THE ARCHITECTURAL FORUM

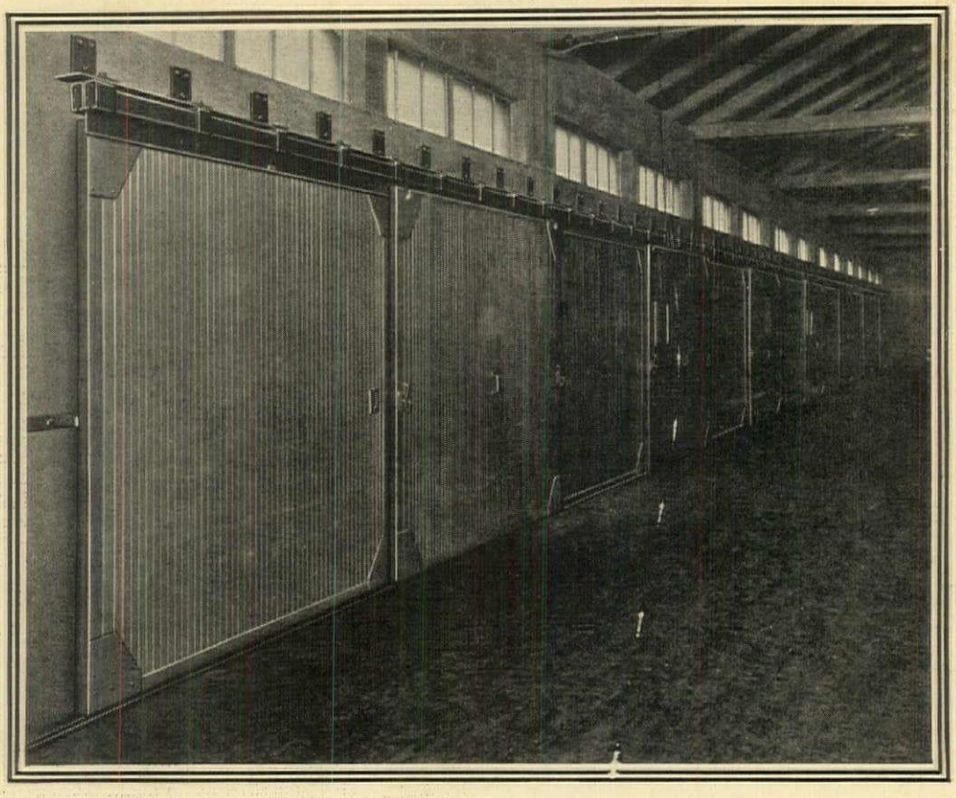
IN TWO PARTS

ARCHITECTURAL ENGINEERING & BUSINESS

PART TWO

OCTOBER

1928



SupeR-Way doors and hardware as installed in Illinois Central Freight House at Indianapolis, Ind.

SupeR-Way

Doors and Hardware

Here is doorway equipment that is meeting the most exacting standards of many of the largest railroads and industries.

The construction of SupeR-Way doors is exactly suited to the strenuous abuse which most doors in roundhouses, freight houses and warehouses must withstand.

SupeR-Way doors are built with a heavy steel frame securely welded. Solid wood members are tongued and grooved and securely spiked together inside the steel T. frame without a spike exposed.

SupeR-Way Hardware, either hangers or hinges, is fitted directly to the steel members—"steel to steel" contact. All weight is carried by the steel frame and corner-bracing so there is no possibility of sagging, warping or pulling apart.

Both doors and hardware are made to take care of any size opening.

Construction details and catalog of designs will be mailed on request.

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 Los Angeles San Francisco Omaha Seattle Detroit

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

An innovation a year ago... an established favorite today!

AN insistent demand for an attractive, structural tile which would lay up in an interior load-bearing or partition wall with one or both faces finished, was recognized—and Natco Vitritile was developed to meet it. Its acceptance was immediate—its popularity amazing.

Natco Vitritile is furnished in several shades, ranging from a light buff to a rich dark brown. Its beautiful, glazed, sanitary finish is easily cleaned and kept clean, and requires no plaster, painting or maintenance.

Its field of use is in subways, basements, corridors, gymnasiums, garages and auto sales rooms, hospitals, laundries, laboratories, natatoriums, restaurants, substations and similar applications. Proper units for both 3-¾ and 8″ walls are available for wainscoting, lintels, bullnose corners, etc., making possible practically any desired form of construction. Units are also furnished kerfed or split for furring.

Natco Vitritile is shipped in corrugated wrappers, assuring its arrival in perfect condition. A folder showing sizes, shapes and shade ranges available will be sent on request.

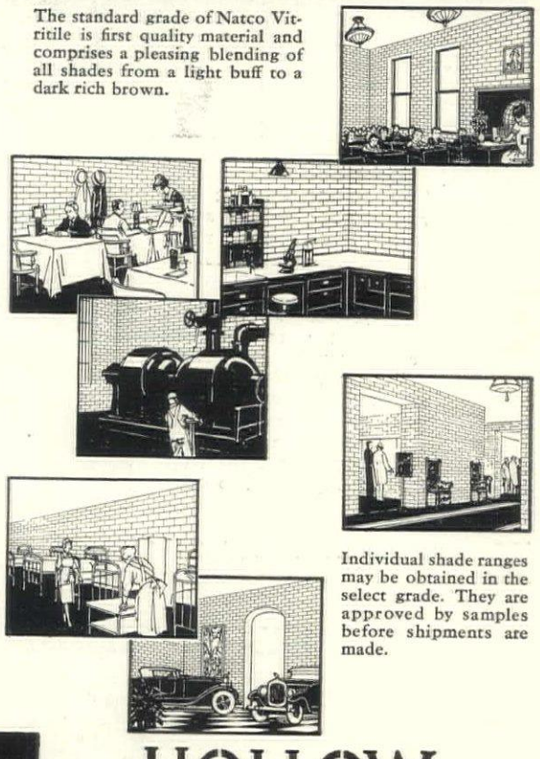
NATIONAL·FIRE·PROOFING·COMPANY

General Offices: Fulton Building, Pittsburgh, Pa.

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

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

The standard grade of Natco Vitritile is first quality material and comprises a pleasing blending of all shades from a light buff to a dark rich brown.



Individual shade ranges may be obtained in the select grade. They are approved by samples before shipments are made.

NATCO

NATCO
THE *COMPLETE* LINE *of*
HOLLOW BUILDING TILE

HOLLOW BUILDING TILE

KEWANEE

STEEL BOILERS

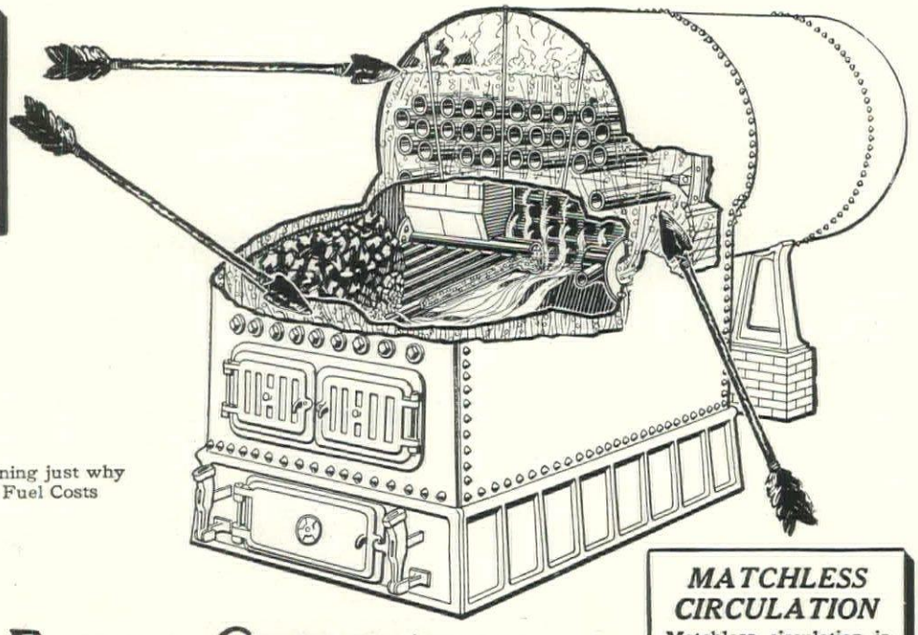
Lower Heating Costs

The right place for plenty of water is in the boiler and not in the steam lines and radiators. The Kewanee boiler style is not cramped, so the steam is delivered dry.

Kewanee provides ample volume of water in rapid circulation in the boiler, it is neither agitated into unmanageable commotion nor forced out into the steam lines by the liberated steam bubbles. It sticks to the job of absorbing heat from the heating surface. That is another reason why Kewanee is able to show *lower heating costs.*

WATER CONTENT

Water content is large enough to absorb all the heat of combustion without undue disturbance. So the water line keeps steady in the gauge glass.



MATCHLESS CIRCULATION

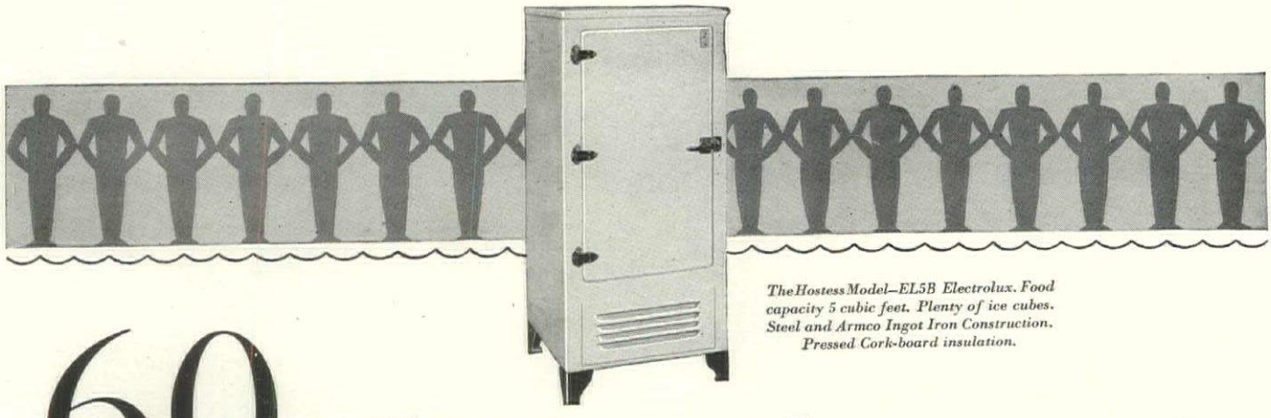
Matchless circulation is forced by the pumping action of the water grate and header built-in at the hottest fire zone.

Fifth of a Series—explaining just why Kewanee Boilers Cut Fuel Costs

KEWANEE BOILER CORPORATION

Kewanee, Illinois

Branches in 40 Principal Cities



The Hostess Model—EL5B Electrolux. Food capacity 5 cubic feet. Plenty of ice cubes. Steel and Armco Ingot Iron Construction. Pressed Cork-board insulation.

60 silent renting agents *in this* new apartment house

Architect decides on Electrolux—the noiseless gas refrigerator without moving parts

Charles Richardson is the architect of this new apartment dwelling on Pelham Parkway, N. Y. Charles Lee Building Corp., Builders. Electrolux equipped throughout.

THE renting value of automatic refrigeration is an accepted fact. Automatic refrigeration is a matter of course in the finest new apartment dwellings. And architects are rapidly turning to Electrolux for such installations. Hardly surprising, when one considers this refrigerator. Electrolux freezes with heat. A tiny gas flame does all the work at much less cost. Since nothing moves, nothing can make any noise; and there are no moving parts to wear out. Add to these advantages of gas refrigeration superior cabinet construction—finest materials and workmanship.

The new building pictured here is equipped with sixty Electrolux Refrigerators—sixty silent renting agents. They will always be on the job, helping to keep tenants happy when the apartments are occupied, helping to rent space when leases expire.

Electrolux is readily adaptable to your decorative schemes. Besides the gleaming white finish, Electrolux is available in four new color harmonies. These are: Biscay Blue, Crystal Green, Ivory Tan and Silver Grey.

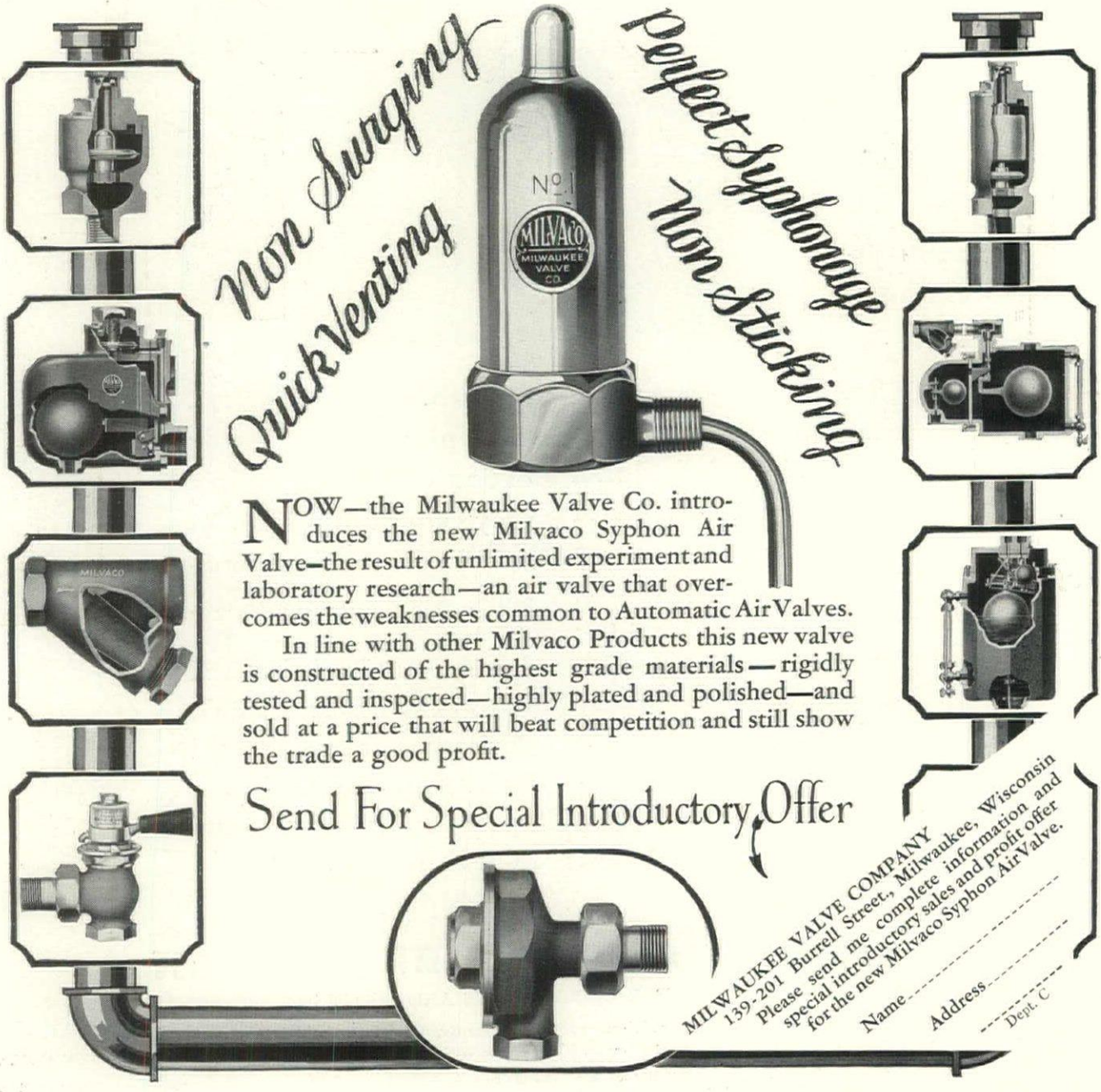
There is a wide range of standard sizes and a special low model that can be used as a table or the base for a gas range.

We shall be glad to send you detailed specifications and any other information you wish. Please write: Servel Sales, Inc., Evansville, Indiana.

ELECTROLUX REFRIGERATOR

MADE BY SERVEL

Milvaco Syphon Air Valve to complete the line



NOW—the Milwaukee Valve Co. introduces the new Milvaco Syphon Air Valve—the result of unlimited experiment and laboratory research—an air valve that overcomes the weaknesses common to Automatic Air Valves.

In line with other Milvaco Products this new valve is constructed of the highest grade materials—rigidly tested and inspected—highly plated and polished—and sold at a price that will beat competition and still show the trade a good profit.

Send For Special Introductory Offer

MILWAUKEE VALVE COMPANY
139-201 Burrell Street, Milwaukee, Wisconsin
Please send me complete information and special introductory sales and profit offer for the new Milvaco Syphon Air Valve.

Name.....

Address.....

Dept. C

MILWAUKEE VALVE CO.

MILWAUKEE, WISCONSIN

Why?

1. WHY did over 400 building owners vote 5 to 1 in favor of one type of concrete floor hardener?
—(Answered on page 8)*

2. WHY did up-keep costs for Northwestern Terra Cotta Company floors amount to only $14 in 15 years?
—(Answered on page 16)*

3. WHY did floors laid in 1917 save the Richman Brothers Company $7000 in 11 years?
—(Answered on page 18)*

4. WHY is metal superior to sand in concrete floor finish?
—(Answered on page 24)*

5. WHY is there so much difference today between two kinds of concrete floors laid side by side in a Pennsylvania Railroad Station in 1912?
—(Answered on page 6)*

6. WHY did the Ohio State University test prove *one* type of concrete floor finish three times more wear-resisting than the type in ordinary use?
—(Answered on page 23)*

7. WHY is "surface treatment" impractical for many types of concrete floors?
—(Answered on page 9)*

*Answered in the book "PLAIN TALK ABOUT CONCRETE FLOORS," a survey presenting official tests, expert investigations and performance reports on actual floors in different industries.

Every architect, engineer or building owner with floors to build or maintain should have this book. Sent free to those who return the coupon or request it on their business letterheads.

THE MASTER BUILDERS COMPANY
CLEVELAND, OHIO

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

Sales Offices in 110 Cities

plain talk about concrete floors

Facts in This Book—

ENABLED one of the world's greatest tire and rubber companies* to secure a floor finish that would hold their heavy traffic at far less cost than material originally specified. This improved type of cement finish saved them thousands of dollars in initial investment and will save hundreds in maintenance.

Area—300,000 square feet

SATISFIED a very large automobile manufacturer* that a super-wear-resisting concrete floor was exactly what his new plant needed. He used the finish which has proven to be the lowest-cost-per-year floor known.

Area—250,000 square feet

SOLVED the floor problem of the largest chain store warehouse* in the Mississippi valley, where experience had shown that only the strongest type of cement floor finish would do. They studied the facts and adopted the floor which the book shows has held traffic like theirs for years.

Area—1,000,000 square feet

*Names on request

These are three out of a long list of builders who have found in this book proven economies they could profit by. That the book must carry important, usable information, is self-evident.

USE THE COUPON—
GET THE FACTS

The Master Builders Company
7016 Euclid Avenue, Cleveland, Ohio

Send a free copy of *"Plain Talk About Concrete Floors"* to

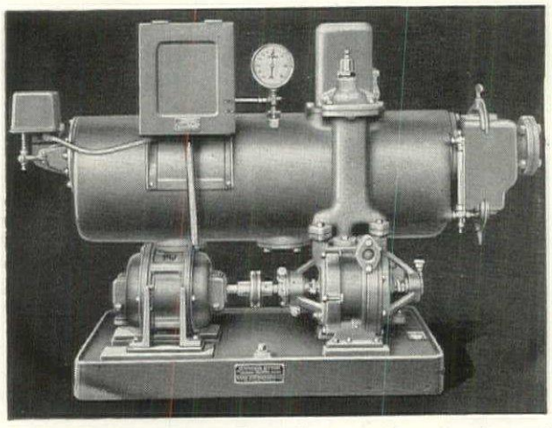
Name Position

Company

Address D

Campbell Union Grammar School, Campbell, Calif., Mr. Wm. H. Weeks, architect, San Francisco. Leland and Haley, heating engineers, San Francisco., Mr. Carl T. Doell, heating contractor, Oakland.

Serves Campbell Union Grammar



Jennings Vacuum Heating Pump, for removing condensation and air from return line heating systems.

IN this impressive school building, of recognized architectural excellence, it is fitting that a Jennings Vacuum Heating Pump is to be found on the return line of the heating plant.

A Jennings unit designed for continuous operation that, by closely regulating the steam flow, enables the system to meet elastic heating requirements satisfactorily—to facilitate the distribution of controlled heat over extensive areas —and to maintain comfortable temperatures in every section of the structure.

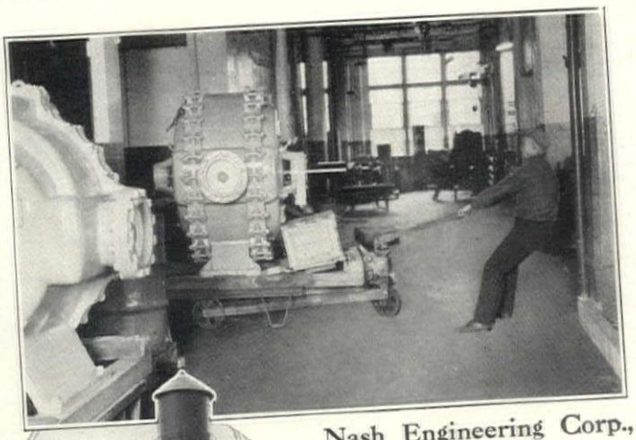
For specification details, see Bulletin 71.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS ∽ CONDENSATION PUMPS ∽ COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES ∽ STANDARD AND SUCTION CENTRIFUGAL PUMPS ∽ ∽ MARINE PUMPS ∽ ∽ SEWAGE EJECTORS ∽ SUMP PUMPS ∽ FLAT BOX PUMPS ∽ HOUSE SERVICE PUMPS

Jennings Pumps

THE NASH ENGINEERING CO 12 WILSON ROAD, SOUTH NORWALK CONN.

Chicago Hardware Foundry Co.,
Chicago, Ill.



Nash Engineering Corp.,
Norwalk, Conn.

American Can Company, New Orleans, La.
Floored throughout with Bloxonend.

Other industries that are large and enthusiastic users of BLOXONEND include:

Automotive Industry
Baking Industry
Chain Store Warehouses
Meat Packing Industry
Publishing Industry
Paper and Pulp Industry
Railroads
Textile Industry
Schools, Gymnasiums and Shops

BLOXONEND is rapidly laid over old or new concrete or wood floors without interrupting operations.

Where loads are burdensome and the trucking continuous

The transporting of enormous loads of sheet metal on hand and electric trucks, the moving, dropping and dragging of huge castings—this is the usage to which BLOXONEND is being subjected in the iron and steel industry. That it renders satisfactory service is evidenced by the many repeat orders received.

The American Can Company has placed 29 orders totaling more than one-half million square feet. The Continental Can Company, Link Belt Company, Crane Company—these and hundreds of other well known concerns have increased trucking efficiency and reduced floor maintenance by installing BLOXONEND. Its construction and method of laying insure *long life, resiliency* and *lasting smoothness.*

Write for Sample and Specifications

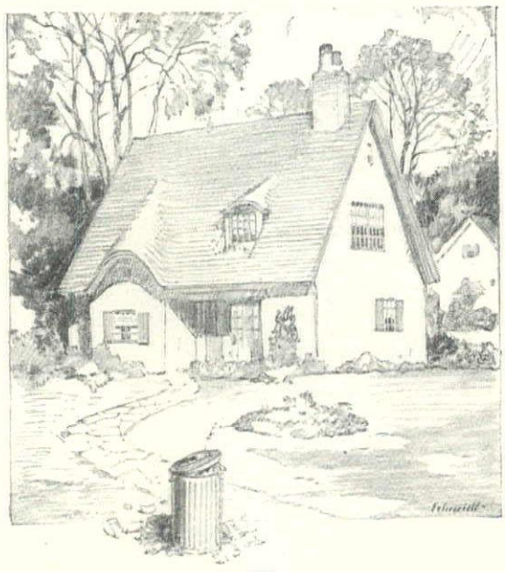
Carter Bloxonend Flooring Co.
Kansas City, Missouri

Branch offices in principal cities

BLOX-ON-END FLOORING

Lays Smooth
Stays Smooth

Bloxonend is made of Southern Pine with the tough end grain up. It comes in 8 ft. lengths with the blocks dovetailed endwise onto baseboards



For as little as $100 f. o. b. factory

NO *ALLEY*– *AUTOMATIC HEAT*– *IRREGULAR GARBAGE COLLECTION*– Specify INCINOR

"Tell me where your lot is, and I can tell you what you want!"

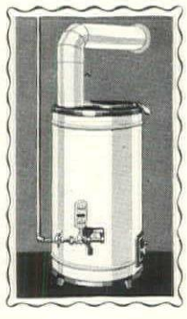
Isn't it true nine times out of ten?

Very few of the new subdivisions have alleys. Where's the garbage can going? Some places it has to be carried out to the *front* door.

Most suburban home builders now want automatic heat. They're not going to be able to cram their garbage, rubbish and trash in the furnace.

And in so many of these rapidly growing communities the garbage service is overtaxed, hit-and-miss.

What can *you* do about it?



Specify Incinor, the Home Incinerator. *Burns* all garbage, rubbish, trash—quickly, completely, cheaply—*with gas*. Reduces bushels of waste at a time to a handful of clean, sterilized ashes.

Installs as easy as a gas range. Uses about 1000 cu. ft. of gas per month. No chute to get slimy, cock-roachy, mousy, or clog up.

The Decent Way to dispose of garbage, rubbish and trash is to burn it *with gas*. Investigate, and you will specify Incinor.

HOME INCINERATOR CO.
Security Building
Milwaukee, Wisconsin

·INCINOR·

THE HOME INCINERATOR

Good Riddance

GARBAGE · RUBBISH · TRASH

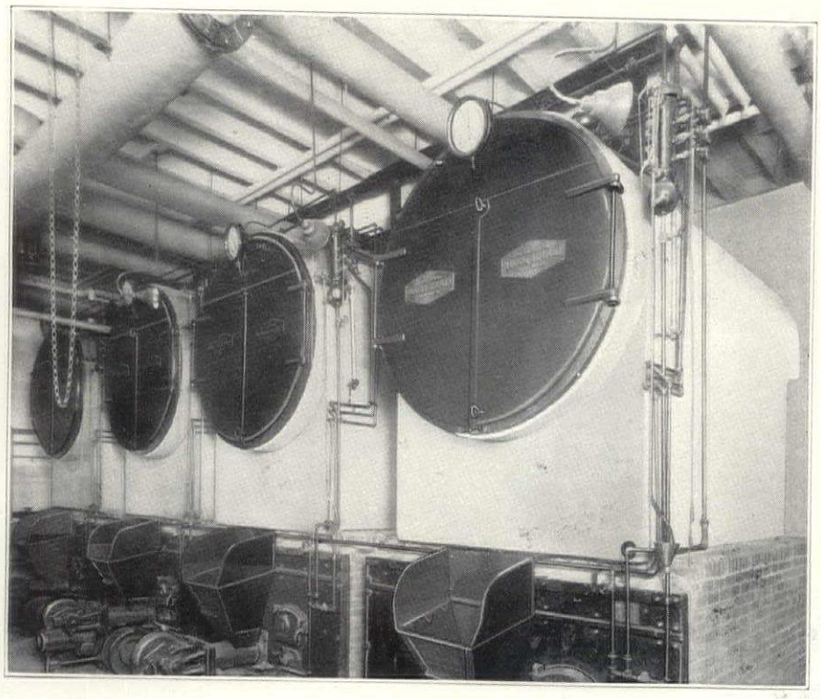
BURN IT WITH GAS — THE DECENT WAY

HOME INCINERATOR COMPANY
Security Building, Milwaukee, Wisconsin

Please send me free Architectural File data on home incineration.

Name.....

Address.....



Ideally Designed for Stoker Operation

THE combustion chamber of the Heggie-Simplex boiler runs the entire length of the boiler bringing a far greater amount of heating surface in direct contact with the fire than is usually provided. A rear-front-rear flue passage for the gases and unrestricted circulation further assure maximum utilization of heat units. These features provide for the most economical and most efficient use of stoker equipment and explain why Heggie-Simplex boilers are seen in such rapidly increasing numbers wherever mechanical firing is employed.

Heggie-Simplex Boiler Co., Joliet, Illinois. Representatives in principal cities — telephone and address listed under "Heggie-Simplex Boiler Company."

HEGGIE-SIMPLEX

ELECTRIC-WELDED STEEL HEATING BOILERS

WHEN
A Famous Hotel Man Designed His Own Kitchen

AT LEFT: *Monel Metal range and sink in the residence of E. M. Statler, Great Neck, L. I. This equipment installed by DUPARQUET, HUOT & MONEUSE CO. of New York.*

AT RIGHT: *Cabinet with Monel Metal top and trim in the Statler kitchen, mfd. by the METAL CABINET & EQUIPMENT CO. also of New York. Monel Metal nosing and backstrip were also used for linoleum in the pantry. George B. Post & Sons, New York, were the architects.*

He specified Monel Metal for sinks, tops and trim

THE late E. M. Statler left many lasting memorials to his sound judgment and business acumen. He left hotels that will stand as models of their kind. But he also left in his own home kitchen an enduring record of his preference for Monel Metal.

Mr. Statler had used Monel Metal in the kitchens of his hotels for years and years. He had seen it used—seen it endure—seen it retain its attractive cleanliness through years of use and abuse.

So when he came to design his own kitchen, he profited by his years of rich experience with food service materials and specified Monel Metal for sinks, cabinet tops, trim and other exposed surfaces.

Monel Metal is now used in fine buildings of all kinds—in the most imposing institutions, the best built homes. In every case it is furnishing rust-immunity, corrosion-resistance, steel-like strength. It is adding to equipment's cleanliness, attractiveness, and long life. It is saving labor, repairs and replacements.

Isn't it evident that you protect your client's interests by specifying Monel Metal for food service equipment and decorative metal work?

WRITE FOR SPECIAL ARCHITECTURAL FOLDERS

Monel Metal is a technically controlled Nickel-Copper alloy of high Nickel content. It is mined, smelted, refined, rolled and marketed solely by The International Nickel Company. The name "Monel Metal" is a registered trade mark

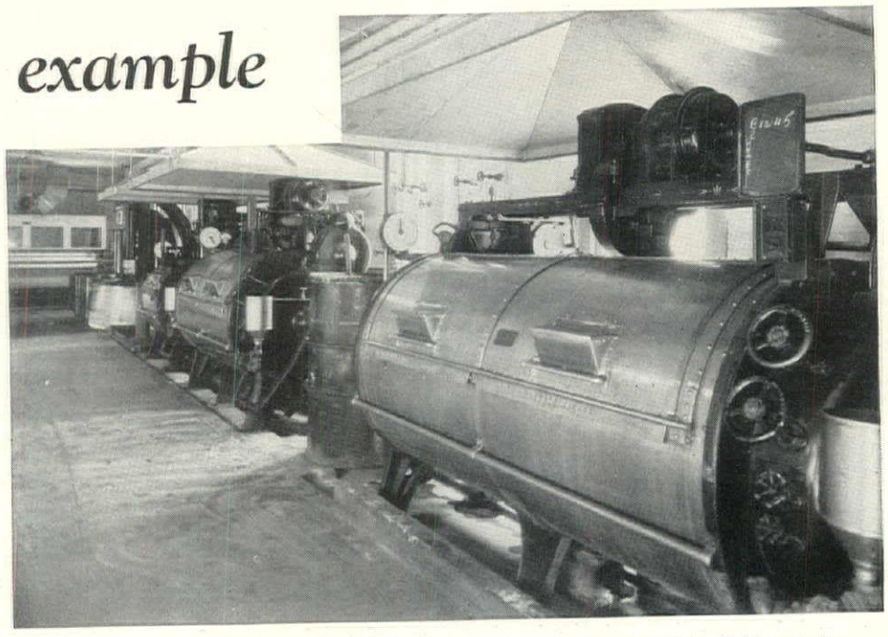
MONEL METAL

THE INTERNATIONAL NICKEL COMPANY (INC.) — INCO MONEL METAL TRADE MARK — 67 WALL STREET, NEW YORK, N. Y.

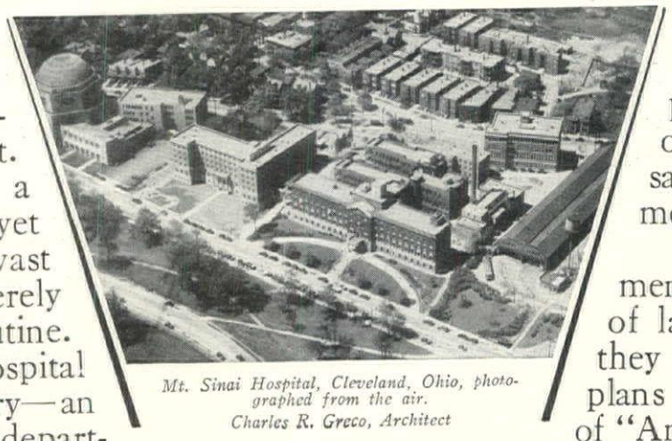
No. 49 of a series of advertisements featuring prominent laundry installations

Laundries like this one

...for example



This modern, dependable laundry department, installed with the cooperation of "American" engineers, is operated under the direct supervision of Mt. Sinai Hospital's own officials.



Mt. Sinai Hospital, Cleveland, Ohio, photographed from the air. Charles R. Greco, Architect

THE "laundry bag" at Cleveland's modern Mt. Sinai Hospital is a mammoth one; yet the handling of its vast weekly wash is merely a matter of routine. For Mt. Sinai Hospital has its own laundry—an "all-American" department—right in its own building.

The same is true in the case of so many, many modern institutions. Almost every day architects confer with engineers of The American Laundry Machinery Company in the planning of these indispensable laundry departments.

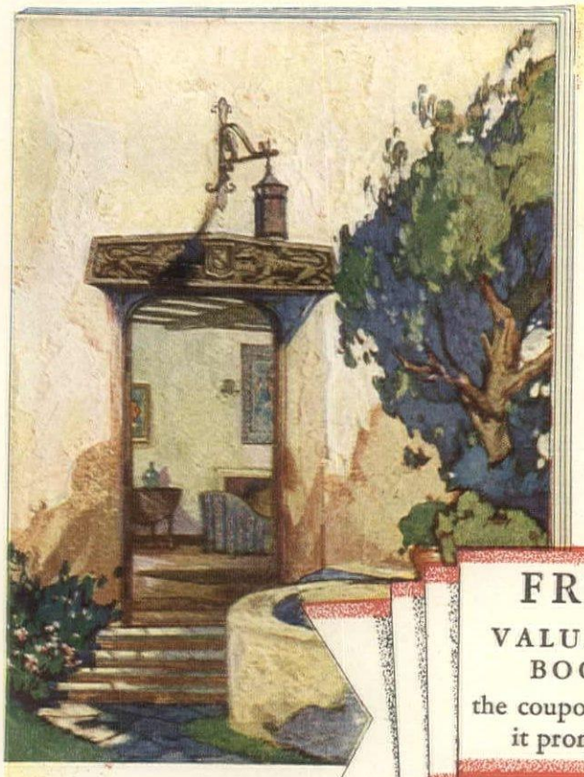
These experienced men know every phase of laundry practice; they can show you floor plans and photographs of "American"-equipped laundries in hospitals, hotels and clubs of all sizes and types. Make use of this helpful "American" service—it is yours for the asking, of course.

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



As good as the principle behind it

FREE
VALUABLE BOOK
the coupon brings it promptly

THIS book, "Better Walls for Better Homes" describes how STEELTEX applies the principle of reinforcing to walls and ceilings.

STEELTEX reinforces plaster with steel exactly as concrete is reinforced.

* * *

Today, when the trend of architectural style is placing so much emphasis on bringing charm to walls and ceilings, the protection of plaster is vastly more important than ever before.

Architects will be quick to appreciate the value of a material that *reinforces* plaster by utilizing the same principle that is used to reinforce concrete—rigid steel embedded in the slab. It has a successful record in over 200,000 installations.

STEELTEX is used in place of lath. It is a fabric of rust-proofed (galvanized) cold-drawn steel, attached by a furring wire to a two-ply waterproofed backing. The steel has an average tensile strength of 78,000 pounds and is welded on 2″ centers—giving it equal strength against stress from all directions. It comes in sheets 50″ x 52″.

Plaster is applied by an ordinary sweep of the trowel and the furring wire provides space for the plaster to spread under the fabric. As a result the steel is uniformly and completely embedded.

Many advantages in one material

The backing not only produces automatic backplastering, but adds effective insulating, damp-proofing and sound-deadening qualities. Naturally it entirely eliminates lath marks. Never before has one material combined all these valuable qualities. The book, "Better Walls for Better Homes" gives complete details. May we send you a copy?

New—STEELTEX for floors

STEELTEX for Floors, recently introduced, has already been used in numerous important installations. Heavier than other types of STEELTEX. It is quickly stretched and secured in place over any type of beam or joist. It comes in rolls, not sheets.

Its obvious advantages include maximum construction speed, elimination of forms, prevention of droppings, uniform reinforcement throughout the slab, better curing, etc. The booklet, "STEELTEX for Floors" contains full details with working designs. Send for your copy.

National Steel Fabric Company

DIVISION OF Pittsburgh Steel Co.

2710 Union Trust Bldg., Pittsburgh, Penna.
The world's largest manufacturers of welded steel fabric

STEELTEX

THREE TYPES—SAME PRINCIPLE—SAME PROTECTION

for plaster . . for stucco . . for floors and roofs (concrete and gypsum)

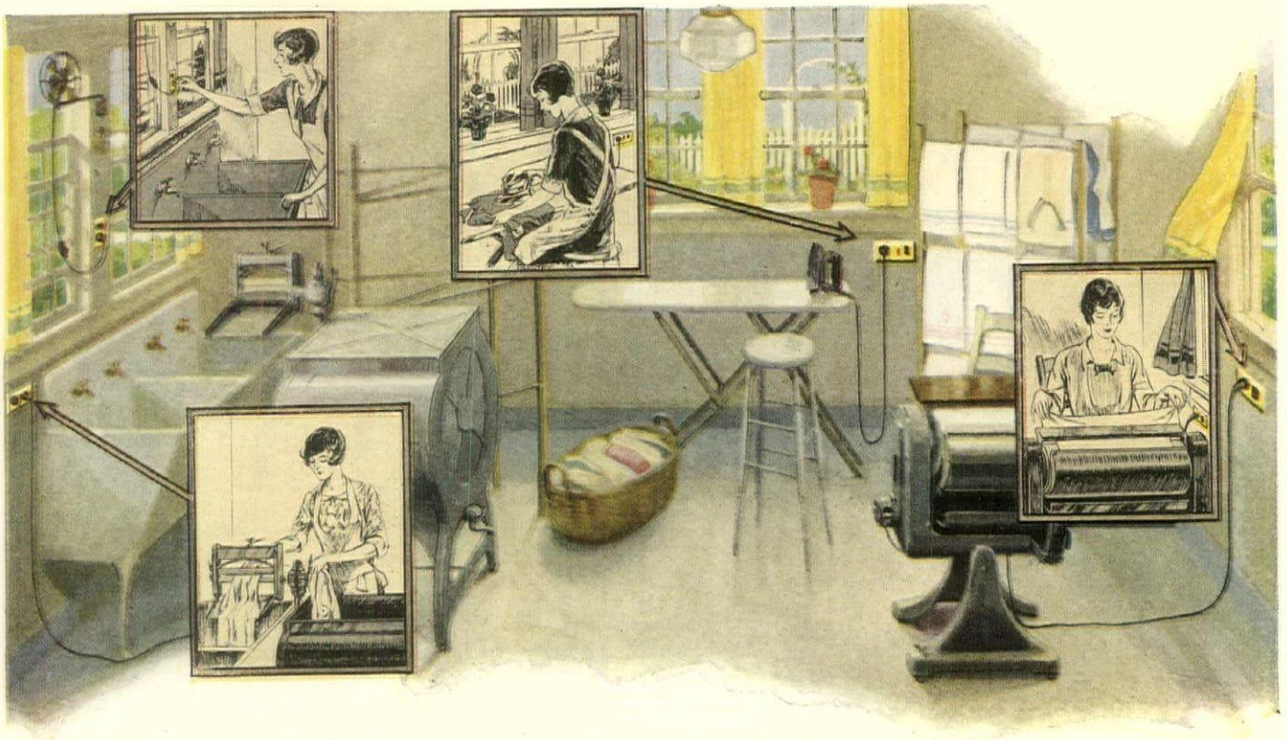
NOW PLASTER IS REINFORCED WITH STEEL—EXACTLY LIKE CONCRETE

National Steel Fabric Co.
2710 Union Trust Bldg., Pittsburgh, Pa.

Without obligation send

☐ (check) *Better Walls for Better Homes.*
☐ (check) *Steeltex for Floors.*

Name_____
Firm_____
Street_____
Place_____



A house isn't modern unless it has *modern wiring*

One of the fundamental differences between a house of ten years ago and a house of today is its electrical wiring. Where two or three convenience outlets were considered enough, today there are twenty or thirty. In the place of the dangling pull chain there is the convenient wall switch—accessible to every door.

Specify a General Electric Wiring System—as the easiest, surest way of providing electrical comfort. This is the wiring that the homeowner has learned to demand through constant national advertising. The fact that it is made by General Electric assures him of lasting and dependable service.

Write for this helpful booklet you should have it in your files

Merchandise Department
Section 21
General Electric Company
Bridgeport, Connecticut

GE WIRING SYSTEM
—for lifetime service

GENERAL ELECTRIC

Residence of R. W. Norton, Shreveport, La., Architect: Clarence W. King. Insulated with Masonite

These Masonite Tests Speak for Themselves

ANYONE can make claims. Proving them is quite another matter. We let Masonite tests speak for themselves.

Masonite's co-efficient of heat conductivity per inch thick per hour is 0.328 (flat plate test made by Armour Institute).

The co-efficient of sound adsorbtion of Masonite for C4-512 frequency is .31 according to the tests made by Prof. Paul E. Sabine of Riverbank Laboratories.

The co-efficient of an equal thickness of hair felt under the same test was only .17.

Full reports of these tests, a sample of Masonite, and the Masonite book of Specifications and Details will be sent promptly on request. Address:

MASONITE CORPORATION
Dept. 6108, 111 W. Washington St., Chicago, Ill.
Mills: Laurel, Mississippi

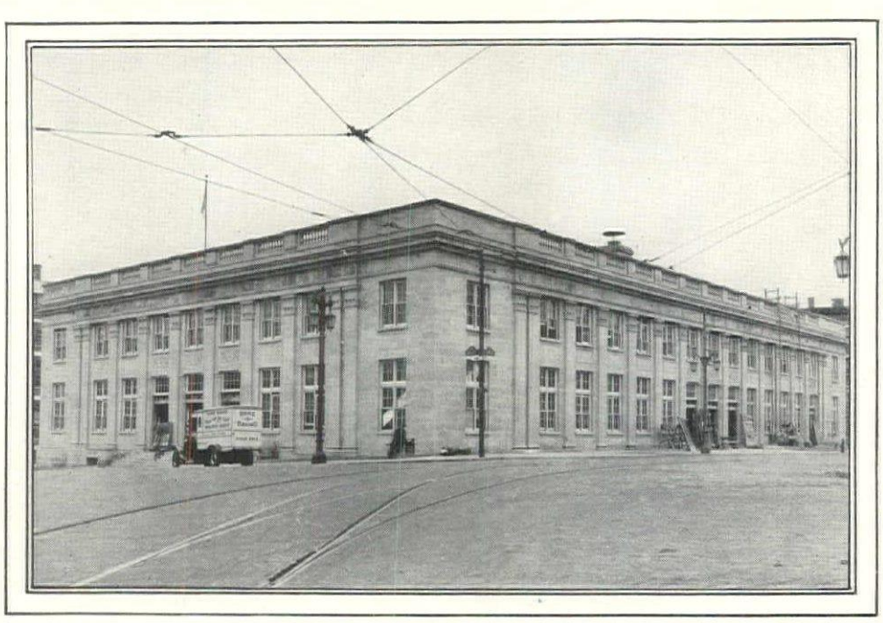
Masonite
THERMOSTATIC WOOD FOR
STRUCTURAL INSULATION
Made by the makers of MASONITE PRESDWOOD
REG. U.S. PAT. OFF.

An architect *does not* add screens to a building to enhance its architectural *beauty*.

We appreciate the fact that screens are used only *when* and *where* they are *necessary* equipment.

Bearing this in mind we build *mechanical excellence* into Orange *Aluminum Frame* Screens. . . . Satisfactory mechanical *performance* is the most important requirement in a screen.

And next in importance, Orange *Aluminum Frame* Screens are beautiful, in a quiet way, in so far as it is possible for such a practical article to be called beautiful.



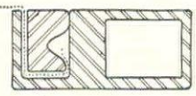
UNITED STATES POST OFFICE, YONKERS, N. Y.
James A. Wetmore, Architect.

This government building, nearing completion, is being screened with Orange *Aluminum Frame* Screens, fitted out with bronze wire screen cloth.

ORANGE SCREEN COMPANY

515 Valley Street . . . . . Maplewood, New Jersey

Same Aluminum as used in Airplane Construction



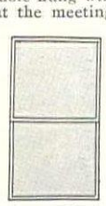
Extruded Section

These screens are made of *extruded bars* of aluminum, a *special alloy* developed for our use by the *Aluminum Company of America*, and which is one of the strongest non-ferrous materials made. Because of its *lightness* and many *structural advantages*, aluminum such as is used in our screen frames is now used in *Airplane Construction*.

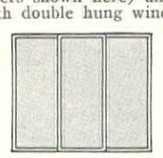
Complete line of Standard Types

This shows stationary (removable) half-circle screen with double frame screens below pivot-hinged at sides. The hardware is simple, strong, and easy action. We frequently supply small circular screens for yachts that rest at anchor a part of the time in southern waters.

Plain rectangular screen pivot-hinged at top or side, easily installed and removed. When this screen is used in *very large* double hung windows a *cross-bar* is used at the meeting rail level.



The double frame vertical sliding screen can be used inside or out (as can any of the others shown here) and is used largely with double hung windows.



A triple horizontal sliding screen. Horizontal sliding screens are provided in batteries of two or more frames, and are the ideal screen installation to be used with *casement* windows that open *out*.

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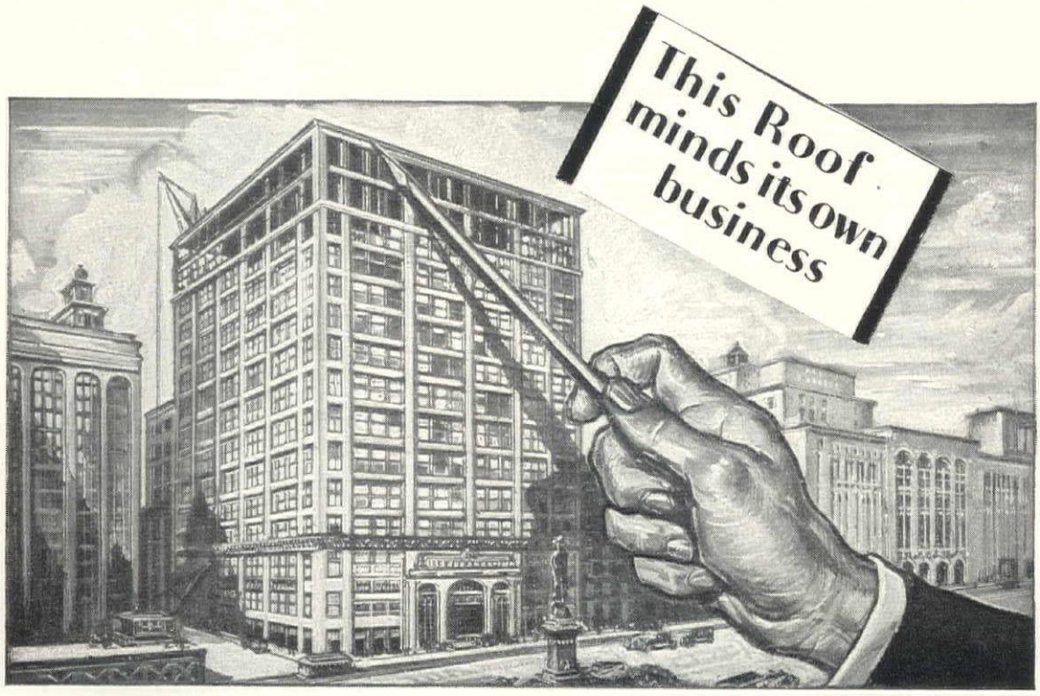
We have designed many screens to be used in connection with pivot and swinging windows and invite your inquiry on any screening problem that you may have, either domestic or industrial . . . write to our Maplewood, N. J., office for information or estimates and we shall instruct our nearest branch office to take care of your inquiry.



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BOOK DEPARTMENT

"ESTIMATING BUILDING COSTS"

Reviewed by CLIFFORD WAYNE SPENCER

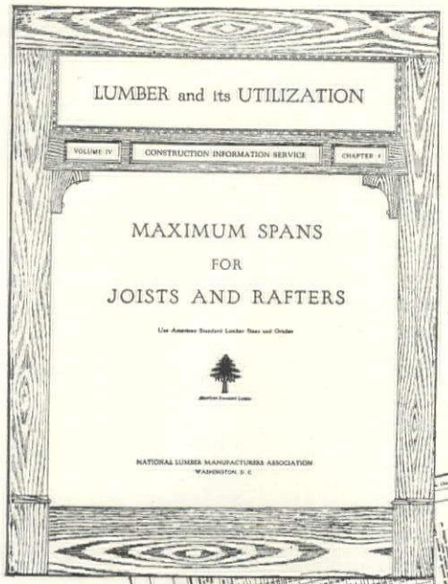
IN this age of commercialism, the question of cost has come to be of prime importance in the business of building, and in no case can it be treated lightly. In addition to being an artist and designer, the architect must now be a cost expert and be able to make a fairly accurate estimate of the cost of the building for which he makes the plans. In fact a very large proportion of modern building is planned on the budget system, which means that it is absolutely essential for the architect to know labor and material costs in order that he may give his client the best possible building and still keep within the limits of the original appropriation. It is probably true that in no other respect is the architectural profession open to so much well deserved criticism as on the question of false or inaccurate estimates. Certainly it is easily understood that if a client has been told by his architect that his house will cost $10,000 and then finds, as is so often the case, that it is to cost $15,000, he will lose confidence in his own architect and much descredit will be cast on the profession in general. No doubt there are some cases where misleading estimates are deliberately given by unscrupulous practitioners for the purpose of encouraging clients to go ahead with building, but the general high standard of ethics in the profession makes such cases few and far between, and in the vast majority of instances such estimates are the result of insufficient preparation or lack of thought on the part of architects.

Of course, a really thorough and complete knowledge of estimating may well require a lifetime of study, research and actual experience, and certainly no one can hope by the mere use of books and printed formulæ to arrive at the solution of a problem in which so much depends on local and rapidly changing conditions. Yet a great deal of preparatory knowledge can be gained from a careful study of the printed results of the experiences and researches of others which, when checked against one's own experience and adapted to circumstances of time and place, will furnish a satisfactory groundwork on which to proceed. The use of the more ponderous collections of data and tabulated information is often discouraged by their very vastness and completeness, and a beginner will be overawed by the great amount of information and the vast variety of different conditions to be complied with. According to a certain great teacher of language, it is better to use "a small grammar, when learning a language, than a big one." And the same is true when learning to estimate or when a person wishes to get a good general knowledge of building costs with-

out spending the time to go through a mass of detail, much of which would probably have no bearing whatever on the particular work he is doing; and even in the case of one who is able to go more deeply into the subject, such a small volume will furnish a good preliminary training to enable him to make better use of the larger and more complete technical works, which are many.

An excellent little book for such preparation and for use in estimating costs of smaller buildings, such as dwellings, barns, stores and industrial structures of moderate cost, has been written by William Arthur and is called "Estimating Building Costs." It is now in its third edition. It is written as compactly as possible, in simple and direct terms so as not to be confusing even to the most elementary student. The material covers all the different steps of building construction from excavation to painting, and each important class of building material is treated in a separate chapter. There are 91 tables showing the number of hours needed and amounts of work done. As the price of labor varies greatly with locality and season, all labor costs are shown at the rate of $1 per hour for mechanics and 60 cents per hour for laborers, so that they may be readily translated into terms of the prevailing local wage rates. In addition to being a reliable guide for use in estimating, the book contains many bits of useful information, and it even includes a chapter entitled "Hints on Drawing," which is no doubt rather elementary to be of much interest to the average architect but which will be very instructive to the beginner or those builders who are not familiar with architectural customs and practices. It discusses such things as plan indication, architects' charges, and general information on the preparation and printing of plans. In the following chapter, however, there is considerable useful information on building methods and materials which may be of interest and use to the architect as well as to the builder. A list of the chapters will give an idea of the completeness of the work and includes, in addition to the two on drawing and building hints already mentioned, chapters dealing with—Excavation and Piling, Concrete, Brickwork, Stonework, Plastering, Woodwork, Millwork and Glass, Solid and Sheet Metal, Roofing, Painting, Plumbing and Heating, and Miscellaneous Subjects. The treatment under each of these headings is very complete and is made especially effective by the fact that in all cases several easily understood examples are given illustrating the various processes and showing how they are applied to actual building problems. The reviews at the end of each chapter are in the form of questions and will be very useful where the book is used as a text book, especially since the answers to these questions are given in the key at the back of the volume. By the use of these questions and answers it will be possible to condense the study of the most important points in a very effective manner. In looking through the pages of this volume one finds that it is much more than a collection of tables for estimating and is really a very practical guide for the construction of small buildings; and that it contains a great deal of information useful to the specification writer as well as the estimator, and certainly to contractor or builder or to anyone interested in construction.

ESTIMATING BUILDING COSTS. By William Arthur. Third Revised and Enlarged Edition, 233 pp., 4½ x 7 ins. Price $2. Scientific Book Corporation, 15 East 26th Street, New York.



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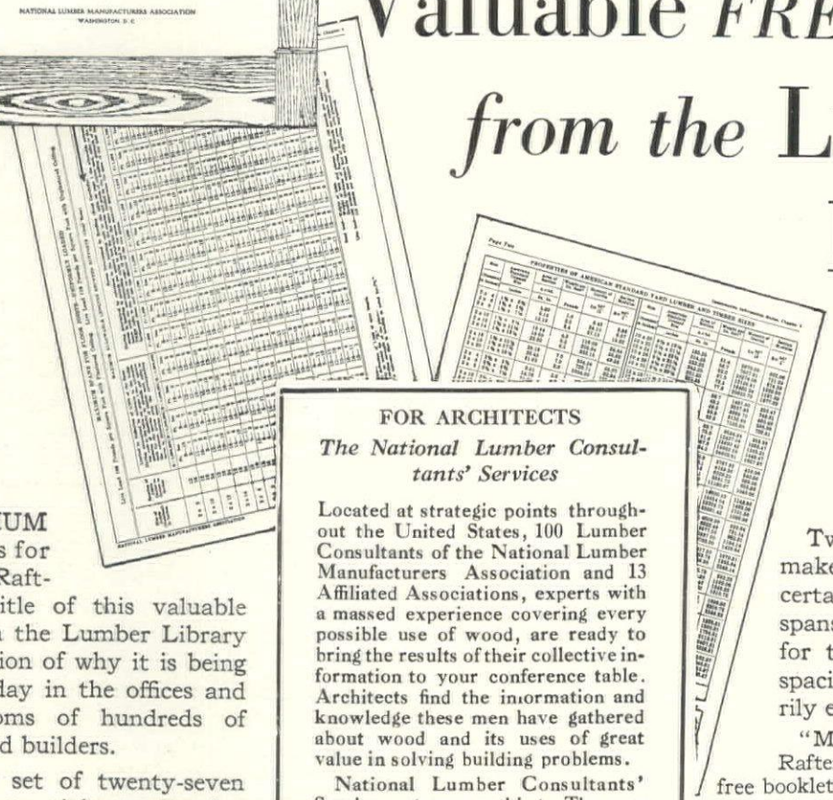

Here are shown two typical pages from the booklet "Maximum Spans for Joists and Rafters." There are 27 tables similar to these.

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STAIR BUILDER'S GUIDE. By Morris Williams. New Edition. 259 pp., 5¾ x 8½ inches. 358 illustrations. Price $3. Scientific Book Corporation, 15 East 26th Street, New York.

ONE of the most prominent features of almost any building is the stairway. It is seen by everyone; its convenience and beauty are readily appreciated, and its faults and defects instantly detected. Its construction is considered the highest branch of joinery, and far more care and knowledge are required in its planning and execution than in any other part of the building. By the design of the staircase there may be achieved an appearance of grandeur that will characterize the whole interior of a building. The prime utilitarian object in designing stairways is to secure ready access to the upper stories, and they should be planned to give ample head room and facilitate travel from one story to another, while at the same time care should be taken to assemble the various members in a harmonious fashion so that the finished structure will present an appearance that is as beautiful and pleasing as its prominence warrants.

When one looks at a graceful flight of stairs circling and spiraling upwards, it is easy to realize that their construction has been no simple matter, and indeed it is true that the science of stair building has its fundamentals in the solution of the most intricate problems of plain and solid geometry. Some of these have been solved by mathematicians and have resulted in systems of cylindrical handrailing. The foremost exponent of this science was Peter Nicholson, and nearly all work along this line since his time has been merely an attempt to simplify the results of his investigations. These attempts have been so successful that it is said that the art is virtually perfect and that further improvement cannot be expected. The number of mechanics who are thoroughly competent to lay out and erect a set of complicated stairs is relatively small, and it is desirable that the individual who designs and supervises the construction of such stairs have a thorough knowledge of the problems and principles involved in their erection. It is said that the chimneypiece is the central motif of a well designed room, and that its design governs the room's scale and treatment, but it is no doubt true that the stairway furnishes the central motif for the entire interior treatment of the building. Being such an important part of the structure, great care should be taken that the design and construction afford the maximum of safety, convenience and æsthetic appeal. In a matter of such importance too much cannot be left to the mechanics, and stairways should always be carefully detailed and their construction supervised by an inspector who is familiar with the principles of scientific stair building.

In the "Stair Builders Guide," by Morris Williams, all the up-to-date information on this important science is presented in short and carefully prepared chapters. The layout of each working detail is carefully considered, explained and illustrated. Plans of many stairways are shown as they are often designed, contrary to all standard and prescribed rules of correct construction, but these defects are pointed out and the correct plans are considered. The author confidently asserts that all those engaged in the building trades will find that this book gives the requisite instructions for becoming proficient in the art of making hand-railing. The book is now in its third edition, and it is considered a standard reference work.

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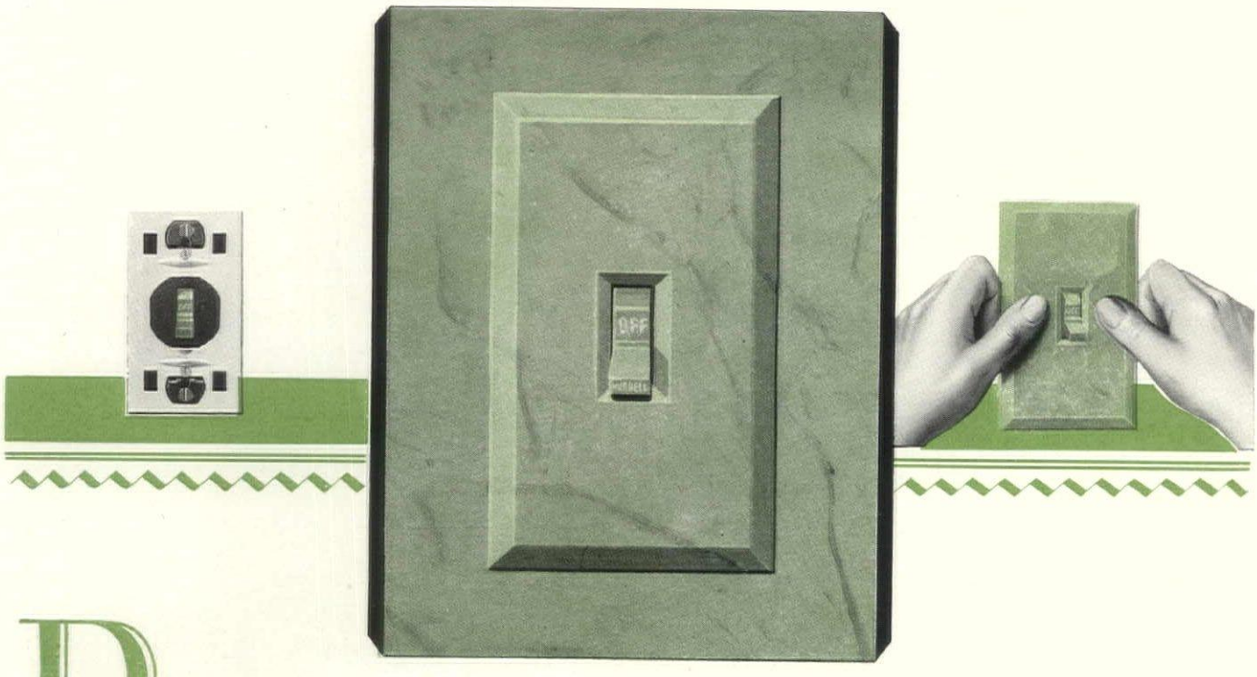
STEEL AND TIMBER STRUCTURES. By G. A. Hool and W. S. Kinne, 695 pp., 6 x 9 ins. McGraw-Hill Book Co., Inc. Price $6.

THE technical considerations in building are becoming ever more important as the height of structures increases and their design becomes more and more intricate. In the planning of bridges and buildings it is necessary for the architect to coöperate with the engineer and to study the engineering problems involved in their construction. It is not necessary for the architect to go into the problems as deeply or as thoroughly as does the engineer, but he should have an intelligent idea of the principles involved so that he may not only talk intelligently on the subject but may be able to make plans that are plausible and practical from an engineering viewpoint. Several very useful and usable reference and text books on the technical phases of building have been compiled by George A. Hool, S. B., Consulting Engineer and Professor of Structural Engineering at the University of Wisconsin, and W. S. Kinne, B. S., Professor of Structural Engineering at the same institution. This series consists of volumes on: Foundations, Abutments and Footings; Structural Members and Connections; Stresses in Framed Structures; Steel and Timber Structures; Reinforced Concrete and Masonry Structures; and Movable and Long-Span Steel Bridges.

The volume on Steel and Timber Structures, which is the subject of the present review, is compiled by a staff of experts who act as associate editors. This staff includes such men as O. A. Bailey, Chief Engineer, Chicago Bridge and Iron Works; W. C. Buetow, State Bridge Engineer, Wisconsin; C. W. Chase, Drawing Room Engineer, American Bridge Co.; Charles D. Conklin, Jr., Civil and Structural Engineer, Cheltenham, Pa.; F. W. Dean of Wheelock, Dean & Bogue, Inc.; F. W. Dencer, Engineer, American Bridge Co.; Henry D. Dewell, Civil Engineer, San Francisco; Phil A. Franklin, Structural Engineer, McClintic Marshall Co.; T. W. Golding, Consulting Structural Engineer, New York; James H. Herron, President, James H. Herron Co., Engineers and Chemists, Cleveland; C. K. Kennedy, Drawing Room Engineer, American Bridge Co.; H. E. Pulver, Associate Professor of Structural Engineering, University of Wisconsin; and Hermann von Schrenk, Consulting Timber Engineer. The volume starts with a section on buildings which consists of a discussion of steel office buildings by F. W. Dencer; steel mill buildings by C. W. Chase and C. J. Kennedy; timber framed floors and roofs by Henry D. Dewell; and slow-burning timber mill construction by F. W. Dean. All these types of construction are thoroughly discussed and illustrated by the use of formulæ, tables and diagrams. Section 2 gives a thorough description of roof trusses by W. S. Kinne, under these sub-headings: General Design; Design of Purlins for Sloping Roofs; Detailed Design of a Wooden Roof Truss; Detailed Design of a Steel Roof Truss; Detailed Design of a Truss with Knee-Braces; Arched Roof Trusses; and Ornamental Roof Trusses. Section 3 is divided into two parts, one dealing with steel railway bridges by George A. Hool and W. S. Kinne, and steel highway bridges by W. C. Buetow. Timber bridges and trestles are discussed by Phil A. Franklin in Section 4, and steel tanks by O. A. Bailey in Section 5. The design of chimneys as discussed by H. E. Pulver in Section 6 will be found very useful and highly instructive.



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Sweets, Pages B2036-2039

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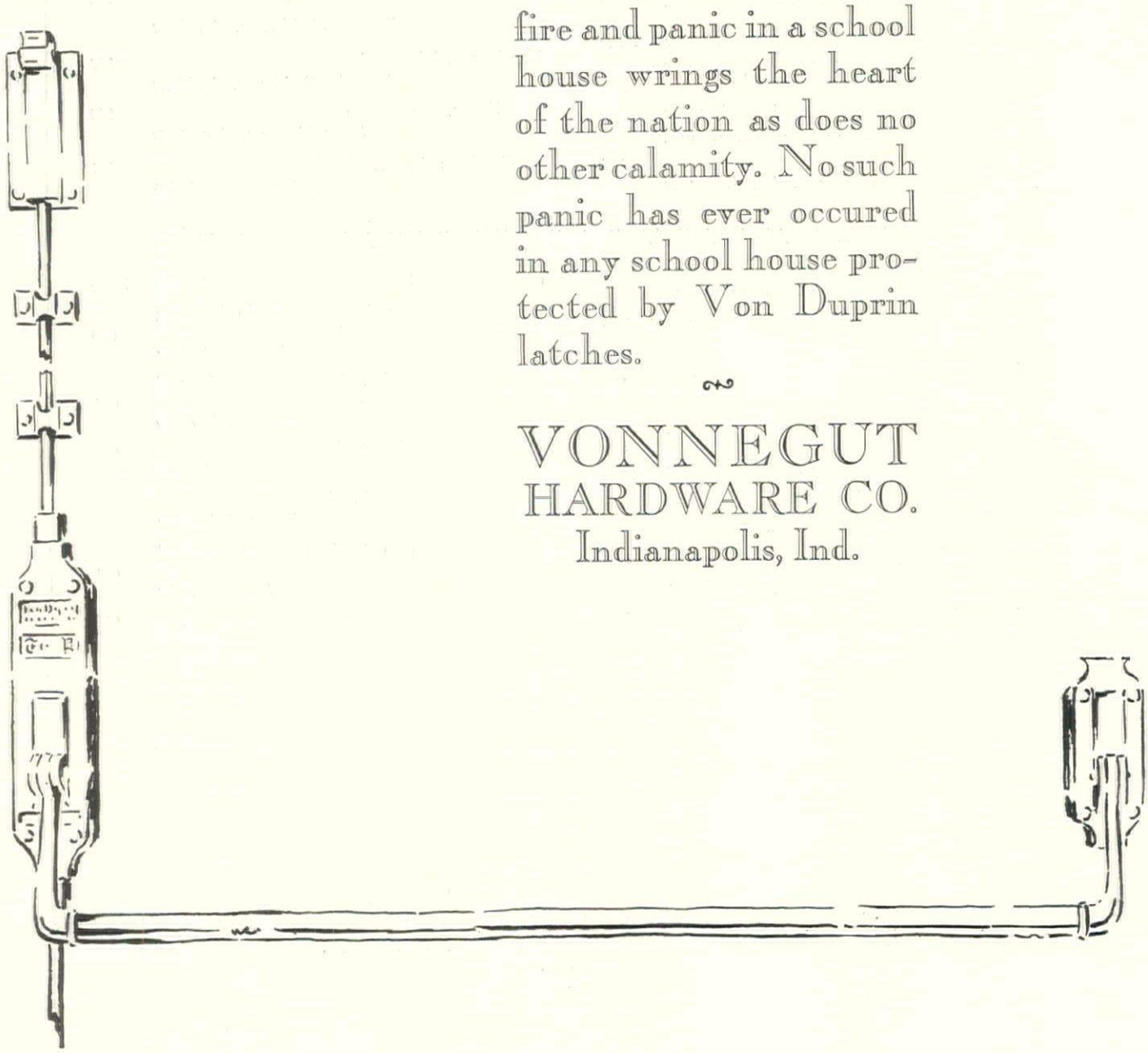

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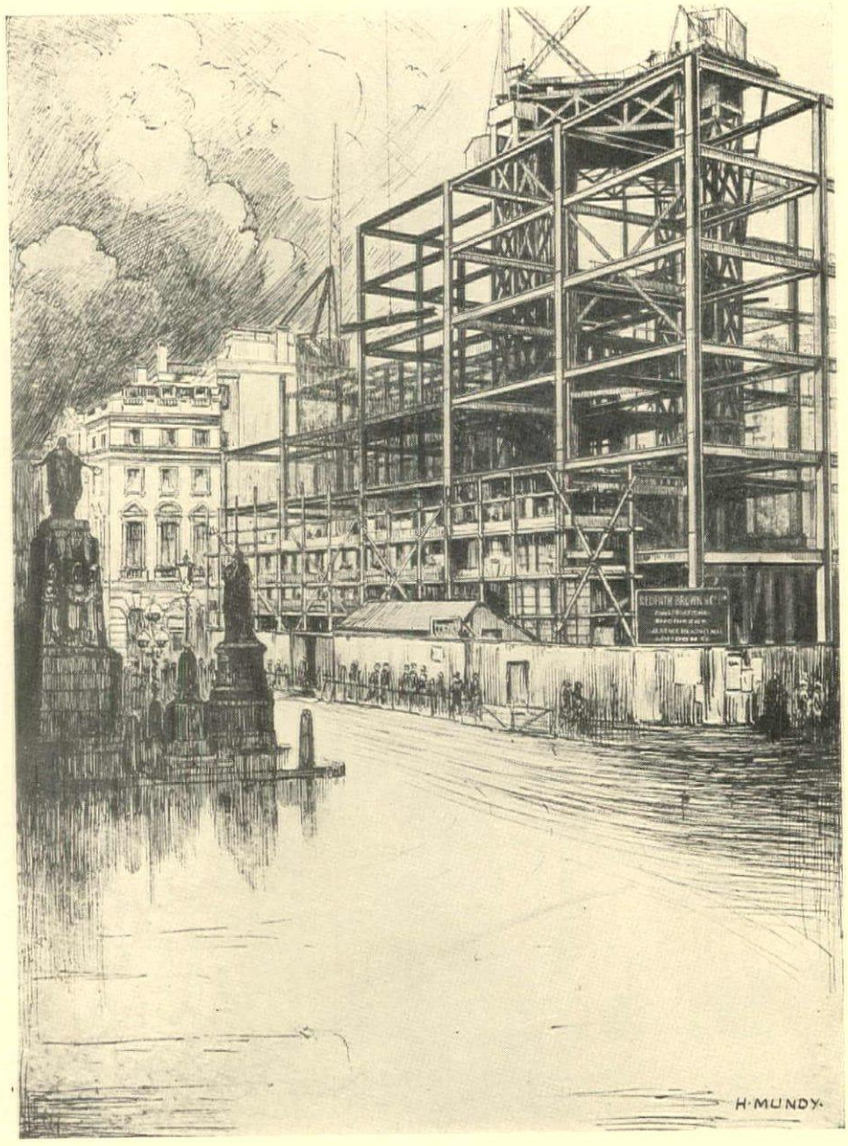


CONSTRUCTION IN LONDON

From a Pen Drawing by Harold Mundy

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER FOUR

OCTOBER 1928

THE PROTECTION AND MAINTENANCE OF STRUCTURAL STEEL

BY
FRANK W. SKINNER
CONSULTING ENGINEER

UNDER ordinarily careful treatment, with reasonable conditions and requirements, the steel framework of a building can be relied on for strength and safety. At the same time, it conforms most readily to architectural æsthetic and economic requirements, occupies a minimum amount of space, permits maximum dimensions of construction, rapidity of erection, ease of repairs, and demolition or extension in service. Structural steel for architectural purposes must almost of necessity be designed in accordance with accepted rules and standards. It must conform to well perfected types and details, be entirely fabricated by skilled workmen with machine tools in special shops, and erected by experts with special equipment which largely eliminates the probability, and most of the possibility, of bad workmanship, poor materials, mistakes, accidental damage, or departure from intended structural type.

Although within the 40 years since structural steel became commercially available for architectural purposes there have been no failures of buildings caused by the deterioration of the steel framework, the safety and durability of the latter have been unjustly attacked, and some prominence has been given to untrue statements concerning it. Within a few months metropolitan newspapers have been given currency to a wholly unwarranted statement that the structural steel frameworks of tall office buildings and the like have been found seriously damaged in service. It was said that they are likely to be, or soon to be, in a highly dangerous condition; that their life is very short and that they require very frequent and extremely rigid inspection, overhauling and repairing to avoid disaster. Such is far from being the case. The erroneous statements have been fully refuted in the public press and no contradiction has been made to the refutation. The present standard practice produces steel framework of ample strength, accurately proportioned for the required service and with a high degree of perfection in design, materials, and workmanship that, under proper conditions, insures practically unlimited safety and durability. Under ordinary conditions that govern the design and construction of steel buildings, the steel will never deteriorate through working stresses, because, unlike other materials, it retains its original strength, elasticity and reliability. So much has been achieved by the metallurgist, manufacturer, designer and builder, that it remains for the architect and owner only to insure conditions and treatment that will maintain the original integrity of the structure unimpaired by any anticipated future conditions. The vital points that practically govern the durability and safety of completed structures are: corrosion, fire hazard and the proper inspection and maintenance after erection. Their important practical features are here treated.

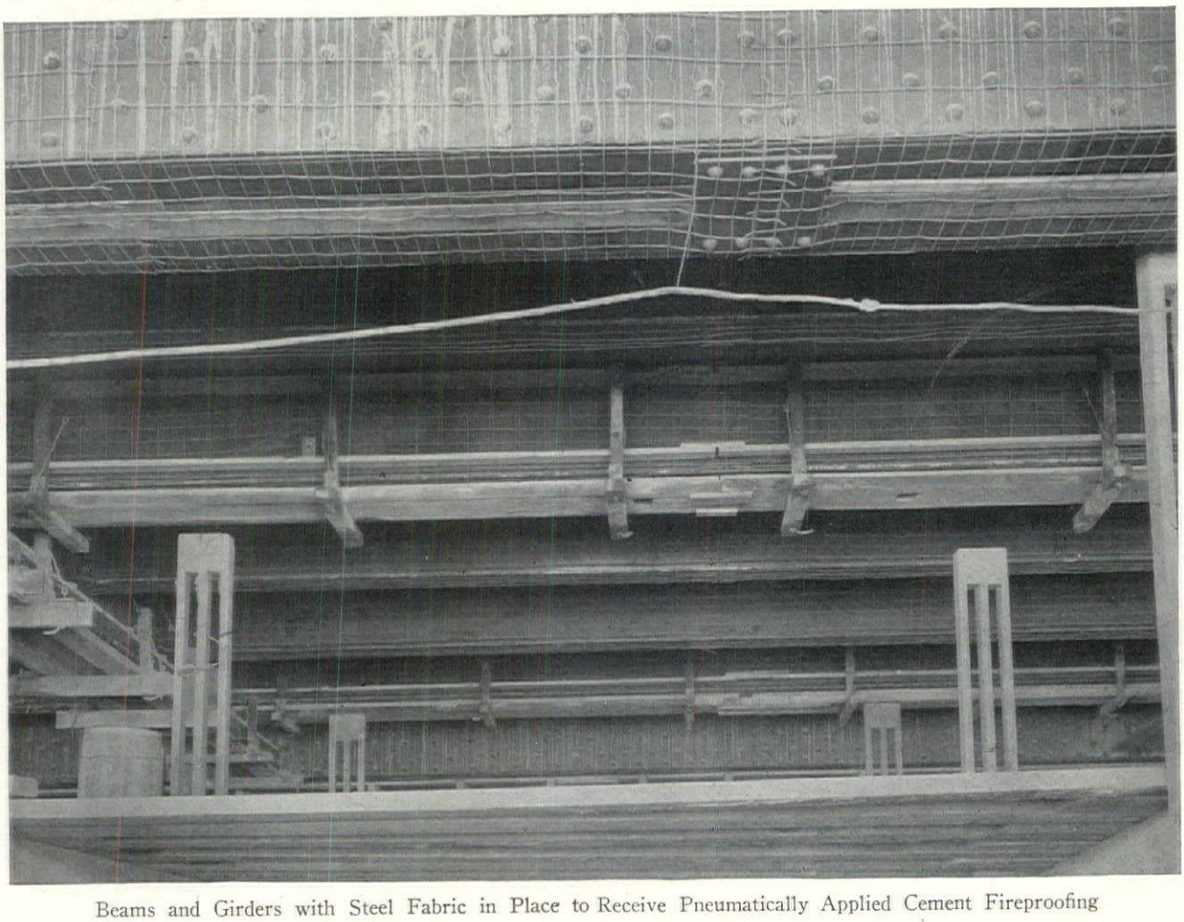
Corrosion. Under certain conditions, some of which are often continually present, all materials are subject to deterioration; wood will decay, stone and concrete will spall or disintegrate; brick and metals are subject to chemical changes that may be destructive. Almost the only agent destructive to structural steel under ordinary working conditions is corrosion, which is possible only through the presence of moisture or acids. Its prevention eliminates almost all possibility of deterioration of strength except by reason of accident, abuse or malicious treatment. Fortunately, corrosion can be absolutely prevented by keeping the steel perfectly dry and by avoiding contact with acids, fumes or liquids. Generally this is practically accomplished either by insuring a pure dry atmosphere, by encasing the steel in a solid protecting the mass, or by thorough painting. Unprotected steel should not be imbedded in cinder concrete because elements often contained in the latter are likely to promote rapid corrosion. Stone concrete or cement mortar well rammed around the steel and completely enclosing it gives a most excellent and satisfactory protection when thoroughly waterproofed. When it is applied the steel should not be covered with any oil paint, since the chemical action of the cement tends to saponify the oil and makes the paint injurious rather than beneficial. Unpainted steel may be covered with graphitic or asphaltic paint, which is often used for steel in footings, in foundations, and when exposed to wet earth. Concrete encasement is also suitable for the protection of superstructural steel when it is desirable for architectural or other purposes and

where it is properly applied, secured and waterproofed. The first inspection is likely to be the last.

In general, structural steel of all sorts may be satisfactorily protected by thorough painting. Before the first coat of paint is applied, the steel should be thoroughly cleaned; grease, scale and all dirt, old paint or other substances removed either by scrapers, wire brushes, washing or sand blast, and it should immediately after be treated with one or two coats of red lead and oil thoroughly applied on a warm, dry surface. This paint should be protected by one or two coats of some good elastic paint such as white lead and oil or other standard metallic paint. When columns, lintels, girders and other members are enclosed in outer walls, whether of concrete, or brick or stone masonry, the latter should be thoroughly waterproofed on their outer surfaces. They should be provided with horizontal water stops over horizontal members, and the steel members themselves should be thoroughly parged with cement mortar and the space between them and the masonry slushed full of mortar.

Some railroads and certain interests having large quantities of structural steelwork to preserve have developed special formulæ for their paints. It has been found that under different atmospheric conditions, different formulæ are necessary, since a paint giving excellent protection in one place may not do so in another place. Paint for the steelwork enclosed in buildings is, however, much easier to select and more durable than that applied to outside structures such as bridges. When repainting any structure, it is very necessary to first thoroughly clean it and especially to remove all dirt and rubbish. Cavities, pockets and narrow clearances likely to retain dirt or moisture should be filled with solid cement or some other waterproof material to protect the paint and prevent the accumulation of moisture or the development of corrosive acids from decaying materials. Where the steelwork is thoroughly protected by concrete or masonry covering, or where it is exposed in a dry atmosphere under cover, the original paint may remain effective for many years, and practically require renewal only for decorative purposes; but where the steel is exposed to wet or salty atmosphere, the fumes of cooking or any other acid condition, it should be frequently inspected and have thorough painting as often as the paint may show signs of deterioration. Originally exposed steel in the interiors of buildings will not require frequent painting, but exposed work may require painting every two or three years or oftener. If thoroughly painted with good materials and at sufficiently frequent intervals, it will afford complete protection for the steel against corrosion.

Fire Hazard. Steel is uninjured by ordinary atmospheric temperatures. Its strength is normal up to 200° Fahr. and increases about 25 per cent as



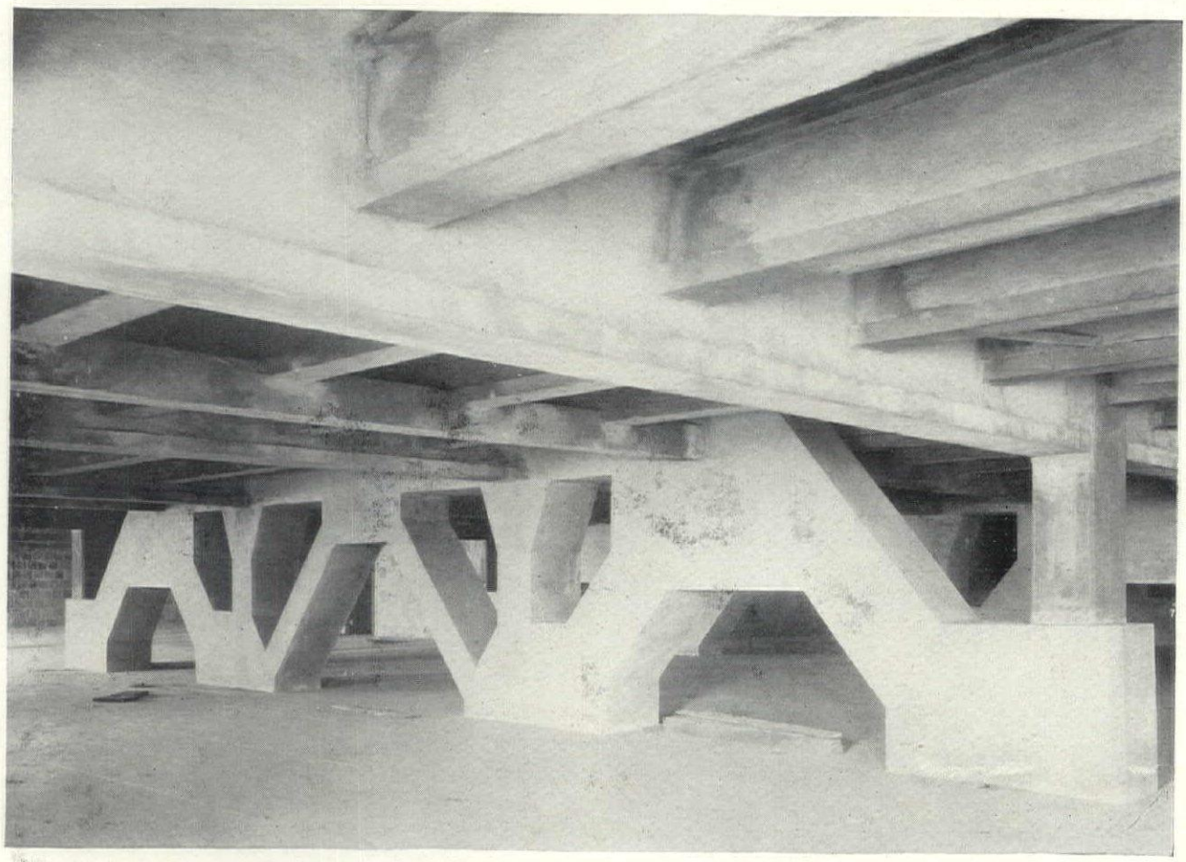
Beams and Girders with Steel Fabric in Place to Receive Pneumatically Applied Cement Fireproofing

the temperature rises to 500°, decreasing to normal at 800°, and to less than half the normal (to approximately the maximum permissible working stress in columns) at 1000° Fahr., above which temperature it should never be called on to carry compressive stresses. Steel is fireproofed by casing it in a complete, durable, strong covering of incombustible, refractory material that may or may not enclose an air space around the steel. Usually the encasing material is brick, tile, gypsum or concrete, with a minimum thickness of from 2 to 8 inches. If concrete is used, it should be reinforced and anchored to the steel. Concrete may be poured in moulds, or may be plastered by hand, or installed by pneumatic pressure, which increases the strength and density of thin bodies of concrete.

Most large American cities and several insurance companies and technical organizations have prepared very careful specifications to govern the fireproofing of steel structures. The specifications recently issued by the American Institute of Steel Construction provide that: "Fire-resisting insulating material shall continue to function within the temperature range of its use, and shall be so applied that it will not crack, spall, or buckle to seriously expose the steel to direct heat from fire. If the insulating of columns contemplates the use of air spaces between the steel and the insulator, there shall be fire stops placed at the floor levels. Steel buildings whose condition of exterior exposure and whose contents under fire hazards will not produce a temperature greater than 800° Fahr. in the steel shall be considered fire resisting without insulating protection for the steel. If the steel has an insulating protection, the safety factor shall be based on the fireproofing material providing protection for a greater period of time than the combustible contents of the building will burn, as shown in Section 3 of this specification; 16 pounds per square foot of combustible materials including wood floor and wood trim, constitutes a 1-hour fire hazard, 30 pounds a 3-hour hazard, 40 pounds a 4½-hour hazard, etc. The safety factor for all skeleton frames and secondary members shall be 1½. For example, if a building contains 10 pounds of combustible material per square foot of floor, and has a fire hazard of 1-hour duration, the steelwork shall be protected against the temperatures here defined for 1½ hours."

Fire Protection Specifications

The tentative 1927 specifications of the National Fire Protection Association, Boston, require that all structural steel members which support loads or resist stresses shall have a fireproof protection of brick, concrete, hollow building tile or gypsum, plaster being unacceptable. Poured-in-place gypsum or concrete shall be secured by steel anchors. Bricks or blocks shall be accurately fitted and bonded, and the spaces between them and the structural steel shall be filled solid with masonry or concrete. Bricks



Encasement on Beams and Girders is Solid, but that on Truss Members is Hollow, Enclosing Air Spaces

or blocks are to be set in Portland cement mortar except gypsum mortar for gypsum blocks. All columns and girders shall be protected from corrosion. No pipes, ducts or wires shall be placed within the fireproofing area. All wall columns shall be enclosed with not less than 3¾ inches of brick or 3 inches of concrete well bonded and anchored. Fireproofing of wall girders shall be the same as for wall columns. Interior columns shall be enclosed in a continuous casing of concrete 3 inches thick, or cast-in-place gypsum not less than 2 inches thick. Where subject to mechanical injury from trucking, handling merchandise, etc., fireproofing shall be protected by jacketing. Webs and bottom flanges of interior girders and trusses shall be protected with fireproofing not less than 2 inches thick at all points. Beams, lintels, and all other structural members except roof trusses and roof purlins shall be similarly protected with fireproofing not less than 1½ inches thick. Minor structural members supporting walls or other construction shall be protected by not less than 1 inch of expanded metal or wire lath and cement or gypsum plaster.

The requirements of the building code of the National Board of Fire Underwriters correspond in general to the specifications of the Fire Protection Association and say that hollow building tiles for fireproofing must have webs and shells not less than ⅝ inch thick. Galvanized steel wire, not less than 12 gauge, shall be securely wrapped around block column coverings so that every block is crossed at least once by a wire. The wire shall not be wound spirally, but each turn shall be a separately fastened unit. Interior metal ties or interlocking blocks are preferable to the wire winding. No blocks shall exceed 12 inches in vertical dimension. Hollow tile protection for the lower flanges of beams, etc., shall be either dovetailed to or integral with the skewbacks, with solid mortar joints. All concrete protection shall be anchored to the structural steel member with interior pieces securely hooked to the enclosed members.

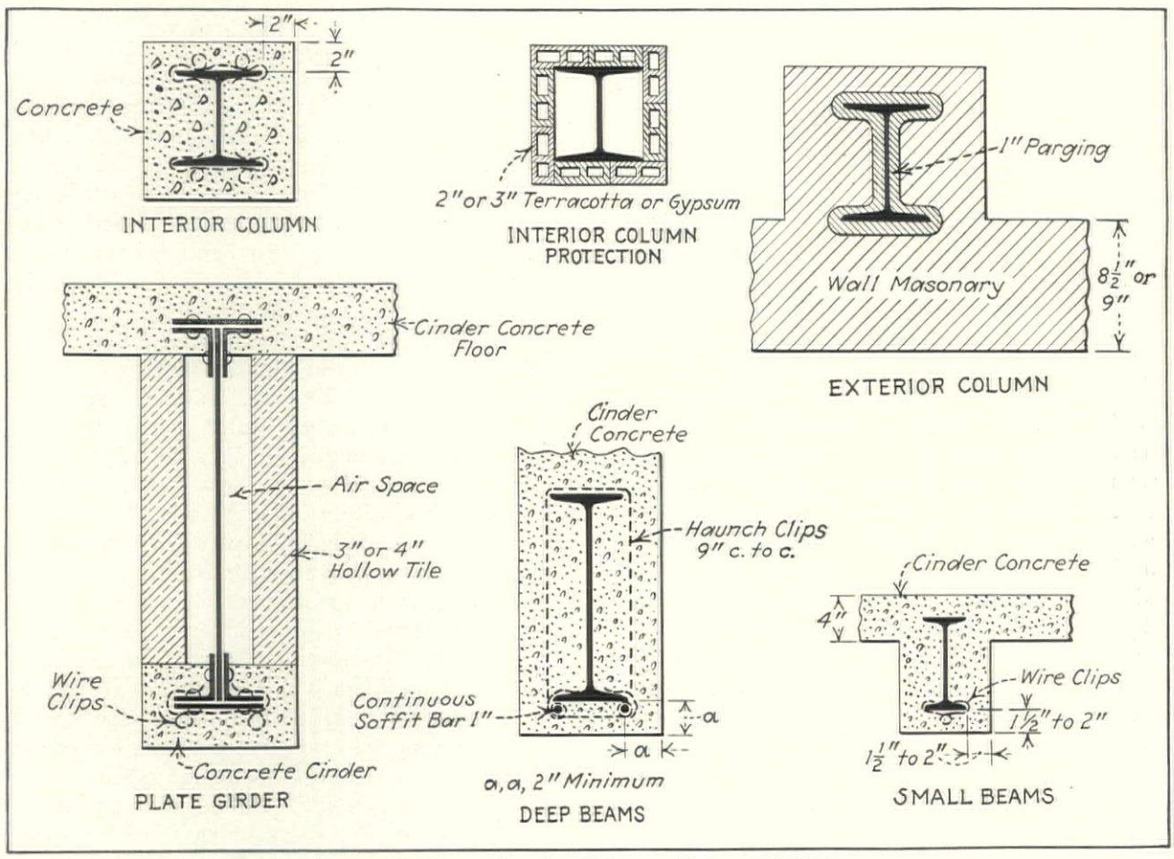
In discussing the most efficient type of fireproofing for structural steel columns, H. G. Balcom, consulting engineer, recommended a solid jacket of limestone concrete anchored to the column flanges.

Long Roof Trusses of Madison Square Garden in Perfect Condition after 35 Years of Service

A very popular alternative is the use of terra cotta blocks on all sides of the column. He recommended for ordinary beams a solid encasement of anchored concrete integral with the floor or ceiling slabs. For deep girders, the bottom flange may be protected by cinder concrete and the sides by properly secured terra cotta blocks thoroughly jointed to the floor slab. Kort Berle of the Gunvald Aus Company, consulting engineers, recommended that beams and girders be fireproofed with solid concrete encasement, and that interior columns be enclosed in a solid mass of concrete or brickwork of a minimum thickness of 2 to 4½ inches respectively. Exterior columns should have one shop coat and one or two field coats of approved paint and in addition should be well parged.

There are various types of commercial fireproofing systems and details, and special provision is made to prevent the running of any pipes, wires or conduits inside the fireproofing jacket of any column or girder, entirely separate protection or chases being provided for them as is required by the building codes. Ordinary standard specifications, construction methods and equipment suffice for fireproofing concrete that is poured in forms, but to secure the durability, strength, hardness, watertightness and greatly decreased volume and weight, fireproofing pneumatically applied to any steel members should be made with the proportions of one bag of Portland cement well mixed with 3 cubic feet of dry screened sand under a minimum pressure in the receiving chamber of 30 pounds, mixed at the discharge nozzle with clean water at 60 pounds, and delivered at right angles to the fireproofed surface. The fireproofed members must be thoroughly cleaned of all paint, grease, rust, etc., and have ½-inch holes approximately 3 feet apart in the webs close to the top and bottom flanges. Anchor rods shall be secured through these holes, and to them longitudinal rods shall be attached and wired about every 12 inches to galvanized welded fabric or expanded metal of required size and weight that has been carefully cut to size and bent over templates so as to closely follow the outline of the member and insure a minimum thickness of ¾ inch of protection.

The outer edges of flanges and stiffeners are squared to true lines by the use of detachable "shooting strips." The main surfaces of girders, beams, columns, etc., are trued before the cement sets, by cutting off all high spots with the sharp edge of a trowel and dragging the surface with a wide, long-haired, wet, whitewash brush. Cement must not be placed during freezing weather, nor against frosty surfaces, and it must be kept wet for at least one week after placing. In no case shall the thickness of the cement be less than 1½ inches on vertical surfaces and above horizontal surfaces, and not less than 2 inches below bottom surfaces and around edges of lower flanges. Thickness shall be measured from the surface of the steel and not from the tops



Types of Fireproofing for Columns, Beams and Girders

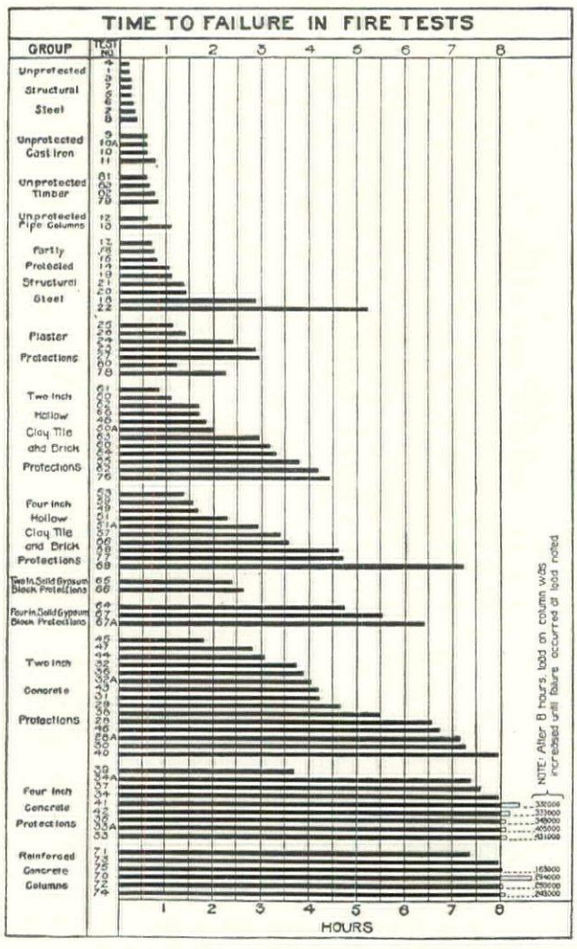


Table of Results of U. S. Bureau of Standards' Test of Columns and Fireproofing

of rivet heads. A Columbia University test of a pneumatically built cement slab was made with an average temperature of 1695° Fahr. for three hours, combined with a load test of 40 pounds per square foot, and after cooling, a load test of 200 pounds without failure, the 200-pound load producing tensile stresses of 7,450 and 62,000 pounds per square inch in the concrete and steel, respectively.

Examples of Steel and Wrought Iron Buildings. No deterioration was observed in small wrought iron beams removed after nearly 100 years' service in an old shot tower in New York. The roof trusses over the main shop of the Dominion Bridge Company, Montreal, erected in 1884, have been seriously overloaded, exposed to very injurious smoke and fumes, seldom repainted and never reinforced, yet they are still in service, and are considered to be in good condition. The Woman's Temple, one of the first so-called steel frame buildings in Chicago, was removed after 33 years, and only very slight deterioration was found in any of the steelwork. The Tower Building on lower Broadway, erected in 1888, was called the first steel cage building in New York, and its I-beams were in good condition when removed after 26 years' service. After 30 years' service the steelwork in the Benoist Building, St. Louis, was found as good as the day it was erected. I-beams in the Rand & McNally Building, one of the first tall buildings in Chicago, were recently exposed during its demolition and found uninjured. About 300 tons of steel I-beams were salvaged and re-used in new building construction after 25 years' service in a New York hotel. When recently demolished to make room for modern structures, the steel frameworks of the Savoy, New Netherland, and Delmonico Buildings, New York, were found in good condition. Well protected steelwork, although exposed to dust, moisture, and sulphurous fumes, does not show deterioration in two generating stations and 15 sub-stations about 30 years old of the Brooklyn Edison Company, the framework being now in perfect condition. On a 40th Street, New York, sidewalk, I-beams, only partly waterproofed, showed no deterioration after 20 years' service. Foundation girders in the Samson Building, New York, were painted with graphite and asphalt, and were found uninjured after 22 years' exposure to drip and moisture. Many hundred tons of structural steel and iron were used in the roofs, floors, columns, and great trusses of the famous Madison Square Garden, New York, which was built about 35 years ago. When it was razed in 1925, careful inspection was made of its framework, and except for a very small portion of the ornamental top of the tower (perhaps 1 per cent of the whole) that was exposed, unprotected, seldom or never visited, and entirely neglected, all of the steel and iron was found in perfect condition; as good as new. Large quantities of the I-beams were salvaged for re-use, and the great long span roof trusses were very carefully removed and stored for re-erection in a new building. Generally the I-beams provided by the demolition of old buildings are salvaged, cut to required lengths and sold for erection in new buildings. Columns, girders and other fabricated members could also be salvaged if their details and dimensions were adaptable to new work.

Jacob Volk, New York house wrecker, says: "In the demolition of more than 200,000 tons of structural steel and iron, the condition of the steel has been found, in general, excellent, and 90 per cent of the floor beams are reused." E. A. Prentis, president, Spencer, White & Prentis, New York, who for many years has done a large amount of underpinning, exposing old foundations at and below ground water level, says: "Usually the steel in them is in good condition; never dangerously corroded. In designing thousands of foundation piles made of heavy steel pipe, filled with concrete, an excess of 1/16 inch in thickness is ample to allow for corrosion. That portion of the unpainted pipe driven into clay or firm soil sometimes does not corrode at all, but usually the exterior does corrode a little, and the corrosion ceases, the oxidized steel combining with the earth to form a hard, dense jacket, resembling iron ore, that, when knocked off, discloses a

bright, smooth, clean, uninjured metal surface, apparently free from progressive corrosion. This condition has been repeatedly observed in the oldest piles of this type in New York that have been in service 20 years or more." Answering charges of deterioration of the famous Eiffel Tower, erected in an exposed situation in Paris, M. Hubie, Chief Engineer 16th Arrondisement, Paris, and Secretary of the Eiffel Tower Inspection Committee, recently wrote: "We do not see any reason why the Eiffel Tower should not last indefinitely if properly cared for," and C. Marc, C.E. Administrator of the Eiffel Tower Society, says: "The Tower is in as good condition today as the day it was built."

In an exhaustive research of structural steel in the United States and Canada, conducted in 1926 by the writer for the American Institute of Steel Construction, a questionnaire of 63 interrogations on their practice, observation, records, opinions and beliefs regarding the principal features of the deterioration, durability, and best maintenance of structural steel was addressed to more than 1,000 of the most eminent engineers, architects, and builders in this country and Canada. From about 17,000 items of replies received, and from conferences with, and letters from more than 200 prominent architects, engineers and contractors of long experience in New York, Boston, Philadelphia, Chicago, San Francisco and other cities, these details were tabulated:

The safety of a structure in general is not endangered by corrosion.

There need be no fear of serious results from corrosion in well designed and maintained buildings. Serious corrosion in buildings would become obvious to reasonable inspection before the building could be endangered.

The worst peril from corrosion is due to accumulation of dirt and filth, from exposure to moisture, salt air, acid fumes, brine, and other artificial conditions.

All steel may be protected from corrosion.

The protection of buildings from corrosion may be 94 per cent perfect.

The best protection from corrosion is afforded by painting and cleaning.

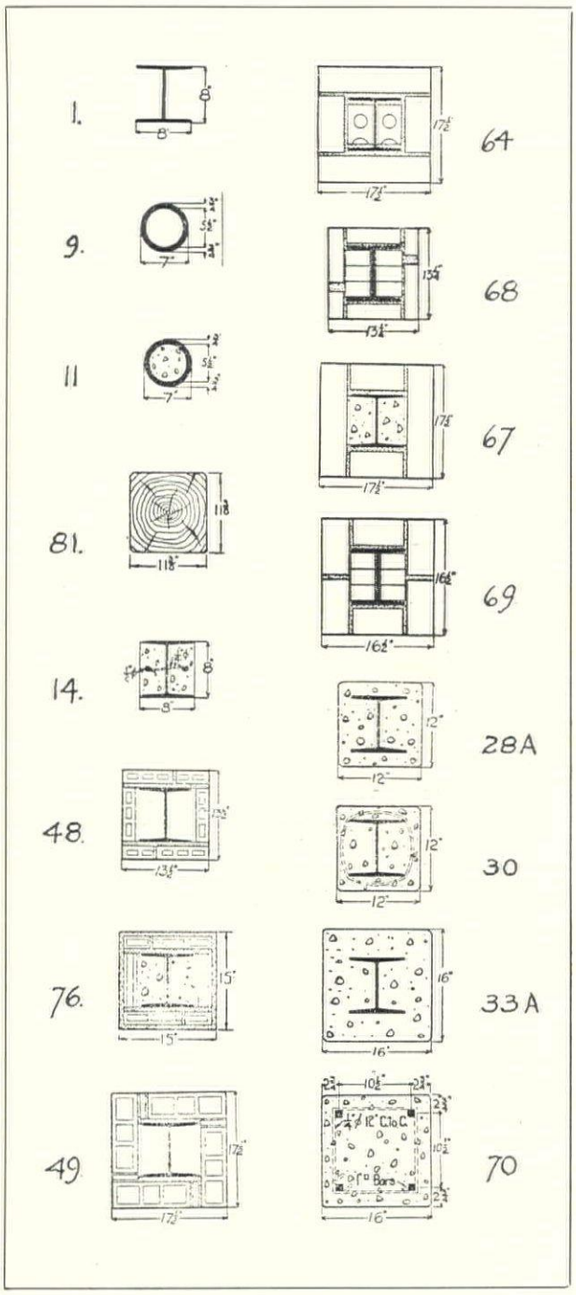
Very efficient protection from corrosion may be afforded by enclosing it in dense, fine, stone concrete.

Unless buried or encased in concrete, steel should be protected by a priming coat of red lead paint followed by an elastic coat of waterproofing paint. Graphite or asphalt paint should be used rather than oil paint on steel enclosed in concrete.

Exterior walls containing steel members should be waterproofed, and stop courses built over lintels and wall girders.

There is no limit to the life of properly protected steel.

The worst neglect causing corrosion is failure to keep it clean and dry, and failure to provide good and adequate painting.



Sections of Several Columns Tested (Numerals Refer to Test Numbers of Table on Page 574)

There is practically no danger of corrosion from electrolysis.

The actual values and comparative efficiencies of different types of fireproofings on different steel columns have been thoroughly investigated by a recent series of official fire tests on building columns, etc.

Official Fire Tests of Structural Steel Columns. "Fire tests of Building Columns," Paper 184, published April 21, 1921, by the U. S. Bureau of Standards, describes in great detail 96 tests of structural steel columns made in Chicago in 1917 and 1918 under the joint direction of the Associated Factory

Mutual Fire Insurance Companies, the National Board of Fire Underwriters, and the United States Bureau of Standards. They were made to ascertain, first, the ultimate resistance against fire, of protected and unprotected columns as used in the interiors of buildings; second, their resistance against impact and sudden cooling from hose streams when in a highly heated condition. The columns were of ten standard cross sections, with cross sectional areas varying from about 7 to 14 square inches, lengths of about 12½ feet, and designed for working loads of approximately 100,000 pounds. They were tested without protection; partly protected by concreting interior and re-entrant spaces; protected by 2-inch or 4-inch thicknesses of concrete, hollow clay tile, clay bricks, gypsum blocks; and by single or double layers of metal lath and plaster. The load pressure was uniformly maintained while the columns were heated in a gas-fired furnace whose temperature rise was regulated to conform with a predetermined time-temperature relation. Elaborate measurements were taken of the temperatures of the furnace and test columns, and of the deformations of the latter, due to load and heat.

Firproofing was applied so as to reproduce, as nearly as possible, conditions obtaining in building construction. The machine-mixed concrete was spaded inside the forms which were tapped with hammers. The overtapping joints of wire lath were wired, the lath was supported on ⅜ x ¾-inch channels, and the plaster coats were of maximum thickness. Hollow tiles and bricks were set in cement mortar, and when concrete was placed between tiles and column, the tiles were held in place by clamps 2 feet apart. Gypsum blocks were set in 1:3 gypsum mortar. The load pressures were applied by a hydraulic ram of 545,000 pounds' capacity and an accuracy usually within 1 per cent. The 7 x 7-foot brick testing chamber 12 feet high had four primary gas burners in the corners that were supplied through a 6-inch pipe from the city mains. Two of the furnace walls were movable to permit the application of a stream of cold water delivered through a 1⅛-inch nozzle. The columns in the fire test series were subjected to a constant working load and fire exposure, increasing according to a predetermined time-temperature relation until failure occurred, or until they had withstood the test eight hours or more.

In the fire and water tests, the working load was maintained constantly, and the column exposed to fire for a predetermined period when water at given pressures was applied by means of a hose stream. In case the columns withstood the fire test, they were immediately loaded to failure under full fire exposure. In the fire and water tests, three columns were loaded to failure after they had cooled, and four columns were loaded to twice the applied working load and then reserved for further tests. The time to failure in the fire test extended from the beginning of the test to the time when the column was unable to sustain the working load. The duration of the fire and water test period varied from 22½ minutes to one hour, and that of the subsequent water application from one to five minutes. The length of the maximum period of fire was the time within which the water is generally applied in building fires, estimated at one hour.

Maintenance. In order to insure the continued integrity of the steel framework of a building that has been properly designed, constructed and protected as has been here described, it is necessary that it should receive adequate periodical examinations and such maintenance as is required to prevent any injury or to correct any incipient trouble. Certain portions of the structure,—such as the steelwork in the foundation and footings and the steel embedded in exterior walls scrupulously protected with adequate covering,—are undoubtedly permanently safe, and need never be disturbed, notwithstanding the hysterical demands of a newspaper which insisted that the walls and foundations of important structures should be frequently torn open.

Wherever there is reason to fear the penetration of corrosive liquids, gases or moisture, there should be preventive measures taken. Ordinary corrosion, though it may present a rough and a scaly exterior, is seldom structurally important, unless long continued, and a very rough surface may not indicate the loss of 1 per cent of the original strength and efficiency of the member, an amount which is entirely admissible without impairing the safety of the steel. Extreme cases of excessive and prolonged corrosion may demand the replacing of the member. Usually a casual examination of the most exposed and vulnerable parts of the interior framework will indicate whether corrosion is present, and if found, it generally is necessary to repaint only the member and maintain the required protecting jacket to insure its safety. When local spots of corrosion are detected, they should be removed immediately and the places covered with one coat of red lead and oil plus the application of an additional coat of paint entirely covering the structure or members.

Exterior steelwork must be carefully and thoroughly inspected at intervals of from three months to one year, according to the character of the structure and the conditions obtaining. Two kinds of metal must not come in contact where there is a possibility of there being moisture. There should be no narrow spaces between or around steel members or portions thereof, and there should be no contact with dirt, rubbish, or any other materials at places where moisture or filth can accumulate. If such are inevitable, they must always be frequently exposed and cleaned, unless it is possible to eliminate them by filling with solid waterproof, watertight materials. The greatest care must always be taken to keep steelwork clean and dry. Accumulation of any kind of dirt or rubbish must never be permitted. If it is kept clean, and dry, and well painted, the steel's working life should be unlimited. Proper protective encasing of steel insures its structural integrity.

LINOLEUM AND CORK COMPOSITION FLOORING MATERIALS

BY

C. STANLEY TAYLOR

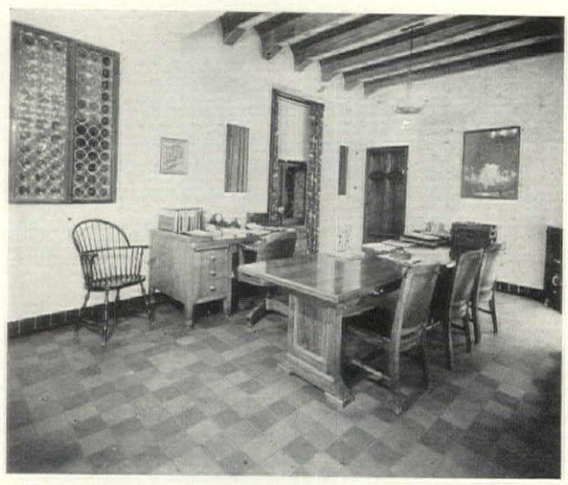
RESILIENT flooring materials are the outgrowth of a definite need for a suitable and economical floor over wood, concrete and other hard floor surfaces, and for a material which can be easily applied as a replacement floor over old floors of any type. Cork composition products and rubber are the principal flooring materials having resiliency as a dominant characteristic. They have been evolved through many years of development and improvement, and have today reached a state of perfection and quality which places them very definitely in the class of quality materials having distinctive characteristics not present in similar combinations in any other type of floor surfacing material.

We are concerned in this discussion primarily with cork and cork composition floorings, which are known in the trade under the general titles of linoleum, linoleum tile, natural cork tile, and cork carpet. The evolution of cork composition flooring materials from the status of a floor cover to that of a finished flooring material has been slow, and architects have only recently awakened to the intrinsic values which such materials possess as contrasted with their use primarily as substitutes or replacement coverings. It must be acknowledged today that these products have earned for themselves a definite, permanent place in the building field, and that they offer to architects, builders and owners new opportunities for creating special effects in color, pattern and texture and for introducing other values of comfort, quietness, sanitation and maintenance that particularly adapt them to solving many modern flooring problems.

Types of Cork Flooring Products. The various types of resilient flooring materials, of which cork in some form is the principal component, each possess special characteristics which make it important to differentiate one from the other, both in this discussion and in the use and specification of such materials. The prevalent use of trade names to distinguish the various types of products is somewhat confusing, and we must go back of the distinguishing and commonly employed trade names and classify the products in another manner. There are three major classes of cork flooring products; (1) cork composition floorings, broadly termed linoleums and linoleum tiles; (2) natural cork tiles; (3) cork carpets. Their characteristics deserve consideration.

Natural Cork Flooring Products. Cork tiles are composed of particles of cork, such as the thin shavings of cork which are largely produced as a by-product in the manufacture of cork bottle stoppers. These particles are compressed under heat in such a manner that the natural gums of the cork are liquified and form the only binder required to produce a firm, rigid, and homogeneous product. The better grades of natural cork tile contain nothing but pure cork without any of the harder bits of cork bark or other foreign ingredients. The tile forms come in various size, usually in square or rectangular shapes, and in thicknesses ranging from approximately ¼-inch to ½-inch.

Natural cork tiles take their color from the cork itself and from the baking process which is essential to their manufacture. They are thus available only in natural cork browns of various shades, ranging from light to dark, according to the amount of heat applied. The extreme hydraulic pressure usually employed in the manufacture of cork flooring produces a material which is quite resistent to wear and abrasion, and which is at the same time highly resilient, quiet, and pleasant to walk upon.



Cork Tile Showing Random Use of Several Shades

Embossed Inlaid Linoleum Resembling Tile Floor

Embossed Inlaid Linoleum Indicating Adaptability to Definite Architectural Styles

Cork Composition Flooring, Linoleum. In this type of flooring ground cork is a principal ingredient. The cork is pulverized almost to the fineness of flour and is mixed with oxidized linseed oil and various gums, fillers and pigments. The mixture is compressed under huge heated calendar rolls onto a burlap backing employed as a measure of reinforcement on the underside. A process of curing the cork composition aids in producing a firm, homogeneous material of considerable resiliency which will not buckle or crack and which is practically free from odor. Cork composition floorings are available in many forms and in a number of distinct types. The sheet forms may be classified as Battleship Linoleum, Jaspe, Inlaid Linoleum, Embossed Linoleum and Marbleized Linoleum.

Battleship Linoleum is a high quality, plain color cork composition flooring in sheet form, which earned its name from its original use as a decking material over the steel decks of warships. It is available in various thicknesses from slightly less than ⅛-inch to a full ¼-inch.

Jaspe Linoleum is distinguished by its striated pattern in two tones of a single color, giving a variegated effect and a characteristic appearance of graining. It is otherwise similar to Battleship Linoleum in its composition, and is usually available in three weights. Small insets of contrasting color are frequently used in Jaspe Linoleum with interesting effects.

Inlaid Linoleums have various patterns in which each individual color runs through to the burlap back. In surface appearance these linoleums often resemble a floor laid with individual tiles, but possess the advantage of lower initial cost and considerably lower laying cost because of its sheet form. This type of linoleum is available in many combinations of colors and in a wide variety of patterns, some of the small tiles forms resembling mosaic tiles, and some patterns resemble quarried tiles or blocks of cut stone or slate, as well as other designs.

Embossed Linoleums are usually inlaid linoleums in which an apparent joint is introduced between the tile units of the pattern, and this joint is compressed below the surface of the sheet to give the appearance of a masonry joint in a hard tile floor. The tiles themselves may also be embossed for decorative effects.

Marbleized Linoleums are classified separately because of their special appearance. Ingenious processes of manufacture result in producing a variegated color effect which resembles with remarkable fidelity the color and appearance of fine marbles, there apparently being no limitation to the manufacturing process in the reproduction of all types of colored marbles. Marbleized Linoleums may be in either full sheet forms, in which the marbleizing effect is carried out over the entire sheet, or of the inlaid type, having the appearance of blocks of marble laid in pattern.

The tile forms, which are sold under various distinguishing trade names, are essentially the same as in the sheet forms in composition but are usually available only in plain colors or in marbleized effects. There are in addition a number of newer types constantly being developed which produce various special flooring effects, including a reproduction of wood plank floor, accomplished by using the Jaspe Linoleum with inset joint strips, pegs and butterfly wedges of darker color. The tile forms are in plain colors and in marbleized effects. Some manufacturers are producing an embossed tile for special uses which have the appearance of decorative faience tiles and which are employed to introduce variety and interest in the pattern of a floor. The architect has at his disposal, in these materials, floorings to harmonize with any designs.

Cork Carpet. Though frequently classified with linoleum, cork carpet differs somewhat from both cork tiles and linoleums. It is composed of granulated cork using a different proportion of cork and linseed oil from that usually employed in Battleship Linoleum. It is compressed under heat. As the name implies, it is manufactured in sheet forms. It comes in several solid colors, and in thicknesses of approximately .22-inch (polished) and .26-inch (unpolished). Cork carpet has not the density nor therefore the resistance to wear of the several types of cork composition flooring materials, but its great resiliency and relatively low cost give it a very

definite utility for solving certain flooring problems.

These classifications cover the principal standard types of cork composition flooring, but it should be noted that each individual manufacturer is constantly developing new combinations and new patterns which have their special uses from both the decorative and service point of view. The essential features here noted, however, may be applied to the newer forms, and hence an extended discussion of them is not necessary before we proceed to the next consideration.

Border of Marbleized Linoleum as a Transition from Inlaid Marbleized Pattern to Embossed Tile Pattern

An important new development in the manufacture of linoleum and cork composition flooring materials is the utilization of pyroxylin or nitrocollulose lacquers to produce a surface wholly impervious to moisture, dirt and to the staining effects of many common materials such as ink, foods, greases, mild acids, and even synthetic gin. The lacquer finish is not merely a surface painting in the ordinary sense, for the leading manufacturers while retaining in secrecy the exact nature of the process employed, claim and demonstrate that there is a certain amount of penetration of the lacquer into the upper strata of the material, although no manufacturers claim complete penetration. The lacquer functions to close the minute pores in linoleums and other cork composition flooring products so that ordinary dirt and dust will not be ground into the surface, vastly simplifying the cleaning and maintenance operations. The nature of the lacquer employed is such that most common substances which will normally stain wood, marble, concrete and other types of flooring will not penetrate into the cork compound, and a spot can be readily wiped off from the surface without leaving any stain or mark. To a large extent the lacquer treatment eliminates or minimizes the need for waxing linoleum floors for their maintenance and preservation, although wax may be applied as usual if desired. Undoubtedly this new development marks a real advance in improving the life and utility of cork composition flooring materials, giving added qualities of sanitation, low maintenance cost, improved appearance and probably greater durability.

Appearance and Service Characteristics. While architects universally appreciate the decorative importance of floors in every type of room where architectural design deserves the least consideration, they also know that the selection of flooring materials must depend also on many service factors, including durability, safety (which means freedom from excessive slipperiness when either wet or dry), ease of maintenance, ease of replacement, sanitation, quietness and comfort, and economy. To a surprising degree, cork composition and linoleum floorings possess the qualities of an ideal flooring material. It is hardly necessary to stress the appearance factor. The variety of colors and patterns available, not only in the sheet forms of linoleum, but also through the employment of the tile forms with which the architect can develop individual patterns to meet the specific design problems, is equaled by no other type of flooring. Color in almost unlimited variety is available in all forms except Battleship Linoleum, cork carpet and natural cork tile; the latter being confined to natural brown tones, and the first being available only in a limited number of plain colors, though special colors can be produced on large orders. The use of sheet linoleums and the tile forms in combination, one for the border and the other for the field, and the opportunities for developing special patterns by inlaying the sheet forms with decorative units of almost any required shape and color, gives further versatility to this type of flooring and challenges the ingenuity of the architect to create decorative effects appropriate to every architectural style, and to every design problem.

We have already noted the inherent resiliency of cork composition products, which is responsible for their making an exceptionally quiet and comfortable floor. From the safety angle, linoleum and cork flooring materials possess the well known non-slipping characteristics of plain cork when either wet or dry. The use of a wax finish for maintenance purposes introduces a slight hazard, but if the wax is thoroughly rubbed in and polished it does not pre-

Special Pattern Set in a Marbleized Linoleum Floor

sent a slippery or dangerous surface. Linoleums also possess sanitary qualities in a high degree, particularly those which have been manufactured with the lacquer treatment.

Maintenance of linoleums and other types of cork and cork composition flooring is largely confined to waxing at periodical intervals and to dry cleaning with a soft brush on all other occasions. The use of caustic or gritty soaps or scouring compounds is both unnecessary and positively harmful to these flooring materials and should never be permitted at any time, though the newer forms employing the best lacquer treatments are not likely to be harmed. Occasional washing with a mild household soap, washing a small area at a time and following the washing by immediate wiping with clean water, is permissible a few times a year, but the waxing process alone should be sufficient to remove surface dirt and leave a clean and fresh surface. Many of the difficulties that have been encountered with linoleums in the past have been due to the excessive use of water and strong soaps in their daily maintenance. These service characteristics are accompanied by ease of replacement where worn spots must be removed, a feature particularly notable with the tile forms, one or more of which can be readily taken up and replaced without relaying the entire floor. They are also accompanied by the important factor of considerable initial economy, for linoleum and cork floorings are less expensive than any other type of finished flooring material or floor covering, having equal characteristics of quality, durability, resiliency, color and pattern.

Proper Use of Cork Composition Floorings. The selection of flooring materials is properly based upon their characteristics and cost, and it is hardly necessary to itemize the types of floor space for which linoleums, cork composition tiles and pure cork flooring materials are adapted. It is sufficient to note that they have properly come into general use in residences of all types, and in any room, not as a substitute material, but primarily because of their distinctive features which adapt them to both the decorative and service requirements of domestic interiors. They have earned a prominent place in commercial and institutional buildings, particularly those which have concrete structural floors, because of their resiliency, comfort and quietness, their ease of maintenance, their excellent appearance, and their low cost. The Battleship Linoleums particularly make excellent service floors in commercial, industrial and institutional buildings of all types where trucking is not required.

One precaution should be noted in connection with

Sunburst Design Set in Linoleum Floor with Striking Effect

Unlimited Variety Is Possible with Inlaid Linoleum

the use of resilient flooring materials. Heavy furniture standing on small casters or slender legs may compress the flooring and form a disfiguring indentation which will be apparent whenever the furniture is moved. For this reason architects should take care that their clients utilize wide face casters, caster cups, or the newer types of broad faced sliding casters or gliders on all furniture, a matter that is equally important for the protection of fine wood or marble floors.

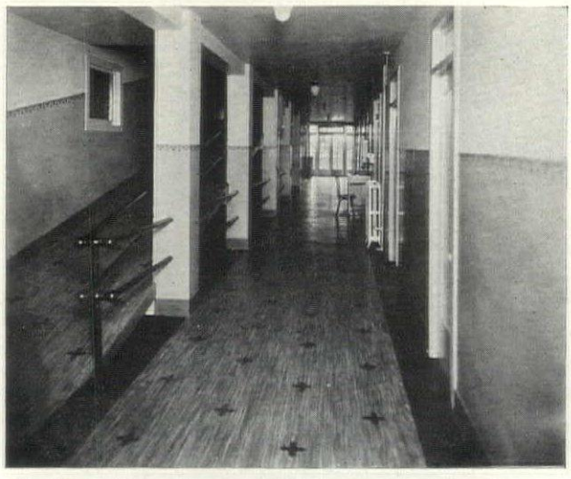
In specifying linoleum and cork composition flooring materials, the architect should be concerned primarily with two considerations. First, the service characteristics of the floor should be adapted to the traffic which it must bear. The quality of the flooring material should also be related to the service requirements, for as in the case with every other building product, there are wide differences in quality and cost, and usually the best grades are lower in ultimate cost than the cheap products.

The second consideration involves the problem of laying. It is impossible here to describe in detail the correct laying methods for each type of floor, and it is quite unnecessary to do so, for the best results are obtained when the manufacturer's instructions are made a part of the specification and where, if possible, the floor laying contractor is one whose work is approved by the flooring manufacturer. The reason for this lies in the fact that use of correct laying methods produces a far superior result,—to such an extent that the method of laying is often considered of importance equal to the quality of the flooring material. Careless contractors and those who are untrained in the work will not only use inferior cements but will frequently omit the rolling and the use of sand bags or weights to hold the linoleum or tile in place while the cement hardens.

The manufacturer's specifications should also be followed with respect to the preparation of the subfloor surfaces and to the use of suitable flooring felts under linoleums and sometimes of rosin-sized paper under cork tile, where these materials are installed over a wood floor. With these simple precautions and with careful supervision of the work, the architect may be sure of a satisfactory floor. It is never desirable, however, to lay these floors on wood or ordinary concrete in direct contact with the ground, either on or below grade.

In summarizing, it is perhaps worth while to point out the importance of these low cost resilient flooring materials as an alternative for more expensive types of flooring in those cases where the construction budget has been exceeded in the early part of a project, necessitating a reduction in finishing costs.

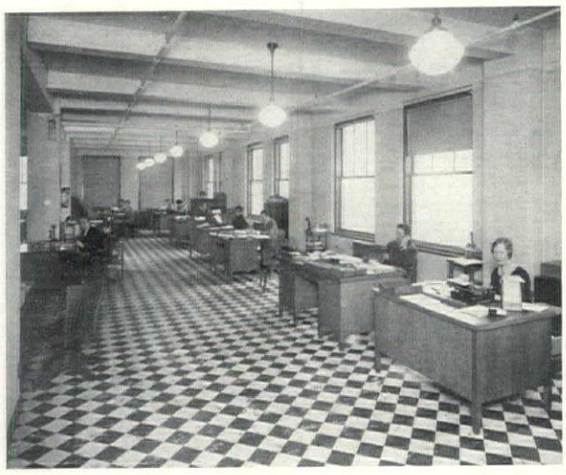
Marbleized Linoleum in Contrasting Squares



Jaspé Linoleum with Inset Pattern Used on Hospital Ramps

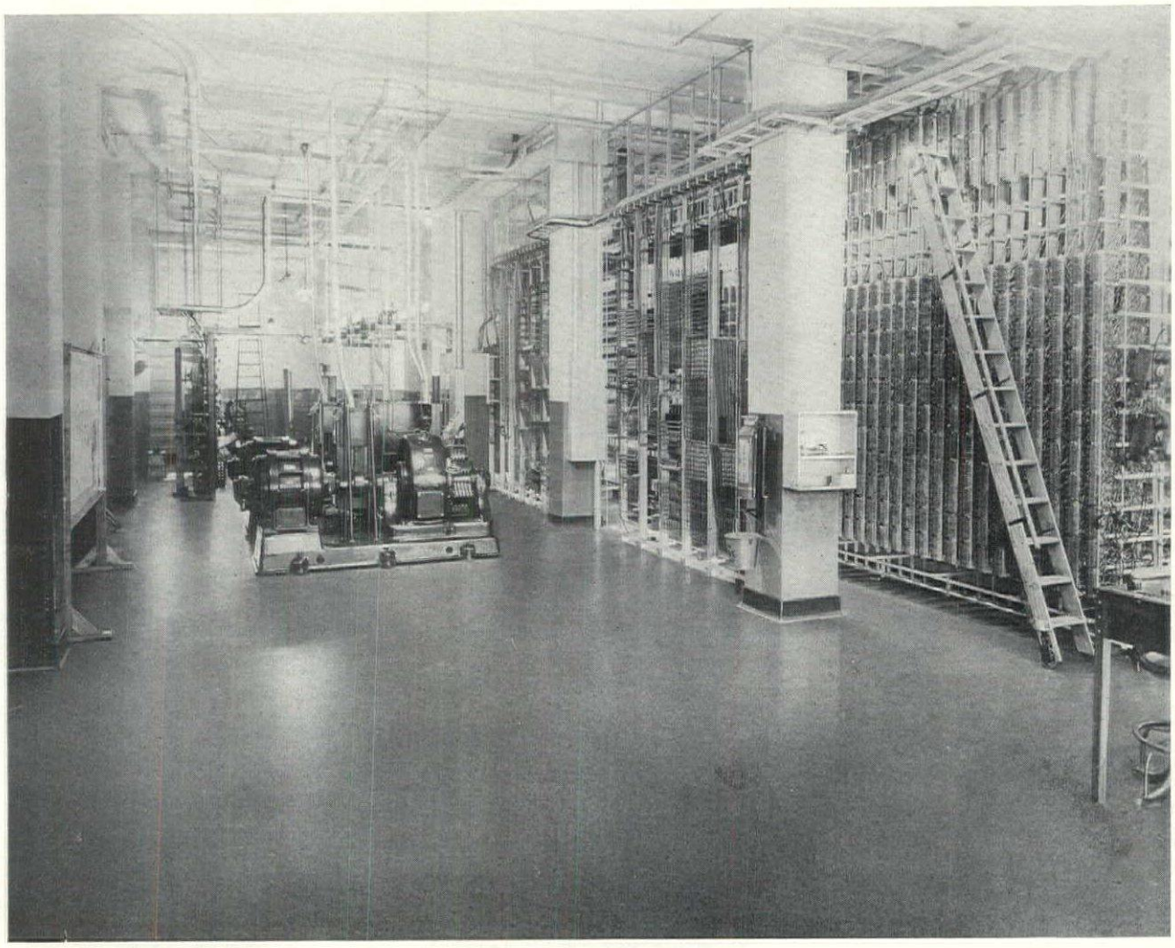
Cork Composition Flooring Repeating Ceiling Design

Cork Composition Flooring in Square Tile Form Used in Lobby of Small Theater



Resilient, Durable and Quiet, Cork Composition Floors Are Extensively Used in Offices

This circumstance arises so frequently that architects are often put to a severe test of their ingenuity and inventive genius to find materials which will produce a desired decorative effect and at the same time represent a substantial saving over the cost of luxurious or heavier materials having the same appearance. It is important to bear in mind that the comparative low cost of resilient cork and cork composition floorings, combined with their many excellent characteristics, renders them exceptionally well adapted to the economical flooring of all types of buildings, and in harmony with any architectural style.



Battleship Linoleum Is an Ideal Floor for Many Commercial and Industrial Uses

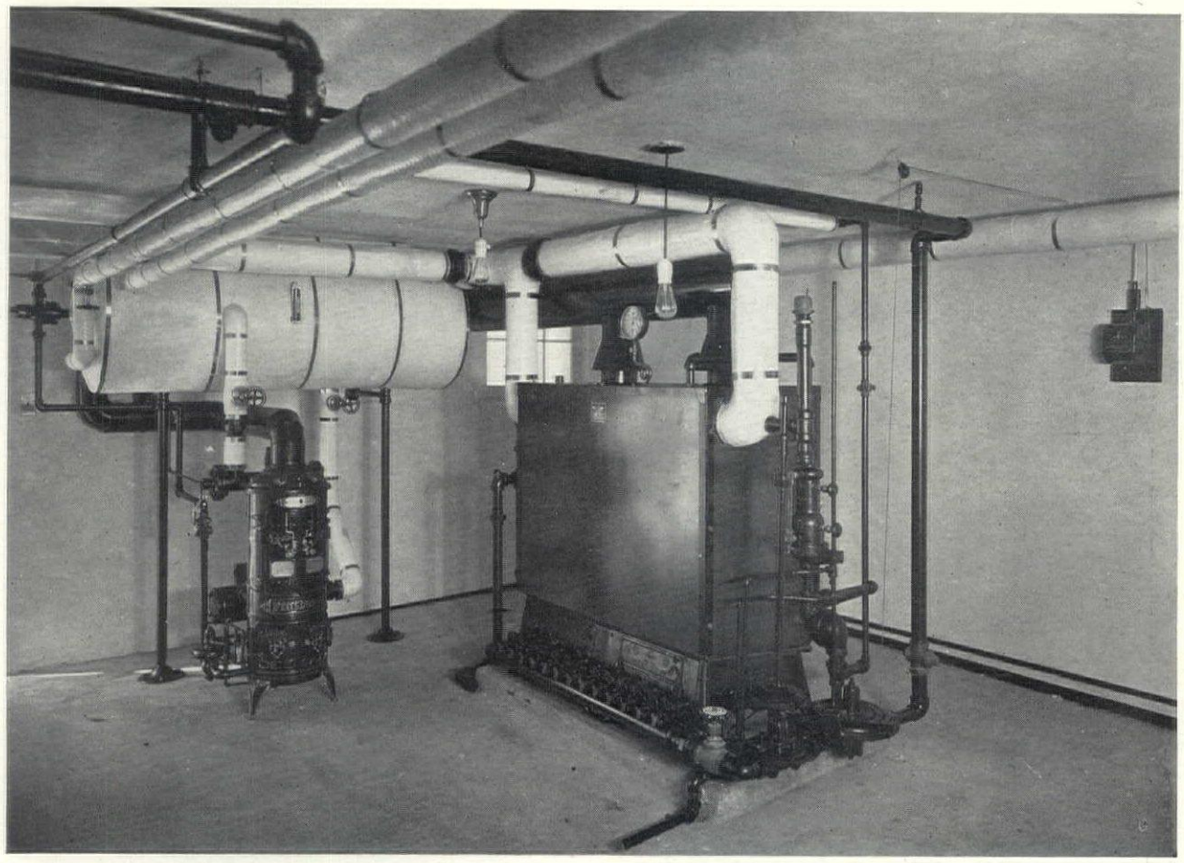
GAS IN THE AMERICAN HOME

I. HEATING WITH GAS

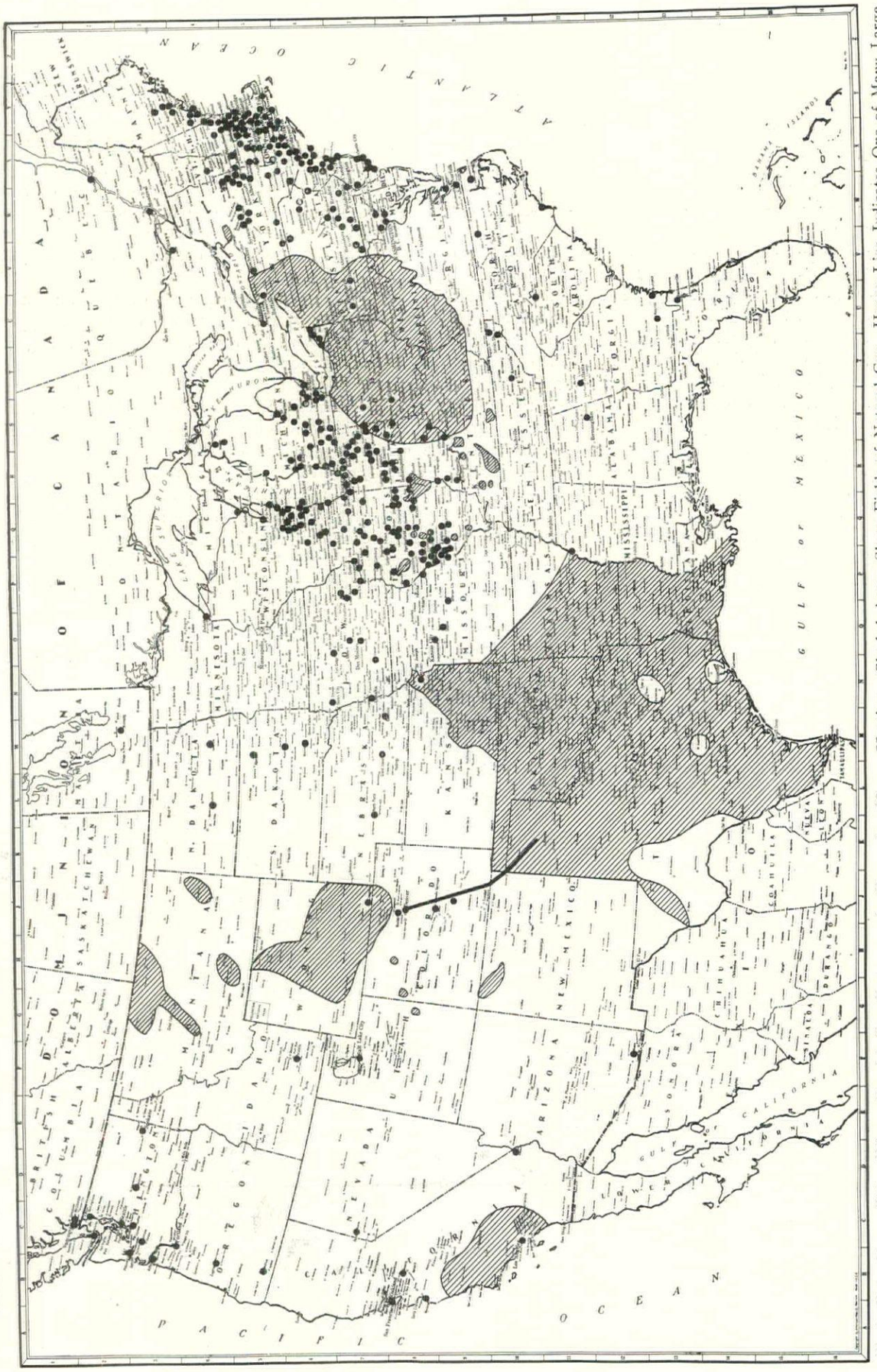
BY P. E. FANSLER
ASSOCIATE EDITOR, THE HEATING & VENTILATING MAGAZINE

GAS is serving the home owner in many ways not dreamed of when public utilities were first incorporated as "The Citizens' Gas Light Company" or under some similar title selected to suggest the scope of usefulness of this product. Executives of many of these utilities were gravely concerned when the use of electricity for illuminating purposes spread through the country like wildfire; they imagined that the knell of the gas industry had sounded. Fate was not so unkind, however, and the use of gas for cooking soon caused demands far in excess of the old lighting loads. Then came the beginning of the present phase,—the era of fluid fuels,—and far-seeing executives have already started aggressive campaigns for house-heating loads as well as for the other uses of gas that are now so much talked about,—refrigeration, incineration, air conditioning, and water heating. Also there came the development of industrial gas applications,—in laundries, bakeries, heat-treating and other metallurgical plants, for brick making, peanut roasting, and un-numbered highly specialized uses. It does seem passing strange that gas company officials wept at the thought of losing thousands of lighting customers who turned to electricity, when today there passes through a single meter, in any one of the great industrial plants, more gas than was registered in a multitude of little meters serving the house-lighting load of those old days,—and payment comes in a single check, in place of in thousands of small cash payments, with the requisite bookkeeping and accounting cost.

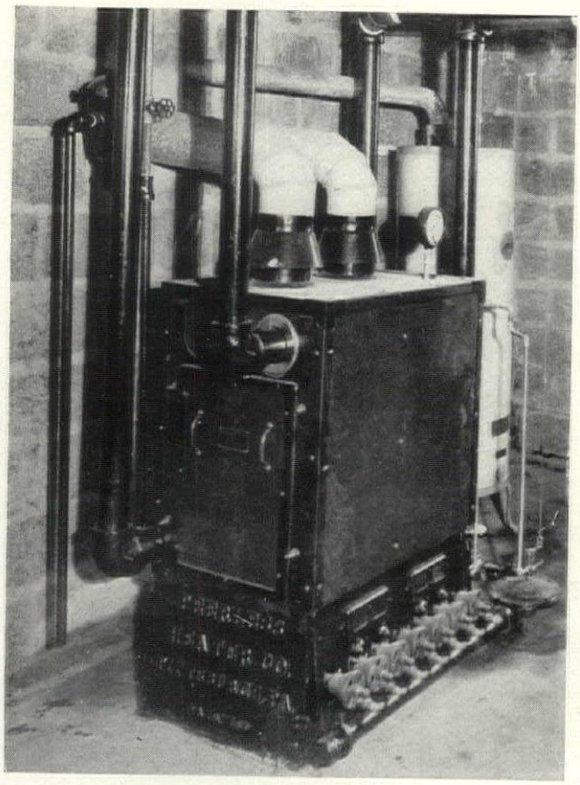
This article deals with the use of gas as a house-heating fuel; a second article will discuss the apparently paradoxical use of gas for household refrigeration as well as for the other comparatively recent applications, in the home. Househeating with gas, both natural and manufactured, is attracting the attention of the architect and heating engineer largely through a concerted and nation-wide educational campaign on the part of the organized manufacturers of gas, retailers of natural gas, and the manufacturers of gas-heating equipment. These activities were stimulated, if not initiated, by the tremendously rapid increase in the use of oil as a domestic fuel during the last three or four years. Several far-seeing executives of gas companies, in as many scattered cities, have quietly been working out the problem for the last ten or more years, and many of the



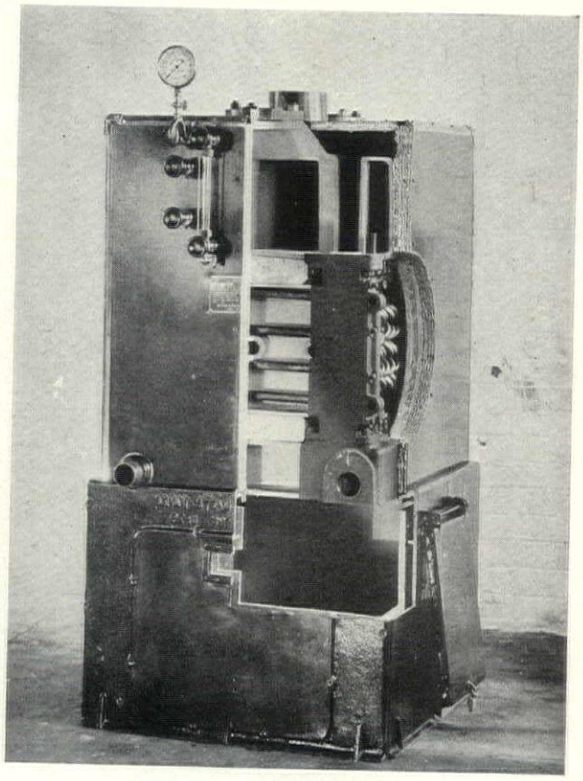
A Gas-fired Heating Plant with Automatic Control of the Steam Circulated, and Automatically Controlled Gas-heated Domestic Hot Water Supply



Black Dots Show Cities Where Special Gas Rates are in Force for House Heating. Shaded Areas Show Fields of Natural Gas. Heavy Line Indicates One of Many Large Pipe Lines for Natural Gas



Typical of the Compactness and Cleanliness of Gas-fired Boilers for Fairly Large Houses

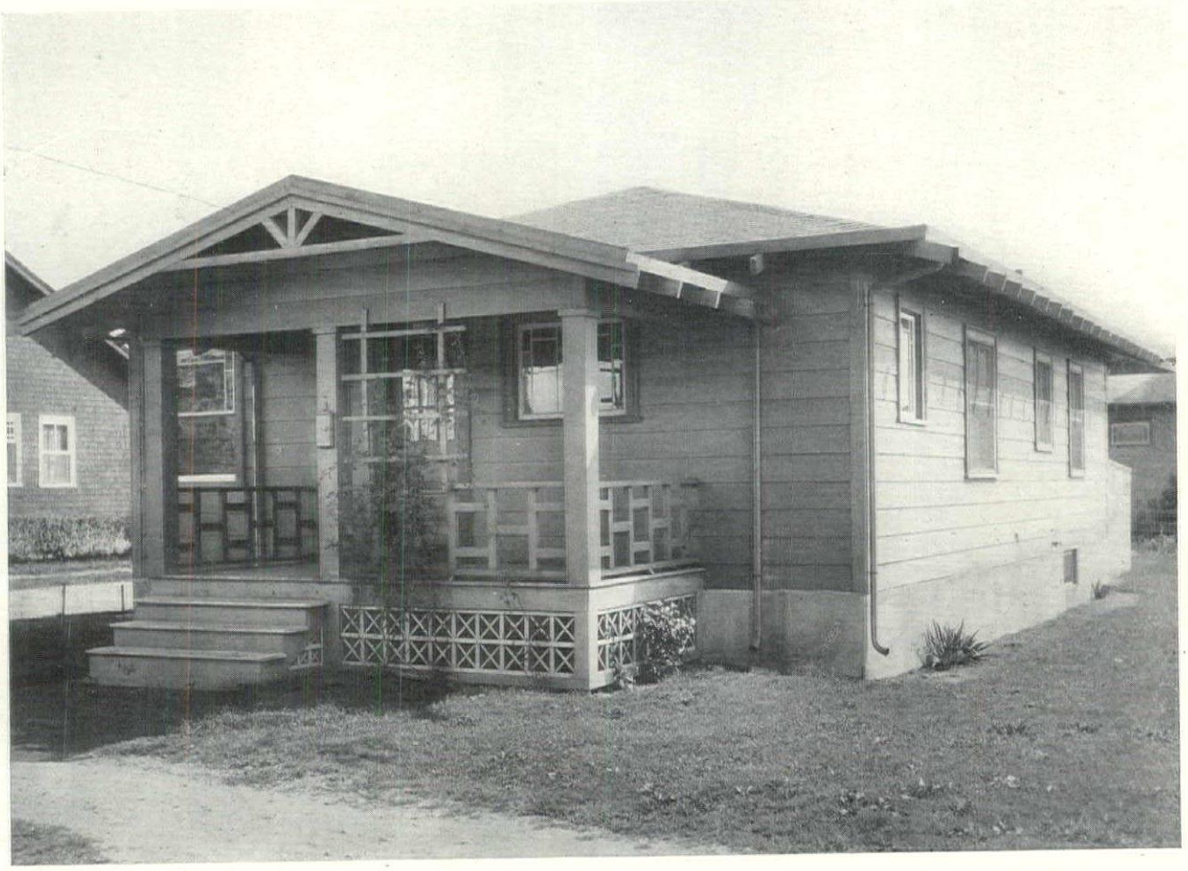


Cut Section Showing Construction of Boiler Designed for Gas or Oil. Copper Tube Elements Removable

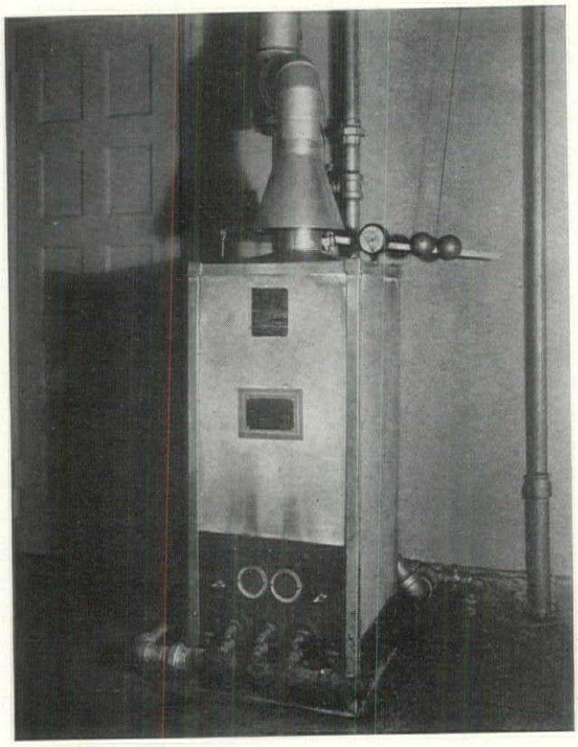
essential factors have been definitely established. The nation-wide campaign for this market has only started within the present year, and the next ten years undoubtedly will see an enormous growth in the ranks of gas users.

Broadly speaking, there are two kinds of gas fuels and two methods of using either. Natural gas, used in the gas areas and in large population centers to which it is piped, contains from 1000 B.t.u. to 1100 B.t.u. per cubic foot, and sells for from 35 to 60 cents per 1000 cubic feet. Manufactured gas is fairly well standardized at 535 B.t.u. per cubic foot, and costs, as a domestic fuel, from 70 cents to $1. Thus it will be seen that the home owner who has natural gas available at the average cost, pays 50 cents per 1,000,000 B.t.u., in contrast to the user of manufactured gas, who has to pay, on the average, $1.50 for the same quantity of heat. Either kind of gas can be burned in a boiler or furnace designed and built especially for the purpose, or a special type of gas burner can be installed in any furnace or boiler designed for coal,—this latter being termed a "conversion" installation. Quite naturally, conversion installations originated in the natural-gas areas, in the early days, when this fuel sold approximately for "a quarter" per thousand. Efficiency was not thought of, and the wastage seems criminal. Even today, in some of these sections, gas street lights are used and allowed to burn all day,—it is cheaper than paying for the labor of lighting and extinguishing!

From the technical standpoint, there are three interesting features of the gas-fired boiler or furnace. Gas is a hydro-carbon, with a large proportion of its contents hydrogen in both free and combined states. The natural consequence of combustion is the combination of this hydrogen with oxygen to form water vapor, in volume about equal to the volume of the gas. Approximately 10 per cent of the heat energy in the gas is represented in this transformation, and this cannot be utilized unless the flue gases are cooled to their dew point,—about 130° Fahr. On account of the large amount of water formed by this condensation, it is usually desirable to keep the fine gases well above this temperature. Conventional combustion practice has been to mix the necessary air for combustion with the gas prior to initiating combustion, producing the characteristic blue flame of the Bunsen burner. Gas burned for illumination, on the other hand, is emitted from a small hole in a burner, and the flame is filled with minute particles of free carbon, heated to incandescence before the oxygen of the surrounding air has an opportunity to combine with it; it is the luminosity of these particles that gives to this flame its high emission of radiant heat. The Bunsen flame, however, produced by gas burners, emits but little *radiant* heat. As a consequence, in boilers and furnaces designed for gas firing, little or no attempt is made to absorb heat energy radiated by the flame; rather, there is provided a comparatively large amount of flue surfaces, with



Even a Small House, such as this, may be Heated Economically with Gas where Rates are Favorable



This Gas Boiler, in the Small House Illustrated, is about a Foot Square

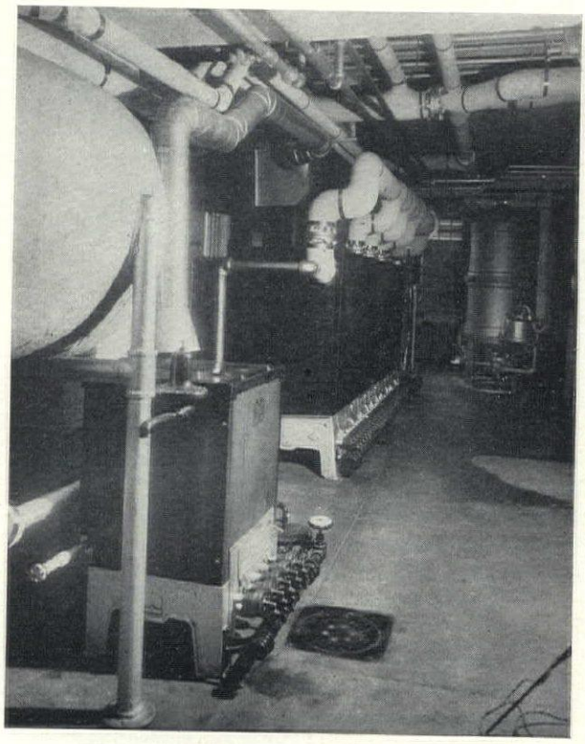
water on the opposite side in boilers and air in furnaces, for heat transfer from the hot products of combustion. It is this combustion characteristic that has dominated boiler design.

The third feature of the gas-fired boiler lies in the fact that combustion is best promoted when there is virtually no draft. Therefore, when a gas-fired boiler is attached to a chimney, a "draft-breaker" is inserted in the flue pipe, between the boiler and the chimney. This consists of a double-cone-shaped shell of sheet metal suspended in the axis of the smoke pipe, where a section of the pipe, 6 to 10 inches long, has been removed. A "skirt" is fixed to the upper part of the break. Hot gases flowing up the smoke pipe are carried around the double cone and up the chimney by virtue of the draft in the latter. Air is drawn in around the opening, nullifying the effect of the chimney pull on the boiler. If there should be a "back-draft," or downward movement in the chimney, it would be diverted by the cone and would pass out around the opening and not interfere with the functioning of the burner in the boiler. Thus a fixed draft, equal only to the flue action of the boiler itself, is maintained, regardless of fluctuations in the chimney due to combustion or to atmospheric effects. It is obvious that absolute and relatively high efficiencies can be maintained

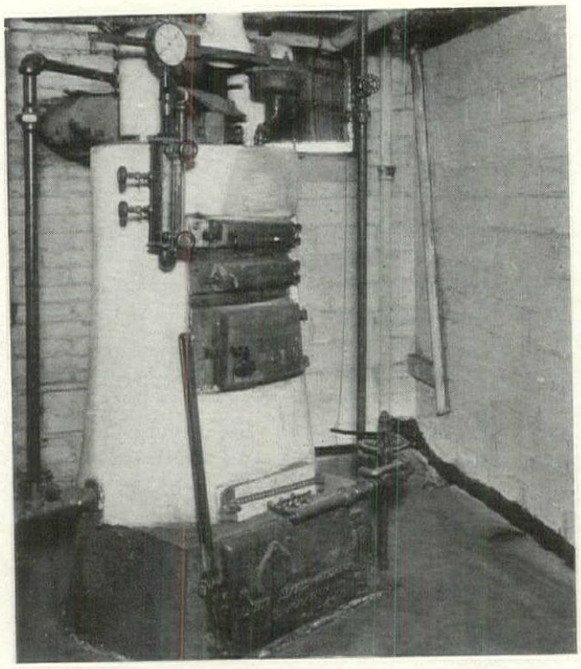
This Typical Large Residence where Winters are oftenSevere is Heated Advantageously by Gas-fired Boilers

where gas automatically is fired at a fixed fuel rate, with a non-fluctuating draft, and with all vital conditions controllable for optimum operation. A uniform seasonal operating efficiency of from 80 to 85 per cent is well within reason, as against from 60 to 65 per cent in an oil-fired boiler and from 35 to 50 per cent where coal is hand-fired. It is for this reason, chiefly, that comparatively high-cost fuel can be used universally, especially where insulation is installed, and other controlling factors in minimizing heat loss from the building are favorable.

Conversion installations are not looked upon with especial favor by gas companies where manufactured gas is to be burned, chiefly because of prejudice based on the woefully inefficient makeshift installations which were common years ago in the natural gas fields. In the New York area, for instance, it probably would be difficult to induce a gas company to make a service connection to such a plant. However, in Baltimore, hundreds of gas burners have been installed in boilers and furnaces with very satisfactory results, many of these having a record of ten or more years of service. The reason lies in the careful study that was made when the house-heating load was first considered. The technique was developed until these conversion installations, as now put in, are almost equal in efficiency to a plant using



The Heating Plant and Domestic Hot Water Plant of the Residence Illustrated



Boiler Originally Using Coal Now Converted for the Use of Gas Fuel

a specific gas-fired boiler. To secure satisfactory results when burning gas in a boiler designed originally for coal, it is necessary to simulate, as far as may be possible, the combustion characteristics of coal. To this end a ring-shaped burner is set on the grates, so that the flame is close to the walls of the combustion chamber. A barrel-shaped form of fire brick is then built up on the grate, almost to the top of the combustion chamber, leaving an annular space for the gas flame. The idea is to heat this mass of brick both by the limited radiation from the inside surface of the flame and by convection, so that the radiation from it will act on the walls of the combustion chamber in a way very like that of a bed of red hot coal. If a rectangular boiler is to be equipped to burn gas, the burner follows the walls, and the fire-brick form also is rectangular. The material increase in efficiency when this plan is carefully followed can easily be demonstrated by running a test before and after putting in the bricking.

Realizing the vast number of house-heating plants of the coal-burning type now in use, and the possibilities for conversion, much experimental work is being done along this line, and it is within reason to say that developments recently brought to a head will make possible conversion installations that will equal, if not surpass, the best gas-fired boilers now available. A boiler or furnace using gas as a domestic fuel can probably be brought as near to perfection, on an efficiency basis, as can any energy-transforming device, and on account of the enormous potential annual consumption, this phase of the matter is occupying the minds of many executives, engineers and research workers. Curiously, the absolute efficiency of a boiler is not an exact criterion of its usefulness in the home. For instance, in determining boiler efficiency the heat radiated from the boiler jacket is charged against the boiler as a loss. This is because it represents heat not available at the boiler outlet, in water or steam. At the same time this heat is manifestly useful, in that it warms the basement, especially the ceiling, which is under the living rooms. Cold floors are not desirable, so the heat marked up as wasted by the boiler does serve a useful purpose. By the same token, at least a portion of the heat in the flue gases is utilized in heating the house, particularly if the chimney is inside. It is only necessary to take the temperatures of the flue gas at the bottom and top of the chimney to determine the useful effect of this so-called waste heat. In a certain research study, where a warm-air furnace was used, the net efficiency of the furnace, as computed, was only slightly over 30 per cent. Yet the net heat lost to the house was less than 40 per cent, and the real efficiency of the heating plant, as rated by the heat actually utilized in the house, was more than twice the calculated furnace efficiency. Taking these things into account, it is not unlikely that gas heating can be accomplished with an efficiency above 90 per cent.

Much of the confusion that has grown up in regard to the rating of coal-fired boilers has, happily, been eliminated in the consideration of gas-fired units. The American Gas Association, realizing the

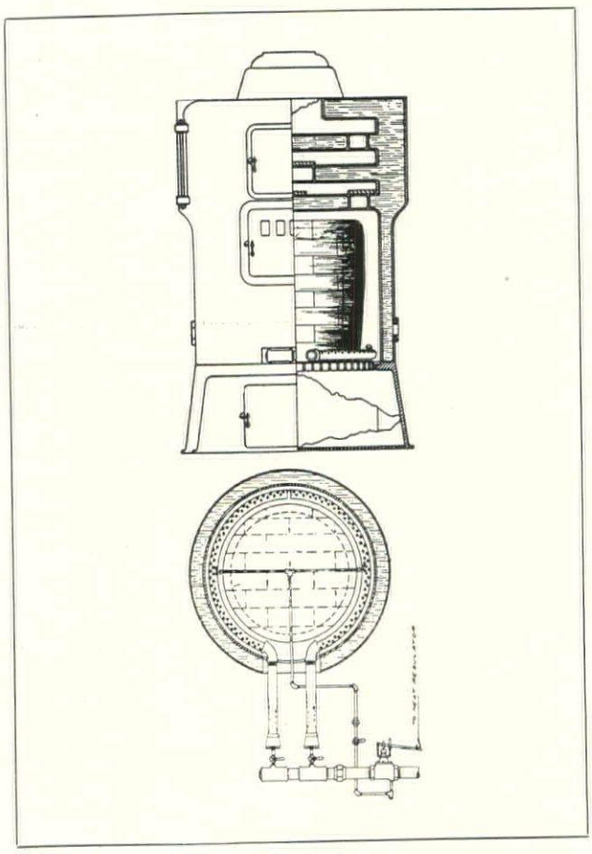


Diagram of a Typical "Conversion" Installation here Described

importance of logical and uniform capacity designations to those responsible for making rating recommendations and selection, as well as to owners, has brought about a logical and uniform scheme of rating, whereby products of manufacturers are tested in the Association's laboratory, and rated in B.t.u. available at the boiler outlet. This procedure removes one of the variables which the architect, heating engineer and contractor are least qualified to determine, and greatly simplifies the selection of a boiler for any purpose.

Two interesting considerations now make gas a desirable fuel for larger and better types of houses. Warm-air heating has, in the past, been used almost entirely for the smaller and cheaper houses, especially those built for speculative purposes. The everyday variety of warm-air installation admittedly has been "cheap,"—little more than a glorified stove with a tin can around it. Many furnace manufacturers were content with this class of market, and little progress was made in a half-century, so far as warm-air engineering was concerned. Less than four years ago leaders in that industry, and prime movers in the National Warm Air Heating and Ventilating Association, decided that some real engineering would be a good thing to stimulate development. So a research residence was built at Urbana, Ill., and since its completion it has been constantly in use as a field laboratory, under the direction of Professor

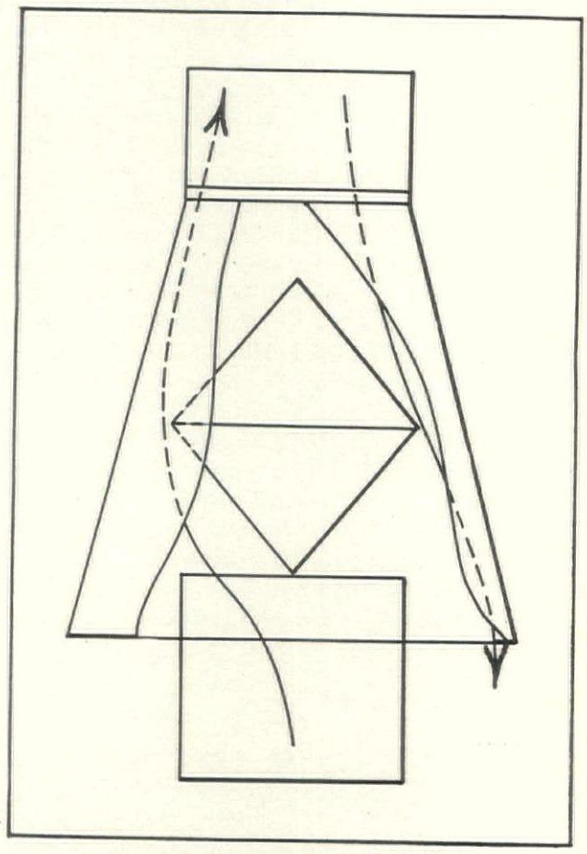
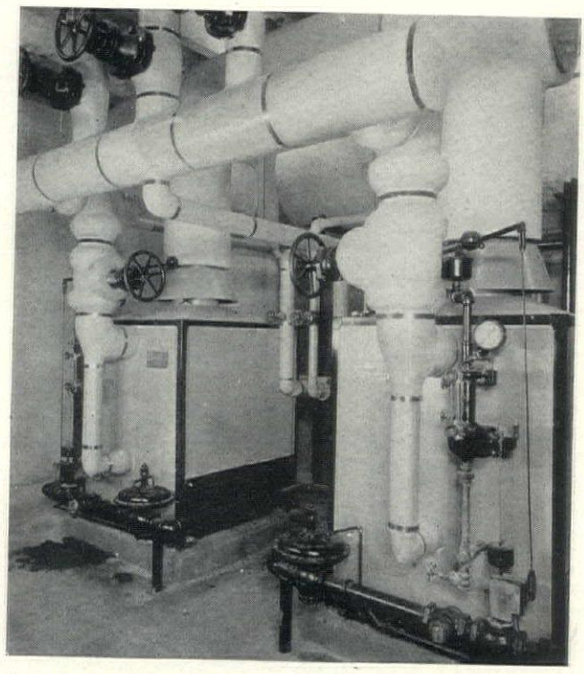


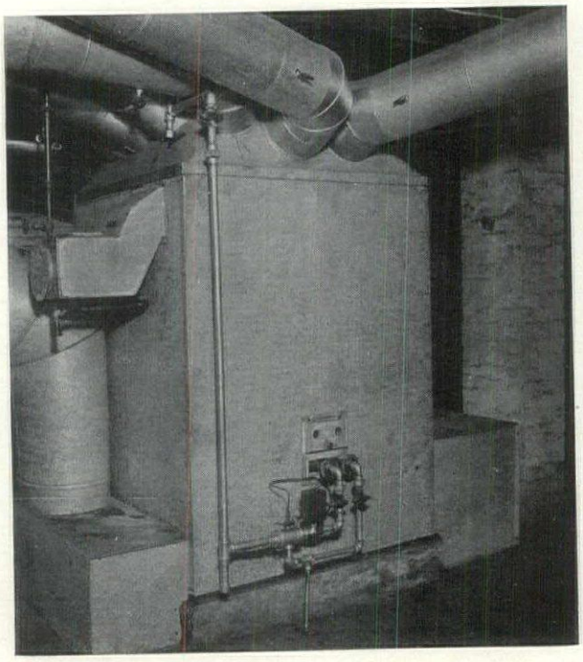
Diagram of the "Draft Breaker" Described on Page 586



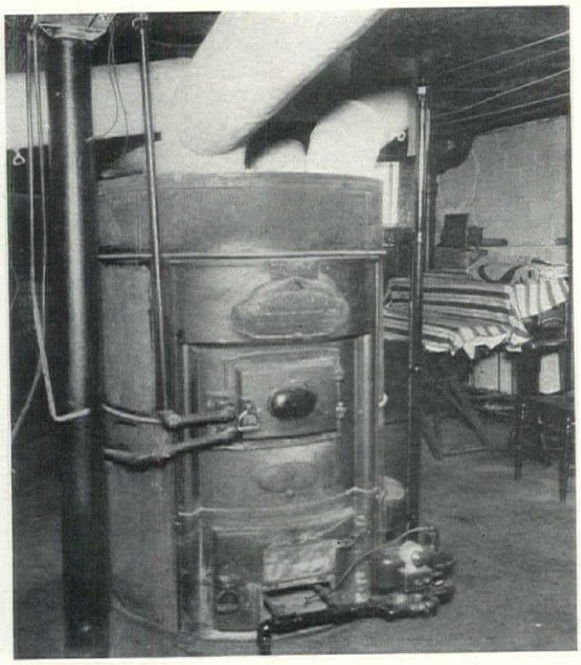
A Large Gas-fired Boiler Installation Using Two Boilers for Flexibility

A. C. Willard, of the University of Illinois, assisted by a notable staff of research engineers. Professor Willard has turned out to be the modern Moses of this industry, and more real progress has resulted from the efforts of the director and his staff in three years than was made in the quarter-century preceding. For another influence of vital importance to the development of gas heating we must look to the electric refrigerator, the washing machine and the oil burner. Each of these devices utilizes a small electric motor, usually from 1/10 to 1/4 horse power.

With these two thoughts in mind, let us turn back to a consideration of the possibilities of the gas-fired warm-air furnace. In the first place, warm air is an ideal heating medium because, where it is used directly, and not with steam or water as an interposed medium, it can be properly humidified,—and it is definitely established that proper humidity is an essential to optimum comfort. Not only that, but the proper humidity will keep furniture together for many years, whereas, in a dry atmosphere, it will quickly fall apart. On the other hand warm air, as it has been used in the past, was not a satisfactory heating medium, for the simple reason that its movement to the rooms of a house was dependent upon the natural rise of warm air and the tendency of cold air to settle; such plants were called "gravity" systems. The trouble was that, against infiltration from a cold winter wind, the warm air would not rise to the rooms on the windward side of the house; these rooms "never could be heated." So the desirable features of warm air were more than nullified by the fact that it wouldn't go where it was wanted. Enter, then, the idea of using a little fractional horse-power motor. The motor has been proved



Gas-fired Warm Air Furnace, Showing a Type Frequently Installed on the Pacific Coast



Warm Air Furnace "Conversion" Installation of a Type often used when Natural Gas is Available

reliable by the washing machine, the refrigerator and the oil burner. It would run six to ten or 12 hours a day for an insignificant sum. What could be more simple than to place a fan in the supply duct of the furnace, and to force the flow of air, regardless of infiltration or whatnot? This scheme has been so far developed that residences having as many as 20 rooms and 24 registers have been well heated in the coldest sections of the country. In other words, the market of today for warm-air furnaces is not limited to small houses nor to homes of low cost.

Now introduce gas as the fuel to be burned in one of these modern warm-air furnaces with positive air circulation. This fuel is delivered into the house only as used; considered in this way, it has no appreciable weight. The gas-fired furnace can be built extremely light in weight. It does not, as does the coal-fired boiler, require a 30-foot to 50-foot chimney. Rather, it wants a zero draft. Why should we not, in view of these figurative fingers all pointing the same way, put the gas-fired warm-air heating plant in the attic where it will occupy practically waste space, eliminating the basement altogether, or making it a considerable addition to the livable portion of the house? The objection that "warm air will not flow downward" is silenced by the positive delivery of warm air, by the blower, to any part of the house, up or down. In the summer time a gas-fired refrigerator can be utilized to cool the air that is being circulated through the house. The entire conception is simple, although somewhat striking, merely because it hasn't yet been done.

This, perhaps, is the ultimate in gas "heating." It is not a "pipe dream," because the essentials have been conceived and put into practice by one of the foremost engineers specializing in the field of conditioned air. For over a year nearly a hundred "unit air-conditioning plants" have been in operation in as many homes. The unit for a ten-room house is little larger than an office desk. It is gas-fired, automatically controlled as to heat supply, provides a definite circulation of air that is humidified to just the proper degree, and, in the summer, provides the house with cooled air, dehumidified.

The more general use of gas as a fuel for domestic heating may depend to some extent on the increase in the amount of gas devoted to this use which, in turn, may bring about a lowered price which will enable the owner of a modest home, located within a reasonable range of centers of population, to heat his house with gas economically and automatically.

NEW TREATMENT OF MONOLITHIC EXTERIORS

BY
JOSEPH B. MASON

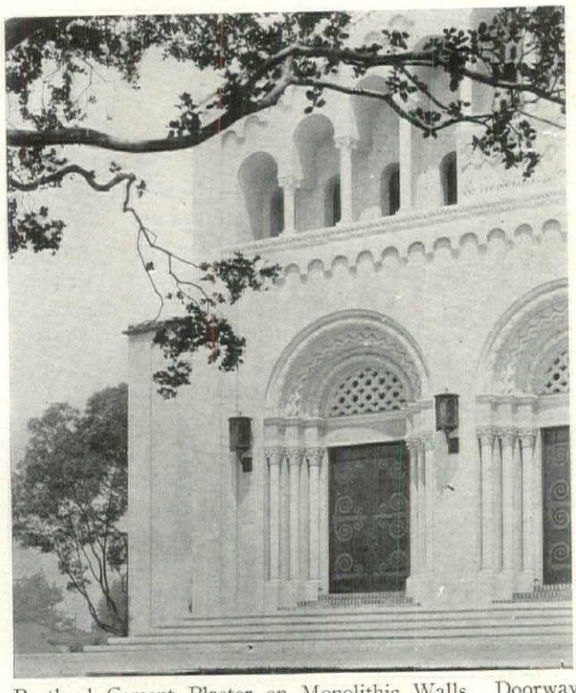
A SURPRISING number of somewhat imposing buildings, including a representative allotment of churches, theaters, lodge buildings, court houses and other public and semi-public structures, have been designed within the last two years in what, for lack of a better term, has been called the "monolithic" style. Possibly it would be more illuminating to say that they have been designed as monolithic structures in which both the architectural and structural requirements have been met with concrete. In these buildings the columns, floors and walls are cast as a unit, the forms being built so as to include practically all of the architectural details and trim as the work progresses. Such buildings are characterized by solid walls, clean cut lines, tall pilasters which carry the eye from the ground to the sky-line, and interesting relief work, which for the most part is cast in place. They have colorful exteriors, achieved through use of stucco and through varied methods of surface treatment of the concrete walls and columns. A technique has been developed to secure attractive surfaces in the monolithic concrete which warrants especial attention. Whether we approve of the design or not, we cannot help feeling keen interest in the new methods employed.

In reinforced concrete the architect has a medium which flows and may be moulded, and through which form appears in gracefully unfolding stages until the final mass stands revealed. The nature of the work demands special care in concrete mixing, since concrete serves as both the structural and facing material. The fact that the concrete is to be exposed to the elements makes it important that unusual care and attention be paid in making and placing it. Contractors should bid on the concrete at a price that will permit this especially careful attention. It is apparent that the old time 1:2:4 concrete mix does not possess the qualities necessary for all this class of work. No rigid mix can wisely be used for many different purposes. The fact that better concrete and concrete that can be adapted to given purposes is being made has had much to do with the development of the monolithic type. Today architects and engineers may demand and obtain concrete that will fulfill their requirements, both structural and architectural, with assurance that it will withstand the elements at least as successfully as any other material to be had within the economic limit of his design. Intelligent and constructive research has checked and re-checked theories of concrete design so thoroughly that concrete can now be made to a definite specification.

Concrete for the exposed walls and columns of the monolithic structure must be of a uniform composition throughout the entire exposed area. Size and grating of the fine and course aggregates should be consistent throughout, so that the class of concrete may be uniform. A water-cement ratio of 6 to 6½ gallons of water to one sack of cement will produce concrete that will resist weathering and prevent the obsorbing of moisture in the walls. Consistency and workability are very important qualities, which must be watched. Concrete should be of such a consistency that it will go into all of the corners of the forms without excessive spading. On the other hand, the mix should not be so wet that after the concrete has been in the forms for 10 or 15 minutes water will rise to the surface. Too liquid a mix will cause the cement paste to work to the surface of the forms, so that when the concrete is exposed, a fatty face with an unpleasant, almost polished, surface of pure cement results. Each batch of concrete should have the aggregate and water measured very carefully, so that the density of every batch will be the same.

In the forming of mouldings, projecting bands, recesses, fluting, etc., it must be constantly borne in mind that everything must be designed for the perfect flow of material. It is important that the concrete be evenly distributed along the form so as not to flow by gravity from the point of discharge to any far point in the wall. The forms should be filled evenly and the concrete, where possible, placed in one continuous operation. Any break in the placing should be made at definite lines along the bottoms of window openings. Inequality of surface and elimination of form markings are not desirable.

In the order of present popularity, the principal methods of treating the concrete exteriors of monolithic buildings are: *first,* stucco; *second,* surfaces with exposed form marks; *third,* grinding and rubbing; *fourth,* special applied finishes. I shall take these up in this order. Stucco exteriors in pure whites, creams and varied colors have been used with success not only on the Pacific coast, where this method of treatment has been widely practiced, but also in other parts of the country. In order to secure a firm bond between the stucco and the monolithic surface, all dirt, grease, oil or other similar matter must be removed. When two- or three-coat stuccoes are employed, it is usually advisable to roughen the surfaces of the concrete before application. This may be done most easily by brushing the surface with wire brushes before the concrete has fully hardened. A special preparation is now obtainable which may be spread on the interior surfaces of forms and which will retard the hardening of the cement mortar at the surface. It may then be easily roughened by brushing. A good bond is also dependent upon good suction. A concrete



Portland Cement Plaster on Monolithic Walls. Doorway Ornament of Pre-cast Stone
John Galen Howard & Associates, Architects

saturated with water will have practically no suction; pure or dry concrete will probably have too much.

A single coat of stucco which improves the coarse appearance of the surface of the concrete but which does not completely obscure the form marks is used very often and with considerable success. A mixture made in the proportion of 1 cubic foot of Portland cement to 2 cubic feet of sand has proved very satisfactory when just sufficient water has been added to make a mortar of creamy consistency. This mixture is dashed on the concrete surface with a stiff brush and allowed to harden without troweling. Two- and three-coat stuccoes are used to achieve surface effect beyond the possibilities of the single-coat. Various trowel effects are possible, or the exterior stucco coat may be marked off in the pattern of stones. Some of the most unique effects have been achieved by combing stuccoed surfaces with a stiff wire brush. An interesting effect is obtained by combing alternate blocks at right angles to the horizontal. Commercial Portland cement stuccoes containing, where color is used, thoroughly tested mineral pigment, are recommended. The colors of stuccoes can be controlled very closely.

Probably the most interesting, because of the boldness of the experiment, has been the practice of leaving the monolithic surfaces just as they come from the forms, with no further surface treatment. Without entering into the merits of this procedure, it is sufficient to say that it has been used to produce a number of striking and interesting structures and is worthy of consideration. Surfaces that are to be left as they come from the forms must of course be detailed carefully. Good quality lumber and boards of uniform width, well finished, must be specified for the forms. Careful study should be made to determine the proper widths of form boards to be used. Wide boards tend to make the

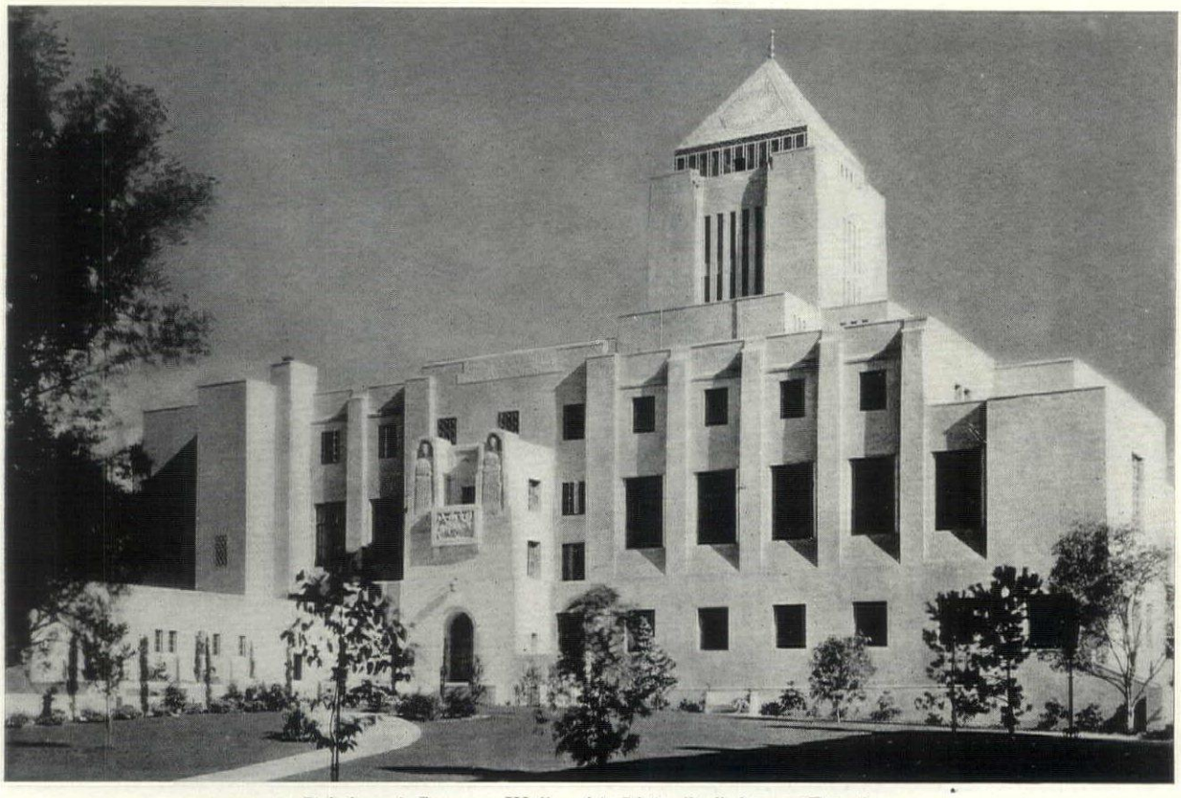
Monolithic Concrete with Cast Stone and Colored Stucco Exterior
George Applegarth, Architect

structure look heavy and clumsy, while narrow boards warp the design. The form boards must be leveled and carried entirely around the building at the proper elevation, and joints should be so broken that they will not be conspicuous.

Some surface treatment with a portable grinding outfit or carborundum wheel is often made. The grinding should not remove all of the form marks, but should merely even the surface, giving it a more pleasing appearance without destroying the textural effect. The extent to which grinding or rubbing of the hardened concrete surface is carried forward will depend upon the effect desired. Many structures which have proved very attractive received only slight rubbing with a carborundum stone after application of a cement wash. Again, to achieve the desired effect, more intensive rubbing or grinding of the entire surface is often carried out. Bush hammering and other air-tooling treatments of concrete surfaces are in general use over panels and small border areas. Concrete of good quality may be tooled with success, and this provides an interesting variation in the surface treatment. Exposed aggregate surfaces offer interesting possibilities. A surface material made up of specially colored aggregates is applied either as stucco or by casting and applying to the surface of the wall. After this facing material has been applied and allowed to harden, the aggregates are exposed by washing with diluted muriatic acid. This method produces concrete that is very hard and durable and yet permits the carrying out of even the most minute details.

Monolithic Concrete with Rough Concrete Finish
F. Pierpont & Walter S. Davis, Architects

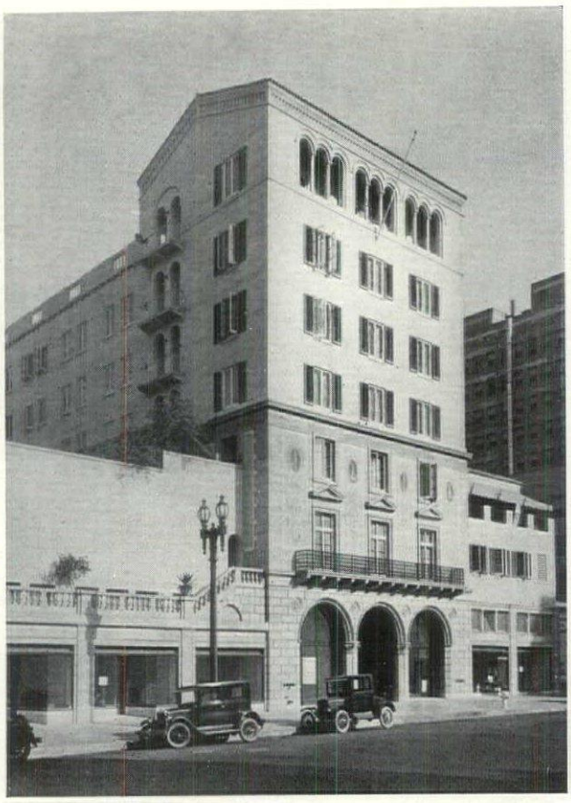
One of the advantages of using the monolithic concrete type is that decorations or embellishments can be cast as integral parts of the walls. Reverse plaster or wooden moulds are built into the forms as they are erected, and are filled with the concrete that is used in the rest of the structure.



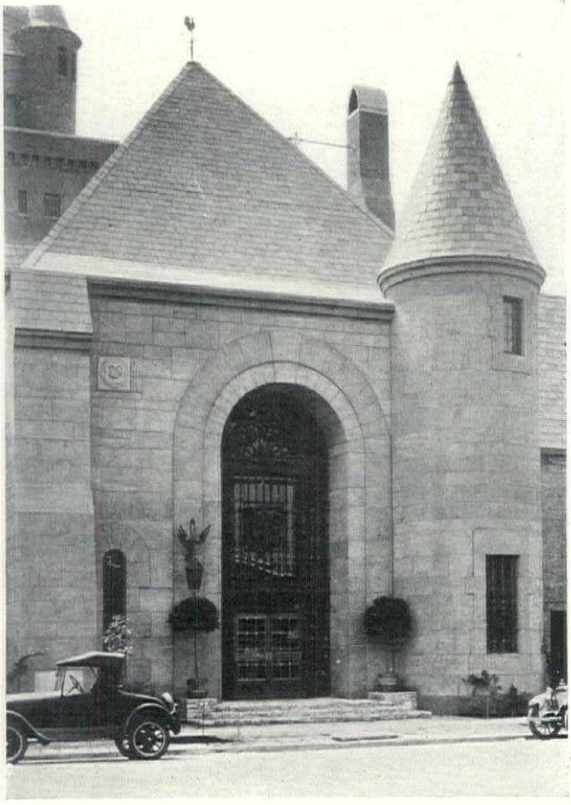
Reinforced Concrete Walls with Light Buff Stucco Exterior
Bertram Grosvenor Goodhue, Architect; Carleton Monroe Winslow, Associated

Monolithic Concrete with White Portland Cement Stucco Exterior
Derrick Hubert, Architect

Portland Cement Stucco and Cast Stone Trim and Ornament
L. L. Dongan, Architect



Brush Coat of Cream Colored Stucco Trimmed with Cast Stone and Sgraffito
Allison & Allison, Architects



Light Chocolate Colored Stucco Exterior over Reinforced Concrete
Curlett & Beelman, Architects

ARCHITECTURAL USE OF LIME

BY
J. J. HURLEY
CONSTRUCTION ENGINEER

IT is well known that modern structures require lime in some form or another, and for certain purposes for which no other material is "just as good." Lime putty is probably the "stickiest" and "slipperiest" cementitious material known. For this reason lime putty sticks where it it put, and as many would say, "it puts very easily." Every variety of lime has its architectural use, but the number of kinds of lime that may be used for each architectural purpose is very small.

First of all, just what *is* lime? It is the product obtained by heating limestone to its dissociation temperature (1600° to 2100° Fahr.) under such conditions that the carbon dioxide and other volatile matter are expelled. Lime consists primarily of calcium oxide, but may contain magnesium oxide, which in some limes may range in amounts as high as 45 per cent. Small amounts of alumina, ferric oxide and silica, and traces of other impurities are frequently present. The suitability of lime for any particular use depends on its chemical composition and its physical properties. It is here that the architect is forced to depend on established and reputable lime manufacturers to guide him in specifying the kind of lime for the purpose in mind.

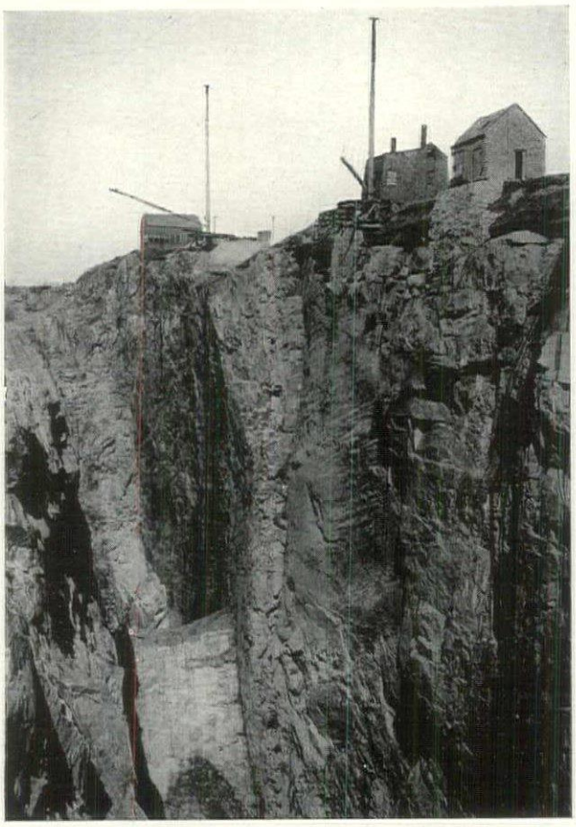
History. Lime was probably the first cementitious binder used by man. The technique and practice of its use have been developed by centuries of experiment and observation. The fact that many architectural gems have come down to us from ancient days, and that they have resisted the ravages of the elements for centuries, bears eloquent testimony to lime's lasting qualities and integrity. Lime was first used because of the fact that it hardens from a soft, smooth, easily handled paste into a dense, hard mass. Brick, stone or other building units laid in it are bound together into monolithic, durable structures. The structural details and natural roughness of the construction units can be masked by spreading lime mortar over them in the form of plaster, thus giving a pleasing and hygienic surface.

Any lime manufacturer of recognized standing can be depended upon not to recommend the lime he makes to be used for a purpose for which it is not suitable. It is especially important that the instructions issued by the manufacturer regarding the slaking of the lime he manufactures be followed and emphasized by the architect in his specifications. With some lime it is necessary in slaking it *to pour the water on the lime.* With other lime, of different chemical and physical composition, it is necessary *to put the water in the box and to dump the lime into the water.* All of this is necessary in order to obtain the best results, and it is obvious that the architect cannot be expected to know these things unless he has had long experience with the particular brands of lime used in any special given instance.

Specifications. Unless it is wished to confine the kind of brand of lime used to one special make, it is suggested that these short specifications be used: "The lime (quicklime or hydrated lime) shall meet the current standard specifications of the American Society for Testing Materials and shall be used in accordance with the manufacturer's printed instructions. The brand of lime shall be approved by the architect." Modern methods have been applied to the manufacture of lime by the more progressive lime manufacturers. They have been quick to make use of the valuable research work done by the United States Bureau of Standards. The Bureau is the authority for the statement "that any good lump lime pulverized and passed through a 50-mesh screen *can be guaranteed not to pit or pop.*" This is the reason why at least one of the largest lime manufacturers in the country advertises that one of his brands is *"guaranteed not to pit"* when used for plastering. Pulverized lime has many advantages for the architect, when guaranteed by a reputable manufacturer. When made as directed by the United States Bureau of Standards, the architect does not have to wait for the lime putty to age for from two to eight weeks, as is necessary with lump quicklime putty, or hydrated lime. Putty made from pulverized quicklime so manufactured may be used with perfect safety as soon as it is cold.

The modern manufacturing process of making lime is in accord with exact chemical science in which experienced chemists are regularly employed, and in which mechanical engineers, civil engineers, and geologists are also on the regular payrolls. The modern lime plant is a most interesting place. Everywhere one sees motors, conveyors made of steel pans for handling hot lime, labor-saving devices of all kinds, electrical recording pyrometers for keeping track of the heat of the kilns; modern automatic gas producers; automatic coal-handling machinery for handling coal from cars or barges; barrel plants where wood barrels are turned out complete, almost without human hands touching them; electrical, steam, and gasolene locomotives and all-steel cars for hauling both limerock and the finished product to where they are needed,—and in fact all of the up-to-the-minute appliances of big business.

Hydrated Lime. This lime is a very important architectural material, and it is demanding its increasing place in the architect's mind. Hydrated lime is quicklime with its chemical appetite for water satisfied. It is produced in this way. The lump quicklime to be hydrated is crushed, and then conveyed mechanically to the machine known as the "hydrator." This supplies the quicklime with the proper amount of water to convert it into hydrated



Portion of a Large Lime Quarry

lime of the required chemical and physical properties. Three types of hydrators are used, differing in detail, but all providing for mechanically mixing the quicklime with the necessary water and for conserving the heat of the chemical reaction in sufficient degree to effectively hydrate the quicklime without "burning." The hydrated lime is discharged from the hydrator as a dry white powder. The modern mill uses air-separation units, conveying machinery where air currents carry the hydrated lime to the bins, devices which measure exactly the predetermined amount of water for every pound of quicklime, and last but not least, careful laboratory tests of every batch so as to be sure that the hydrated lime meets the current standard specifications of the American Society for Testing Materials before it is shipped. Hydrated lime and pulverized quicklime are the lime manufacturers' answer to the incessant modern demand for speed.

Kinds of Lime and Hydrated Lime. The "trade," meaning manufacturers, dealers, masons and plasterers, divide lime into these classes:

(1) Common or masons' lime (quicklime), which is usually lump lime, but may be pulverized, and is run-of-kiln lime without any selection. This is the type of lime that is generally used for masonry of a less important nature, bearing light loads, for rough plastering, and for stucco work.

(2) Finishing lime (quicklime) is the best selected lump or pulverized lime made by the manufacturer. It contains a minimum of core and other foreign matter, and is used for the best class of masonry, all grades of plastering, and stucco work. It is more plastic than common lime.

(3) Masons' hydrated lime may be used for scratch and brown coat plastering, for stucco, for masonry mortars, and as an admixture to Portland cement concrete.

(4) Finishing hydrated lime may be used for any purpose for which masons' hydrated lime may be used, and in addition, it may be used as an ingredient for the final or white coat of plaster. Finishing hydrated lime will have a plasticity figure of 200 or more on the Emley plasticmeter, all as outlined in the American Society for Testing Materials Tentative Methods of Sampling, Inspection, Packing and Marking of Lime Products. The Federal Specifications Board has Master Specifications covering lime of all kinds, both quicklime and hydrated lime, which are essentially the same as the "Standards" published by the American Society for Testing Materials. There are 38 varieties of limestone listed by Knibbs, which run from alabaster, through chalk and marble to travertine. Marble is perhaps the purest high calcium limestone that we know today.

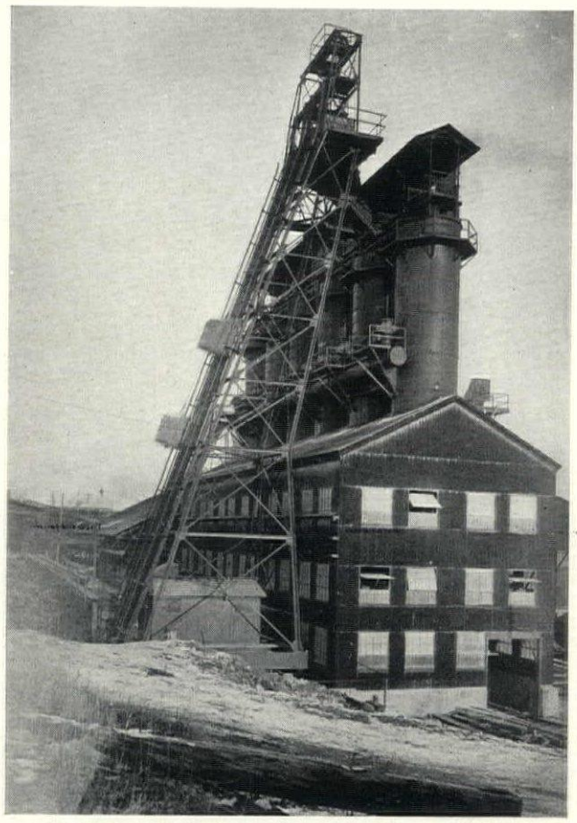
Modern Stucco. The architect is much interested today in stucco. The economy of its construction, its durability of surface, fire resistance, low maintenance cost, its use in improvement and repair of unsightly or old surfaces, and the pleasing artistic effects possible with stucco, all find favor with the architect, and with his client as well. The term "stucco," which was formerly used in referring to ornamental plasterwork, whether interior or exterior, is now confined to exterior plastering, either plain or ornamental. Stucco may be defined as a material used in a plastic state to form a hard coating for exterior walls or surfaces. Stucco is a mixture of one or more cementitious materials with sand or other fillers, and with or without other materials such as hair, fiber and coloring matter. Lime stucco is a mixture of properly prepared lime putty or paste, sand and water, with or without the addition of a small percentage of cement. Hair or fiber may be added to assist in forming the "key," depending on the style and character of the background. Coloring matter may be added to obtain the desired tone, although most satisfactory color effects are obtained through the use of selected sands. Different colored (fine or coarse) aggregates may be used for obtaining various effects of colors and surface textures. There are many fine examples of the architectural use of lime stucco in the older states, both of New England and the South, especially in Charleston, S. C., and the missions of California. New Orleans must also be mentioned, as the French influence is most noticeable in the stucco on homes and churches in that fine old city. The economy of lime stucco is due to a number of factors. The ability of lime putty to carry a large amount of sand makes possible a leaner mix, which authorities agree is the best in

stucco work. The high plasticity enables the plasterer to apply lime stucco easily, to spread it with little effort, and to work it thoroughly. Freedom from cracks is one of the special merits of lime stucco. A. H. White, an authority on stucco, says: "Freedom from initial hair cracks can be secured only by using a lean mixture, not richer that 1 part of cementing material to 3 parts of sand by volume." The manner in which lime stucco hardens prevents the formation of cracks. It hardens slowly enough, due to evaporation of the water and recarbonation of the lime, to permit the lath to which it is applied to adjust itself. Where other backing, such as masonry, is used, there is no movement. While the freshly applied stucco expands and contracts with moisture changes, the fully hardened stucco shows little change, since it will consist of porous bodies in greater or less degree. Waterproofing is unnecessary in properly proportioned, mixed and applied lime stucco. Stucco will absorb in rainy weather,—but this is not injurious. The density of lime stucco corresponds closely with mortar used for masonry.

Plastering. Plastering involves perhaps the most important architectural use of lime. It is used to shut out drafts, to make for more privacy, and to make dwellings and other structures more sanitary and beautiful. It also affords some protection against fire. There are two kinds of plastering,—good and bad. As everybody seems to be talking about *good* plastering, it seems to be in order to discuss *bad* plastering,—at least some of its most glaring faults.

Plaster Cracks. In a long and varied experience in a number of states, the writer has seldom heard anyone suggest that the lath or structure itself might be responsible for the cracks, although in over 90 per cent of the cases investigated where severe cracking has been the cause of the complaint, the defects of the structure have been the real reason for the trouble. It must not be supposed that lime plaster does not have defects and cracks which are the fault of the plaster or the way the plaster is applied, for it does. There are map cracks, shrinkage cracks, check cracks, fire cracks, and crazing. There are also the "pitting" and "popping" that, despite the best efforts of the manufacturers and all other persons interested in plastering, will put in their appearance occasionally when unguaranteed lime in lump form is used. All of the defects that can be charged to the plaster can be dismissed from the mind of the architect if a reliable, well established, and experienced plastering contractor does the work, and if a lime that is guaranteed by the manufacturer not to pit or pop is used.

Efflorescence. This defect, sometimes called "blotches," is most difficult to avoid. Sometimes areas of considerable size have the appearance of being wet. They dry out after a while, but they come back intermittently over a long period of time. These blotches are caused by certain salts which are soluble and hygroscopic. As the mixing water evaporates, these salts are brought to the surface and deposited. Their hygroscopic property causes them to absorb water from the air, thus keeping the plaster damp. Calcium chloride is one of these salts, and this substance is readily formed by interaction between lime and common salt. This is one reason why sea water or beach sand should not be used for plastering. This is also a reason for not using calcium chloride in the mortar for plastering to reduce the danger of freezing.



A Modern Vertical Lime Kiln

The peeling or blistering of paint is almost always due to the presence of water in the plaster. If plaster is painted before it is absolutely dry, trouble may be expected. *Lime or any other type of plaster should not be painted in less than three months from the time the finished plaster is applied, and then only if the plaster is dry.* Paint sometimes "burns" when applied over plaster. Free lime, oxide or hydroxide, will destroy linseed oil, causing the paint film to become brittle. One may expect to find free lime in all green (damp, or wet, newly applied) plasters, whether they be lime, gypsum or cement. If it is not desirable to wait for the free lime to become inert through carbonation, a priming coat may be used. This coat should be prepared by dissolving three pounds of zinc sulphate in a gallon of water. The zinc sulphate reacts with the lime to produce compounds which have no effect on oil. Cold water paint may be used without taking this precaution. All architects want good plastering, because plaster is about two-thirds of the area visible in the usual

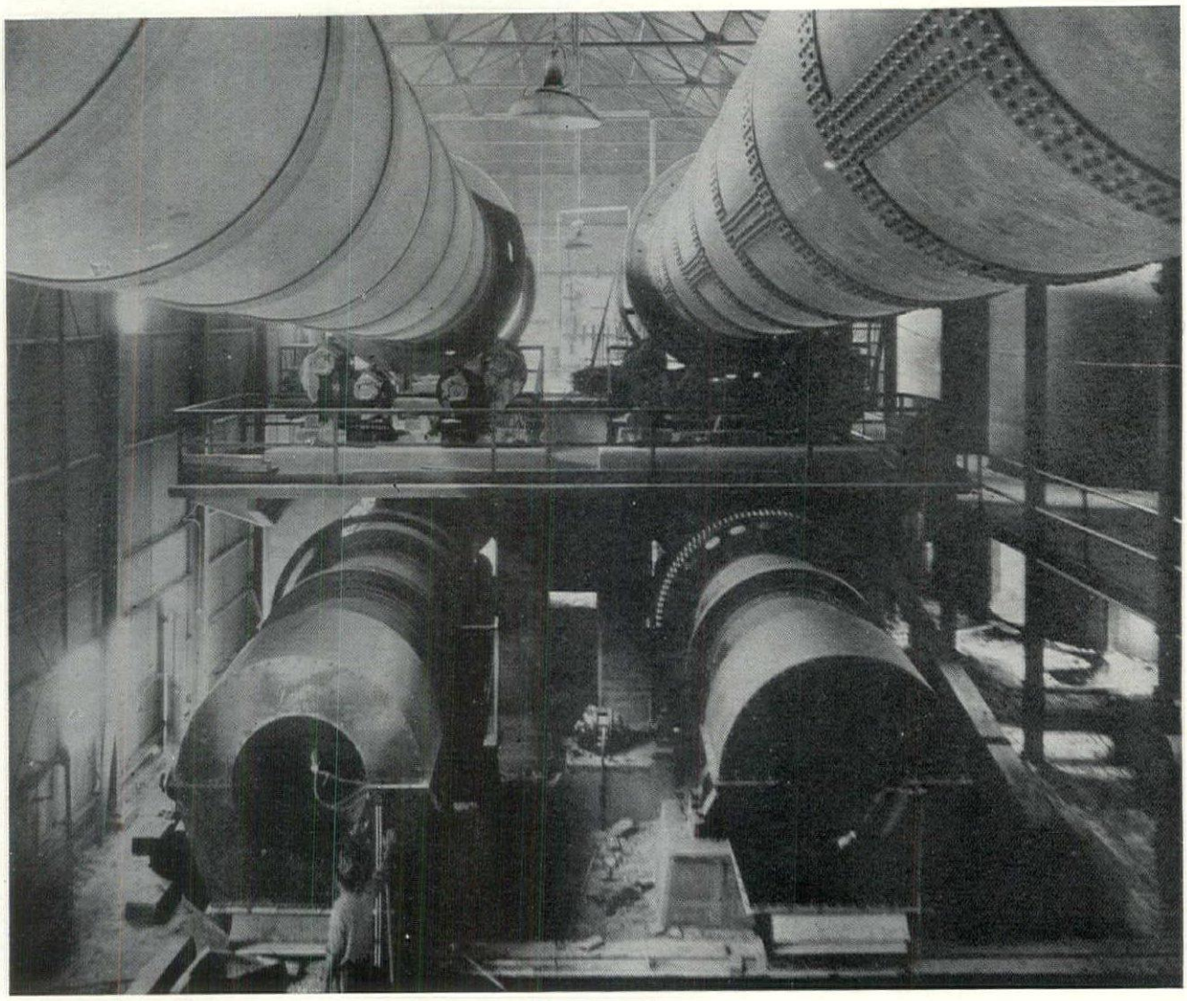
room. The plaster should make and continue to give a good impression over a long term of years. This is not possible if the architect permits, for any reason, inferior work. One-coat plaster work is to be especially condemned.

Two-coat Plaster. Two-coat lime plaster on wood or metal lath, when properly done, will give satisfaction. This is especially true if the under coat is put on in two parts and brought out to grounds and well darbied and straightened, and then floated down properly with a wooden float after the plaster has stiffened, but before it is dry. This floating operation is very important, for it fills up all the shrinkage cracks and leaves a mechanically roughened surface for the finish or "skim" coat. The so-called "Boston skim coat," when applied by an experienced plasterer, is a most satisfactory finish over doubled-up, two-coat lime plaster. Boston skim is made of clean, sharp sand and lime putty in about equal parts and troweled to a smooth, hard surface.

Three-coat Work. This represents the proper use of lime plaster, the first or scratch coat being applied and allowed to become absolutely dry before the second or brown boat is applied. The brown coat is also allowed to dry before the finish coat is applied. All this is true, no matter to what kind of lath or masonry backing the plaster is applied. Plastering often seems to be a good detail on which to save money in cutting the cost of a structure, but for the architect's peace of mind, it would be much better to save on some other item, for nothing comes under the observation of owners and tenants quite as constantly as plaster.

The American Institute of Architects in collaboration with the National Lime Association has prepared standard specifications for lime plaster, copies of which can be had by an architect if he will apply to any lime manufacturer, or to the National Lime Association, at Washington. The United States Bureau of Standards is responsible for the statement that in the presence of moisture (and all plaster is subject to exposure to moisture at one time or another), lime plaster preserves metal lath from rusting. This is so because lime has an alkaline reaction. On the other hand, there are some so-called "patent plasters" to be had that have an acid reaction.

Mortar for Brick and Other Masonry. The function of mortar in laying up brick, stone, tile, etc., is twofold. It must provide a smooth bed upon which the building units may be easily laid, and it



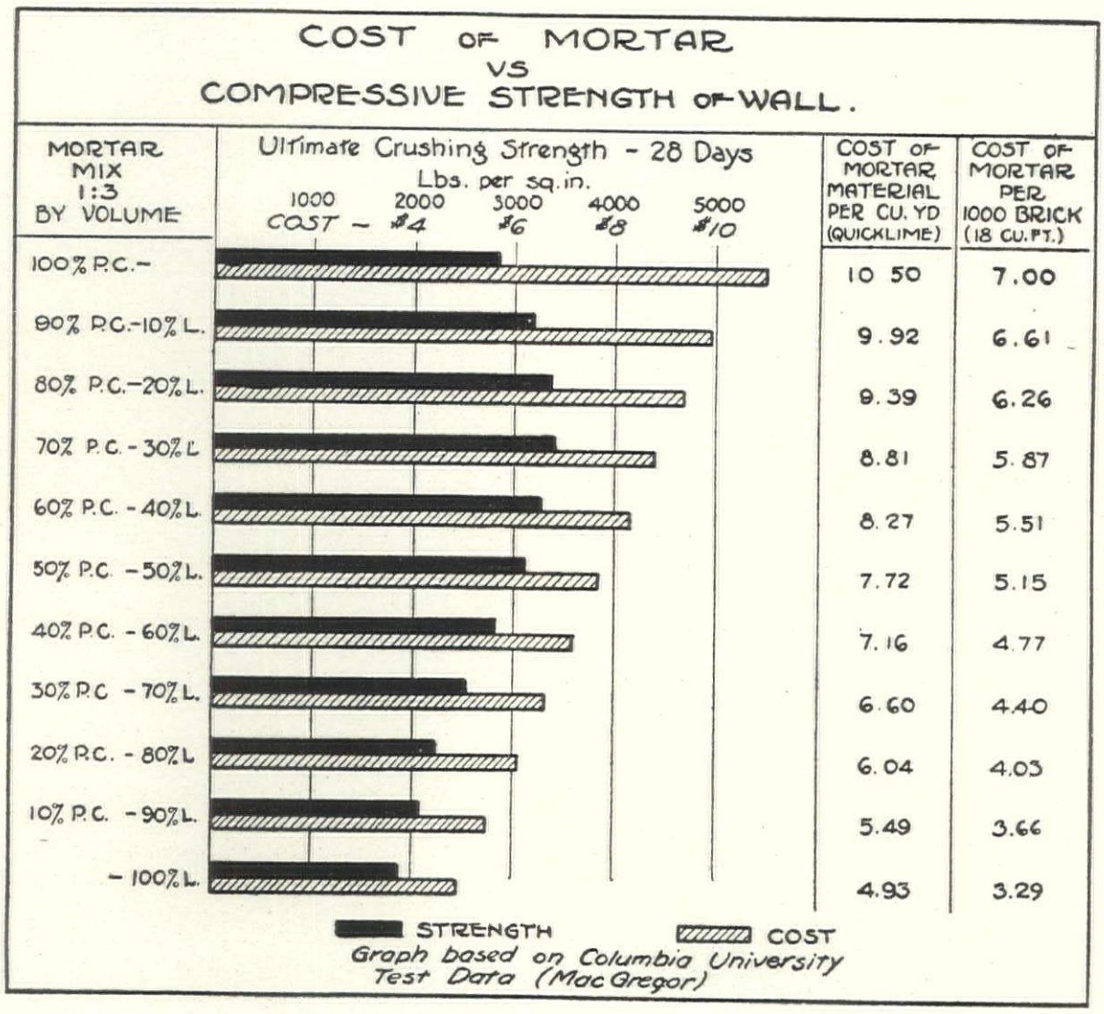
A Modern Horizontal Revolving Drum Lime Burning Kiln

must bind them together into a permanent mass. From the architect's point of view, it is necessary, in addition, to prevent the entrance of rain, wind, and cold through the spaces between the building units, which must be entirely filled with mortar. It is necessary that the mortar develop a safe compressive strength to resist the load on the lowest mortar bed, and also develop sufficient cohesive and adhesive strength to properly hold the building units in their places while the mortar is attaining its initial strength. The mortar must also finally pass the tests of durability and density. In all these qualities lime mortar or "1:1:6" mortar (made of 1 part by volume of Portland cement, 1 part by volume of lime putty, and 6 parts by volume of sand) properly used, meets the requirements.

Strength of Lime Mortar. The tests of Prof. McGregor, at Columbia University, will serve as an illustration of the strength of varying mixes of mortar from straight Portland cement to straight lime for the cementitious portion and 3 parts of sand, by volume. The graph included here tells the story, and while the cost figures given do not pretend to be accurate for all portions of the country, they are relatively correct, as a substitution of local prices will show. It will be noted in this graph that the greatest compressive strength is obtained by using 70 per cent of Portland cement and 30 per cent of lime putty. The graph also shows that 50 per cent of Portland cement and 50 per cent of lime putty give almost as great strength as the strongest combination shown; that is, that it gives well over 3,000 pounds per square inch.

Costs. It is impossible to give actual costs on mortar for the whole country, but it is easy to point out that lime putty is the cheapest per cubic foot of any cementitious material used for mortar.

Watertight concrete is concrete through which water cannot pass. "Waterproofed" concrete is concrete to the surface of which some treatment has been applied which may or may not prove permanent, to prevent the entrance of water. Hydrated lime is used in making concrete more "watertight." Because quicklime must be made into putty before it can be used in concrete, and because lime putty does not lend itself well to easily mixing with dry Portland cement, sand and other aggregate, hydrated lime is today universally used and is recommended.



SIMPLIFIED PRACTICE ACHIEVEMENTS IN THE BUILDING AND CONTRUCTION FIELD

BY

RAY M. HUDSON

ASSISTANT DIRECTOR COMMERCIAL STANDARDS GROUP, BUREAU OF STANDARDS

THE high standards of living enjoyed by the American people are the results of steadily mounting *per capita* productivity. Further advances in these standards must be brought about by improving methods and processes, through the elimination of waste in materials and motion in our production and distribution system. Just as 20 years ago we undertook nation-wide conservation of our natural resources, so today we must even more vigorously sustain this campaign for a better utilization of our industrial resources and effort. Wastes in commerce and industry fall into a number of classes. While they are of immediate importance to manufacturing concerns, the business community, and construction engineers, the interests of the general public are involved to an important degree.

In 1921, when the "Hoover Committee on the Elimination of Waste in Industry," made a survey of conditions in six of our major industries, it found that the building industry stood in fourth place, with 53 per cent waste. Thirty-four per cent was chargeable to management. One of the major causes was lack of simplification and standardization in materials, methods, machinery, and so on. When it is remembered that five billion dollars are spent annually in construction, some conception may be gained of the extent to which this loss reduces the country's income. Manufacturers and business men are forced to look into their businesses more intensively than ever before for opportunities to cut down costs and yet maintain for themselves a fair profit. They are finding that a prolific source of waste is using too much variety. A surprising proportion of this variety is made up of slight dimensional differences, of models and types which are not markedly dissimilar, but which were originated in an effort to be "just a little different."

The Department of Commerce, through the Division of Simplified Practice, is assisting the building and construction industry to check this waste, through the reduction of unnecessary variety in sizes and dimensions and other immaterial differences in everyday commodities. This coöperation on the part of the government involves nothing regulatory nor inquisitorial. The service is to help such industrial groups as are interested in reducing waste to get the *facts* as to waste and to put their corrective actions into practice. Safeguards have been set up to protect the fullest development of individual initiative and inventon, as well as to care for the changing trends of business. This is done by providing that the simplified practice recommendations, developed under the auspices of the Division of Simplified Practice, shall be subject to review at the end of such a period as may be fixed by the industry. The re-survey is conducted by a standing committee representative of all factors in the industry, or through another general conference of producers, distributors and organized users. Acceptance by manufacturers, distributors and organized users, representing 80 per cent of the total volume of the industry, is necessary before a program can be published as part of the Elimination of Waste series of the Department of Commerce.

These percentages of reduction in variety have been startling, especially in the application of simplified practice in the building and construction field:

Simplified Practice Report	Items	Reductions From–	To–	Percentage
1	Vitrified Paving Brick.....	66	5	92
3	Metal Lath	125	24	81
7	Rough and Smooth Face Brick..	75	2	97
	Common Brick	44	1	98
8	Range Boilers	130	13	90
12	Hollow Building Tile.....	36	20	44
13	Structural Slates for Plumbing and Sanitary Purposes.....	827	138	83
14	Roofing Slates (descriptive terms, thickness and sizes).....	98	48	51
16	Lumber — Standard Nomenclature Grades and Sizes for Softwood Lumber			
18	Builders' Hardware (items;.....	6948	5130	26
	finishes)	100	29	71
21	Brass Lavatory and Sink Traps..	1114	76	93
25	Hot Water Storage Tanks.....	120	14	88
26	Steel Reinforcing Bars; Cross-sectional Areas	32	11	66
28	Sheet Steel	1819	261	85
29	Eaves Trough and Conductor Pipe	21	16	24
32	Concrete Building Units (length, width and height of blocks, tile, and brick)	115	14	88
38	Sand Lime Brick (length; width; height)	14	3	79
43	Paint and Varnish Brushes.....	480	143	70

Certainly a major contribution to the stability and prosperity of American business is reflected in the savings which industry has gained from simplification. Industrial leaders estimate that these amount in value to more than $500,000,000 a year.

Elimination of 60 per cent of variety in sizes of softwood yard lumber is estimated to have reduced extent of inventories formerly carried by four billion board-feet, thus releasing some $200,000,000 of relatively idle capital. Strict adherence to this lumber simplification assures the home builders of the country the production and distribution of standard dimension lumber supported by the united interests of the industry. During the past year, the lumber simplification program was given even greater impetus through the development of grade marking for cut lumber, on the part of many companies.

FIRE RESISTANCE OF BUILDING MATERIALS AND CONSTRUCTION

BY

S. H. INGBERG

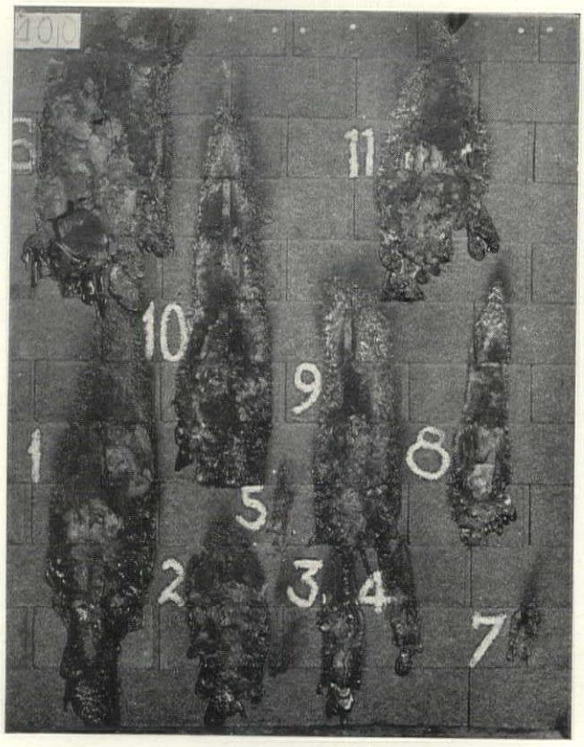
SENIOR ENGINEER, BUREAU OF STANDARDS, WASHINGTON

THE fire-resistance activities of the Bureau of Standards have been concerned mainly with research into the fire-resistive properties of materials and members entering into the construction of buildings, the fire hazard of materials constituting the contents of buildings, the severity of fires that can occur with given amounts of combustible building contents, and the protection afforded by devices such as insulated record containers.

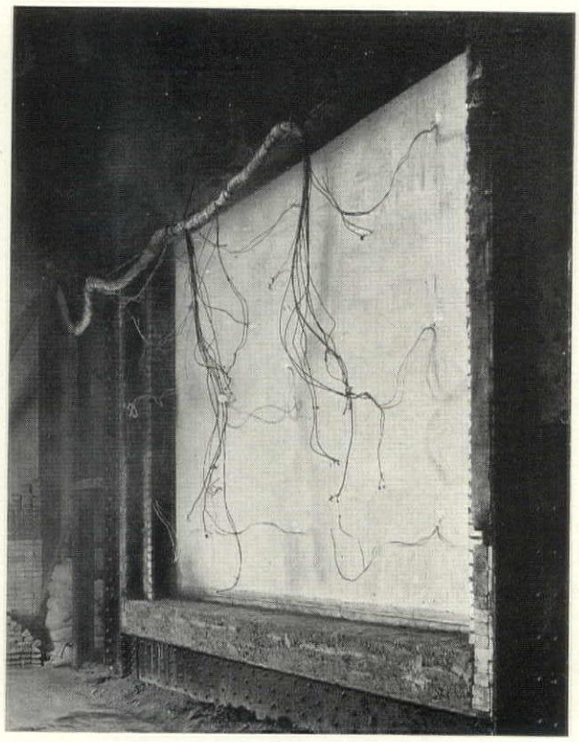
Fire-resistance, if in the form of materials incorporated into the building itself, has the advantage of being independent of the human element, upon which fire-prevention of many other kinds must depend. It loses little in effectiveness with age, remaining practically unchanged as long as the structure serves the purpose for which it was built. While general fire-prevention efforts and fire-detective and fire-prevention devices are of value, the building itself must remain as the chief factor in taking care of the margin of danger due to carelessness, ignorance and crime that cannot otherwise be further reduced. Consistent and continuing reduction in life and property loss from fire can be safely premised only on achieving greater fire-resistance of exterior and interior building members, details and finishes, a large gain in which is possible with proper application and combinations of materials now used.

The standard fire test consists in subjecting the material, construction or device to a furnace fire, the intensity of which is regulated so that given average temperatures obtain in the furnace chamber at stated times after the fire is started. By means of this control approximately the same fire exposure can be obtained at different times and in different laboratories. The other requirements will vary with the type of construction or device being tested. Thus, columns are required to support a load approximating what they would carry in a building; floor constructions and bearing walls are similarly required to support loads and also to afford resistance to flame and temperature penetration to an extent that will prevent ignition of materials in contact with the unexposed sides of the walls; incombustible finishes must serve similarly in preventing ignition of the material or construction protected; and insulated containers must preserve their contents. The fire-resistance of the material, construction or device tested is measured by the number of hours and minutes during which these requirements are met in the fire test. Ability to withstand erosion from hose streams, as applied in extinguishing fire, is also required for walls, floors and partitions.

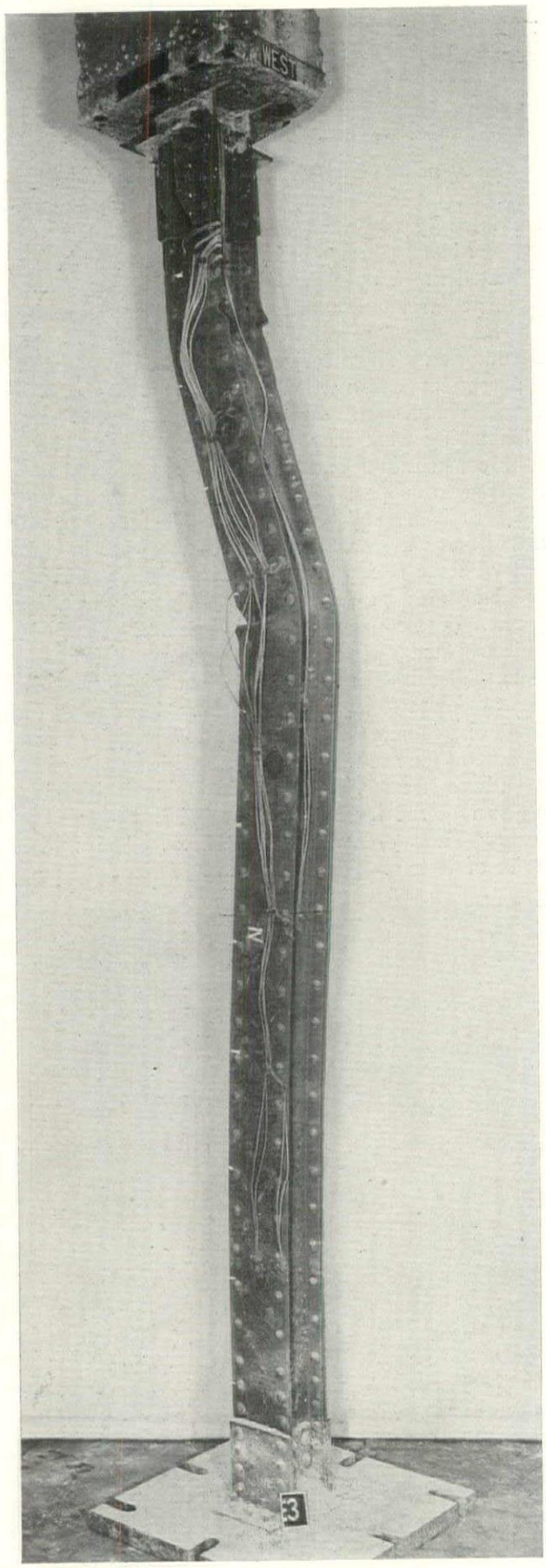
Fire Tests of Building Columns. The initial series of tests undertaken on the basis outlined was



Deck of Prepared Roofing Shingles after Firebrand Tests with Air Currents at Ordinary Temperatures



The Unexposed Side of a Theater Proscenium Curtain Shortly after the Other Side was Exposed to Fire



Typical Failure of Unprotected Steel Column after 11 to 21 Minutes of Fire Exposure

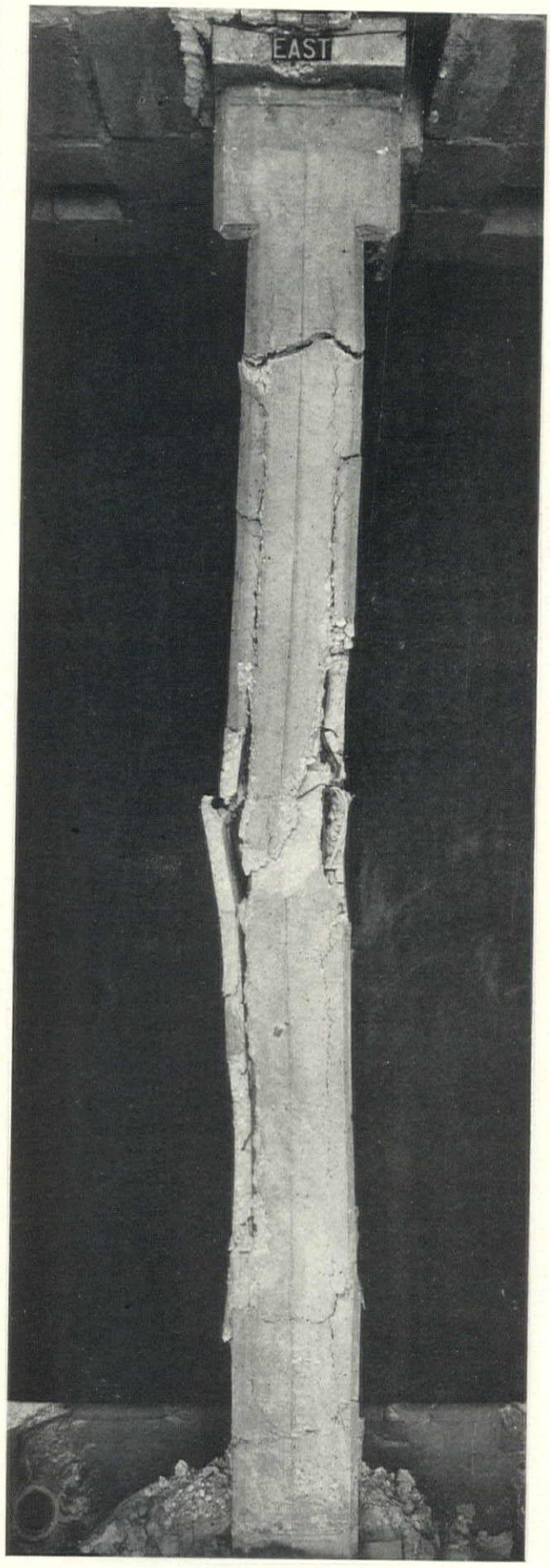
of columns, one series, comprising over 100 tests, being conducted in coöperation with the Associated Factory Mutual and the Underwriters' Laboratories. Typical rolled steel, cast iron, concrete and timber columns were tested unprotected, partly protected and also completely encased in concrete, hollow tile, gypsum block, brick and plaster on metal lath, applied in different thicknesses. The effect of the protection in increasing the fire-resistance of the columns is evident from the fact that unprotected steel columns failed under load in the tests after from 11 to 21 minutes of fire exposure; columns partly protected by filling the interior or reëntrant portions with concrete but with the flanges exposed to fire withstood the test for periods of between 48 minutes and 1 hour, 24 minutes; and columns encased in concrete 2 inches in thickness outside of the metal developed fire-resistance of periods ranging from 1 hour, 47 minutes, to nearly 8 hours. A wide range in effectiveness was found with materials of a given class and applied in the same thickness due to differences in the amount of cracking and similar fire effects sustained. This is evidenced by the range in effectiveness found for 2-inch concrete protection already cited. Similar differences were found for burnt clay products applied as column protection. The results of these tests have been published by the Underwriters' Laboratories, Chicago, as a joint report entitled "Fire Tests of Building Columns," and also by the Bureau of Standards as "Technologic Paper No. 184." The tests deal with a building detail of the greatest importance from the standpoint of maintaining the structural integrity of the building during a fire, and the results are of interest to all concerned with the design or construction.

Fire Tests of Concrete Columns. The other series of column tests was conducted at the former Pittsburgh laboratory of the Bureau of Standards and comprised fire tests of about 60 typical reinforced concrete columns with strength tests of companion columns at room temperatures. Here also a wide range in fire resistance of columns, similar in all respects except for the sand, stone or pebbles used in making the concrete, was noted. Thus columns 18 inches in outside diameter with 1½ inches of concrete over the reinforcing steel failed under working load after from 3 to 4 hours of fire exposure when the concrete was made with siliceous (quartz, chert, granite) sand and pebbles, while with concrete made with broken limestone, trap rock, blast furnace slag or calcareous pebbles, the columns withstood the 4-hour fire test under working load and at its end under loads from 2½ to 3½ times that applied during the test. The difference in performance was determined as due to the mineral composition of the aggregates used, quartz, chert and granite inducing early spalling of the concrete when exposed to fire, while concrete made with limestone, calcareous gravel, trap rock and slag showed few effects of this kind even from very severe fires. It was further shown that a large improvement with the former type of con-

crete can be effected by placing metal mesh in the outer portion of the column to prevent large cracks and dislodgment of cracked portions. Covering or replacing the outer concrete with plaster was also found effective in increasing the fire resistance of the column. The results of these tests have been published by the Bureau of Standards in "Technologic Paper No. 272," entitled "Fire Resistance of Concrete Columns."

Brick Walls. While fire walls of brick have been long recognized as increasing the fire safety of individual buildings as well as decreasing the community hazard from spreading fires, no quantitative measurement of the protection afforded had been made until fire tests of walls, comparable in size to that of a wall panel in a building, were made by the Bureau of Standards. As subjected to the standard fire test, fire resistance periods from about 1 hour for the 4-inch partition to 9 hours or more for solid walls 12 inches thick were developed. Several types of hollow brick walls made by setting a portion or all of the bricks in the wall on edge were also tested, and while the resistances developed were not as high as for solid walls, they indicated adequacy for a considerable range of fire conditions, provided proper wall thicknesses are used. Articles giving summaries of results have been published in several outside journals, and pending publication by the Bureau of Standards, "Letter Circular No. 228," giving results for clay and shale bricks and "No. 229" for concrete and sand lime bricks have been prepared and are available on request.

Hollow Tile Walls. These hollow units of burnt clay vary in size from a unit filling the same space in the wall as two bricks to that of a 12-inch cube. The effects of the fire and the temperature transmission through the wall differ considerably from what obtains for the relatively smaller and solid brick units. The rapid increase in the use of hollow tile as a wall material prompted inquiry as to its fire-resistive properties, and the Bureau was requested to undertake tests of typical wall constructions. The first series consisted of fire exposure tests under load of piers built of tile of typical designs made from representative clays. A wide difference in fire effects was noted, ascribable mainly to differences in the mineral composition of the clay and to a less extent to the design of the unit. A further series of tests of small walls was undertaken to ascertain the effect of certain changes in raw material, manufacturing details and design. In this as in other portions of the work, coöperation with the industry was had through the Hollow Building Tile Association. The final series consisted of about 170 fire tests and fire and water tests of typical hollow tile wall constructions, 8 to 16 inches in thickness, tested (1) bare, (2) plastered or stuccoed, (3) furred and plastered, or (4) faced with brick. Depending on the shape of the unit and the clay from which it was made, fire resistance of from 1½ to 3 hours obtained for unplastered 8-inch walls,



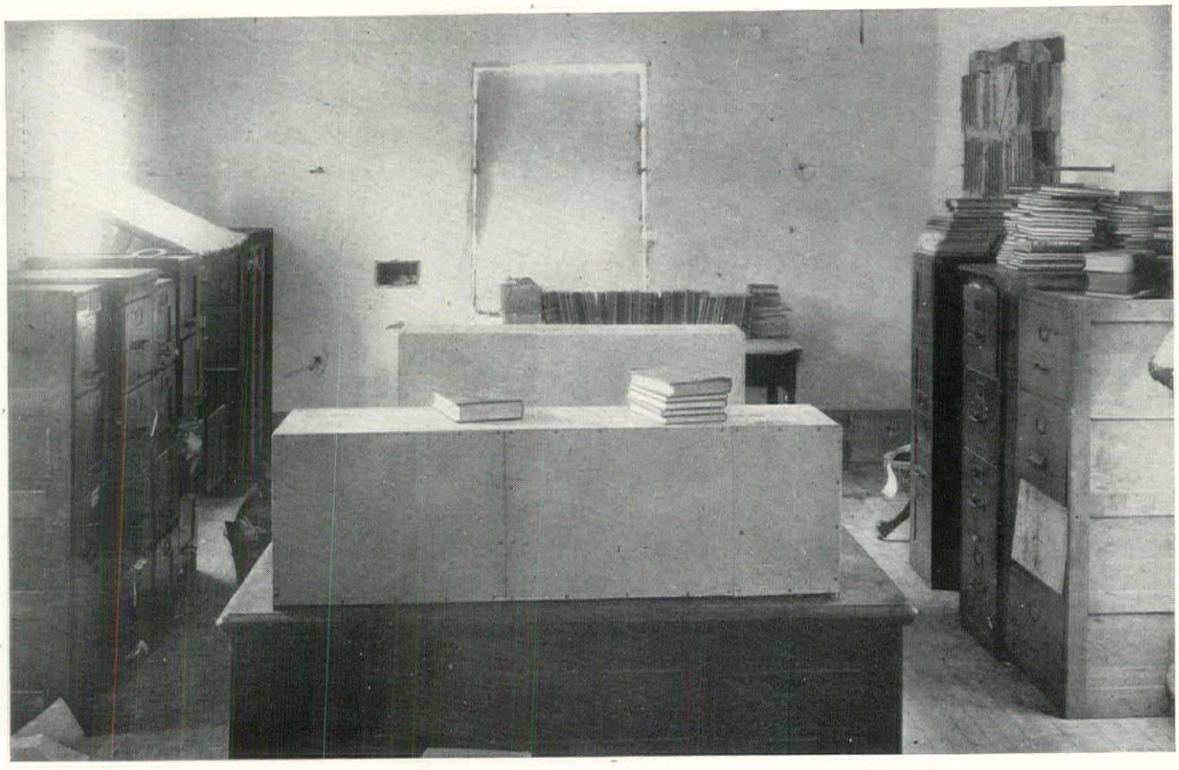
Steel Columns Protected by 2 Inches of Concrete Withstood Fire Test for Periods up to Almost 8 Hours

from 3 to 6 hours for 12-inch walls, and from 4 to 12 hours for 16-inch walls. Tile with the greatest number of cells or webs through the wall thickness was found to give the highest fire-resistance. Plaster was found to add 1 hour or more to these periods and also to decrease the fire damage. Plaster applied on split furring gave protection to the load-bearing portion of the wall to such an extent that very little damage resulted from fires of from 4 to 6 hours' duration.

The final report, giving results of all tests made, has been submitted for publication as a Bureau of Standards "Technologic Paper." It is believed that the fire-resistance of this relatively new type of wall construction has been ascertained and defined in all essential respects by these tests.

Theater Proscenium Curtains. Many disastrous fires in theaters have shown the need for a dependable movable partition or curtain for closing the opening between the stage and the auditorium in case a fire originates on the stage. The devices used vary from single-ply asbestos cloth curtains to ponderous steel-framed constructions faced with metal sheets and asbestos boards and weighing, for an ordinary opening, ten tons or more. A number of operation and fire tests were made of the different types in the Bureau's large wall furnace. The heavy constructions, properly installed, were found to be satisfactory from the operation standpoint and to keep back smoke and glow from an intense fire on the stage side for periods of ½ hour. The single asbestos cloth curtains hung between a top and a bottom pipe batten were found to be unreliable in securing closure of the opening, since drafts such as might be caused by a fire or by ventilating fans caused them to bulge and fail to come down, being held by the friction with the proscenium wall. An improved type of asbestos cloth curtain, consisting of wire-reinforced cloth applied on each side of a pipe or structural steel framework, was also tested. This can be hung so that it will be reliable in operation, and in the fire test it was found to prevent smoke and glow from showing on the auditorium side for 15 minutes. This affords time for exit from the auditorium, with a considerable margin of safety. Pending publication of the results, "Letter Circular No. 137" has been prepared and can be obtained on request. It gives a summary of results, recommended specifications for proscenium curtains, and suggestions for improving existing installations.

Fire Tests of Roofing Materials. In efforts to decrease the community fire hazard, most municipalities impose restrictions on the kind of roofing materials permitted within city limits or in certain portions thereof. The scope of such restrictive measures has occasioned much dispute, and at the request of organizations representing producers and users of roofing materials, a comprehensive series of tests of the fire-resistance of all prepared roofing materials in ordinary use was undertaken and was completed during the present year. This has included tests of new and weathered wood shingles, and asphalt prepared roll roofing and shingles, slate, asbestos, metal and tile roofings. Tests have also been made of painted and chemically treated wood shingles, both new and after exposure to the weather



Interior of Small House Simulating Office Occupancy, before Fire Test

for periods of up to 12 years. Specimens of weathered wood shingle roofs covered with asphalt prepared roll roofing and shingles or with paint coatings have also been tested. For the combustible roofings, the fire-resistance of the weathered roofings was generally considerably below that of the newly applied materials, although some forms of asphalt roofings showed little decrease in fire-resistance after weather exposures of up to 12 years. Results of the tests also emphasize the general superiority from the fire-resistance standpoint of incombustible roofing materials, such as slate, cement-asbestos, clay and concrete tile, and metal. The results of the tests are being prepared for publication in the Bureau of Standards technologic series. Copies of a preliminary report, giving the results of tests with new roofings, have been supplied to the officials of a number of cities who requested them in connection with the adoption of roofing ordinances.

Strength of Materials at High Temperatures. In connection with fire tests of building construction, it is often important to know the strength and elastic properties of the constituent materials at the pertaining temperatures. An equipment with which good temperature uniformity and control are obtainable has been in use during the past three years. Tests with structural steel and cast iron have been completed. A paper ("Compressive Strength and Deformation of Structural Steel and Cast Iron Shapes at Temperatures up to 950°C," Proceedings of American Society for Testing Materials, Vol. 26, Part II, pp. 33-51, 1926) giving results with structural shapes has been published. To this there was added a series of tests for obtaining information on effect of length, which has also been completed.

Severity of Building Fires. In order that protection requirements, such as those for structural members, wall openings and record containers, be placed on a definite basis, it is necessary to be able to make reliable estimates of the severity of fires that can arise with typical constructions and occupancies involving given amounts of combustible materials per unit of floor area. This severity would have to be interpreted as equivalent to so many hours of the standard fire test, the fire-resistance of the protections, constructions and devices to be used being measured by this standard.

Since the data obtained from actual fires are inconclusive as it concerns temperatures developed and the length of time they prevailed, some burning-out tests have been conducted in one-story, fire-resistive buildings erected for the purpose, one being 15 by 29 feet and another 30 by 60 feet in plan. These buildings were fitted with old furniture and records to represent light, commercial and record storage occupancies, the weight of the combustible contents ranging from 13 to 55 pounds per square foot. Further extension of this work to other typical occupancies is contemplated in order that the effect of any difference due to the character of the combustible materials involved may be had. The results so far obtained indicate the possibility of establishing by this means a basis for applying materials, constructions and devices as resistance against fire with as great a degree of safety and economy as they are being applied for other structural purposes.

View During a Fire Intensity Duration Test of Small House Shown Opposite

ADVERTISING ARCHITECTURAL SERVICE

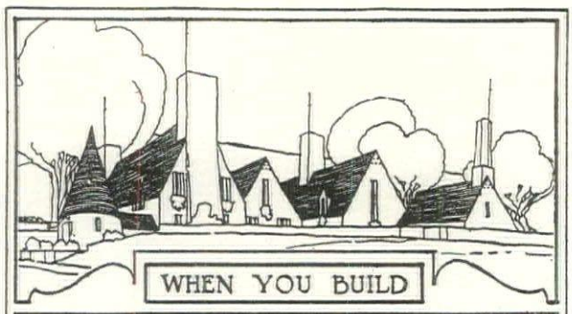
BY

M. NIRDLINGER

THE architectural members of the Architects' Council of the Chamber of Commerce of Pittsburgh recognized the necessity of acquainting the building public with the advantages derived from an architect's services. The question confronting us was how these messages could best be presented.

After many weeks of discussion, it was decided to first determine the extent to which the local architects would financially support an advertising campaign. To ascertain this it was necessary to make a general canvass among the architects. This was accomplished, and results showed a generous response which assured us of the success of the undertaking. After careful consideration of several mediums, the committee decided on newspaper advertising. We entered into a contract with a local morning paper for display advertising on Thursday of each week.

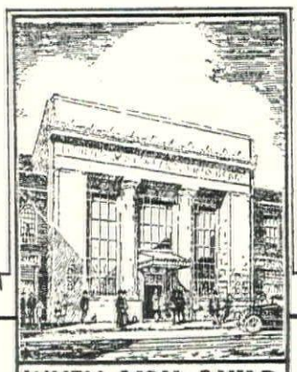
Notwithstanding the limited space possible in the first year's campaign, we succeeded in interesting the public, and received many favorable comments which proved the wisdom of our activity. We traced many direct and indirect advantages to the profession from this concerted action. Architects discontinued some of their private advertising that was without merit, and the saving was far greater than their share of our mass advertising. Due to our activity, we are receiving most friendly coöperation from the daily press. We are brought into closer contact with one another, this being most helpful in creating good fellowship. We are now recognized as business men instead of dreamers, especially by the business men of our city. This in itself removes a long recognized barrier that has stood between the practical business man and the professional man. We are showing our fellow citizen the folly of trying to secure good architecture without an architect. We are also convincing him that he cannot obtain reproduction of gems he has found in the larger cities unless he permits us the same liberty and freedom that were given the architect in the larger city. We are convincing our fellow citizen also that the service of a local architect is his best investment. It is not our intention to try to reach the men or corporations associated with important structures, since they are as a rule our clients already; but it is the small man and the small estate, corporation, etc., preparing to build.



WHEN YOU BUILD

THROUGH improper planning and faulty construction in building operations, regardless of quality of materials and construction costs, depreciation begins early and continues at a rapid rate. Commercial value is based largely upon permanent desirability. A building that lacks attractiveness and fails to meet the demands of utility cannot compare in value with one that possesses these essential features. Physical depreciation may not be great, but inferior planning will quite often destroy a building's value from a commercial standpoint. Every prospective builder should safeguard the value of his property by consulting a competent local architect. He will save you time, money and worry.

ENGAGE A LOCAL
ARCHITECT



WHEN YOU BUILD

WHEN you build employ an Architect. You'll avoid preventable delays, misunderstandings. You'll reduce "extras" or eliminate them altogether. An Architect will both **protect your interests** and assist your contractor. He is trained to save you time, money and worry.

ENGAGE A LOCAL
ARCHITECT

Two of the Advertisements used by the Pittsburgh Architects
(Size as published in newspapers, approximately 4 by 6 inches)

AN OPPORTUNITY FOR ARCHITECTS

THE REVISION OF THE NEW YORK TENEMENT HOUSE LAW

BY

ARTHUR C. HOLDEN, ARCHITECT

IT has been said that opportunity does not go around wearing a label. Some even contend there is no such thing as opportunity at all, but that opportunity is a way of looking at things. The man of genius will see an opportunity in an apparently usual situation, whereas the ordinary man would pass it by. There are many men in the architectural profession who have genius, though some of them are handicapped by preconceived notions of what an architect should do and how an architect should act. A kind of self-consciousness is a handicap to genius.

There is an opportunity now which lies open to the architectural profession. The Tenement House Law of New York is up for revision. Happily, under the American constitutional system, when one state takes a step in advance, it is possible for other states to go further. Two winters ago the legislature created a Temporary Commission to Examine and Revise the Tenement House Law. Last January the Commission brought in its first report. The architects announced that since they had not had time to study the proposed law, they could not take a position either favoring or opposing it. Several months of controversy followed, and the legislature adjourned without taking action other than to enlarge the Commission and to continue it for another year. A new report will be brought in to the next legislature. Last summer was spent in further investigation by sub-committees and in conferences with civic, social and technical bodies.

The present Tenement House Law has been amended 150 times since its passage in 1901. It is due for a thoroughgoing revision. Its original passage was made necessary by the shocking revelations of the comprehensive report of the Tenement House Commission of 1900. It was the social service organizations, not the architects, who sponsored the legislation. The law was designed to restrain unscrupulous promoters from putting up buildings which were unsafe from the point of view of egress in case of fire and unhealthy because of the lack of proper light and ventilation or because of insufficient provision of sanitary equipment. The immediate purpose of the law was to protect the poorest class of people and to prevent their exploitation by overcrowding in inadequate and unsanitary quarters. The Tenement House Law is, in consequence, a law replete with "prohibitions and minimum requirements."

Since the time of the law's passage New York has doubled in population and assessed realty values have increased amazingly,—from $3,357,224,369 in 1900 to $14,738,806,010 in 1928,—exclusive of the Borough of Richmond. The value of the dollar has been cut in half, and methods of building have been revolutionized. We have just begun to look upon housing as an industry requiring very nice balancing of the art of design, the science of construction, and the economics of housing finance. At the time the present Commission was called into being, economic pressure was working havoc with the enforcement of the law. In all classes of dwellings methods for evading the law had become so well defined that they were reflected in property values. The old definition of a tenement house as a "building occupied by three or more families, living independently of each other and doing their own cooking," exempted from the requirements of the law any building in which theoretically not more than two families did their own cooking, no matter how many families lived in the building. On expensive land it was possible to run a towering skyscraper with practically no courts to provide light and air, if only it were called an "apartment hotel" and if the suites were provided with "pantries" instead of "kitchens." Where there existed old fashioned residences in which it was no longer economical for a single family to live, they could be converted into "studio apartments" with inadequate safeguards against fire, provided that no more than two *bona fide* kitchens were put in the same house. Where the price of land appeared cheap, it was possible to build frame houses within 3 feet of each other and to move large sections of the population into jerry-built districts unequipped with sewers.

In all of the great mass of home building in the United States during the past ten years,—taking it from top to bottom, good, bad and indifferent,—what sort of a role has the architect played? How great has been his influence upon housing construction? Has the architect been a follower or a leader? Of course there are different kinds of architects. A great deal of work is done by a class of men who might be dubbed "archytecks." They make drawings largely for the purpose of "filing" with the various building departments. Their plans show certain essential details, such as the thicknesses of foundation walls, the locations of the houses with respect to building and lot lines, and the plumbing sections. These men also perform the valuable service of getting plans "passed through the department," a labor which requires a great deal of waiting in outer offices, and which the average builder is quite willing to have someone else perform for him. The so-called "high brow" architects are very slightly interested in this class of work. They generally look down upon men whom they call "commercial architects," whose business is drawing out to ¼-inch scale the apartment plans that have been worked out by the real

Typical two-family, semi-detached houses, with courts between, which are not under the jurisdiction of the Tenement House Law. They represent good construction except for the poor lighting in the narrow side courts, which are garage driveways

Rapid depreciation, carrying costs, and economic pressure have forced the subdivision of these frame buildings into apartment suites which are not supposed to contain kitchens. These are typical of conversions made in spite of the Tenement House Law

estate men, and then designing elevations to fit. The latter work under great pressure, and their worry in life is very similar to that which plagues the high brow architect and the "archyteck,"—namely, "where the next commission is to come from."

What architects lack is point of view. I have always felt that conventions of the Institute should be held in a giant Zeppelin, and that not only the high brows but *all* architects should attend. During the reading of the report of the Board of Directors, the airship should be taken on a tour of the United States to let the architects see at first hand the conditions in architecture throughout the nation. Looking down from above, they would see tremendous building activity here and there. Below them there would also lie all the buildings erected in the country since the coming of the Mayflower,—such at least as have survived the ravages of fire, the elements, and the eternal process of rebuilding. I'm sure that the consensus of opinion of such a convention would be that the vast majority of the buildings designed to house the human family were unworthy.

I do not believe that it would be necessary to hold very many aërial conventions before the idea would become firmly planted in the minds of the delegates that there is absolutely no reason in the world why architects should not influence all of the building in the country instead of a very small part of it. There would be a ringing battlecry set up that architects must assume the leadership, that architects must "show how it could be done." From the vantage point of aërial perspective, one can see over mountains and barriers. One learns that some of those things that have appeared to set definite limits to architectural accomplishment can be circumvented. A look at the whole problem in perspective gives the architect a better conception of his task. He learns what it is that has been hampering him. For example, when the architect sees that there is preparation for the revision of any code which regulates building, he recognizes the opportunity to free himself from outworn prohibitions and to protect himself against sub-standard competition.

The over-intensive use of land is one of the evils that, unchecked, threatens to lower the standard of public health and decency. Proper sanitary protection and adequate provision for escape in case of fire are no less essential. The architect is constantly told that he must build economically; that he must not sentimentalize, and that he must keep his design close to the minimum standards of light and air, sanitation and safety allowed by law. The reason given is familiar enough to him. "One cannot afford to do better, because construction costs are so high." But construction costs, as the architect has learned, are not the only costs in producing a building. He has to reckon with the cost of land, which includes the cost of expensive improvements. He has to reckon also with the cost of financing and promotion, which, including sales costs, ranges from 25 cents to over 40 cents on the dollar of cost of the finished housing product. From the vantage point of aërial perspective, the architect would see that by accepting the cost of land and the cost of financing as factors which he is unable to control, he has been compelled with every increase of these costs to either reduce the amount of money available for construction or to crowd his building upon less land than is desirable. Confronted with this dilemma, the architect, assisted by his brother the engineer, has created the skyscraper. By reaching into the upper air above its neighbors, the skyscraper has increased the usable area of the ground on which it stands from 6 to 12 fold, and then to even 20, 30 and 40 fold. The genius of the American architect has been acclaimed around the world. The skyscraper movement, beginning with commercial types, inevitably spread to residential buildings. There is an essential difference, however, in the application. The commercial skyscraper, situated at the mart or business center, maintains its desirability and rentability to a much greater degree than does the residential

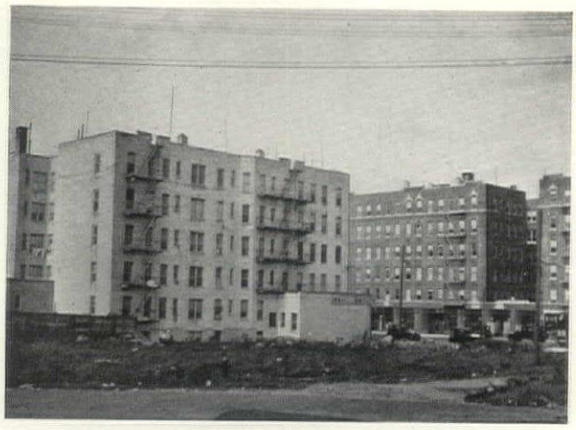


Illustration of a typical non-fireproof tenement. On such low value lands it is uneconomical and wasteful to build so intensively. Original rents can be obtained only because of borrowed light and air. The buildings are bound to depreciate when the neighborhood becomes built up

High class apartments built in exclusive residential section originally developed with frame houses on 60-foot lots. The economic unit for the new development is two lots or 120 feet, yet owners insist upon the right to build just as intensively on a 60-foot lot

skyscraper after the neighborhood around it has become built up with similar structures so as to shut off light and air. Business operations can be conducted by artificial light, but so far no one has come forward to urge that homes in which children are brought up are desirable without direct sunlight.

Today in our experience with the 6-story, barracks-like apartments, and, even with the larger 9- and 15-story fireproof buildings, we are experiencing the same tendency to depreciation after the light is shut off as was experienced with the original 6-story, dumb-bell flats erected under the law of 1879. Of course the modern building has not sunk to the low standards of sanitation and health that brought the older buildings into discredit, but the depreciation takes place none the less, and the community pays.

From the architectural observation balloon, skyscrapers,—and in particular residential skyscrapers,—are self-evidently desirable when they are placed alternately with low buildings separating them. It would of course be impossible and inequitable at law to restrict skyscrapers by law to alternate plots of ground. Therefore, the first report of the Commission offered to the legislature in January, 1928, recommended the creation of lot line courts at least 10 feet wide to begin at a point not higher above the street than the width of the street plus 5 feet. This recommendation was the greatest step in advance ever offered for the protection of high value properties against blanketing by abutting lot-line walls. Its provisions were equivalent to a proviso that no skyscraper walls could be carried up nearer to one another than 20 feet, and that in the intervening space no building could be built to a height exceeding the width of the street by more than 5 feet or to a greater depth than 60 feet from the building line. There was a great deal of complaint about this provision on the ground that it worked hardship upon owners of high value property. Such complaint was based on misconception. The Tenement House Law of 1901 limited all walls including lot-line walls to one and one-half times the width of the street. The original recommendations of the Commission permitted greater heights, but required the building to set back away from the property lines so as to protect adjacent property.

Architects are perfectly familiar with the conditions which the skyscraper creates. They know exactly what should be done to make the skyscraper more desirable and to protect it from abuse. Architects are equipped more than any other group to speak for the public good and to say what should and what should not be done. Here is their opportunity to say what good standards should be. If the architects fail in this, and if the advice which they give now is shortsighted, let no architect complain in the future that he can't do better work, that he has to meet the low standards of commercialism. Rapid obsolescence and depreciation are the direct result of low standards, and the architect has had sufficient experience with these to know that the penalty which they exact is high rates of finance, over-rapid amortization, high discounts and more cash in financing and for land, and less cash for construction proper. The architect should be the champion of the people in this. He will find them willing followers, once they realize that to follow him means ultimately securing a more stable building industry and more building for the same rent. Landlords are trained in the rule of thumb, they are not analysts; most of them do not realize what the disorganized state of the housing industry means to them. By following the architects instead of the land peddlers, they can assure themselves more stability of income, for the buildings which they get for the same money will be of higher standards, not subject to such rapid obsolescence and depreciation as at present, and therefore a better and safer investment.

The illustrations given here show some of the common types of houses that have been erected since the war. In the recodification of the law the end sought should be reasonable. In certain fields the abuses

A typical row of recently built frame dwellings. They represent an uneconomic type of construction where full assessment for street opening, paving and sewer will make necessary the ultimate replacement of such housing by a more intensive development

A 3-foot court between frame buildings. An entirely uneconomic system of planning, as the narrowness of the court destroys all usefulness except for the ventilation of bathrooms or stairs. There are types identical with this being built today

have been greater than in others; the purpose should always be stabilization of income and desirability from the tenants' point of view.

In trying to be reasonable, it is necessary to take variations in land values into consideration. Some city land is of such high value that it demands a sky-scraper type of development with all apartments reached by modern, high speed elevators. Medium-priced land, on the other hand, is susceptible to development with lower buildings of the walk-up, non-fireproof type. Cheap land should involve some approximation of rural or suburban conditions. From the point of view of theory, lower-value land does make it possible to design with wider courts and better conditions of light and air; but from the point of view of law, a really desirable standard of court sizes cannot be set, because such standards might be unreasonably restrictive to higher-value property. As a result, where good standards might easily be possible, competition operates to bring all standards down to the level of the most unscrupulous. The first report of the Commission sought to get around this difficulty by setting two standards for court sizes and for bulk of building,—one for high-value and one for low-value lots. Apparently it was a tactical mistake, for this one feature of the report brought opposition from those who claimed to speak for the owners of land. Schooled to think that a permanent "Bull" market for real estate is an economic necessity, they viewed with alarm any restriction at all upon land which would limit its potential development to something less than the limits already attained by other land.

Such a view actually retards improvement, for it begins by discounting possible improvements. The assumption that the land itself will continually increase in value amounts to saying that whatever improvements are made to the land, these improvements must grow rapidly less in value, and that the land will ultimately increase sufficiently in value to offset this rapid depreciation. This is a dangerous philosophy. It ignores the consideration that the basic value of land is derived from the stable income that comes from the land. Any law which in this scientific day and age allows the uneconomical, and unreasonable over-development of land, puts a premium on plunder. The critics of the Commission's proposal to grade the restrictions imposed upon land according to the value of the land, brought in no proposal for a more equitable method. Perhaps, since it is the fools and the "suckers" who continually pay the price of over-rapid depreciation in the form of needlessly high rents, it is outside the province of the law to protect them!

The Commission was also criticized for recommending that all classes of residential buildings should be included under the Dwellings Law. A great deal of misleading information was circulated in order to stir up opposition. Individual owners were told that their homes would be made the subject of tenement inspection in regard to sanitation and cleanliness. It raised incredible alarm. What was really intended was to make it impossible to evade the law on the mere pretense that the building was of a type which did not come within the province of the law. Only by a law which recognizes all types is it possible to encourage the better types, and to put under curb the less desirable types only in cases where abuses have arisen. Whenever a law is drafted in terms that are comprehensive, it is bound to arouse opposition. Such a law cannot be passed (nor could it be enforced, if it were passed) unless it is thoroughly understood. Above all others, the architects are they who should lead in the education of the public. If the architects stand for better types in housing, they will find their leadership irresistible, and the public will give them unqualified support.

SANITARY DESIGN IN MODERN BUILDINGS —COLD WATER SUPPLY

BY
HAROLD L. ALT

THE assurance of a continued water supply at proper pressure is the most important consideration in designing sanitary equipment. While there are many comparatively small installations depending entirely on direct city pressure, the larger buildings almost invariably utilize house tanks. This is because the water reserved in the house tank is usually sufficient to carry over any temporary cut-off of the street supply, and because the use of the tank also insures a constant water pressure on the plumbing fixtures without fluctuation, such as often occurs in the city mains. It will therefore be assumed in this article that a house tank is contemplated. When the tank is made a combined house and fire tank, the capacity is often about 5,000 gallons, which allows a fire reserve of 3,000 gallons and another 2,000 gallons on top of this for building service. These two quantities are prevented from interfering with each other by taking the fire connection off of the bottom of the tank (or from the side near the bottom), and the building supply off the side of the tank three-fifths of the distance up from the bottom of the tank to the water line, as shown in Fig. 1. A 5,000 gallon tank must contain about 700 cubic feet of water, and the sides must carry up about 12 inches above the water line. Thus the dimensions of a 5,000 gallon tank could be 10 feet long by 10 feet wide by 8 feet high. The building supply opening would be on the side three-fifths of 7 feet or 4 feet, 2 inches above the bottom. With the tank full, there is available for fire use the entire contents, but with the tank drained down to the level of the building outlet,—below which it cannot go unless leaving through the fire outlet at the bottom,—there are still 3,000 gallons left for fire service. The piping in such an installation is frequently arranged as shown in Fig. 2. Of course if the fire tank is kept separate from the house tank, the building service would be taken from the bottom of the tank. In some cases the demands of the authorities for water storage are much greater. For instance, in a theater they may insist on 5,000 gallons reserve for sprinklers, 5,000 gallons more for fire standpipes, with whatever amount is desired for house service added to this (usually 2,000 to 3,000 gallons more.) This makes the combined tank capacity between 12,000 and 13,000 gallons.

House tanks must rest on substantial supporting walls or columns, since the weight of such tanks when filled is about 5 tons for each 1,000 gallons. House tanks are usually constructed of steel and are square or rectangular in shape. A middle partition is desirable with duplicate valved pipe connections to each side so that one-half of the tank may be cleaned, painted or repaired without disturbing the water in the other half. A curb angle about 3 x 3 x ⅜ inch is run around the top to stiffen the edges, and vertical angles about 2 x 2 x ¼ inch or 2½ x 2½ x ¼ inch are used to prevent the sides from bulging. The middle partition ties the two sides together and must be stiffened against pressure in either direction. Under the tank 12-inch to 18-inch I-beams are placed on edge to permit access for painting and repairs. These beams often rest in a drip pan of steel about ⅛ inch thick, the pan projecting 6 inches outside of the tank all around and turned about 3 inches around the edge. A 2-inch drain is run from the drip pan and connected to the tank overflow pipe so that any condensation occurring on the sides of the tank will run down into the drip pan. The pan is supported in turn on a second set of I-beams which are arranged to come directly under the upper tier of beams. A typical steel house tank is illustrated in Fig. 3.

In order to fill the house tank three different sets of conditions must be considered: (a) whether the normal street pressure is sufficient to fill the tank at all times without the use of a pump; (b) whether the city pressure is sufficient to fill the house tank only part of the time, and at other times is inadequate to raise the water into the tank; (c) whether the city pressure seldom, if ever, is sufficient to raise water into the house tank. In the first case, all that is required is a float valve on the tank to shut off the water whenever the tank is full and to open up the supply line whenever the water level in the tank begins to drop. In the second instance, a pump must be used to keep the tank filled during times of low street pressure. This pump should be of centrifugal type so as to allow the water to flow through it up to the tank whenever the street pressure is sufficient; there must be a float control in the tank which will start and stop the motor on the pump whenever the water line fluctuates, and there must be a ball cock on the discharge into the tank so that the street pressure will not overflow the tank continuously whenever it is high enough to force water into the tank. In the third case, any type of pump with float control from the tank will fulfill the needs.

For buildings over 150 feet in height it is advisable to use a system of water supply with two pressures, so that the water pressure in the lower part will not greatly exceed 50 pounds per square inch. A house tank may be installed somewhat above the middle story to supply the lower portion, and a second tank on the roof to supply the upper stories. These tanks may be filled: (a) by using two house pumps, one for each tank; (b) by using one house pump and pumping all the water to the upper tank with a pipe from the upper tank to the lower con-

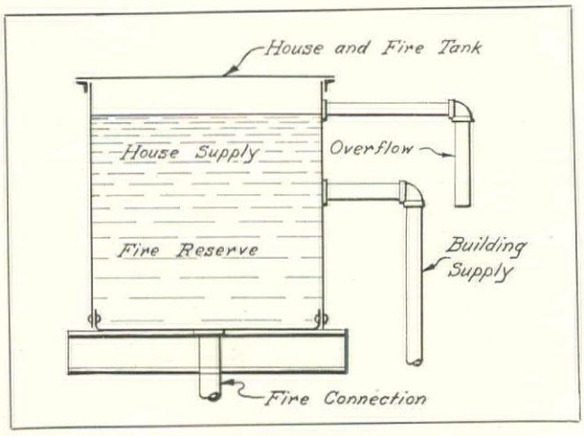


Fig. 1. House Tank, Showing Supply, Overflow and Fire Connections

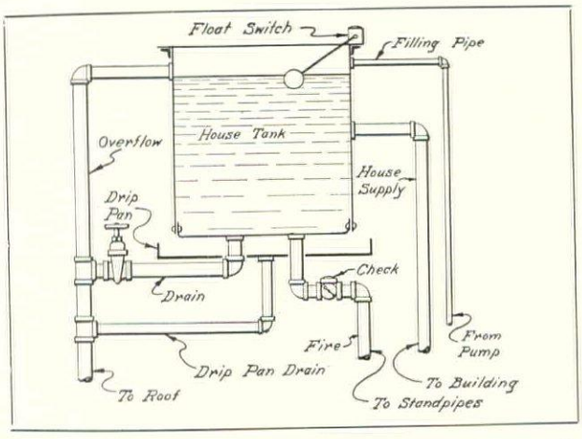


Fig. 2. House Tank, Showing Connections Frequently Employed

trolled by a float valve in the lower tank; (c) by using one house pump to deliver all the water into the lower tank and a booster pump to raise the water for the upper tank from the lower tank level. These three methods will be clearly understood by referring to Figs. 4, 5 and 6. The first method has the objection of requiring four pumps,—two to do the work and two to serve as emergency pumps in case of breakdowns. Owing to the difference in heads on the pumps, it is hardly practical to attempt to use only one pump as a standby. This method does have the advantage of economy in operation, as the water pumped to each level is only the water actually required at that level. In the second method only two pumps are required,—one being a standby,—but all the water required on the lower level must be pumped to the higher level first, and this means a much greater power consumption than in the first scheme. As a substitute for this, the lower tank may be omitted and a pressure-reducing valve placed in the line so as to cut the pressure down to the same pressure as would be obtained with the use of the lower tank. This is illustrated in Fig. 7. The

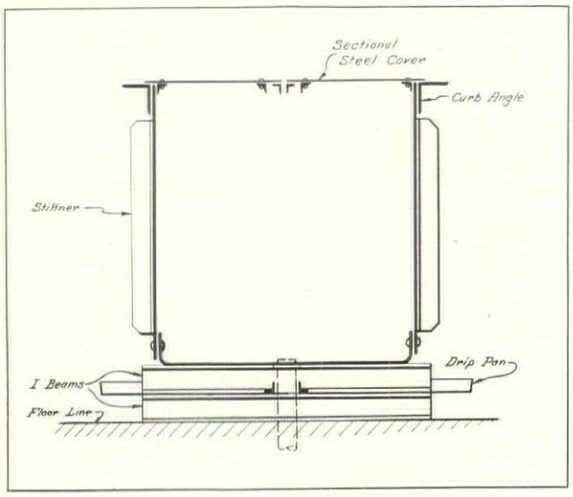


Fig. 3. Typical House Tank Construction

third method also involves use of four pumps, and has the disadvantage of having the pumps far apart. It is seldom used, possibly on account of this drawback.

The Downfeed Cold Water System. With a house tank in the building, this is the most economical method of water distribution. An overhead main is run on or above the ceiling of the top floor, usually in the furred space under the roof, and all cold water lines branch off this main and drop down the side walls or in any other position where they may be required. Branches from this main may be made from a tee turned in any direction, but the most desirable method is shown in Fig. 8. When the construction of the building is such that it does not permit the running of an overhead main, an upfeed system must be employed with the large supply pipe in the basement, and this is the usual method employed in buildings on direct pressure when the water connection from the street enters the basement. Where two pressure systems are in use, an overhead, downfeed system may be used for the upper portion and an upfeed system for the lower portion. This will eliminate horizontal piping and mains in the middle story of the building.

Pipe Sizing. The determining of the necessary cold water pipe sizes for a large installation is a matter of judgment, experience and calculation. Unless some mathematical basis is used, one error may lead to another and seriously affect the whole work. One way to check the diameter of the cold water supply pipe, either main or branch, at any particular point, is to determine the number of fixtures to be supplied and then to take each fixture or group of fixtures and determine what the average load on the line would be. In order to do this, certain factors must be assumed for each fixture according to the size. Thus, fixtures may be divided roughly in this way:

	Factor
(a) Those with ½″ connections (lavatories and sinks)	1
(b) Those with ¾″ connection (sinks, slop sinks, baths)	4
(c) Those with ¾″ to 1″ connection (urinal flush valves)	9
(d) Those with 1″ or 1¼″ connection (w. c. connections)	24

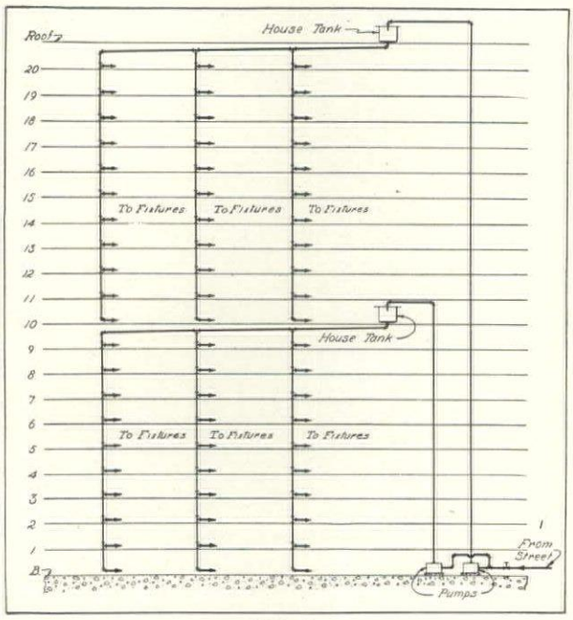


Fig. 4

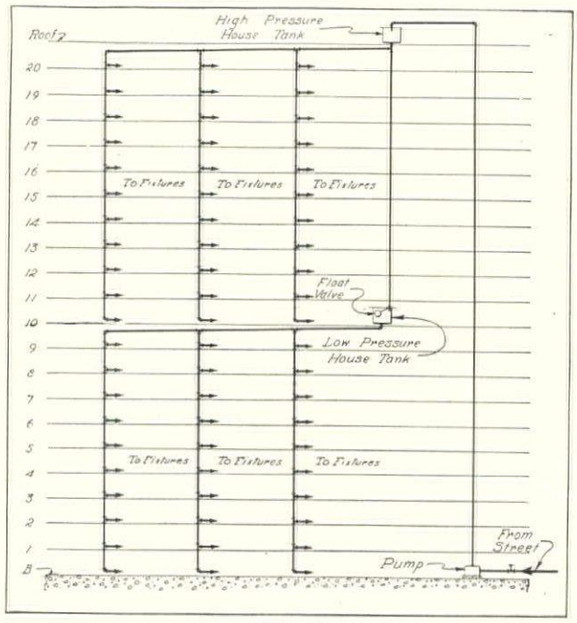


Fig. 5

The sum of all the factors on the line may then be used to determine the pipe size if this sum is first multiplied by a percentage of use based on the percentage of fixtures likely to be turned on at one and the same time.

The various sizes of pipe are also rated in corresponding factors, these being:

Size of Pipe Inches	Factor Allowed
½	6
¾	11
1	17
1¼	30
1½	40
2	66
2½	96
3	148
3½	198
4	254
5	400
6	580
8	1000
10	1600

To apply this system it is still necessary to size the first few fixtures on the branch by judgment, and then to use the factors for determining the sizes of main branches, risers, or supplies. For example, assume five toilet rooms on a riser, each toilet having

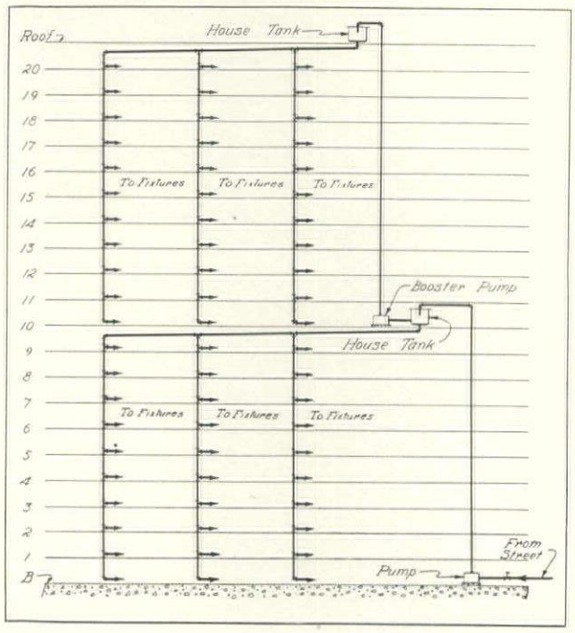


Fig. 6

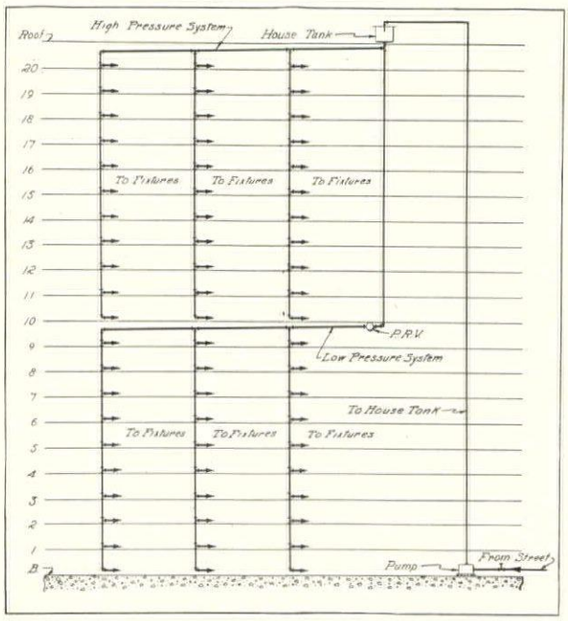


Fig. 7

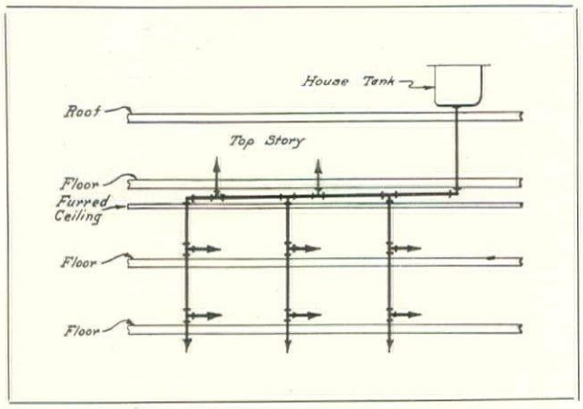


Fig. 8. Method of Connecting Branches of Downfeed System

five flush valve water closets, three flush tank urinals, five lavatories, and one slop sink; what would be the size of the branch to the toilet and what would be the size of the riser?

Fixture	Number	Factor	Equiv. Factor	Percentages of Use	Net Factor
F. v. water closets	5	24	120	40	48
F. t. urinals	3	1	3	33	1
Lavatories	5	5	25	60	15
Slop sink	1	4	4	0	0
Total			152		64

The size of pipe having a higher factor rating than the net factor as computed is 2-inch pipe. It will be noted that the "percentages of use" are based on two water closets out of five being flushed together (or 2/5, which is 40 per cent); one urinal out of three (or 1/3, which is 33 1/3 per cent); three lavatories out of 5 (or 3/5, which is 60 per cent); and that the slop sink is neglected because it is not generally in use when other fixtures are.

Since the branch to the toilet must be 2-inch pipe, the riser size to the top toilet (assuming an upfeed system) must also be 2-inch pipe. But after taking in the second toilet, the riser will begin to have a more equalized load, due to the larger number of fixtures. With a single fixture the size of pipe would have to be based on a "percentage of use" of 100, owing to the fact that when the fixture is turned on it is running at the rate of 100 per cent. But with 1000 fixtures the average use runs only about 33 1/3 per cent because all the fixtures are never turned on at the same instant. As a result of this, the "percentage of use" will constantly recede from 100 and will continuously approach 33 1/3, and, sometimes, be as low as 25 as the number of fixtures is increased. After two toilets are connected to the riser, a total of 26 fixtures is being considered, and this average "percentage of use" should approach the general average of 33⅓ by reducing the "percentage of use" to, say, 40. Then the total sum of equivalent factors (taken at 100 per cent) must be multiplied by 40 to find out the net factor for each toilet and thus multiplied by 2 for two toilets, thus:—

Total equivalent factors,—top toilet.....152
Multiplying by a percentage of 40 per cent equals:

Net factor for each toilet..... 60
Net factor for two toilets.....120
Size of pipe for this factor..... 3 inches

With three toilets the percentage of use could be reduced to, say, 38% giving

$$152 \times 3 \times 38\% = 173 \text{ factor}$$

which requires 3½-inch pipe, and with four toilets and 35% use the result is

$$152 \times 5 \times 33\ 1/3\% \text{ or } 253 \text{ net factor}$$

which also requires 4-inch pipe.

Pneumatic Tank Systems. While pneumatic tanks are seldom used for large buildings, they are sometimes installed in smaller structures and have several advantages. They may be buried with only the heads projecting through the foundation walls, or they may be set in the basements and do not introduce heavy loads at the tops of the buildings. They will give better pressures on the top floor than when a house tank is used unless the house tank is set at a considerable distance above the highest story. They have some serious disadvantages. One of these is a fluctuating pressure on the water line; that is to say when the tank is "pumped up" the pressure is high, and when the tank is "down" or close to the point where refilling must commence, the pressure is low. The less the pressure variation is made, the smaller will be the amount of available water or "storage capacity." The pressure in the tank is due to the air compressed above the water. This air generally occupies about one third of the total tank, as illustrated in Fig. 9, so that this portion of a pneumatic tank can never be used for storage of water and is lost as far as water supply is concerned. But the remaining two thirds, which is filled with water, is seldom all available because before all the water is withdrawn from the pneumatic tank the air has expanded to a point where the air pressure has fallen too low. To overcome this some pneumatic tank manufacturers put an initial air pressure of about 20 pounds, as shown in Fig. 9, on the tank before the water is pumped in. The water is pumped in against this initial air pressure, and the entire amount of water may be withdrawn from the tank before the water pressure (due to the air) falls to 20 pounds. The difficulty encountered in this procedure is that with an initial air pressure of 20 pounds, the quantity of water which may be pumped into the tank without producing excessive pressures is also reduced. In ordinary practice it is customary to decide how much pressure fluctuation it will be safe to permit on the system, and to base the pneumatic tank design on this amount. If it is assumed that 1000 gallons available water storage is desired and that a maximum pressure fluctuation of 20 pounds is permissible, the problem gets down to determining what size of tank will have the air pressure drop 20 pounds when 1000 gallons are withdrawn from it. The size of the tank and

the initial pressure can be easily calculated by the engineer of the tank manufacturer, assuming that the 20 pounds variation will occur between 60 pounds maximum and 40 pounds minimum.

Air Cushions. Every good water supply system has provision made to overcome water hammer and noise in the piping. This danger is minimized and in many cases entirely overcome by (a) employing ample pipe sizes to prevent excessive velocities in the pipes; (b) limiting the maximum pressure under which the water system operates; (c) the judicious and adequate providing of air cushions to absorb the shock of the moving water column when the flow is suddenly stopped. The impact caused by the sudden stoppage of a moving column of water is increased by increasing the velocity, by lengthening the run, by increasing the pressure, or by reducing the pipe size. An air cushion placed at the top of the riser (in a downfeed system) allows the column of water in the riser to shoot up (or down) into the air cushion, which acts to take the impact and bring the pressure to normal. Similar cushions at the end of each branch pipe, formed by turning up the end of the branch a distance of from 12 inches to 18 inches, produce similar results in the branches, and small diameter cushions just back of each fixture are frequently used in first class work. Fig. 10 illustrates a typical pipe installation with the air cushions properly placed.

There are those who argue that air cushions are an unjustified expense because they become water-logged in time and in that condition are no better than if the pipe were "dead ended" in the first place. It is quite true that the water will gradually absorb the air from a cold water air-cushion, making it useless. The air can be replaced by draining the line and then turning the water on again. Water logging does not occur on the hot water line air cushions, as the hot water constantly gives off air and automatically keeps the air cushion properly filled. There has not been offered a better or more practical solution to the water hammer problem than the use of air cushions. Air cushions are usually installed on the branch from the street to protect the meter from damage when the street pressure may be shut off and then turned on again. Another place where a cushion is particularly desirable is on the discharge side of a pressure-reducing valve to prevent noise from opening and closing of the valve.

Valving of Lines. There are three matters to be kept in view when deciding on locations of valves: (a) to locate valves so that various sections of piping may be closed off for repairs or other purposes; (b) to put in as few valves as possible, and to use one valve for as many purposes as possible; (c) to locate all valves in accessible places, so that they may be manipulated without too much difficulty. It is the general practice to place a stop valve on each fixture, particularly when the fixtures are in large groups in first class work. Stop valves are located

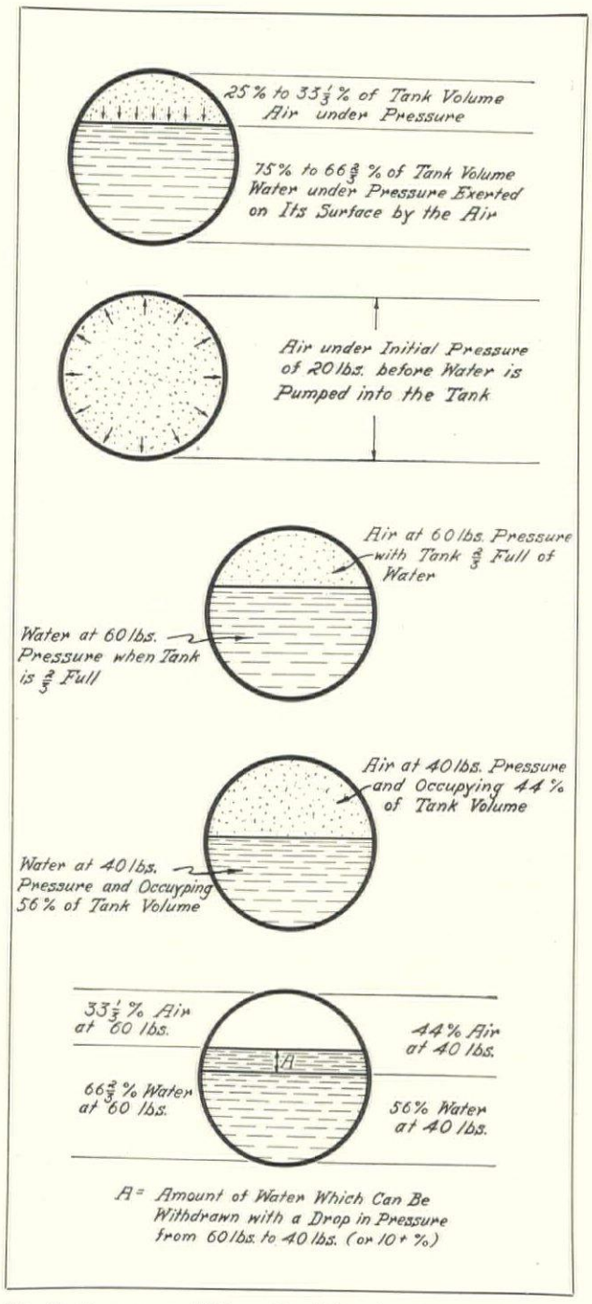


Fig. 9. Pressure and Water Conditions in a Pneumatic Tank

under lavatories, in the vertical supplies to bath tubs, and in the flush valves for water closets and urinals. Slop sinks are usually arranged with valves on the supplies somewhere in the slop closet, or the valves may be omitted on this fixture altogether. Sinks may be valved under the fixture or,—as these fixtures are usually set singly,—on the branch to the fixture. A valve is generally employed on the branch from the riser and is located close to the riser. This valve controls the branch to the toilet room and, consequently, all fixtures on that branch. In cases when the fixture branch only has a few fixtures, such as in the bathrooms of apartment houses or

hotels, it is permissible to omit the fixture valves to save on installation costs. Lavatory stop valves have an advantage in making it possible to regulate the flow from the lavatory faucets to prevent splashing.

The riser itself is usually valved where it leaves the main. This permits cutting off any particular riser in which trouble may develop without affecting any other riser. Frequently the main itself is valved at the various principal branches, but this is often omitted and may be considered as desirable but not absolutely necessary. Of course each piece of apparatus must be valved, and pumps should be valved on both suction and discharge sides, as well as having a check valve placed on the discharge between the stop valve and the pump. Water meters are valved on both sides and are sometimes provided with bypasses. The house tank is valved; the cold water to the hot water heater and the water supply to the boiler are both valved and provided with checks. Wherever a check valve is used, it is highly desirable to have a valve on each side so as to permit opening and examining the check at any time. All valves used on water lines should be of the gate type, owing to the almost negligible amount of resistance which they interpose in the line in comparison to globe valves. Customary practice employs all brass gate valves of from ½- to 2-inch size, and iron body valves, bronze mounted on sizes 2½ inches and over; they are usually of the screw type up to 4 or 6 inches, but are flanged in larger sizes.

Material of Cold Water Pipes. Cold water piping in the best work, and where character of the local water supplied permits, may be made of brass pipe, iron pipe size, or of red brass or red metal. Brass pipe usually contains about 65 per cent copper, while red brass or red metal runs to 85 and sometimes to 88 per cent of copper. There are some localities where the use of brass and red brass pipe is not practical, owing to the characteristics of the local water, and this matter should be carefully investigated. If cost is a consideration, galvanized genuine wrought iron pipe is used with excellent results. Added first cost reduction may be effected by substituting the spellerized pipe on sizes 4 inches and smaller. Above 4-inch pipe, either genuine wrought iron or steel may be used, the steel being somewhat less in price. The all-steel piping is the cheapest, where water analysis permits, and it will answer the purpose for many years. Fittings for cold water pipe are nearly always made of galvanized cast malleable iron, beaded pattern, screwed, up to 6 or 8 inches, and then flanged in larger sizes.

Underground Lines. Where water pipe is run underground and the size is 4-inch or over, regular cast iron water pipe is used, and it is not unusual to raise underground lines of lesser sizes to sizes where cast iron water pipe with calked lead and oakum joints can be employed.

Draw-offs and Drains. It is good practice to provide drains at all low points in the piping system and on risers just beyond the riser stop valve. These drains are nearly always ¾-inch size, with valves having hose threads so that a hose can be coupled on and run to floor drains or pails. To aid in this draining out, it is desirable to pitch all cold water lines back toward the riser, and the riser branches back toward the main, and the main back toward the meter, so that any line may be properly drained.

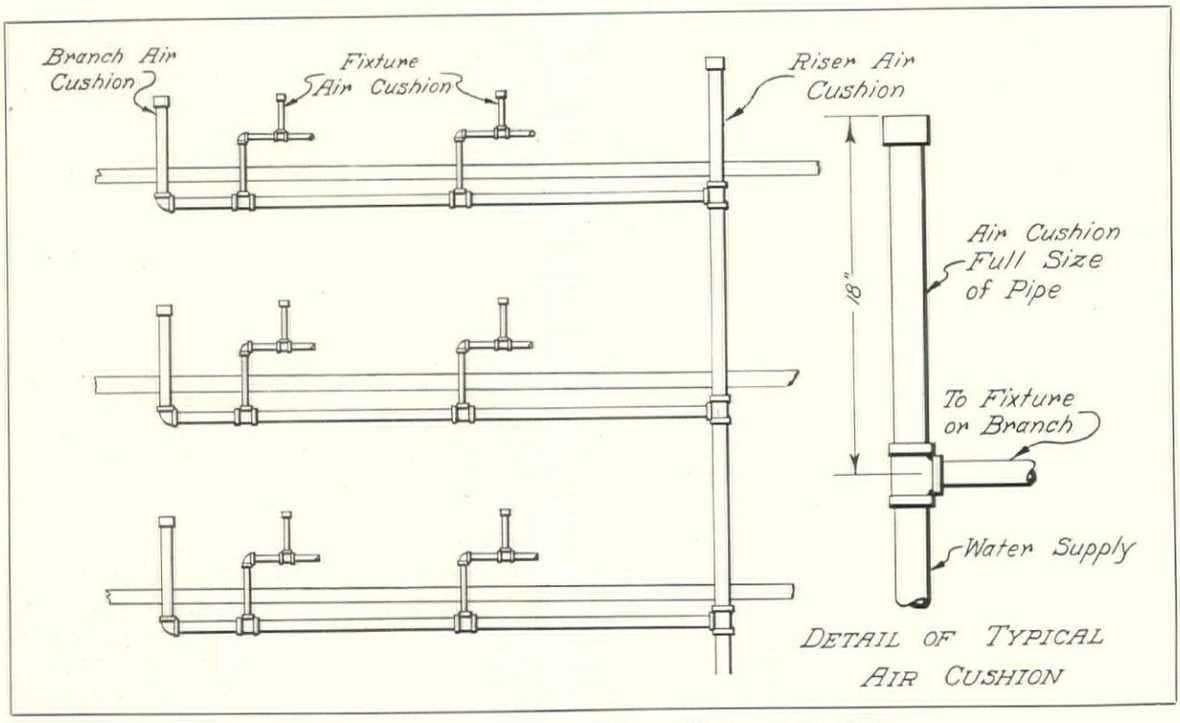


Fig. 10. Typical Air Cushion and Proper Placing of Air Cushions

THE ARCHITECT AS CONSTRUCTOR

PART III—OPERATING A CONSTRUCTION ORGANIZATION

BY
WILFRED W. BEACH

IN preceding articles on this subject, in THE ARCHITECTURAL FORUM for May and August the author discussed the possibility and feasibility of members of the architectural profession attempting to circumvent an apparently increasing tendency of general contractors and constructing engineers to include in their proffered services the functions of the architect. Obviously, the services of an architect are essential to the success of a building, if it be of any consequence. Whether or not the services of the general contractor are likewise, may be considered open to question. If either is to survive to the exclusion of the other, it would seem probable that the individual who creates is most likely to be he who will carry on. But we are facing no such extremity.

The pertinent thing we are presumably facing is the loss of particular commissions to contractors who "furnish plans." If there be owners who prefer this sort of service,—who are convinced that the method is fundamentally sound,—why should it not be the duty of the architect to accommodate them, especially if the architect can convince himself that both client and the architect as builder are to profit considerably thereby? We have therefore shown how it is possible for the architect to acquire new business of this character, and have set forth a contract form to cover an agreement with such a client (THE ARCHITECTURAL FORUM, August, 1928, Part II). The signing of the first of such contracts by the architect should be indicative of his fixed intent to add field construction to the functions of his office. The departure is too comprehensive to be invoked for a single operation, there to deliberately stop. To be sure, he is burning no bridges by the innovation. So long as he guarantees no costs, he is in no way jeopardizing his status as an ethical architect, nor is he necessarily setting himself at loggerheads with the better class of contractors. They may not approve of his entering their fenced preserves, but they will still (most of them) continue to bid on his work when invited, knowing that he will not ask them to waste time figuring on work which is not intended to be let. In other words, one can be both architect and cost-plus builder without encountering insurmountable obstacles.

Having secured the contract, one proceeds to organize the project while working drawings are being completed. One must determine what work is to be sublet and what is to be executed with one's own forces, and must prepare specifications accordingly. It will be found that the duties of the office man in charge of contracts and construction have increased many fold, and that he must be prepared to meet them, whether he be the architect himself or an employe. It may be found advisable to bring in a construction manager from outside if no one in the organization has special fitness for the tasks confronting the office. On the other hand, an architect with inclinations in that direction can readily augment his knowledge of the subject by reference to any one of several up-to-date books on construction methods and management. As work increases, one will add departments of purchasing, expediting, accounting etc., always holding down the overhead to its efficient minimum.

The trades most generally handled through foremen are concrete work, masonry, carpentry, lathing, plastering and painting. General excavating had best be sublet, as a rule, because of the special equipment needed and because men in that line generally know what to do with excavated material. Such a contract should not include the necessary hand-digging of pits and trenches, which can better be handled by common labor under the general foreman or a "straw boss." Piling and deep foundation work, with its necessary shoring, should also be sublet to experienced concerns equipped to do such special work. But by the time the constructing architect is ready to execute large work and heavy construction, he will have gained the necessary preliminary experience and will have found that each commission presents its own problems, beginning with the excavating and continuing through the last detail of the decorating and equipping.

Bids are taken and contracts awarded on the items first needed, as rapidly as drawings and specifications can be issued to bidders. In addition to asking bids of local concerns, if the work be outside a large city, one makes careful canvass of all others available, getting, if possible, three or more bids on each subcontract and material list. The preparation of the latter is, of course, new procedure for the architect. A builder does not hand a set of prints and specifications to a material supply house as he does to a plumber or other subcontractor. Instead, he prepares itemized schedules of lumber, brick and the like, and gets prices accordingly. Contrary to general opinion, there are no standard fixed prices of building materials. There are "list prices" and "quoted prices" and "customary prices,"—and there are also the "prices that are necessary to get the business." Hence the perspicacious purchasing agent. He is quite likely to find that some of the owner's "friends" in the building supply business have had their eyes on this particular project for some time,

and have perhaps been avidly anticipating their profits. In this, as in all other lines of commerce, there are two distinct classes, each intent upon doing the "right thing." But to one, it means the right thing for the *customer,* and to the other the right thing for the *dealer.* To the latter, a legitimate profit means whatever he can get. The purchasing agent must be able to discriminate, as it is up to him to adequately protect the owner against those of his neighbors who are out to gouge him. Furthermore, they would like to be able to show their regular customers that they exacted toll from the outsider. The owner will give his builder a list of those from whom he wants prices,—he may even secure some of the prices himself,—but he should be explicit as to which if any he wishes to have specially favored. Frequently, the association or connection between owner and purveyor is so close that the former especially welcomes the intervention of a purchasing entity to shoulder all responsibility. The construction architect has no axes to grind but can distribute his favors exactly as he and the owner decide is best for the project. They may decide that the ownership of stock or a position on the board of a company does not warrant buying from the incumbent at fat prices, as a local builder might have to do.

As has been intimated, no one individual is more vital to the success of the undertaking than the general foreman. It is to be assumed that he will be chosen with the utmost discrimination. If new to the organization, he will be brought into the office and made thoroughly familiar with its general practice and with the intended procedure in his particular work. He will take time to familiarize himself with the drawings and specifications, material lists and subcontracts. If he is being merely moved from job to job, he can do this in the field. Nevertheless, it is well to give him time between assignments to come into the home office and be checked up,—to get acquainted with his co-workers. It makes *esprit de corps.*

In any event, it is essential that the home office shall have prepared a detailed set of instructions to superintendents or general foremen (as they may be called). Oral advice lacks uniformity, adequacy and force,—leaves too much to the judgment of the individual. He has abundant opportunity to exercise his initiative, even after complying with all home office "red tape." After digesting his instructions, his experience will tell him what is mandatory as well as where he is supposed to "use his head." But, for regular procedure, he should be placed in a position to know what is expected of him without having to ask. If he is the right type of man, he will appreciate printed instructions, even though his previous employers have had nothing of the kind, and any advice may irk him somewhat. Some of the best foremen will put all their energy into pushing the work ahead rapidly and capably but, when it comes to keeping their records and correspondence in shape, they will be beautifully "balled up." They are simply not office men. Foremen of that type should, if big enough, be used on larger work where one or more clerks can be assigned to assist in the time keeping, petty purchasing, receiving, storekeeping, expediting, cost accounting (distributing), and correspondence. It is up to the construction manager to determine how much of such "overhead" the work requires. It is easier to provide too much than not enough. There should be no one in the job office whose time is not fully employed,—crowded. Nothing so demoralizes a field organization as lack of employment. If clerks haven't enough to do to keep them busy, their spare time should be given to such manual labor as can be assigned them. If their white collars are inclined to wilt too much in arduous toil, they may as well get out of the building game before they have wasted too much time at it. This applies to foremen as well. The working foreman who forgets to watch his men while he is working with them may be a poorer investment than he who does nothing but oversee them. The most valuable type is the man who can do both efficiently. Foremen's time goes on whether the work does or not. When interruptions occur and men must be laid off, the good foreman allows nothing to slacken, but pitches in at whatever he can do to lessen the expense of the lull, whether it be for a day or a fortnight.

The drawing up of a set of instructions for the guidance of general foremen should deal with fixed office practice as applicable to the average project. Special conditions demand specific rulings, and no attempt need be made to provide for such exceptions in a formal guide. The instructions included here have been in practical use for some time, being revised as was proved necessary by experience.

1. *The General Foreman's Responsibilities.* The general foreman will act as the representative of the building company on the job and will have entire charge of it under instructions from the home office. He will lay out all the work and superintend all construction and be solely responsible. He will *personally* sign all payrolls, reports, and correspondence.

2. *Drawings and Specifications.* The general foreman will be supplied with as many copies of prints and specifications as may be necessary for his own use and for the use of subcontractors and foremen; he must keep careful record of them, and see that they are not mishandled or mislaid.

3. *Issues and Revisions.* Preliminary prints are sometimes issued for the purpose of starting excavating or foundations before working drawings are completed. When these or later prints are superseded by revised issues, the general foreman shall make careful note of all changes and their effect, if any, on the work already done or laid out, and shall have a distinct understanding with the home office regarding it. He shall also observe due caution that superseded prints are marked "Void" and not left accessible, where they might be subject to misuse.

4. *Checking.* As soon as prints and specifications are received, the general foreman shall carefully review and compare them and check all features in a

general way. He shall then notify the home office that this has been done, calling attention to errors or discrepancies, if any have been noted. This is important and must not be delayed; it may affect later work.

5. *Job Program.* As soon as the construction manager has assigned a general foreman to a project, they will confer and outline a job program, by means of which will be determined the sequence for ordering all materials, dates when they should be ready, and the degree of advancement of the whole work at each fortnightly interval. It shall thereafter be the duty of the general foreman to live up to this program or to show reason for each specific lapse.

6. *General Purchasing.* General purchasing is done through the home office, each order in triplicate;—one to the vendor, one to the general foreman, and one to the home office file. If the owner so requests, a copy is sent him also.

7. *Material Lists.* The general foreman (or such other person as designated by the home office,) will prepare accurate lists of all materials for the work, except such as are included in subcontracts. If not prepared by the general foreman, they must be checked by him and either approved or criticised before being requisitioned. Lists must cover exact materials specified, or else adequate reason be given for variation. They must also state the use of each article listed, the time it is needed at site, how it is to be delivered, and whether quantities given are net or whether allowance is made for waste and shrinkage.

8. *Requisitions and Expediting.* As soon as possible after a project is assigned, program arranged, material listed and checked, the general foreman shall begin requisitioning the home office for material and shall continue doing so in proper time and due sequence until all has been taken care of. Each requisition shall be accompanied by approved material lists, if needed, the number of the purchase order, if one has been issued, and such information as the general foreman has to offer as to the best available source of supply, proper price, etc. He is expected to make all requisitions well ahead of time needed (which shall be stated on requisitions), and to follow up requisitions, not permitting the home office to lose sight of his necessities. Slackness in this particular is much worse than over-insistence. Whereas the general foreman is giving his whole attention to his particular work, he should bear in mind that it is only one of several in the home office, and hence his is the greater responsibility. If he foresees delay in receipt of anything, he should use his best efforts to expedite it or, if beyond his ability to do so, he should ask the home office for special assistance.

9. *Job Purchase Orders.* The general foreman (or the purchasing agent assigned) will make such purchases from local dealers as have been previously arranged for by the construction manager. For all such purchases (except items of less cost than $1, bought out of petty cash) a job purchase order must

PURCHASE ORDER

THE W. W. BEACH COMPANY
ENGINEERS ARCHITECTS BUILDERS
SIOUX CITY, IOWA

OWNERS COPY

ADDRESS _____

DELIVER TO THE W. W. BEACH CO. AT _____

CARE OF _____

VIA _____ R. R. OR EX.

P. O. NO.
(This number must appear on your invoice)

NAME OF JOB _____

CHARGE TO
WORK ORDER NO. _____

ORDERED _____

REQUIRED

EACH ORDER MUST HAVE A SEPARATE INVOICE, RENDERED IN TRIPLICATE, SENT TO US AT

INVOICES NOT IN OUR OFFICE BY THE THIRD DAY OF THE MONTH FOLLOWING DATE OF DELIVERY, WILL BE TREATED IN ALL RESPECTS AS THE FOLLOWING MONTH'S INVOICES.
PAYMENT FOR MATERIAL ON THIS ORDER WILL BE MADE ON THE 15TH OF MONTH FOLLOWING DELIVERY, AND 2% DEDUCTED UNLESS OTHERWISE AGREED.

THE W. W. BEACH COMPANY

REQUISITIONED BY _____

_____ PURCHASING AGENT

Fac-simile of Purchase Order Blank
(Original size 8½ by 11 inches)

be written beforehand in quadruplicate. If it is a cash item, one copy goes to job file and three to home office, each receipted by vendor (in place of an invoice). For items to be charged, the original of the four copies shall be given to vendor. Only such charge accounts should be opened as seem absolutely necessary, favoring such dealers as the owner prefers or as make best prices consistent with quality, and as give best service. All job purchase orders must be numbered consecutively, from No. 1 up, and each number accounted for to the home office, even though canceled, in which latter case, the reason for cancelation should be given. Wherever possible, purchase prices should be given on orders.

In all purchasing, note particularly that needs should be studied and lists made of all required materials which can be obtained from a single vendor, and competitive prices secured where possible; then the list should be ordered all at once,—enough, but not too much.

Single rush orders of small items mean added costs, additional bookkeeping and possible delays.

Telephone orders should be used only for emergency, and should be followed at once by job purchase orders confirming.

Cash should never be paid for any item to a vendor with whom there exists a charge account.

No general foreman or other employe should open a charge account away from home. They shall pay cash and their credit will not be recommended.

10. *Construction Forces.* One of the first duties of a general foreman upon arriving at a job will be to examine the local labor situation and report upon it in detail to the home office, advising what can be counted upon, what preferences are expressed by the owner, and any other suggestions of value. He will confer with the construction manager on the subject from time to time and will follow his instructions, employing always the best men available, at rates determined, getting best values at all times. In general, skilled labor should never be employed for work that can be done more economically by common labor. Workmen will be paid only for time actually employed, unless other special provision is approved by the home office. Over-time is only to be used when expressly pre-arranged for or in actual emergency. Foremen are to be employed only when the number of men in any trade warrants. The work done by themselves, as well as by the men under them, should be kept at maximum, just the same as if directly overseen by the general foreman. A week's work will consist of 44 to 60 hours' regular time, depending upon the season and the project's requirements, of which all employes are to be kept informed. Holidays will be observed, except in emergencies (approved by home office), and no pay allowed for them, unless pre-arranged. Pay for transportation or other unusual expenses must also be pre-arranged.

11. *Subcontracts.* When expedient, subcontracts will be let for specific work. The general foreman will be provided with copies of all such contracts and specifications governing them and will act as inspector of all work included therein; he will see that ample notice is given each subcontractor ahead of time such work is needed (particularly for members to be built into walls and concrete), that all provisions of such contracts are properly fulfilled, that the work is properly correlated with that of others,

This Report must give a complete accounting of *all* material on hand and received; its use, etc. Record must be carefully kept from day to day; balanced weekly and made out in triplicate each Tuesday. One copy each to Owner, Home Office and Job.

THE W. W. BEACH COMPANY
ARCHITECTS ENGINEERS BUILDERS
SIOUX CITY, IOWA

WEEKLY MATERIAL REPORT

FROM _____ TO _____

OWNER: _____
LOCATION: _____
JOB NO.: _____
DATE: _____

DATE	MATERIAL	QUANTITY REC'D	COST				PREVIOUSLY ON HAND	QUANTITY USED	HOW USED	BALANCE ON HAND
			RATE	AMOUNT	FREIGHT	HAULING				

SIGNED _____ SUPERINTENDENT

Weekly Material Report (Size 8½ by 11 inches)

DAILY CONSTRUCTION REPORT

A report must be fully made out in duplicate, one kept on job and one mailed promptly to Home Office, six days a week and also on Sunday, if work is done that day. Each report must be an accurate record of conditions existing, job requirements, causes of delay etc.

THE ABCDEFG COMPANY
ENGINEERS ARCHITECTS BUILDERS
CHICAGO. ILLINOIS

OWNER
LOCATION
JOB NO.
DATE

WORK DAY NO. FORCE WORKED HOURS WEATHER CONDITIONS A.M. P.M. TEMP. To

NUMBER AND KIND OF WORKMEN EMPLOYED

ABCDEFG Co's. PAYROLL				OTHER PAYROLLS			
TRADES	FOREMEN	MEN	TOTAL	TRADES	FOREMEN	MEN	TOTAL
OVERHEAD AND OFFICE MEN							
GRAND TOTAL				GRAND TOTAL			

Work to-day Consisted of

Cause of Delays, if any

Material Needed *Ordered (When)*

Expedited (How) *Expected (When)*

Drawings or Information Needed

First Requested

Daily Letter

(Use Other Side if Necessary) (SIGNED) GENERAL FOREMAN

Daily Construction Report Blank (Size 8½ by 11 inches)

and that amounts of partial payments demanded are proper and duly proportionate. Prior to the letting of such contracts, either by the home office direct or by the general foreman under order from the home office, it is essential to know (1) the general reputation of the party whose bid it is proposed to accept; (2) his equipment and other fitness for the work; (3) the attitude of his employes toward the architect's organization and its probable effect; and (4) the name of his liability insurance company and number of his policy, if the contract is to include labor at the job.

12. *Permits and Ordinances.* Before beginning a given project, the general foreman must familiarize himself with local and state ordinances and laws relating to the work and shall take out and pay for such permits as may be required, notifying the home office if any bonds are necessary. In general, subcontractors for plumbing, wiring and the like will secure their own permits, but the general foreman must see that those who do such work are properly licensed. Great care must be taken as to street and alley obstructions and occupancy of adjoining property.

13. *Insurance, Accidents, Etc.* The owner will carry fire insurance on work and equipment, and the company will maintain workmen's compensation insurance, but the general foreman will be expected to do all in his power to prevent fire and accidents, maintaining temporary fences and barricades, danger signs, "No Smoking" notices, red lights and other means of warning employes and the public. He must personally inspect all equipment, hoists, ladders, scaffolding, shoring and other possible sources of danger, known capacities, and see to and

make everything safe. He will be supplied with a "first aid kit" and must make himself and at least one other man familiar with its use, as well as seeing that it is kept properly filled. Telephone numbers of doctor, hospital, ambulance service, police and fire department must be prominently displayed in the office. All accidents must be reported promptly to the proper authorities and in detail to the home office, giving cause, result, treatment, present status, attending physician and means adopted to prevent the recurrence of accidents. Try to prevent the first accident as well as the next. Do not permit men to ride on material hoists.

14. *Temporary Buildings.* Such temporary structures as are directed by the construction manager, built as he instructs, are to be located to the best advantage and constructed as soon as possible after the arrival of the general foremen, who shall bear in mind their possible use in cold weather and also their value and disposition at completion of the work.

15. *Daily Construction Reports.* Daily construction reports are to be made out in duplicate, the original sent to the home office (mailed on day it records), and duplicates kept in proper sequence in job file. When so directed, a third carbon copy must be provided for the owner. Each detail of required information must be clearly given, and the progress of work from day to day given in percentages on in manner directed by the construction manager. No letter, other than that on the daily report, to the home office is necessary.

16. *Job Correspondence.* In general, all correspondence relating to a job will be handled by the home office, with copies to the general foreman of such letters as are needed in job file. The general foreman will hold to a minimum all correspondence with outsiders, thus avoiding duplicating the work of others. Emergency matters having to do with expediting, corrections, etc., should be handled promptly by mail, telephone or telegraph, with copy to the home office in each case. All correspondence regarding shop drawings, also their checking, will be handled by the home office, but copies will be sent the general foreman for approval or record. These and all other correspondence records shall be carefully filed. All mail for the work will be directed to the company, for which purpose the general foreman shall promptly provide a street address or will rent a post office box, if preferable.

17. *Telephone and Telegraph Service.* On day of arrival at a job, the general foreman will call at the local telegraph and telephone offices and make arrangements for prompt service, both day and night. If a job phone is to be installed, the contract should be made at once in the name of the company, so that it can be put in as soon as the office is ready. Unless confirmation is made by job purchase order, all telephone calls of importance must be recorded in duplicate on "Telephone Record" blanks, one copy to home office and one to job file. A third copy must be made of messages of sufficient importance and sent to other party to the conversation for confirmation. Such confirmation may be a deciding factor in some important matter.

18. *Changes* from the work as laid out by drawings and specifications are always a fruitful source of error and expense and are to be avoided as much as possible. The general foreman must never suggest a change to the owner nor allow another employe to do so. Advice and constructive criticism are always welcomed, but the home office will take care of all business dealings with the owner. The general foreman is sent out to construct the building in accordance with drawings and specifica-

WEEKLY PAYROLL REPORT

THIS PAYROLL MUST BE MADE OUT IN TRIPLICATE EACH WEEK AND DUPLICATES SENT TO HOME OFFICE NOT LATTER THAN THE FOLLOWING TUESDAY

THE ABCDEFG COMPANY
ENGINEERS ARCHITECTS BUILDERS
CHICAGO, ILLINOIS

OWNER
LOCATION
JOB NO.

FROM TO DATE

NO.	NAME AND TRADE	WORKED AT	DATE / DATE	S	S	M	T	W	T	F	HOURS	TOTAL HOURS	RATE	AMOUNT
	TOTAL													

(SIGNED) GENERAL FOREMAN

Weekly Payroll Report Blank (Size 8½ by 11 inches)

tions and has no authority to make any change whatever without first consulting the construction manager or home office. The home office must receive immediate notification in event of any dispute with or expression of dissatisfaction on the part of the owner, and that portion of the work affected shall not proceed until a decision (permanent or temporary) has been made.

In the same way these important subjects are taken up in order and specific instructions given:

19. Extra Work Orders
20. Payrolls
21. Funds for Payrolls and Incidentals
22. Hauling
23. Returnable Items
24. Transferred Items
25. Weekly Cash Reports
26. Tool Reports
27. Equipment Reports
28. Weekly Material Reports
29. Cost Accounting
30. Cost Schedule.

In General. The loyalty of the home office to the interests of the owner is its first consideration, but the success of its building methods depends largely upon the loyalty of employes to the home office. The first sign of dissatisfaction on the part of the owner is generally found to be due to gossip of disappointed local competitors or of their employes or some one who has been discharged. This should be watched and defeated if possible, the home office being always kept informed. The owner must be shown a whole-hearted attention to his interests that is thoroughly convincing. The general foreman should also keep the home office fully informed as to all other matters relating to the work in hand and regarding any other items of building activity or prospects in the vicinity in which the home office might be interested. While the particular work in hand is supposed to demand all of the general foreman's time (including overtime when necessary) regardless of regular hours, it is assumed also that he will be alive to what is going on around him,—that he possesses something better than a "one-track mind." He will be expected to so conduct himself and his affairs as to obtain these results when the work is completed: A. A first quality structure, as set forth in drawings and specifications. B. Completion according to time schedule or better. C. Closure or complete adjustment of all unsettled matters and accounts preparatory to the final billing. D. A written acceptance by the owner, to be obtained by the construction manager, indicating entire satisfaction.

The foregoing instructions, although apparently somewhat lengthy, will by no means be found adequate for all work. Much still devolves upon the construction manager in the way of advice, and still more upon the experience and initiative of the general foreman himself. In this article, we are dealing only with the duties of purchasing and supervising. Auditing and accounting require the services of an expert bookkeeper. Hence, with proper care in building up his field organization, it should be apparent that the high class architect is at least as well qualified to engage in actual building as is the general contractor to undertake to do his client's planning.

THE W. W. BEACH COMPANY
ARCHITECTS AND ENGINEERS
SIOUX CITY, IOWA

CERTIFICATE FOR PAYMENT

JOB NO:
CERTIFICATE NO:
DATE:

To _____

This certifies that _____ Contractor for _____

For your _____ at _____

_____ entitled to _____ payment on account under his contract to the amount of

_____ Dollars ($_____)

Contract Price	
Extras	
Deductions	
Total Contract	
Previously Allowed	
This Certifitate	
Allowed to Date	
Balance	

THE W. W. BEACH COMPANY, Architects.
By _____

Received the amount of above certificate.

_____ 19.— _____

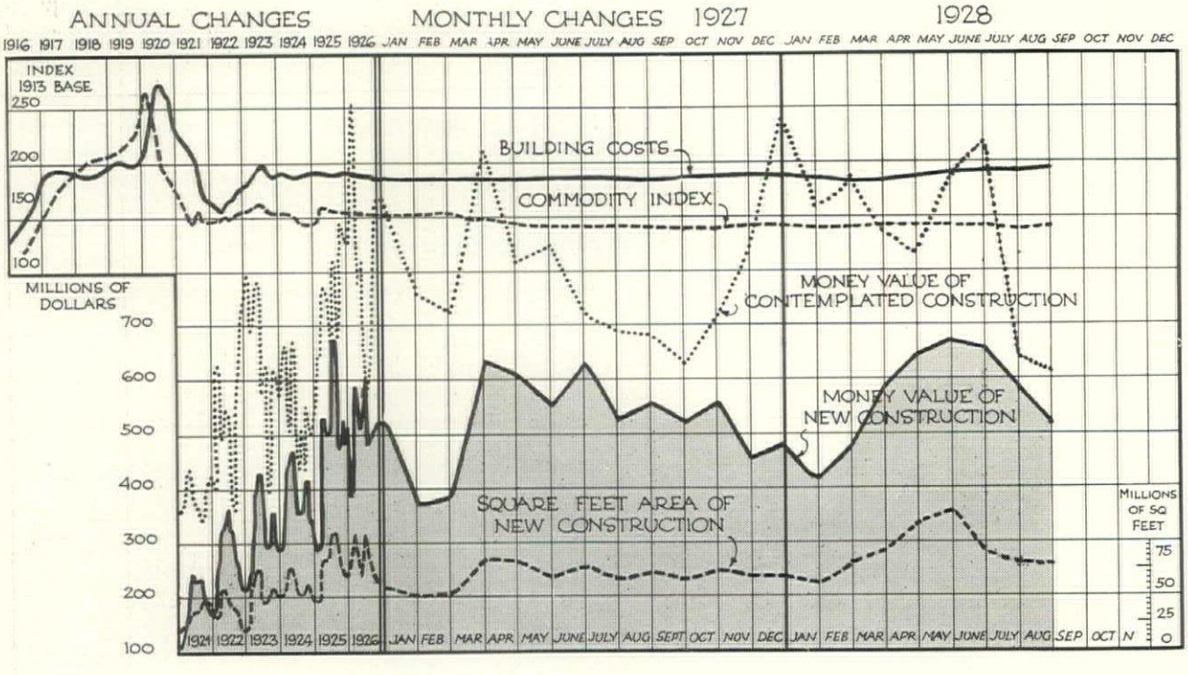
Certificate for Payment used by the Author

THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

THE usual summer slump in both the volume of new construction and the amount of contemplated work took place during July and August, although not in sufficient measure to prevent the first seven months of the year from establishing a new record for the total amount of construction. According to the figures of the F. W. Dodge Corporation, the building and engineering contracts awarded during July in the 37 states east of the Rockies amounted to $583,432,400. This represents about 91 per cent of the entire country, and the figure was the highest July contract total on record. It was 9 per cent ahead of the July, 1927 total, but was a drop of 10 per cent from the total for June of this year. Two districts made new high totals for the month of July, —the Middle Atlantic States and the Central Western States (which enjoyed the highest monthly totals ever made in these territories, while the New England and the Southeastern States exceeded the volume of construction over July, 1927. In New York state and northern New Jersey, in the Pittsburgh district, the Northwest, and in Texas there was a decline as compared with July, 1927 figures; and only in the Central Western, the Northwestern and in the Southeastern States, did July totals exceed the figures recorded for the preceding month of this year.

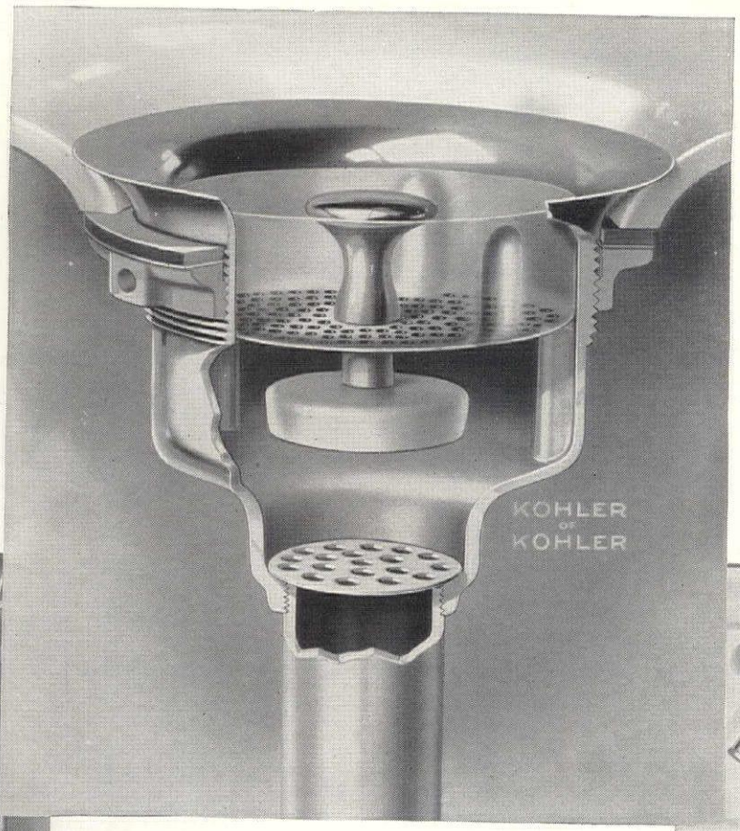
The distribution of building construction by types showed $228,734,800 or 39 per cent of the total for residential construction; $137,074,700 or 23 per cent for public works and utilities; $95,696,800 or 16 per cent for commercial buildings; $36,926,400 or 6 per cent for educational projects; and $31,399,800 or 5 per cent for industrial projects. A decided drop in new work contemplated took place during July, the total for the month being $647,682,700, which is a loss of 37 per cent from the amount reported in June, 1928, and a drop of 7 per cent below the amount reported for July of last year. In August construction contracts to the amount of $516,970,200 were awarded in the Eastern States, which is about 11 per cent below the July figure and 6 per cent below the figure for August, 1927. The New England States and the Northwest were the only two districts showing increases over their July, 1928 records, and the Central West, Northwest, and Southeastern States were the districts which showed increases over their records for August of last year. The total amount of new building and engineering work started since the first of the year amounts to $4,545,270,100, an increase of 6 per cent over that of 1927.



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.* Value 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.

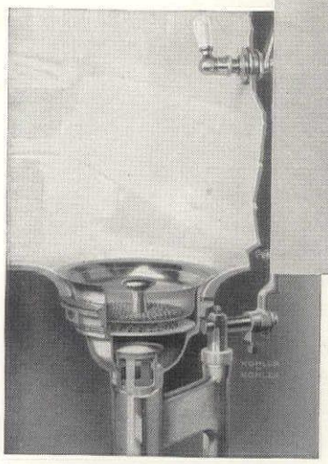
The
Kohler Duostrainer
Lever Type

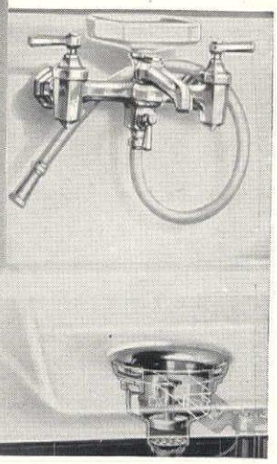
Turn lever . . . drain opens or closes . . . cup lifts out for easy emptying . . . regular equipment on all Kohler Electric Sinks



Here's Where
The Duostrainer
Goes

Takes place of old-style open drain . . . traps water in sink . . . makes dishpan unnecessary . . . the modern sink fitting





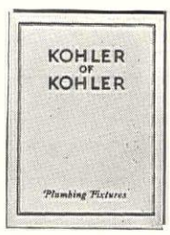
The Kohler Duostrainer—*Hand Type*
(in open position)

Raise cup . . . water rushes out . . . cup catches debris . . . lifts out for easy emptying . . . sink holds water just like lavatory bowl . . . hallmark of the ultra-modern sink . . . available on ALL Kohler apron sinks

Women are enthusiastic *about this Kohler fitting*

Women are the best critics of kitchen sinks. They know what they want—at least when they see it! And they have received the Kohler Duostrainer so enthusiastically that it is rapidly replacing the old-style open drain.

No sink installation now need be without this admirable convenience. The complete Kohler line of sinks offers Duostrainer-equipped models suited to every situation.



Specification Service for Architects

This service provides correctly drawn specifications in handsome form for presentation to clients and others. Your office is invited to make the fullest use of it.

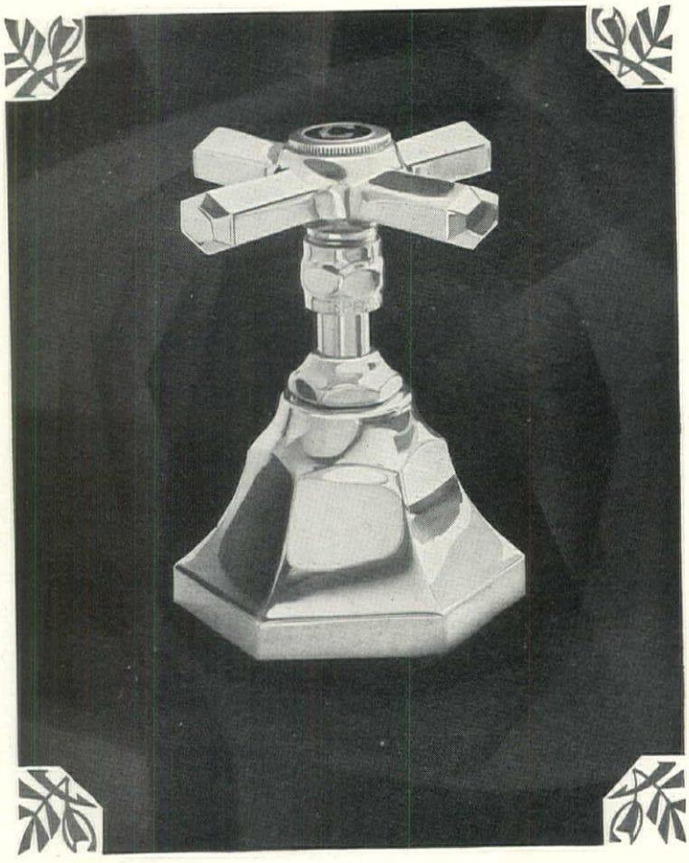
Your clients, once they know about this new, modern improvement, will be sure to want it.

Kohler sinks are made in the full range of Kohler Colors, and may be had in Kohler Flint-gloss acid-resisting enamel—exceptionally durable and lustrous. And then there are the Kohler Electric Sinks for dishwashing and clotheswashing. A remarkable line!

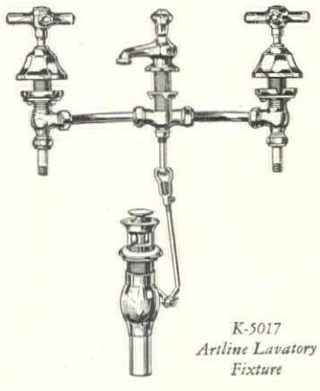
KOHLER CO., *Founded 1873,* KOHLER, WIS. · *Shipping Point,* Sheboygan, Wis. · *Branches in Principal Cities*

KOHLER OF KOHLER

Plumbing Fixtures



New brilliant beauty that can never tarnish



K-5017
Artline Lavatory Fixture

THE Speakman Artline group sets new high standards for beauty and permanence in fixtures. In distinction of design, line and finish, it stands absolutely alone.

Artline fixtures are finished in brilliantly-bright Speakman chromium-plate, which has a depth and richness far surpassing that of other finishes. They never darken, rust or tarnish. They are *always* new, even after years of the hardest usage.

Specifications are in the Speakman catalog.

SPEAKMAN COMPANY
Wilmington, Del.

SPEAKMAN SHOWERS & FIXTURES

NEW

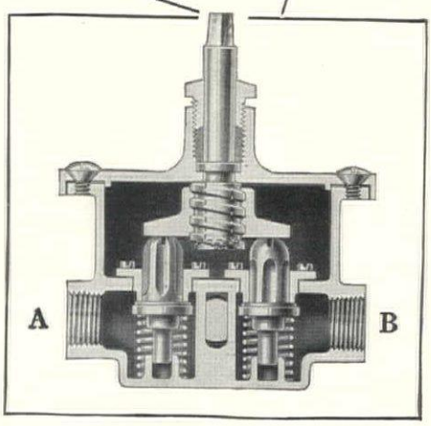
Diagram shows New Clow "Triumph" mixing valve. Cold water valve at right opens first; the water enters at B. Hot water valve follows; the water enters at A. Cold water valve shuts off before the hot water is full on. Note how water presses *with* the closing of this valve—not against it. Note also phosphor bronze springs which help closing of both valves.

The New Clow "Triumph" Mixing Valve

The new Clow "Triumph" Shower Mixing Valve closes *with* water pressure—not against it. Moreover, phosphor bronze springs on both hot and cold valves further insure a proper closing each time. Water cannot trickle, to cause wear on seats.

And the seats are renewable. They are not threaded, but are held in place with screws. A few turns of a screwdriver removes them. No wrench is needed.

The Clow Mixing Valve is just one of the new "Triumph" line of fixtures. Write us for further information on this line of "15 year tested" fixtures.



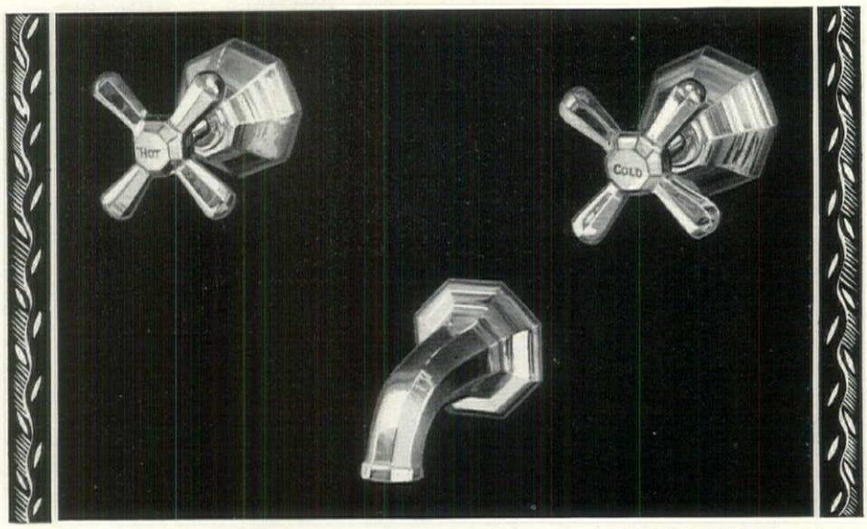
JAMES B. CLOW & SONS, 201-299 N. Talman Avenue, CHICAGO
Sales offices in principal cities

CLOW

PREFERRED FOR EXACTING PLUMBING SINCE 1878

The BRILLIANT CRODON FINISH

- - - of plumbing fixtures never will water-spot, tarnish or corrode - -



Fixtures by Peck Bros. and Co.

BRIGHT gleaming surfaces . . . beautiful to the eye . . . non-tarnishing . . . everlasting even though handled constantly . . . these are CRODON features that greatly improve the lifelong appearance of plumbing fixtures.

For CRODON'S initial lustre does not fade with time. Bathroom, kitchen and public wash room fixtures, plated with this durable chromium plate, retain their beauty always.

And true cleanliness is made easy to attain. Polishing and constant care are unnecessary. An occasional wiping is all that's required.

Because their finish is permanent . . . because maintenance is low . . . CRODON fixtures are being used more and more in hotels, hospitals, apartments, public buildings and homes. To supply the growing demand manufacturers and jobbers carry them in stock. Builders hardware and other metal fittings are also finished in CRODON in ever-increasing numbers.

Our Service Department would welcome the opportunity to furnish full details about CRODON and its advantages . . . they will gladly refer you to our licensees if estimates for any building project are wanted.

CHROMIUM CORPORATION OF AMERICA

120 Broadway . . New York City

Branch Offices and Plants:

4645 West Chicago Ave., Chicago, Ill. — 3125 Perkins Ave., Cleveland, O. — *and at Waterbury, Conn.*

Metal and Thermit Corp., *Agents*, South San Francisco, Cal.

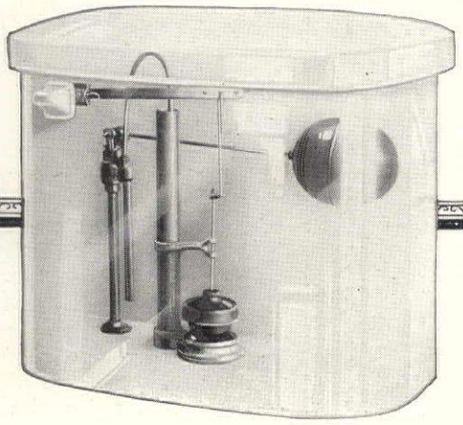
CRODON

TRADE MARK REG. U. S. PAT. OFF.

THE CHROME PLATE

PERMANENTLY BEAUTIFUL - DOES NOT TARNISH - WEARS INDEFINITELY

China Tanks are Best



This phantom view of the "Te-pe-co" Bellemeade China Tank illustrates the simple, practical set of tank fittings with which it is equipped. No effort has been spared to develop their high efficiency.

"The Place for the Low Tank"

"EVERYTHING in its proper place"—a platitude often quoted. This applies to water closet tanks and flush valves. Both have their place. Both have their advantages for certain purposes and we recommend the installation of them accordingly. Our years of experience in manufacturing water closets for every type of building has proved the china tank to be the better means of flushing any closet which has a syphonic action. We particularly recommend it for all residential work and believe every well-informed plumber and architect will, too, for the following reasons:—

1st *Efficiency in Flushing*

The flush tank with proper fittings not only flushes the bowl as thoroughly with the same quantity of water, but it is also much quieter in operation.

2nd *Pressure Requirements*

In some localities the flush valve is simply out of the question because the fluctuation in pressure during certain hours of the day interferes with its operation, while in others there is not sufficient pressure to work it at all. Still worse is the growing community where the increasing demands on the water supply and corroding of pipes reduce the pressure to such an extent that the flush valves, which could at one time be operated, have to be replaced with a flush tank.

3rd *Relative Maintenance*

When equipped with properly-constructed fittings the flush tank is practically trouble-proof and requires far less replacement or adjustment of parts than a flush valve, particularly in communities that are troubled with corrosive water or other water impurities.

4th *Appearance*

The glistening impenetrable surface of a china tank is imperishable and will retain its brilliancy of finish permanently. It cannot tarnish and requires no polishing to keep in a clean, sanitary and presentable condition.

5th *Dependability*

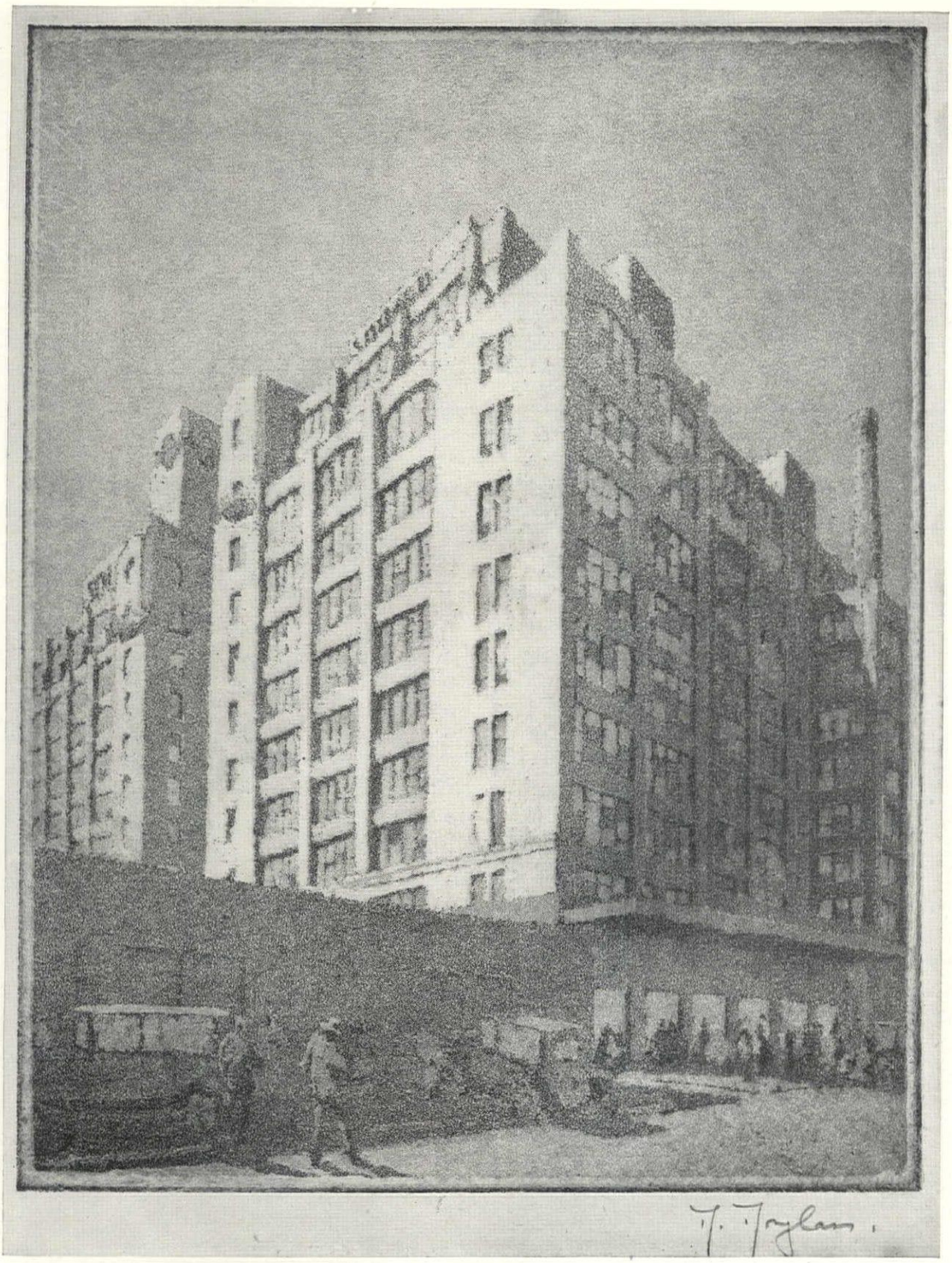
The flush tank never fails to operate when water is being drawn at a lower level which reduces the pressure and frequently interferes with the operation of a flush valve.

6th *Relative Cost*

The larger size piping that is required to insure the proper operation of a flush valve even where there is adequate water pressure at least doubles the cost of such an installation over one with a first-class flush tank.

THE TRENTON POTTERIES COMPANY
Trenton, New Jersey, U. S. A.
Boston New York San Francisco Philadelphia
World's Largest Makers of All-Clay Plumbing Fixtures
Export Office—115 Broad St., New York City

TE-PE-CO
ALL-CLAY PLUMBING FIXTURES



Presenting new standards of beauty in bathroom furniture

The book shown above illustrates and describes the latest de luxe creations by Maddock in lavatories, toilets, dressing tables and bidets.

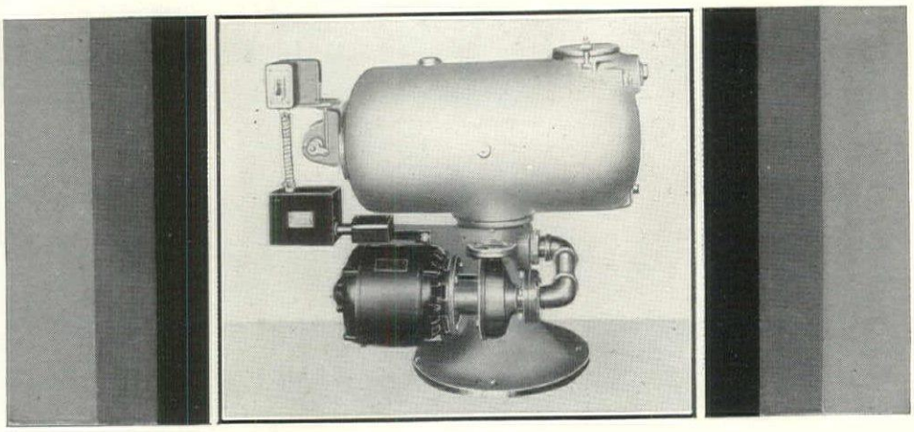
New and exclusive Blentone color effects in vitreous china, blending two-tones with the beauty and lasting charm of the sunset . . . striking new models in white . . . trimmings and legs in gleaming china, sparkling chromium-plate and glowing gold-plate of outstanding design . . . commanding sanitary superiorities!

A book full of new decorative thought and suggestion for the architect in planning the bathrooms for distinctive modern homes.

This book is too expensive to be sent out broadcast, but will be mailed immediately to architects who request it on their professional stationery.

THOMAS MADDOCK'S SONS CO., TRENTON, N. J.

New Trane Condensation Pump Develops Amazing Capacity



Assembled on one base and wired for installation

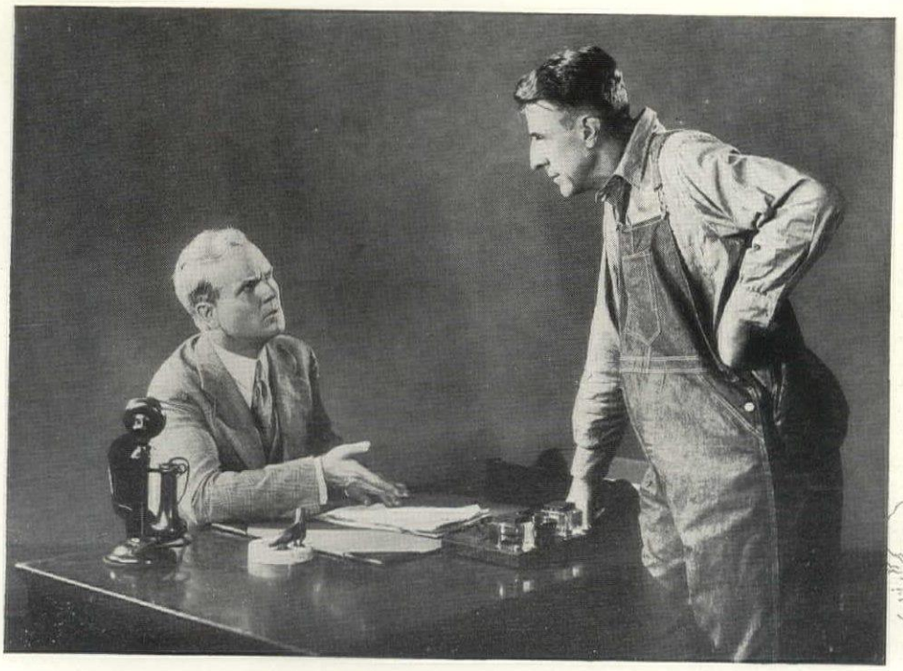
This new model upsets all previous standards in centrifugal pumps. ¾ H. P. motors do work that has required one or 1½ H. P. in the past. On the larger pumps, 7½ H. P. motors do work that has always required ten. The new design is remarkably compact and light in weight, yet sturdy in construction. Capacities are higher, operation costs are reduced. And prices are still low.

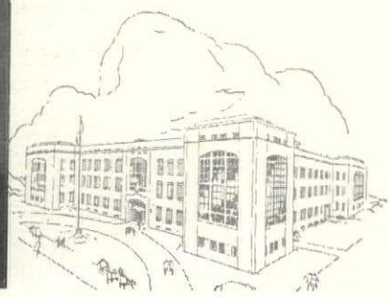
This is the simple pump outfit you have been waiting for. The pump, motor, receiver, switch box, and motor protective equipment are mounted as a single unit on one base. The contractor has nothing extra to buy. A one-man job of installation. Hook up the feed wires, make two simple pipe connections, and the pump is ready to operate.

The same new features of construction are embodied in pumps for boiler feed, booster, circulating, and general service. Write for new bulletin containing complete information.

THE TRANE CO. (Est. 1885)
220 Cameron Ave. La Crosse, Wis.

VACUUM CONDENSATION **TRANE** CIRCULATING BOOSTER
PUMPS





Couldn't the Architect foresee this?

This one bill wipes out all we saved.

I know, Mr. Olds. It isn't the first one we've had; and I'm afraid there'll be more like it.

But surely this is abnormal. These pipe lines aren't a dozen years old. What does it mean?

Cheap pipe. That's about all you can expect from it, in our kind of service and with our water what it is. Good wrought iron lasts at least twice as long. Any experienced architect ought to know that.

What are we using for all these replacements? The same stuff?

No indeed, Mr. Olds. Genuine wrought iron. Byers—the best that's made. Of course it's rather discouraging to patch up with good pipe when you know other parts are sure to break down shortly. But in the end, we'll have a complete Byers installation.

Shall we be tearing down and replacing the same walls and floors two or three times over?

Oh, no, Mr. Olds! We look out for that. Of course, we don't open up a section until we have to; but when we do, if it's in a concealed place, and hard to reach, we see that every inch is replaced with Byers Pipe before we leave it.

It's a pity we allowed the original pipe specifications to be changed. But it looked like an easy way to save money—at the time. Guess the architects knew what they were doing when they specified Byers. But what gets me is this: Why didn't they object more strenuously when we set out to substitute cheaper pipe?

THE incident related is only too typical of what is taking place in buildings of every type, in every part of the country, erected ten to twenty years ago and equipped with cheaper, less rust-resisting pipe than Byers. Repair expenses, even for a few failures, soon wipe out everything saved initially, and become heavier from year to year.

Byers Pipe, because made of highly rust-resistant wrought iron, costs from 60 to 80% more than ordinary black and galvanized pipe, *but installed in the system,* it adds only about 5% to the cost. Thus, for 5% more, you obtain a system which will last from 100% to 200% longer.

A. M. BYERS COMPANY

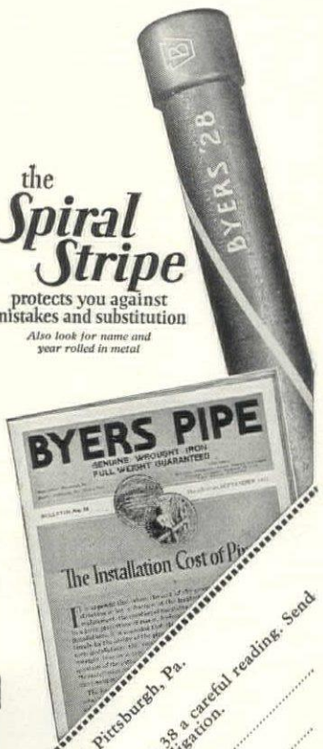
Established 1864 Pittsburgh, Pa.

Distributors in all Jobbing Centers

Send for Bulletin No. 38

"The Installation Cost of Pipe." Contains cost analyses of scores of heating, plumbing, power and industrial pipe systems.

Shows the high cost of replacing rusted pipe and the folly of using cheap pipe.



the *Spiral Stripe*

protects you against mistakes and substitution

Also look for name and year rolled in metal

BYERS PIPE

GENUINE WROUGHT IRON

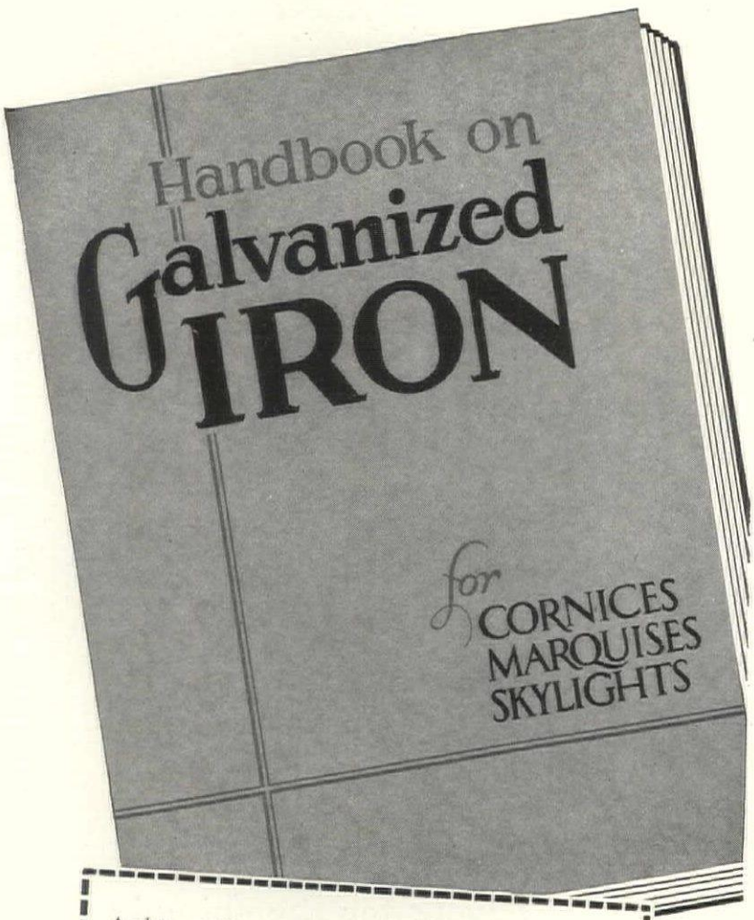
A. M. Byers Company, Pittsburgh, Pa.

Gentlemen: I will give Bulletin No. 38 a careful reading. Send me a copy without obligation.

Name .....

Address .....

Here's Your Copy Mr. Architect....



"GALVANIZED Iron for Cornices, Marquises, and Skylights" is a new book that you will find invaluable in every-day practice. It comes to you free, with the compliments of ARMCO.

Here is an informative book designed especially for the busy architect, and prepared with his every possible requirement in mind. Between its covers is a veritable wealth of information on practical construction details of various types of cornices, marquises, and skylights. Specifications are suggested. Finally, there is a special chapter devoted to the economy of rust-resisting pure iron.

Several prominent and competent architectural and sheet metal firms contributed of their knowledge and experience to make this book an authoritative work. No pains were spared to insure its being correct, concise, comprehensive, and practical.

Now you can get the information you need on cornices, marquises, and skylights from one complete book. No more poring through many volumes in quest of the right data and suggested plans. It's all here and available for instant use.

Your copy of "Galvanized Iron for Cornices, Marquises, and Skylights" is ready for you. Where shall we send it? Your request on your firm letterhead brings it. Or, use the handy coupon.

Architects' Sheet Metal Service Bureau
The American Rolling Mill Company
Middletown. Ohio

The description of your "Galvanized Iron for Cornices, Marquises, and Skylights" sounds interesting. I shall be glad to have a copy.

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Firm.....

Street.....

City..... State.....

(A. F. 9-28)

THE AMERICAN ROLLING MILL COMPANY

Executive Offices, Middletown, (O)

***Export:* The ARMCO International Corporation**

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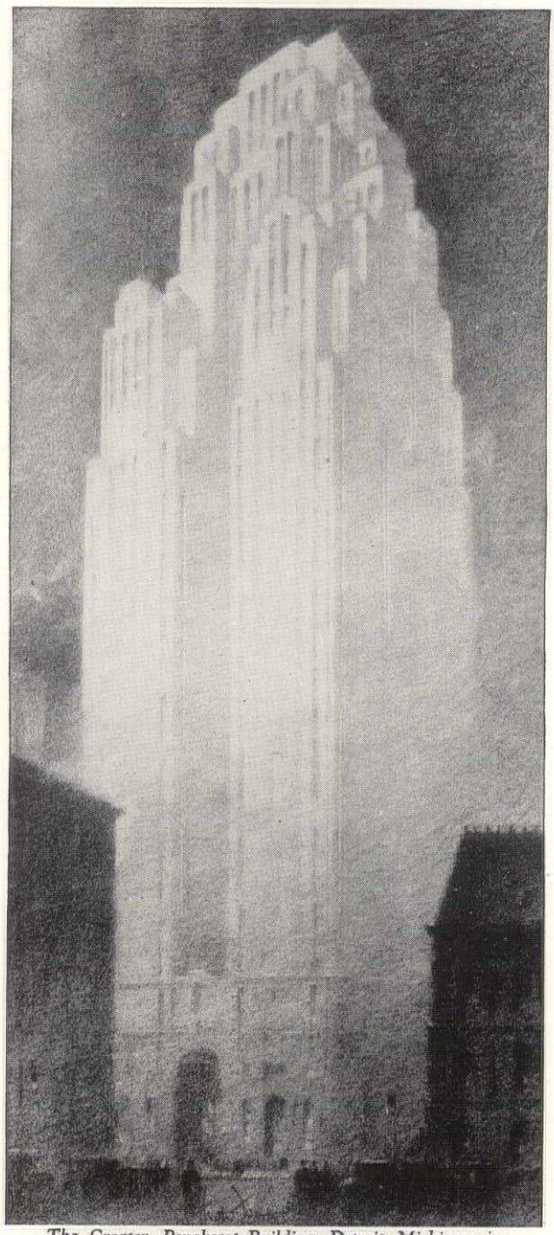
ARMCO
INGOT IRON
RESISTS RUST

Steel-Trained Counsellors



The Greater Penobscot Building, Detroit, Michigan, in which Youngstown Pipe was used in plumbing and sprinkler systems; Youngstown Buckeye Conduit for the electrical wiring, both for building and elevators; Youngstown Sheets for the ventilating system.

Architects—Smith, Hinchman & Grylls. *Advisory Architects*—Donaldson & Meier. *General Contractor*—Albert A. Albrecht Co. *Plumbing Contractor*—Harrigan & Reid. *Electrical Contractor*—Hatzel-Buehler Co. *Owners' Construction Manager*—T. McInerney.

YOUR specification writers are urged to call freely on the nearest Youngstown district sales office for advice on any problem connected with the selection of pipe, conduit or sheet metal.

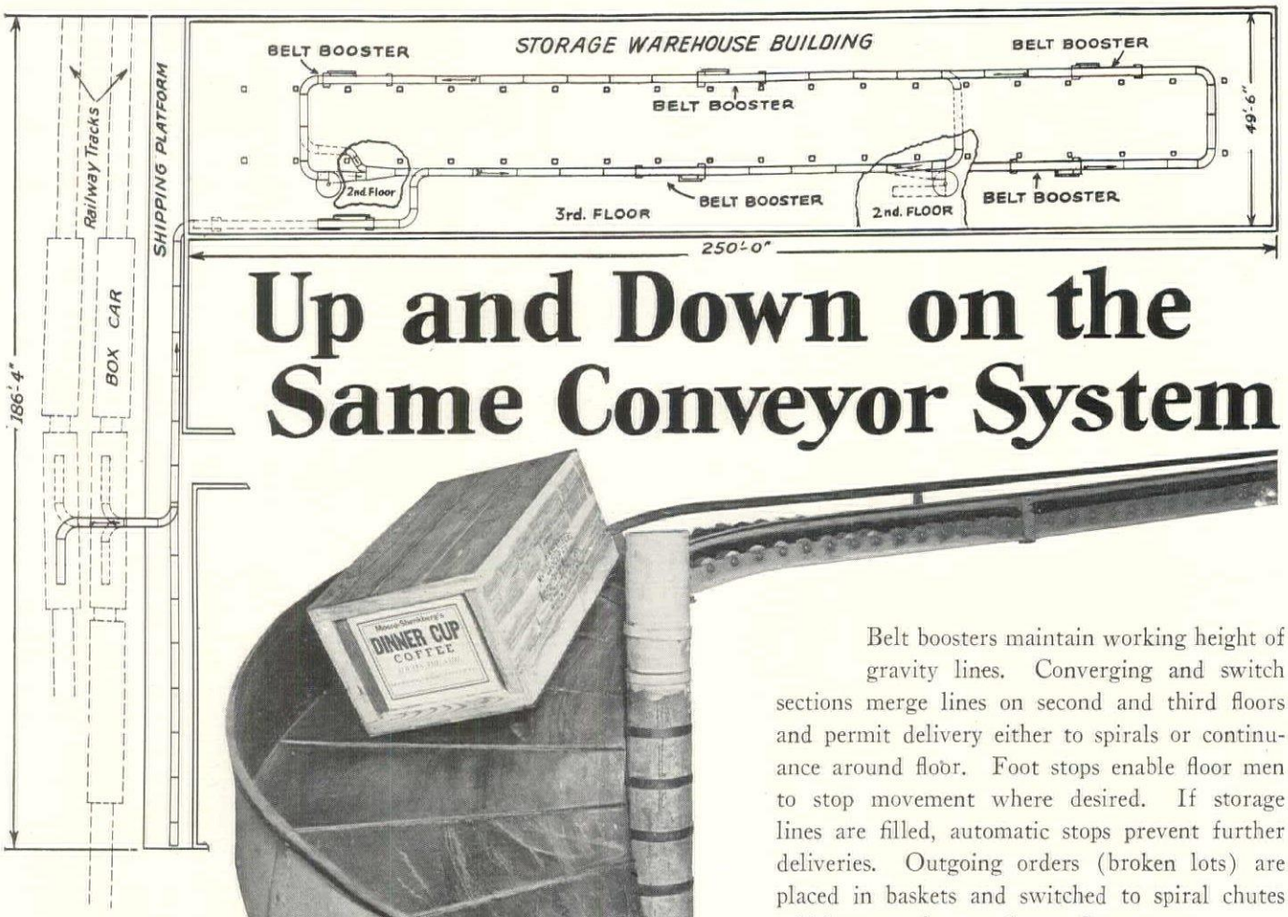
Each Youngstown representative brings to an architectural office intimate, first-hand steel lore acquired by thorough schooling, often backed by actual mill experience. In addition, should the problem prove to be new and particularly complex, he has immediate access to the service and research of the Youngstown Sheet & Tube metallurgical laboratories, all without expense or obligation on your part.

THE YOUNGSTOWN SHEET & TUBE CO.
General Offices: Youngstown, Ohio
Sales Offices in 20 Cities

"Just Ask"

PIPE SHEETS CONDUIT

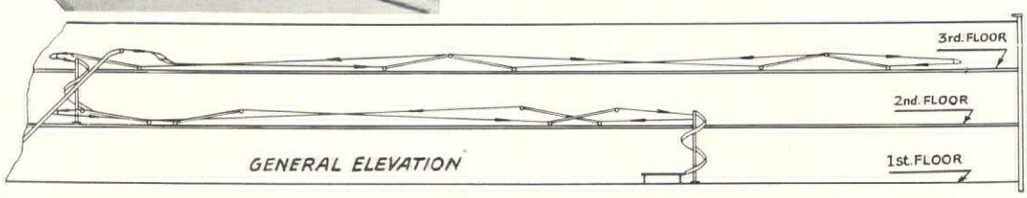
YOUNGSTOWN



Up and Down on the Same Conveyor System

Belt boosters maintain working height of gravity lines. Converging and switch sections merge lines on second and third floors and permit delivery either to spirals or continuance around floor. Foot stops enable floor men to stop movement where desired. If storage lines are filled, automatic stops prevent further deliveries. Outgoing orders (broken lots) are placed in baskets and switched to spiral chutes which carry them to lower floors.

Portable conveyor extends directly into freight cars, the line being reversible to either end of car. Cars do not need to be definitely spotted. This is due to terminal slide which can be hooked on main line rollers at any point.



An excellent example of a system embodying two ideas, namely—gravity roller is principal unit with power conveyor used for securing grade; also, same system is used for both incoming and outgoing merchandise. Primary purpose is to carry incoming commodities such as cased goods, cartons, etc., from cars on track to second and third floors of warehouse for storage. At same time system being continuous, delivers to spiral chutes terminating on first floor where outgoing orders are checked and packed for shipment. An idea particularly adaptable for use in storage warehouses. More complete information as to costs and details gladly sent on request to any interested architect.

STANDARD CONVEYOR COMPANY

NORTH SAINT PAUL, MINNESOTA

New York Office, 420 Lexington Avenue
Chicago Office, 549 West Washington Street
Philadelphia Office, 3110 Market Street
Cleveland Office, 1108 Hippodrome Building
Buffalo Office, 908 Ellicott Square

Kansas City Office, 419 Manufacturers' Ex. Bldg.
Milwaukee Office, 209 Wisconsin Avenue
Los Angeles Office, 335 So. San Pedro St.
Seattle Office, 321 Lumber Exchange
Charlotte Office, 301 Builders Bldg.

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*, 383 Madison 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.

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

AIR FILTERS

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.

BASEMENT WINDOWS

Genfire Steel Company, Youngstown, Ohio.
Architectural Details. Booklet, 28 pp., 8½ x 11 ins. Details on steel windows. A. I. A. File No. 16E.

BATHROOM FITTINGS

A. P. W. Paper Co., Albany, N. Y.
Onliwon for Fine Buildings. Folder, 8 pp. 3¼ x 6 in. Illustrated. Deals with toilet paper fittings of metal and porcelain.
Architects' File Card. 8½ x 11 in. Illustrated. Filing card on toilet paper and paper towel cabinets.
A Towel Built for Its Job. Booklet, 8 pp. 4¼ x 9⅝ in. Illustrated. Paper Towel System and Cabinets.
Cabinets and Fixtures. Booklet, 31 pp. 5¾ x 4¾ in. Illustrated. Catalog and price list of fixtures and cabinets.

BRICK

American Face Brick Association, 1751 Peoples Life Building, Chicago, Ill.
Brickwork in Italy. 298 pages, size 7½ x 10½ in., 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 in. 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, 15 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.

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.

International Cement Corporation, New York.
Incor Cement. Brochure, 12 pp., 8½ x 11 ins. Illustrated. Data on a perfected, early strength Portland cement.

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

Lawrence Cement Co., New York, Boston and Philadelphia.
Dragon Super Cement. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Data on a vaduable waterproof material.

Louisville Cement Co., 315 Guthrie St., Louisville, Ky.
BRIXMENT for Perfect Mortar. Self-filing handbook 8½ x 11 inches. 16 pp. Illustrated. Contains complete technical description of BRIXMENT for brick, tile and stone masonry, specifications, data and tests.

Missouri Portland Cement Company, St. Louis, Kansas City, Memphis.
Twenty-four Hour Cement. Booklet, 15 pp., 8½ x 11 ins. Illustrated. Data on a cement which makes a quick-drying concrete.
Precautions for Concrete Paving Construction in Cold Weather. Folder, 4 pp. 6 x 9 ins.
Design and Control of Concrete Mixtures. Booklet, 32 pp. 8½ x 11 ins. Illustrated.
Concrete Paving Construction in Hot Weather. Booklet, 11 pp. 6 x 9 ins. Illustrated.

North American Cement Corporation, 285 Madison Ave., New York.
The Cal Boon. Brochure. 32 p. 6 x 9 ins. Illustrated. Use of Cal in Portland Cement mixtures.

Pennsylvania-Dixie Cement Corp'n., 131 East 46th St., New York.
Celluloid Computing Scale for Concrete and Lumber, 4⅝ x 2½ ins. Useful for securing accurate computations of aggregates and cement; also for measuring lumber of different sizes.

CEMENT—Continued

Portland Cement Association, Chicago.
Concrete Masonry Construction. Booklet, 47 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.
Town and Country Houses of Concrete Masonry. Booklet, 19 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 Mixtures. 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

Celite Products Company, Chicago, New York, Los Angeles.
Designing Concrete for Workability as Well as Strength. Brochure. 8 pp. Illustrated. Data on how improved workability in concrete is secured without excessive quantities of water.
Better Concrete; Engineering Service Bulletin X-325. Booklet, 16 pp., 8½ x 11 ins. Illustrated. On use of Celite to secure workability in concrete, to prevent segregation and to secure water-tightness.
Economic Value of Admixtures. Booklet, 32 pp., 6⅛ x 9⅛ ins. Reprint of papers by J. C. Pearson and Frank A. Hitchcock before 1924 American Concrete Institute.

Concrete Surface Corporation, 342 Madison Ave., New York.
Bonding Surfaces on Concrete. Booklet, 12 pp., 8 x 11 in., illustrated. Deals with an important detail of building.

Kosmos Portland Cement Company, Louisville, Ky.
High Early Strength Concrete, Using Standard Kosmos Portland Cement. Folder, 1 p., 8½ x 11 in. 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 in. Illustrated. Data on coloring for floors.
Dychrome, Concrete Surface Hardener in Colors. Folder. 4 pp. 8 x 11 in. 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 in. 32 pp. Illustrated. A treatise on fireproof floor construction.

Northwestern Expended Metal Co., 1234 Old Colony Building, Chicago, Ill.
Northwestern Expanded Metal Products. Booklet. 8½ x 10¾ in. 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, 160 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.

DAMPPROOFING

Genfire Steel Company, Youngstown, Ohio.
Waterproofing Handbook. Booklet. 8½ x 11 ins. 80 pp., A. I. A. File No. 7. Illustrated. Thoroughly covers subject of waterproofing concrete, wood and steel preservatives, dusting and hardening concrete floors, and accelerating the setting of concrete. Free distribution.

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

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

The Vortex Mfg. Co., Cleveland, Ohio.
Par-Lock Specification "Forms A and B" for dampproofing and plaster key over concrete and masonry surfaces.
Par-Lock Specification "Form J" for dampproofing 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.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 155*

DOORS AND TRIM, METAL

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

Richards-Wilcox Mfg. Co., Aurora, Ill.
Fire-Doors and Hardware, Booklet. 8½ x 11 in. 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.

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.

DUMBWAITERS

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

ELECTRICAL EQUIPMENT

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

Benjamin Electric Mfg. Co., 120 So. Sarigamore St., Chicago.
Reference Wall Chart, 22 x 28½ ins. "Enables one to select at a glance the right type of reflector or other lighting equipment."
Benjamin-Starrett Panelboards and Steel Cabinets. Booklet, 80 pp. 8½ x 10½ ins. Full data on these details for light and power.
Benjamin-Starrett Panelboards for Light and Power. Booklet, 80 pp., 8½ x 11 ins. Illustrated. Full data on company's line of panelboards, steel cabinets, etc.
Benjamin Electric Ranges. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Data on an excellent line of ranges for apartment house use.

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.

Pick & Company, Albert, 208 West Randolph St., Chicago, Ill.
School Cafeterias. Booklet. 9 x 6 in. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

Signal Engineering & Mfg. Co., 154 W. 14th St., New York.
Signal Call Code System. Booklet, 16 pp., 8½ x 10 ins. Illustrated. Important telephone accessories.
Fire Alarm Systems,—Bulletin A-35. 12 pp., 8½ x 9½ ins. Illustrated. Data on fire alarm equipment.
Electrical Signaling Devices and Control Equipment. Booklet, 11 pp., 8½ x 11 ins. Illustrated.

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, 13 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.

ELEVATORS—Continued

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.

FIREPROOFING

Concrete Engineering Co., Omaha, Nebr.
"Handbook of Fireproof Construction." Booklet, 53 pp., 8½ x 11 in. Valuable work on methods of fireproofing.

Genfire Steel Company, Youngstown, Ohio.
Fireproofing Handbook, 8½ x 11 in. 32 pp. Illustrated. Gives methods of construction, specifications, data on Herringbone metals, lath, steel tile, Trussit solid partitions, steel joists, Self-Centering formless concrete construction.

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

FLAGSTONES

J. G. Robinson, 6202 Germantown Avenue, Philadelphia.
Robinson Flagstones. Brochure, 12 pp., 8½ x 11 ins. Illustrated. Data and Specifications.

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. 23 pp. 8½ x 11 in. Illustrated. Valuable work on an important subject.

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.

FLOORS—STRUCTURAL

Truscon Steel Co., Youngstown, Ohio.
Truscon Floretyle Construction. Booklet, 8½ x 11 in., 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.

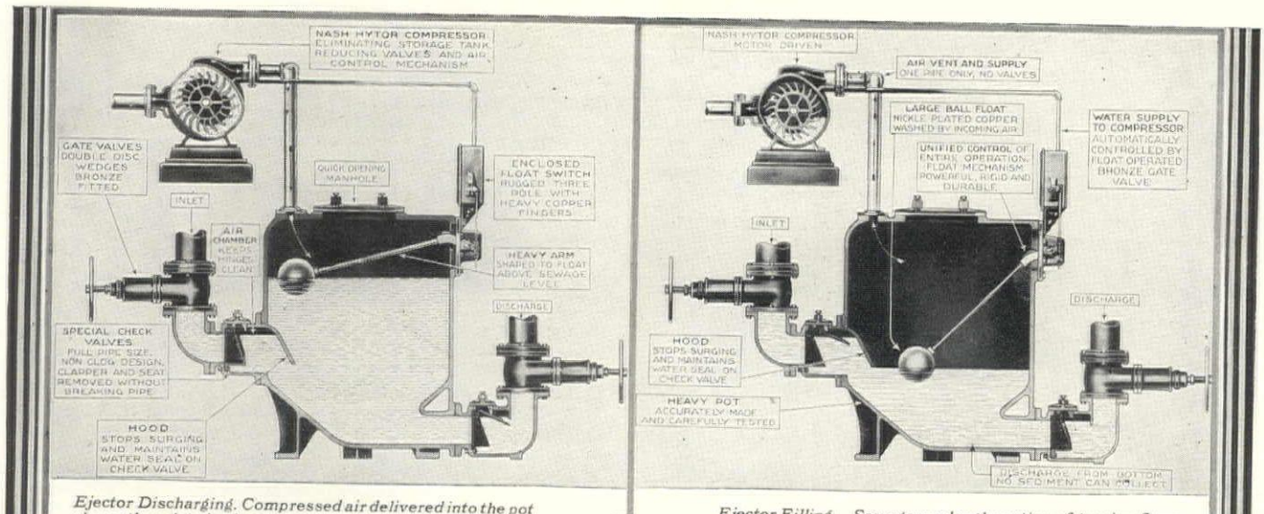
FLOORING

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog. 8¼ x 11 in. 40 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors.
Armstrong's Linoleum Pattern Book, 1927. Catalog. 3½ x 6 in. 272 pp. Color Plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.
Quality Sample Book. 3½ x 5¾ in. Showing all gauges and thicknesses in the Armstrong line of linoleums.
Linoleum Layer's Handbook. 5 x 7 in. 32 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 in. 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.

Blabon Company, Geo. W., Nicetown, Philadelphia, Pa.
Planning the Color Schemes for Your Home. Brochure illustrated in color; 36 pp., 7½ x 10½ in. 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 in. Gives patterns of a large number of linoleums.
Blabon's Plain Linoleum and Cork Carpet. Gives quality samples, 3 x 6 in. of various types of floor coverings.

Bonded Floors Company, Inc., 1421 Chestnut St., Philadelphia, Pa.
A series of booklets, with full color inserts showing standard colors and designs. Each booklet describes a resilient floor material as follows:
Battleship Linoleum. Explains the advantages and uses of this durable, economical material.
Marble-ized (Cork Composition) Tile. Complete information on cork-composition marble-ized tile and the many artistic effects obtainable with it.
Treadlite (Cork Composition) Tile. Shows a variety of colors and patterns of this adaptable cork composition flooring.
Natural Cork Tile. Description and color plates of this superquiet, resilient floor.
Resilient Floors in Schools. Resilient Floors in Stores. Resilient Floors in Hospitals. Resilient Floors in Offices. Resilient Floors in Apartments and Hotels. Booklets, 8 pp., 8½ x 11 ins. Illustrated.
Specifications for Resilient Floors. Leather bound booklet, 48 pp., 8½ x 11 ins. Illustrated. Practical working specifications for installing battleship linoleum, cork composition tile and cork tile.

Carter Bloxonend Flooring Co., Keith & Perry Bldg., Kansas City, Mo.
Bloxonend Flooring. Booklet 3¼ x 6¼ in. 20 pp. Illustrated. Describes uses and adaptability of Bloxonend Flooring to concrete, wood or steel construction, and advantages over loose wood blocks.



Ejector Discharging. Compressed air delivered into the pot closes the inlet check valve and expels the sewage through the outlet. When pot is empty, the float opens the switch, stopping the compressor, through which the air vents. Sewage again flows into the pot repeating the cycle.

Ejector Filling. Sewage, under the action of gravity, flows through the inlet check valve into the pot. As it accumulates, it raises a ball float, which, when the pot is full actuates a float swith, starting up the Nash Air Compressor.

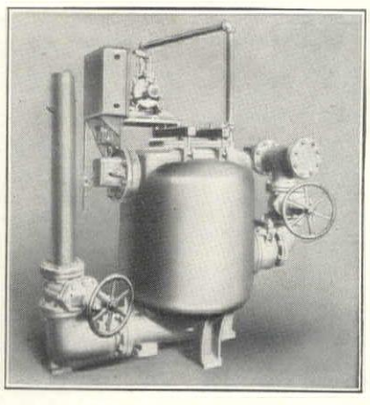
See how it works!

absence of air valves and other complicated parts means better, steadier service.

THE compressor of this dependable sewage ejector is the well known Nash Hytor. Unique in design, it furnishes a large, unvarying volume of air and operates with a single revolving part—the multi-bladed rotor running without contact in its casing. There is nothing to wear out—nothing that needs adjusting.

Aside from the electric motor, the float-switch and check valves at inlet and outlet are the only other moving parts in the entire apparatus. No complicated air valve system is required. Air is supplied only when sewage is being moved. Any necessity for a reciprocating compressor and its accessories is eliminated.

For moving unscreened sewage or drainage from basements below sewer level—for pumping crude sewage from low-lying districts—for handling effluent, sludge, or heavy liquids, the Jennings Sewage Ejector provides a reliable and efficient unit at low operating cost.



Jennings Sewage Ejector, in capacities for handling up to 1500 g. p. m. Discharge heads up to 50 ft.

For more complete information send for Bulletin 67.

Jennings Pumps

THE NASH ENGINEERING CO 12 WILSON ROAD, SOUTH NORWALK CONN.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 156*

FLOORING—Continued

File Folder, 9⅜ x 11¾ in. 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.

Albert Grauer & Co., 1408 Seventeenth St., Detroit, Mich.
Grauer-Watkins Red Asphalt Flooring. Folder, 4 pp., 8½ x 11 in. Data on a valuable form of flooring.

Thomas Moulding Floor Co., 165 W. Wacker Drive, Chicago.
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, Secifications and Uses. Brochure, 16 pp., 11¼ x 13¾ ins. Illustrated. Data on floors.

W. & J. Sloane Mfg. Co., 577 Fifth Avenue, New York.
Linoleum Patterns. Brochure, 10 pp., 8½ x 11 ins. Illustrated. Deals with fine assortment of floor coverings.
Linoleum Floors. Booklet, 42 pp., 8½ x 11 ins. Illustrated. Linoleum Data and Specifications for Architects.

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 in. Illustrated. Data on building floors of hollow tile and tables on floor loading.

United States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 119 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.

U. S. Rubber Co., 1790 Broadway, New York.
Period Adaptations for Modern Floors. Brochure. 8 x 11 in. 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.
Ars Ecclesiastica Booklet. 6 x 9 in. 48 pp. Illustrations of church fitments in carved wood.
Theatre Chairs. Booklet. 6 x 9 in. 48 pp. Illustrations of theater 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., 14 x 11 ins. Illustrated. General Catalog.

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

New York Galleries, Madison Avenue and 48th Street, New York.
A group of Distinguished Interiors. Brochure, 4 pp., 8¾ x 11¼ ins. Filled with valuable illustrations.

GARAGES

Ramp Buildings Corporation, 21 East 40th St., New York.
Building Garages for Profitable Operation. Booklet. 8½ x 11 in. 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.

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, O.
Flat Glass. Brochure, 11 pp., 5⅛ x 7⅝ ins. Illustrated. History of manufacture of flat, clear, sheet glass.

Mississippi Wire Glass Co., 220 Fifth Ave., New York.
Mississippi Wire Glass. Catalog. 3⅞ x 8½ in. 32 pp. Illustrated. Covers the complete line.

GREENHOUSES

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 in. 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 in. 8 pp. Illustrated.

McKinney Mfg. Co., Pittsburgh.
Forged Iron by McKinney. Booklet, 6 x 9 ins. Illustrated. Deals with an excellent line of builders' hardware.
Forged Lanterns by McKinney. Brochure, 6 x 9 ins. Illustrated. Describes a fine assortment of lanterns for various uses.

Richard-Wilcox Mfg. Co., Aurora, Ill.
Distinctive Garage Door Hardware. Booklet. 8½ x 11 in. 65 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.
Distinctive Elevator Door Hardware. Booklet, 89 pp., 16 x 10½ 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 in. 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 Street, Detroit.
Heating and Ventilating Utilities. A binder containing a large number of valuable publications, each 8½ x 11 in., on these important subjects.

American Radiator Company, The, 40 West 40th St., N. Y. C.
Ideal Boilers for Oil Burning. Catalog 5½ x 8½ in. 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 in. 16 pp. Illustrated. A brochure on a space-saving radiator of beauty and high efficiency.
Ideal Arcola Radiator Warmth. Brochure 6¼ x 9¾. 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.
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 Street, Chicago, Ill.
Dunham Radiator Trap. Bulletin 101. 8 x 11 in. 12 pp. Illustrated. Explains working of this detail of heating apparatus.
Dunham Packless Radiator Valves. Bulletin 104. 8 x 11 in. 8 pp. Illustrated. A valuable brochure on valves.
Dunham Return Heating System. Bulletin 109. 8 x 11 in. Illustrated. Covers the use of heating apparatus of this kind.
Dunham Vacuum Heating System. Bulletin 110. 8 x 11 in. 12 pp. Illustrated.
The Dunham Differential Vacuum Heating System. Bulletin 114. Brochure, 8 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.

Excelso Products Corporation, 119 Clinton St., Buffalo, N. Y.
Excelso Water Heater. Booklet. 12 pp. 3 x 6 in. Illustrated. Describing the new Excelso method of generating domestic hot water in connection with heating boilers. (Firepot Coil eliminated.)

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.

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

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

McQuay Radiator Corporation, 35 East Wacker Drive, Chicago. Ill.
McQuay Visible Type Cabinet Heater. Booklet, 3 pp., 8½ x 11 ins. Illustrated. Cabinets and radiators adaptable to decorative schemes.
McQuay Concealed Radiators. Brochure, 3 pp., 8½ x 11 ins. Illustrated.
McQuay Unit Heater. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.

May Oil Burner Corp., Baltimore.
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.

Milwaukee Valve Co., Milwaukee.
MILVACO Vacuum & Vapor Heating System. Nine 4-p. bulletins, 8½ x 11 ins. Illustrated. Important data on heating.
MILVACO Vacuum & Vapor Heating Specialties. Nine 4-p. bulletins, 8½ x 11 ins. Illustrated. Deal with a valuable line of specialties used in heating.

Modine Mfg. Company, Racine, Wis.
Thermodine Unit Heater. Brochure, 24 pp., 8½ x 1 ins. Illustrated. Apparatus for industrial heating and drying.
Thermodine Cabinet Heater. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Cabinet heaters to buildings of different kinds.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 158*

HEATING EQUIPMENT—Continued

Nash Engineering Company, South Norwalk, Conn.
No. 37. Devoted to Jennings Hytor Return Line Vacuum Heating Pumps, electrically driven, and supplied in standard sizes up to 300,000 square feet equivalent direct radiation.
No. 16. Dealing with Jennings Hytor Air Line Heating Pumps.
No. 17. Describing Jennings Hytor Condensation Pumps, sizes up to 70,000 square feet equivalent direct radiation.
No. 25. Illustrating Jennings Return Line Vacuum Heating Pumps. Size M, for equivalent direct radiation up to 5,000 square feet.

National Radiator Corporation, Johnstown, Pa.
Aero Radiators; Beauty and Worth. Catalog 34. Booklet 6 x 9 in., 20 pp., describing and illustrating radiators and accessories.
Six Great Companies Unite to Form a Great Corporation. Booklet, 27 pp., 8½ x 10½ ins. Illustrated. Valuable data on heating.

Oil Heating Institute, 420 Madison Ave., New York.
What about the Supply of Oil Fuel? Booklet, 16 pp. 5½ x 8 ins. Illustrated.

Petroleum Heat & Power Co., 511 Fifth Avenue, New York.
Heating Homes the Modern Way. Booklet, 8½ x 11¼ ins. Illustrated. Data on the Petro Burner.
Residence Oil Burning Equipment. Brochure, 6 pp., 8½ x 11 ins. Illustrated. Data regarding Petro Burner in a bulletin approved by Investigating Committee of Architects and Engineers.
Petro Mechanical Oil Burner & Air Register. Booklet, 23 pp., 8½ x 11 ins. Illustrated. Data on industrial installations of Petro Burners.
Present Accepted Practice in Domestic Oil Burners. Folder, 4 pp., 8½ x 11 ins. Illustrated. A reprint from Heating and Ventilating Magazine.

Trane Co., The, La Crosse, Wis.
Bulletin 14. 16 pp. 8½ x 10⅝ in. Covers the complete line of Trane Heating Specialties, including Trane Bellows Traps, and Trane Bellows Packless Valves.
Bulletin 20. 24 pp., 8½ x 10⅝ in. 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.

HOSPITAL EQUIPMENT

The Frink Co., Inc., 24th St. and Tenth Ave., New York City.
Catalog 426. 7 x 10 in., 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.

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

The Pick-Barth Companies, Chicago and New York.
Some Thoughts About Hospital Food Service Equipment. Booklet, 21 pp., 7½ x 9¼ ins. Valuable data on an important subject.

Wilmot Castle Company, Rochester, N. Y.
Sterilizer Equipment for Hospitals. Book, 76 pp. 8½ x 11 in. Illustrated. Gives important and complete data on sterilization of utensils and water, information on dressings, etc.
Sterilizer Specifications. Brochure, 12 pp. 8½ x 11 in. Practical specifications for use of architects and contractors.
Architects' Data Sheets. Booklet, 16 pp. 8½ x 11 in. Illustrated. Information on piping, venting, valving and wiring for hospital sterilizer installations.
Hospital Sterilizing Technique. Five booklets, 8 to 16 pp. 6 x 9 in. Illustrated. Deals specifically with sterilizing instruments, dressings, utensils, water, and rubber gloves.

HOTEL EQUIPMENT

Pick & Company, Albert, 208 West Randolph Street, Chicago, Ill.
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.

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 ahs 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 Gernerator. 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.

INSULATING LUMBER

Masonite Corporation, 111 West Washington St., Chicago, Ill.
Booklet, 12 pp., 8½ x 11 in. Illustrated. Gives complete specifications for use of insulating lumber and details of construction involving its use.

INSULATION

Armstrong Cork & Insulation Co., Pittsburgh, Pa.
The Insulation of Roofs with Armstrong's Corkboard. Booklet. Illustrated. 7½ x 10¼ in. 32 pp. Discusses means of insulating roofs of manufacturing or commercial structures.
Insulation of Roofs to Prevent Condensation. Illustrated booklet. 7½ x 10¼ in. 36 pp. Gives full data on valuable line of roof insulation.
Filing Folder for Pipe Covering Data. Made in accordance with A. I. A. rules.
"The Cork Lined House Makes a Comfortable Home." 5 x 7 in. 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.

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Insulating Quilt. Booklet, 7½ x 10½ ins., 24 pp. Illustrated. Deals with a valuable type of insulation.

Philip Carey Co., The, Cincinnati, Ohio.
Carey Asbestos and Magnesia Products. Catalog. 6 x 9 in. 72 pp. Illustrated.

Celite Products Co., 1320 South Hope St., Los Angeles.
The Insulation of Boilers. Booklet. 8 pp., 8½ x 11 ins. Illustrated. On insulating boiler walls, breechings, and stacks to reduce amount of radiation.
Heat Insulation Specifications and Blue Prints. Booklet, 20 pp., 8½ x 11 ins. Illustrated. On approved types of insulation.
Sil-O-Cel Insulation Materials and Allied Products. Brochure, 16 pp., 8½ x 11 ins. Illustrated. Important data on insulation.

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.

Genfire Steel Company, Youngstown, Ohio.
Steel Joists. 8½ x 11 ins. 32 pp. A. I. A. File Number 13G. Illustrated. Complete data on T-Bar and Plate-Girder joists including construction details and specifications.

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 in. 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.

Pick & Company, Albert, 208 W. Randolph St., Chicago, Ill.
School Cafeteria. Portfolio. 17 x 11 in. 44 pp. Illustrated. An exhaustive study of the problems of school feeding, with copious illustrations and blue prints. Very valuable to the architect.
School Cafeterias. Booklet. 9 x 6 in. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

LABORATORY EQUIPMENT

Alberene Stone Co., 153 West 23rd Street, New York City
Booklet 8¾ x 11¼ in., 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.
Hand Wrought Lanterns. Booklet, 5¾ x 6¼ in. 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

Genfire Steel Company, Youngstown, Ohio.
Herringbone Metal Lath Handbook. 8½ x 11 in. 32 pp. Illustrated. Standard specifications for Cement Stucco on Herringbone. Rigid Metal Lath and interior plastering.

National Steel Fabric Co., Pittsburgh.
Better Walls for Better Homes. Brochure. 16 pp. 7¾ x 10¾ 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.

Northwestern Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
Northwestern Expanded Metal Products. Booklet, 8½ x 10¾ in., 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.
Northwest 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, ½ x 11 in., illustrating Truscon ¾-inch Hy-Rib as used in industrial buildings. Plates of typical construction. Progressive steps of construction. Specification and load tables.

Armstrong's Corkboard installed between the rafters of St. Mark's and St. John's Episcopal Church, Rochester, N. Y.

Reduces Heat Leakage Out or In –

BECAUSE of the much larger exposure to outside temperatures, it is even more essential than for other buildings that church roofs be insulated with Armstrong's Corkboard.

In winter, insulation greatly simplifies the quick and uniform heating of a large auditorium. Because of its low conductivity, Armstrong's Corkboard confines most of the heat ordinarily wasted through the roof. As a result, room temperature rises much more quickly and is maintained more uniformly and economically.

In summer, Armstrong's Corkboard on the roof or ceiling protects the auditorium below from the heat of the sun. It keeps the heat *outside* just as effectively as it keeps it *inside* in winter.

Year-round comfort, quick heating of the auditorium, and a decided economy in fuel consumption are advantages well worth considering. Armstrong's Corkboard roof insulation assures them all.

Because of the rich brown color and distinctive texture of Armstrong's Corkboard, it presents a very attractive appearance when applied as a ceiling on the under side and left exposed. If desired, it can be spray-treated with paint or tints.

Armstrong Engineers are glad to consult with architects on the use of corkboard. There is no charge for such counsel. Write for filing catalogue containing complete data and specifications on Armstrong's Corkboard. Armstrong Cork & Insulation Company, 132 Twenty-fourth Street, Pittsburgh, Pa.; McGill Building, Montreal; 11 Brant Street, Toronto 2.

Armstrong's Corkboard Insulation

for the Roofs of All Kinds of Buildings

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 160*

LAUNDRY CHUTES

The Pfaudler Company, 217 Cutler Building, Rochester, N. Y.
Pfaudler Glass-Lined Steel Laundry Chutes. Booklet, 5⅛ x 7⅛ in. 16 pp. Illustrated. A beautifully printed brochure describing in detail with architects' specifications THE PFAUDLER GLASS LINED STEEL LAUNDRY CHUTES. Contains views of installations and list of representative examples.

LAUNDRY MACHINERY

American Laundry Machinery Co., Norwood Station, Cincinnati. Ohio.
Functions of the Hotel and Hospital Laundry. Brochure, 8 pp., 8½ x 11 ins. Valuable data regarding an important subject.

LIBRARY EQUIPMENT

Art Metal Construction Co., Jamestown, N. Y.
Planning the Library for Protection and Service. Brochure, 52 pp. 8½ x 11 in. Illustrated. Deals with library fittings of different kinds.
Library Bureau Division, Remington Rand, N. Tonawanda, N. Y.
Like Stepping into a Story Book. Booklet. 24 pp. 9 x 12 in. Deals with equipment of Los Angeles Public Library.

LIGHTING EQUIPMENT

The Frink Co., Inc., 24th St. and 10th Ave., New York City.
Catalog 415. 8½ x 11 in. 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.
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.
Smyser-Royer Co., 1700 Walnut Street, Philadelphia.
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.
Lighting Fixtures, Lamps and Candlesticks. 24 pp. 8½ x 11 ins. Illustrated. Fine assortment of lighting accessories.

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 9¼ in. 8 pp. Illustrated.

MANTELS

Arthur Todhunter, 119 E. 57th St., New York, N. Y.
Georgian Mantels. New Booklet. 24 pp. 5¼ x 6¾ in. 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. 3⅛ x 6 in. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc.
Convincing Proof. 3⅛ x 6 in. 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

The International Nickel Company, 67 Wall St., New York, N. Y.
The Choice of a Metal. Booklet, 6¼ x 3 in. 166 pp. Illustrated. Monel Metal—its qualities, use and commercial forms, briefly described.

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodword. Standardized Book. 9 x 11½ in. 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 in. 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 in. 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.

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

Roddis Lumber and Veneer Co., Marshfield, Wis.
Roddis Doors. Brochure, 24 pp., 5¼ x 8½ in. Illustrated price list of doors for various types of buildings.
Roddis Doors, Catalog G. Booklet, 183 pp., 8½ x 11 in. Completely covers the subject of doors for interior use.
Roddis Doors for Hospitals. Brochure, 15 pp., 8½ x 11 in. Illustrated work on hospital doors.
Roddis Doors for Hotels. Brochure, 15 pp., 8½ x 11 in. 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 in. 4 pp. Illustrated in color, gives full information concerning Clinton Mortar Colors with specific instructions for using them.
Color Card. 6½ x 3¼ in. 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

A. C. Horn Company, Art Craft Division, 101 Park Ave., New York, N. Y.
Tex-Crete, for One-Operation Fixturing. Booklet, 22 pp. 8½ x 11 ins. Illustrated. A work on decorative plastering.
Jacobson & Co., 241 East 44th St., New York.
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. 183 plates. 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

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Creosote Stains. Booklet. 4 x 8½ in. 16 pp. Illustrated.

National Lead Company, 111 Broadway, New York, N. Y.
Handy Book on Painting. Book. 5½ x 3¾ in. 100 pp. Gives directions and formulae for painting various surfaces of wood, plaster, metals, etc., both interior and exterior.
Red Lead in Paste Form. Booklet, 6¼ x 3½ in. 16 pp. Illustrated. Directions and formulae for painting metals.
Came Lead. Booklet, 8¾ x 6 in. 12 pp. Illustrated. Describes various styles of lead cames.
Cinch Anchoring Specialties. Booklet. 6 x 3½ in. 20 pp. Illustrated. Describes complete line of expansion bolts.

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 in. 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 in. 12 p. 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 in. 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 in. 12 pp. Illustrated. A highly technical subject treated in a simple, understandable manner.

Sonneborn Sons, Inc., L., Dept. 4, 116 Fifth Ave., New York.
Paint Specifications. Booklet. 8½ x 10¾ in. 4 pp.
U. S. Gutta Percha Paint Co., Providence, R. I.
Barreled Sunlight. Booklet, 8½ x 11 in. Data on "Barreled Sunlight" with specifications for its use.

Valentine & Co., 456 Fourth Ave., New York.
How to Use Valspar. Illustrated booklet, 32 pp., 3¾ x 8 in. Deals with domestic uses for Valspar.
How to Keep Your House Young. Illustrated brochure, 23 pp., 7 x 8½ in. 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.

Zapon Co., The, 247 Park Ave., New York City.
Zapon Architectural Specifications. Booklet, 28 pp., 8½ x 11 in. Describes odorless brushing and spraying lacquers and lacquer enamels.

PAPER

A. P. W. Paper Co., Albany, N. Y.
"Here's a Towel Built for Its Job." Folder, 8 pp., 4 x 9 in. Deals with "Onliwon" paper towels.

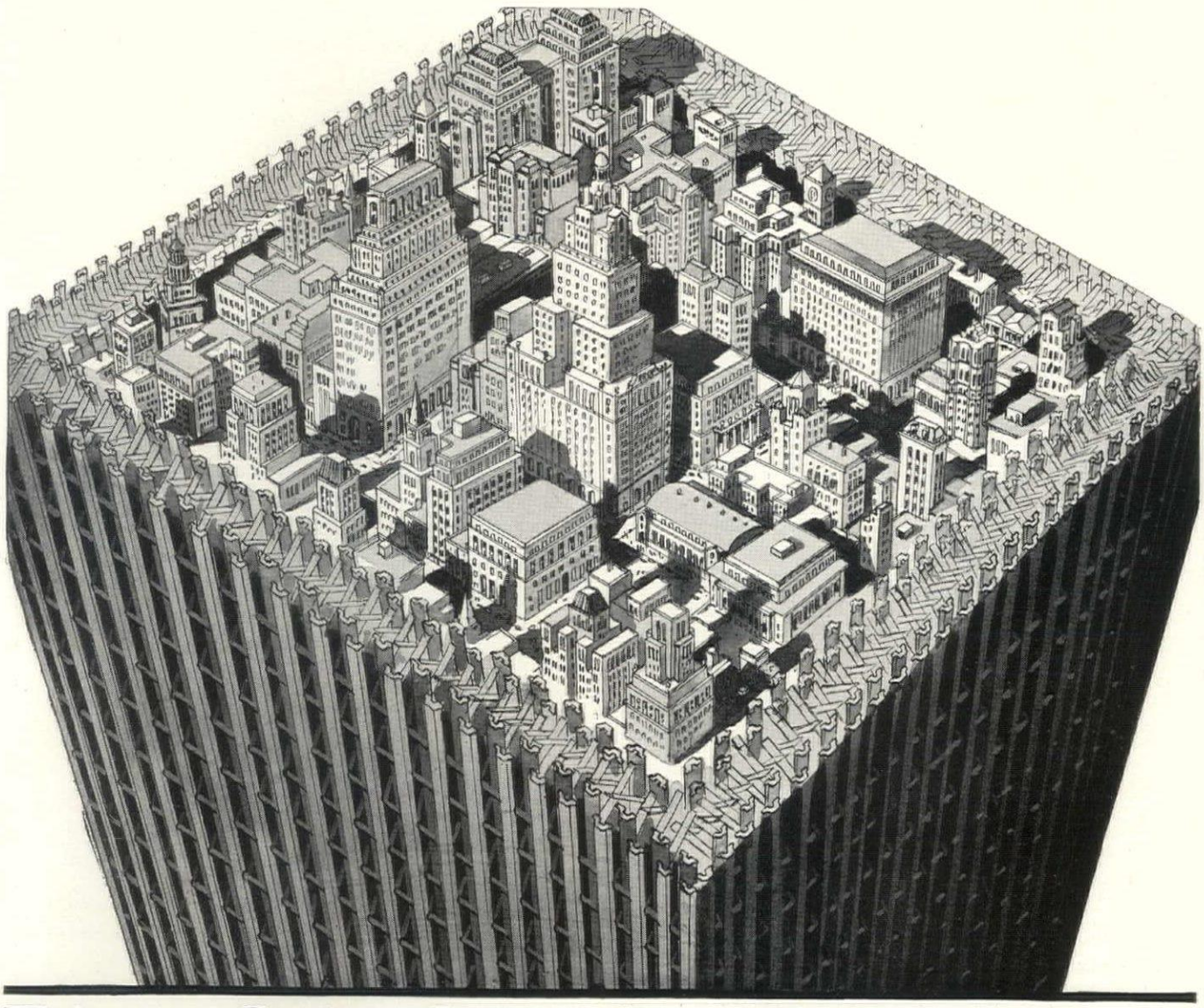
PARTITIONS

Circle A Products Corporations, New Castle, Ind.
Circle A Partitions Sectional and Movable. Brochure. Illustrated. 8½ x 11¼ in. 32 pp. Full data regarding an important line of partitions, along with Erection Instructions for partitions of three different types.

Hauserman Company, E. F., Cleveland, Ohio.
Hollow Steel Standard Partitions. Various folders, 8½ x 11. 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 in. 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. 8½ x 11 in. 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 in. 32 pp. Illustrated. Describes complete line of track and hangers for all styles of sliding, parallel, accordion and flush door partitions.



Rivet-Grip Guards a City of Gold

Leading New York Architects use Rivet-Grip for Bank Vaults

THE following architects have used Rivet-Grip Bank Vault Reinforcement in notable installations in and about Greater New York:

Cross & Cross
Union & New Haven Trust Co., New Haven, Conn. — Guaranty Trust Co., (Madison Ave. and 60th St.) New York.

Delano & Aldrich
WestfieldTrustCo.,Westfield,N.J.

Dennison & Hirons
City National Bank, Bridgeport, Conn.—Federal Trust Company, Newark, N. J. — Essex County Trust Co., East Orange, N. J.

Fellheimer & Wagner
Corn Exchange Bank, (42nd and 8thAve. Branch) New York—Corn Exchange Bank, (170th St. Branch) New York—Corn Exchange Bank (Grand Central Branch) NewYork

A. F. Gilbert
Equitable Trust Co.,(Madison and 79th St. Branch) New York

Cass Gilbert
Broad & Market National Bank & Trust Co., Newark,N.J.—Fidelity Union Trust Co., Newark, N. J.

Firm of H. G. Hardenberg
Stamford Trust Co., Stamford, Conn.

Hoggson Bros.
First National Bank, Amherst, Mass.

Holmes & Winslow
Meriden Sav.Bank,Meriden,Conn.

John Mead Howells
Title Guarantee & Trust Co., (Maiden LaneExtension)NewYork

Arthur C. Jackson
Equitable Trust Co., (Worth and Church Sts.)NewYork—Equitable Trust Co., (28th St. and Madison Ave.) New York.

Ludlow & Peabody
Corn Exchange Bank, (West 231st St. Branch) New York.

A. A. Macdonald
Central Union Trust Co. (5th Ave. and 60th St.) New York.

McKenzie, Voorhees & Gmelin
Travelers Insurance Co., Hartford, Conn.

Morreil-Smith
Bank of the Manhattan Co., (Far Rockway, L. I. Branch)—Bank of the Manhattan Co., (Woodside Branch) New York.

Benjamin W. Morris
Bank of New York & Trust Co. New York.

Adolph E. Nast
United States Trust Co.,NewYork

Schultze & Weaver
Fifth Ave. Bank, New York.

Severance & Van Alen
Bank of the Manhattan Co., (Madison and 43rd St. Branch) New York.

Sloane & Robertson
Chase National Bank, (Grand Central Branch) New York.

Trowbridge & Livingston
Equitable Trust Co., New York. Bank of America, New York.

Walker & Gillette
ChemicalNationalBank,NewYork

B. V. White
Summit Trust Co., Summit, N. J.

York & Sawyer
Bowery Savings Bank, New York

Write for brochure giving interesting facts about the design and construction of modern bank vaults.

The RIVET-GRIP STEEL CO., 2404 Prospect Ave., Cleveland, O.

Rivet-Grip

BANK VAULT REINFORCEMENT

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 162*

PARTITIONS—Continued

U. S. Gypsum Co., Chicago.
Pyrobar Partition and Furring Tile. Booklet. 8½ x 11 in. 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 in. 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 in. Data on dredge pipe.

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog "A". 4 x 6½ in. 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 in. Data on wrought iron pipe.

Duriron Company, Inc., Dayton, Ohio.
Duriron Acid, Alkali, Rust-proof Drain Pipe and Fillings. Booklet, 20 pp., 8½ x 11 in., 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 in. 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 in. 20 pp. Illustrated. Discusses various causes of corrosion, and details are given of the deactivating and deaerating systems for eliminating or retarding corrosion in hot water supply lines.
"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 in. 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 in., 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.
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

C. F. Church Mfg. Co., Holyoke, Mass.
Catalog S. W.-3. Booklet, 95 pp., 7¾ x 10½ in. Illustrated. Data on Sani-White and Sani-Black toilet seats.

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog "M." 9¼ x 12 in. 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 in. 80 pp. Illustrated.
Plumbing Suggestions for Industrial Plants. Catalog. 4 x 6½ in. 34 pp. Illustrated.
Planning the Small Bathroom. Booklet. 5 x 8 in. 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. 10⅞ x 7⅞ in. 242 pp. Illustrated. Complete 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.

PUMPS

Chicago Pump Company, 2300 Wolfram St., Chicago, Ill.
The Correct Pump to Use. Portfolio containing handy data. Individual bulletins, 8½ x 11 ins., on bilge, sewage, condensation, circulating, house, boiler feed and fire pumps.

Kewanee Private Utilities Co., 442 Franklin St., Kewanee, Ill.
Bulletin E. 7¾ x 10¼ in. 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 Kenwanee Private Utilities Co.

PUMPS—Continued

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

Weil Pump Co., 215 W. Superior St., Chicago.
Pumps. Booklet, 8½ x 11 ins. Illustrated. Individual bulletins with specifications on sewage ejectors, and bilge, house, condensation, booster and boiler feed pumps.

RAMPS

Ramp Buildings Corporation, 21 East 40th St., New York.
Building Garages for Profitable Operation. Booklet. 8½ x 11 in. 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 Sylphon Company, Knoxville, Tenn.
Temperature Control of Refrigeration Systems. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Deals with cold storage, chilling of water, etc.

REINFORCED CONCRETE—See also Construction, Concrete

Genfire Steel Company, Youngstown, Ohio.
Self-Sentering Handbook. 8½ 11 in. 36 pp. Illustrated. Methods and specifications on reinforced concrete floors, roofs and floors with a combined form and reinforced material.

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

North Western Expanded Metal Company, Chicago, Ill.
Designing Data. Book. 6 x 9 in. 96 pp. Illustrated. Covers the use of Econo Expanded Metal for various types of reinforced concrete construction.
Longspan ¾-inch Rib Lath. Folder 4 pp., 8½ x 11 in. Illustrated. Deals with a new type of V-rit expanded metal.

ROOFING

Barber Asphalt Co., Philadelphia, Pa.
Specifications, Genasco Standard Trinidad Lake Asphalt Built-up Roofing. Booklet. 8 x 10½ in. Gives specifications for use of several valuable roofing and waterproofing materials.

The Barrett Company, 40 Rector St., New York City.
Architects' and Engineers' Built-up Roofing Reference Series; Volume IV Roof Drainage System. Brochure. 63 pp. 8½ x 11¼ ins. Gives complete data and specifications for many details of roofing.

Bird & Son, Inc., E. Walpole, Mass.
Bird's Roofs. Folder, 16 pp., 3½ x 6 ins. Illustrated. Data of roofing materials.

Philip Carey Co., Lockland, Cincinnati, Ohio.
Architects Specifications for Carey Built-up Roofing. Booklet. 8 x 10¾ in. 24 pp. Illustrated. Complete data to aid in specifying the different types of built-up roofing to suit the kind of roof construction to be covered.
Carey Built-up Roofing for Modern School Buildings. Booklet. 8 x 10¾ in. 32 pp. Illustrated. A study of school buildings of a number of different kinds and the roofing materials adapted for each.

Heinz Roofing Tile Co., 1925 West Third Avenue, Denver.
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 in. 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.

Ludowici-Celadon Company, 104 So. Michigan Ave., Chicago, Ill.
"Ancient" Tapered Mission Tiles. Leaflet. 8½ x 11 in. 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.

Structural Gypsum Corporation, Linden, N. J.
Relative Effectiveness of Various Types of Roofing Construction in Preventing Condensation of the Under Surface. Folder, 4 pp. 8½ 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.
Pyrobar Roof Construction. Booklet. 8 x 11 in. 48 pp. Illustrated. Gives valuable data on the use of tile in roof construction.
Sheetrock Pyrofill Roof Construction. Folder. 8½ x 11 in. Illustrated. Covers use of roof surfacing which is poured in place.

SEWAGE DISPOSAL

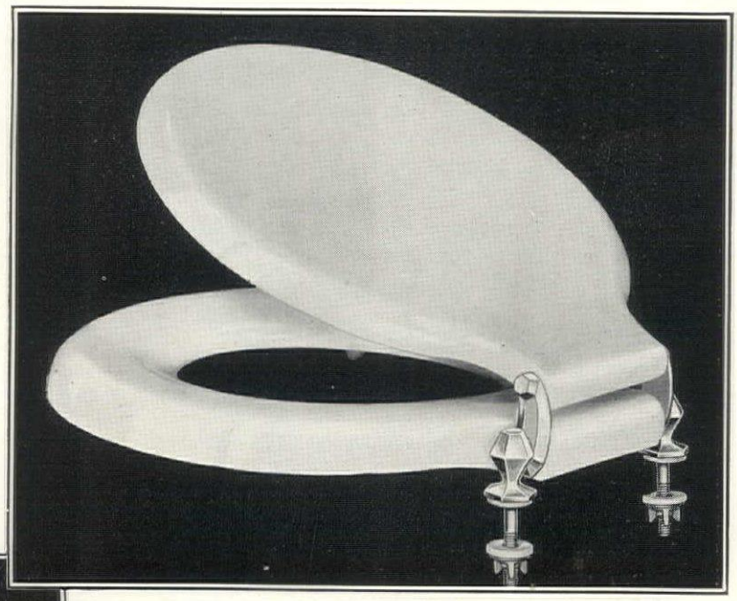
Kewanee Private Utilities, 442 Franklin St., Kewanee, Ill.
Specification Sheets. 7¾ x 10¼ in. 40 pp. Illustrated. Detailed drawings and specifications covering water supply and sewage disposal systems.

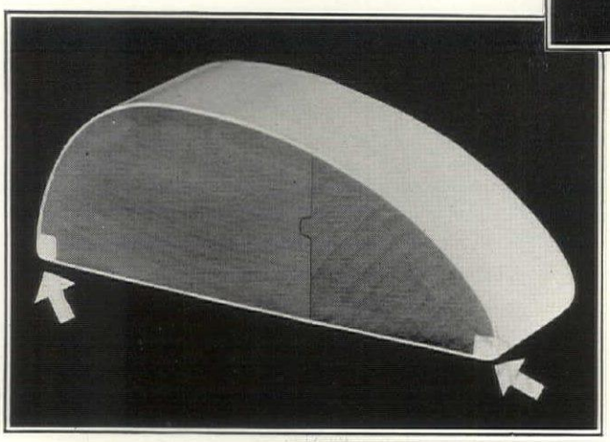
A Brunswick Triumph

In Seat Manufacture!

A sheet-covered seat that is guaranteed indefinitely not to split at the edges

As shown below, Brunswick's new White Seat has a heavy reinforced cushion of tough, resilient pyralin right on the outer edges where blows and rough usage are liable to cause white seats to split open. The sheet pyralin on the new Brunswick Seat is welded to this heavy cushion edge of pyralin. The seat edge is thus made 9 *times* as thick as a single sheet!





Brunswick White Seat, Model 300, with chromium plated hexagon hinge

THE makers of the famous Whale-bone-ite Seat now offer their newest triumph in seat manufacture. The Brunswick White Seat shown here is a pyralin sheet-covered seat on wood base with a unique patented feature that means complete protection at the outer edge of the seat where danger of damage is greatest.

Instead of merely joining the two sheets of pyralin by overlapping or butting, as has been the custom in white seat manufacture, Brunswick has developed and patented a joint which makes what has been the weakest part of a sheet-covered seat now the strongest.

The two sheets of pyralin are now welded at the edge to a heavy cushion of pyralin. Thus instead of the usual thickness at the edge, where blows are most apt to hit, this new-type seat has solid pyralin there 9 times the thickness of a single sheet!

Even the roughest usage won't damage this amazing new construction. It enables us to guarantee this edge against defects for an unlimited period.

Our large manufacturing facilities enable us to offer the Brunswick White Seat at exceedingly attractive prices.

In addition to the Whale-bone-ite Seat, and this new White Seat, Brunswick is now manufacturing a complete line of wood seats. Thus in the Brunswick line you can now find seats for every type of installation. Our catalog showing all models should be in your file. Write for it. The coupon is for your convenience.

Fill In, Clip and Mail

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The Brunswick-Balke-Collender Co.
623 S. Wabash Ave., Chicago

Send your complete catalog, showing all models of Whale-bone-ite, White and Wood Seats.

Name.....

Address.....

City..... *State*.....

BRUNSWICK WHITE SEATS

Made by the Manufacturers of the Whale-bone-ite Seat

THE BRUNSWICK-BALKE-COLLENDER CO. · Chicago · New York

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 164*

SCREENS

American Brass Co., The, Waterbury, Conn.
Facts for Architects About Screening. Illustrated folder, 9½ x 11¼ in., 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.
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 in. Deals with steel cabinets, shelving, racks, doors, partitions, etc.

SKYLIGHTS

Albert Grauer & Co., 1408 Seventeenth St., Detroit, Mich.
Grauer Wire Glass Skylights. Folder, 4 pp., 8½ x 11 in. Illustrated. Data on an important line of wire glass lights.
The Effectiveness of Sidewalk Lights. Folder, 4 pp., 8½ x 11 in. Illustrated. Sidewalk or vault lights.
Let in the Light—The Light That's Free. Folder, 4 pp., 8½ x 11 in. Illustrated. Data on securing good lighting.

SOUND DEADENER

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Deadening Quilt. Brochure 7½ x 10½ ins., 28 pp. Illustrated. Gives complete data regarding a well-known protectection against sound.

STAIRWAYS

Woodbridge Ornamental Iron Co., 1515 Altgeld St., Chicago.
Presteel Tested for Strength—stairways, catalog, 92 pp., 8½ x 11 ins. Illustrated. Important data on stairways.

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.

Genfire Steel Company, Youngstown, Ohio.
Herringbone Metal Lath Handbook. 8½ x 11 in. 32 pp. Illustrated. Standard specifications for Cement Stucco on Herringbone.
Rigid Metal Lath and interior plastering.
Fireproofing Handbook. 8½ x 11 ins. 32 pp. Illustrated. Describes the full line of products manufactured by the Genfire Steel Company.

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 in. 56 pp. Containing specifications and supplementary data relating to the best methods of specifying and using this stone for all building purposes.
Vol. 1. Series B. Indiana Limestone Library. 6 x 9 in. 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.
Vol. 4. Series B. Booklet. New Edition. 8½ x 11 in. 64 pp. Illustrated. Indiana Limestone as used in Banks.
Volume 5. Series B. Indiana Limestone Library. Portfolio. 11⅜ x 8¾ in. 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 in., 80 pages, illustrated.
Volume 12, Series B—Distinctive Homes of Indiana Limestone. 8½ x 11 in., 48 pages, illustrated.
Old Gothic Random Ashlar. 8½ x 11 in., 16 pages, illustrated.

STORE FRONTS

Brasco Manufacturing Co., 5025-35 South Wabash Avenue, Chicago, Ill.
Catalog No. 31. Series 500. All-Copper Construction. Illustrated brochure. 20 pp. 8½ x 11 ins. Deals with store fronts of a high class.
Brasco Copper Store Front. Catalog No. 32. Series 202.
Brasco Standard Construction. Illustrated brochure. 16 pp. 8½ x 11 ins. Complete data on an important type of building.
Detail Sheets. Set of seven sheets; printed on tracing paper, showing full sized details and suggestions for store front designing, enclosed in envelope suitable for filing. Folds to 8½ x 11 ins.

STORE FRONTS—Continued

Davis Solid Architectural Bronze Sash. Set of five sheets, printed on tracing paper, giving full sized details and suggestions for designing of special bronze store front construction, enclosed in envelope suitable for filing. Folds to 2½ x 11 ins.

The Kawneer Company, Niles, Mich.
Store Front Suggestions. Booklet, 96 pp., 6 x 8½ ins. Illustrated. Shows different types of Kawneer Solid Copper Store Fronts.
Catalog K, 1927 Edition. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Details of Kawneer Copper Store Fronts.
Detail Sheets for Use in Tracing. Full-sized details on sheets 17 x 22 ins.
Kawneer Construction in Solid Bronze or Copper. Booklet, 64 pp., 8½ x 11 ins. Illustrated. Complete data on the subject.

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 in. 60 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.
International Store Front Construction. Catalog. 8½ x 10 in. 70 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.

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 in. 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 9⅝ x 12¼ in., 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 in. 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 in. 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 St., Pittsburgh, Pa.
Standard Wall Construction Bulletin 174. 8½ x 11 in. 32 pp. Illustrated. A treatise on the subject of hollow tile wall construction.
Standard Fireproofing Bulletin 171, 8½ x 11 ins., 32 pp. Illustrated. A treatise on the subject of hollow tile as used for floors, girder, column and beam covering and similar construction.
Natco Double Shell Load Bearing Tile Bulletin, 8½ x 11 ins., 6 pp. Illustrated.
Natco Unibacker Tile Bulletin, 8½ x 11 ins. 4 pp. Illustrated.
Natco Header Backer Tile Bulletin, 8½ x 11 ins., 4 pp. Illustrated.
Natcoflor Bulletin, 8½ x 11 in. 6 pp. Illustrated.
Natco Face Tile for the Up-to-Date Farm Bulletin, 8½ x 11 ins.

TILES

Kraftile Company, 55 New Montgomery St., San Francisco. High Fired Faience Tile. Booklet. 32 pp. 8½ x 11 ins. Illustrated. Presents a fine line of tiles for different purposes.

Unites States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 119 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.
The Dunham Packless Radiator Valve Brochure, 12 pp., 8 x 11. Illustrated. Data on an important type of valve.

Jenkins Bros., 80 White St., New York.
The Valve Behind a Good Heating System. Booklet 4½ x 7¼ in. 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 in. 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.

VENETIAN BLINDS

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

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 166*

VENTILATION

American Blower Co., Detroit, Mich.
American H. S. Fans. Brochure, 28 pp., 8½ x 11 in. 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.

Globe Ventilator Company, 205 River St., Troy, N. Y.
Globe Ventilators Catalog. 6 x 9 in. 32 pp. Illustrated profusely. Catalog gives complete data on "Globe" ventilators as to sizes, dimensions, gauges of material and table of capacities. It illustrates many different types of buildings on which "Globe" ventilators are in successful service, showing their adaptability to meet varying requirements.

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

Carey Company, The Philip, Lockland, Cincinnati, Ohio.
Waterproofing Specification Book. 8½ x 11 in. 52 pp.

Genfire Steel Company, Youngstown, Ohio.
Waterproofing Handbook. Booklet. 8½ x 11 in. 80 pp. Illustrated. Thoroughly covers subject of waterproofing concrete, wood and steel preservatives, dustproofing and hardening concrete floors, and accelerating the setting of concrete. Free distribution.

Master Builders Company, Cleveland, Ohio.
Waterproofing and Dampproofing and Allied Products. Sheets in loose index file, 9 x 12 in. 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.

Sommers & Co., Ltd., 342 Madison Ave., New York City.
"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 in.

WATERPROOFING—Continued

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

Toch Brothers, 110 East 42nd St., New York City.
Specifications for Dampproofing, Waterproofing, Enameling and Technical Painting. Complete and authoritative directions for use of an important line of materials.

The Vortex Mfg. Co., 1978 West 77th St., Cleveland, Ohio.
Par-Lock Specification "Form D" for waterproofing surfaces to be finished with Portland cement or tile.
Par-Lock Specification "Forms E and G" membrane waterproofing of basements, tunnels, swimming pools, tanks to resist hydrostatic pressure.
Par-Lock Waterproofing. Specification Forms D, E, F and G. Sheets 8½ x 11 ins. Data on combinations of gun-applied asphalt and cotton or felt membrane, built up to suit requirements.
Par-Lock Method of Bonding Plaster to Structural Surfaces. Folder, 6 pp., 8½ x 11 ins. Official Bulletin of Approved Products,—Investigating Committees of Architects and Engineers.

WEATHER STRIPS

Athey Company, 6035 West 65th St., Chicago.
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

The Kawneer Company, Niles, Mich.
Kawneer Solid Nickel Silver Windows. In casement and weight-hung types and in drop-down transom type. Portfolio, 12 pp., 9 x 11½ ins. Illustrated, and with demonstrator.

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Pivoted Sash, Catalog 12-A. Booklet, 48 pp. 8½ x 11 in. Illustrates and describes windows suitable for manufacturing buildings.

WINDOWS, CASEMENT

Crittall Casement Window Co., 10951 Hearn Ave., Detroit, Mich.
Catalog No. 22. 9 x 12 in. 76 pp. Illustrated. Photographs of actual work accompanied by scale details for casements and composite steel windows for banks, office buildings, hospitals and residences.

STROWGER
P-A-X
PRIVATE AUTOMATIC EXCHANGE

Not merely an automatic telephone, but a perfect system of interior communication designed and built to the finest engineering standards and of the same type of equipment that has been adopted for public exchange service the world over.

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HALF a minute lost in making an inside call may seem trivial—but when this loss occurs on *every* call you make, the total becomes apalling. With Strowger P-A-X, the number is dialed in three to five seconds immediately after picking up the receiver—no waiting for an operator to answer. And, immediately, the station is called—the ringing continues until it is answered, or, if the line is busy, the signal is given instantly. And if the party called is not at his station, the Code Call locates him in the shortest possible time. How much time is lost daily—weekly—annually—in your business? Let the Strowger engineers show you how P-A-X will eliminate this waste, besides providing numerous other valuable services.

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Strowger Automatic Equipment includes Public Automatic Telephone Systems . . . . P-A-X (Private Automatic Exchange) . . . . Watchman Supervisory Systems . . . . Tele-Chec Systems (for Theaters) . . . . Industrial Fire Alarm Systems . . . Supervisory Control Equipment for Industrial and Commercial Devices, and Railway Signalling and Communication Systems.

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Factory and General Offices: 1005 West Van Buren St., Chicago, U. S. A.

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Atlanta, Ga.	Detroit, Mich.	Philadelphia, Pa.	Boston, Mass.
Los Angeles, Calif.	Cleveland, Ohio	St. Paul, Minn.	St. Louis, Mo.
Dallas, Tex.	New York, N. Y.	Pittsburgh, Pa.	Seattle, Wash.

Export Distributors:

For Australasia—Automatic Telephones, Ltd., Sydney
For Canada—Independent Sales & Engineering Co., Ltd. Vancouver
Elsewhere—Automatic Electric Company, Ltd., Chicago

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 168*

WINDOWS, CASEMENT—Continued

Genfire Steel Company, Youngstown, Ohio.

Architectural Details, Casement Windows and Doors. 8½ x 11 ins. 28 pp. A. I. A. File No. 16E. Specifications and construction details.

Hope & Sons, Henry, 103 Park Ave., New York, N. Y.

Catalog. 12¼ x 18½ in. 30 pp. Illustrated. Full size details of outward and inward opening casements.

The Kawneer Company, Niles, Mich.

Kawneer Solid Nickel Silver Windows. In casement and weight-hung types and in drop-down transom type. Portfolio, 12 pp., 9 x 11½ ins. Illustrated, and with demonstrator.

David Lupton's Sons Company, Philadelphia, Pa.

Lupton Casement of CopperSteel. Catalog C-217. Booklet, 20 pp., 8⅜ x 11 in. Illustrated brochure on casements, particularly for residences.

Lupton Heavy Casements. Detail Sheet No. 101, 4 pp., 8½ x 11 ins. Details and specifications only.

Richards-Wilcox Mfg. Co., Aurora, Ill.

Casement Window Hardware. Booklet. 24 pp. 8½ x 11 in. Illustrated. Shows typical installations, detail drawings, construction details, blue-prints if desired. Describes AIR-way Multifold Window Hardware.

Architectural Details. Booklet, 8½ x 11 in. 16 pp. Tables of specifications and typical details of different types of construction.

List of Parts for Assembly. Booklet, 8½ x 11 ins., 16 pp. Full lists of parts for different units.

Truscon Steel Co., Youngstown, Ohio.

Architectural Details. Booklet. 8½ x 11 ins. 16 pp. Tables of specifications and typical details of different types of construction.

List of Parts for Assembly. Booklet. 8½ x 11 ins. 16 pp. Full lists of parts for different units.

WINDOW SHADES AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York.

Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.

WINDOWS, STEEL AND BRONZE

Genfire Steel Company, Youngstown, Ohio.

Architectural Details, Steel Pivoted, Commercial and Architectural Projected Windows. 8½ x 11 ins. 24 pp. A. I. A. File No. 16E. Specification and construction details.

David Lupton's Sons Company, Philadelphia, Pa.

A Rain-shed and Ventilator of Glass and Steel. Pamphlet, 4 pp. 8⅜ x 11 in. Deals with Pond Continuous Sash, Sawtooth Roofs, etc.

WINDOWS, STEEL AND BRONZE—Continued

How Windows Can Make Better Homes. Booklet. 3⅞ x 7 in. 12 pp. An attractive and helpful illustrated publication on use of steel casements for domestic buildings.

Truscon Steel Co., Youngstown, Ohio.

Drafting Room Standards. Book, 8½ x 11 in., 120 pages of mechanical drawings showing drafting room standards, specifications and construction details of Truscon Steel Windows, Steel Lintels, Steel Doors and Mechanical Operators.

Truscon Solid Steel Double-Hung Windows. 24-pp booklet, 8½ x 11 in., containing illustrations of buildings using this type of window. Designs and drawings of mechanical details.

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

WOOD—See also Millwork

American Walnut Mfrs. Association, 618 So. Michigan Blvd., Chicago, Ill.

American Walnut. Booklet. 7 x 9 in. 45 pp. Illustrated. A very useful and interesting little book on the use of Walnut in Fine Furniture with illustrations of pieces by the most notable furniture makers from the time of the Renaissance down to the present.

"American Walnut for Interior Woodwork and Paneling." 7 x 9 in. pages, illustrated. Discusses interior woodwork, giving costs, specifications of a specimen room, the different figures in Walnut wood, Walnut floors, finishes, comparative tests of physical properties and the advantages of American Walnut for woodwork.

Curtis Companies Service Bureau, Clinton, Iowa.

Better Built Homes. Vols. XV-XVIII, incl. Booklet. 9 x 12 in. 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects, for the Curtis Companies.

National Lumber Mfrs. Assn., Washington.

Airplane Hangar Construction. Booklet, 24 pp., 8½ x 11 ins. Use of lumber for hangars.

West Coast Lumber Trade Extension Bureau, Seattle, Wash.

"Durable Douglas Fir; America's Permanent Lumber Supply." Booklet, 32 pp., 7 x 11 ins. Illustrated. Complete data on this valuable wood.

"Douglas Fir Wall Hanger." Metal-bound hanger, 31 x 32 ins. An attractive advertisement for Douglas fir.

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On the Cleveland Union Terminal Building 500,000 Sq. Ft. of MEYER Steelforms-

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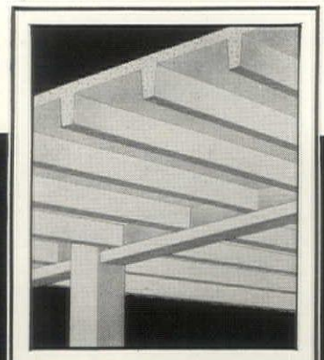

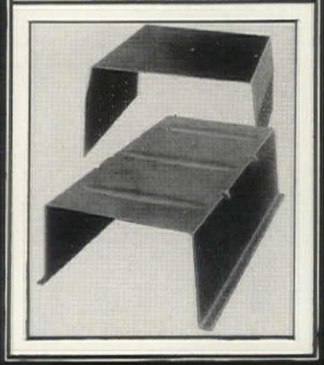

AND now . . . a Cleveland tribute to Meyer Steelform supremacy . . . the great Cleveland Union Terminal Building.

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As for speed! . . . the Concrete Engineering Company put 180,000 square feet of Meyer Steelform equipment to work at one time!

Ceco and Meyer Products and Ceco Super-Service are always at your command to help you build with greater speed, economy and durability. Call our nearest office or write 1001 North 11th street, Omaha, Nebraska.

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General Offices: OMAHA, NEBRASKA

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(2816)

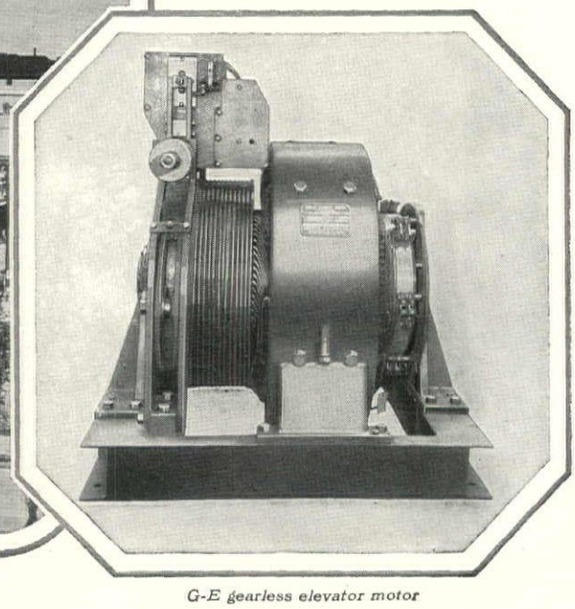
Architects: Graham, Anderson, Probst and White, Chicago, Ill.

General Contractors: Aronberg-Fried Co., New York City and Cleveland, Ohio.

4

The Medical Arts Building, San Antonio, Texas. Elevator equipment supplied by American Elevator and Machine Co., Inc., Louisville

Architect—Ralph H. Cameron



G-E gearless elevator motor

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

Outstanding Contributions *by* General Electric to Elevator Control

1 A system of *automatic speed regulation,* maintaining through a simple device high schedule speed during rush hours, while facilitating accurate landing

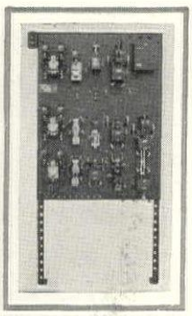
2 A system of *automatic control of acceleration and retardation,* resulting in minimum time consumed, combined with maximum comfort

3 Development of motor and control design for *utmost simplicity and lowest maintenance*

4 A simplified and accurately responsive system of *automatic leveling* for building owners who require the highest grade of elevator service

Automatic Control of Acceleration and Retardation

With G-E automatic control, acceleration and retardation are accomplished in periods of time which make possible the highest schedule speeds—and this with no discomfort to passengers. These desirable results are accomplished by an exceedingly simple control device. It may be adjusted over a wide range; and when once adjusted, it is not affected by changes in speed or load. In combination with the G-E automatic speed regulator, this system makes retardation distance practically constant under all loads. Thus accurate landing is facilitated; and when the system of automatic leveling is employed, leveling time is greatly reduced.



Panel for variable-voltage control

The following manufacturers of gearless traction elevators use G-E gearless elevator motors with G-E elevator control exclusively:

American Elevator and Machine Co. Inc., Louisville
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Warner Elevator Manufacturing Co., Cincinnati

237-30

ELECTRIC

SALES OFFICES IN PRINCIPAL CITIES

The Chanin Building, *New York*

Courtesy of Chanin Construction Company, New York.

The Chanin Building has 56 stories and is 702 feet in height. 15,000 tons of Bethlehem Sections were used in the steel framework.

The new Chanin Building is an impressive example of the tower office building. Like many other large buildings in cities of the United States, the Chanin Building has a steel framework constructed entirely of Bethlehem Wide-Flange Structural Shapes.

Bethlehem Wide-Flange Shapes—commonly known as Bethlehem Sections—are rolled on this Company's patented Grey Mills at Bethlehem, Pa., and Lackawanna, N. Y. When Bethlehem Sections were introduced, years ago, their economy in weight and in cost of fabrication was immediately recognized. Engineers, architects and contractors have extensively adopted these sections. They have been used in many prominent structures, not only in the United States but throughout the world.

33-inch and 36-inch Sections

Until recently the largest Bethlehem Section rolled had a depth of 30 inches. Today, however, this Company is rolling 33- and 36-inch Sections, extending the range of application of Bethlehem Wide-Flange Shapes and making it possible to more fully utilize their advantages and economies. These new deep Sections are having especially wide application in railway and highway bridges, as well as in building construction.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

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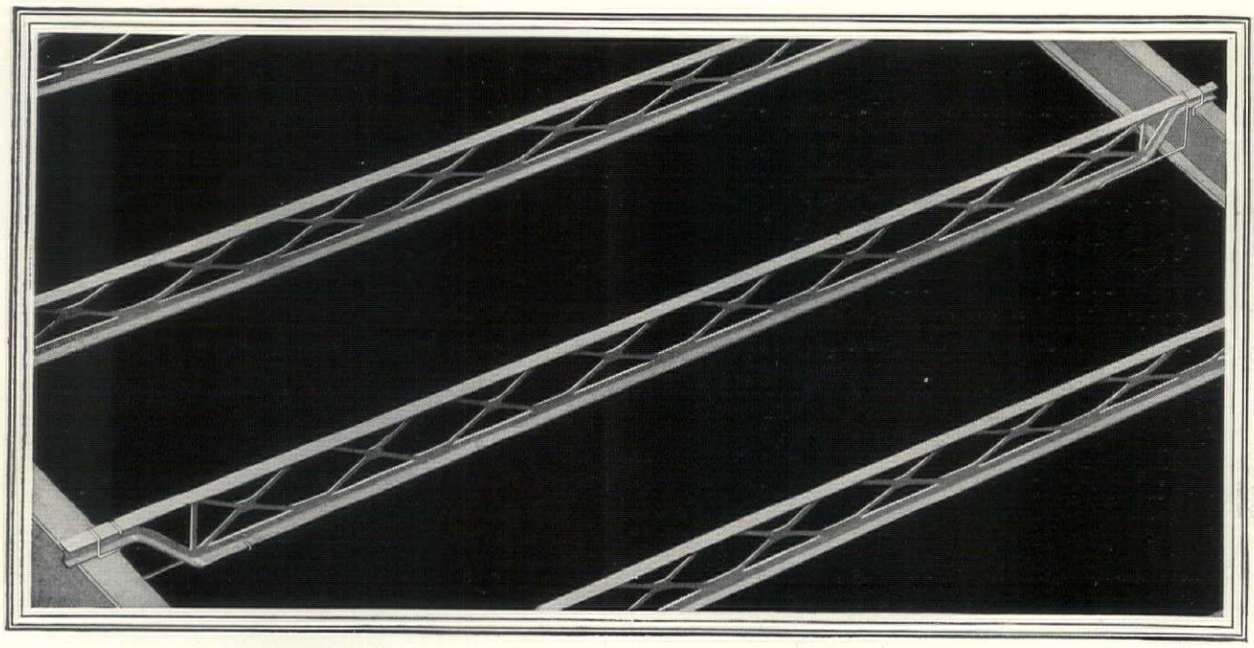
Bethlehem Steel Export Corporation, 25 Broadway, New York, Sole Exporter of our Commercial Products.

BETHLEHEM
Wide-Flange
STRUCTURAL SHAPES



A New Building Product

—*made by a new and different method*

Here is a new Kalman product for safe and economical fire-resisting floor construction. This advanced type of joist gives you a joist which meets the requirements of modern construction methods, and is built according to accepted principles of sound engineering. A new and different method of manufacturing gives you the chords and web members which are formed from one piece of steel. There isn't a bolt, rivet or weld in tension. You can see the Kalmantruss joist — can read about it — and you can get lots of other valuable information from the new Kalmantruss catalog. Write for it.

KALMANTRUSS

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KALMAN STEEL COMPANY

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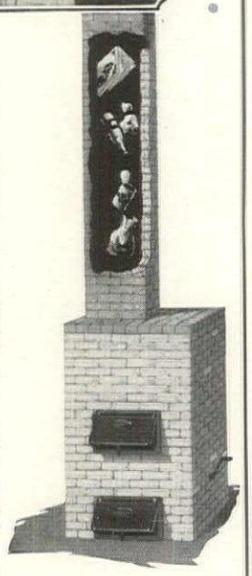
Eight Times We Changed This Door—

IN pioneering flue-fed incineration, 15 years ago, the Kerner Incinerator Co. was forced to turn, for data, to the pitiless crucible of actual usage. Little was known of such factors as moisture content, smoke, draft and flame control, air movement, gas distillation.

One by one, this organization faced and settled these problems, scientifically — exactly. Typical of the painstaking route traveled toward perfect dimensioning of each part of the Kernerator, is the effort expended in making the door shown above precisely right in width, height, weight, slant and positioning.

Eight times we changed this door. Foolish? Not a bit of it! Such care is the big reason why the Kernerator works — always. Such care is responsible for the famous, patented Kernerator By-Pass, without which satisfactory flue-fed incineration is impossible.

The Kernerator is positively guaranteed to handle all waste—not only garbage, but sweepings, tin cans, broken glass, papers, magazines, household rubbish of every kind. Metallic objects, such as tin cans and the like, are flame-sterilized for removal with the ashes. IT COSTS NOTHING TO OPERATE —NO FUEL IS USED—THE WASTE ITSELF IS FUEL FOR ITS OWN DESTRUCTION. The illustration shows how it is built in and how it operates.



Residence Models as low as $95— and the masonry adds but little more when regular chimney is used.

For details see Sweet's, write for Kernerator Catalog in ready-to-file A. I. A. folder 35J41 or phone your local Kernerator representative. Offices in 90 cities.

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Garbage and Waste Disposal without Leaving the Kitchen

THE CUTLER MAIL CHUTE

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Full information, details, and specifications on request.

THE CUTLER MAIL CHUTE CO.
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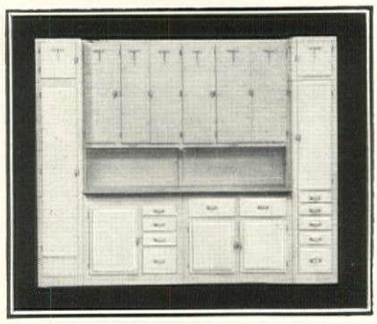

Back of every unit

in the Kitchen Maid line, lies a record of years of close co-operation between architect and manufacturer. It is significant that Wasmuth-Endicott, whose products bear the Kitchen Maid trademark, are today America's largest exclusive makers of built-in equipment for the kitchen.

Wasmuth-Endicott Co., 1810 Snowden St., Andrews, Ind.
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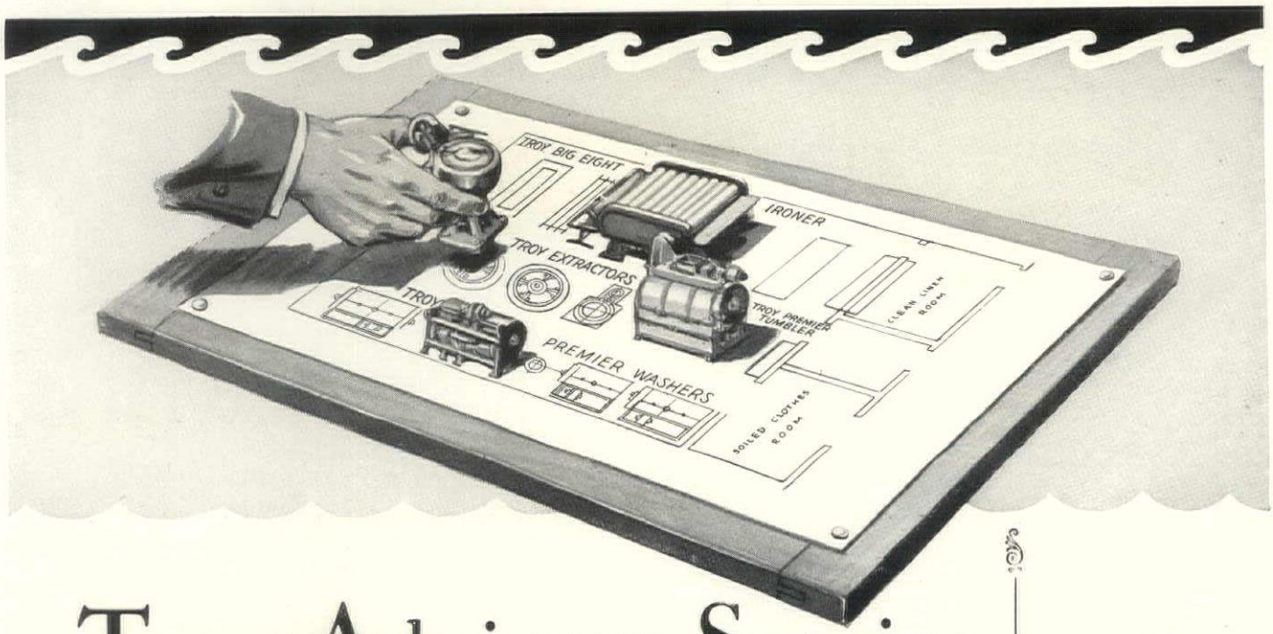
"Let the Kitchen Maid be your Kitchen Aid"

KITCHEN MAID
STANDARD UNIT SYSTEMS

SINCE 1882 ... THE WORLD'S PIONEER MANUFACTURER *of* LAUNDRY MACHINERY



Troy Advisory Service

will plan, lay out, estimate and prepare specifications for your institutional laundries

Care and expert attention should be employed in planning the institutional and commercial laundry.

Many factors are to be considered. Machinery installations and equipment layout vary with the work to be done, the space available, the location of doors, windows and bin space. Linens and garments should pass through the various processes without waste motion — in a direct line from one operation to another.

As an aid to the architect in laying out laundry facilities, Troy offers without charge the TROY ARCHITECTS' ADVISORY SERVICE — in planning, estimating and preparing specifications for laundry equipment in any type and size of institution.

Feel free to consult Troy at any time.

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TROY
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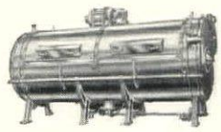
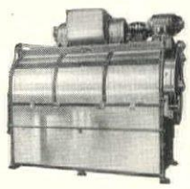
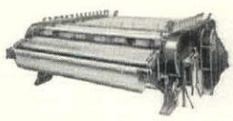


Front view 42 x 94 inch Premier all-monel washer. Type A motor drive.

Marathon Extractor. Belt drive, with angle countershaft attached.



Front view 42 x 90 inch Premier Drying Tumbler Type A motor drive.



Troy Big Eight Roll Flatwork Ironer. Feed side showing motor belt drive.

The Unseen Qualities

The achievement of comfort is a function of building no less than the achievement of good design, arrangement and beauty.

Comfort is one of the unseen qualities—intangible but very real. A house built so that sounds are deadened—so that dampness is not present—so that winter cold and summer heat do not easily penetrate walls and roof—has the unseen qualities.

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GYPSTEEL

A Proven PRE-CAST *System* of Floor and Ceiling Construction

ANYTIME now, on jobs where construction speed and economy are requisite, you may want to use a superior, fireproof floor and ceiling construction.

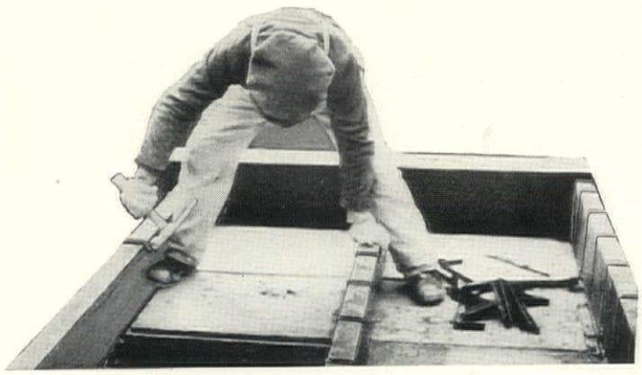
Gypsteel floor and ceiling construction has a record of five years' successful use. It gives a construction of definite calculable strength and unequalled fire-resistive properties.

The lightness in weight of Gypsteel floor and ceiling units effect substantial economies in both structural steel tonnage and foundation sizes.

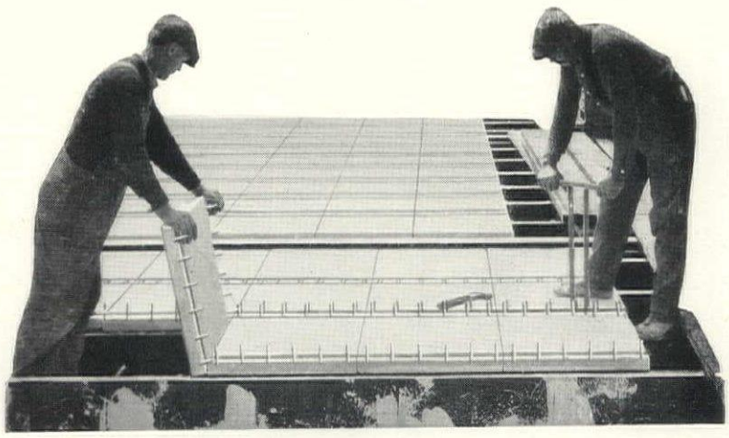
Gypsteel pre-cast floor and ceiling slabs are machine made to insure accuracy. They are constructed of the highest grade calcined Gypsum, correctly reinforced by cold drawn steel rods.

The ceiling slabs are suspended directly from the channels by steel hangers. All joints are completely filled with Gypsum grout, insuring absolute fire protection.

Gypsteel floor slabs are laid directly on the channels. The reinforcing rods projecting from the abutting slabs are tied together. A continuous reinforcement is thus obtained throughout the entire floor area.



Clinching the steel hangers suspending Gypsteel ceiling slabs



Placing Gypsteel floor slabs and tying the extending reinforcing rods

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The Union Central Life Building Annex

Third & Vine Streets, Cincinnati, Ohio

Architects, Garber & Woodward
General Contractor, The Ferro Concrete Construction Co.
Par-Lock Applied by the Par-Lock Appliers of Columbus.

Efficient Protection for Fine Interiors

THE splendid Union Central Life Building, Cincinnati, Ohio, has a recently completed Annex, of striking design and a model of good construction. Par-Lock Plaster Key was employed on all ceiling slabs, columns and beams, except where finished for acoustical effect.

Par-Lock is applied in accordance with a variety of specifications for a wide range of uses. Essentially, it is a Plaster Key that protects the plaster against moisture, stain or cleavage originating from causes within the structural surface. It is also invaluable in a wide range of damp-proofing and water-proofing operations. Applied only by responsible Par-Lock Appliers, this treatment assures uniformly, efficient interior protection.

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PAR-LOCK CORK INSTALLATIONS
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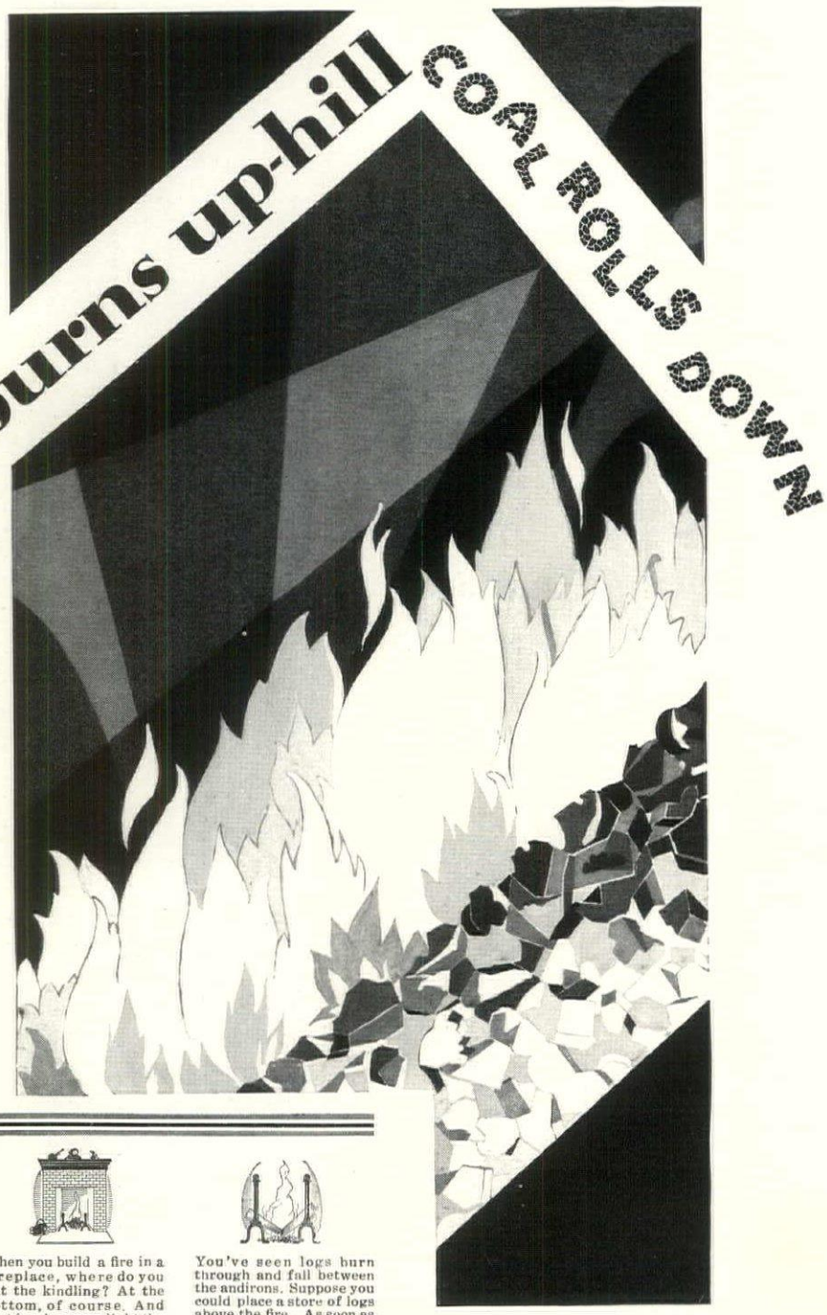


Your clients' coal bills can go up or down depending on the fuel you specify

You know how simple it is to add a few more dollars to the first cost of a home or building, to save many dollars every year in up-keep and repairs. Yet how difficult it is sometimes to convince a client of the saving.

That is because the savings are intangible. Even brass pipe and copper gutters have no specific standard by which to measure their saving. They are often "sold" as they are advertised, because of their insurance against inconvenience rather than because of their economy.

Obvious-saving Gables

The Spencer is different. You not only know that a Spencer saves but your client knows how much it saves. The Spencer is designed with a sloping Gable-Grate that makes fire burn up-hill, and with a storage Magazine that feeds fuel continuously to keep the fire-bed uniform in depth. It is obvious that these two features maintain the thin fire-bed that will and does burn small size, low cost fuels.

When you specify the heater for a home or building, you automatically specify the fuel to be used. A Spencer saves as much as half the owner's fuel bill, by burning No. 1 Buckwheat anthracite at an average of $6 less per ton than the egg, stove and nut sizes required by ordinary heaters. Pea and Buckwheat coke and any small size non-coking graded fuel make proportionate savings, when used in a Spencer.

An unqualified guarantee

Specify the Spencer in any home or building you design, for use with steam, vapor or hot water systems. Expect it to save your client enough in its lifetime to pay your entire fee, and it will. Just as important to you is the fact that in saving it will give better, more uniform heat. Arbitrary ratings are no longer used to measure Spencer efficiency. Instead, a guarantee of actual cast iron column radiation capacity in square feet is given for each Spencer. You know how much it saves, and you know how much it heats. Write for illustrations, descriptions and guaranteed capacities of new Spencer Heaters for any size and type of building. Spencer Heating Company, *Division of Lycoming Manufacturing Company,* Williamsport, Pa.

When you build a fire in a fireplace, where do you put the kindling? At the bottom, of course. And that is where you light the fire—for fire burns up. The Spencer Gable-Grate is sloped to make fire burn up-hill, the way it burns easiest and best.

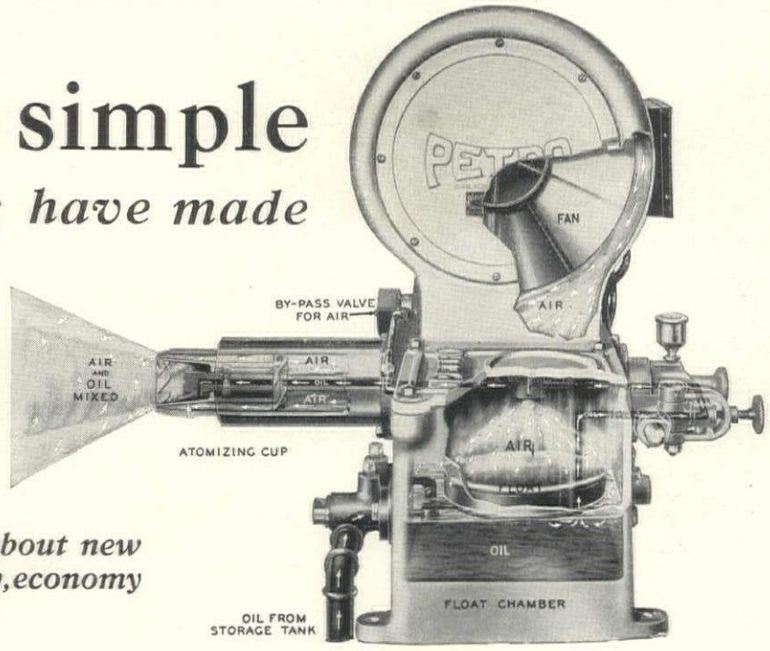
You've seen logs burn through and fall between the andirons. Suppose you could place a store of logs above the fire. As soon as one burned through, another would roll down to take its place. That's how the Spencer Magazine feeds fresh fuel to the sloping Gable-Grate.

SPENCER
steam, vapor or hot water
HEATERS

See how simple

Petro engineers have made

OIL HEAT



New simplicity brings about new standard of dependability, economy and effiicency

By putting free air to work, Petro engineers have reduced the mechanics of oil heating to remarkably simple elements. And in so doing, they have achieved results of major importance to architects who are seeking an oil burner they can recommend.

Not only does air do the work more quietly, efficiently and economically, but air costs nothing and never wears out.

Petro's simplicity has so increased dependability that less than two calls per burner per year is the average. Petro's air principle permits of the use of any residence oil, heavy or light, thick or thin. The Underwriters' Laboratories list all six Petros as standard. Petro Burners are listed to burn the cheapest fuel oil available for residence use. Efficiency is so high that Petro Oil Heat commonly costs less than hard coal. Complete satisfaction is absolutely guaranteed by every Petro dealer.

Petro domestic oil burners range in capacity from ¾ gal. per hour to 45 gal., or any radiation up to 18,000 sq. ft. rad. Industrial models range from 50 h.p. to 1000 h.p. boilers, using 12-16 gravity oil.

Your local distributor or dealer has been selected with the greatest care. His financial resources, organization and experience, backed by the integrity of Petro's unique board of directors assure you continued oil heating service of the highest type. Petro is an oil burner you may recommend or specify for use in any type of home from the very smallest to the largest estate.

Write today for detailed engineering data on the complete Petro line.

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Makers of oil burners since 1903

FESS SYSTEM CO. (subsidiary), 220 Natoma St., San Francisco, Calif.

The SIROCCO for Industrial Heat-

Imagine a heating unit that forces heated air where you want it, when you want it and as much as you want—that eliminates cold corners, and heat pockets from large industrial areas—a unit that can be used for ventilating as well as heating! Imagine a heating unit that can be shut off all night and thrown open in the morning to heat a large area comfortably in less than 30 minutes—a heating unit that occupies the minimum of floor space and is so simple and accessible that it can be taken apart and assembled by anyone with only a few ordinary tools! Imagine a heating unit that will operate year after year with practically no attention whatever; that can be regulated to keep comfortable working conditions regardless of outside weather conditions; that puts waste heat to work and reduces expense in every manner known to scientific heating! Such a unit is the new Sirocco Unit Heater.

Companion to the World Famous Venturafin Unit Heater

Built by the makers of the Venturafin Unit Heater —the Sirocco Unit is of high velocity type for floor and ceiling applications, high or low pressure installations. It fills a decided need for adequate heating equipment in large industrial buildings, warehouses, gymnasiums and other structures of large areas where forced heat at high velocity is desirable or necessary.

Illustrated below is the 4-18 F. Sirocco Unit Heater for industrial heating and ventilating. When the Sirocco Unit is used to ventilate as well as heat, one air intake opening at the lower part of the unit is connected up with the wall box and fresh, invigorating air is drawn from out-of-doors whence it passes over the heating coils to be correctly tempered and forced out into working areas. A mixing damper and control lever regulate the amount of outdoor air taken into the unit.

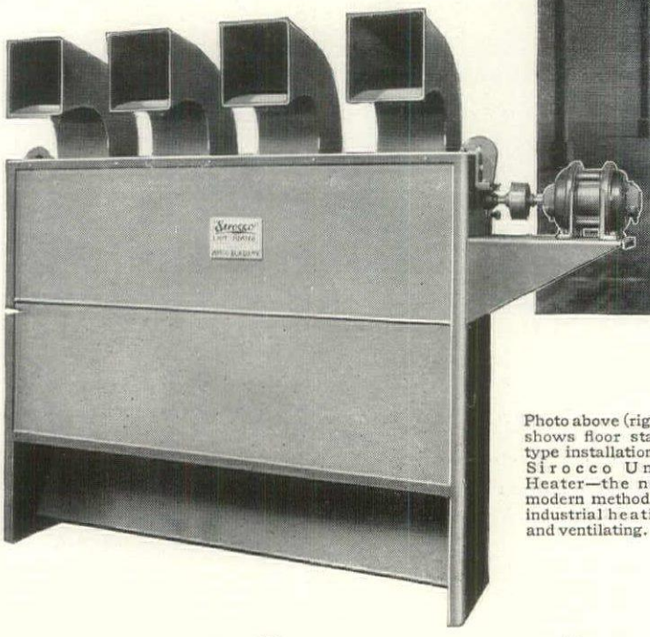


Photo above (right) shows floor stand type installation of Sirocco Unit Heater—the new modern method of industrial heating and ventilating.

New Advantages and Economies

The Sirocco Unit Heater offers many important advantages for heating and ventilating large areas. It has a lower tip speed than any other unit of

American Blower

"Sirocco" TRADE MARK

VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

UNIT HEATER *ing and Ventilating*

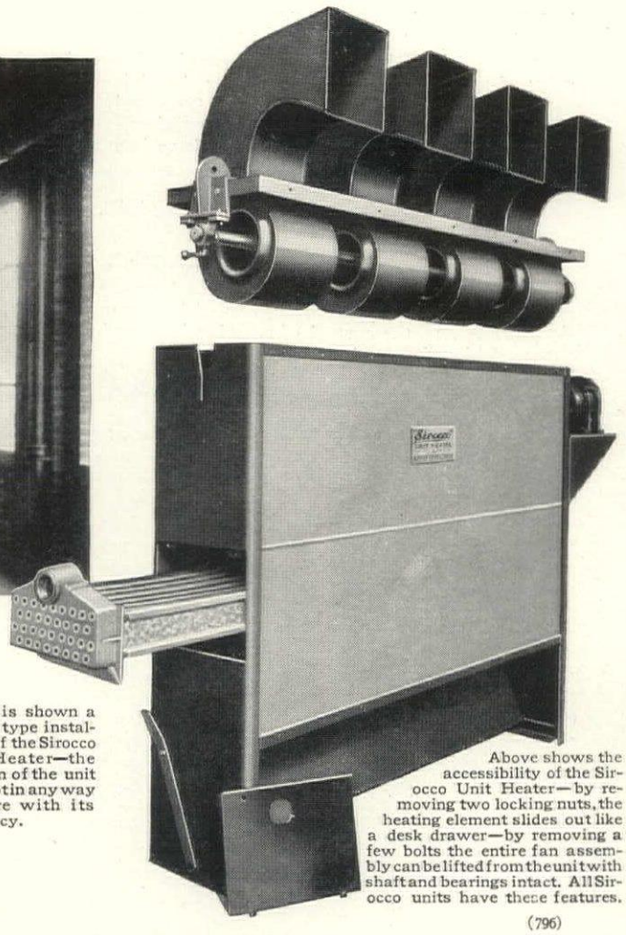
equivalent capacity, which assures more quiet and satisfactory operation. It is scientifically designed to reduce waste heat to a minimum and to actually put "waste heat" to work. It is built as only American Blower, with its vast resources, years of experience and complete facilities, builds heating and ventilating equipment. It is the most accessible unit heater on the market. It distributes heat more evenly and over a larger area through the use of specially designed Evase type discharge cowls. It ventilates as it heats—or can be used for either heating or ventilating alone. Made in twenty-eight sizes and capacities to fit every need.

Ventilating Units for schools, offices and public buildings; and Venturafin units for general industrial applications (stores, factories, garages and shops) to the Sirocco Unit Heater for large industrial areas where forced heat at a high velocity is advisable or necessary.

Send for Complete Information

Every user, buyer or dealer of heating equipment, as well as architects and engineers, should have complete information on the Sirocco Unit Heater. Fill out and mail the coupon today and we will send it to you free of charge and without obligation.

Above is shown a ceiling type installation of the Sirocco Unit Heater—the position of the unit does not in any way interfere with its efficiency.



Above shows the accessibility of the Sirocco Unit Heater—by removing two locking nuts, the heating element slides out like a desk drawer—by removing a few bolts the entire fan assembly can be lifted from the unit with shaft and bearings intact. All Sirocco units have these features.

(796)

A Complete Line of Unit Heaters

The addition of the high velocity Sirocco Unit Heater gives us a complete line of unit heaters ranging in types from the Universal Heating and

AMERICAN BLOWER CORP., DETROIT, MICHIGAN
CANADIAN SIROCCO CO., LTD., WINDSOR, ONTARIO
BRANCH OFFICES IN ALL PRINCIPAL CITIES

C O U P O N

I am interested in the Sirocco Unit Heater for industrial heating and ventilating as applied to the subjects checked on right.

Name _____

Firm _____

Full Address _____

☐ Factory ☐ Warehouse
☐ Shop ☐ Gymnasium
☐ Garage of large area

REVIEWS OF MANUFACTURERS' PUBLICATIONS

OIL HEATING INSTITUTE, 420 Madison Avenue, New York. "Installing Oil Heat." Booklets concerning use of oil.

Particularly useful to architects and engineers are the valuable publications being issued used by this associaton of manufacturers of oil-burning equipment and oil companies. The titles of some of them are: "Are Oil Heaters Perfected?"; "Does It Pay to Install an Oil Heater?"; "Making Better Use of the Basement"; "What About the Supply of Fuel Oil?". The particular booklet being noticed here, which deals with the subject from the architects' point of view, is a carefully prepared study, giving data regarding different types of oil-burning mechanism. The brochure is fully illustrated, and it explains the matter well.

ATLAS WHITE PORTLAND CEMENT COMPANY. 25 Broadway, New York. "Houses of Stucco."

The interest which attaches to any building coated with stucco is of course that given by use of appropriate and attractive texture and color. That this is true has been proved again and again when a structure ordinary and commonplace if not actually ugly and dreary has undergone a course of treatment and has come forth clad in a dress of stucco which by having wholly transformed its appearance has prolonged indefinitely its life and usefulness. There is probably no firm manufacturing building materials which issues publications more practical and useful than the Atlas White Portland Cement Company. Its booklets and brochures have been reviewed many times upon these pages of THE FORUM because it has been long felt that they carry to architects and builders information which might not be had from any other source. This particular brochure deals with the color and texture which wise use of Atlas White in stucco may give. In addition to presenting illustrations in color of surfaces so treated and giving the plainest possible directions as to how to secure the textures and colors, the brochure illustrates a large number of buildings,—residences, garages, apartment houses, etc.,—which have been so treated.

THE UNITED STATES GYPSUM COMPANY, Chicago. "Sabinite." A brochure on its use.

There are not many departments of research which have yielded more practical and valuable results than have the researches which have to do with acoustics.—a term which, since it concerns the control of sound, might, perhaps, without stretching its meaning unduly, be taken to mean the *prevention* of the transmission of sound as well as the improving of the *hearing* of sound. This brochure on the use of the material known as "Sabinite" deals with this important subject. It confines itself to two of the three major phases of the general problem. The first two are treated here; the third is to be treated separately in a subsequent publication. These three problems are: (1) Audience Rooms,—treatment of audience rooms in order to provide proper hearing conditions for both speech and music. (2) Noise Absorption,—the absorption of noise created in and about hotels, office buildings, banks, hospitals, restaurants, railroad stations, etc.; to quiet such structures and make them more generally useful to people occupying them. (3) Sound Insulation,—the treatment of any room, partition or floor to prevent the transmission of noise from that room to abutting rooms, in short, sound *insulation*, as compared to sound *absorption*. While it is true that sound absorbents are useful in preventing transmission of noise, they are not completely efficient in this regard, and are in no sense offered to the public as sound insulators. The problems are distinctly different, and consequently are treated separately. The first two of these problems owe their theoretical solution almost wholly to the work of one man, the late Wallace C. Sabine, Professor of Physics in Harvard University. In 1895 he began 25 years of intensive, careful scientific research in a field that had hitherto been the playground of guess work and opinion. This work made Professor Sabine the founder of what is today an important branch of engineering science, the control of sound.

METAL DOOR & TRIM CO., La Porte, Ind. "Hollow Metal Construction; Details and Specifications."

The attention of designers as well as of those more particularly interested in specifications and building might well be given to this publication. It deals fully with the fine line of doors and trim of different kinds, mouldings, hardware, etc., which the firm manufactures, and it illustrates their use by means of cross-sections and other diagrams. An impressive list of important structures in which metal doors and trim made by this firm are used is given, together with the names of their architects, and a large part of the 188 pages is devoted to illustrating some of the important buildings in which installations of metal have been made.

INTERNATIONAL NICKEL COMPANY, INC., New York. "Planning Ahead for Monel Metal." Some data on its use.

The dictionaries describe monel metal as "an alloy of nickel, copper and iron which possesses great elasticity and high tensile strength." Useful for many purposes, it is particularly so for the manufacture of utensils which are used in cooking and in the preparation of food products, and thus the material finds extensive use in hotels, restaurants, hospitals, and elsewhere where cooking must be done on a more or less extensive scale. The ingenuity of metallurgists and manufacturers, and the use which they have made of advertising have created in the public mind what might be called a "consciousness" of what monel is and what it is for, and in this large booklet there is given an excellent idea of what this advertising has been and still is. The large size of the booklet's pages makes possible a presentation of countless advertisements which have appeared in magazines of general circulation; in class journals; publications devoted to the restaurant, hotel, hospital and laundry interests; and journals dealing with the manufacture of textiles and other materials. Owing to the wide extent covered by its subject matter, the booklet possesses great interest and value for architects, engineers and builders.

MACOUSTIC ENGINEERING CO., INC., Cleveland, Ohio. "Macoustic Sound Control." Important data on the subject.

Architectural designers, no less than those interested in the structural side of architecture, may well have their attention brought to this publication. This company "devotes its facilities exclusively to the manufacture of acoustic material and to the conducting of a highly specialized engineerng service directed solely to the solution of acoustical problems. In 1895 a building was constructed on the Harvard campus, and upon its completion the acoustics were found to be so poor as to actually interfere with the use of the structure. This raised considerable comment among the professors of Harvad University, because this building had been intentionally designed after the manner of another building in Cambridge that was almost acoustically perfect. The Department of Physics was asked to determine what caused the difference in the two structures. After certain experiments had been made, it was discovered that the cushions on the seats of the earlier building contributed to its ideal acoustical conditions. Out of this discovery grew original data and basic formulæ which are universally used today in predetermining the acoustical quality of any type of interior and the correction of any acoustical faults that exist. The Macoustic Engineering Company, Inc., was organized in 1921 by a group of technical men who realize the need for a high grade acoustic material and authoritative data on acoustical problems. After extensive research and the study of acoustics, these engineers developed Macoustic,—a fireproof, vermin-proof material that produces built-in sound control and goes on like plaster. The experience and data accumulated through years of scientific and practical experiments in acoustics are placed at the disposal of the architect, without charge." The booklet goes fully into the use of Macoustic and its possibilities in various ways, and it presents illustrations in half-tone of a number of important buildings in which it has been used.

FUEL ECONOMY *goes with* HEATING EFFICIENCY *in* ELECTROL

KNOW ELECTROL BY THE HOMES IT HEATS

Home of H. B. Stanz, Jr., Whitefish Bay, Wisconsin. Heated by Electrol Model TJ in a hot air furnace.

On the basis of the amount of heat obtained for every dollar spent for fuel, Electrol Automatic Oil Heat costs less than the equivalent amount of heat supplied by any other automatic heating equipment, or by any other fuel, except soft coal.

The advanced principles and design employed in Electrol result in maximum heating efficiency, with ample capacity for the largest homes and buildings.

Fuel economy and heating efficiency are combined in Electrol.

Quiet . . . All-Electric . . . Entirely Automatic, Electrol is as fine as engineering skill and exceptionally strong financial resources can produce. It is the oil burner with *The Master Control* which watches over every phase of the burner's operation, day and night, like a living sentinel always at the furnace door.

A Blue Book of Electrol Owners would read like the social register of America. Electrol is heating some of the country's finest homes.

Electrol's positive, automatic electric ignition eliminates the need for a gas pilot light. Mechanical fuel atomization, with the scientific mixing of the correct amount of air, produces intense heat with the minimum consumption of fuel. The oil and air supply are controlled separately,—an important part in producing best results.

Correct Installation is Part of the Purchase

When you specify Electrol Automatic Oil Heat you know that the burner will be correctly installed. The Electrol dealer makes an intelligent and conscientious survey of the heating requirements and advises candidly regarding the possibilities with Electrol.

All installations are made by men who have been thoroughly trained at the factory in the correct methods of fitting Electrol to each type of heating plant.

Complete Oil Heating Service

Wherever Electrol is sold you will find a complete oil heating service, backed by a sound, large and growing manufacturing organization. Purchase of Electrol can be financed along with the financing of the new building.

For complete details, write for the regulation A. I. A. Folder on Electrol. Or, if you prefer, consult the Electrol Sales and Service Representative in your city. Electrol Inc. *of* Missouri, 179 Dorcas St., St. Louis, U. S. A.

ELECTROL

The OIL BURNER with *The Master Control*

Listed as Standard by the Underwriters' Laboratories, and bears their label.

Member of the Oil Heating Institute

Electrol Inc. *of* Missouri
179 Dorcas St., St. Louis, U. S. A.
Gentlemen: We will appreciate a copy of your regulation A. I. A. Folder.

Name .....

Address .....

City ..... State .....

REVIEWS AND ANNOUNCEMENTS

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY. "Catalog of Electrical Supplies, 1928-1930."

The use of electricity for a great variety of purposes means, of course, provision of countless details of electrical equipment. This publication, one of quite a number issued by the Westinghouse firm, is a cloth-bound volume of almost 1,200 pages, fully illustrated. It presents a complete listing of the supply apparatus and appliances manufactured by the Westinghouse Electric & Manufacturing Company and obtainable through its district offices and agent-jobbers. A brief presentation of the company's industrial motors and controllers, power and marine equipment, large switchboards and oil circuit-breakers and railway apparatus is also included; complete information on any of this apparatus will be furnished upon request. For the convenience of users of the catalog, a very complete cross-index is given.

ORANGE SCREEN CO., Maplewood, N. J. "Orsco Screens and Other Products." Important data on several materials.

The study which has been given to the metal screens used for various purposes has resulted in their production in high quality at no great cost. This brochure deals with the screens and with certain other products made by the Orange Screen Company, the screens used at windows and doors as protection against flies and other insects, and the "one-way vision screens" often used in banking rooms and ground floor offices to secure privacy. These screens are fully described and illustrated. They are to be had in great variety for windows of different kinds, the double-hung type, casements, pivoted windows, etc., and the booklet deals also with "Orsco" methods of construction, "Interlocking Drum-Tile Moulding," "Corner Construction," "Mortise and Tenon Corner," "Astragal Joint" and with the "Orsco Kiln-Drying Process," "Orsco Rustless Wire," and with the hardware of many kinds used upon screens.

JOHNS-MANVILLE CORPORATION, NEW YORK. "Sound Absorbing Treatment in Banks and Offices."

In the planning of banking quarters, one of the problems which must be solved has to do with the prevention of noise,—or rather in most instances with the *absorption* of noise. It is possible to enter one bank and have one's ears saluted by the din of typewriters, adding machines and other useful and necessary devices, while in another bank there may reign the quiet which is always associated with dignity,—one of the chief qualities or characteristics which a bank is expected to possess. The difference is likely to be due to use in the latter instance of certain materials in walls and ceiling which absorb the sound. "Once produced in a confined room such as a business office or bank, this energy will continue to exist until it is absorbed by the boundary surfaces of the room, the walls, floor and ceiling, or is transmitted to the space beyond. An entirely negligible amount is absorbed in the viscosity of the air itself. It spreads in the form of a spherical wave from its source in all directions, and its loudness or intensity diminishes as the square of the distance from its source. These are simple laws of physics. When this noise or energy is produced in a business office or bank in which the boundary walls, floor and ceiling are composed of almost perfect reflectors of sound, it is evident that by far the major portion of the energy produced by whatever source, such as talking, telephone bells, typewriters, adding machines, bookkeeping machines, or other office mechanical devices, must go through a considerable process of multiple reflection, from walls to ceiling, ceiling to floor, floor to walls and ceiling again, many times, before the energy or noise has been wholly dissipated." This brochure dwells upon the use of "Akoustikos," an acoustic felt composed of asbestos fiber and hair. "When this material is installed strategically upon the principal reflecting surface of a bank or office, usually the ceiling, it is in effect a blotting paper for sound, absorbing the major portion of the sound energy immediately over its source, and in this way successfully eliminating most of the energy accumulation due to continued reflection."

OAK FLOORING BUREAU, Hearst Building, Chicago. "The Story of Oak Floors." Their value in building.

Today, as in all ages of building, many materials are used for flooring, and yet were it possible to take account, it might well be found that the vast majority of the floors throughout the world are of wood, and were one able to determine the variety of wood, it would probably be found that most of the better class floors are of oak,—a wood held in high favor in all ages and in all countries where it it grown. This brochure deals with the merits, as a flooring material, of this most excellent wood. It dwells upon many of the qualities of oak, such as its beauty, durability, cleanliness and economy for flooring structures of several kinds, and it considers its use in schools, hospitals, public buildings, and residence structures of a number of sorts. This well written booklet should be in every specification file.

MOSAIC TILE COMPANY, Zanesville, Ohio. "Mosaic Tiles in Colors." Their excellence for several purposes.

In this brochure there is given an idea of what may be done with Mosaic tiling when it is intelligently used. Everyone is familiar of course with tiling when used for dadoes or even for facing entire walls in bathrooms, but this has generally involved use of the white tile which are undoubtedly highly sanitary and easily cleaned but sadly lacking in character which might be considered either architectural or decorative. This booklet, however, presents illustrations in color of several bathrooms having floors, walls and even ceilings in excellent color combinations, and several illustrations show kitchens so arranged. Another page shows the interior of a restaurant fitted with tile of a particularly rich and beautiful arangement of tan, red and dull blue, while still another illustration is of a bank where the working out in mosaic tile of even the banking screen suggests the adaptability of the material.

Ralph C. Flewelling announces his removal from 423 Camden Drive to the Beverly Arcade Building, Beverly Hills, Cal. The publications of manufacturers are desired.

J. de Forest Griffin announces his removal from Chehalis, Wash., to 222 No. Western Avenue, Los Angeles. He desires the catalogs and other publications of manufacturers.

Announcement is made of the change of the firm name of Morison & Wallace to that of Miller & Wallace, Inc., Architects and Engineers, with offices at 222 West Adams Street, Chicago.

Credit for the designing of the house of James A. Trowbridge, Esq., Noroton, Conn., shown in Plates 51 and 52 of THE FORUM for September, should have been given Electus D. Litchfield and Pliny Rogers, not to Mr. Litchfield alone.

Tex Rickard *says:*

"LAPIDOLITH did what you claimed. The floors *improve* under traffic."

MADISON SQUARE GARDEN CORPORATION
49TH AND 50TH STREETS-EIGHTH AVENUE
G. L. RICKARD, President
NEW YORK

May 24, 1928.

L. Sonneborn Sons, Inc.
114 Fifth Ave
New York N Y

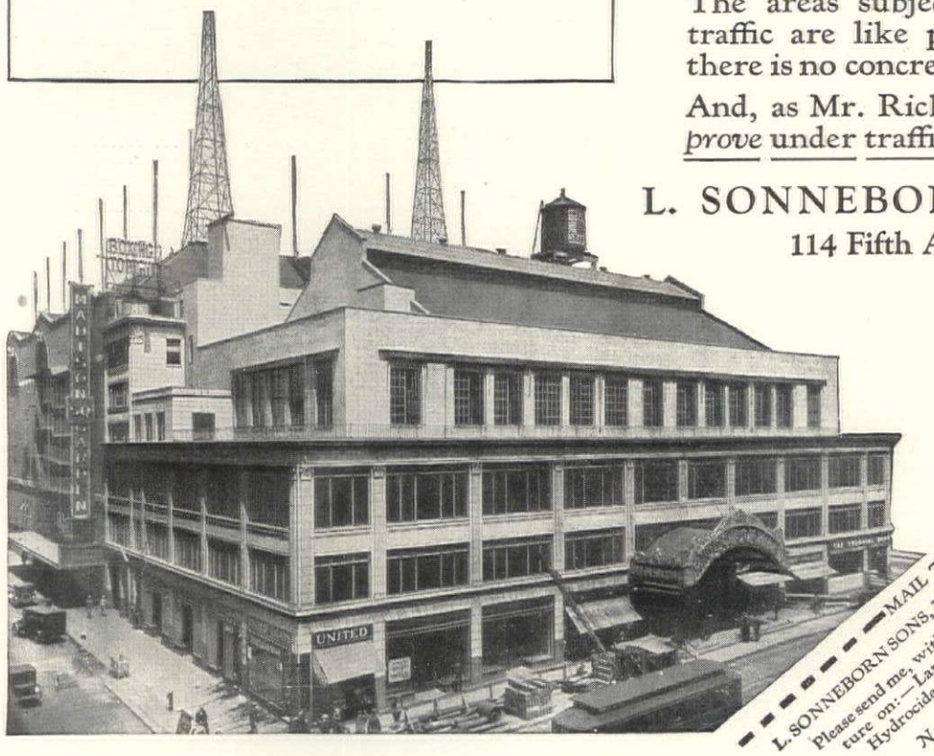
Gentlemen:-

This is the third year since you applied your Lapidolith Hardener and Dustproofer to all the cement floors of the New Madison Square Garden, New York City.

Lapidolith did what you claimed and as a result the floors are hard and smooth showing no signs of wearing or dusting, but improve under traffic.

Yours truly,
Madison Square Garden Corporation
By Geo L Rickard
President

G.L.RICKARD:L



TEN million people, it is estimated, have swarmed into Madison Square Garden since its opening three years ago.

Twenty million feet! Pounding, kicking, scuffing the Garden's concrete floors.

What a test for Lapidolith—Sonneborn's Concrete Floor Hardener that protects these floors.

Tex Rickard knows how to pick the winners. When he found that the untreated concrete floors at the Garden gave off clouds of concrete dust, he picked Lapidolith to harden, wearproof and dustproof them.

Just how effectively Lapidolith hardened the 250,000 square feet of concrete is shown in the letter at the left. Lapidolith did its work because of its quick absorption at night without interfering with the operation of the Garden.

If you visit Madison Square Garden, look at the floors. They are hard as flint. The areas subjected to the heaviest traffic are like polished marble. And there is no concrete dust.

And, as Mr. Rickard says, "They *improve* under traffic."

L. SONNEBORN SONS, Inc.
114 Fifth Avenue, New York City

MAIL THIS COUPON TODAY

L. SONNEBORN SONS, Inc., 114 Fifth Ave., New York
Please send me, without obligation, demonstration samples and literature on:—Lapidolith....; Lignophol....; Hydrocide Colorless....; Cemcoat....;
(Check products that interest you.)

Name.....
Address.....
Company.....
Position.....

A. F.-10

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DUNHAM HEATING

An open letter from the president of C. A. Dunham Co.

OUR National business has become International. Under corporate powers vested in several companies, the latest of these is the C. A. DUNHAM COMPANY, LTD., of London, England.

There are at present more than eighty offices in the United States, Canada and Great Britain, and in addition thereto, there are several agencies in other parts of the World. This forms an active background for the Dunham Differential Vacuum Heating System.

An Organization of Specialists

In each office there are from one to ten members —one or more of whom have engineering training, qualifying them to advise on the proper application of this new heating method.

Certain well defined territory boundaries surround each company office, and all installations are the fixed responsibility of the managing engineer in whose territory these systems may be located.

Such local tie-ups between the company's organization and the Architect's engineer to design the heating, and subsequently with the heating contractor in the installation, is insurance of satisfaction to the owner.

This is a brief picture of the merchandising end of the Dunham organization.

It represents the contact point thru which our message of helpful service is demonstrated;—only on its proper functioning, can the years of rich experience be turned into channels of everlasting profit to the recipient of Better Heating. The reputation and the combined intelligence of the men who are back of this work cannot be questioned; each has a sustaining conviction of his responsibility in helping to make this system possible for a general use.

Its Value Has Been Proved

There is no mistake about the value of heating buildings with low temperature steam which may be varied to meet the needed output to balance the heat loss. Mr. Apple, Superintendent of the Barlum Tower, Detroit, states that the season's cost of heating that forty-story building with this system, was $0.292 per square foot of radiation. The season started September 12, 1927, and ended June 5, 1928; it was a green building and had all the usual handicaps of foreign matter to clear, which invariably attends the first year of any installation. Steam costs were $1.00 per 1000 pounds.

Our own building heating costs dropped from $0.199 the first season to $0.169 the second season's operation per square foot of radiation, and in each case this record was for the entire period between October 1st and May 31st using oil as the fuel.

Chicago apartment buildings show greater savings the second season than for the first, with a radiation operating cost per square foot as low as $0.212 for the full heating period just passed using coal as fuel.

We have records on file of installations in and between Quebec, Canada, and Dallas, Texas; between Rhode Island and Oregon, each reflecting variables in fuel conditions and weather changes. Reports from every installation which was in operation during any portion of the winter, have been uniformly satisfactory and with fuel saving established beyond our most sanguine expectations.

A Most Important Development

Our own engineers, who have been so closely identified with me in this development, admittedly agree that for useful results wherever artificial heat is needed, this system numbers with the most important developments of the present day.

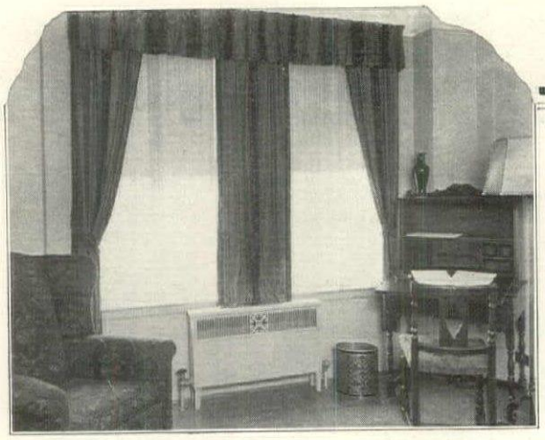
A mere statement that the Differential System properly installed and operated can accomplish the remarkable fuel saving claims, sounds bombastic without the evidence, but it is true—we have the evidence and the proof that the Dunham Differential System will save 25% (or more) of fuel over the standard vacuum return line system in general use today.

C. A. Dunham

U. S. Patent No. 1644114. Additional patents in the United States, Canada and Foreign Countries now pending.

C. A. DUNHAM CO.
450 EAST OHIO STREET

Dunham Building
CHICAGO, ILLINOIS



Modern Buildings Need this Modern Radiator

Typical of the fine buildings installing modern McQuay Radiators, is this New York City Apartment at 201 East 35th Street.

Gronenberg & Leuchtag, Architects.

Barron-Hubert Co., Heating Contractors.

Its Beauty Attracts Tenants ---it Cuts Operating Costs

Complete circulation of the heated air—so essential to economical heating—is provided by the McQuay Cabinet Radiator (a complete radiator, not just a cover). For, heated air is impelled out into the room with ***sufficient velocity to distribute it evenly throughout.*** A humidifying pan inside the cabinet, provides the moisture needed for healthy, effective heating.

A Complete Radiator

McQUAY
Cabinet
RADIATOR

Not Just a Cover

Actually, because of the adequate circulation, and the greater heating effectiveness of moistened air—*the temperature of a McQuay may be kept many degrees below* that of old-style radiators. The fuel saving is considerable.

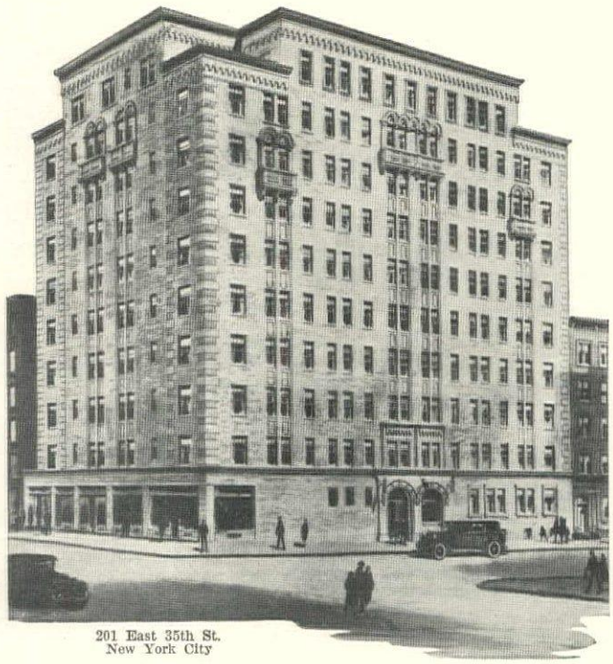
The copper heating unit—a distinctive McQuay achievement—is immune from rust and corrosion, will not "clog" and is practically indestructible.

Also: Concealed Radiators and Unit Heaters to meet any contingency

McQUAY RADIATOR CORPORATION

General Sales Office: Pure Oil Bldg., Chicago

New York: 2148 Graybar Bldg. Boston: 164 Federal St.
Newark, N. J.: J. F. McLaughlin Co., 738 Broad St.,
Cleveland: 291 E. 149th St.



201 East 35th St.
New York City

Built to be more than "quiet"

ENGINEERS and architects expressed a need for a unit ventilator that would be more than "quiet" in operation —a unit ventilator which they could install, confident that it would run so silently that the occupants of a schoolroom, church or office would be unable to detect its operation.

Sturtevant Engineers set out to build such a unit ventilator. In the Sturtevant Research Laboratories, where ventilating equipment has been evolved to meet the demands of the greatest projects in air engineering, the work was begun. Designs were made—revised—made again. Countless experiments were conducted. Special motors and fans were developed. Finally, the "Silent" Sturtevant Unit Ventilator was produced.

As many installations of the "Silent" Sturtevant have already been made, the nearest Sturtevant representative will gladly take you to a local installation where you can observe this equipment in operation. You will then know why it meets the most exacting requirements for quietness and efficiency.

Bulletin 344-A explains the equipment in detail. Let us send you a copy.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

Atlanta	Camden	Cleveland	Detroit	Los Angeles	New York	St. Louis
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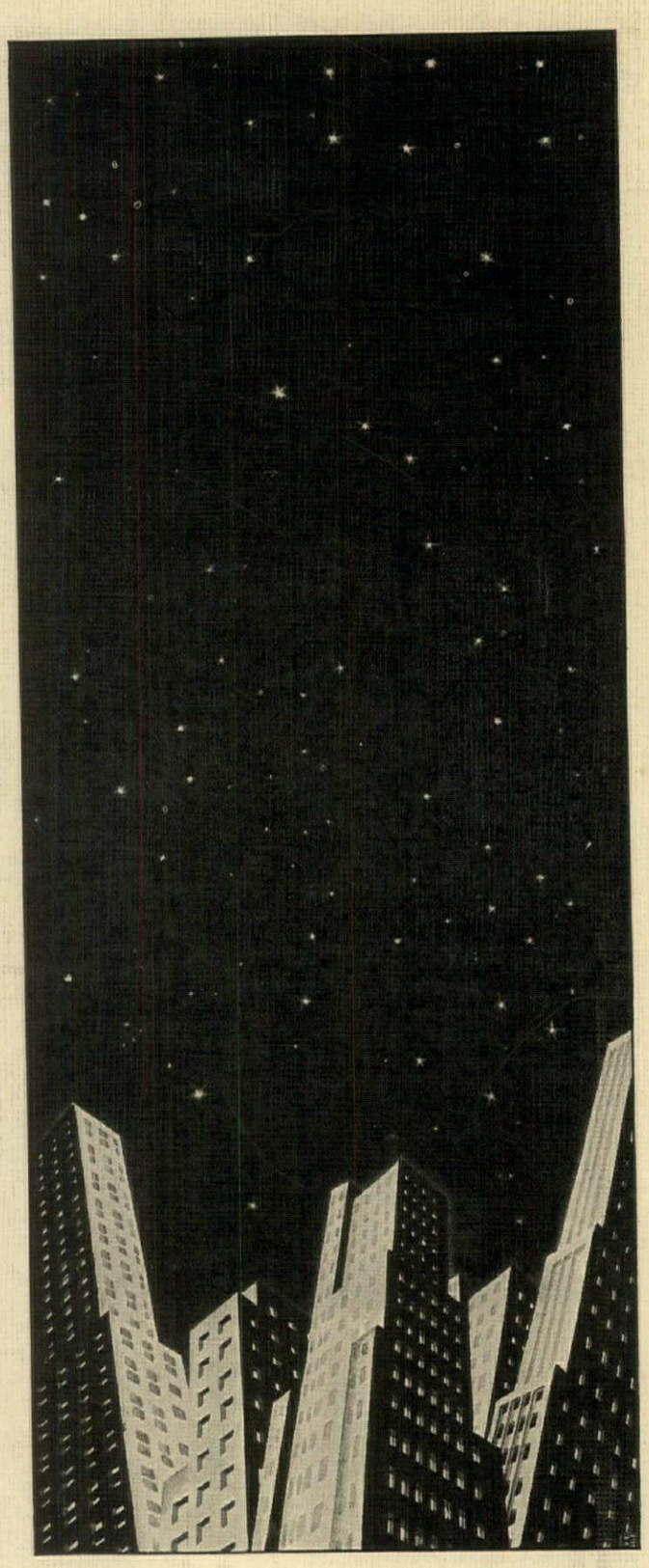
Canadian offices at: Toronto, Montreal and Galt, Ontario. Also Agents in principal Foreign Countries.

Sturtevant TRADE MARK *the Silent Unit Ventilator*

"And silence like a poultice, comes
to heal the blows of sound."
—*Holmes*



. . . with the Silence of Stars

A Scientific Answer to Objectionable Sound Travel — the USG System of Sound Insulation

ARCHITECTS and engineers are more and more concerned with the problem of objectionable sound travel. Therefore they are urged to investigate the USG System of Sound Insulation.

This distinctly new idea is now a proved and permanent success, as shown by a substantial number of completed jobs. It is applicable to existing structures as well as to new construction.

Before launching this revolutionary improvement, the United States Gypsum Company laid the foundation through years of patient, scientific development.

The USG System of Sound Insulation is not a material but is a method of interior finishing which interposes a "shock absorber" between interior surfaces and the structural floor, wall or ceiling. Time does not lessen its efficiency. Furthermore, the USG materials are fire-proof and vermin-proof.

The USG System has a broad application. It is especially recommended for music studios, dance halls, bowling alleys and other places of amusement when situated in the same building with other units of space where quiet is essential or desired. Its use in the better class of apartment buildings is reflected in increased returns and greater satisfaction of tenants.

The Sound Insulation division of the United States Gypsum Company contracts for the complete installation of this system *to insure definite results and undivided responsibility*.

Recommendations and estimates of cost, based on plans or on existing structures, gladly furnished without obligation. Descriptive booklet is yours for the asking. Write to United States Gypsum Company, *Sound Insulation Division*, 300 W. Adams St., Chicago, Illinois.

USG

USG SYSTEM OF SOUND INSULATION

Guaranteed to eliminate objectionable sound travel

CREATED BY THE UNITED STATES GYPSUM COMPANY