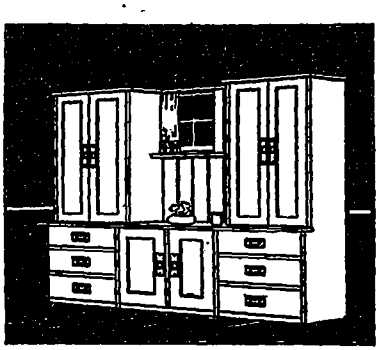


Figure 1.—Built-in kitchen cupboard.

jointed, might better be replaced by a panel like those of the doors, or the whole space might be shelved. The construction of the piece speaks for itself. It is, of course, designed on severely plain lines and is supposed to be made of the same kind of wood that is used for the other woodwork of the room. If meant for a kitchen cupboard, it would afford ample room for dishes, cooking utensils and supplies. In a dining room it would serve for china closet, linen press and cabinet for silver and glassware, and in the living room it could be used to store away almost anything that it might be desirable to put out of sight.

Copper door and drawer pulls and escutcheons are suggested for this design, as they harmonize with the dark-colored wood intended to be used; but for other woods wrought iron might be more effective.

SIDEBOARD AND CHINA CLOSET.

The piece shown in Fig. 2 is meant for the dining-room, and is a combined sideboard and china closet. The construction is much simpler that that of the big kitchen cupboard and the piece is meant to occupy

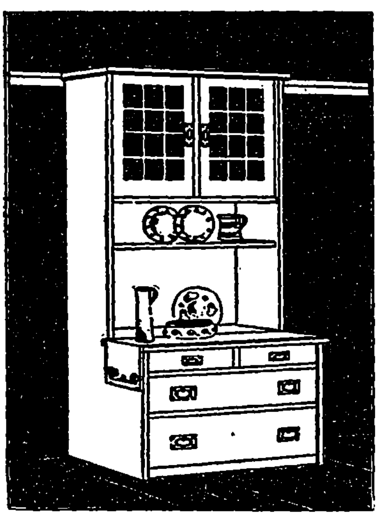


Figure 2.—Sideboard and china closet.

about one-third of the space demanded for the other. The chief difference in the making is found in the doors of the cupboard, which have small square panes of leaded glass with broad muntins of wood. This sideboard also is easily convertible to other uses, as it would be quite as convenient in the kitchen as in the dining-room, and in a small kitchen would be better than the larger piece. Also it might serve as a cabinet for a living-room; but in that case, the whole open space should be shelved for books. In a house with little closet room the drawers might prove very convenient in a piece of living-room furniture.

DESIGN FOR CABINET.

Fig. 3 is a design for a cabinet, and is simple. It is primarily designed for the living-room. This cupboard, of course, can be fitted for a variety of uses, from the storing of such things as books, magazines and writing material, down to overshoes; and in camp life such a convenience would often be greatly appreciated. Yet like the former two this piece would be equally at home in the din-

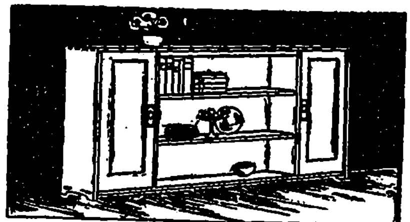


Figure 3.—Design for combination bookcase and cupboard.

ing-room or kitchen, or wherever a combination of shelf and closet room happens to be required. Like the others also, this was primarily intended to be built into the wall, but can be made as a separate piece, if necessary. A slight touch of decoration is seen in the dovetails and tenons at the ends, but the natural beauty or crudity of the whole piece depends entirely upon the workmanship. Any one of these cabinets can just as well be made with an accuracy of workmanship, fineness of finish, and beauty of color that would harmonize with the most carefully planned surroundings; or it may be finished so as to express the camping character of bungalow furnishings—although, of course, there would be no difference so far as the construction goes. The whole difference would lie in the choice of wood and the finish of minor details.

BOX COUCH.

Another bit of furniture that is equally useful is the box couch shown in Fig 4. This is very strongly made with mortise and tenon construction, carefully pinned through with wooden pins so that racking apart is impossible. The decorative effect is entirely dependent upon those features which give strength to the piece, and is very interesting, the rails along the sides and ends being so adjusted as to give the impression of a long panel between. The ends are raised considerably higher than sides to allow a support for the pillows. The whole lower part of the couch, that is, the box proper, is carefully lined with wood so that it is proof against dust, moths, or dampness. It would be an excellent plan to make this lining of cedar, as that fragrant wood is in itself a preservative, but, of course, this extravagance would be advisable only in case of a very finely finished

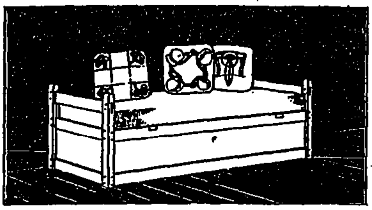


Figure 4.—Box couch.

couch, the lower part of which might be used for storing furs, winter garments and other things from which it is necessary to keep the moths. For a bungalow—and for storing in daytime of the bedding used upon the couch at night—a lining of plain pine would be quite good enough. The top of the couch is supported upon stout webbing stretched firmly across the frame. Couch springs are placed upon this webbing and then comes the thickly padded upholstered top, which does away with the necessity for a mattress and makes the couch entirely comfortable for use as a bed. The presence of one or two such couches in a bungalow or small cottage adds greatly to the sleeping accommodations, as well as offering a storage place for bedding or extra clothing. Like the other pieces, this couch can be made as plain or as sumptuous

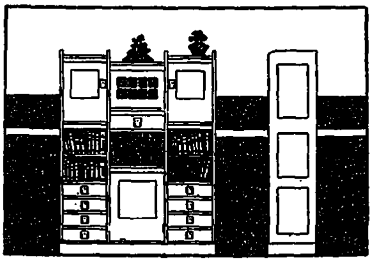


Figure 5.—Bookcase.

looking as seems desirable. It all depends upon the wood selected, the finish given and the material used for the upholstering.

BOOKCASE.

In the bookcase shown in Fig. 5, the arrangement of the open bookshelves with relation to the cupboards above the drawers below gives to the piece a marked individuality which would make it an interesting piece of furniture in any room. The door and drawer pulls and escutcheons are also definitely decorative in character, and the placing of the square panels in the cupboard doors, as well as the use of the small leaded panes of glass in the door of the upper central compartment, all combine to carry out consistently the quaint effect that is desired. This piece, and those that follow, are close enough to the craftsman idea to combine with them very well in a general scheme of furnishing, and in many instances, would add much to the decorative effect of the room.

BOOKCASE AND SECRETARY.

The combination bookcase and secretary shown in Fig. 7 carries out the same idea; the open compartments which serve as bookshelves being placed with an eye to the decorative effect of the whole. The square central cupboard is divided into a set of rather intricate pigeon-

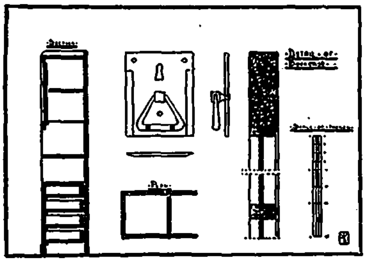


Figure 6.—Detail of bookcase shown in Figure 5.

holes for use as a secretary, and the long cupboards at the sides, as well as those at the top, give additional room for filing away manuscripts. In this piece there is a touch of applied ornament in the small geometrical design, which is inlaid in black wood in the upper part of each long panel.

BOOKCASE AND DESK.

The model shown in Fig 9 is a combination bookcase and desk. More open shelf-room for books, is provided in this piece, though there is also ample provision for the filing away of papers and manuscripts in the cupboards and drawers. In this case the inlay takes the form of one tiny square in the centre of each of the small panels in the upper

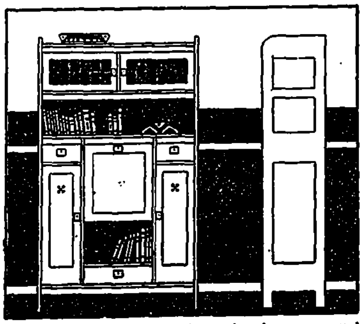


Figure 7.—Combination bookcase and secretary.

cupboard doors, and of four squares in each of the lower panels.

BOOKCASE.

The piece shown in Fig 11 carries more intentional ornamentation than the others of the group. In addition to the leaded panes at the top and the inlaid design on the panels of the

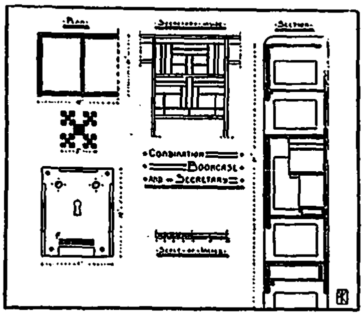


Figure 8.—Detail of combination bookcase and secretary shown in Figure 7.

three lower doors, the escutcheons and hinges are definitely decorative in character, and the corner posts depart from the usual severity of line in being chamfered at the top and bottom, and in showing a beading, which also appears below the doors. If the plainer effect is preferred, all these touches of decoration may, of course, be omitted, as the use of them is entirely a matter of personal preference.

SIDEBOARD.

The sideboard shown in Fig. 13 is of ample size, being eight feet in length, and provided with good-sized cupboards and seven drawers, large and small, for silver and table linen.

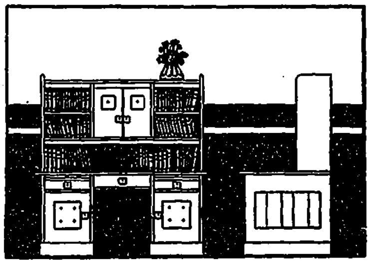


Figure 9.—Combination bookcase and desk.

The back extends nine inches above the top, and a rail is fastened across it in such a way as to afford support for plates and platters which may be stood on edge at the back. The doors, which are strengthened inside with chamfered cleats, are ornamented on the outside with long strap hinges of wrought iron. These, with the door and drawer pulls also of wrought iron, form the only touch of decoration. Nevertheless, the piece may be made exceedingly beautiful by using carefully selected oak or chestnut—or any other wood that is rich in color and hard enough for cabinet making purposes—and finishing the wood so that its full quality of color and grain are left revealed. While it may be given a surface tone to harmonize with the color scheme of the room, this tone should be carefully chosen with reference to the innate color quality of the wood. The best way to treat almost any wood is to use a chemical process to deepen and mellow the natural tone and then, if any further modification of color is needed, give it a very light surface tone of gray, green or brown which will be hardly perceptible, and yet will bring the natural color of the wood into harmony with the color scheme demanding one of these tones. With some

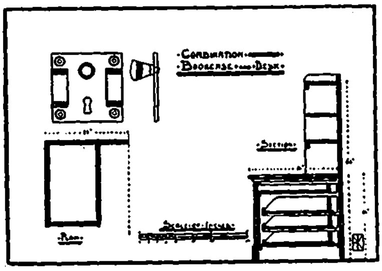


Figure 10.—Detail of combination bookcase and desk shown in Figure 9.

woods, wrought iron is by far the most effective for hinges, pulls and escutcheons; but for others, copper is more in keeping, and still others demand dull natural brass.

CUPBOARD.

The cupboard, Fig. 14, is a kitchen piece, and is made large enough to serve practically all the purposes of a pantry. This is made throughout of V-jointed boards, but in the lower doors the boards are used in the form of panels. The upper cupboard is shelved for the accommodation of kitchen dishes and supplies and would better be made with glass doors as shown in the model. There are two large cupboards below, each supplied with one shelf for the stor-

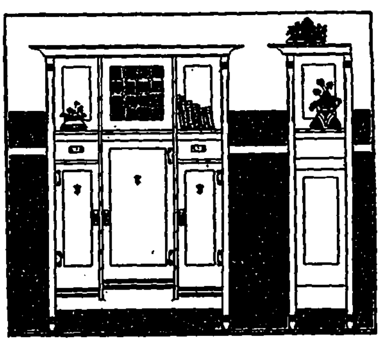


Figure 11.—Bookcase.

ing of the larger kitchen utensils and more bulky provisions. Each of these cupboards has two doors opening from the centre to allow the most convenient access to the shelves. Above these cupboards are four good-sized drawers and then a top shelf that affords a working space twenty inches wide. The upper cupboard is sufficiently raised above this shelf to allow it to extend to the full width, and in this recess a small shelf five inches wide is placed across the back to hold spice cans and such small matters.

COUNTER-SHELF.

The counter-shelf, Fig. 15, is plac-

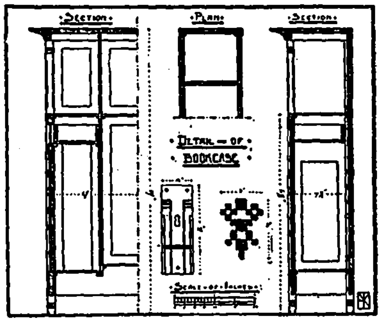


Figure 12.—Detail of bookcase shown in Figure 11.

ed directly below the kitchen window and conveniently near the sink. It is raised six inches from the floor so that the space beneath may be cleaned without difficulty, and has an ample supply of drawers and cupboards below the broad work-shelf at the top. The work-shelf overhangs the lower part sufficiently to allow plenty of room for anyone working there, and is supported on brackets so that it is quite strong. The shelf is used in the place of a work-table, and would be better if covered with zinc, both because the zinc is easier

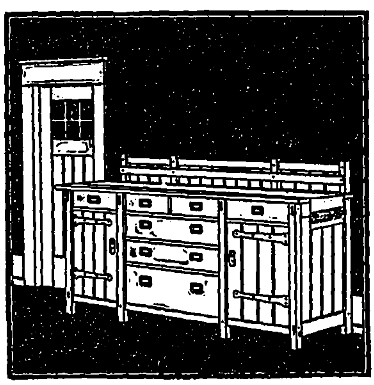


Figure 13.—Sideboard.

to keep clean than wood, and because such a covering would make the shelf much easier to build at home, as there would not be the necessity for the wide boards and careful joining that would be demanded if the wood were left exposed.

FINISH OF WOODWORK.

As so much of the beauty of any scheme of furnishing or interior decoration depends upon the finish of the woodwork, we herewith give for the benefit of those who are interested or engaged in carrying out work of this kind, an excellent process used for mellowing and deepening the color of such woods as pine, British Columbia fir and cypress, but not oak or chestnut.

This process is simple, as it is merely the application of diluted sulphuric acid directly to the surface of the wood. The commercial sulphuric acid should be used rather than the chemically pure, as the first is much cheaper and is quite as good for this purpose. Generally speaking, the acid should be reduced with water in the proportions of one part of acid to two parts of water, but the amount of dilution depends largely upon the temperature of the weather. Conditions are best for the work when the thermometer registers 70 degrees or

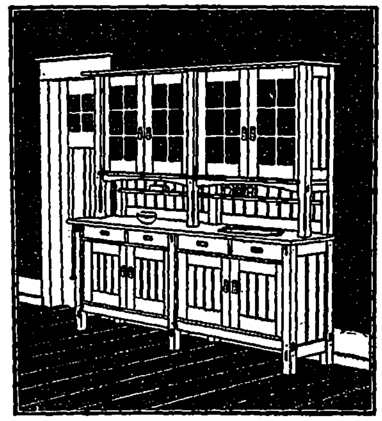


Figure 14.—Kitchen cupboard.

more; if it is much above 70 degrees, the sulphuric acid will stand considerably more dilution than it will take if the air is cooler. Of course, the state of the weather must be taken into consideration only when the work is to be done on the exterior of the house, as with interior work it is possible to bring the temperature to the required height by means of artificial heat. Sunshine is not necessary to produce the desired result, as

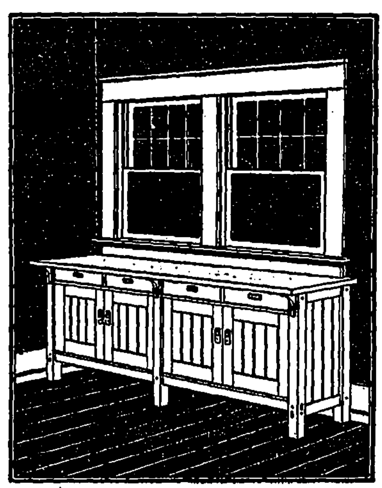


Figure 15.—Built-in counter shelf.

the process of darkening is not oxidation, but corrosion. The final finish for interior woodwork, should be one or two coats of wax.

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Vol. 2 Toronto, July, 1909 No. 9

Current Topics

A GRAVITY INCLINE at a German quarry generates power for reinforcing the quarry engine. A dynamo geared to the drum shaft is connected electrically to a motor on the engine shaft. The cars are started by running the dynamo as a motor, the change back being automatic when the dynamo voltage rises.

* * *

ALTHOUGH THE USE OF SCAGLIOLA has been general on this continent only a few years, it is by no means a new invention. On the contrary, it is an old Italian process, revived in the early part of the sixteenth century by Guido Sassi. It was largely used by the Florentines in some of their most elaborate works, and was introduced into Great Britain by Wyatt about 1750. Properly used it is an excellent material. But it should never be employed to replace marble in monumental buildings, where strength, durability and richness are called for. Above all, it should never be used in juxtaposition with and in imitation of genuine marble.

* * *

THE WINNIPEG BUILDERS' EXCHANGE is now comfortably settled in its new home in the recently completed Ideal Block at the corner of Portage avenue and Hargrave street, where two modernly equipped flats have been leased. The new quarters are far more commodious and conveniently arranged that the old place on McDermot street, and the accommodations are sufficiently ample to meet the growing requirements of the exchange for some time to come. In addition to a large Exchange room, 53 x 20 feet, with three adjoining estimating rooms, there is a board room, secretary's room with private office, and twenty-one large and small offices appropriately furnished. As all the space is well occupied, and as the membership is steadily increasing, the Exchange nowadays is a veritable hub of activity.

POSSIBLY THE OLDEST ROOFING TILE in existence has recently been brought to prominence in Alsace. The roofing tile has been used on the chapel in connection with the Castle Lichtenberg. The tile bears the inscription of the year 1682, and is remarkable for its size. Its length is 16 inches and the width is 6½ inches, and the tile weighs 4 pounds. The tile is burnt well and still of good color. The maker of the tiles has scratched in the tile clay a picture of the old castle with the towers.

* * *

IT IS A WELL-KNOWN FACT that blue prints are apt to fade when exposed to sunlight or even to an ordinary strong light, and the result, during a long contract when plans are constantly in use, is unsatisfactory. According to the AMERICAN MACHINIST, a remedy is to be found by exposing the prints until badly burned, and then washing in clear water until all the emulsion is removed. While they are still wet, the prints should be laid, with the blue side up, on a smooth surface, and covered evenly with peroxide of hydrogen by means of a paint brush. The background will thus be brought out very blue, and the lines perfectly white, and the prints will remain practically permanent even in bright sunshine.

* * *

A NEW BRICK with an outline of glass and centre of concrete has been invented by Mr. C. B. Lawton, of Pittsburg (Penn.). Any color of which glass is capable can be utilized. The surface is imperishable except by violence. A wall built in this manner, it is said, becomes like one solid sheet of glass and concrete, and will prevent the opening of a joint because of settling as is the case in ordinary brick or stone construction. It is further contended that a glass brick wall is proof against the passing of water. At the works of the company (in which the inventor is interested), is a large experimental tank which holds 1,000 barrels of water. When completed the tank was found to be proof against the passing of water, and it is now used for water supply and for fire purposes. These bricks can also be readily laid up with a butted joint without concrete filling, thus leaving a dead air chamber. This, it is claimed, fills a large demand where dampness is to be figured with or sweating walls are to be avoided. An additional claim is that partitions built of this brick need no centre support as the combination of glass brick with concrete filling makes a truss capable of holding its own weight and tenfold more, if necessary.

* * *

ARCHITECTURE IN PARTICULAR found support and patronage at Constantinople even in those ages when the plastic arts had sunken into a state of barbarism and almost entirely disappeared. We read in the histories of the Byzantine emperors of the seventh, eighth and ninth centuries accounts of buildings of astonishing magnitude, splendor and beauty, says an English writer. These qualities especially distinguished the palace of Justinian II. among the numerous edifices erected by him; the walls of it were overlaid with gilded bronze and with marble slabs, and the entire floor was of marble. He, however, was surpassed by one of his successors, Theophilus. This emperor built the celebrated Bucoleon, in which stood a bronze lion seizing a cow; the summer palace Bruos, the palace named the Pearl, and Pentapurgion, the Karian palace and the Triconchus. To the last building adjoined the colonade of the Sigma, and an acoustic structure was contiguous to the latter. At the Triconchus and Sigma Theophilus constructed a fountain, the basin of which was set in silver. Below it was an eminence on which seats could be placed for his courtiers, and to which there led up a flight of steps of white marble from Proconnesus. The fountain was supported by two slender columns, on which stood two bronze lions from whose mouths water flowed, for the purpose of diffusing coolness over the open ground in front of the Sigma.

THE MAMMOTH NEW BRIDGE of the C.P.R. at Lethbridge, previously described in these columns, will, in all probability, be opened to traffic the early part of August. The last of the steel towers of the structure has just been completed and all that now remains to be done is the putting on of the deck. This bridge will rank among the world's great structures of its kind, and it is a glowing tribute to Canadian engineering skill and enterprise. Its construction involved the labor of a small army of men for a period of two and a half years, and the cost of its erection was $1,500,000.

* * *

FIREPROOF CONSTRUCTION is coming to be more widely adopted in the United States with each succeeding year. There is a growing conviction among builders that it is not only the safest and sanest, but the cheapest in the long run. Building records of the country show that the total of new construction done in the 51 leading cities during 1908 amounted to $546,467,390. The building record in the same cities for the past month of March was nearly $64,000,000, just about twice what it was for March, 1908. A goodly proportion of this later work was built or is being built fireproof. Considerable reinforced concrete work is being done, although the largest percentage of fireproofing executed is of standard steel and hollow fireproofing tile blocks.

* * *

AN EARTHQUAKE-PROOF BUILDING, says BRICK AND POTTERY, of London, (Eng.), has been worked out in design by Professor Boermel, a well-known engineer and scientist. The essential feature of the building is a massive foundation, consisting of a massive bowl upon which is placed a rocking foundation, the radius of whose curved bottom surface is somewhat less than that of the bowl. At its centre is a half-spherical pivot, fitting into a cup bearing at the centre of the foundation. Upon the rocking foundation is built the house or other desired construction. To prevent the movable portion from canting too freely, and to bring it back to the vertical position after the earthquake shock has passed, it is supported at eight points, near its periphery, by a series of spring buffer, which are bedded in the lower bowl-shaped foundation. The shock of an earthquake is transmitted to the building through the yielding springs, and its interior steel-frame structure is relied upon to take care of any remaining stresses that pass through the springs to the building itself.

* * *

THE MASSIVE CONCRETE BRIDGE at Peoria, Illinois, has failed and many theories are advanced as the cause. Investigation, however, has shown happily that the failure was not due to the concrete structure itself but to a bad foundation. The two piers beyond the draw span toppled suddenly and noiselessly from their foundations and, carrying three arches of steel and concrete with them, slid into the waters of the Illinois River and sank almost entirely from sight. The pier beyond the draw was the first to give way, sinking towards the draw span. The sinking of this pier dragged the next one with its connecting arch with it, and this in turn dragged the second and third arches down to the water twenty feet below. The plans and specifications set forth that the piers which sank were to have been built on piling sunk six feet below the bed of the river, there being 110 piling under each one of the piers which gave way. These piers had been built on the piling without any regard as to whether rock bottom had been touched or not. Consequently, the weight of hundreds of tons had slowly but surely crushed down its frail support. Investigations have proven that the concrete structure itself was perfect and merely the fact that no care was taken to place the bridge on a rock foundation caused the destruction of this structure, valued at $100,000.

THE NEW TYPE OF CONCRETE RAILWAY TIE, of which the Italian Government recently ordered 300,000, is proving so satisfactory that a contract for a similar lot has just been awarded. The cost of the ties is $1.48 each, and it is understood that before long they will be universally employed on all lines throughout that country.

* * *

IT IS GENERALLY AGREED that the oldest house in the United States stands in St. Augustine, Fla., on a tiny,, narrow thoroughfare near the center of the old city. This house was built in 1564 by the monks of the Order of St. Francis. It is a solid structure, built of coquina, a combination of seashells and mortar that is quite indestructible. In the early days of the Spanish settlements this substance was quite plentiful in the vicinity of St. Augustine, the walls of the old city gate as well as that of Fort Marion being built of it.

* * *

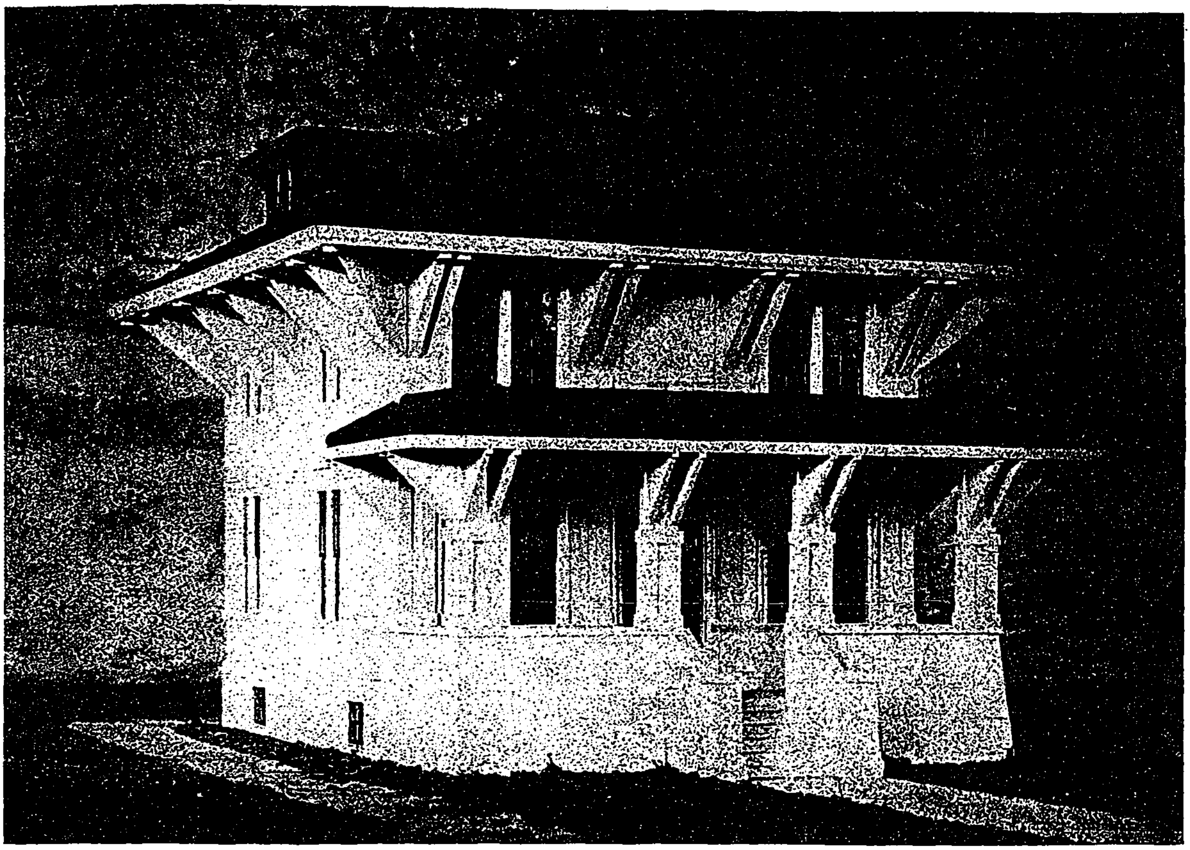
CONSIDERABLE NEW WORK in railway construction will in all probability be shortly undertaken in the Canadian West. At the present time, in and about Winnipeg great interest is manifest regarding the proposed new line of the "Soo" railroad, which is to run from Thief River Falls to Duluth, thereby opening a direct line from Winnipeg to Duluth and Chicago. This is evidently a line projected to meet the plans of the Great Northern Railway Company, which is about to build a line from the international boundary into Winnipeg. Two survey parties have begun work, and the actual construction will follow. It is predicted the direct line between Winnipeg and Chicago will be in operation over the tracks of the Canadian Pacific Railroad by the fall of 1910. There is also considerable speculation over the probability of the "Soo" building a line to Fort William, connecting at that point with the Canadian Pacific, while it is the well-known intention of the Canadian Northern Railroad to build into Duluth from Fort William. These new lines indicate the activity in railroad circles of Western Canada, and their operation will mean much in the development of Winnipeg and the Prairie Provinces.

* * *

TORONTO'S LACK OF APPRECIATION of the aims and objects of the Canadian Cement and Concrete Association in treating their first annual show, held in the Queen City last March, as a purely commercial undertaking, has been the object of some very severe criticism, especially by our contemporaries in the United States, who fail to understand such unpatroitic as well as parsimonious treatment of an infant industrial organization.

CONCRETE of Detroit, in its July number, says: "Two things have been done recently by the official board of the Canadian Cement and Concrete Association that will mean a betterment of conditions across the border. The first and less important move was the decision to bring before the city officials of Toronto the benefits to be derived from an annual cement show. The city charged the association $1,150 last March for a week's rental on a cold, damp, over-ventilated market building in which the exhibition of concrete machinery and supplies was held. A committee from the Association will wait upon the Toronto Board of Control with a petition asking for a rebate of this charge.

"The Association lost money on its convention and show, as was anticipated. The city officials and the newspapers of Toronto seemed to look upon the exhibition as a purely commercial proposition. They refused to believe that it had any educational features and no helping hand was offered to the promoters of the project. It is to be hoped that the Association's committee will succeed in its mission and convince the board that the organization is working only for the improvement of the building trade in Canada and the education of the builders and the general public in the uses of Portland cement."



Front view of new model for Mr. Edison's $1,200 concrete, fire-proof workingman's house, the practicability of which the inventor claims he is about to demonstrate.

THE EDISON $1200 MONOLITHIC HOUSE.—New Model of One-piece Poured Concrete Dwelling Designed for the Economic and Sanitary Housing of the Working Class.—Adjustable Moulds Provide for Variety in Design.—Practicability of Invention Shortly to be Tested.

Under the heading "The Edison Concrete House," we published in "Construction," (May, 1908), an illustrated description of the method proposed by Mr. Edison for the erection of a $1,200 cement house for the working man. With this, we gave a criticism by Mr. E. S. Larned, C.E., of Boston, Mass., of Mr. Edison's model with his proposed methods of construction. Both architects and engineers did not believe that "the Wizard's" scheme was practicable; first, because it would tend to eliminate individuality in design, and, secondly, because it was not believed possible to pour concrete into a great set of molds, such as would be required to cast a complete structure in one solid monolithic mass. Mr. Edison determined to overcome these objections, and has just completed another model, in which Mr. Edison believes he has overcome the criticisms of his first attempt. The following is an abstract from an article which appeared in a recent issue of the "Cement World," and will prove of exceptional interest not only to architects and engineers, but to all who are concerned with the problem of providing sanitary, fireproof and vermin proof dwellings for our laboring classes, at a low cost.—Editor's note.

ARCHITECTS AND ENGINEERS and in fact all technical men who have a knowledge of the properties of concrete greeted the first announcement of the Edison poured house two years ago with incredulity and smiles. The most frequent objection, or criticism, offered was the apparent impracticability of pouring concrete into an intricate set of molds and securing a surface throughout that would be free from imperfections. "It will clog," "It will not flow," were expressions heard on all sides. Then objections were offered on artistic grounds. "Imagine a city of houses, every one of which was like all the others. It is preposterous," was said. Mr. Edison has answered all these objections to the full satisfaction of the most critical. Here are the important facts about the poured house which will be spoken of more in detail further on. He has produced a mixture of a consistency almost like water which holds the stone or aggregates in suspension, allows the mixture to flow freely to all parts of the molds and secures a uniform distribution of the aggregates throughout the mass. The molds are adapted to variations of arrangement, thus making it possible to change the style of houses with the same set of molds. With five or six sets of molds, therefore, a wide variety of style is possible.

Yet Mr. Edison makes no boast of his accomplishment. The first house itself, which will be cast in a few weeks, will be sufficient answer to all critics. And while hitches may occur and unforseen difficulties may arise it must be the conviction of any man who views the specimens of poured work in the laboratory—specimens in which the aggregate was held in suspension while being poured—that the poured house is a fact and not a dream.

For be it known that with this problem solved and with the further fact that the design for every one of the parts of the intricate mold has been completed and now awaits only the pattern maker and the foundry there seems no doubt of its success.

The model for Mr. Edison's $1,200 house, as is illustrated herewith, is about 4 ft. high and everything, even to the interior partitions were included, is on the cast. The window glass was not overlooked, and the little house is lighted by miniature electric lamps.

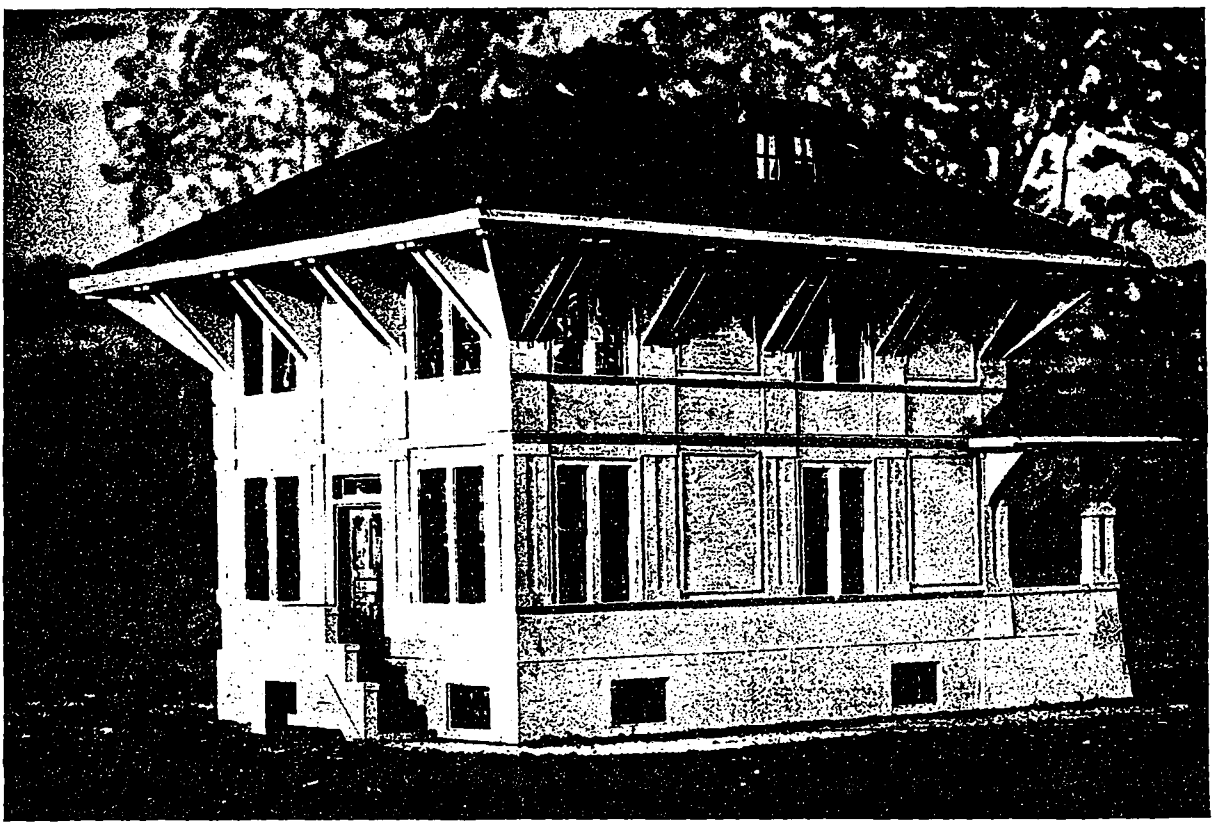
It has been mentioned casually that Mr. Edison has had this matter on his mind for eight years. His first idea was a two-family house, the designs for which were furnished by a New York architect. Considerable work was done on this design, which is the one familiar to all newspaper and magazine readers.

The work progressed so far that some of the patterns for the molds were made. But Mr. Edison came to the conclusion nearly a year ago that the design was not practicable and offered many serious obstacles. But more important than this consideration was the fact brought forcibly to his mind that the one-family house is the structure demanded. He brought into his organization George E. Small, a young engineer from Philadelphia, a man expert in detail work, and Henry J. Harms, an engineer who has seen service all over the world, particularly with the Dutch government in India. These men designed the house shown on these pages and were in-

Each room has large windows, so that there is an abundance of light and fresh air. The cellar, 7 feet 6 inches high, extends under the whole house and will contain the boiler, wash tubs and coal bunker. The main room, as well as the outside of the house, will be richly decorated.

The decorations will be cast with the house and will, therefore, be a part of the structure and not stuck on, as is done at the present time.

It is an important fact about this house that it will be entirely of reinforced concrete, including the roof, floors, bath and laundry tubs. The doors and window frames will be the only parts of wood or metal, so it will be practically fireproof. The mixture composing it is both water-proof and verminproof. The inside walls, stairs and partitions will be concrete also, and no plaster will be used. The surface left by the molds will be perfectly smooth and can be painted or tinted if desired.



View of model, showing how Mr. Edison's house will appear from the side and rear. The design, it must be admitted, is eminently superior in every respect to Mr. Edison's original model.

structed after its acceptance by Mr. Edison to proceed with the designs for the patterns and make all necessary experiments.

A house like this built of stone, both Mr. Edison and his engineers say, would cost several thousand dollars. But if the operator of the molds for the Edison house buys his materials in large quantities it can be built for $1,200. Now this house is designed for one family with a floor plan 25 by 30 feet. It is intended to be built on lots 40 by 60 feet, giving lawn and small garden room.

The front porch extends 8 feet and the back porch 3 feet.

On the first floor is a large front room 14 by 23 by 9½ feet high, intended as a living room, and a kitchen in the back 14 by 20 by 9½ feet high. In the corner of the front room is a wide staircase leading to the second floor. This contains two large bedrooms, a wide hall and a roomy bathroom (7 feet 6 inches by 7 feet 6 inches by 8 feet 2 inches high). The third floor has two large rooms.

All the decorations and ornaments will be cast with the house and in every case will be a part of the wall which it adorns; in fact, the entire house will be in one piece, as if hewn or carved out of a solid piece of stone. The cost of the house, $1,200, Mr. Edison says, includes heating and plumbing and a structure ready for occupancy. He lays special emphasis on the fact that this price is based on the building of houses in large numbers where materials can be purchased in large quantities and where the gravel excavated on the site can be used in the mixture.

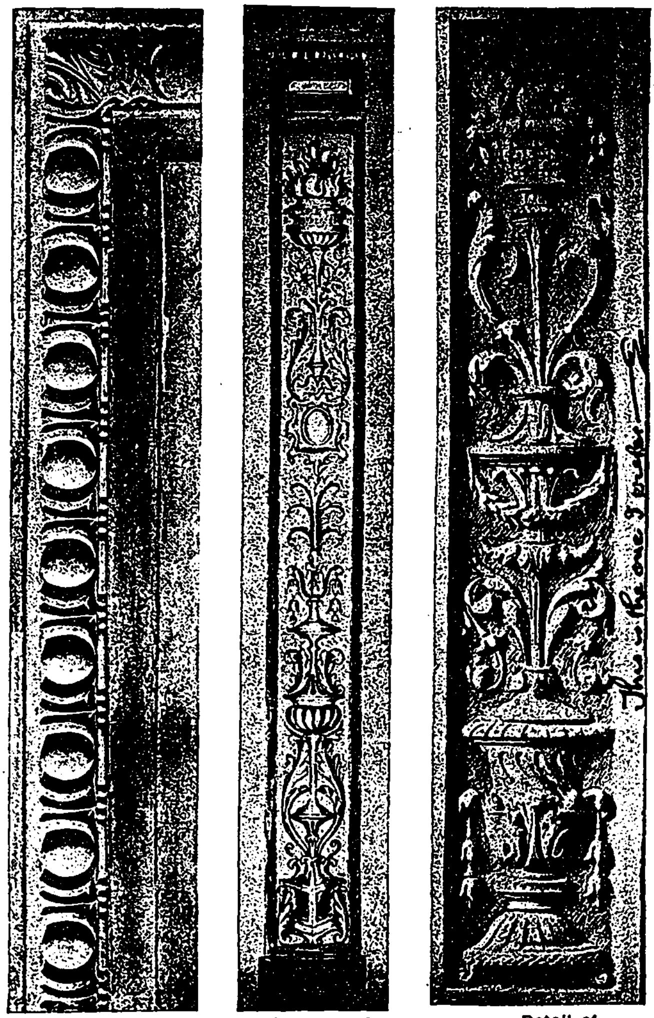
As has been indicated, cast iron molds will be used, set up on a concrete foundation or footing. Some time before the molds are set up this footing and the basement floor will be placed in order that they may be thoroughly set before the molds are erected. The molds will be placed on this footing, and the cast house will include the basement walls. Regulation reinforcing rods can be used in the molds. The stack for the bathroom and all gas pipes will be placed at the time the molds are set up. Mr. Edison allows four days for the erection of the molds. For this house several hundred pieces will be required. Each will be fitted to be assembled with the others and locked readily. The time necessary for the pouring of the liquid he says will be only six hours. Four days after the pouring the dismantling can be done. Six more days are allowed for the hardening of the concrete. The inventor thus makes fourteen days as the time necessary for the completion of a house. This time may be reduced under favorable conditions.

It is estimated that with six sets of molds 144 houses can be built in a year. As the same forms are used indefinitely the cost is reduced to a minimum. Concrete residences at the present time and under the conditions that require the use of wood for forms are prohibitive on account of the expense for lumber.

As to the method of pouring there has been much speculation outside of all consideration of the mixture itself. Extra large size mixers will be used. The concrete after being mixed, will be dumped into large tanks from which it will be conveyed to a distributing tank on the roof or top of the forms. A large number of open troughs or pipes will lead the mixture to various openings in the roofs, whence it will flow down and fill all parts of the molds to the footings in the basement till it overflows at the tip of the roof. The actual pouring will require about six hours, and while the pouring is going on the mixture will be agitated to prevent the congestion of the materials. This will be further accomplished by the addition of a certain colloid, or clay, to the mixture.

The fact has been absolutely demonstrated by experiment, as proved by specimens in the laboratory and by actual and exhaustive tests, that a mixture is produced that has all the characteristics of a liquid, flows readily and fills all interstices and openings, and that during this flow the heavier aggregates can be held in suspension so that they are distributed evenly throughout the mass. This hardly seems credible, but the details of the ornamental work shown from the laboratory appears to substantiate this fact. Each piece was poured from this liquid that was almost as fluid as water, yet it is a true concrete and stands all the compressive and tensile strength tests. Any good Portland cement can be used in the mixture.

The most convincing fact in support of Mr. Edison's claim that the mixture he has evolved will be satisfactory in the pouring process is the result of a test at the laboratory.



Ornament for large panel. Ornament for columns. Detail of panel decoration.

Details of decorative scheme for the Edison Concrete House.

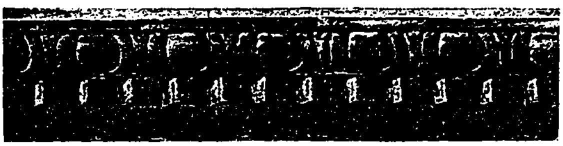
In this test the face of the form was removed so that the surface of the material was exposed. The upright section to which the funnel was attached was 7 feet high. The lower section was 24 feet long, jointed to another section 16 feet long by a perpendicular part 3 feet high. The tail end of the form was another perpendicular section 3 feet high. The forms were made of ordinary dressed lumber, 1-inch stuff, and securely nailed. The inside dimensions were 4 by 4 inches. The liquid used in this test contained crushed granite of the size that would pass a half-inch mesh sieve. It was poured in a funnel, the pouring continuing till the mixture ran over at the other end, which is nearly on a level with the funnel. In its progress the liquid containing the stone made a turn at the bottom, passed along 24 feet to the upward turn, flowed up, stone and all, 3 feet to the section parallel with the bottom one, back 16 feet and up 3 feet. The stone remained uniform in the mixture throughout, and was as evenly distributed at the far end of the form as at the funnel. The surface is even and smooth, but is much improved by the use of cast iron forms, for by the use of these the grain of the wood forms is avoided.

Messrs. Small and Harms have all the remaining parts of the molds ready for the pattern maker, and as soon as the patterns are completed the work of casting the molds will be done. After that the first experimental house will be poured in sections to learn certain points and discover possible defects if any may exist. It is expected now that the first pouring will be made this summer, possibly the end of August. If this is successful, as it now appears sure of being, a larger pouring will be made of the cellar and the first floor and a third pouring will include the complete house.

It is not to be presumed that Mr. Edison and his engineers have had no difficulties. Difficulty is a factor that lurks all about the Edison laboratory, just as it does about any other institution where original things are being accomplished. But so many seemingly impossible things have been done that the inventor and his lieutenants feel reasonably certain that they have reached the goal of success with this house. The mixture has been secured. The forms are a certainty. Now for the house. One of the last difficulties encountered, Mr. Harms said, was the problem of removing the interior molds after the pouring, particularly those of the basement. This problem has been solved satisfactorily and the system of taking away the inner molds no longer presents any trouble.

One of the principal objections made to the Edison house was on artistic grounds. When announcement was made of the poured house the architects instantly offered the objection that every house would be alike, that a whole town might be built with one set of molds and would present an appearance of monotony. We are able to assure all who object to the cast house that a number of variations of style are possible and provided for in any set of molds. There may be variations in the porch, or a 1-story bungalow may be cast with the molds. Then if six sets of molds are made use of the field of variety will be greatly widened.

A complete set of molds will cost approximately $25,000, while the necessary plant will cost $15,000 more. Successful operation will require six sets of molds to keep men and machinery constantly employed. So it will be seen that a large capital will be required, and on that account building operations with the Edison molds will be



Detail of the two exterior ornamental bands, Edison concrete house.

carried on only by responsible men. The inventor himself will not be commercially interested in the molds. With the problems involving the industrial world that surround the adoption of the forms and the building of any very great number of houses after his method neither Mr. Edison nor the men engaged in the cement industry have any concern. He aims to accomplish the building of good homes for the workingman at a price within his reach, and the change in economic conditions that may come must be met when the time arrives.

The architect will always have clients and the skilled mechanic will always be in demand, for individual taste must continue to find expression. But the tenement house dweller for whom this house is intended cannot build under present conditions, much less consult an architect.

The Edison house will reduce living expenses enabling any man to own a home without paying twice its cost. Fire insurance and repair expenses will be eliminated altogether.

Such is the Edison house as it was explained by the inventor himself and his engineers for your instruction and profit.

There's a cry from millions of mothers and children who group about in the human bee-hive tenements of the great cities, craving a breath of air, a glimpse of blue sky, a few blades of grass. Swallowed up and submerged as they are in the dark back rooms, this house Genius of Invention is to be their salvation.

An Omnicient Architect.

Of the various vocations that absorb the humand mind,
The architect's profession is the most peculiar kind.
An office and a shingle are essential things, no doubt,
But, several other factors help to round the practice out.

Mechanical ability a set of plans to make,
Artistic sense to work them up so they are sure to take.
Preliminary estimates at maximum prepared,
That will foot up so little that the clients won't get scared.

Some knowledge of surveying, that he may lay out the land,
The lines and grades electing where the edifice shall stand.
In "ancient lights" and "real estate" he must be quite at ease,
Not to mention landscape gardening, sidewalks, sewers, shrubs and trees.

Then he must cope with coping and everything discussed,
And know much more of fencing than how any arch will thrust.
Clarivoyant he must be, to know before the work's begun,
Exactly how the thing complete will look when it is done.

Aufait in all materials, in every kind of stone.
Which best will hang together, and which will stand alone.
Not stuck on stucco, but in clays familiar as a potter,
And be on terra firma when he talks of terra cotta.

Then, he must pile-up harmony, both presto and andante,
And take care of his capital when he puts up his antae.
He must be fully posted on his heating and his frieze,
And the lining of his architrave must not bag at the knees.

His members, frames, groins, ribs and feet would puzzle any doctor,
His attics and his lofty forms electrify the Proctor.
No laundress or musician knows as much as he of fluting,
His moulding way up to O. G. as well as his mail-chuteing.

Slate, tiles, conductors, shingles, tin, eaves, cornices and flues;
Paints, oils, stains, putty, glass, the finishes they use;
Accoustics, optics, papers, paint interior decoration;
Distempers, dog-teeth, dados, plumbs, jambs, beads of every nation.

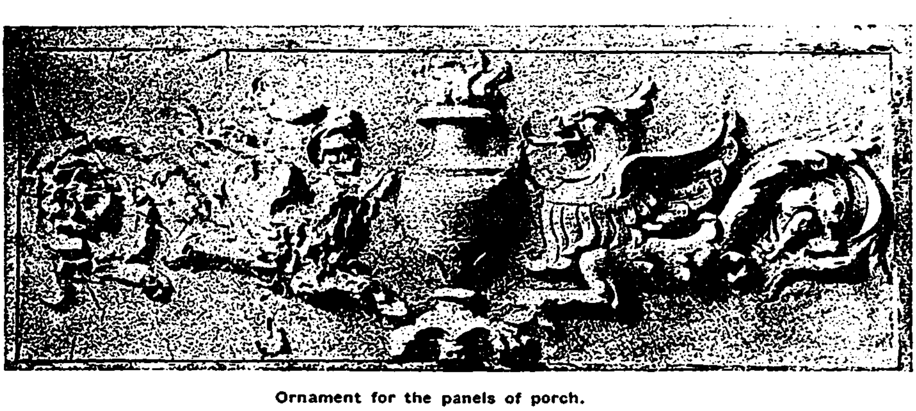
There's tensile strength, and crushing strain and fireproof construction,
Plumbing and gas, electric work and ventilating suction;
Lime, mortar, plaster, cement, brick, locks, bolts, door closers, hinges,
And with each peculiar client know just where the shoe impinges.

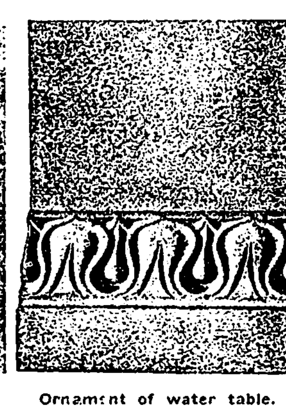
Boilers and fuel, pipes, exhaust, the fastest elevator,
Cold storage as embodied in the ——— Refrigerator;
Ranges and grates and furnaces, the principal of Ruskin;
The better points of every school, Assyrian, Greek Etruscian.

Stair builder, mason, carpenter, designer, what a head!
'Tis marvellous that "Fools rush in where angels fear to tread."
He gives his best for perfect work, and when he's done it all,
He finds his labor is in vain, "that closet is too small."

—EXCHANGE.

AN ENGLISH COMPANY capitalized at $5,000,000 has been formed to purchase the British patent rights of Dr. Heinrich Colleseus, of Berlin, covering a method of manufacturing Portland cement from the waste product of iron blast furnaces. The company expects to erect cement plants at different points, and to make a bid for export trade.





Ornament for the panels of porch. Ornament of water table.

Detail of decorative work, Edison concrete house.

CELTIC ARCHITECTURE.*—Examples of the Various Periods of Building Design in Ireland.—Cromlech and Dolmen Builders and Methods of Construction.—The Influence of Christianity.—Irish Ecclesiastical Work.

By W A. SCOTT, A R.I.B.A.

MANY SAVANTS in other arts besides Architecture, I believe, agree in placing the Celtic conception of current architecture as at least as interesting, if not as prominent or far-reaching, as the other well-known developments of the elements of building.

This same art of building is, after all, the very foremost of all arts, because, without it, no other art or science could have been born, much less developed.

Concurrently with my poor endeavors on the archæological aspect of my subject, I am to remark upon the lessons which this practice of architecture by those long-dead Celts may teach to us modern exponents of architecture the art of building. These lessons are, I think, self-evident, and I do not propose to labor this point at all.

To more readily understand the origin and development of those Christian buildings in Ireland, which are the first structures that may be dignified by the term Architecture, it is advisable to pass in brief review the pre-Christian structures and buildings of which we have evidence or remains.

To use the words of the late Margaret Stokes: "Owing to the fact of Ireland being the farthest western point of Europe from those centres of culture in the East and South, whence the current flowed, it was long centuries after the first wave of culture broke upon the Irish shore. It is in that country, where they last existed, that we find the largest traces of those elements which are common to all races in the development of their primeval arts. In the older countries, where they first existed, they have been superseded in the vast tracts of time covered by their history. But in this little western isle, where their appearance was later, their periods of existence were shorter, their transition more rapid than in the East, since the older the human race becomes the more rapid does progress advance, and changes follow in quick succession; so that it is only in a country that is situated as Ireland was that we may expect to find such a series of monuments still existing as will give us tangible evidence of the arts and customs of each period, back to that which is remote."

CROMLECH AND DOLMEN BUILDERS.

Ireland may be said to possess more remains of early Christian art and architecture than most other countries. This is due to many causes, amongst which are its isolated position and being the most westerly point of Europe. So far as can be ascertained the first buildings in Ireland were the cromlechs or dolmens, erected probably by the Fir-Bolgs. They were generally placed on a hill or rising ground, and constructed of several upright stones, covered by a large slab. This slab in some cases extremely massive and said to weigh in some examples so much as 100 tons. Kernanstown, County Carlow, may be quoted as an instance of this Cyclopean construction. These structures were intended as tombs for a hero, a chieftain, or some person of remarkable distinction. The remains of monuments of this class are very numerous, there being no less than 800 of them spread all over this island.

That the cromlech builders came from the East is evidenced by the diminution in size of the covering slabs and blocks of stone used in their construction, as one traverses the island westward. While those along the eastern coast in Leinster have covering slabs of from 18 to 29 feet in length, those on the western coast are only 8 to 10 feet, thus tending to show that the fashion having been set on the east coast (always the richer and more cultured part of Ireland), the poorer builders, often no doubt by lack of suitable material, built as near to the admired originals as possible.

This gradual degeneration of the type in Ireland, as we travel westward across the island, would lead us to surmise that dolmen builders—who have left still finer monuments in Britain (as at Stonehenge) and on the Continent—reached the Irish shores from the East, the stream of emigration pressing westward till its final arrest on the Atlantic coast.

These dolmens are sometimes surrounded by circles of upright stones, measuring so much as 150 feet in diameter (as at Loughcrew, Newgrange, and elsewhere). More advanced monuments of this type—but covered with a mound of earth or stones—are the dome-roofed sepulchres, as at Dowth and Newgrange. A distinguishing feature of the later monuments is the carving found on the upright stones forming the walls, the roofs, and lintels, consisting of incised patterns, amongst which are to be found circles, groups of concentric rings, spirals, zig-zag, lozenges, dots, stars, and fern pattern. These carvings were executed with chisel and scraper and sometimes with the punch. A fine collection of plaster casts of the principal inscribed stones at Newgrange is now exhibited in the Irish section of the Science and Art Museum.

EARLY FORTS OR DUNS.

Stone forts or duns, such as those on the Arran Islands, are roughly oval or circular in form, with massive walls constructed without mortar. The outsides of the walls are of carefully fitted masonry, the centre part being filled in with rubble.

In Dun Aengus, on the Arran Islands, it seems as if the wall had been built in short lengths, each completed independently of the other, and such a method would resemble that which the French term building in parcs. Then the stones, which are fixed as headers, are tilted downwards towards the fact of the wall, so as to draw off the water from the joints, These details, along with the existence of regular doorways, at once raise these forts to the rank of "buildings," and place them far above the ordinary camps and strongholds of the Britons. In these doorways, which are all formed with inclined jambs and horizontal lintels, we see—as at Fort Staigue and Dun Aengus—that the weight of the superstructure is thrown off the lintel by means of a still wider stone placed a layer or two above it. These doorways vary in depth from 18 to 27 feet, and are roofed by a series of stone slabs from 6 to 8 feet in length.

The Staigue Fort, in Kerry, is the most perfect example now existing in Ireland. It is nearly circular in plan and about 114 feet in external diameter. It is built of Shistose slate, the spaces between the larger stones being filled in with spawls. The wall varies in height from 10 to 18 feet, and is 13 feet 6 in. thick at the base and 7 feet at the top—both faces of the wall are built with a batter. The inside of the wall is formed into series of stages all round, with steps connecting them at intervals. The steps are surmounted by small platforms

*Paper read before the Architectural Association of Ireland.

near the top of the wall. The whole work exhibits considerable skill and much consideration.

Although the structures and buildings just described may seem to many of you entirely out of place in this paper, yet they will serve to indicate that the inhabitants of this island were skilled in the handling of stone as a building material, as distinguished from those primitive people who were only used to build their huts with mud-and-wattle construction.

INFLUENCE OF CHRISTIANITY.

Upon the introduction of Christianity, the conversion of the king or chieftain—the owners of these forts—usually followed the establishment of a Christain mission, and instances are recorded in which the owner dedicated his fortress to the service of the new God.

After a time, or perhaps at once, an oratory or church, with a cell, was built within the old military enclosure for the residence of the missionary and for worship; and as time went on those men who became missioners banded themselves together under certain rules of life and became what we know as "monks."

In the erection of these buildings local workmen and undoubtedly existing methods of construction were employed.

Such proceeding as the foregoing is clearly set forth in the History of the Monastery of Inismurray:

"With these facts before us, it is easy to see how the first Christian architecture in Ireland was developed from the pagan. It would appear that the monks had adopted the methods of building then practised by the natives before the introduction of Christianity, gradually making such modifications in form as their difference of purpose and some traditional usage required. Within this stone fort, now become Christian, or the cashel built in imitation of it, the first Christians found shelter for their little oratories, their round bee-hive huts, their wells, gardens, and burial grounds."

I fear I may be dealing at too great length with these structures, so will pass on to, and briefly examine, two other classes of buildings, approaching more nearly to the form of the early oratories and churches.

The next form of building which we meet is that commonly known as the Bee-Hive Cell. Some of these were placed under the ground level, or covered with a mound of earth, the entrance being concealed; but those we will not consider: others were formed over the ground, and were somewhat in the shape of the common straw bee-hive. They were usually circular in plan and dome-shaped inside and out. This shape was not obtained by the use of the arch (which seems to have been then unknown) but by projecting each succeeding course of stones beyond the other (in other words, corbelling), that is, forming smaller horizontal rings at each course, and so on till the small opening at the top was covered by one stone. The Esquimaux to this day build their ice-huts somewhat in this manner.

This form of building was adopted by the first Christian missionaries. After a time the inside was changed from circular to rectangular in plan, as at Skellig-Michael, off the coast of Kerry. Later still, the rectangular shape was continued to the outside, and this gives the form of the recognized Christian oratories.

The oratory of Gallerus, in Kerry, seems to be the direct outcome of the change in plan from circular to rectangular. The same principle of construction is used, the difference being, as before pointed out, in the shape of the floor of the building. The door is now made more important, and an eastern window is first introduced. This oratory of Gallerus is rectangular in plan, measuring about 15 feet long and 10 feet wide inside. The walls are 4 feet thick at the base and slope upwards in a curved form till they meet at the ridge. As in the bee-hive cell the roof is formed by setting back the stones from the outside, one above the other, till the apex is reached. The angles of the projecting stones, inside of which the roof is formed, were cut off and show tool-marks. There is a bass-stone, with socket for a cross on the ridge over the eastern gable. The doorway in the west gable is covered by a lintel. On the inside over the lintel are two projecting stones, with holes, from which the door was hung. A small window, with rounded head, cut out of a single stone, gave light from the east gable.

At Kilmakeder, not far from this place, is a similar oratory, but in a ruinous condition. The main features are the same as at Gallerus, but the quality of the masonry and the general finish of the work is not nearly so good. The east window is covered by a lintel, and the jambs have an external as well as an internal splay. The external splay is unusual; but, being unusual, only adds to its interest. It is impossible to think that these old builders were regulated by any canons of art, and they certainly were not so prone to follow other men's rules and regulations, as some architects are at the present day.

CELTIC ARCHITECTURE.

We now come to what I call Celtic Architecture. This may be said to commence in the churches built with cementing material and dressed masonry, as distinguished from the earlier buildings erected of dry rubble. These churches were rectangular in plan, with a doorway in the western and a window in the eastern gables. In later times windows were introduced in the side walls; but not usually at first. The doorways have inclined jambs, like those in the earlier forts, and are covered by a large lintel stone. In later churches the lintel is sometimes smaller, and had a relieving arch turned over it to take the weight off the centre. An example of this occurs at Glendalough.

Great blocks of stone were used in some places for the lintels, which must have required considerable ingenuity to lift into position.

The lintel stone over the doorway of St. Fechin's Church, at Fore, County Westmeath, is 6 feet long, 3 feet wide, and 2 feet 4 inches high, and weighs about 3 tons. A local tradition tells of the difficulties experienced by the workmen in raising this stone to its place, and that St. Fechin, taking compassion on the workmen, sent them away for the night, and that on their return next morning the stone was found perfectly adjusted over the doorway. This story was related to me about sixteen years ago by an old man in the village of Fore. Such stories are, however, common and not confined to Fore.

Windows are small, usually in the eastern end, at first covered with a lintel, and later with two stones inclined together in the form of an isoceles triangle, then a rounded head hollowed out of one or more stones, the sides invariably splayed to the inside, to permit the spread of light as it entered.

The massive masonry, composed of huge blocks of stone—especially in limestone districts—is very remarkable, some of the stones being so long as 8 to 10 feet. The quality of the masonry varies considerably, and depends almost entirely on the material to be had in the district. The stones were sometimes dove-tailed and halved into each other in quite accurate fashion, and in some instances were without spawls. This masonry was cemented together with a cement or mortar, in which sand and shells (near the sea-coast) and sand and clay (in inland places) were used.

In treating of architecture or building of any period it has been usual to lay down rules to define the characteristics and features of that period. From these features the date or style is supposed to have been known. I cannot follow this course, nor can I conceive that the early builders who designed and erected these churches worked by any code of rules other than that of fashion or from what some one of them had seen or possibly had heard of. In districts where material and surrounding influences differed widely, the builders were not greatly concerned that their buildings should correspond, or be in a "pure style," as the term now goes. In fact, I am perfectly convinced that no such rules existed and that no great anxiety to conform to a style could have prevailed. The early builders were true designers, and, working from the primitive cell, with its lintelled doorway and sloping jambs, by development, and with the assistance of that most revolutionary discovery in all the world's building, "the arch," arrived at the beauty of the work which, for an Irish example, exists at this day in Cormac's Chapel at Cashel and numerous other places.

FEATURES OF EARLY CHURCH WORK.

One striking feature of these early churches was the projecting pilasters on the gables and sometimes on the angles, at first massive and about the same thickness as the walls themselves, later much reduced in size, moulded on the angles, and with carved caps and bases, as at St. Molaise's House on Devenish Island. These projections were carried up along the slope of the roof and a string course was carried along the side walls at the top where the slope of the roof commenced, to throw the rain water clear of the walls. These features lent an air of strength and dignity to the building, which went to enhance that dignity it already possessed in the broad, simple surfaces, and large massive masonry.

The first churches, as I said before, were simple, rectangular buildings: as time went on, and the number of Christians increased, it became necessary to enlarge the churches or build new ones. Many instances of enlarged churches exist. Sometimes a chancel was added to an eastern end, and the old east window enlarged till it reached the importance of a chancel arch. In other cases the original church, which was too small, was converted into a chancel and a new body or nave was built to the western end of it. In this latter the old western doorway was converted into a chancel arch.

We will now consider some of the main features. The form which the first chancel arches took was that of a semi-circle springing from straight jambs, with square angles, and all unmoulded: no impost was used. The stones were chisel-dressed, of varying or equal sizes, and well jointed. In later work an impost moulding was used; at first plain, but later moulded, and afterwards carved. Then new features were introduced in the shape of one or more sub-arches, sometimes called "orders of arches." These were at first plain, but afterwards moulded and carved with a wonderful variety of ornament, such as "chevron," rows of sculptured human and animal heads.

STONE ROOFS AND METHOD OF CONSTRUCTION.

The roofs of most of the churches are no longer in existence; those only which were built of stone have remained, and even some of these latter are in ruins. The first stone roofs were formed by projecting each succeeding course of stones, as in the case of the bee-hive cells; but when the use of the arch became known the roofs were supported on arched vaults, as at Cormac's Chapel.

It may be that the most important achievement of Irish architecture was the discovery of a method of stone roofing at once enduring, lofty, and picturesque, which seems a natural growth as a defence in a climate exposed to rain, snow and tempest. The latter examples of these buildings mark the transition from the period of the round to the pointed arch; but there are early stone roofs of simpler and ruder form, and there still remain a number of buildings in Ireland which can be so arranged as to show in a regular series the striving after and final achievement of the pointed arch.

These churches all form studies of the deepest interest owing to this fact; but it will be sufficient for our present purpose to name four—Gallerus, Friar's Island (near Killaloe), St. Columba's House at Kells, and Cormac's Chapel, Cashel.

The first evinces no knowledge of the principle of the arch, for the form of a pointed arch was obtained by one stone projecting beyond another till they met at the apex. This roof was liable to sink at the sides from the great weight of the stones.

The second church in our list shows that the method adopted for counteracting this was as follows:—The lower storey of the building was roofed by a barrel vault, built on the radiating principle. On this was raised the high-pitched stone roof, at first—as in Friar's Island—constructed of rectangular slabs of various thicknesses laid in courses, each overlapping the preceding one, and dressed inside and out to the rake of the roof. Under the ridge is a space left, the primary purpose of which was to lighten the weight on the vault, but which afterwards in larger buildings served as a chamber. In the oratory or house of St. Columba, at Kells, the construction of the upper arch is less rude, and the builders were evidently striving to rise from the false-pointed to the more perfect form of the radiating arches. The stones are laid in horizontal layers half way up and then radiate towards the top.

The open space above the barrel vault is divided by cross walls into three portions, the section being a triangle, having two sides formed to a rude curve, these sides not being arched but built of thin stones and thick beds of mortar, the courses projecting as they rise. The process followed seems to have been this—that the walls were brought up to the level of the springing of the arch, and then dry stone cross walls were built supported on which a rough centering was made, and upon this the arch was formed by building flat stones on their edges with a rough approach to radiation by the use of thick mortar beds, and finished at the top by selecting a thicker or a thinner stone, as the case might require for keying. Then, having brought the external walls to the level of the eaves, they proceeded to form the roof, carrying it up in masonry resting on the back of the arch as far as was judged safe to go, and building with a hollow space to reduce the weight, introducing cross walls for support.

In the roof of Cormac's Chapel a farther advance is seen. Here the coverings of both storeys are true, arches, constructed with radiating joints and the upper one in every respect a pointed arch. This is only one of several examples of the kind in which pointed arches were used, and the date of whose erection is probably prior to the existence of buildings in England in the pointed style. The boldness with which the heavy stone roof of Cormac's Chapel is placed 50 feet above the ground upon a structure little more than half the width, as well as the skilful manner of its execution, are very striking.

TYPICAL EXAMPLES.

To come now to particular examples of the early churches. In St. MacDara's Church, on an island off the coast of Connemara, we have a typical example of the early stone-roofed church. It is built of large stones some 4 or 5 feet in length; the gables have projecting pilasters, and this projection is carried up along the slope of the roof. The doorway is of the lintel type, with inclined jambs. A round-headed window lighted the interior from the east end, and there is another window in the south wall. The roof was of stone, with level beds, but is now in ruins. The old church at Killiney contains a portion which was erected in the early times of which we are speaking.

The doorway in the west gable is lintel-covered; on the soffit of the lintel is marked a cross. This is a peculiarity found in another place—the Lady Chapel at Glendalough. The east window has inclined jambs, with splays to the inside, and is covered with a flat lintel. The chancel arch is of the early type, being square on the angles or jambs, and without imposts or sub-arch.

Glendalough contains one of the most interesting groups of ecclesiastical buildings in the country. It presents examples of almost every type of Christian architecture in Ireland. There is the Early Oratory, the Small Church, the Round Tower, the Stone-roofed Oratory or Church, the Cathedral, the Romanesque Church; and numerous Crosses.

The Church of Our Lady, one of the earliest of the buildings, consisting of a nave and chancel, the walls 3 feet thick, of local mica slate, with quoins of dressed granite. The chancel arch is in ruins, the doorway of the lintel type, with inclined jambs, is formed of dressed granite in large stones, and has a shallow projecting flat band as an architrave running round the jambs and head. The lintel has a cross inscribed on its soffit, like the one at Killiney Church.

Trinity Church contains an interesting example of the early chancel arch, without mouldings or impost. The stones forming the arch are well-dressed and accurately fitted. The east window is round-headed, cut out of a single stone. The insides of the jambs and arch are splayed, and the inside arch is formed of several stones; a triangular-headed window occupies a position in the south wall. The doorway in the west gable is square-headed. Petrie says: "There was formally a round tower belfry attached to the western end, which fell in 1818."

The Cathedral, said to have been erected in the seventh century, is of considerable extent, the nave being 48 ft. 6 in. long by 30 feet wide. This was evidently roofed with timber, being too wide and the walls too light for a stone roof, as constructed in that early period. The chancel seems to have been added subsequently, the masonry differing from that of the main church, and not being bonded into it. The east window was of remarkable and considerable richness, widely splayed on the inside and moulded on the angles. The arch had a zig-zag or chevron moulding running round its inside. The carving of this window is now in a dilapidated condition, but sufficient remains to show its design and general appearance. The chancel arch is incomplete, only the jambs and part of the springing-stone remaining. The doorway is square-headed, with a comparatively small lintel stone, having a relieving arch over.

St. Kevin's House (sometimes called "St. Kevin's Kitchen") may have originally been used as a domestic building; but it was afterwards converted into a church by the addition of a chancel, (now disappeared). A smaller added building at the north side of the position occupied by the chancel now remains. This addition was probably used as a vestry or sacristy. It is stone-roofed, but the outer covering is dilapidated. The entrance from the nave into the chancel was cut through the east wall, and was not constructed as an arch, but formed with a semi-circular head, cut through the courses of stone.

The upper part of the original east window, built up when the chancel opening was made, may be traced over this opening. The nave is covered with a circular vault, and over this is a low chamber between the top of the circular-vaulted ceiling and the splayed roof. The roof is formed of horizontal courses of stone, with the outer angles cut off to the slope of the roof. Over the west end is a belfry in the form of a small round tower. This was probably also an addition. The doorway in the west gable, now built up, is square-headed, with a relieving arch over the lintel.

LATTER ADDITIONS.

Speaking of the additions to the building, Petrie, who made a very careful examination of it says: "It is highly probable that these additions were made not long after the erection of the original building, that this building in its original state was at once the habitation and oratory of the eminent ecclesiastic. . . I see no reason to doubt, and it is highly probable, that it received shortly after his death those additions which were necessary to make it a church fit for worship of those who would be led thither from reverence to his name."

The House of St. Columba, at Kells, County, Meath, is very similar to this building, and, except that it was not added to, and corresponding as it does in the manner of construction, one is led to suppose that it was built by the same masons.

Another building of this type is St. Flannan's House at Killaloe. Petrie is, however, in error when he speaks of St. Molaise's House, on Devenish Island, as having been exactly similar to these structures in everything but the superiority of its masonry. St. Molaise's House is smaller by half than any of the other buildings compared, and would correspond more with St. MacDara's Church (with its projecting pilasters) than to any other. The Rev. J. E. McKenna, C.C., M.R.I.A., of Enniskillen, in his book on "Devenish," says: "What makes this work unique of its kind and throws such a mystery around its age, is the beautiful sculpturing of its pilaster quoins." The Cyclopean masonry belongs to a very early period. Dr. Petrie, who examined it, saw no reason to doubt that Molaise performed his devotions in it; but Petrie must not have examined its sculptured quoins, or he would have pronounced this to be work of the 10th or 11th century.

From the position they occupy, and the great distance the stones, of which they are part, extend into the wall, it is quite clear that they were not, as has been suggested, inserted hundreds of years after the church was built. We can account for the architectural anachronism which the Devenish pilasters involve only by supposing that they were left perfectly plain at first, just like the projecting side-walls of MacDara's Church, and centuries after they were carved as we now find them.

This church, or oratory, as it might more properly be termed, is quite small, and could not have afforded accommodation for more than half-a-dozen persons. The walls remaining are only 3 or 4 feet high; the doorway in the west gable is square, with a flat projecting architrave, and the jambs do not incline. A peculiar feature of the doorway is that it is recessed or rebated on the inside as though for a door-frame or to form a surface for the door to close against. The roof was of well cut stone, not roughly dressed, as in the buildings before noticed, but finely chiselled and each stone lapping over the one underneath to protect the joints from the entry of water and also prevent the thin edge of the stone being flushed by the action of frost or weather, as it undoubtedly would be if cut to a sharp edge. Father McKenna, during his examination of this building, discovered some of the roofing and barge stones, and made a restoration of the roof, which is illustrated in his book on Devenish.

"IRISH OR HIBERNO ROMANESQUE" PERIOD.

We now find ourselves at a period in the history of the architecture of Ireland which is designated by the term "Irish-Romanesque" or "Hiberno-Romanesque." This kind of work did not commence all at once, but grew, as indeed all styles or kinds of work do, and it is impossible to draw a line dividing the buildings which came before this time, and say "this style commenced here, and the other ceased."

There are two methods of describing remains of this class. One by general description of the leading characteristics, picking out the features from the building generally; the other by describing the building separately. The latter will be, I think, the best for our purposes. However, a few notes of the general appearance will not be out of place. Afterwards we can examine the buildings separately.

The changes we first notice in the buildings now under consideration are: The substitution of the arch for the lintel in doorways and other openings, the multiplification of arches or orders of arches, and the elaborate ornamentation and sculpturing of these features.

Walls are not constructed with such massive masonry, and are often higher, the roof being sometimes less steep in pitch.

Windows have mouldings and carvings on their external faces and are larger and sometimes moulded and carved on the inside.

The sculptured decoration bears strong resemblance to the unequalled metal work of this country.

As we examine the buildings separately, we shall notice further distinctive characteristics, which, though not universal, are observable in such charming variety and without any tiresome repetition, such as may be found in some modern buildings.

Hardly two buildings are alike, and all have their own peculiar diversity of detail.

The church on the island of Inniscaltra, on Lough Derg, is, perhaps, one of the earliest of this type, re-erected, it is said, in the end of the 10th or early in the 11th century. The nave measures 30 feet long and 21 feet wide, and the chancel about 15 feet long and the same in width. The chancel was probably added at the time of re-erection by King Brian Boruma, the masonry of which it is constructed differing from that of the main church. The doorway, now in ruins, consisted of three orders, that is, of three receding arches, with the jambs recessed to correspond. The angles of the jambs were rounded and finished with small sculptured human heads as capitals under the imposts. The arches were ornamented with chevron or zig-zag ornament. The inside of the doorway was finished with a single jamb only, having a rounded angle, with shallow sinkings on either side to form an attached column.

The chancel arch, springing from carved capitals, was composed of three receding arches or orders, and was unmoulded. The centre arch sprung from two attached semi-columns. The capitals were simple bowl-shaped, connecting the round columns with a square abacus. They were carved in low relief, with a broad simple leaf pattern.

The windows in the nave are different, one with a square head and inclined jambs has shallow flat bands continued round as an architrave, probably belonging to the original chancel; the other, round-headed, cut out of a single stone, with shallow moulded architrave continued all round the sill and head. A small triangular opening is placed in the west gable high up.

The doorway of the church at Kilmakeder, in Kerry, combines the arch and lintel. It is of three orders, with characteristic carving. The inner order is covered by a large lintel stone, filling the whole tympanum of the arch. On this lintel is carved a grotesque head, in relief. The angles of the jambs are rounded and grooved at the sides to form columns. The capitals are simple bowl-shaped, with a round neck-moulding to connect it with the column.

The chancel arch is in two orders without marked impost; the inner order of the arch is ornamented with zig-zag moulding, and the outer order has a round moulding on the angle and a band of incised beads bounded by shallow grooves.

The side walls are recessed and panelled, with engaged semi-columns, having simple caps and bases.

The church of Killeshin, near Carlow, contains remains of a remarkable doorway, whose arch is in four order, the outer order projecting beyond the face of wall and supporting a pediment surmounting the whole doorway. The angles of the jambs are slightly rounded and some are ornamented with shallow bead and scroll enrichments. The capitals are very fine, having carved heads on the angles, the remaining spaces being filled with interlaced work. The faces and soffits of the arches are ornamented with delicately carved ornament of the zig-zag pattern, with borders of beads. The whole work displays considerable refinement.

The church at Freshford, County Kilkenny, is noticeable for its beautiful porch doorway. The outer order projects beyond the face of the wall, and is surmounted by a pediment. The angles of the jambs are rounded to form attached columns, and have simple caps and bases. The caps bear traces of carving in low relief. The outer arch is covered with an ornamental hood-moulding, and is decorated with an incised pattern, unique in this style. The same pattern, somewhat varied, is continued on the soffit of the arch. The inner arches are ornamented with zig-zag, and have engaged columns, with caps and bases. The inside order of the doorway is quite plain, but contains an inscription in two rows encircling the arch and part of the jamb.

A singular feature, and one which flavors of the classic, is the short frieze over the impost moulding, returning round the ends of the porch with a band of sculpture.

The circular window in the gable may be said to be the only one (except another very similar at Rahan) of the period remaining in Ireland. If there be others, I am unaware of them. The arch at Freshford is in two orders, the inner with a rounded moulding on the angle, the outer enriched with chevron moulding, and, outside of this, is a hood-moulding continued all round the circle, with a string of balls carved on the inner angle.

The doorway of Clonfert, now used as a parish church, is of sandstone. Two outside pilasters support a pediment, inside of which are five orders. The sloping sides of the pediment are ornamented with a rope pattern, having carved human heads at the terminations. The orders of the arches are ornamented diversely, some with beak-heads, others with pierced discs, and others with rows of bosses. The impost moulding is well marked, and has carved on its outer angle a row of dogs' heads. The columns on the angles of the orders are round, except in two cases, where they are semi-octagonal. The whole of these shafts are ornamented with delicately incised patterns of wonderful variety and beauty. The pediment of the doorway contains a blank arcade of columns and arches, and the upper part over the arcade is filled with a triangular diaper, the alternate spaces being sunk, and having human heads carved in high relief.

The western doorway of St. Cronan's Church, Roscrea, is in three orders, with a steep pediment over; the inner orders of the arch are ornamented with chevrons and the outer one with a round moulding. On either side of the doorway an arcade is continued till stopped by the projecting pilasters at the ends of the gable. The two arches of the arcade on either side have pediments, but are quite subordinate to the central one.

Perhaps one of the most beautiful bits of carved work in the country is the chevron ornament on the inside of the east window in the church at Annaghdown. Beads, scroll, and leaf ornament is delicately used, and almost suggest goldsmith's work as a pattern.

The Rock of Cashel presents a group of buildings the most interesting in Ireland. The rock itself rises to a height of 300 feet over the great fertile plain in which it is situated. The principal building is the Cathedral, which was built according to the then new principles of the pointed arch, but the one with which we have to deal is that universally known as Cormac's Chapel. Historical records show that this church was erected by King Cormac McCarthy in the early part of the 12th century. The date of consecration is given as 1134 or 1135. At the moment we are not greatly concerned with the exact date: this matter has been discussed at length, and all the historical evidence quoted by Petrie in his work on the Round Towers.

The building consists of a nave and chancel, with two flanking square towers on the north and south sides at the end of the nave next the chancel. The building is not placed due east and west, but lies north-east by east. The chancel differs from the plan of the early Irish churches in having no east window, but in its place a rectangular recess, covered by a semi-circular moulded arch and with an arcade running round it under the springing of the main arch. Another point of difference and one that is peculiar, is the fact of the chancel not being placed on the axis of the nave, but inclining somewhat to the south side of it.

The ceiling of the chancel is formed by intersecting barrel vaults and diagonal ribs or arches. At the intersection of these ribs are four sculptured human heads. The whole of this groined ceiling and the walls of the chancel appear to have been decorated with frescoes, of which some traces remain. The chancel arch is composed of four orders, with well-marked impost mouldings. Two of the shafts are fluted and ornamented spirally. The capitals of the shafts in the jambs are variously carved, some with human heads at the angles, and others with strap ornaments. The carving of one side in one of these capitals remains unfinished. The orders of the chancel arch are richly carved with chevron ornament and a row of human heads.

The internal walls of the nave are ornamented with recessed arcades in the lower part, having flat pilasters, finished on top with a broad impost moulding, the under angle being carved. The angles of the pilasters are carved with zig-zag or chevron ornament in varying patterns. The round arches over these pilasters are without mouldings or projections, but are ornamented on the face and soffit with shallow, zig-zag pattern similar to that on the jambs. The upper part of the walls, which are recessed, have engaged half-columns, with moulded bases and carved capitals running up to support the ribs of the vaulting. The ceiling of the nave is a barrel vault, with square, unmoulded ribs or arches, standing clear below the surface.

The external features of the building are: A deeply recessed northern porch, in six orders. In each angle is a column, with base and capital. The arches are richly ornamented with zig-zag and bands of discs. The lintel which covers the inner arch is remarkable, and has a sculptured lion being shot by the arrow of a centaur. The whole doorway is crowned by a steep pediment, with broad barges ornamented with a zig-zag pattern. The upper part of the pediment is divided by a horizontal band and three vertical ones, all ornamented with zig-zag similar to that running up the slopes of the pediment.

A plaster cast of this fine porch has been made by Mr. George Coffey, and is now on view in the Science and Art Museum.

The doorway on the south side is smaller and much plainer, recessed in two orders, the arches ornamented with zig-zag, the outer order of the jambs with rounded shafts, the inner with a broad splay, having a faint interlaced pattern carved upon it. The tympanum contains a grotesque figure of an animal. The towers at the east end of the nave are square and of unequal height; that to the northern side is ornamented with horizontal projecting bands or courses of stone. This tower is covered with a pyramidal roof. The southern tower is ornamented with similar bands, but it is higher and finished by a paraquet. It contains the spiral staircase for access to the chamber over the vaulting. A blank arcade of small columns and arches is continued round the face of tower at about the level of the eaves. The south wall of the nave is divided up by rows of blank arcades and the upper part under the eaves is recessed with engaged semi-columns.

The apartments in the roof over the vaulting are on different levels, that over the chancel being much lower. This latter is lighted by two small windows, with flat lintels on the inside. The large apartment is lighted by similar openings in the east end and on the front side. Cutting into the roof are two square apertures for light, but they do not seem to be the original windows. At the west end is a fire-place, with flue and horizontal flues carried round the side walls, perhaps to heat the apartment. The walls of this compartment curve upward till they meet in a point over the centre and form a true pointed arch.

Stone corbels project from the converging sides or arches, probably to support the wooden floor of another apartment over. The roofing of this remarkable building I have already described when speaking of stone roofs.

Now, this practically ends, for purposes of my discourse, the work done in this beautiful style, and, although developed to such an extent, as exhibited in Cormac's Chapel, we may feel assured that it did not reach perfection.

One can see in thought what magnificent works would now exist had this style not been interrupted, but had run on and expanded, in the numerous and extensive abbeys and monasteries erected under non-native influences.

I am fully aware that I have but feebly and imperfectly glanced at some of the examples of this style of architecture, and that I have omitted points which may seem all-important to numbers of my audience.

I now purpose, however imperfectly, to say a few words on the adaptability of the examples of Celtic Architecture and ornament to the requirements of the present day. The early builders were well content to use the materials they found to hand. They did not, at least in early days, import stone easy to work, nor did they travel far for labour. In their massive building, their simple roofs, and their quiet but effective grouping of blocks of building, there is much to be admired and followed as a lead at the present time.

Their ornament was simple, but not the less effective, and was all of a type easily done years after the completion of the building. Some of the doorways and windows present examples of how beautiful a feature can be built up from simple forms of simple material. Any of these old doorways or windows will serve as types for architecture of the present day. Let us take care that, with all the advantages of Science now common to all, our work falls not behind that of these old masters, who made so much out of so little.

The man who starts out to follow the lead which has been set to him must be careful to imbue himself with a like spirit to theirs.

I am unable to lay down a more definite course, nor do I think it desirable to do so.

MR. J. H. LAUER, secretary of the Montreal Builders' Exchange, has given out an interesting review on the progress of building construction throughout Canada. The total value of buildings erected in 1908 in 73 localities throughout the Dominion was $51,223,398, compared to $56,305,792 in 1907. There were only 51 localities from which returns were received in 1907. Toronto leads in the total of the year's operations, with $11,795,436. Vancouver is second, Winnipeg third and Montreal fourth, with $5,062,326. Coming to the present year, 1909, the improvement throughout the principal building centres is strongly apparent, and marks a distinctive return to the prosperous state of affairs existing up to 1907. Under normal conditions, with a steadily increasing acreage and population, people are beginning to recover their confidence in the present and future prosperity of the Dominion.

Clinker brick residence, located at the corner of Crescent Roadand Cluny Avenue, Toronto, and originally the home of F. Sanderson, Esq. Mr. Eden Smith, Architect.

TORONTO'S FIRST CLINKER BRICK RESIDENCE.—An Attractively Designed Structure Which Demonstrates the Use of this Material in Domestic Architecture.—Interior Excellently Planned.—Living and Service Portions Distinct.—Fireplaces in All Main Rooms.

ONE CANNOT fail to observe in passing through our residential district the increasing number of clinker brick houses that have been erected during the past few years. The time is not so far removed when the use of clinker bricks in building construction was practically an unknown quantity. It is, in fact, only within the past ten or fifteen years—except in a few isolated cases where they were employed as a secondary material—that we have come to see any work of this character. Prior to then, clinker bricks were regarded as being an inferior product, a sort of a residue of the kiln that nobody seemed to want, and for which the manufacturers of burned clay products, try as they would, could not create a demand. Whether by chance or preconception, their value as a surface material for exterior walls was first recognized, is, judging from various opinions advanced, still a matter of conjecture. It may have been that originally some designer discerned in their semi-vitrified and mottled character a subtile quality yet unexploited; or again, possibly, owing to the low cost at which these brick could at one time be obtained, economy on the part of some builder first led to their adoption and thus revealed the excellence of their texture and richness of effect.

But, whether the one or the other, it has nevertheless followed that the former prejudice against clinker bricks, has been entirely overcome; and to-day, instead of these bricks being a rejected material, they are regarded as not only being desirable, but in many cases as being most preferable.

Structurally there is possibly no better brick available. Its hard burned surface renders it of a most serviceable character, enduring in quality, and but little susceptible to moisture. The only danger in its use, is in too great a striving for effect, which sometimes results in a surface with an over-studied, over-colored rigid appearance.

A noteworthy example of the use of clinker bricks in residential work, is to be seen in the accompanying illustrations. This home, it may be of interest to add, was the first clinker brick house erected in Toronto. It is situated at the corner of Crescent Road and Cluny avenue (Rosedale), and was designed by Architects Eden Smith & Sons, originally for F. Sanderson, Esq., from whose hands it subsequently passed to the present occupant.

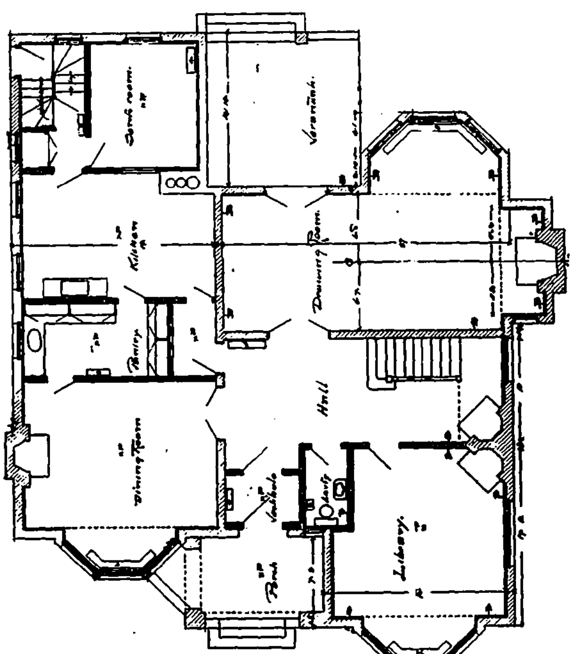
The exterior of the house is most satisfactory in its treatment, the lines being direct and happily arranged, while the plain surfaces of the walls derive a pleasing expression from the variegated tones of the brick, the latter contrasting effectively with the gray stone of the foundation, the white painted woodwork and green of the stained shingled roof.

Directly at the front is a spacious porch with gabled roof and brick walls having a large arched opening and stone steps. Immediately above the porch, the main roof, slightly hipped at the left extreme and having a dormer with four windows, comes forward with a well graduated pitch, while to the right it forms a front gable with three small end windows. Beneath these windows is a bay projection at the ground and first floor, this feature having also been introduced on the ground floor at the left of porch. All windows with the exception of the dormer and gables, are of small leaded glass panes, excellently arranged, and the chimneys, which are direct, rectangular

Entrance porch, clinker brick residence, Toronto, showing detail of arch and brick work. Mr. Eden Smith, Architect.

and uniform in outline, are so placed as to give balance and dignity to the general scheme.

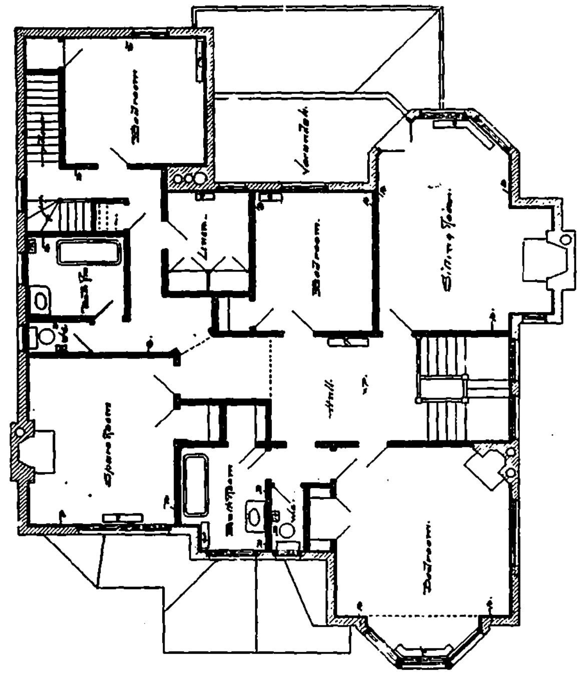
Within, the disposition of the different rooms has resulted in an arrangement with every facility for comfort and convenience. The porch leads into the vestibule,



Ground floor plan, clinker brick residence, Toronto. Mr. Eden Smith, Architect.

which in turn gives access to the hallway, having a fireplace and an open staircase at one end. This arrangement makes the living and service departments quite distinct, and yet affords ready access from any one room to the other.

The library is situated at the right of the entrance so as to give it the greatest degree of quietude and privacy, while the drawing room occupies the entire space

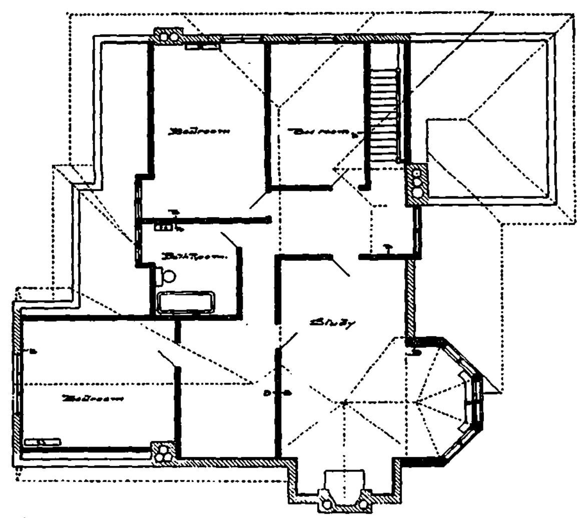


First floor plan, clinker brick residence, Toronto. Mr. Eden Smith, Architect.

back of the hallway, and opens on to a large verandah overlooking a sloping garden at the rear.

The left portion of the floor is entirely taken up with the service department, the dining room being placed at the front. A large pantry with built-in cupboards and shelves, gives a direct passage between this room and the kitchen, the latter having a servant room and steps to the upstairs and basement at the rear. All the rooms are trimmed with oak, and the drawing room, dining room, and library all have open fireplaces and bay windows.

On the first floor are four bedrooms with built-in wardrobes, a sitting room, two bath rooms, and a large linen



Second floor plan, clinker brick residence, Toronto. Mr. Eden Smith, Architect.

closet, all advantageously located. Two of the bedrooms and the sitting room, have open fireplaces, while the latter opens on a balcony which is placed over the rear verandah.

The second or attic floor provides for an additional bath room, two bedrooms, a box room, and a study having also a bay window and an open hearth.

BRICK MAKING IN BIBLE TIMES.—Material First Employed in Mesopotomia Nearly Ten Thousand Years Ago.—Practice of Stamping Brick with Makers Name in Vogue Sixty Centuries Back.—Interesting Discovery Made by Chicago University Expedition.

THE RECENT BABYLONIAN expedition of the University of Chicago, while excavating at Bismya, discovered that the brick was first employed in Mesopotamia nearly ten thousand years ago. In that level alluvial plain, absolutely without stones for building material, but with an abundance of clay, primitive man, when he wished for a house more substantial than one of reeds, constructed its walls of the common clay soil of the ground. Experience taught him that if clay were molded and dried in the sun, it would be more durable. When he laid a chunk of moist clay in the sun to dry, he made the first brick.

In the lowest strata of the ruins of the exceedingly ancient cities of Bismya walls of these shapeless bricks were discovered; it was at a very early period that the Babylonians began to form the clay in a rectangular mold, as the modern Arabs of the desert still continue to do. During all of the period of Babylonian history sun-dried bricks, resembling the Mexican adobe, were employed not only in the houses of the common people, but as filling in the interior of the walls of the temples and royal palaces.

The man who discovered that bricks could be burned was that half-naked Babylonian of about 4500 B. C., who, while poking among the ashes of his old campfire, saw that the once moist clay beneath it had become hard and red. The first bricks which he burned were exceedingly crude in shape, flat on the bottom where the moist clay had rested upon the ground to dry, and rounded upon the top. Although the form was suggestive of the rectangular, the bulging sides gave it a somewhat circular appearance, as soft mud if placed upon the ground to dry, would assume. These early bricks were small and thin, measuring about 20 centimeters in length and 5 in thickness, yet as time progressed they rapidly grew to about twice that size.

The modern manufacturer who stamps his name upon the bricks from his kiln, is but imitating the brickmaker of 6,000 years ago. The earliest known mark which appears upon the surface of the ancient brick was made by pressing the end of the thumb or of a round stick into the soft clay. As the bricks became larger, an interesting system of markings was adopted by the royal builders. The first mark of the series consisted of but a straight line drawn lengthwise along the surface of the brick; the next generation varied the mark by a diagonal line, forming a St. Andrew's cross. The fourth generation drew two parallel lines lengthwise upon the surface of the brick; the fifth drew them diagonally, and thus the series continued with three, four and five lines until the dynasty came to an end.

Not far from 3800 B. C. the Semites invaded Babylonia, and Sargon, the king of about that date modified the brick to a square shape, a form which has continued in the Orient to the present time. He also discarded the ancient system of brick marks to adopt a stamped impression of his name and titles. His son, Naram Sin, finding the larger bricks of Sargon, which measured 42 centimeters square and 9 in thickness, too cumbersome, reduced them to about 32 centimeters square. A thousand years later, or about 2800 B. C., the size had been reduced to about 30 centimeters, with the thickness of 6 centimeters. Thus they remained to the end of the Babylonian empire, and the palaces of Nebuchadnezzar at Babylon were entirely constructed of them.

The brick inscription which first appeared in 3800 B. C., sometimes engraved, but more frequently stamped, was not placed upon every brick of a structure. Naram Sin marked a few of his bricks with the brief legend, "Naram Sin, the Builder of the Temple of Ishtar." Of later kings the inscriptions, which were longer, appeared upon a greater number of bricks. I found in the Bismya temple about one of every twenty bricks of Dungi, of 2750 B.C., inscribed with nine lines. Nebuchadnezzar stamped nearly every brick in his numerous vast constructions with a shorter inscription, which read:

"Nebuchadnezzar, king of Babylon;
The restorer of the temples Esagil and Ezida;
The first born son of Nabopolassar, king of Babylon."

The mason of about 2800 B. C., while laying the square brick, found that to end the courses evenly, it was necessary to break a brick in halves. The manufacture of half bricks then began, and thus arose a brick of the shape and approximately the size of those employed in our own country and in Europe. Together with the half brick, as architecture became more complicated, the Babylonians employed other forms for binding the corners of walls, building columns and wells, and for ornamentation. Some were circular or semi-circular; some were wedge shape with a rounded base, or with the point missing; some were square, with one or more edges concave or convex, and of others a square from one corner had been omitted.

In laying the bricks those of a plano-convex shape, which were employed about 4500 B. C., were set in the wall upon one edge, and held in place with bitumen, the black pitch which comes from the hot springs at Hit upon the Euphrates, or more frequently with mud. While the use of both bitumen and mud continued, lime from the edge of the Arabian plateau was employed before Nebuchadnezzar's time. It is now the common cement of Mesopotamia.

Thus the brick and the brick stamp arose. Several thousands of years were required for its evolution from the lump of clay to the form which the Babylonians regarded as perfect. In durability and in the variety of shapes the skill of the early brickmaker has never been surpassed. At Bismya we found bricks from 4500 B. C. as perfect as upon the day they were made, and our large desert house was constructed mostly of them. Our desert well was walled up with bricks 5,000 years old, and they will still be perfect long after the ordinary brick from the modern American kiln shall have crumbled to dust. In the latter days of Babylon, after the process of glazing had been discovered, huge designs of animals in various colors were represented in relief upon the brick walls, and so perfect was the design that each brick was molded as carefully as the sculptor now shapes the various stones which are fitted together to form a richly carved monument.

To the archaeologist this discovery of the origin and development of the brick and their stamps is of more than usual interest. It not only increases his knowledge of the life of early man, but, what is more valuable, it presents him with a clue by which he may determine at a glance the comparative, if not the absolute age of the ruins of the many burned Babylonian cities if only the fragment of a brick remains.—Prof. Edgar J. Banks, in Scientific American.

ACCORDING to Canada's Acting Trade Commissioner at Leeds, England, there is an increasing demand in that country for hardwood flooring, mainly rising out of the revived interest and enthusiasm universally shown towards roller-skating, which is said to have resulted in the formation of nearly 130 joint stock undertakings during the last twelve months to operate roller-skating rinks in different parts of the United Kingdom. The importers are experiencing a steady demand for suitable timber for use in the erection of new rinks and for the purpose of repair in those already built, and desire to ascertain what Canadian shippers have to offer in this direction.

BUILDING STATISTICS FOR JUNE.—Increase per cent. Greatest Ever Recorded in Canada.—Average Gain 102 per cent.—Winnipeg Shows Largest Volume of Business.

FROM A STANDPOINT of building progress, June was a month of universal gains and no decreases. Extraordinary high percentages were attained in all sections of the country and the average increase for the month, 102 per cent, as based on the comparative figures supplied CONSTRUCTION by seventeen of the twenty cities reporting, exceeds any of the big successive gains made heretofore this year, and is probably the greatest advance ever recorded in the building history of the Dominion. Two cities exceeded the two million mark, another had over half that amount, and ten additional places registered totals varying from one to six hundred thousand dollars, for permits issued during the month.

Winnipeg shows the largest volume of new work undertaken, her total being $2,041,645, as against $802,200 for the previous June. Toronto is second in this respect and Montreal next, their figures being $2,011,545 and $1,170,790, in order named, as compared with $1,055,405 and $559,972, for the corresponding period of last year; the relative increase in all three cases being 154 per cent., 90 per cent. and 109 per cent., respectively. The remarkable rapidity with which these three cities are growing, while clearly seen in the comparative amounts of the past few months, can more fully be realized when compared with the growth of the larger cities in the United States. None, in fact, aside from New York, Chicago and one or two of the other large cities, are making greater headway, and even these places are not showing a greater proportionate expansion.

The largest increase per cent. for the month has been recorded by Moose Jaw, which comes to the crest of the wave with a striking gain of 1056 per cent. This place, it will be noted, was one of the three to show a falling off last month, her loss being 19 per cent.

Regina, of the same province, shows an advance of 61.53 per cent., while Saskatoon's enormous total, that of $149,000, although no figures for June, 1908, were submitted, makes it quite plain that this thriving city has met with no reversal.

In Alberta, Calgary and Edmonton still continue to forge strongly ahead, each adding to their former increases by another relative advance of 37 per cent. and 106 per cent.

The second largest increase for the month is noted in the case of Brandon, which over-reaches last year's figures for the corresponding period by 157 per cent.; while other western cities of much larger magnitude, which show a decided advance, are Vancouver and Victoria, both augmenting the aggregate amount of their previous consecutive monthly gains by a further gain of 104 per cent. and 21 per cent., respectively.

Reports from various centres throughout Ontario indicate plainly that building operations are going on at a tremendous rate. In addition to Toronto's increase, Fort William reclaimed herself from her decrease of 5 per cent. in May, by a gain of 94 per cent. Peterboro made an increase of 119 per cent.; London 106; Berlin 56; and Hamilton 5 per cent. Windsor's total investment for the month was $48,550, while the value of the permits of Port Arthur amounted to $17,600. Fort William's aggregate total for the first six months of this year, that of $2,000,000, is one-third again as great as she recorded for the whole of 1908, and equally as good a showing has been made in several of the other cities of the province.

Rapid strides forward are also evidently being in the extreme eastern section. Both the reports from Halifax and Sydney show a most wholesome condition. The former's gain for the month is 7 per cent., while the latter's increase of 130 per cent. after the unusually active month in May, is really remarkable.

All the cities in the list send in encouraging reports which express the outlook as being decidedly favorable.

	Permits for June, 1909.	Permits for June, 1908.	Increase, per cent.	Decrease, per cent.
Berlin, Ont.	$25,000	$16,000	56.25	......
Brandon, Man.......	52,235	20,320	157.06	
Calgary, Alta.	202,710	147,700	37.24	......
Edmonton, Alta. ...	201,790	97,645	106.65	......
Fort William, Ont...	307,125	158,175	94.16	......
Halifax, N.S.	66,830	61,890	7.98	......
Hamilton, Ont.	195,959	185,425	5.41	......
London, Ont.	127,629	61,800	106.51	......
Montreal, P.Q.	1,170,790	559,972	109.08	......
Moose Jaw, Sask. ..	118,500	10,250	1036.09	......
Peterboro, Ont.	44,322	20,195	119.47	......
Port Arthur, Ont...	17,600	......	......	......
Regina, Sask.	121,650	75,310	61.53	......
Saskatoon, Sask. ...	149,000	....	......	......
Sydney, N.S.	22,360	9,700	130.51	......
Toronto, Ont.	2,011,545	1,055,405	90.59	......
Vancouver, B.C.	682,270	333,400	104.64	......
Victoria, B.C.	90,120	74,010	21.76	......
Windsor, Ont.	48,550	....	......	......
Winnipeg, Man.	2,041,650	802,200	154.54	......
	$7,482,485	$3,689,397	102.81	......

A LETTER TO "CONSTRUCTION."—Architect F. S. Baker Writes Quoting Mr. Ernest George, President of R.I.B.A., on Subject of Architectural Education and Registration.

JUST NOW while the matter of improving the condition of architecture in its relation to the public is receiving so much attention, and a federation of all the Canadian bodies with this object is pending, I feel that the recent speech of Mr. Ernest George, the President of the Royal Institute of British Architects, throws considerable light on the subject.

Mr. George's utterances, coming as they do from a man who is recognized throughout the profession as one who has devoted himself to the art side of architecture, are agreeably moderate, and yet from the common sense point of view, he very forcibly points out the benefits which would accrue from the proper training and registration of architects.

At the R.I.B.A. dinner, which was held in London on Wednesday, 26th of May, Mr. George in reply to the toast "The Royal Institute of British Architects and Allied Societies," said in part:

That since their gathering last year the most important event in their history, has been the granting by the King of the Supplemental Charter for which they applied. This enables them to make rules for the better ordering of their own house, for the regulation of themselves, and, it was to be hoped for the benefit of the community. This revision of the Charter and By-laws was the result of movement that stirred, if it did not divide their camp.

Architects, especially those in the provinces, found that work which should come to them, too often went to auctioneers, who ventured to include architecture in their sphere of usefulness. This was a difficulty, but it must be met by the architects keeping their own work at a high level, and by a growing perception of what was good on the part of the public. To have all architects registered has been proposed—though this would not prevent the employment of outsiders; they would also, he held, have to admit all sorts and conditions of men in practice. The Institute preferred to insist that in future all should enter through the schools, obtaining the diploma or certificate which should distinguish the architect from the quack, and they looked for further legislation to accentuate the difference. The training would come gradually by the wise organization of the training schools, bringing all men into line, and demanding that a standard of efficiency should be attained by those who would enter their Guild. This would be the preparation for Associateship, and Fellows of the Institute would be chosen only from those who had passed through the schools with a sound knowledge of the constructive art, thus insuring the public against ignorance and incompetence. No board of examiners could guarantee that a man was an artist. The subject of examination had had serious consideration, and on the Educational Board, professors of the universities were working with their best men.

Till of late the Institute had not been an educational body, having helped only by the award of the Pugin and Travelling

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Studentships. A distinct advance, however, had been made in the system of training, and young men would now start with a better equipment than their seniors enjoyed, and he hoped they would do better work. Students of ability were coming to the front every year and carrying off the Institute scholarships. It would be a grand thing if some of them had the opportunity of carrying their studies further in a higher school, acquiring a knowledge of what is really great in art. A special school had been suggested for these diploma men, among whom a distinctive prize—a Prix de Rome—would be awarded. It was felt that Englishmen should have their School of Rome and be under the influence of the noblest monuments, as well as Frenchmen, Germans and Americans, who already had that advantage. The Council had been conferring with the existing British School of Rome, and had received a cordial invitation to co-operate in any project. The present arrangements of that school did not, however, accommodate the Institute students, nor meet the requirements that had been formulated for the architectural school; but the Institute Committee, who were considering the subject, would shortly have, he hoped, a definite proposal to bring forward.

Hitherto, the general public had declined to know anything about architecture as a fine art; a good building had not always been appreciated, nor a bad building found out; but there were indications of a growing knowledge in these matters, and of a higher criticism, to which architects would, he felt sure, respond. Technical schools would increase knowledge and power among skilled craftsmen, but they were not a substitute for a good system of apprenticeship. There was danger that those who gained a smattering of the arts in such schools would expect to become painters, sculptors, or architects, and so swell the ranks of the useless unemployed. **A good mechanic was a nobler object than a bad architect.**

In passing, Mr. George referred in terms of approval to Mr. Burns's Housing and Town-Planning Bill, and to the generous endowment by their guest, Mr. W. H. Lever, of a school of architects for the special study of town-planning. Architects ought to be willing, he considered, in the interests of their art, to sink some of their individuality for the sake of obtaining in towns continuity, harmony, symmetry, and balance.

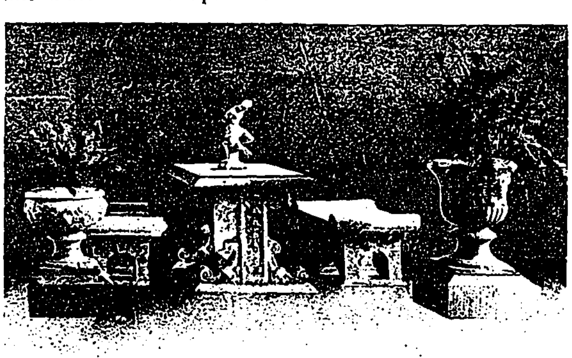
The President also urged the advisability of securing copyright for architects, mentioning that a good client recently showed him with pride a group of cottages that looked curiously familiar, though in strange surroundings. "These," said the client, "are copied from those you did for me on the other side of the park." The chairman added that he had not the heart to tell his informant, good, easy man, that he had committed an act of piracy. He concluded by remarking that the Institute was in a healthy and prosperous condition, having now the largest membership on record, there being 2,300 on the roll. They had now seventeen allied societies in the United Kingdom, three in South Africa, one in Canada, and one in Australia. The Institute possessed, moreover, an increasing influence, which, he trusted, had been used for the general good."

I am, yours very truly,

June 22, 1909. F. S. BAKER.

CONCRETE IN ORNAMENTAL WORK.—The Advantages It Offers as a Medium of Artistic Expression.—Economy a Factor in Its Use.

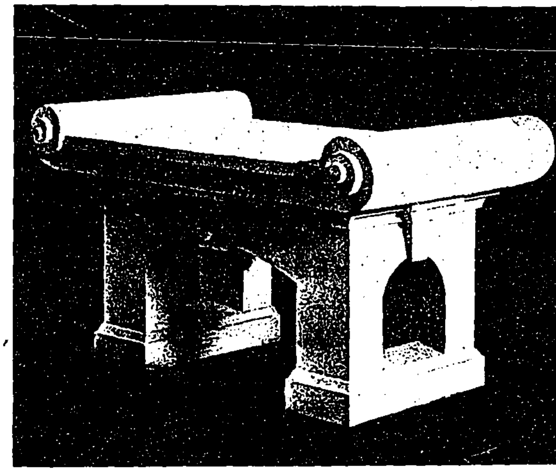
THE APPLICATION OF CONCRETE to practical utilitarian and decorative purposes, during recent years has amply demonstrated how admirably this material is adapted to meet either or both of these



Concrete Garden Furniture.

requirements. While probably this cannot be said of all concrete work, sufficient has been done to fully convince the most skeptical, both as to its constructive merits, and its importance and value as a medium of artistic expression.

With the growing demand for suburban and country homes and the accompanying desire for more artistic environments, the use of concrete, owing to its plastic nature, texture and durability, and the opportunity which it offers for the economical embellishment of lawns and gardens, is coming much into evidence. In this respect, its use embraces not only statuary, garden furniture, fountains and urns, but ornamental walls, pergolas, bridges and balustrades. In fact, an entire estate, so far as buildings and structural features are concerned, might

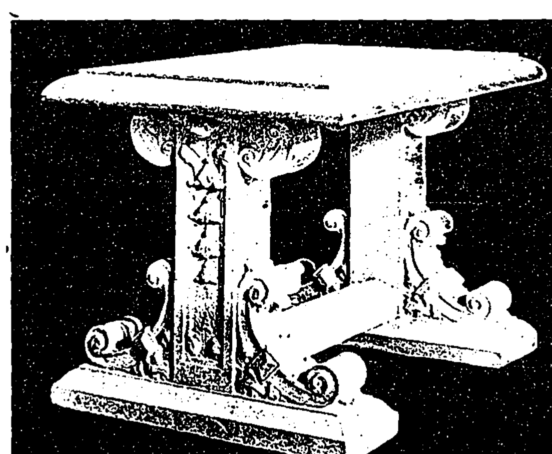


Garden Seat in Concrete.

well be of concrete, from the dwelling to the least of objects intended to ornament a garden or lawn.

One of the chief factors in the development of ornamental work in concrete has been the economy of its production. After a mold is made, the cost becomes the veriest trifle, as compared with stone or marble. As an artistic medium, concrete is quite as good as stone or terra cotta, and, considering its greater economy, it may be employed in many cases where the cost of cut stone would be prohibitive and terra cotta unsuitable.

Monier, to whom the engineering world owes so much, made his first combination of concrete and steel in the form of a garden vase. Whether or not he adopted this for the mere purpose of structural investigation or had



An Artistically Designed Lawn Table.

conceived in it one of the uses to which concrete was especially adapted, it has, nevertheless, followed that his experiment suggested and gradually developed into the utilization of this material for landscape ornaments in a great variety of patterns and design.

In Italy the utilitarian and decorative possibilities of concrete have long been demonstrated. From the structural element of aqueducts, and of domestic and civic

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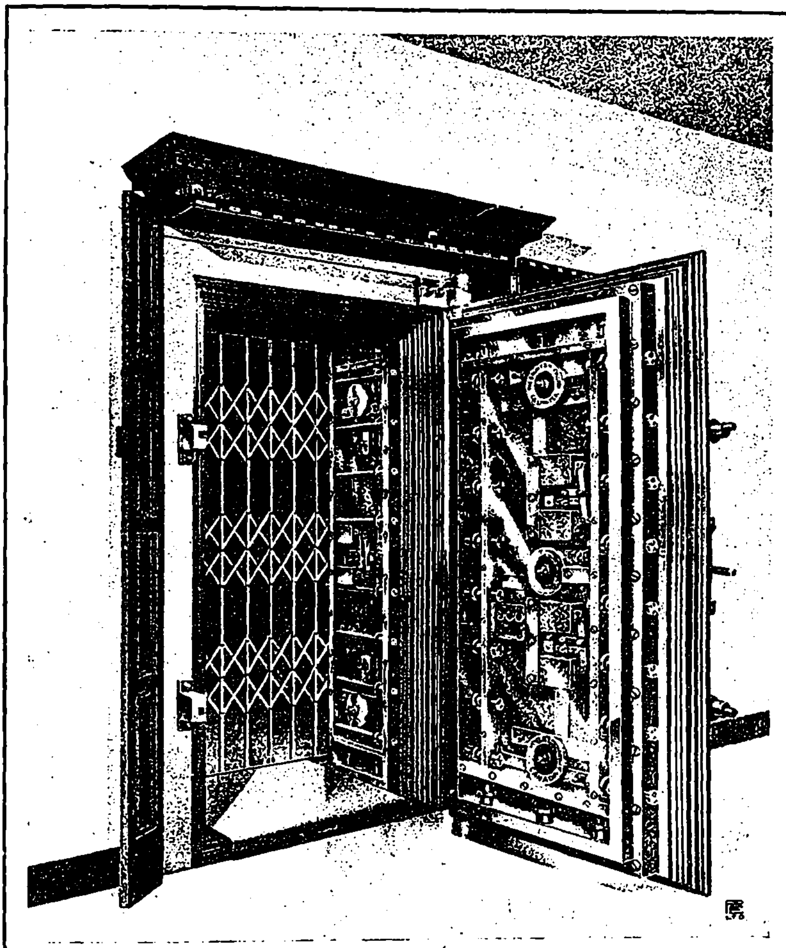

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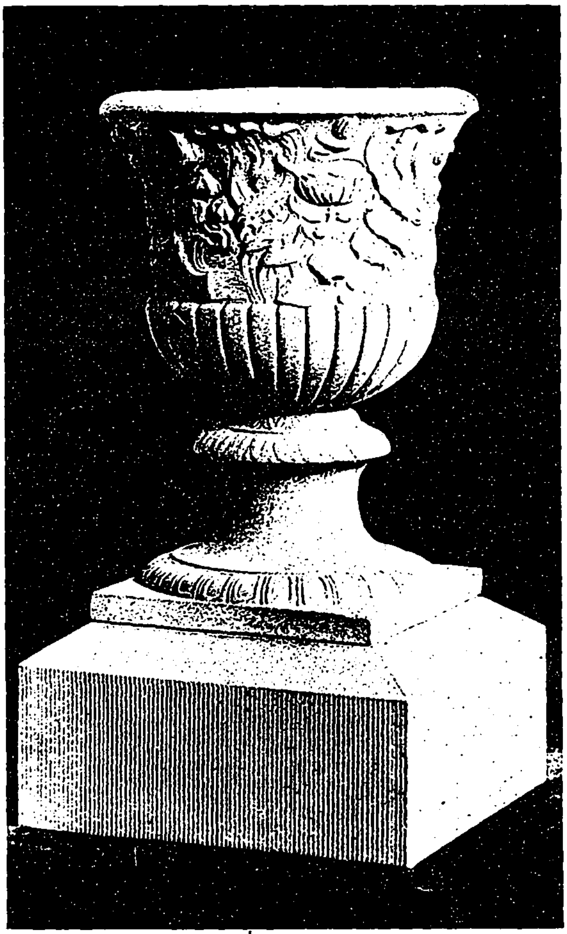
building, culminating in the monolithic Pantheon at Rome, to the balustrades, fountains and the statues for their enrichment, the adaptation has been perfectly made; and many of the splendid Italian examples have served as an inspiration for much of the excellent work done on this continent.

Both in Canada and the United States the prejudice which formerly existed against artificial stone is gradually dying out. Many architects who, at first were loath to experiment with it have since become familiar with its better qualities, and are specifying this material in their best work. It is now to be seen in some of the finest public and commercial buildings, schools, churches, theatres, and residential structures where it consistently serves every structural and ornamental requirement.

The representative concerns and studios engaged in the manufacture of concrete stone are employing the very best of skilled modelers, so as not only to give their products the highest character of workmanship and individuality of treatment, but also to guarantee that the design of the architect will be accurately and faithfully reproduced. The material itself, in this respect, places no limit

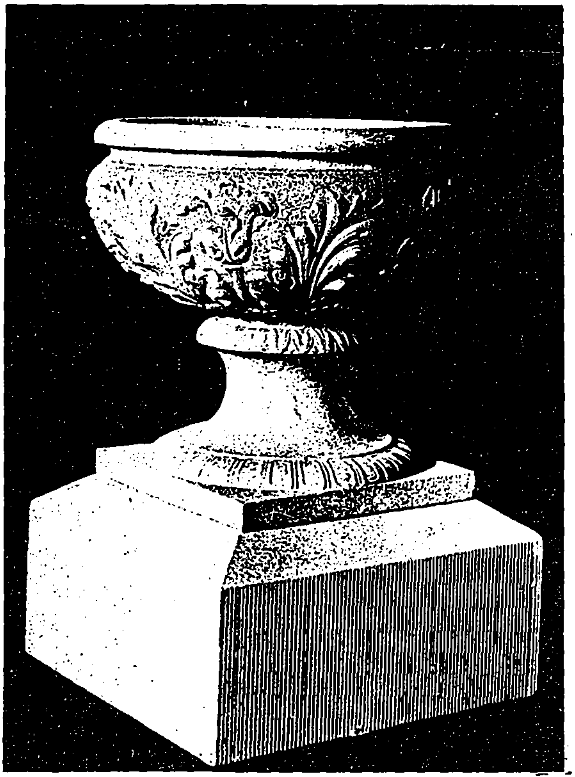


A Substantial and Attractive Garden Vase.

to the resources of the worker. If he is of the faith that rejects all that is modern and original, and admires only the masterpieces of the old world, the plaster mold will furnish him with an almost exact reproduction of designs wrought by hand. In fact the most intricate and elaborate patterns, which may have involved months or years of toil on the part of their creator, may be duplicated in concrete in a few days.

Obviously no architect or intelligent owner will raise a question as to the strength and durability of concrete. The point generally in debate relates solely to the architectural treatment and the appearance of finished surfaces. To secure the proper results particular attention must be paid to securing the right firm to do the work, it being realized that desirable results can be obtained with this material, but that great skill and experience are required to secure results that are uniformly pleasing and of the character to be desired.

The fact that ornamental work with cement can be done for not more than two-thirds the cost of stone, and frequently even cheaper, that it is often more available, and requires less time to execute, combine with it other



Conrete Flower Urn.

qualities to complete a series of advantages which destines concrete to be one of the most accepted material of the near future. Montreal, Toronto, and many other cities thrughout the Dominion have many excellent examples of its use in decorative work, which show that it is rapidly winning the recognition which it deserves.

The illustrations shown herewith of the use of concrete in ornamental work, were reproduced from photographs kindly loaned Construction by the Canadian Art Stone Company, Toronto, and are representative of the excellent class of work which this company is producing.

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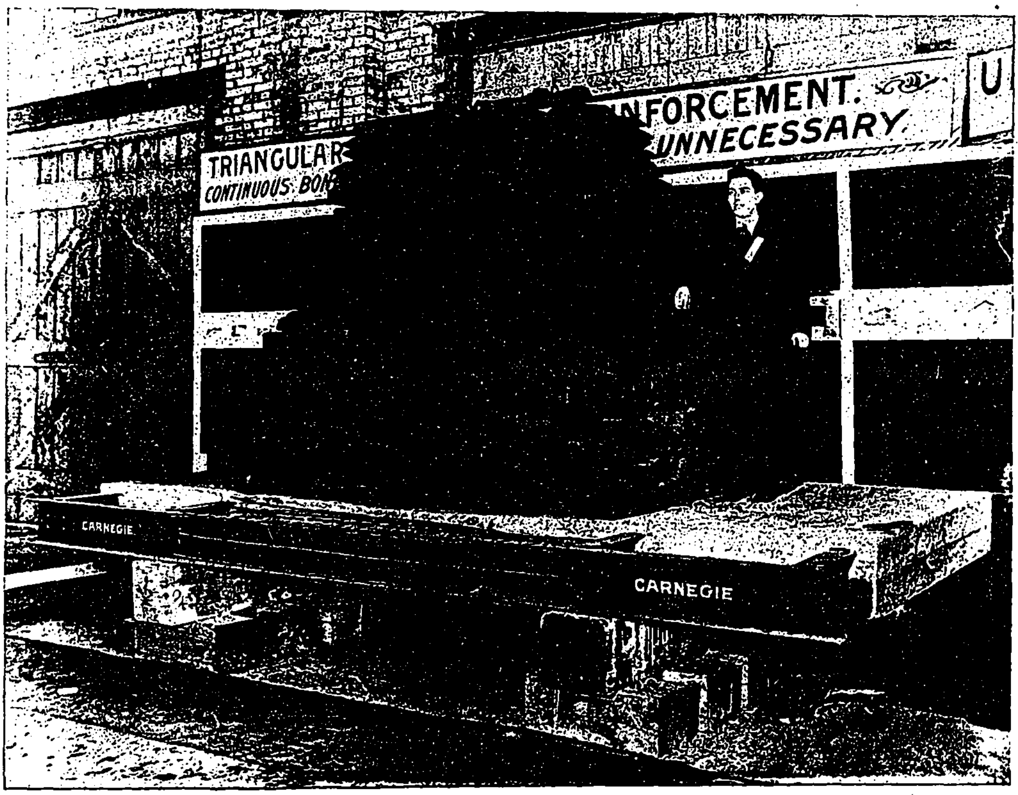

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pendability, promptness and thoroughness in operation. Working automatically, positive in action and always ready for service, it not only practically precludes the possibility of a fire gaining any headway, but effectively extinguishes the flames within the immediate area in which the fire started. Only 165 degree Fahrenheit is necessary to release the sprinkler and set it in operation. At this temperature the fuse of the nipple melts and the pressure on the sprinkler head cause it to revolve at a velocity capable of throwing a heavy shower of water in every direction, the area covered by each sprinkler head in this respect being approximately 10 feet square. The releasing of each sprinkler, however, is entirely independant of the others, so that no water is thrown or damage done except at the point where it is needed. Another feature that may be mentioned in this connection is an alarm device so arranged that should a fire occur in the area protected by a sprinkler the alarm would be sounded simultaneously with its release, thus bringing the service of the fire department to render additional assistance should it be required and to stop the flow as soon as the flames are extinguished.

But apart from lessening the fire hazard, there is another advantage, equally as important, which the automatic sprinkler affords, viz.:—the reduction of insurance rates. So great an economy does it effect in this respect that the cost of such a system is practically offset in a few years' time. As a specific instance, we might mention that in that Jamieson Building, corner Queen and Yonge sts., Toronto, the automatic sprinkler system installed by the General Fire Equipment Company, Toronto, resulted in a saving that within two years was sufficiently great to cover the complete cost of its installation.

It would be interesting to go more fully into the history of the sprinkler and trace its developement from its inception nearly a century ago up to the high standard it has attained to-day; but suffice it to say that since 1872 when the present type of automatic sprinklers came prominently into use, it has been so unanimously endorsed by insurance companies, merchants and manufacturers that hundreds of millions of dollars are now under their protection in all parts of the world. So unqualifiedly are they approved, that the insurance companies have established departments to regulate their manufacture and installation and have carried the science of automatic fire protection so far that there is now scarcely a possibility of a serious fire where they are installed, as their inspectors are continually making tests in their own labratories and in the factories where the sprinklers are made.

Possibly the best time to install sprinklers is when a building is being erected, especially where it is desired to conceal the pipes. The installing engineer can then work in conjunction with the architect and arrange the sprinkler heads so that they in no way will interfere with the decorative scheme. However, it may be added that quite often the pipes can be successfully concealed after a building has been completed, as is to be seen in Ryrie Bros.' store, Toronto, where the sprinkler heads are arranged so that they in no way mar the ornamental ceiling.

This system was also installed by the General Fire Equipment Company and is but one of the many important contracts which they have executed without causing inconvenience or annoyance to the occupant of the building, the job being carried out without any delay, and the character of the workmanship excellent.

This company is in receipt of letters from merchants and manufacturers in all parts of the Dominion, attesting to the efficiency of their sprinklers and the thorough manner in which they have been installed. A copy of these letters will be sent to anyone interested upon request to the General Fire Equipment Company, 72 Queen st., East, Toronto.

AN AGGRESSIVE AMERICAN IN CANADA.

OUR FRIENDS on the other side of the border tell us with a certain degree of pride that they have adopted some of our Canadian sons and of them made highly prosperous citizens, and with the same national pride we point to instances where young Americans have found their way to Canada and become heart and soul engaged in the great work of industrial development which is the world's marvel at this present day.

One of the most striking examples of a young American "making good" in Canada is Mr. W. H. Ford, of Montreal. Mr. Ford was born in Charleston, S.C., Sept. 1, 1879. Some twenty-four years later he decided that the cement industry was about of the proportions to provide him with a life work, and consequently on Jan. 1, 1903, he engaged with the Carolina Portland Cement Co., Charleston, in the capacity of travelling salesman. One year later he was promoted to the position of assistant manager of sales with headquarters at Atlanta, Ga. Two years from that date found him general manager of the Kosmos Portland Cement Co. at Louisville, Ky. Another two years, after a most strenuous and successful career, however short, Mr. Ford was made vice-pres. of the Wm. G. Hartranft Cement Co., with headquarters at Philadelphia. Shortly after this event he came to Canada and located in Montreal incharge of The Hartranft Canadian business, which company disposes of the entire output of The Vulcan Portland Cement Company.

W. H. FORD.

Mr. Ford is one of the many young American business men who early foresaw the coming great development of Canada, and lost no time in associating himself with Canadian business circles, where he quickly became known as a most alert business man and one of the Dominions most active and enthusiastic promoters.

Mr. Ford in conversation says he is of the opinion that Canadian resources and business possibilities are sufficiently great to occupy the undivided attention for the next fifty years of the keenest men on the continent.

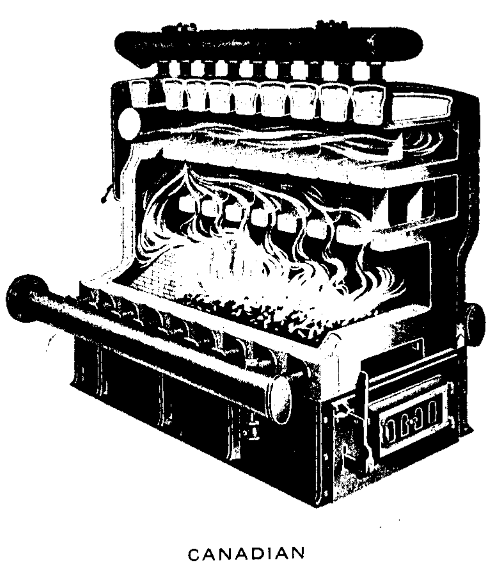
OPENS TORONTO OFFICE.

THE DENNIS WIRE & IRON WORKS CO., Ltd., of London, Ont., have recently opened a branch office in the Pacific Building, Toronto. Mr. C. R. Ebernard will be in charge of this end of the business. This step was deemed necessary owing to their increased business in Toronto. Already the advisability of this move has been demonstrated by the dispatch with which Toronto orders have been executed.

Taylor-Forbes "SOVEREIGN" Heating

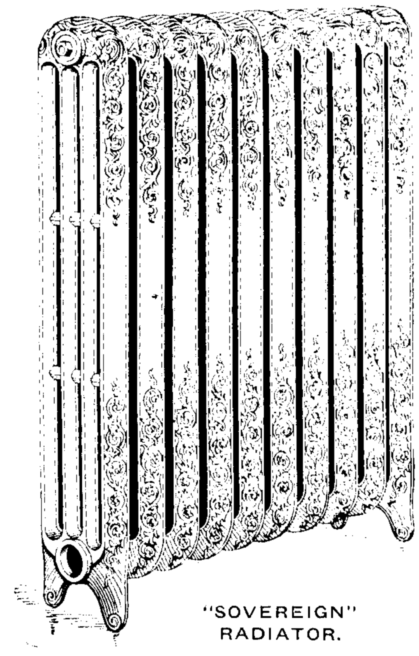
"DUNSMUIR" CASTLE, VANCOUVER ISLAND.

This magnificent residence, the home of the Dunsmuir family on Vancouver Island, is said to be the largest private building in the West. It is heated by Canadian Steam Boilers and Sovereign "Radiators" made at the Taylor-Forbes foundry in Guelph.



CANADIAN STEAM BOILER.

Canadian Steam Boilers are built on the unit principle, each section being separable from its adjoining section without the destruction or injury of any connecting part. The size of the boiler may thus be added to, to provide increased heating capacity in a building that has been extended. A boiler built on the unit principle is easily installed and an accidental injury to any section will not affect the satisfactory operation of the heating system.



"SOVEREIGN" RADIATOR.

TAYLOR-FORBES COMPANY, LIMITED, GUELPH, Can.

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TAYLOR-FORBES CO., 122 Craig St. W., MONTREAL.
GENERAL CONTRACTORS SUPPLY CO., HALIFAX, N.S
H. G. ROGERS, 53½ Dock St., ST. JOHN, N.B.
VULCAN IRON WORKS Limited, WINNIPEG, CAN.

THE

Calorific Furnace

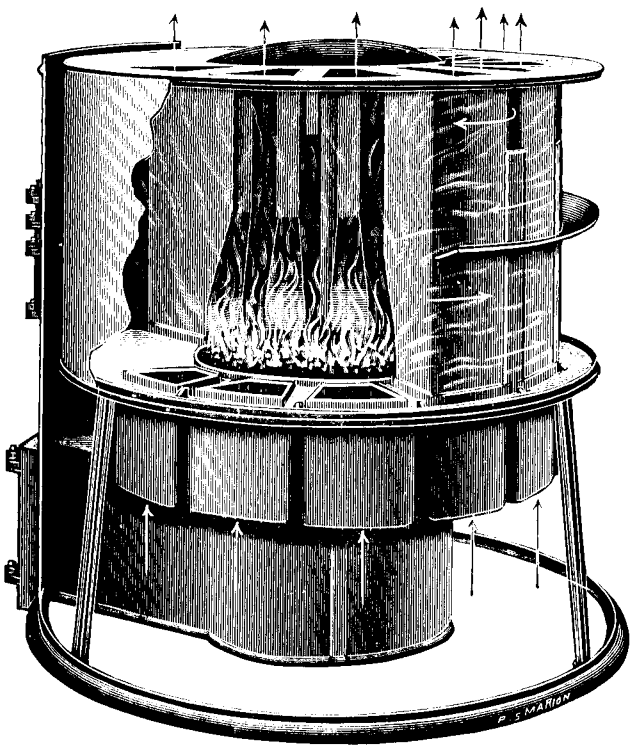
Under no circumstances should a room or office be HEATED EXCLUSIVELY BY DIRECT RADIATION from exposed steam radiators or pipes. It is one of the most unhealthy, KILLING SYSTEMS IN EXISTENCE.

LEWIS W. LEEDS,
Consulting Engineer of Ventilation and Heating for U. S. Treasury Department, in "Proceedings of Franklin Institute."

From a physician's standpoint, there is only one correct method of heating, and that is by the indirect hot air furnace method, properly installed and with a provision for producing the proper degree of relative humidity.

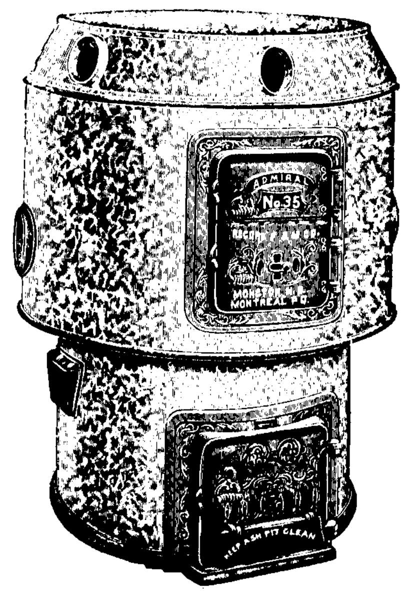
After careful study and trial and observation, I am compelled to condemn all direct methods of heating by radiators located in the rooms.

B. G. LONG (M.D.).



Sectional Diagram, showing Interior of Combustion Chamber, Position of Hot Air Columns and Direction of Fire Travel. Record Calorific Warm Air Heat Producer.

ADMIRAL FURNACE



Read what a satisfied customer has to say of the ADMIRAL:

KINGSTON, Ont., February 18th, 1908.

RECORD FOUNDRY & MACHINE CO.,
52 Colborne Street, Toronto.

GENTLEMEN,—

I respectfully give answer to your favor of the 12th inst., concerning the No. 47 Admiral Furnace installed by Messrs. Simmons Bros., of this city, at my residence, No. 23 Mack Street.

I beg to say that the Furnace gives entire satisfaction, and no praise of mine can possibly convey how well satisfied my wife and myself are with this Admiral Furnace. The house is not by any means an easy one to heat, having three flats, and rooms so arranged that equal distribution of heat is difficult, but the Admiral Furnace has mastered all difficulties and works like a charm.

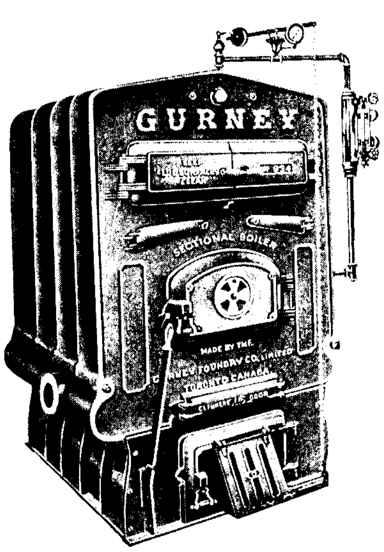
During the past month of unusually severe weather this Furnace has done more than we could expect. The consumption of coal is ver small for the heat it throws through all parts of the house. No Furnace that I have yet seen equals this, so far as I am able to judge. It also burns the coal thoroughly and uniformly, and the ashes require little if any sifting.

Yours respectfully,
(Signed) J. H. METCALFE,
Kingston, Ont.

Record Foundry & Machine Co.

Montreal, Que. = Moncton, N. B.

The Best Boiler Because It Gives the Best Results



The Gurney-Oxford 900 Series Boiler, for steam or water, is designed on the most practical lines.

The Highest Technical Knowledge is embodied in the general construction, great care being taken to preclude any possibility of flaws or faulty parts.

Many features of a decided excellence are worthy of the closest scrutiny and after comparisons are made you'll readily substantiate our modest claim for the

GURNEY-OXFORD 900 SERIES BOILERS

Study These Facts

—DEEP FIRE BOX.
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—LARGE CLINKER DOOR.
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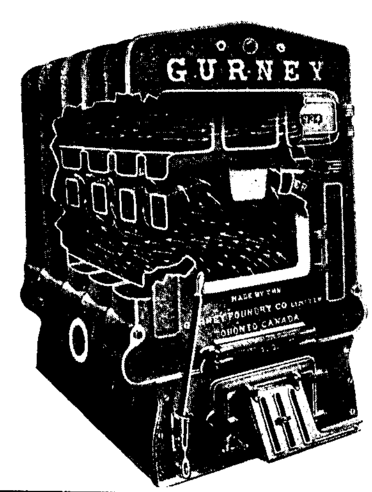
—COMPACT AND EFFICIENT.



WE'LL GLADLY ANSWER QUESTIONS, AND ANY ASSISTANCE OUR DRAUGHTING OR ENGINEER DEPT. CAN GIVE IS YOURS FOR THE ASKING

GURNEY FOUNDRY CO., Limited

TORONTO

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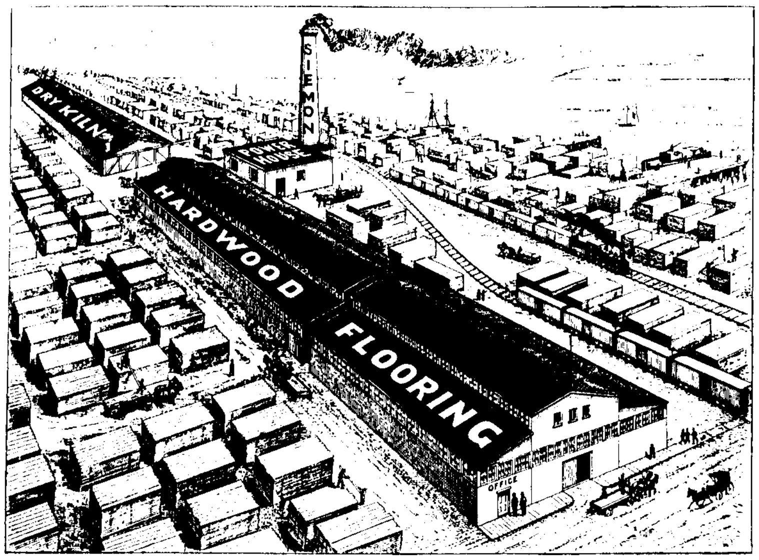

Our New Plant 80 x 600 Feet on 15 Acre Site

500,000 Feet of Finished Flooring in Stock Ready for Shipment

TORONTO OFFICE: 309-10-11 CONFEDERATION LIFE BUILDING—PHONE M. 6508

New Department

We have decided to establish a New Department in "Construction," commencing with the August number, to be known as a "Correspondence Department," in which will appear letters from our readers, discussing current building topics, asking questions, and general comment.

Correspondents may be assured that their contributions will be dealt with by the very best authorities obtainable on the several topics that will be ventilated in this department.

We earnestly request our readers to take a lively interest in this new departure and send along their questions and comments. While it may occur from time to time that all letters may not be dealt with in the issue immediately following their receipt, owing perhaps to the volume received, still it can be depended upon that they will receive our attention in the same relative order as they are received.

Address all correspondence to

THE EDITOR, . .
"CONSTRUCTION,"
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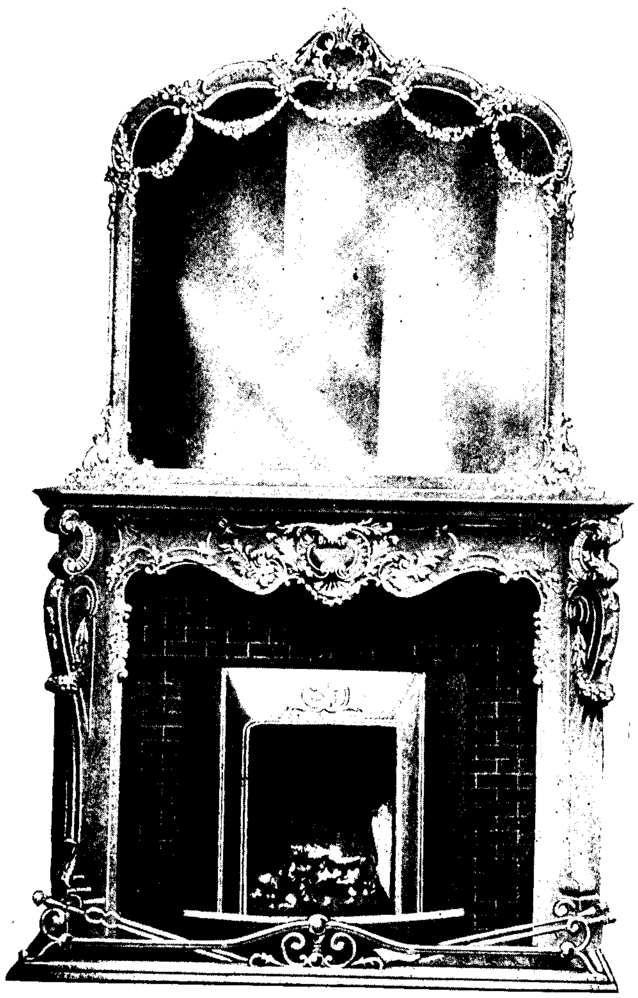

Louis XIV.
Louis XV.
Louis XVI.
Renaissance
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Etc.

The beautiful homes that are now under course of construction will no doubt require the utmost care on the part of the architects to see that they are finished and equipped in a manner that will fulfill their fondest hopes and result in a residence equal to their expectations. Notwithstanding the excellent conceptions of the designers of our homes, it often occurs that architects are confronted with a serious difficulty when they attempt to materialize their designs. Realizing this difficulty, we have established our House Furnishing Department on such broad and comprehensive lines as to reduce such difficulties to a minimum. Particularly we may mention our Mantel, Tile and Fireplace Goods Department, in which is carried a complete range of Fireplace Goods and Mantels from the world's best manufacturers, and we especially invite architects to call with their clients and inspect our various lines. They will find a staff of expert decorators at their service and suggestions and designs will be gladly submitted.

We make a specialty of carrying out architects' designs in all classes of decorative work.

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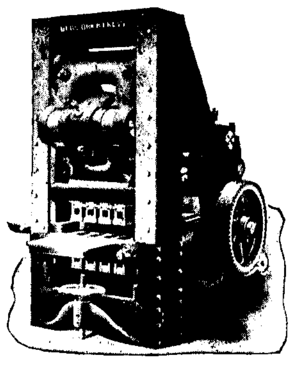
The "BERG PRESS" is the highest development in the art of Brick Making Machinery, so pronounced by the United States Government



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BERG MACHINERY M'F'G CO., LTD.

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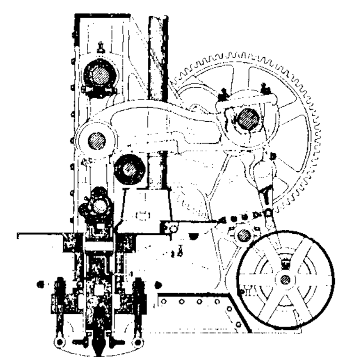

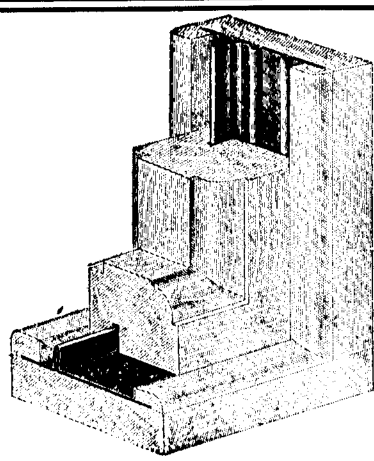

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are invited to call upon our ILLUMINATING ENGINEER when planning ELECTRIC LIGHTING INSTALLATIONS. Absolutely no obligation. His services are gratis. Phone M. 3975, write or, better still, call.

THE TORONTO ELECTRIC LIGHT CO., Limited
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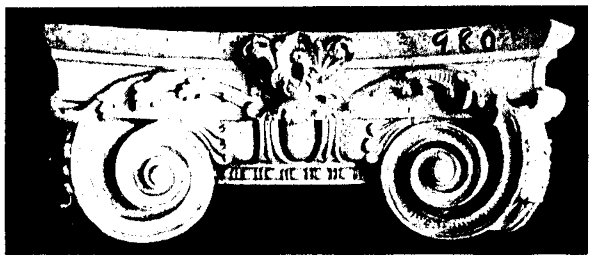

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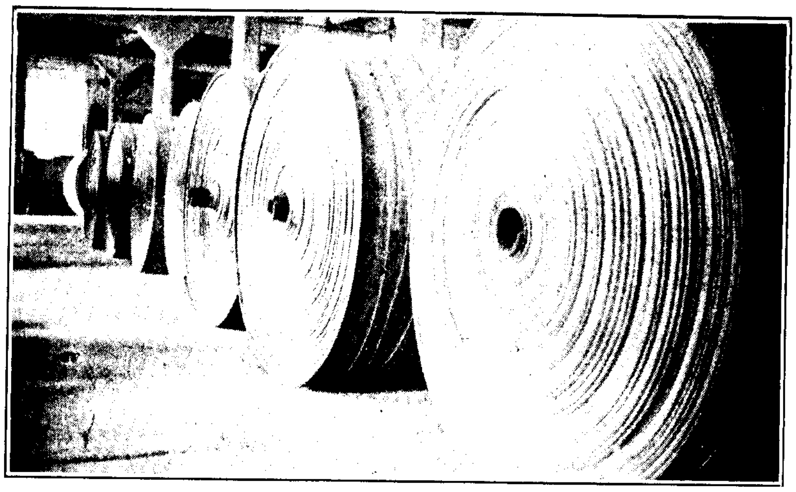
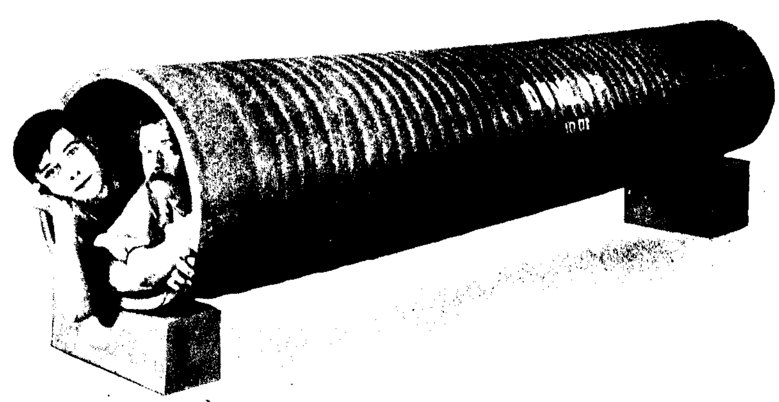


Conveyor Belting made by the Dunlop Tire and Rubber Goods Co. Part of a 35-ton order.



One Length of Large Shipment of Suction Hose for Sand Dredge made at the Dunlop Rubber Works.

Do not associate the Dunlop Company exclusively with the solid rubber and pneumatic tire industry.

In these lines the Dunlop factory supplies the great proportion of the trade in Canada.

But the Mechanical Rubber Goods Department is no less important a branch of the Dunlop industry in Rubber.

The Mechanical Department now occupies half the Dunlop Rubber Works, and at the present rate of expansion will soon constitute a good sized factory in itself.

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Rubber Belting in all grades and sizes. Also Friction Belts, Band Saw Belts.

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Rubber Heels and Rubber Soling. Shoemakers' Cement.

Horseshoe Pads, Crutch Tips, Rubber Bumpers, Prop Blocks.

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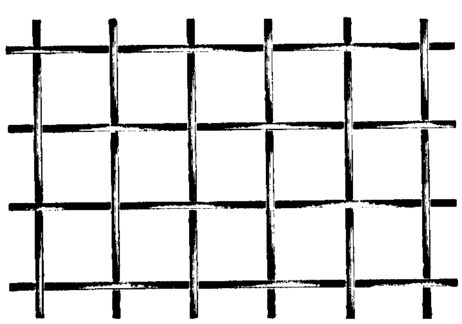

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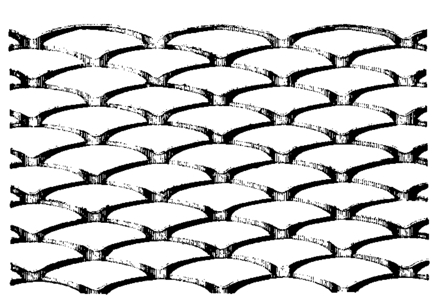

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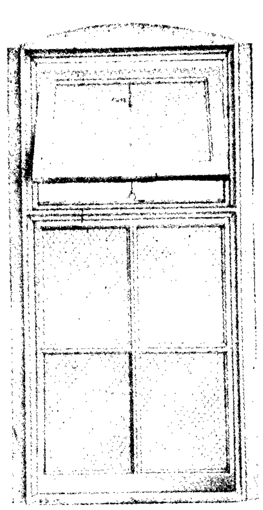

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Reduction in weight of material.

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Simple in construction.

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No brackets

Permanent treads—no need of temporary treads.

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Structural Steel for Quick Delivery

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THE CANADIAN ART STONE COMPANY, LIMITED
PRICE STREET, TORONTO.

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Architects and Engineers, Attention!

The following tests made by the Faculty of Applied Science and Engineering, University of Toronto, shows the superior quality of "Water-Washed" sand over the average pit sand used for building purposes and reinforced concrete steel construction, where sand is expected to come up to the standard of other first-class materials used on the work. If fire occurs, disintegration cannot possibly take place in walls or concrete with a mortar containing 55 per cent. of silica (standard quartz), such as water washed sand is.

CHEMICAL ANALYSIS OF WATER-WASHED SAND

Silica	55.0 %
Alumina and Iron	12.3
Lime	17.0
Magnesia	2.4
Moisture and Carbon Dioxide	13.3

FUSHION TEST OF WATER-WASHED SAND

Sample ground to pass 80 mesh and compressed in form of Segar cone.

Temp. C.	Temp. F.	Behaviour.
1250°	2280°	Cone sintered.
1350°	2460°	Cone softened.
Unground material heated in crucible.		
1350°C.	2560°F.	Sintered slightly.

Sand & Dredging Limited

Tel. Main 4507 — Spadina Avenue Dock, Toronto

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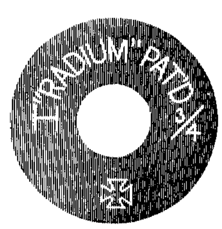
VALVE DISCS



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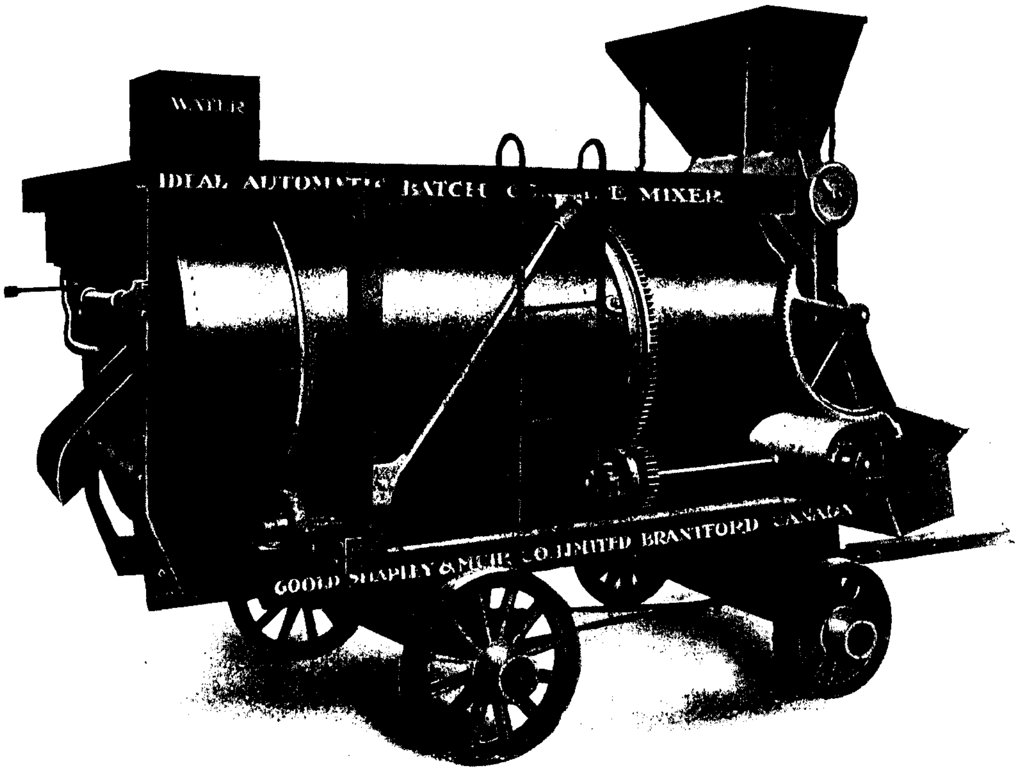

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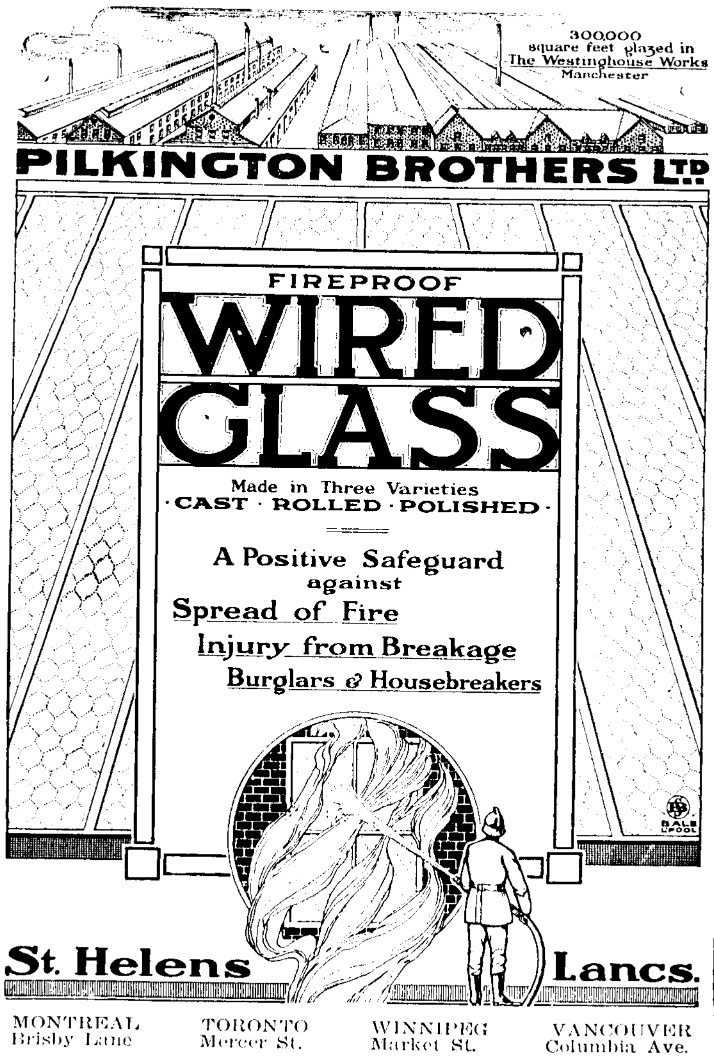

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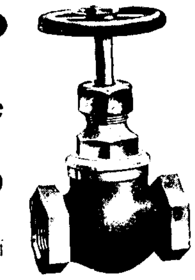

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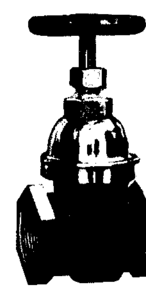

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Gaudry & Co., L. H.
Somerville, Limited.
Francis Hyde & Co.

PLATE AND WINDOW GLASS.
Pilkington Brothers, Ltd.
Canada Glass, Mantel and Tile Co., Limited.

PLASTER BOARD.
Francis Hyde & Co.
Stinson-Reeb Builders' Supply Co.

PLUMBERS' BRASS GOODS.
Somerville, Limited.
James Robertson Co., Limited.

PLUMBING FIXTURES.
Somerville, Limited.
Standard Ideal Co., Limited.

PLUMBER AND STEAM FITTER SUPPLIES.
L. H. Gaudry & Co.
General Brass Co., Limited.
Somerville, Limited.
Standard Ideal Co., Limited.
Taylor-Forbes Co.
Dominion Radiator Company.

PORCELAIN ENAMEL BATHS.
Somerville, Limited.
Standard Ideal Co., Limited.

PUMPING MACHINERY.
Mussons, Limited.
Otis-Fensom Elevator Co., Limit .

RADIATORS.
King Radiator Co.
Dominion Radiator Co., Limited.
Gurney, Tilden Co., Limited.
Warden King, Limited.
Taylor-Forbes Co., Limited.
Somerville, Limited.

RADIATOR VALVES.
Kerr Engine Co.

REFRIGERATING MACHINERY.
Linde British Refrigeration Co., Limited.

ROOFING (Slate).
A. B. Ormsby, Limited.

ROOFING PAPER.
The Pedlar People.

ROOFING TILE.
E. F. Dartnell.
Francis Hyde & Co.
David McGill.
The Pedlar People.

RUBBER TILING.
Dunlop Tire & Rubber Co.
Gutta Percha & Rubber Mfg. Co., Limited.

SAND.
Sand and Dredging Company.

SAND AND GRAVEL SCREENS.
B. Greening Wire Co., Limited.

SEE INDEX TO ADVERTISEMENTS FOR ADDRESSES OF FIRMS IN THE ABOVE DIRECTORY

INTERIOR WOODWORK.
Globe Furniture Co.
Canadian Office & School Furr ure Co.
Seaman Kent & Co.

JAIL CELLS AND GATES.
Dennis Wire & Iron Works Co. lted.
J. & J. Taylor.

JOIST HANGERS.
Taylor-Forbes Co.
Francis Hyde & Co.

LAMP STANDARDS.
Dennis Wire & Iron Works Co., Limited.

LATH (Metal).
Expanded Metal and Fireproofing Co.
Clarence W. Noble.
Galt Art Metal Co.
Gaudry & Co., L. H.
B. Greening Wire Co., Limited.
Metal Shingle & Siding Co.
Metallic Roofing Co. of Canada.
The Pedlar People.
Stinson-Reeb Builders' Supply Co.
Trussed Concrete Steel Co.

LEADED GLASS.
David McGill.
Pilkington Brothers, Ltd.
Canada Glass, Mantels and Tiles, Limited.

LIGHTING AND POWER PLANTS.
Colonial Engineering Co., Ltd.

LODGE FURNITURE.
Canadian Office & School Furniture Co.
Globe Furniture Co.

MANTELS.
T. Eaton Company.
John Kay Co.

MARBLE.
E. F. Dartnell.
Holdge Marble Co.
Missisquoi Marble Company.
Smith Marble & Construction Co., Limited.

METAL SHINGLES.
Galt Art Metal Co.
Metal Shingle & Siding Co.
The Pedlar People.

METAL WALLS AND CEILINGS.
Galt Art Metal Co.
Metal Shingle & Siding Co.
C. W. Noble.
A. B. Ormsby, Limited.
The Pedlar People.

METAL WEATHER STRIPS.
Chamberlain Metal Weather Strip Co.

OPERA CHAIRS.
Canadian Office & School Furniture Co.
Globe Furniture Co.

ORNAMENTAL IRON WORK.
Canada Foundry Co., Ltd.
Gaudry & Co., L. H.
Dennis Wire & Iron Co., Limited.

PACKING.
Dunlop Tire & Rubber Co., Limited.
Gutta Percha & Rubber Mfg. Co.

PAINTS
James Langmuir & Co., Ltd.

PIPE COVERING.
Kent Company, Limited.

PLASTERERS.
W. J. Hynes.
Holdge & Sons.

PLASTER CORNER BEADS.
The Pedlar People.

PLATE AND WINDOW GLASS.
Pilkington Brothers, Limited.

PLUMBERS' BRASS GOODS.
General Brass Co.
Somerville, Limited.
Jas. Robertson Co., Limited.

PLUMBING FIXTURES.
Somerville, Limited.
Standard Ideal Co., Limited.
Jas. Robertson Co., Limited.

PNEUMATIC TOOLS.
Canadian Fairbanks Co.
Mussons, Limited.

PORCELAIN ENAMEL BATHS.
Somerville, Limited.
Standard Ideal Co., Limited.
Jas. Robertson Co., Limited.

RADIATORS.
General Brass Co.
King Radiator Co.
Gurney, Tilden Co., Ltd.
Dominion Radiator Co., Limited.
Warden King, Limited.
Taylor-Forbes Co., Limited.
Somerville, Limited.

RADIATOR VALVES.
Kerr Engine Co.

REFRIGERATING MACHINERY.
Kent Company, Limited.
Linde British Refrigeration Co., Ltd.

REFRIGERATOR INSULATION.
Kent Company, Limited.

REINFORCED CONCRETE.
Expanded Metal & Fireproofing Co.
David McGill.
Clarence W. Noble.
The Pedlar People.
W. D. Beath & Son.
Trussed Concrete Steel Co., Limited

RELIEF DECORATION.
W. J. Hynes.

ROOFING PAPER.
Alex McArthur & Co.
The Pedlar People.

ROOFING (Slate).
A. B. Ormsby, Limited.

ROOFING TILE.
E. F. Dartnell.
Francis Hyde & Co.
David McGill.
The Pedlar People.

RUBBER TILING.
Dunlop Tire & Rubber Co.
Gutta Percha & Rubber Mfg. Co., Limited.

SAFES, VAULTS AND VAULT DOORS.
J. & J. Taylor.
Goldie & McCulloch Co., Limited.

SANITARY PLUMBING APPLIANCES.
Somerville Limited.
Standard Ideal Co., Limited.
Jas. Robertson Co.

SCHOOL FURNITURE.
Canadian Office & School Furniture Co.
Globe Furniture Co.

SHEET METAL
A. C. Leslie & Co.

SHEET METAL WORKERS.
Galt Art Metal Co.
Metal Shingle & Siding Co.
A. B. Ormsby, Limited.
The Pedlar People.

SIDEWALKS, DOORS AND GRATES.
Dennis Wire & Iron Works Co.

SHINGLE STAINS
James Langmuir & Co., Ltd.

SIDEWALK LIFTS.
Otis-Fensom Elevator Co., Limited.
Parkin Elevator Company.

STABLE FITTINGS.
Dennis Wire & Iron Works Co., Lim-

STAFF AND STUCCO WORK.
W. J. Hynes.

STEAM APPLIANCES.
Sheldons, Limited.
Kerr Engine Co.
Taylor-Forbes Co.

STEAM AND HOT WATER HEATING.
King Radiator Co., Ltd.
Warden King, Limited.
Gurney, Tilden & Co., Ltd.
Dominion Radiator Co., Limited.
Taylor-Forbes Co., Limited.

STEEL CASEMENTS.
L. H. Gaudry & Co., Limited.
David McGill.

STEEL CONCRETE CONSTRUCTION.
Expanded Metal & Fireproofing Co.
Clarence W. Noble.
The Pedlar People.
W. D. Beath & Son.
Trussed Concrete Steel Co.

STEEL DOORS.
A. B. Ormsby, Limited.
The Pedlar People.

STRUCTURAL IRON CONTRACTORS.
Dominion Bridge Co.
Stratford Bridge & Iron Co.
Jenks-Dresser Co., Ltd.
Hamilton Bridge Co.
Reid & Brown.

STRUCTURAL STEEL.
L. H. Gaudry & Co., Limited.
Jenks Dresser Co., Limited.
Hamilton Bridge Co.
Dominion Bridge Co.
Reid & Brown.
Dennis Wire and Iron Works Co., Limited.
Stratford Bridge Co.

STORE FIXTURES.
Gold Medal Furniture Mfg. Co.
Canadian Office & School Furniture Co.
Globe Furniture Co.

TERRA COTTA FIREPROOFING.
Eadie-Douglas Co.
Don Valley Brick Works.
E. F. Dartnell.
Francis Hyde & Co.
The Milton Pressed Brick Co.
David McGill.

TILE (Floor and Wall).
David McGill.
Smith Marble & Construction Co.
Francis Hyde & Co.
E. F. Dartnell.

VALVES.
Gurney Foundry Company, Ltd.
Kerr Engine Co.
Somerville, Limited.
Taylor-Forbes Co.
Dominion Radiator Company.

VENTILATORS.
Wm. Stewart & Co.
Sheldons, Limited.

WALL HANGERS.
Taylor-Forbes Co.

WALL HANGINGS.
T. Eaton & Co.
John Kay Co.
W. A. Murray & Co., Ltd.

WINDOW GUARDS.
B. Greening Wire Co., Limited.

·A·DIRECTORY·FOR· ·CONTRACTORS'·SUPPLIES & MACHINERY·

ADAMANT PLASTER.
Francis Hyde and Co.
Stinson-Reeb Builders' Supply Co.

ARTIFICIAL STONE.
Canadian Art Stone Co.
Roman Stone Co.

ASBESTOS PRODUCTS.
A. B. Ormsby, Limited.

BELTING.
Dunlop Tire and Rubber Co., Limited.
Gutta Percha & Rubber Mfg. Co., Limited.

BLOWERS.
Sheldons, Limited.

BLOW AND VENT PIPING.
Metal Roofing Co., Limited.
Metal Shingle & Siding Co.
A. B. Ormsby, Limited.

BOILERS.
Gurney Foundry Company, Ltd.
Warden King, Limited.
Dominion Radiator Co., Limited.
Berg Machinery Mfg. Co., Limited.
Somerville, Limited.
Taylor-Forbes Co.
Goldie and McCulloch Co., Limited.

BRASS WORKS.
Somerville, Limited.
James Robertson, Limited.
Kerr Engine Co.

SEE INDEX TO ADVERTISEMENTS FOR ADDRESSES OF FIRMS IN THE ABOVE DIRECTORY

SHAFTING PULLEYS AND HANGERS.
Goldie & McCulloch Co., Limited.

SANITARY PLUMBING APPLIANCES.
Somerville, Limited.
Standard Ideal Co., Limited.

STEEL CASEMENTS.
L. H. Gaudry .. Co.
David McGill.

STRUCTURAL STEEL.
Gaudry & Co., L. H.
Dominion Bridge Co.
Hamilton Bridge Co.
Jenks-Dresser Co., Limited.
Dennis Wire & Iron Works Co., Limited.
Reid & Brown.
Stratford Bridge Co.

TERRA COTTA FIREPROOFING.
Eadie-Douglas Co.
Don Valley Brick Works.
E. F. Dartnell.
Francis Hyde & Co.
David McGill.

VALVES.
Gurney Foundry Company, Ltd.
Kerr Engine Co.
Somerville, Limited.
Taylor-Forbes Co.
Dominion Radiator Co.

VENTILATORS.
Sheldons, Limited.

WALL HANGERS.
Taylor-Forbes Co.

WATER HEATERS.
Somerville, Limited.

WATERWORKS SUPPLIES.
Somerville, Limited.
Kerr Engine Co.
Mussons, Limited.
Dominion Radiator Co.

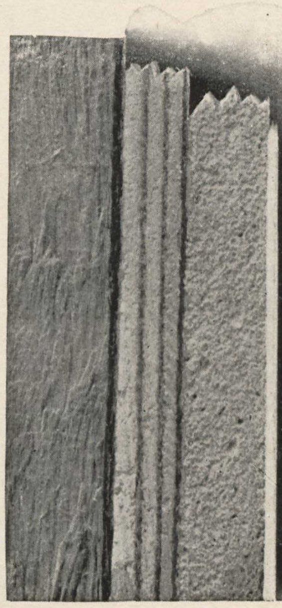
WHEELBARROWS.
Mussons, Limited.

WIRE ROPE AND FITTINGS.
B. Greening Wire Co., Limited.
Otis-Fensom Elevator Co., Limited.
Mussons, Limited.

An Index to the Advertisements

SACKETT PLASTER BOARD

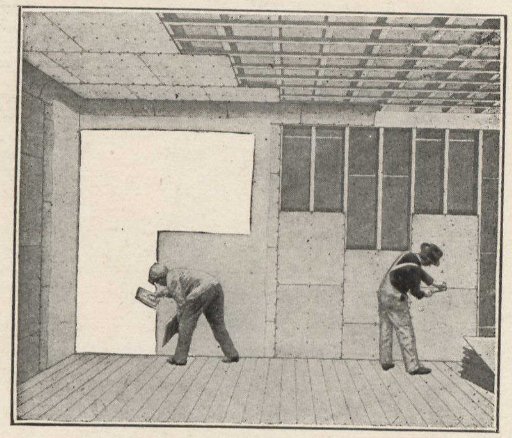
INSTEAD OF LATH



Sectional View (full size) of Sackett Plaster Board, applied to Wooden Stud, with ¾-inch grounds.

Fireproof and Economical

SACKETT PLASTER BOARDS have been successfully used since 1891 in thousands of buildings of all classes, including small cottages, prominent hotels, costly residences, churches and theatres.



Method of applying Sackett Boards to Walls and Ceilings.

Walls and ceilings of Sackett Plaster Boards will be DRY AND READY IN HALF THE TIME required when lath is used, as less than half the quantity of water is needed.

Less moisture means *less damage* from warped and twisted trim and woodwork.

Their superior insulating qualities make warmer houses with less fuel. The first cost is *no more* than good work on wood lath, and *less* than on metal lath.

Sackett Plaster Board is an efficient and economical FIREPROOFING not only for walls but between floors, and for protecting exposed wooden surfaces in mills, warehouses and industrial structures. It is also used extensively instead of lumber as outside sheathing under weather boards.

Sackett Plaster Board comes in sheets or slabs 32x36 inches, ready to be nailed direct to the studding, furring or beams.

For all kinds of buildings its use is ideal. It speeds construction; it lessens building cost; it reduces fixed charges for insurance; it makes fire resisting walls and ceilings, and gives absolute satisfaction.

BOOKLET SHOWING BUILDINGS ALL OVER THE COUNTRY WHERE THESE BOARDS HAVE BEEN SUCCESSFULLY USED, WITH SAMPLES, FURNISHED ON APPLICATION.

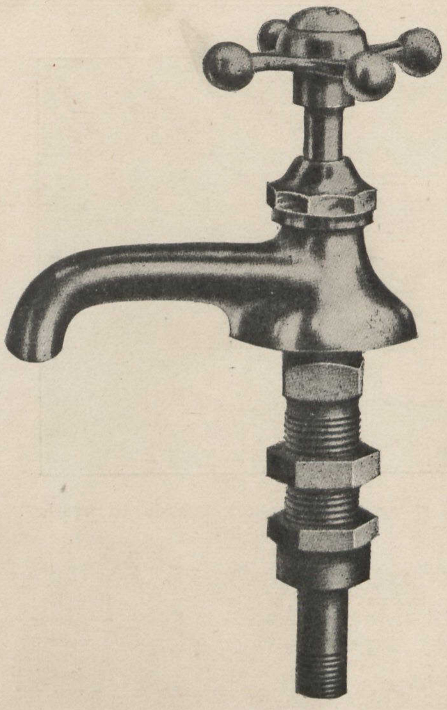
FLAWLESS PLASTER

Sound Proof	**Guaranteed**
Fire Proof	**Unsurpassed**
Water Proof	**Sanitary**
Germ Proof	**Dependable**
Shock Proof	**Everlasting**

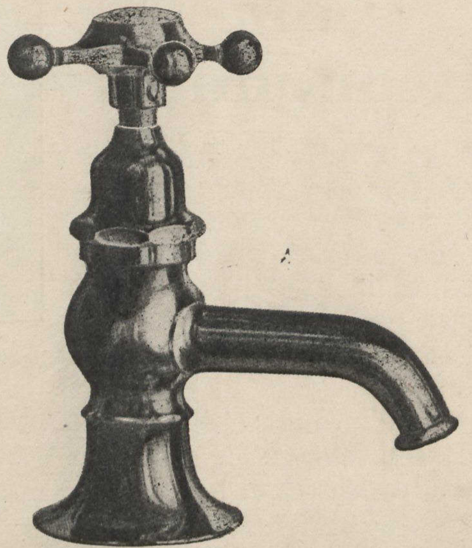
Stinson-Reeb Builders' Supply Co., Limited

9th Floor Eastern Townships Bank Building - - - MONTREAL

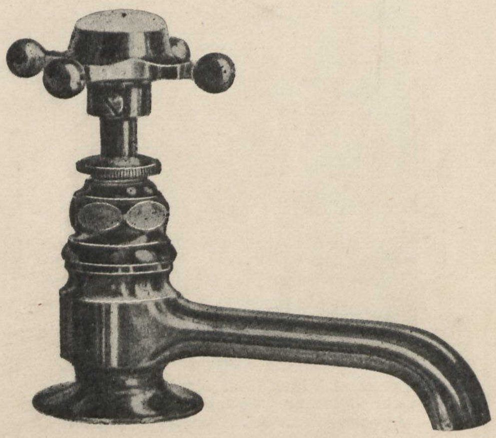
"Goods of Quality"



"MIDGET" BASIN COCK.

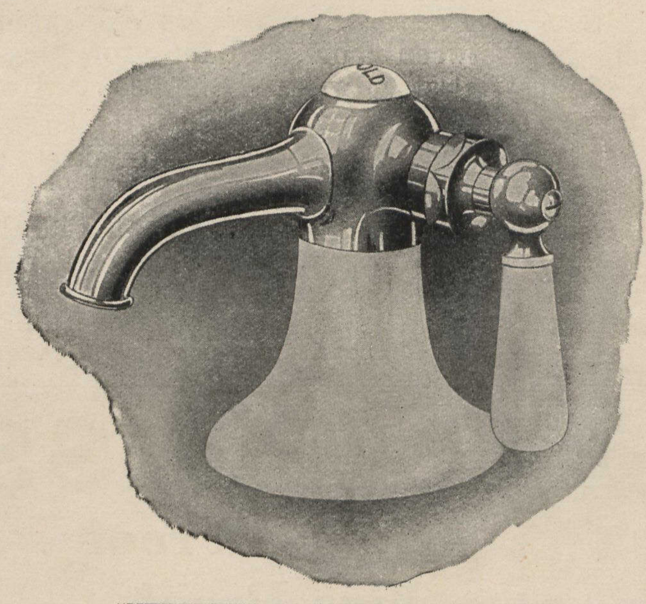


"NEPTUNE," SELF CLOSING COCK.



LOW DOWN COMP BASIN COCK.

"NEPTUNE" SOLID BASE FULLER COCK.



"NEPTUNE" PORCELAIN BASE FULLER COCK.

SOMERVILLE LIMITED

Brass and Lead Plant and General Office, 284 St. Helens Ave., Toronto

Sales Offices and Show Rooms:

Fred Somerville
Saturday Night Building
Toronto

Stanley Block
156 Lombard St.
Winnipeg

Arthur Somerville
27 Nordheimer Building
Montreal

W. A. Maclauchlin,
26 Union St.
St. John, N.B.