THE ARCHITECTURAL FORUM

IN TWO PARTS

ARCHITECTURAL ENGINEERING & BUSINESS

PART TWO

OCTOBER

1929

Police Headquarters Garage, St. Louis, Mo. . . . R-W equipped

RW ELECTRICALLY OPERATED DOORS

fully meet all doorway problems

Positive and unfailing control of large, heavy doors! That's the certain sure result of using R-W doorway equipment and Aut-O-Dor, the electric operator that always works.

R-W engineers can handle any and all problems of door hanging or control. In St. Louis, when the new Police Headquarters garage was completed, R-W engineers were called upon to solve the doorway problem.

R-W engineers installed R-W industrial doorway equipment for four 9-foot high, 800-pound doors. Each door operates separately on ball bearing hangers. They are controlled electrically from three points and can be stopped instantly at any point. Delays and accidents are thus prevented.

Call upon R-W engineers at any time to help you solve difficult doorway problems. No door is too high, no opening is too wide, to be met by R-W equipment.

"Quality leaves its imprint"

Richards-Wilcox Mfg. Co.

"A Hanger for any Door that Slides"

New York . . . . AURORA, ILLINOIS, U.S.A. . . . . Chicago

Boston Philadelphia Cleveland Cincinnati Indianapolis St. Louis New Orleans Des Moines Minneapolis Kansas City Atlanta Los Angeles San Francisco Omaha Seattle Detroit

Montreal · RICHARDS-WILCOX CANADIAN CO., LTD., LONDON, ONT. · Winnipeg

« « « « What the Dismantling of the Tacoma Building Revealed » » » »

EVER since the first skyscraper went up, pessimistic tongues have been busy with doleful predictions. "What's happening to the steel?" they ask. "Some day there'll be nothing left of the skeleton but criss-cross streaks of rust."

The doubters have been answered, with the dismantling in Chicago of the Tacoma Building, erected in 1887 for the World's Fair. Natco Fire Proofing was used throughout; floors were the old reliable Natco Flat-Arch (still a favorite today).

After 42 years, the steel work in this building was as perfect as the day it was installed. The steel corroded more in two weeks when the steel was exposed during the wrecking than it had in the preceeding 42 years.

There is only one interpretation; when steel work is properly protected by Natco Girder and Column Covering, the building should stand indefinitely. Obsolescence, and not depreciation, will determine its span of life.

In the floors of this old building is a tribute to Natco Flat Arch, too. The passing of the years have left their strength unimpaired. It is a comforting thought that the Natco Flat Arch Floors you install will still be rendering flawless service in 1970.

Each member of the Complete Natco Line of Structural Clay Tile has its own outstanding advantages to recommend it. The Line provides a size and shape for every building need—and the building gains in strength, safety, and service, through Natco.

NATIONAL FIRE PROOFING COMPANY

General Offices: Fulton Building, Pittsburgh, Pa.

Branch Offices: New York, Chanin Bldg; Chicago, Builders Bldg; Philadelphia, Land Title Bldg; Boston, Textile Bldg.

In Canada: National Fire Proofing Co. of Canada, Ltd., Toronto, Ontario

TURN TO "SWEET'S"

PAGE A383 – A416

NATCO

THE COMPLETE LINE OF STRUCTURAL CLAY TILE

RAYMOND

Here you see

what the Engineer and Contractor sees of a finished Raymond Concrete Pile, after installation—simply the top of the spirally reinforced steel shell filled with concrete.

and below you see

the sections of the shell itself before they are put together—and driven—and left in the ground as a solid, substantial, pressure-resisting hollow steel "form" (whose interior can be inspected). This is the famous Raymond Method of installing tapering concrete piles . . . every pile poured into a spirally reinforced steel shell that is left in the ground.

CAST IN PLACE PILES
COMPOSITE PILES
PRECAST PILES
PIPE PILES

*"A form for every pile
A pile for every purpose"*

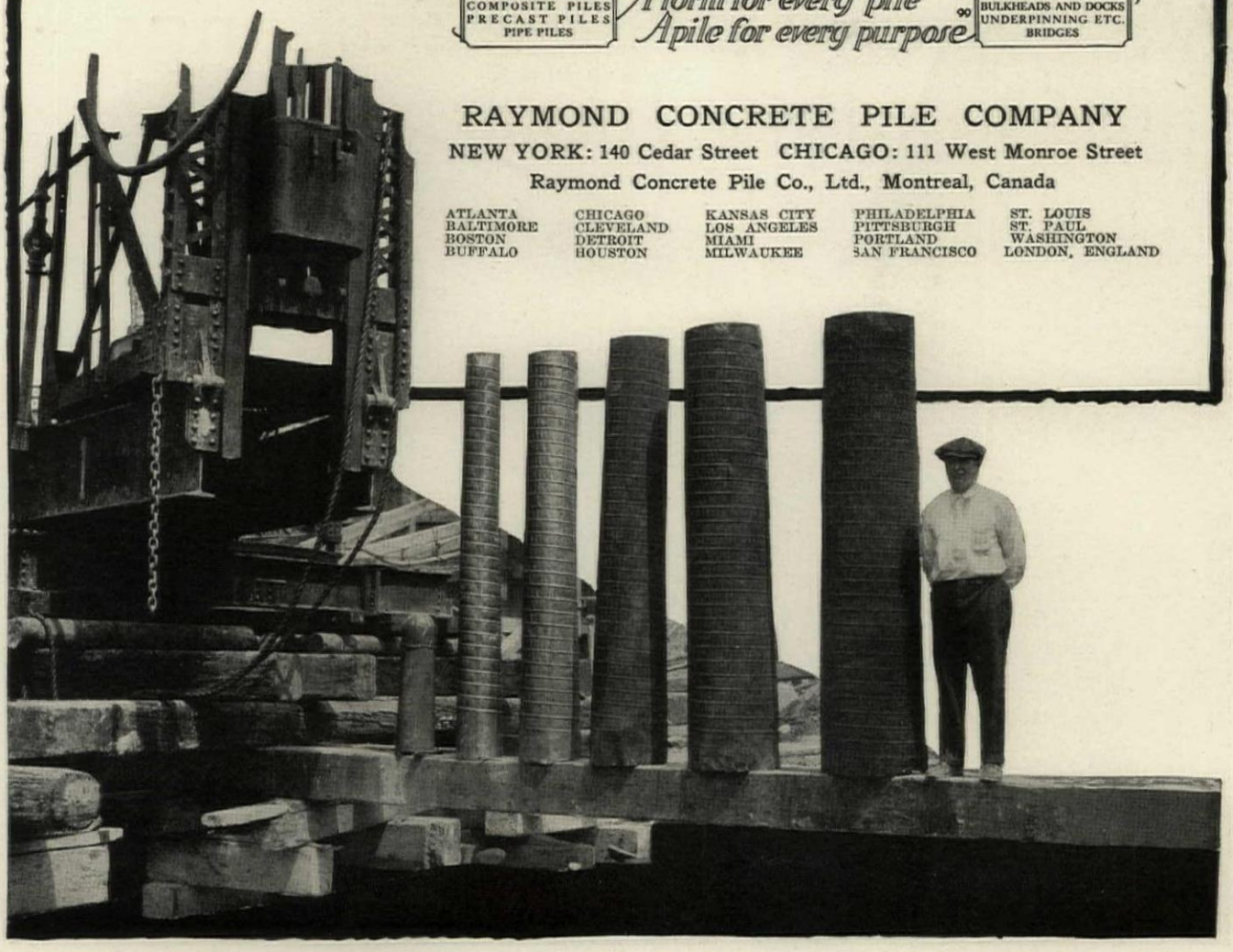
BUILDING FOUNDATIONS
BULKHEADS AND DOCKS
UNDERPINNING ETC.
BRIDGES

RAYMOND CONCRETE PILE COMPANY

NEW YORK: 140 Cedar Street CHICAGO: 111 West Monroe Street

Raymond Concrete Pile Co., Ltd., Montreal, Canada

ATLANTA	CHICAGO	KANSAS CITY	PHILADELPHIA	ST. LOUIS
BALTIMORE	CLEVELAND	LOS ANGELES	PITTSBURGH	ST. PAUL
BOSTON	DETROIT	MIAMI	PORTLAND	WASHINGTON
BUFFALO	HOUSTON	MILWAUKEE	SAN FRANCISCO	LONDON, ENGLAND



Picking the Right Concrete Floor
. . . For the World's Largest Auditorium

Lockwood, Greene and Co., Architects
The M. B. Markland Co., Contractors.

Over 250,000 square feet of concrete floor in the Atlantic City Auditorium are colored and hardened with Master Builders Dycrome.

AT Atlantic City is the world's largest auditorium, showplace of the world's merchandise—meeting place of world conventions. Here floor beauty is imperative. Color is more than desirable—it is a necessity.

And whatever the requisites for beauty *the surface must be highly resistant to wear.* Thousands of feet tramp over the floors night and day, the year 'round—no time nor budget for frequent redecorating and repairs.

Colored Masterbuilt Concrete Floors, because of their smooth, hard surface, their resistance to the wear of foot traffic, their "built-in" color, supply the answer to floor requirements such as this. They offer a wide selection of colors in treatments that strengthen the concrete as they color it.

Colored Masterbuilt floors are obtained by the application of Colormix, Dycrome, or Colored Metalicron, whichever is most adaptable to the specific installation. Ask the Master Builders' representative to explain the advantages of each.

THE MASTER BUILDERS COMPANY, *Cleveland, Ohio*

Factories in Cleveland, Ohio
Buffalo, N.Y. and Irvington, N. J.

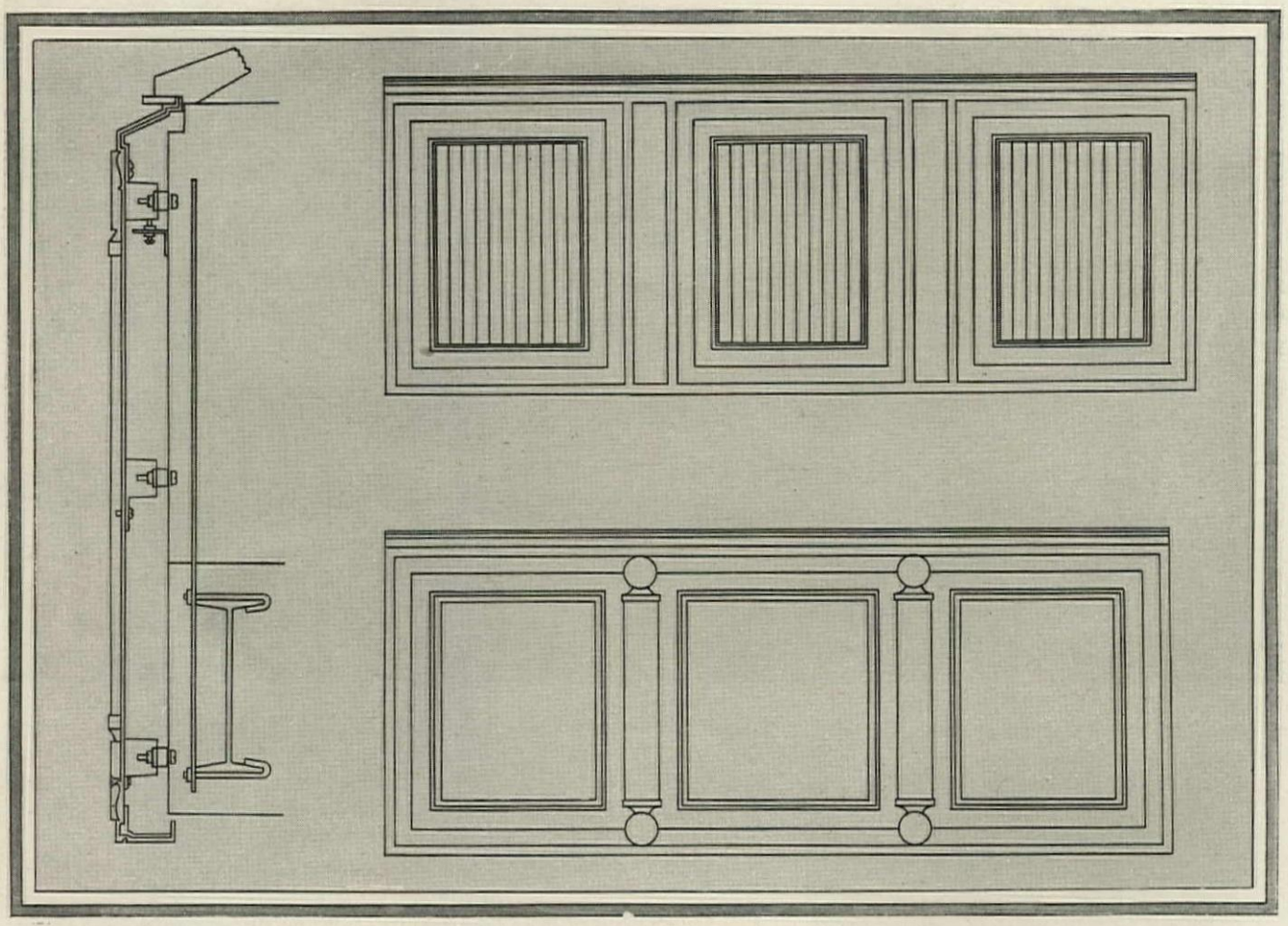
Sales Offices
in 110 Cities

Colored Masterbuilt Floors

HARDENED DUST-PROOF CONCRETE

WORKING DRAWINGS OF ALUMINUM SPANDRELS

[*These spandrels are described on pages 68, 69*]



SPECIFICATIONS

THESE Aluminum Spandrels shall be made of No. 43 alloy, having a silicon content of 5%. The weight shall not exceed .097 pounds per cubic inch and the average tensile strength shall be not less than 17,000 pounds per square inch. The surface shall be free from imperfections and equal in all respects to the smoothness and color of the sample submitted.

ALUMINUM COMPANY OF AMERICA
24993 Oliver Building
Pittsburgh, Pa.
Offices in 19 Principal American Cities

ARCHITECTURAL ALUMINUM

Occupy Less Space–

Yet They Heat Quicker and More Completely

Their beauty *alone* is sufficient reason for installing McQuays but they are far more than attractive radiators. Actually they heat rooms quicker and more thoroughly, **with a decided fuel saving.**

McQuay radiators impel the heated air out into rooms in a horizontal direction, with sufficient initial velocity to drive it all around and **provide the complete circulation so essential to effective heating.**

The heating units of tube and copper fin construction are the most efficient means known for transferring heat. **Cabinets are now built of rust-defying copper alloy steel,** so that the entire radiator is rust proof and practically indestructible.

They weigh about one quarter as much as cast iron, and occupy far less space—**saving considerably in freight, handling and installation costs.** Each radiator is guaranteed to heat the full amount of capacity shown by its catalog rating.

Sold by any recognized heating contractor, McQuay Radiators are made in dimensions and capacities for every heating need—in both cabinet and concealed types.

McQUAY RADIATOR CORPORATION

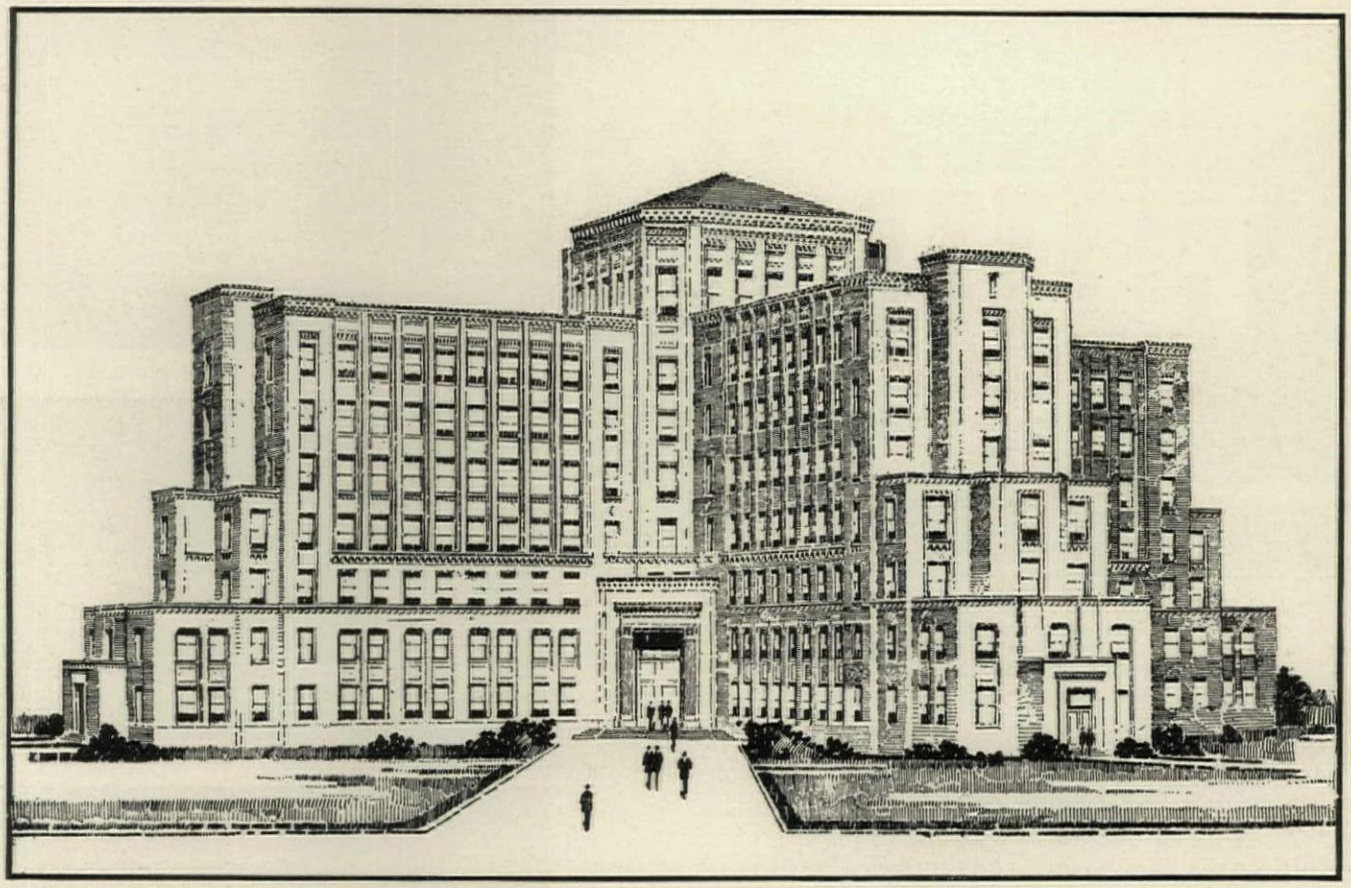
General Offices, 35 East Wacker Drive, Chicago

Branches in most principal cities

EXIDES PROTECT

Administration building of locomotive plant

AGAINST CURRENT FAILURE

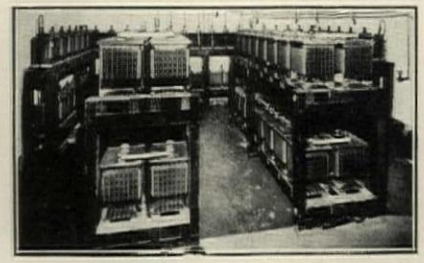


ADMINISTRATION BUILDING *of Baldwin Locomotive Works, Eddystone, Pa., protected against sudden darkness by 60-cell Exide Battery, Chloride type. Simon & Simon, Philadelphia, architects.*

Architects specified Exide Batteries to guard Baldwin building against sudden darkness

SUDDEN current failure will not endanger the occupants of the administration building of the Baldwin Locomotive Works' Eddystone plant. Reliable Exide Batteries stand guard.

Should normal power fail, important lights are switched to Exides . . . *instantly and automatically* . . . without a hand touching a switch. In the building shown here, main stairway, fire towers, executive offices, transformer, battery and engine rooms are safeguarded against sudden darkness. The architects realized that interruption of electric current might result in confusion and danger. That's why they chose *absolutely reliable* Exide Emergency Lighting Batteries for protection.



THIS DEPENDABLE EXIDE *protects lights in Baldwin administration building. The 25-cell Exide, Chloride type, in background, supplies current for entire telephone system throughout plant.*

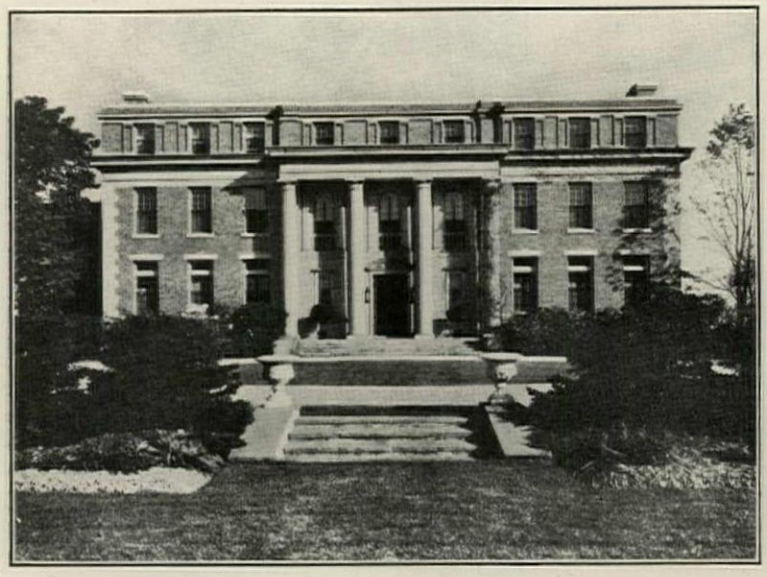
Exide engineers have combined in these batteries the following important qualities: (1) moderate initial cost, (2) exceptionally long life, (3) low operating cost, (4) simple, foolproof operation and charging, requiring no expert knowledge, (5) absolute power dependability. Architects all over the country are specifying this never-failing system of protection for hospitals, auditoriums, stores, theatres, offices and any buildings where the public gathers. Write for information.

Exide
EMERGENCY LIGHTING BATTERIES

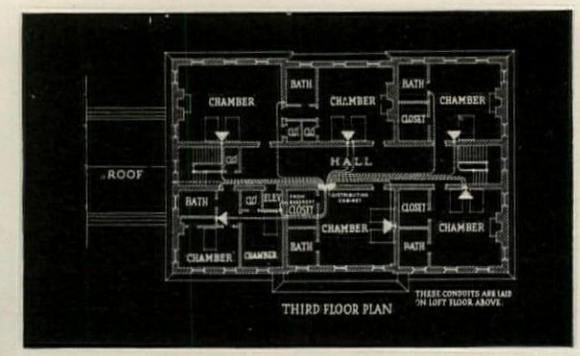
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

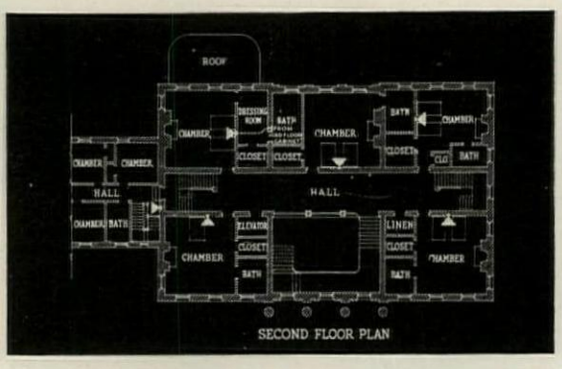
Exide Batteries of Canada, Limited, Toronto

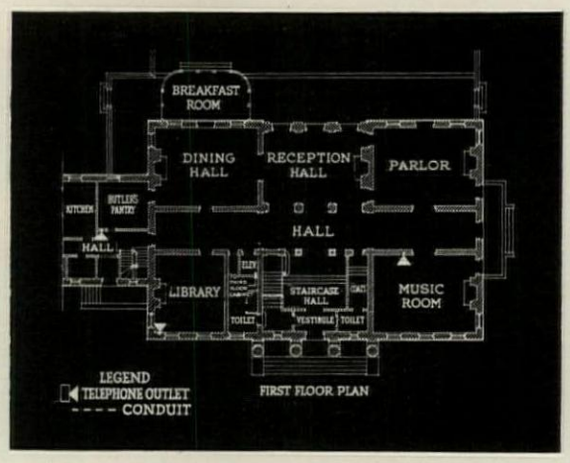
Telephone Convenience for Larger Residences

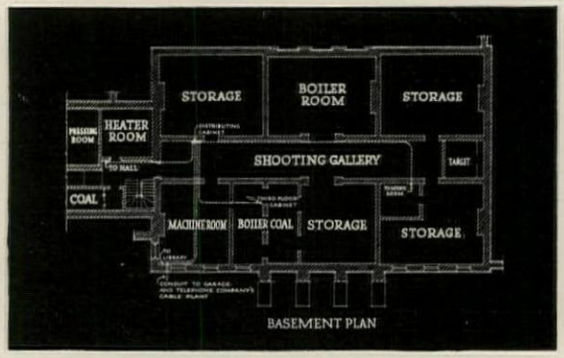


In the residence of Col. F. M. Alger at Pride's Crossing, Massachusetts, seventeen telephone outlets, including two in the garage, are provided for complete telephone convenience. The telephone wiring is carried in conduits built into the walls. Walker, Walker & Kingsbury, Architects, Boston, Massachusetts.









In planning the telephone arrangements for larger residences, it is especially desirable that architects consult freely with the telephone company.

Most important, of course, is the placing of the outlets so that the telephones, when installed, will bring greatest convenience and comfort in the use of the service . . . and providing conduit to conceal and protect the telephone wiring.

Bell Company representatives will gladly aid in working out the telephone convenience which may be needed, both now and in the future. They will suggest such service features as seem appropriate to particular houses . . . a second telephone line . . . push buttons and switches for intercommunication among the house telephones . . . additional bells so incoming calls can be easily heard and promptly answered . . . portable telephones for plugging into jacks at appropriate places . . . and many other modern telephone conveniences.

Your local Bell Company is constantly studying ways to improve its service. It has much information of interest to you as an architect. Without charge, it will help you in planning the facilities for telephone service for all of your houses, small as well as large. Just telephone the Business Office.

BRIXMENT *protects* winter masonry . . .

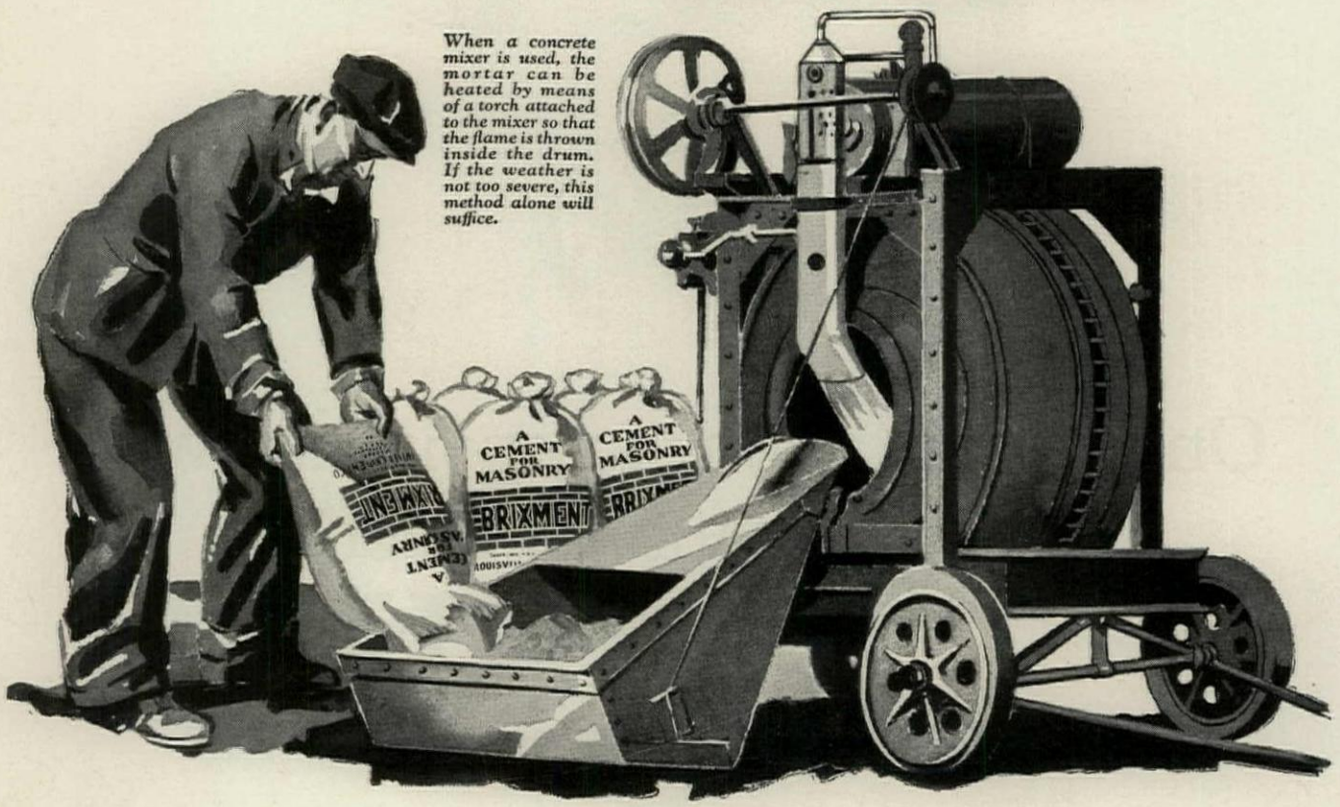
BRIXMENT mortar, like any other mortar containing water, is not freeze-proof. Nevertheless it is used regularly for mid-winter masonry even in the severest northern climates. In fact during the winter months more BRIXMENT is sold in proportion to the volume of building construction than at any other time.

BRIXMENT mortar sets up faster than portland-cement-and-lime mortar in which a large quantity of lime is used and this set can be made to take place at any temperature before freezing occurs by heating the sand and water. Once BRIXMENT mortar has set, it remains sound and unimpaired no matter how long and severe the freezing period may be.

The oily content of BRIXMENT which reduces the freezing point of the mortar gives further protection in freezing weather. Send for architect's handbook. Louisville Cement Company, *Incorporated*, Louisville, Ky.

District Sales Offices: 1610 Builders Bldg., *Chicago*; 301 Rose Bldg., *Cleveland*; 602 Murphy Bldg., *Detroit*; 101 Park Ave., *New York*

BRIXMENT
for Mortar and Stucco



When a concrete mixer is used, the mortar can be heated by means of a torch attached to the mixer so that the flame is thrown inside the drum. If the weather is not too severe, this method alone will suffice.

THERE'S A NATIONAL HEATING SYSTEM FOR EVERY BUILDING NEED

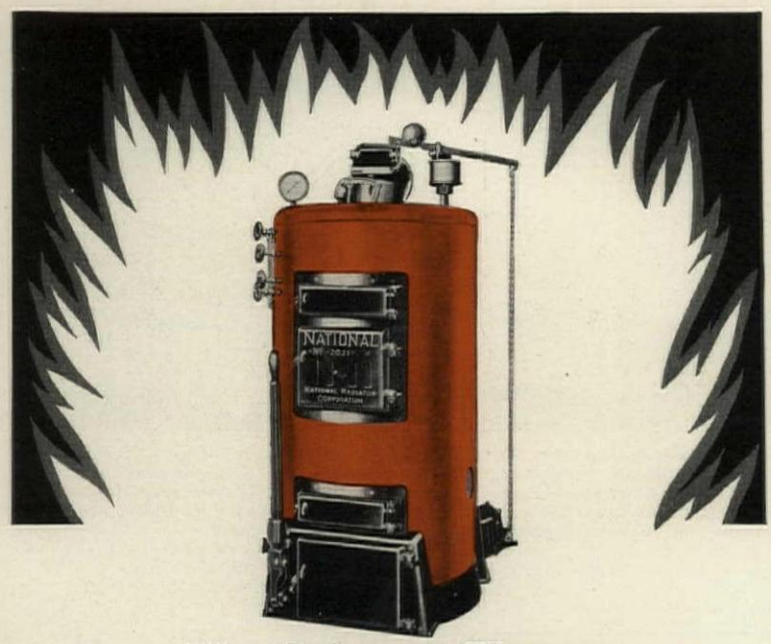
Playroom

Bed Rooms

Grandma's Room

Bath Room

Living Room



The Crimson Flame

A Vivid Promise of Friendly Warmth

The "Crimson Flame" is styled for maximum beauty, engineered for outstanding efficiency. It performs efficiently with all types of fuel: domestic sizes of anthracite and bituminous coal, oil, gas, and coke. It can be converted on the job to meet the individual requirements of the fuel selected. The design of the grate and heating surface; the scientific size and shape of its combustion chamber; the serpentine fire travel; the properly proportioned waterways, and the balanced system of air intake and damper control all unite to set up a condition resulting in extremely low fuel consumption and absolutely satisfactory heating performance.

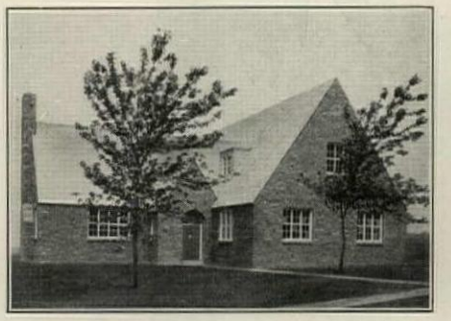
National Heating Systems are *Made-to-Measure:* that means that the heating requirements of each room are scientifically determined. Then the boiler, the radiators, and the accessories required to establish a balanced system, proportioned in every respect to the need, are selected and installed by the National Heating Specialist. Each National Boiler is guaranteed—and the guarantee is endorsed by a Surety Bond, issued by The Fidelity and Casualty Company of New York. It covers three distinct guaranteed stipulations as to performance, manufacture, design, and replacement of any defective part. It assures customer satisfaction, protects against criticism or complaint. A line to us will bring complete and helpful information.

NATIONAL RADIATOR CORPORATION

Executive Offices: **55 West 42nd Street, New York, N. Y.**

NATIONAL *Made-to-Measure* HEATING SYSTEMS

They found new in these two major forms



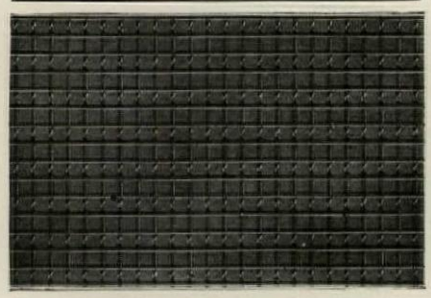
This attractive home was designed for Mr. Elmer Wible, Brookside Farms, Pittsburgh, Pa., by George M. Rowland, architect, Pittsburgh. The permanence of its beautiful walls and ceilings is assured by reinforcing plaster with RIBBED STEELTEX.

In beautiful Edgemere Manor Apartments, Oakland, Cal., D. D. Stone, architect, STEELTEX puts welded steel fabric on guard in walls and ceilings. STEELTEX for Floors was also used (see right-hand page).

Home of Mrs. Viola Hasse, New Rochelle, N. Y., Richard W. Buckley, Mamaroneck, N. Y., architect. One of 8 modern residences in exclusive Westchester County built or under construction by Thomas W. Gotti, New Rochelle, N. Y., in all of which RIBBED STEELTEX safeguards plaster walls and ceilings.

10 advantages of the New *Ribbed* Steeltex

1. New V-rib stiffener produces level lathing job of board-like rigidity.
2. Furring device assures embedment of reinforcing fabric.
3. Slab of uniform thickness assured—smooth in back as well as front.
4. All plaster functions in slab—no waste in keys or hangovers.
5. Plaster applies easily and stays put when applied.
6. New-type absorptive backing assures proper curing.
7. Nails up fast as any lath.
8. New-size sheets — 28½″ x 50″ — make this a one-man lath.
9. Easily cut with tin snips—easily shaped for angles.
10. Requires no change in customary operations, either lathing or plastering.



Front view of the NEW RIBBED STEELTEX showing reinforcing fabric and absorptive backing.

Back view of the NEW RIBBED STEELTEX, showing new V-shaped metal stiffening rib and heavier backing.

Permanently Beautiful Walls of plaster reinforced with *Ribbed STEELTEX*

The NEW RIBBED STEELTEX takes plaster out of the "Replacement group"—furnishings, wall paper, paint, ordinary plaster—and puts it into the "Single-Cost group" — concrete, brick, stone, steel, *reinforced plaster*.

It makes plaster a permanent building material.

And it protects the architect's skilled design, because it *reinforces* walls and ceilings with steel.

This lasting reinforced construction — which STEELTEX alone can provide — is today safeguarding plaster walls and ceilings in over a quarter of a million homes and buildings, including many of America's most beautiful residences.

Now the NEW RIBBED STEELTEX brings reinforced plaster within easy reach of even the modest home. Its new features which lower construction costs include a V-rib stiffener that produces a lathing job of board-like rigidity, and a heavier, absorptive backing to which the plaster clings tight. Write for detailed information and booklet.

National Steel Fabric Company

DIVISION OF Pittsburgh Steel Co.

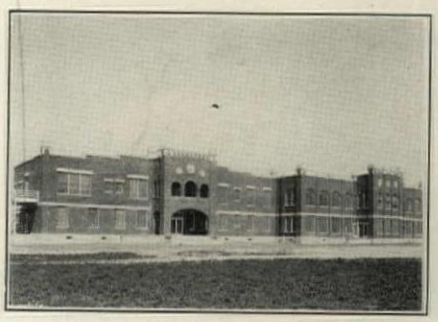
3610 Union Trust Bldg. Pittsburgh, Pa.

the New *Ribbed* STEELTEX

"BUILDS LIFETIME WALLS AND CEILINGS"

economy and strength

of plastic construction



STEELTEX for Floors comes in rolls and is attached to the joists in continuous strips from one side of the building to the other. Fits any type of wood or metal beam or truss. The picture shows the Riverside California Hospital, Riverside, California, S. L. Pillar, architect—a recent installation.

69th St. Center Building, Philadelphia, Pa., Tunis and Baker, architects. STEELTEX for Floors, used in this modern business building, acts as combined reinforcing and concrete form and saves time, labor, material, and money.

The backing of STEELTEX for Floors is of ample strength not only to support concrete while being poured, but also to afford safe walking surface once the fabric has been attached to the joists. Pennsylvania Apartment House, Pittsburgh, Pa.

Adaptability and Speed in concrete floor construction with *STEELTEX* for Floors

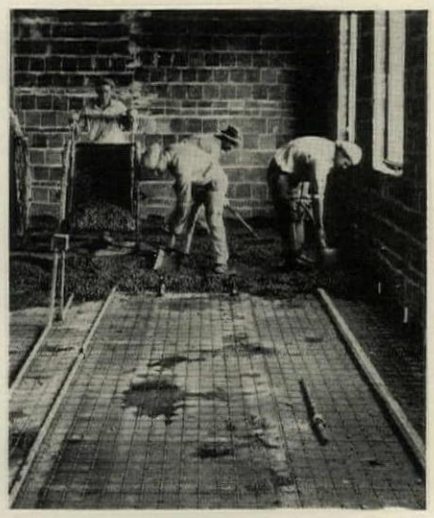
STEELTEX for Floors offers the logical method for all light steel joist construction. A STEELTEX-for-Floors job is a strong, clean job at low cost, whether you are building concrete floors for apartments, hotels, hospitals, schools, churches, theatres, or office buildings.

Today's leading architects, engineers, and contractors are turning increasingly to STEELTEX for Floors because of its economy, strength, speed, adaptability, and eminently satisfactory finished results.

The photographs on this page of a few typical STEELTEX jobs among hundreds of installations tell the story, but we would like to send you complete informa tion. Please write us for it.

10 advantages of Steeltex for Floors

1. Eliminates wood or metal forms.
2. Steel properly embedded automatically—full strength developed as true reinforcing.
3. Time and labor saved—quickly cut from roll and easily attached, to any type beam.
4. Saves concrete. Minimizes droppings.
5. Water-cement ratio maintained—assuring full strength of concrete.
6. Proper curing assured.
7. Eliminates clean-up expense.
8. Sound deadening factor especially desirable in hotels, schools, hospitals, and apartments.
9. Permanence of reinforcing guaranteed by heavily galvanized mesh.
10. Temperature stresses resisted and reinforcing correctly spaced, without necessity of inspection or special handling to cover these points.



Watertight form, correct reinforcing. The method of attaching mesh to the backing insures automatic embedment of the reinforcing wires without any labor for blocking up, or for pouring slab in two operations.

Other products of the National Steel Fabric Company

Ribbed Steeltex for Plaster, Steeltex for Stucco, Steeltex for Brick and Stone Facing, Steeltex for Floors and Roofs (concrete or gypsum)—same principle, same protection. National Reinforcing for all other types of concrete construction—buildings, roads, streets, sidewalks, dams, canals, concrete pipe, cement gun work. Made by the world's largest manufacturers of welded steel fabric.

STEELTEX

FOR FLOORS AND ROOFS

The Baptist Memorial Hospital *modern to the last detail*— is ENTIRELY GENERAL ELECTRIC WIRED

Baptist Memorial Hospital in Memphis, Tenn.

Architect— Pfeil & Awsumb

General Contractors— Kaucher-Hodges Co.

Electrical Contractor— Thompson Electric Co.

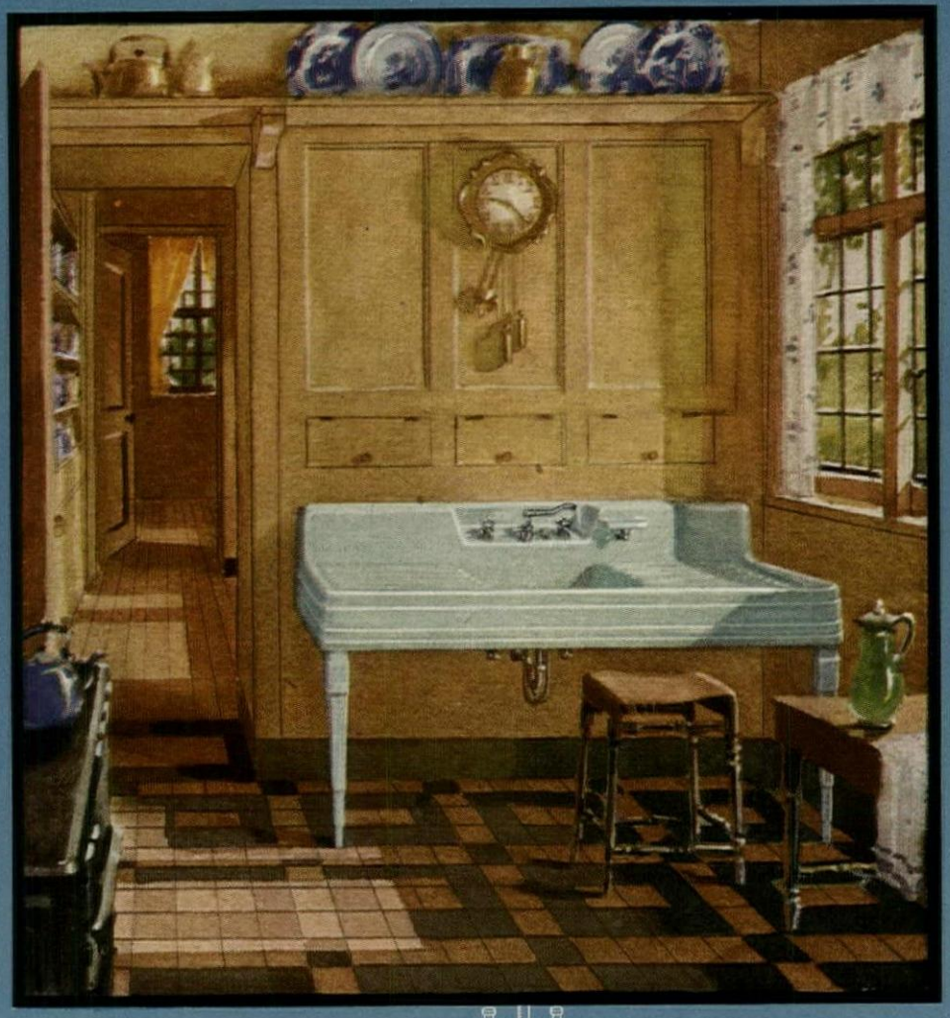
Hospitals and hotels, office buildings and universities—clubs and apartments . . . every type of building where efficiency *counts* is now being wired with General Electric materials.

For it is important that every foot of wiring hidden behind the walls should be completely dependable . . . too much is at stake to take any chances. And, of course, the question of maintenance is always vitally important. General Electric wiring materials reduce it to a minimum.

The architects, contractors, engineers and builders who are most particular to choose all their materials to meet the exacting standards of modern business and modern living, are those who guarantee electrical efficiency for their buildings by using only General Electric wiring.

GENERAL ELECTRIC WIRING SYSTEM

MERCHANDISE DEPARTMENT · GENERAL ELECTRIC COMPANY · BRIDGEPORT, CONNECTICUT



THE four essentials of a modern kitchen are found in this Crane room. Restful color, in the sun-tan walls, brown and black linoleum, Lucerne blue *Corwith* sink. Good lighting, from the window at the right of the *Corwith*, flooding its roomy beauty. Correct arrangement, in the placement of the *Corwith*, the table, and stove, only a step apart. And lastly, convenient, sanitary equipment in the *Corwith* itself. . . . This new sink of acid-resisting or regular enamel has many points of real convenience not found in ordinary fixtures. Fittings out of the way in a recess eliminate obstruction and breakage. A lever-operated outlet stopper permits use of the sink as a dishpan. A hose and spray rinses vegetables and dishes. . . . At nearby Crane Exhibit Rooms, architects will find many other new ideas for kitchen decoration and equipment. Visits will be welcomed.

150 Pounds Pressure

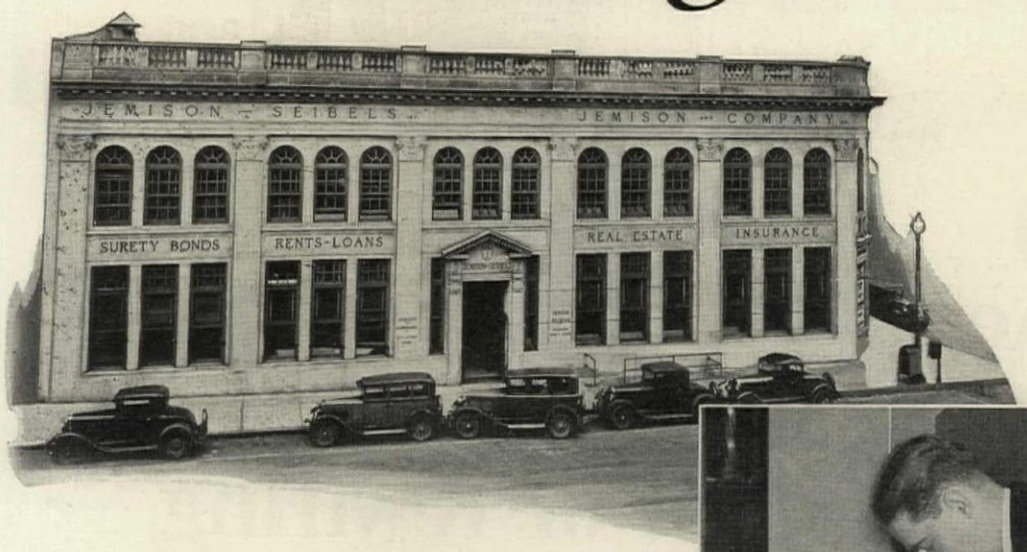
CRANE

2500 Pounds Pressure

FIXTURES, VALVES, FITTINGS, AND PIPING, FOR DOMESTIC AND INDUSTRIAL USE

Crane Co., General Offices, 836 S. Michigan Ave., Chicago + 23 W. 44th St., New York + Branches and sales offices in one hundred and eighty cities

The Largest Firm *of its kind in the South* uses Frigidaire



The Jemison Companies, Birmingham, Ala., use Frigidaire in 90% of the apartments they handle and also have Frigidaire Water Coolers in their own office building.

THE Jemison Companies and subsidiaries deal in investment banking, real estate, mortgage loans, and insurance. This is the largest firm of its kind in the South. Read what Mr. Chas. P. Marks, Vice-President, says about Frigidaire.

"I am pleased to advise that the Frigidaire installation in our office has proven most satisfactory, supplying drinking water at the proper temperature at all times. We formerly cooled our drinking water by an old ice cooler with coils throughout, but have found the Frigidaire service to be more satisfactory and more economical. We also use Frigidaire in about 90% of the apartments handled by this office . . . quite an asset in renting the apartments."

In any type of building, Frigidaire Water Coolers offer distinct advantages . . . effect important money savings as well as pay big dividends in better health and higher efficiency. And in apartment houses, both old and new, Frigidaire provides quiet, dependable, automatic refrigeration . . . keeps profitable tenants better satisfied . . . reduces vacancies . . . increases net income.

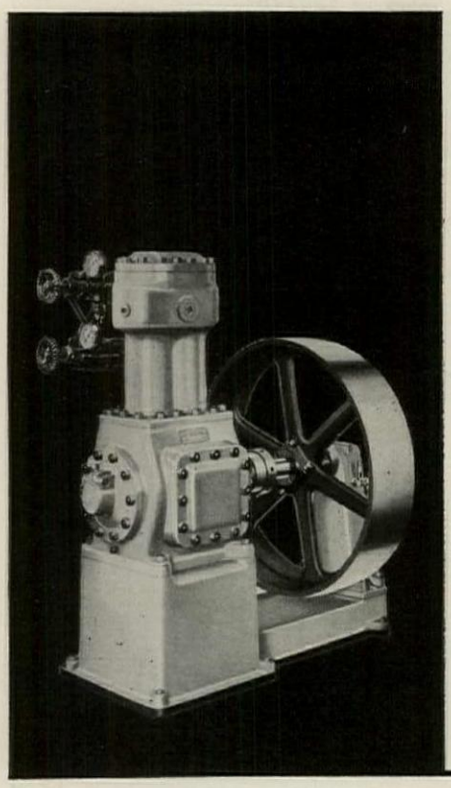
We'd like you to have complete information about Frigidaire. We'd like you to have the facts that show why business leaders are turning more and more to the use of this equipment. For descriptive booklets, write to Frigidaire Corporation, Subsidiary of General Motors Corporation, Dayton, Ohio.

FRIGIDAIRE
PRODUCT OF GENERAL MOTORS

Remodeling Campaigns— Non-Metallic Sheathed Cable cuts the cost of rewiring

An old house can be *thoroughly* modernized only by installing a complete wiring system...plenty of outlets for the toaster, the vacuum cleaner, the heater, radio and floor lamps. But to do so economically

NON-METALLIC



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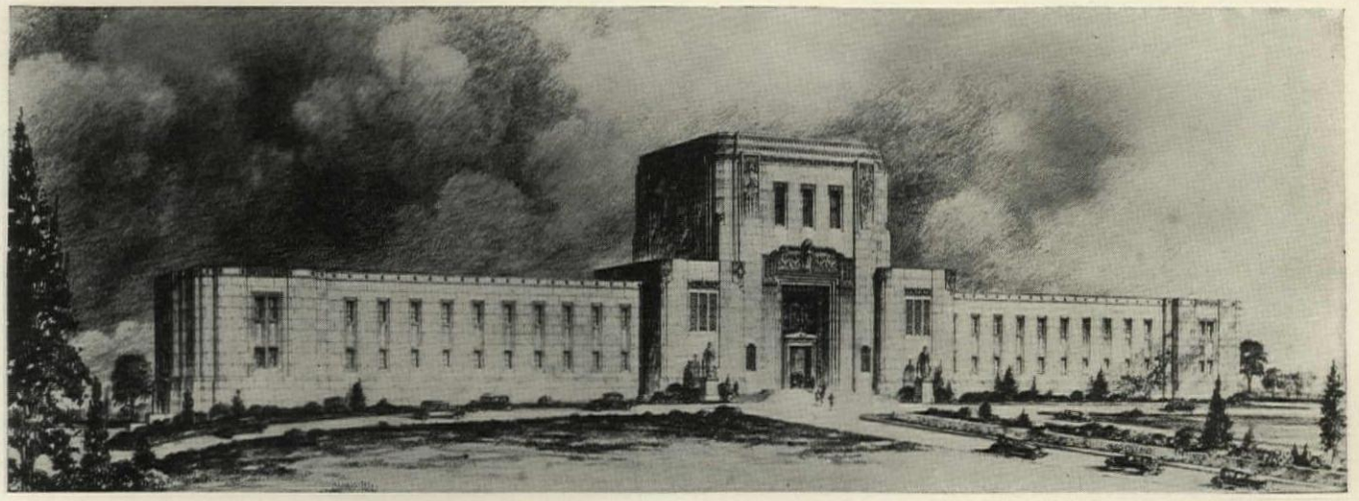

White Chapel Memorial, Detroit, Mich.—Alvin Harley, Architect. P. E. Brender, Construction Engineer. Ganz & Killian, Heating & Plumbing Contractors.

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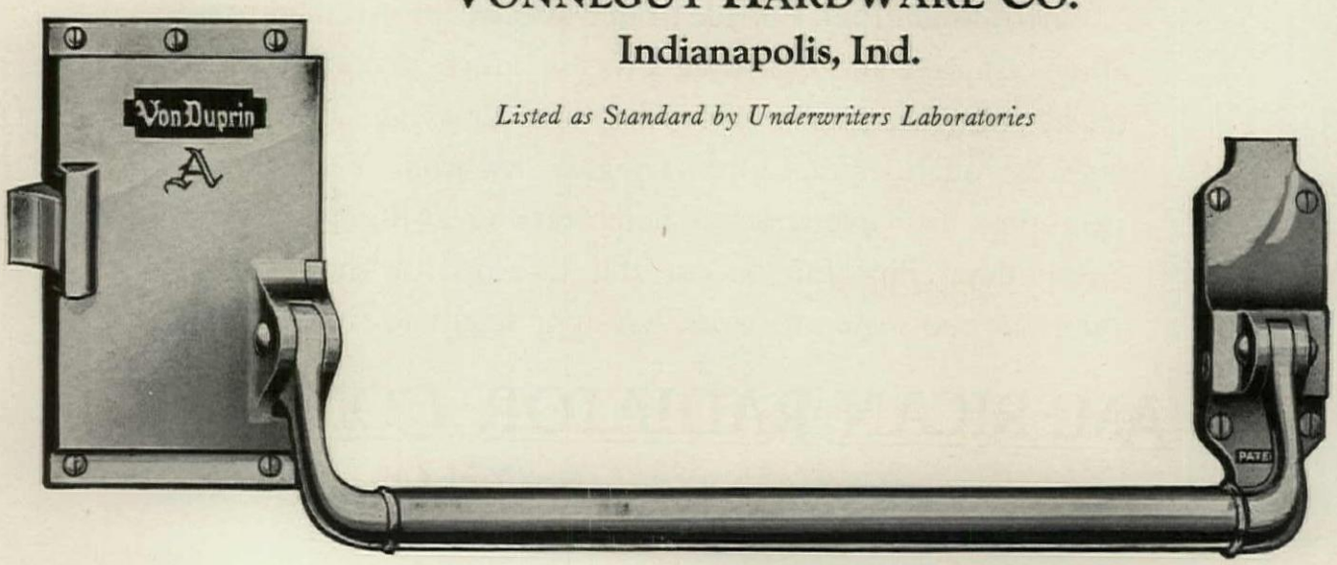

BOOK DEPARTMENT

CONCRETE, PLAIN AND REINFORCED

A REVIEW BY

CLIFFORD WAYNE SPENCER

THE sole limitation to structural extent in architecture has always been the strength of the materials used in construction, although legend implies that the Tower of Babel would surely have reached the heavens had it not been for the confusion of tongues. We of the present day, however much we may marvel at the skill of the ancient builders and the sizes and staunchness of their structures, know that the materials with which they had to work imposed a very definite limitation on the height to which their structures could be carried. Man in his building has always striven for greater height, and in the effort to attain it he has gradually worked out new methods of disposing the materials at hand in such a way that their strength be utilized to the greatest possible advantage. The Romans by developing the arch accomplished much in this direction, but even with use of this clever device the utmost limit to which stone and wood could arise was attained in the Gothic cathedrals of the middle ages, and it was not until the latter part of the nineteenth century that any further progress in this direction was made,—the beginning of what we call "steel construction."

During the period just preceding the invention of the skyscraper, the tendency of people, especially in America, to congregate in limited areas gave a fresh impetus to the attempts to build larger and taller structures. In these attempts it was found that the old materials were quite inadequate. If a structure of more than ten stories were built of masonry, it was found necessary to make the lower walls so massive as to cause them to occupy nearly the whole floor area, and though several such structures were actually built, it soon became evident that they were quite unsatisfactory from an economic point of view. It was at this point that the introduction of the new materials,—structural steel and concrete,—made possible the development of the skyscraper as we know it today. As our modern materials are superior to those of the ancients in strength and utility, so is our

knowledge of the principles underlying their use superior to the science available to the ancient builders, and as our structures become larger and more and more complicated, a greater degree of scientific knowledge is necessary for their safe construction. In the designing of steel framework, modern engineers have attained an amazing proficiency which has been manifested in great buildings and bridges everywhere.

Although it is of course purely a matter of opinion, there is every reason to suppose that the outstanding building material of the future will be ferro-concrete, and one has but to study some of the great modern churches and public structures which have been built of this material to realize how great is the potentiality for beauty and strength latent therein. The possibility of spanning enormous spaces with great parabolic arches in reinforced concrete is being utilized extensively, especially in Europe, and it is difficult to predict to what undreamed of proportions the buildings of the future may attain. At all events, it is quite safe to say that the successful architect of the future will be the man who knows his concrete. As the use of concrete has developed, there has grown up a considerable volume of published material on the subject, there being many excellent works dealing with all phases of the science of building in concrete. One of the recognized standard works in this field is "Concrete, Plain and Reinforced," written by Frederick W. Taylor and Sanford E. Thompson, but as is the case with all new and rapidly developing sciences, new theories and facts are constantly being discovered and applied, and the work has recently been brought up-to-date and rewritten by these authors and by Edward Smulski. The new edition, which is the fourth, is in four volumes, the second volume being the subject of this review. Volume I, already issued, deals with concrete and reinforced concrete structures from the standpoint of design, while Volume II goes still more deeply into the technical and practical aspects of the subject and covers the theory and design of continuous beams, frames, building frames and arches. Taken altogether, the two volumes comprise one of the best and most comprehensive treatises ever published on the subject. Data on continuous beams as specified in the findings of joint committees and in various building codes are given for ideal conditions where the spans of the beams are equal and the loading uniformly distributed. In all other cases, understanding of the action of continuous beams and of the principles upon which formulæ can be based is essential for the intelligent designing of concrete structures. In the chapter on continuous beams, formulæ and explanations governing a large variety of possible cases are given, and the findings are carefully tabulated. Maximum shears and bending moments for continuous beams up to four spans, with or without fixed ends, are given, and the influence of cantilevers on continuous beams is investigated. Also moments of inertia and their effect on continuous beams will supply much data of practical value to bridge engineers and others interested in the designing of beams with straight or parabolic haunches.

The practical application of the formulæ and principle presented is demonstrated by five actual problems worked out for various arrangements of continuous beams. This chapter may be considered the most complete treatment in any language of continuous beams

with uniform moment of inertia, which are freely supported at intermediate points and either freely supported or fixed at the two end supports. The care of unequal spans for such beams is handled in usable form. The formulæ here given may be applied to the designing of concrete slabs, joists or beams upon a steel framework. They may not be properly applied to rectangular slabs, joists or beams built monolithically with concrete columns and girders as their intermediate supports, which is by far the more common practice in modern construction. The solutions also do not apply to T-beams where the moment of inertia at the center is often twice that at the support, but within the limited range in which they do apply, the solutions are exceptionally complete and usable. The treatment of the effect of varying moments of inertia starts with cases in which the I at the center of span is one fiftieth of that at the support and stops when they are equal. In actual building it is far more common that the I at the center of the span exceeds that at the support, since T-beams and T-joists are the usual flexural members employed in design.

The authors seem to have had the rectangular beam and the one-way slab, with or without brackets, chiefly in mind in this whole treatment. The method of computing the moment of inertia of a reinforced concrete member of flexure, as given, is satisfactory for preliminary design, but the final design should be more carefully worked out. The analysis of bending and direct compression is exceptionally complete for rectangular sections, though here, as in other parts of the work, departures from standard notation result in unnecessary confusion and delay to the reader. Many diagrams are saved by giving only those for N-15 and by supplying two simple conversion tables for other values of N. Circular sections are not discussed. Detailed solutions of many cases in the treatment of rigid frames are given and present much data that have heretofore been available chiefly in European texts. These are limited largely to structures of one or two panels in width, leaving the more common multi-bay building to be worked out by the general slope-deflection equations which are given. This portion of the book is very usable in both concrete and steel design, but it is a matter of regret that the great possibilities for a condensed treatment, more applicable to rapid design, have not been utilized. Four chapters are devoted to the treatment of rigid arches with simple, effective analysis and clear exposition of the basic structural action. Both approximate and exact methods are given.

The authors have planned the text so as to make it useful to the greatest possible number of persons, including students and professionals. For the student the theory and derivation of formulæ are given, while final formulæ are furnished for practical use. To take care of unusual cases, general formulæ are given, the more common cases being covered by simple final formulæ supplemented in many cases by constants and diagrams, the use of the formulæ being made clear in all cases by giving practical examples as illustrations.

Although the volume is a new edition of an already well known work, the material contained in the second volume is entirely new and is not contained in any of the previous issues. The authors believe that, "this is the first book in any language in which the subject of statically indeterminate structures has been fully treated

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from both theoretical and practical standpoints." In all cases easily understood explanations are furnished for the action of statically indeterminate structures. The relation between statically indeterminate and simple structures is given, and the causes for the difference in action are explained. Bending moment diagrams for rigid frames show in all cases the type of bending moments to which the various frames are subjected for different types of loading. When used intelligently, these alone may form a basis for approximate solutions of problems in cases where accuracy is not of prime importance. The chapter on building frames contains material and formulæ never before published. The treatment of arches is of great importance, and the explanations, formulæ and diagrams presented on this branch of the subject are original and of great value in understanding the action of an arch when subjected to loading or to changes of temperature. Of especial interest at the present time, in view of the great popularity of the parabolic arch as the basis of the design of large modern buildings, are the formulæ for this type of arch. The bending moments and thrusts at the critical sections for these arches may be taken directly from tables given.

From the point of view of the general architect, this book may seem rather involved and unnecessarily technical, when such problems can usually be referred to the structural engineer for solution. However, with architecture tending more and more toward the solving of its problems in accordance with simple engineering principles, a working knowledge of the underlying principles is very much to be desired, and to those who have to make the preliminary designs of structures involving concrete construction, the methods here described and the tables here presented for arriving at rapid approximations will be very valuable. Certainly if one wishes to have available information on the mechanics of concrete design it would be hard to find a more complete or standard work than is published in these four volumes.

CONCRETE, PLAIN AND REINFORCED. Volume II. Fourth Edition. By Frederick W. Taylor, Sanford E. Thompson and Edward Smulski. 688 pp. 6 x 9 ins. Price $7.50 Net. John Wiley & Sons, Inc., 440 Fourth Avenue, New York.

MEDITERRANEAN DOMESTIC ARCHITECTURE IN THE UNITED STATES

A REVIEW BY
WILLIAM P. SPRATLING

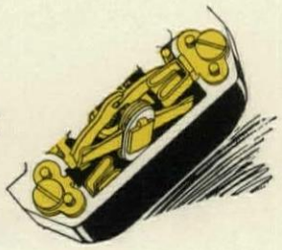
USING the phrase, "Mediterranean Domestic Architecture," Rexford Newcomb has gathered under that colorful title a more than interesting collection of illustrations showing distinguished present-day adaptations of Latin-Moorish architecture in America. Architects of almost any part of the country, though particularly those practicing in climates where such things are practical, will find this material sound, well selected and probably extremely valuable. Mr. Newcomb has already brilliantly distinguished himself in the profession as one of those few who are willing and able to take upon themselves the selective-critical duties of the true architectural educator. Of minds such as his there are all too few in the profession. His has been a work not only of explanation, but of true interpretation,—and stimulation. In the brief text he has tied his theme in well with tradition without being tiresomely specific historically. But at times one suspects Mr. Newcomb of painting an almost too alluring picture of his medium; or is it merely his literary phraseology? At that, he has said many things which will doubtless open the eyes of some of the more conservative members of the profession to certain possibilities of color and the like. He casually explains a certain electicism in the use of these "Mediterranean" styles by the variety of our climatic conditions in America, though neglecting to add that a comparatively unsophisticated America is likely to indulge in what may be termed nothing less than "stage stuff."

For one who likes to see the "stylistic sources" of these things inquired into more searchingly, Mr. Newcomb's remarks about derivations from what he calls the "Mexican Colonial" are perhaps inadequate. Speaking of Santa Fe and Mexico, he remarks: "This many-terraced type, fine examples of which are still to be seen in Taos, Laguna, San Ildefonso and other places, generally passes under the name 'pueblo,'—pueblo of course referring to a peopled place, or village, the generic Spanish term in Latin America"; and: "When the Spaniards employed these Indians to build structures with European plans and utilities, of the materials and upon the lines of the native work, there resulted a new type, half-Spanish, half-Indian, the like of which has nowhere else been developed." In this, of course, Mr. Newcomb is either entirely ignoring or merely neglecting to mention the vast accumulation of Spanish Colonial things in Mexico, where there are more than 15,000 early domed structures, most of which have received the definite impress of the hand of the native Mexican,—the Indian. However, he makes some acknowledgment in closing, saying that, " . . . by relying upon the early local expression in each community, and by the judicious selection of forms from the varied parent styles of Spain, Mexico, Italy or north Africa, the architect of our time may find a grammar sufficiently broad. . . . "

Mr. Newcomb's examples are well selected and run the whole gamut as to types. There are a few which are pretentious and frankly expensive; some of the simple utilitarian and intensely domestic types, and there are many, are not only very beautiful but also very distinguished. None of them are commonplace, and all show that ingenuity of design which gives evidence of the real fertility of imagination among the architects of America. And all of these examples, being related to the conditions out of which they have sprung, are certainly integral with the life of America today. The material for this book has not only been well selected, but fully illustrated. For each of the 70 examples shown there are probably an average number of six to eight illustrations from well taken photographs, and beautifully and consistently well drawn plot plans. As an example of bookmaking, Mr. Jansen has made a splendid thing of it. It is a volume which will make a distinguished addition to the shelves of an architect's library.

MEDITERRANEAN DOMESTIC ARCHITECTURE IN THE UNITED STATES, 223 pp. 10½ x 15½ ins. Price $15. J. H. Jansen, 315 Caxton Building, Cleveland.

This radically different



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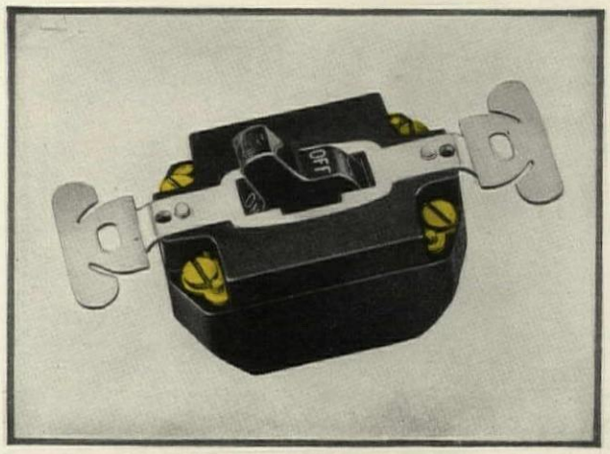

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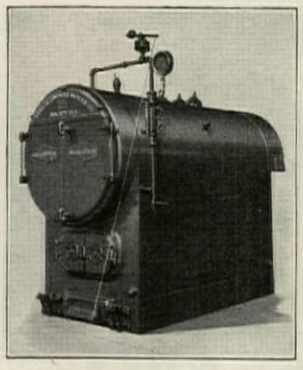
The Wardman Park Hotel Cuts Heating Costs with Heggie-Simplex



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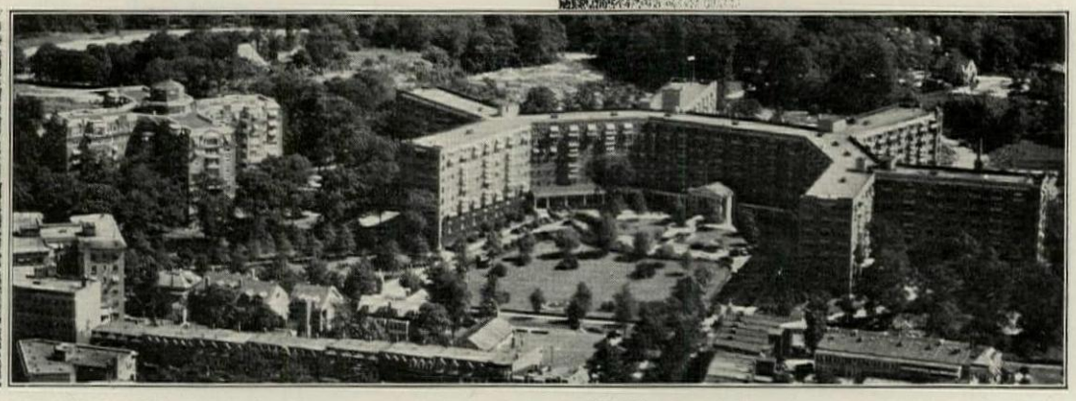

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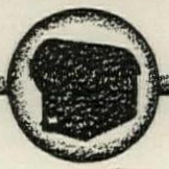

THE
ARCHITECTURAL FORUM

VOLUME LI — OCTOBER 1929

CONTENTS

PART ONE—ARCHITECTURAL DESIGN

PART TWO—ARCHITECTURAL ENGINEERING AND BUSINESS

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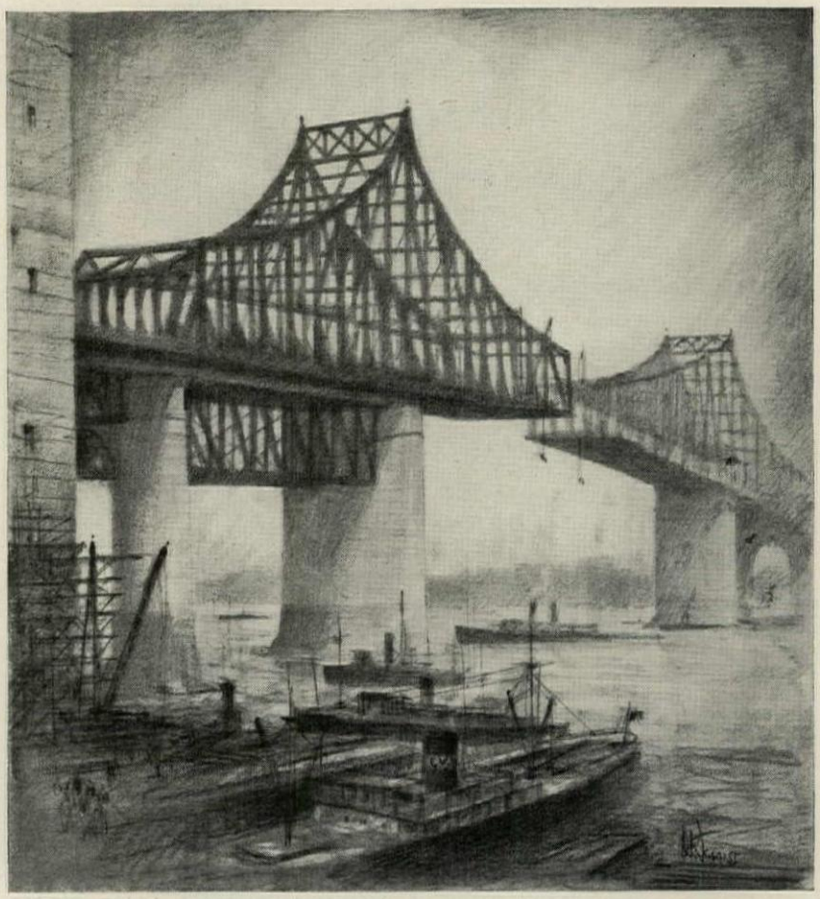

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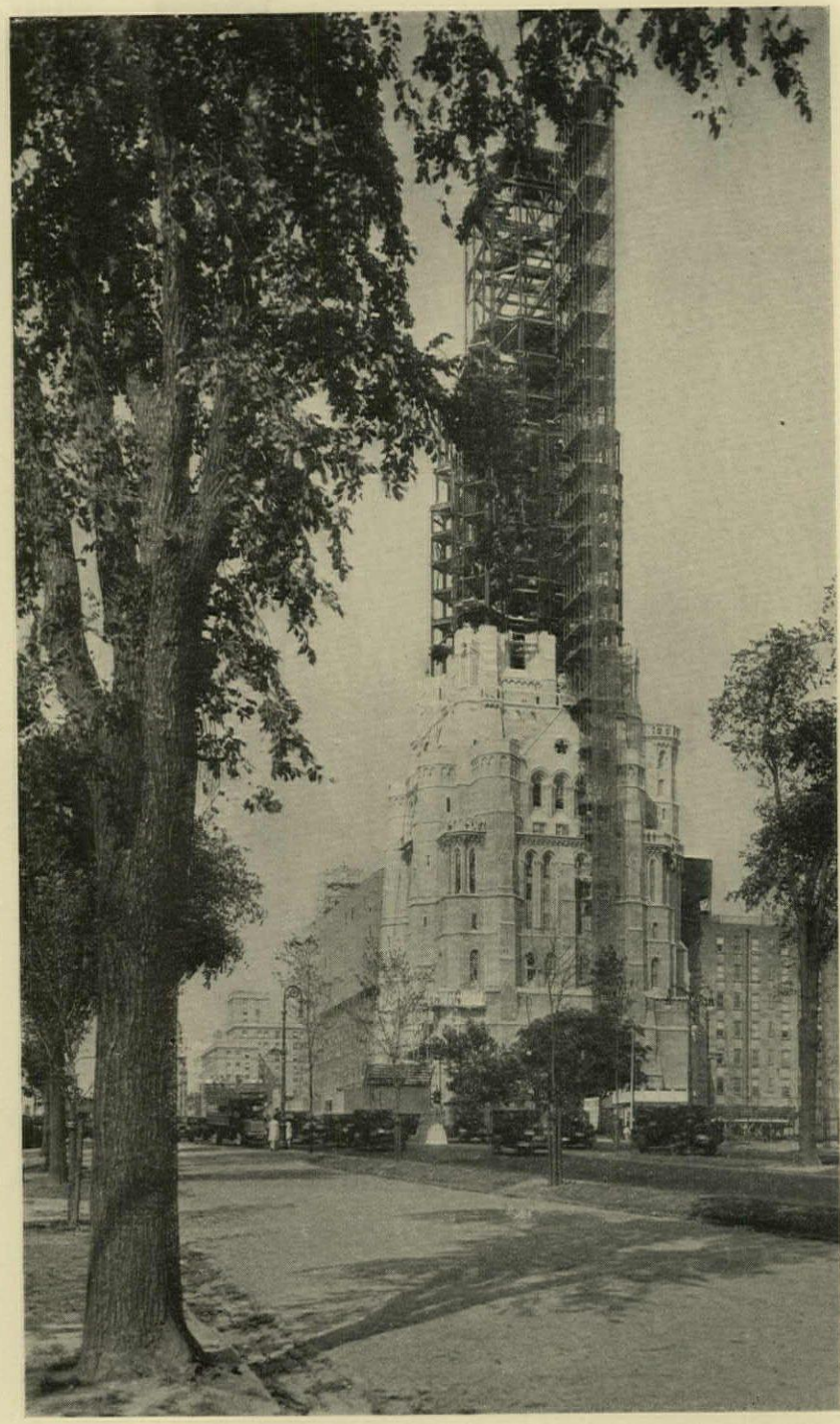

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The Architectural Forum

THE
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VOLUME LI NUMBER FOUR

OCTOBER 1929

COLD STORAGE WAREHOUSES

BY

CARL de MOLL

ARCHITECT AND ENGINEER, THE BALLINGER COMPANY

THE preservation of food has always been an important factor in the comfort, health, and existence of the race. In early times food was preserved either by burying it in the earth or by drying it in the sun. One of the steps in the progress of food preservation was the recognition of the fact that a low temperature would retard the progress of decay. A cellar or cave maintained a relatively low temperature throughout the year, being somewhat warmer than the outdoors in winter and much cooler in summer. Of course the smoking of meats was an early way of preserving them, and spices played an important part in food preservation. The search for short routes by water to the spice-producing countries of the East brought about many of the discoveries of the New World. Pickling is also one of the early forms of preservation, and alcohol still has its uses in this connection. All of the preservatives, however, change the nature or at least the taste of foods, and it remained for artificially produced conditions of cold and controlled relative humidity to keep foods for long periods without appreciable change from their fresh condition. The last 40 years have brought a tremendous development in the science of refrigeration and the storage of foodstuffs and other perishables.

Chemists and physicists had known for many years that it was possible to extract heat from almost any substance, but it was not until the latter part of the nineteenth century that machines were devised to do this on a relatively large scale. Fundamentally, a refrigerating machine is merely an appliance to extract heat from one place and put it into another. Any refrigerating machine must be equipped with water, air or some other substance to take the heat extracted by the machine away from the material or space to be cooled. Refrigerating machines were in early days used in breweries, and later in slaughter houses and meat packing houses. Probably their most rapid development began with the erection of great numbers of cold storage warehouses all over the country. With the increased use of cold storage warehouses there came the realization of the extreme importance of securing relative humidity as well as accurate temperature control. As the designing of a modern cold storage warehouse for the preservation of food products is a very complex problem, it is imperative that the best specialized engineering service be obtained. Only by the employment of experienced experts is it possible to obtain the best and most efficient building for the least expenditure of money.

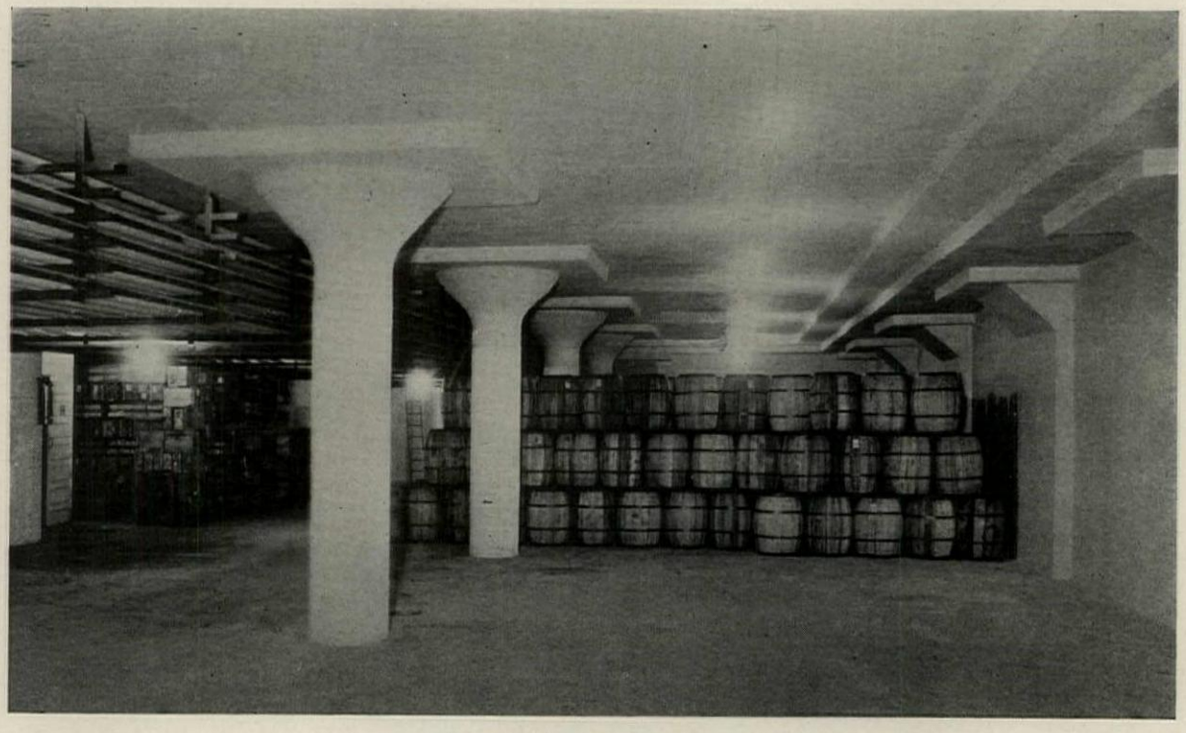
In general, cold storage warehouses can be roughly divided into two general classes,—one, buildings designed for the preservation of a particular substance at one temperature; the other, buildings which must be capable of taking care of a large variety of substances, each at a different temperature. In the first class are buildings for the storage of citrus fruits, apples, or meats. It is important, in the storage of fruit, to recognize the fact that the general tendency of a cold storage warehouse is to reduce the relative humidity of the air. This is deleterious to the product, as it extracts a large amount of water from the fruit, thus drying it and reducing its size and quality. It is, therefore, imperative that a properly high relative humidity be maintained at all times. This is complicated by the great danger of there being fungus growths and mould, which will always appear if the humidity is too high. This has led to the adoption of elaborate systems of ventilation, and it has also led to the introduction of use of chlorine fumes for the prevention of mould.

Where a building is for the general storage of a great variety of foods, it is necessary to divide it into a number of separate rooms. There are many foods, including meat and fish, that it is frequently desirable to receive and place in rooms with a temperature at or below zero, known as

Quaker City Cold Storage Warehouse, Philadelphia
The Ballinger Company, Architects and Engineers

"sharp freezing rooms," where the material is frozen, then transferred to a room slightly below the freezing point where it can be carried in a frozen condition almost indefinitely. This of course leads to serious complications in insulation, as goods piled close to the wall next to a sharp freezing room are likely to freeze unless there is proper air circulation in the room. A room over a freezing room must have the material stored on high dunnage and air circulation maintained across the floor. The building must, of course, be designed with the various coils under separate control, so that the temperature of the room may be changed to suit the various seasonable commodities as they are stored at various times during the year. Over a period of years, through scientific research, there have been established ideal temperatures and relative humidities for practically all the food products which are usually carried in cold storage warehouses.

Important factors in the design of a warehouse are the arrangements for receiving, distribution, checking and delivery of goods. Most warehouses of any size are, of course, equipped with railroad sidings, most of the goods coming in by railroad in carload quantities, and after the period of storage distributed to trucks or wagons from an adequate shipping platform. This necessitates very careful checking, so that not only the packages belonging to various owners, but various brands can be so segregated that they can be taken out of storage as the demand warrants. It is found that certain manufacturers are packing the same or similar goods with a number of different brands or labels. These must, of course, be segregated, so that they are obtainable with a minimum amount of handling. There are some houses where the goods are received by trucks or wagons, and after a period of storage, are shipped by railroad. This is more often true in houses built for a single commodity, which is received from the growers at the ripening time and carried in storage and shipped by carloads as the demand warrants. The design of the mechanical equip-



Interior of Quaker City Cold Storage Warehouse Showing Construction
The Ballinger Company, Architects and Engineers

ment of a storage house is very important, due to the large expenditure of power which is involved. Slight losses become extremely serious in additional cost. The availability of a large supply of water is imperative, and if it is possible to obtain this water from deep wells, giving a low temperature water at all times in the year, great economy can be obtained. It is also usually advisable to use outside current wherever possible, as, there being no use for the heat, the public service current is usually cheaper than that of an individual power plant. Many cold storage houses have, as an auxiliary business, the manufacture of ice, in some cases installing large rooms for ice storage, so that a relatively small plant working every day in the year can store ice during the colder weather to be available at the time of greatest demand. The owner can thus supply a very large demand at certain seasons with a relatively small expenditure for ice-making equipment.

The building should be of fireproof construction, with adequate insulation, the best material being compressed cork slabs, 4, 6 or 8 inches in thickness. In general, there are two systems of insulation; one known as the "envelope" system, in which the entire storage area is enclosed in a continuous envelope of cork,—that is, a multiple-story building of 10 or 12 floors would have the first floor used for receiving and shipping; the second floor would have a thick cork insulation. The roof and four walls would also be insulated. The intervening floors would simply be of concrete

Great Lakes Terminal Warehouse, Toledo
William H. Adams, Architect

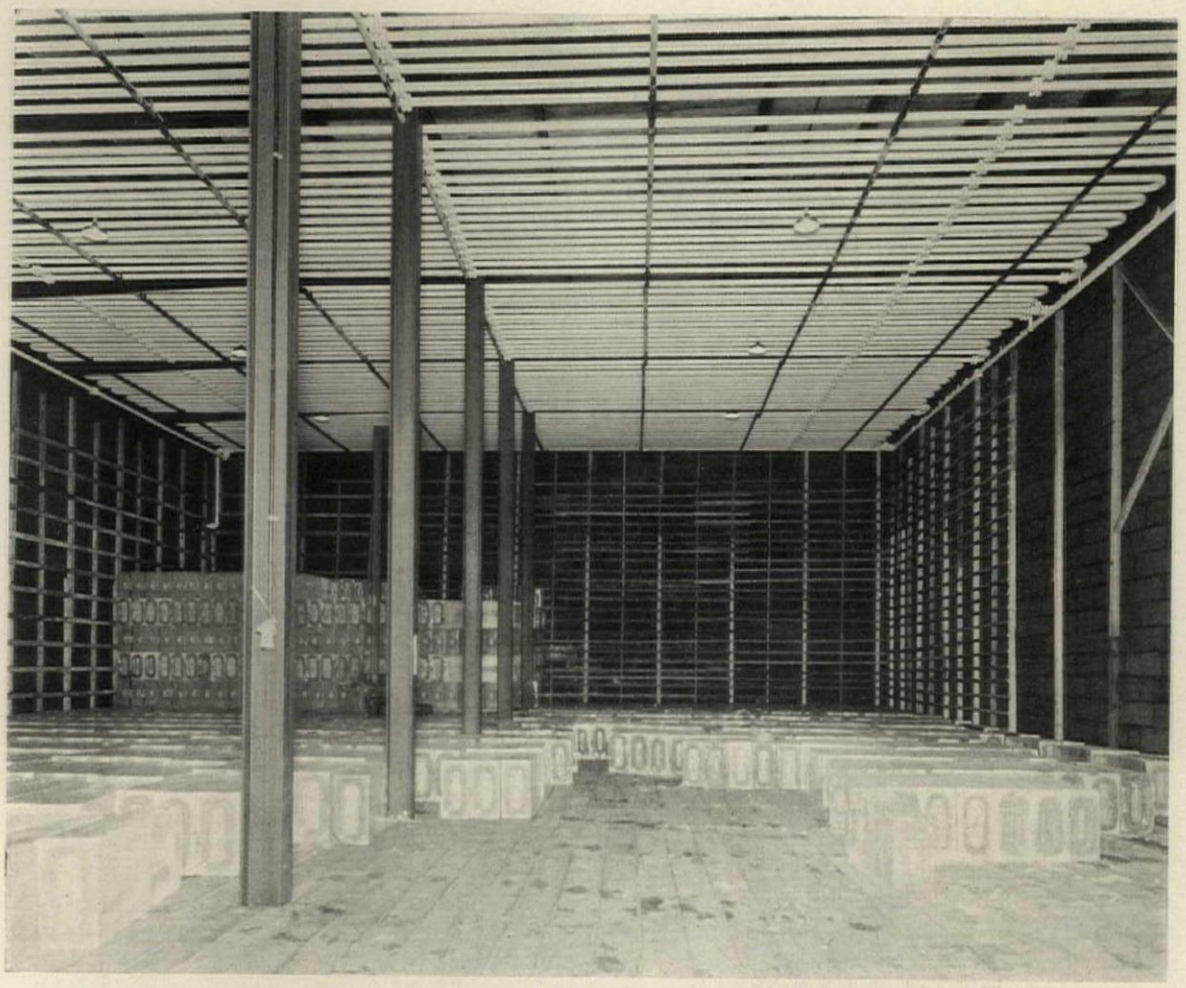
or steel construction. This system is usually recommended only for a large building and for storing one kind of goods, where the same temperature is carried through the entire house, since it would be impossible to carry different temperatures on the various floors without insulation between. It also has the disadvantage of being extremely difficult to avoid there being settlement cracks in the insulation, especially in the upper part. In some buildings which have been built under this system, it is necessary to have periodical inspections made of the insulation, carefully calking any cracks which develop. Where rooms of different temperatures are needed in the building, it is much more advantageous to segregate each of

Interior of Great Lakes Terminal Warehouse, Toledo, Showing Construction and Equipment
William H. Adams, Architect

Effective Design of the Bekins Van & Storage Co., San Francisco
F. Eugene Barton, Architect

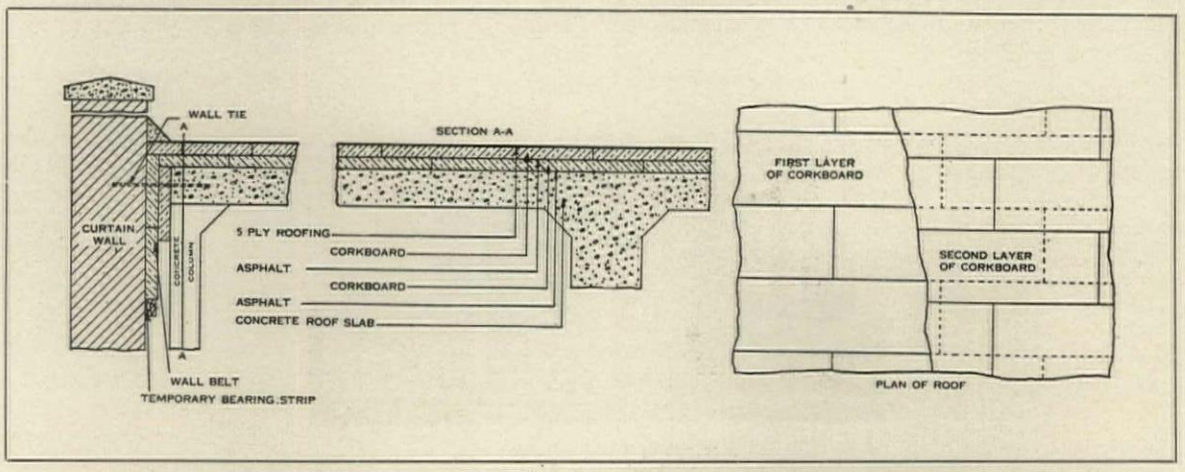
these rooms with heavy insulation, sometimes placing insulation on every floor. The building for the Quaker City Cold Storage Company in Philadelphia, illustrated here, is designed to contain rooms of all temperatures from below freezing to rooms held slightly above freezing, for the storage of vegetables, candy, etc. The apple storage warehouse for the Arrington Cold Storage Company at Arrington, Va., is designed for the storage of apples in barrels, solely. An interesting feature of this building is that only the alternate floors are solid. The intervening floors are of slat construction, so that the bunker containing the refrigerating pipes and ventilating system is available for two stories of storage.

The question of insurance is important, due to the fact that this cost must be added to the storage charges, so that any saving is directly reflected in profits. It is, therefore, imperative that every effort be made in the design of the building to obtain the minimum rate both on building and contents. There should be the proper division of areas by fire walls, segregation with fire doors, automatic sprinklers, fire hydrants and hose reels through the building, adequate water supply and pumping equipment. The sprinkler equipment will necessarily be of the dry pipe type, and special precautions should be exercised so that there shall be no condensation to freeze in the pipes or around the heads. The electric lighting equipment must be entirely open wiring, as it has been shown that an installation of conduits is impracticable, due to accumulation of moisture in the pipes. The elevators should be of a large size, and of high speed, with an automatic leveling system. The size of elevators should be adapted to the size and number of trucks which it is decided to use, selecting a standard truck which will hold the largest amount it is possible for one man to handle. It is also desirable to consider the use of platforms for lift trucks. In a tall building, the elevator should run at as high a speed as it is possible to obtain. As there is a great deal of leakage of cold air down the elevator shafts when the doors are open, most houses are equipped with vestibules on each floor. It is much better, however, to in-

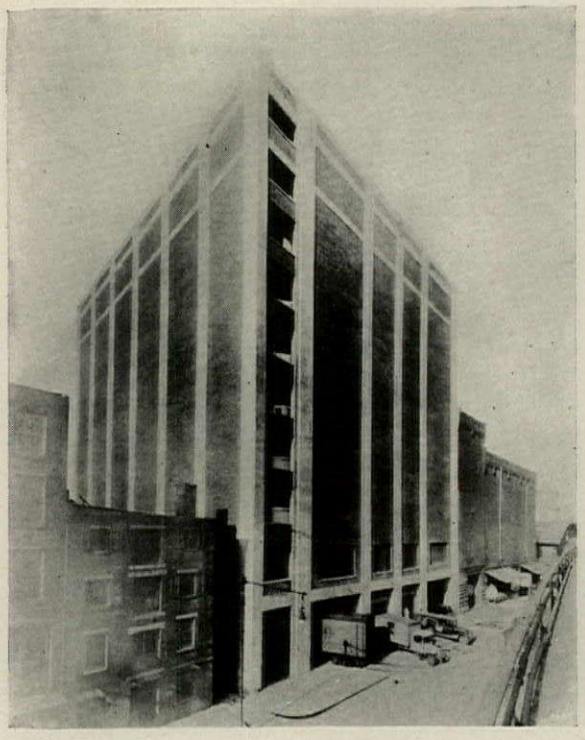


Interior of Ice Storage Plant of Borin Brothers, Detroit, Showing Insulation and Temperature Maintaining System

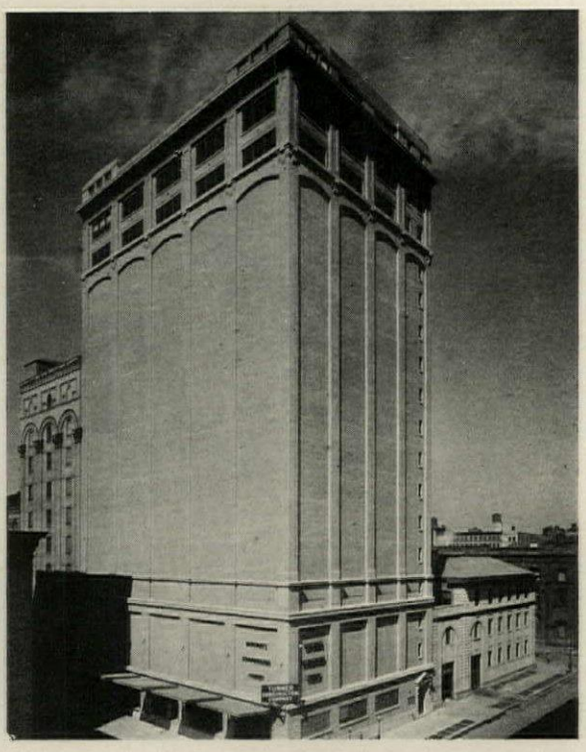
sulate the floor, roof and three sides of the elevator car with heavy cork, installing a rubbing strip around the door and installing weather strips of heavy soft rubber bearing on these rubbing strips, so that when the elevator car is level with the floor, the door can be opened and no air can escape down the shaft around the door opening. It is also desirable to use heavy insulation around the door frame to avoid condensation at the sill, there being a great deal of trouble due to condensation forming around the sill and freezing where rooms are closed for a long period of time.



Section and Plan Showing Method of Insulating a Cold Storage Building

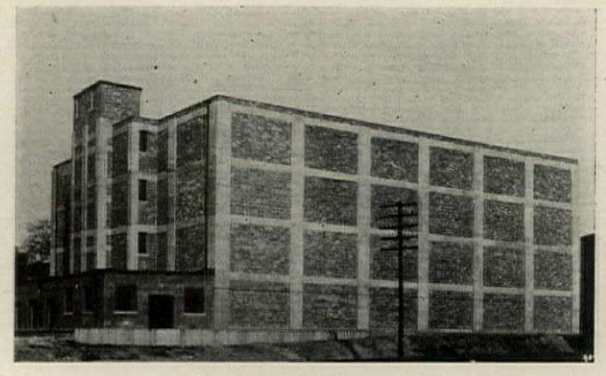


Quaker City Cold Storage Co., Philadelphia
The Ballinger Company, Architects and Engineers



Merchants' Refrigerating Co., New York
G. B. Snook & Sons, Architects

The matter of handling goods by conveyors is still a debatable point among cold storage building operators. Some things, such as sides of beef and material of similar character, are now handled on overhead tracks. There have been some houses where belt and live roll conveyors can be used. There are also some installations of vertical conveyors, for both loading and unloading the room. Where wages are high, it is economical to use the largest amount of conveying machinery possible. As this equipment is relatively expensive, however, it requires a very careful analysis of the entire problem, as it is never economical to use expensive machinery unless it can be kept moving a large part of the time. There are many and varied interests to be satisfied in an intricate building of this kind. The heads of the shipping and receiving departments, the storage departments, the accounting department and the general manager frequently have very different ideas as to the proper design and layout of the building. It is usually the major problem of the designing engineer to analyze the opinions of the various executives, giving due weight to the ideas of the men who have to do the work, but being careful not to sacrifice the efficiency of the complete unit for slight additional gains of a single department. Whether or not the proper solution of these various factors is obtained frequently makes the difference between a good and economical, or very bad and inefficient design in the completed building, and a pleased or a displeased client.



Arrington Cold Storage Co.
Arrington, Va.
The Ballinger Company, Architects and Engineers

INFILTRATION AND THE HEATING PROBLEM

BY

P. E. FANSLER

INFILTRATION and exfiltration combine to make a formidable problem for the architect; that is, if he has consideration for the comfort and for the pocketbook of his client. Consider a house of ordinary construction, an outdoor temperature of zero, and a high north wind. Air at zero temperature infiltrates through the north side of the house, is heated, and exfiltrates through the southern walls, windows and doors. Until recently very little reliable information has been available as to the demand on the heating plant due to infiltration. Indeed, it is hard to believe the actual facts, now that they are known, because they seem to be out of all reason.

About two years ago the research committee of the American Society of Heating and Ventilating Engineers determined to solve the infiltration riddle and replace, with the results of actual tests, figures that were little more than guesses. The Bell Telephone Company of Missouri had erected a new and high building in St. Louis and offered the use of one of its upper floors to the Society. The elaborate equipment developed in the research laboratory of the Society was set up in St. Louis so that actual infiltration could be determined. One reason for accepting this offer was that steel windows of the latest type had been used, and infiltration data on them were of great value because of the increasing use of this type of window. The testing apparatus installed consisted of a large rectangular metal box, open on one side with a device fixed at the center of the opposite side so that orifices of desired diameters could be used. The box was fastened to a wall area containing the window to be tested, and the periphery carefully calked so that the contact was airtight. An arrangement of a very delicate pressure gauge permitted the taking of readings that determined the flow of air through the orifices, so that air infiltered through the window cracks passed through the orifices and was quantitatively determined.

One of the interesting stories of practical research is that of these investigators who waited, day after day, for wind of desired velocities and directions, so that practical determinations could be made. But the wind blew from every direction but that desired. Finally, exasperated, they exercised typical ingenuity by fitting a casing to the window, with a pipe to which a blower was attached. Thus it was possible artificially to simulate wind pressure of any desired velocity, regardless of the caprices of nature. Valuable data were obtained, showing the extent to which these metal windows could be expected to limit infiltration. From the knowledge we have on this subject, it is evident that a building may require more heat when the thermometer is well above zero and with a high-velocity wind blowing than for a condition where the temperature is below zero and the air at rest. For this reason the average wind velocities of the three months of greatest heating load,—December, January and February,—must be taken into consideration when determining heating requirements. Not only velocity, but direction, is a factor in figuring infiltration as well as heat loss. Obviously, it is impossible to set up test equipment that will exactly simulate natural conditions of "wind and weather." A controllable pressure that is equivalent to a known wind velocity *at right angles to the plane of the window* can be provided, but windage *against* a window is seldom uniform and fixed in direction.

In order to picture the situation and to show how the architect can control it to the lasting benefit of his client, let us consider a living room, as shown in Fig. 5, extending across one end of a house. Essential data are given on the sketch. From values actually determined by tests made in the research laboratory of the American Society of Heating and Ventilating Engineers, let us build up a tabulation for various wind velocities, showing: (a) the infiltration through the uncalked crack around the frame *of the north windows only;* (b) the radiation required to heat this inflowing air to 70°; (c) the infiltration through the crack around the sash, including the meeting rail crack; (d) the radiation necessary to heat this volume of air; (e) the total infiltration on account of these windows; (f) the total radiation necessary because of *infiltration* around this group of windows and its frame. Bear in mind that we are not considering the loss of heat through the window glass. The results, Table I, are startling.

With an assumed wind velocity of 5 miles an hour,—a wind condition hardly noticeable,—there will blow into this room, through the north windows alone, in one hour, almost enough air, at zero temperature, to entirely fill the room. At least 15 square feet of radiation will be necessary to heat this air to 70°. With a 10-mile wind the infiltration will be 6,535 cubic feet, and 35 square feet of radiation will be needed. Increasing the wind velocity to 20 miles an hour brings the infiltration to almost four times the volume of the

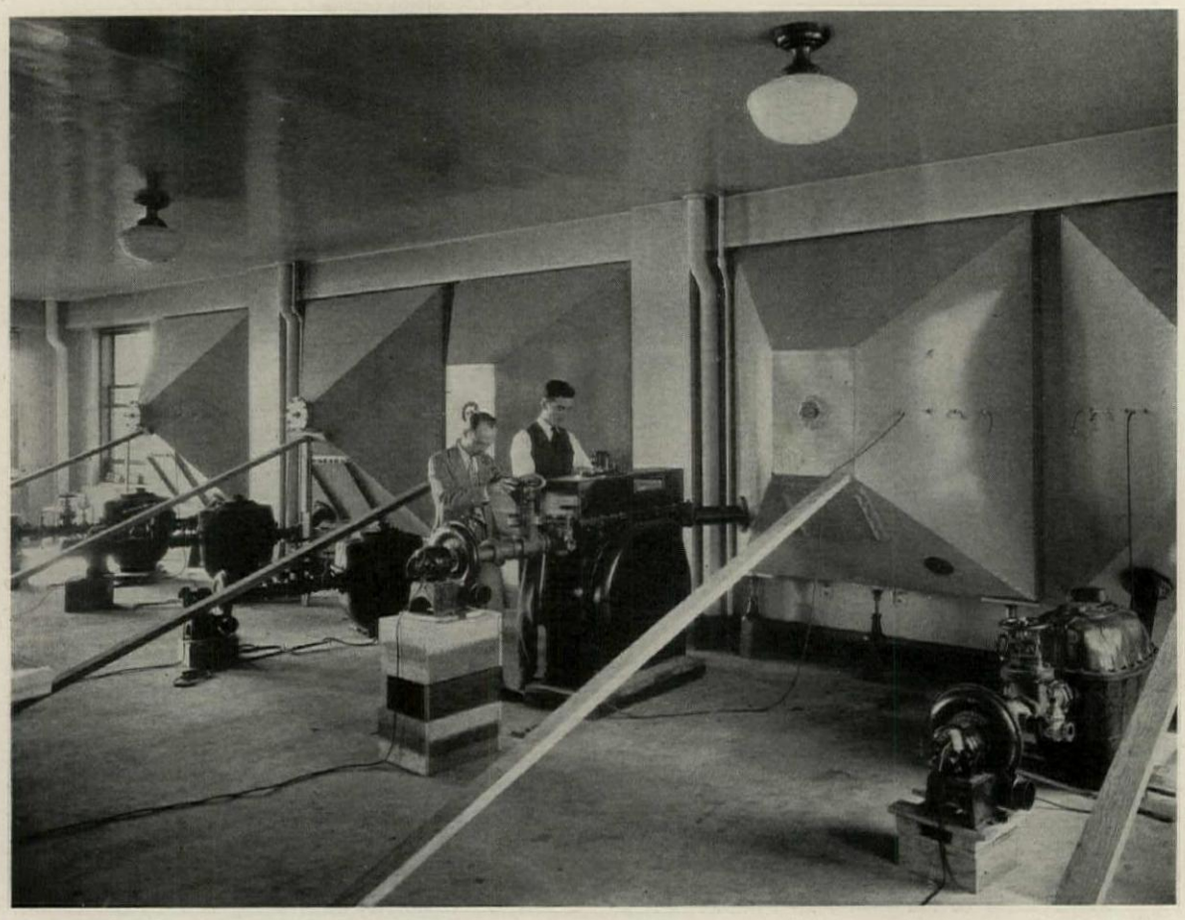


Fig. 1. Measuring Infiltration in a Field Laboratory Established in an Office Building

room, and the radiation to 61 square feet, and if we consider a 30-mile wind,—no stranger during the bitter cold of December and January,—the leakage through this window will change the air in the living room every *11 minutes*. Under this condition heat must flow continuously from a huge radiator,—100 square feet,—to heat the incoming air, and coal must be burned at the rate of 3 pounds per hour, or nearly 75 pounds per day, just because of this "leaky" window. To show what can be saved by carefully installed stripping, another portion of the table has been computed. It is evident that the reduction in radiation requirement,—100 square feet with no weatherstripping and a 30-mile wind, reduced to 33.8 square feet,—is so material as to warrant serious attention to the problem. This example admittedly is extreme, as a 30-mile wind is considerably in excess of normal winter winds, but such a wind is not uncommon, and should be taken into consideration.

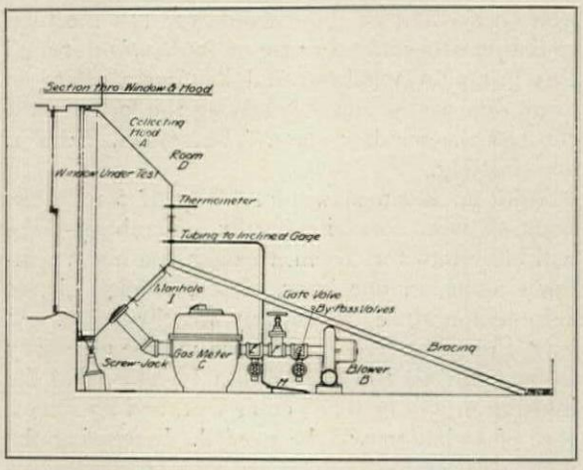


Fig. 2. Diagram Showing the Arrangement of Apparatus Used in the Office Building Tests

It must be remembered that one part of this so-called loss is entirely unnecessary where attention is paid to details in construction. Practically all leakage around window frames can be stopped by proper calking. This is true whether wood or metal windows are considered. Taking the case of the room and windows under discussion, we have found a radiation requirement of 100 square feet for the four windows, with a 30-mile wind. Of this, 10.4 square feet represents frame leakage, and all of this 10 per cent of the whole can be prevented if the frame is well calked. By proper weatherstripping, the

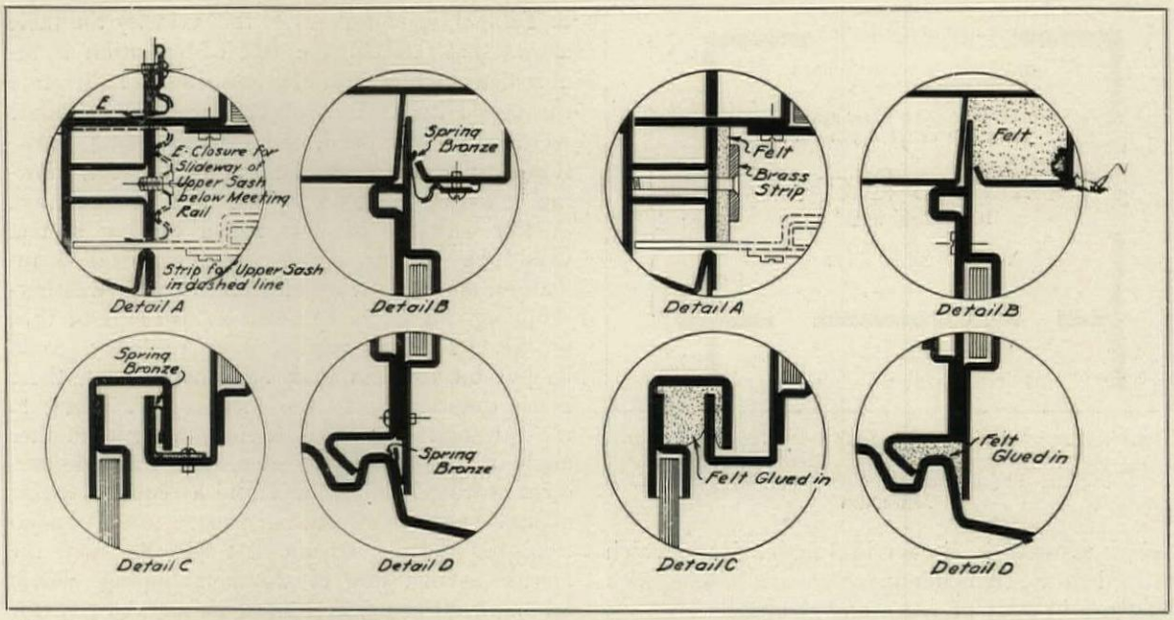


Fig. 3. Design and Construction Details of Two Commercial Types of Weatherstripping Applied to Metal Windows Under Test

radiation, as we have seen, can be reduced to 33.8 square feet,—a gross saving of 76 per cent. Surely economies of this order demand, in every case, attention and analysis by the architect.

Essential data developed through the tests at St. Louis[1] are presented here in tabular form in Table 2. The values have been reduced by 20 per cent from the figures shown by the tests because, while they are derived from actual tests, they do not represent ordinary conditions, where pressure is built up in rooms, reducing the infiltration rate by about one fifth. Of course, all the air that blows into the windward side of a house exits from the leeward openings and cracks, frequently accelerated by suction created as the result of the wind. Consequently, when arriving at the total demand, only one half of the radiation due to infiltration loss (as computed for all exposed walls of a building) need be added to the radiation required to offset the direct heat loss.

In studying infiltration losses, research engineers have differentiated between "crack" and "clearance." The drawing, Fig. 6, will make this clear. The crack is taken as one half the difference between the width of the frame and the width of the sash. The clearance is the difference between the width of the stile and the thickness of the sash. One of the interesting findings, in reseach[2], is the fact that increasing the crack around the perimeter of a plain sash did not materially increase the leakage, and that weatherstripped sash, while permitting much less leakage, showed a small increase in leakage with increase in crack. Tests on a plain wood window, with various clearances, brought out the curious fact that the size of the crack around the perimeter has no appreciable effect on the leakage. Consequently the data developed can be applied to any window of the type tested with a crack of from 1/16 of an inch to ¼ of an inch. It has not been found practical to install wooden windows with cracks of less than 1/16 of an inch, and as the windows age and dry, the cracks increase in width. A typical set of test curves for a plain double-hung

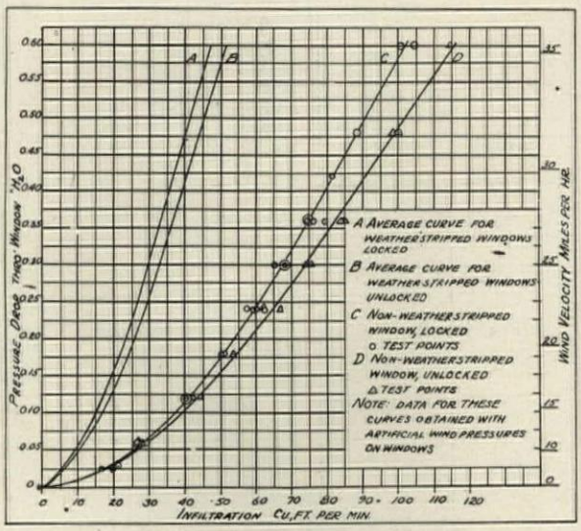


Fig. 4. Graph of Infiltration Through Metal Windows, Locked and Unlocked, With and Without Weatherstripping

[1]Note 1.—"Saving Heat in Skyscrapers," a paper read at the 1928 annual meeting of the A. S. H. & V. E. by F. C. Houghten and M. E. O'Connell.

[2]Note 2.—"Effect of Frame Calking and Storm Windows on Infiltration Around and Through Windows," a paper presented at the 1928 semi-annual meeting of the A. S. H. & V. E., by W. M. Richtmann and C. Braatz.

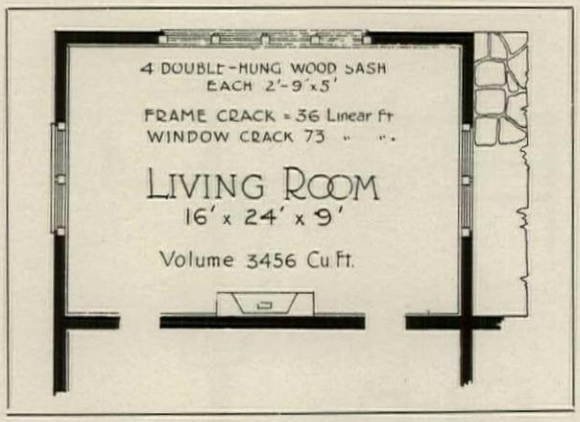


Fig. 5. Plan of Living Room with Four North Windows, for which Infiltration Losses are Computed (Table 1), to Show the Importance of Reducing Infiltration to a Minimum

wood window is shown in Fig. 7, from which is evident the tremendous increase in leakage with increase in sizes of crack and clearance.

Referring to Table 3, we can readily determine the economies of weatherstripping. For New York and vicinity the average wind velocity during the three months of December, January and February is 13.3 miles. The nearest to this figure, in Table 3, is 15 miles. At this velocity the table shows that 0.65 square feet of radiation is required to take care of the loss due to infiltration through 1 linear foot of crack. If the window were weatherstripped, the corresponding radiation requirement would be 0.12 square feet, showing a saving of 0.63 square feet of radiation. A fair estimate of cost for a heating system would be $2 per square foot of installed radiation, and the saving effected through weatherstripping can safely be taken as one half of this, or $1. As the weatherstrip probably could be put on for less than 50 cents a foot, there is no question as to the economy. Turning to the question of annual saving, we get another angle of the problem. If we assume 5,300 degree-days heating load, we will find a requirement of about 70 pounds of coal per square foot of radiation, per heating season. At $16 per ton, the annual saving, due to weatherstripping, would be about 30 cents, or almost enough to pay for it. With the data here given, and by applying the method of fuel determination described in the article on "Determining Fuel Requirements by the Degree-Day Method" in the February, 1929 issue of THE ARCHITECTURAL FORUM, the archi-

TABLE 1.—CALCULATIONS OF INFILTRATION AND CONSEQUENT RADIATION REQUIREMENTS OF WINDOWS SHOWN IN FIG. 5

Wind Velocity	CRACK AROUND FRAME				WINDOW CRACKS (No Weatherstripping)			
	Factors per Ft. Uncalked Crack Around Frame		Total for Frame for 4 D. H. Windows Having 36 Lin. Ft. Frame Crack		Factors per Ft. Crack Around Sash*		Total for 4 D.H. Windows With 73 Lin. Ft. Crack	
Miles per Hour	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5	1.41	0.007	48	0.3	39.3	0.21	2860	15.2
10	11.3	0.06	405	2.16	84.9	0.45	6180	32.8
20	31.1	0.16	1110	6.1	161.0	0.85	11750	55.2
30	53.6	0.28	1925	10.4	233.0	1.23	16950	89.6
Wind Velocity	WINDOW CRACKS (Weatherstripped Window) Quantities same as (6), (7), (8) and (9)				Total for Frame and Window Infiltration		Total for Infiltration, Frame and Weatherstripped Window	
Miles per Hour	Leakage, Cu.Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required	Leakage, Cu. Ft. Per Hr.	Sq. Ft. Radiation Required
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
5	3.00	0.016	219	1.2	2908	15.3	267	1.5
10	11.7	0.062	854	4.5	6585	35.0	1259	6.7
20	34.9	0.19	2540	13.8	12860	61.3	3650	19.9
30	59.6	0.32	4340	23.4	18875	100.0	6265	33.8

*Including meeting rail. Allowing for 1/16-inch crack and 7/64-inch clearance.

tect can determine the saving effected for his client by calking window frames, providing for tight windows, and by having weatherstripping installed.

Attention should be directed to the fact that the best types of weatherstripping carelessly applied may fall far short of providing the immunity from infiltration claimed in the printed matter of the manufacturer. The technique of application is of as great importance as the excellence of design or quality of manufacture. Again, some defect quite apart from the weatherstripping may defeat its purpose. A certain living room, for example, had two French doors in the west wall. The leakage was so great that it was impossible to maintain a 65° temperature when a wind was blowing from the north or west. When a real "norther" was blowing, a candle flame was frequently blown out at a distance of 3 feet from the crack between the door edges. Metal weatherstripping was applied, and, as the house was rented, the owner tried to economize by awarding the contract on a price basis. When the next "norther" came, it was found that the infiltration had materially been reduced, but that the candle flame was in danger 1 foot from the tops of the doors! Investigation proved that the doors were warped to such an extent that tight weatherstripping was impossible. It all goes to show the dependent character of the various component parts of a building, and that it does not pay to skimp in any particular.

In many parts of the country storm sash are in common use, and it is interesting to read the conclusions drawn by W. M. Richtmann and C. Braatz, of the faculty of the University of Wisconsin on an exhaustive study of frame calking and storm window application[2]. They say that: "The infiltration through the crack between a brick wall and window frame is a very important factor in calculating the infiltration into a room. However, this source of leakage can be practically eliminated by the application of some type of calking compound to the crack. The application of storm sash does not materially decrease the infiltration of a tight-fitting window, but it does give a large saving if the crack and clearance of the window are large. The application of a wool strip between the frame and storm sash reduced the infiltration appreciably. The storm sash applied by means of four turn-buttons reduced infiltration much more than those applied by means of a hook-and-eye suspension arrangement. The infiltration through the crack between a brick wall and window frame for a plastered wall is about 40 per cent of that through the same crack on a plain wall. This leakage may be as great as the leakage through the sash perimeter of the window."

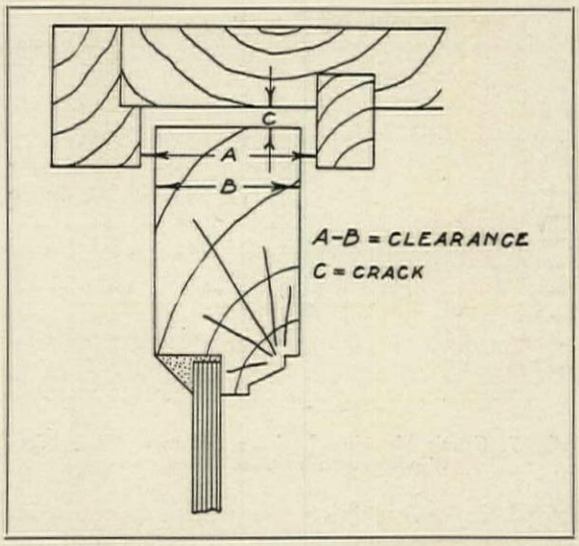


Fig. 6. Sketch Showing the Distinction Between "Crack" and "Clearance"

Turning, now, to the modern steel window, much used in industrial buildings and residences, we find some valuable data resulting from a series of tests made at the University of Michigan by Professor J. E. Emswiler and W. C.

TABLE 2—INFILTRATION THROUGH DOUBLE-HUNG METAL SASH WINDOWS PER FOOT OF CRACK

Wind Velocity Miles per Hour	Non-Weatherstripped Window, Locked			Non-Weatherstripped Window, Unlocked			Weatherstripped Window, Unlocked		
	Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation	Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation	Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation
5.0	20.4	25.7	0.10	20.4	25.7	0.10	6.5	8.2	0.03
10.0	45.4	57.2	0.24	47.3	59.6	0.25	18.6	23.4	0.10
15.0	70.4	88.6	0.37	74.0	93.1	0.39	31.5	39.7	0.17
20.0	96.3	121.2	0.51	103.8	130.7	0.55	46.0	57.9	0.24
25.0	125.0	157.6	0.66	137.1	172.8	0.72	60.2	75.8	0.32
30.0	153.8	193.4	0.81	170.4	215.0	0.90	76.0	95.6	0.40
35.0	186.8	236.0	0.98	212.0	267.5	1.11	94.5	119.0	0.50

Values for practical use; average test values reduced by 20 per cent to allow for building up of pressure in room, etc.

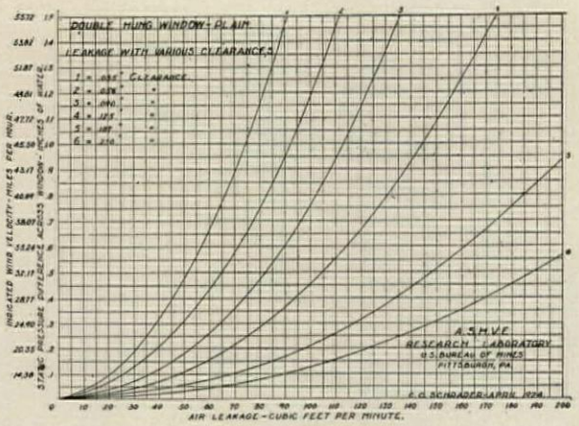


Fig. 7. Graph Showing Leakage Through Plain Wood Window with Various Clearances

Randall[3]. In addition to carrying out a study of leakage through the cracks of rolled steel windows, a field study was made to determine the crack widths found in practice. Measurements of more than 1,600 steel windows are tabulated in Table 4, from which it will be seen that much less air can pass through the cracks of steel windows than through corresponding openings around conventional unweatherstripped wood sash. The tests indicated that when steel windows are calked with mastic, as is the common practice with residential casements, heavy section casements, heavy casement-section projected, and possibly architectural projected, or grouted with cement, as is the common practice with industrial pivoted windows, the frame leakage is negligible.

[3]Note 3.—"The Weathertightness of Rolled Section Steel Windows," presented at the 1928 meeting of the A. S. H. & V. E.

In figuring wood windows, the frame and the other leakage are to be added to the crack leakage to obtain the total. In the steel window there will be little or none of the frame leakage often found in wood windows, because the steel framing is usually installed in the opening with grout or mastic, and the co-efficient of expansion of steel is so near that of building construction that the bond is maintained intact. Cracks at mullions and at contacts where the windows are attached to the steel framework are found to give negligible leakage if care is exercised in installation.

Professor Emswiler brings out an interesting and important point in connection with high buildings. He says: "Even without any wind, a difference of temperature inside and outside will cause the pressure state inside to be less than that outside at the ground, and greater near the roof, and inflow will occur at lower windows and outflow at upper windows. If the building is tall and open throughout from bottom to top, or if arranged in stories in free communication from one to another, and if the temperature difference is great, the pressure difference created at a point near the ground and also at a point near the roof may be considerable. Thus in a building 200 feet high with 70° Fahr. difference in temperature, this force alone, causing inflow at the ground and outflow at the top, may easily exceed 0.2 inches of water, which is the equivalent of a 20-mile wind. If the building is multiple-storied, and if there is absolutely no communication between stories, then the force of temperature difference is effectually nullified, or rather reduced

TABLE 3—INFILTRATION THROUGH DOUBLE HUNG WOOD SASH WINDOWS

	Wind Velocity Miles per Hour	Per Foot of Uncalked Crack Around Frame*			Per Foot of Crack around the Sash including Meeting Rail for Cracks of 1/16-in. and 7/64-in. Clearance, Window Unlocked					
					Plain Non-stripped Wood Window			Aver. Weatherstripped Window		
		Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation	Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation	Leakage, Cu. Ft. per Hr.	Heat Loss B.t.u. per Hr. 0–70° Fahr.	Sq. Ft. Radiation
Values for practical use; average test values reduced by 20 per cent to allow for building up of pressure in room, etc.	5.0	1.41	1.77	0.007	39.3	49.5	0.21	3.00	3.80	0.016
	7.5	6.36	8.08	0.034	62.8	79.2	0.33	6.82	8.60	0.036
	10.0	11.3	14.3	0.060	84.9	107.0	0.45	11.7	14.9	0.062
	15.0	22.6	28.7	0.12	124.0	157.0	0.65	22.9	29.1	0.12
	20.0	31.1	39.4	0.16	161.0	203.0	0.85	34.9	44.3	0.19
	30.0	53.6	68.2	0.28	233.0	294.0	1.23	59.6	75.6	0.32
	40.0	76.0	96.5	0.40	309.0	390.0	1.63	87.8	111.0	0.46
	50.0	88.9	114.0	0.48	390.0	492.0	2.05	117.0	148.0	0.62

Notes.—*A.* This table is approximately correct for cracks up to ¼-in.

B. The values given for the plain non-stripped wood window and for the weatherstripped window include the "elsewhere" leakage through the frame, but not the leakage through the uncalked crack around the frame. If the frame is to be left uncalked, the loss under that heading should be included in the heat loss calculations.

*Practically all leakage around frames can be stopped by proper calking.

to an amount proportional to the height of a single story. However, there is always some communication by means of stairs and otherwise, so that the force of temperature difference is always operative in some degree."

It is worth comment that the quantity of infiltration is dependent upon things other than wind velocities and cracks. It is obvious that the outer air cannot be forced through the cracks of a building on the pressure or windward side unless the same volume of air passes out through the leeward side. Therefore the interior layout of the building and the character of its occupancy must enter into the problem. If a room on the side of excessive winter exposure is seldom used, and if the communicating doors are generally kept shut, the infiltration will be slight regardless of the weather-tightness of its walls and windows. For this reason, it might be in order to weather-strip interior doors as a means of decreasing infiltration. By the same token, open transoms tend to increase infiltration, as do chimneys from fireplaces and kitchen vents, especially if supplemented by electric fans. An interesting example came up in connection with a large house where the kitchen was vented with draft produced by an electric fan. The ventilation was entirely adequate, but it was not realized that the infiltration, some 400 cubic feet an hour, required the use of more than 1,000 gallons of oil per heating season.

An interesting point came to light recently when calculations were made of heat losses and infiltration for a house located near New York. Three rooms, forming one long and one short adjoining wall, were considered (Fig. 8). The radiation requirements were computed for the condition where the long wall faced north and the short wall, east. The house then was assumed to be rotated clockwise, so that the long wall faced northeast and the short wall, southeast, and the amount of radiation was determined. This process was repeated, with 45° steps throughout the circle. It was found that the requirements varied 50 per cent.

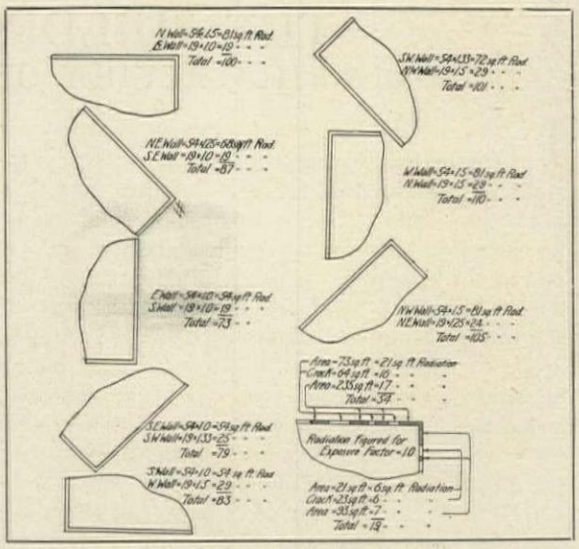


Fig. 8. Diagram Showing Variation in Radiation Required for Various Exposures

There is a growing tendency on the part of the builders to install insulation, weatherstripping, and the other elements that may add to the first cost of a house but which reduce the annual cost of operation, and which frequently provide for more comfortable occupancy. As has been suggested, these refinements may bring about savings in other elements that completely offset their cost. It is entirely possible, in the construction of a small house, to spend $500 for insulation and weatherstripping and save $300 or $400 in the cost of the heating plant. At the same time, a more comfortable house is insured for summer occupancy, and a more salable property is produced.

TABLE 4—MEASURED CRACK WIDTHS OF STEEL WINDOWS IN SERVICE

Building Designated by Letter	Type of Window	Number of Ventilators Having Crack Width Indicated Which Represent the Average of a Number of Trials at Edges of Ventilators							
		0.006″	1/64″	1/32″	1/16″	1/8″	1/4″	Total No.	Aver. Crack
A (U. of M.)	Heavy section casement	7	28	25	4	4	..	68	1/32″ −
B (Detroit)	Residential casement	56	39	6	1	..	..	102	1/64″ −
C (U. of M.)	Heavy casement section projected	..	8	12	9	7	..	36	3/64″ +
D (U. of M.)	Heavy casement section projected	58	214	6	10	2	..	290	1/64″
E (U. of M.)	Heavy casement section projected	77	127	10	..	..	..	214	1/64″ −
F (U. of M.)	Industrial pivoted	..	7	19	30	35	6	97	3/32″ −
G (Detroit)	Industrial pivoted	16	45	46	27	11	15	160	1/16″ −
C (U. of M.)	Commercial projected	..	..	..	..	128	103	231	3/16″
H (U. of M.)	Commercial projected	..	80	24	6	..	..	110	1/64″ +
I (U. of M.)	Architectural projected	43	41	5	21	..	..	110	1/64″ +
J (U. of M.)	Architectural projected	6	53	13	10	6	..	78	1/32″ −
K (U. of M.)	Architectural projected	76	90	13	..	..	..	180	1/64″ −

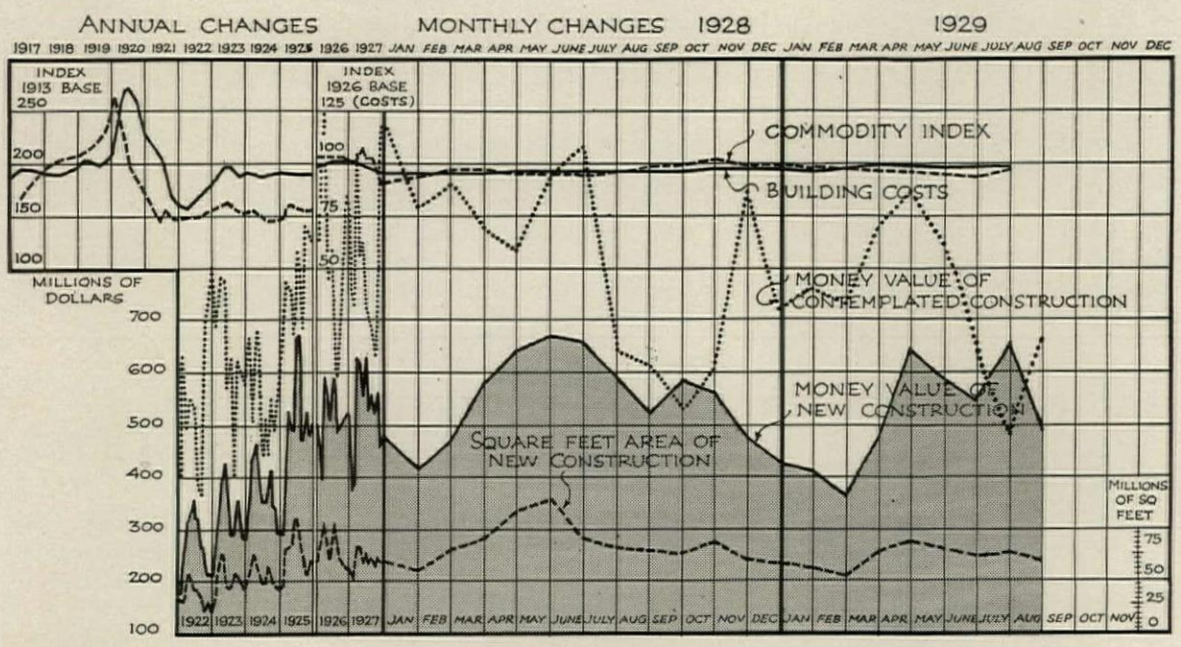
THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

IN view of the fact that contracts awarded for construction during the month of July represented the second highest monthly total recorded to date, it is not surprising that August construction shows a decided falling off in several of the areas of the United States. The August contract total for the 37 states east of the Rocky Mountains amounted to $488,882,400, according to the F. W. Dodge Corporation, a decline of 25 per cent from the July total and a decline of 5 per cent when compared with that of August of last year. This brings the total of the first eight months of this year up to $4,-156,865,300, a decrease of 9 per cent from the corresponding figures of 1928. In the district comprising New York state and northern New Jersey, value of August contracts amounting to $94,506,000 was 57 per cent below the July figures and 26 per cent below those of August, 1928. For the first eight months of the year this district showed total contracts awarded amounting to $1,001,911,700, a decrease of 16 per cent.

Construction work started in the New England states totaled $33,459,900 during August, a figure 21 per cent below that of the preceding month and 14 per cent below that of August, 1928. The construction total in this district for the first eight months of this year amounted to $283,950,100, which is 12 per cent below the first eight months of 1928. In the middle Atlantic states construction fell off 39 per cent as compared with July. The August total was $45,-595,600. This also represents a decrease of 11 per cent from that of August a year ago. For the eight months of this year the total of $508,-393,700 was 5 per cent below that of 1928.

The central western and northwestern states showed a comparatively small decline in August. In the central west, with contracts awarded amounting to $153,170,800, the decrease was 4 per cent from the July figures and 8 per cent from the August, 1928 total. For the eight-month period this district showed new construction started to the amount of $1,225,572,900, a decrease of 11 per cent from that of the first eight months of last year. The total of $8,303,100 for August construction in the northwestern states was 6 per cent below the preceding month and 20 per cent below August of last year. However, construction for the first eight months of 1929, with a total of $65,734,500, was 21 per cent ahead of the corresponding period of 1928.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Values of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp. and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

ELECTRICAL WIRING LAYOUTS FOR OFFICE BUILDINGS

BY

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THE electrical wiring layout for an office building will be necessarily influenced by the size and location of the building, the type of construction, and the completeness of the equipment desired, and also upon whether the building is to be occupied wholly by the owner or is to be wholly or partially for rental.

In general, the wiring layout will include separate wiring systems for the control of lighting and power services; conduit raceways for the development of the telephone and miscellaneous low tension office equipment; protective wiring, including fire alarm and watchman's clocks, together with the required distributing switchboards, panelboards, wire closets, motor, equipment, and lighting fixtures, etc.; and the final connection with the service mains.

Construction. With the smaller office buildings of second class construction, and where it is unlikely that the walls and partitions will be changed to meet the requirements of new tenants, the use of B X armored wire is permissible where the circuits occur in wood construction. With the use of B X armored wires, however, standard 4-inch conduit outlet boxes should be used on all branch circuits for all outlets. These boxes are fitted with the regular fixture receptacle and switch covers, the armored wires entering the boxes with approved clamp type box connecters and lock nuts. With the use of B X, construction "troubles" will nearly always occur at the "outlets" and are mainly due to the use of too small outlets or ceiling plates, the improper insulation of splices, and the crowding of the wires and splices in the outlet boxes.

Expense permitting, however, rigid conduits should always be used for both high- and low-tension wiring and for all types of building construction, since, with the use of rigid conduit properly installed, there is ample room for the installation of wires without crowding, and the wires may be withdrawn, replaced, or added to. at will without the necessity of cutting walls or construction.

With all buildings of first class construction, or where wires must be installed under cement floors, in masonry, or in damp locations, the use of rigid conduits for all services is obligatory.

Preliminary Information. Upon the commencement of the work, a rough approximation should be made of the connected load for both lighting and power services, and such information, together with the rough plot plan, should be given to the public service company, in order that the company may determine the character of the service available for both lighting and power, and also determine the point at which the service cables will enter the building. A copy of the local installation rules of the public service company should also be obtained, as well as any local ordinances governing the installation of the work, and such rules together with the requirement of the "code" should be also ascertained and this information given the telephone company and like service companies, in order that the point of entrance may be determined and the low tension service conduits proportioned for the maximum requirements of the building.

Circuit Wiring. In planning the circuit wiring throughout the office floors, provision should be made for a meter closet on each of the floors. This closet should be located at some central point, and be accessible from the public stair hall or corridor. Panelboards of the lighting system and connecting cabinets of the low tension systems, as well as the terminal cabinets of the public telephone and A.D.T. services, should be installed in these meter closets, and all circuits of all services on the floor should be run back to the meter closet and connect with the respective cabinets, etc.

To facilitate the installation of risers and feeders, meter closets should, as far as possible, be located one over another on the different floors and connected with a vertical wire shaft. The required demensions of the meter closet will depend upon the number of offices served from the closets. With the smaller buildings with some 15 or 25 offices on a floor, a closet floor space of approximately 6 x 8 feet or more may be required. With the larger buildings, the closet space should be increased in proportion.

Where, with large floor areas and the use of one meter closet, branch circuits exceed 125 feet in length, two or more meter closets should be considered for each floor, these closets being so spaced that the average length of the branch circuits will not exceed 100 feet. With the use of more than one meter closet on a floor, each closet should be made to serve a definite zone, and all branch circuits of all services within the zone should be run back to, and connected with the respective meter closets. Where a building is to be occupied wholly by one tenant, less space may be required in the meter closets, as individual office meters will not be required.

In planning the circuit wiring throughout the offices and rented spaces, provision must not only

be made for fixed ceiling outlets, and outlets in permanent walls and columns, etc., but a flexible arrangement of conduit outlets, and switches, etc. must be had, these being interconnected to permit of the ready extension of circuits, and the metering of one or any number of offices from a single meter as desired.

In general, the outer building walls, corridor bearing walls, columns, and stair enclosures, being fixed, may be equipped with sub-panels, outlets, switches, etc. Conduits and outlets, however, should, in general, be kept clear of partition walls, permitting the removal and relocation of the partitions without interference with electric conduits and outlets.

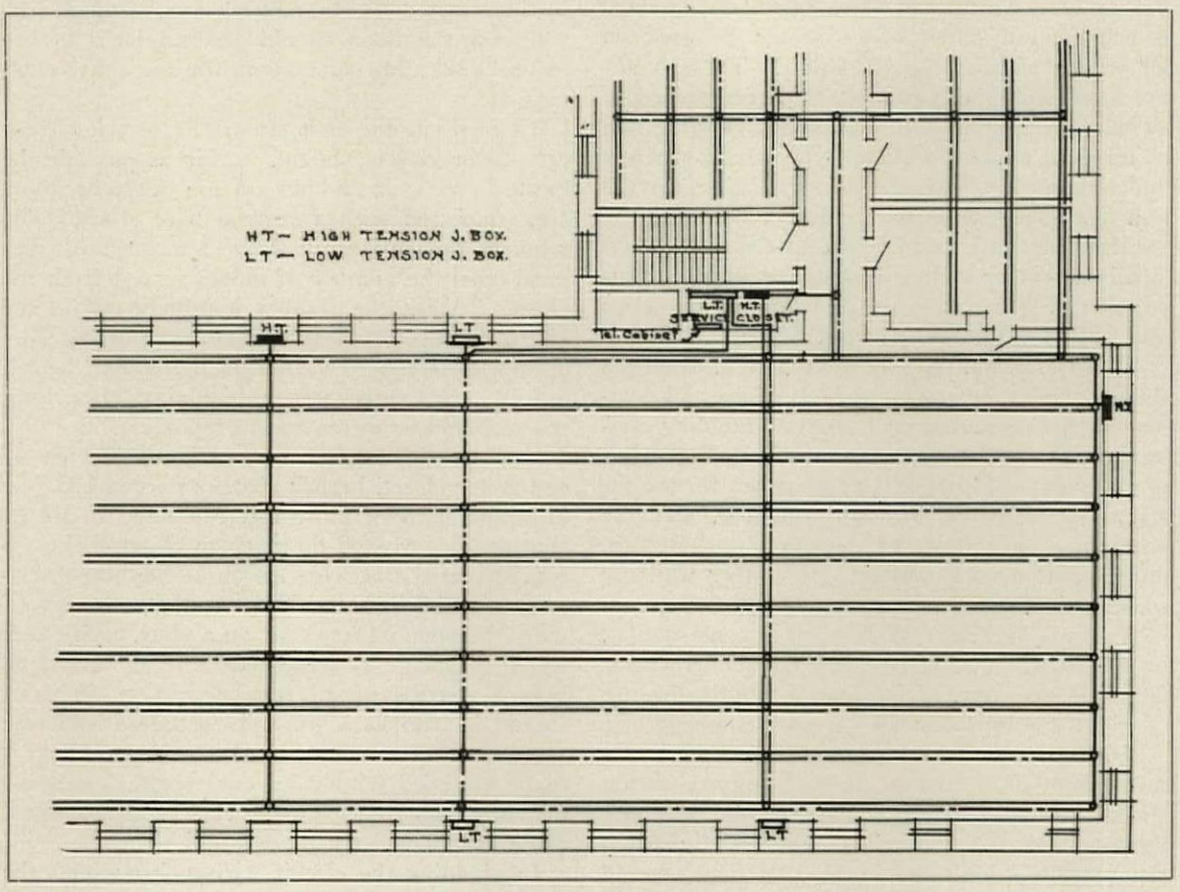
The spacing of outlets for ceiling fixtures throughout the offices will be influenced by the height of the ceilings and the location of the exposed beams. In offices with floor areas of approximately 12 x 20 feet, two ceiling outlets will give satisfactory results. Where the office width exceeds 12 feet, it is advisable to use four outlets. In larger areas, spacing of ceiling outlets should not exceed the hanging height of lighting unit.

It is difficult to determine the required lighting intensity for different offices, as this will be influenced by the class of work carried on and the individual desires of the tenants. The code rules call for a definite number of watts per square foot of floor area, but this value will be far exceeded in practice. It is well to provide additional room in the conduits, as well as extra circuits on the panelboards to permit of the extension of additional branch circuits if they are required.

In practice, no office circuit should be fully loaded, and it is seldom that more than two or three ceiling outlets are connected on a circuit from the panelboard. Outlets for the use of wall fans should be wired on separate circuits from the lighting, and convenience outlets should be also wired on separate circuits with not more than two convenience outlets connected to the branch.

In general, an office of approximately 12x24 feet of floor area will require two ceiling outlets connected on one branch circuit, and under local switch control; four convenience receptacles, properly spaced and wired on two circuits, permitting the later extension of additional circuits from the outlets for possible special equipment; and two receptacle outlets on walls or columns, 7 feet, 6 inches above the floor (wired on one circuit) to provide for wall fans.

Where it may be determined that certain office spaces may be rented for barber shops, hair dress-



Typical Under-floor Duct System Giving Full Coverage in Large Office Space

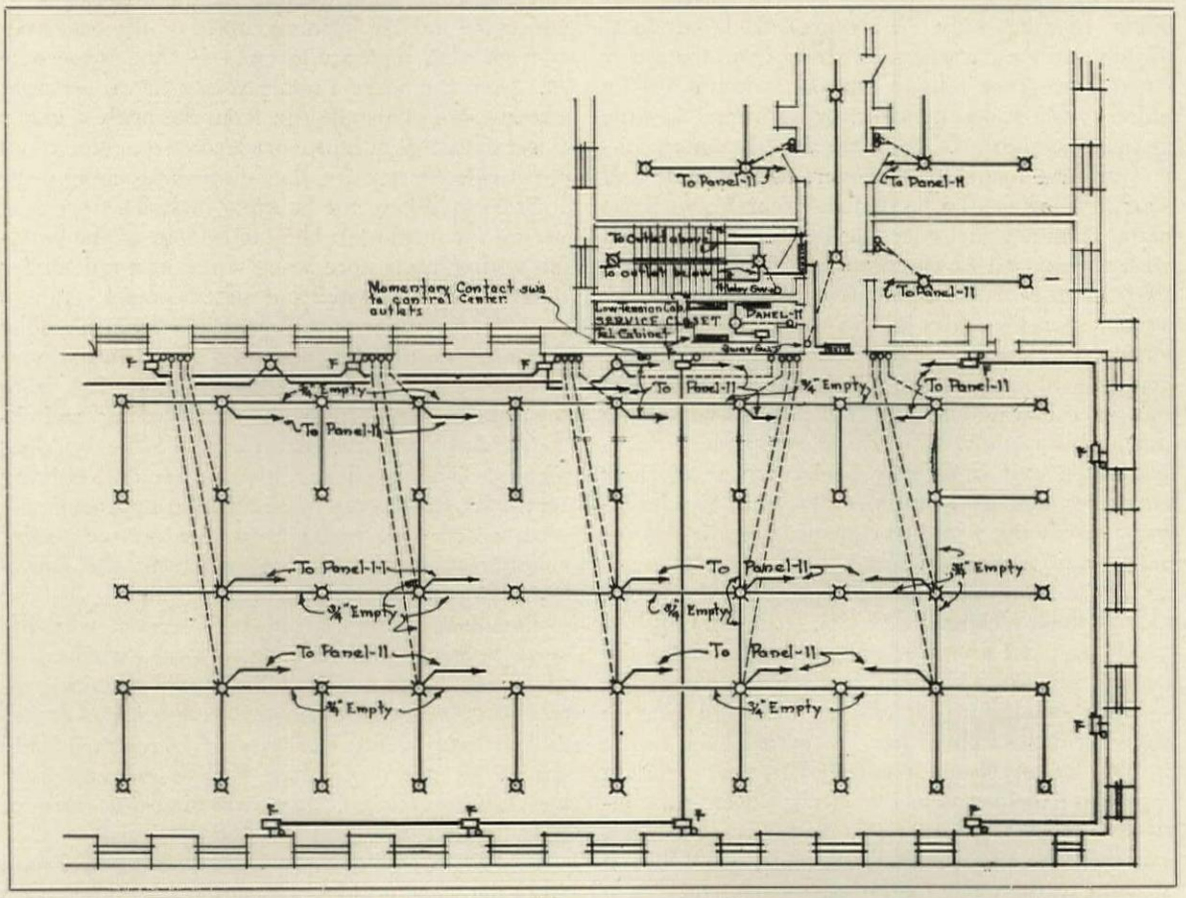
ing parlors, or beauty parlors, and where high wattage equipment may be required, it is good practice to provide an empty conduit (of not less than 1¼ inches) from the panel cabinet in the meter closet to each such office space to provide for possible future loads, the conduit to be capped at a point near ceiling convenient for future extension.

For the development of the lighting circuits throughout larger areas, one method of circuit wiring employs the use of one ceiling outlet in the center of each bay, this outlet fed from two full circuits from the panelboards in the meter closet. With the development of the "space," circuits are extended from the center outlets using a metal moulding to additional ceiling outlets, switches, and convenience receptacles, as may be required. These center outlets may be further cross-connected using empty ¾-inch conduits forming a conduit network in the ceiling construction through which future circuits may be developed.

A second method employs the use of uniformly spaced outlets throughout each of the bays, at approximately from 8- to 10-foot spacings, (usually four outlets to the bay) and each two outlets fed from a circuit from the meter closet; switch legs are dropped from the outlets to switches on columns or on permanent walls. Receptacle outlets are also provided on columns and permanent walls, setting them 18 inches above the floor for general office use and 7 feet, 6 inches above the floor where used for wall fans. Where an underfloor duct system is not used, the conduits feeding the receptacle outlets should be run in the floor slab. Added flexibility may be secured by the use of junction boxes, one in each bay section, these being set in columns at a point near the ceiling, the feeding conduit passing from the meter closet through the junction boxes to the outlets, the junction boxes in turn being connected together with empty conduits, thus permitting the interconnection of the office circuits.

Public Circuits. Public circuits will include all wiring throughout corridors, stair halls, general toilets, elevator lobbies, outside lighting, public rooms, etc. These circuits should be run back to the meter closets on the respective floors and connected to the public service panelboards in the meter closets, these panelboards controlling from the public feeders, and metering from the building meters on the distributing switchboard.

Corridor lighting outlets may be spaced to conform to the ceiling design, and with flat ceilings



Typical Lighting System in a Large Office Space

Lighting Fixtures Properly Spaced to Illuminate a Large Open Office Area

will be spaced approximately 20 feet apart. Corridor lighting may be controlled from local switches in the corridors, in group from the meter closets, or from remote control switches in the office of the superintendent, or by means of time switches as desired. With the use of remote control or time switches, however, the corridor and stair lighting should be double-circuited, with the main illumination under the master control, and with the second or emergency circuit controlling part of the illumination from local three-way switches on the stairs and in the corridors. The emergency lighting under the three-way switch control will also act as "watchman's lights," permitting the watchman to "light up ahead" as he makes his rounds. Red lamp receptacles, or illuminated exit signs may be located at all their entrances and also at the exits from the building, these being wired to control from the emergency corridor circuits.

Where illuminated direction signs may be required, flush receptacles may be set at the required height and fed from the public circuits under the control of local switches.

With the use of floodlights or large electric signs, branch circuits may be carried back to the nearest meter closet, connected to feed from a separate panelboard in the meter closet and controlled from separate risers and remote control switches on the switchboard with push-button stations in the office of the superintendent.

Provision must be made for the lighting of the elevator cars from outlets in the hoistways to which the flexible lighting cables of the cars may connect with separate circuits feeding these outlets from the nearest meter closet. Two separate circuits should also be run from the nearest meter closet to each pent house or elevator machine room to provide current for floor-indicating equipment.

Stores. Where the building includes stores, all wiring for them must be independent of the building wiring, each store being wired as a unit under separate service switch and meter control. Where possible, a service room accessible from a public corridor should be provided for the service switches and meters, the whole being fed from separate feeders from the distributing switchboard and from the street side of the building meters. This applies to both power and lighting services. Each store must have an approved service switch with meter loop, the service feeder running from the service switch to the panelboard in each of the stores.

Panelboards may be in the basement with the store lighting controlled from local switches, or they may be in the stores and all circuits controlled from switches on the panelboard. Stores will include ceiling outlets over counters usually spaced on not more than 10-foot centers, floor and fan receptacles, show window and entrance lighting, and provision for electric signs.

Circuits for window and sign lighting may pass from the panelboard to a junction box at or above the transom, the circuits developing from the

B&S Gage	Area in Circular Mils.	Capacity of Wires: Rubber Insulation Amperes	Varnished Cambric Amperes	Other Insulation Amperes	Conduit Sizes for Wires: Size of Conduit, in Inches								
					1	2	3	4	5	6	7	8	9
18	1624	3		5									
16	2583	3		10									
14	4107	15	18	20	½	½	½	½	½	¾	¾	1	1
12	6530	20	20	25	½	½	½	¾	¾	1	1	1	1¼
10	10380	25	30	30	½	¾	¾	¾	1	1	1¼	1¼	1¼
8	16510	35	40	50	½	¾	¾	1	1	1¼	1¼	1¼	1¼
6	26250	50	60	70	½	1	1¼	1¼	1½	1½	2	2	2
5	33100	55	65	80	¾	1¼	1¼	1¼	1½	2	2	2	2
4	41740	70	85	90	¾	1¼	1¼	1½	2	2	2	2	2½
3	52630	80	95	100	¾	1¼	1¼	1½	2	2	2	2½	2½
2	66370	90	110	125	¾	1¼	1½	1½	2	2	2½	2½	2½
1	83690	100	120	150	¾	1½	1½	2	2	2½	2½	3	3
0	105500	125	150	200	1	1½	2	2	2½	2½	3	3	3
00	133100	150	180	225	1	2	2	2½	2½	3	3	3	3½
000	167800	175	210	275	1	2	2	2½	3	3	3	3½	3½
0000	211600	225	270	325	1¼	2	2½	2½	3	3	3½	3½	4
Circular Mils													
200000		200	240	300	1¼	2	2½	2½	3	3	3½	3½	4
250000					1¼	2½	2½	3	3	3½			
300000		275	330	400	1¼	2½	3	3	3½	3½			
400000		325	390	500	1¼	3	3	3½	4	4			
500000		400	480	600	1½	3	3	3½	4	4½			
600000		450	540	680	2	3	3½	4	4½	5			
700000		500	600	760	2	3½	3½	4½					
800000		550	660	840	2	3½	4	4½					
900000		600	720	920	2	3½	4	4½					
1000000		650	780	1000	2	4	4	5					
1100000		690	830	1080									
1200000		730	880	1150									
1250000					2½	4½	4½	6					
1300000		770	920	1220									
1400000		810	970	1290									
1500000		850	1020	1360	2½	4½	5	6					
1600000		890	1070	1430									
1700000		930	1120	1490									
1750000					3	5	5	6					
1800000		970	1160	1550									
1900000		1010	1210	1610									
2000000		1050	1260	1670	3	5	6						

the location of the motor, an overload and underload protective device must be provided at the motor.

The full load current as well as the permissible size of wires for motor circuits may be obtained from tables in the code; these should be followed in laying out motor wiring. Tables are also given in the code showing the current allowed for the different wire sizes, as well as the conduits allowed for the circuits.

Motors of large capacity should, in general, be connected on single circuits or feeders. Where motors are grouped, a single feeder may be run to a fused junction terminal with tap circuits taken from the cut-outs to the respective motors of the group.

Single-motor circuits should be proportioned for not less than 125 per cent of the full load-running current of the motor. Wires which will be required for motor circuits are:

Direct current	2	wires each same size
Single-phase A.C. current	2	" " " "
Three-phase A.C. current	3	" " " "
Two-phase four-wire A.C. current	4	" " " "
Two-phase three-wire A.C. current	2	" " " "

The neutral or third wire to be 50 per cent larger than either outside wire.

To be concluded in the November issue.

will be of convenience for control of corridor and stair lighting. Remote control switches may be used when it is required to control a circuit or motor from a distant point, the switch being located at the load with control wires running to and terminating in momentary-contact push-button stations, with a pilot lamp to indicate when the switch is closed. Approved safety switches must be used at all motors to master the circuit, these in addition to remote control switches if they are used.

Convenience receptacles, as a rule, should connect on circuits separate from the lighting outlets. Receptacles may be had in 10-, 20-, 30-, 50-, and 100-ampere capacity and in two- or three-pole type. Single circuits must be run to all receptacles of more than 10-ampere capacity, and also to 10-ampere receptacles where the anticipated load exceeds 300 watts. The carrying capacity of the wires connecting to high capacity receptables should be not less than the ampere capacity of the receptacle.

Lighting Fixtures. The type and design of the lighting fixtures for the building is largely a matter of choice. Lighting fixtures of special design will probably be required in the entrance lobby, for post standards, outside brackets, vestibules, and for special offices, etc., and they may be of the multiple arm, ceiling collar or pendant type, designed for direct, semi-indirect, or wholly indirect illumination.

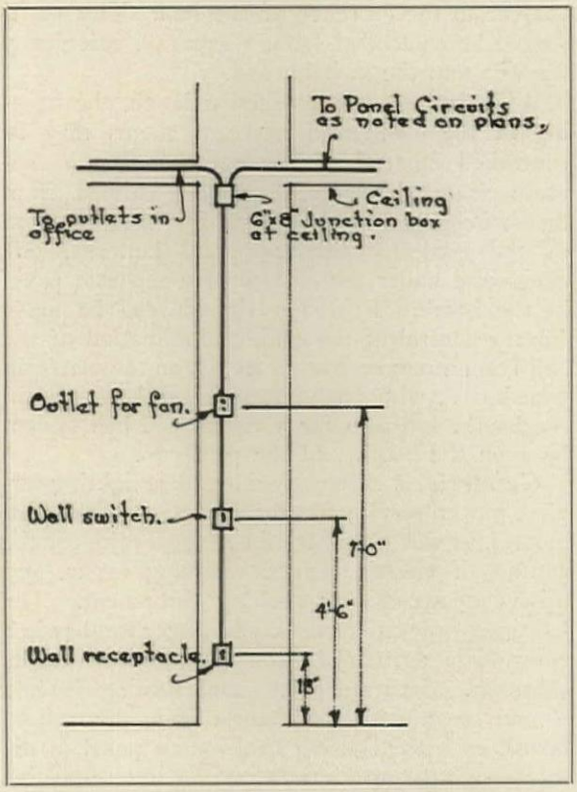
The standard type of lighting fixture, in general use for office illumination, consists of a pendant or ceiling collar, (depending upon the height of the ceiling,) employing a single lamp of the required wattage, with a partial or wholly enclosing globe. Pendant fixtures may be of the rigid pendant type, the chain hanger type, or the "single link" type, which permits the pendant to always "hang plumb." In general, for good results, the lamp should hang from 8 feet, 6 inches to 10 feet above the floor. In corridors, toilets, etc., and where the ceiling height does not exceed 8 or 9 feet, some type of ceiling collar must be considered. In the design of the wiring layout ,the type of lighting fixture need be considered only in a general way, as with proper spacings and with ample wattage at the outlets, any desired type of lighting fixture may be used.

Power Circuits and Equipment. All motor circuits (other than for motors of fractional horse power) should be designed to operate from the separate power feeders from the power section of the distributing switchboard. These circuits are independent of the lighting service, even though the characteristics of the power and lighting services (as with a single-phase, or direct-current) are the same. Power and lighting services should be metered separately, to take advantage of the power rate usually offered by the companies.

Office Lighting Showing Development of Circuits from Central Outlets by Using Metal Moulding Conduit

Motors of fractional horse powers for desk fans and portable office equipment, etc., are standardized to operate at the lighting voltage of from 110 to 125 volts, and as a rule feed from receptacles and from the lighting circuits. Motors of fractional horse power for kitchen equipment, including dishwashers, polishers, grinders, food choppers, and refrigerator boxes, are standardized to operate at the lighting voltage for both direct or single-phase A.C. current, and as such motors are rarely of more than 1 horse power, they may connect from the lighting feeders or may operate from the power service and at the power voltage, with the motors balanced on the phases. The use of the standard single-phase motors on such equipment is to be preferred, as these motors are carried in stock, and can quickly be replaced in the event of breakdown.

All motor circuits should be run in conduits, terminating in fused safety switches at the motors, the circuit leading from the switches to the motor terminals. Direct current motors will require a controller or starting box connected between the switch and the motor. Alternating current motors of not exceeding 7½ horse power will not require controllers. Motors of more than 7½ horse power will require controllers or starters. This applies to both the constant and variable speed types. Where motors are stopped and started under remote control, or other than from



Typical Column Layout for an Office Building, Showing Dimensions

"grade of insulation on the wires." In the writer's experience, the cost of *high grade insulation* for all wires carrying secondary lighting or power voltage and for "code insulation" has been offset by the lower maintenance cost in operation.

It is further suggested that all wires and cables for use on primary circuits (2,300 volts and above) be insulated for not less than double the working voltage of the circuits on which they are to be used. Conduits and wires should not be installed in close proximity to steam pipes, or where subjected to high temperatures. Where it becomes necessary to run wires in trenches or elsewhere with steam piping, varnished cloth-insulated wires should be used rather than those of rubber. Cables insulated with varnished cloth may be generally used for feeder cables and mains; they are allowed a greater current-carrying capacity than rubber-insulated cables, and as a rule are cheaper to install.

Where feeder circuits are run under floors of sub-basements or in outside trenches and are subjected to moisture, the wires and cables must be sheathed with lead in addition to the insulation. Where the length of the branch circuits exceeds 80 feet, it is advisable to use nothing smaller than No. 12 wire.

Where vertical feeders or riser circuits are run to the panelboards in the wire closets and in elevator hoistways, etc., provision must be made for supporting the weights of the cables in a way other than from the terminal lugs of the panels and switches. The required clamping methods may be obtained from the code.

All wires used throughout the low tension system for the operation of clocks, bells and like equipment should be of No. 14 gauge as used for the lighting circuits, and should be installed with the same care as the wires of the lighting service. In view of the development of the circuits throughout an office building to meet the requirements of new tenants, as well as the tendency toward the use of high wattage equipment, the mains and feeders should be proportioned for not less than the full connected load of the building.

Outlet Boxes and Fittings. The exact types of the outlet boxes to be used for any installation must necessarily be dependent upon the building conditions at the outlets. In general, however, nothing less than the standard 4-inch galvanized conduit boxes should be considered for both fixture, switch and receptacle outlets. This also applies to both conduit and B X construction in second class buildings. Outlet boxes for use with low tension wiring should, in general, be of the same type as used with the lighting circuits, except where special boxes of cases are required for special equipment.

Local Switches and Receptacles. In general, flush switches will be used for the control of local circuits. The use of the tumbler or push-button switch is a matter of choice, either giving satisfactory service. Switch plates may be of brass, bakelite, or of composition, and either may be had in any standard finish. Where the circuit load is heavy, the use of a double-pole switch "connected single-pole," (with the two blades in multiple) will provide double capacity and reduce switch maintenance cost. It is good practice to set local switches not less than 58 inches above the floor in order that the switches will not interfere with the installation of a chair rail.

Local switches controlling the lighting in vaults may be set in the outside of the vault wall and adjacent to the entering door, such switches being made up in combination with a receptable, (for use with a portable lamp for the vault,) and with a pilot lamp that will glow when the vault lighting is in use.

Lighting outlets in closets may be controlled from switch combinations with pilot lamps, or door switches may be installed in the door jambs. Similar pilot lamps are of convenience in circuits controlling local electric heating equipment, these being wired to indicate when the circuit is in use, and also for use with small motors in ducts or remote from the point of the control.

Three-way and four-way switch combinations

junction box (in the window construction) to the outlets. Show window reflectors may be of the flush recessed type or of the surface type. They are as a rule set approximately on 12-inch centers and are wired on two or more circuits, with the circuits controlling alternate reflectors. Outlets should be designed for not less than 150-watt lamps. Each window should also be provided with two base receptacles on independent circuits. In view of the store's possibly requiring power service, or service for the use of electric heating devices of high wattage, it is good practice to make the main lighting feeder for the stores "oversize" and to provide also a power feeder from the distributing switchboard to the meter group, in turn carrying an empty conduit from the meter group to the basement of each of the stores, terminating the conduits in pipe caps in readiness for later extension. Provision for public telephones may be made throughout the stores, using conduits and wire mouldings.

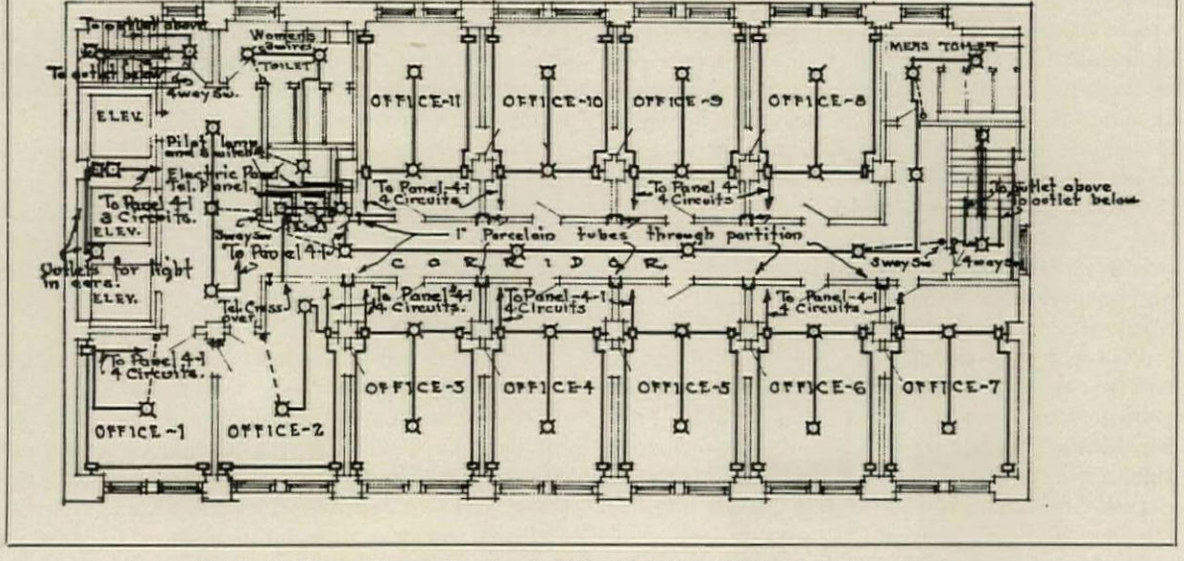
Assembly Hall. An assembly hall will require the lighting of the platform, by means of possibly one or more stage border reflectors, a footlight reflector, and a series of floor outlets and receptacles on the platform, and also flush receptacles at the front of the platform for the lighting of the music of an orchestra. Lighting of the hall will be from properly spaced ceiling outlets and from brackets on the side walls. The whole is controlled from a panelboard on the platform, and from a separate feeder from the switchboard.

Provision must be made for illuminated exit signs at all exits, as well as for emergency lighting for the aisles, etc., these circuits being fed from a separate panelboard in the lobby or convenient to the entrance of the hall. This panel should be controlled from a separate emergency feeder from the switchboard.

With the use of a projection booth, the lighting of the booth and adjacent rooms may be controlled from the lobby panelboard. A separate circuit, however, should be carried from the switchboard to the booth for the operation of the projector machines and lanterns, this equipment under the control of a separate panel in the booth. Provision should also be made for the control of the ceiling illumination of the hall from a remote control switch on the platform panelboard, with push-button control stations in the booth, and also for a return call bell system between the booth and the platform.

Cafeteria. A cafeteria will require lighting service, power service for the operation of kitchen motors, as well as electric heating circuits for the control of electric ranges, warming ovens, and miscellaneous electric cooking equipment. The lighting of the cafeteria may be under local switch control or controlled from a special cabinet in the cafeteria. Separate power and heating feeders should be run to the cafeteria from the switchboard, each terminating in a cutout panel in the kitchen, with tap circuits run to the respective kitchen motors and heating outlets. Power and heating feeders for the cafeteria should each be separately metered from the switchboard.

Wires and Cables. All considered, the successful operation of the wiring system is dependent upon the "insulation" of the system as a whole, and this applies not only to the insulation of joints and splices in outlets and junctions, panel and switchboards, etc., but also to the



Typical Wiring Layout for Small Office Building Divided into Small Offices

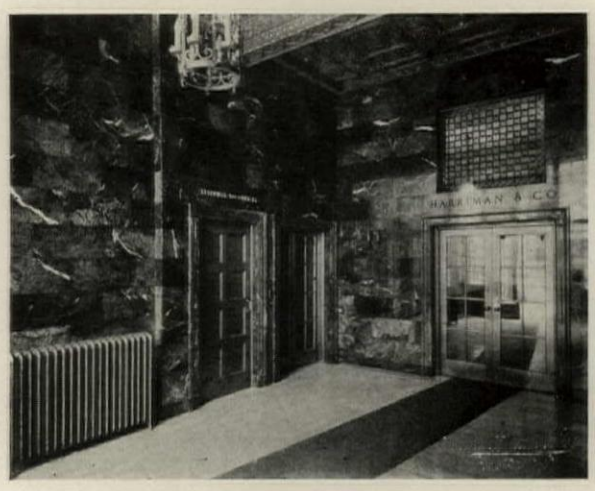
MODERN TENDENCIES IN THE USE OF MARBLE

BY

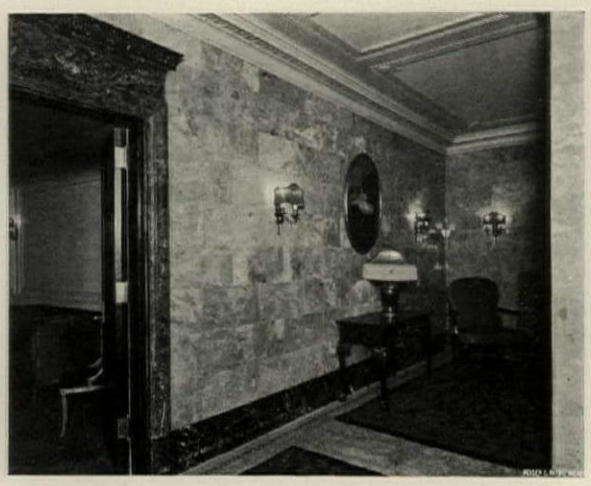
CLIFFORD WAYNE SPENCER

MARBLE in various forms and uses has furnished one of the records of the character of the various stages through which civilization has passed. The marble structures of ancient Greece are a true indication of the severe simplicity of Greek taste, while the riotous luxury of the Roman Empire was expressed in terms of richly colored marbles and brilliant mosaics. And so it has progressed through various color cycles to the present time. Within the period of our own history, very marked tendencies along these lines can be discerned. Beginning with the pure white of the Colonial and Greek Revival periods, popular taste gradually developed in favor of more richly colored decorations, and the result was the "Victorian" style which was characterized by the use of richly colored red and black marbles in connection with highly ornamental oak or mahogany woodwork. Again the wave of color subsided, and for the past two or three decades we have had cool white marble with more recently a decided tendency toward the use of the buff monotones, such as Botticino and Tavernelle. In any town of considerable size, bank interiors and other buildings can be found whose interior treatment is based entirely on the use of buff marble. In fact, buff marble has come to be considered the "bread and butter" of the marble industry, like sugar in a grocery store. The marble yards of the country are stocked with this type of marble, and it can be supplied in large quantities.

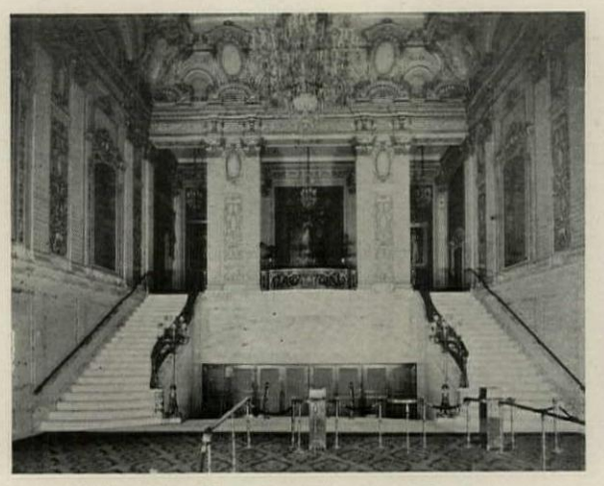
But the world moves on, and the pendulum swings rapidly in the opposite direction. There is little doubt that we are now entering upon a new color era, which, stimulated by new discoveries and scientific research, bids fair to go beyond anything we have yet known. Always the builder has loved to work in marble. The effects to be gained by its use are unlimited in number, and its lasting qualities are such that his work will endure. Moreover, no material lends itself in quite the same way to the expression of beauty in color. Its colors are natural, and therefore have unlimited possibilities from the standpoint of harmony. Color is now being used where once it was not even considered, and especially is this true of the modern home. Formerly, little marble was used in domestic architecture except in the most pretentious homes of the very rich. Now, however, it has a very definite place, and lends color to many bathrooms and is being used in mantels, radiator coverings, as well as for many exterior uses. These uses of marble are being very definitely recognized by a new policy which has been adopted by the marble industry as a whole. Marble was formerly sold to dealers by the great producers and distributors in block form only, so that if an architect or his client particularly desired a certain kind of marble for a mantel or lavatory slab, he might find that dealers in that locality did not happen to have a block of that particular variety on hand and could not afford to buy one for such a small order, so that a less desirable variety would have to be substituted or the use of marble abandoned altogether. Now, however, the producers offer to sell marble of any variety in lots of one slab or more, so that the architect can now have much greater freedom in



Entrance to Office Building in Dark, Richly Colored Marbles



Golden Veined Ashlar Walls With Red Levanto Trim



In Elaborately Decorated Interiors, Plain White Marble May Be Used Effectively

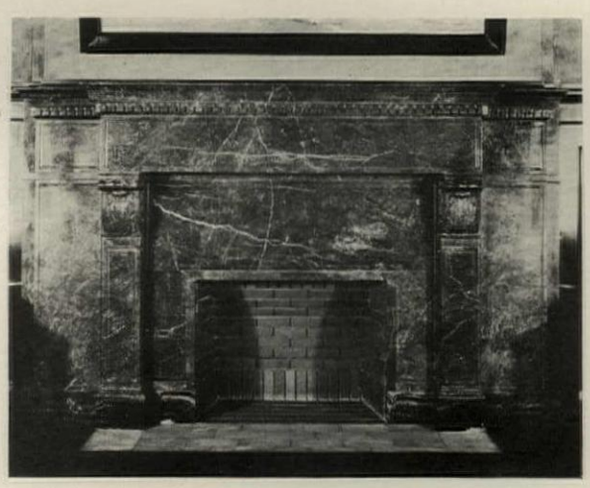
The Carpet-like Pattern in Marbles Relieves the Monotony of Wide Floor Areas

making his choice of marbles for such purposes.

In choosing marble for use in a prospective building, there are many points to be considered, and experienced marble men should be consulted in all cases. The choice of marble requires some thought, there being about seven hundred different varieties available in this country at the present time. This does not mean that the choice can be made indiscriminately. For instance, an architect may choose a beautiful marble and base his whole scheme of decoration on it only to find that it cannot be supplied in quantities sufficient for his needs. He may wish to use monolithic columns of such sizes that only a very limited list of marbles can be had with sufficient length to serve the purpose. Again he may find that the physical properties of his chosen variety are such that it is unsuitable for his particular project. All these details should be investigated.

The supply of marble depends not only on the existence of the deposit in large quantities, but on its accessibility and the methods used in quarrying it. There are vast quantities of beautiful stone hidden away in the hills which are so inaccessible that only a very limited supply of them is to be had. The mountains of Colorado have vast deposits which are scarcely touched because of the great difficulty in bringing the marble to market. Some quarries in that state are worked, and we have the beautiful Colorado Yule which is available for fairly large buildings, but which is marketed with great difficulty. Another illustration of this is found in Spain, where there are deposits of the richest marbles, which were so greatly desired by the ancients that they were transported in great quantities to the Italian cities and even to Greece and more distant countries. The retrogression which has taken place in Spain has caused such great confusion in the transportation system that these valuable marbles are quarried only in very limited quantities, and then only for local use. The length of the working season is another factor governing supply. If a quarry can be worked for only three of four months of the year, the supply will naturally be limited. This is the case in many of the quarries located in the Pyrenees and the Alps in Europe, and in Colorado and Alaska and the northern sections of North America. This handicap has been overcome in many cases in this country by using modern quarrying methods, and this is especially true of the Vermont district, where most of the quarries are in the form of tunnels and can be worked throughout the year. The southern districts, such as Georgia, Tennessee, Missouri and Alabama, are of course, not subject to this condition, and quarries there are worked in the form of open pits. Modern quarrying methods are doing much to insure a steady supply of blocks. In this country practically all operations are carried on with mechanically operated channeling and drilling machines, so that a constant supply of blocks can be had with very little waste. In Europe, however, the general procedure has been to blow off the side of a mountain or to split off blocks by means of wedges, and to salvage as much of the debris as possible. There has also been use of wasteful methods in this country, foremost among which are those causing the ruining of the deposits of white marble in New York state, and of the black marble beds in Virginia by blasting. The loss of the Virginia black marble is to be particularly regretted, as it is said to be the most beautiful and uniform black marble found anywhere in the world. These quarries are now being worked for terrazzo chips, and it is possible that solid marble will be reached and that this valuable variety will be made available once more.

The sizes of blocks depend on the formation



Native Utah Marble is Used in this Mantel in the Church Administration Building, Salt Lake City

Domestic Marbles Are Unsurpassed for Giving an Effect of Cleanliness to Shop Interiors

of the strata as well as on the facilities for getting out and transporting the blocks. Many varieties can be had in sound blocks of 5 or 6 feet only, while others are limited in size only by the machinery used to raise them from the quarry. A block of white marble, weighing 63 tons and being 14 feet square and 3 feet thick, was especially quarried for the basin of the Scott Memorial Fountain in Detroit, and monolithic columns can be had as large as 32 feet long by 4 feet in diameter. It is always best to ascertain what sizes are available before planning to use monolithic blocks of large sizes.

Another matter to be carefully considered in choosing marble, is that of the suitability of its physical properties to the conditions to which it will be subjected. Marble is not wholly a scientific classification but a trade name, applied to a certain class of limestone possessing peculiar characteristics. In general, marble is more dense and is said to be "metamorphosed" or "recrystallized" limestone. It is more compact and is generally distinguished from limestone by its ability to take a polish. The line of demarcation between limestone and marble is rather vague, and it is sometimes difficult to tell in just which class to place a stone. In general, marble is divided into three classes according to chemical composition. The calcites are almost pure lime carbonate, while Dolomite marble carries a high percentage of magnesium carbonate, and the serpentine marbles have abundant silicates crystallized with the carbonates. The tensile strength of marble is very great, which fact not only adds greatly to its structural value, but makes it especially adaptable to delicate sculptural ornamentation. The crushing resistance of marble ranges from 11,000 pounds to the square inch to 22,000 pounds per square inch, depending on the variety. Its resistance to heat is especially important in case of fire, and marble is well up in the list of stones in this respect. Under carefully conducted tests, it was found that marble may be subjected to a heat of 12,000° Fahr. without physical change. The freezing of liquids absorbed by stone is very likely to cause disintegration of its structure, but so small is the quantity of moisture that can be taken up by marble (from .06 to .09 by weight) that there is no great danger from this source. This quality of non-absorption is also of great advantage in resisting stains from oils, dyes and other liquids. The quality of hardness is very important, especially where the material is to be subject to constant wear, as in floors and stair treads. Everyone knows how hollows will be worn in stone floors and steps by the passing of countless feet over a long period of time.

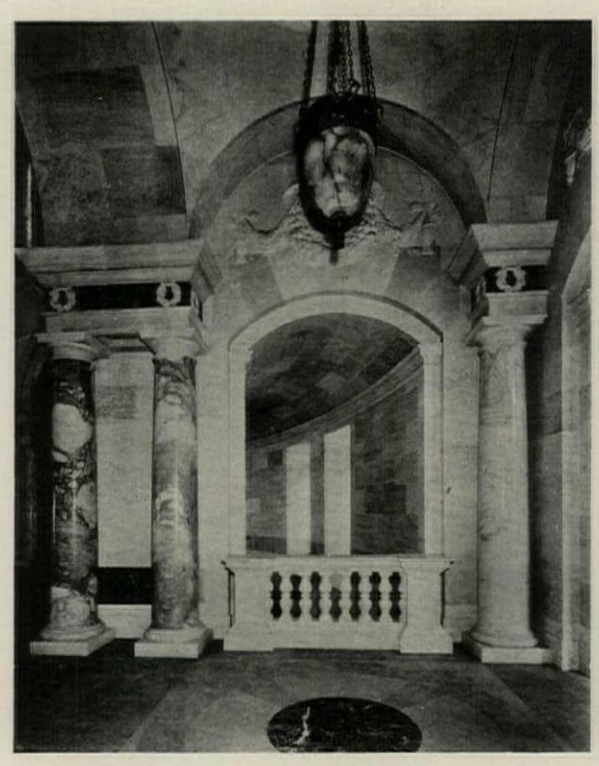
Special care should be taken in using stones of different wear resistance in the same floor, as the floor is likely to become hilly or uneven through wear. An example of this is found in the Union Station at Washington, where a very hard red Champlain marble was used in connection with a softer white marble to gain decorative effect, and the heavy traffic has worn away the white marble leaving the red projecting quite noticeably. The United States Bureau of Standards is making tests at the present time to determine the wearing qualities of floors and the possible remedies, if any. An apparatus has been designed, and tests with this are being compared with a series of measurements of similar materials under service conditions. A paper showing the results of these tests is now ready for publication and should be of great interest. It contains the results of abrasion tests on about 90 materials, including marble, slate, limestone, and sandstone.

Perhaps the most important consideration in choosing marble to withstand special conditions is that of soundness. Many of the varieties most

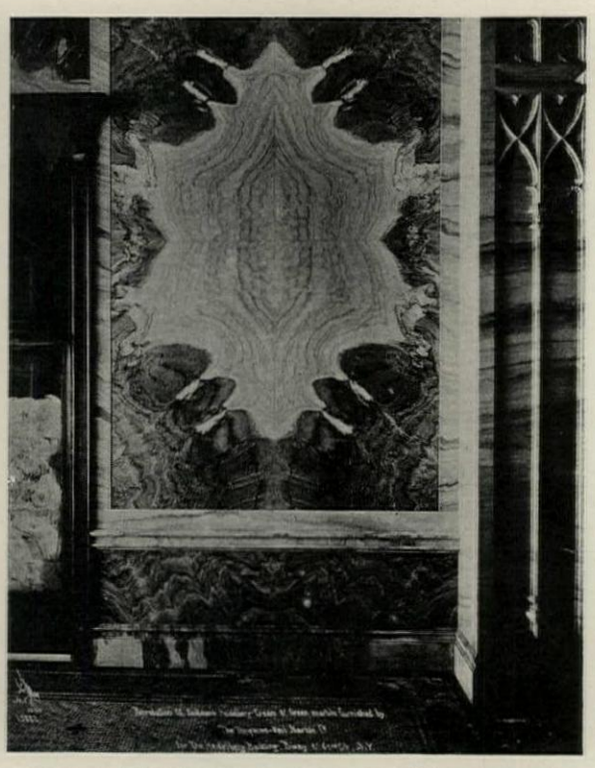
highly prized for their rich color and pattern have, by their very nature, natural fissures and depressions. These defects are successfully remedied by the use of wax and by "sticking" the marble together, and in some extreme cases by cementing it to a "liner" of heavier marble or some other sound stone. It is said that in ancient times it was the custom to specify that marble should be *"sine cera,"* without wax,—and that it was from this custom that our English word "sincere" was evolved. One should not get the impression, however, that marble that is waxed or "stuck" is not an honest product or that its value or durability is lessened thereby. Whatever may have been the practice in times past, the marble industry, in common with the rest of modern business, has adopted the principle that honesty and frankness are the best policy, and if an architect or his client will consult a reputable marble man as to the soundness of a given brand of marble, the facts will not be misrepresented, no matter how much of that particular variety the dealer has for sale. Of course, there are some instances where the use of a highly waxed marble should be avoided. Wax should never be used on exterior marble. It should not be used where it will be subjected to an unusual amount of heat, such as around radiators or as mantel facings for fireplaces. While the color and veining of marble can be matched perfectly with wax, the wax has not the same wearing qualities as marble, and in time a slight change of color or shade may occur in the wax, due to impurities absorbed from the air. For this reason it is sometimes not advisable to use wax in buff monotones or white marble, as the wax which originally matched the color of the marble may change slightly in color and betray itself. An example of this is seen in the Botticino of the Grand Central Building, New York, where the wax veins are quite conspicuous in some places. This as often enhances the beauty as not. The National Association of Marble Dealers has classified the various marbles according to their soundness into these four classes:

Group A.—Sound marbles and stones, which require no sticking, waxing, or filling, and which possess characteristically uniform and favorable working qualities.

Alabama
Alaska Tokeen
Blue Vermont
Caen Stone
Carthage
Chassignelle
Clarendon
Colorado White
Georgia Cherokee
Georgia Creole
Gravina
Italian English Vein
Italian White
Kasota Pink
Lee
Logan Missouri Gray
Mankato Pink
Napoleon Gray
Pentilicon
Red Ark Fossil
Regina
Tennessee
Vermont French Gray
Vermont Lepanto
Vermont Pearl Gray
Vermont Verdoso
Vermont White Grades
Wellington Cream



A Large Variety of Colored and Plain Marbles in The Elks' Memorial, Chicago



Patterned Panels May be Formed of Burled Marble Slabs

Group B.—Marbles and stones similar in character to those of the preceding group, but having somewhat less favorable working qualities; occasional natural faults; limited amount of waxing and sticking necessary.

Alta Vein
Batesville
Belgian Black
Bianco Statuary
Blanco P
Breche Blanc
Champlain Black
Champville
Colorado Travertine
Eastman Cipollino (light)
Eastman Cipollino (dark)
Eastman Cream (light)
Eastman Cream Statuary
Eastman Cream Green (veined)
Fossgraynel
Glens Falls Black
Italian Statuary Vein
Kasota Yellow
Mankato Yellow
Middlebury Italian
Regal Blue
Travertine
Vermont Champlain Jasper
Vermont Champlain Lyonais
Vermont Champlain Oriental
Vermont Pavonazzo
Vermont Royal Antique
Vermont Swanton Black
York Fossil

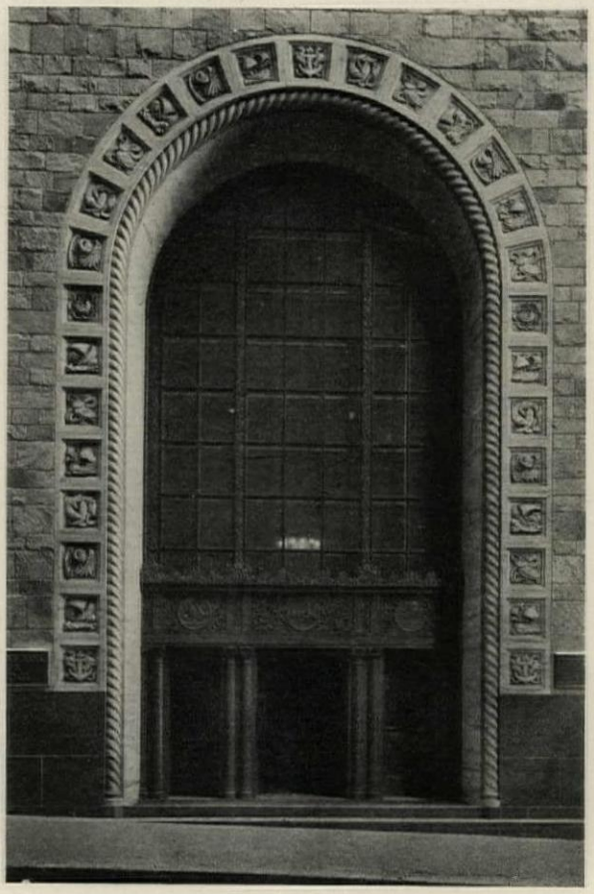
Group C.—Marbles of uncertain variation in working qualities; geological flaws; voids, veins and lines of separation common; standard shop practice is to atone for Nature's shortcomings by sticking, waxing and filling; "liners" and other forms of reinforcement freely employed.

Alabama Fancy Grades
Basseville
Blue Belge
Bois Jourdan
Botticino
Breche Opale
Breche Pavonazzo
Breche Stazzema
Breche Violette
Brecia Fiorito
Campan Melange
Cenere
Eastman Heidelberg
Emerald Curley Green
Escalete
Famosa
Furst Gray
Hauteville
Italian Pavonazzo
Jaune Benou
Juraville
Rosato
St. Genevieve
Skyros "A"
Skyros No. 12
Skyros No. 14
Tavernelle Clair
Tavernelle Fleury
Tavernelle Rose
Tinos
Tranivelle
Verdello
Vermont Verde Antique
Verd d'Estour
Verona Red
Verona Yellow
Wallen Gray
Westfield Green

Group D.—Marbles and stones similar to those of the preceding group and subject to the same methods of finishing and manufacture, but embracing those materials which contain a larger proportion of natural faults and a maximum variation in working qualities, etc.; this group includes many of the highly colored marbles prized for their decorative qualities.

Alps Green
Biegenelle
Black and Gold
Breche Oriental
Breche Rose
Brocatelle Violette
Byzantine
Campan Rouge Griotte
Cardiff Green
Cipollino Greek
Cipollino Swiss
Eschaillon
Fleur de Peche
Florido Rose
Forest Green
Genoa Green
Grand Antique
Griotte
Jasos Arobico
Juane De Brignolis
Languedoc
Levanto
Maurin
Monte Aurato
Moreisque
Nebo Golden Travis
Numidian Pink
Numidian Red
Numidian Yellow
Onyx
Portoro Rose
Rosso Aligante
Rosso Antico
Rouge de Rance
Rouge Etrusque
Rouge Royal
Royal Jersey Green
Royal Rose
St. Baume
Siena Gray
Siena Yellow
Sylvan Green
Verde
Vert Antico
Vert Campan
Violet de Brignolis

Another point on which a careful architect should be well informed is in regard to the care that is necessary in maintaining marble in its original state. It might be felt by some that when the building is finished the architect has no further concern. However, if materials which he has selected grow dingy and do not weather well, he will be blamed by many for not having made a wise choice. Then, too, if the owner finds on completion of the work that there is an unusual amount of maintenance cost which he had not expected, he is likely to hold the architect morally responsible. The owner should be warned in advance as to exactly what will be necessary to keep the marble work in good condition. With regard to unpolished exterior marble, it is true of marble as of other stones that "the mellowing influence of time is a great beautifier of architectural work." In the process of weathering, the cold and dazzling whiteness of freshly cut stone takes on an atmosphere of antiquity and warmth that is greatly to be desired. Buildings may be robbed of a distinct part of their charm and dignity through the laborious process of cleaning. Be sure, therefore, that the building actually needs cleaning and will be improved thereby. Sandblast cleaning should never be resorted to, as it removes



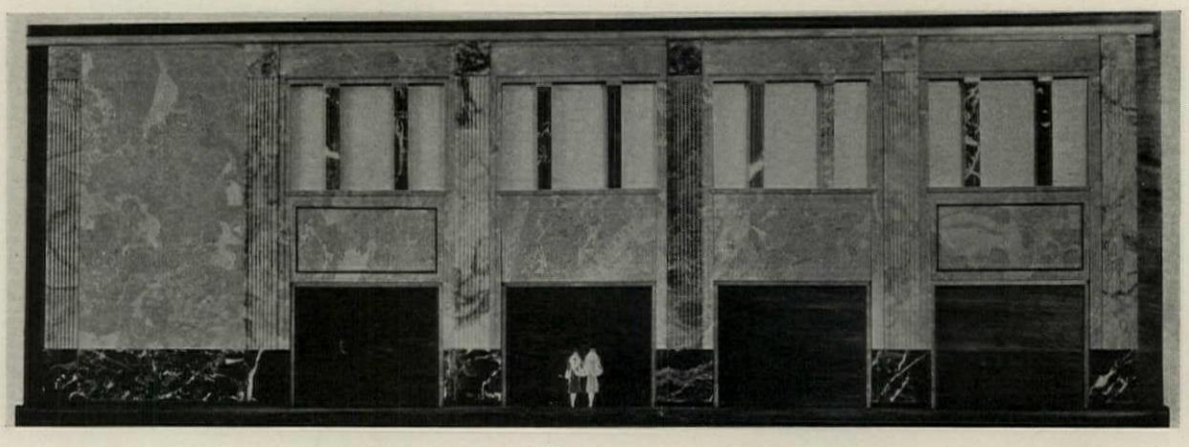
A Carved Doorway of Gray Missouri Marble

Colorado Marble is Especially Suitable for Exterior Work

White Vermont Marble is Used Extensively for Public Buildings

the surface and thus lays the stone open to more easily becoming soiled and stained. Also, the sandblast treatment has a tendency to wear down the sharp edges and arrises of the tooling and carving, sometimes to the extent of obliterating them altogether. If the building must be cleaned, the best method is to scrub it with a good cleaning solution and water, using plenty of "elbow grease." Where highly polished marble is used externally, considerable care is required. There is probably only one marble (Westfield Green) that will hold polish indefinitely when exposed to the elements. In all other cases, marble soon becomes dull and dingy, and there is nothing which tends more to give the front of a building a dilapidated appearance than the presence of marble that has once been polished but has lost its luster. Such marble should be gone over regularly, at least once every four weeks with a mixture of beeswax and turpentine and then polished till the original luster returns. In the case of interior polished marble, this is not necessary, but it should be washed regularly to remove the film of grease and dirt that tends to form on the surface and to dim the polish. Of course, the length of time that a marble will hold its polish varies greatly according to the variety. In general, the harder marbles are harder to polish, and for that very reason are likely to retain their polish much longer. There are many preparations for removing all sorts of stains and discolorations from marble, and these are fully described in a booklet called "Maintenance of Interior Marble," compiled by the National Bureau of Standards and published by the National Association of Marble Dealers, 648 Rockefeller Building, Cleveland.

The many conditions under which marble is manufactured in various parts of the country and the varying costs of transportation and setting make it impossible to give any very definite information as to the cost of marble. This depends on the accessibility and extent of the supply. The difficulty by which it is manufactured and transported to the building site is also an important factor. A price for marble quoted in one locality may be utterly misleading



Scale Models May be Made of Actual Marble Samples

when applied to an estimate for work to be done in another locality. In general, however, marbles can be said to fall into comparative price classes. The domestic marbles of comparatively slight coloring are in the low price class, along with some grades of white Italian marble. The buff monotones are in a slightly higher class and include Botticino, Buffneato, Montenelle, Beige Nelle, and Tavernelle. The next class includes buffs carrying some color and bringing a higher price, such as Hauteville, Florido, St. Baume and Jaune Lavatine. The next price class includes the Breccias (Roman, Oriental, Rose and Violette), and other colored marbles. A still more expensive group includes both domestic and foreign varieties of reds and dark greens and other highly colored marbles. Marble for exterior use is somewhat higher in price than most of the other materials used for this purpose, and its general use fluctuates with the prosperity of the country. Its great beauty coupled with its lasting qualities and the low cost of upkeep causes it to be chosen in many cases where securing a low initial cost is not important. Many buildings are built of a very beautiful random ashlar which is made of what is practically waste material from the marble mills and can be used at a cost only slightly higher than that of brick.

Exterior marble is most often specified in "sand finish," as this brings out to the greatest degree the natural veining of the stone. It is put on by rubbing the sawed blocks with coarse sea sand. Where a rougher finish is desired, tooling is often specified. The work is done by hand or by a special tool used in a planer. It leaves a slightly corrugated surface, the lines being continuous and evenly spaced. When the lines are irregular and finer than tooled finish, it is known as "axed finish." Rock-face ashlar is also very beautiful for exterior marble work, the face of the block being chipped off after the pieces are sawed, leaving a natural stone finish.

Commercially speaking, marble is any stone that is of less hardness than granite; that is sufficiently close-grained to take and retain a polished face; and that can be obtained in quantities sufficient for commercial use. Many stones that are not strictly marble are considered by the trade as such and are handled by marble dealers and included in lists of marble. Among these is travertine, a very important building stone, widely used for interior ashlar and trim and very suitable for floors on account of its hardness and non-slipping qualities. This is a limestone formed by the action of water in limestone caves. Another stone not properly marble but often considered as such, is onyx, which is composed largely of lime and is formed by the precipitated lime from the water of hot springs. The various kinds of marble are distinguished from one another by trade names adopted in many cases arbitrarily, but usually being descriptive of the coloring or formation of the veining. Thus the term "Breche Violette" is both descriptive of the broken triangular markings and the rich violet coloring. Cipollino marble, which comes from Greece, and which has been used since the days of the Roman Empire, is so named because of the fact that its layers resemble those of an onion. Other varieties are named from the regions or towns in which they are quarried, and many are named from important buildings in which they were first used, such as "Steinway Green" and "Cunard Pink." One variety, which bears the high sounding name "Loredo Chiaro," derives its first name from a combination of the first two letters of the first name and the first three of the last name of the architect who was instrumental in introducing it in this country,—Eddie Lord. Another case of the arbitrary adoption of a name was when some particularly fine gray and gold marble was shown a German architect and he exclaimed in delight, *"famos,"* so this variety has since been called "Famosa."

These trade names do not refer exclusively to the product of any single producer but are adopted merely for the purpose of distinguishing a particular variety from countless others. The distribution of marble deposits is very wide. Scarcely any section of the country is without some such deposit, although most of them are not worked for one reason or another. Quarrying ventures are regarded with a great deal of uncertainty and are considered a highly speculative investment. It would be impossible in the space of this article to discuss all the different deposits and varieties produced in the country. However, some of the more important, from a commercial point of view, can be treated briefly.

The Vermont region, which has been more thoroughly exploited than any other marble-producing district, furnishes a wide variety of high quality marbles for both exterior and interior uses. The West Rutland deposit alone furnishes over 15 varieties ranging from almost pure white statuary marble to dark greens, such as Verdoso and Olivo. The quarries along the Otter Creek Valley furnish good varieties, most of which are white or pearly white with blue or gray markings, among which Pittsford Italian and Florence are important commercial varieties. The Vermont Verde Antique is very well known and is quarried in the central region. Its extreme hardness makes special machinery necessary for quarrying and manufacturing this variety of serpentinous marble. The Champlain reds are very rich in coloring and include Jasper, Oriental, Olive, Lyonais and Royal Red. The Georgia

deposits of crystalline marble are particularly adaptable for statuary work and exterior building, two notable examples of its use being in the statue of "Civic Virtue," New York, carved from a single 55-ton block 14 feet x 8 feet x 6 feet, and the McKinley Memorial, at Niles, O. The main deposit of Georgia marble is said to be a solid block four miles long, three-eighths of a mile wide and between 185 feet (known depth) to a half mile (estimated possible depth) deep. It ranges from light, slightly clouded gray to dark gray. There are also a very vivid pink variety and a good quality, even veined Verde Antique available in quantities to supply architects' needs. The Tennessee region is also an important producer of marble, most varieties being of the fossil-bearing class. It is used most extensively for interior work, such as walls, floors, stairways and toilet room work. There are three distinct classes designated by various trade names. The grays and pinks usually have a characteristic wavy black line, called "crow-foot" veining, running through them at intervals. The dark brown varieties are known as Dark Cedar or Dark Chocolate and are of a very rich uniform appearance. They have been produced in large quantities and have been very widely used in public buildings throughout the country. Missouri is also an important marble district, most varieties being of a warm uniform gray with or without black pencil-like veining. A variety that is particularly desirable is the Golden Vein, which has a ground mass of silver gray with occasional golden markings. This compares very favorably with the imported Famosa. The Missouri marbles are especially adapted to interior work and have been widely used for floors and walls in washrooms as well as public lobbies, banking rooms and corridors.

The only marble quarried in important quantities in Colorado is the Colorado Yule, which is found near Marble, Colo. This is an extremely beautiful white-to-gray material, suitable for exterior purposes. The main structure of the Lincoln Memorial, at Washington, is built of this beautiful stone, as are also many other fine monumental buildings throughout the country. Colorado travertine is also available in large quantities and compares very favorably with the foreign variety, being somewhat warmer in coloring than Roman travertine. The Alabama varieties are suitable for both exterior and interior use and are very striking in their vivid, dark, contrasting veining; the best known variety is Alabama Madre Vein. From Alaska comes a remarkably beautiful interior marble of light, pearly gray background, the Tokeen variety having light gray, clouded veining, and the Gravina, very definite black markings. Both are extremely beautiful and are widely used, especially on the Pacific coast. Maryland has important marble deposits, and much marble which was used in the national capitol came from this state. Now, however, most of these quarries are inactive. One of these quarries has recently been reopened and is producing a beautiful soft Verde Antique called Cardiff Green. Another deposit of valuable Verde Antique here was ruined by destructive blasting, and what might have been valuable marble is now being used as railroad ballast. Among the Dolomitic marbles, are those of Lee, Mass., used largely for structural purposes. Another important variety produced in Massachusetts is Westfield Green, famous for its ability to retain its polish when exposed to the elements. The white Dolomite marble of South Dover, N. Y., is an important building stone which is widely used, a notable example of its use being for the Savoy-Plaza Hotel, New York.

France, Italy and Belgium are the principal sources of marble in Europe, although other countries are rich in marble deposits. Italy is perhaps best known for its marbles, and among others the white statuary marble of Carrara is well known for sculptural purposes. Among the highly colored varieties from this country are Black and Gold, Alps Green, the various Breccias, Siena marbles of varying yellow tints, Botticino which has had such general use recently, Pavonazzo, Tavernelle, and a long list of other richly veined marbles. The marbles of France are equally as varied and as richly colored. Among the better known are Escalette, Grand Antique, Hauteville, and the various Breche varieties. From Belgium comes Belgian Black, the standard black marble in use today. There are also Blue Belge, Rouge de Rance, and Rouge Fleuri. The Famosas from Germany are also well known as are several other varieties. Other sections of Europe also are rich in marble, and American marblemen are going about prospecting for new and more beautiful marbles to meet the demand that is sure to develop as we learn to use more and more the beautiful colors nature has given us. Marble must be seen to be appreciated, and a visit to some of the marble sample rooms, which are located in all large cities, is best when there is a choice of marble to be made for architectural use.

THE SUPERVISION OF CONSTRUCTION OPERATIONS

BY

WILFRED W. BEACH

CHAPTER 9. CONCRETE WORK, CONTINUED

THE specification clause on measuring reads: "MEASURING. A systematic method shall be employed for the measurement of all materials, including water. Measurement by shovels or barrows (other than approved measuring barrows) is prohibited. Measurement of aggregates shall be by loose volume, the unit being a 94-pound bag of cement, assumed to be equivalent to 1 cubic foot."

There can be no misunderstanding about measurements of concrete ingredients, but there can be much variation in the accuracy by which this measuring is performed. Contractors, doing their own work, may easily train men to use shovel measurement with fair accuracy and with small economy on minor work, but the method is forbidden on all operations supervised by architects or engineers. Before mixing is started, the barrows should be measured by filling cement sacks with aggregate, then emptying them into the barrows, thus judging the degree of fullness taken up by the required amount; but, inasmuch as a cement sack will contain only about 7/8 cubic foot of sand and slightly less of the coarse aggregate, due allowance should be made for this variation. The barrow capacity can also be measured by dumping cement into it up to the amount of sand specified; or the contractor can have a box made of 1- or 2-cubic foot capacity, to use for a measuring device. This latter is convenient for hand mixing where a barrow is unnecessary. Having determined the barrow measurement, the inspector must see that it is closely adhered to, that all barrows used are identical, and that, where the mix is varied for plain and reinforced work, the change is made in feeding the mixer.

(3). *Cement Must be Fresh, Up to Standard, and Used in Correct Ratio.* The character and quality of Portland cement are matters of laboratory determination. The superintendent of the schoolhouse construction sent in samples for test as soon as he could get them from the first car, and from each successive car thereafter. None was permitted to be used until reports upon it were received. If these had been unsatisfactory, there would have been no alternative but to reject the entire car, if the samples were properly representative of the shipment, and a new source of supply would have been necessary. As was set forth in Chapter 5, it is extremely unlikely that any but acceptable cement will be sent to a job where it is supposed to be tested. Manufacturers do their own testing and know their products. In certain localities, it is customary to specify that each bag of cement shall bear a test tag, and this evidence of quality is supplied by the manufacturers at an additional cost of 10 cents a bag. On small work, this is the best procedure but, on large work, such increase of nearly 20 per cent to the cost of the cement is too heavy a tax. Proper storage and care of cement after delivery will guarantee its suitable condition at the time of use. But if any is overtaken by accident and suffers water damage, it should be discarded and thrown aside at once.

(4). *All Ingredients Shall be Properly Mixed.* On this subject, the specifications say:

"MIXING CONCRETE. All concrete shall be mixed in a rotating batch mixer, except that, under certain conditions, the superintendent may permit small batches to be mixed by hand. Under either method, the materials shall be thoroughly mixed dry, then sufficient water added to produce concrete with required moisture content. A competent foreman shall be in constant attendance at the mixer to see to the correct proportioning and mixing of each batch produced. Mixing drums shall operate at a uniform speed of 200 feet per minute and for a minimum of 1½ minutes after water has been added. Volume of materials per batch shall not exceed the maker's rated capacity of mixer. Machine and hoppers shall be thoroughly cleaned before being allowed to stand idle. For hand mixing, the cement and sand shall first be mixed dry by being turned over three times, then the coarse aggregates added and again turned three times while water is being added to produce the required consistency."

As to the required consistency, this is determined by test, specified thus:

"SLUMP TEST. All concrete mixtures shall be subject to a slump test by the Contractor, once or twice a day during pouring, as requested by the Superintendent and under his direction. For such test, the Contractor shall provide a conical form of No. 20 gauge galvanized iron; also a 5/8-inch pointed metal rod, 21 inches long. The form shall be 8 inches in diameter at bottom, 4 inches at top and 12 inches high. The percentage of water in concrete shall not be in excess of that required to produce a maximum slump of 4 inches for mass concrete and base of floors on earth, and a maximum of 7 inches for reinforced slab, beam and column work."

Greater refinement in slump testing is often met with in specifications,[1] but refinements are not characteristic of such testing, which is merely a rough method of ascertaining in the field whether the concrete is being turned out as moist as desired and whether it reaches the work in that condition. "Inasmuch as the amount of water required will depend upon the dampness of the ingredients, the richness of the mix and the percentage of fine aggregate, it is not expedient to specify any exact quantity of water, and hence the burden is on the superintendent to see that the correct amount is used. Its three-fold purpose should be remembered, viz:

(1) To carry cement in suspension and hold it in contact with the surface it is to bind.

(2) To produce the proper fluidity of mass for best manipulation.

(3) To combine with the cement to bring about crystallization and adhesion.

"The success of concrete work depends upon how well these details have been carried out, to the end that maximum density shall have been achieved."[2]

The first of these conditions results from thorough mixing; the second is demonstrated by the slump test; and the third implies that the water, once mixed with the cement, shall be allowed the proper period of repose and none be permitted to be withdrawn by evaporation, suction or other means. Whereas the specifications permit the superintendent to demand two slump tests a day of the contractor, these are seldom needed except where immense quantities of concrete are being produced. An experienced inspector has learned to judge the output of the mixer by its color and consistency, and hence will not demand frequent tests. While work is under way, other tests[3] may be in order and should receive the attention of the superintendent. Inasmuch as testing during construction can serve no purpose other than to influence greater care in the making of concrete, such tests are not often used, final tests of actual slab construction serving the same end.

There are various methods in use for the regulation of water supply in the mixer, but one finds the "rule of thumb" method most in vogue. With an experienced man in charge, there is no particular objection to this,—but such a man is not always in charge, and hence mechanical regulation is preferable. For large operations, there are on the market mixing devices in which the water supply is regulated by the degree of moisture content in the aggregates as determined by their weights.

Not only is the density of the concrete to be considered in connection with the water ratio, but also the ultimate resistance of the finished product to the forces of disintegration. It is fairly well established that complete crystallization of all the cement in a mass is a very slow process, and hence the importance of keeping concrete moist during curing, as will be brought out more fully later. Concrete improperly hydrated will absorb free moisture to an extent that will cause it to swell. If it freezes in that condition, the swelling is dangerously increased. If it then thaws and later dries out, the mass contracts. As this process is repeated, hair cracks appear, absorbency becomes greater,—and disintegration may set in. But to such a degree as concrete is properly hydrated, to just that degree does it become impermeable to free water and less subject to expansion and contraction and to effects from alternate freezing and thawing.[4]

(5-a) *Concrete Mix to be Deposited Promptly Without Separation of Ingredients.* Concrete mixes are delivered to places of deposit by direct spouting from the mixer, or from a tower and spouting adjoining the mixer, or by wheeled vehicles (barrows, buggies or trucks), or by combinations of these devices. The essential is that the conveyance used shall carry the concrete to its final resting place in time to permit adequate tamping or agitating within the 30-minute limit specified:—

"PLACING. Concrete shall be conveyed to point of delivery in watertight carriers and deposited as nearly as possible in final position immediately after mixing. Re-tempering or unnecessary re-working of concrete will not be permitted, and any concrete placed or disturbed after 30 minutes from the time water has been added to the cement will be rejected and must be removed from the premises. Pouring shall be continuous from working joint to working joint. Each column shall be poured in a continuous operation. Overtime labor shall be provided for these purposes, without extra charge, where such continuity cannot be otherwise secured. If spouting is used, the plant shall be of such size (with spouting at such incline) as to

[1] The Portland Cement Association, in "Design and Control of Concrete Mixtures," publishes this table of:

Recommended Slumps for Concrete

Type of Structure	Slump in inches Minimum	Maximum
Massive sections, pavements and floors laid on the ground	1	4
Heavy walls, slabs, beams	3	7
Thin walls, columns, etc.	4	8

(One should note the considerable permissible variation in these slumps and bear in mind that few recommendations as to concrete have any great degree of permanency. The foregoing is from the "Second Edition" of the booklet, "Revised and Enlarged, January, 1927." Later issues may advise changes in these figures.)

[2] W. W. Beach in "Specifications for a Hospital." York & Sawyer, Architects, The Pencil Points Press, Inc., 1927.

[3] See "Specifications for Plain and Reinforced Concrete, Water-cement Ratio Method, A.I.A. File 4b." Bulletin of the Portland Cement Association.

[4] From a "Symposium on the Behavior of Concrete," American Society for Testing Materials, 1923.

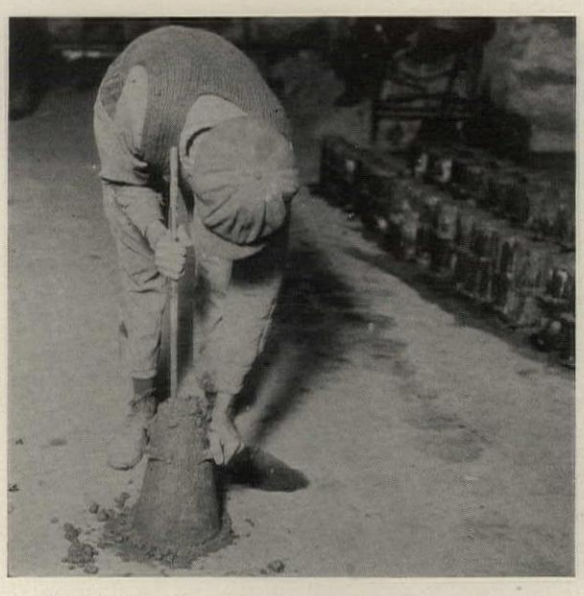


Fig. 11. Rodding the Concrete for Slump Test

Fig. 12. Measuring the Slump of the Concrete

secure a practically continuous flow during operation. Equipment shall be located as approved and shall be thoroughly cleaned after each run."

Separation of the ingredients is not likely to occur unless flowability has been induced by the addition of too much water in place of giving the spouting adequate incline. Such separation should be compensated for in the forms by the prompt addition of enough cement and sand to take up the surplus water. The mere fact of water coming in contact with unset concrete is not in itself harmful. The cement already in solution will not suffer, but it is most essential that it shall not be washed from the aggregate it is supposed to cover. Thus, concrete can be successfully deposited under water, provided that no current is permitted to pass against or through the mass and carry away any of the cementing element. This is effected by the use of special vessels (tremies) designed to dump the mix directly in its permanent position where it may be lightly tamped but not otherwise disturbed. Material so deposited should have a slightly excessive cement content to compensate for probable losses, and should be most accurately placed. It is not unusual for an entire job of the kind to be lost through some minor miscalculation.

(5-b) *The Newly Deposited Mix to be Adequately Agitated.* Whereas the density of concrete is dependent largely upon the proper grading of the ingredients, it is no less important that each atom, duly coated with liquid cement, shall rest in the closest possible juxtaposition to those surrounding it. As stipulated in the specifications:—

"DENSITY of all concrete shall be effected by thoroughly puddling, rodding, churning or otherwise agitating the wet mass to remove all air pockets and water holes and prevent honey combing of surfaces; but no concrete shall be agitated after the time limit specified."

This means elimination to the greatest possible degree of all air bubbles and water pockets, to avoid the possibility of there being cavities produced by evaporation. Agitation of the mix for this purpose is done by means of spading, rodding or churning the wet mix as soon as deposited, or by pressing an air hammer against the outside of the forms, or by tapping them with a hand hammer. "Honey combing" or pitting of surfaces is due to failure to surround the larger aggregates resting against the forms with fluid material,—strictly speaking, a defect in the agitation process. Except for mixes deposited under water and for dry mixes deposited on earth, the word "tamping" is no longer found in the best concrete specifications, since flowable mixes deposited in forms require tools other than the tamp. The initial set of Portland cement is assumed to begin about 30 minutes after it comes in contact with water; hence, under no circumstances, should it be disturbed in the slightest degree after that time. Contractors are likely to ignore this and have a way of asserting, with real confidence, that the "second set" of cement is as good as the first,—or practically so. There is no foundation for such belief, and hence the only safe course for the superintendent is to know that all cement is still fresh at the time of deposit and undisturbed after the 30-minute period. The custom in vogue by some mechanics of shoveling stale droppings back into the mix is to be deprecated. The saving attempted is not worth the chance being taken.

Habit is so strong with concrete workers that

it is sometimes found that gangs accustomed to paving and sidewalk work cannot be depended upon to follow specifications for reinforced construction. They persist in mixing too dry and in not sufficiently rodding the work, especially in deep forms. They are accustomed to following specifications which call for deposits in layers and tamped, which means rammed,—not rodded. Only recently have the better specifications ceased demanding that concrete in walls and similar masses shall be deposited in tamped layers from 8 to 12 inches thick. Such work is not monolithic, though that is the ideal condition at which we are aiming. When poured at considerable depth, therefore, as in column forms, the inspector must see that long, thin rods are vigorously used all around the reinforcing and other inserts and against the forms, but that such agitation shall not extend beyond the material just deposited. The same is true if compactness is sought by hammering the outside of the forms by hand or power hammers. The new, not the old, must be adequately attacked.

The dual importance of properly proportioning and mixing concrete and of correctly placing it implies, on work of any size, an omnipresence on the part of the inspector quite outside the sphere of human ability. One simply cannot watch the mixer and the place of deposit at the same time. This means that by the time the pouring is about to begin, the superintendent must have made up his mind as to the character of the contractor and his workmen,—whether or not they are to be counted upon to try to fulfill the specifications, or if attempted cheating is to be expected.

If in doubt, the architect should be notified and an opportunity given to have one or more additional inspectors assigned. The work of inspection starts well ahead of the pouring, as is evidenced by this specification paragraph:

"SUPERVISION. Before starting any pouring, the Superintendent shall be notified and given opportunity to inspect all surfaces which are to be covered and all members intended to be embedded. The Contractor shall also have a capable man (more, if needed), who shall watch the forms just ahead of pouring, see that all reinforcement and other built-in members are rigidly supported in proper position; all tags, chips and other refuse removed; all needed sleeves placed; all pipe and conduit ends plugged and all surfaces ready for the concrete. He shall strengthen all form supports as needed to prevent deflection or spreading.

"CLEANING FORMS. No concrete may be poured until all rubbish has been removed from the forms and they have been brushed clean and drenched just ahead of pouring (except in freezing weather) and the rubbish holes at bottoms of forms properly closed."

Thus are the duties of inspection at this juncture set forth in the specifications, with but one exception, which is treated of in the next section.

(5-d) *New Concrete to be Properly Bonded to Previous Work.* This is also covered in the specifications quite fully:

"CONSTRUCTION JOINTS. Each run of concrete shall be carried vigorously to completion. All temporary joints in walls or floors shall be at right angles to the run of work. Where reinforced floor work is stopped before an entire area is finished, joints shall be made in beams, joists and slabs under uniform load near middle of span. Where beams receive concentrated loads from connecting beams, the construction joint shall be located not less than twice the width of connecting beams from supporting beams. Beams having loads derived from a single connecting member shall have no construction joints. A 12-hour interval shall be allowed between the pouring of columns and that of beams and slabs. Construction joints in walls and piers shall be horizontal or vertical in all cases and shall not occur within 12 inches of a concentrated bearing. Dowels shall be constructed in all horizontal joints and continuous tongues in all vertical joints."

Then, under "Pouring",—

"UNFINISHED CONCRETE, against which new concrete is to be poured, shall first have the dowels removed, then be drenched and treated with thin grout or approved bonding cement."

It is customary to pour footings before wall forms are built, as a matter of convenience, whether or not they are of same ratios, and regardless of whether either is reinforced. Applying the paragraph on "Construction Joints" to those between footings and the superimposed walls, it is apparently necessary to lay dowels in the upper surface of the footing. For this purpose, it is customary to use vitrified brick or pieces of stone of about the same size or larger, laid half their depth in the wet flux at intervals of about 3 feet; or blocks of beveled plank, 2 x 6 x 18 to 30 inches, are pressed into the surface, to be removed when work is resumed. But, if a dampproofing layer is called for on top of the footings, as in the work of which we are writing, it is necessary that the dowel shall form a continuous beveled edge trench (as shown in Fig. 8), and hence planks must be prepared and laid in, to produce such a trench. Similar planks are set vertically in forms to make the tongues continuous.

It is obvious that the natural roughness of the aggregate in an unfinished surface is of assistance to the bonding of the new material laid against it, and yet the time such a surface may stand before being considered "old" and not amenable to bonding is not well established. There is no apparent reason for this other than that it is customary to continue a day's work anywhere that is found convenient on the job, regardless of the time when

the last concrete was poured in that locality. This is careless procedure, since it is evident that any concrete that has been quiescent for 30 minutes has taken its initial set and should not be disturbed or, if it has been in place for two or three hours, it will not readily amalgamate with new material. Therefore, the experienced superintendent will size up a day's work in advance and will see that each section poured is either complete in itself or is "bulkheaded off" with the construction joint members called for, so that they will be there when needed, regardless of whether the time lapse is one hour or 24. Workmen or their foreman, unless such procedure is insisted upon, will not ordinarily start setting construction joint members until the middle of the afternoon, apparently assuming that any concrete surface is "new" during the day on which it is poured. To this cause are to be attributed many "weepy" walls which, even though waterproofed, will transmit water along the lines of structural joinings.

(5-e) *Concrete to be Deposited Only Against Surfaces in Proper Condition to Receive it.* Not only must all surfaces of previous pourings be known to be in fit condition, but *all* surfaces of every character that the mixture will reach, including everything that is to be built in, must be inspected and passed upon. This is reiteration of the duties of inspection described in the preceding chapter, to which reference should be made. A good superintendent will, as soon as he finds the right man in the builder's crew, train him to inspect the work just ahead of pouring, as required by the specifications, and he must be able to depend upon him for such assistance. Once started right, a good concrete gang will coöperate with an apt superintendent; but, improperly managed, they may prove extremely difficult.

(5-f) *Concrete to be Properly Protected Until the Final Set is Complete.* The specifications on this subject read:

"PROTECTION. Concrete poured in warm weather shall be kept thoroughly wet after initial set and for 7 to 10 days or more thereafter dependent upon outside temperature. For all concreting carried on during freezing weather, such special precautions shall be taken as will obviate all danger of injury by frost. Only boiling water and heated aggregates shall be used. Frost shall be drawn from all surfaces with which fresh laid concrete is to come in contact, by blowing with live steam or drenching with boiling water, or both. An adequate enclosure, heated by continually fired salamanders, shall be maintained for the protection of work after pouring, and same shall also be covered, while fresh, with sand or straw and tarpaulins. No concrete may be poured, except by special permission, on days when the temperature at 9 a. m. is less than 25° above zero, Fahr."

The guarding of green concrete from dangers of undue heat or cold is of the utmost importance. Covering and moistening are correct preventives against the former, are easily attended to, and should be insisted upon as essential to proper curing. But protection against cold is much less simple, though no less necessary. "A. I. A. File 4c4" of the Portland Cement Association gives "Specifications for Making, Placing and Curing Concrete in Cold Weather" and also describes "Cold Weather Protection for Reinforced Concrete Works," particularly stressing the latter. These specifications are preceded by this warning: "Adequate protection of concrete against damage by frost during the making and early curing period is *absolutely essential* whenever temperatures below 40° Fahr. are likely to occur within that period. The use of a *definite and complete specification* governing such protection *is imperative* if real assurance of an undamaged and completely satisfactory structure is to be obtained." From a perusal of these specifications and directions, it can be readily understood that the carrying on of concrete operations in freezing weather is not a project to be lightly undertaken, —is not warranted, except in cases of extreme emergency and when the contractor is fully equipped for proper procedure. It is to be noted that the Portland Cement Association, in this publication, says that "the use of salts, chemicals or other foreign materials in the mix to lower the freezing point of the concrete is prohibited," but that "within certain limitations, calcium chloride or calcium oxychloride may be used in Portland cement mixtures to hasten hardening and to increase early strengths." But this whole subject of cold weather concreting is one for the attention of a superintendent of experience. He must needs be well versed in the specifications and protection methods described and have a working knowledge of their practical application. The less experienced inspector should have recourse to the paper just quoted and other authorities on the subject,—then wait for better weather, if possible to do so. If work must proceed, regardless of weather, he should see that *all* recommended precautions are taken, as no one can afford taking the chance of a failure of concrete construction.

Recapitulating, our superintendent on the schoolhouse project arranged to be notified just before the first concrete was deposited in the footing trenches in the southeast corner. He inspected the bottom, had some earth droppings removed, and ordered some loose earth above to be shoveled back, to prevent further droppings. He had previously made his final check of dimensions and approved them, after slight corrections. The mix for footings was specified to be 1:2½:5, with a 2-inch maximum aggregate, while that for base-

ment walls was to be 1:2:4, with a 1-inch maximum. Owing to this difference (and for general convenience), the contractor had two mixers on the job, one of fair size in connection with his stationary concrete plant, and a smaller portable mixer which he proposed using for the footings, for mortar and for other minor work. Thus, the concreting was started on the morning of Monday, April 23, just two weeks from the day ground was broken,—and they were still two days ahead of their schedule. Thereafter, for many days, the chief task of the superintendent was in watching the concreting, the formwork and the placing of reinforcement and other built-in members. The experienced inspector, knowing what factors to watch in the manufacture of his concrete, gives them his closest attention. Other materials are brought on the job ready-made, but, during the making of concrete, his building is transformed into a factory, the output of which is its own structural framework or some of its most essential parts. The ease with which some of the vital members of the building may prove defective is indicated by an extract from the report of a committee of the Detroit Engineering Society dated November 2, 1925:

"The character of structural concrete now being obtained in this city is a matter which is causing grave concern to all who are thoroughly informed regarding local conditions.

"Tests made from a number of the large local construction projects have indicated that concrete, as being produced, is, in general, very deficient in strength as compared with its strength assumed in the design calculations."

There is no good reason to suppose that conditions in Detroit were very different from those prevailing elsewhere in the country, or that they have since improved to the extent they should.

"Various reports and papers classify the causes of defective concrete and of failures. They are:

1. Poor cement.
2. Defective aggregate.
   (a) Stone not durable (as used in the Nashville bridge).
   (b) Aggregate not clean.
   (c) Presence of too much clay or organic matter.
3. Impure water.
4. Improper mixture.
   (a) Poor grading of aggregates.
   (b) Excess of water.
   (c) Insufficient mixing.
5. Poor workmanship.
   (a) Segregation.
   (b) Inaccuracy in proportioning and in controlling the quantity of water.
   (c) Carelessness in placing.
6. Improper curing.
7. Insufficient protection or heating in cold weather.
8. Removing forms too soon.
9. Poor design.
10. Shrinkage and expansion after set.
11. Corrosion of the metal.
12. Localized abnormal changes of temperature.
13. Action of alkalies or sea water, or trade wastes or sewage or atmospheric fumes.

This is a long list, and there may be other causes."[1]

Another writer on the subject[2] says that the reasons for poor concrete have been thus proportioned: "90 per cent from poor workmanship; 8 per cent from using poor aggregates; 2 per cent from using poor cement." He says that fine aggregates need very careful examination, and cites a case where concrete gave trouble because use was made of water from a stream affected by a factory using chemicals; another where disintegrating stone in a dirty car became mixed with broken stone otherwise all right; another where sand, otherwise usable, contained many grains injuriously coated. Verily, when dealing with concrete, no superintendent can be too alert.

[1] From "Steel for Strength and Security," by George F. Swain, Professor of Civil Engineering, Harvard University.

[2] R. S. Greenman, American Society for Testing Materials, 1914.

CHAPTER 10

THE SUPERVISION OF CONSTRUCTION OPERATIONS

CONCRETE REINFORCEMENTS AND OTHER BUILT-IN MEMBERS

AMONG the first materials to arrive at the school site were the steel bars intended to be used as concrete reinforcement. Since it is not possible for a superintendent to determine by inspection whether such bars are of the quality specified, the architect must be satisfied in this respect with what is supplied or must have recourse to laboratory tests or their equivalent; or, still another alternative, may specify a proprietary brand or brands of bars which he prefers.

Inasmuch as the variation in the quality of reinforcing bars on the market is not great, it is more economical for the designer to base his calculations on the poorest grade of material the market offers, using a commensurate factor of safety. On minor work, such procedure is probably warranted, rather than to subject the owner to the expense of employing an accredited testing laboratory. But on work of any importance, especially on public work such as the school build-

ing we have under consideration, it is common practice in the better offices to specify that such materials shall be tested. Such specifications may call for "new billet stock of structural grade" or "either re-rolled rail or new billet stock," in "rounds or squares" or "deformed bars of approved design and make," all to be "of full length required and accurately bent to details and meeting all requirements of the latest standard specifications for such materials as issued by the American Society for Testing Materials and subject to test (at Owner's expense) by a standard testing laboratory as directed by the Architect." Our school building specification further provided for use of a steel wire fabric of definite description in certain locations, and stipulated generally that "all reinforcing materials and inserts shall be free from paint, oil, dirt, scale or excessive rust." There were also the customary provisions as to the submission and approval of shop drawings, and a specification for placing reinforcement which stipulated, among other things, that it must "be correctly placed, rigidly wired together at each intersection with No. 18-gauge annealed wire, and carefully maintained in exact position and clearance, horizontally and vertically."

Operating under these specifications, the superintendent permitted the unloading and sorting of bars in the space allotted, pending receipt of advice regarding samples sent to the testing laboratory. The following day, he and the foreman received copies of schedules and bending diagrams, and men were at once set to work cutting and bending the members first needed. Bars are purchased by builders, either in accordance with diagrams and lists or in bulk quantities, to be formed on the site. Where bars are of simple shape and do not exceed 1 inch in diameter, there is supposed to be economy in the latter procedure. In either case, the superintendent must carefully check all sizes, shapes and quantities and see that the bars are properly sorted and stored under the direction of a man of sufficient intelligence and authority to prevent improper withdrawal at time of usage. In a location remote from a base of supplies, such as the site of the work we are discussing, the incorrect placing of any structural member in finished work implies a like misplacement of another and may be the cause of much annoyance and delay. This is to be particularly avoided in the case of reinforcement because of the crowding of concrete pourers on the heels of those placing the steel.

The first bars placed were in certain footings where they were supported up from the ground on small concrete blocks prepared for the purpose. The practice of using pieces of stone for this, or that of laying the bars on the ground and permitting the tampers to lift them slightly when concrete is poured is not sanctioned by good usage. Broken stones or pebbles tip easily, and hence are undependable for the purpose; nor should the bars rest upon the tops of small stakes as is sometimes done. Use of chairs, such as are commonly used in form work, is not practicable on soft earth, therefore the recourse to use of blocks of some sort. Bats of hard-burned common brick are permissible as chairs in footings, but in this case the superintendent had recently rejected the local brick, so he cautioned the foreman to have the pieces of concrete cast and in readiness, fearing possible delay in the receipt of better brick.

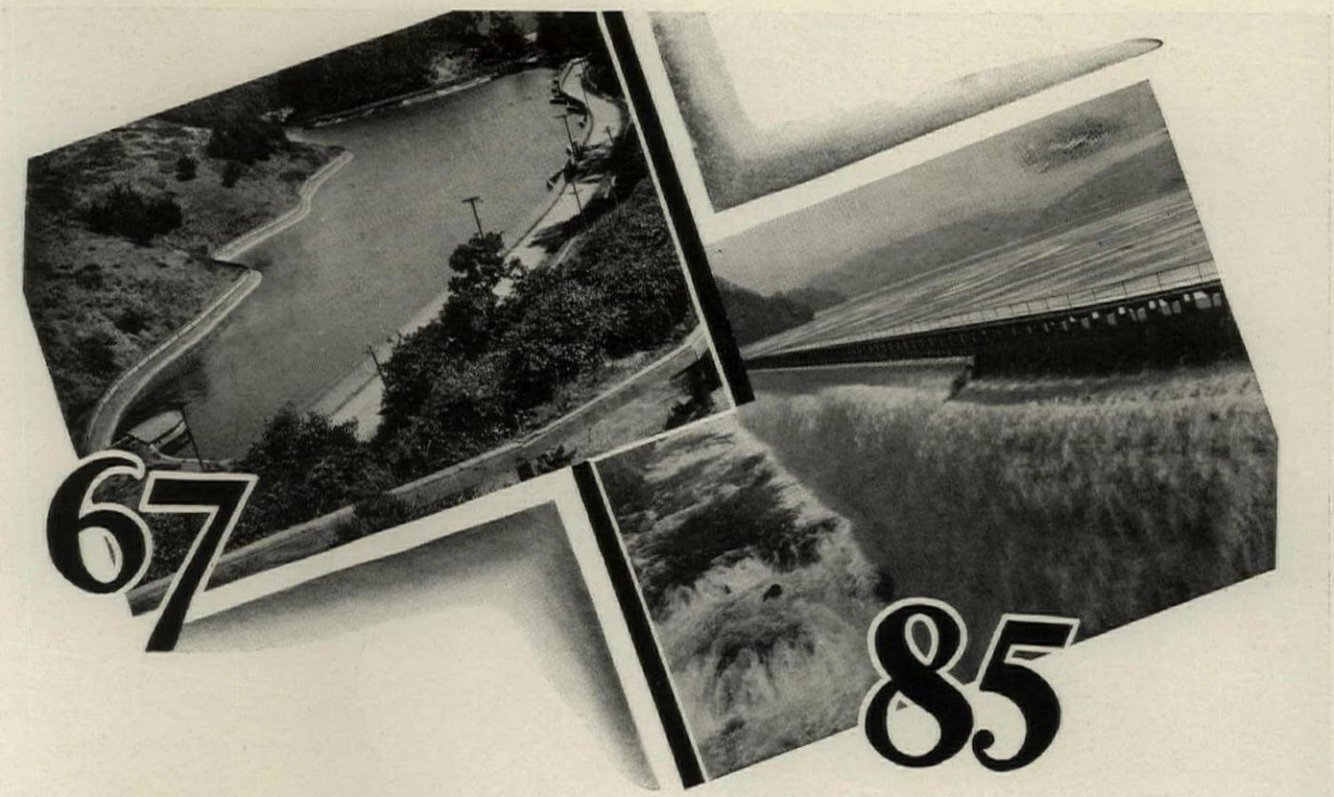
Since the design of reinforced concrete footings is based upon the location of tension members in certain relation to the encasing slab, it is incumbent upon the superintendent to see that such relationship is adhered to reasonably well. This, of course, applies throughout all reinforced work, but one finds workmen less careful with footings than when dealing with relatively smaller members. An instance of this is the case of an octagonal spread-footing, 18 feet in diameter, with 4-way reinforcement. A drawing of a section through the footing showed the first tier of bars 2 inches up from the bottom, and the others at successive intervals of 1½ inches above, making a total of 4½ inches between the centers of the first and top tiers. The architect witnessed the laying of the lower tier, then went to another part of the work. Returning a half hour later, he found that the tiers had been placed 6 inches apart, and hence the upper layer was close to the top of the 2-foot-thick slab. The foreman had failed to consult his drawings. When the concrete was promptly ordered out, he appealed to the contractor who, though a man of much experience and good repute, backed up his employe and made an issue of the matter. The work was on a cost-plus basis and, the architect standing by his decision, the owner decided in his own mind that he and the contractor were abused and stood the expense of making the correction. The architect didn't learn, until the owner employed someone else for his next project, that the contractor's contention that the architect was overly particular in matters of minor import caused the owner to believe that this was a foible that tended to make work emanating from his office unduly expensive. Of such slender threads is an architect's standing fabricated! Not only must he, as a superintendent, be most meticulous in discerning use of incorrect materials and placements, but he must anticipate such improprieties, catch them at their inception, if possible, in order to save time, expense and avoidable argument!

It is not unusual for a contractor to complain that an architect's supervision is too intermittent,—that it is not fair to the owner or builder to demand removal of materials, no matter how inferior or badly placed, discovered several days after installation. There is a certain degree of justice in this claim, and hence it is important that an architect, at the time of his employment, should make the point clear to the owner, explaining just what is to be expected as to number and frequency of visits under the terms of the contract; and that too extended intervals between inspections do not enable one to either check up the dishonest contractor or offer adequate assistance to one who is striving to do his best. The architect should urge upon the owner the need of the constant attention of a clerk-of-the-works at certain times during construction or under certain conditions that may be encountered on any construction work, and should reserve the privilege of assigning one (at the expense of the owner) at any time he thinks it advisable to so protect the owner's interests. Some architects, in order to avoid the waste of perfunctory visits at stated intervals, especially on out of town work of lesser importance, arrange their remuneration for supervision on a per-trip or per-diem basis. Then, if the work goes smoothly, the owner is spared all expense of unnecessary supervision.

In connection with the inspection of placement of reinforcing materials, too much stress cannot be laid upon the importance of knowing that every piece is in the exact location intended before pouring begins. Heavy rods are awkward members to handle, and slight inaccuracies in bending will tend to throw them well out of position. Chairs are easily neglected or displaced, wiring carelessly done and not always with the right kind of wire. A bar more than an inch out of place may not be subjected to the stresses computed for it or it may not receive the proper amount of protective covering. No doubt many expensive failures could have been traced to carelessness in such particulars. When one is supervising building a factory . . . engaged in the manufacture of artificial stone in monolithic form, one cannot well afford to permit the slightest detail of production operations to be slighted, but must bear in mind that the "personal equation" of each operative is bound to be reflected in the finished product.

Perhaps too little emphasis is ordinarily given to the considerable difference between supervising an ordinary lump-sum contract and one that is let on a cost-plus basis. In the case of the former, the inspector is concerned only in seeing that the owner gets what he is paying for, but with a cost-plus operation it is necessary also to know that the work is being economically handled as well as being honestly accounted for. Economical handling implies that each employe be suited to his task and produces as nearly to maximum capacity as can reasonably be expected. That there is much waste of labor in building is beyond question, some of it beyond prevention. In this, as in almost everything connected with construction procedure, all depends upon the foreman. And the greatest of labor waste can be found in slipshod concrete operations. An example of this was displayed by a gang of six men engaged with a mixer of small capacity. Two were wheeling the sand and gravel, two were wheeling the flux (four barrows to each charging), the "straw boss" was handling the cement and operating the mixer, and a college youth in rubber boots was agitating the flux in the forms. Having his eyes open, the latter suggested a change which was put into effect, whereby each charge was contained in two full barrow-loads, thus promptly releasing the mixer for recharging and speeding it up 100 per cent. Then the young man undertook to wheel and empty both barrows and do the small amount of necessary tamping as well, and releasing the two loafers who had been lazily wheeling half-full barrows. By the efficiency thus effected, the labor cost was reduced by one-third and the product doubled, turning it out at exactly 33 1-3 per cent of what it had been costing. This is an extreme case but an actual instance, and serves to show the need of watching labor action when one is paid to safeguard the owner's interest in it.

In addition to inspection of reinforcement placing, the superintendent must concern himself with each of the various members that should be in its correct position and there effectually secured before concrete is poured. He must be advised regarding all trades that will want to install members in or through concrete, ascertain that they have been duly notified, and see that such items are in place or that sleeves or boxes have been set to provide necessary holes for later installation and anchorage. Specification requirements as to who shall provide such sleeves and boxes and who shall place them vary in different offices, but they must, in any case, be most definite, or confusion and protest will result. Some architects stipulate that the concrete (or general) contractor shall provide all needed sleeves and boxes for such purposes and that the contractor for each interested trade shall "direct the placement" of all that are demanded for his work. Others say that each trade shall provide and install its own sleeves or shall provide the sleeves and oversee their placing in the forms. This last is probably the best practice, though the chief requisite is that there shall be no doubt or foundation for argument as to who is to do which.



It's the WATER SUPPLY that *writes the Specifications*

DEPENDING on their sources and the treatment they undergo, waters vary greatly in their effect on plumbing pipes. Some waters are but normally corrosive while other waters — even those which are purest for drinking — are *highly* corrosive, and very destructive to pipe.

In writing water pipe specifications, therefore, the character of the local water supply should be carefully considered. Brass pipe will outlast rustable pipe under *all* water conditions, but not all alloys of brass will give the same satisfactory service everywhere.

To meet all different water conditions, The American Brass Company offers *two* alloys of Anaconda Brass Pipe.

For normally corrosive waters — Anaconda 67 Brass Pipe. This pipe contains not less than 67% copper. It is guaranteed to be structurally sound and physically perfect. It is semi-annealed and seamless.

For highly corrosive waters—Anaconda 85 Red-Brass Pipe. This pipe contains not less than 85% copper, and is offered as the best corrosion-resisting pipe obtainable. It, too, is fully guaranteed.

Proved by 16 years of testing!

These two alloys will serve all water conditions. This has been proven in 16 years of exhaustive research—when various alloys of brass pipe were tested, to determine which alloys would best resist various degrees of corrosion. The laboratory tests were then checked with tests of actual use—and Anaconda 67 Brass Pipe and 85 Red-Brass Pipe is the result.

An important service to architects

Today, the Technical Department of The American Brass Company is prepared to help determine the character of the local water supply and recommend the best alloy of pipe for use under specific conditions. You are cordially invited to communicate with The American Brass Company, General Offices, Waterbury, Conn.

ANACONDA BRASS PIPE

FOR HOT AND COLD WATER LINES

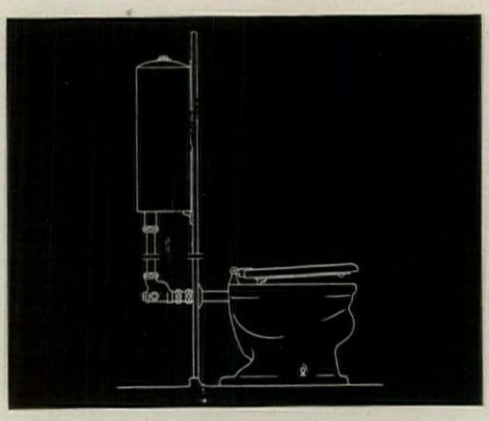
HAS BUT ONE DUTY...
and that it can't forget

Unflushed closets are an ever-present danger that can cause sickness, disease, and even worse.

And children *do* forget—sometimes grown-ups.

To guard health with a complete flush each time—is the one duty of Clow Madden Automatics. That they can't forget. They operate automatically.

Surely, swiftly, high pressure water scours the bowl from top through trap. All residue is whisked away—



RECORD NO. 103
After 14 years' service in a Buffalo Center, Iowa, school, 28 Clow Madden Automatics looked "good as new" and were re-installed in the new school building.

for Clow Madden bowls are free from those hollows that make ports of safety for germs.

Less than half the usual water consumption. A tiny fraction of the usual for repairs—years and years longer service — that's Clow Madden Automatic. Records on countless closets prove it.

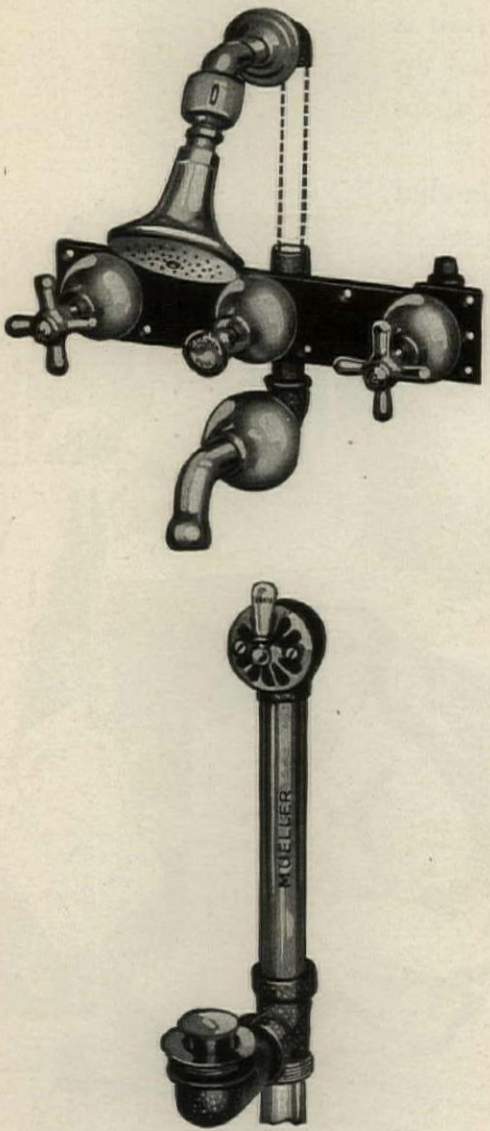
This fixture is only one of the complete line of James B. Clow & Sons—established over half a century.

JAMES B. CLOW & SONS, 201-299 N. TALMAN AVE., CHICAGO

CLOW MADDEN AUTOMATIC

Forty-Eight Styles, Heights and Types to Meet Your Requirements

"Or equal"



"OR equal" is a dangerous thing to write into specifications. What goes into a building determines the kind of service it will give to its owner. An architect's reputation depends upon year-after-year satisfaction as well as upon good design. Be sure of your specifications.

For nearly three-quarters of a century architects have specified Mueller Bronze Faucets and Fittings. Not because of sentiment. Not because of price. But because they *know* that Mueller Fittings will give dependable service *for the life of their buildings*.

MUELLER CO. (Established 1857), Decatur, Illinois; *Branches:* New York, 135th St. and Walnut Ave., Bronx; Dallas, San Francisco, Los Angeles; *Canadian Factory:* MUELLER, Limited, Sarnia.

MUELLER G-4760 (illustrated)

The Mueller Automatic Diverter for Tub and Shower meets the popular demand for bathroom luxury. It is impossible to get an unexpected shower from this fitting because, after side or control valves have been shut off, the Automatic Diverter Valve directs the flow to the tub when the water is again turned on. Desirable for hotel and apartment installations. Furnished complete with pop-up drain for bath.

MUELLER

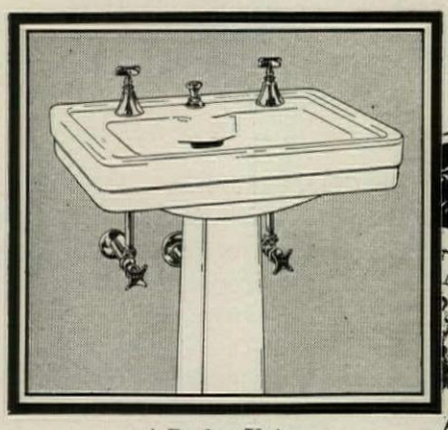
PLUMBING BRONZE AND VITREOUS WARE

"*Any* Slab will fit. This is *Kohler Ware*"

WHEN Kohler Vitreous China is specified the plumbing contractor can pick any lavatory slab and *know* that it will fit any leg or pedestal. Slabs and pedestals never have to be kept together in pairs. No time is wasted hunting up missing partners.

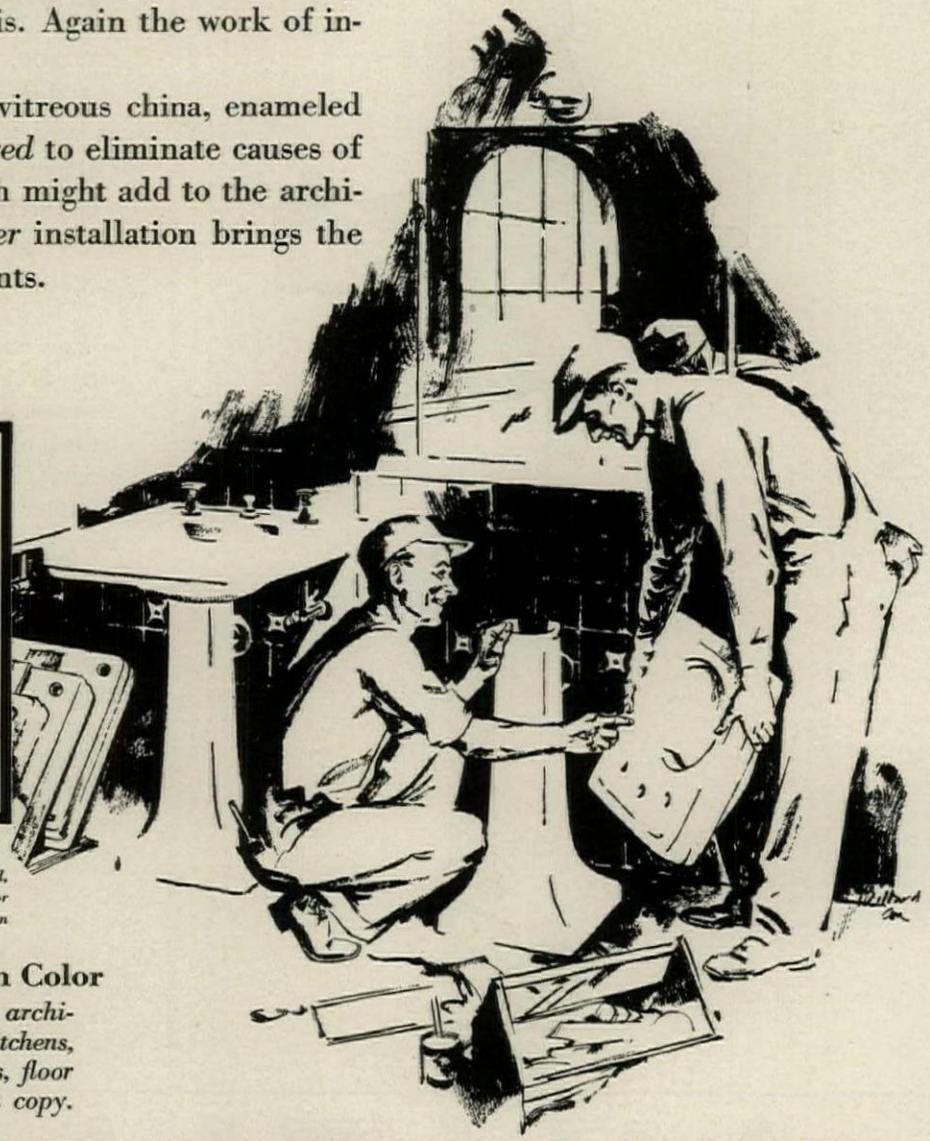
In the Kohler Pottery, one of the largest and most modern in the world, many such improvements have been introduced. For instance, every lavatory slab is prepared at the factory so that it may be leveled up without using plaster of paris. Again the work of installation is expedited.

The whole Kohler line—vitreous china, enameled ware, and brass—is *engineered* to eliminate causes of delay and complication which might add to the architect's burdens. An *all-Kohler* installation brings the full benefit of these betterments.



A Perfect Union

In addition to being interchangeable and easily leveled, Kohler lavatory slabs are designed to blend with the leg or pedestal, making an inconspicuous joint—a perfect union



New 72-Page Book in Color

A helpful book for the architect. Shows bathrooms, kitchens, laundries, color schemes, floor plans, etc. Write for a copy.

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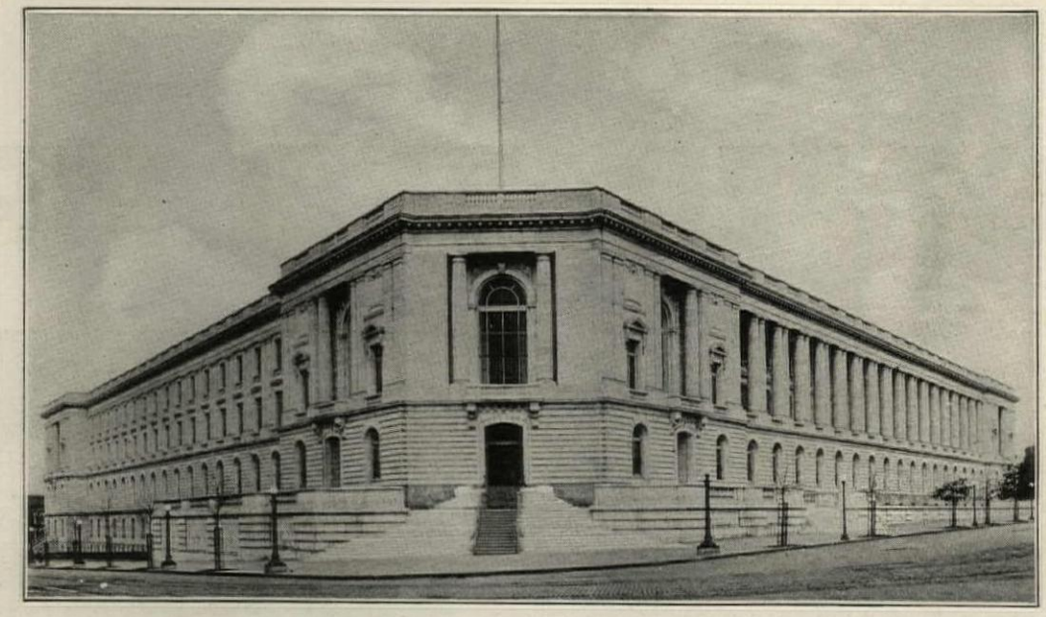
PLUMBING FIXTURES

LOOK FOR THE KOHLER TRADE MARK ON EACH FIXTURE

MEETING ARCHITECTURAL STANDARDS OF QUALITY

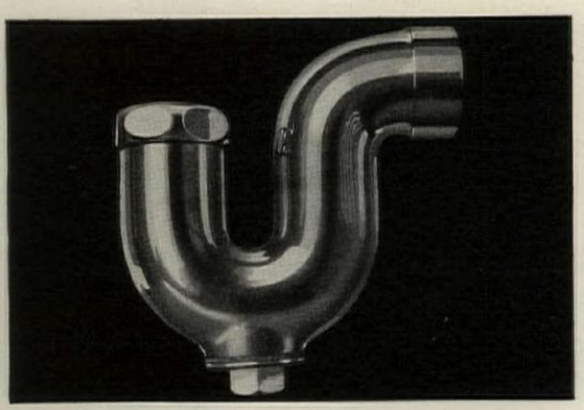


Office building of U. S. Senate, Washington, D. C. with Solid Nickel Silver plumbing fixtures by The Meyer-Sniffen Co.*

24 YEARS IN SERVICE—STILL IN EXCELLENT CONDITION

SOLID NICKEL SILVER* PLUMBING FIXTURES BY MEYER-SNIFFEN

A recent inspection of the Solid Nickel Silver plumbing fixtures installed in 1905 in the U. S. Senate office building disclosed that they are still in excellent condition. This 24-year service record is proof of the permanent attractiveness and unusual durability of fittings of this material. Since they are comparable in both beauty and physical properties to Pure Nickel and high alloys of Nickel, Solid Nickel Silver fixtures retain their lustre during long years of hard use. They are corrosion-resisting and easily kept clean. With hardness, toughness and strength similar to tough bronze, Nickel Silver provides increased wear-resistance in valve seats and produces fixtures not easily marred in installation or use. For quality installations which must meet highest architectural standards, Nickel Silver is the most satisfactory material now available.



Diamond Metal waste trap. Manufactured by The Meyer-Sniffen Co., New York, N. Y.*

18% 22 Nickel SILVER

*Diamond Metal is the name used by The Meyer-Sniffen Co. to identify its Nickel alloy used in manufacturing Nickel Silver plumbing fixtures. This is a solid white metal and contains a high percentage of Nickel.

THE EAGLESVILLE SANATORIUM, EAGLESVILLE, PA.

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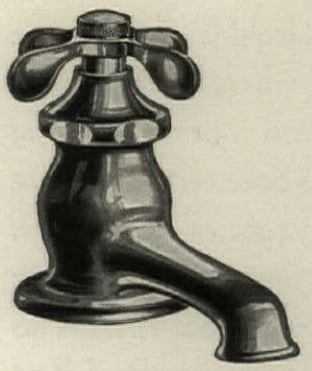
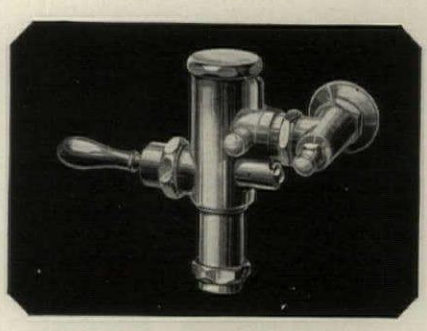
Another Fine Building Equipped With



DOUGLAS Solid Nickel Silver Self-closing Faucet with drop ear indexed handles.



DOUGLAS Solid Nickel Silver Flush Valve—outstanding for its mechanical construction, quality of materials and enduring finish.

DOUGLAS

PLUMBING FIXTURES

and Solid Nickel Silver Trimmings

Douglas China Plumbing Fixtures trimmed with Solid Nickel Silver are noted for their enduring beauty, uniformly high quality, and absolute dependability. They resist the corrosive action of acids—will not chip, craze or discolor—easy to clean and keep clean. That is why they were specified by Simon & Simon, for the new Eaglesville Sanatorium—why they are used in many of the country's finest buildings—hospitals, hotels, schools, office buildings, industrial plants and residences.

Douglas Solid Nickel Silver, used in Douglas finer trimmings, is a hard nickel alloy, tough as bronze, and nickel color, through and through. Never rusts.

SOLID 18% 22 Nickel SILVER

There is no plating to chip or wear off. It is easily cleaned. The rich, silvery lustre is permanent. Due to its toughness, valve seats are highly wear resistant.

For more than forty years, we have specialized in the manufacture of high grade plumbing fixtures and fittings. If you haven't a copy of our catalog, write now!

THE JOHN DOUGLAS CO. Cincinnati, Ohio

MAKERS OF HIGH GRADE PLUMBING FIXTURES SINCE 1887

Never, Never, Never Again Will These Hands Be Needed!

This pipe begins a job lasting for generations. Probably never, never again will the costly hands of a workman be needed to repair or replace it. For this is Reading 5-Point Pipe—the pipe that outlasts the building.

The reason for this remarkable endurance! Reading 5-Point Pipe is Genuine Puddled Wrought Iron! It is born in the puddling furnace, where fire and force mingle the pure iron with rust-defying silicious slag. It has been tested by more than four-score years of actual use. That is why you get proved savings with Reading 5-Point Pipe. There is no substitute for Genuine Puddled Wrought Iron.

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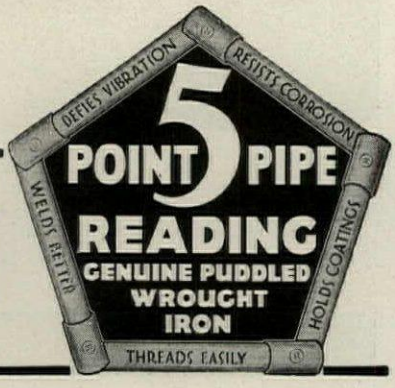
GENUINE PUDDLED WROUGHT IRON
READING PIPE
DIAMETERS RANGING FROM ⅛ TO 20 INCHES



What women DON'T *talk about ...*

CALL it natural delicacy. Or convention. Or habit. The fact remains that the subject is seldom discussed — even among women.

Yet oddly enough almost any woman — if she were utterly frank — would tell you that the matter is to her of considerable concern; would undoubtedly urge you to make provision for it.

The plain facts are these: The average toilet being made today — even those of high quality — is unable to pass the sanitary pad with certainty. It has a trapway no larger than a golf ball. Stoppage — embarrassment — expense are common.

The Improved Madera was *designed to pass sanitary pads without fail.* It has a very large trapway. Flushing is powerful — yet quiet.

In every detail the Improved Madera is as fine a toilet as can be built. Nothing whatever can stain its glassy-hard vitreous china surface. It stays spotlessly clean merely by wiping with a cloth. It has a very long, comfortable seat. Entire surface beneath seat is covered with water. It is exceptionally quiet. And every fitting is the very best that money can buy. It is a toilet that will function quietly and efficiently for a lifetime — often without a single repair.

It merits your serious consideration.

THOS. MADDOCK'S SONS POTTERY
Division of Standard Sanitary Mfg. Co.
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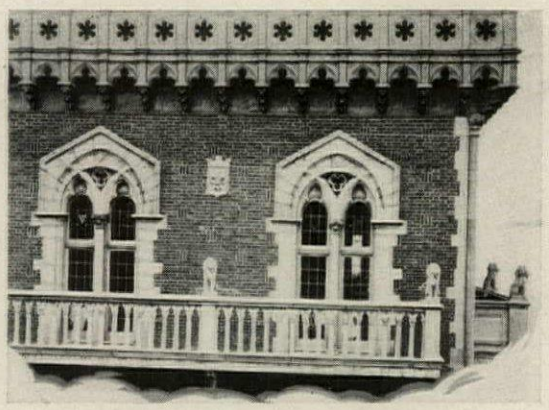
You can identify the ARMCO Ingot Iron Shop by this sign. It stands for good workmanship, as well as for enduring metal.

ARMCO INGOT-IRON
— SHOP —
"Quality Work with Quality Iron"

Put your sheet metal work *in able hands*



When Architect F. P. Barnett Company designed the exterior sheet metal details of the City Club, St. Louis, he had an Ingot Iron Shop in mind for its execution—The Wand & Niehaus Sheet Metal Company, of that city. The elaborate ARMCO Ingot Iron cornice shown above testifies to the capable and artistic craftsmanship of these "quality workers with quality iron."

WHEN you place the contract for sheet metal work with an Ingot Iron Shop, you may be certain it's in able hands. For the creed of their organization defines every job as an opportunity for service and increased good will for their industry.

These shops are willing to stake their reputation and good will on rust-resisting ARMCO Ingot Iron for your sheet metal work because their experience has shown that it makes possible the kind of service and workmanship you want.

Among the seven thousand Ingot Iron Shops scattered throughout the country there is one or more near you. They will be glad to work with you in producing the kind and quality of sheet metal construction you want. Just look for the blue and white triangled sign shown above.

THE AMERICAN ROLLING MILL COMPANY

Executive Offices, Middletown, Ohio

Export: The ARMCO International Corporation **Cable Address: ARMCO, Middletown (O)**

DISTRICT OFFICES — CHICAGO — CINCINNATI CLEVELAND — DETROIT NEW YORK — PHILADELPHIA PITTSBURGH — ST. LOUIS SAN FRANCISCO

ARMCO INGOT IRON RESISTS RUST

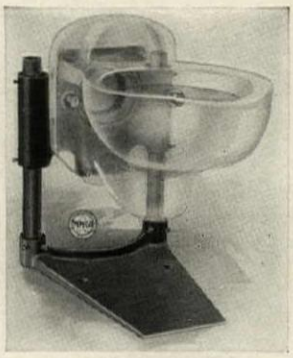
LEGION *of* HONOR BUILDING, San Francisco, Cal.

GEO. APPLEGARTH, *Architect* GEO. H. TAY CO., *Supplies* WM. F. WILSON CO., *Plumbers*

Equipped with
TE-PE-CO Wall Hung Closets

THE term "wall hung" as applied to the Te-pe-co line is used as a matter of convenience only. The Te-pe-co Carrier, upon which our wall closets are supported, actually depends not one whit upon the wall for support. It bears the weight of the closet and applied load *independent of the walls or connection to the soil.* Your brief examination of the illustrations will cause your immediate appreciation of this statement.

So today the merits of the wall hung closet, which are very apparent and long since recognized, may now be safely employed by architects and engineers who, before the perfecting of this Te-pe-co Product, felt the means of support unsatisfactory.



Phantom view, showing how Te-pe-co Wall Hung Closets are supported.

The Trenton Potteries Company, Trenton, New Jersey, U.S.A.

National Showroom—New York City
101 Park Avenue, Entrance on 41st Street

Branch Offices
Boston, Philadelphia, Chicago

Export Office—115 Broad Street, New York City

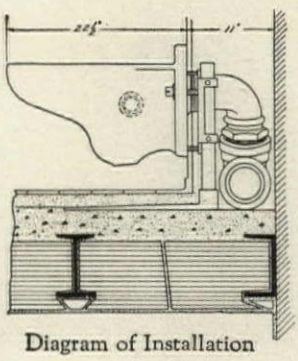


Diagram of Installation

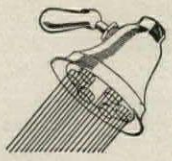
Should your files not contain a copy of our Book on Te-pe-co Wall Closets, by all means write us. This product is but one example of the intelligent study and development into practical form of the latest thoughts in plumbing sanitation.

Our Guarantee: We make but one grade of ware—the best that can be produced—and sell it at reasonable prices. We sell no seconds or culls. Our ware is guaranteed to be equal in quality and durability to any sanitary ware made in the world. The Te-pe-co trade mark is found on all goods manufactured by us and is your guarantee that you have received that for which you have paid.

K-3395 Patent applied for

This new shower head
IS REVISING ALL CONCEPTIONS
of what a shower can be

A turn of the lever sluices all sediment away.



Another turn of the lever gives a normal spray.

Or you can adjust to a veritable stinging needle shower.

Because this amazingly ingenious new Speakman Shower sluices out every trace of clogging sediment from the water apertures with a twist of a handle . . .

Because it gives, with slight movements of this same handle, any sort of shower desired —mild, normal, stinging needle spray . . .

Because it will last a lifetime, and never get out of order or need attention . . .

Because it is brilliantly finished in tarnish-proof Speakman chromium plate, giving sparkle and color to the bathroom . . .

Because of all its unquestioned superiorities, architects everywhere are specifying the new Speakman Self-Cleaning Anystream Shower with an enthusiasm seldom shown for any new product. Speakman Company, Wilmington, Del.

This complete Speakman Shower, K4034M, with the new self-cleaning head, in Speakman Chromium Plate, Price $75.00.

SPEAKMAN
SHOWERS & FIXTURES

"U.S." Rainbow Line

50% Easier Pulling

Circuit Testing in one-third the time

United States Rubber Company

TRADE MARK

We'll gladly serve you through your jobber

1790 BROADWAY · · NEW YORK

United States Rubber Company, Room No. 491, 1790 Broadway, New York, N. Y.

☐ Please send me free samples of the 8 colored wires comprising the "U. S." Rainbow Line.

☐ Please send me proof of the above statements.

*Name*_____ *Address*_____

*Company*_____ *Title*_____

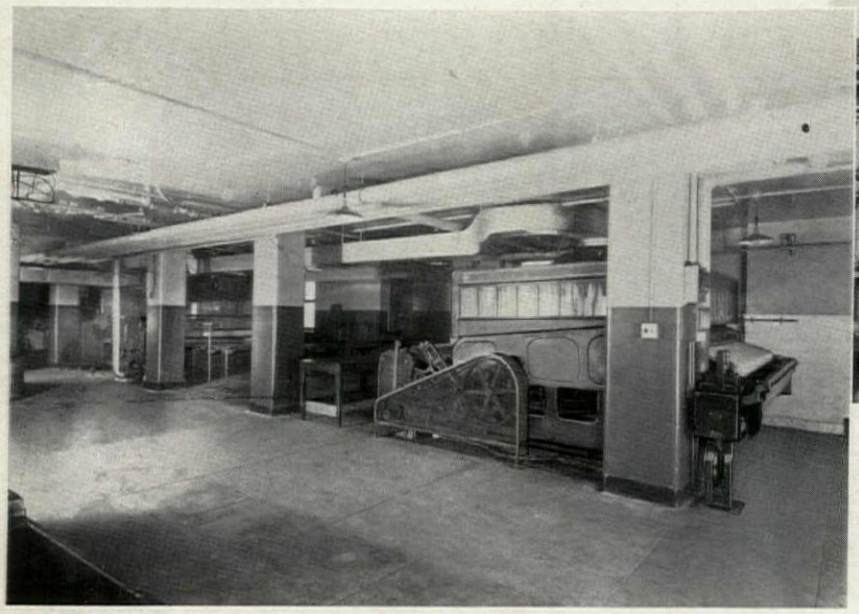
THE **RAINBOW LINE** OF "U. S." PARACORE WIRES AND CABLES

No. 61 of a series of advertisements featuring prominent laundry installations

How about the *location* of that indispensable hospital laundry?

IN the basement? Or on the top floor, where gravity can be employed to route the flow of the work? How about power? Lighting and ventilation? Placing of the machines?

Those are problems upon which the architect must have definite information when he begins to plan the building itself. And that is where the laundry-practise knowledge of American Laundry Machinery Company engineers is helpful. These men have been privileged to work with architects in the planning of scores of laundries, of every type and size. Their experience is at your disposal, any time you wish.



A view of one of the splendid laundries "American" engineers have helped to install . . . the modern, airy department at Hahnemann Hospital, Philadelphia.

J. Hall Marshall, New York City, Architect

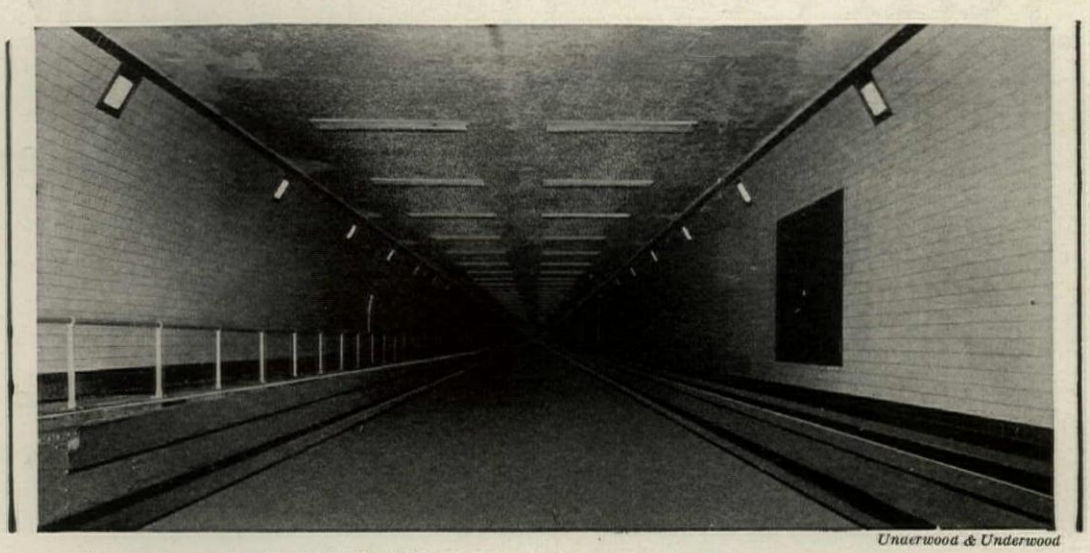
THE AMERICAN LAUNDRY MACHINERY COMPANY
Norwood Station Cincinnati, Ohio

The Canadian Laundry Machinery Co., Ltd.
47-93 Sterling Road, Toronto 3, Ont., Canada

Agents: British-American Laundry Machinery Co., Ltd.
Underhill St., Camden Town, London, N. W. 1, England

HOW JOSAM DRAINS

are making it safe for 15,000,000 cars to pass thru the Holland Tunnel yearly



Underwood & Underwood

Chief Engineers: Clifford M. Holland, M. K. Freeman, (succeeding Mr. Holland at his death); Ole Singstad, (succeeding Mr. Freeman at his death)

THE Holland Tunnel, the first structure of its kind in the world, revolutionized under-water communication.

Because they had no precedent to guide them, the engineers had to be doubly careful to avoid every possible chance of failure.

Among the safety precautions taken were the installation of Josam Drains to keep the tunnel dry and properly drained at all times. The rain, snow and moisture carried in from the outside, the oil, gas and grease drippings, the water for cleaning the tunnel must be quickly carried off. Wet, slippery floors would result in slowing up the traffic that must whiz through at all times.

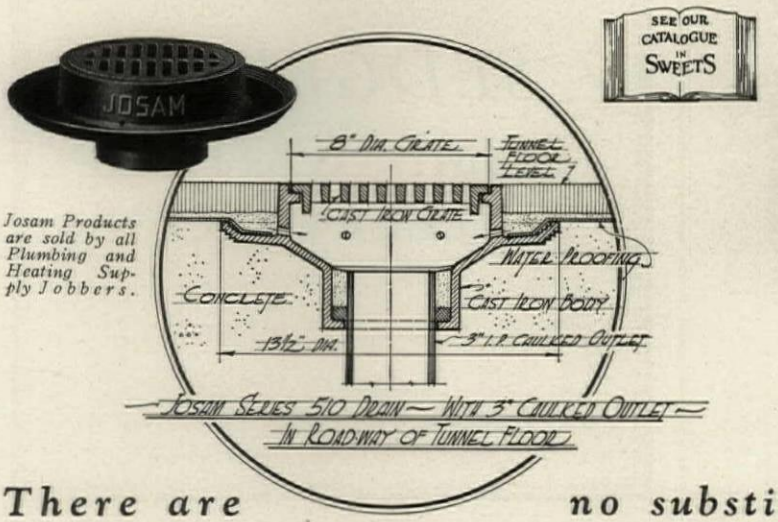
Josam Drains overcome not only the ordinary drain problem but the most difficult one as well. Josam Drains are being installed not only at convenient places in buildings but at all strategic points to preserve their beauty and strength. Architects working with Josam engineers are discovering new uses for Josam Drains—uses that not only add the extra measure of safety but in the end work out more economically for owners and operators.

Whether you are planning a garage or a skyscraper—whether your next structure is a private yacht or a war memorial—Josam Drains will solve every phase of draining.

Josam Catalog "G" shows the adaptability of Josam Drains and other Josam Products. It recommends hundreds of uses, and tells the story of Josam experience. Advise us if you do not have a copy and one will be mailed you promptly.

The Josam Mfg. Company
407 Euclid Building
Cleveland, Ohio

Factory: Michigan City, Indiana
Branches in Principal Cities

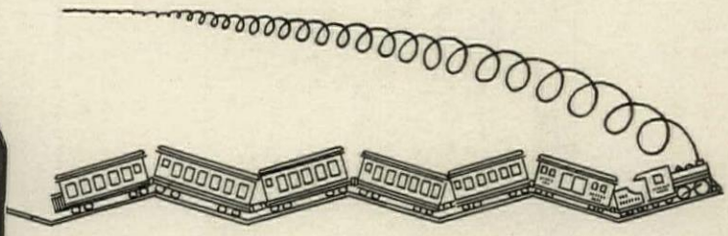


Josam Products are sold by all Plumbing and Heating Supply Jobbers.

Josam TRADE MARK REG. PRODUCTS

The Josam Line Includes: Josam Drains for Floors, Roofs, Showers, Urinals, Garages and Hospitals; Josam Swimming Pool Equipment; Josam-Marsh Grease, Plaster, Dental and Surgical, Sediment and Hair Interceptors; Josam-Graver Floor-Fed, Gas-Fired Portable Garbage and Rubbish Incinerators; Josam Open Seat Back Water Sewer Valves; Josam Open Seat Swing Check Valves; Josam Adjustable Water and Gas-Tight Closet Outlet Connections and Bends.

There are no substitutes for Josam Products



THE GREATEST IMPROVEMENT *in soil pipe in* 50 *years*

If railroad tracks were laid without regard to expansion, trains would run as shown above. And expansion is an equally serious problem in soil, waste and vent lines. ***Yet, until the arrival of EXPAN-HUB there was no real solution.***

EXPAN-HUB is the finest soil pipe that can be made. On top of that it has one feature that is actually the greatest improvement in 50 years —**the Compressible Gasket**—which is revolutionizing the soil pipe industry.

This feature takes care of all contraction and expansion, thereby preventing buckling of the soil stack and assuring permanently gas-tight joints.

In every type and size of building—from Skyscraper to Bungalow—EXPAN-HUB solves every soil pipe problem.

Your wholesaler can supply you.

Consider these Features of EXPAN-HUB

Extra thickness at hub adds strength, reducing breakage, when caulking, to a minimum.

This extra thickness is carried down to the pipe, tapering off a few inches below the hub.

EXPAN-HUB can be immediately recognized by its brilliant orange band, on which is printed the name EXPAN-HUB.

MANUFACTURED AND SOLD BY

ALABAMA PIPE COMPANY
Anniston, Ala.

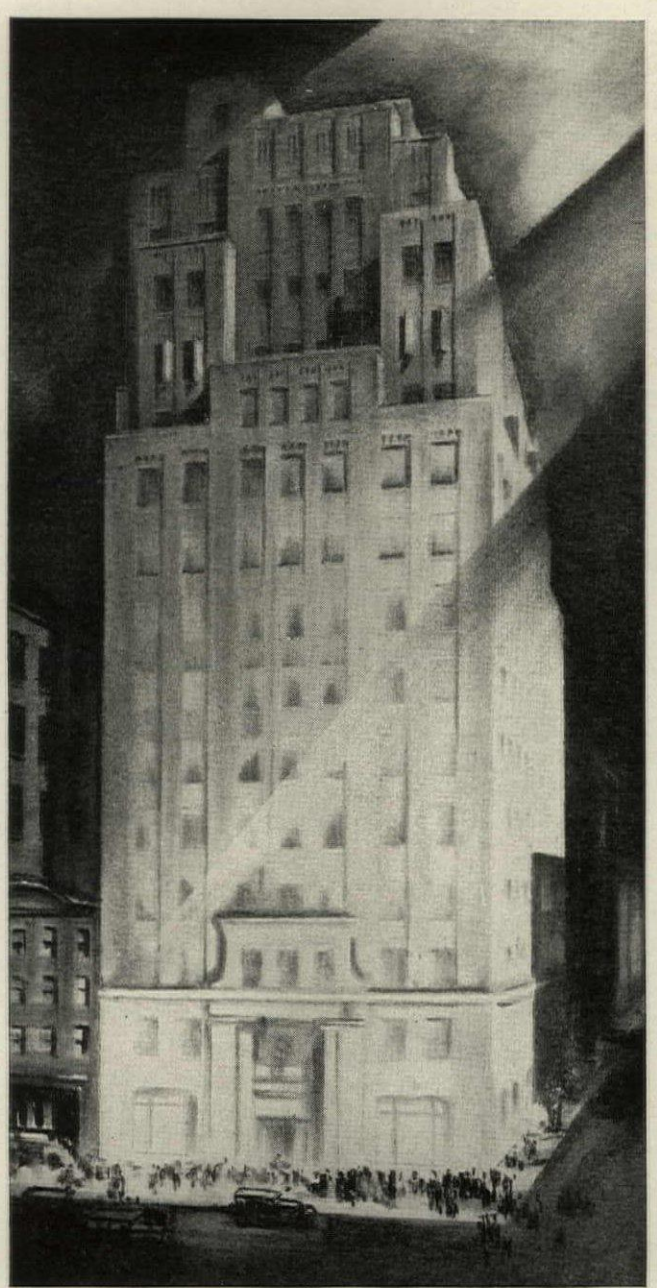
342 Madison Ave. New York, N. Y. — 122 So. Michigan Ave. Chicago, Ill. — 1749 Sacramento St. San Francisco, Calif.

STRINGER BROS. CO., Inc.

1100 W. 38th St. Chicago, Ill. — Gadsden, Ala. — 128 Sidney St. Cambridge, Mass.

EXPAN-HUB SOIL PIPE

"The most fire-proof building in the United States"



THE HOME BUILDING OF THE NATIONAL BOARD OF FIRE UNDERWRITERS
Barrett Specification Roofed, 1926. *Architect:* Clinton & Russell. *General Contractor:* James Stewart & Company. *Roofer:* Sobel & Kraus, Inc. All of New York City.

THE National Board of Fire Underwriters point with pride to their Home Office in New York City as *"the most fire-proof building in the United States."*

Their opinion holds special interest, for no group of men could be better equipped to pass upon the question of *fire-safety* in building construction.

Analyzed, the reasons this building affords superlative protection from fire are: Fire-resistive materials in both exposed and concealed locations; automatic sprinklers and automatic fire-doors as well as standpipe and hose throughout; enclosed stairways and elevator shafts; wired glass windows in metal frames—and a *Barrett Specification Coal-tar Pitch and Felt Roof* surfaced with gravel.

The gravel (or slag) wearing surface of a Barrett Roof is fire-safe and practically indestructible. The waterproofing element is Barrett Specification Coal-tar Pitch—which is *preserved,* not deteriorated, by moisture and dampness and is virtually immune to climatic variation. Barrett Specification tarred felt serves as a base to hold together the heavy layers of pitch.

Thus there is a permanent "union" of gravel, felt and pitch in a Barrett "Built-up" roof that enables each material to do its work to best advantage. That's why Barrett Specification Roofs resist sun, fire and water and are bonded against repair or maintenance expense for 20 years.*

But 20 years by no means represents their "life-expectancy." Many Barrett Pitch and Felt Roofs with gravel surfaces laid 30, 40, even 50 years ago are still giving staunch, weather-tight service.

Barrett Approved Roofers, each one selected for his experience, ability and integrity, are invariably leaders in their cities. Consult with them or with us on any roofing problem.

BONDED BARRETT FLASHINGS

Flashings are the most sensitive parts of any roof. Barrett Flashing Blocks and Forms are now bonded for 20 or 10 years when used with Barrett Specification Bonded Roofs. Barrett Approved Roofers will gladly tell you about this new feature of Barrett Roofing Service.

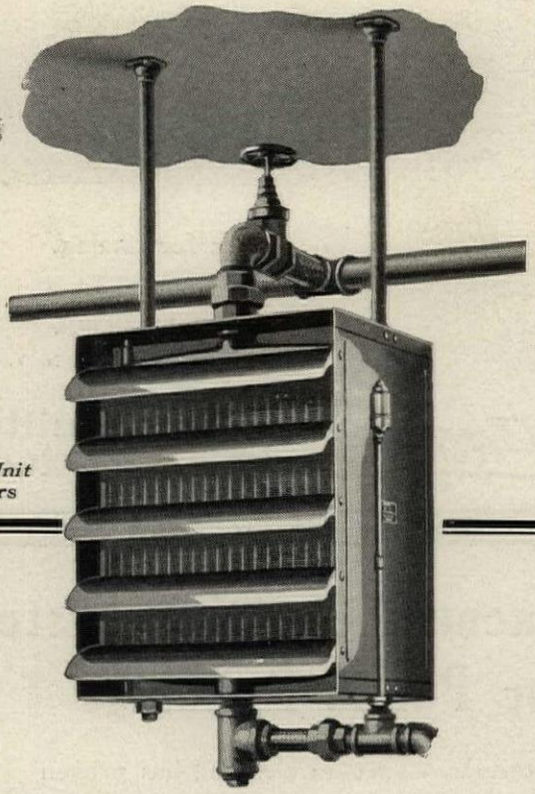
*The Barrett Company also offers a Specification Type "A" Roof which is bonded for 10 years. This type of roof is adaptable to a certain class of buildings. The same high-grade materials are used, the only difference being in the quantities.

Barrett Specification Roofs

Inspected and Bonded by Barrett

THE BARRETT COMPANY, 40 Rector St., New York ~ *In Canada* ~ THE BARRETT COMPANY, Ltd., 5551 St. Hubert St., Montreal, P. Q.

Temperature
too - is vital in Production



Heat with Unit Heaters

Venturafin Units can be mounted on wall, column or ceiling with ordinary ¾-inch hanger pipes, an exclusive American Blower feature—or they can be used as a floor stand unit with recirculating box. They can be used on high, medium or low pressure steam applications.

DO workers drop ice-cold tools and breathe warmth into their fingers? Do others mop perspiration off their sweaty brows? Are employees inefficient . . . frequently absent because of colds and similar ailments?

When machines stand idle and production suffers . . . when costly mistakes are made and profits vanish—you'll be convinced that *temperature,* too, is vital in production.

You can *control* the temperature throughout any building with the Venturafin Method of Heating . . . force heated air directly into working areas without wastefully heating ceiling areas first. Venturafins put an end to cold corners and heat pockets because they force heated air—*where* you want it, *when* you want it and as *much* as you want.

Call in any of the reliable heating contractors in your city. Ask them about the moderate cost of Venturafin Units . . . their quick adaptability to practically any position in your plant . . . their economy of space . . . their low maintenance costs and the actual *savings* in fuel that result year after year.

Ask for all the facts about Venturafin Units and how they can be most profitably applied to your business.

AMERICAN BLOWER CORPORATION, DETROIT, MICH.
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.
BRANCH OFFICES IN ALL PRINCIPAL CITIES

American Blower
VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

VENTURAFIN
TRADE MARK REG.
METHOD OF HEATING

For stores, showrooms, factories, shops, garages and many other types of buildings.

COUPON (916)

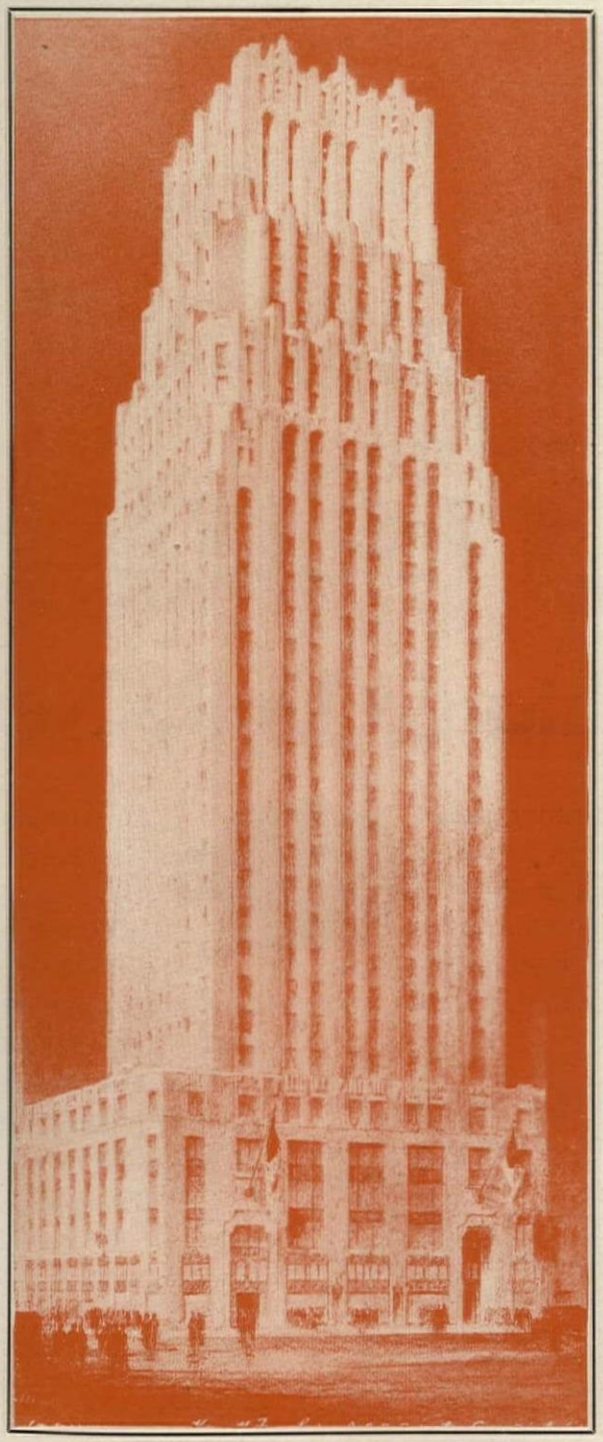
American Blower Corp.
6000 Russell St., Detroit

Please send me your 24-page Venturafin Book

*Name*_____

*Address*_____ *City*_____

WRITE lifetime performance into your specifications



The Gulf Building, Houston, Texas—another Youngstown piped building.

Architect
ALFRED C. FINN

Consulting Architects
KENNETH FRANZHEIM
J. E. R. CARPENTER

Consulting Engineer
R. J. TAYLOR

General Contractor
AMERICAN CONSTRUCTION CO.

Plumbing and Heating Contractor
WALLACE PLUMBING CO.

WHETHER it is for pipe, conduit, or steel sheets there is a one-word specification that assures unfailing lifetime performance—*Youngstown.*

These Youngstown Sheet & Tube Co. products have stood the tests of time and service during the decades that they have been serving the building industry. Their performance in thousands of installations from coast to coast has definitely proved that no sounder specification can be written.

For unfailing pipe performance in plumbing, heating, sprinkler, or refrigeration systems specify Youngstown steel pipe; for lifetime protection to electrical wiring specify Youngstown Buckeye Conduit; for lasting sheet metal work specify Youngstown Copperoid sheets. Such a specification is the soundest insurance of lifetime performance.

THE YOUNGSTOWN SHEET AND TUBE COMPANY, *General Offices,* Youngstown, O.

One of the oldest manufacturers of copper-bearing steel, under the well-known and established trade name "Copperoid"

DISTRICT SALES OFFICES:

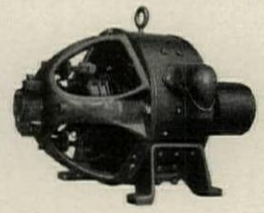
ATLANTA—Healey Bldg.
BOSTON—80 Federal St.
BUFFALO—Liberty Bank Bldg.
CHICAGO—Conway Bldg.
CINCINNATI—Union Trust Bldg.
CLEVELAND—Union Trust Bldg.
DALLAS—Magnolia Bldg.
DENVER—Continental Oil Bldg.
DETROIT—Fisher Bldg.
MINNEAPOLIS—Andrus Bldg.
KANSAS CITY, MO.—Commerce Bldg.
NEW ORLEANS—Hibernia Bldg.
NEW YORK—30 Church St.
LONDON REPRESENTATIVE—The Youngstown Steel Products Co., Dashwood House, Old Broad St., London, E. C. England
PHILADELPHIA—Franklin Trust Bldg.
PITTSBURGH—Oliver Bldg.
SAN FRANCISCO—55 New Montgomery St.
SAVANNAH—M and M T Terminals
SEATTLE—Central Bldg.
ST. LOUIS—Shell Bldg., 13th and Locust Sts.
YOUNGSTOWN—Stambaugh Bldg.

YOUNGSTOWN

"GALVANIZED SHEETS PROTECT" -- -- "SAVE WITH STEEL"

Architects—Holabird and Root
Engineer—Joshua D'Esposito
General Contractors—Hegeman Harris Co.
Ventilating Contractors—The Haines Co.

In the Chicago Daily News



FOR more than a half century, the Chicago Daily News has served the mid-western metropolis and its environs . . . . . building its tremendous circulation through complete editorial independence and the impartial presentation of news.

In its new building, one sees materially that progressive spirit, ever striding forward . . . . . planning for years to come. And in keeping with the architectural achievement, engineering skill has been diligently applied—skill that represents specialized service and dependable motor and control applications that characterize Westinghouse efficiency in buildings.

Westinghouse motors drive the ventilating equipment, assuring a continuous circulation of clean, fresh air to every part of the building. Westinghouse motors also drive the fire pumps and circulating pumps, furnishing an adequate supply of water every minute of the day and night. In fact, throughout the building there is liberal evidence of the part Westinghouse is taking in serving this ultra-modern publishing plant.

WESTINGHOUSE ELECTRIC & MFG. COMPANY
EAST PITTSBURGH PENNSYLVANIA

SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES IN THE UNITED STATES

Westinghouse

T 30703

Serves Publishing Plants

with . .

Capacitors
Circuit-breakers
Cooking Equipment
Elevators
Fans
Insulating Materials
Lighting Equipment
Mazda Lamps
Motors and Control
Motor-generators
Panelboards
Safety Switches
Switchboards
Transformers
Water Heaters

Delivered complete.. ready to go to work

PLANS and layout drawn . . . machinery, equipment and accessories specified and installed . . . provision made for future expansion . . . laundering processes formulated . . . operating staff organized . . .

TROY ARCHITECTS' ADVISORY SERVICE is prepared to take care of every step in the planning and equipping of the institutional laundry. Troy specialists will deliver to your client a plant, complete in every way, set up and ready to work as a going concern.

Let Troy cooperate with you. Without charge or obligation, Troy will handle the entire laundry job from the preliminary stages through to actual operation. Feel free to take advantage of this service.

TROY LAUNDRY MACHINERY CO., INC.

Chicago—New York City—San Francisco—Seattle—Boston—Los Angeles

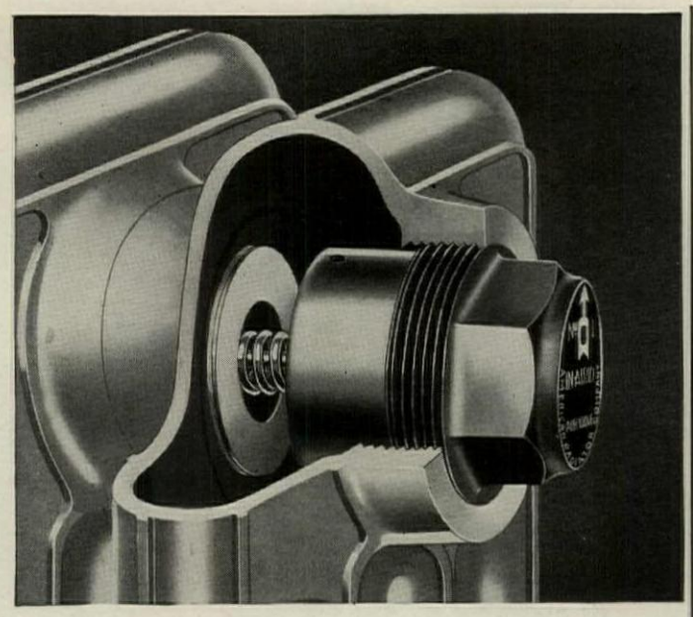
JAMES ARMSTRONG & CO., Ltd., European Agents: London—Paris—Amsterdam—Oslo

Factories: East Moline, Ill., U. S. A.

TROY

LAUNDRY MACHINERY

SINCE 1879 . . . THE WORLD'S PIONEER MANUFACTURER OF LAUNDRY MACHINERY



IT CAN BE DONE OTHER WAYS

SOME contractors have used plugs—others have gone to the needless expense of putting in blind nipples but these are only clumsy inefficient attempts to solve the problem of venting new water—for steam radiators. The only successful way is the In-Airid way.

The In-Airid shown above was specially designed to vent new water radiators when used on steam. It prevents the short circuiting of steam across the top openings and insures complete venting of all cold air. This valve is the one sure means of avoiding venting troubles on your new one-pipe steam and vacuum jobs.

• • •

Thousands of Heating contractors have standardized on In-Airid—There must be a Reason!

IN AIRID

The Invisible **AIR VALVE**

No. 1 for Steam . . . No. 2 for Vacuum

Airids No. 500 and Vac-Airids No. 510 are still the best valves to use for replacement on old style steam radiation.

AMERICAN RADIATOR COMPANY

Makers of a complete line of VALVES, VENTS, *and* REGULATORS

The FIRES *of* MEN

A RADIO FEATURE

Every Thursday Night over Columbia Network

STATIONS: WABC New York City
WCAU Philadelphia - - - WNAC Boston
WISN Milwaukee - - - - WGHP Detroit
WEAN Providence - - - - WMAK Buffalo
WFBL Syracuse - - - - WHEC Rochester

AUTOMATIC HEAT for EVERY HOME

Labor saving convenience with safety, cleanliness and highest fuel efficiency. Uniform, automatic heat at a great reduction in cost over any other heating method.

The Electric Furnace-Man

(Patented Automatic Coal Burner)

Investigate the unusual merits of this great invention. See it in operation at our local dealers. Know the comforts and satisfaction that it brings to thousands of users.

The ELECTRIC FURNACE-MAN can be installed for surprisingly little money at a moment's notice in any furnace or boiler. Used in cottage or mansion wherever modern, automatic heat is desired.

The ELECTRIC FURNACE-MAN burns the lower priced Buckweat sizes of ANTHRACITE—feeds the coal, removes the ashes and maintains uniform heat—ALL AUTOMATICALLY.

Also Ideal for Hot Water Supply
ENDORSED BY ANTHRACITE OPERATORS' CONFERENCE
(A Billion Dollar Industry)

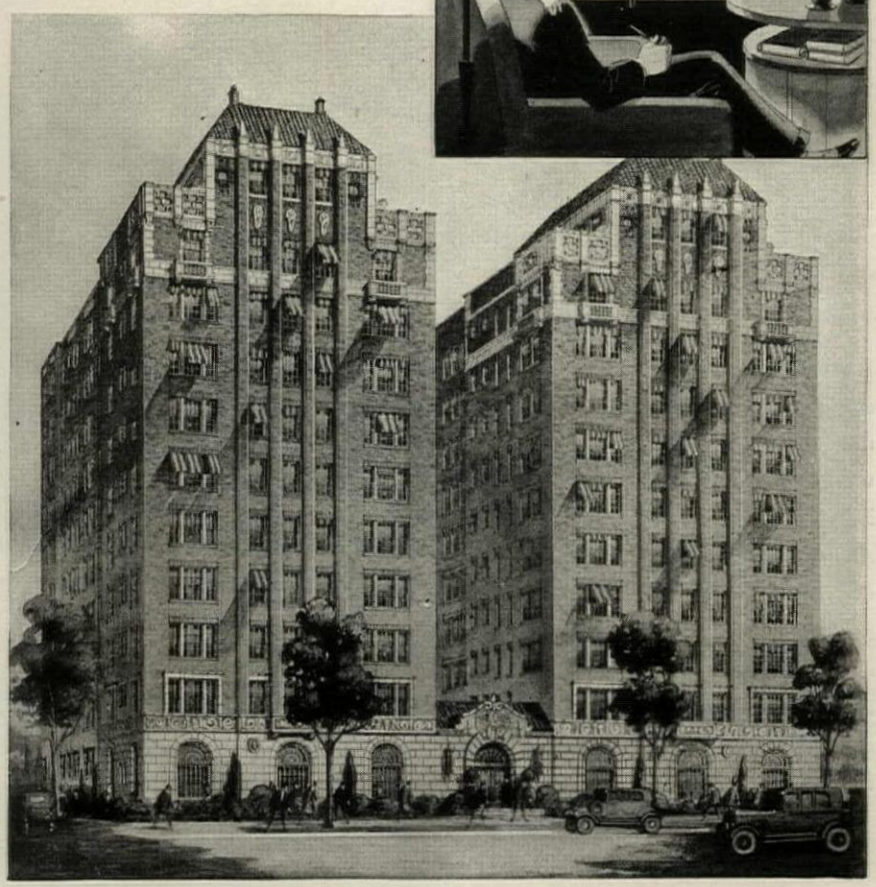
Patented Product of

DOMESTIC STOKER COMPANY
7 Dey Street **New York**

RCA CENTRALIZED RADIO

in this Kansas City Apartment Building

Now adopted by architects as necessary, permanent equipment.



The CHIEF Apartment Building, 307 East Armour Blvd., Kansas City, Mo.
Architect: Harry Foster Almon, Kansas City. *Builder:* Kelley Investment Corp., Kansas City.

THE specifications of the new *Chief* Apartment Building in Kansas City, Mo., call for the largest installation ever built of the antenna distribution type of RCA Centralized Radio.

In this single building there will be 218 radio outlets connected with the central antenna. Each tenant will be able to plug in conveniently with his own receiving set, and hear the broadcast program he chooses.

The ever growing problem of disfiguring, individual antennae is permanently solved and reception is notably bettered.

All RCA Centralized Radio equipment has been approved by the National Board of Fire Underwriters. Every item has been especially designed and developed for centralized radio use, as "adapted" equipment has not been found suitable by RCA engineers.

Now standard modern equipment

RCA Centralized Radio is being chosen by hotel and apartment house builders as necessary equipment in modern residence construction. It is available in two principal forms:

1. A single antenna connected with a distribution system to radio receivers in rooms throughout the building. As many as 80 radio sets of different makes can be independently operated from this common antenna, by plugging into wall outlets—and far more satisfactorily than by the use of individual antennae. Additional central antennae may be installed, if required, for additional groups of 80 receivers.

2. Centralized Radio receiving equipment to distribute broadcast programs to as many as 5000 rooms throughout a building. Equipment may be installed to transmit a single program, or to make available the choice of programs from two, three or four broadcasting stations.

The first method is ideally adapted for apartment houses, dormitories, office buildings, etc., where tenants desire to have their own receiving sets. It does away with the unsightly multiplicity of individual aerials, and the inconvenience of connecting them with distant rooms.

Where central control is advantageous

The second method is particularly designed for hotels, hospitals, sanitariums, schools, passenger ships, etc., where transient occupants of rooms may enjoy radio programs or phonograph record entertainment from loudspeakers or headsets, all operated from a central control.

Descriptive literature available

Descriptive pamphlets of these two systems, and of the special apparatus designed for them are available for architects, builders and building owners.

The Engineering Products Division, Radio-Victor Corporation of America, at any District Office named below, will answer inquiries, and prepare plans and estimates for installations of any size.

ENGINEERING PRODUCTS DIVISION
RADIO-VICTOR CORPORATION OF AMERICA
261 FIFTH AVENUE, NEW YORK CITY

Chicago, Illinois
100 West Monroe Street

Atlanta, Georgia
101 Marietta Street

Dallas, Texas
Santa Fe Bldg.

San Francisco, California
235 Montgomery Street

HOTEL GROWS FROM RESTAURANT

Use of GYPSTEEL Pre-Cast Gypsum Floor Construction Permits Addition of Seven Stories on Original Columns

WHEN the two-storied Hildebrecht Restaurant was built several years ago, it was planned eventually to add six more floors for use as a hotel. The floor construction was to be concrete arch and the columns were designed on this basis.

As time drew near for this completion of the building, it was decided that the addition of one more floor was imperative. To do this with the heavy concrete arch construction necessitated alterations in the original columns. Such alterations would mean that the restaurant must be closed for some time. This would mean, aside from a complete redecoration, a loss of the entire revenue for a period of over three months.

Ten-story Hotel Hildebrecht, Trenton, N. J.
Walter Hankin, Trenton, N. J., *Architect*

Hildebrecht Restaurant before Gypsteel floor addition was made.

The light weight of the Gypsteel Pre-Cast Gypsum Floor construction made it possible to add seven floors by reinforcing but one of the original columns. It provided practically a fire-proof, sound-proof, floor construction with flush ceilings. One in which the floor and ceiling could go forward as fast as the steel was in place. No workmen were held waiting for material to dry or harden. No forms interfered with their work. The finished floor was laid almost immediately after the Gypsteel floor was in place.

As is usual on jobs where the Gypsteel system is used, the architect, engineer and owner were unusually well satisfied with the speed of construction and the finished product.

GYPSTEEL

Hanging ceiling slabs | Clinching ceiling slab hangers | Grouting ceiling slabs | Laying Gypsteel floor slabs | Tying the reinforcement together.

General Offices: Linden, N. J.

STRUCTURAL GYPSUM CORPORATION

Sales Offices in Principal Cities

Selected List of Manufacturers' Publications

FOR THE SERVICE OF ARCHITECTS, ENGINEERS, DECORATORS, AND CONTRACTORS

The publications listed in these columns are the most important of those issued by leading manufacturers identified with the building industry. They may be had without charge unless otherwise noted, by applying on your business stationery to *The Architectural Forum*, 521 Fifth Ave., New York, or the manufacturer direct, in which case kindly mention this publication.

ACOUSTICS

R. Guastavino Co., 40 Court St., Boston.
Akoustolith Plaster. Brochure, 6 pp., 8½ x 11 ins. Important data on a valuable material.

Johns-Manville Corporation, New York.
Sound-Absorbing Treatment in Banks and Offices. Booklet, 18 pp., 8½ x 11 ins. Illustrated.
Sound-Absorbing Treatment in Churches and Religious Institutions. Brochure. 22 pp., 8½ x 11 ins. Illustrated.

U. S. Gypsum Co., 205 W. Monroe St., Chicago, Ill.
A Scientific Solution of an Old Architectural Problem. Folder, 6 pp., 8½ x 11 ins. Describes Sabinite Acoustical Plaster.

ASPHALT

Barber Asphalt Company, New York, Philadelphia, Chicago, Pittsburgh, Kansas City, St. Louis, San Francisco.
Specifications for Applying Genasco Asphalt Mastic. Booklet, 16 pp., 8 x 9 ins.
Genasco Trinidad Lake Asphalt Mastic. Brochure, 32 pp., 6 x 9 ins.
Specifications for Applying Genasco. Booklet, 16 pp., 8 x 10½ ins.

BRICK

American Face Brick Association, 1751 Peoples Life Building, Chicago, Ill.
Brickwork in Italy. 298 pp., size 7½ x 10½ ins., an attractive and useful volume on the history and use of brick in Italy from ancient to modern times, profusely illustrated with 69 line drawings, 300 half-tones, and 20 colored plates, with a map of modern and XII century Italy. Bound in linen. Price now $3.00, postpaid (formerly $6.00). Half Morocco, $7.00.
Industrial Buildings and Housing. Bound Volume, 112 pp., 8½ x 11 ins. Profusely illustrated. Deals with the planning of factories and employes' housing in detail. Suggestions are given for interior arrangements, including restaurants and rest rooms. Price now $1.00 postpaid (formerly $2.00).

Common Brick Mfrs. Assn. of America, 2134 Guarantee Title Bldg., Cleveland.
Brick; How to Build and Estimate. Brochure, 96 pp., 8½ x 11 ins. Illustrated. Complete data on use of brick.
The Heart of the Home. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Price 25 cents. Deals with construction of fireplaces and chimneys.
Skintled Brickwork. Brochure, 16 pp., 8½ x 11 ins. Illustrated. Tells how to secure interesting effects with common brick.
Building Economy. Monthly magazine, 22 pp., 8½ x 11 ins. Illustrated. $1 per year, 10 cents a copy. For architects, builders and contractors.

Hanley Company, Bradford, Pa.
General Catalog. 16 pp. 8½ x 11 ins. Illustrated.
Bradford Reds. Folder. 8 pp., 3 x 8 ins. Illustrated.

CEMENT

Carney Company, The, Mankato, Minn.
A Remarkable Combination of Quality and Economy. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on valuable material.

Kosmos Portland Cement Company, Louisville, Ky.
Kosmortar for Enduring Masonry. Folder, 6 pp., 3½ x 6½ ins. Data on strength and working qualities of Kosmortar.
Kosmortar, the Mortar for Cold Weather. Folder, 4 pp., 3⅜ x 6½ ins. Tells why Kosmortar should be used in cold weather.

Louisville Cement Co., 315 Guthrie St., Louisville, Ky.
BRIXMENT for Perfect Mortar. Self-filing handbook, 8⅜ x 11 ins. 16 pp. Illustrated. Contains complete technical description of BRIXMENT for brick, tile and stone masonry, specifications, data and tests.

Portland Cement Association, Chicago, Ill.
Concrete Masonry Construction. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.
Town and Country Houses of Concrete Masonry. Booklet, 20 pp., 8½ x 11 ins. Illustrated.
Facts About Concrete Building Tile. Brochure, 16 pp., 8½ x 11 ins. Illustrated.
The Key to Firesafe Homes. Booklet, 20 pp., 8½ x 11 ins. Illustrated.
Design and Control of Concrete Mixers. Brochure, 32 pp., 8½ x 11 ins. Illustrated.
Portland Cement Stucco. Booklet, 64 pp., 8½ x 11 ins. Illustrated.
Concrete in Architecture. Bound Volume, 60 pp., 8½ x 11 ins. Illustrated. An excellent work, giving views of exteriors and interiors.

CONCRETE BUILDING MATERIALS

Concrete Steel Company, 42 Broadway, New York.
Modern Concrete Reinforcement. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

Kosmos Portland Cement Company, Louisville, Ky.
High Early Strength Concrete, Using Standard Kosmos Portland Cement. Folder, 1 page, 8½ x 11 ins. Complete data on securing high strength concrete in short time.

CONCRETE COLORINGS

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Color Mix, Colored Hardened Concrete Floors (integral). Brochure, 16 pp., 8½ x 11 ins. Illustrated. Data on coloring for floors.
Dychrome. Concrete Surface Hardener in Colors. Folder, 4 pp., 8 x 11 ins. Illustrated. Data on a new treatment.

CONSTRUCTION, FIREPROOF

Master Builders Co., Cleveland, Ohio.
Color Mix. Booklet, 18 pp., 8½ x 11 ins. Illustrated. Valuable data on concrete hardener, waterproofer and dustproofer in permanent colors.

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Fire Proofing Bulletin 171. 8½ x 11 ins., 32 pp. Illustrated. A treatise on fireproof floor construction.

North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
North Western Expanded Metal Products. Booklet, 8½ x 10¾ ins. 16 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated, Plaster-Sava and Longspan lath channels, etc.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins., contains actual samples of several materials and complete data regarding their use.

CONSTRUCTION, STONE AND TERRA COTTA

Cowing Pressure Relieving Joint Company, 100 North Wells St., Chicago, Ill.
Pressure Relieving Joint for Buildings of Stone, Terra Cotta or Marble. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Deals with preventing cracks, spalls and breaks.

CORNICES, METAL

Sheet Steel Trade Extension Committee. Terminal Tower, Cleveland.
This committee will send upon request full data published by its members on sheet steel cornices and specifications for their use.

DAMPPROOFING

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Waterproofing and Dampproofing Specification Manual. Booklet, 18 pp., 8½ x 11 ins. Deals with methods and materials used.
Waterproofing and Dampproofing. File. 36 pp. Complete descriptions and detailed specifications for materials used in building and concrete.

Minwax Company, Inc., 11 West 42nd St., New York.
Complete Index of all Minwax Products. Folder, 6 pp., 8½ x 11 ins. Illustrated. Complete description and detailed specifications.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.
Specification Sheet, 8½ x 11 ins. Descriptions and specifications of compounds for dampproofing interior and exterior surfaces.

Toch Brothers, New York, Chicago, Los Angeles.
Handbook of R. I. W. Protective Products. Booklet, 40 pp., 4½ x 7½ ins.

The Vortex Mfg. Co., Cleveland, Ohio.
Par-Lock Specifications "Forms A and B" for dampproofing and plaster key over concrete and masonry surfaces.
Par-Lock Specification "Form J" for dampproofing the tile wall surfaces that are to be plastered.
Par-Lock Dampproofing. Specification Forms C, F, I, and J. Sheets 8½ x 11 ins. Data on gun-applied asphalt dampproofing for floors and walls.

DOORS AND TRIM, METAL

The American Brass Company, Waterbury, Conn.
Anaconda Architectural Bronze Extruded Shapes. Brochure, 180 pp., 8½ x 11 ins., illustrating and describing more than 2,000 standard bronze shapes of cornices, jamb casings, mouldings, etc.

The Kawneer Company, Niles, Michigan.
Detail sheet, 8½ x 11 ins., with A.I.A. File No. featuring Heavy Welded Bronze Doors.

REQUEST FOR CATALOGS

To get any of the catalogs described in this section, put down the title of the catalog desired, the name of the manufacturer and send coupon to THE ARCHITECTURAL FORUM, 521 Fifth Avenue, New York.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 187*

DOORS AND TRIM, METAL—Continued

Richards-Wilcox Mfg. Co., Aurora, Ill.
Fire-Doors and Hardware. Booklet, 8½ x 11 ins., 64 pp. Illustrated. Describes entire line of tin-clad and corrugated fire doors, complete with automatic closers, track hangers and all the latest equipment—all approved and labeled by Underwriters' Laboratories.

Sheet Steel Trade Extension Committee, Terminal Tower, Cleveland.
This committee will send upon request full data published by its members on metal doors and trim and specifications for their use.

Truscon Steel Company, Youngstown, Ohio.
Copper Alloy Steel Doors. Catalog 110. Booklet, 48 pp., 8½ x 11 ins. Illustrated.

DOORS, SOUNDPROOF

Irving Hamlin, Evanston, Ill.
The Evanston Soundproof Door. Folder, 8 pp., 8½ x 11 ins. Illustrated. Deals with a valuable type of door.

DRAINAGE FITTINGS

Josam Mfg. Co., Michigan City, Ind.
Josam Products. Booklet, 73 pp., 8½ x 11 ins. Illustrated. A valuable line of accessories.
Josam-Marsh Grease, Plaster, Sediment and Hair Interceptors. Brochure. 7 pp., 8½ x 11 ins. Illustrated.
Josam New Saw Tooth-Roof Drain. Folder, 4 pp., 8½ x 11 ins. Illustrated.

DUMBWAITERS

Sedgwick Machine Works, 151 West 15th St., New York, N. Y.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¼ ins., 60 pp. Illustrated.
Catalog and pamphlets, 8½ x 11 ins. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT

Baldor Electric Co., 4358 Duncan Avenue, St. Louis, Mo.
Baldor Electric Motors. Booklet, 14 pp., 8 x 10½ ins. Illustrated. Data regarding motors.

Bryant Electric Company, Bridgeport, Conn.
HooKeX Plug and Receptacle. Folder, 6 pp., 3½ x 6¼ ins. Illustrated.
KeNeX Plug and Receptacle. Folder, 6 pp., 3½ x 6¼ ins. Illustrated.
Three-wire Polarized Caps and Receptacles. Leaflet, 8½ x 10 ins. Illustrated.
Three-wire Polarized Caps and Receptacles for Heavy Duty. Leaflet, 8½ x 10 ins. Illustrated.

General Electric Co., Merchandise Dept., Bridgeport, Conn.
Wiring System Specification Data for Apartment Houses and Apartment Hotels. Booklet, 20 pp., 8 x 10 ins. Illustrated.
Electrical Specification Data for Architects. Brochure, 36 pp., 8 x 10½ ins. Illustrated. Data regarding G. E. wiring materials and their use.
The House of a Hundred Comforts. Booklet, 40 pp., 8 x 10½ ins. Illustrated. Dwells on importance of adequate wiring.

Harvey Hubbell, Inc., Bridgeport, Conn.
Electrical Specialties. Catalog No. 19. 52 pp., 8½ x 10 ins. Illustrated.

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
School Cafeterias. Booklet, 6 x 9 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Power for Buildings. Brochure, 14 pp., 8½ x 11 ins. Illustrated. A publication important to architects and engineers.
Variable-Voltage Central Systems as Applied to Electric Elevators. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Deals with an important detail of elevator mechanism.
Modern Electrical Equipment for Buildings. Booklet, 8½ x 11 ins. Illustrated. Lists many useful appliances.
Electrical Equipment for Heating and Ventilating Systems. Booklet, 24 pp., 8½ x 11 ins. Illustrated. This is "Motor Application Circular 7379."
Westinghouse Panelboards and Cabinets (Catalog 42-A). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Important data on these details of equipment.
Beauty; Power; Silence; Westinghouse Fans. (Dealer Catalog 45.) Brochure, 16 pp., 8½ x 11 ins. Illustrated. Valuable information on fans and their uses.
Electric Range Book for Architects (A. I. A. Standard Classification 31 G-4). Booklet, 24 pp., 8½ x 11 ins. Illustrated. Cooking apparatus for buildings of various types.
Westinghouse Commercial Cooking Equipment (Catalog 280). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Equipment for cooking on a large scale.
Electric Appliances (Catalog 44-A). 32 pp., 8½ x 11 ins. Deals with accessories for home use.

ELEVATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Otis Push Button Controlled Elevators. Descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.
Otis Geared and Gearless Traction. Elevators of All Types. Descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.
Escalators. Booklet, 8½ x 11 ins., 22 pp. Illustrated. Describes use of escalators in subways, department stores, theaters and industrial buildings. Also includes elevators and dock elevators.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Elevators. Booklet, 8½ x 11 ins., 24 pp. Illustrated. Describes complete line of "Ideal" elevator door hardware and checking devices, also automatic safety devices.

Sedgwick Machine Works, 151 West 15th St., New York, N. Y.
Catalog and descriptive pamphlets, 4¼ x 8¼ ins., 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.
Catalog and pamphlets, 8½ x 11 ins. Illustrated. Important data on different types of elevators.

ESCALATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Escalators. Booklet, 32 pp., 8½ x 11 ins. Illustrated. A valuable work on an important item of equipment.

FIREPLACE CONSTRUCTION

H. W. Covert Company, 243 East 44th Street, New York, N. Y.
Covert Fireplace Construction. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Valuable data on an important topic.

FIREPROOFING

Concrete Engineering Co., Omaha, Neb.
Handbook of Fireproof Construction. Booklet, 54 pp., 8½ x 11 ins. Valuable work on methods of fireproofing.

Concrete Steel Company, 42 Broadway, New York.
Economical Fireproof Floors for Suburban Buildings. Folder. 4 pp., 8½ x 11 ins. Illustrated.

North Western Expanded Metal Co., 407 South Dearborn Street, Chicago, Ill.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.

FLOOR HARDENERS (CHEMICAL)

Master Builders Co., Cleveland, Ohio.
Concrete Floor Treatment. File, 50 pp. Data on securing hardened dustproof concrete.
Concrete Floor Treatments—Specification Manual. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Valuable work on an important subject.

Minwax Company, 11 West 42nd Street, New York, N. Y.
Concrete Floor Treatments. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Lapidolith, the liquid chemical hardener. Complete sets of specifications for every building type in which concrete floors are used, with descriptions and results of tests.

Toch Brothers, New York, Chicago, Los Angeles.
Handbook of R.I.W. Protective Products. Booklet, 40 pp., 4½ x 7½ ins.

FLOORS—STRUCTURAL

Concrete Steel Company, 42 Broadway, New York.
Structural Economies for Concrete Floors and Roofs. Brochure, 32 pp., 8½ x 11 ins. Illustrated.

Truscon Steel Co., Youngstown, Ohio.
Truscon Floretyle Construction. Booklet, 8½ x 11 ins., 16 pp. Illustrations of actual jobs under construction. Lists of properties and information on proper construction. Proper method of handling and tables of safe loads.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on flooring.

FLOORING

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog, 8½ x 11 ins., 44 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors. Newly revised, February, 1929.
Armstrong's Linoleum Pattern Book, 1929. Catalog, 9 x 12 ins., 44 pp. Color plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.
Linoleum Layer's Handbook. 5 x 7 ins., 36 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.
Enduring Floors of Good Taste. Booklet, 6 x 9 ins., 48 pp. Illustrated in color. Explains use of linoleum for offices, stores, etc., with reproductions in color of suitable patterns, also specifications and instructions for laying.

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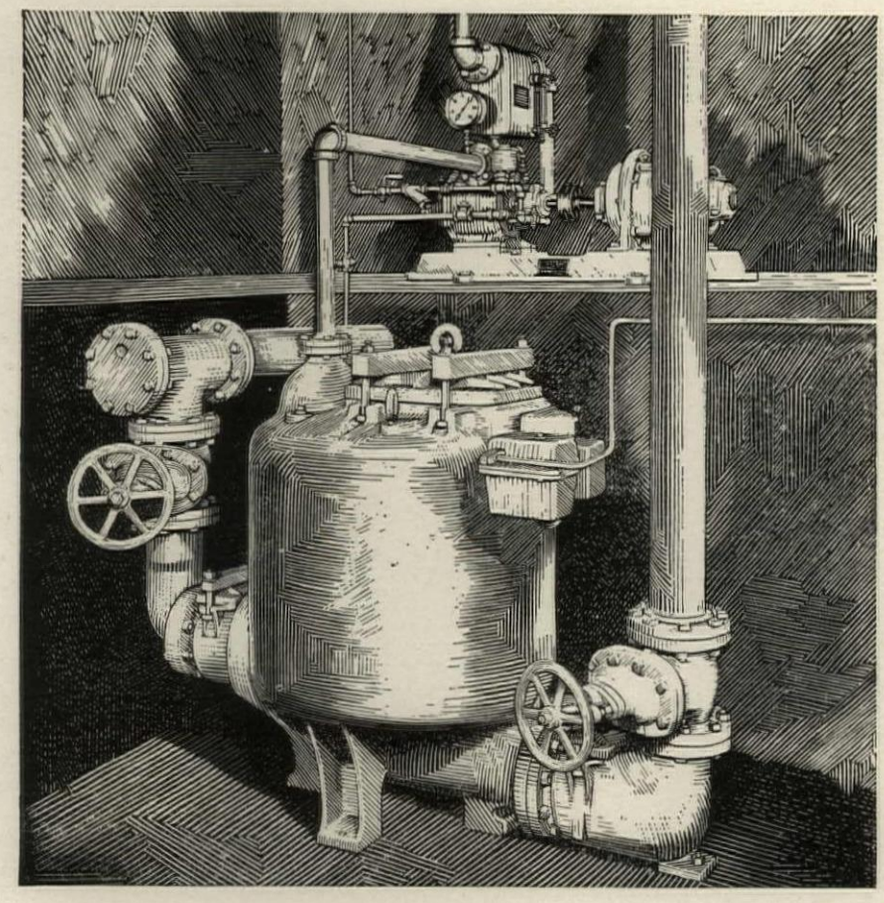

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 188*

FLOORING—Continued

Blabon Company, Geo. W., Nicetown, Philadelphia, Pa.
Planning the Color Schemes for Your Home. Brochure, illustrated in color; 36 pp., 7½ x 10½ ins. Gives excellent suggestions for use of color in flooring for houses and apartments.
Handy Quality Sample Folder of Linoleums. Gives actual samples of "Battleship Linoleum," cork carpet, "Feltex," etc.
Blabon's Linoleum. Booklet, illustrated in color; 128 pp., 3½ x 8½ ins. Gives patterns of a large number of linoleums.
Blabon's Plain Linoleum and Cork Carpet. Gives quality samples, 3 x 6 ins. of various types of floor coverings.

Carter Bloxonend Flooring Co., Keith & Perry Bldg., Kansas City, Missouri.
Bloxonend Flooring. Booklet, 3¼ x 6¼. ins., 20 pp. Illustrated. Describes uses and adaptability of Bloxonend Flooring to concrete, wood or steel construction, and advantages over loose wood blocks.
File Folder. 9⅜ x 11¾ ins. For use in connection with A. I. A. system of filing. Contains detailed information on Bloxonend Flooring in condensed loose-leaf form for specification writer and drafting room. Literature embodied in folder includes standard Specification Sheet covering the use of Bloxonend in general industrial service and Supplementary Specification Sheet No. 1, which gives detailed description and explanation of an approved method for installing Bloxonend in gymnasiums, armories, drill rooms and similar locations where maximum resiliency is required.

Cellized Oak Flooring, Memphis, Tenn.
Style in Oak Floors. Booklet, 16 pp., 6 x 9 ins. Illustrated.

Congoleum-Nairn, Inc., 195 Belgrove Drive, Kearny, N. J.
Facts you should know about Resilient Floors. A series of booklets on floors for (1) schools, (2) hospitals, (3) offices, (4) stores, (5) libraries, (6) churches, (7) clubs and lodges, (8) apartments and hotels. Illustrated.
Specifications for Resilient Floors. Booklet, 12 pp. A reprint from Sweet's.
A New Kind of Floor Service. Brochure, 8 pp. Data on Bonded Floors.
Sealex Battleship Linoleum. Booklet, 12 pp. Illustrated. Shows typical installations.
Sealex Treadlite Tiles. Two booklets, 8 and 16 pp. Illustrated.
Colonial Planks. Brochure, 8 pp. Illustrated.

Thomas Moulding Floor Co., 165 W. Wacker Drive, Chicago, Ill.
Better Floors. Folder, 4 pp., 11¼ x 13¾ ins. Illustrated. Floors for office, administration and municipal buildings.
Better School Floors. Folder, 4 pp., 11¼ x 13¾ ins. Illustrated.
Characteristics, Specifications and Uses. Brochure, 16 pp., 11¼ x 13¾ ins. Illustrated. Data on floors.

C. Pardee Works, 9 East 45th St., New York, N. Y., and 1600 Walnut St., Philadelphia, Pa.
Pardee Tiles. Bound Volume, 48 pp., 8½ x 11 ins. Illustrated.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on floorings.

U. S. Gypsum Co., Chicago.
Pyrobar Floor Tile. Folder, 8½ x 11 ins. Illustrated. Data on building floors of hollow tile and tables on floor loading.

U. S. Rubber Co., 1790 Broadway, New York, N. Y.
Period Adaptations for Modern Floors. Brochure, 8 x 11 ins., 60 pp. Richly Illustrated. A valuable work on the use of rubber tile for flooring in interiors of different historic styles.

FURNITURE

American Seating Co., 14 E. Jackson Blvd., Chicago, Ill.
Art Ecclesiastical Booklet, 6 x 9 ins., 48 pp. Illustrations of church fitments in carved wood.
Theatre Chairs. Booklet, 6 x 9 ins., 48 pp. Illustrations of theatre chairs.

Kittinger Co., 1893 Elmwood Ave., Buffalo, N. Y.
Kittinger Club & Hotel Furniture. Booklet, 20 pp., 6¼ x 9½ ins. Illustrated. Deals with fine line of furniture for hotels, clubs, institutions, schools, etc.
Kittinger Club and Hotel Furniture. Booklet, 20 pp., 6 x 9 ins. Illustrated. Data on furniture for hotels and clubs.
A Catalog of Kittinger Furniture. Booklet, 78 pp., 11 x 14 ins. Illustrated. General Catalog.

McKinney Mfg. Co., Pittsburgh, Pa.
Forethought Furniture Plans. Sheets, 6¼ x 9 ins., drawn to ¼-inch scale. An ingenious device for determining furniture arrangement.

GLASS CONSTRUCTION

Adamson Flat Glass Co., Clarksburg, W. Va.
Quality and Dependability. Folder, 2 pp., 8½ x 11 ins. Illustrated. Data in the company's product.

Libbey-Owens Sheet Glass Co., Toledo, Ohio.
Flat Glass. Brochure, 12 pp., 5⅛ x 7⅝ ins. Illustrated. History of manufacture of flat, clear, sheet glass.

GREENHOUSES

King Construction Company, North Tonawanda, N. Y.
King Greenhouses for Home or Estate. Portfolio of half-tone prints, varnishes, 8¼ x 10½ ins.

GREENHOUSES—Continued

William H. Lutton Company, 267 Kearney Ave., Jersey City, N. J.
Greenhouses of Quality. Booklet, 50 pp., 8½ x 11 ins. Illustrated. Conservatories making use of Lutton Patented Galvanized Steel V-Bar.

HARDWARE

P. & F. Corbin, New Britain, Conn.
Early English and Colonial Hardware. Brochure, 8½ x 11 ins. An important illustrated work on this type of hardware.
Locks and Builders' Hardware. Bound Volume, 486 pp., 8½ x 11 ins. An exhaustive, splendidly prepared volume.
Colonial and Early English Hardware. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Data on hardware for houses in these styles.

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet, 4 x 9¼ ins., 8 pp. Illustrated.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Distinctive Garage Door Hardware. Booklet, 8½ x 11 ins., 66 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.
Distinctive Elevator Door Hardware. Booklet, 90 pp., 10½ x 16 ins. Illustrated.

Russell & Erwin Mfg. Co., New Britain, Conn.
Hardware for the Home. Booklet, 24 pp., 3½ x 6 ins. Deals with residence hardware.
Door Closer Booklet. Brochure, 16 pp., 3½ x 6 ins. Data on a valuable detail.
Garage Hardware. Booklet, 12 pp., 3½ x 6 ins. Hardware intended for garage use.
Famous Homes of New England. Series of folders on old homes and hardware in style of each.

HEATING EQUIPMENT

American Blower Co., 6004 Russell St., Detroit, Mich.
Heating and Ventilating Utilities. A binder containing a large number of valuable publications, each 8½ x 11 ins., on these important subjects.

American Radiator Company, The, 40 West 40th St., N. Y. C.
Ideal Boilers for Oil Burning. Catalog 5½ x 8½ ins., 36 pp. Illustrated in 4 colors. Describing a line of Heating Boilers especially adapted to use with Oil Burners.
Corto—The Radiator Classic. Brochure, 5½ x 8½ ins., 16 pp. Illustrated. A brochure on a space-saving radiator of beauty and high efficiency.
Ideal Arcola Radiator Warmth. Brochure, 6¼ x 9½ ins. Illustrated. Describes a central all-on-one-floor heating plant with radiators for small residences, stores, and offices.
How Shall I Heat My Home? Brochure, 16 pp., 5¾ x 8½ ins. Illustrated. Full data on heating and hot water supply.
New American Radiator Products. Booklet, 44 pp., 5 x 7¾ ins. Illustrated. Complete line of heating products.
A New Heating Problem. Brilliantly Solved. Broadside, 4 pp., 10¾ x 15 ins. Illustrated. Data on the IN-AIRID invisible air valve.
In-Airid, the Invisible Air Valve. Folder, 8 pp., 3½ x 6 ins. Illustrated. Data on a valuable detail of heating.
The 999 ARCO Packless Radiator Valve. Folder, 8 pp., 3½ x 6 ins. Illustrated.

James B. Clow & Sons, 534 S. Franklin St., Chicago, Ill.
Clow Gasteam Vented Heating System. Brochure, 24 pp., 8½ x 11 ins. Illustrated. Deals with a valuable form of heating equipment for using gas.

C. A. Dunham Company, 450 East Ohio St., Chicago, Ill.
Dunham Radiator Trap. Bulletin 101, 8 x 11 ins., 12 pp. Illustrated. Explains working of this detail of heating apparatus.
Dunham Packless Radiator Valves. Bulletin 104, 8 x 11 ins., 8 pp. Illustrated. A valuable brochure on valves.
Dunham Return Heating System. Bulletin 109, 8 x 11 ins. Illustrated. Covers the use of heating apparatus of this kind.
Dunham Vacuum Heating System. Bulletin 110, 8 x 11 ins., 12 pp. Illustrated.
The Dunham Differential Vacuum Heating System. Bulletin 114. Brochure, 12 pp., 8 x 11 ins. Illustrated. Deals with heating for small buildings.
The Dunham Differential Vacuum Heating System. Bulletin 115. Brochure, 12 pp., 8 x 11 ins. Illustrated. Deals with heating for large buildings.

The Fulton Sylphon Company, Knoxville, Tenn.
Sylphon Temperature Regulators. Illustrated brochures, 8½ x 11 ins., dealing with general architectural and industrial applications; also specifically with applications of special instruments.
Sylphon Heating Specialties. Catalog No. 200, 192 pp., 3½ x 6¾ ins. Important data on heating.

Hoffman Specialty Company, Inc., 25 West 45th St., New York, N. Y.
Heat Controlled With the Touch of a Finger. Booklet, 46 pp., 5¾ x 8¾ ins. Illustrated.
How to Lock Out Air, the Heat Thief. Brochure, 48 pp., 5 x 7¼ ins. Illustrated.

Janette Manufacturing Company, 556 West Monroe Street, Chicago.
More Heat from Any Hot Water System on Less Fuel. Folder. 4 pp., 8½ x 11 ins. Illustrated. Deals with use of the "Hydrolator."

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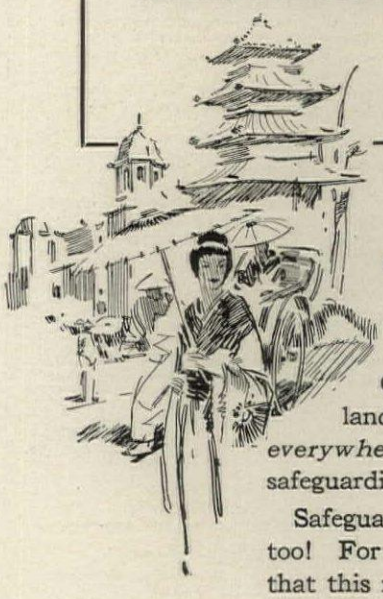

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 190*

HEATING EQUIPMENT—Continued

S. T. Johnson Co., Oakland, Calif.
Johnson Oil Burners. Booklet, 9 pp., 8½ x 11 ins. Illustrated.
Bulletin No. 4A. Brochure, 8 pp., 8½ x 11 ins. Illustrated. Data on different kinds of oil-burning apparatus.
Bulletin No. 31. Brochure, 8 pp., 8½ x 11 ins. Illustrated. Deals with Johnson Rotary Burner with Full Automatic Control.

Kewanee Boiler Corporation, Kewanee, Ill.
Kewanee on the Job. Catalog, 8½ x 11 ins., 80 pp. Illustrated. Showing installations of Kewanee boilers, water heaters, radiators, etc.
Catalog No. 78, 6 x 9 ins. Illustrated. Describes Kewanee Firebox Boilers with specifications and setting plans.
Catalog No. 79, 6 x 9 ins. Illustrated. Describes Kewanee power boilers and smokeless tubular boilers with specifications.

May Oil Burner Corp., Baltimore, Md.
Adventures in Comfort. Booklet, 24 pp., 6 x 9 ins. Illustrated. Non-technical data on oil as fuel.
Taking the Quest Out of the Question. Brochure, 16 pp., 6 x 9 ins. Illustrated. For home owners interested in oil as fuel.

McQuay Radiator Corporation, 35 East Wacker Drive, Chicago, Ill.
McQuay Visible Type Cabinet Heater. Booklet, 4 pp., 8½ x 11 ins. Illustrated. Cabinets and radiators adaptable to decorative schemes.
McQuay Concealed Radiators. Brochure, 4 pp., 8½ x 11 ins. Illustrated.
McQuay Unit Heater. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.

Modine Mfg. Co., Racine, Wisc.
Modine Copper Radiation. Booklet, 28 pp. 8½ x 11 ins. Illustrated. Deals with industrial, commercial and domestic heating.
A Few Short Years. Folder. 4 pp. 8½ x 11 ins. Illustrated. Heating for garages.
Dairy Plant Heating. Folder. 4 pp., 8½ x 11 ins. Illustrated.

Nash Engineering Company, South Norwalk, Conn.
Bulletin 85. Booklet. 12 pp. 10¾ x 7½ ins. Illustrated in color. Describes construction and operation of the Jennings Return Line Vacuum Heating Pump.
Bulletin 87. Brochure. 8 pp. 10¾ x 7½ ins. Illustrated in color. Deals with Sizes T and U Jennings Vacuum Heating Pump for 2500 and 5000 square feet equivalent direct radiation.
Bulletin 63. Booklet. 4 pp. 10¾ x 7½ ins. Illustrated. Describes in detail the Unit Type Motor Driven Jennings Condensation Pump.
Bulletin 52. Brochure. 6 pp. 10¾ x 7½ ins. Illustrated in color. Devoted to Jennings Standard Centrifugal Pumps for house service, boosting city water pressure to supply top stories, for circulating warm water, etc.

National Radiator Corporation, Johnstown, Pa.
Aero Radiators; Beauty and Worth. Catalog 34. Booklet, 6 x 9 ins., 20 pp., describing and illustrating radiators and accessories.
Six Great Companies Unite to Form a Great Corporation. Booklet, 28 pp., 8½ x 10½ ins. Illustrated. Valuable data on heating.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

Sarco Company, Inc., 183 Madison Ave., New York City, N. Y.
Steam Heating Specialties. Booklet, 6 pp., 6 x 9 ins. Illustrated. Data on Sarco Packless Supply Valves and Radiator Traps for vacuum and vapor heating systems.
Equipment Steam Traps and Temperature Regulations. Booklet, 6 pp., 6 x 9 ins. Illustrated. Deals with Sarco Steam Traps for hospital, laundry and kitchen fixtures and the Sarco Self-contained Temperature Regulation for hot water service tanks.

Spencer Heater Co., Williamsport, Pa.
Catalog. Booklet, 20 pp., 6⅞ x 9 ins. Illustrated. Complete line of magazine feed cast iron sectional and steel tubular heaters.
The Fire that Burns Uphill. Brochure, 24 pp., 6⅞ x 9¼ ins. Illustrated in color. Magazine feed heaters for steam, vapor and hot water heating.

B. F. Sturtevant Company, Hyde Park, Boston, Mass.
Tempervane Heating Units. Catalog 363. Booklet, 44 pp., 8½ x 11 ins. Illustrated. Data on "Heating Every Corner with Maximum Economy."

Trane Co., The, La Crosse, Wis.
Bulletin 14, 16 pp., 8½ x 10⅝ ins. Covers the complete line of Trane Heating Specialties, including Trane Bellows Traps, and Trane Bellows Packless Valves.
Bulletin 20. 24 pp., 8½ x 10⅝ ins. Explains in detail the operation and construction of Trane Condensation. Vacuum, Booster, Circulating, and similar pumps.
How to Cut Heating Costs. Booklet, 18 pp., 8½ x 11 ins. Illustrated.

HOISTS, TELESCOPIC

Gillis & Geoghegan, Inc. 535 West Broadway, New York.
G & G Telescopic Hoist. Booklet. 24 pp. 8½ x 11 ins. Illustrated complete data on hoists.
Ash Removal. Folder. 8½ x 11 ins. Illustrated. Hoists for removing ashes from basements.

HOSPITAL EQUIPMENT

The Frink Co., Inc., 369 Lexington Ave., New York City.
Catalog 426. 7 x 10 ins., 16 pp. A booklet illustrated with photographs and drawings, showing the types of light for use in hospitals, as operating table reflectors, linolite and multilite concentrators, ward reflectors, bed lights and microscopic reflectors, giving sizes and dimensions, explaining their particular fitness for special uses.

Holophane Company, 342 Madison Avenue, New York.
Lighting Specific for Hospitals. Booklet, 30 pp., 8½ x 11 ins. Illustrated.

The International Nickel Company, 67 Wall St., New York, N. Y.
Hospital Applications of Monel Metal. Booklet, 8½ x 11½ ins., 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
Some Thoughts About Hospital Food Service Equipment. Booklet. 22 pp.. 7½ x 9¼ ins. Valuable data on an important subject.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

HOTEL EQUIPMENT

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
Some Thoughts on Furnishing a Hotel. Booklet, 7½ x 9 ins. Data on complete outfitting of hotels.

INCINERATORS

Home Incinerator Co., Milwaukee, Wis.
The Decent Way. Burn it with Gas. Brochure, 30 pp., 5¼ x 7¼ ins., inside. Illustrated. Incinerator sanitation equipment for residence use.
A. I. A. File, 12 pp., 8¾ x 10¾ ins., inside. Suggestions for architect on incineration, showing installation and equipment.
Specialized Home Comforts Service Plan Book. 40 pp., 8½ x 11 ins., inside. Illustrated. A complete outline of the many advantages of incineration.
Blue Star Standards in Home Building. 16 pp., 5½ x 8½ ins., inside. Illustrated. Explaining fully the Blue Star principles, covering heat, incineration, refrigeration, etc.

Josam Mfg. Co., Michigan City, Ind.
Josam-Graver Incinerators. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Kerner Incinerator Company, 715 E. Water St., Milwaukee, Wis.
Incinerators (Chimney-fed). Catalog No. 15 (Architect and Builders' Edition). Size 8½ x 11 ins., 16 pp. Illustrated. Describes principles and design of Kernerator Chimney-fed Incinerators for residences, apartments, hospitals, schools, apartment hotels, clubs and other buildings. Shows all standard models and gives general information and working data.
Sanitary Elimination of Household Waste. Booklet, 4 x 9 ins. 16 pp. Illustrated. Gives complete information on the Kernerator for residences.
Garbage and Waste Disposal for Apartment Buildings. Folder, 8½ x 11 ins., 16 pp. Illustrated. Describes principle and design of Kernerator Chimney-fed Incinerator for apartments and gives list of buildings where it has been installed.
Sanitary Disposal of Waste in Hospitals. Booklet, 4 x 9 ins., 12 pp. Illustrated. Shows how this necessary part of hospital service is taken care of with the Kernerator. Gives list of hospitals where installed.
The Kernerator (Chimney-fed) Booklet. Catalog No. 17, 20 pp., 8½ x 11 ins. Illustrated. Data on a valuable detail of equipment.

INSULATION

Armstrong Cork & Insulation Co., Pittsburgh, Pa.
The Insulation of Roofs with Armstrong's Corkboard. Booklet. Illustrated. 7½ x 10½ ins., 32 pp. Discusses means of insulating roofs of manufacturing or commercial structures.
Insulation of Roofs to Prevent Condensation. Illustrated booklet, 7½ x 10½ ins., 36 pp. Gives full data on valuable line of roof insulation.
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The Cork-lined House Makes a Comfortable Home. 5 x 7 ins. 32 pp. Illustrated.
Armstrong's Corkboard. Insulation for Walls and Roofs of Buildings. Booklet, 66 pp., 9½ x 11¾ ins. Illustrates and describes use of insulation for structural purposes.

Structural Gypsum Corporation, Linden, N. J.
Heat Insulation Value of Gypsteel. Folder, 4 pp., 8½ x 11 ins. Brochure, by Charles L. Norton, of M. I. T.

JOISTS

Bates Expanded Steel Truss Co., East Chicago, Ind.
Catalog No. 4. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Gives details of truss construction with loading tables and specifications.

Concrete Steel Company, 42 Broadway, New York, N. Y.
Structural Economies for Concrete Floors and Roofs. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 192*

JOISTS—Continued

Modern Concrete Reinforcement. Brochure, 32 pp., 8½ x 11 ins. Illustrated.
Construction Details for Installing Havemeyer Trusses. Data sheets, 8½ x 11 ins. Illustrated.
Standard Practice for Placing Havemeyer Reinforcement in Columns, Beams and Slabs. Data sheets, 8½ x 11 ins. Illustrated.

KITCHEN EQUIPMENT

The International Nickel Company, 67 Wall St., New York, N. Y.
Hotels, Restaurants and Cafeteria Applications of Monel Metal. Booklet, 8½ x 11 ins., 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.
Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
School Cafeteria. Booklet, 6 x 9 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.
Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

LABORATORY EQUIPMENT

Alberene Stone Co., 153 West 23rd Street, New York City.
Booklet, 8¾ x 11¼ ins., 26 pp. Stone for laboratory equipment, shower partitions, stair treads, etc.
Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali and Rust-proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

LANTERNS

Todhunter, Arthur, 119 E. 57th St., New York, N. Y.
Hand-wrought Lanterns. Booklet, 5¼ x 6¼ ins., 20 pp. Illustrated in black and white. With price list. Lanterns appropriate for exterior and interior use, designed from old models and meeting the requirements of modern lighting.

LATH, METAL AND REINFORCING

Milwaukee Corrugating Co., Milwaukee
The Milcor Manual. Booklet, 96 pp., 8½ x 11 ins. Illustrated. Data on metal lath and similar materials.
Milcor Metal Ceiling Catalog. Booklet, 288 pp., 8½ x 11 ins. Illustrated. Data on metal ceiling and wall construction.
National Steel Fabric Co., Pittsburgh, Pa.
Better Walls for Better Homes. Brochure, 16 pp., 7¾ x 11¼ ins. Illustrated. Metal lath, particularly for residences.
Steeltex for Floors. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Combined reinforcing and form for concrete or gypsum floors and roofs.
Steeltex Data Sheet No. 1. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with round top chords.
Steeltex Data Sheet No. 2. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with flat top flanges.
Steeltex Data Sheet No. 3. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for folders on wood joists.
North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
North Western Expanded Metal Products. Booklet, 8½ x 10¾ ins., 20 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plasta-saver and longspan lath channels, etc.
Longspan ¾-inch Rib Lath. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.
Norwest Metal Lath. Folder, 8½ x 11 ins. Illustrated. Data on Flat Rib Lath.
Truscon Steel Company, Youngstown, Ohio.
Truscon ¾-inch Hy-Rib for Roofs, Floors and Walls. Booklet, 8½ x 11 ins., illustrating Truscon ¾-inch Hy-Rib as used in industrial buildings. Plates of typical construction. Progressive steps of construction. Specification and load tables.

LAUNDRY MACHINERY

American Laundry Machinery Co., Norwood Station, Cincinnati, O.
Functions of the Hotel and Hospital Laundry. Brochure, 8 pp., 8½ x 11 ins. Valuable data regarding an important subject.
Troy Laundry Machinery Co., Inc., 9 Park Place, New York City.
Laundry Machinery for Large Institutions. Loose-Leaf booklet, 50 pp., 8½ x 11 ins. Illustrated.
Laundry Machinery for Small Institutions. Loose-leaf brochure, 50 pp., 8½ x 11 ins. Illustrated.
Accessory Equipment for Institutional Laundries. Leather bound book, 50 pp., 8½ x 11 ins. Illustrated.
Dry Cleaning Equipment for Institutional Purposes. Brochure, 50 pp., 8½ x 11 ins. Illustrated.

LIGHTING EQUIPMENT

The Frink Co., Inc., 369 Lexington Ave., New York, N. Y.
Catalog 415, 8½ x 11 ins., 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screen and partition reflectors, double and single desk reflectors and Polaralite Signs.
Holophane Company, Inc., 342 Madison Ave., New York, N. Y.
The Lighting of Schools; A Guide to Good Practice. Booklet. 24 pp., 8½ x 11 ins. Illustrated.
Lighting Specifications for Hospitals. Brochure, 30 pp., 8½ x 11 ins. Illustrated.
Industrial Lighting. Bulletin 448A. Booklet, 24 pp., 8½ x 11 ins. Illustrated.
Holophane Catalog. Booklet, 48 pp., 8½ x 11 ins. Combination catalog and engineering data book.
The Lighting of Schools. A Guide to Good Practice. Booklet, 24 pp., 8½ x 11 ins. Illustrated.
Smyser-Royer Co., 1700 Walnut Street, Philadelphia, Pa.
Catalog "J" on Exterior Lighting Fixtures. Brochure, illustrated, giving data on over 300 designs of standards, lanterns and brackets of bronze or cast iron.
Todhunter, 119 East 57th St., New York, N. Y.
Lighting Fixtures, Lamps and Candlesticks. 24 pp., 8½ x 11 ins. Illustrated. Fine assortment of lighting accessories.
Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
Industrial Lighting Equipment. Booklet, 32 pp., 8½ x 11 ins. Illustrated.
Commercial Lighting. Brochure, 24 pp., 8½ x 11 ins. Illustrated.
Airport and Floodlighting Equipment. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

LUMBER

National Lumber Mfrs. Assn., Washington, D. C.
Use of Lumber on the Farm. Booklet, 38 pp., 8½ x 11 ins. Illustrated.

MAIL CHUTES

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet, 4 x 9¾ ins., 8 pp. Illustrated.

MANTELS

Henry Klein & Co., Inc., 40-46 West 23rd Street, New York.
Driwood Mantels. Booklet. 12 pp. 8½ x 11 ins. Illustrated. Fine line of eighteenth century English and American mantels.
Arthur Todhunter, 119 E. 57th St., New York, N. Y.
Georgian Mantels. New booklet, 24 pp., 5¾ x 6¼ ins. A fully illustrated brochure on eighteenth century mantels. Folders give prices of mantels and illustrations and prices of fireplace equipment.

MARBLE

The Georgia Marble Company, Tate, Ga.; New York Office, 1328 Broadway.
Why Georgia Marble Is Better. Booklet, 3⅜ x 6 ins. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc.
Convincing Proof. 3⅜ x 6 ins., 8 pp. Classified list of buildings and memorials in which Georgia Marble has been used, with names of Architects and Sculptors.
Hurt Building, Atlanta; Senior High School and Junior College, Muskegon, Mich. Folders, 4 pp., 8½ x 11 ins. Details.

METALS

Aluminum Company of America, Pittsburgh.
Architectural Aluminum. Brochure, 30 pp., 8½ x 11 ins. Illustrated. An excellent booklet on the subject.
Central Alloy Steel Corporation, Massillon, Ohio.
Sheet Iron Primer. Booklet, 64 pp., 5¼ x 7¾ ins. Illustrated.
The Path to Permanence. Brochure, 52 pp., 8½ x 11 ins. Illustrated. Data on sheet iron.
The International Nickel Company, 67 Wall St., New York N. Y.
Monel Metal Primer. 8 folders, 4 pp., 8½ x 11 ins. Illustrated. Valuable data on use of monel in kitchens, laundries, etc.

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodwork. Standardized Book, 9 x 11½ ins., 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.
Better Built Homes. Vols. XV-XVIII, incl. Booklet, 9 x 12 ins., 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.
Curtis Details. Booklet, 19½ x 23½ ins., 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.
Curtis Cabinet and Stair Work. Booklet, 48 pp., 7¾ x 10½ ins. Illustrated.
Curtis Windows. Brochure, 7¾ x 10½ ins. Illustrated.
Curtis Interior Doors. Booklet, 7¾ x 10½ ins. Illustrated.
Curtis Entrances and Exterior Doors. Brochure, 7¾ x 10½ ins. Illustrated.

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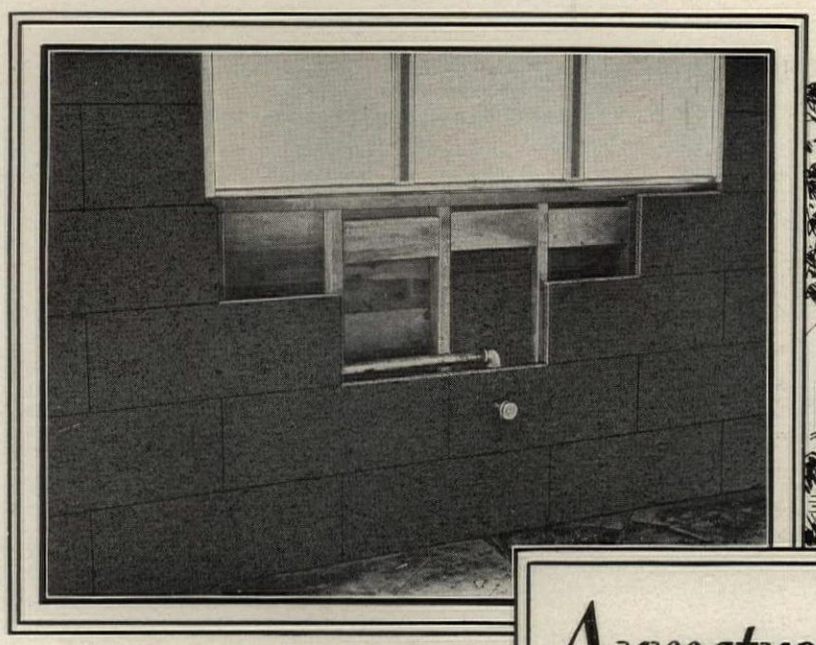

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Armstrong's Corkboard "The Best Investment" for "Perfect Comfort"

THE experience of Mr. M. J. Schubert with his cork-lined home in Pierre, S. D., affords convincing proof of the effectiveness of Armstrong's Corkboard in extremely cold weather. Mr. Schubert built his home in 1926, insulating the walls with 2,200 square feet of Armstrong's Corkboard 1½ inches thick and the second-floor ceilings with 1,500 square feet, 2 inches thick. His letter, after he had lived in his house more than two years, reflects the enthusiasm invariably displayed by clients of architects who specify Armstrong's Corkboard. The letter follows:

> "We have never been as warm in winter and as cool in summer as we have been since living in this house. Perfect comfort at all times. Do not notice the wind at all. The last two months have been a good test, as we have had some severe cold weather. The Armstrong's Corkboard Insulation is the best investment anybody could make when building a house. Wouldn't build one without using it—knowing what I do about it."

In specifying insulation for residence work, the proper thickness is of paramount importance. For best results, that is, for the maximum of comfort and saving of fuel per dollar invested in insulation, 1½ inches of Armstrong's Corkboard is recommended for the wall and 2 inches for the ceiling or roof.

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Armstrong's Corkboard Insulation

A Heatproof Lining for Walls and Roof

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 194*

MILL WORK—See also Wood—Continued

Hartmann-Sanders Company, 2155 Elston Ave., Chicago, Ill.
Column Catalog. 7½ x 10 ins., 48 pp. Illustrated. Contains prices on columns 6 to 36 ins. diameter, various designs and illustrations of columns and installations.
The Pergola Catalog. 7½ x 10 ins., 64 pp. Illustrated. Contains illustrations of pergola lattices, garden furniture in wood and cement, garden accessories.

Klein & Co., Inc., Henry, 11 East 37th St., New York, N. Y.
Two Driwood Interiors. Folder, 4 pp., 6¼ x 9 ins. Illustrated. Use of moulding for paneling walls.
A New Style in Interior Decoration. Folder, 4 pp., 6¼ x 9 ins. Illustrated. Deals with interior woodwork.
Driwood Period Mouldings in Ornamented Wood. Booklet, 28 pp., 8½ x 11 ins. Illustrated.
How Driwood Period Mouldings in Ornamented Wood Set a New Style in Decoration. Folder.

Roddis Lumber and Veneer Co., Marshfield, Wis.
Roddis Doors. Brochure, 24 pp., 5¼ x 8½ ins. Illustrated price list of doors for various types of buildings.
Roddis Doors, Catalog G. Booklet, 184 pp., 8½ x 11 ins. Completely covers the subject of doors for interior use.
Roddis Doors for Hospitals. Brochure, 16 pp., 8½ x 11 ins. Illustrated work on hospital doors.
Roddis Doors for Hotels. Brochure, 16 pp., 8½ x 11 ins. Illustrated work on doors for hotel and apartment buildings.

MORTAR AND CEMENT COLORS

Clinton Metallic Paint Co., Clinton, N. Y.
Clinton Mortar Colors. Folder, 8½ x 11 ins., 4 pp. Illustrated in colors, gives full information concerning Clinton Mortar Colors with specific instructions for using them.
Color Card. 3¼ x 6½ ins. Illustrates in color the ten shades in which Clinton Mortar Colors are manufactured.
Something New in Stucco. Folder, 3½ x 6 ins. An interesting folder on the use of coloring matter for stucco coated walls.

ORNAMENTAL PLASTER

Jacobson & Co., 241 East 44th St., New York, N. Y.
A Book of Old English Designs. Brochure, 47 plates, 12 x 9 ins. Deals with a fine line of decorative plaster work.
Architectural and Decorative Ornaments. Cloth bound volume, 184 pp., 9 x 12 ins. 18 plates. Price, $3.00. A general catalog of fine plaster ornaments.
Geometrical ceilings. Booklet, 23 plates, 7 x 9 ins. An important work on decorative plaster ceilings.

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

Minwax Company, Inc., 11 West 42nd St., New York.
Color Card and Specifications for Minwax Brick and Cement Coating. Folder, 4 pp., 8½ x 11 ins. Illustrated.

National Lead Company, 111 Broadway, New York, N. Y.
Handy Book on Painting. Book, 5½ x 3¼ ins., 100 pp. Gives directions and formulæ for painting various surfaces of wood, plaster, metals, etc., both interior and exterior.
Red Lead in Paste Form. Booklet. 6¼ x 3½ ins., 16 pp. Illustrated. Directions and formulæ for painting metals.
Came Lead. Booklet, 6 x 8¾ ins., 12 pp. Illustrated. Describes various styles of lead cames.

Pratt & Lambert, Inc., Buffalo, N. Y.
Specification Manual for Paint, Varnishing and Enameling. Booklet, 38 pp., 7½ x 10⅝ ins. Complete specifications for painting, varnishing and enameling interior and exterior wood, plaster, and metal work.

Sherwin-Williams Company, 601 Canal Rd., Cleveland, Ohio.
Painting Concrete and Stucco Surfaces. Bulletin No. 1. 8½ x 11 ins., 8 pp. Illustrated. A complete treatise with complete specifications on the subject of Painting of Concrete and Stucco Surfaces. Color chips of paint shown in bulletin.
Enamel Finish for Interior and Exterior Surfaces. Bulletin No. 2, 8½ x 11 ins., 12 pp. Illustrated. Thorough discussion, including complete specifications for securing the most satisfactory enamel finish on interior and exterior walls and trim.
Painting and Decorating of Interior Walls. Bulletin No. 3, 8½ x 11 ins., 20 pp. Illustrated. An excellent reference book on Flat Wall Finish, including texture effects, which are taking the country by storm. Every architect should have one on file.
Protective Paints for Metal Surfaces. Bulletin No. 4, 8½ x 11 ins., 12 pp. Illustrated. A highly technical subject treated in a simple, understandable manner.

Sonneborn Sons, Inc., L., Dept. 4, 116 Fifth Ave., New York. N. Y.
Paint Specifications. Booklet, 8½ x 10¾ ins., 4 pp.

Toch Brothers, New York, Chicago, Los Angeles.
Architects' Specification Data. Sheets in loose leaf binder, 8½ x 11 ins., dealing with an important line of materials.

U. S. Gutta Percha Paint Co., Providence, R. I.
Barreled Sunlight. Booklet, 8½ x 11 ins. Data on "Barreled Sunlight" with specifications for its use.

PAINTS, STAINS, VARNISHES AND WOOD FINISHES—Continued

Valentine & Co., 456 Fourth Ave., New York, N. Y.
How to Use Valspar. Illustrated booklet, 32 pp., 3¾ x 8 ins. Deals with domestic uses for Valspar.
How to Keep Your House Young. Illustrated brochure, 24 pp., 7 x 8½ ins. A useful work on the upkeep of residences.
Architectural Four-Hour Varnishes and Enamels. Booklet, 8 pp., 4½ x 6 ins. Data on a useful line of materials.

PARCEL DELIVERY DEVICES

Receivador Sales Company, Grand Rapids, Mich.
Architects' Portfolio. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Deals with delivery problems and their solution.

PARTITIONS

Circle A. Products Corporation, New Castle, Ind.
Circle A. Partitions Sectional and Movable. Brochure. Illustrated. 8½ x 11¾ ins., 32 pp. Full data regarding an important line of partitions, along with Erection Instructions for partitions of three different types.

Dahlstrom Metallic Door Company, Jamestown, N. Y.
Dahlstrom Standard Steel Partitions. Booklet, 24 pp., 8½ x 11 ins. Illustrated.

Hauserman Company, E. F., Cleveland, Ohio.
Hollow Steel Standard Partitions. Various folders, 8½ x 11 ins. Illustrated. Give full data on different types of steel partitions, together with details, elevations and specifications.

Improved Office Partition Company, 25 Grand St., Elmhurst, L. I.
Telesco Partition. Catalog, 8¼ x 11 ins., 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions, cuts of finished partition units in various woods. Gives specifications and cuts of buildings using Telesco.
Detailed Instructions for Erecting Telesco Partitions. Booklet, 24 pp., 8¼ x 11 ins. Illustrated. Complete instructions, with cuts and drawings, showing how easily Telesco Partition can be erected.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Partitions. Booklet, 7 x 10 ins., 32 pp. Illustrated. Describes complete line of track and hangers for all styles of sliding parallel, accordion and flush-door partitions.

U. S. Gypsum Co., Chicago, Ill.
Pyrobar Partition and Furring Tile. Booklet, 8½ x 11 ins., 24 pp. Illustrated. Describes use and advantages of hollow tile for inner partitions.

PIPE

American Brass Company, Waterbury, Conn.
Bulletin B-1. Brass Pipe for Water Service. 8½ x 11 ins., 28 pp. Illustrated. Gives schedule of weights and sizes (I.P.S.) of seamless brass and copper pipe, shows typical installations of brass pipe, and gives general discussion of the corrosive effect of water on iron, steel and brass pipe.

American Rolling Mill Company, Middletown, Ohio.
How ARMCO Dredging Products Cut Costs. Booklet, 16 pp., 6 x 9 ins. Data on dredging pipe.

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog A. 4 x 16½ ins., 700 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

Cohoes Rolling Mill Company, Cohoes, N. Y.
Cohoes Pipe Handbook. Booklet, 40 pp., 5 x 7½ ins. Data on wrought iron pipe.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali, Rust-proof Drain Pipe and Fittings. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on a valuable line of pipe.

National Tube Co., Frick Building, Pittsburgh, Pa.
"National" Bulletin No. 2. Corrosion of Hot Water Pipe, 8½ x 11 ins., 24 pp. Illustrated. In this bulletin is summed up the most important research dealing with hot water systems. The text matter consists of seven investigations by authorities on this subject.
"National" Bulletin No. 3. The Protection of Pipe Against Internal Corrosion, 8½ x 11 ins., 20 pp. Illustrated. Discusses various causes of corrosion, and details are given of the deactivating and deaereating systems for eliminating or retarding corrosion in hot water supply lines.
"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 ins., 88 pp. This bulletin contains 254 illustrations of prominent buildings of all types, containing "National" Pipe, and considerable engineering data of value to architects, engineers, etc.
Modern Welded Pipe. Book of 88 pp., 8½ x 11 ins., profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

PLASTER

Best Bros. Keene's Cement Co., Medicine Lodge, Kans.
Information Book. Brochure, 24 pp., 5 x 9 ins. Lists grades of plaster manufactured; gives specifications and uses for plaster.
Plasterers' Handbook. Booklet, 16 pp., 3½ x 5½ ins. A small manual for use of plasterers.

REQUEST FOR CATALOGS

To get any of the catalogs described in this section, put down the title of the catalog desired, the name of the manufacturer and send coupon to THE ARCHITECTURAL FORUM, 521 Fifth Avenue, New York.

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Name .....Business .....

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 196*

PLASTER—Continued

Interior Walls Everlasting. Brochure, 20 pp., 6¼ x 9¼ ins. Illustrated. Describes origin of Keene's Cement and views of buildings in which it is used.

PLUMBING EQUIPMENT

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog M. 9¼ x 12 ins., 184 pp. Illustrated. Shows complete line of plumbing fixtures for Schools, Railroads and Industrial Plants.

Crane Company, 836 S. Michigan Ave., Chicago, Ill.
Plumbing Suggestions for Home Builders. Catalog, 3 x 6 ins., 80 pp. Illustrated.
Plumbing Suggestions for Industrial Plants. Catalog, 4 x 6½ ins., 34 pp. Illustrated.
Planning the Small Bathroom. Booklet, 5 x 8 ins. Discusses planning bathrooms of small dimensions.

John Douglas Co., Cincinnati, Ohio.
Douglas Plumbing Fixtures. Bound volume, 200 pp., 8½ x 11 ins. Illustrated. General catalog.
Another Douglas Achievement. Folder, 4 pp., 8½ x 11 ins. Illustrated. Data on new type of stall.
Hospital. Brochure, 60 pp., 8½ x 11 ins. Illustrated. Deals with fixtures for hospitals.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali and Rust-Proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.
Watrous Patent Flush Valves, Duojet Water Closets, Liquid Soap Fixtures, etc. 8½ x 11 ins., 136 pp., loose-leaf catalog, showing roughing-in measurements, etc.

Maddock's Sons Company, Thomas, Trenton, N. J.
Catalog K. Booklet, 150 pp., 8½ x 10⅞ ins. Illustrated. Data on vitreous china plumbing fixtures with brief history of Sanitary Pottery.

Speakman Company, Wilmington, Del.
Catalog K. Booklet, 150 pp., 8½ x 10⅞ ins. Illustrated. Data on showers and equipment details.

Trenton Potteries Company, Trenton, N. J.
The Blue Book of Plumbing. Bound volume, 182 pp., 8½ x 10½ ins. Illustrated.

PNEUMATIC TUBE SYSTEMS

Gillis & Geoghegan, Inc., 535 West Broadway, New York.
G & G Atlas Systems. Booklet. 12 pp. 8½ x 11 ins. Illustrated. Tube systems for department stores.
Quickly and Efficiently Handling Sales Transactions. Folder. Illustrated. Plan of tube system for a department store.

PUMPS

Kewanee Private Utilities Co., 442 Franklin St., Kewanee, Ill.
Bulletin E. 7¾ x 10¼ ins., 32 pp. Illustrated. Catalog. Complete descriptions, with all necessary data, on Standard Service Pumps, Indian Brand Pneumatic Tanks, and Complete Water Systems, as installed by Kewanee Private Utilities Co.

The Trane Co., La Crosse, Wis.
Trane Small Centrifugal Pumps. Booklet, 3¾ x 8 ins., 16 pp. Complete data on an important type of pump.

RADIO EQUIPMENT

Radio Corporation of America, Woolworth Building, New York City, N. Y.
R. C. A. Antenna Distribution System for Multiple Receivers. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Apparatus for apartment houses and similar large buildings.
R. C. A. Centralized Radio Receiving Equipment. Brochure, 8 pp., 9 x 11 ins. Illustrated. Radio equipment for hotels, hospitals, etc.

RAMPS

Ramp Buildings Corporation, 21 East 40th St., New York, N. Y.
Building Garages for Profitable Operation. Booklet, 8½ x 11 ins. 16 pp. Illustrated. Discusses the need for modern mid-city, parking garages, and describes the d'Humy Motoramp system of design, on the basis of its superior space economy and features of operating convenience. Gives cost analyses of garages of different sizes, and calculates probable earnings.
Garage Design Data. Series of informal bulletins issued in loose-leaf form, with monthly supplements.

REFRIGERATION

The Fulton Syphon Company, Knoxville, Tenn.
Temperature Control of Refrigeration Systems. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Deals with cold storage, chilling of water, etc.

North Western Expanded Metal Company, Chicago, Ill.
Designing Data. Book, 6 x 9 ins., 96 pp. Illustrated. Covers the use of Econo Expanded Metal for various types of reinforced concrete construction.

REINFORCED CONCRETE—See also Construction, Concrete

Longspan ¾-inch Rib Lath. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.

Truscon Steel Company, Youngstown, Ohio.
Shearing Stresses in Reinforced Concrete Beams. Booklet, 8½ x 11 ins., 12 pp.

RESTAURANT EQUIPMENT

John Van Range Company, Cincinnati.
Planning Restaurants That Make Money. Booklet, 78 pp., 8½ x 11 ins. Illustrated. Excellent work on equipment.

ROOFING

The Barrett Company, 40 Rector St., New York City.
Architects' and Engineers' Built-up Roofing Reference Series; Volume IV Roof Drainage System. Brochure, 64 pp., 8½ x 11¼ ins. Gives complete data and specifications for many details of roofing.

Federal Cement Tile Co., 608 S. Dearborn Street, Chicago.
Catalog and Roof Standards. Booklet, 36 pp. 8½ x 11 ins. Illustrated. Describes Featherweight Concrete Insulating Roof Slabs, including complete data, weights and dimensions, specifications and detail drawings. Also includes complete information on Featherweight Concrete Roof Slabs for use with ornamented slate or copper covering. The catalog is profusely illustrated and contains also a partial list of users.
Examples of Theaters and Theater Roofs. Brochure, 16 pps., 8½ x 11 ins., Illustrated. Contains views of theaters designed by some of the country's leading architects.

Heinz Roofing Tile Co., 1925 West Third Avenue, Denver, Colo.
Plymouth-Shingle Tile with Sprocket Hips. Leaflet, 8½ x 11 ins. Illustrated. Shows use of English shingle tile with special hips.
Italian Promenade Floor Tile. Folder, 2 pp., 8½ x 11 ins. Illustrated. Floor tiling adapted from that of Davanzati Palace.
Mission Tile. Leaflet, 8½ x 11 ins. Illustrated. Tile such as are used in Italy and Southern California.
Georgian Tile. Leaflet, 8½ x 11 ins. Illustrated. Tiling as used in old English and French farmhouses.

Johns-Manville Corporation, New York.
The New Book of Roofs. Brochure, 24 pp., 8½ x 11 ins. Illustrated. Roofing from the Architect's point of view.

Ludowici-Celadon Company, 104 So. Michigan Ave., Chicago, Ill.
"Ancient" Tapered Mission Tiles. Leaflet, 8½ x 11 ins., 4 pp. Illustrated. For architects who desire something out of the ordinary this leaflet has been prepared. Describes briefly the "Ancient" Tapered Mission Tiles, hand-made with full corners and designed to be applied with irregular exposures.

Milwaukee Corrugating Co., Milwaukee.
Milcor Architectural Sheet Metal Guide. Booklet. 72 pp., 8½ x 11 ins. Illustrated. Metal tile roofing, skylights, ventilators, etc.
Milcor Sheet Metal Handbook. Brochure. 128 pp., 8½ x 11 ins. Illustrated. Deals with rain-carrying equipment, etc.

Sheet Steel Trade Extension Committee, Terminal Tower, Cleveland.
This committee will send upon request full data published by its members on steel roof decks and specifications for their use.

Structural Gypsum Corporation, Linden, N. J.
Relative Effectiveness of Various Types of Roofing Construction in Preventing Condensation of the Under Surface. Folder, 4 pp., 8¼ x 11 ins. Important data on the subject.
Gypsteel Pre-cast Fireproof Roofs. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Information regarding a valuable type of roofing.

U. S. Gypsum Co., Chicago, Ill.
Pyrobar Roof Construction. Booklet, 8 x 11 ins., 48 pp. Illustrated. Gives valuable data on the use of tile in roof construction.
Sheetrock Pyrofill Roof Construction. Folder, 8½ x 11 ins. Illustrated. Covers use of roof surfacing which is poured in place.

SEWAGE DISPOSAL

Kewanee Private Utilities, 442 Franklin St., Kewanee, Ill.
Specification Sheets. 7¾ x 10¼ ins., 40 pp. Illustrated. Detailed drawings and specifications covering water supply and sewage disposal systems.

Nash Engineering Company, South Norwalk, Conn.
Bulletin 97. Booklet. 16 pp. 10¾ x 7½ ins. Illustrated in color. Describes the design, construction and operation of the Jennings Suction Sump Pump.
Bulletin 11. Brochure. 8 pp. 10¾ x 7½ ins. Illustrated in color. Deals with Nash Hytor Vacuum Pumps for air and gases.
Bulletin 67. Booklet. 16 pp. 10¾ x 7½ ins. Illustrated in color. Describes Type A Jennings Sewage Ejector for handling Unscreened sewage and raising it from basements below sewer level.
Bulletin 103. Brochure. 16 pp. 10¾ x 7½ ins. Illustrated in color. Deals with small size Type B Jennings Sewage Ejector.

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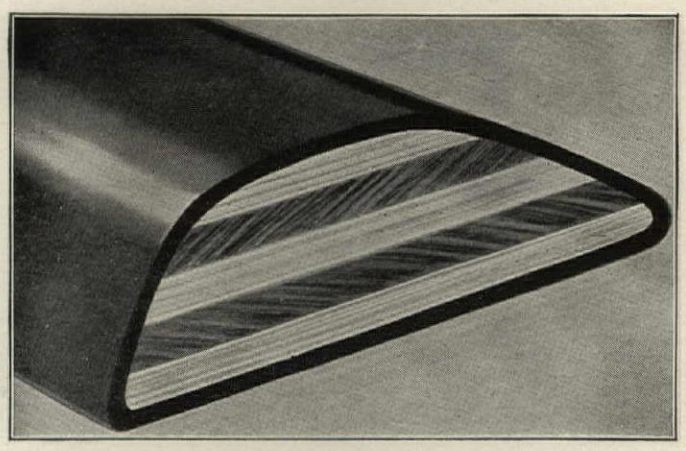


Note the Laminated Construction—a core of alternating-grain layers of hardwood—sealed and bonded to the whole by Whale-bone-ite. It is warp-proof and is guaranteed against warping, cracking and splitting.

Many automobile accidents that might not have been serious except for flying glass led to the development of stronger, LAMINATED, non-shatterable glass.

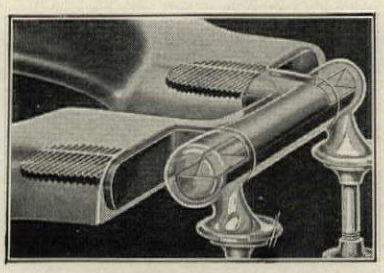
The excessive cost of replacing toilet seats smashed by the slam-bang abuse of the careless public led to the development of indestructible Whale-bone-ite LAMINATED construction—the only construction that can be guaranteed for the life of the building—the only construction that immediately ends all replacement expense.

We and others have tried to make toilet seats as strong, as light and as sanitary by other methods. But it can't be done. Only *laminated* construction can give the abuse-defying strength of Whale-bone-ite—the careless abuse that every public toilet seat receives. Fourteen years and a million Whale-bone-ites in use have proved it. Today, nearly all seats going into public toilets are of laminated construction.

Whale-bone-ite Seats are found quite generally in the guest bathrooms of fine hotels as well as in public institutions where service requirements are severe. Many new apartment houses are equipping all toilets with them.

Send for free cross-section —see its strength yourself

Figures show that on the average ordinary seats have to be replaced about every three years. If you want to end this needless expense, just as it already has been ended in more than a million public toilets in modern and remodelled buildings, simply install Whale-bone-ite Seats as fast as other seats wear out. Not only will the replacement expense end, but the toilets will be cleaner as Whale-bone-ite is easier to keep clean. Without obligation send for a free Whale-bone-ite cross-section. Simply address Dept. A-8, Seat Division, The Brunswick-Balke-Collender Co., 623 South Wabash Ave., Chicago.



THE Whale-bone-ite steel hinge is moulded integral with the Seat forming an unbreakable unit. Covered with Whale-bone-ite, the hinge is as handsome as the Seat. It cannot tarnish. It is easy to clean.

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Boston	Cleveland	Houston	Newark	Richmond	Washington
Buffalo	Dallas	Kansas City	New Haven	San Antonio	Montreal
Charlotte	Denver	Los Angeles	New Orleans	San Francisco	Ottawa
Chattanooga	Des Moines	Memphis	New York	Seattle	Toronto

Sidney, Australia Havana Buenos Aires

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 198*

SCREENS

American Brass Co., The, Waterbury, Conn.
Facts for Architects About Screening. Illustrated folder, 9½ x 11¾ ins., giving actual samples of metal screen cloth and data on fly screens and screen doors.

Athey Company, 6015 West 65th St., Chicago, Ill.
The Athey Perennial Window Shade. An accordion pleated window shade, made from translucent Herringbone woven Coutil cloth, which raises from the bottom and lowers from the top. It eliminates awnings, affords ventilation, can be dry-cleaned and will wear indefinitely.

Orange Screen Co., Maplewood, N. J.
Orsco Aluminum Screens. Booklet, 8 pp., 8 x 11 ins. Illustrated. Data on a valuable line of screens.
Orsco Screens and Other Products. Brochure, 20 pp., 8 x 11 ins. Illustrated. Door and window screens and other hardware.

SHADE CLOTH AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York, N. Y.
Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.

SHELVING-STEEL

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Steel Shelving. Catalog E. Illustrated brochure, 40 pp., 8½ x 11 ins. Deals with steel cabinets, shelving, racks, doors, partitions, etc.

STEEL PRODUCTS FOR BUILDING

Bethlehem Steel Company, Bethlehem, Pa.
Steel Joists and Stanchions. Booklet, 72 pp., 4 x 6¾ ins. Data for steel for dwellings, apartment houses, etc.

Sheet Steel Trade Extension Committee, Terminal Tower, Cleveland.
This committee will send upon request full data published by its members on steel partitions and specifications for their use.

Steel Frame House Company, Pittsburgh, Pa. (Subsidiary of McClintic-Marshall Corp.)
Steel Framing for Dwellings. Booklet, 16 pp., 8½ x 11 ins. Illustrated.
Steel Framing for Gasoline Service Stations. Brochure, 8 pp., 8½ x 11 ins. Illustrated.
Steel Frame Standard Gasoline Service Stations. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Three standard designs of stations.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
The Arc Welding of Structural Steel. Brochure, 32 pp., 8½ x 11 ins. Illustrated. Deals with an important structural process.

STONE, BUILDING

Indiana Limestone Company, Bedford, Ind.
Volume 3, Series A-3. Standard Specifications for Cut Indiana Limestone work, 8½ x 11 ins., 56 pp. Containing specifications and supplementary data relating to the best methods of specifying and using this stone for all building purposes.
Volume 1. Series B. Indiana Limestone Library, 6 x 9 ins., 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.
Volume 4. Series B. Booklet. New Edition, 8½ x 11 ins., 64 pp. Illustrated. Indiana Limestone as used in Banks.
Volume 5. Series B. Indiana Limestone Library. Portfolio, 11⅛ x 8¾ ins. Illustrated. Describes and illustrates the use of stone for small houses with floor plans of each.
Volume 6. Series B. Indiana Limestone School and College Buildings. 8½ x 11 ins., 80 pp. Illustrated.
Volume 12. Series B. Distinctive Homes of Indiana Limestone. 8½ x 11 ins., 48 pp. Illustrated.
Old Gothic Random Ashlar. 8½ x 11 ins., 16 pp. Illustrated.

STORE FRONTS

Brasco Manufacturing Co., 5025-35 South Wabash Ave., Chicago, Ill.
Catalog No. 33. Series 500. All-Metal Construction. Brochure, 20 pp., 8½ x 11 ins. Illustrated. Deals with store fronts of a high class.
Catalog No. 34. Series 202. Standard construction. Booklet, 16 pp. 8½ x 11 ins. Illustrated, complete data on an important type of building.
Detail Sheets. Set of seven sheets, 8½ x 11 ins., printed on tracing paper, giving full-sized details and suggestions for store front designs.
Davis Solid Architectural Bronze Sash. Set of six sheets, 8½ x 11 ins., printed on tracing paper. Full-sized details and suggestions for designs of special bronze store front construction.

The Kawneer Company, Niles, Mich.
Catalog M, 1929 Edition, 64 pages, 8½ x 11 ins., with the A.I.A. File No., profusely illustrated. General Catalog.
Detail Sheet and descriptive folder, 8½ x 11 ins., with A.I.A. File No. featuring "B" Store Front Construction, designed along modernistic lines.

STORE FRONTS—Continued

Modern Bronze Store Front Co., Chicago Heights, Ill.
Introducing Extruded Bronze Store Front Construction. Folder, 4 pp., 8½ x 11 ins. Illustrated. Contains full-sized details of metal store fronts.

Zouri Drawn Metals Company, Chicago Heights, Ill.
Zouri Safety Key-Set Store Front Construction. Catalog, 8½ x 10½ ins., 60 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.
International Store Front Construction. Catalog, 8½ x 10 ins., 70 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.
Store Fronts by Zouri. Booklet, 30 pp., 9 x 12 ins. Illustrated.

TELEPHONE SERVICE ARRANGEMENTS

All Bell Telephone Companies. Apply nearest Business Office, or American Telephone and Telegraph Company, 195 Broadway, New York.
Planning for Home Telephone Conveniences. Booklet, 52 pp., 8½ x 11 inches. Illustrated.
Planning for Telephones in Buildings. Brochure, 74 pp., 8½ x 11 inches. Illustrated.

TERRA COTTA

National Terra Cotta Society, 19 West 44th St., New York, N. Y.
Standard Specifications for the Manufacture, Furnishing and Setting of Terra Cotta. Brochure, 8½ x 11 ins., 12 pp. Complete Specification, Glossary of Terms Relating to Terra Cotta and Short Form Specification for incorporating in Architects' Specification.
Color in Architecture. Revised Edition. Permanently bound volume, 9⅛ x 12¼ ins., containing a treatise upon the basic principles of color in architectural design, illustrating early European and modern American examples. Excellent illustrations in color.
Present Day Schools. 8½ x 11 ins., 32 pp. Illustrating 42 examples of school architecture with article upon school building design by James O. Betelle, A. I. A.
Better Banks. 8½ x 11 ins., 32 pp. Illustrating many banking buildings in terra cotta with an article on its use in bank design by Alfred C. Bossom, Architect.

TILE, HOLLOW

National Fire-Proofing Co., 250 Federal Street, Pittsburgh, Pa.
Natco. The Complete line of Structural Clay Tile. Booklet. 39 pp. 8½ x 11 ins. Illustrated. A General Catalog.
Natco Double Shell Load Bearing Tile Bulletin. 8½ x 11 ins., 6 pp. Illustrated.
Natco Face Tile for the Up-to-Date. Farm Bulletin. 8½ x 11 ins.
Natcoflor Bulletin. 8½ x 11 ins., 6 pp. Illustrated.
Natco Header Backer Tile Bulletin. 8½ x 11 ins., 4 pp. Illustrated.
Natco Unibacker Tile Bulletin. 8½ x 11 ins., 4 pp. Illustrated.

TILES

Hanley Company, Bradford, Pa.
Hanley Quarry Tile. Folder. 4 pp., 5 x 8 ins. Illustrated.

C. Pardee Works, 9 East 45th St., New York, N. Y., and 1600 Walnut St., Philadelphia, Pa.
Pardee Tiles. Bound volume, 48 pp., 8½ x 11 ins. Illustrated.

United States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 120 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.
Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

VALVES

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
No. 51. General Catalog. Illustrated. Describes the complete line of the Crane Co.

C. A. Dunham Co., 450 East Ohio St., Chicago, Ill.
The Dunham Packless Radiator Valve. Brochure, 12 pp., 8 x 11 ins. Illustrated. Data on an important type of valve.

Jenkins Brothers, 80 White Street, New York.
Office Buildings Yesterday and Today. Folder, 8½ x 11 ins. Illustrated. Valves for use in office buildings.
The Valve Behind a Good Heating System. Booklet, 4½ x 7¼ ins., 16 pp. Color plates. Description of Jenkins Radiator Valves for steam and hot water, and brass valves used as boiler connections.
Jenkins Valves for Plumbing Service. Booklet, 4½ x 7¼ ins. 16 pp. Illustrated. Description of Jenkins Brass Globe, Angle Check and Gate Valves commonly used in home plumbing, and Iron Body Valves used for larger plumbing installations.

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TRIMMED SQUARE .. PACKAGED .. READY TO USE .. GUARANTEED

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 200*

VENETIAN BLINDS

Burlington Venetian Blind Co., Burlington, Vt.
Venetian Blinds. Booklet, 7 x 10 ins., 24 pp. Illustrated. Describes the "Burlington" Venetian blinds, method of operation, advantages of installation to obtain perfect control of light in the room.

Columbia Mills, Inc., 225 Fifth Ave., New York.
Columbia Venetian Blinds. Booklet, 6 pp., 8½ x 11 ins. Illustrated. Complete data and specifications.

VENTILATION

American Blower Co., Detroit, Mich.
American H. S. Fans. Brochure, 28 pp., 8½ x 11 ins. Data on an important line of blowers.

Duriron Company, Dayton, Ohio.
Acid-proof Exhaust Fans. Folder, 8 x 10½ ins., 8 pp. Data regarding fans for ventilation of laboratory fume hoods.
Specification Form for Acid-proof Exhaust Fans. Folder, 8 x 10½ ins.

Staynew Filter Corporation, Rochester, N. Y.
Protectomotor High Efficiency Industrial Air Filters. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Data on valuable detail of apparatus.

WATERPROOFING

Master Builders Company, Cleveland, Ohio.
Waterproofing and Dampproofing and Allied Products. Sheets in loose index file, 9 x 12 ins. Valuable data on different types of materials for protection against dampness.
Waterproofing and Dampproofing File. 36 pp. Complete descriptions and detailed specifications for materials used in building with concrete.

Minwax Company, Inc., 11 West 42nd St., New York.
Waterproofing Stadia. Folder, 4 pp., 8½ x 11 ins. Illustrated.
Transparent Waterproofings for All Masonry Walls and Surfaces. Folder, 4 pp., 8½ x 11 ins. Illustrated.
Data Sheet on Membrane Waterproofing. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Sommers & Co., Ltd., 342 Madison Ave., New York, N. Y.
"Permantile Liquid Waterproofing" for making concrete and cement mortar permanently impervious to water. Also circulars on floor treatments and cement colors. Complete data and specifications. Sent upon request to architects using business stationery. Circular size, 8½ x 11 ins.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Pamphlet, 3¾ x 8¾ ins., 8 pp. Explanation of waterproofing principles. Specifications for waterproofing walls, floors, swimming pools and treatment of concrete, stucco and mortar.

Toch Brothers, New York, Chicago, Los Angeles.
Architects' Specification Data. Sheets in loose leaf binder, 8½ x 11 ins., dealing with an important line of materials.

WEATHER STRIPS

Athey Company, 6035 West 65th St., Chicago, Ill.
The Only Weatherstrip with a Cloth to Metal Contact. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Data on an important type of weather stripping.

WINDOWS

Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Blue Book. Brochure, 75 pp., 8½ x 11 ins. Illustrated. Data on steel windows.

The Kawneer Company, Niles, Mich.
Circular, 8½ x 11 with A.I.A. File No. featuring full size details and specifications of Heavy Type Sealair Independent Balanced Sash Window.
Circular, 8½ x 11 with A.I.A. File No. featuring full size details and specifications of Light Independent Balanced Sash Sealair Windows.
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David Lupton's Sons Company, Philadelphia, Pa.
Lupton Pivoted Sash. Catalog 12-A. Booklet, 48 pp., 8½ x 11 ins. Illustrates and describes windows suitable for manufacturing buildings.

WINDOWS, CASEMENT

Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Casements. Booklet, 14 pp., 8½ x 11 ins. Illustrated. Discusses casements, particularly for residences.
Fenestra Screen Casements. Brochure, 16 pp., 8½ x 11 ins. Illustrated.
Decorating With Casements. Booklet, 18 pp., with inserts in color 6 x 8½ ins. Deals with use of decorations, particularly draperies, with casement windows.

Hope & Sons, Henry, 103 Park Ave., New York, N. Y.
Catalog, 12¼ x 18½ ins., 30 pp. Illustrated. Full-size details of outward and inward opening casements.

WINDOWS, CASEMENT—Continued

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Casement of Copper Steel. Catalog C-217. Booklet, 24 pp., 8⅝ x 11 ins. Illustrated brochure on casements, particularly for residences.
Lupton Creates a Complete Casement. Folder, 8½ x 11 ins. Illustrated data on a casement providing for screens, shades and draperies.
Lupton Heavy Casements. Detail Sheet No. 101, 4 pp., 8½ x 11 ins. Details and specifications only.

Richards-Wilcox Mfg. Co., Aurora, Ill.
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List of Parts for Assembly. Booklet, 8½ x 11 ins., 16 pp. Full lists of parts for different units.

WINDOW SCREENS

Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Screen Casements. Brochure, 16 pp., 8½ x 11 ins. Illustrated.

Orange Screen Company, Maplewood, N. J.
New Vogue Aluminum Frame Screens. Booklet, 12 pp., 3½ x 8½ ins. Illustrated.

WINDOW SHADES AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York, N. Y.
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Window Shade Rollers. Brochure, 24 pp., 8 x 11 ins. Illustrated. Rollers and accessories.

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Truscon Steel Company, Youngstown, Ohio.
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Continuous Steel Windows and Mechanical Operators. Catalog 126. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

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Curtis Companies Service Bureau, Clinton, Iowa.
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National Lumber Mfrs. Assn., Washington, D. C.
Airplane Hangar Construction. Booklet, 24 pp., 8½ x 11 ins. Use of lumber for hangars.

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Minwax Company, Inc., 11 West 42nd St., New York.
Color card and specification for Minwax Flat Finish. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a penetrative, preservative stain finish giving stain and soft wax effect.

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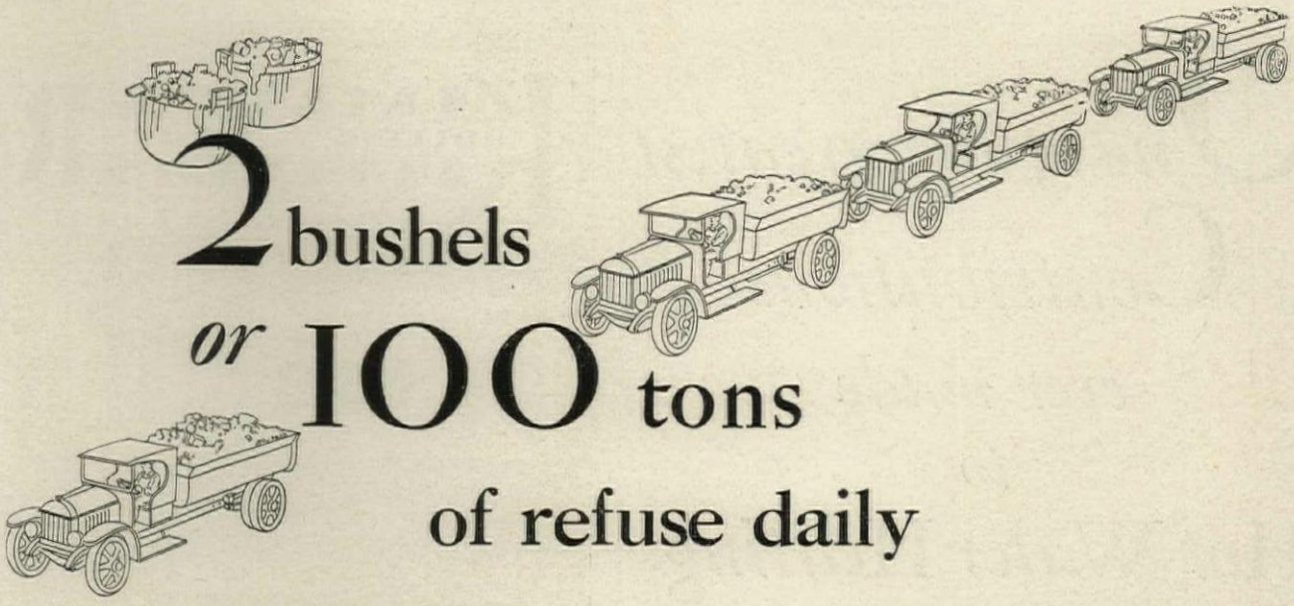

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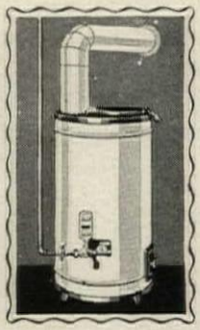

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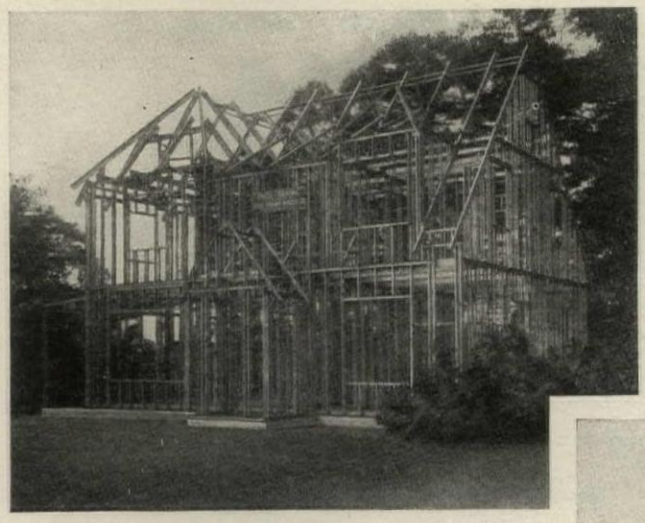

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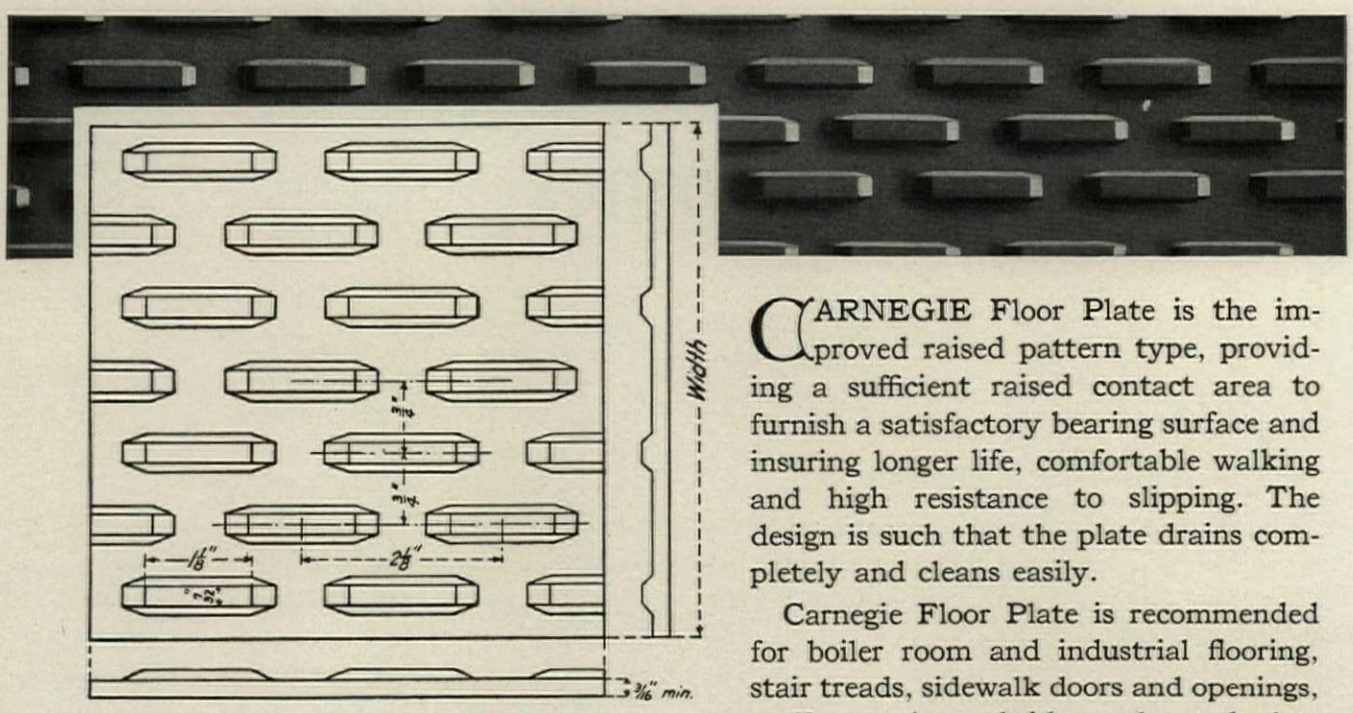

Thickness, Inches	Width and Length, Inches						Weight per Sq. Foot, Pounds
	Over 6 to 12	Over 12 to 24	Over 24 to 36	Over 36 to 48	Over 48 to 60	Over 60 to 66	
¾	...	120	180	280	264	240	31.7
⅝	...	180	200	300	300	260	26.6
½	120	240	240	320	360	300	21.5
7/16	120	240	240	340	360	300	19.0
⅜	120	240	300	340	360	300	16.4
5/16	120	240	300	320	360	300	13.9
¼	120	240	300	320	360	240	11.3
5/16	120	240	300	320	360	240	8.8

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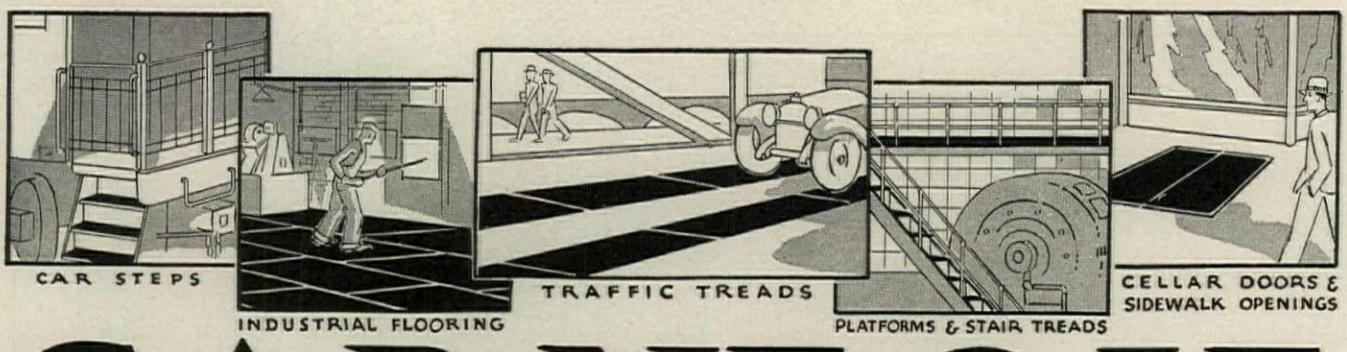

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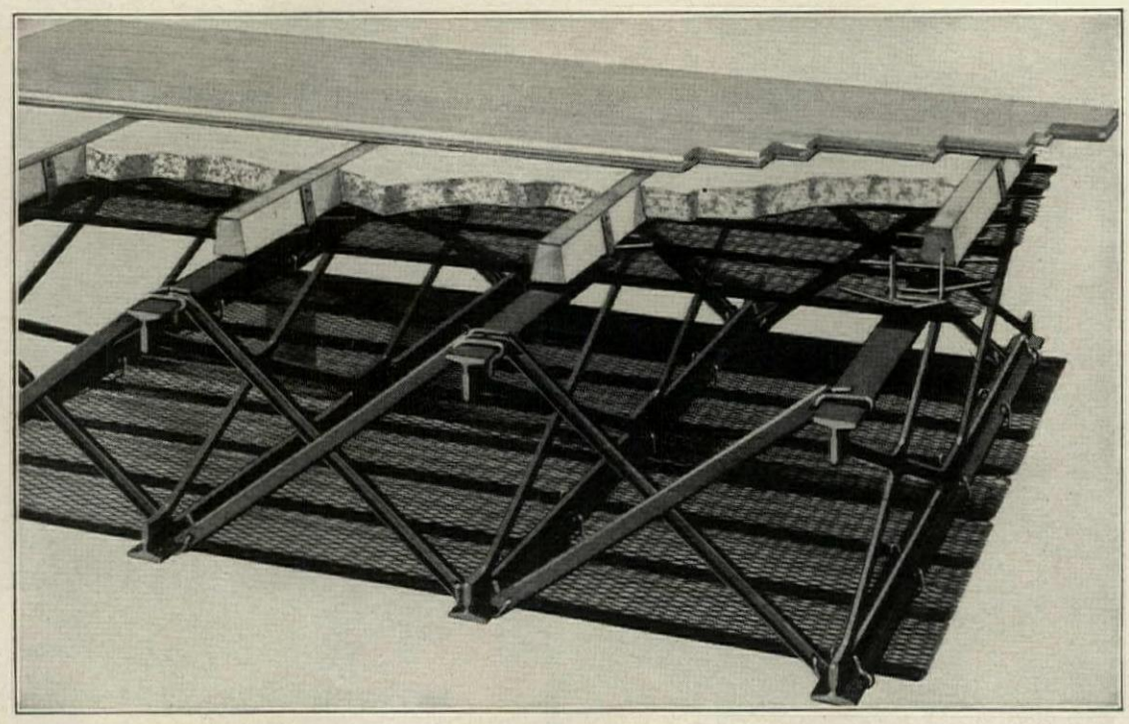

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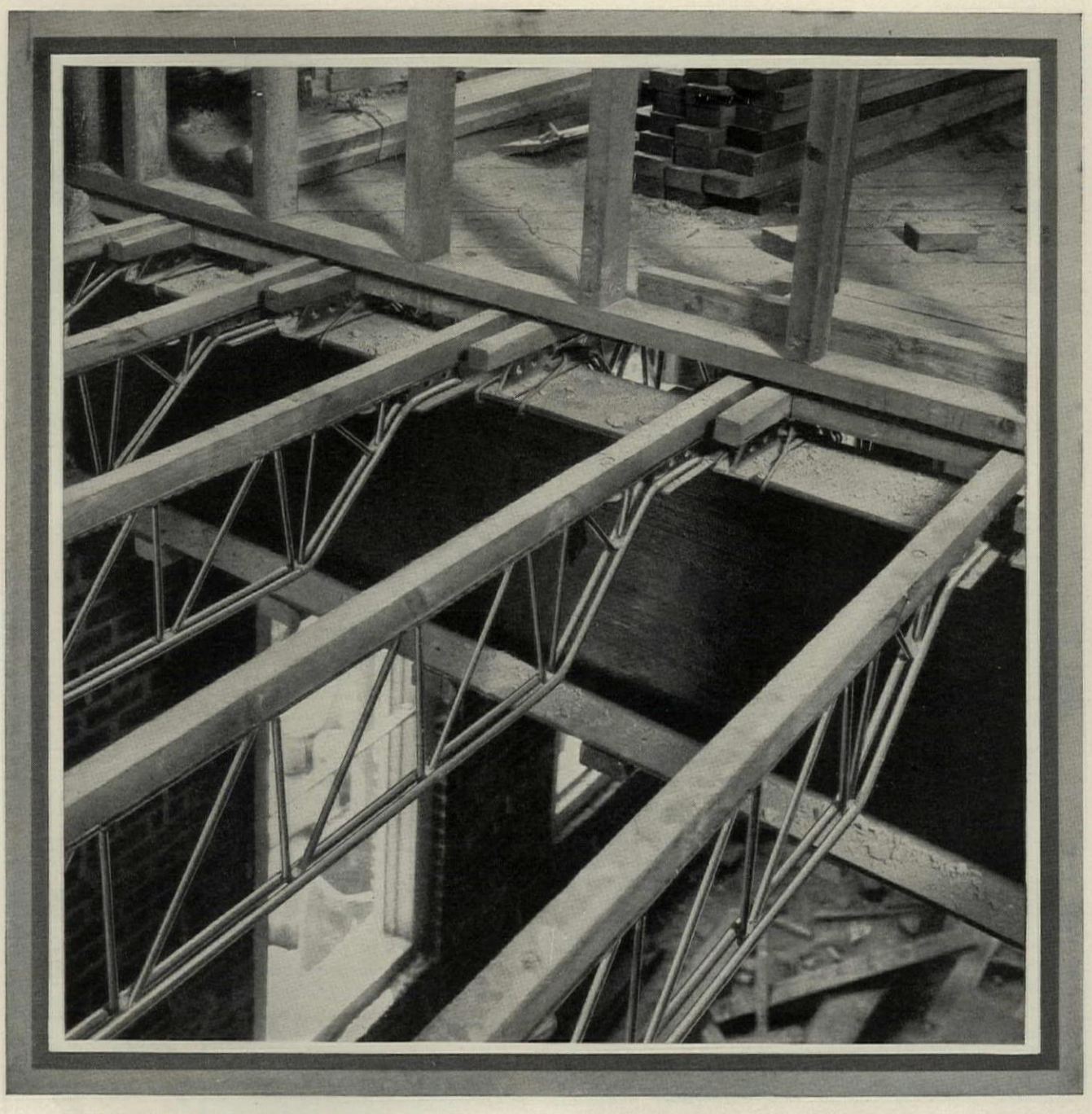

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These desired advantages—greater rigidity, minimum dead load and economical cost—are obtained in a concrete floor of Meyer Steelform construction.

Architects and contractors, everywhere, have proved this to their own complete satisfaction—a fact that is responsible for the universal acceptance of this floor construction and for its use in the largest buildings in the world where strength, speed of operation and low cost are the real essentials.

In planning Cleveland's new tower of safety and saving—the Midland Bank Building—the architects have again paid tribute to Meyer Steelform construction and to the services of this organization which make this floor construction so intensely practical and so genuinely economical.

Meyer Steelforms are installed and removed by an organization especially trained to render the greatest possible cooperation to both architect and contractor. A nominal rental covers both installation and removal. Warehouses located at strategic centers make immediate shipments to the building site.

You are invited to ask a representative to call and show you how Meyer Steelforms and the service back of them will help you to realize a construction that does full justice to your plans.

CONCRETE ENGINEERING COMPANY
General Offices: Omaha, Nebraska

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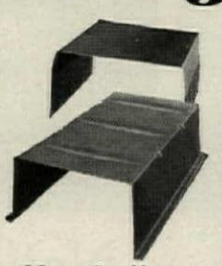

Meyer Steelforms are furnished in 1, 2 and 3 ft. lengths.

Standard widths are 20 in. and 30 in.; special widths —10 in. and 15 in.

MEYER Steelforms

THE STANDARD

THE ORIGINAL REMOVABLE STEEL FORMS FOR CONCRETE RIB FLOOR CONSTRUCTION

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Permits full expression of the architect's art. Beautiful interiors depend upon this basic feature of design and construction, which gives complete freedom for correct decorative and furnishing treatment.

It eliminates the one obstacle which architects, interior decorators and owners, alike, have fought to overcome — by banishing unsightly radiators which destroy harmony and symmetry in the room.

Then there is the practical advantage of Trane Concealed Heating—more generous, cleaner and quicker heat, uniform heating, instantaneous control of heating, and continuous savings in fuel used.

Trane Concealed Heating is *the* big new feature of any building with which to render a real service and satisfaction to the client. It is a wonderful boon to the architect.

To recommend Trane Concealed Heating is the progressive thing to do. Leading architects are doing this and Trane sales are mounting tremendously. Invariably the complete Trane Vapor System is used, because of its known reliability.

Write now for facts regarding this revolutionizing heating method.

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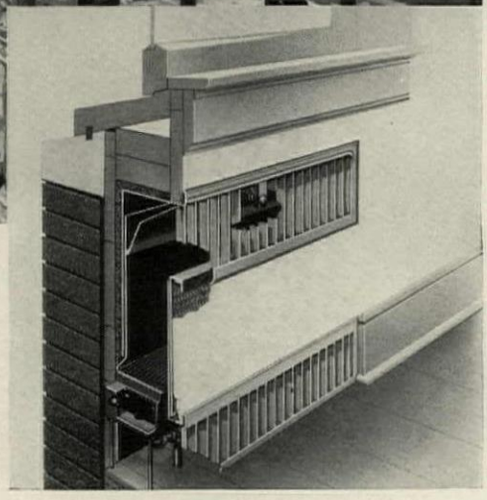
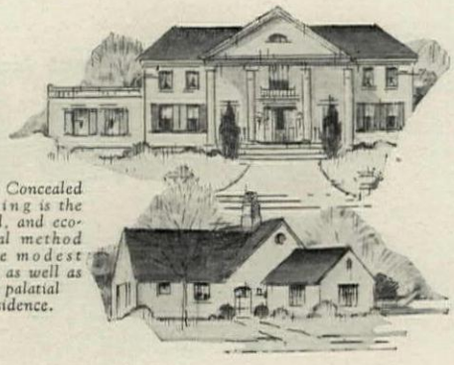
Established 1885 *Branches in All Principal Cities*



Sectional view of a Trane Concealed Heater installation showing the Trane patented heating element made without soldered, brazed or welded joints, and the adjustable stack which accommodates installations of various heights by its telescoping action. The heating element is easily accessible through the lower grille. No special fitting or extra work is required on the job. The unit is shipped complete from the factory.



Trane Concealed Heating is the logical, and economical method for the modest home, as well as the palatial residence.

RELIABLE HEAT

FOR A NEW AQUARIUM

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OF THE FIELD MUSEUM, CHICAGO

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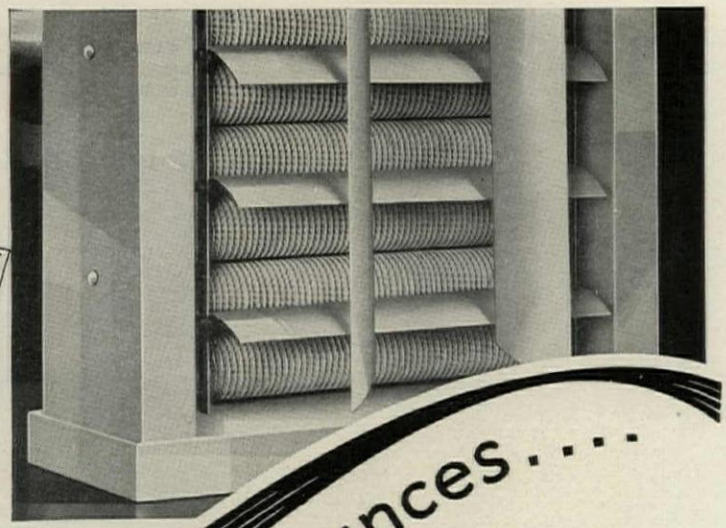

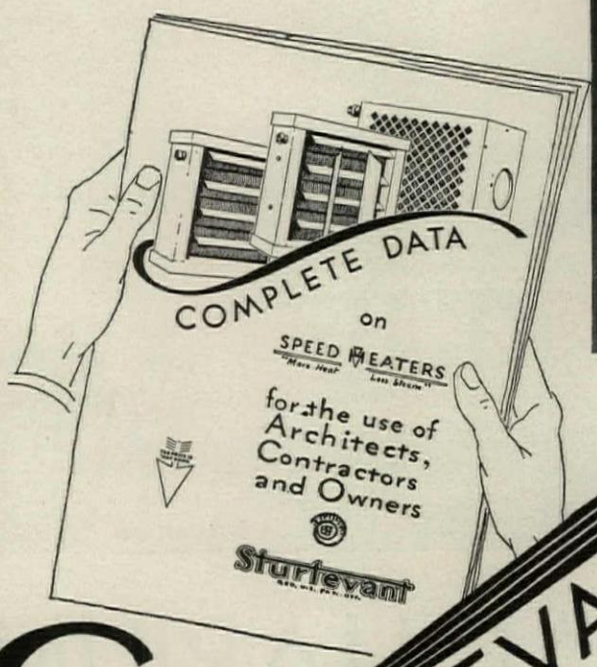

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An interesting feature is the vertical vanes, in addition to the regular horizontal vanes. These radiate the heat in a wider arc and break up objectionable hot air streams.

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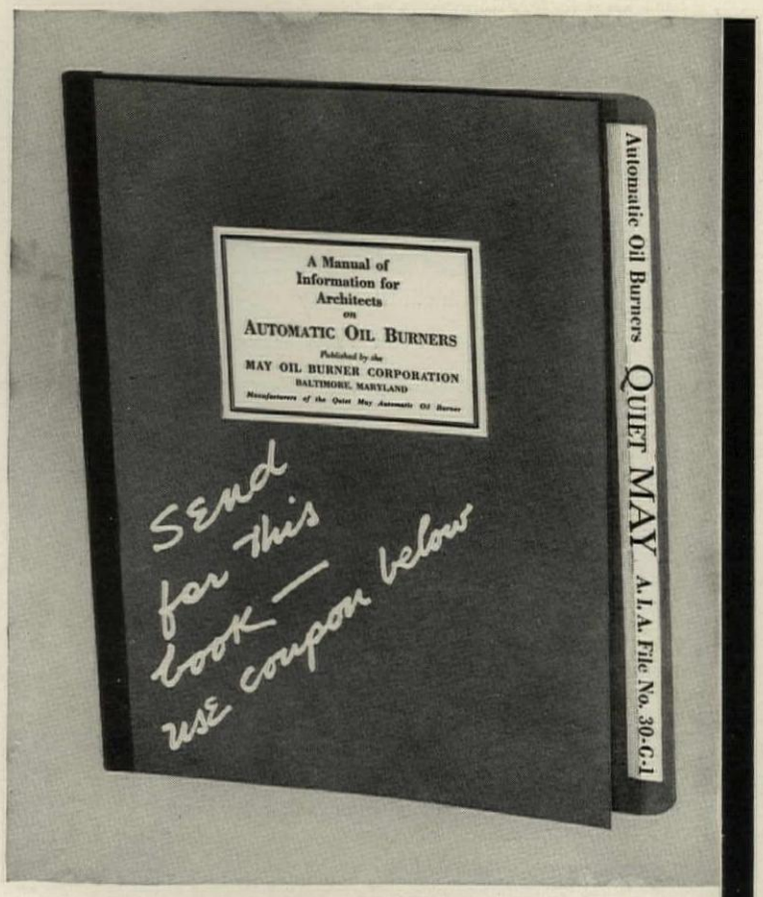

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It is of inestimable value to the designer and specification writer who wish to cover the details in connection with the installation of any approved make of oil burner. In addition to being a comprehensive textbook on oil burners, it contains a complete reprint of the Regulations of the National Board of Fire Underwriters, covering oil burners.

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The Dunham Differential Vacuum Heating System

will furnish delightful warmth for the tenants of this palatial new 24-story Chicago residence apartment building...

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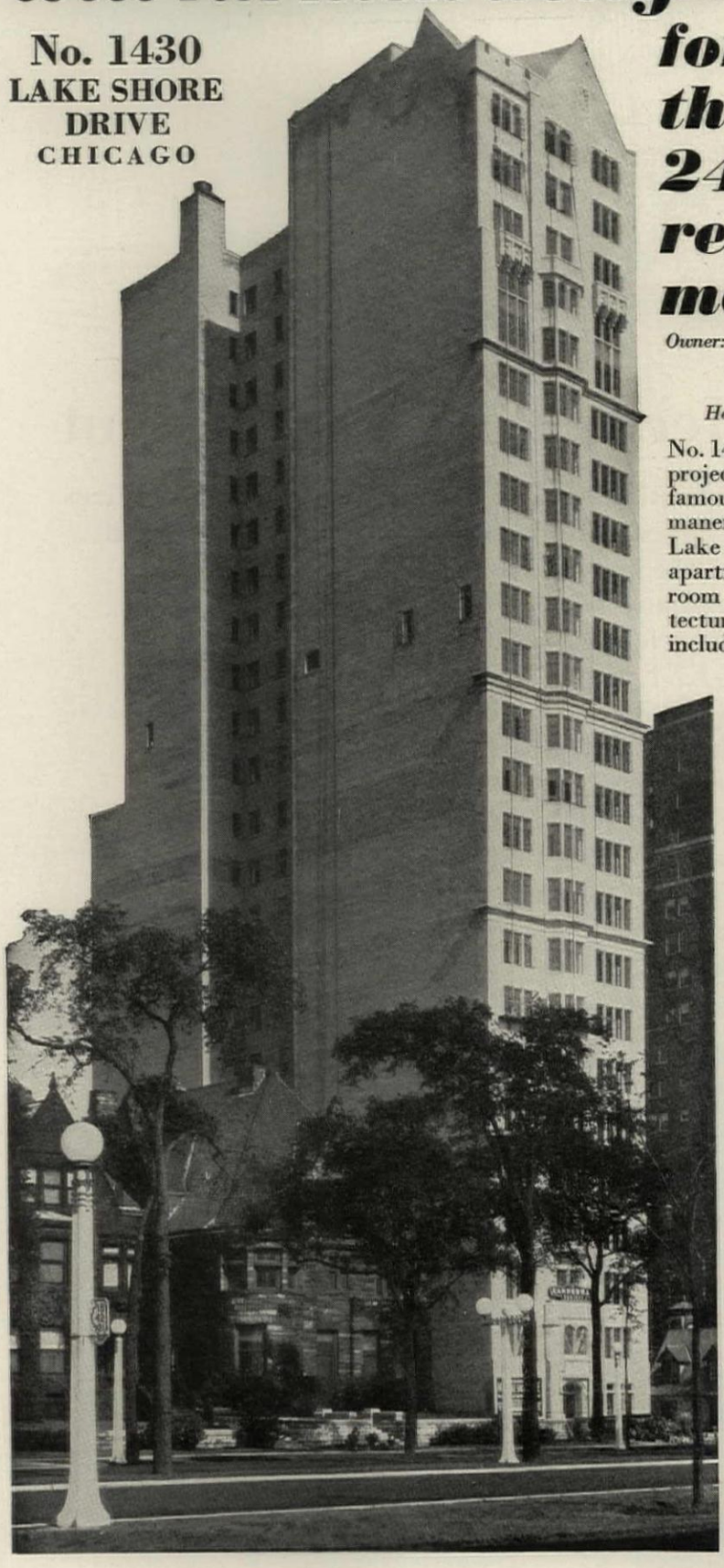

Owner: 1430 Lake Shore Drive Building Corporation, Chicago
Architects: Robert S. De Golyer & Co., Chicago
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Heating Contractor: Kinzie Engineering Co., Chicago

No. 1430 Lake Shore Drive is an outstanding building projecting some 270 feet skyward amid a setting of famous skyscraper apartment buildings, with a permanently unobstructed and commanding view of Lake Michigan. It contains twelve twelve-room apartments, including six baths, and eleven eleven-room apartments, including five baths. Its architecture is modified Tudor Gothic. The first floor plan includes a twenty car garage for use of tenants, with chauffeurs room adjoining.

The apartments, each of which occupies an entire floor, give the privacy of a detached residence and offer the most lavish and complete of accommodations, with every modern convenience and improvement for the comfort and welfare of tenants.

The Dunham Differential Vacuum Heating System installed in this palatial building will simulate, as closely as modern heating science can accomplish it, the balmy, delightful warmth of famous winter resorts in California and Florida. *There will be no overheating in this building.* Regardless of the outdoor weather conditions, each room will be warmed to a degree that is comfortable—healthful—exactly right for ideal living conditions. The structure has a total cubage of 1,439,970 cu. ft. and its heating system comprises 20,622 sq. ft. of direct radiation.

Over eighty sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

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This nameplate identifies a genuine Dunham Thermostatic Radiator Trap

The Dunham Differential Vacuum Heating System and individual parts of the apparatus used in that system are fully protected by United States Patents Nos. 1,644,114 and 1,706,401, and Canadian Patents Nos. 282,193, 282,194 and 282,195. Additional patents in the United States, Canada and foreign countries are now pending.

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A satisfactory installation of heating and ventilating equipment requires more than a series of mechanical units. It requires engineering skill and *service*. These intangible factors are just as important as silent operation, an efficient radiator, up-to-date methods of temperature control, and other features which are embodied in the modern PEERVENT Unit. This Company offers the service and skill of the *Pioneers* in unit heating and ventilation. Peerless Units installed *eighteen years* ago are still giving satisfactory service, and the improved PEERVENT Unit of today is backed by *forty years* of specialized experience in heating and ventilating. For catalog, please address

PEERLESS UNIT VENTILATION CO., Inc.
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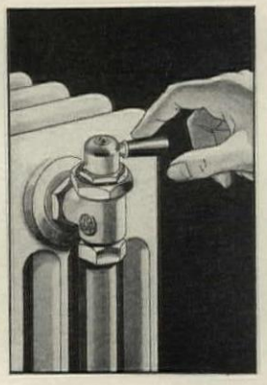
Sales and service representation in all principal cities from coast to coast.

Have heating specifications *kept pace with* Paris couturieres ?

MODERN woman's scanty raiment brings the need for more heat in homes than is comfortable for wool-clothed men. The heating system that satisfies every member of the family must enable the occupant of each room to govern its temperature without effect on any other room.

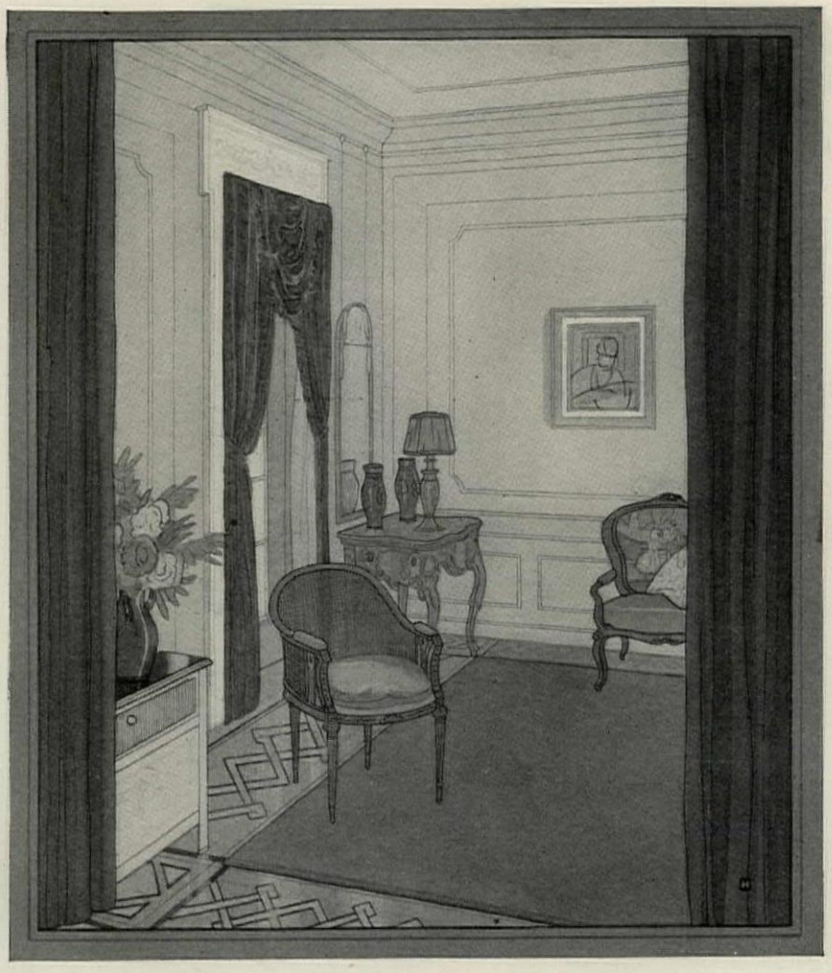
Many architects and heating engineers have found the answer. It is Hoffman Controlled Heat. With this modern luxurious system, the heat output of each radiator is regulated or changed at any time by the pressure of a finger on the lever handle of the radiator valve. This system automatically adjusts itself to the hour-to-hour need for heat. It is economical as well as comfort assuring, because only as the call for heat increases does the supply of steam automatically accumulate.

The equipment that makes it a Hoffman Controlled Heat system can be added to any standard boiler and radiators, coal, gas or oil fired. This equipment includes (1) Hoffman No. 7 modulating valves, which are easily adjustable for quick balancing of the system and for controlling steam flow into each radiator, (2) Hoffman return line valves, which automatically open for passage of water and air and close to steam, (3) the precise Hoffman Damper Regulator, which in response to the demand for steam automatically operates the check damper and draft door, (4) the remarkable Hoffman Differential Loop which safeguards the water line of the boiler, and, (5) the No. 15 Vacuum Valve.



Hoffman Controlled Heat is guaranteed in writing by a conscientious maker to fulfill every promise for years. For architects and heating engineers who are interested in modern heating methods we have published a booklet describing in detail the operation of Hoffman Controlled Heat. Address Hoffman Specialty Company, Inc., Dept. EF-10, Waterbury, Connecticut. It will reach you promptly.

HOFFMAN CONTROLLED HEAT



Modine

Cabinet Heaters

MORE and more, architects are specifying Modine Cabinet Heaters—the modern Copper Radiation.

The improved room appearance with Modine Equipment is something that even builders of more modest homes desire. And for the costly home, nothing else could suffice.

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CPSF

A new heating measure joins the group of famous initials

Until now, the architect has never had a dependable yardstick for measuring the cost of heating.

The cost per room, cost per family per day, cost per cubic contents—these are no more accurate than an order for a house full of lumber. Any large unit, like the annual ton cost, varies widely in different years.

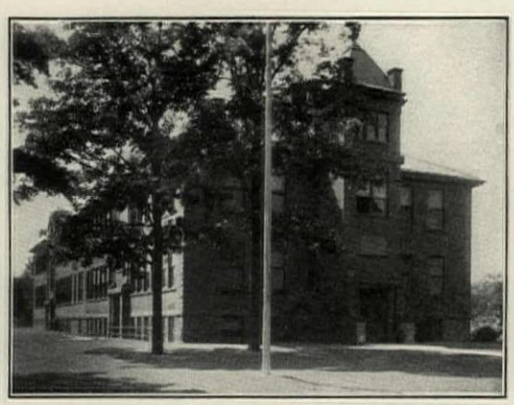
There is a unit of heating cost, which makes surprisingly little variation from year to year. It is based upon the scientific relationship between cubic contents, exposed surfaces, glass areas, and all of the factors which make heating costs for buildings of the same size vary so widely.

The radiation is gauged according to the building's needs. Two buildings of equal size may require vastly different radiation maximums. The cost of heating will naturally vary. Yet the cost of heating each square foot of radiation should not vary, if the radiation is correctly figured. That is why this new unit of heating measure, the cost per square foot of radiation per annum, is fast becoming known familiarly by its initials —c.p.s.f.

It is when the cost of heating is reduced to the c.p.s.f. that architects have been able to demonstrate to their clients the amazingly efficient operation of the Spencer Magazine Feed Heater. In residences, by using No. 1 Buckwheat anthracite, instead of larger sizes that cost twice as much, the Spencer can cut the annual heating cost in half. In the middle west, where anthracite is not used at all, Spencer Heaters use small size coke, to produce heat at a c.p.s.f. that is as much as one-third less than the cost with soft coal.

In schools, the most remarkable demonstration has been made. Spencer Heaters have been able to cut the c.p.s.f. to an average of ten cents and lower. Some instances are recorded of cost cut as low as six and nine-tenths cents per square foot of radiation per year. You probably have some data on buildings in which you are interested, where the heating costs run as high as thirty and forty cents per square foot.

If you are interested in low cost heat for large buildings, write in and ask for detailed information, with the names of the buildings, their locations, and the size and type of Spencer boiler used. This should be of value to the architect in the design of all public buildings. Spencer Heater Company, Williamsport, Pennsylvania.



Cayuga Street School, Niagara Falls, N. Y., where remodeling and additions increased the radiation one hundred per cent., heated by a Spencer for a c. p. s.f. of nine cents, less than the former cost of heating a building only half as large.

SPENCER
Magazine Feed
HEATERS
for steam, vapor or hot water

REVIEWS OF MANUFACTURERS' PUBLICATIONS

ANTHRACITE COAL SERVICE, 1421 Chestnut Street, Philadelphia. "Anthracite in Modern Architecture."

The matter of heating which must be decided by a prospective home owner,—or more frequently by his architect,—involves making a choice among several types of heating equipment. More than that, it means choosing one of several kinds of fuel, those most frequently used being coal, gas, or oil. It could hardly be said that any one of these fuels could be decided upon without giving careful attention to several considerations, among which are location, type and size of the building in question, initial cost, upkeep or maintenance cost, and the likelihood of there being or not being reasonably skilled attendants to operate the heating system. Probably the fuel most widely used, taking the country as a whole, is coal, and among the varieties of coal Anthracite would no doubt be considered by most people as preferable. This booklet deals with the use of Anthracite and is, as its subtitle suggests, "a manual of information for architects and builders." Merely to name its chapter headings would indicate its completeness. "The Selection of a Fuel for New Buildings; Planning Buildings for Heating Comfort and Economy; Designing and Planning Boiler Rooms for Anthracite; Selection of Type and Capacity of the Heating System; The Requirements of an Efficient Hot Water Supply System; The Automatic Control of Anthracite; The Chimney as an Object of Interest and Beauty; Equipment for the Economical Utilization of the Small Sizes of Anthracite; The Magazine Feed Boiler; Solving the Labor Problem of the Boiler Room; The Fuel Problem of the Modern Apartment House; The Selection of a Fuel for Churches, Auditoriums and Schools; Central Station Steam; Relative Value of Privately Generated and Purchased Power; A Comparison of Oil and Anthracite; Anthracite vs. Bituminous, City Gas, and Coke; Forced Draft with Large Coal." Part of the brochure gives tables and data in other form.

THE EN-TOUT-CAS COMPANY, LTD., Syston, Leicestershire, England. "Fast-Drying Tennis Courts."

The making of a practical and serviceable tennis court involves more than the measuring of the necessary markings on the ground and defining them with a brush or a tool. The present-day tennis court, in fact, shares with almost everything else connected with the modern home, country club or country hotel the improvement which study and research have brought to bear upon planning and construction. This brochure, issued by what is perhaps the world's leading firm of tennis court builders, deals with just this. "Lawn tennis, as the name implies, was originally played on grass, and first developed into a recognized sport in England. As the popularity of the game increased, the expense of properly maintaining turf courts became apparent. Asphalt, gravel, concrete and clay were tried. Ordinary clay courts were soon generally accepted . . . but still caused dissatisfaction because of their failure to dry rapidly after rain. Precious tennis hours were lost. Players and would-be spectators were disappointed. Finally, in 1912, the En-Tout-Cas Company of Syston, Leicestershire, produced the first 'En-Tout-Cas' court. The material for the surface of this court was made of a special type of clay, found only in Leicestershire. Many complete laboratory tests had been made before this type was selected. After the clay was treated by a patent process in the En-Tout-Cas kilns it became the proper texture to permit rapid drying and not to stain the clothing or balls. It was passed through a fine screen and then was laid over a quick-draining, perfectly level foundation. Players in every tennis country quickly recognized the advantages of En-Tout-Cas courts. England, Sweden, Norway, Denmark, France, Germany, Spain, Switzerland, New Zealand, Canada and the United States now boast more than 15,000 of them . . . 2,000 of these are additional orders placed by satisfied customers." The booklet gives views of tennis courts which this firm has built upon the estates of many well known people in America, courts in the open air or else indoors. Building of "Fast Drying Tennis Courts" in America is supervised from the office of the American representatives—H. A. Robinson & Co., Inc., 128 Water Street, New York.

TODHUNTER, INC., 119 East 57th Street, New York. "Hand Wrought Lanterns; Authentic Reproductions."

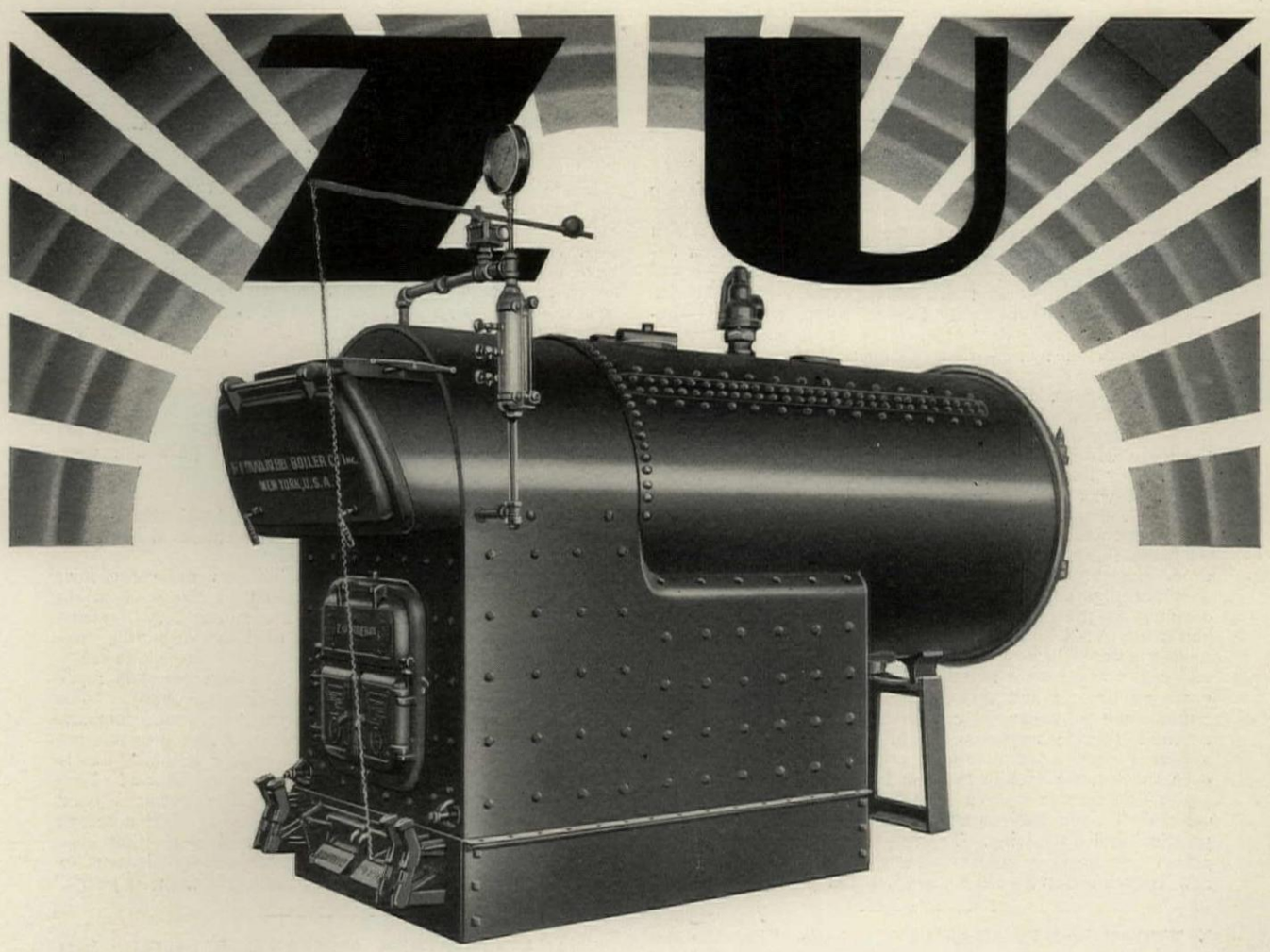
Architects and decorators, as well as home owners, will be interested in this brochure, which illustrates and lists an excellent assortment of lanterns for various exterior and interior uses. The lanterns are chiefly reproductions of old examples, and they have been skillfully adapted for use of electricity. Like all the metal work of the Todhunter firm, the lanterns embody excellent craftsmanship. They are to be had in a variety of metals,—brass, steel, wrought iron, etc.,—and in many different finishes. The glass used with them is of several kinds, and in some instances horn is used.

HOLOPHANE COMPANY, INC., 342 Madison Avenue, New York. "Light for Library Bookstacks and Record Vaults."

The quick and smoothly functioning service which is rendered to its readers by the modern public library could never be given were it not for the aid given by good planning and the most improved forms of equipment. No part of such a library is more important than its bookstacks, and no detail of their equipment is more important than their lighting, since obviously even the most capable attendants would be unable to select the books required were the aisles of the stockroom poorly illuminated. The Holophane Company, Inc., has for many years been making careful study of lighting the interiors of buildings which are more or less "technical," designing upon the basis of such study their highly developed lighting systems. This brochure gives to architects, engineers, librarians, and owners of certain types of buildings full details of the equipment which the skill of the Holophane Company, Inc., places at their disposal. The booklet is replete with all the data likely to be required, and it names some of the libraries so equipped.

PENNSYLVANIA SLATE INSTITUTE, Pen Argyl, Pa. "From Rock to Roof." A brochure on slate for roofing.

On a number of occasions these pages have drawn attention to the associations of manufacturers of building materials or equipment formed to conduct research or to promote movements for the benefit of all the organizations' members. Such an organization is this large association of workers in slate for roofing. The Institute has issued various booklets, brochures, and other publications to place before architects, engineers, builders, and the home-building public the merits of its excellent roofing slates, and such a publication is the booklet here under review. It dwells, first of all, upon the interest which attaches to hand-made products of all kinds, though the meaning of the term "hand-made" might possibly be thought a trifle stretched where applied to slate, which is obviously the work of Mother Nature's hands, and human hands exercise merely the function of preparing it for use. But this function in itself constitutes a form of handwork, and upon it the booklet dwells with emphasis, illustrating and describing the processes which convert huge blocks of slate ripped from the bowels of the earth and hoisted to the earth's surface, and then subjected to one process after another until the blocks are made into slates ready for covering roofs with surfaces which will endure forever. "When roofing slate first came into use in this country, it was chosen for its practical qualities, its ability to withstand blistering sun, blustering wind, driving sleet as could no other roofing. Today its increasing use is based fully as much on its artistic qualities as on its practical merit. Slate is a natural product, hand-fashioned. Two slate shingles can no more be exactly alike in texture or color than can two leaves from the same tree or two roses from the same stem. Therein lies its charm. In this day of machine-made products, of metal window casements, factory-made tile, and even steel skyscraper construction adapted to home building, a slate roof, with its air of hand craftsmanship, has become the distinctive, even the 'distinguished' feature of the house. And yet to cover a house with almost imperishable Pennsylvania blue-gray slate will cost less than it costs to cover its floors with perishable rugs and carpets." The booklet is of course replete with data.



The radically different FIREBOX BOILER

The Z U is a distinct advance in firebox boiler design. It is a better firebox boiler because it adds to the time-tried-and-proven good points of the conventional design a number of vital developments which (1) definitely improve combustion; (2) produce quicker, more efficient heat transfer.

Ample proof of the benefits of these developments is furnished by the many installations in which *more steam at substantially lower cost* is the rule.

The new Z U Boiler Catalog explains these developments and the clear-cut scientific principles on which they are based. It shows: how complete combustion with minimum excess air is secured; how the thermo-syphonic action created by the design induces a remarkably positive and forceful water circulation; why the Z U picks up the heating load with unusual speed. It also explains the many other noteworthy features of this outstanding steel firebox boiler and gives complete information as to ratings and dimensions.

Write for a copy of the Z U catalog—today.

TYPES FOR ALL FUEL REQUIREMENTS

The Z U Steel Firebox Boiler for steam or hot water heating is built in the following types:

Smokeless Type for burning soft coal smokelessly.
Updraft Type for burning bituminous coal, anthracite coal including buckwheat sizes, coke and wood.
Oil, Gas, Stoker Type for oil or gas or stoker firing.
Sizes—from 4,000 to 34,000 sq. ft. radiation.

FITZGIBBONS BOILER CO., Inc.

570 SEVENTH AVE. NEW YORK, N. Y.

WORKS: OSWEGO, N. Y.

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REVIEWS AND ANNOUNCEMENTS

INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York. "Sink Design Contest."

With a view to securing greater excellence in the design of sinks and in the use of Monel metal in their making, this large concern recently conducted a contest in which more than 500 designs were submitted, the competition being conducted by the Art Alliance of America. The jury of award consisted of several well known New York architects, —Harvey Wiley Corbett, Ely Jacques Kahn, and Miss Marcia Mead; an interior decorator,—Mrs. Frederick Ackerman; a craftsman in metal,—Oscar Bach; Miss Katharine A. Fisher, Director of the Good Housekeeping Institute; and Louis Hassinger, President of the John Trageser Steam Copper Works. This brochure reproduces as illustrations the drawings and details of the five prize-winning designs, the three which received honorable mention, and a number of others. "The selection of the winning designs by the jury of award was made doubly difficult because of the excellence of the many designs submitted and the conditions of the contest which called for the judging of each design on the basis of appearance, utility and suitability for quantity production. All have been selected as offering the greatest possibilities to architects and builders in meeting the critical demands of the modern housewife for pleasing appearance and utility. All indicate how extensive is the modern trend toward greater beauty and added convenience in the home. All demonstrate how readily adaptable Monel metal is to variations in size and form, and the facility with which a custom-built sink can be constructed, at small extra cost, to meet specific requirements in individual cases." The increased interest which is being taken just now in rendering even the kitchen architectural and attractive should secure for this booklet wide circulation among architects and home makers. Its illustrations are full of suggestions which are practical and interesting. The brochure is replete with diagrams and drawings which suggest novel arrangements and new conveniences to add to kitchen and pantry equipment.

NEWPORT BOILER COMPANY, Chicago. "The Practice of Scientific Heating as Developed in the Newport Boiler."

A prospective home builder is likely to be keenly interested in what is to be the heating equipment for his home, and quite naturally he looks to his architect for advice as to what type of heating to choose and then as to which particular manufacturer's system of equipment he shall select. There are of course several types of heating in wide use, all good, and equipment of each type is supplied by a number of manufacturers. One type is excellent for buildings of certain kinds while not quite so suitable in others. On the whole it might seem that the types popularly known as "steam" and "hot water" are best suited to the general run of buildings, and where these types are used much of course depends upon the boiler which supplies the steam or the hot water. This booklet deals with the excellent line of boilers supplied by the Newport Boiler Company. "The Newport is a magazine-feed boiler. This is to say, the fuel is never thrown onto the fire bed. Instead it is placed in a large hopper, from which it is fed into the fire bed through an adjustable throat, which controls the 'speed' of the feed just as a throttle controls the speed of a motor,—really an engineering refinement on the principle of the old base burner, though as far separated from it in point of effectiveness as Fulton's 'Clermont' was from a modern ocean liner. Gravity is the mechanical stoker. The fuel feeds down into the fire bed, which lies on a sloping grate. This fire bed keeps a uniform depth, determined for the utmost combustion efficiency. As the fuel is burned gradually away, fresh fuel is gradually fed into the fire bed. This is a process that requires the absolute minimum of fuel. It is a precise mechanical process that requires no personal attention. You fill the magazine. That's all. Care of the ashes doesn't amount to anything in the Newport. An ash spray (exclusive with Newport) wets them down so that there is no dust. No Newport Boiler owner ever sifts his ashes. Combustion is, in fact, for all practical purposes, complete. This means that there is comparatively little ash. The Newport is equipped with an ash pit 100 per cent oversize. It is a great convenience also, because it means that the ashes need be removed at the most only twice a week."

McPHILBEN STUDIOS, 153 Jamaica Avenue, Jamaica, N. Y. "Suggestions from McPhilben Studios."

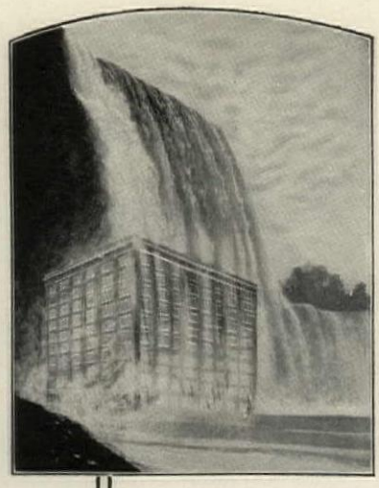
These pages of THE FORUM have often drawn attention to the fact that among all the items involved with furnishing and decorating there is no one more important than fixtures used for lighting. In every age architects and designers have produced fittings suitable for use with the types of architecture with which they were working, and the result is a store of design so large and rich that whatever be the conditions, there are to be had lighting fixtures which will not only be appropriate but which may often be depended upon to add a note of distinction to their surroundings. This brochure illustrates and describes an assortment of lighting fitments of such variety that an interior either quite formal or extremely informal may be suitably lighted, some of the fittings having been obviously designed for particular uses.

NATIONAL FIRE PROOFING COMPANY, Pittsburgh. "Natco, The Complete Line of Structural Clay Tile."

Specification writers as well as builders and contractors know the aid to construction afforded by the publications of a concern which manufactures a complete line of structural clay products. This well edited and carefully prepared booklet lists, describes, and to a great extent illustrates the extensive variety of clay tile building materials made and sold by the National Fire Proofing Company. "The total production of the National Fire Proofing Company approximates a million tons of structural clay products annually. This production comprises hollow building tile to meet every building need. The company operates 22 plants in 17 different localities. In addition, it operates a plant in Hamilton, Ont. It owns or leases over 5000 acres of clay deposits. It is estimated that the deposits thus controlled contain not less than 56,000,000 recoverable tons of clay, which is amply sufficient to last more than 50 years."

INDIANA LIMESTONE COMPANY, BEDFORD, IND. "Administration Buildings of Limestone."

A demonstration of the desirability of using limestone as a material likely to give a building dignity and architectural character has been made in the erection of this Company's own administration building. This booklet gives many views of the exterior and interior of the structure, of which Granger & Bollenbacher, of Chicago, were architects. "The entire exterior of the building is faced with Select Gray Indiana Limestone. Its architectural form, like all architectural forms, is necessarily bound up with the character of the materials used, and in this respect the architects have taken full advantage of the opportunity it afforded them to design a building of distinct architectural interest and of an imposing character consistent with its purpose as a commercial building, the administrative headquarters of a large corporation. The architects are to be complimented on the masterful and appropriate design that they developed for the structure as it combines the logical use of stone in an economical way without sacrifice of an impressive architectural treatment." The brochure likewise gives views of several other structures of limestone which form parts of the Company's plant, and one particularly interesting illustration shows part of a wall of some 25 sections, each of the sections being built to show the effect of some treatment.



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Hydrocide No. 633 for dampproofing inner surfaces of outside vertical walls above foundation. Saves expense of furring and lathing. If furring and lathing are used, walls and furring should be coated with Hydrocide No. 633. Use Hydrocide Semi-Mastic where conditions are more severe.

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Hydrocide No. 611 waterproofs and protects lime stone, caen stone, marble and other fine stones from destructive action of alkali in cement mortar.

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Hydrocide Colorless for Brick, Concrete, Stone. Penetrates deeply. Caulks pores. Contains no paraffin. Won't run, crack, tear, abrade.

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OUR years of experience; our close study of constructional needs; our research laboratories; have combined to create products of the highest quality and performance.

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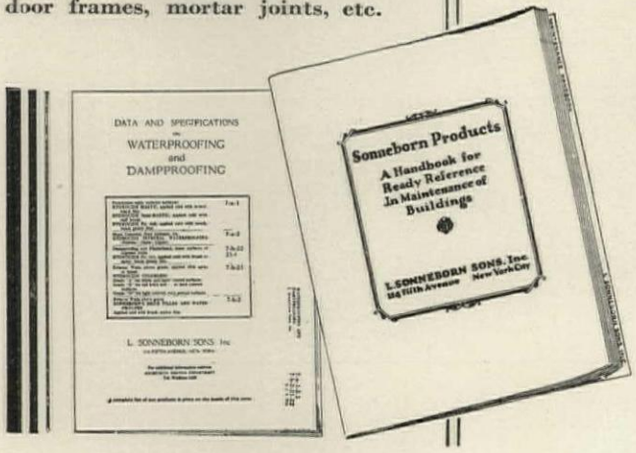

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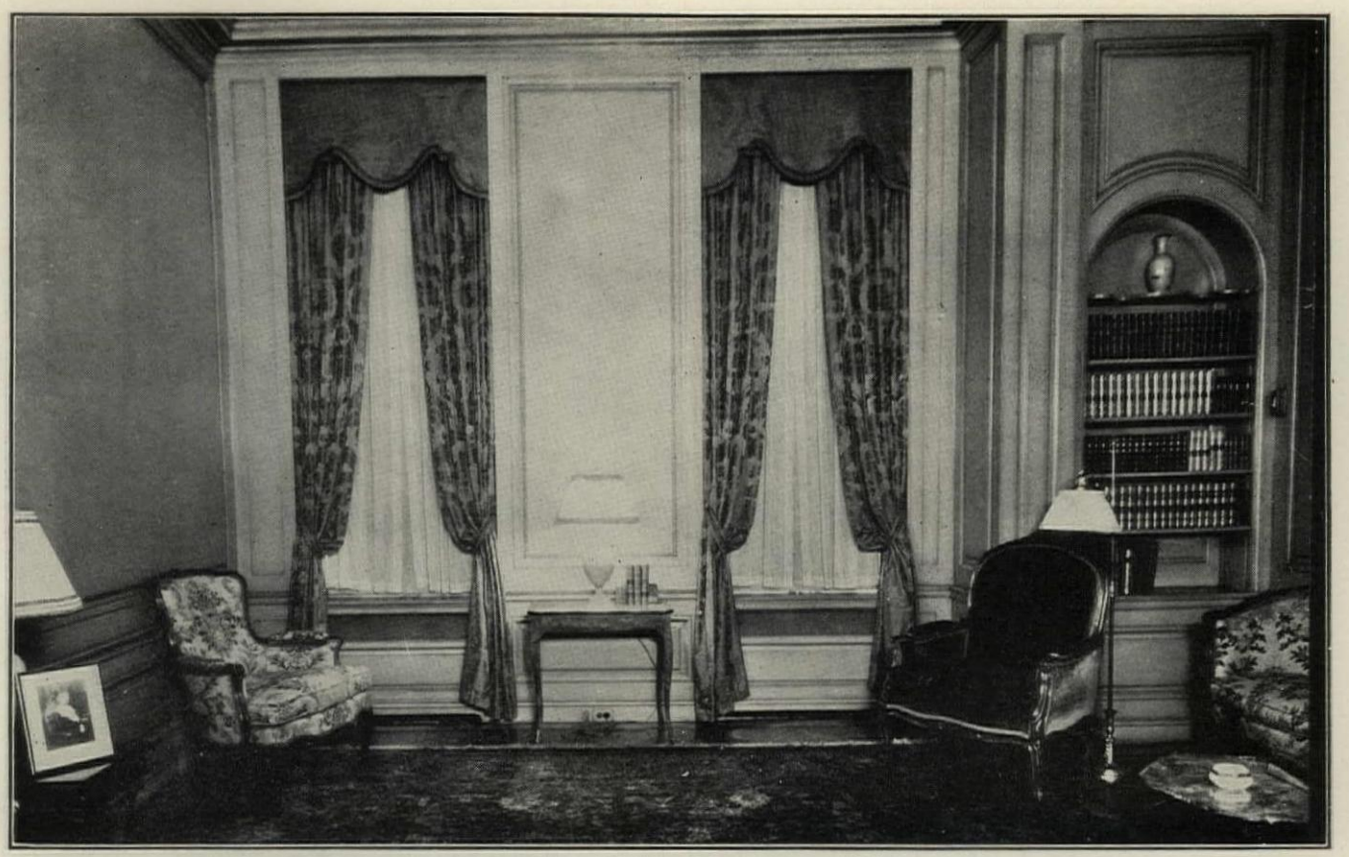
INDEX TO ADVERTISING ANNOUNCEMENTS

Part 1—Architectural Design

Part 2—Architectural Engineering and Business



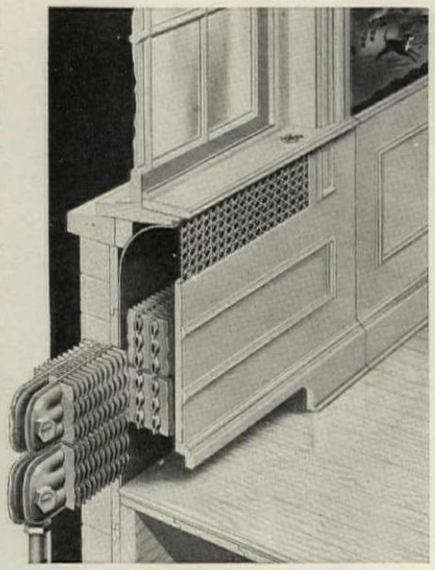
ROBRAS 20-20 Radiators in the wall, under the windows, in the residence of J. M. Cameron, Esq., Harrisburg, Pa. Paul P. Cret, *Architect*. Isaac H. Francis, *Engineer*. Herre Bros., *Heating Contractors*.

Heated by Hidden ROBRAS 20-20 Radiators

In the Wall—Out of Sight—Out of the Way

NO small amount of anxiety is caused today by clients demanding that their radiators be out of sight and out of the way. Covering the old-fashioned radiator is hardly enough. They want the space in front of the windows unoccupied because they want the curtains to hang straight from valance to floor or because of some preferred arrangement of furniture.

A conservative answer to the problem is the use of ROBRAS 20-20 Radiators. These radiators have a history of successful use in some of the finest residences and apartment buildings in this country. ROBRAS 20-20 Radiators are *designed* for installation between the studding. There need be no fear that they will fail to live up to their rated radiation. They are strongly made of brass plates electrically welded together. They can't leak.



Showing method of installing four-section ROBRAS 20-20 Radiator in the four-inch space under a window.

The fins are of sturdy brass. They cannot easily be bent, closing up the tiny flues. These ROBRAS 20-20 Radiators actually accelerate the flow of air in the room.

Because of the high heat conducting properties of brass they give off useful heat at once when the heat is turned on.

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Sweets' catalog, your A. I. A. file or one of our offices can give you any additional information you may want.

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The crash of waves

Sound travels in waves. Sound waves may not be arrested by a wall or ceiling, but set it vibrating, somewhat as a telephone diaphragm vibrates, with the result that the sound is transmitted to the opposite side.

In this industrial age *we live in bedlam.* Outside the buildings in which we live and work are whistle, blare and screech; within are the spoken word, the sounds of musical instruments, the jar and racket of machinery.

From bedlam we require protection that we may live and relax in peace.

Modern science has made it possible to prevent the transmission of sound from room to room. Such prevention is provided by the U S G System of Sound Insulation.

This system is a supplemental construction for floors, partitions and ceilings so that audible sound will not be transmitted through them. It includes the treatment of vents, ducts, etc., and the setting of machinery bases.

The U S G System of Sound Insulation is installed, under contract, by the United States Gypsum Company, which assures undivided responsibility, and guaranteed results. For information address Sound Insulation Department, United States Gypsum Company, 300 W. Adams St., Chicago, Ill.

The United States Gypsum Company offers a complete sound service, which includes noise absorption and acoustical correction, as well as sound insulation

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AS LONG AS THE BUILDING STANDS

SHERARDUCT CONDUIT is a permanent wiring raceway doubly protected against corrosion. Spellerized, scale-free, pipe zinc treated by Sherardizing inside and outside combined with a treatment of acid-resisting enamel makes a rust and corrosion-proof surface on the outside and inside that will last as long as the building.

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