THE ARCHITECTURAL FORUM

IN TWO PARTS

ARCHITECTURAL ENGINEERING & BUSINESS

PART TWO

MAY

1929

FOLDER-WAY utilizes idle floor space

Several small rooms quickly converted into one large assembly hall

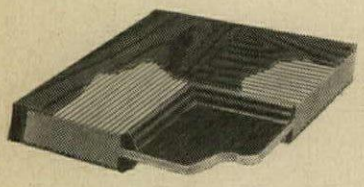
Additional space for extra large gatherings is a frequent and urgent need in churches, community centers, auditoriums, lodge halls and clubs. But the cost of idle floor space prevents reserving a room exclusively for such occasions. Several smaller rooms must be thrown into a single large assembly hall.

This problem is adequately met by R-W FoldeR-Way partition door equipment, engineered to fill any and all requirements.

Rapid, noiseless operation of the doors was an essential feature specified by the architect of the Denver Y.W.C.A. FoldeR-Way filled the bill with complete satisfaction, as illustrated. Perfect alignment and smooth, silent, easy moving, trouble-free operation are assured by FoldeR-Way.

Write for R-W Catalog No. 43.

"Quality leaves its imprint"



R-W Compound Key Veneered Doors have laminated stile and rail core construction. Extra heavy sawed veneer is applied by the exclusive tongue and groove method. The result is a combination of beauty and sturdiness that lasts for decades, free from warping, swelling, shrinking, etc.

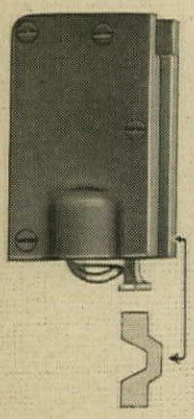
Richards-Wilcox Mfg. Co.

"A Hanger for any Door that Slides"

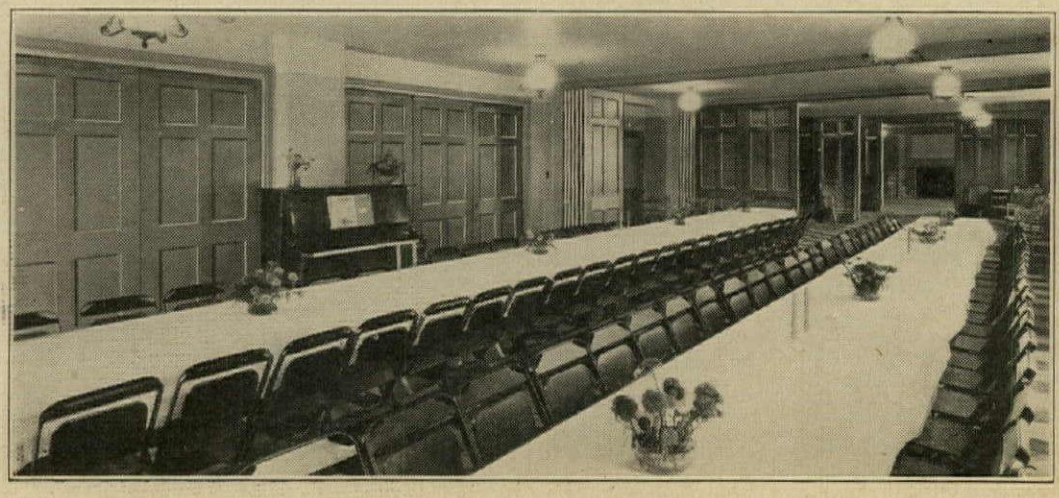
New York . . . . AURORA, ILLINOIS, U.S.A. . . . . Chicago

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

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



Bottom roller for FoldeR-Way doors, beautiful brass finish or dull black.



PLANNING A FACTORY BUILDING?

NATCO Double Shell Face Tile is the logical choice for any structure where attractiveness, permanence, and comfort must be combined with economy, and is extensively and successfully used for residences, schools, garages, factories, warehouses, gas stations, and similar structures.

Load Bearing, it provides the most economical form of masonry construction. Each tile laid forms a section of an insulated, moisture-resisting wall, with a glazed textured or combed exterior face. Upkeep is negligible, as the tile does not discolor, disintegrate, or weather. Painting and similar maintenance is entirely eliminated.

NATCO GLAZED TEX-TILE has a texture face resembling a high quality tapestry brick, and is furnished in rich brownish shades. The inside face is scored for plaster. Furnished in 8" thickness only.

NATCO GLAZED COMBED FACE TILE has an exterior scratched or combed face, and a glazed smooth, sanitary, easily cleaned interior surface. It is furnished in 6" and 8" thicknesses.

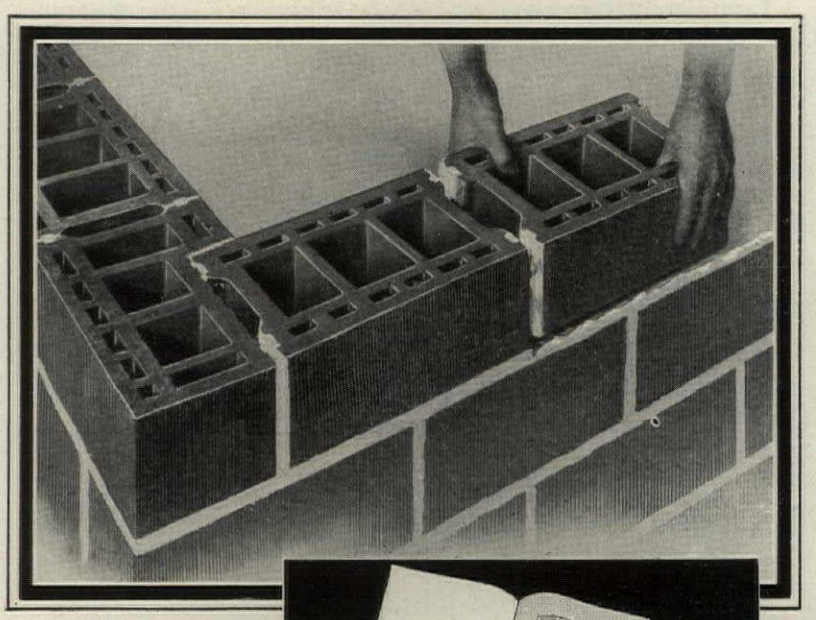
Each Natco Face Tile unit has a 5"x12" face, and is equivalent in volume to six brick. Accessory shapes for sills, jambs, and so on are provided. Easily and quickly laid, it effects considerable savings in labor and material costs, is an ideal material in its field.

NATIONAL·FIRE·PROOFING·COMPANY

General Offices: Fulton Building, Pittsburgh, Pa.

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

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



WRITE NATCO FACE TILE INTO THE SPECIFICATIONS

TURN TO "SWEET'S"

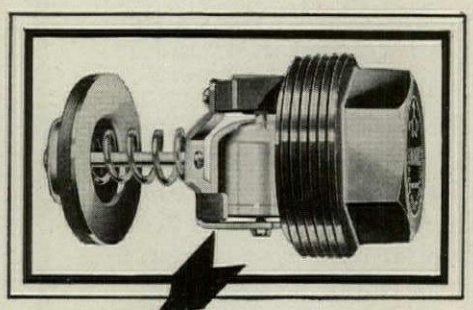
NATCO

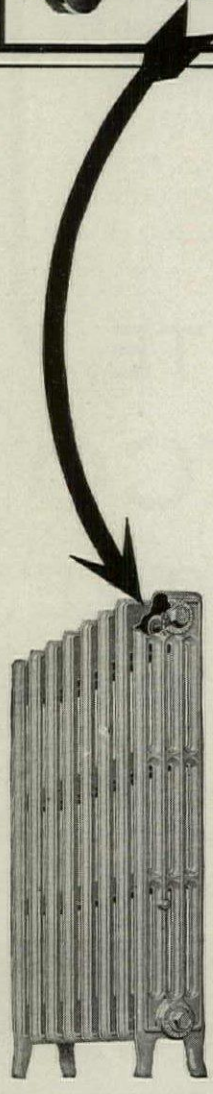
THE *COMPLETE* LINE *of* STRUCTURAL CLAY TILE

IN-AIRID

is not . . . just another

AIR VALVE





Features Found Only in the IN-AIRID

Complete Venting

All working parts located within the radiator—air traps entirely eliminated—insured full efficiency for the radiator.

Cannot Be Stolen

Can't be tampered with or turned upside down to prevent operation.

Entirely Invisible

Completely concealed—adds to the appearance of the radiator.

THE Architect looking for improved appliances to add to the comfort and convenience of his client will want to specify the New In-Airid on every one-pipe steam job.

The In-Airid is not just another air valve. It is designed to meet a new problem which has arisen with the recent standardization on water-for-steam radiation. When this new radiation is used on one-pipe steam there is a tendency for the steam to short circuit across the top openings and close the air valve before all of the air has been vented. This traps a quantity of air which considerably reduces the heat output of the radiator.

The In-Airid is the only successful solution to this problem. Protect yourself against complaints and embarassment by specifying them on all of your one-pipe steam jobs.

In-Airid No. 1 for steam. In-Airid No. 2 for Vaccum.

For replacement work on old-style steam radiation use the FAMOUS AIRID No. 500 or VAC-AIRID No. 510.

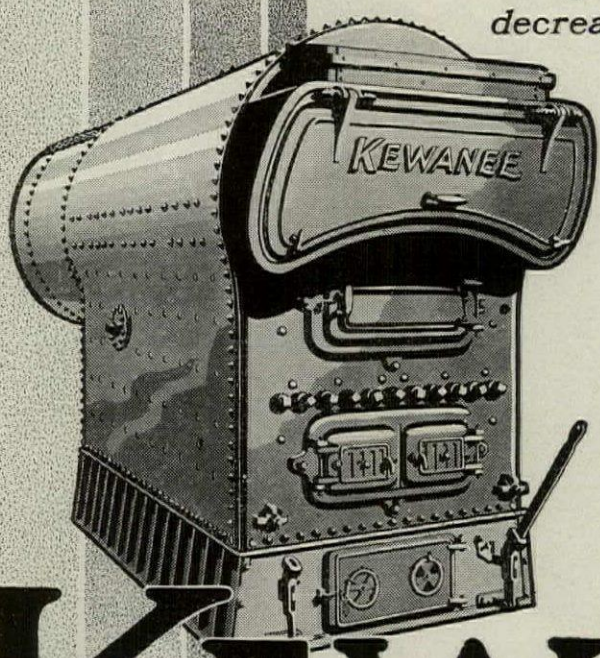
AMERICAN RADIATOR COMPANY

Makers of a complete line of QUALITY Heating Accessories

AIRID AND VAC-AIRID AIR VALVES · ARCO PACKLESS VALVES FOR STEAM, WATER OR VACUUM
MERCOID CONTROLS · ARCO DAMPER REGULATORS · ARCO TANK REGULATORS

If the First Cost is too low - - the Final Cost will be too high

Any maker can build a low priced boiler. But to do so, he must take something out of it—something that lessens the boiler's life, and *decreases its efficiency.*



So that any saving on the purchase price is soon swallowed up by the higher fuel and upkeep costs.

Kewanee Boilers are built (of steel, riveted) according to designs and specifications which 50 years of building have proved are right. And they are priced fair enough to permit putting into them the necessary quality of steel and quantity of rivets for husky joints to stand the gaff of many years hard service.

KEWANEE

STEEL BOILERS

Hence in building from the boiler up the user of a Kewanee can rely on many extra years of "service", plus a fuel saving during every year of its life.

KEWANEE BOILER CORPORATION

Kewanee, Ill. Branches in Principal Cities

CORRECT WATERPROOFING AND DAMP-PROOFING PRACTICE

ARCHITECTS

CHARACTER OF WORK	SUGGESTED "R. I. W." SPECIFICATIONS	DATA
Dampproofing and Plaster-Bond. Interior or Exterior Masonry Walls above grade. Stain-proofing of interior plaster.	"R. I. W." No. 232.	Applied with roofers bristle brush or spray gun. A black, elastic tacky composition which resists dampness and gives perfect bond to hard wall plaster. Two coats should be applied.
Colorless Dampproofing for exterior treatment of Brick, Stone, Concrete, Stucco or other masonry exposed to the elements.	"R. I. W." Toxloxpore.	Will not darken or discolor masonry. Applied in two absorbing coats by brush or spray gun. Open masonry joints or holes should be pointed with "R. I. W." Elastic Caulking Compound. Assists in eliminating efflorescence.
Waterproofing, Integral Method, for Concrete, Stucco and other Portland Cement mixtures.	"R. I. W." Toxement.	A compound in powder or paste form which densifies and brings about the proper hydration of all Portland Cement Mixes. Should be used in proportion of 2% by weight of Portland Cement used. Adds materially to the workability and plasticity.
Waterproofing and Dampproofing for exterior of foundation walls, footings, etc. Also for preservation of wood sleepers laid in concrete.	"R. I. W." Marine Cement.	Applied with roofers brush. A black Dampproof, water proof and alkali-proof heavy bodied paint which does not require heating. For application in two coats.
Decoration and dampproofing of exposed brick, concrete, stucco, stone and other masonry.	"R. I. W." Liquid Konkerit.	A flat weather resisting cement paint made in white and colors in Priming and finishing coats.
Integral Hardening, densifying and accelerating set of Concrete, Cement Floors, brick mortar, etc.	"R. I. W." Toxmix Clear.	A colorless liquid to be used in proportion of 1 quart to the bag of cement. Increases compressive and tensile strength. Renders concrete or mortar permanently hard, dense and waterproof.

CHANIN BUILDING
On the new 56 story $12,000,000 Chanin Building in New York Toch Brothers' "R. I. W." Products were used.

THE AUTHORITY OF ACHIEVEMENT

TOCH BROTHERS

FOUNDED IN 1848

WATERPROOFING & DAMP PROOFING COMPOUNDS – TECHNICAL PAINTS

NEW YORK
CHICAGO
LOS ANGELES
LONDON

REMEMBER IT'S WATERPROOF

RIW

division of
STANDARD
VARNISH WORKS

AND THE FLOORS IN THE GYMS ARE BLOX-ON-END

THE Central Continuation School, Milwaukee, is another of the finer type schools floored with Bloxonend. The architects, Van Ryn & DeGelleke, nationally known school specialists of that city, specified 12,000 sq. ft. of Bloxonend for the Boys' and Girls' Gymnasiums.

Bloxonend is being specified for gymnasiums and shops by nearly all leading school architects because it meets the requirements of their clients.

The hazard of splinters—ever present in ordinary wood flooring—is eliminated when Bloxonend is used. The tough end-grain forms the wearing surface. This surface (2½ in. thick) is firm and fast, yet affords cushion-like resiliency. It is handsome, noiseless, lasts a lifetime, stays smooth and provides satisfactory anchorage for apparatus and machines. Write for specifications, descriptive literature and sample.

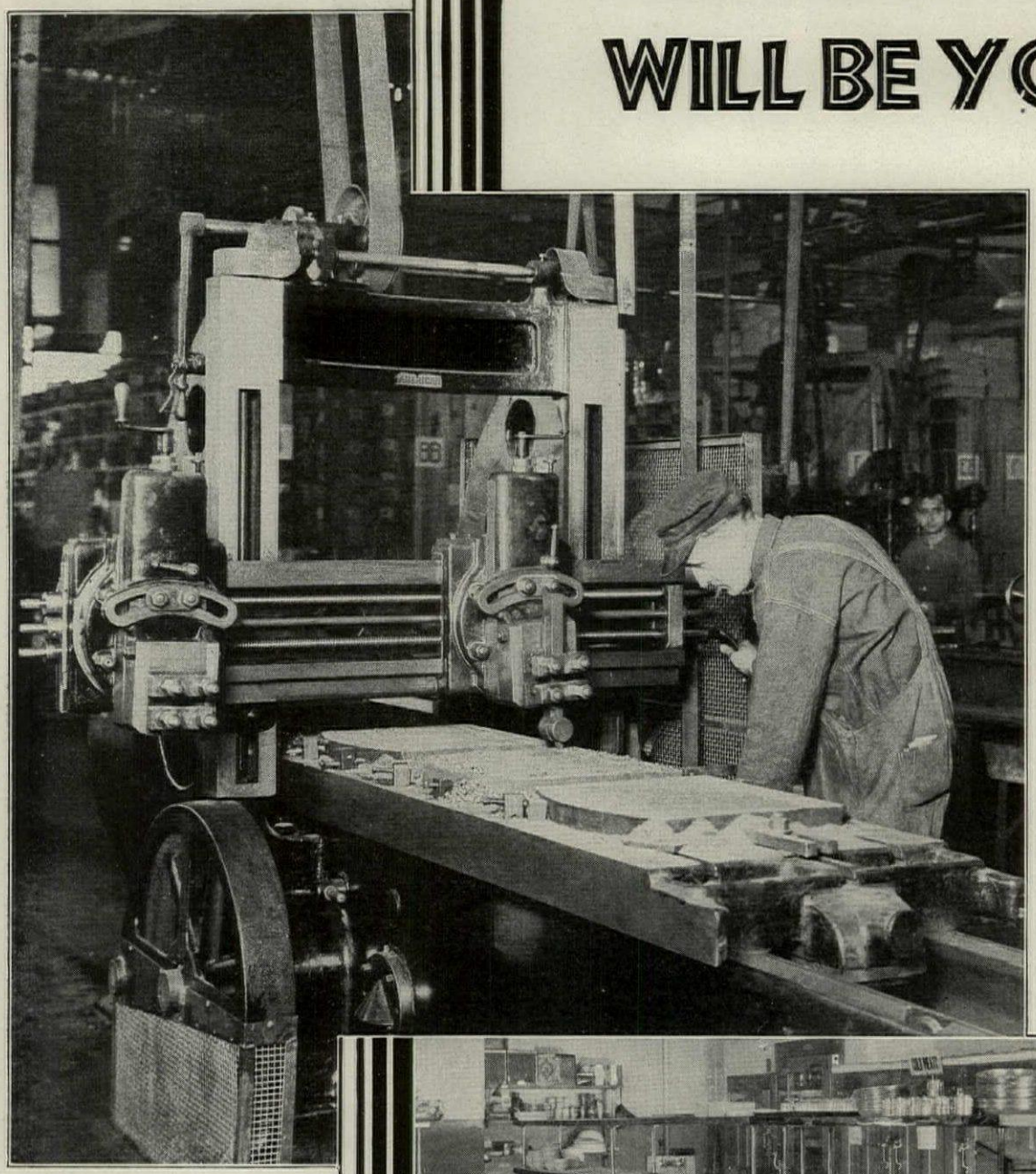
CARTER BLOXONEND FLOORING CO.
KANSAS CITY, MISSOURI
Branch Offices in Principal Cities

BLOX-ON-END FLOORING

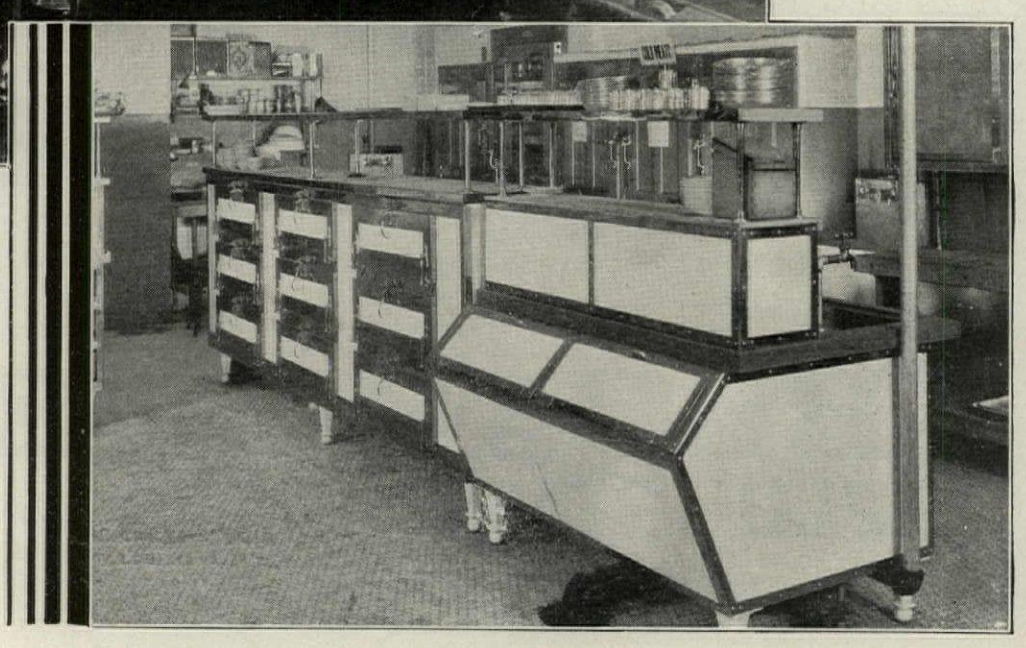
Bloxonend is made of Southern Pine with the tough end grain up. It comes in 8 ft. lengths with the blocks dovetailed endwise onto baseboards

Lays Smooth
Stays Smooth

OUR PRIDE IN WILL BE YOURS



Chiselling cold metal down to the thousandth fraction of an inch with special machinery is one of the infinitely varied operations in the great Van Factory. No detail is too small for the most exacting care.



Right, two views of the Van Kitchen in the Jefferson Hotel, St. Louis, Mo. The quality which is apparent in its appearance is deep-rooted in every piece. Its calibre is safeguarded at every point. It is a pleasure to point to such a kitchen as a typical Van creation.

Teich & Sullivan
Architects

MANUFACTURE IN OWNERSHIP

Van Craftsmen Painstakingly Build into Van Equipment All the Features that Will Make You Value It for Years to Come

To those who believe there is no sentiment in modern business we would suggest a trip through the Van Factory. Here they will find men who lavish upon their handiwork the same infinite care, patience and pride that an architect devotes to his plans, or an engineer to his calculations. This pride is personal with every man, and is instinct in the spirit of the entire organization. Each year for more than seventy years Van Craftsmen have sought to build equipment that was finer than any that had been built before. Experiments have been conducted, tests have been made, production re-organized so that Van Equipment would be even better and its cost lower, so that the pride of every user would continue to be our best advertisement.

We can invite you to try Van Equipment in any manner you select, under any conditions that you choose. We can invite you to ask one user or a thousand for opinions. We can suggest Van Equipment for the finest kitchen that has yet been planned, or the simplest that one can conceive. We can do these things with honest regard for our handiwork—for we know what we have produced, know the results of your experiments, and anticipate your continued pleasure for year after year after year.

ATLANTA
CLEVELAND

The John Van Range Co.
EQUIPMENT FOR THE PREPARATION AND SERVING OF FOOD
Cincinnati

DALLAS
NEW ORLEANS

DIVISION OF ALBERT PICK-BARTH COMPANY, INC.

Chicago Sales Office
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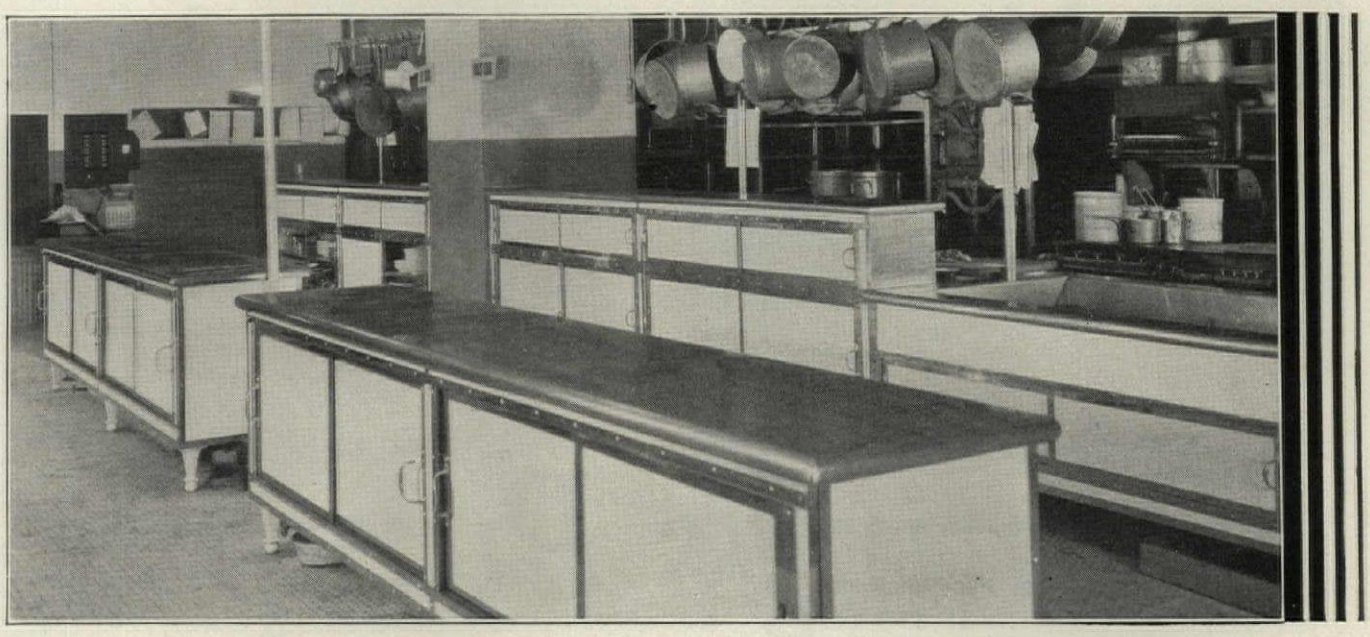
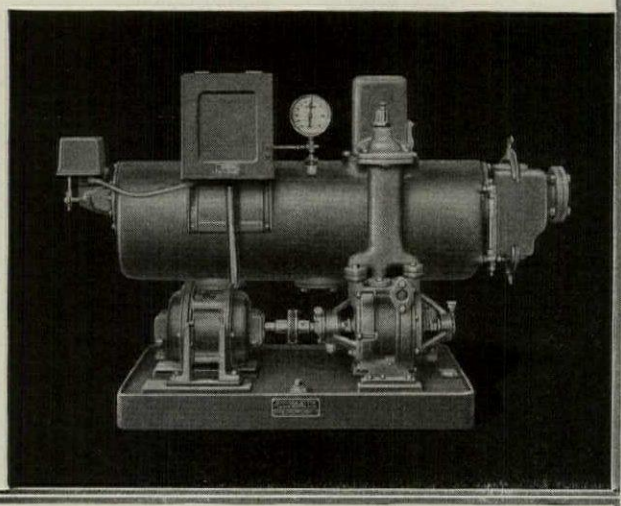
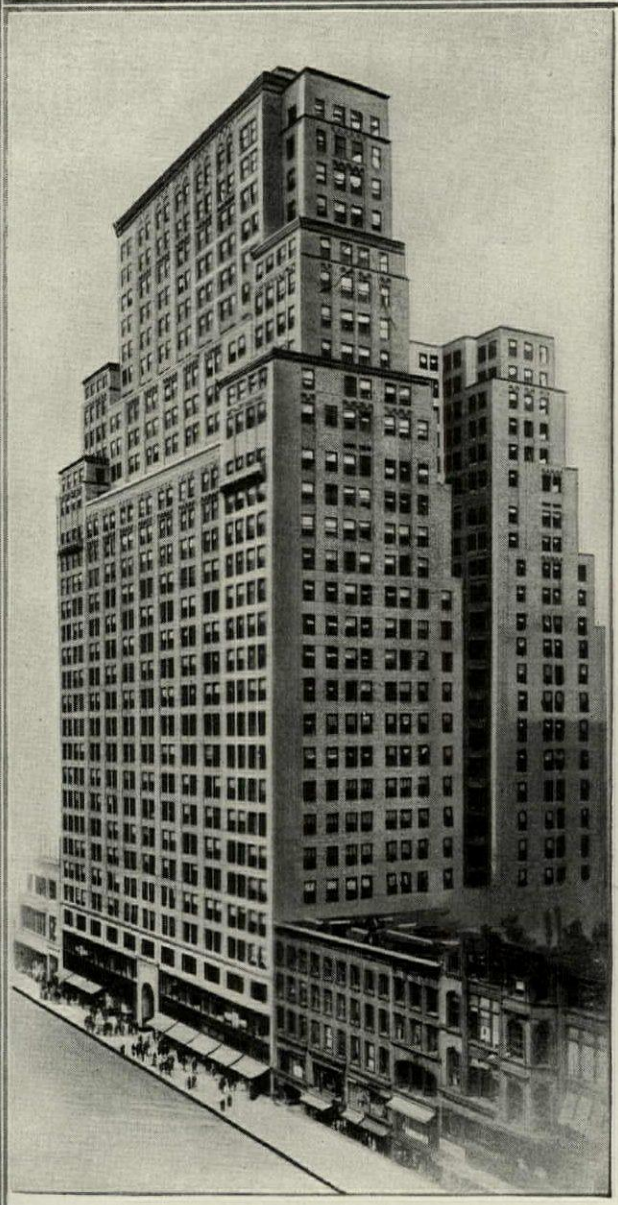


Twofold endorsement

Handsomely endorsed both for its architecture and construction details, Salmon Tower is also to be commended for the foresight of the designers that called for the installation of a Jennings Vacuum Heating Pump—a foresight that has enabled the heating system to serve the building occupants quickly, comfortably, healthfully·





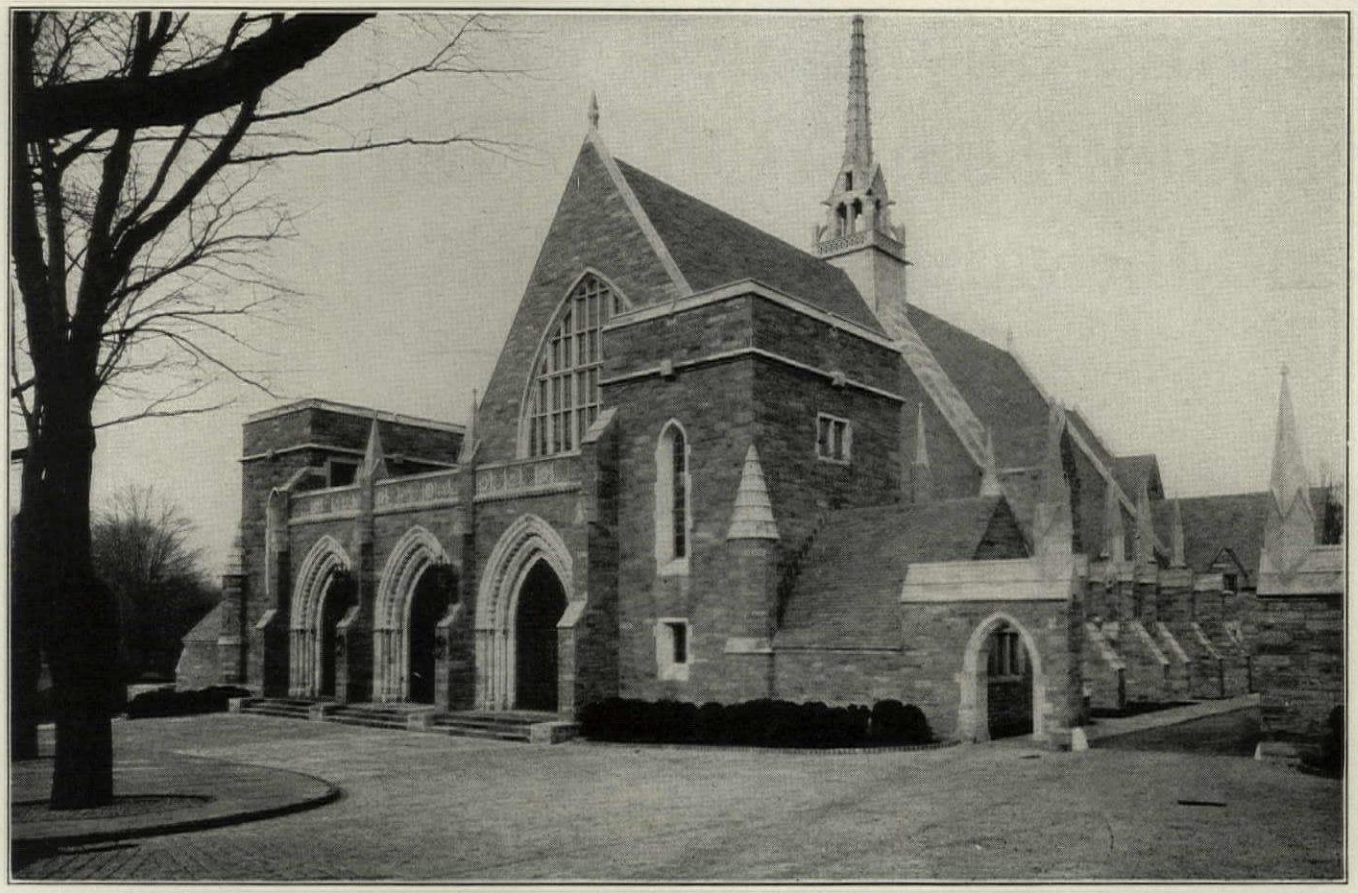
Salmon Tower Building, New York, N. Y. York & Sawyer, architects; Clyde R. Place, consulting heating engineer; W. G. Cornell Co., heating contractors; C. T. Willis, Inc., builder.

Jennings Return Line Vacuum Steam Heating Pump, size F-40, two of which are installed in Salmon Tower.

Jennings Pumps

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

Flexible . . . reliable . . . *this lighting protection*



Goodhart Hall, the new auditorium of Bryn Mawr College, Bryn Mawr, Penna., protected by Exide Emergency Lighting Battery. Mellor & Meigs, Phila., Architects.

Specify it to SAFEGUARD *buildings where the public assembles.*

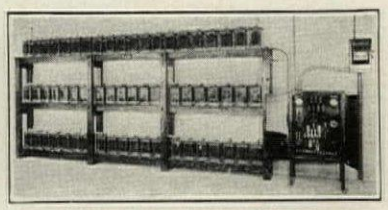
MODERN specifications for schools, hospitals, theatres, churches, public buildings, include emergency lighting. Lights must continue to burn even though normal current is interrupted in any building where the public gathers.

Consider, for example, an auditorium packed with people. Sudden darkness might involve serious consequences. That is why so many architects are specifying Exide Emergency Batteries as a necessary safeguard.

The various needs in lighting protection call for emergency lighting that is *flexible* and *absolutely reliable.*

The wide range of Exide Emergency Lighting Battery sizes makes them adaptable to any plan. The devices necessary to control and charge them are extremely simple, and *automatic* in operation.

For forty-one years Exide has been building storage batteries for every purpose. This long experience is very evident in these desirable qualities of the Exide Emergency Lighting Battery: (1) absolute power reliability, (2) long life, (3) freedom from trouble, (4) moderate initial cost, (5) low operating cost. Experienced Exide representative will be glad to consult with you. This entails no obligation. A letter will bring him.



Control Panel and 60-cell Exide Battery at Goodhart Hall.

Exide
EMERGENCY LIGHTING BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, Toronto

Use 48% Less Fuel

"The two Heggie-Simplex Boilers in our buildings at Armour Blvd. and Campbell St. are two years old and have given perfect satisfaction in every way.

"These two boilers are overloaded to the extent of some 750 feet of radiation, but have carried the load at 12 degrees below zero with apparent ease.

"On checking the consumption of fuel oil based on number of feet of radiation, also type of building, figured on a comparative basis with other makes of boilers, we find that Heggie-Simplex is more economical."*

C. O. Jones Building Co., Kansas City, Mo.
By N. W. Duff

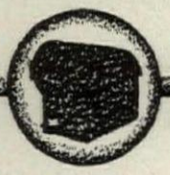
*A recent check showed that the owner's oil bill for heating these twin apartment buildings has averaged per square foot of radiation only 7.8c.

The owner advises us that the cost of heating another apartment building of the same type, using another make of steel boiler with an oil burner similar to that used in the Heggie-Simplex boilers, has averaged per square foot of radiation 14.9c.

Heggie-Simplex engineers can show you also how to obtain important savings in heating costs. Ask for one to call. Heggie-Simplex Boiler Co., Joliet, Illinois. Representatives in principal cities. Telephone and address listed under "Heggie-Simplex Boilers."

HEGGIE-SIMPLEX

STEEL HEATING BOILERS



New Steeldeck Roof

Insulated *and* Waterproofed

TRUSCON Ferrobord

TRADEMARK REG. & PAT. APPLIED FOR

Here is a quality Steeldeck roof furnished in six-inch wide, easily handled units of any desired length. The Ferrobord units interlock along the sides, forming rigid reinforcing ribs and a smooth unbroken surface free from perforations.

Furnished in 18 and 20 gauge and two depths of ribs, Ferrobord Steeldecks are economical for all practical roof loads or purlin spacings, and are adapted to any shape of roof for any building. They provide a light-weight, permanent, firesafe roof, quickly installed at economical cost. *Write for full information.*

ARMCO INGOT IRON

SECTION SHOWING FERROBORD STEELDECK-INSULATION AND BUILT-UP ROOFING

Truscon Steeldeck Roofs also include I-Plate and Ferrodeck types to meet requirement of new roofs and replacement.

TRUSCON STEEL COMPANY
Youngstown, Ohio
STEELDECK DIVISION
Sales and Engineering Offices in Principal Cities
Trussed Concrete Steel Co. of Canada, Ltd.
Walkerville, Ontario

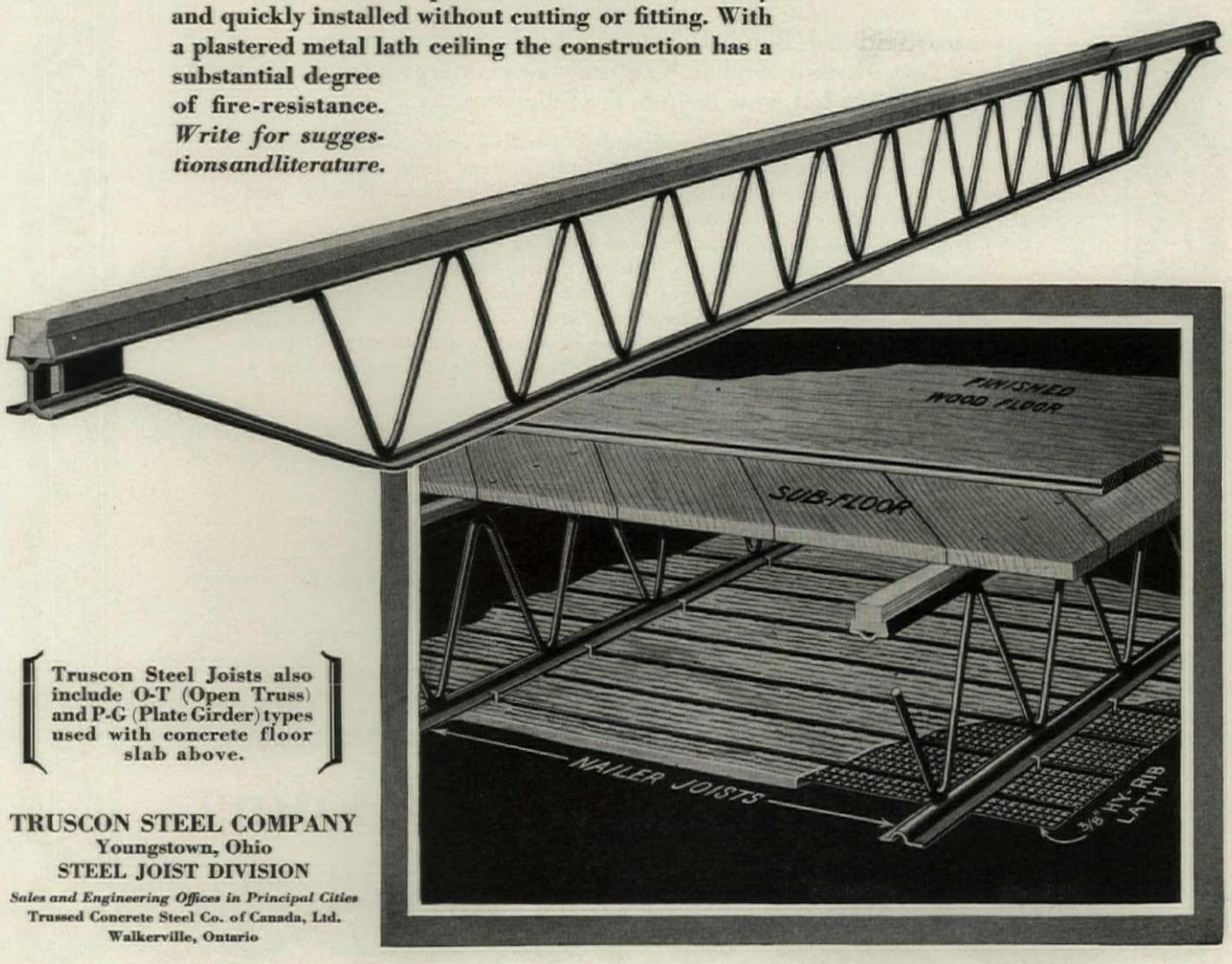
New Steel Joist for Light Occupancy Buildings

TRUSCON NAILER JOISTS

PAT. APPLIED FOR

Permanent construction for homes, apartments, stores and other light-occupancy buildings at a cost comparable to wood is now available with Truscon Nailer Joists.

Wood flooring is nailed directly to the wood strips attached to the joists. Of the same superior design as Truscon Open Truss Joists, Nailer Joists provide unusual strength and permit passage of pipes in any direction through the floor. Being completely and accurately fabricated in the Truscon plant, Nailer Joists are easily and quickly installed without cutting or fitting. With a plastered metal lath ceiling the construction has a substantial degree of fire-resistance. ***Write for suggestions and literature.***



Truscon Steel Joists also include O-T (Open Truss) and P-G (Plate Girder) types used with concrete floor slab above.

TRUSCON STEEL COMPANY
Youngstown, Ohio
STEEL JOIST DIVISION

Sales and Engineering Offices in Principal Cities
Trussed Concrete Steel Co. of Canada, Ltd.
Walkerville, Ontario

Masterbuilt Floors

HARDENED DUST-PROOF CONCRETE

Plus OMICRON

BEHIND the closed doors of research laboratories are enacted stories more dramatic than many which are staged in our theaters—stories involving high hopes and heart-breaking disappointments, long hours of separation, sacrifices and even personal danger and—occasionally—the transcending thrill of *achievement.*

The lay world knows little or nothing of these dramas—it sees only the final contribution and is unaware of the romance and excitement of all that has preceded it.

For nine years such a drama has been under way in the Research Laboratories of The Master Builders Company. For nine years Master Builders chemists and engineers have been searching for something which, they realized from the very outset, might never exist except in their imaginations.

The culmination of this nine-year drama came two years ago —in the creation of *Omicron.*

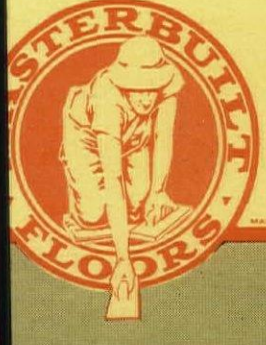
The unknown something for which they searched was an ingredient for concrete that would answer the question which, for years, the leading minds in the construction industry have been asking.

"How can we check the disintegration constantly taking place in all concrete structures because of the insidious action of corrosive agents, which, in the case of floors, prepares the wearing surface for untimely destruction by the abrasive wear of industrial and commercial traffic?"

The contribution they ultimately made to construction science is Omicron—a new ingredient impalpably fine and of itself inert, which in combination with Portland Cement activates new and permanent combinations with the soluble elements, and indicates important beneficial changes in the colloidal structure. Omicron establishes wholly new standards of compression strengths, tensile strengths, and resistance to corrosive acid and alkali conditions.

What Omicron accomplishes, what Master Builders Metallic Hardner *plus Omicron* now makes possible in concrete floor construction is told in specific detail on the two pages immediately following. These describe the new Hardner, Metalicron.

Overnight, Omicron has antiquated all outstanding specifications for hardened concrete floors.



Masterbuilt Floors

HARDENED DUST-PROOF CONCRETE

A new IN INDUS- made possible

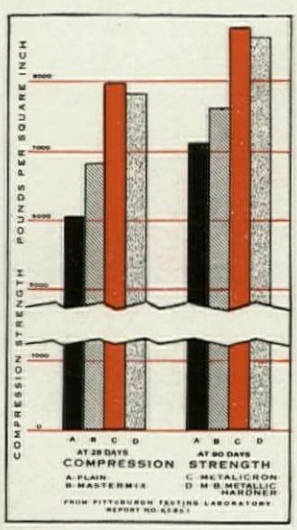
THE Construction Industry has acknowledged the capacity of concrete floors armored by the use of Master Builders Metallic Hardner to resist to a high degree the *abrasive* wear of modern traffic. The great value of this tough, ductile aggregate to floors bearing heavy industrial trucking has been established by twenty years of service for building owners the world over.

Yet there has been a need—recognized and voiced by authorities in the building field—for some check to the "wear" that is *not* abrasive but in many instances equally as serious—disintegration. Scientific research has responded with Omicron.

Now, to Metallic Hardner with all its advantages, is added still greater strength and its physical powers are supplemented by the new chemical reaction that checks disintegration. That the discovery of Omicron and subsequent development of Metalicron mean greatly increased permanence for concrete in its manifold applications, and to concrete floors in all types of service, is clearly seen in the reports on tests of its strength and resistance to corrosion.

CHECK THIS

Photograph of an actual floor that bears no abrasive traffic whatever, yet is "wearing out"—Why?



New Strength

The increased compression strength of Metalicron concrete is reported by the Pittsburgh Testing Laboratories, Test No. 62951, and indicated by the graph.

Note the great contribution to physical strength made by Master Builders Metallic Hardner; at the same time note the still further increase with Metalicron.

METAL

MASTERBUILT FLOORS

TRADE MARK

Masterbuilt Floors

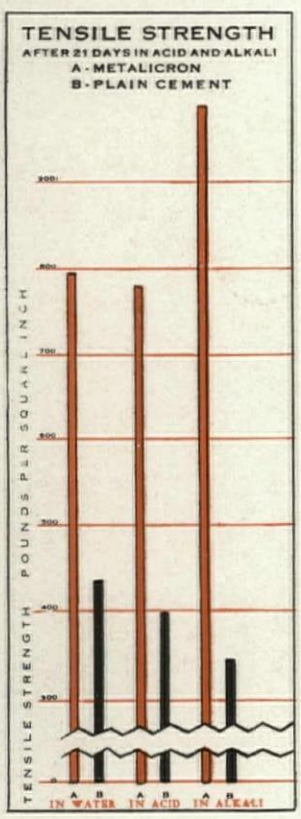
HARDENED DUST-PROOF CONCRETE

Standard

TRIAL FLOORS by OMICRON

New Resistance to Corrosive Acids and Alkalies

Of even greater significance is the protection Metalicron affords against the weakening action of corrosive solutions present to a degree on all floors which quickly sap the strength of ordinary concrete, as indicated by the graph at the right.



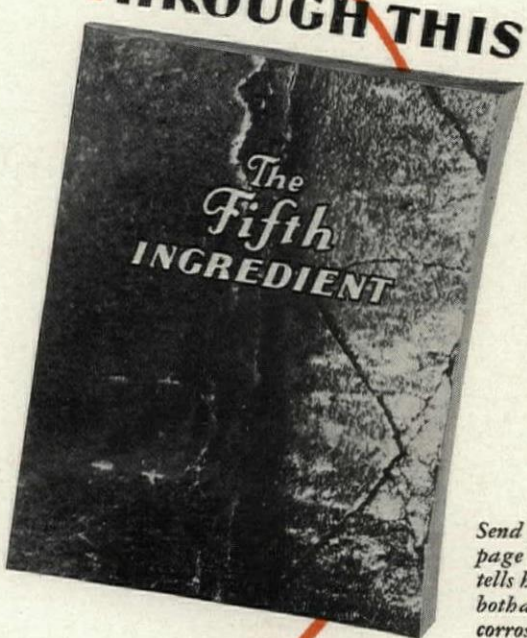
A New Standard of Permanence

That the demand for longer-lived concrete floors would be met when the insidious unseen damage by disintegration could be checked has been the conviction of the authorities in the construction industry for years. The solution was inevitable; that it has been reached by those who pioneered "hardened concrete floors" two decades ago and who have ever since remained the leaders in the development of better concrete floors is logical.

American Industry and Commerce today are floor conscious. They recognize the floors as the bearings on which a business runs, and consequently are demanding the utmost in floor permanence and serviceability.

By the perfection of Metalicron the service-life of concrete floors has been lengthened to a new span; the value of floor investments has been pushed up to a "new high."

THROUGH THIS



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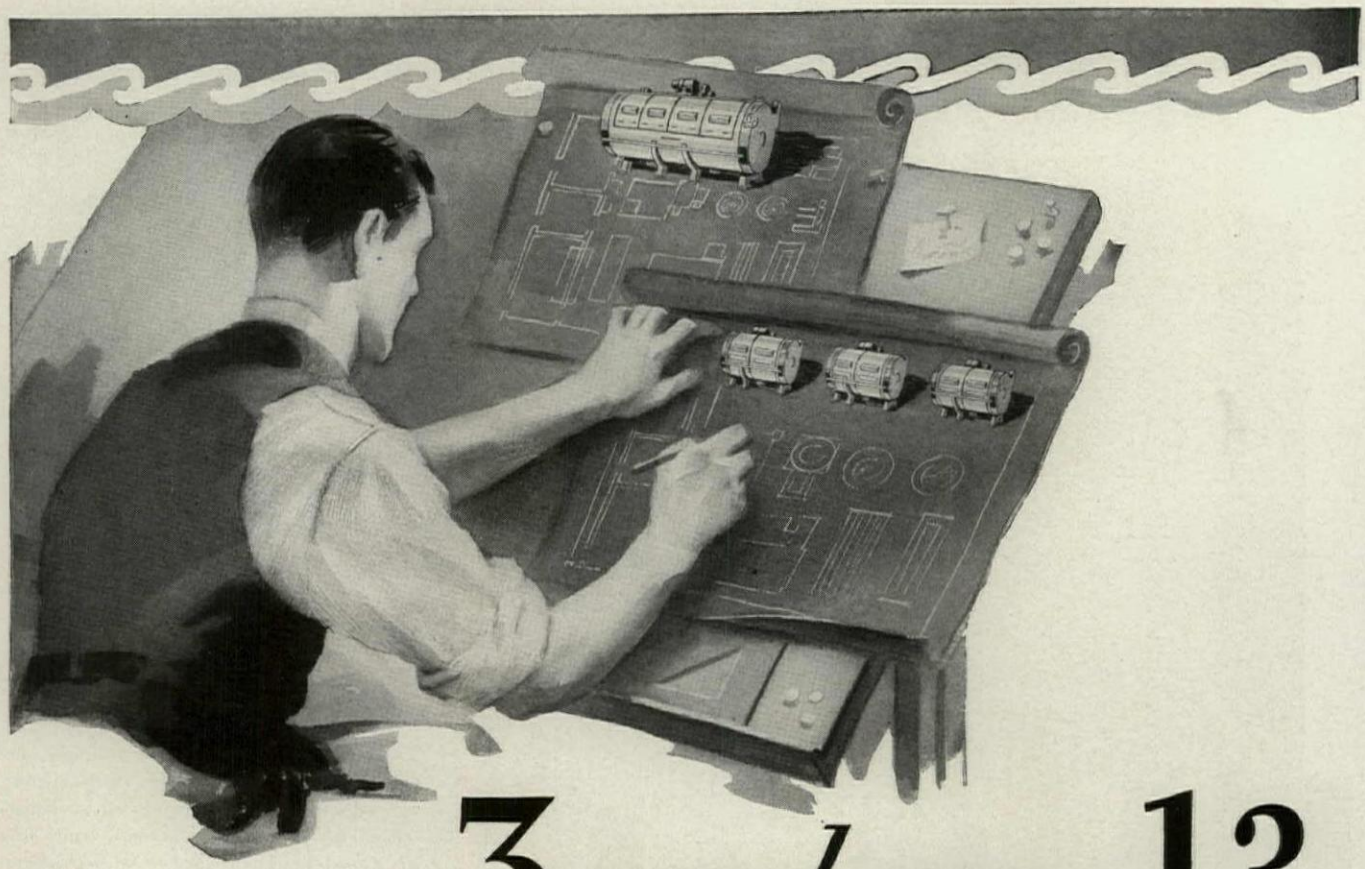

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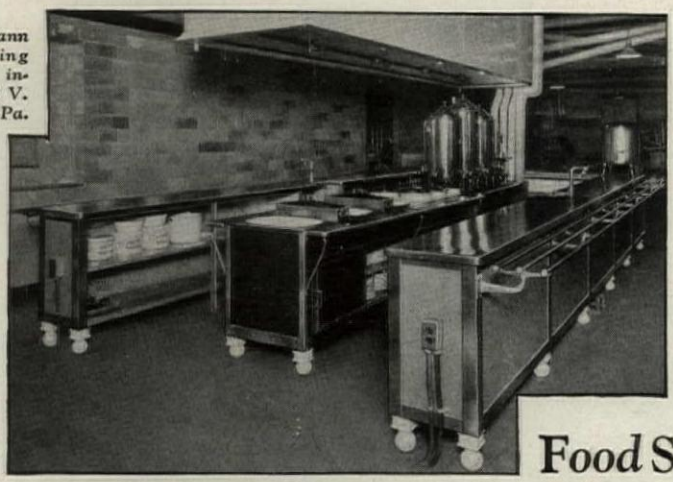

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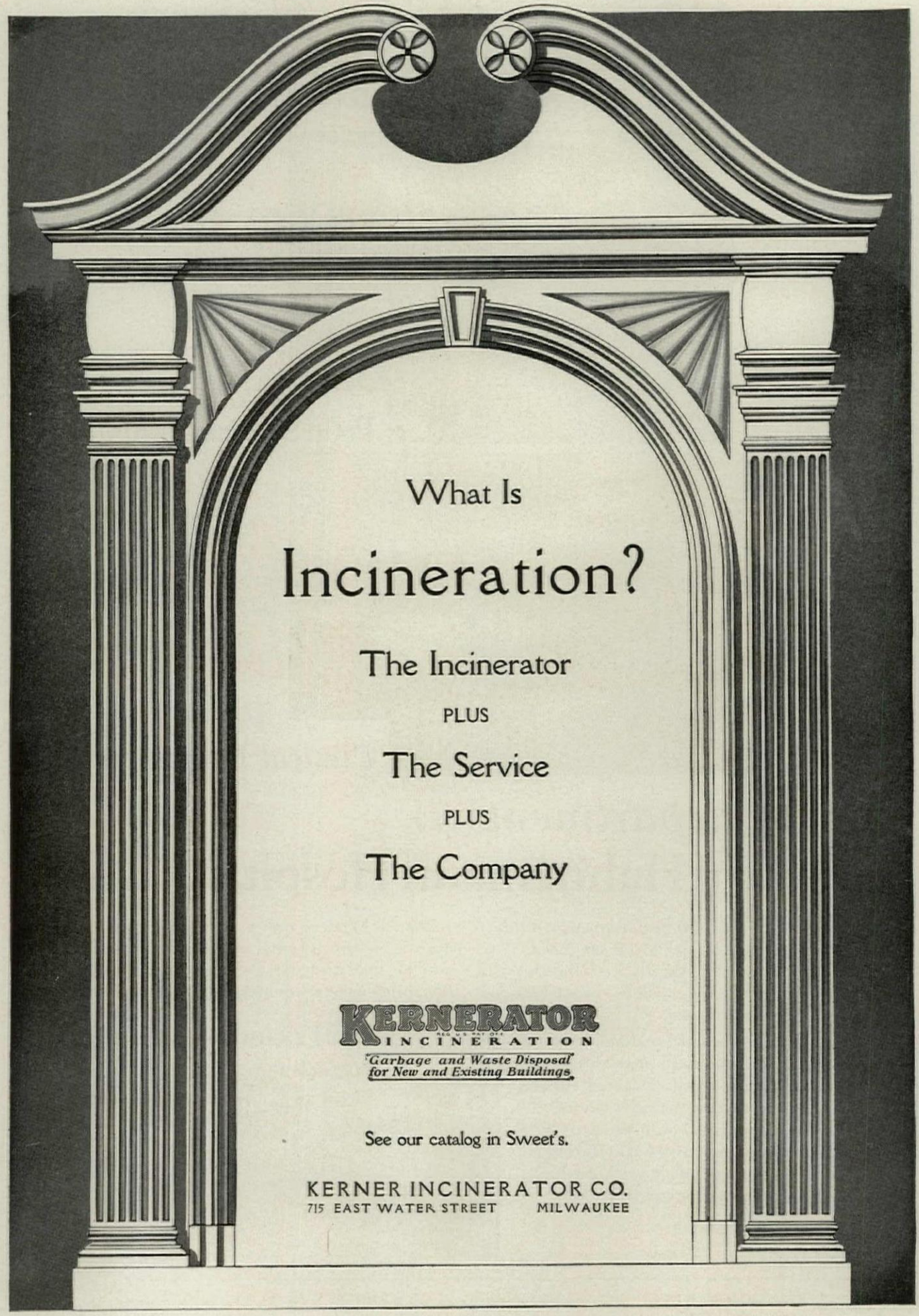
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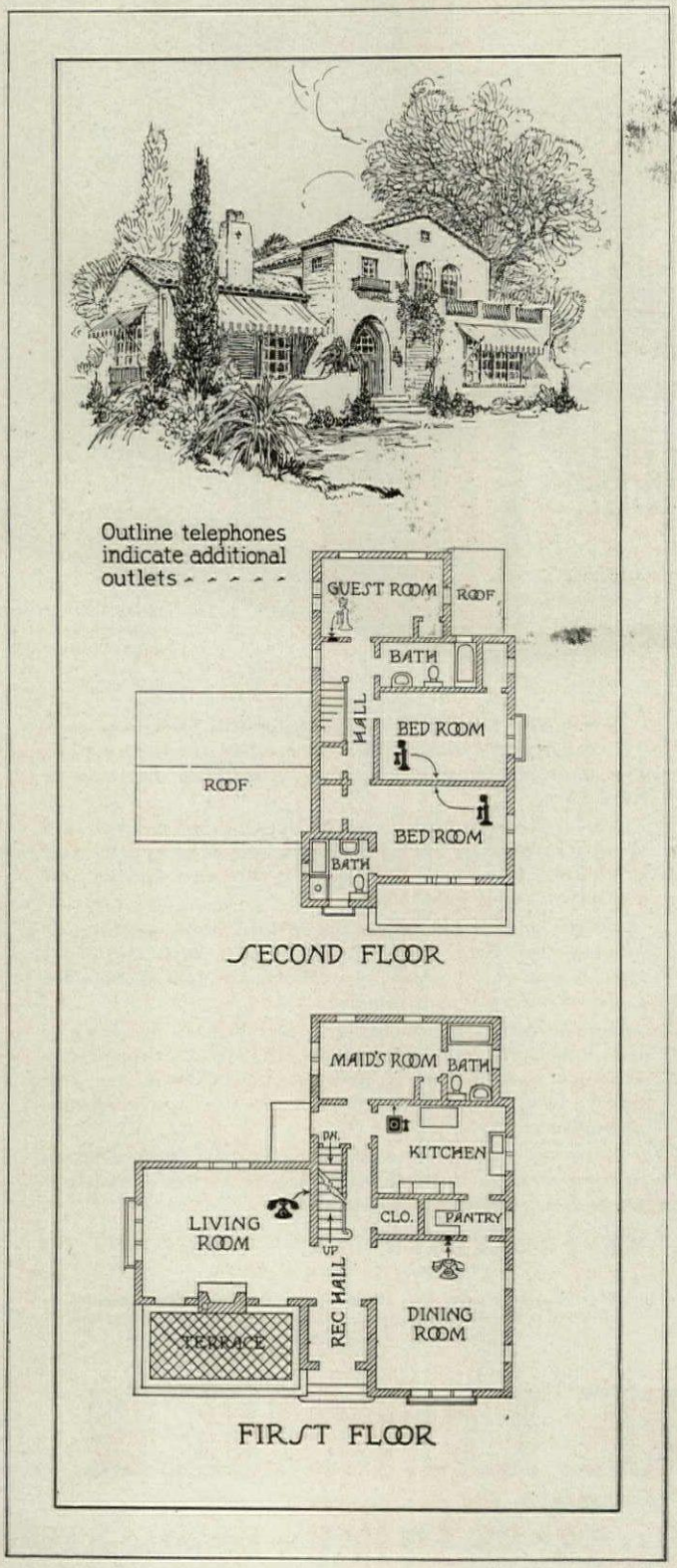

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BOOK DEPARTMENT

THE LIFE AND WORK OF AN EARLY AMERICAN ARCHITECT

A REVIEW BY
CLIFFORD WAYNE SPENCER

IN the forward march of progress, many things of real worth and beauty are thoughtlessly trampled under foot and forgotten. This is especially true in the case of architecture. Buildings which are representative of the best in their respective periods must be torn down and carted away to make room for some great, ugly structure for economic reasons, or because of the egotism which leads people to believe that that which is not new and up-to-date is not to be desired. This does not apply exclusively to the present craze for modern art, since every age has boasted of its splendid modern art and architecture and gone about replacing architectural gems with monstrosities in whatever fashion happened to be prevalent at the time. We do not contend that such progress is an unnecessary or undesirable thing, but it seems a pity that some permanent record of the lives and work of our great architects cannot be made before it is too late. Their buildings are demolished or "altered and made ugly," and the few records bearing on their lives and work are scattered and lost, so that in some instances not even a memory remains of men who have played important parts in the development of their country. A very great service is rendered to posterity by those who at great expense of time and labor, make long investigations and consult obscure records and documents in order that the general reader may be able to know what manner of men these were and what were the conditions under which they worked. Thus Edward W. Root, a son of Elihu Root, and a lecturer on art at Hamilton College, has performed such a service in publishing his volume on the life and work of Philip Hooker, one of the earliest architects to practice in this country.

Hooker arrived in Albany from Massachusetts, at the age of ten, in about 1772. Upon reaching maturity he became a surveyor and also a builder. The latter activity, carried on over a period of 25 years and augmented by a "long and diligent investigation of ancient and modern architecture" of that time, enabled him to become the outstanding architect of his period for the section in and around Albany, and one of the foremost architects in the republic. Like that of many other old American towns, the architectural history of Albany has developed in several successive stages. Starting with the mediæval Dutch cottages, of which the first settlement consisted entirely, Albany received a great influx of settlers from New England in the period following the Revolution. Many of these pioneers remained in Albany and, as was natural, soon began to transform it from a primitive Dutch settlement, with its rows of steep roofed cottages built end-on to the streets, into an almost typical New England village. It was this period of rebuilding and enlargement that gave Philip Hooker his opportunity, and his work became so popular that at one time practically every important public building and many of Albany's finer private residences had been built "agreeable to his designs." Of the early Dutch architecture nothing remains at the present time, although its influence can undoubtedly be traced in many buildings still in existence. The work of the New England settlers has been scarcely more fortunate, and of it there remain in Albany only one complete example (the Albany Academy) and a few fragments of the work of Hooker. Outside of Albany there are still a few good examples of his work, including Hyde Hall at Springfield, on Otsego Lake, and the Hamilton College chapel at Clinton.

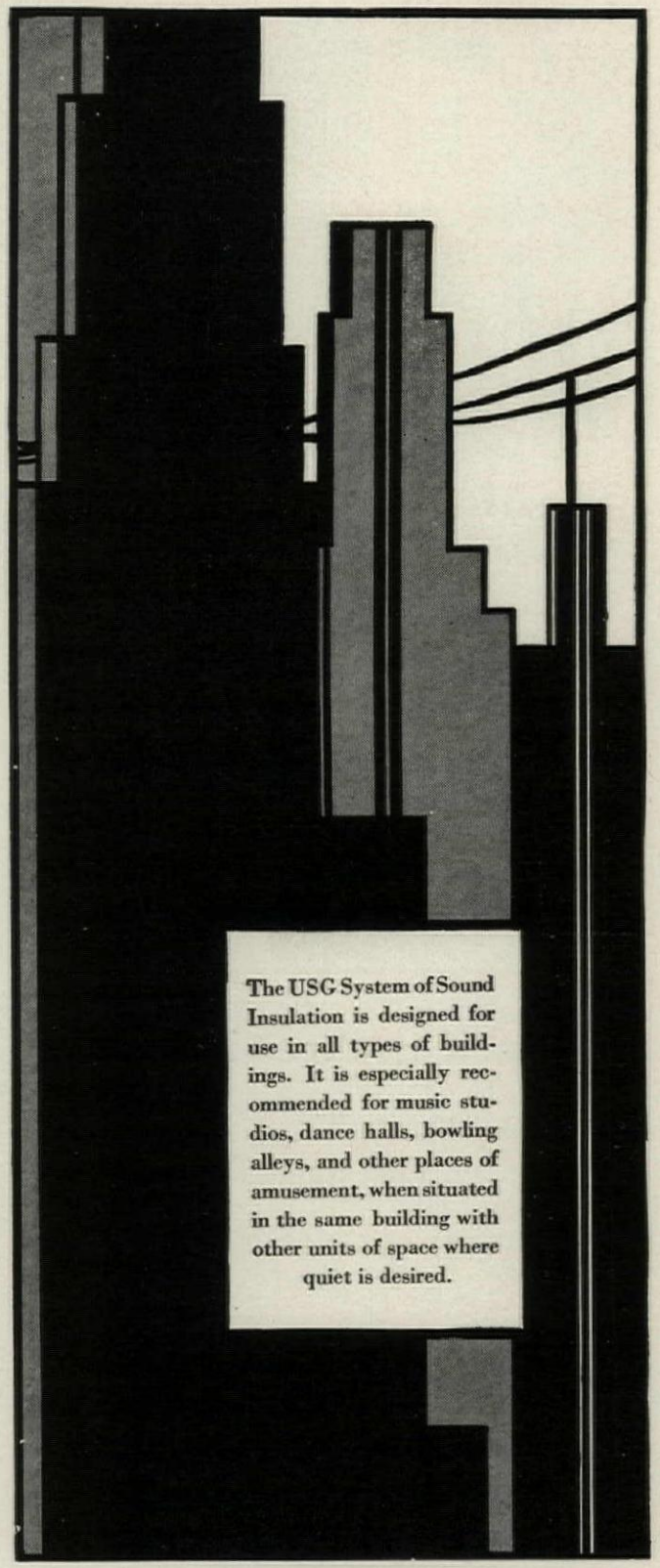
As is so often the case, the true value of the work of Hooker was not fully realized until it was almost too late to learn anything of a personal nature about his career. He left no descendants and no personal correspondence, and the notes bearing on his connection with the various buildings are so meager that there is doubt in many a case as to whether he was actually the architect of the building. Mr. Root has collected such information as is available and published it in attractive form, using as illustrations the best available photographs and drawings of buildings known to have been designed by Hooker. Although the author modestly asserts that his investigations resulted in an accumulation of dead facts, and that the book as published is intended "primarily as a source book, a publication of records likely to be overlooked or lost," it seems that to the discerning reader it will prove to be much more than this. True, the main portion quotes liberally from the reports and minutes of meetings and from letters and other documents, yet these references have such a direct bearing on the everyday life of the times and the way in which an architect of that day carried on the duties of his profession, that they cannot fail to be of absorbing interest to the architecturally minded reader who is interested in the history of the profession. For the general reader there is an introduction of considerable length discussing the background for the work and containing a well written crit-

ical description of some of the work of early American architects. As a source book it is of great value, for although the work of Hooker, as is pointed out, was often adapted from that of others farther east or in Europe, it shows a very masterful handling of the Renaissance and is typically American in every sense. It is said that Hooker was the last of the American architects to receive the Renaissance "in unbroken succession from its originators." After him came the period of "revivals."

The illustrations from photographs of buildings now in existence are, of course, very well chosen and presented, but in the case of those examples that have fallen before the march of progress we are less fortunate and must be content with views having some especially timely interest, but little architectural treatment, such as a view of the Albany City Hall on the morning after the fire of 1880, and a view of the first capitol building seen through a park filled with snow-clad trees. Of the buildings built from Hooker's plans now remaining in anything like their original form, perhaps the most important is the Albany Academy, located in the park to the north of the present state capitol building. This structure is quite generally recognized to be one of the outstanding examples of Georgian architecture in the United States. It has been little changed and is still used for school purposes, although the school has outgrown the building and is contemplating moving to a more favorable location. Both Governor Smith and Governor Roosevelt have appealed to the legislature to provide for its preservation by the state, and there has been some talk of using it as an executive mansion for the governor. Whatever use is to be made of it, it is to be hoped that the state will find some means of preserving for posterity this fine old building. Architecturally it contains a wealth of material, with its delicate and yet bold decorative treatment, which together with the dignified proportions of the mass make it a subject worthy of careful study. That Hooker was also a master of interior design is shown by his treatment of the chapel of this building as well as by the salon and dining room of Hyde Hall. These two rooms are among the finest in America and are preserved in almost their original state.

The Hamilton College chapel is noteworthy chiefly on account of its facade and bell tower, which were probably the only portions of the building designed by Hooker. The officers of the college ordered by mail "a plan or elevation of a chapel," and it is presumed that the remainder of the structure was built to fit Hooker's front elevation. A few other fragments of Hooker's work remain, among which is a part of the facade of the old New York State Bank of Albany, which in 1927 was moved several feet westward and incorporated in the wall of the bank's new 16-story office building. This amusing concession on the part of "modern business" to sentiment is very commendable, although the architectural effect of the original building is almost wholly lost. Many churches, residences, schools and business buildings known or supposed to have been the work of Hooker but long since demolished are discussed, and it is evident from the scarcity of material existing on this subject that Mr. Root's investigations were made none too soon, for it is likely that in a few more years there would have remained not even a memory of his work.

PHILIP HOOKER. By Edward W. Root. 242 pp., 9 x 12 ins. Price $12. Charles Scribner's Sons, New York.



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ARCHITECTURAL DETAILS OF SOUTHERN SPAIN. By Gerstle Mack and Thomas Gibson. 100 measured drawings and 113 illustrations from photographs. Price $16. William Helburn, Inc., New York.

THIS work by Gerstle Mack and Thomas Gibson falls into a class of publication which the architects of America are coming more and more to lean upon for sound and intelligent reference data on a given style.

The most helpful thing that might be said about the examples selected by the authors is that they are least of all imposingly "stylish" things. Rather these illustrations concern very intimate and personal qualities drawn from the houses from which this material has been collected,—and amazingly well drawn and photographed. The measured drawings of the volume are perhaps done with as fine a finish and convey as much intimate knowledge of their subject as any such drawings this reviewer has ever seen. And after the volumes of Byne and Stapley, it is always somewhat surprising to realize, in a freshly searching volume such as this, what a rich and constant source of architectural inspiration an area such as southern Spain may give birth to.

In the make-up of the volume, we are glad to note that there are almost as many measured drawings as illustrations from photographs, and the sizes of the latter have frequently been reduced in order that the measured drawings might occupy full-page spaces. It is also a definite pleasure to note that, in spite of attention being called to the fact that the illustrations are placed opposite the measured studies in order to convey the effect of time and climate in the examples, in actuality the drawings are so carefully observed, so felicitously executed, that they are what must be regarded as the most revealing characterizations of the details presented. The authors have wisely limited their scope to material which will be found definitely applicable by architects in America. They say: "The major part of the work is devoted to domestic architecture. During the sixteenth and seventeenth centuries an enormous increase in wealth followed the Spanish conquests in America; the nobles built magnificent palaces, and general improvement in the standards of domestic comfort took place. Details from several of these great houses are illustrated here, as well as a number of examples from simpler village dwellings. Public buildings and museums were drawn upon for certain details, and churches, monasteries, and hospitals furnished the rest; but choice was made only of ecclesiastical details which might be adapted to secular use."

Neither the Gothic, which has always seemed strange in its Spanish phases, nor the Moorish, likewise a rather special quantity, has been included in the volume. There is just enough information offered in the brief introduction to make one who might be interested in certain data regarding these architectural types wish for more. And it might be added that since the selections have been so critically made, the photographing so interestingly done, and the drawn matter so thoroughly studied, one would perhaps find the volume more significant had there been included, if only a few pages of it, something slightly biographical or perhaps personal regarding the authors and concerning what must have been for them a series of most charming excursions and minor expeditions in a fascinating portion of the Spanish peninsula. In a sense this would have been perhaps somewhat more a book and

less a file of merely available architectural data. But perhaps this is pushing criticism somewhat too far.

It should be noted that in selecting the material for this volume the authors have, with every good reason, avoided presenting too many over-all or general views of facades, and that they have focused their illustrations on the more intimate details and what are, architecturally, the more significant parts of these buildings. The material has been gathered copiously from Cordova, Ronda, Ecija, Andujar, Seville, Ubeda, Dsuna, Baeza, Granada, Carmona, Jerez and Arcos de la Frontera. A perfect wealth of details from these cities is finely representative of the best things and particularly in splendidly paneled doors, intricately carved; wrought ironwork; and there are a few very delightful fountains, windows, balconies, escutcheons, brackets, and splendidly ornate beamed ceilings. The illustrations of ironwork which are included in this volume are alone a sheer delight, and one is constrained again to remark on the exquisite draftsmanship with which there are so faithfully recorded many little vagaries, slight irregularities, and many thoroughly ingenious mannerisms of construction.

DOMESTIC ARCHITECTURE IN RURAL FRANCE. By Samuel Chamberlain. Text and 55 plates, 9¾ x 12¾ ins. Price $12.50. Architectural Book Publishing Co., New York.

FOR securing material to stimulate the imagination in designing smaller buildings in this country, no field is more fertile than rural France. It is considered almost essential to a thorough education in architecture that the student have at least some travel in Europe, and especially in France. Too often this is done in a hurried and superficial fashion, and the traveler dashes about from one well known place to another for a few weeks, and then leaves without even suspecting the great wealth of material that lies hidden in out of the way places. The better known buildings have been so frequently photographed and sketched that they have become a rather old story, so that it is to the bypaths and the crossroads of the more remote districts that one must go for fresh inspiration. Moreover, the subjects to be found in these places are often those most adaptable to application in modern domestic building. The half-timbered and stucco effects borrowed from French buildings have already been used to advantage in this country, and yet the field has scarcely been touched, and in the constant effort to improve the quality of our architecture, a great deal can be learned from study of the farms and villages of rural France. The vast extent of this field of study makes it almost impossible for an architect or student to anywhere nearly cover it during the time that is usually available for this sort of study. The provinces of Burgundy, Auvergne, Provence, Normandy, Brittany and Touraine are especially rich in this material. On every hand one comes upon intimate bits of domestic architecture, unspoiled by so-called modern improvements and expressing the character and history of the French people developed during a period covering several centuries.

In making his collection of sketches of these hitherto unpublished gems, Samuel Chamberlain spent over two years in traveling in an unhurried fashion through the rural districts, making sketches of such subjects as seemed appropriate for a painstaking and well premeditated series of plates. Being in no hurry to get somewhere, he was able to search out the best examples of old buildings and to give much careful study to the preparation of his sketches. These are executed in the various black and white media of which Mr. Chamberlain is master, including lithograph, drypoint, pencil and wash. The subjects chosen include a wide range of old buildings from the most pretentious chateaux to the humblest cattle sheds, all sketched in a pleasingly informal fashion, yet with the greatest attention to correct proportions and accuracy of detail. There is a frontispiece consisting of an original signed etching of Bourges, printed in Paris on Papier d'Arches by M. Edmond Rigal, one of the foremost plate printers of France. The rest of the plates are printed on heavy plate paper, 9¾ by 12¾ inches. More than 250 subjects are illustrated, and they include, in addition to cottages, chateaux, windmills and farm buildings, several measured drawings of wrought iron work and details of doorways. Although one or two well known buildings are illustrated, most of the sketches were made in places whose very names will be unknown even to those familiar with the French countryside. An interesting foreword by Mr. Chamberlain contains a brief description and some valuable comment on many of the subjects illustrated, which add greatly to the interest of the sketches. A brief resume of some of these descriptions may give an idea of the variety and usefulness of the subjects illustrated. Five sketches illustrating some new ideas in half-timber work from Liseaux are shown on Plate 1. A row of five houses under one roof at Conches should be especially interesting to architects doing suburban work, and a group of fourteenth century stone towers on a farm near Chartres is most interesting. A study in informal grouping of windows and doorways in houses at Vitre is readily adaptable to small houses or shop fronts in this country, and the rambling, informal farm buildings shown on Plate V present interesting combinations of timber treatment and various roof coverings. The "Farmyard of M. Billebot," near Vernon, is delightfully ancient and informal, with a most interesting outer gate. These plates are followed by several sketches of picturesque cottages and sunny streets in tiny villages and a dry point of a winding street in Vernon showing a glimpse of the church in the background. Another etching of this town shows the market place on Saturday morning and is full of life and architectural interest. More cottages from little known towns are followed by several unpretentious though interesting chateaux. The plate entitled "Details of Farm Buildings in Normandy" presents interesting compositions in half-timber and masonry. In the plates that follow many interesting farm and town houses are sketched in a most pleasing manner, and the detail drawings of ornamental iron brackets, gates, locks and door fittings give valuable suggestions for adaptations. The plate on windmills, although perhaps not so valuable as some others for purposes of emulation, is very interesting and original. This is a brief description of only a small part of the material shown, but it will perhaps give some idea of how the artist has worked with a view to collecting such material as may be adapted to American domestic architecture. In addition to its value as a source of architectural reference, the sketching technique is worthy of study, and the work is most interesting to the laity.

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THE ARCHITECTURAL FORUM

MAY, 1929

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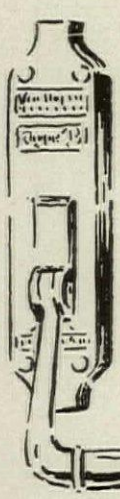

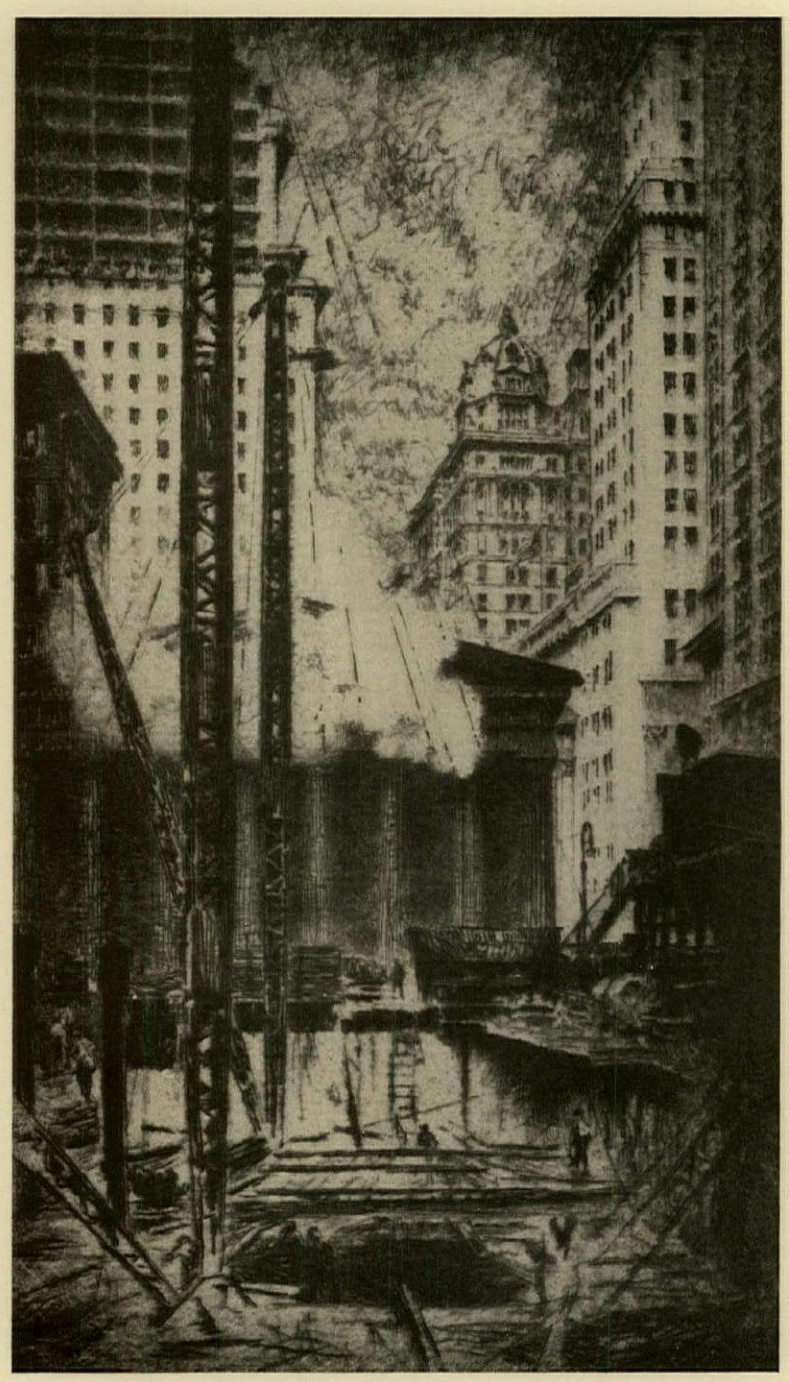

EXCAVATION

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THE
ARCHITECTURAL
FORUM

VOLUME L NUMBER FIVE

MAY, 1929

CHOOSING STRUCTURAL SYSTEMS AND MATERIALS

PART II—EXTERIOR WALLS AND WATERPROOFING

BY

THEODORE CRANE

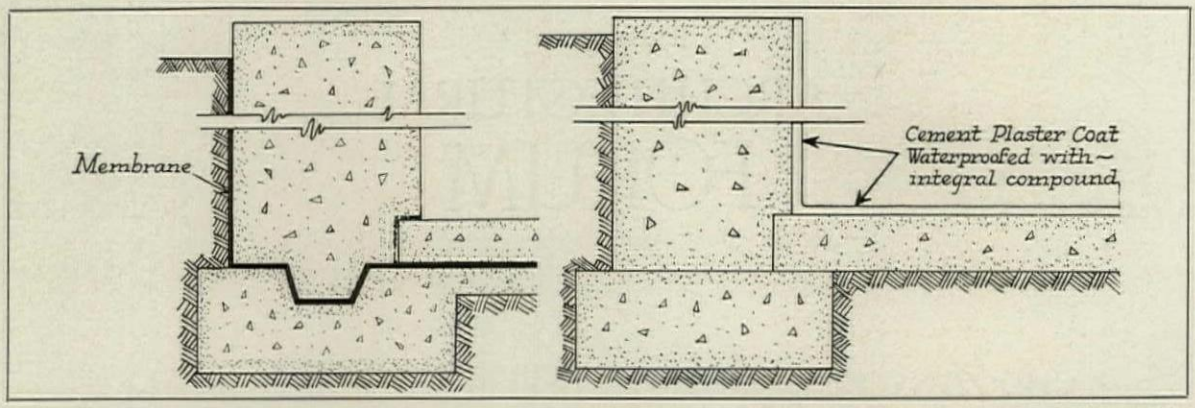
ASSOCIATE PROFESSOR OF BUILDING CONSTRUCTION, YALE UNIVERSITY

SINCE the earliest days, walls have served mankind as enclosures for the purpose of protection. Many and various methods have been used, depending upon the material available and the skill of the builders. In ancient and mediæval times the stone walls of isolated residences, three or four stories in height, were often of masonry 6 or 8 feet in thickness. Such were not necessary as supports for floors or roofs, but every foot added a definite increment to the time required by an enemy to effect a breach. Through long ages military considerations played a large part in the construction of most important structures, even within the limits of walled cities, and military motifs, such as crenelations and machicolations, still appear in the architecture of today.

With the development of modern artillery and the resulting futility of offering even massive masonry as a target for heavy ordnance, military necessity, of course, ceased to exert an influence on construction. In modern buildings, the utilitarian purpose of walls is to support incumbent loads, resist the inclemency of the weather, and give a certain amount of privacy to those within. Artistically, their exterior and interior finishes, thicknesses and disposition, must meet the architectural demands. It is not mere banality to rehearse these all too obvious requirements. In our search for combinations of materials, the use of which will effect the greatest economy, these simple, basic principles are often lost to view in the mist produced by modern advertising and high powered salesmanship. That our present methods of construction are a complete success, few would have the temerity to affirm. It would seem desirable to advance step by step in our consideration of anything as important as wall construction. It is not easy, for instance, to make tall buildings water-tight against wind-driven rain. Some of the most important structures in New York have caused no end of trouble, simply because their walls do not serve the basic requirement of being satisfactory enclosures. The pity of it is that these conditions are preventable; even with the limitations of our present knowledge, the profession knows how to build tight walls, and workmen properly supervised are capable of doing it.

Proportioning Footings. Let us first consider the requirements of stability or structural strength and commence at the bottom or foundation of the wall. Structures may rest upon rock, soil, or piles. The choice of footings for the support of piers or columns was referred to in the April issue of THE ARCHITECTURAL FORUM. Bearing walls and load-carrying partitions occur principally in buildings of only a few stories in height, and the footings are usually built of concrete with sufficient width to bring the load per square foot within the permissible bearing value of the soil. This would be a very simple matter were it not for the fact that most soils are compressible when subject to even moderate loads, well within the limits of ordinary practice. This fact makes it necessary to widen footings under piers and chimneys, or other masses of masonry, and to make proportionment of footing areas on the basis of dead load alone, or in combination with a small portion of the live load. This matter receives careful attention on the part of the engineer when he is employed to design important structures, and it should not be passed over too lightly by the architect if he would have his buildings settle evenly and avoid unsightly cracks.

To illustrate the application of this principle, consider the case of a three-story-and-basement school building with exterior bearing walls and interior columns supporting any type of fire-resistant floor system. Under most building ordi-



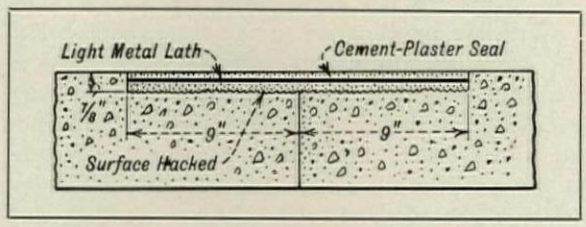
Left: The Membrane Method of Waterproofing Basements Where the Exterior Surfaces of Walls Are Accessible. *Right:* The Plaster-Coat Method of Waterproofing Basements, Applied Upon the Interior.

nances the classrooms would be designed to support a live load of 75 pounds per square foot. Published investigations by the Building Code Committee of the Department of Commerce lead us to believe that normal occupancy would result in an actual live load, including pupils and desks, of between 10 and 14 pounds per square foot. The *constant* and not the *occasional* loads are those that cause settlement. It is also true that the proportion of live load to dead load is much higher for the interior supports, such as columns, than for the exterior walls. If we design our footings for the entire live and dead load, *without other proportionment,* the interior footings will exert a much lighter soil pressure, owing to the fact that 60 or perhaps 65 pounds per square foot of live load are non-existent. In order to avoid the possibility of the exterior walls' settling more than the interior of the building, it is not only necessary to design the footings of adequate sizes to carry, with the allowable soil pressure, the *full design load* of the buildings, but also to proportion them, as in this case, on the basis of the dead load alone.

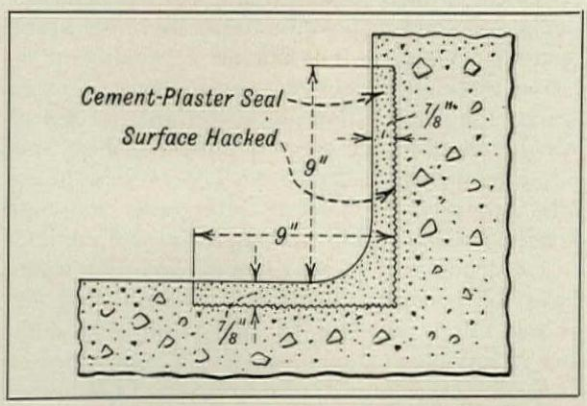
Foundations resting upon piles present a condition entirely analogous to soil-bearing footings. Piles may be driven to refusal, or their sustaining power may be due to "skin friction." In the latter case they will probably be subject to greater settlement than if their ends reach an impervious stratum. The most critical condition is where a portion of a building rests on rock, or other unyielding material, and the remainder of the structure is supported by a compressible soil or piles subject to settlement.

As the function of basement walls is purely structural, use should be made of the cheapest material that will give support and impermeability. The latter requisite, as applied to masonry, is a somewhat relative expression, and it is often economical to accept a system of drainage in lieu of absolute water-tightness in basement construction. This principle is acknowledged in the design of some of our largest buildings, where sub-cellar drains, sumps and automatic pumps are installed, as well as in residence work where land tile are used around the exterior footings. Concrete, plain or reinforced, is probably the most popular material for basement walls in many sections of this country. There is no question about its load-carrying capacity, nor its ability when properly reinforced to resist the pressures due to earth thrust and surcharge. The chief difficulty arises in the fact that, as ordinarily built, concrete does not fully resist the passage of ground water; neither does rubble masonry or the other materials ordinarily used for basement walls.

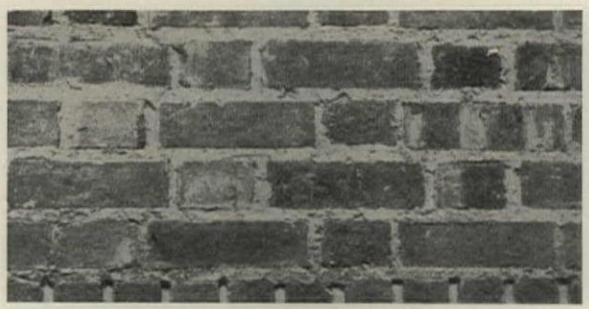
Waterproofing. It would seem to be the general practice in building construction where brick or stone masonry is required to resist any appreciable head of ground water, to employ an ap-



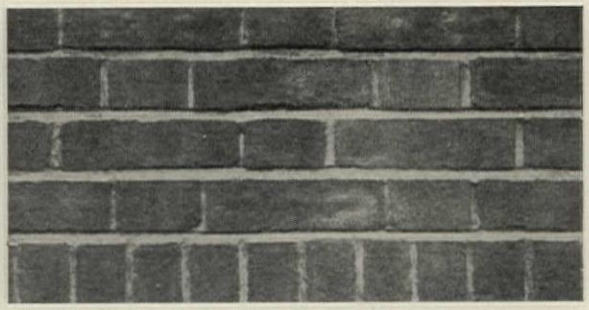
Cement Seal at Joint in Integral Waterproofing



Method of Reinforcing a Construction Joint Between Floor and Wall in Integral Waterproofing



Rough Flush Joints, of Coarse, Dry Mortar Cannot Be Expected to Be Rain-tight in Exposed Locations

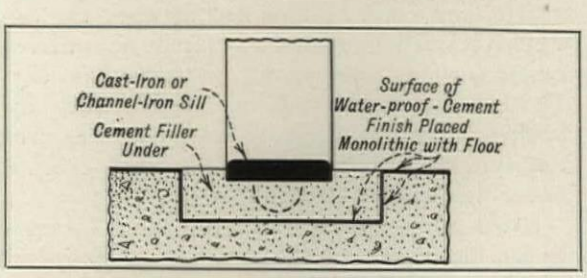


A Well Compressed, Weathered Joint Helps Make Walls Tight Against Wind-driven Rain

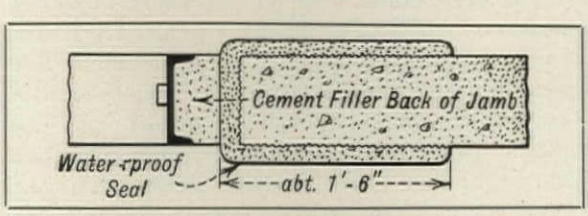
plied waterproofing. Such is usually of the membrane or of the "cement-coat" variety, although certain methods employing bituminous compounds are occasionally used without a membrane, and the so-called "iron process," referred to later, may be applied to brick walls. Owing to the fact that concrete is manufactured on the site, it is possible, in the case of this material, to use integral compounds. This fact has been the genesis of a great and widely advertised industry. There does not seem to be any valid objection to the use of accredited admixtures in concrete work, and in fact many of them have a distinct value for waterproofing purposes. The unfortunate part of the situation is that emphasis has too often been laid upon the use of proprietary compounds instead of upon good workmanship. Good concrete is reasonably impermeable to water, but poor concrete cannot be made so by the use of any admixture yet placed upon the market.

The subject of waterproofing concrete walls has received a great deal of attention during recent years. Broadly speaking, the various systems at present in general use are:—

1. The membrane method, employing layers of felt, jute or cotton drill laid in pitch or asphalt, or some composition of bituminous materials.



Cement Waterproofing Under a Metal Door Sill



Cement Waterproofing Back of a Metal Door Jamb

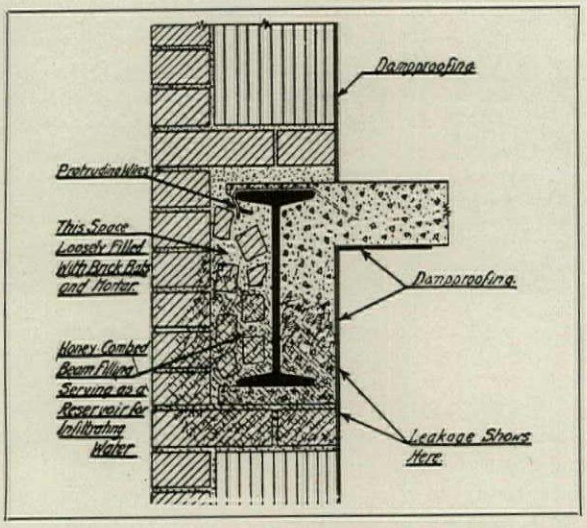
2. The "plaster-coat" method, being the application of two coats of cement mortar, containing a waterproofing compound, to face of wall. The total thickness is normally ⅝ to ¾ of an inch.

3. Integral compounds, which are added as dry ingredients to the cement, or as liquids to the mixing water, for the purpose of making the concrete itself more impermeable.

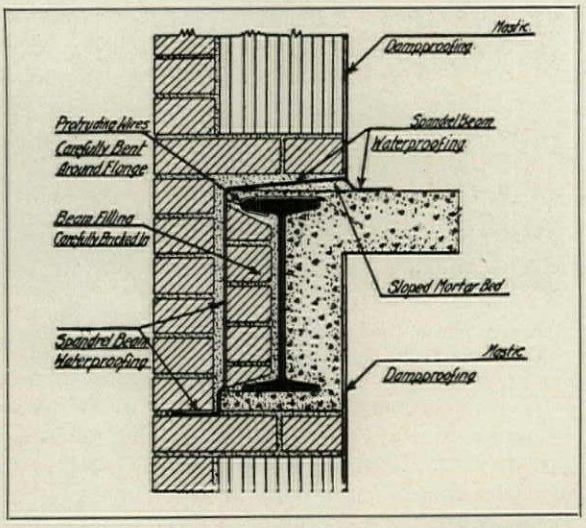
4. Various spray, brush, mop and trowel applications to walls below grade, generally employed where no hydrostatic pressure exists.

The problem of choosing the best type of waterproofing is so dependent upon the particular conditions of the particular work that it is extremely difficult to give any general rules. The membrane method, employing a good quality impregnated fabric with an elastic binder, can be successfully used against high pressures, but the cost is often very high. For comparatively shallow basements, the membrane can be applied to the exterior, but when the outside of the building below grade is inaccessible, the cost of interior application, with the accompanying seal, makes the operation proportionately more expensive. Some of the largest buildings in New York have exterior walls sunk by the caisson method, 50 to 70 feet below ground-water level. On such operations the so-called "plaster-coat" method, applied to the interior of the wall surfaces and to the cellar floor, has been successfully used. It should be remembered, however, that the concrete walls are often 6 or 8 feet in thickness, and that a system of drainage is usually installed below the cellar floor, connected to a central sump and relieved by automatic pumps. Furthermore, the mortar is carefully prepared with Portland cement mixed with a well graded sand and an effective waterproofing compound. The success of such work done by trained mechanics, under expert supervision, is no reason to accept this method where technical skill is unavailable.

The principle of waterproofing the concrete composing the wall, instead of applying surface applications, has very interesting possibilities, but under the conditions ordinarily encountered in building construction, it requires the greatest care



A Typical Spandrel-Beam Construction That Frequently Causes Leakage



A Typical Spandrel-Beam Construction Showing a Recommended Method of Flashing

if the work is intended to withstand any appreciable head of water. The concrete should be composed of well graded aggregates proportioned for maximum density. The mixture should be thoroughly homogeneous and as dry as may be consistent with perfect "workability." Some waterproofing preparations add to the plasticity of the mixture, thereby lessening the amount of water required for placement, which results in a stronger and more impermeable concrete. It is also claimed that the addition of certain compounds causes a more complete hydration of the cement. The use of calcium or ammonium stearate, which is the active ingredient of numerous waterproofing compounds, has been found to greatly reduce the capillarity of mortars, but this effect is of much greater comparative value against wind-driven rain above grade than against hydrostatic pressure below ground. Another method of integral waterproofing consists of introducing 2 or 3 per cent of inert material for the purpose of filling the voids of the concrete. The object is excellent, but unfortunately the air and water voids in the completed mass, which do affect permeability, cannot be so easily filled.

The whole subject of integral compounds has given rise to so much acrimonious discussion that it is a very delicate field upon which to trespass. The proposed building regulations promulgated by the American Concrete Institute have very consistently avoided any reference to the subject, from the first "Standard Building Regulations" published in the "Proceedings" of 1917, to the tentative "Joint Code" published in 1928. It is not the function of a building code to control decisions in regard to methods of waterproofing. The various "Joint Committees" on specifications, however, have taken a real interest in the subject. In 1926 the "Final Report" of the old Joint Committee could hardly be said to encourage the use of integral compounds; in 1921 the "Progress Report" of the new "Joint Committee" said that "Integral compounds shall not be used"; the "Final Report" in 1924 contained the specification that "Integral compounds shall not be used for waterproofing unless specifically authorized by the Engineer." This committee represented four of the leading professional societies, and there was no higher authority in the field at that time. On the other hand, we have a record of excellent results obtained by the better grade of waterproofing compounds, where they have not been expected to do the impossible and have been used with a just appreciation of their limitations.

When employing this method of waterproofing basements against actual pressure, it is essential that the floors and walls be properly keyed together, that laitance and honeycomb be eliminated, and that complete homogeneity as well as a tight, interlocking bond be obtained between the concrete comprising sections poured at different times, such as that placed on successive days. The fact that these conditions are extremely difficult to obtain, is adequate reason for reserving this system of waterproofing for work executed under the strictest supervision.

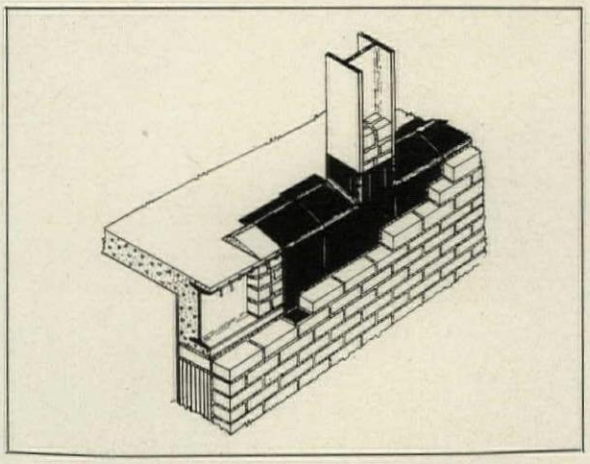
Brush and spray applications should generally be considered more in the nature of dampproofing than waterproofing treatments. However, there are at present materials falling under this classification, such as an emulsified asphalt, which seems to be satisfactory against a considerable head. Furthermore, the "iron process," which consists in applying three or more coats of iron dust, mixed to a cream with water combined with varying amounts of Portland cement, has been used successfully on basement walls where comparatively little pressure existed. Nevertheless,

the chief value of these preparations is for dampproofing basement walls and as surface coatings above grade, to reduce the permeability of masonry. Of course, only the colorless compounds can be used on the exteriors of buildings, but the bituminous compounds are usually to be recommended on other than exposed surfaces.

Masonry Walls. Omitting special types of construction peculiar to certain localities, exterior masonry walls above grade are usually built of brick, stone, concrete, load-bearing terra cotta, or cement block. All of these materials have sufficient structural strength, and when built into masonry walls of the thickness called for by good practice and code requirements, they furnish adequate support to carry imposed loads. In other words, if the exterior finish of the building is to be brick, either terra cotta, "back-up tile" or common brick can be used for the body of the masonry wall. In most climates an air space is necessary to avoid condensation, so if solid brick is used the wall should be furred, preferably with terra cotta. The requirements of appearance, structural strength and insulation will then be satisfied, but it remains to make the wall rain-tight.

Brick is one of our oldest manufactured articles. Its origin as a structural material is lost in antiquity, many thousand years ago, but it is not a uniform product. Architecturally, this is an immense advantage, permitting a pleasing variation in texture and color of wall surfaces. Structurally, it implies the necessity for accurate specification in order to obtain the best results. Most bricks are sufficiently impermeable to shed water on vertical surfaces. Standard requirements eliminate the soft "salmon" bricks or those that fall below a minimum compression strength, and often they place a maximum limit upon the absorption of about 15 per cent by weight. But it is not customary to place a *minimum* requirement upon the absorption, nor to specify a low limit on the modulus of rupture. Face brick, similar to those used recently for a building in southern New England, give an absorption of less than 2 per cent. The walls constructed of these units showed a lack of bond between brick and joint, which was a contributary cause of serious leakage.

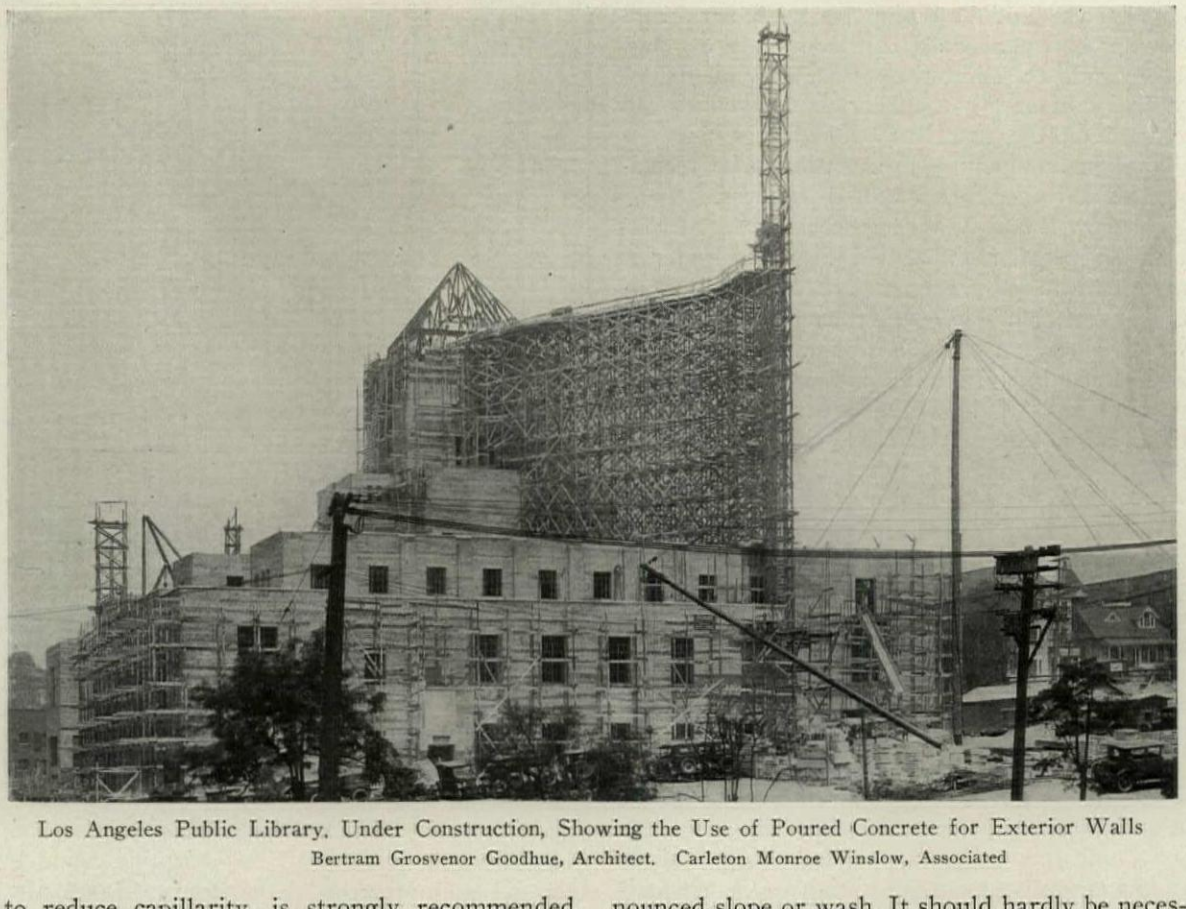
Weatherproof Brick Walls. It is probably true that most of the trouble from leaky walls is not due to the quality of the materials, but to the faults of execution, and it occurs principally at floor levels in skeleton buildings, along parapets, and around openings. It would appear, however, that care should be exercised in the choice of brick for exterior use in exposed locations, and preference placed upon those which have enough absorption to draw the mortar into the pores, without being sufficiently porous to become water-soaked during hard, driving rains. Furthermore,



Spandrel-Beam Waterproofing

the specification for thoroughly "wetting all brick immediately before laying" is one that should be considered in the light of the characteristics of the particular brick to be used, and not as a standard clause. Neither should brick be laid in weather even *approaching* the freezing point without due precaution. The technology of brickwork is a subject which merits, and is at present receiving, very serious consideration. It is to be hoped that the building departments of our municipalities will, in the near future, avail themselves of the information offered by our scientific committees and manufacturers' associations. To specify a limiting value for the compressive strength of brick probably results in eliminating very soft, underburned material, but this requirement is only remotely related to the strength of the wall which the specification is supposed to safeguard, as failure seems to result from the *breaking* of the brick and not from their *crushing*. As there is not a definite relation between these two types of stress, it would seem desirable to specify a minimum value for the modulus of rupture.

The character of the joints, as well as the bond between mortar and brick, plays an important part in making walls rain-tight. With all due respect to architectural considerations, thick joints of coarse, dry mortar should be avoided in exposed locations. The raking out of joints is only a little more harmful than the ordinary method of "striking" a flush joint by which the mortar is torn by the trowel and often actually drawn away from the side of the brick. A vast amount of trouble within the last few years, particularly on the tall buildings in New York and Philadelphia and hotels at Atlantic City, has proved that the proper construction of the joints is of vital importance. It is desirable to point the joints with the same mortar that was used in laying the wall, as a richer mixture gives greater contraction on setting. A waterproofing compound such as ammonium stearate, which has been definitely proved



Los Angeles Public Library, Under Construction, Showing the Use of Poured Concrete for Exterior Walls
Bertram Grosvenor Goodhue, Architect. Carleton Monroe Winslow, Associated

to reduce capillarity, is strongly recommended. The correct amount is about 2 per cent by weight of the cement. A normal, cement-sand-lime mixture should be used, but the sand should be carefully chosen as clean, not too fine, and well graded. In the operations of pointing, particular care should be exercised to thoroughly compact the mortar; a so-called "rodded" joint or a well pressed "weathered" joint is to be preferred.

The choice of the bond is not an important matter from a structural viewpoint, as all standard bonds give adequate strength. If 8-inch walls are used, it is necessary to thoroughly bed the through headers, and two coats of bituminous dampproofing on the interior give excellent insurance, although inadequate to overcome any serious defects such as settlement. Fortunately, 12-inch walls are required for all important buildings, and the longitudinal mortar joint should serve as a water break.

The design of details, as well as the quality of the work, should be given serious consideration if exterior masonry walls are to be made tight against wind-driven rain. It is very important that drips be provided on all projecting or capping members, such as parapet copings and window sills. Stone sills with lugs are less likely to leak than those of the "slip sill" pattern. The upper surfaces of masonry units should also have a pronounced slope or wash. It should hardly be necessary to say that flashings must be properly designed and gutters and leaders be of adequate proportions, yet much trouble is due to the neglect of these items. Particularly troublesome is the leakage through vertical joints in brick sills and parapets. These should be pointed with mortar containing a water-repellent, such as ammonium stearate, and flashed entirely across the wall with copper or with a high grade membrane, as the latter is quite effective and much easier to use. The backs of parapets should also be flashed with metal or membrane and not merely painted with a "black waterproofing." A great deal of serious leakage results from poorly designed parapets, and even if water is prevented from entering the building by flashings carried across the wall at the roof level, efflorescence may appear upon the exterior unless the *inside* is rendered impermeable.

Elastic cement should not be counted upon to make tight the vertical joints between natural or artificial stone, employed for cornices and copings, except when it is impracticable to flash. In most cases a metal or membrane flashing can be installed as illustrated by the standard construction employed for cornice work. If this is not feasible, a high grade elastic compound should be chosen that will not stain the stone nor quickly decompose under climatic variations. It is ques-

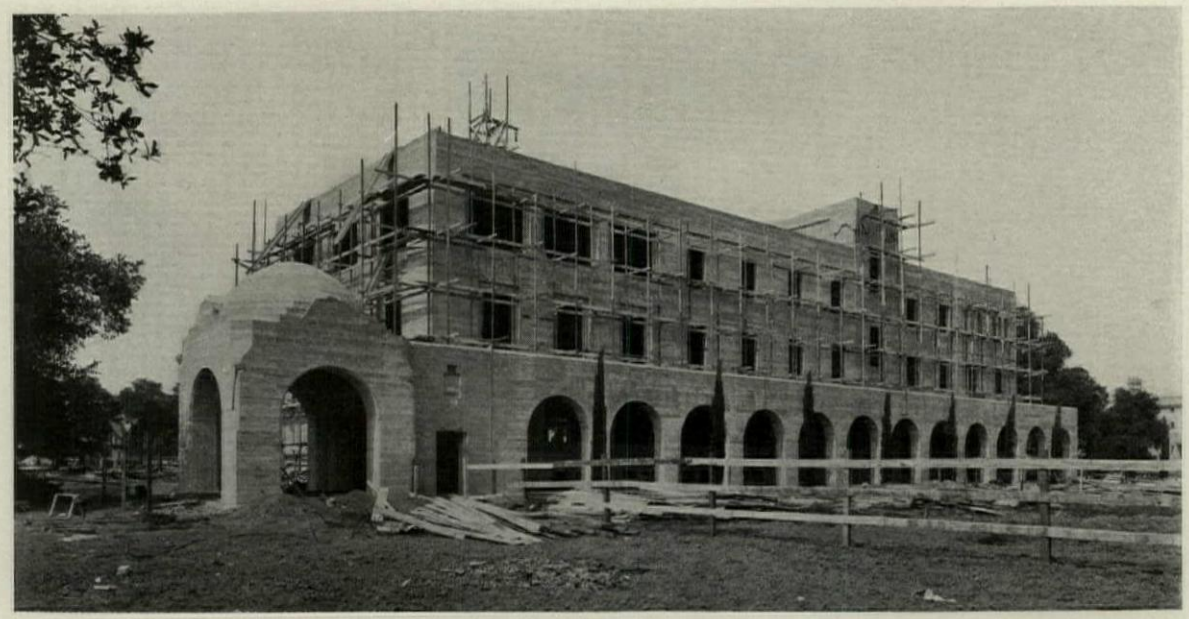
The Los Angeles Public Library, Nearing Completion, Showing the Architectural Effect Obtained
Bertram Grosvenor Goodhue, Architect. Carleton Monroe Winslow, Associated

tionable, however, if any material on the market will permanently close vertical joints on exposed work. The principal use of elastic cement, or more properly of caulking compounds, is to make weather-tight joints around openings. Wood frames in masonry walls should be packed with oakum on top of which a beat of elastic cement can be run beneath the staff bead. The same material is used to advantage in making tight the junction between the wood sill and the supporting masonry. A similar process, without the use of oakum, can be successfully applied to the setting of steel or hollow metal frames in masonry walls.

Waterproofing Spandrel Beams. One of the most frequent sources of trouble on structural steel buildings, is lack of proper flashing at spandrel beams. The typical "cinder arch" floor construction, so widely used in parts of the East, often results in providing practically no resistance to wind-driven rain other than a 4-inch brick or stone veneer. As this condition occurs at all floor levels, it is hardly any wonder that a large number of our tallest buildings have developed serious leaks. This situation has lately received considerable study on the part of some of our best builders, assisted by waterproofing engineers. On new work of the better class a membrane is employed, often backed up by a trowel coat of mastic. It is first necessary to fill with brick the space between the flanges of the beam, bending the ends of the floor slab reinforcement out of the way. A bed of cement mortar is then laid on top of the floor arch, along its outside edge, to form a base for the waterproofing. The membrane and mastic are applied, as shown in the sketch, included here, when the brickwork of the veneer has reached the first course below the bottom flange of the spandrel beam and is built into the masonry, continuing over the top of the floor arch a distance of 3 or 4 inches beyond the inside face of the wall. The membrane is placed on three sides of ordinary wall columns and upon all four sides of corner columns. These precautions apply to stone as well as to brick veneer.

Efflorescence. The problem of making exterior walls rain-tight is closely associated with that of efflorescence. Soluble salts are always present in varying amounts in cement, brick and terra cotta; if such come in contact with moisture, by reason of inadequate flashing or leaky joints, they are likely to be carried in solution to the face of the masonry and there deposited as white coatings which not only disfigure the wall, but actually exfoliate the surface. Efflorescence consists of various compounds, principally sulphates and chlorides of sodium, potassium, calcium and magnesium. Because the formation of minute crystals takes place under the surface, as well as upon the face of the wall, serious scaling often results.

Some excellent research work has lately been



The Biology Building, California Institute of Technology, Illustrates a Design Particularly Suited to Reinforced Concrete. The Wall Surfaces Were Later Stuccoed

Mayers, Murray and Phillip, Architects

devoted to the investigation of these phenomena, from which it is possible to make definite recommendations to eliminate, or at least to materially lessen, this evil. In the first place, the design should provide for thorough flashing and require adequate drips on all projecting members. Fine buildings should have a highly impermeable course such as granite, at the ground level, and every type of masonry structure should be provided with a layer of membrane with mastic separating foundation from superstructure, to prevent water being drawn up from the basement walls by capillary action. Natural stone veneer should be laid in mortar made with a non-staining cement, preferably waterproofed with calcium or ammonium stearate. The unexposed surfaces of the stone can best be protected by a heavy parging of the same mortar that is used for setting. If a coat of "black dampproofing" is preferred to the use of mortar, it is recommended that the material selected be given a thorough investigation, as some preparations offer but little resistance to the action of either sodium, magnesium or calcium sulphate.

Although it is not customary to lay brick veneer in a mortar containing non-staining cement, this would appear at times to be a very sensible procedure, as much of the efflorescence on brick walls seems to come from the cement. Both the ordinary Portlands and the other cements, now quite widely used in brick-setting mortars, contain soluble salts capable, in the presence of water, of producing discoloration. Having decided upon the materials to be used, the precautions to be taken against efflorescence are exactly the same as those required to make exterior walls rain-tight, with the added suggestion that while it is imperative to keep water from getting *into the wall,* it is extremely desirable to minimize the amount of water *flowing down the exterior.* It should not be inferred, however, that all efflorescence comes from the mortar. In some parts of the country, notably in southern Connecticut, common brick cause their full share of trouble, and it would seem to be a case of the pot calling the kettle black. The use of colorless applications for waterproofing purposes upon the exposed surfaces of stone or brick walls, is not always entirely efficacious. It is so difficult to completely seal a surface, even with the best of workmanship, that air and moisture will usually penetrate. Neither are the various proprietary washes advocated for the removal of efflorescence to be considered as universally permanently effective. It is quite a simple matter to clean the walls, but the white salts will soon re-form if the cause is not removed. There has been more or less discussion lately about the desirability of mixing barium compounds in the clay of which certain common brick are formed, for the purpose of reducing efflorescence by changing the sulphates into insoluble precipitates. This principle has been successfully applied both in the ceramic and the face brick industry; it would seem to be equally applicable to common brick.

There are very few builders who do not realize the importance of properly protecting both natural and artificial stone before and during construction. Brick should also be piled on plank and protected from snow and rain. Particularly

Residence Before Application of Stone Veneer
C. E. Reichle Co., Designers

The Same Building Veneered in Limestone Finished in Old Gothic. Random Ashlar

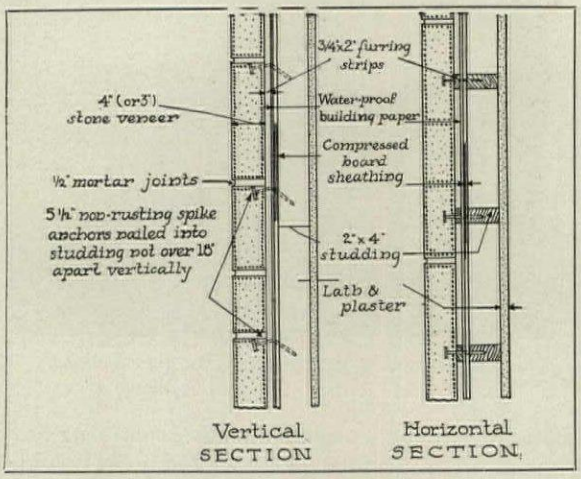
essential is some effective method of covering the tops of incompleted walls which must remain for some time exposed to the elements. During even a few days' exposure to heavy rains they may entrap sufficient water to cause discoloration of the surface of the wall long after the completion of the work. Serious efflorescence has also resulted from the seepage of rain water through a con-concrete roof slab, left for several months without a protecting membrane. In this case a limestone cornice was badly disfigured by the precipitation of salts dissolved from the concrete.

Concrete, Cement Bricks and Blocks. For over a generation now, while the more conventionally minded have been building walls of stone and brick and terra cotta, engineers have been experimenting with monolithic concrete. About 20 years ago this type of construction was applied to a number of dwellings ranging from large residences to very small houses; since then the public has quite often been aroused by the thought of obtaining "poured" houses at a fraction of the cost of building them. In the east, these ideas have never materialized on a large scale; the cost of the wood forms, the impracticability of using steel forms for other than standardized work, and the mechanical difficulties of handling comparatively small operations economically, have all counted in the score against building walls of poured concrete. On large operations, however, where local conditions are favorable, concrete walls may be cheaper than brick, and we are all familiar with their use for industrial buildings, where an efficient plant has already been installed for the concrete of the frame and floor construction. Again, it is extremely hard to generalize. The architectural characteristics of concrete are so well suited to certain types of architecture, particularly the so-called "Spanish" style of our southwest, that this advantage alone may dictate its choice.

Cement blocks have been used in building construction since Civil War days; units removed lately from an old building showed a compression strength which would meet present-day specifications, although probably made from a natural cement. The average plant of today is turning out a product conforming to the requirements of the American Concrete Institute. Nevertheless, it is extremely important to make certain that the blocks are cured in such a way as to avoid, or rather to minimize, volumetric changes after incorporation in the building. At present it is not apparent that curing methods are standardized or at all times adequate, and if cracks are to be avoided, it is of vital importance that only thoroughly cured units be used.

Although the Portland Cement Association has laid down a conservative policy in regard to furring walls built of hollow cement units, it is regrettable that contractors will take the chance of plastering directly on the inside of the block. As in the case of terra cotta walls built of a single thickness of hollow tile, such construction may be successful, but it cannot be considered good practice. If properly designed, both terra cotta and cement block serve excellently as bases for stucco. The former is, at the present time, a somewhat more uniform product and not subject to as large volumetric changes. On the other hand, the bond between cement block, as ordinarily manufactured, and the base coat of stucco is excellent, while the tile surfaces depend largely upon the scoring for bonding. Besides these units that have been used for over a period of years, cement brick and cement cinder block have a wide field as "back up" material in the rear of brick or stone veneer, and the cement cinder block is particularly suitable under stucco.

Stucco. The use of stucco as an exterior wall finish in northern climates is a subject that merits serious consideration. Portland cement stucco can be applied successfully to brick, stone, cement block, terra cotta, wire mesh or wood lath. Some years ago wood lath ceased to be used for this purpose in many parts of the east, but excellent work in northern sections of the middle west definitely proves the possibility of obtaining good results with this construction. Metal reinforcement was, at one time, considered to fail by rea-



Details Illustrating the Assembly of Stone Veneer Over a Wood Frame

son of rusting when used along the sea coast, but it has been found that such failures can be attributed to poor workmanship, as a dense mortar will adequately protect the reinforcement if the latter is properly placed.

Over frame construction, good practice would require a rather large meshed metal fabric held free of the sheathing by means of furring nails or other means which permit the stucco of the base coat to pass back of and to thoroughly embed the steel. The requirements covering materials and method of application are well defined by the excellent specifications furnished by the Portland Cement Association, which should be scrupulously followed. No one, however, can guarantee success if the work is done over a wooden frame that will shrink appreciably after the stucco is in place. Every precaution should be exercised to obtain well seasoned lumber and to permit the building to dry out as much as possible before the final coat of stucco is applied.

In this country comparatively little stucco is used over brick or stone; when these materials are employed, they are generally desired for their architectural as well as their structural value. Occasionally we see a brick chimney over which stucco has been applied, but it is almost impossible to avoid there being cracks due to temperature variations, which soon result in failure of the surface. Stucco over terra cotta or cement block is a thoroughly established method of construction. With proper care there is no reason why it should not be entirely successful. The partial failures, which are only too evident throughout the country, can be definitely attributed to improper specifications or to poor workmanship. Again, the data available in the publications of the Portland Cement Association can be taken as authoritative. In matters of design the limitations of the material, or rather its structural characteristics, should be clearly understood; particularly important is the avoidance of using stucco on other than vertical surfaces. For example, the tops of ornamental parapets, sills and belt courses are often a source of trouble. Chimneys above roofs should be built of brick or stone, without any surfacing, wherever the architectural design will permit such a treatment. If stucco is required, it should be carried upon wire fabric, placed so as to provide an air space between it and the block or tile composing the chimney. The flashings should receive particular attention, as it is of vital importance to keep water from penetrating in back of stucco. Particularly critical are the sections where masonry joins a superstructure of wood, which sometimes occurs on dormers in residence construction. In such places wire fabric should lap the masonry at least 12 inches, or more if necessary to secure firm nailing into the joints. Stucco panels in half-timbered construction should be flashed at the top, if exposed, and always at the bottom; a rabbet $\frac{5}{8}$ inch wide and the depth of the base coats, should suffice on the vertical joints between wood and stucco. Brick veneer over a wooden frame is quite popular in parts of the south, and the method of construction is too well known to warrant description. In some sections of the country stone veneer, 3 or 4 inches thick, is used in much the same manner. Where the cost of masonry is relatively high, a stone exterior can thus be obtained at a price considerably less than that of solid walls.

The use of insulating materials to reduce the heat loss from buildings, particularly those of wood construction, has recently been given much publicity. From the research work of certain progressive companies we have been made appallingly aware of the great heat losses through ordinary types of construction. It should be remembered that the actual loss through the walls of even a frame structure, is only about 25 per cent of the entire heat loss of the building. Approximately 75 per cent of such so-called "waste" occurs through glass areas, around openings, under eaves and through attic floors or roofs. In other words, the application of some proprietary system of insulation to the exterior walls of a country residence, from sill to plate, might be expected to reduce by 5 or 6 per cent the number of heat units required to heat the interior of a moderately well constructed house.

The next article of this series will treat of floor and roof construction.

NOTE. *The author wishes to acknowledge his indebtedness to these firms and associations for their assistance in the preparation of this article: American Face Brick Association; Indiana Limestone Company; A. C. Horn Sales Corporation; Structural Waterproofing Company; and Toch Brothers.*

SOLVING THE ELEVATOR PROBLEM

BY
THEODOR CARL MÜLLER

TALL buildings offer so many possibilities in the way of arranging mass and in use of materials and the amplification of anything the architect may wish to express, that their habitability, their circulation dependent upon the elevator, may suffer. Through the architect's preoccupation with the building as an expression, the elevator, which appears to be entirely within the province of the engineer, remains with many of its architectural possibilities unsounded. Formerly it was the continual complaint of the elevator engineer that he was called in at some stage of making scale drawings where his success was handicapped beyond a solution by mechanical skill. It is much to the credit of the manufacturers that they have largely overcome this condition through their continued efforts to coöperate with the architect at the outset, and through their maintenance of a staff of experts and specialists in service determinants, whose aid the architect may enlist previously to the contracting for an elevator system. One views with hope a closer coördination of function and expression as a single factor dependent upon human want.

The service aspect of an elevator system finds an immediate index to its success in the popularity of the building and the consequent rentals in relation to competing buildings with superior elevator systems. Unless passengers are to be shot upward in a radically different way, the possible limits of speed have been reached. By increasing the velocity of the car over 600 feet per minute, it was found that the operator could not reduce the round trip time because of the premature slow downs necessary for a safe landing. But with the introduction of automatic operation, a velocity of 900 feet per minute was feasible and time lost in landing was completely eliminated by use of micro-leveling apparatus. Greater velocity would be neither comfortable nor profitable in view of the added installation and operating costs. The further development of speed lay in the perfection of the signal systems, the closer coördination of the work of the starter and the despatcher with the individual operators, and the greater efficiency due to by-pass switching for crowded or delayed cars. Here, too, the development has gone so far that greater speed is dependent upon facilitating, through design, the recognition of the signals by the public.

Of great credit to the service in general has been the avoiding of accidents, nine-tenths of which are now landing and door accidents. Carelessness is the chief cause of these, but to further fool-proof the system, solid doors with hydraulic or air checks and solid gates may be specified, and the sizes of door openings be diminished. Free the operator mechanically from the hand operation of both car and door, so that he may devote himself to guarding against carelessness on his part and on the part of the passengers. The expense of such improvement would be somewhat lessened by a reduction of insurance costs. The possibility of general improvement of the system, therefore, lies chiefly in bringing the designer's skill to deal with the features so well secured by the engineers, in collaborating more fully on future evolution, and in the care taken with car interiors and with exterior doors, which by their very nature as design problems, have been widely abused by thoughtlessness and incompetence.

Determinants. General service determinants limit discussion because of their dependence upon the individual building and also because the hypothetical case, as much as the actual, demands the specialized knowledge of an expert versed in probability theory and load plotting. Coupled with an expert solution, goes the speculation of the building committee as to what may develop over a period of years, the type of occupancy, altering perhaps the amount of rentable area, and giving a different quality of service. Single tenant occupancy may result in a great increase of inter-floor traffic, as well as in unusual peak loads. The impracticability of designing for the abnormal traffic of a rush hour forces a choice between congested and delayed service and the stagger system, a remedy which gains the popularity of the public but slowly. Its desirability is obvious, but experience has found it to be in conflict with the human gregariousness which, for example, makes a person prefer to ride in a packed subway with a friend than to sit alone. The business habits of a tenant may cause tremendous peak loads at nine, at noon and at five. While it would hardly be economical to condition a service by the peak loads in the proximity of a railroad terminal where delays cause the missing of trains, concessions to the evening rush hour may prove profitable. In buildings for professionals, the "in and out" curves will not rise to such abrupt heights at nine and five as in those tenanted by organizations whose staffs are made up chiefly of clerks and stenographers. However, the natures of the professional's clients are a vital determinant. The ailing human being, no matter how desirous of receiving the attention of a doctor or a dentist, should not be whisked upward at a

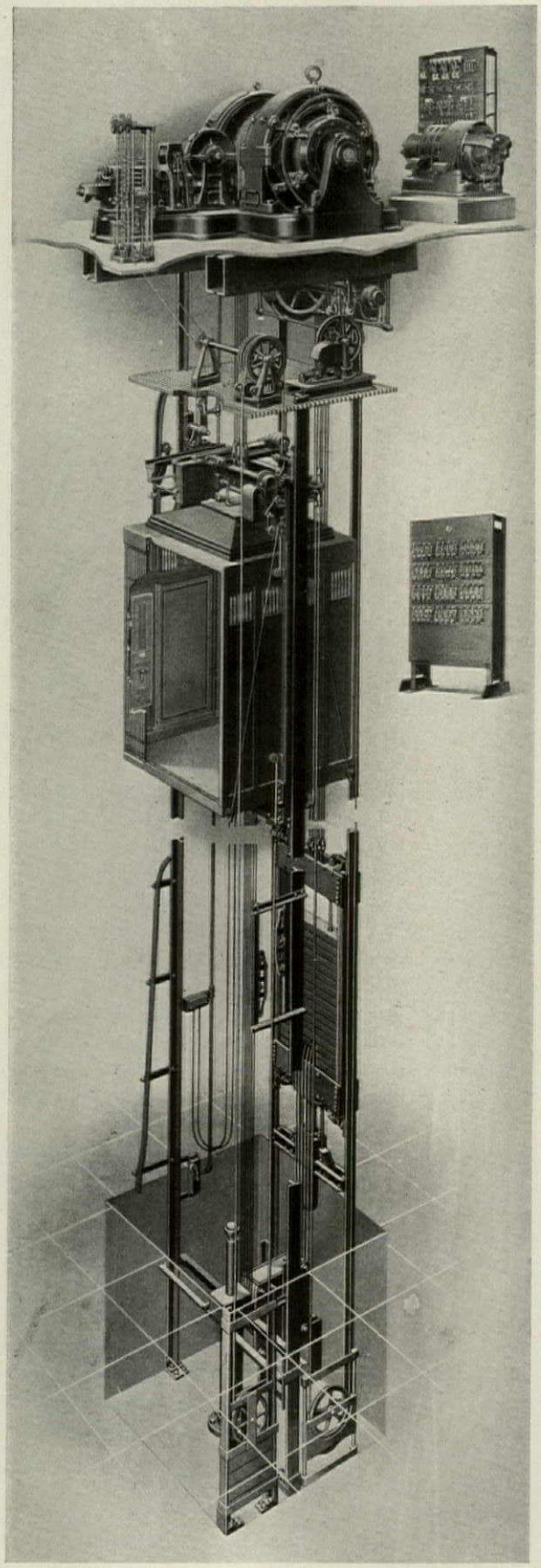


Diagram of Automatically Operated High Velocity Elevator

rate of 900 feet per minute and should be let down with extraordinary care, while the worried man hastening to his lawyer, cannot be judged on the basis of "normal patience."

Just what "normal patience" is, how long the intending passenger will wait for a car, and how long he can be expected to stay in a car without tax on that patience, is debatable. In general, service with a 20-second interval between cars has been found satisfactory, and that with a 30-second interval is considered fair. The passenger entering the building will be more satisfied to find a waiting car at the lobby floor than to find a bank of closed doors, for the seconds waiting *in* a car seem shorter than those waiting *for* it. Without an actually proposed building with all its elements known and the speculation about its future established, even the expert could not be expected to decide what would be successful interval and round trip time, nor could he make "in and out" studies from which the number and speed of elevators could be computed. Likewise, without a known location, no judgment could be passed on the proportion of area cost to service cost.

Square footage rentals may influence the planning of a building to such an extent that no expense need be spared in minimizing the area occupied by elevator shafts. The saving of several square feet on each of 40 floors may appear finally as a matter of astounding importance in the annual rental. But where this is not the case, the balance is a delicate matter. The added convenience of all that modern developments can offer is not as readily evaluated as square footage saving, and the building owner is likely to err on the side of immediate economy, incurring the risk to his building of the strong competition of a neighboring, fully equipped structure.

The greater cost of installing high velocity cars, with micro-leveling devices and automatic doors, carries with it an increased power cost, an appreciable factor in the building's overhead. This balances against a service impaired by inching to the landings and the operator's gradual fatigue in handling doors.

Circulation Area. The ground floor plan controls elevator accessibility and involves the handling of peak traffic. By comparison, planning the upper floors is hardly problematical. The advisability of segregating the intending passengers from the through lobby traffic and general ground floor circulation is obvious and has resulted in use of the highly effective blind wing corridor. Good practice in blind wing planning divides the elevators into groups of six or eight, arranged on both sides of a short corridor, each wing taking a proportionate amount of the traffic by serving but a portion of the building. These corridors open from a general lobby, which facilitates the

directing of passengers and the signal coördination of the starters and despatchers. A starter's indicator panel is indispensable in a large installation and should be centrally located.

When the architect has arrived at successful space distribution of the ground floor circulation, an equally successful time distribution remains to be developed. From the scheduled rate of reception and discharge of passengers, circulation areas are dimensioned with the aid of such empiricisms as the allowance of a 4-foot aisle for every 50 persons passing per minute, adding a 2-foot clearance in front of walls or free-standing columns and a 4-foot standing room space before booths and elevators facing the aisle. Where circulation area is closely computed, crowding may be extremely detrimental, and nothing endangers functioning more than multitudes arriving at one time. The need for time distribution resulted in the use of revolving doors, because of their known capacities. For example, an ideally dimensioned revolving door, 7 feet, 6 inches in diameter, admits a maximum of 50 people per minute. Prejudice against the revolving door, because of its unpopularity with the public, especially where it must admit a large percentage of women and children, and because some building laws forbid its sole use, has led to control by careful adjustment of narrow entries.

The determination of just what elevator equipment will do after installation has developed far beyond its early mystery, and yet it is not subject to any strict formula. By experience and the specialized knowledge of probabilities, there is being rendered service that agrees closely with the lines of theoretical calculations.

Retaining the visibility of doors becomes a problem as circulation areas are minimized, corridors narrowed, and sight line angles reduced. Later, under the designing of individual features, an attempt will be made to show how dependent is the service upon the collaboration of the human element, and how much the human being can be influenced by design to collaborate automatically.

Considering here the factors bearing chiefly on the plans and early scale drawings limits discussion to the actual structure. By far the most practical method of rendering the elevator entrance readily seen and accessible is the use of splayed jambs. Theoretically an arrangement of entrances on the arc of a circle or the use of converging walls in the blind wing plan would obviously accelerate circulation, and it might become general practice were it not for complications in construction and the planning of upper floors. Fortunate-

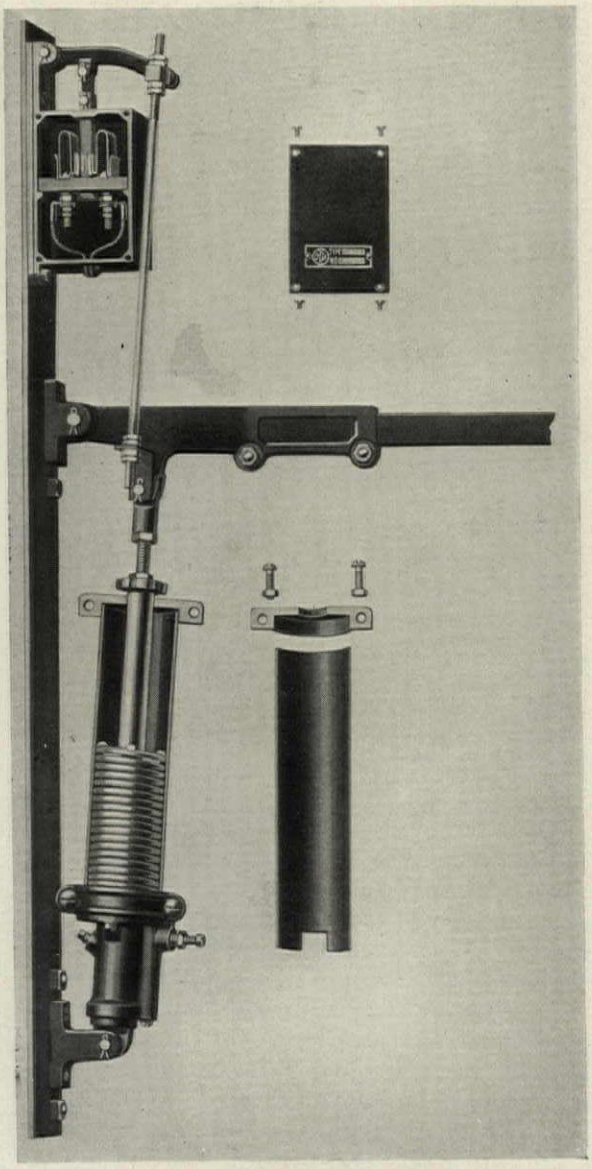
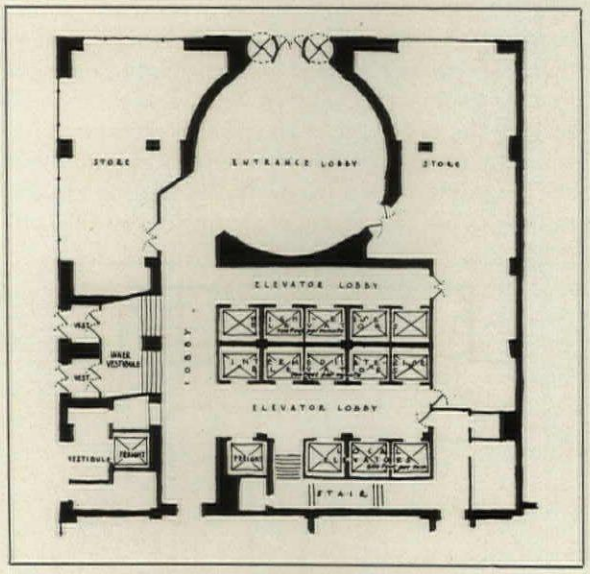
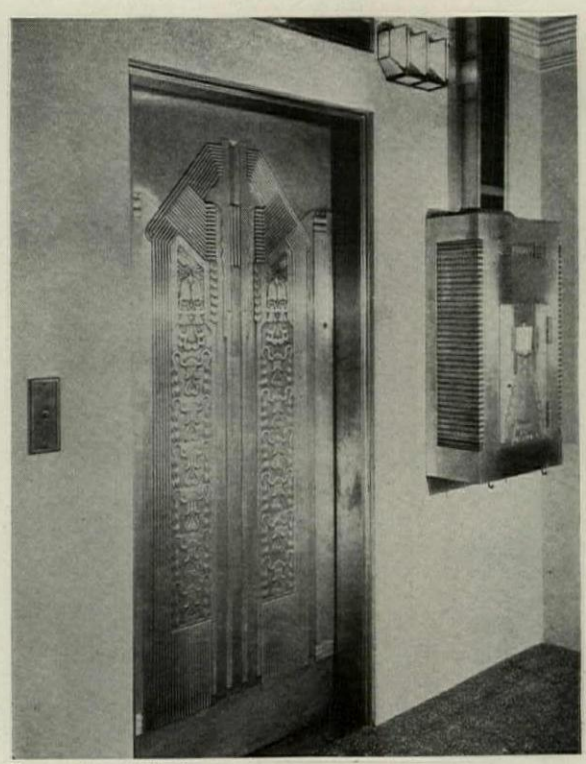


Diagram of Landing Door Check



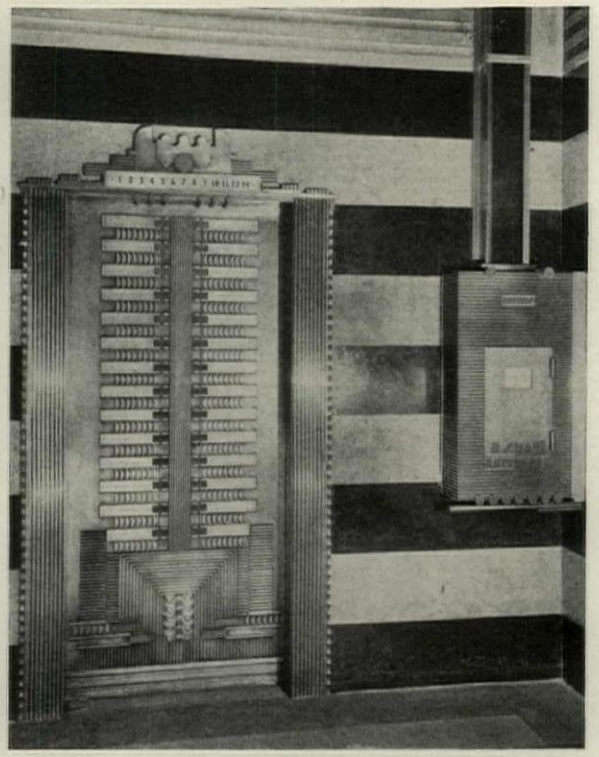
Daily News Building, New York
John Mead Howells and Raymond M. Hood, Architects



Photos. Sigurd Fischer

Elevator Doors, Federation Building, New York

Buchman & Kahn, Architects



Elevator Doors, Film Center Building, New York

Buchman & Kahn, Architects

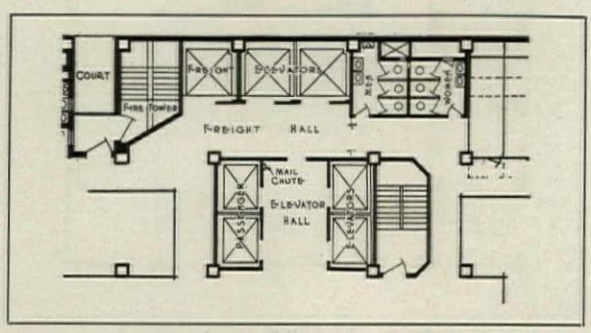
ly, the alignment of six or more elevators in a row has condemned itself, through waste of corridor space and the forced waiting of cars at the other end of the line from the intending passenger.

Shaft Area. To minimize shaft areas in the average tall building contributes more to its success than minimizing circulation area, not only because the shaft saving increases with every story, but also because an excess of corridor space over and above its functional necessity has in the main floor a very real value in contributing dignity and spaciousness. It may afford the only opportunity in the building for architectural treatment.

The elevator corridor of the Film Center has, in the extraordinary motivation of the ceiling, the quality of influencing circulation into the elevators through depression along the axis and, by achieving an acute angle at the intersection with the shaft walls, it emphasizes them with a directional movement upward. As the building increases in height, the percentage of the area devoted to elevator shafts becomes greater, and the profit that might be derived from an appreciable reduction of shaft space becomes considerable. More and more radical reductions will be made, no doubt, to permit an advance in building heights.

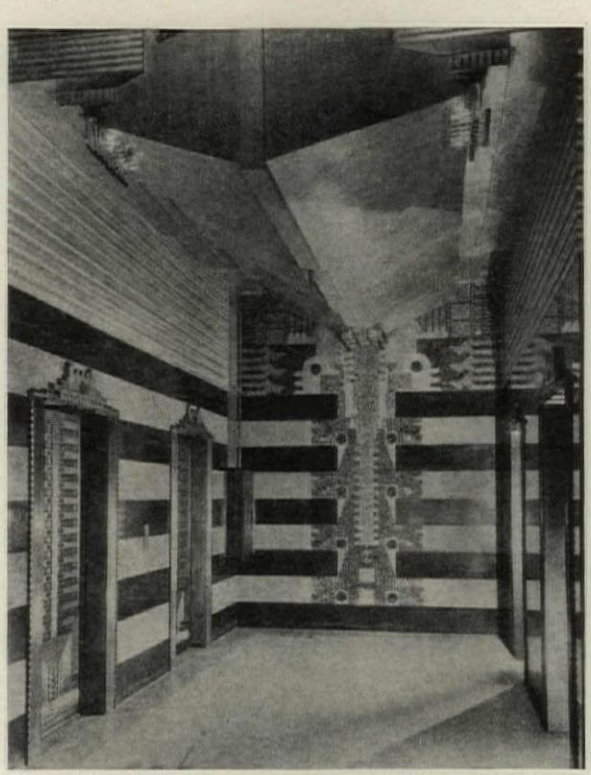
How much the introduction of automatic operation has done is best exemplified in those instances where hand-operated elevators were in use. It is invariably found that fewer automatically-operated cars are an adequate substitute for the hand-operated cars. What future economies will be possible is pure speculation. The healthiest sign, however, is that although manufacturers are loath to prophesy regarding tomorrow's elevator, they are equally reluctant to consider today's elevator as perfected, and they work with its obsolescence continually in mind.

There has been suggested a double-deck car which would serve two consecutive floors at once and terminate in two entrance hall floors, each ramping half its height to the street level. Other proposals involve the idea of there being more than one car per shaft. A local might serve the first 20 floors of a building, following an express serving the upper 20. Safety from collision is insured by the use of electro-mechanical guard and blocking devices, similar to those used on electric railways. Or else three locals might run opposite



Elevator Plan, Film Center Building

Buchman & Kahn, Architects



Photos. Sigurd Fischer

Elevator Lobby, Film Center Building, New York

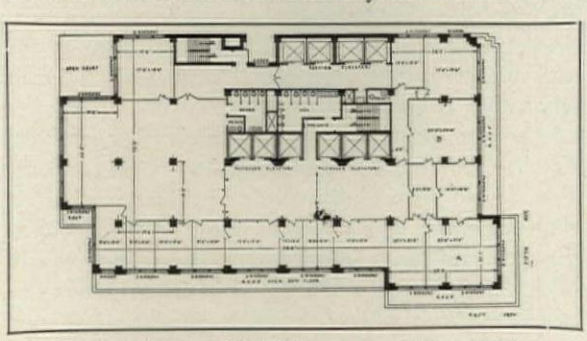
Buchman & Kahn, Architects

Elevator Lobby, 261 Fifth Avenue, New York

Buchman & Kahn, Architects

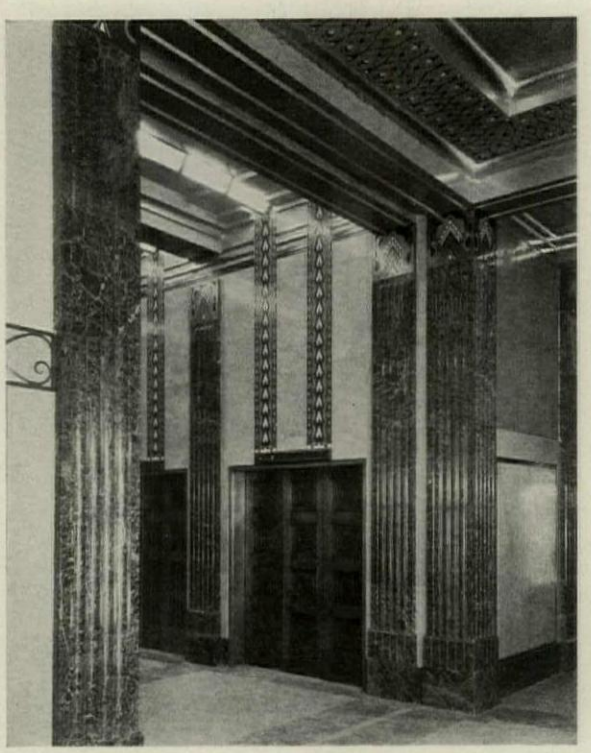
an express, stopping at terminal floors, blocking devices making it possible for both an upper and a lower car to stop at the same terminal floor without danger. The desirability and simplicity of these proposals come into question when the engineer begins to attack the problem of getting lifting power to the cars. The hydraulic car and the climber were superseded by the counter-weight cable car, where the foot pounds of power have direct relation to the number of passengers and are not wasted on the weight of the apparatus.

Regardless of drastic diminution of shaft requirements, the number of inches involved in the solution of the ideal car size remains significant. The fallacy of using increased depth is indicated in the time lost when a person at the rear of a crowded car attempts to get off. Using an increased width has the same objection if the door is narrow, but with the wide door, the operator has less control over passengers and encounters forced waits, due to jamming and overloading, especially on the upper floors where there is no starter, and this aside from exposing the system to the danger of the entry accidents already mentioned. Somewhere between these extremes the ideal car size is to be found, and it is influenced by the size of the building and the speed of the scheduling. Ostensibly the small car making rapid trips is better suited to tall, narrow buildings, and the larger car is adapted to a building of less story height, where several passengers are likely to get off at the same floor. The most desirable car sizes range between 7 feet wide and 5½ feet deep, and 7 feet wide and 6½ feet deep. The highly successful installation in the Equitable Building, New York, includes a car 6 feet, 10¼ inches wide by 5 feet, 2½ inches in depth. Often in one building of the set-back type, several differing sizes are used, the high-rise cars smallest, the intermediate-rise cars of medium size, and the locals quite large. In the State Tower Building, Syracuse, the expresses running from the 10th to the 21st floors are smaller than the locals running only to the 10th. In this building one finds an excellent example of the use of the "combination car." Isolated by a separate signal system, this car does the freight work during the day and is most advantageous for the night duty of passengers and



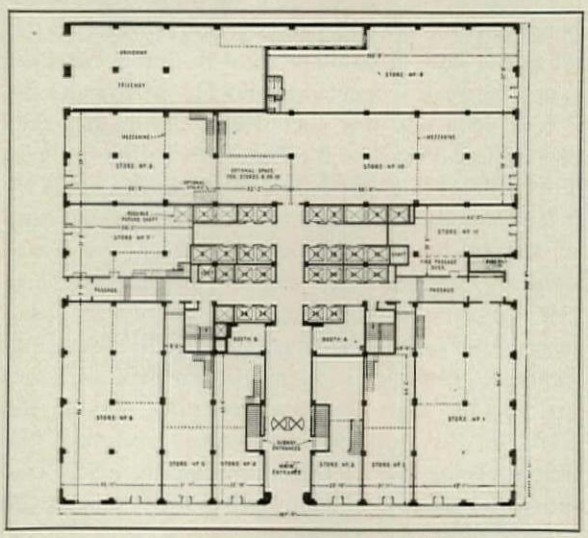
Typical Floor, 261 Fifth Avenue, New York

Buchman & Kahn. Architects

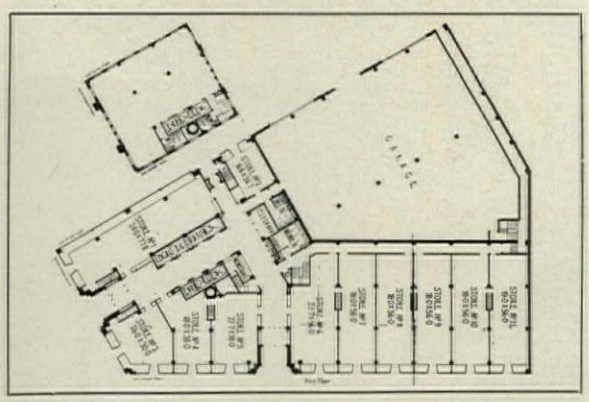


State Tower Building, Syracuse
Thompson & Churchill, Architects

freight. During rush hours it may be switched into the general signal system and aid in coping with the peak loads. It is the one car that serves every floor. The shaft doors serving the "combination car" slide as the others and may swing open to permit entrance to the full breadth of the car. The architects permitted the dimensions of this door to control that of the others, because it made possible uniformity of design and greater domination of the corridors. The shaft is from 8 to 12 inches in excess of the car dimensions on



Park Avenue Building, New York
Buchman & Kahn, Architects



Ground Floor; 18th Floor Plan Above
State Tower Building, Syracuse
Thompson & Churchill, Architects

three sides. The floor entrance doors are generally constructed with jambs that approximate the width of the car, but the actual opening is controlled by the sliding doors which are permitted to open but from 3 to 3½ feet, a dimension which has been found generally satisfactory.

In dealing with a proposed building whose future is made uncertain by a host of probabilities, the architect should take into account the possibility of there being a demand for more elevators, and should show on his plans the location of future shafts that there may be no conflict with the steel or with the general functioning of the plans if additional elevators should be found necessary at a later date. The Park Avenue Building, New York, presents an admirable example of planning where almost any variation of usage can be accommodated. The plan permits of a possible future shaft, and in addition to an installation of 26 elevators, it includes three blank shafts to care for future wants.

Significant to the importance of these elevators is a quotation from the architect, Ely J. Kahn, writing on the "Economics of the Skyscraper": "The height of the building was determined through a table of calculations largely affected by the number of passenger and freight elevators serving the various floors. The set-back conditions, column centers, standpipe regulations, stairways, toilets and the like, fixed the extent of the service portions, and the relations of the usable space to the unproductive area determined reasonably soon at what floor to stop."

The danger of writing of the elevator problem lies in departing from generalities. One corporation found regretfully that the dissemination of data led more to a misconception of the problem than any aid to its solution, and now it devotes all of its energies to working with the architect.

The author wishes to acknowledge the courtesy of the Otis Elevator Company in providing the diagrams on pages 760 and 761.

SOUNDPROOFING APARTMENT HOUSES

PART II

BY

V. L. CHRISLER

ASSOCIATE PHYSICIST, U. S. BUREAU OF STANDARDS

A PREVIOUS paper upon this subject, published in THE ARCHITECTURAL FORUM for January, dealt with the methods by which sound is transmitted through partitions of apartment houses and discussed some of the changes in construction that were desirable to obtain better sound insulation. It is the intention in the present paper to give numerical data on some of the more common types of construction and to explain what is meant by the results.

Methods of Expressing Results. All of the results referred to in this paper have been obtained by the use of the telephone as a detector and measurer of sound energy. The indications of this instrument are given on what is called the "physical scale," which measures the energy of the sound wave. But the instrument most universally used for detecting sound and estimating its intensity is the human ear, and unfortunately the ear does not respond according to the physical scale. As the intensity of a sound increases steadily on the physical scale, the response of the ear fails to keep pace with it. There appears to be in the ear a regulating or protective mechanism whose nature is not understood, which, like the well known mechanism of the eye, protects the organ against excessive stimulation. Experiment shows that the response of the ear is proportional to the logarithm of the physical intensity, that is, energies proportional to 10, 100 and 1,000 would produce in the ear effects proportional to 1, 2 and 3 respectively. This logarithmic scale has sometimes been termed the "ear scale." The telephone engineers[1] for some time have been using a scale expressed in sensation units. This scale merely multiplies the numbers on the ear scale by 10, the unit of this new scale being that fractional change in intensity which is approximately the smallest that the average ear can detect. For this reason this unit is called a "sensation" unit. In the example given, the intensities corresponding to 1, 2 and 3 on the ear scale would be represented by 10, 20 and 30 sensation units. Wallace Waterfall, in a private communication, has suggested the illustration of the values of the sensation units in familiar terms. We may call it an "ear sensation scale" (Fig. 1).

Ear Sensation Scale. When considering a partition as a sound insulator, one wishes to know by how many sensation units a sound will be reduced when listened to through the partition. To illustrate this, suppose we refer to the ear sensation scale. Assume the intensity of a sound to be 80 sensation units, but when listened to through the partition it is 30. The reduction factor in sensation units of the panel would be the difference between 80 and 30, or 50.

Discussion of Results. The present paper gives the results of sound transmission measurements on a number of panels representing the usual types of construction. Table 1 gives the results of sound transmission at four different frequency bands, and also the average. Panel 30c gives an example of a double wall. The sound insulation is considerably more than it would have been if a single panel of the same weight had been used. Panel 59a is another illustration. In this case the panels were tested in a horizontal position, the upper panel being supported at the four corners by wooden blocks. Panel 59b was the same as 59a, except that hair felt pads were placed above and below the wooden blocks supporting the corners of the second panel. The air space was the same as for 59a. The pads improved the sound insulation by approximately seven sensation units. An improvement of about this much can generally be expected by the use of pads, providing no nails are driven through so as to spoil the effect of the pad as a sound insulator.

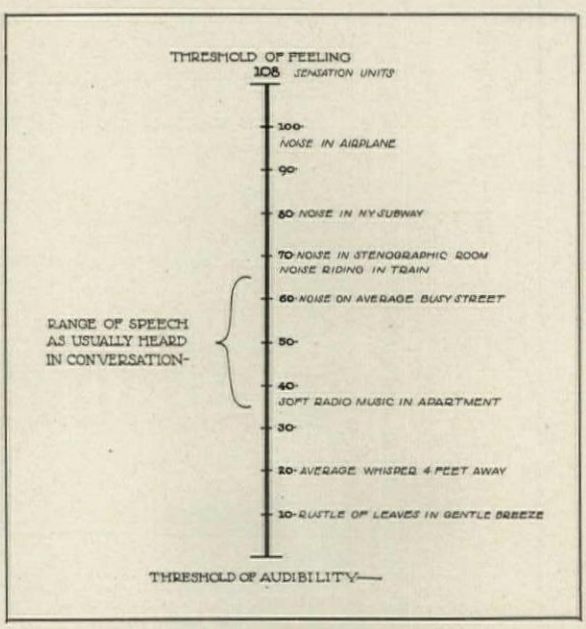


Fig. 1. Diagram Illustrating the Values of Sensation Units

[1] Fletcher: Bell Telephone Laboratories, Reprint B-152-1, *Journal Franklin Institute*, September, 1923.

DESCRIPTION OF PANELS					REDUCTION FACTOR IN SENSATION UNITS FOR FREQUENCY BANDS INDICATED					
Panel Number	Kind of Studding	Kind of Lath	Kind of Plaster	Plaster Coats	Panel No.	250–257	1000–1087	2000–2570	3000–3470	Average
3	Wood	Wood	Lime	Scratch and brown coats only	3	58.9	64.2	76.6	76.6	69.1
4	Wood	Wood	Gypsum	Scratch and brown coats only	4	43.7	39.3	50.7	53.9	46.9
5	Wood	Wood	Lime	3 coat smooth finish	5	53.8	50.6	67.0	72.0	60.9
6	Wood	Wood	Gypsum	3 coat smooth finish	6	31.4	42.9	42.1	54.5	42.7
9	Wood	Metal	Lime	Scratch and brown coats only	9	62.9	63.2	74.7	73.3	68.5
10	Wood	Metal	Gypsum	Scratch and brown coats only	10	51.7	51.7	53.9	57.5	53.7
11	Wood	Metal	Lime	3 coat smooth finish	11	55.3	61.0	63.9	67.5	61.9
12	Wood	Metal	Gypsum	3 coat smooth finish	12	53.1	53.1	55.0	58.9	55.0
13	Wood	Wood	Lime	3 coat sand finish	13	50.5	54.6	61.4	61.7	57.1
14	Wood	Wood	Gypsum	3 coat sand finish	14	51.0	43.9	57.5	60.0	53.1
15	Wood	Wire	Lime	3 coat smooth finish	15	58.7	61.3	61.6	59.7	60.3
16	Wood	Wire	Gypsum	3 coat smooth finish	16	49.0	47.5	58.3	59.6	53.6
18	Wood	Plaster board	Gypsum	3 coat smooth finish	18	52.6	50.5	55.2	57.5	53.9
22	Metal	Metal	Gypsum	Solid partition	22	42.1	44.5	49.1	49.0	46.2
26	Brick 4″	None	Gypsum	Brown coat smooth finish	26	46.4	48.8	58.4	61.3	53.7
28	4″ Clay tile	None	Gypsum	Brown coat smooth finish	28	39.1	35.7	59.3	57.0	47.8
30b	3″ Gypsum tile	None	Gypsum	Brown coat smooth finish	30b	43.1	39.3	42.1	43.5	42.0
30c	Double wall gypsum tile	None	Gypsum	Brown coat smooth finish	30c	52.6	56.1	65.3	73.5	61.9
39	Wood	Wood	Lime	3 coat lime and Keene's cement, smooth finish	39	53.5	60.7	71.6	57.1	60.7
50	Wood	Gypsum wall board	None		50	43.5	46.4	48.7	39.7	44.6
55	Wood	½″ Fiber board, one side	None		55	23.1	24.9	29.6	29.3	26.7
57	Wood	Gypsum wall board, one side	None		57	34.8	33.4	35.1	30.7	33.5
59	Metal	Metal	Gypsum	Solid partition						
59a	Metal	Metal	Gypsum	Two solid partitions air space between	59a	35.7	50.0	62.4	68.2	54.1
59b	Metal	Metal	Gypsum		59b	48.5	50.9	72.4	72.0	61.0
59c	Metal	Metal	Gypsum	Two solid partitions hair felt between	59c	49.0	51.3	71.5	69.0	60.2
59d	Metal	Metal	Gypsum	Two solid partitions seaweed between	59d	49.4	49.4	74.7	70.1	60.9
59e	Metal	Metal	Gypsum	Two solid partitions fiber board between	59e	54.1	54.6	75.6	71.9	64.1
60	12″ Clay tile (2 unit)	None	Gypsum	Brown coat smooth finish	60	49.4	37.0	55.2	53.6	48.8
62	8″ Clay tile	None	Gypsum	Brown coat smooth finish	62	44.3	48.9	58.0	53.2	51.1
63	6″ Load bearing, clay tile	None	Gypsum	Brown coat smooth finish	63	38.8	46.6	53.5	54.7	48.4
64	6″ Partition clay tile	None	Gypsum	Brown coat smooth finish	64	41.2	45.1	52.1	52.7	47.8

Table I. Results of Sound Transmission Tests

Panels 59c, 59d and 59e show the effect of introducing material into the air space. Panels 59c and 59d give the same sound transmission within experimental error as 59b. Panel 59e shows some improvement,—approximately three sensation units. This improvement would hardly appear sufficient to justify the additional cost. The results from this group of panels indicate that practically all of the sound energy was transferred from the first surface to the second through the corner supports, and that if filling material is introduced loosely into the air space in such a wall, it has little if any value in improving the sound-insulating qualities of the wall. This agrees with the results found by Paul Sabine[2] for hair felt. It has been a common assumption with builders that good (felt) heat-insulating materials are likewise good sound insulators. Experiments do not bear this out. In some cases there is a slight improvement in sound insulation. In many cases there is no improvement, and in a few cases a filling material which is a good heat insulator may actually decrease the sound insulation. Various attempts have been made to improve wood stud construction so as to obtain better sound insulation, but none of the structures tested have proved to be better than some of those given in Table 1. For masonry construction there are apparently three methods for improving the sound insulation: (1) The wall can be made very heavy, but in many cases this is not practicable. (2) A double wall can be built as illustrated by 30c. This wall gives very good sound insulation; it is not excessively heavy, but is rather difficult to build, as it is essential that mortar should not be dropped into the air space and thus form a tie between the two walls. (3) The wall can be built in layers as described in the first paper (January, 1929). The numerical results for this work are not available at the present time, but the indications are that they will be about the same as for a double wall.

In addition to transmission measurements made with the telephone as a sound detector, a good many audibility tests have been made by different observers of the Bureau of Standards with different panels under test. From these observations some general statements as to the meaning of the reduction factor might be made by classifying the panels in four groups:

1. Panels whose reduction factors are *over 60 sensation units.* Conversation carried on in an ordinary tone of voice is reduced to inaudibility in passing through the panel. If there is an external noise in the listening room, a shout on the other side of the panel would be practically unnoticeable.

2. Panels whose reduction factors lie *between 50 and 60 sensation units.* Conversation in ordinary tones heard through the panel is barely audible but unintelligible. If the voice is raised, it may become intelligible.

3. Panels whose reduction factors lie *between 40 and 50.* Conversation in ordinary tones heard through the panel is quite audible, but difficult to understand. If the voice is raised, it becomes easily intelligible.

4. Panels whose reduction factors are *less than 40.* Conversation in ordinary tones is distinctly audible and intelligible through the panel.

These comparisons are based on tests in a listening room in which there was no noise, and which was quite reverberant. In a room furnished with rugs, draperies or other sound-absorbing objects, the result would be apparently more effective than when tested in bare rooms. Attention must also be called to the effect of external noises. If a panel having a reduction factor of between 30 and 40 sensation units is taken as an example, these facts may be noticed. If there is no external noise, and if the panel acts as the wall between two rooms which are fairly reverberant, it is quite easy for two people who are on opposite sides of the panel to carry on a conversation; but if there is the slightest noise in the room where the person is listening, the conversation becomes a mumble, and the chances are that not a single word will be understood. The louder the noise in the room, the greater the masking effect.

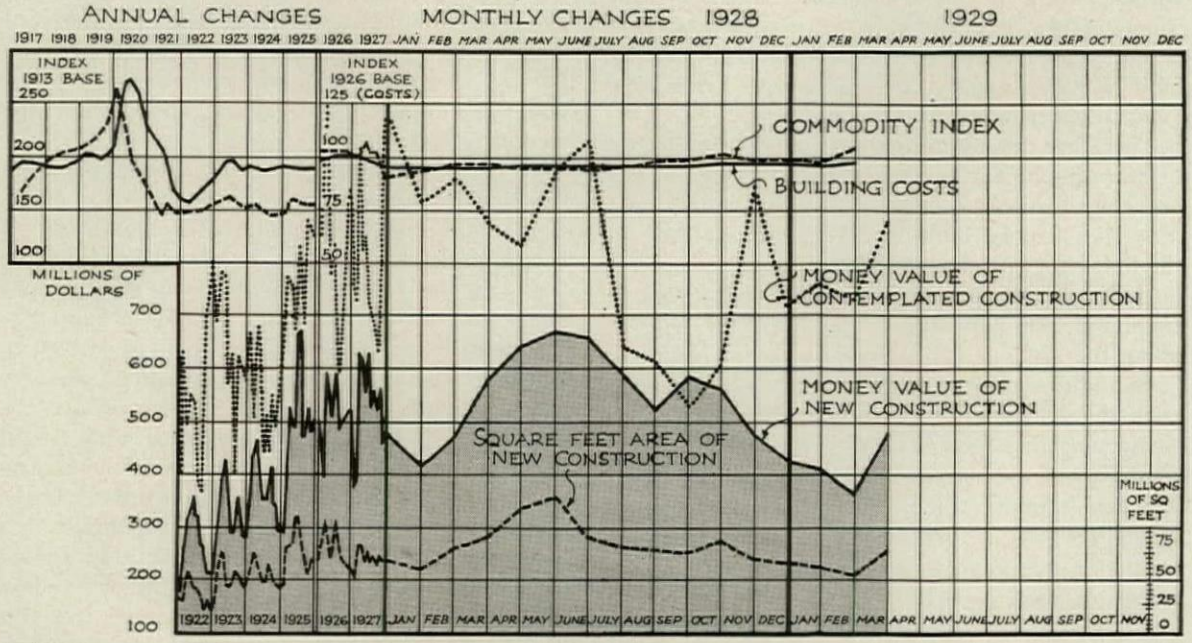
From this it is readily seen that a partition might give entirely satisfactory results under some conditions while under other conditions it would be unsatisfactory. In other words, when choosing the type of partition to give proper sound insulation, two things should be known,—the intensity of the sound which it is desired to reduce to inaudibility, and the minimum intensity of the sounds present in the room where the listener is located. For instance, very slight noises in this room might mask any sound having an intensity of 20 or less sensation units. If the noise which we wish to reduce to inaudibility has an intensity of 70, the wall or partition should have a reduction factor of 50. This will reduce the sound to an intensity of 20 units, and this would be masked by the other noises present so as to be inaudible. If the room is absolutely quiet, it will be necessary to have a partition with a reduction factor of 70 to reduce the sound to inaudibility. Whether a partition is satisfactory or not, therefore, depends upon the intensities of other noises present as well as upon the sound-insulating qualities of the partition which is built.

[2] Paul Sabine "Architectural Acoustics," *The Armour Engineer*, May, 1926. He also found that heavier materials, such as sawdust and slag, increased the sound transmission.

THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

THE money value of construction contracts awarded in the 37 eastern states during the month of March is given by the F. W. Dodge Corporation as $484,847,500. This represents an increase of 34 per cent over the value of contracts awarded during the previous month, but a decrease of 18 per cent from that of March of last year. For the first quarter of 1929 the total given is $1,256,089,300 which is 15 per cent below the figures for the first quarter of 1928. In the section which includes New York and northern New Jersey, the March contract total of $111,539,200 exceeds that of February by 49 per cent, but it was 27 per cent below the total for March of 1928. For the quarter the 1929 total showed a decrease of 32 per cent from that for the corresponding period of 1928. The New England March construction total was $31,970,300, an increase of 21 per cent over February and a decrease of 24 per cent from that of March of last year. The contracts for the first quarter amounted to $87,719,400, which was 13 per cent below the total for the corresponding quarter a year ago. The Pittsburgh district showed improvement of 10 per cent for the first quarter of 1929, with a total of $160,372,700, as compared with the first quarter of 1928. The March figures of $52,965,900 were 6 per cent above those for February, but 31 per cent below March, 1928. An even stronger upward trend is shown for the northwest, where the March total of $5,494,300 exceeded that of February by 47 per cent and equaled the total for March, 1928. For the first quarter in this district an improvement of 43 per cent over the first quarter of 1928 is noted, with a total contract valuation of $12,750,200. In the middle Atlantic states, the central west, and the southeastern states, similar trends were in evidence. The middle Atlantic states, with March contracts valued at $59,069,200, showed an improvement of 17 per cent over February, but a decline of 16 per cent from March of 1928. The total for the first quarter, $119,517,700 was 5 per cent below that of the first quarter of 1928. In the central west the March total of $159,609,300 was 61 per cent above February, but 9 per cent below that of the previous March. For the first quarter of 1929 this district lagged 16 per cent behind the figures for the corresponding period of 1928. The southeastern states, with a total of $115,011,400 for the first quarter of 1929, were also 16 per cent behind their 1928 figures for a similar period.



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

WALL STREET ENTERS THE BUILDING FIELD

BY
JOHN TAYLOR BOYD, JR.

WHAT part will the architect play in the profound changes which may be impending in construction and real estate, if the movement toward huge scale operation, starting in New York, continues to develop? Recent months have witnessed a startling series of immense mergers, combinations and financial alliances of construction and real estate interests,—including in one case, a group of well known architects. Two of these combinations have provided themselves with the sinews of war in the shape of strong Wall Street backing, and all for the purpose of issuing securities for real estate and construction developments. The successive announcements of these programs were enough to surprise even New York, accustomed as it is to vast enterprises. In the present era, economic changes arrive in an industry with devastating swiftness,—often, alas, catching individuals unprepared. If such is to be the case in the construction field, architects might find it to their advantage to note these recent happenings and to mark whatever future progress they may make. For it is not impossible that the building industry and its allied activity, real estate development, may at last be affected by that trend toward large financial combinations which has become characteristic of American industry.

Chiefly the matters here under consideration are of these three kinds:

1. The launching of the huge real estate-construction-financing organizations and combinations just referred to,—in particular the Beaux-Arts Development Corporation, a syndicate composed chiefly of architects under the presidency of Kenneth M. Murchison, in combination with the U. S. Realty & Improvement Company and its construction subsidiary, the George A. Fuller Company, and with the backing of the National City Bank in a program that is announced in the New York press as contemplating expenditure of $100,000,000.

2. New methods of financing contemplated by these huge organizations, involving issuing securities to the public for both a part of the equity and for the mortgage portions of cost of a building operation, the effect of these financial plans, however they vary in details, being to supply almost unlimited funds at a much lower cost than could be done by conventional real estate methods.

3. The organization of the Real Estate Board of New York Exchange intended to develop a public market for real estate securities of all classes.

Naturally, such a far-reaching development is causing no little discussion,—not to say anxiety,—as to what may be its effects on the building industry and the various interests within it. So far, the new movement does not seem dangerous to the architect, but quite the contrary. In contrast with similar attempts in the past to establish huge construction-financing concerns, in which the architect was eliminated except as an employe, these companies generally retain independent architects for their buildings on a professional basis. Furthermore, since they issue long-term securities against their properties, they have a strong motive for having these properties hold their value during the lives of the issues. On this account they recognize that sound architecture is a factor in giving *investment values* to buildings, as distinguished from a *speculative status.*

But if there is no threat to architecture involved, this cannot be said of some of the other interests in the construction industry,—namely, contractors, promoters, "operators," material manufacturers, and real estate financing organizations. Others among these interests, on the other hand, should profit by a trend toward large scale building. The material manufacturer, for example, will approve of the large transaction, carrying with it large single orders, excellent credit risk and a demand for durability of construction. If the lightning strikes in his direction, it may be in the form of mergers or combines among the 10,000 or more manufacturers of building materials and equipment, if the example of the American Radiator Company-Standard Sanitary Manufacturing Company merger finds imitators. The fact that the stock of these two companies was listed on the New York Stock Exchange is significant in two ways,—first, it invited the merger, and second, it allows the companies concerned to obtain their supplies of capital on the favorable terms which that securities market affords.

One interest, however, may find the competition of these combinations formidable. That is the "old line" mortgage-bond companies and the junior mortgage finance companies, whose charges for discounts may require drastic revision in order to bring the costs of their financing down to the level of that of the newcomers, as will be explained later on in this article. Of course, any such reduction should vastly benefit the building industry. Financing charges in many building operations comprise almost as large an item as do either labor or materials of construction. Fi-

An Example of a Large-scale Project to Cost Approximately $25,000,000

nancing is the one department which offers the greatest opportunity of cutting building costs and thus expanding the market for new buildings. Some of the vast possibilities in this direction I outlined in THE ARCHITECTURAL FORUM for January, 1928,—"Housing, the Responsibility of the Building Industry."

Further possible effects on the various interests in the building world must be left to conjecture as, and if, the movement develops. Obviously, the economic ramifications are too great, and the movement itself is too new, to allow one to make very definite statements as to its ultimate effects. Nevertheless, as a general result, there is likely to occur throughout the industry a drastic scaling down of overhead. The architect also may not escape this turn of fortune's wheel. He might find interesting Mr. Murchison's reply to my question as to how the architect in the smaller towns and cities might fare: "Why not let him put our plan into effect, in combination with the local bank?"

Possibly the new plan will be unfavorable to some real estate promoter or "operator." Today commercial building promotion is generally in the hands of wealthy individuals and their financial following, acting in groups or syndicates, and organized as "private" or "closed" companies, in the language of Wall Street. By contrast, the new method largely,—though not entirely,—transfers the initiative to large "public" corporations which obtain the principal of the cost of a building operation, including a portion of the equity, directly from the public by means of security issues of stock. To anyone familiar with the building industry, this is a significant change.

Another result of these financial plans is to introduce the "chain" principle into real estate, as distinct from the principle of the isolated operation and the "revolving fund" idea. Chains of properties are developed, spreading the financial risk. The chain forms a nucleus for expansion along the lines now familiar in other industries, such as the retail merchandising field. The strength and prestige of the chain allows rapid expansion by making easy the raising of additional capital for each new unit.

This general summary of the new movement becomes clearer in a more specific description of a new organization. The most interesting of the new "mergers" is the combination mentioned of the syndicate of architects, called the Beaux-Arts Development Corporation with the U. S. Realty & Improvement Company and the National City Company. The list of architects who are stockholders in the Beaux-Arts Development Corporation contains familiar names: Benjamin Wistar Morris; Delano & Aldrich; Voorhees, Gmelin & Walker; Charles Z. Klauder; Raymond Hood, Godley and Fouilhoux; John W. Cross; William H. Gompert; James W. O'Connor; and Whitney Warren. There are also four artists and decorators. The construction interest is represented by the George A. Fuller Company, and that of real

View of the Tudor City Group of the Fred F. French Company

estate by Douglas and Roland Elliman and by the U. S. Realty & Improvement Company. The enterprise is backed by the National City Company, which is the securities company of the National City Bank. Obviously, this is a combination strong in every sense.

The first operation of this organization is the Beaux-Arts Apartments, a $5,250,000 project on East 44th Street, Manhattan, near the Beaux-Arts Institute of Design. The architects are the firm of Kenneth M. Murchison and Raymond Hood, Godley & Fouilhoux in association. The Beaux-Arts Development Corporation, the "parent" company, owned the site and contributed it as its part of the project, receiving in exchange second preferred stock in the Beaux-Arts Apartments, Inc., as well as a portion of the common stock, under the novel plan of financing which attracted so much attention in New York when it was announced. The Beaux-Arts Apartment Company is the company formed to put through this single apartment building project. This plan will be described in detail in a later article, along with several others of the sort. At this point it should be noted that the plan involved two major differences from the conventional real estate financing: (a) the mortgages were eliminated entirely, being replaced by an issue of 6 per cent first preferred stock to the amount of 75 per cent of total cost, carrying with it a bonus of the common stock; and (b) the issues were sold by the National City Company and its vast chain of branches and associated investment houses extending all over the country, even to other nations, at an underwriting cost of 5 per cent plus a profit in the form of a bonus of common. This common stock is expected to begin to earn dividends in about 11 years, after a large portion of the preferred stocks is retired. Thus, by using the Wall Street machinery of securities distribution, in this case, the building enterprise obtained the advantages of (1) 75 per cent of the cost at a rate of about 6 1/3 per cent, as compared with a much higher rate charged for a first and second mortgage totaling the same amount, or their equivalent in the conventional mortgage bond issue, in which discounts of from 11 to 18 per cent,—or even more, according to circumstances,—are not unknown, and (3) immediate sale of stock, this particular issue, it is understood, having been sold in *one day*.

But there are two other sides to this triple combination,—that of the U. S. Realty and the National City Bank. The U. S. Realty & Improvement Company was incorporated in 1904, to replace an older concern. Stated in ordinary terms, its field of operation appears to cover nearly all the possibilities of profit in real estate and construction operations. It has various subsidiary companies, including the George A. Fuller Construction Company. The balance sheet of U. S. Realty and its numerous progeny shows total assets of nearly $73,000,000 as of April 30, 1928. Earnings for the year previous were $5,516,302.-

60, equal to $7.52 per share on the common stock then outstanding. U. S. Realty owns several large buildings, including the Plaza Hotel and the Trinity (office) Building, New York. The George A. Fuller Company did a huge construction business last year on the cost-plus fee basis.

Now, in its size and scope of operations, the U. S. Realty & Improvement Company is not, of course, unique. The idea of the large development-financing-contracting company is not new, and examples of it have long been known in various sections of the United States. Familiar instances are the group of engineering-construction concerns, such as the Turner Construction Company, the J. G. White Engineering Company, and Stone & Webster. In the more strictly real estate field, the rise of the Fred F. French organization since the war is familiar. The French Company, in fact, goes even further, in maintaining its own architectural and stock selling departments.

What then is the significance of the U. S. Realty to the building world as an instance of new economic development? The answer is chiefly in its new financial methods. The significance of the U. S. Realty's methods of financing, centering about its alliance with the National City group, is two-fold: (1) possibilities of obtaining capital at low cost for each specific building project, and (2) alternative means of obtaining cheap funds through its listing of its stock on the New York Stock Exchange. The first advantage has been briefly mentioned and will be illustrated more specifically, as noted, in a later article. The second advantage, namely that derived from the "Big Board" listing, appears perhaps most novel to those familiar with conventional building finance. It deserves a brief explanation. On January 1, 1929, U. S. Realty capital consisted of approximately 733,000 shares, no par common, with no senior obligations ahead of this issue of the parent company in the form of bonds or preferred stocks, although there were such obligations and some mortgages outstanding against some of its subsidiary organizations. As noted, this stock earned $7.52 a share for the year ended April 1, 1928, and paid $4 dividends. Stock dividends of 10 per cent each were paid to stockholders in 1925 and 1927. December 31, 1928, the closing price of the stock was 84⅛, the lowest price of the year having been 64¼, on February 4. Its highest price for the year was 93⅝, on May 7.

In these bare, apparently irrelevant, figures there lies a deep meaning. The meaning is, in brief, that shareholders were willing to pay a high price for U. S. Realty, in the hope of reward, not so much in interest return, but in the shape of stock dividends, in rights on new issues, and in the expectation of appreciation of price of the stock itself as the company made money on an increasing scale; also as a result of the favor of its stock among the public, U. S. Realty was able this year (1929) to raise new capital for its various purposes, to the extent of 244,367 additional shares of common stock, which were offered to the stockholders at $80 per share. The point here to be made is the remarkable advantage to U. S. Realty of having its stock listed on the New York Stock Exchange, enabling the company to raise some $19,000,000 new capital on a basis of 5 per cent or possibly a slightly higher rate.

One should not suppose that this apparent drawing of rabbits out of the Wall Street hat is pure financial magic. Notwithstanding the controversy over the gigantic speculation in the security markets, U. S. Realty did supposedly offer something tangible in return for these liquid assets of new capital,—something more than the prospect of speculative appreciation in the price of its stock. These considerations are generally:

1. Liquidity of a ready market.
2. A history of several years' steady expansion in size and earnings, an indication of sound, capable management.
3. Diversification of risk in its operations, conservatively undertaken, in providing a basic necessity of life.
4. Ability to meet competitors on account of the economy of large-scale methods and economical financing.
5. Financial responsibility of the company.
6. Responsible financial statements made public and at stated intervals, as required by the rules of the New York Stock Exchange as a qualification for listing. This is only a part of the spotlight of publicity which beats upon a company whose securities are listed on the "Big Board" where they must compete for the favor of the investing public, advised as it is by an army of investment brokers' experts, against the stock of others of the most powerful industrial and public utility corporations and railroads.
7. Value of stock to investors as collateral, due to its Stock Exchange listing.
8. Partnership in a large, successful company.

Clearly, a huge "public" corporation, seeking the favor of the investment public in a world-wide public market, has its heavy responsibilities, and its own stiff competition to meet, although these may be different from those of the conventional "closed" real estate company. All this responsibility is summed up in the question which the investor asks an investment expert—or his banker: "Which do you think is the best buy at present prices, General Motors or U. S. Realty?"

So U. S. Realty appears to have two strings to its financial bow. Whichever one it chooses to use, the public offers its savings for a low re-

turn. How different this is from the characteristic real estate operation! In the usual operation, only the first mortgage proportion of the project's total cost resembles this favorable situation. But, as everyone knows, terrific charges are demanded for junior mortgage discounts, and the junior mortgages must usually be paid off in a very few years. Worse yet, almost anything must be promised to the wealthy "operators" who are solicited for stock participation, or to the go-between who can influence them to join in the venture. In New York a "proposition" must "show a paper profit" of 15 per cent or more, depending on circumstances, to attract capital for the equity. Another defect of the conventional method is that this crushing burden of finance costs comes heaviest in the first few years of the project's history, at precisely the time when it is being established as a going business. Sometimes the load brings foreclosure to a worthy project.

The other familiar effects of this conventional real estate method of financing naturally follow, —namely, the high speculative risk, the pressure to build for quick re-sale, "shoestring" financing, uncertain credit, and minimum financial responsibility of the promoters through the practice of incorporating each building operation as a separate company. Still other evils follow, each aggravating the others and creating a chain of doubtful links. These are low standards of design, of construction, and of building management; high costs of small-scale production; excessive overhead; and, finally, lack of coördination of the various elements in the building industry which coöperate to produce a building, and the splitting up of real estate into a number of small units and holdings. In contrast, the Beaux-Arts Development Corporation and the U. S. Realty & Improvement Company-National City Company combination follows an almost contrary set of principles. Allowing for the difference of conditions in specific cases, which of the two methods is the better? Which, in the long run, will be the more beneficial to the building industry and to the architect? In any case, the new method, which is simply that which is extensively practiced throughout American business and industry, has certain definite advantages in competition. I believe that we are likely to witness a new development on these novel principles, which are those of large-scale operation. They seem to me to be sound and logical, notwithstanding the fact that there are some dangers.

Three years ago, when our organization, as consulting architects, assisted the New York State Housing Board to prepare its practical program, I had an opportunity to study the matter. This plan is set forth in the article "Housing,—the Responsibility of the Building Industry," published in THE FORUM for January, 1928, already mentioned. Briefly, it was set forth there that the building industry enjoyed an opportunity for unparalleled activity,—on a greater scale, in fact, than anything which the post-war building boom has yet seen,—in developing a large-scale construction program based on low-cost financing through use of the Wall Street machinery, by this means supplying housing to the middle economic third of the population. Now, evidently, these principles of building organization that were first formulated chiefly by architects are coming into actual operation.

Returning to a specific consideration of these new organizations, a brief mention of the other large concerns may be of interest. The Beaux-Arts-U. S. Realty-National City combination has been chosen as the most typical, and in some ways, most interesting. But it is not the only one of its type. A second great combination of somewhat similar character, though possibly more conventional, is the $42,000,000 General Realty & Utilities Corporation. This concern is affiliated on the construction side with the Thompson-Starrett Company, and on the real estate development side with the Tishman Realty & Improvement Company, the stock of both being listed on the New York Curb. General Realty & Utilities, too, has its Wall Street connection. It is backed by a group of investment houses and other public utility interests, particularly Stone & Webster. On its directorate are representatives of six Wall Street investment houses. Organized this winter, this company, pending development of its program, placed $10,000,000 in construction loans advanced to other builders, and lately it has announced a huge new building project on the East River front of Manhattan.

A third large and expanding organization is that of the Henry Mandel Associates. It resembles the Fred F. French Company in its comprehensive activity in all phases of real estate and building, including the sale of its securities by a department of its own organization. However, it is not "its own architect." Its latest announcement is a $25,000,000 block of 16-story apartment houses on West 23rd Street, of which Farrar & Watmough are the architects. This group, planned two rooms deep, covering as it does 49 1/3 per cent of the site area, and containing a great block garden in the center of the plot, 71 feet at its narrowest, is an example of the enlightened policy of this company toward sound architecture. Its financial plan, which involves the principle of selling securities to the public, based on individual building projects and carrying, in addition, a share in the chain of properties contemplated by the Mandel plan, will be explained in a later article.

The Fred F. French Company is more widely

known, having been established some time, and also being known through its extensive stock selling publicity. Its "Tudor City" development in the Grand Central district of Manhattan covers approximately six acres, extending from 40th to 44th streets and situated between First and Second Avenues. Nine buildings of the apartment or apartment-hotel type are either built or under construction, and a little more than half the site remains undeveloped. There is a huge interior garden equal to two city blocks in the center of Tudor City. The total expenditure in land and in buildings built and now under construction has been about $30,000,000.

It will be noted that both the French and the Mandel organizations do not use Wall Street investment houses to market their securities. Presumably, for their own purposes at least, they market their own stock themselves directly to the public because it is cheaper. Of course, they are thus performing a great task, one that is doubtless possible only because these two concerns operate steadily on a vast scale. In this connection, it is said that the French Company's securities are sold in increasing amounts in the "over-the-counter," or unlisted securities market of New York. This over-the-counter market for stocks has grown greatly in recent years, and is now rather firmly controlled by the Unlisted Dealers' Association, a responsible organization actively interested in preventing abuses in sales of securities. Many stocks of the highest investment caliber, such as the shares of the New York banks, are sold chiefly in this market. Thus it is active, "liquid," and its best securities possess a certain collateral value at the banks. Still another organization is the Lefcourt Realty Corporation, whose stocks are listed on the New York Curb. It, however, does not do its own construction or its own architecture. Shreve & Lamb are the architects for its latest great building, the 38-story office building located on the corner of Fifth Avenue and 43rd Street. In this building THE ARCHITECTURAL FORUM has its new home, in company with other technical and business magazines. Here is still another illustration of the merger movement.

Finally, it may be pertinent to point to the fact that the conventional type of mortgage bond issue has for several years attracted Wall Street investment houses. A number of them have floated some of the largest issues. A typical case is G. L. Ohrstrom & Company, a house active in public utility issues. In its real estate financing, G. L. Ohrstrom has limited itself to office buildings. On the other hand, several of the conventional mortgage bond companies, which formerly specialized almost exclusively in real estate issues, have gone more and more into general security issues. An example is S. W. Straus & Company, whose Fifth Avenue building bears this lettering: "Straus National Bank & Trust Company."

Such is the brief record of a number of interesting developments which may, or may not, indicate a new economic trend in the building world. Time alone can tell the outcome. In any case, the architect should view the movement from two sides. One is the possible effect on the building industry and on architecture, as a whole; the other is the effect on himself. As to the latter, the individual architect is doubtless his own best judge. Let him be prepared for any changes that may come. And as to the former, architects should try to realize (1) the enormous stimulus to building which should result from the greatly reduced costs possible in large-scale operation, in the method of "public" financing, and in the greatly reduced cost of operating buildings in large developments comprising a city block or more; (2) the higher architectural standards incident to long-term security issues; (3) economic stability of large-scale operation to the construction industry; (4) better standards of architecture.

There is, of course, no guarantee of these benefits, but it may be well for architects to lend their influence in the direction of progress and, if the new movement spreads throughout the industry, to do all they can to see that it is rightly handled and kept in strong, responsible hands. Otherwise its effects on the industry might be disastrous.

THE SEVERITY OF FIRES IN BUILDINGS

BY

S. H. INGBERG

SENIOR ENGINEER, U. S. BUREAU OF STANDARDS

ONE of the main objects of public regulation of building construction is to prevent undue hazard to life and neighboring property from fire. Fire exposure arises from interior and exterior origins. The evaluation of the exterior exposure can be done only with difficulty in quantitative terms, and the gradual accumulation of data from actual fires will probably continue as the main guidance in providing the proper protection. The present paper will deal mainly with methods of gauging the severity of fires resulting from the burning out of the contents of buildings whose walls, floors and column constructions are sufficiently fire-resistive to be capable of withstanding a complete burning out of the buildings' contents without collapse of major parts. It is only when the problem is thus restricted that there is much possibility of obtaining experimentally quantitative information pertinent to the answer sought. The severity of fires completely consuming the combustibles of frame buildings and masonry-walled buildings with combustible interior construction is of interest mainly as it concerns the exposure to adjacent or neighboring buildings and the fire exposure on party and fire walls and on record containers. As it concerns the severity of fires in buildings with interior combustible construction protected with incombustible floor, ceiling and wall finishes, the present discussion will apply up to the limit set by the fire resistance of these protections.

The Standard Fire Test and Building Fires. Indications of the intensity of building fires have been obtained from fused metals and from general fire effects on materials, on the reaction of which to temperature or fire exposure, such as in test fires, information is available. The fire ruins or reports of fires give, however, little information on the duration of the temperatures in a given portion of a building. The absence of data indicating how forms of construction or devices giving a certain record of performance in the standard fire test to be applied as protection against fire conditions in buildings with as much precision as results of strength tests are applied for load-carrying purposes, led me to consider the possibility of conducting burning-out tests in suitably designed structures to obtain the needed information. If such tests could be made to yield quantitative information on the equivalent fire durations to be expected with given building types and occupancies, it would help matters measurably to place the whole matter of fire-resistance requirements on a rational basis. Fire is a contingent condition that may or may not involve a building or given portion thereof in its lifetime. In theory, at least, the owner should be required to make provision for safety to life within and near the building and for protection to adjacent and neighboring property, only as it concerns the building type and size proposed and the type of occupancy for which it is intended. With requirements more or less uniform for all occupancies, the tendency would be to require more than the needed protection for buildings with the lighter occupancies from the fire hazard standpoint, and not enough for those with greater proportions of combustible contents.

Test Structures and Testing Methods. The first building, erected in 1922, was a one-story brick

Fig. 1. Interior View of Large Building Before Test With Office Occupancy

Fig. 2. View of Large Building During Test With Office Occupancy

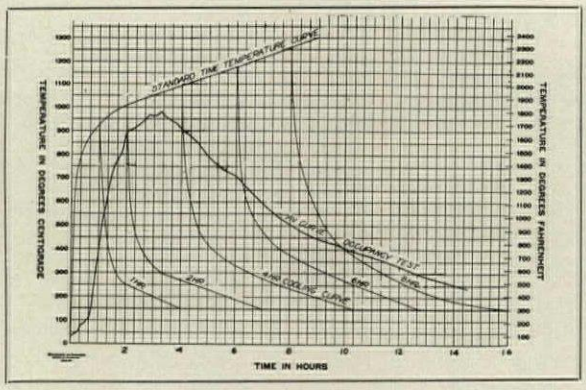


Fig. 3. Standard Furnace Exposure Cooling Curves and Curve From Occupancy Test

and concrete structure, 15 by 29 feet inside and about 9 feet in its dimensions from floor to ceiling without finish. This was filled with discarded furniture and records to simulate an office or light commercial occupancy, a wood top floor on sleepers in cinder fill being provided in some of the tests. The fire was started either in a waste paper basket placed near one of the desks or it was given what approximated an exposure fire start by burning a quantity of oil-soaked wood kindling in a grate about 3 feet in diameter and 7 feet high placed in one corner of the room. A metal shield around it was withdrawn when the contents were burning freely, the temperatures from the resulting hot blast being above the ignition points of wood and paper over most portions of the room. Pivoted shutters in the walls were regulated to give what was deemed to be the proper amount of air for maximum fire conditions within the room. Three tests with wood furniture and records, giving combustible contents inclusive of the wood floor, if present, from 13.1 to 15.4 pounds per square foot (Table 1), were conducted in this building, and also one test with records on wood shelving giving 55.4 pounds per square foot. The tests with office and records occupancy were repeated in a larger building, 30 by 60 feet in plan, with a monitor over the center section to provide draft conditions similar to those produced by an open stair or elevator shaft. This room was deemed to be of a size sufficient to account for

TABLE 1
RESULTS OF FIRE INTENSITY-DURATION TESTS WITH OFFICE AND RECORD ROOM OCCUPANCIES

Occupancy	Furniture	Finish floor	Building	Fire start	Amount combustible materials			Equivalent fire duration		
					Lbs. per sq. ft.	Approx. B.t.u. per sq. ft. of floor area	Approx. B.t.u. per cu. ft. of room volume	150°C. base Hr.-Min.	300°C. base Hr.-Min.	Curve used
Office	Wood desks, files, etc.	Wood	Small	Exposure	14.8	120,000	13,100	1–03	0–47	Average
Office	Wood desks, files, etc.	Wood	Small	Slow	15.4	121,000	13,200	1–26	1–15	Average
Office	Wood desks, files, etc.	Cement	Small	Exposure	13.1	105,000	11,500	1–05	0–54	Average
Office	Wood desks, files, etc.	Wood	Large, E. section	Slow	20.6	166,000	15,800	2–05	1–51	Average
Office	Wood desks, files, etc.	Wood	Large middle section	Exposure	16.3	132,000	11,300	2–01	1–49	Average
Office	Wood desks, files, etc.	Wood	Large W. section	Exposure	20.2	162,000	15,400	2–04	1–51	Average
Office	Steel desks, files, etc.	Wood	Small	Exposure	10.0	76,900	8,400	0–04	0–01	Average
Office	Steel desks, files, etc.	Wood	Small	Exposure	10.0	76,900	8,400	0–09	0–05	Upper
Office	Steel desks, files, etc.	Wood	Small	Exposure	12.0	87,000	9,500	0–35	0–02	Average
Office	Steel desks, files etc.	Wood	Small	Exposure	12.0	87,000	9,500	0–48	0–11	Upper
Record room	Wood shelving	Cement	Large, E. section	Slow	44.0	347,000	33,000	5–10	3–17	Average
Record room	Wood shelving	Cement	Large middle section	Exposure	52.2	411,000	35,400	6–57	5–00	Average
Record room	Wood shelving	Cement	Large W. section	Exposure	49.0	386,000	36,800	8–14	6–21	Average
Record room	Wood shelving	Cement	Small	Exposure	55.4	440,000	48,000	8–44	6–50	Average
Record room	Skeleton type steel shelving	Cement	Small	Slow	48.5	350,000	38,100	5–15	4–40	Average
Record room	Partitioned type steel shelving	Cement	Small	Exposure	49.2	333,000	36,400	5–00	3–41	Average

the effect on the fire severity attributable to room area. A view within this room before test is shown in Fig. 1, and one during a fire test in Fig. 2. The fires were started at one or more points in one (the east) end of this room, the large room size rendering it impractical to attempt an exposure start for the fire as was done in the smaller room. However, as it concerns the middle and farther (the west) section of this room, the fire start can be regarded as equivalent to exposure from the burning of the contents of the section in which the fire originated. Air temperatures were measured at three levels; measurements were also made of temperatures in the debris. In the smaller room between 35 and 40 thermocouples were used for these purposes; in the other about 100.

Heat of Combustion of Contents. Besides listing the combustible contents in pounds per square foot, the heat value of the contents is also given in Table 1 in terms of British thermal units per square foot of floor area and per cubic foot of room volume. The heat of combustion of the wood and paper constituting the contents was determined in tests on typical samples.

Reduction of Temperature Data. From the temperatures at the different points in the room the average for the room or a given section thereof is obtained, which, together with the corresponding maximum and minimum temperatures, is plotted against time as abscissa. The data are also reduced to show the average temperatures at the different levels. As a rule, only the average room or section temperature is used in the comparisons to obtain the equivalent fire durations. In the case of the tests with office occupancy and steel furniture, the average temperature for the upper level, 18 inches below the ceiling, was also used.

The standard furnace exposure curve used generally in American fire-testing practice, together with cooling curves obtained from temperature measurements of our furnace chambers after the fire was shut off, are shown in Fig. 3. There is also given in Fig. 3 the average temperature curve from one of the burning-out tests. An approximate comparative measure of severity is obtained by assuming that the area under the latter curve, expressed in degree-hours, gives severity equivalent to an equal area under the standard exposure curve and the cooling curve applicable for the given period. The assumption that equal areas under time-temperature fire exposure curves stand for equivalent severity of exposure is an approximation only, since in the heat conductivity equation applicable for the case, the exposing temperature enters directly as a factor in the expression for the temperature obtaining at any point within an exposed body, while the time, which is the other factor in the time-temperature area, enters as an exponent. However, we have

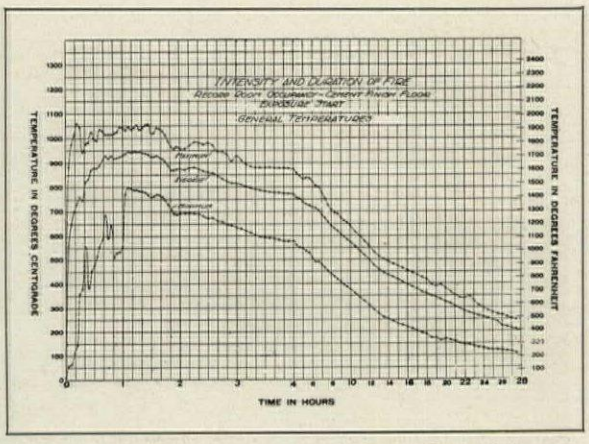


Fig. 4. Time-Temperature Curves From Record Storage Test With Wood Shelving in Small House

so far found no better measure of comparison than this that can be conveniently applied. It might also be noted that temperature transmission through materials is retarded not only by the heat insulating properties present but also by calcination effects and evaporation of free and combined water, and it appears probable that the effect of the fire exposure in breaking down resistance of the latter type is also measured approximately by the product of exposing temperatures and the time they prevail.

Another point that must be considered in making such comparisons is the minimum temperature that need be considered as an exposing temperature. For the results reported here, 150° C. (302° Fahr.) and 300° C. (662° Fahr.) have been taken as base lines, and only the areas of standard and occupancy test curves above these lines are considered significant. The former is below the ignition points of ordinary combustible materials, and it would not in any general case appear necessary to take into account lower temperatures, even considering that temperatures somewhat higher than the average room temperatures used in the comparison obtain in portions of the room. Where only protection for incombustible structural members is involved, temperatures below 300° C. (662° Fahr.) can probably be neglected where the fire exposures are of the relatively short durations incident to fires in buildings. To make convenient the determination of equivalent durations from burning-out tests, the area to a given base line under the standard furnace curve plus cooling curve, expressed in degree-hours, is plotted against time as abscissa. The area, to the same base line of the time-temperature curve from the occupancy burning-out test considered, is obtained in the same unit, and the equivalent duration of the latter can be read directly from the area-time curve of the standard furnace test.

Details of Tests and Results. All tests from which results were obtained in the form of equiv-

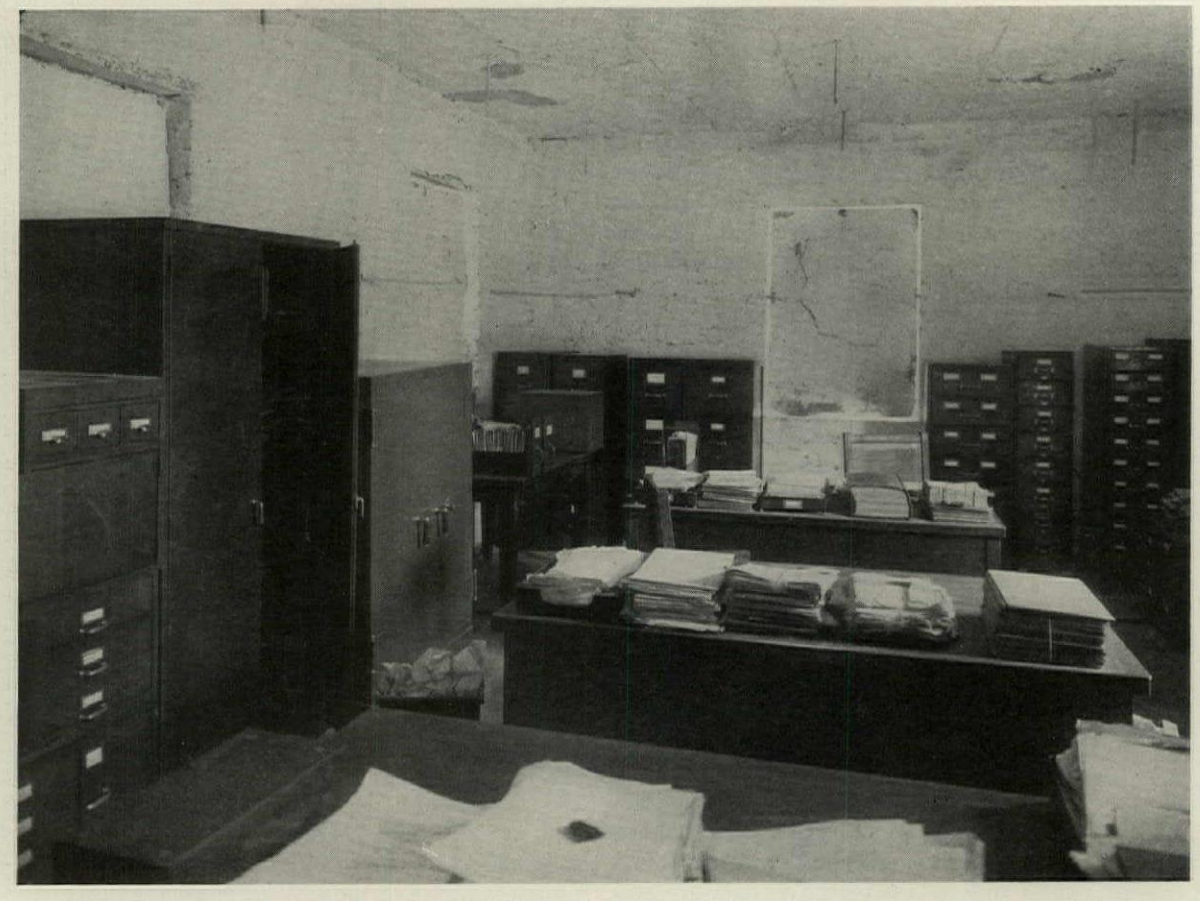


Fig. 5. Office Occupancy With Metal Furniture Before Test

alent fire durations, are given in Table 1 (page 776).

Office Occupancy; Wood Furniture. As already indicated, three tests of office occupancy with wood furniture were made in the small structure and a similar test with a somewhat larger amount of combustible contents in the larger building. As it concerns equivalent fire durations, the results of the latter test are reported separately for each of three 20-foot sections in the 60-foot structure. These fires resulted in complete burning of contents, including the wood finish floor where present. Time-temperature curves from one test are shown in Fig. 4. The larger room area gave a little greater severity than would be expected from the results of tests in the smaller room, even after allowing for the difference in amounts of combustible contents present. The fire in the end sections of the large building apparently affected the temperatures in the middle section to such an extent as to give it nearly the same equivalent fire duration in spite of the lower content. The vent over the middle section induced air currents that undoubtedly aided in equalizing the room temperatures.

Office Occupancy; Metal Furniture. These tests were conducted in the small building, the furniture consisting of desks, tables, filing cabinets and shelves similar in number and disposition to what was present in the tests with wood furniture (Fig. 5). The total quantity of records was, however, greater by about 25 per cent, and about one half of it was placed on top of tables or in open shelves or cabinets. With cement finish floor no room temperatures above 104° C. (219° Fahr.) developed when fires were started from burning contents of waste paper baskets. The fire was confined to the contents of the open shelves and to other exposed paper adjacent to the origin. With a wood finish floor and a start for the fire in a pile of waste paper, contents of adjacent open shelves and of filing cabinets under which the floor burned out were wholly or partly consumed. The progress of the fire was very slow, 8 hours being required before 30 per cent of the floor was consumed. The maximum room temperatures at the different points ranged from 50 to 230° C. (122 to 446° Fahr.), and except for the slow fire in the finish floor, no general spread of fire occurred.

Two exposure starts for the fire were staged, one with a cement finish floor and one with a wood top floor. In the former, exposed paper over about two thirds of the room was ignited by the blast from the grate, but no general fire

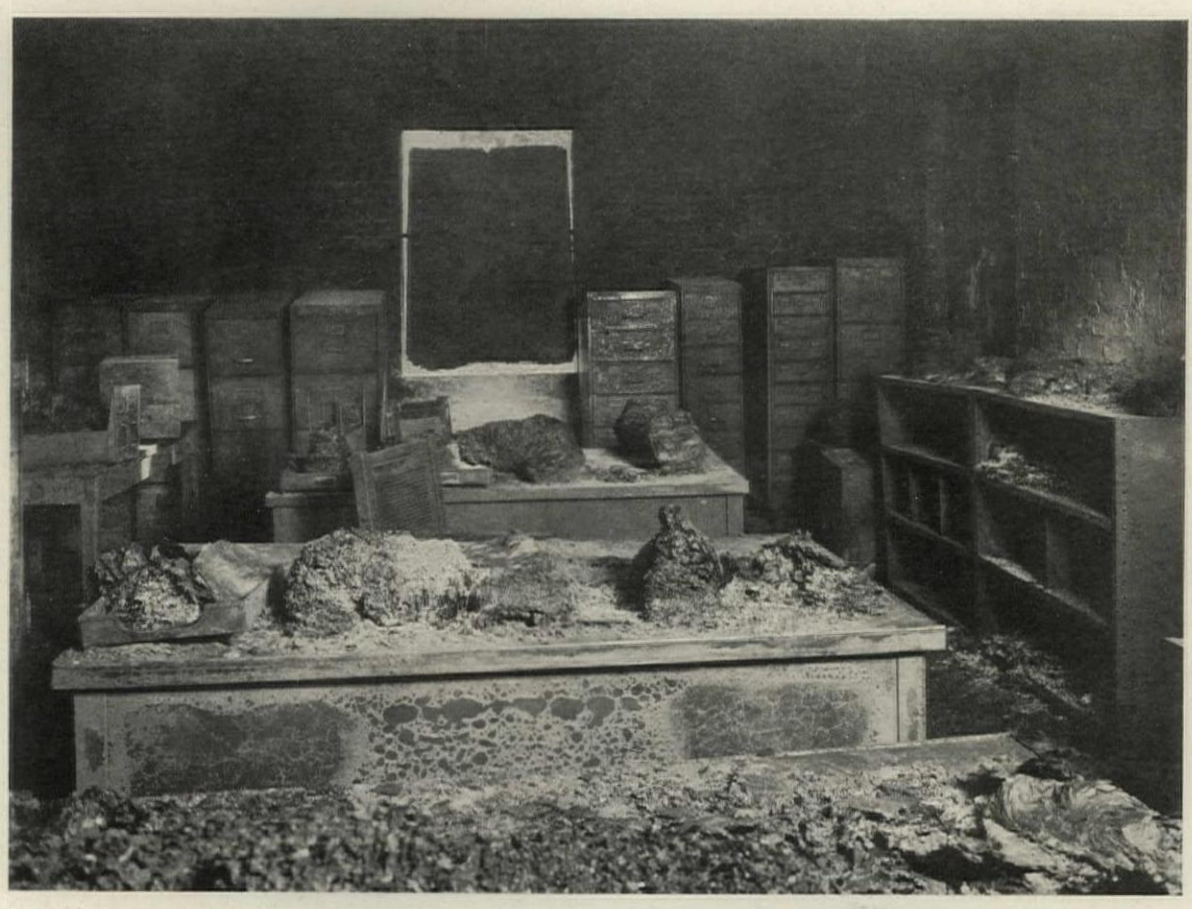


Fig. 6. Metal Furniture on Wood Floor After a Fire With Exposure Start

condition involving the room contents developed. Temperature maximums from 55 to 808° C. (131 to 1,486° Fahr.) were recorded for different portions of the room, most of the heat developed being from the fuel in the grate. At the end of 30 minutes, the temperature maximums were generally below points causing ignition of combustible materials. The highest equivalent duration obtainable from this test was 9 minutes, which was obtained from the curve for the upper level, 18 inches below the ceiling. After the exposure start with wood finish floor, about the same extent of initial spread of fire occurred as in that with cement finish floor. The fire in the wood floor progressed more rapidly than with the slow start for the fire, being about 20 inches from the opposite end of the room at 4 hours, when the fire was put out. Average room temperatures above the ignition point of paper obtained for most of this period. The equivalent fire durations (Table 1) range from 2 minutes to 48 minutes, depending on the base line and the temperature curve taken.

Record Room Occupancy; Wood Shelving. One test was conducted in the large building with records on wood shelving, the combustible weight being from 44 to 52.2 pounds per square foot assumed to be uniformly distributed. This followed a previous similar test in the small building with records and shelving weighing 55.4 pounds per square foot. The latter was given an exposure start from the grate, the equivalent durations being longer than for any other test. The results for the east section of the large house cannot be considered fully valid on account of the irregularities involved in starting the fire from a single small origin in this section. The wood shelving in these tests collapsed within one hour after the fire was burning freely, precipitating the paper contents in a mass which burned slowly.

Record Room Occupancy; Metal Shelving. The long equivalent durations obtaining for the tests with records on wood shelving prompted inquiry into methods whereby the hazard can be reduced, which led to tests with metal shelving. The results with wood shelving indicated that the building members adjacent to such concentrations would require heavier protection than those for the portions of the building housing the regular office occupancy as such. Inasmuch as these concentrations may occur anywhere within the building, the general design would have to take them into account, if fires completely consuming them without any fire extinguishment are to be premised. The tests with records on metal shelving

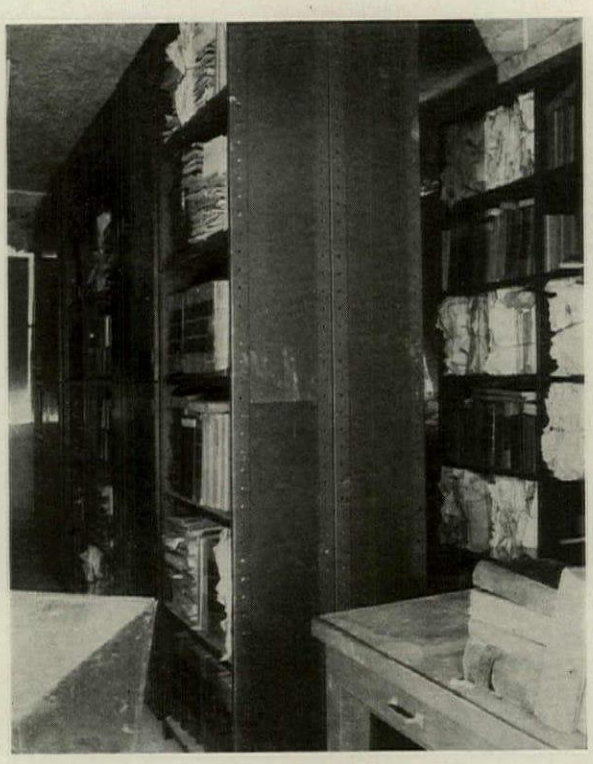


Fig. 7. Metal Shelving, Backed and Partitioned Type, Before Fire Test

were all conducted in the small building, the weight of records, assumed uniformly distributed, being 48.5 pounds per square foot of floor area, which was the same as was present in the previous test in the same building with records on wood shelving. No wood top floor was present in any of the tests with "record room" occupancy. In the first tests, shelving representative of several general types was introduced, nearly one half of the records being on "skeleton" type shelves having no partitions or backs. Others had partitions but no backs, or else backs without partitions, and one single-depth, 29-foot row had both backs and partitions, with doors on two 3-foot-wide sections.

The first of these tests was started with a waste paper basket fire in front of a single-depth bay open at the front, but with metal back and partitions. The window shutters were opened to give the air supply deemed most favorable for fire spread, but no general fire condition resulted, the fire when put out after 7 hours, 20 minutes, being confined to two 3-foot sections with some charred or glowing papers in a cupboard adjacent to one of them. The affected paper was replaced, and two fires were started simultaneously in piles of waste paper placed on the floor,—one in front of shelving similar to that used in the first trial, and the other in front of a double-depth "skeleton" row. The fire progressed more rapidly than in the first test, particularly in the open shelving, and at the end of 1½ hours the whole room was involved. Collapse of skeleton-type shelving began at this time and eventually involved all of the shelving that did not have partitions. All combustible contents of the room were completely consumed, the equivalent duration of the fire being 5 hours, 15 minutes as derived for the 150° C. base and 4 hours, 40 minutes for the 300° C. base.

The room was fitted with new shelving, mainly of the backed and partitioned type with doors every third bay. Three double bays of well braced skeleton type shelving were also included. In one test with a slow start for the fire, made in a manner similar to that of the first test already described, the fire progressed laterally through a 3-foot wide cupboard section and another 3-foot wide section with open front in 20 hours, but no general fire spread resulted. A second fire in front of a double-depth, open-front, backed and partitioned bay, spread through a closed front section on each side and involved the whole 18-foot wide stack in about 9½ hours. In this test the window shutters were kept at the lowest opening, and while this retarded the fire at some stages, it enabled room temperatures to be built up high enough to cause general fire spread at 13½ hours.

The room was reloaded for tests with "exposure" start for the fire, approximated as in the previous tests by starting a fire in oil-soaked wood kindling in the grate in one corner of the room. After withdrawing the surrounding shield when the kindling was burning freely, the resulting air temperatures in most portions of the room were above the ignition point of paper for from 10 to 15 minutes. While fires started at many points, they did not progress, and after 2 hours the average room temperature was below 100° C. Similar results were obtained in a second exposure start. After one hour the window shutters were closed to their lowest opening, and the fires which had started in various portions of the room were allowed to go on until air temperatures high enough to cause general fire spread were built up.

TABLE 2
EQUIVALENT FIRE DURATIONS FOR OFFICE AND RECORD ROOM OCCUPANCIES IN FIRE RESISTIVE BUILDINGS EQUIPPED WITH COMBUSTIBLE FURNITURE AND SHELVING

Total combustible content (Inclusive of finish floors and trim)		Equivalent fire duration	
Lbs. per sq. ft.	Assumed B.t.u. per sq. ft.	Hrs.	Min.
10	80,000	1	00
15	120,000	1	30
20	160,000	2	00
30	240,000	3	00
40	320,000	4	30
50	380,000	6	00
60	432,000	7	30

This required about 4 hours, the fire in the skeleton bays being mainly responsible for the relatively rapid temperature rise. The contents of the whole room were soon involved, the fire being quite intense but of shorter duration than in previous tests with record room occupancy. No collapse of shelving supports from fire exposure occurred during this test, most of the contents remaining on the shelves until consumed (Fig. 8). The equivalent duration of the fire (Table 1) was 5 hours, computed to a base of 150° C., and 3 hours, 41 minutes computed to the 300° C. base.

Temperatures in the Debris. The temperatures and equivalent fire durations so far discussed are based on free air temperatures and do not consider those in the glowing or hot debris on the floors after the fire. Measurements of such temperatures were made at three or more points in the different tests. For office occupancy with wood or metal furniture, these temperatures were indicated to give a more severe exposure than the air temperatures only where extra high cabinets of considerable area were present. Insulated safes, having fire resistance of little above 1 hour as referred to the standard fire test and placed closely adjacent to four-drawer wood filing cabinets in the burning-out tests, satisfactorily preserved their contents. However, the depth of the debris from some of the large stacks of shelves or cupboards 6 feet high, present in the office occupancy test in the large house as well as the temperatures measured in it, indicated a more severe exposure than the air temperatures developed. The depth of the debris and duration of high temperatures were even greater for record room occupancy and wood shelving, average temperatures of 300° C. (572° Fahr.) or over obtaining for periods of up to 16 hours. For the test with records on the skeleton-type shelving that collapsed, the debris temperatures indicated a condition only slightly more severe than the air temperatures, and for the last test with steel shelving that did not collapse, the debris or floor temperatures gave a duration about the same as that for the air temperatures computed for the 150° C. base and very much lower (1 hour, 46 minutes) for the 300° C. base.

While these temperatures indicate the desirability of not placing safes and similar containers in close proximity to high concentrations of combustible materials, the heat effects from the debris will be mainly on the floor construction. Since as a rule there are no combustible materials or finishes on the ceiling side of floor construction, higher temperatures can be permitted than for walls and partitions protecting combustible materials in contact with the unexposed side. This consideration, together with the fact that water

Fig. 8. Metal Shelving, Backed and Partitioned Type, After Fire Test

TABLE 3
EQUIVALENT FIRE DURATIONS FOR OFFICE AND RECORD ROOM OCCUPANCIES IN FIRE RESISTIVE BUILDINGS EQUIPPED WITH INCOMBUSTIBLE FURNITURE AND SHELVING

Occupancy	Furniture	Finish floor	Total combustible content, (Inclusive of any wood floor and trim)		Equivalent fire duration	
			Lbs. per sq. ft.	Assumed B.t.u. per sq. ft.	hrs.	min.
Office	Incombustible filing cabinets, desks, shelves	Incombustible	10	74,000	0	10
Office	Incombustible filing cabinets, desks, shelves	Combustible	12	91,200	0	30
Record room	Incombustible open shelving	Incombustible	50	350,000	5	00
Record room	Incombustible partitioned and backed shelving	Incombustible	50	350,000	4	30

will generally be applied on the debris from such concentrations, apparently justifies the basing of fire-resistance requirements on fire durations derived from measurements of the air temperature of the room rather than from those of the debris.

Summary and Conclusion. The equivalent durations given in Table 2 for assumed amounts of combustible contents are based on the results given in Table 1 for office and record room occupancies employing wood furniture and shelving. The periods given are intermediate between those obtaining for the 150 and the 500° C. base, being possibly a little closer to the former than the latter. The periods for the 30 and the 40 pounds per square foot of combustible content are derived by interpolation between the results with office occupancy on one side and with record room on the other. There is also a little extrapolation involved in connection with the periods for the 10 and the 60 pounds per square foot floor load. The heat of combustion of the contents is taken at 8,000 B.t.u. per pound up to 40 pounds per square foot combustible content, beyond which it is decreased to 7,600 and 7,200 B.t.u. per pound for the 50- and 60-pound floor load, to allow for the relatively greater amount of paper entering into the contents.

To judge by the trend of the experimental data, the one-hour equivalent duration for 10 pounds per square foot combustible content is a little higher than indicated by the tests. The periods for the 15- and 20-pound load are, however, near the average of experimental values. The small margin for the lowest period is considered desirable, since with low room contents the increase in severity from exterior exposure and similar fire effects would be relatively more pronounced than for rooms with a greater amount of combustible contents. The periods as they stand contain an element of exposure of the amount obtainable from the equipment used to produce an exposure for the fire in the tests. The periods given in Table 2 for 50 and 60 pounds per square foot content appear a little low as judged by the weight of contents alone. In the tests with records on wood shelving, the contents were mainly old government account records on grades of paper that had a higher fuel value than can be premised for the paper that generally constitutes the contents of record rooms. Hence in Table 2 a somewhat lower B.t.u. value is assumed for the contents than obtained for the paper in the tests with record rooms, and on the basis of these assumed values, the equivalent durations given will be found to accord with the results of the tests.

The periods for office and record room occupancies with metal furniture and shelving given in Table 3 are obtained directly from Table 1, from the tests with comparable equipment and combustible contents. For office occupancy with cement finish floor, the value in Table 3 is a little above the maximum obtaining at the upper level in the burning-out test with exposure start for the fire. The other periods are chosen to include allowance for exposure start for the fire comparable with what was done in deriving periods in Table 2.

Application to Other Occupancies. The equivalent fire durations summarized in Tables 2 and 3 apply in the main to light commercial, office or record storage occupancies where the combustible materials are principally wood and paper. The extent to which the results of these tests can be applied to other occupancies depends on the character of the combustible materials housed and their calorific values as compared with those for wood and paper. In Table 4 are given the calorific values for most materials or material-forming substances that are housed in buildings. These were compiled mainly from printed matter on the subject. Determinations were made on wood and paper present in the tests and on some fibrous organic materials. In addition to the calorific value, the readiness with which a given material burns would also have to be considered. It is intended to conduct some tests in the near future to obtain information on the effect of such variations on resulting equivalent fire durations. It will be seen from the table that a considerable number of materials have calorific values within the range given for wood and paper. It appears probable that for occupancies housing such materials, and possibly for some that have properites outside of this range but with burning properties not too far different from wood and paper, a fair approximation of the equivalent fire durations to be expected can be obtained by applying the B.t.u. values and corresponding equivalent fire durations given in this paper.

Acknowledgments. The writer acknowledges helpful coöperation in supplying material and equipment for the tests from R. E. LeFevre, Superintendent, General Supply Committee of the Treasury Department, and officers of the Bureau of Supplies and Accounts of the Navy Department. The metal furniture and shelving used in some of the tests were supplied through the courtesy of the National Association of Steel Furniture Manufacturers, J. D. M. Phillips, Secretary. The brick for the larger test structure were donated by the Common Brick Manufacturers' Association of America, Ralph P. Stoddard, Secretary-Manager. Acknowledgment for assistance in the construction of the buildings, the conducting of tests and the reduction of the test data is due to J. F. Angier, C. R. Brown, A. C. Hutton, N. D. Mitchell, L. B. Morris, Gale Murphy, and H. E. Newcomer, members of the Fire Resistance Section of the Bureau of Standards.

THE SUPERVISION OF CONSTRUCTION OPERATIONS

BY

WILFRED W. BEACH

CHAPTER 5, BEGINNING THE WORK—(CONTINUED)

Editor's Note. In the April issue Mr. Beach gave an interesting and instructive account of the architect's superintendent's "First Day on the Job." He also began Chapter 5, entitled, "Beginning the Work," continued here. In this issue of THE ARCHITECTURAL FORUM, *Mr. Beach also takes up Chapter 6, "Contract Changes," and shows the problems that arise and the part the superintendent must play in their solution. The article in the April issue quoted paragraphs from the specifications regarding storm water and pumping.*

In consideration of the provisions in these clauses, the superintendent suggested that, inasmuch as the general contractor was obligated to continue to keep the excavation free from water after his subcontractor had finished excavating, the general foreman would be justified in getting a power pump and putting it to work, leaving the question as to who would pay for this emergency pumping to be settled next day, when the general contractor would be present to give his views. It was so arranged, and a gasolene-driven pump was at work before the downpour had ceased. The grounds were too wet for other operations, and the foreman intimated that they would be justified in asking for credit for a day's delay, under the clause in the specifications appertaining to such an event. This is "Art. 18. Delays and Extension of Time" of the General Conditions of the American Institute of Architects and provides that "if the Contractor be delayed . . . by any causes beyond the Contractor's control . . . then the time of completion shall be extended for such reasonable time as the Architect may decide." But it further stipulates that "no such extension shall be made for delay occurring more than seven days before claim therefor is made in writing to the Architect."

The superintendent admitted the validity of the claim and cautioned the foreman that it must be made to the architect in writing, but the foreman preferred to leave this formality to the contractor who was expected back the next day. Here the superintendent took occasion to advise the foreman that, in the absence of his employer, the general foreman was supposed to be in charge, and that he should have a more distinct understanding as to the amount of authority vested in him. This is clearly set forth Art. 14 of the General Conditions just quoted. It is most important that a general foreman be made to realize that he is possessed of adequate authority for full conduct of the work at all times when the contractor cannot give it personal attention. If this is not insisted upon and made clear at the start, the superintendent is likely to be frequently rebuffed with the statement that this, that or the other thing must await the decision of the contractor, either by mail or at the time of his next visit,—the while the work goes on, and the issue may be dodged or forgotten.

Under such conditions the superintendent may eventually find himself doing the work of the general foreman,—perhaps with full approval of the contractor, who is thereby saving the additional wage of a more competent foreman, and asserting meanwhile that a better man is not available or that a new man might "ball things up." "The job is going satisfactorily all 'round, isn't it? What more can one want?" "It's dangerous to change horses in the middle of a stream," etc. Such a situation arrives with imperceptible advances and is extremely dangerous. The superintendent is assuming responsibility which may seriously react upon his employer and for which he is not being remunerated.

A case in point is that of a superintendent who had acquired the habit of doing little things for a backward foreman on a residence alteration. Arriving at the house late one morning on his regular round, he saw men standing idle, waiting for flooring, and no foreman in sight. He telephoned the lumber yard and demanded:

"How about that oak flooring for the Smith job?"

"Are you talking for Edwards & Henry?" was the rejoinder.

"For their foreman, yes."

"Well, we're glad to know you're ready for it. First we've heard. Send it right up."

"All right; hop to it. The men are waiting."

"Sure. It'll be there right after lunch."

Now, the superintendent didn't know, or didn't think, about the big Smith apartment house being built under another architect by the same contractors, who called *it* the "Smith job" and the smaller contract, the "J. T. Smith alterations." The unfortunate superintendent had inadvertently ordered all the flooring for a 75-apartment building, a rush job. Truckload after truckload filed out there during the afternoon, before the shipment could be countermanded, only to find the plastering unfinished and no place to unload.

When the sleepy foreman awakened and began to inquire for *his* flooring, the mess was untangled,—at a cost for hauling and handling of $160, which was assessed against J. T. Smith's architect. In vain did the superintendent contend that the same mistake *might* have occurred if the foreman had done his own telephoning. There was no escaping the fact of who had ordered the flooring. Thereafter, one superintendent was much more discreet in the performance of duties other than his own. His telephone demand should have been made to the office of the contractors,—not to the yard.

On Tuesday morning, the architect and contractor were both on hand at the school building, which we are discussing, and the subcontractor at once brought up the question as to who was to pay for the pumping just mentioned. Of course the general contractor insisted that it was included in the excavating, as it should have been according to the specifications,—but he could not swear that the excavator had seen the specifications. Appeal was made to the architect, who called the superintendent aside to discuss particulars, remarking that it appeared that the contractor was "stuck" because he had been careless in letting an oral contract, albeit on a written bid. But the superintendent had discovered that the excavator had a pumping outfit and had expected to use it, hence his contention was in the nature of a bluff, fairly well founded. The architect thereupon advised the contestants that, under the contract, it was distinctly not his business to interfere between a contractor and his "sub" but that, if they cared to leave the matter to the superintendent as an arbitrator, he would permit him to render a decision. After discussion with his foreman, the contractor acceded to this, as did the excavator. The superintendent made his acceptance of the office of arbitrator conditioned upon their further agreement to abide by his decision when rendered, not because it was his function nor that of the architect to act in this capacity, but purely for the sake of amicable procedure. With this assurance, he decreed that, inasmuch as it was essential that the excavation be kept free from water in order that the steam shovel could work efficiently, as well as to enable the general contractor to dig his footing trenches and pour his concrete, and that this contingency was fully covered in the specifications (by which, if it came to a showdown, the subcontractor must be bound or vacate the premises), and whereas both contractor and subcontractor were equally remiss in the failure of the latter to read that portion of the specifications in which he was particularly interested, it therefore appeared most fair that, so long as the subcontractor and his men remained in the excavation, he and the general contractor should share equally in the expense of keeping the water out. Everybody appeared satisfied, including two members of the board who had appeared during the discussion.

The general foreman then raised the question of a time allowance for loss of the preceding day, of which the contractor made note and said a letter would be sent the architect on the subject from the contractor's office next day. This caused a suggestion from the superintendent to the effect that there should be specific understanding all around that the foreman possessed the necessary authority to handle all matters demanding prompt action, in the absence of his employer. In this he was warmly seconded by the architect, who pointed out that this contract plainly called for a foreman competent to have such dependence placed in him, adding that copies of such orders as the foreman might issue or accept should be in his home office next day to be checked up. Such was therefore made the general understanding.

CHAPTER 6

CONTRACT CHANGES

EVERY superintendent of experience has learned to appreciate the joy of seeing a "no-change" building contract carried to completion and, conversely, to dread changes, at least to a degree that will impel him to make use of every safeguard to avoid having trouble and entanglements follow in the wake of such changes. In this, he has the specific mandates of the specifications to support him. (Arts. 15 and 16 of the General Conditions of the American Institute of Architects.)

One of his duties is to see that these provisions are closely adhered to, both by his own home office and by the contractors. One absolute and inviolable rule must be that no departure of any character, no matter how seemingly trivial, from a strict interpretation of the terms of the contract will be permitted, unless covered by a formal change order. This is one of the most important of a superintendent's inhibitions, yet it is one too much abused by men whose experience should have taught them the peril of laxity in this particular. It is easy to say "Yes, it will be just as well to do it that way," or "Stick in a half-dozen extra rods there; we can save them somewhere else," etc. But it is only a short step from such

offhand procedure to carelessness in more important matters. The only wise course is to make strict adherence to due formality the positive rule, from which there are to be no exceptions. This applies not only to orders emanating from the architect and superintendent but to the owner's instructions as well. The latter should be prevented, to such extent as can be diplomatically effected, from doing or saying anything to any contractor or employe on a building that may be construed as authority to do something at variance with contract stipulations. Ordinarily, an owner with average intelligence or common business sense can readily see the purpose of this, or will quickly be brought to appreciate it, if explained. Such explanation should not be withheld on the assumption that it is the owner who foots the bills, that he is fully of age, and hence should be permitted to do as he pleases with his own. One who does so to the extent of interfering with the proper execution of his contract is likely, later on, to claim in defense that the architect was employed to keep the owner from getting into trouble but did not use adequate measures. Such an owner should be held in restraint, if possible. He may carry his officiousness so far as to ultimately induce an allegation on the part of the contractor (as in a particular example) that the terms of his contract had been set aside *in toto* by reason of several orders from the owner. The admission by the owner of the validity of some of these orders once tended to establish the general contention of the contractor and provided a foundation on which he based a claim to several extras for which the owner had not anticipated any charge whatever.

One is naturally more formal in conducting the details of public work than in private matters; and one will commonly encounter fewer changes in work of a public nature. In operations for an individual client, the owner takes a closer personal interest and insists upon having things to his liking. If it be an alteration job, the number of changes may mount up rapidly, and one must watch every step, or the day of final reckoning may prove anything but a joyous holiday. If a superintendent can face such a day with the record of every extra and deduction "in plain black and white" and duly attested, he has no reason to worry, even if the number of such changes should reach a hundred or more,—as is quite possible.

The superintendent on our school building being considered in these articles had no intention of allowing any loose ends to drag at the beginning of his work and to later develop into sources of misunderstanding and disagreement. He therefore took note at this juncture of the fact that, although the steam shovel was in position to operate on Tuesday morning after the storm, it was not possible for the dump trucks to get around in the mud until later in the day. This was important in connection with the excavator's contention that further delay in decision on depth of the basement would cause him added expense. It was evident that no such claim could be established until all the excavating equipment could work to advantage.

The subject of this proposed change in height of grade at the building was therefore next in order for the attention of the architect when he came on the work Tuesday forenoon. In explanation of this proposed change, the reader is referred to the plot plan in Fig. 8. Datum was established at +100′ (marked "O" on the plot plan) and several other bench marks were permanently shown by incised crosses on the curb, so separated that an instrument could pick up at least one from any position. The bench mark on the curb at the head of Ash Street, opposite the center of the building on the north, was +117.00′. Natural grade around the building is shown by the plot plan to vary from +117.05′ at the northwest corner to + 111.15′ at the southeast corner. Finished grade at the building had been established at +118.00′ along the north front and at +116.00′ on the south, with short slopes connecting the two levels on the east and west ends; making a fill of nearly 5 feet at the southeast corner, tapering up to grade toward the north and west. To raise the grade 3 feet, as was proposed by the town planning commission, would have improved the commanding appearance of the north facade, as viewed from Ash Street, but the architect questioned the probable benefit as viewed from Orchard Street or other points to the south, as the building was already sufficiently high for that prospect, in his estimation. He did see a possible advantage to be gained by increasing the height of the basement windows, in case the grade on the south were left 4 feet lower than the north, in place of the 2-foot difference shown by the drawings. The west wing of the basement was given over to toilet and bath rooms, including a swimming pool, the center section to laboratories and rooms for the school dentist and nurse, while the east wing was devoted to the heating plant and storage. There were no windows provided on the north side of the basement, as the main floor was only 1 foot, 9 inches (three steps) above grade.

Apparently, the only serious objection to the change was that the bearing capacity of the underlying soil would probably not be so good at the higher level. This would have to be investigated, —possibly tests made. The area of the building was 21,050 square feet, and the area to be excavated (2 feet larger all around than the outside

dimensions of the basement walls) was 23,006 square feet. The entire excavation totaled 11,438 cubic yards. Each foot of rise of the building would save 852 cubic yards of excavating, or 2,556 cubic yards if the building were raised 3 feet. It developed, in the course of conversation with board members who were visiting the site, that one of the local unsuccessful bidders had said that the district could save over $1,000 for every foot the building was elevated, and hence the board was counting on a saving of at least $3,000 by making the change. The architect took the subject under advisement and promised to have a report ready for decision at the called meeting of the board that afternoon.

In discussion with the general contractor and his subcontractor for excavating, the architect learned that the contract price for this branch of the work was $7,400, or about 65 cents per cubic yard, and hence the saving for the 3 feet of excavating could not apparently exceed $1,660.40. But even this amount of saving was denied by the "sub," who divulged the fact that he was getting $1 a yard for the earth he had contracted to haul to a certain low lot; that he expected to use all his surplus in this manner, and that it netted him a profit of about 37½ cents a yard, which he stood to lose if the 2,556 yards were taken away from him. He said his competitors were sore at him because they had fixed $1.15 a yard as the price to be used on the school job, and that they were undoubtedly back of the attempt to reduce the amount of his work and cut his profits accordingly. The deduction of 2,556 cubic yards would take away almost one-fourth of his work, and he felt that he was entitled to the profits he had anticipated, regardless of the amount of material eventually moved, especially as he had been the means of saving the district considerable money.

It is thus evident that contract changes may be much more involved than merely the deduction or addition of so many units at a known cost price, plus overhead. In many trades, they are not so readily computed. In this case there were several factors to be considered, and it was also evident to the architect that local jealousies were beginning to appear and would have to be reckoned with. He had learned that the board member who was on the town planning commission was a brother-in-law of an architect, one of the losing competitors for this particular work, and hence this board member could be expected to introduce embarrassing issues whenever opportunity offered. In order to be sure of his ground in this case, the architect secured a sworn copy of the grading contractor's bid and was also able to get a copy of a bid by another grader which ran nearly twice as high. He then carefully computed the various quantities of excavating and fill and paid a visit to the lot to be filled and to its owner. The latter confirmed the price to be paid for the earth. He could not use more than 1,200 yards, whereas the contractor had to take out about 5,500 yards more than he could use on the premises. He would therefore still have about 1,800 yards to dispose of, if he were to submit to a deduction of 2,556 yards. It appeared doubtful if he would find any better place to dump it than on the lots south of the school property, where he could get nothing for it. The whole question thus resolved itself into these elements:—

1. To what extent were the contractor and his "sub" entitled to unearned or anticipated profits on such items as this when a deduction from the contract price was made?

2. What could be assumed to be the true anticipated profit of the subcontractor on the material he had hoped to sell?

3. If he were deprived of his sale price of $1 per yard on 2,556 cubic yards, what would that make the remainder of his excavating cost him per yard?

Answering the first of these, it is customary, in making deductions from a contract price (unless the items are *very* large), to deduct the computed net cost to the contractor without reducing his gross profits on the entire work, since those profits represent his interest in the whole transaction, the which is not lessened by the lopping off of minor items. Carried to a logical conclusion, this would appear to be true in the case of a subcontractor. The answers to the second and third queries were purely matters of conjecture. No definite evidence could be adduced as to the exact cost of the work per yard, since the contract included subsequent backfill and grading; but, for his own information, the architect set up some actual and some empirical figures:—

6,000 yds. to be taken out and graded, @ 90¢	$5,400
5,438 yds. to be taken out and removed, @ $1.25	6,798
Total	$12,198
To be derived from sale of 5,438 yds., @ $1	5,438
Net cost of excavating and grading	6,760
Subcontractor's profit	676
Contract price	$7,436

If it were costing 90 cents a yard to take the material out and re-handle it, it was probably costing about 60 cents net for the general excavating, and would cost about 15 cents additional per yard to haul it across the road to the south.

Thus was derived a figure of 75 cents per yard, which the architect fixed upon as his unit of cost. Not so the excavating contractor. He and the contractor attended the meeting, and the former let it be known whence, in his opinion, had come the idea of the change, and he added that he did not propose to allow disgruntled competitors to interfere with the profits on work he had beaten them out of. He insisted that he would lose 37½ cents profit on each yard of filling material of which he was deprived, and therefore could allow only a deduction of what would remain after these anticipated profits had been deducted from his cost per cubic yard, which he was willing to assume at 75 cents a yard, as the architect had reckoned it. The general contractor said he would allow a deduction of whatever his "sub" would consent to, but that he could not allow any of his own profit to be forfeited in the change. Here there entered the school principal, who did not intend to keep in the background in such matters, and who had also been doing some figuring. He estimated the saving to be 2,340 cubic yards at $1.15 a yard or $2,691, to which he had added the contractor's profit, making $2,960, as his idea of what should be credited to the owner.

The excavator's figure was $958.50 for the 2,556 yards, but he demanded, also, that he be allowed $100 for the delay he had been caused by not being allowed to proceed at once to the contract depth. This the architect vetoed promptly, both because there had been no delay up to that time, except as due to the storm, and because if there had been a delay to the extent of resultant damage, it would accrue only by going to the lower depth, not if the building were kept up the 3 feet. He also explained the discrepancy in the estimate of the principal, which was evidently due to his having used the net area of the building instead of the gross area to be excavated. The architect further dwelt upon the saving that had been made for the district by virtue of the excavator's having taken the work at a price so much under the $1.15 unit, which could not therefore be used in these computations, nor did he see reason for the contractor's assumption that he should be reimbursed for a conjectured possible profit, of which he had no definite evidence. The architect declared it to be the policy of his office, that, after a contract was signed, the profit to the contractor was thereby fixed for the given work, not to be disturbed by later deductions. He saw no reason why this policy should not be extended to the benefit of the subcontractor in this instance, but insisted that it applied to actual net profits and not to hypothetical earnings. He estimated the net cost of taking out the material and disposing of it at the least expense to be 75 cents per cubic yard, and hence was prepared to issue the order for the change, of which he approved, at that rate, or a total deduction of $1,917. The members of the board saw plainly that the principal's estimate was at fault, and the contractor was able to convince his "sub" that he had best accept the architect's figure.

The change in grade was from +118.00′ to +121.00′ on the north and from +116.00′ to + 117.00′ on the south. This left 2 feet of additional wall exposed on the south and parts of the two ends, which called for about 5,000 extra face brick. The architect took advantage of the change to add 12 inches to the height of the glass in both the upper and lower sash of the basement windows. For these latter changes, the architect and general contractor had readily agreed upon an extra cost of $467, leaving a net deduction of $1,450 for the change. This the architect supplemented by warning the board that, as yet, there could be no definite assurance that the footings as designed would be adequate at the new level. This could not be established until the bottoms of the trenches could be inspected, perhaps tested for bearing capacity.

The board next took up for reconsideration the subject of restoring the tile partitions throughout the building and eliminating the wood lath that were to have been substituted under the contract.

The architect next presented the bond of the general contractor and those of the electric and heating contractors for acceptance, and inquired if the board had received one from the plumbing contractor, a local man. The latter was present and asked that the board approve a personal bond, a copy of which he submitted, naming two prominent men as his sureties. He offered to deduct $400 if the personal bond were accepted. The bond was passed over to the board's attorney, who said the form was "O.K." and handed it back with a question as to how much the other form would have cost, insisting that, if the personal bond were accepted, the district should receive full credit for the difference in cost of the two forms. The contractor admitted that a surety bond would cost 1½ per cent of his contract price (which was $54,000) or $810, the which he grudgingly agreed to allow and which the board unanimously voted to accept. The members appeared to have quite forgotten the advice of the superintendent anent personal bonds, hence neither he nor the architect joined in the discussion, though the latter had a report from the superintendent to the effect that the plumber's reputation in the community was none too good, the which had been confirmed by an adverse report from a plumbing supply house. The reason for the architect's reticence (which

greatly surprised his superintendent) was that the next bid was $7,200 higher and was that of a concern in the architect's home town, toward which he was known to be friendly. He noted that this local man had at least two sponsors on the board, one of whom was the lumber dealer. It was later learned that the latter held the plumber's note for $1,200, which the latter had promised to liquidate out of his first payment,—and did. It was a good time for the architect to wait until spoken to, considering the insinuation already voiced to the effect that he welcomed opportunities for increasing his fee through enlarged building costs.

The architect produced the change orders and presented them for signatures, he having anticipated the board's action on both matters. The first of these read:

CHANGE ORDER NO. 1.
CONSOLIDATED DISTRICT SCHOOL
EAST MILLVILLE, P.M.

Millville, P.M., Apr. 24, 1928

Mr. J. Q. Brown, Contractor,
Millville, P.M.

Dear Sir:—Referring to your contract of April 2, 1928, *for the general construction of the East Millville Consolidated District School Building, you are hereby authorized to raise the established grade along the north front of the building from* + 118′0″, *as shown on drawing, to* + 121′0″, *without increasing the cubic contents of building or walls. The grade along the south side will be raised from* + 116′0″ *to* + 117′0″, *thus increasing the exposed area of basement walls on south elevation and on portions of east and west elevations* 2 *vertical feet. The glass area and brick facings on these elevations will be correspondingly increased.*

For the saving in excavating due to the foregoing change, there will be deducted from your contract price the sum of nineteen hundred seventeen and 00/100 *dollars* ($1,917); *and for the additional expense due to changes in basement windows and brick facing, you will be allowed the extra sum of four hundred sixty-seven and* 00/100 *dollars* ($467); *leaving the net sum of fourteen hundred fifty and* 00/100 *dollars* ($1,450) *to be deducted from your contract price on account of the foregoing changes.*

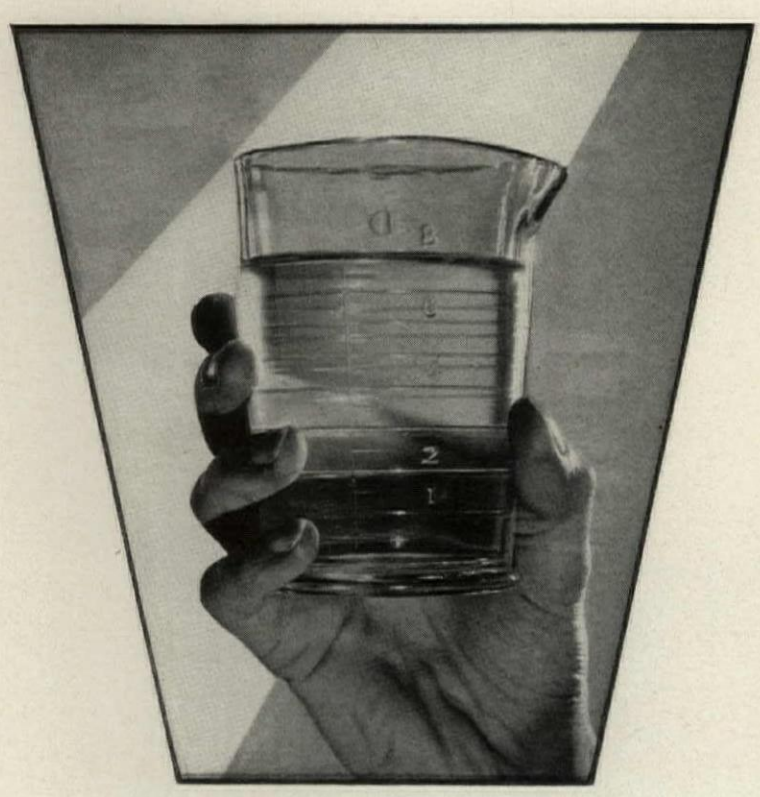
Signed, John Smith Jones, Architect
Approved, Consolidated School, District of
East Millville, P.M., Owner
By A. B. Hendricks, President
J. U. Petty, Clerk
Approved, J. Q. Brown, Contractor

Deduction,	$1,917
Extra,	467
Net Deduction,	$1,450

The foregoing account of these first job changes is related in detail, chiefly to impress upon the reader the importance of due formality and meticulous care in the conduct of all business transactions and the keeping of all records.* Nor can one be too diplomatic in observing due respect for the personal interests of the owner's representatives, whether these interests be proper or the reverse. In this case, the unbiased members of the board were well satisfied, and the lumber dealer was mollified for the loss of the sale of his wood lath by the assurance that the plumber would now be able to meet his note. The school principal was somewhat out of countenance, but no one appeared to censure him, and hence he was willing to bide his time, for he was beginning to harbor the idea that it would "be a feather in his cap" if he could catch the self-reliant superintendent in a serious mistake.

* Exhibit 22 on page 73 of the Handbook of Architectural Practice of The American Institute of Architects offers a proper standard form for contract changes. It contains no intimation, however, that such orders should be approved by the contractor. Such approval is of value, both as a means of forcing immediate settlement of any possible dispute regarding the terms of the order, and also as affording indisputable evidence on the subject later, in case the contractor should claim non-delivery or loss of the order or ignorance of its terms.

This series of articles by Mr. Beach, entitled "The Supervision of Construction Operations," began in the January, 1929, issue of The Architectural Forum *and continued in order in the February and April issues. In the July issue Mr. Beach will take up Chapter 7, "Foundations and Masonry Materials." The June issue is a Reference Number devoted exclusively to shops and stores, and consequently will not contain an article of this series.—The Editor.*



THIS WATER *contains important information for* ARCHITECTS

WATERS from different localities may be alike in color, taste and healthfulness — and yet differ greatly in their action on pipe. Depending on their sources and the treatment they undergo, some waters are but *normally* corrosive while others are *highly* corrosive.

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

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

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

Proved by 16 years of testing!

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

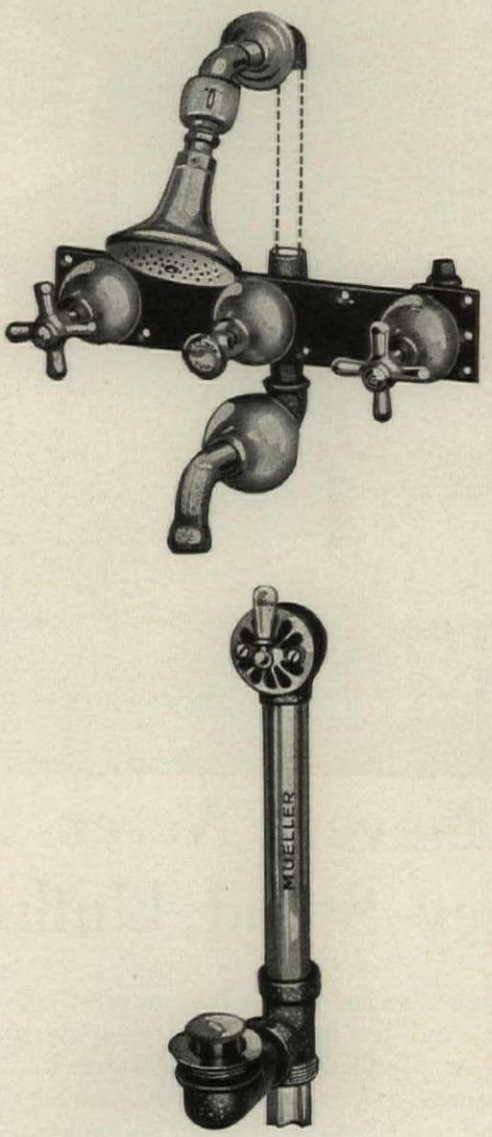
An important service to architects

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

ANACONDA BRASS PIPE

FOR HOT AND COLD WATER LINES

No more surprise showers *with* Mueller Automatic Diverter Valve



A NEW Mueller feature especially desirable for hotel and apartment tub and shower installations.

The MUELLER *Automatic Diverter Valve* eliminates all danger of an unexpected shower for anyone not familiar with the operation of the fitting. It assures of the flow remaining diverted to the tub when the side or control valves have been shut off.

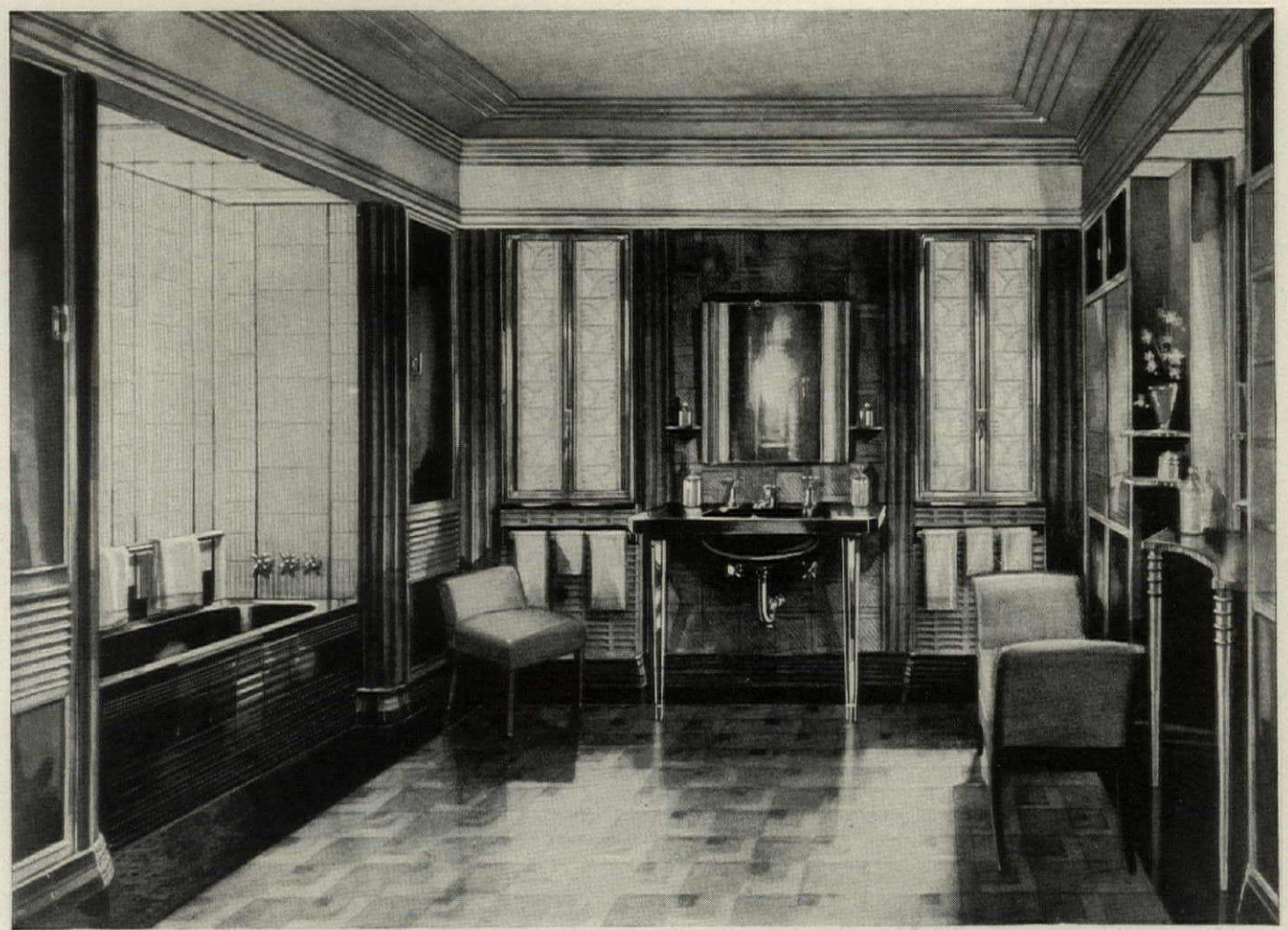
Four styles to choose from—send for complete information on this new improved Mueller quality fitting.

MUELLER CO. (Established 1857) Decatur, Illinois. World's Largest Manufacturers of Plumbing Brass Goods. *Branches:* New York, Dallas, San Francisco, Los Angeles.

Canadian Factory: MUELLER, Limited, Sarnia.

MUELLER

PLUMBING BRASS AND VITREOUS WARE

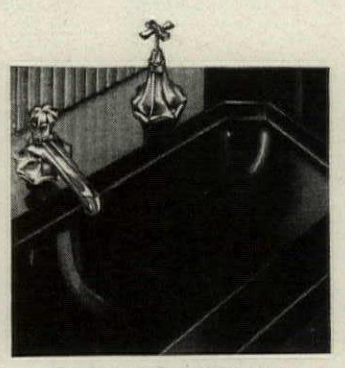


A modern bath and dressing room, designed by Ely Jacques Kahn, Architect, New York City. Plumbing fixtures by Kohler of Kohler.

Kohler Colored Fixtures In the Metropolitan Museum of Art

KOHLER OF KOHLER makes appreciative acknowledgment of the compliment conveyed by the selection of Kohler colored plumbing fixtures for this distinguished bath and dressing room, designed by Mr. Ely Jacques Kahn for the Metropolitan Museum's current Exhibition of American Industrial Art.

The purpose of the group of eminent architects who collaborated to make this exhibition possible was to interpret the tempo of today and to direct modern stylistic trends along lines which, favoring no foreign national models, would assure the correct use of appropriate modern materials.



To match the beauty of jet black Kohler fixtures, Mr. Kahn chose Kohler fittings in chromium plate

Nowhere, we believe, was this purpose more admirably realized than in the beautifully logical simplicity of Mr. Kahn's bathroom . . . in the clear note of comfort and utility pervading this room, with its walls of colored glass, its floor of yielding rubber, and its Kohler plumbing fixtures in jet black, with their chromium-plated Kohler fittings.

"It Pays to Modernize Your Plumbing and Heating."

KOHLER CO., *Founded 1873*, Kohler, Wis. • *Shipping Point*, Sheboygan, Wis., • *Branches in Principal Cities*

KOHLER OF KOHLER

Plumbing Fixtures

LOOK FOR THE KOHLER TRADE MARK ON EACH FIXTURE

DOUGLAS SOLID NICKEL SILVER FITTINGS - STAND - THE TEST OF TIME

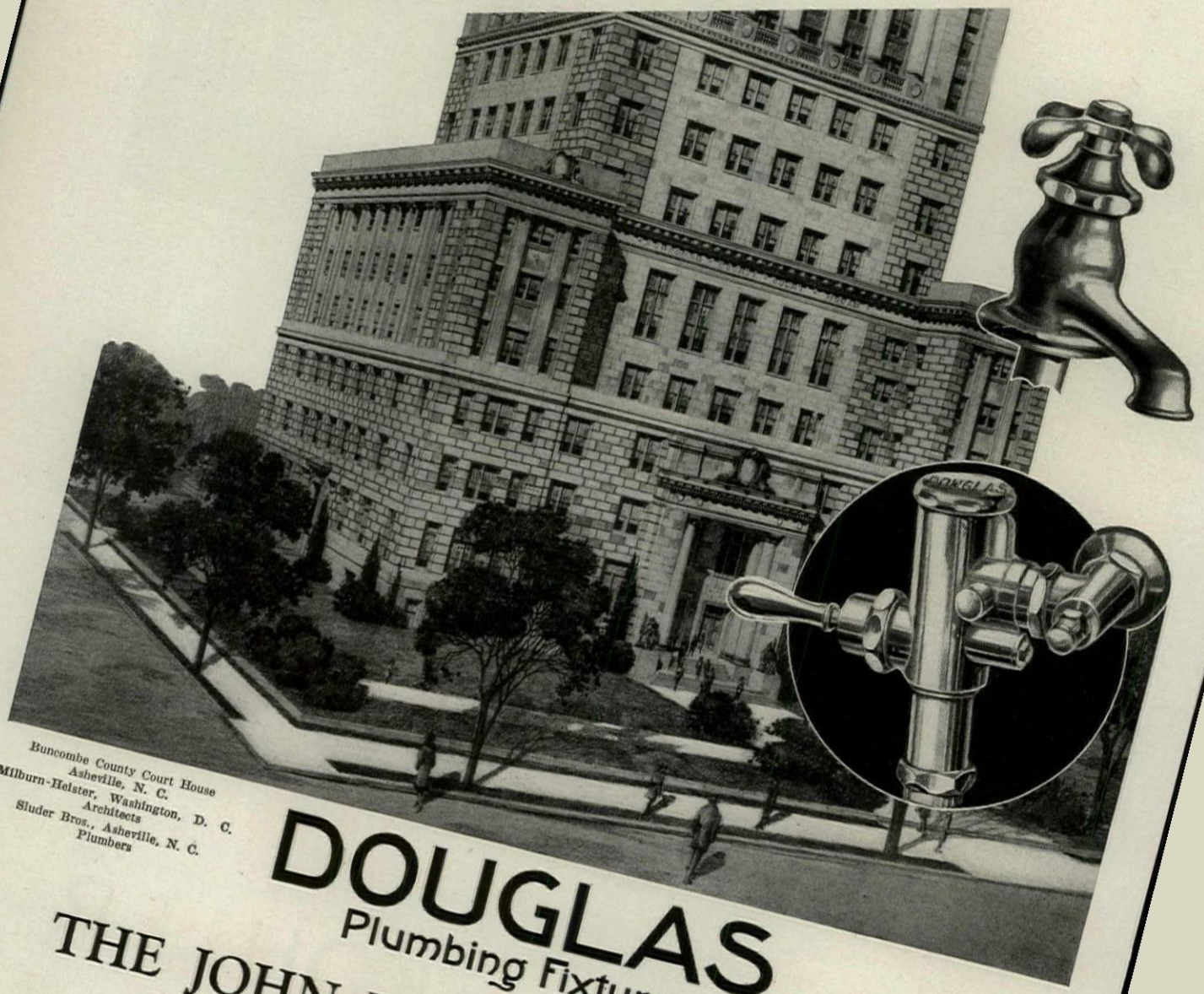
YEARS of public usage mean nothing to Douglas Solid Nickel Silver plumbing fixture fittings. Long after the plating of ordinary fittings has been worn away by constant polishing and after they have become unsightly you will find Douglas Solid Nickel Silver fittings looking like new.

The reason is that Douglas Solid Nickel Silver is an alloy of at least 20% nickel and has the tensile strength of tough bronze. The color is identical with Nickel Plate and is solid all the way through.

When architects specify fittings of this kind they may be assured of the best that can be had and that their selection will reflect credit.

Remember that Douglas Solid Nickel Silver fittings are not plated, that they are carefully machined and that each fitting has been tested under water pressure.

A request will bring you descriptive literature by return mail.



Buncombe County Court House
Asheville, N. C.
Milburn-Heister, Washington, D. C.
Architects
Sluder Bros., Asheville, N. C.
Plumbers

DOUGLAS
Plumbing Fixtures

THE JOHN DOUGLAS COMPANY
CINCINNATI, OHIO

Women *are entitled to this consideration*

PERHAPS it is because today's bathroom equipment is designed by men and today's bathrooms principally planned by men . . .

But the somewhat startling fact is that one of the most important fixtures of the bathroom is generally designed without regard for an ever-present and embarrassing problem of feminine hygiene.

The average water closet found even in pretentious homes today has a small trapway—so small, in fact, that it will scarcely pass a golf ball. Such a closet is manifestly physically unfit to properly dispose of modern sanitary pads. Where repeated disposal is attempted, stoppage must sooner or later follow. This intolerable condition is a constant problem, not only in homes, but in every business establishment where women are employed.

Maddock's Improved Madera will pass sanitary pads. ★ It has a large, oversize trapway. The twin-jet, siphon flushing is extremely powerful, yet quiet. Disposal is swift and sure.

The Madera has a long bowl and long, comfortable seat, large water area, snowy, flawless Durock body and finest fittings. Famous from its national advertising, it is as beautiful and supremely sanitary a closet as can be found today. Include it in your next specifications. Thomas Maddock's Sons Co., Trenton, N. J.

★ For homes and buildings in which the sanitary pad is not a problem, Maddock offers the Madbrook, with long bowl and seat, large water area. Also the dependable Maderno.

To make $500 .. look like $1000

Problem . . .

A limited amount of money to spend for a bathroom. Client wants distinction and beauty. Won't be satisfied unless he gets it. How to make a $500 bathroom look like the $1000 variety?

? ? ? ?

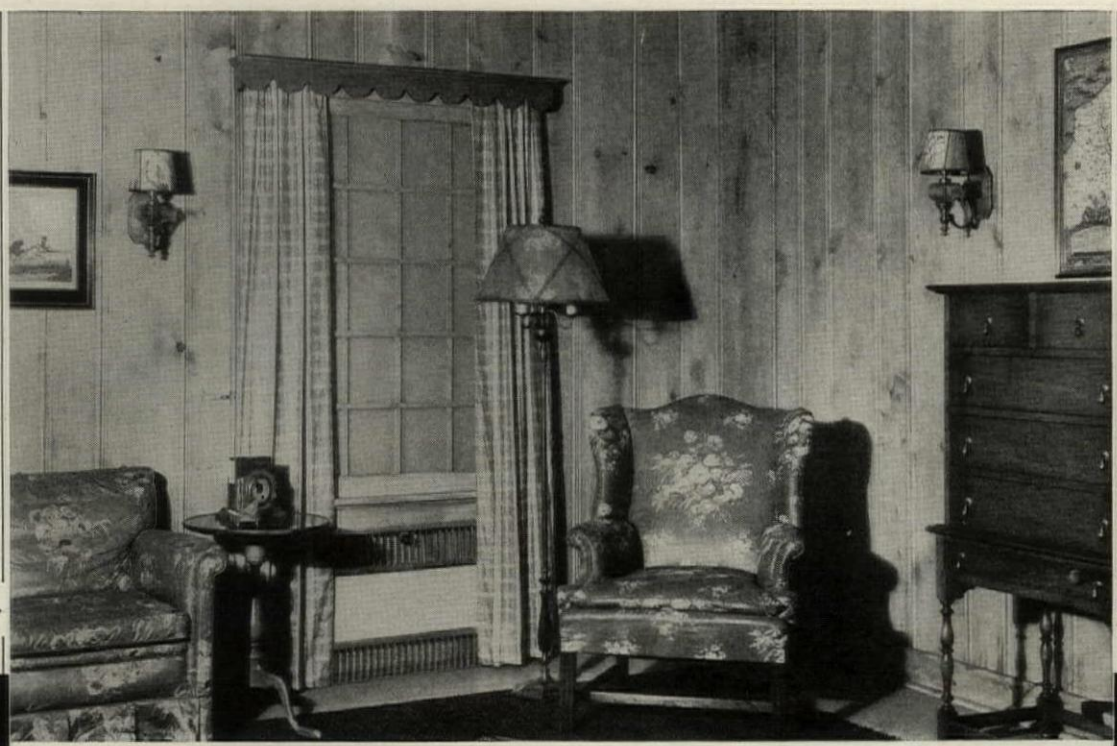
Solution . . .

Take a lesson from the dinner-table, —its good taste, sparkle and lustre are due in no small extent to the beauty and character of the silverware. Because this is no less true for the bathroom, we suggest that you specify mirror-bright, graceful fixtures of Speakman chromium plate for shower, lavatory and tub.* They have eye-catching beauty, as new in ten years as today. They never tarnish. They never need polishing. They are made to hair-breadth accuracy by skilled artist-craftsmen. They make moderate-priced bathrooms superlatively beautiful. Speakman Company, Wilmington, Delaware.

*Kitchen sinks, too.

Get the facts on the Speakman Artline group, a brilliant family in Speakman chromium plate.

SPEAKMAN
SHOWERS & FIXTURES



The Trane Bellows Packless Valve.

The Trane Bellows Radiator Trap

When the Client Demands this New Style of Concealed Heating

The owner usually thinks of concealed heating primarily as a matter of style which vitally affects the appearance of his rooms. And knowing the lightning rapidity of style changes, he is uneasy if this trend is ignored. But you have the broader problem of producing a successful heating installation, handled without a hitch through the various steps of construction.

The Trane Concealed Heater is the answer to the questions you naturally formulate when concealed heating is up for consideration. It embodies all the original features of the Trane Concealed Heater, including the Trane Copper Heating Element, instantaneous control, etc. It requires no special construction in walls of ordinary thickness. The unit is completely built at the factory — no extras. One man installs it — no trade disputes. And the entire front panel is removable at the turn of a few screws, for easy access should it be necessary.

You can specify "Trane" with equal confidence in the other departments of heating served by Trane products. When you install Trane Bellows Traps or Valves, for example, you take advantage of the precision standards established in the Trane factory and maintained by an elaborate system of testing, including tests originated by Trane and used nowhere else. The Trane Bellows is tested with steam — tested for tension — tested for mechanical breakdown — tested by the Bureau of Standards method under operating conditions. You can depend on heating products bearing the Trane label.

THE TRANE CO., Department 5
220 CAMERON AVENUE LA CROSSE, WIS.
THE TRANE CO. OF CANADA, LTD., TORONTO

HEAT CABINETS **TRANE** CONCEALED HEATERS
PUMPS, UNIT HEATERS, AND HEATING SPECIALTIES

THE TRANE COMPANY, (*Est. 1885*)
Dept. 5—220 Cameron Ave., La Crosse, Wis.

Send free booklet on the new style in heating.

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Address _____

Maccabees Building, Detroit, Michigan
Albert Kahn, Inc., Architects

Why We Call it "5-Point" Pipe

Reading Genuine Puddled Wrought Iron Pipe is called "5-Point" Pipe because it is the only pipe material ever developed which gives you and your clients in so great a measure the five major protective qualities that make pipe endure.

These qualities are assured by the puddling process—the kneading and working together of fiery, pure pig iron and silicious slag inside a flame-filled furnace. Generations of experience have shown that this is the only way to make Genuine Puddled Wrought Iron Pipe—the pipe that outlasts the building!

Reading 5-Point Pipe gives you five guarantees that your clients will get full protection from pipe troubles. Its cost is truly moderate. At your request, an engineer of the Reading Iron Company will be glad to explain the remarkable economy of Reading 5-Point Pipe—identified by the Reading name, date of manufacture and cut-in spiral knurl mark. Just drop us a line today.

READING IRON COMPANY, Reading, Pennsylvania

Atlanta · Baltimore · Cleveland · New York · Philadelphia
Boston · Cincinnati · St. Louis · Chicago · New Orleans
Buffalo · Houston · Tulsa · Seattle · San Francisco
Detroit · Pittsburgh · Ft. Worth · Los Angeles

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

Dependable Information on Steel Products

EVERY district sales office of The Youngstown Sheet & Tube Company is a "consulting room" maintained for the service of users of steel. There you can go with any question regarding pipe, sheet-metal or electrical conduit with the assurance that it will receive the prompt, courteous attention of a specialist. A telephone call will bring this service.

Should your problem prove to be new or complex, these offices have at their immediate disposal all the facilities of The Youngstown Sheet & Tube Company's modern research laboratories and skilled engineers.

For sound advice on any problem in steel do not hesitate to call upon the nearest Youngtsown office—they are there to serve you.

Chanin Building, New York, in which Youngstown steel pipe is used for plumbing and heating.

Architects—SLOAN & ROBERTSON
Mechanical Engineers—CLARK, McMULLEN & RIELEY
Plumbing Contractor—LOUIS BLACK
Heating Contractor—JARCHO BROS.

THE YOUNGSTOWN SHEET & TUBE COMPANY

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

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PITTSBURGH—Oliver Bldg.
SAVANNAH—M and M T Terminals
SAN FRANCISCO—55 New Montgomery St.
SEATTLE—Central Bldg.
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YOUNGSTOWN

No Guesswork the PURE IRON WAY

WHEN you select ARMCO Ingot Iron for the sheet metal parts of that new building, you've eliminated the element of chance in your choice of materials.

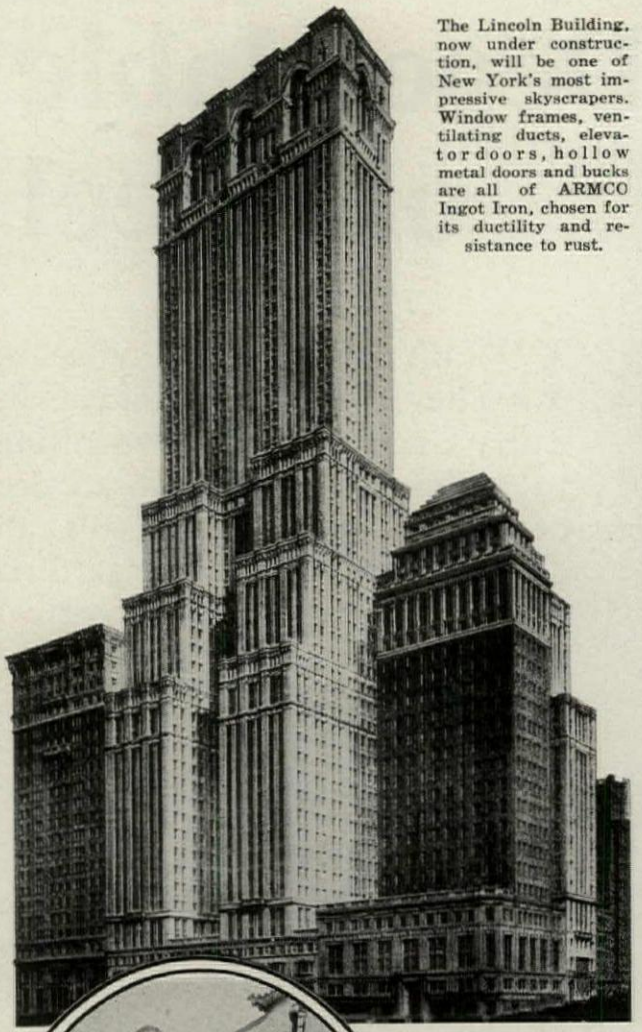
Twenty-two years of exacting service has demonstrated the fitness of this "purest of all irons" for every type of architectural sheet metal construction.

Workability, rust-resistance, long, low-cost service—these are the advantages of ARMCO Ingot Iron that will serve you well.

Moreover, ARMCO Ingot Iron is uniformly pure and dependable. Sheet by sheet and plate by plate it is consistently the same.

Submit your sheet or plate problems to the office nearest you. They'll be glad to work with you for best results.

[See page 510, Section A of Sweet's Architectural Catalog, for additional data on ARMCO Ingot Iron.]



The Lincoln Building, now under construction, will be one of New York's most impressive skyscrapers. Window frames, ventilating ducts, elevator doors, hollow metal doors and bucks are all of ARMCO Ingot Iron, chosen for its ductility and resistance to rust.

The Ming Yee Building, San Francisco, is well equipped and protected with durable ARMCO Ingot Iron. The architect, Charles E. Rogers, specified **pure iron** for marquises, ventilators, ornaments and metal tile because of its pronounced workability and longevity.

THE AMERICAN ROLLING MILL CO.
Executive Offices, Middletown, Ohio
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A Directory of Sheet Metal Savings—with ARMCO Ingot Iron

Clothes Chutes	Flashing
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Downspouts	Hollow Metal Doors
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Medicine Cabinets	Roofing
Metal Base	Rolling Doors
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ARMCO

ARMCO INGOT IRON RESISTS RUST

"— or equal" can't give you UNIVENT VENTILATION

because Univent results are due to exclusive features that cannot be duplicated

SUCCESSFUL results of the Univent have brought national recognition to the basic idea of unit ventilation. With success has come imitation; but—imitation is not duplication.

Thanks to the architect, this fact is becoming known to the public: the results of Univent Ventilation *cannot* be duplicated by any other unit ventilator. The Univent's important features *are* exclusive to the Univent.

The Univent is a complete individual ventilation machine which draws fresh air directly from out of doors, cleans it, warms it to a comfortable temperature, distributes it gently, silently yet thoroughly throughout the room. Windows may remain shut. Dangerous drafts are eliminated.

Univent *and* Glass *make the difference*

UNIVENT (TRADE MARK)

For schools, hospitals, telephone companies, office and public buildings, the Univent has created a new standard of helpful, economical ventilation. The Architects' and Engineers' edition of "Univent Ventilation" will be gladly sent to you upon request. The Herman Nelson Corporation, Moline, Illinois.

Our Contribution
to the art of Heating & Ventilation

SIX YEARS AGO when the Herman Nelson light weight, compact, indestructible radiator was placed on the market, it was immediately accepted as the greatest advance in the art of Heating and Ventilation in a generation. It has made possible heating and ventilation dependability and performance hitherto unattainable. The Herman Nelson Wedge Core Radiator is an exclusive feature of all Herman Nelson Heating and Ventilating Products and accounts for their unequaled performance.

HEATING · VENTILATING · COOLING · DRYING · CONDENSING

UNIVENT

for the ventilation of schools, hospitals, offices and other buildings presenting an acute ventilating problem.

HERMAN NELSON
Invisible
RADIATOR

... supersedes all previous radiators, radiator cabinets or enclosures. Occupies no room space and makes possible any desired decorative scheme or furniture arrangement. Indestructible in service.

THE HERMAN NELSON
hiJet
HEATER

It operates at steam pressures from 1 to 150 lbs., and offers the better and more economical way of diffusing heat in Factories, Railroad Shops, Roundhouses, Mills, Warehouses, Garages, Gymnasiums and Industrial Buildings.

Herman Nelson Radiator Sections
for Blast Heating and Cooling

Indestructible, operating at any steam pressure from 1 to 150 lbs., non-corrosive and leak-proof. May be arranged in banks to solve any special problem of heating or cooling.

THE HERMAN NELSON CORPORATION · *Moline, Illinois*

Builders of Successful Heating and Ventilating Equipment for over 20 Years

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PROVIDENCE	PHILADELPHIA	CHARLOTTE, N. C.	CLEVELAND	INDIANAPOLIS	GREEN BAY	ATLANTA	EMPORIA	SPOKANE	VANCOUVER
NEW YORK CITY	WASHINGTON, D. C.	GRAND RAPIDS	COLUMBUS	CHICAGO	MINNEAPOLIS	MEMPHIS	KANSAS CITY	PORTLAND	TORONTO
									WINNIPEG, MAN.

Of the whole installation cost, the pipe *isn't* 10%

DRIVE that down as the first peg in our survey of the case, Mr. Bardwell. Even if we specify Byers, the pipe alone represents only one tenth of our complete piping installation. The rest is fittings, freight, cartage, labor, incidentals, and overhead. If the proportion is surprising to you, I can verify it from the detailed estimates.

It does sound a little surprising; but go on with your analysis.

Well, comparing with Byers, if we could get other pipe for nothing, all we should save on our system as a whole would be 10%.

I understand.

Now of course we can't save all that 10%; for even the cheapest pipe costs something. What we have to consider is how much we can save, and whether it's a real saving, in the sense of being a real economy.

Well, how much can we save?

Let's be liberal in our answer. Let's say we can save half the cost of Byers. We can't, quite, for no pipe can be bought for half this estimate; but suppose it could. Then our saving on the whole cost of our pipe system would be half of 10% or 5%. That isn't too much of a premium to pay for length of life in a thing so vital as the pipe, is it?

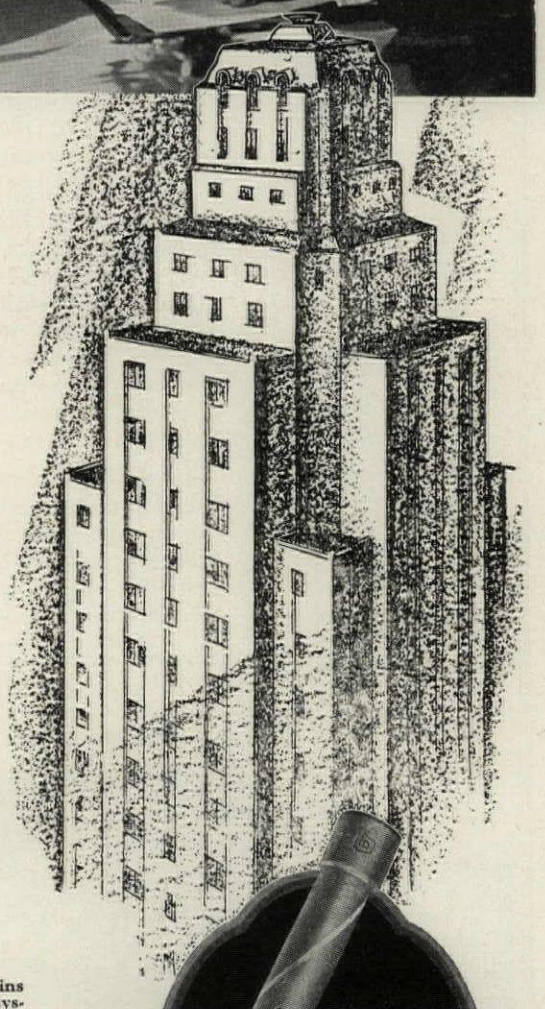
Not if there's any great difference in the service to be expected. How much longer will wrought iron last?

Taking an average, in different cities the country over, about twice as long as ordinary merchant pipe. The difference under our conditions here, engineers advise us, is rather more.

What you're trying to sell me, then, Mr. Ross, is double service for 5% added cost?

About that, yes. We've every reason to think it'll be at least double.

I'm sold already. I've heard a good deal about the excellence of Byers Pipe; but I never saw the extra cost in its true light as an investment in durability. I approve of the specification as it stands—Byers Pipe throughout.



A. M. BYERS COMPANY
Established 1864 Pittsburgh, Pa.
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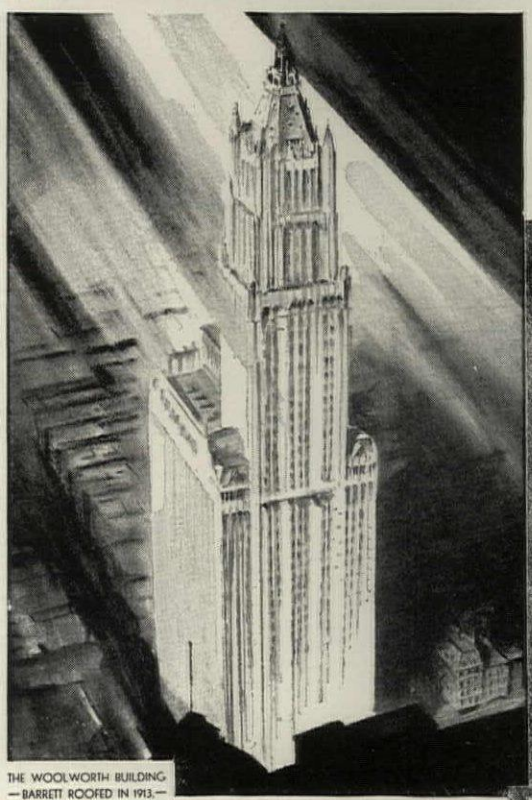
Send for Bulletin No. 38
"The Installation Cost of Pipe" contains analyses of the cost of scores of pipe systems and also of replacements. Send for this valuable book. It's free.

BYERS PIPE

GENUINE WROUGHT IRON

WOOLWORTH *prefers to* ROOF *according to the* BARRETT SPECIFICATION



THE WOOLWORTH BUILDING —BARRETT ROOFED IN 1913.—

The same ROOF *the* same *SERVICE* *in metropolis or province*

Find efficiency, and keep it! Well-organized business adopts that policy—and keeps it.

Many years ago the F. W. Woolworth Co. learned of an unmatched value in roofs and roof service. A Barrett Roof became a part of the majestic Woolworth Building—and today Woolworth rarely roofs or re-roofs any of its properties with other than a Barrett Specification Roof, applied by a Barrett Approved Roofer and bonded for 20 years against repair or maintenance expense.

The first consideration, of course, is twenty years of bonded expense-free performance. But two other major considerations also influence the choice of this roof:

(1) Woolworth knows that Barrett Specification Roofs far outlive the 20-year* guarantee in the bond;

(2) Woolworth knows that, wherever it buys, it can deal with a Barrett Approved Roofer and profit by Barrett Inspection Service.

The nation-wide recognition of Barrett Coal-tar Pitch and Felt roofs is the result of seventy-five years of endeavor and experience. Architects and builders can point to 30-, 40- and even 50-year roofs of *Barrett Coal-tar Pitch and Felt and gravel* that have outlasted countless changes in building methods, without *once* surrendering to weather or wear. *Without once costing a penny for repairs!*

Guaranteed for 20 years is a watchword with Barrett. But it is the 10, 15, 20 and 30 years' service *beyond* that time that has so firmly established Barrett as standard.

There is a Barrett Approved Roofer within easy reach of your business.

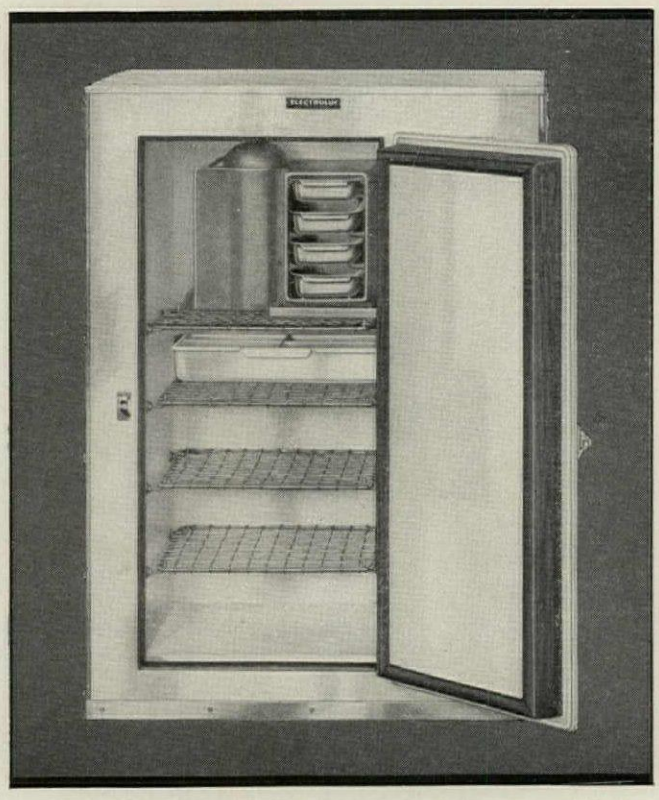
*The Barrett Company also offers a Specification Type "A" Roof which is bonded for 10 years. This type of roof is adaptable to a certain class of buildings. The same high-grade materials are used, the only difference being in the quantities.

Barrett Specification Roofs are constructed of alternate layers of prime quality tarred felt and the finest coal-tar pitch, armored and fire-safed with surface-imbedded gravel or slag. They are laid by Barrett Approved Roofers according to the Barrett Specification and bonded by Barrett against repair or maintenance expense.

Barrett Specification Roofs

Inspected and Bonded by Barrett

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



THE NEW YORKER *model Electrolux has a food capacity of three cubic feet and makes forty large ice cubes between meals. Specially designed for serving pantry or kitchenette.*

Now...

a Gas Refrigerator for the smallest apartment kitchen

New Electrolux New Yorker model specially designed for the serving pantry or kitchenette

A REFRIGERATOR for the small apartment no problem now. The new model Electrolux was designed to fill this need. It's called the New Yorker and fits in a space only 26 1-8 inches by 19 9-16 inches.

The New Yorker possesses all the unique qualities that have made the other Electrolux models so popular. Ample food space . . . plenty of large ice cubes . . . perfect refrigeration at all times . . . And it is absolutely noiseless. The Electrolux has no machinery or moving parts to wear, get out of order, or make the slightest whisper of sound. A tiny gas flame and a trickle of water do all the work of making endless, dry cold.

The Gas Refrigerator costs far less to operate than any other refrigerating system. And no moving parts means no irritating repair and replacement bills.

There are many different Electrolux models. One for the largest mansion and one for the tiniest apartment. A letter will bring you complete specifications. No obligation. Just address your request to: Servel Sales, Inc., Evansville, Indiana.

ELECTROLUX

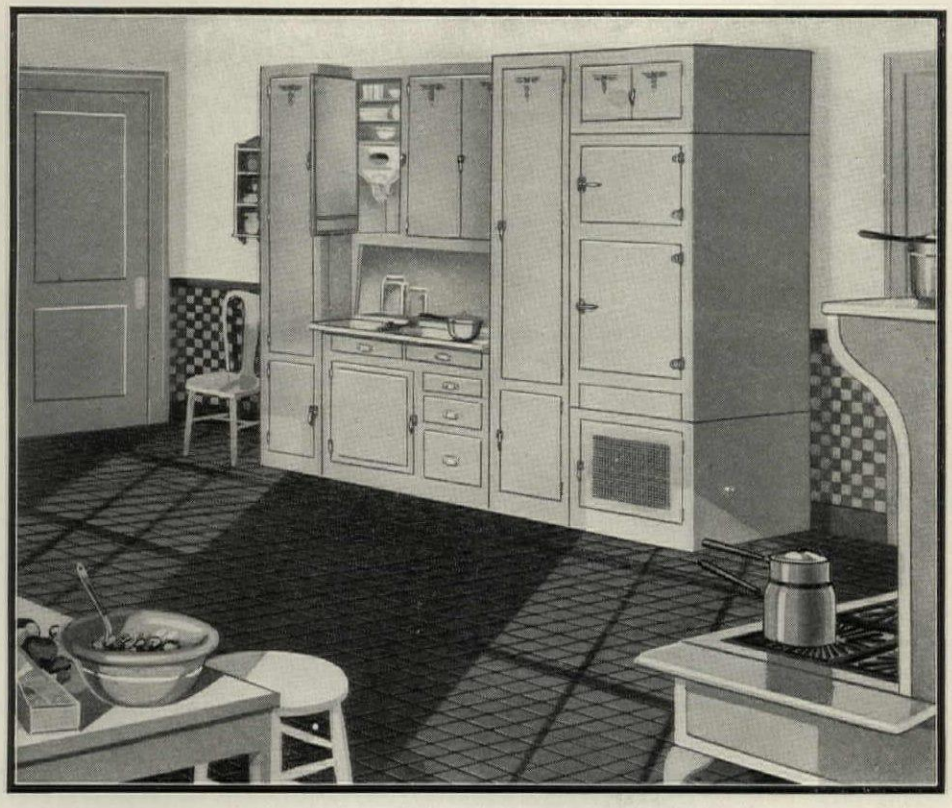
THE GAS REFRIGERATOR

MADE BY SERVEL

KITCHEN MAID

STANDARD KITCHEN UNITS

KITCHEN MAID
STANDARD UNIT SYSTEMS



FLEXIBILITY . . . plus features that spell *client satisfaction*

So varied and so flexible are the new Kitchen Maid Units that, no matter what style or size of kitchen you are planning, there are units to fit your equipment specifications.

But even more important is the fact that these units possess features which invariably meet the ideals of those who pay for their installation.

They provide color to harmonize with any interior scheme—a choice of Pastel Green, Cactus Green, Travertine Ivory, Dove Gray or Shasta White enamel finish.

They offer a new degree of sanitation; rounded inside corners; smooth surface, five-ply lumber cove doors; concealed hinges with chromium plating; enameled compartments for pots and pans; rust-proof catches, strikes and interior hardware; opalescent glass drawer pulls.

And Kitchen Maid Units, moreover, have back of their manufacture the experience and craftsmanship of America's largest exclusive makers of built-in equipment for the kitchen. Let us send you our catalogue, dimensional drawings and prices.

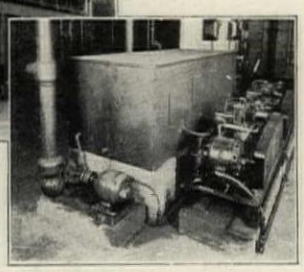
Right: the Dinofold ready to serve four people. Sturdy, rigid, charming in appearance. There is a color combination to harmonize with any kitchen color scheme.

Above: the Dinofold—folded up and out of the way in an instant. May be used on wall, door, or in wall recess.

WASMUTH-ENDICOTT COMPANY, 1305 Snowden St., Andrews, Ind.

REPRESENTATIVES IN ALL PRINCIPAL CITIES. IF IN CANADA, ADDRESS BRANCH OFFICE WATERLOO, ONT.

Frigidaire Water Coolers add to the comfort, health and satisfaction of tenants in the Breslin Building, Louisville, Ky. It is one of the most popular and successful modern office buildings in the city. Joseph & Joseph, architects.



Frigidaire Compressors in Breslin Building.

That slight difference between the obsolete and the new

WE consider the old method of cooling water with ice practically obsolete," write Joseph & Joseph, designers of the Breslin Building. Louisville, Ky. "The various Frigidaire equipments used in our work have proved highly satisfactory."

Buildings with obsolete water cooling equipment cannot compete upon equal footing with those that are modernized with Frigidaire Water Coolers. Frigidaire provides the final touch of perfect service that sets the well planned and expertly managed property apart from the mass. It attracts the more desirable class of buyers and renters, speeds up sales and rentals, and builds up net profits... all at lower operating cost than must be paid for inefficient methods of water cooling.

Make a full investigation. Learn about the low costs and the new, easy G.M.A.C. terms to builders and owners. Payment may be made either out of income or capital, as most convenient. Write a memo for complete imformation today. Frigidaire Corporation, Subsidiary of General Motors Corporation, Dayton, O.

FRIGIDAIRE

The QUIET Automatic Refrigerator

COLOR *in Te-pe-co Bathrooms*

STRIKING in originality, this bathroom vibrates with the spirit of modern art. The pleasing variation in the color of its appointments and decorative scheme, is evidence of how greater interest, beauty and cheerfulness may be obtained by the artistic blending or contrasting of several harmonious colors. A marked departure from the conventional form of decorative scheme, it is an excellent example of how various colors may be employed in the creation of beautiful bathrooms.

In delicate tints that blend delightfully with whatever color effect you may desire, Te-pe-co Vitreous China and Porcelain Plumbing Fixtures afford the utmost in beauty and sanitation. Whatever Te-pe-co color you may prefer carries the same guarantee of quality and durability.

THE TRENTON POTTERIES COMPANY
Trenton, New Jersey, U.S.A.

National Exhibit Rooms
101 Park Ave., New York City
Entrance on 41st Street

Sales offices in
Philadelphia, Boston
and San Francisco

Export Office: 115 Broad St., New York City

THE TRENTON POTTERIES COMPANY
TEPECO
TRENTON, N.J. U.S.A.

Our Guarantee

The Trenton Potteries Company makes but one grade of ware—the best that we can produce—and sells it at reasonable prices. We sell no seconds or culls. Our ware is guaranteed to be equal in quality and durability to any sanitary ware made in the world. The TE-PE-CO trade mark is found on all goods manufactured by this Company and is your guarantee that you have received that for which you have paid.

A copy of "Bathrooms of Character" Edition B —together with color chart showing the various tints and grainings of Te-pe-co ware, will be forwarded upon receipt of 10c in postage.

TE-PE-CO
ALL CLAY PLUMBING FIXTURES

Photographed by the Rager Photographic

AMERICAN INSURANCE UNION CITADEL
50 West Broad Street, Columbus, Ohio
Architect & Engineer: C. Howard Crane of Detroit, Mich.
Associate Architect: J. Upton Gribben, Columbus, Ohio
General Contractor: John Gill & Sons, Cleveland, Ohio
Electrical Contractor: Iron City Engineering Co., Detroit, Mich.

Equipped with GENERAL ELECTRIC WIRING MATERIALS

Rising high into the clouds stands the American Insurance Union Citadel . . . splendid, impressive, modern! Its architect, engineers and builders may well be proud.

They have created a beautiful structure, and they have made a practical, comfortable building as well.

Lasting electrical efficiency is assured because, hidden behind its walls, are General Electric Wiring Materials. They will cut maintenance costs and maintain the high standards of electrical service. The General Electric name guarantees that!

GENERAL ELECTRIC WIRING SYSTEM

MERCHANDISE DEPARTMENT · GENERAL ELECTRIC COMPANY · BRIDGEPORT, CONNECTICUT

Selected List of Manufacturers' Publications

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

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

ACOUSTICS

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

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

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.

Making the Most of Your Protectomotor. Folder, 6 pp., 3½ x 6½ ins. Illustrated.

The Protectomotor Industrial Air Filter. Folder, 6 pp., 4 x 9 ins. Illustrated.

Introducing the Model C. P. Pipe Line Filter. Folder, 8 pp., 4 x 9 ins. Illustrated.

ASPHALT

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

Genasco Trinidad Lake Asphalt Mastic. Brochure, 32 pp., 6 x 9 ins.

Specifications for Applying Genasco. Booklet, 16 pp., 8 x 10½ ins.

BATHROOM FITTINGS

A. P. W. Paper Co., Albany, N. Y.
Onliwon for Fine Buildings. Folder, 8 pp., 3¼ x 6 ins. Illustrated. Deals with toilet paper fittings of metal and porcelain.

Architects' File Card. 8½ x 11 ins. Illustrated. Filing card on toilet paper and paper towel cabinets.

A Towel Built for Its Job. Booklet, 8 pp., 4¼ x 9⅝ ins. Illustrated. Paper Towel System and Cabinets.

Cabinets and Fixtures. Booklet, 32 pp., 5¾ x 4¾ ins. Illustrated. Catalog and price list of fixtures and cabinets.

BRICK

American Face Brick Association, 1751 Peoples Life Building, Chicago, Ill.
Brickwork in Italy. 298 pp., size 7½ x 10½ ins., an attractive and useful volume on the history and use of brick in Italy from ancient to modern times, profusely illustrated with 69 line drawings, 300 half-tones, and 20 colored plates, with a map of modern and XII century Italy. Bound in linen. Price now $3.00, postpaid (formerly $6.00). Half Morocco, $7.00.

Industrial Buildings and Housing. Bound Volume, 112 pp., 8½ x 11 ins. Profusely illustrated. Deals with the planning of factories and employes' housing in detail. Suggestions are given for interior arrangements, including restaurants and rest rooms. Price now $1.00 postpaid (formerly $2.00).

Common Brick Mfrs. Assn. of America, 2134 Guarantee Title Bldg., Cleveland.
Brick; How to Build and Estimate. Brochure, 96 pp., 8½ x 11 ins. Illustrated. Complete data on use of brick.

The Heart of the Home. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Price 25 cents. Deals with construction of fireplaces and chimneys.

Skintled Brickwork. Brochure, 16 pp., 8½ x 11 ins. Illustrated. Tells how to secure interesting effects with common brick.

Building Economy. Monthly magazine, 22 pp., 8½ x 11 ins. Illustrated. $1 per year, 10 cents a copy. For architects, builders and contractors.

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

CEMENT

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

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

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

CEMENT—Continued

Portland Cement Association, Chicago, Ill.
Concrete Masonry Construction. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.

Town and Country Houses of Concrete Masonry. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

Facts About Concrete Building Tile. Brochure, 16 pp., 8½ x 11 ins. Illustrated.

The Key to Firesafe Homes. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

Design and Control of Concrete Mixers. Brochure, 32 pp., 8½ x 11 ins. Illustrated.

Portland Cement Stucco. Booklet, 64 pp., 8½ x 11 ins. Illustrated.

Concrete in Architecture. Bound Volume, 60 pp., 8½ x 11 ins. Illustrated. An excellent work, giving views of exteriors and interiors.

CONCRETE BUILDING MATERIALS

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

CONCRETE COLORINGS

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Color Mix, Colored Hardened Concrete Floors (integral). Brochure, 16 pp., 8½ x 11 ins. Illustrated. Data on coloring for floors.

Dychrome. Concrete Surface Hardener in Colors. Folder, 4 pp., 8 x 11 ins. Illustrated. Data on a new treatment.

CONSTRUCTION, FIREPROOF

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

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

North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
North Western Expanded Metal Products. Booklet, 8½ x 10¾ ins. 16 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated, Plaster-Sava and Longspan lath channels, etc.

A. I. A. Sample Book. Bound volume, 8½ x 11 ins., contains actual samples of several materials and complete data regarding their use.

CONSTRUCTION, STONE AND TERRA COTTA

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

DAMPPROOFING

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Waterproofing and Dampproofing Specification Manual. Booklet, 18 pp., 8½ x 11 ins. Deals with methods and materials used.

Waterproofing and Dampproofing. File. 36 pp. Complete descriptions and detailed specifications for materials used in building and concrete.

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

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

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

Par-Lock Specification "Form J" for dampproofing the tile wall surfaces that are to be plastered.

Par-Lock Dampproofing. Specification Forms C, F, I, and J. Sheets 8½ x 11 ins. Data on gun-applied asphalt dampproofing for floors and walls.

DOORS AND TRIM, METAL

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

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — *Continued from page 189*

DOORS AND TRIM, METAL—Continued

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

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, N. Y.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¼ ins., 60 pp. Illustrated.

Catalog and pamphlets, 8½ x 11 ins. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT

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

General Electric Co., Merchandise Dept., Bridgeport, Conn.
Wiring System Specification Data for Apartment Houses and Apartment Hotels. Booklet, 20 pp., 8 x 10 ins. Illustrated.

Electrical Specification Data for Architects. Brochure, 36 pp., 8 x 10½ ins. Illustrated. Data regarding G. E. wiring materials and their use.

The House of a Hundred Comforts. Booklet, 40 pp., 8 x 10½ ins. Illustrated. Dwells on importance of adequate wiring.

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

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.

School Cafeterias. Booklet, 6 x 9 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Power for Buildings. Brochure, 14 pp., 8½ x 11 ins. Illustrated. A publication important to architects and engineers.

Variable-Voltage Central Systems as Applied to Electric Elevators. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Deals with an important detail of elevator mechanism.

Modern Electrical Equipment for Buildings. Booklet, 8½ x 11 ins. Illustrated. Lists many useful appliances.

Electrical Equipment for Heating and Ventilating Systems. Booklet, 24 pp., 8½ x 11 ins. Illustrated. This is "Motor Application Circular 7379."

Westinghouse Panelboards and Cabinets (Catalog 42-A). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Important data on these details of equipment.

Beauty; Power; Silence; Westinghouse Fans. (Dealer Catalog 45.) Brochure, 16 pp., 8½ x 11 ins. Illustrated. Valuable information on fans and their uses.

Electric Range Book for Architects (A. I. A. Standard Classification 31 G-4). Booklet, 24 pp., 8½ x 11 ins. Illustrated. Cooking apparatus for buildings of various types.

Westinghouse Commercial Cooking Equipment (Catalog 280). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Equipment for cooking on a large scale.

Electric Appliances (Catalog 44-A). 32 pp., 8½ x 11 ins. Deals with accessories for home use.

ELEVATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Otis Push Button Controlled Elevators. Descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.

Otis Geared and Gearless Traction. Elevators of All Types. Descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.

Escalators. Booklet, 8½ x 11 ins., 22 pp. Illustrated. Describes use of escalators in subways, department stores, theaters and industrial buildings. Also includes elevators and dock elevators.

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

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

Catalog and pamphlets, 8½ x 11 ins. Illustrated. Important data on different types of elevators.

ESCALATORS

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

FIREPLACE CONSTRUCTION

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

FIREPROOFING

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

North Western Expanded Metal Co., 407 South Dearborn Street, Chicago, Ill.

A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.

FLOOR HARDENERS (CHEMICAL)

Master Builders Co., Cleveland, Ohio.
Concrete Floor Treatment. File, 50 pp. Data on securing hardened dustproof concrete.

Concrete Floor Treatments—Specification Manual. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Valuable work on an important subject.

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

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

FLOORS—STRUCTURAL

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

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

FLOORING

American Blue Stone Co., 101 Park Avenue, New York, N. Y.
Non-Slip Floors. Brochure, 12 pp., 8½ x 11 ins. Illustrated.

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog, 8½ x 11 ins., 44 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors. Newly revised, February, 1929.

Armstrong's Linoleum Pattern Book, 1929. Catalog, 9 x 12 ins., 44 pp. Color plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.

Linoleum Layer's Handbook. 5 x 7 ins., 36 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.

Enduring Floors of Good Taste. Booklet, 6 x 9 ins., 48 pp. Illustrated in color. Explains use of linoleum for offices, stores, etc., with reproductions in color of suitable patterns, also specifications and instructions for laying.

Blabon Company, Geo. W., Nicetown, Philadelphia, Pa.
Planning the Color Schemes for Your Home. Brochure, illustrated in color; 36 pp., 7½ x 10½ ins. Gives excellent suggestions for use of color in flooring for houses and apartments.

Handy Quality Sample Folder of Linoleums. Gives actual samples of "Battleship Linoleum," cork carpet, "Feltex," etc.

Blabon's Linoleum. Booklet, illustrated in color; 128 pp., 3½ x 8½ ins. Gives patterns of a large number of linoleums.

Blabon's Plain Linoleum and Cork Carpet. Gives quality samples, 3 x 6 ins. of various types of floor coverings.

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 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.

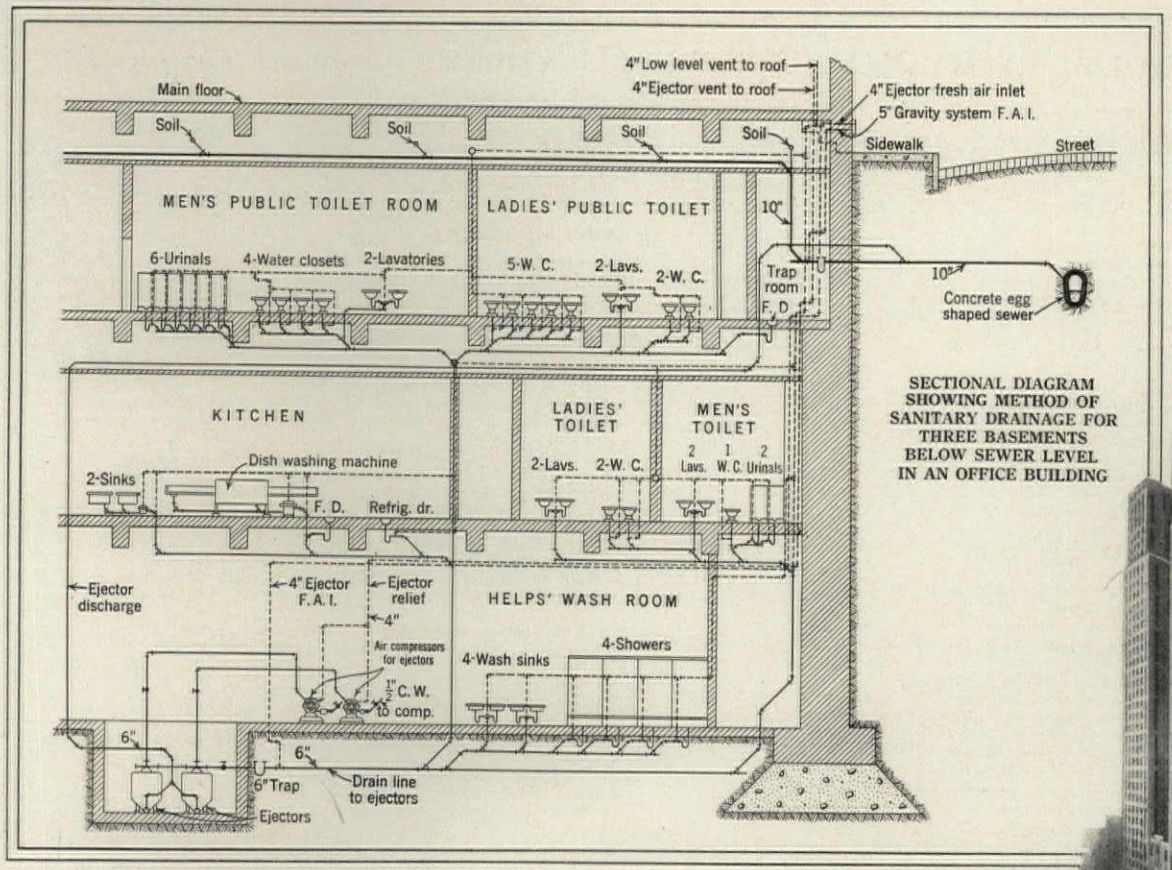
Resilient Floors in Schools. Resilient Floors in Stores. Resilient Floors in Hospitals. Resilient Floors in Offices. Resilient Floors in Apartments and Hotels. Booklets, 8 pp., 8½ x 11 ins. Illustrated.

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, Missouri.
Bloxonend Flooring. Booklet, 3¼ x 6¼. ins., 20 pp. Illustrated. Describes uses and adaptability of Bloxonend Flooring to concrete, wood or steel construction, and advantages over loose wood blocks.

File Folder. 9⅜ x 11¾ ins. For use in connection with A. I. A. system of filing. Contains detailed information on Bloxonend Flooring in condensed loose-leaf form for specification writer and drafting room. Literature embodied in folder includes standard Specification Sheet covering the use of Bloxonend in general industrial service and Supplementary Specification Sheet No. 1, which gives detailed description and explanation of an approved method for installing Bloxonend in gymnasiums, armories, drill rooms and similar locations where maximum resiliency is required.

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



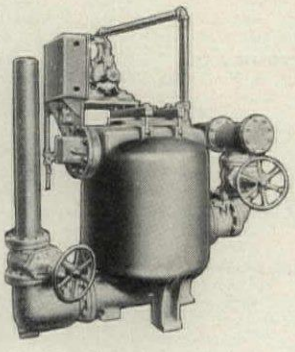
SECTIONAL DIAGRAM SHOWING METHOD OF SANITARY DRAINAGE FOR THREE BASEMENTS BELOW SEWER LEVEL IN AN OFFICE BUILDING

To handle sewage from sub-basements

THE disposal of sewage and drainage from sub-basements of tall buildings is easily and satisfactorily provided for by installing a Jennings Sewage Ejector.

Operating on the pneumatic principle, the Jennings Ejector is simple in construction and reliable in operation. Crude sewage is raised to street sewer level without being screened. Low pressure air is furnished only when material is being moved. Air valves, air storage tanks and reciprocating compressors all become unnecessary. No working parts come in contact with the sewage. There are no submerged impellers to lose efficiency by becoming caked with solid matter. A Jennings Ejector retains its original capacity throughout its entire life.

Jennings Sewage Ejectors are furnished in capacities ranging from 30 g.p.m.—sufficient to serve five toilets —up to 1500 g.p.m. Heads up to 50 feet. Write for Bulletin 67.



Jennings Pumps

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

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

FLOORING—CONTINUED

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

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

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

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

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

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

FURNITURE

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

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

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

New York Galleries, Madison Avenue and 48th Street, New York.
A Group of Distinguished Interiors. Brochure, 4 pp., 8¾ x 11¾ ins. Filled with valuable illustrations.

GARAGES

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

GLASS CONSTRUCTION

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

Libbey-Owens Sheet Glass Co., Toledo, Ohio.
Flat Glass. Brochure, 12 pp., 5⅞ x 7⅝ ins. Illustrated. History of manufacture of flat, clear, sheet glass.

GREENHOUSES

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

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

HARDWARE

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

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

McKinney Mfg. Co., Pittsburgh, Pa.
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.

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

Russell & Erwin Mfg. Co., New Britain, Conn.
Hardware for the Home. Booklet, 24 pp., 3½ x 6 ins. Deals with residence hardware.
Door Closer Booklet. Brochure, 16 pp., 3½ x 6 ins. Data on a valuable detail.

HARDWARE—CONTINUED

Garage Hardware. Booklet, 12 pp., 3½ x 6 ins. Hardware intended for garage use.
Famous Homes of New England. Series of folders on old homes and hardware in style of each.

HEATING EQUIPMENT

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

American Radiator Company, The, 40 West 40th St., N. Y. C.
Ideal Boilers for Oil Burning. Catalog 5½ x 8½ ins., 36 pp. Illustrated in 4 colors. Describing a line of Heating Boilers especially adapted to use with Oil Burners.
Corto—The Radiator Classic. Brochure, 5½ x 8½ ins., 16 pp. Illustrated. A brochure on a space-saving radiator of beauty and high efficiency.
Ideal Arcola Radiator Warmth. Brochure, 6¾ x 9½ ins. Illustrated. Describes a central all-on-one-floor heating plant with radiators for small residences, stores, and offices.
How Shall I Heat My Home? Brochure, 16 pp., 5¾ x 8½ ins. Illustrated. Full data on heating and hot water supply.
New American Radiator Products. Booklet, 44 pp., 5 x 7¾ ins. Illustrated. Complete line of heating products.
A New Heating Problem. Brilliantly Solved. Broadside, 4 pp., 10¾ x 15 ins. Illustrated. Data on the IN-AIRID invisible air valve.
In-Airid, the Invisible Air Valve. Folder, 8 pp., 3½ x 6 ins. Illustrated. Data on a valuable detail of heating.
The 999 ARCO Packless Radiator Valve. Folder, 8 pp., 3½ x 6 ins. Illustrated.

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

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

The Fulton Sylphon Company, Knoxville, Tenn.
Sylphon Temperature Regulators. Illustrated brochures, 8½ x 11 ins., dealing with general architectural and industrial applications; also specifically with applications of special instruments.
Sylphon Heating Specialties. Catalog No. 200, 192 pp., 3½ x 6¼ ins. Important data on heating.

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

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

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

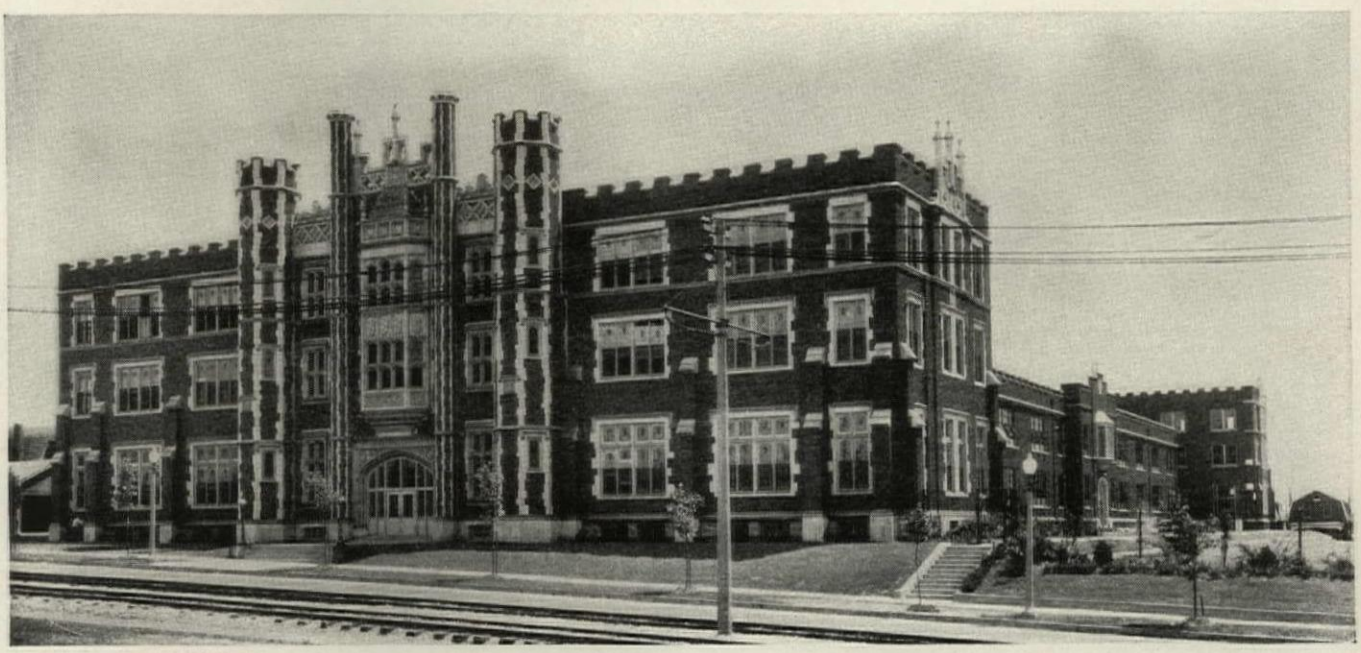
May Oil Burner Corp., Baltimore, Md.
Adventures in Comfort. Booklet, 24 pp., 6 x 9 ins. Illustrated. Non-technical data on oil as fuel.
Taking the Quest Out of the Question. Brochure, 16 pp., 6 x 9 ins. Illustrated. For home owners interested in oil as fuel.

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

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

Nash Engineering Company, South Norwalk, Conn.
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.

They'll see their own children graduate under the same Carey roof!



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The splendid University High School—one of St. Louis' finest—has the permanent protection of a Carey Built-up Roof. 55,000 square feet of it!

SOME years from now, the students of this fine University High School in St. Louis will have children of their own. And many of these children will graduate under the same roof that protects the building now . . . a Carey Built-up Roof!

When the Widmer Engineering Company planned this handsome school, they were naturally anxious to give it the finest of roof protection. In specifying a multi-layered, multi-sealed Carey Built-up Roof, they knew they were providing it with super-protection.

Built up scientifically of sinewy, tensile-tough, long-fibred felts, alternated with the specially-refined asphalt that Carey uses—and laid according to Carey specifications—this roof will defy the severest weather for years!

The fact that so many of the country's finest hotels, hospitals, office buildings, schools, and industrial plants are given this same overhead protection is a real tribute to Carey quality of which Carey is justly proud.

Let us send you our Architects' Specification Book for your files.

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Carey BUILT UP ROOFS

"A roof for every building"

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

HEATING EQUIPMENT—Continued

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 ins., 20 pp., describing and illustrating radiators and accessories.

Six Great Companies Unite to Form a Great Corporation. Booklet, 28 pp., 8½ x 10½ ins. Illustrated. Valuable data on heating.

Oil Heating Institute, 420 Madison Ave., New York, N. Y.

What About the Supply of Oil Fuel? Booklet, 16 pp., 5½ x 8 ins. Illustrated.

Petroleum Heat & Power Co., 511 Fifth Avenue, New York, N. Y.

Heating Homes the Modern Way. Booklet, 8½ x 11¾ 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, 24 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.

Sarco Company, Inc., 183 Madison Ave., New York City, N. Y.

Steam Heating Specialties. Booklet, 6 pp., 6 x 9 ins. Illustrated. Data on Sarco Packless Supply Valves and Radiator Traps for vacuum and vapor heating systems.

Equipment Steam Traps and Temperature Regulations. Booklet, 6 pp., 6 x 9 ins. Illustrated. Deals with Sarco Steam Traps for hospital, laundry and kitchen fixtures and the Sarco Self-contained Temperature Regulation for hot water service tanks.

Spencer Heater Co., Williamsport, Pa.

Catalog. Booklet, 20 pp., 6⅛ x 9 ins. Illustrated. Complete line of magazine feed cast iron sectional and steel tubular heaters.

The Fire that Burns Uphill. Brochure, 24 pp., 6⅛ x 9¼ ins. Illustrated in color. Magazine feed heaters for steam, vapor and hot water heating.

B. F. Sturtevant Company, Hyde Park, Boston, Mass.

Tempervane Heating Units. Catalog 363. Booklet, 44 pp., 8½ x 11 ins. Illustrated. Data on "Heating Every Corner with Maximum Economy."

Trane Co., The, La Crosse, Wis.

Bulletin 14, 16 pp., 8½ x 10⅝ ins. Covers the complete line of Trane Heating Specialties, including Trane Bellows Traps, and Trane Bellows Packless Valves.

Bulletin 20. 24 pp., 8½ x 10⅝ ins. Explains in detail the operation and construction of Trane Condensation. Vacuum, Booster, Circulating, and similar pumps.

How to Cut Heating Costs. Booklet, 18 pp., 8½ x 11 ins. Illustrated.

HOSPITAL EQUIPMENT

The Frink Co., Inc., 369 Lexington Ave., New York City.

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

Holophane Company, 342 Madison Avenue, New York.

Lighting Specific for Hospitals. Booklet, 30 pp., 8½ x 11 ins. Illustrated.

The International Nickel Company, 67 Wall St., New York, N. Y.

Hospital Applications of Monel Metal. Booklet, 8½ x 11½ ins., 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.

Some Thoughts About Hospital Food Service Equipment. Booklet, 22 pp., 7½ x 9¼ ins. Valuable data on an important subject.

Wilmot Castle Company, Rochester, N. Y.

Sterilizer Equipment for Hospitals. Booklet, 76 pp., 8½ x 11 ins. Illustrated. Gives important and complete data on sterilization of utensils and water, information on dressings, etc.

Sterilizer Specifications. Brochure, 12 pp., 8½ x 11 ins. Practical specifications for use of architects and contractors.

Architects' Data Sheets. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Information on piping, venting, valving and wiring for hospital sterilizer installations.

Hospital Sterilizing Technique. Five booklets, 8 to 16 pp., 6 x 9 ins. Illustrated. Deals specifically with sterilizing instruments, dressings, utensils, water, and rubber gloves.

HOTEL EQUIPMENT

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square New York.

Some Thoughts on Furnishing a Hotel. Booklet, 7½ x 9 ins. Data on complete outfitting of hotels.

INCINERATORS

Home Incinerator Co., Milwaukee, Wis.

The Decent Way. Burn it with Gas. Brochure, 30 pp., 5¼ x 7¼ ins., inside. Illustrated. Incinerator sanitation equipment for residence use.

A. I. A. File, 12 pp., 8¾ x 10¾ ins., inside. Suggestions for architect on incineration, showing installation and equipment.

Specialized Home Comforts Service Plan Book. 40 pp., 8½ x 11 ins., inside. Illustrated. A complete outline of the many advantages of incineration.

Blue Star Standards in Home Building. 16 pp., 5½ x 8½ ins., inside. Illustrated. Explaining fully the Blue Star principles, covering heat, incineration, refrigeration, etc.

INCINERATORS—Continued

Kerner Incinerator Company, 715 E. Water St., Milwaukee, Wis.

Incinerators (Chimney-fed). Catalog No. 15 (Architect and Builders' Edition). Size 8½ x 11 ins., 16 pp. Illustrated. Describes principles and design of Kernerator Chimney-fed Incinerators for residences, apartments, hospitals, schools, apartment hotels, clubs and other buildings. Shows all standard models and gives general information and working data.

Sanitary Elimination of Household Waste. Booklet, 4 x 9 ins. 16 pp. Illustrated. Gives complete information on the Kernerator for residences.

Garbage and Waste Disposal for Apartment Buildings. Folder, 8½ x 11 ins., 16 pp. Illustrated. Describes principle and design of Kernerator Chimney-fed Incinerator for apartments and gives list of buildings where it has been installed.

Sanitary Disposal of Waste in Hospitals. Booklet, 4 x 9 ins., 12 pp. Illustrated. Shows how this necessary part of hospital service is taken care of with the Kernerator. Gives list of hospitals where installed.

The Kernerator (Chimney-fed) Booklet. Catalog No. 17, 20 pp., 8½ x 11 ins. Illustrated. Data on a valuable detail of equipment.

INSULATION

Armstrong Cork & Insulation Co., Pittsburgh, Pa.

The Insulation of Roofs with Armstrong's Corkboard. Booklet. Illustrated. 7½ x 10½ ins., 32 pp. Discusses means of insulating roofs of manufacturing or commercial structures.

Insulation of Roofs to Prevent Condensation. Illustrated booklet, 7½ x 10½ ins., 36 pp. Gives full data on valuable line of roof insulation.

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 ins. 32 pp. Illustrated.

Armstrong's Corkboard. Insulation for Walls and Roofs of Buildings. Booklet, 66 pp., 9½ x 11¾ ins. Illustrates and describes use of insulation for structural purposes.

Cabot, Inc., Samuel, Boston, Mass.

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

KITCHEN EQUIPMENT

The International Nickel Company, 67 Wall St., New York, N. Y.

Hotels, Restaurants and Cafeteria Applications of Monel Metal. Booklet, 8½ x 11 ins., 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.

School Cafeteria. Booklet, 6 x 9 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

LABORATORY EQUIPMENT

Alberene Stone Co., 153 West 23rd Street, New York City.

Booklet, 8¾ x 11¼ ins., 26 pp. Stone for laboratory equipment, shower partitions, stair treads, etc.

Duriron Company, Dayton, Ohio.

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

LANTERNS

Todhunter, Arthur, 119 E. 57th St., New York, N. Y.

Hand-wrought Lanterns. Booklet, 5¼ x 6¾ ins., 20 pp. Illustrated in black and white. With price list. Lanterns appropriate for exterior and interior use, designed from old models and meeting the requirements of modern lighting.

LATH, METAL AND REINFORCING

Milwaukee Corrugating Co., Milwaukee

The Milcor Manual. Booklet, 96 pp., 8½ x 11 ins. Illustrated. Data on metal lath and similar materials.

Milcor Metal Ceiling Catalog. Booklet, 288 pp., 8½ x 11 ins. Illustrated. Data on metal ceiling and wall construction.

National Steel Fabric Co., Pittsburgh, Pa.

Better Walls for Better Homes. Brochure, 16 pp., 7¾ x 11¼ ins. Illustrated. Metal lath, particularly for residences.

Steeltex for Floors. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Combined reinforcing and form for concrete or gypsum floors and roofs.

Steeltex Data Sheet No. 1. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with round top chords.

Steeltex Data Sheet No. 2. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with flat top flanges.

Steeltex Data Sheet No. 3. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for folders on wood joists.

North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.

North Western Expanded Metal Products. Booklet, 8½ x 10¾ ins., 20 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plasta-saver and longspan lath channels, etc.

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

A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.

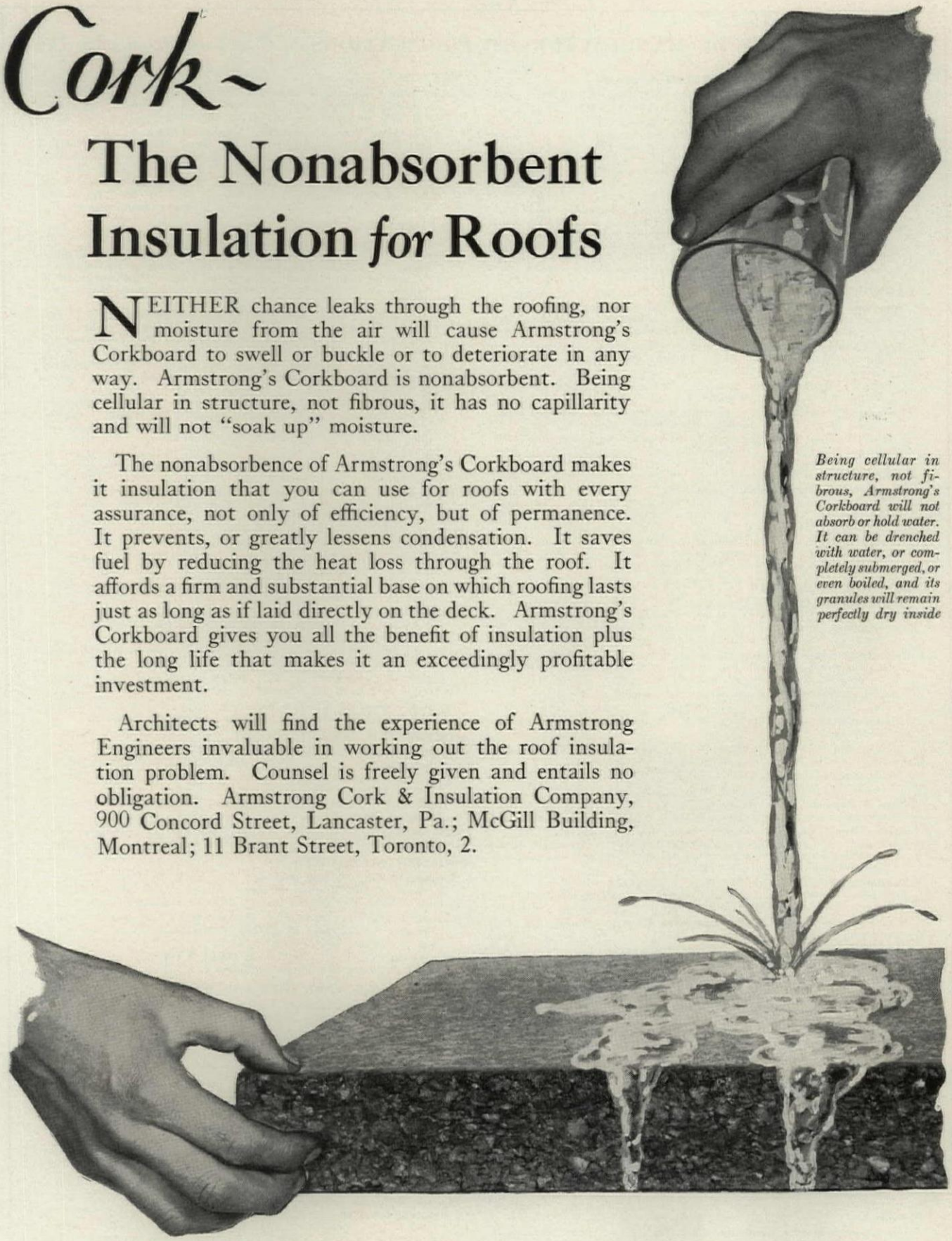
Cork—

The Nonabsorbent Insulation *for* Roofs

NEITHER chance leaks through the roofing, nor moisture from the air will cause Armstrong's Corkboard to swell or buckle or to deteriorate in any way. Armstrong's Corkboard is nonabsorbent. Being cellular in structure, not fibrous, it has no capillarity and will not "soak up" moisture.

The nonabsorbence of Armstrong's Corkboard makes it insulation that you can use for roofs with every assurance, not only of efficiency, but of permanence. It prevents, or greatly lessens condensation. It saves fuel by reducing the heat loss through the roof. It affords a firm and substantial base on which roofing lasts just as long as if laid directly on the deck. Armstrong's Corkboard gives you all the benefit of insulation plus the long life that makes it an exceedingly profitable investment.

Architects will find the experience of Armstrong Engineers invaluable in working out the roof insulation problem. Counsel is freely given and entails no obligation. Armstrong Cork & Insulation Company, 900 Concord Street, Lancaster, Pa.; McGill Building, Montreal; 11 Brant Street, Toronto, 2.



Being cellular in structure, not fibrous, Armstrong's Corkboard will not absorb or hold water. It can be drenched with water, or completely submerged, or even boiled, and its granules will remain perfectly dry inside

Armstrong's Corkboard Insulation

for the Roofs of All Kinds of Buildings

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

LATH, METAL AND REINFORCING—Continued

Norwest Metal Lath. Folder, 8½ x 11 ins. Illustrated. Data on Flat Rib Lath.

Truscon Steel Company, Youngstown, Ohio.
Truscon ¾-inch Hy-Rib for Roofs, Floors and Walls. Booklet, 8½ x 11 ins., illustrating Truscon ¾-inch Hy-Rib as used in industrial buildings. Plates of typical construction. Progressive steps of construction. Specification and load tables.

LAUNDRY CHUTES

The Pfaudler Company, 217 Cutler Building, Rochester, N. Y.
Pfaulder Glass-Lined Steel Laundry Chutes. Booklet, 5⅛ x 7⅜ ins., 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, O.
Functions of the Hotel and Hospital Laundry. Brochure, 8 pp., 8½ x 11 ins. Valuable data regarding an important subject.

Troy Laundry Machinery Co., Inc., 9 Park Place, New York City.
Laundry Machinery for Large Institutions. Loose-Leaf booklet, 50 pp., 8½ x 11 ins. Illustrated.

Laundry Machinery for Small Institutions. Loose-leaf brochure, 50 pp., 8½ x 11 ins. Illustrated.

Accessory Equipment for Institutional Laundries. Leather bound book, 50 pp., 8½ x 11 ins. Illustrated.

Dry Cleaning Equipment for Institutional Purposes. Brochure, 50 pp., 8½ x 11 ins. Illustrated.

LIBRARY EQUIPMENT

Art Metal Construction Co., Jamestown, N. Y.
Planning the Library for Protection and Service. Brochure, 52 pp., 8½ x 11 ins. 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 ins. Deals with equipment of Los Angeles Public Library.

LIGHTING EQUIPMENT

The Frink Co., Inc., 369 Lexington Ave., New York, N. Y.
Catalog 415, 8½ x 11 ins., 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screen and partition reflectors, double and single desk reflectors and Polaralite Signs.

Holophane Company, Inc., 342 Madison Ave., New York, N. Y.
The Lighting of Schools; A Guide to Good Practice. Booklet. 24 pp., 8½ x 11 ins. Illustrated.

Lighting Specifications for Hospitals. Brochure, 30 pp., 8½ x 11 ins. Illustrated.

Industrial Lighting. Bulletin 448A. Booklet, 24 pp., 8½ x 11 ins. Illustrated.

Holophane Catalog. Booklet, 48 pp., 8½ x 11 ins. Combination catalog and engineering data book.

The Lighting of Schools. A Guide to Good Practice. Booklet, 24 pp., 8½ x 11 ins. Illustrated.

Pass & Seymour, Inc., Syracuse. N. Y.
Lighting Your Home with Alabox. Folder, 6 pp., 3 x 6 ins.

Smyser-Royer Co., 1700 Walnut Street, Philadelphia, Pa.
Catalog "J" on Exterior Lighting Fixtures. Brochure, illustrated, giving data on over 300 designs of standards, lanterns and brackets of bronze or cast iron.

Todhunter, 119 East 57th St., New York, N. Y.
Lighting Fixtures, Lamps and Candlesticks. 24 pp., 8½ x 11 ins. Illustrated. Fine assortment of lighting accessories.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
Industrial Lighting Equipment. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

Commercial Lighting. Brochure, 24 pp., 8½ x 11 ins. Illustrated.

Airport and Floodlighting Equipment. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

LUMBER

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

MAIL CHUTES

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

MANTELS

Arthur Todhunter, 119 E. 57th St., New York, N. Y.
Georgian Mantels. New booklet, 24 pp., 5¾ x 6¼ ins. A fully illustrated brochure on eighteenth century mantels. Folders give prices of mantels and illustrations and prices of fireplace equipment.

MARBLE

The Georgia Marble Company, Tate, Ga.; New York Office, 1328 Broadway.

Why Georgia Marble Is Better. Booklet, 3⅜ x 6 ins. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc.

Convincing Proof. 3⅜ x 6 ins., 8 pp. Classified list of buildings and memorials in which Georgia Marble has been used, with names of Architects and Sculptors.

Hurt Building, Atlanta; Senior High School and Junior College, Muskegon, Mich. Folders, 4 pp., 8½ x 11 ins. Details.

METALS

Aluminum Company of America, Pittsburgh.
Architectural Aluminum. Brochure, 30 pp., 8½ x 11 ins. Illustrated. An excellent booklet on the subject.

Central Alloy Steel Corporation, Massillon, Ohio.
Sheet Iron Primer. Booklet, 64 pp., 5¼ x 7¾ ins. Illustrated.
The Path to Permanence. Brochure, 52 pp., 8½ x 11 ins. Illustrated. Data on sheet iron.

The International Nickel Company, 67 Wall St., New York N. Y.
Monel Metal Primer. 8 folders, 4 pp., 8½ x 11 ins. Illustrated. Valuable data on use of monel in kitchens, laundries, etc.

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodwork. Standardized Book, 9 x 11½ ins., 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.

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

Curtis Details. Booklet, 19½ x 23½ ins., 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.

Hartmann-Sanders Company, 2155 Elston Ave., Chicago, Ill.
Column Catalog, 7½ x 10 ins., 48 pp. Illustrated. Contains prices on columns 6 to 36 ins. diameter, various designs and illustrations of columns and installations.

The Pergola Catalog. 7½ x 10 ins., 64 pp. Illustrated. Contains illustrations of pergola lattices, garden furniture in wood and cement, garden accessories.

Klein & Co., Inc., Henry, 11 East 37th St., New York, N. Y.
Two Driwood Interiors. Folder, 4 pp., 6¼ x 9 ins. Illustrated. Use of moulding for paneling walls.

A New Style in Interior Decoration. Folder, 4 pp., 6¼ x 9 ins. Illustrated. Deals with interior woodwork.

Driwood Period Mouldings in Ornamented Wood. Booklet, 28 pp., 8½ x 11 ins. Illustrated.

How Driwood Period Mouldings in Ornamented Wood Set a New Style in Decoration. Folder.

Roddis Lumber and Veneer Co., Marshfield, Wis.
Roddis Doors. Brochure, 24 pp., 5¼ x 8½ ins. Illustrated price list of doors for various types of buildings.

Roddis Doors, Catalog G. Booklet, 184 pp., 8½ x 11 ins. Completely covers the subject of doors for interior use.

Roddis Doors for Hospitals. Brochure, 16 pp., 8½ x 11 ins. Illustrated work on hospital doors.

Roddis Doors for Hotels. Brochure, 16 pp., 8½ x 11 ins. Illustrated work on doors for hotel and apartment buildings.

MORTAR AND CEMENT COLORS

Clinton Metallic Paint Co., Clinton, N. Y.
Clinton Mortar Colors. Folder, 8½ x 11 ins., 4 pp. Illustrated in colors, gives full information concerning Clinton Mortar Colors with specific instructions for using them.

Color Card. 3¼ x 6½ ins. Illustrates in color the ten shades in which Clinton Mortar Colors are manufactured.

Something New in Stucco. Folder, 3½ x 6 ins. An interesting folder on the use of coloring matter for stucco coated walls.

ORNAMENTAL PLASTER

Jacobson & Co., 241 East 44th St., New York, N. Y.
A Book of Old English Designs. Brochure, 47 plates, 12 x 9 ins. Deals with a fine line of decorative plaster work.

Architectural and Decorative Ornaments. Cloth bound volume, 184 pp., 9 x 12 ins. 18 plates. Price, $3.00. A general catalog of fine plaster ornaments.

Geometrical ceilings. Booklet, 23 plates, 7 x 9 ins. An important work on decorative plaster ceilings.

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

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

National Lead Company, 111 Broadway, New York, N. Y.
Handy Book on Painting. Book, 5½ x 3¼ ins., 100 pp. Gives directions and formulæ for painting various surfaces of wood, plaster, metals, etc., both interior and exterior.

Red Lead in Paste Form. Booklet. 6¼ x 3½ ins., 16 pp. Illustrated. Directions and formulæ for painting metals.

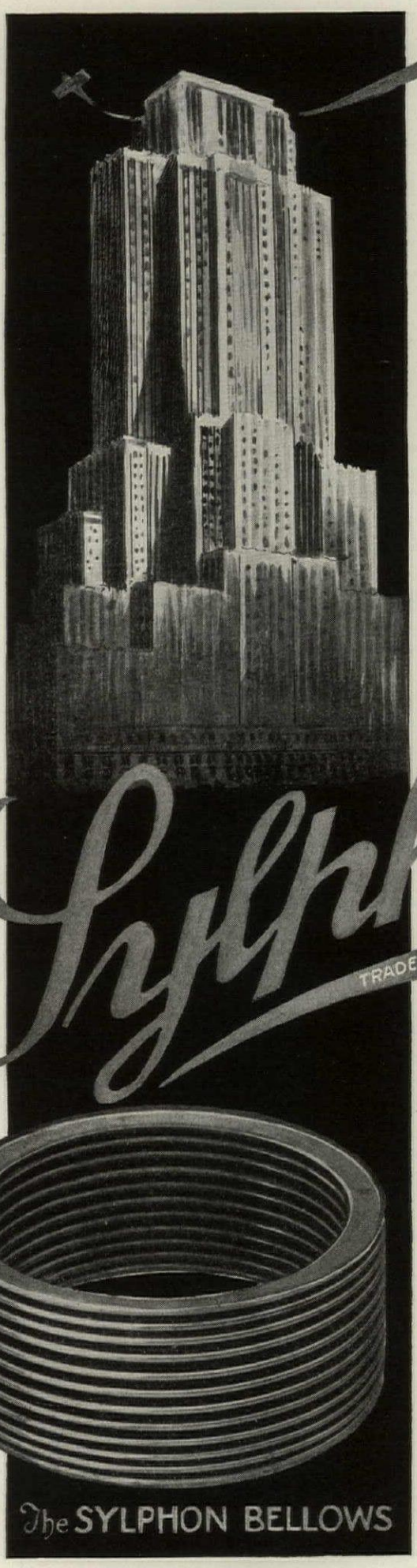
Came Lead. Booklet, 6 x 8¾ ins., 12 pp. Illustrated. Describes various styles of lead cames.

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

Sherwin-Williams Company, 601 Canal Rd., Cleveland, Ohio.
Painting Concrete and Stucco Surfaces. Bulletin No. 1. 8½ x 11 ins., 8 pp. Illustrated. A complete treatise with complete specifications on the subject of Painting of Concrete and Stucco Surfaces. Color chips of paint shown in bulletin.

Enamel Finish for Interior and Exterior Surfaces. Bulletin No. 2, 8½ x 11 ins., 12 pp. Illustrated. Thorough discussion, including complete specifications for securing the most satisfactory enamel finish on interior and exterior walls and trim.

Painting and Decorating of Interior Walls. Bulletin No. 3, 8½ x 11 ins., 20 pp. Illustrated. An excellent reference book on Flat Wall Finish, including texture effects, which are taking the country by storm. Every architect should have one on file.



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STORIES HIGH

Suggests

Sylphon Packless Expansion Joints

on the

Steam Risers

BASED upon *demonstrated efficiency* in *many installations*, upon *performance* not *claims*, Sylphon Packless Expansion Joints are almost *universally specified* for Steam Heat Risers in America's notable buildings.

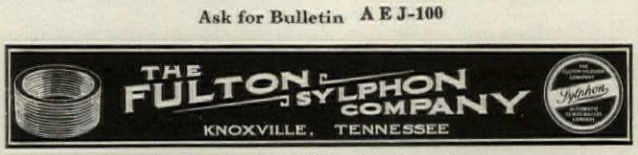
Modern engineering and construction methods are abandoning the antiquated joints "packed with trouble" and requiring repacking. "*Leak Loose*" or "*Jam Tight*" they are wholly unfit for a vacuum system or one where a slight vacuum is pulled.

Packless Expansion Joints

Always steam tight, yet free to move without jamming, are easily installed on the vertical riser. They eliminate damaging drains on pipe work, tapping radiator branches, and space wasting "expansion loops." No more worry over repacking jobs, almost impossible when the riser is concealed in furring.

We will be glad to send complete details and full information as to dimensions, prices and shipping weights.

Ask for Bulletin A E J-100



Representatives in all Principal Cities in U. S. A.—European Representatives, Crosby Valve & Eng. Company, Ltd., 41-2 Foley St., London, W 1, England Canadian Representatives, Darling Bros., Ltd., 140 Prince St., Montreal, Que., Canada.

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

PAINTS, STAINS, VARNISHES and WOOD FINISHES—Continued

Protective Paints for Metal Surfaces. Bulletin No. 4, 8½ x 11 ins., 12 pp. Illustrated. A highly technical subject treated in a simple, understandable manner.

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

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

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

Valentine & Co., 456 Fourth Ave., New York, N. Y.
How to Use Valspar. Illustrated booklet, 32 pp., 3¾ x 8 ins. Deals with domestic uses for Valspar.

How to Keep Your House Young. Illustrated brochure, 24 pp., 7 x 8½ ins. A useful work on the upkeep of residences.

Architectural Four-Hour Varnishes and Enamels. Booklet, 8 pp., 4½ x 6 ins. Data on a useful line of materials.

PAPER

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

PARCEL DELIVERY DEVICES

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

PARTITIONS

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

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

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

Improved Office Partition Company, 25 Grand St., Elmhurst, L. I.
Telesco Partition. Catalog, 8¼ x 11 ins., 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions, cuts of finished partition units in various woods. Gives specifications and cuts of buildings using Telesco.

Detailed Instructions for Erecting Telesco Partitions. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Complete instructions, with cuts and drawings, showing how easily Telesco Partition can be erected.

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

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

PIPE

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

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

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

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

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

National Tube Co., Frick Building, Pittsburgh, Pa.
"National" Bulletin No. 2. Corrosion of Hot Water Pipe, 8½ x 11 ins., 24 pp. Illustrated. In this bulletin is summed up the most important research dealing with hot water systems. The text matter consists of seven investigations by authorities on this subject.

"National" Bulletin No. 3. The Protection of Pipe Against Internal Corrosion, 8½ x 11 ins., 20 pp. Illustrated. Discusses various causes of corrosion, and details are given of the deactivating and deareating systems for eliminating or retarding corrosion in hot water supply lines.

"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 ins., 88 pp. This bulletin contains 254 illustrations of prominent buildings of all types, containing "National" Pipe, and considerable engineering data of value to architects, engineers, etc.

Modern Welded Pipe. Book of 88 pp., 8½ x 11 ins., profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

PLASTER

Best Bros. Keene's Cement Co., Medicine Lodge, Kans.
Information Book. Brochure, 24 pp., 5 x 9 ins. Lists grades of plaster manufactured; gives specifications and uses for plaster.

PLASTER—Continued

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

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

Crane Company, 836 S. Michigan Ave., Chicago, Ill.
Plumbing Suggestions for Home Builders. Catalog, 3 x 6 ins., 80 pp. Illustrated.

Plumbing Suggestions for Industrial Plants. Catalog, 4 x 6½ ins., 34 pp. Illustrated.

Planning the Small Bathroom. Booklet, 5 x 8 ins. Discusses planning bathrooms of small dimensions.

John Douglas Co., Cincinnati, Ohio.
Douglas Plumbing Fixtures. Bound volume. 200 pp., 8½ x 11 ins. Illustrated. General catalog.

Another Douglas Achievement. Folder, 4 pp., 8½ x 11 ins. Illustrated. Data on new type of stall.

Hospital. Brochure, 60 pp., 8½ x 11 ins. Illustrated. Deals with fixtures for hospitals.

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

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

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

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

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

Wolff Co., 2057 W. Fulton St., Chicago, Ill.
General Catalog. Bound volume. 8½ x 10½. Illustrated. A fine publication dealing with an excellent line of fixtures.
Modern and Ancient Luxury. Brochure. 24 pp. 5 x 7¾ ins. Illustrated. Fixtures for domestic use.

PUMPS

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

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

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

RADIO EQUIPMENT

Radio Corporation of America, Woolworth Building, New York City, N. Y.

R. C. A. Antenna Distribution System for Multiple Receivers. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Apparatus for apartment houses and similar large buildings.

R. C. A. Centralized Radio Receiving Equipment. Brochure, 8 pp., 9 x 11 ins. Illustrated. Radio equipment for hotels, hospitals, etc.

RAMPS

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

Garage Design Data. Series of informal bulletins issued in loose-leaf form, with monthly supplements.

REFRIGERATION

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

REINFORCED CONCRETE—See also Construction, Concrete

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

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

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

A Public Toilet Seat

should be made of *STEEL*

And it *would* be if practical disadvantages didn't make steel out of the question, for only a seat of sheer unbreakable strength can stand the unbelievably careless treatment of the public.

Whale-bone-ite is such a seat. Though it costs no more than the cheapest composition closet seat made, its unbreakable construction—guaranteed for the life of the building—immediately ends all replacement expense.

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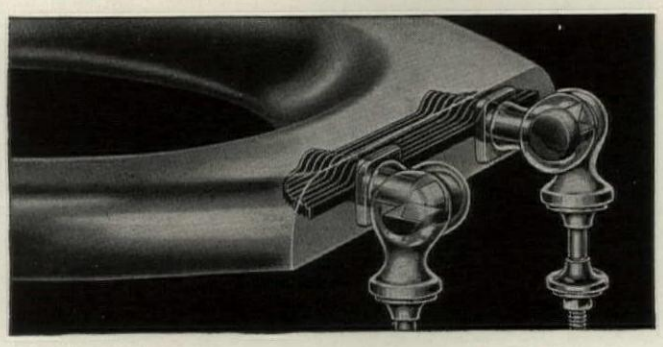
Its use is spreading to the guest bathrooms of fine hotels. Many new apartment houses are equipping all toilets with it.

Send for free cross-section
—see its strength yourself

Figures show that on the average ordinary seats have to be replaced about every three years. If you want to end this needless expense, just as it already has been ended in more than a million public toilets in modern and remodelled buildings, simply install Whale-bone-ite Seats as fast as other seats wear out. Not only will the replacement expense end, but the toilets will be cleaner as Whale-bone-ite is easier to keep clean. Without obligation send for a free Whale-bone-ite cross-section. Simply address Dept. A-3, Seat Division, The Brunswick-Balke-Collender Co., 623 South Wabash Avenue, Chicago.



THE WHALE-BONE-ITE Seat and Hinge form an unbreakable unit. The Seat is molded around a laminated core of alternating-grain layers of hardwood, making it proof against warping, cracking and splitting. The die-cast hinge is molded integral with the seat.

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Birmingham	Cincinnati	El Paso	Minneapolis	Philadelphia	St. Louis
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Buffalo	Dallas	Houston	Newark	Richmond	Washington
Charlotte	Denver	Kansas City	New Haven	San Antonio	Montreal
Chattanooga	Des Moines	Los Angeles	New Orleans	San Francisco	Ottawa
		Toronto		Havana	

BRUNSWICK
WHALE-BONE-ITE
TOILET SEATS

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

ROOFING

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

Federal Cement Tile Co., 608 S. Dearborn Street, Chicago.
Federal Nailing Concrete Roof Slabs. Folder. 4 pp., 8½ x 11 ins. Illustrated.
Roof Standards. Booklet. 30 pp., 8½ x 11 ins. Illustrated.
Federal Interlocking Tile and Glass Tile. Folder. 4 pp., 8½ x 11 ins. Illustrated.
Federal Long-Spare Roof Slab. Folder. 4 pp., 8½ x 11 ins. Illustrated.
New Federal Light Six Roof Slab. Folder. 4 pp., 8½ x 11 ins. Illustrated.

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

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

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

Structural Gypsum Corporation, Linden, N. J.
Relative Effectiveness of Various Types of Roofing Construction in Preventing Condensation of the Under Surface. Folder, 4 pp., 8¾ x 11 ins. Important data on the subject.
Gypsteel Pre-cast Fireproof Roofs. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Information regarding a valuable type of roofing.

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

SEWAGE DISPOSAL

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

SCREENS

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

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

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

SHADE CLOTH AND ROLLERS

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

SHELVING-STEEL

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

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 protection against sound.

STEEL PRODUCTS FOR BUILDING

Bethlehem Steel Company, Bethlehem, Pa.
Steel Joists and Stanchions. Booklet, 72 pp., 4 x 6¼ ins. Data for steel for dwellings, apartment houses, etc.

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

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

STONE, BUILDING

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

STORE FRONTS

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

The Kawneer Company, Niles, Mich.
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 ins., 60 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.
International Store Front Construction. Catalog, 8½ x 10 ins., 70 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.
Store Fronts by Zouri. Booklet, 30 pp., 9 x 12 ins. Illustrated.

TELEPHONE SERVICE ARRANGEMENTS

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

TERRA COTTA

National Terra Cotta Society, 19 West 44th St., New York, N. Y.
Standard Specifications for the Manufacture, Furnishing and Setting of Terra Cotta. Brochure, 8½ x 11 ins., 12 pp. Complete Specification, Glossary of Terms Relating to Terra Cotta and Short Form Specification for incorporating in Architects' Specification.
Color in Architecture. Revised Edition. Permanently bound volume, 9⅛ x 12¾ ins., containing a treatise upon the basic principles of color in architectural design, illustrating early European and modern American examples. Excellent illustrations in color.
Present Day Schools. 8½ x 11 ins., 32 pp. Illustrating 42 examples of school architecture with article upon school building design by James O. Betelle, A. I. A.
Better Banks. 8½ x 11 ins., 32 pp. Illustrating many banking buildings in terra cotta with an article on its use in bank design by Alfred C. Bossom, Architect.

TILE, HOLLOW

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Wall Construction Bulletin 174. 8½ x 11 ins., 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 Face Tile for the Up-to-Date. Farm Bulletin. 8½ x 11 ins.
Natcoflor Bulletin. 8½ x 11 ins., 6 pp. Illustrated.
Natco Header Backer Tile Bulletin. 8½ x 11 ins., 4 pp. Illustrated.
Natco Unibacker Tile Bulletin. 8½ x 11 ins., 4 pp. Illustrated.

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

TILES

Hanley Company, Bradford, Pa.

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

Kraftile Company, Niles, Calif.

High Fired Faience Tile. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Presents a fine line of tiles for different purposes.

C. Pardee Works, 9 East 45th St., New York, N. Y., and 1600 Walnut St., Philadelphia, Pa.

Pardee Tiles. Bound volume, 48 pp., 8½ x 11 ins. Illustrated.

United States Quarry Tile Co., Parkersburg, W. Va.

Quarry Tiles for Floors. Booklet, 120 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.

Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

VALVES

Crane Co., 836 S. Michigan Ave., Chicago, Ill.

No. 51. General Catalog. Illustrated. Describes the complete line of the Crane Co.

C. A. Dunham Co., 450 East Ohio St., Chicago, Ill.

The Dunham Packless Radiator Valve. Brochure, 12 pp., 8 x 11 ins. Illustrated. Data on an important type of valve.

Jenkins Bros., 80 White St., New York, N. Y.

The Valve Behind a Good Heating System. Booklet, 4½ x 7¼ ins., 16 pp. Color plates. Description of Jenkins Radiator Valves for steam and hot water, and brass valves used as boiler connections.

Jenkins Valves for Plumbing Service. Booklet, 4½ x 7¼ ins. 16 pp. Illustrated. Description of Jenkins Brass Globe, Angle Check and Gate Valves commonly used in home plumbing, and Iron Body Valves used for larger plumbing installations.

VENETIAN BLINDS

Burlington Venetian Blind Co., Burlington, Vt.

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

VENTILATION

American Blower Co., Detroit, Mich.

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

Duriron Company, Dayton, Ohio.

Acid-proof Exhaust Fans. Folder, 8 x 10½ ins., 8 pp. Data regarding fans for ventilation of laboratory fume hoods.

Specification Form for Acid-proof Exhaust Fans. Folder, 8 x 10½ ins.

Staynew Filter Corporation, Rochester, N. Y.

Protectomotor High Efficiency Industrial Air Filters. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Data on valuable detail of apparatus.

WATERPROOFING

Master Builders Company, Cleveland, Ohio.

Waterproofing and Dampproofing and Allied Products. Sheets in loose index file, 9 x 12 ins. Valuable data on different types of materials for protection against dampness.

Waterproofing and Dampproofing File. 36 pp. Complete descriptions and detailed specifications for materials used in building with concrete.

Sommers & Co., Ltd., 342 Madison Ave., New York, N. Y.

"Permantile Liquid Waterproofing" for making concrete and cement mortar permanently impervious to water. Also circulars on floor treatments and cement colors. Complete data and specifications. Sent upon request to architects using business stationery. Circular size, 8½ x 11 ins.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.

Pamphlet, 3¾ x 8¾ ins., 8 pp. Explanation of waterproofing principles. Specifications for waterproofing walls, floors, swimming pools and treatment of concrete, stucco and mortar.

Toch Brothers, New York, Chicago, Los Angeles.

Architects' Specification Data. Sheets in loose leaf binder, 8½ x 11 ins., dealing with an important line of materials.

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, Ill.

The Only Weatherstrip with a Cloth to Metal Contact. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Data on an important type of weather stripping.

WINDOWS

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., 8⅝ x 11 ins. 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 ins., 76 pp. Illustrated. Photographs of actual work accompanied by scale details for casements and composite steel windows for banks, office buildings, hospitals and residences.

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

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

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 Copper Steel. Catalog C-217. Booklet, 24 pp., 8⅝ x 11 ins. 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 ins. Illustrated. Shows typical installations, detail drawings, construction details, blue-prints if desired. Describes AIR-way Multifold Window Hardware.

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WINDOW SHADES AND ROLLERS

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

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David Lupton's Sons Company, Philadelphia, Pa.

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Truscon Steel Company, Youngstown, Ohio.

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

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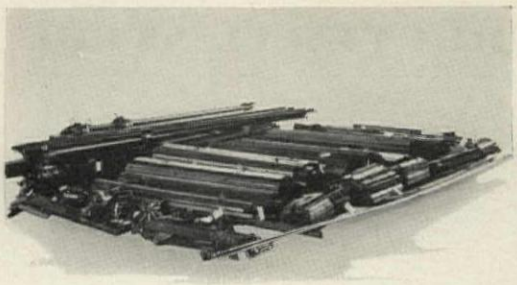

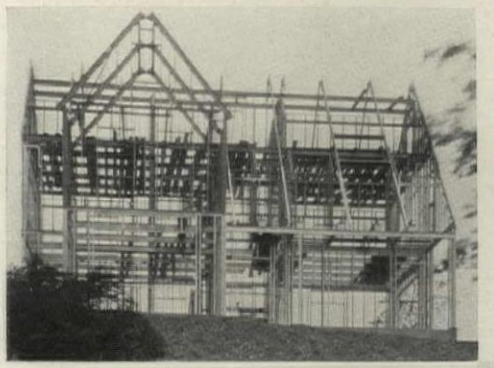

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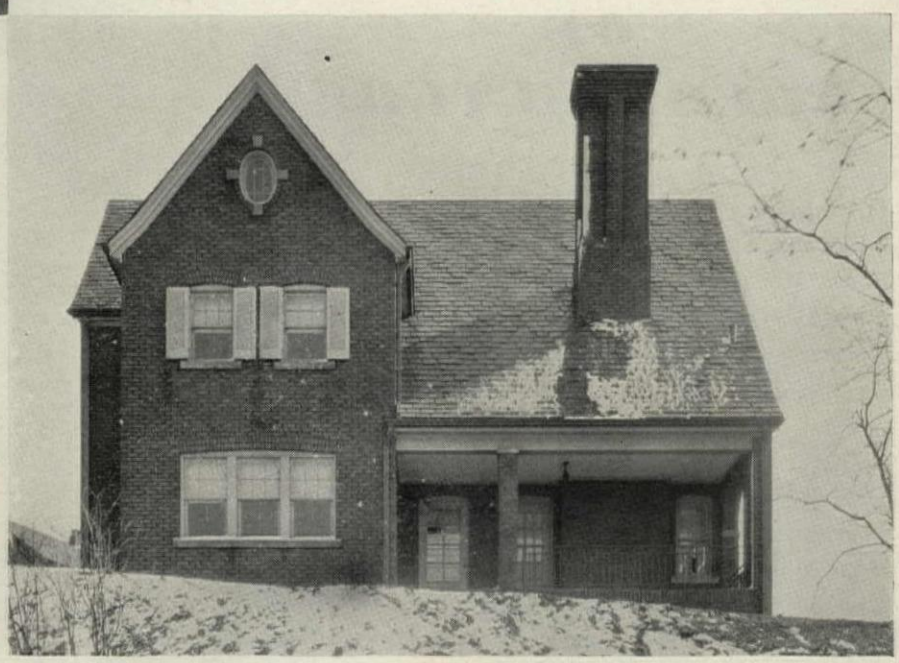

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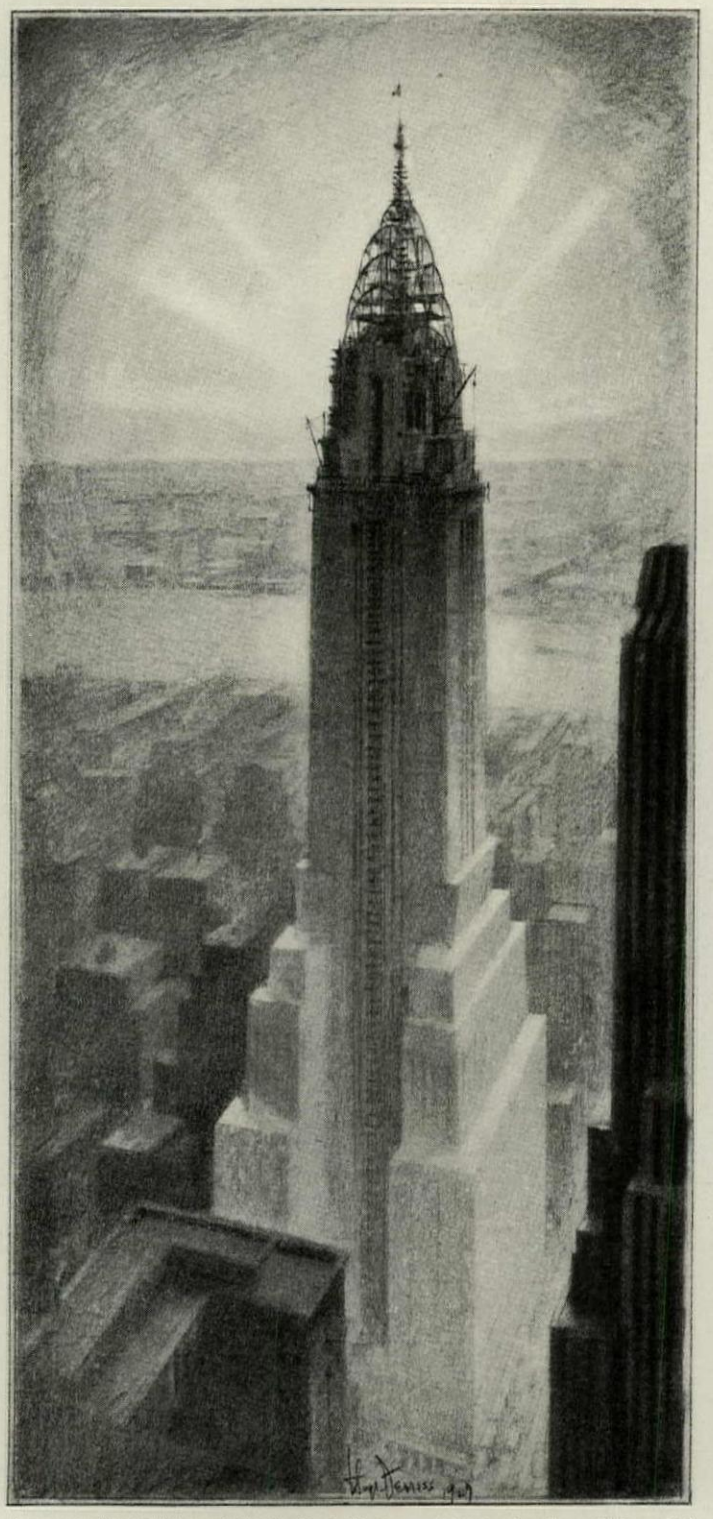

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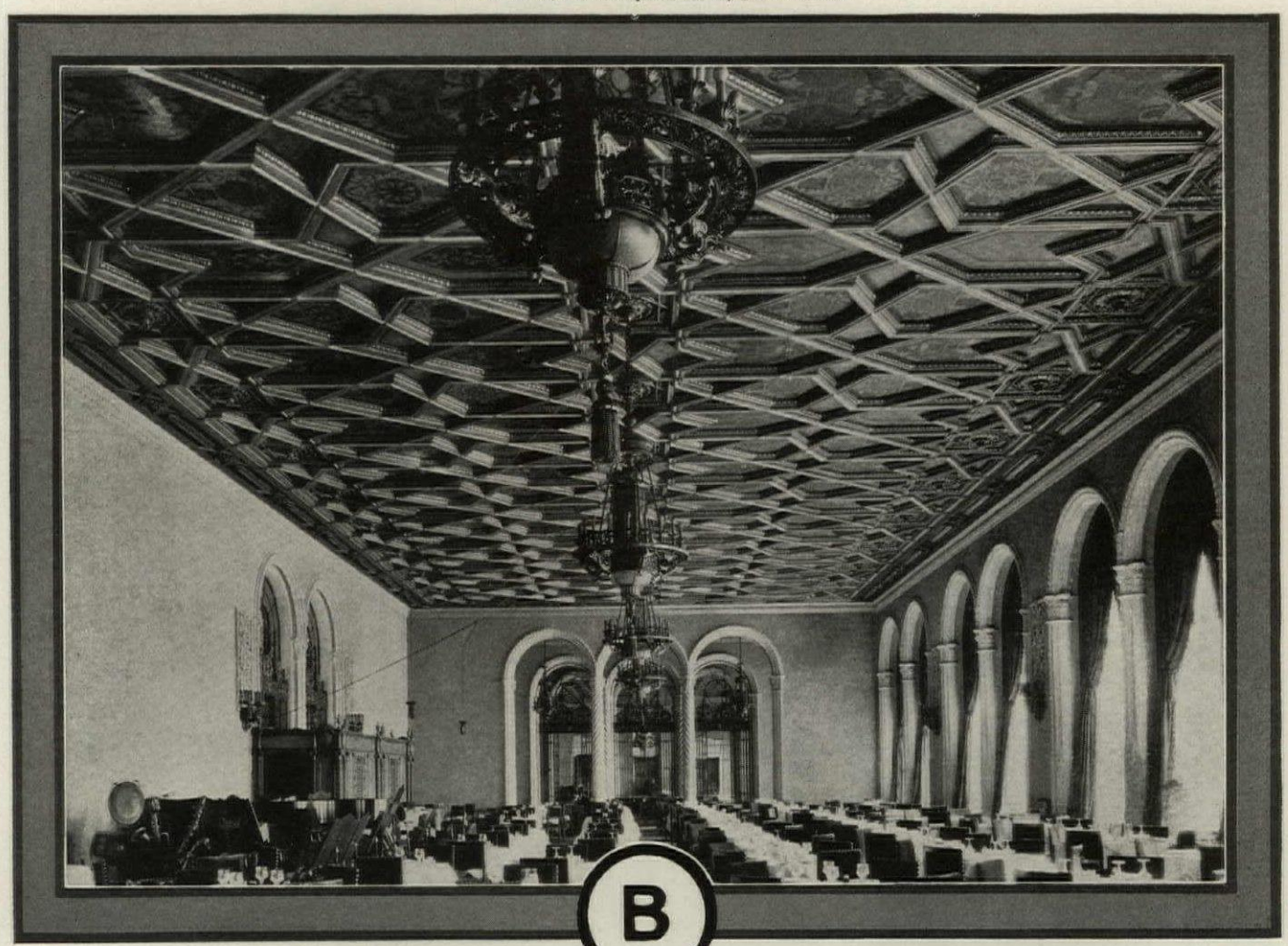

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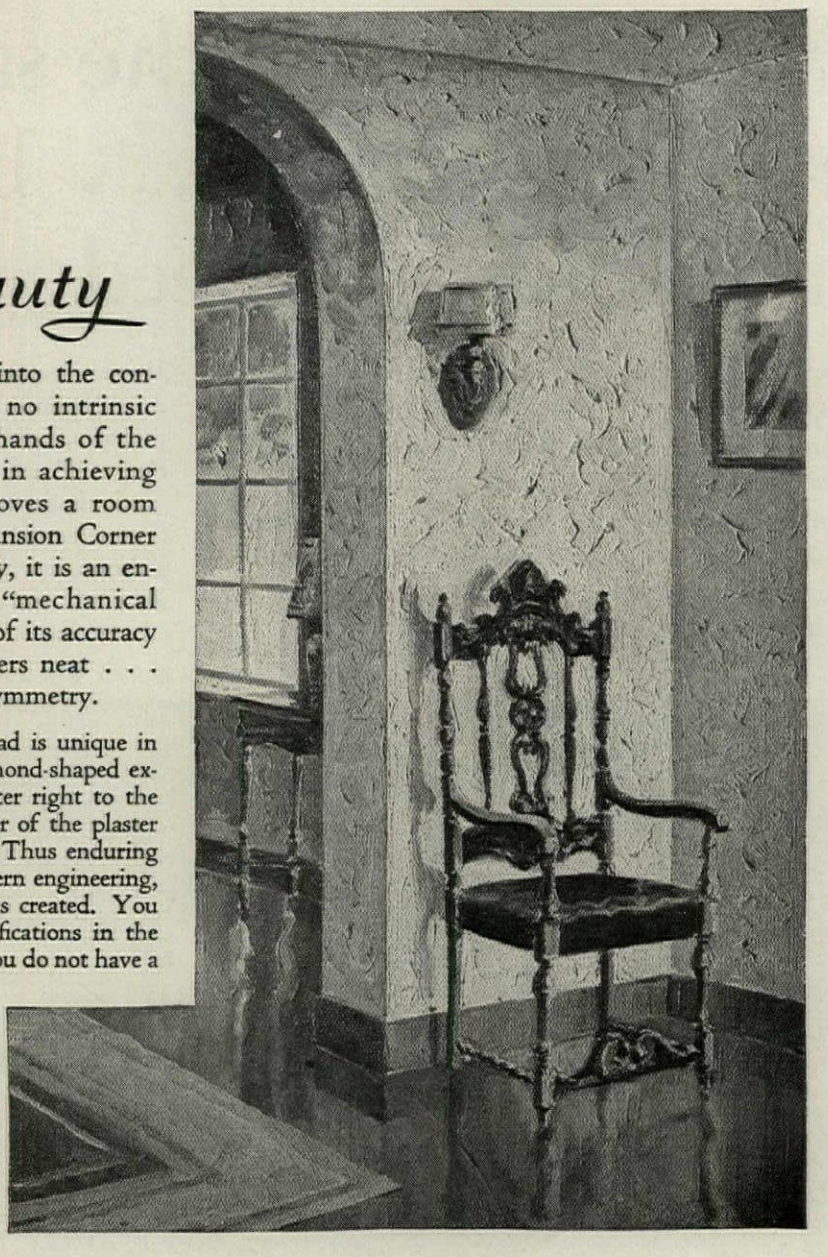

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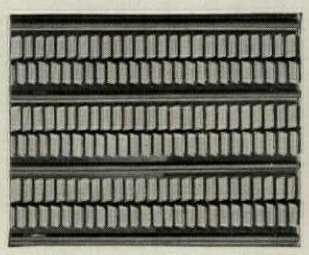

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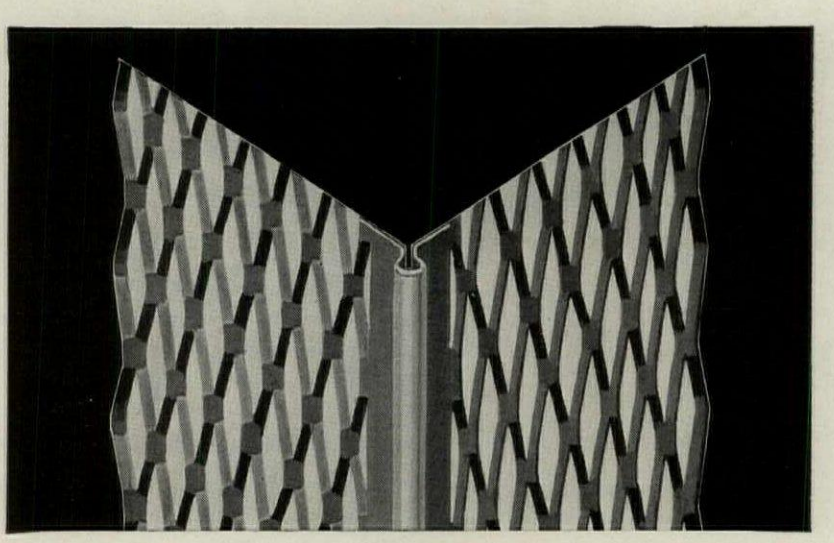

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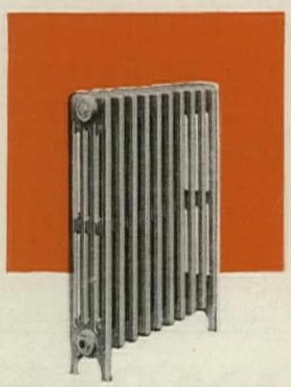

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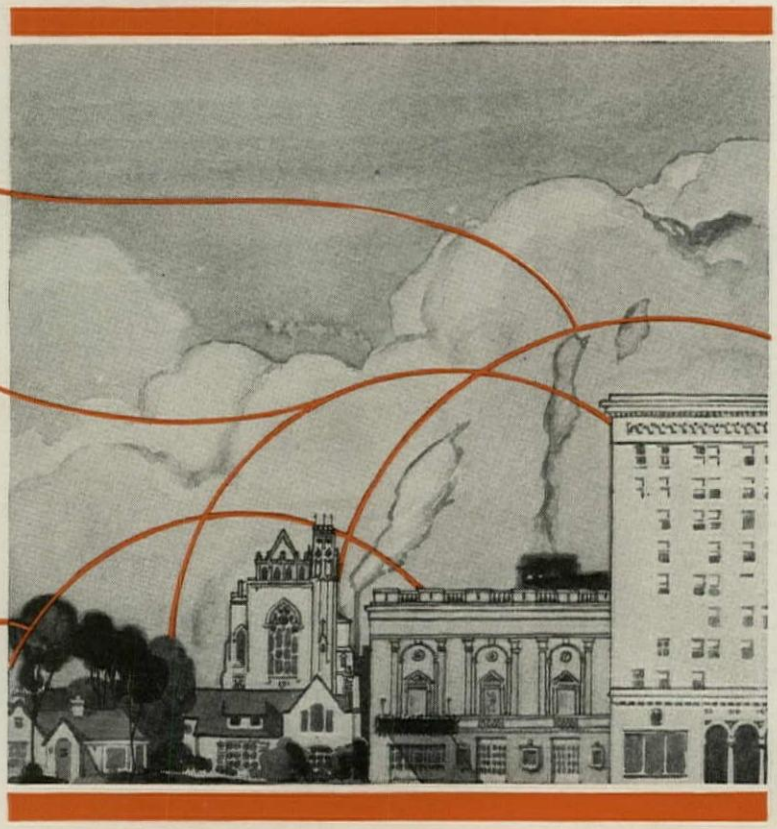

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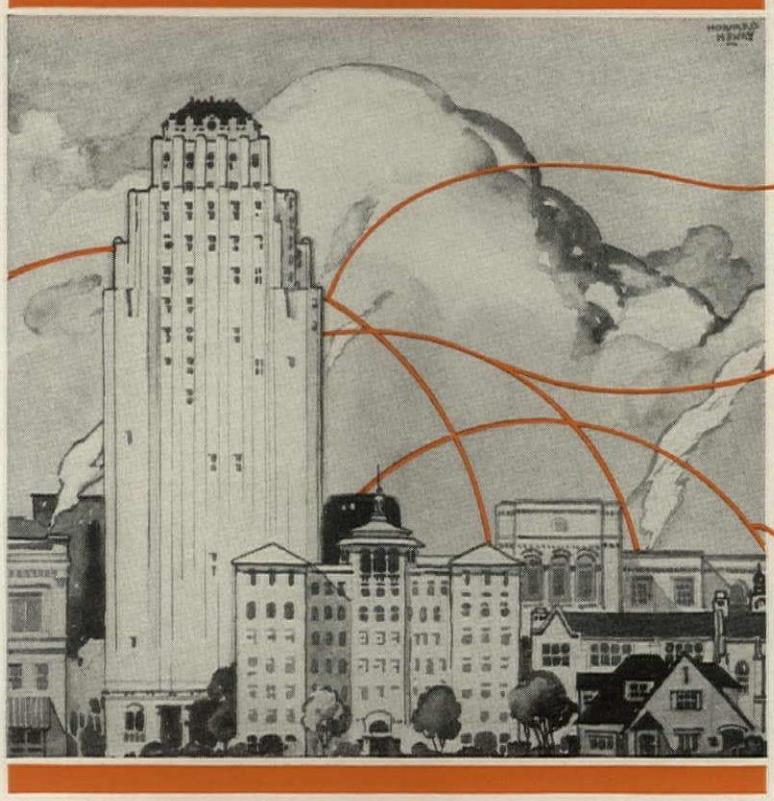

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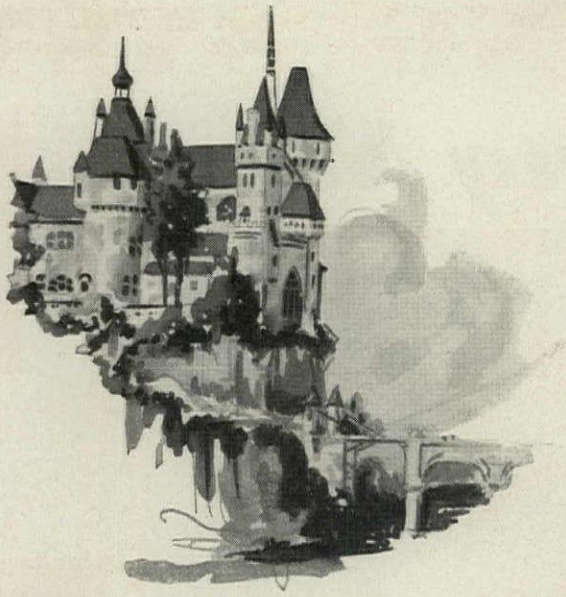

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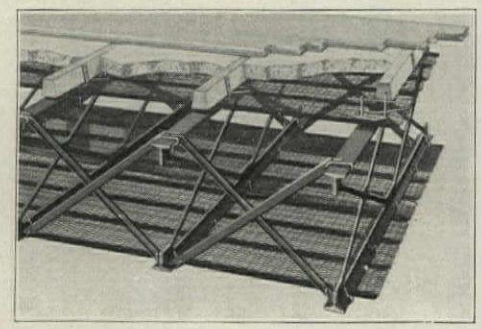

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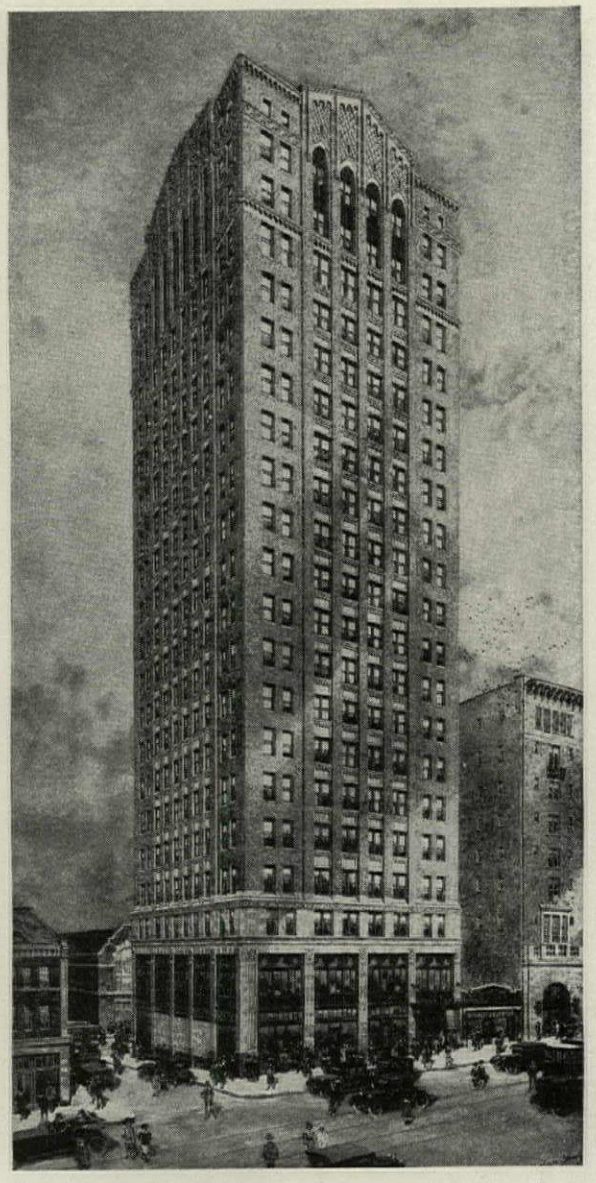

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NEW YORK CITY, 50 Church Street
PHILADELPHIA, 1700 Walnut Street
PITTSBURGH, 207 Fulton Building
SCRANTON, PENNA. Cedar Avenue
ST. LOUIS, 1514 Chemical Building
TORONTO, 2258a Bloor Street, West
TRENTON, 339 Broad St. Bank Bldg.
YOUNGSTOWN, 503 City Bank Building
WILKES-BARRE, PA. 904 Second Nat'l Bank Building

The biggest consideration of them all

Construction

Here's one answer

"Built to Fit the Job"

Our Gravity Roller Conveyor can be furnished with Through Shaft ball bearings for shaft, sizes ranging from ⅝" to 1⅛" and with bearing construction in proper proportion.

Where conditions only require a bearing with shaft size of ⅜" we are not compelled to use a ½" and where a ⅝" shaft is required we have it to use and do not have to skimp through with a ¾".

Performance depends upon construction. It is easy to see why, therefore, that Standard Conveying Systems are constantly rendering the kind of service that is paying in production. Examine a Standard Conveyor, any type, part after part, and you will see the excellent engineering responsible for the construction. This information may help you in planning for your clients. It will be sent you gladly, on request, without obligation.

STANDARD
CONVEYOR COMPANY
NORTH SAINT PAUL, MINNESOTA

Baltimore Office, 2125 Lyndhurst Ave.
Boston Office, 25 Huntington Ave.
Buffalo Office, 908 Ellicott Square
Chicago Office, 549 West Washington St.
Cincinnati Office, 907 Chamber of Commerce Bldg.
Cleveland Office, 5005 Euclid Ave.
Dallas Office, 6313 Oram St.
Detroit Office, 420 U. S. Mortgage Bldg.
Kansas City Office, 215 Mfrs. Exchange Bldg.
Los Angeles Office, 335 S. San Pedro St.
New Orleans Office, 1003 Magazine St.
New York City Office, 420 Lexington Ave.
San Francisco Office, 4401 San Bruno Ave.
Seattle Office, 321 Lumber Exchange Bldg.

Concrete Rib Floor Construction

A Permanent Achievement

The New Paxton Hotel
Omaha, Neb.

Architect:
John G. McArthur
Omaha

Contractor:
Selden-Breck Construction Co.
Omaha and St. Louis

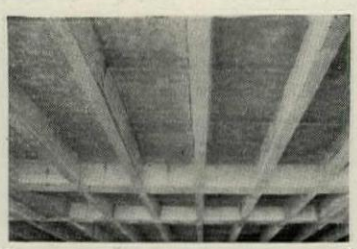
At the gateway to wonders of the Golden West is the new Paxton Hotel —splendid example of the strength, simplicity and beauty of present day architecture.

Significant is the fact that the floors in this modern structure are of concrete rib design—and that the Meyer Steelform method of construction was employed. Meyer Steelforms insure that high-speed operation and economy of construction which are so all-important in today's building program.

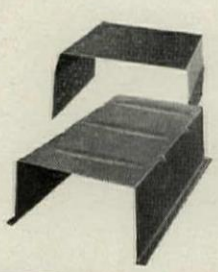
Meyer Steelforms are installed and removed by an organization especially trained to render the greatest possible cooperation to both architect and contractor. A nominal rental charge based on continued re-use of the sturdy steel forms covers installation and removal.

Warehouses located at strategic centers make immediate shipments to the job. You are invited to ask a representative to call and show you how Meyer Steelforms will help you to realize a construction that does full justice to your plans.

CONCRETE ENGINEERING COMPANY
General Offices: OMAHA, NEBRASKA
Sales Offices and Warehouses
Chicago, Detroit, Milwaukee, Minneapolis, Des Moines
Kansas City, St. Louis, Dallas, Houston, San Antonio
Oklahoma City, Los Angeles, Pittsburgh, San Francisco



Note the clean-cut, good-looking joists when Meyer Steelforms are used. Meyer Steelforms are installed and removed by a trained organization. A nominal rental charge based on continued re-use of the sturdy steel forms covers installation and removal.



MEYER Steelforms

THE STANDARD

THE ORIGINAL REMOVABLE STEEL FORMS FOR CONCRETE RIB FLOOR CONSTRUCTION

NO. 56 *of a series of advertisements featuring prominent laundry installations*

For every size hotel, *large, small and "in-between,"* there's an "American" laundry that *fits*

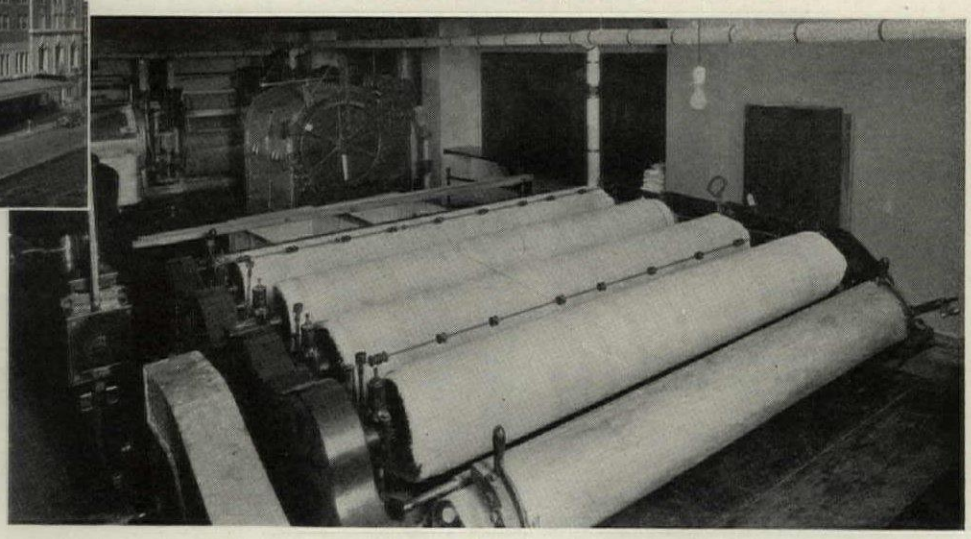
EVERY TYPE of institution nowadays—hotel, hospital, club, factory, office and apartment building—has its own planned-from-the-start laundry department. And a majority of them, as you have probably observed, are installed with the assistance of "American" engineers.

If you are planning a laundry installation of any type or size, our engineers will be glad to tell you about dimensions, powering and pressure, ventilation, weight of machinery. They'll show you drawings and actual photographs—take you through some of the laundries they have helped to plan and equip. "American" service is yours for the asking—yours whenever you want it.

THE AMERICAN LAUNDRY MACHINERY CO.
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

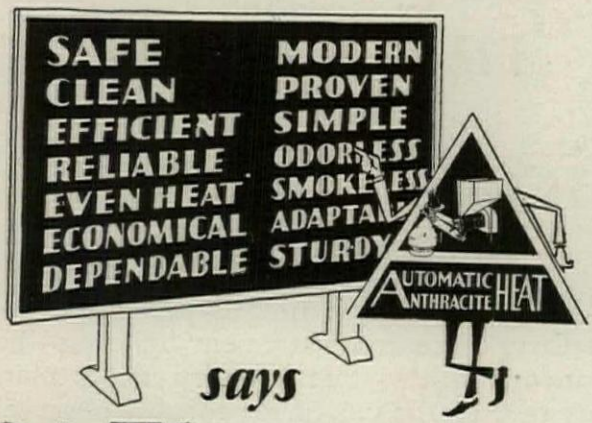
CHARLES W. NICOL, Chicago, *Architect*



THE engineers of The American Laundry Machinery Company collaborated with the architects who designed this complete laundry department at the Gary Hotel, Gary, Indiana.

WE have some very complete reference-file material on modest units of laundry machinery for smaller institutions. Compact equipment, with minimum power requirements. Write for it.

"Truly Modern AUTOMATIC HOME-HEAT must be all these things"



says

The Electric Furnace-Man

READ above list carefully. Compare it word for word with the results home owners are obtaining from their present heating plants.

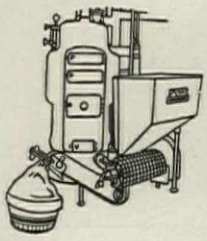
If they want MODERN heating comfort and convenience, do not consider any heating system that does not give them ALL these advantages.

First, consider the fuel. Make sure that it is *safe*. ANTHRACITE—which modern science has made AUTOMATIC—is the one SAFE fuel, giving UNIFORM HEAT without any trouble—without danger—and it is surprisingly economical.

The ELECTRIC FURNACE-MAN is not only a marvelous mechanical device which supplies the fuel and removes the ash, but it brings out *the full heat value* of ANTHRACITE—makes it burn with highest efficiency. No waste—CLEAN—no smoke—no smudge—no odor.

It uses the Buckwheat or Rice sizes—and only as required to maintain UNIFORM HEAT.

No grates to shake—no drafts to regulate. Easily installed in a few hours in any heating plant—warm air, steam, vapor or hot water.



Ideal for Hot Water Supply.

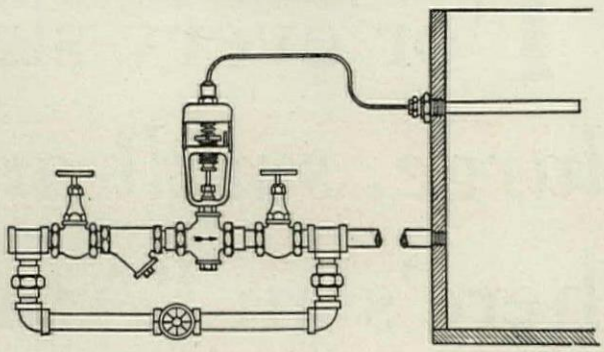
Authorized distributors in principal cities

Patented Product of

DOMESTIC STOKER COMPANY

Gillespie Building, Seven Dey Street, New York

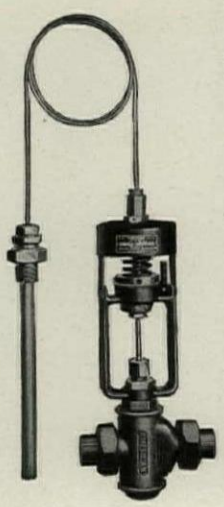
Temperature Control



for Water Heaters and Storage Tanks

Precision regulation pays. If the temperature is to be controlled at all, then the closer the better. The American Precision Temperature Controller maintains a uniform temperature all the time. There is never any variation. It will regulate to within 1° F., plus or minus. Compare its accuracy.

The heart of a temperature controller is the bellows. The bellows in the American Precision Controller will expand and contract 60 million times before rupturing.



That's what gives it long life. Compare its durability.

Test one your self—without obligation. You will not be expected to keep it unless you're completely satisfied.

Send for Folder R-8.

AMERICAN INSTRUMENTS

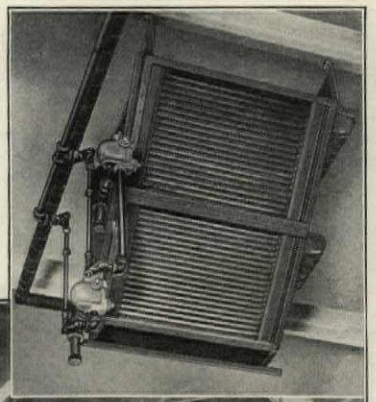
Since 1851

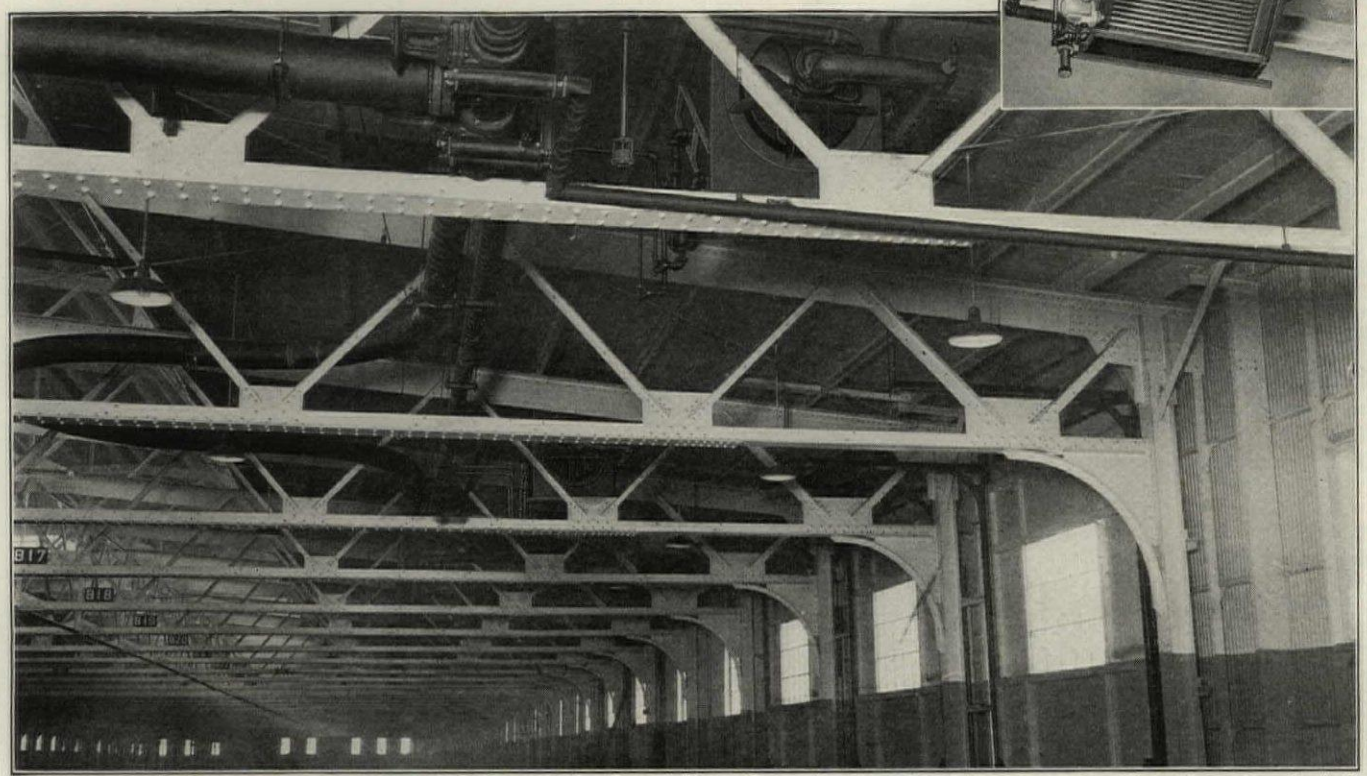
CONSOLIDATED ASHCROFT HANCOCK CO. INC.

Subsidiary of Manning, Maxwell and Moore, Inc.

100 East 42nd Street, New York City

A tricky heating job you'd say?





ERIE RAILROAD CO., PIER 21, NORTH RIVER, NEW YORK CITY

Photos Brown Bros. for A. C.

Erie Railroad Co. Engineering Dept., Engineers

Henry R. Kent & Co., Heating Contractors

Buffalo Forge Co., Unit Heaters

135,000 sq. ft. of Perishable Produce

on one undivided River Pier,—open doors at the street end, trucks whizzing in and out, blizzards howling up the open River! New York's mammoth daily fruit and vegetable supply to be protected,—quickly, uniformly, controllably, unfailingly! A tricky job, indeed,—for old-fashioned methods. But Unit Heaters with AEROFIN (The Standardized Light-Weight Fan System Heat-Surface which fathered the modern Unit Heater) did it as slick as a whistle,—because AEROFIN, as is, or as the heart of a Unit Heater, is light, compact, non-corrosive and in one of its three types* and 94 standardized *encased unit* sizes, instantly adaptable to any requirement.

* AEROFIN (LOW PRESSURE), *Tube-Plate Construction, for pressures up to 50 lbs. gauge.*

* AEROFIN (UNIVERSAL), *continuous seamless tubes, multiple-coil construction, for pressures from 2½ to 150 lbs. gauge.*

* AEROFIN (HIGH PRESSURE), *continuous seamless tubes, for pressures from 25 to 350 lbs. gauge (Temp. 500° F.)*

All Units in standardized steel Casings, ready for Pipe and Duct connections.

Write for Bulletin F-59, gratis

Manufactured by

AEROFIN CORPORATION

850 Frelinghuysen Avenue, NEWARK, N. J.

39 Cortlandt Street, NEW YORK

Burnham Building CHICAGO

Land Title Building PHILADELPHIA

United Artists Building DETROIT

Oliver Building PITTSBURGH

Paul Brown Building ST. LOUIS

AEROFIN is sold only by Manufacturers of nationally advertised Fan Heating Apparatus

HELPING TO

Bring America Back Home

"...Home, the spot of earth supremely blest,
A dearer, sweeter spot than all the rest"

The CASTLE of CONTENTMENT in the PRINCIPALITY of LOVE!

The sweet visions of this happy Wedding Day hold the dearest dream of all...the age-old dream of youth and love!...The Dream of Home!...trysting place of hearts and hopes united...that Castle of Contentment which a man protects...that Principality of Love in which a woman rules...but even married couples must be practical ...winter months follow the Wedding March...home must be made secure against the rigors of storm and cold...cheeks that glowed with health in June must not languish for warmth in January...suffering must not dim those eyes that now sparkle with love...give your home, however simple or however fine, the blessings of radiator heating...Marriage is the promise of Perpetual Happiness...American Radiator Heating is the supreme Wedding Gift of Perpetual Summer!

You can own the home of your dreams. Consult your local Building and Loan Association, let them show you how. There is no obligation whatsoever.

If you will sign your name below and send it to the American Radiator Company, 40 West 40th Street, New York, N. Y., we will send you particulars of our convenient plan by which you may have your home heated at a uniform temperature of 70° by an American Radiator Heating Unit at less than $75 a room!

My name is _____ My address is _____

My Wedding Day is _____

REPRODUCED in four colors, beautifully executed, this advertisement will appear during the month of June in the Saturday Evening Post, Ladies Home Journal and other leading national publications reaching 30,000,000 people.

Part of our national advertising program to promote home ownership and the building of better homes.

AMERICAN RADIATOR COMPANY

40 WEST 40TH STREET, NEW YORK
AND ALL PRINCIPAL CITIES

for New York's Largest Apartment House

NEW YORK'S largest apartment house will soon be ready for occupancy. On Park Avenue from 93rd to 94th Streets, it will contain more than 1,300 rooms. Its architects are Schwartz & Gross. Its builders and owners are the Bricken Construction Company.

The entire hot water supply for its 400 bathrooms will be furnished by *two* Taco Water Heaters, hooked up to the building's 4 regular steam heating boilers.

This fine apartment house is thus assured an unfailing hot water supply, automatically heated by the same fire that heats the rooms. Through the summer months one boiler does the hot water job.

More and more modern homes and buildings are being equipped with Taco Water Heaters. Taco provides the most effective and economical method for heating the hot water supply. It does away with the need of extra fires. Many heating engineers have endorsed Taco, and recommended this low-cost, never-failing system on all jobs. The makers of Taco guarantee results.

Taco Water Heaters are especially well adapted to oil burner hookups for year-round automatic hot water.

If you haven't already received the facts about Taco, you will probably like to have them. If you will drop us a line, we shall be glad to furnish them without obligation. Address Taco Heaters, Inc., Dept. D-3, 342 Madison Avenue, New York City.

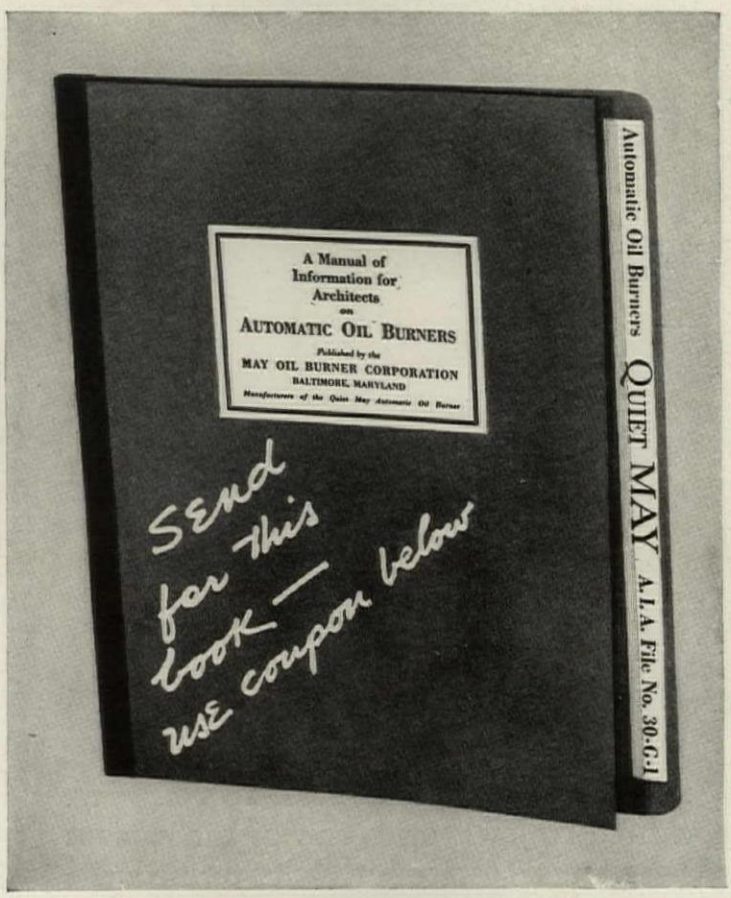
TACO

AUTOMATIC FUEL-LESS WATER HEATERS

Two Books on Automatic Oil Burners

FOR THE ARCHITECT

Our "Manual of Information for Architects on Automatic Oil Burners" is being cordially received by the profession. If your office has not received a copy, or if you want a duplicate copy, one will be mailed upon request. This manual is useful to architects because: (a) It is a text book on oil burners, (b) It is a time-saver for the designer and specification writer, (c) It is an excellent guide for the superintendent from your office, (d) It contains the complete Regulations of the National Board of Fire Underwriters covering oil burners.



MAY OIL BURNER CORPORATION
3500 E. BIDDLE ST., BALTIMORE, MD.

MEMBER OIL HEAT INSTITUTE OIL HEAT

Please send me items checked below:

☐ Manual for Architects
☐ Book for Home-Owner

Individual_____

c/o Firm_____

Street_____

City_____ State_____

F

FOR THE HOME-OWNER

Realizing that our Architects' Manual would not be clear to the average home-owner, and that the burden of explaining *what it's all about* must fall upon the architect, we have prepared a *picture book* on the Quiet May Automatic Oil Burner, A CLOSE-UP of WHAT IT IS and HOW IT WORKS.

We shall be glad to send you either or both of these books.

MAY OIL BURNER CORPORATION
3500 E. BIDDLE ST., BALTIMORE, MD.

MORE UNIFORM HEATING IN MILD WEATHER

Modine

Cabinet Heaters

MODINE Cabinet Heaters, in addition to improving room appearance, provide vastly better heating.

Temperature control, a most essential factor in correct heating, is easily and quickly secured through operation of the cabinet damper control . . . The Modine damper may be opened the merest crack or to full capacity regulating the amount of warmed air for the mildest or coldest day.

Modine Cabinet Heaters are made in a wide range of capacities and in numerous sizes to conform to varying sill heights. Made in two types—the Floor Cabinet, above, and the Wall Cabinet, particularly desirable where space is an important consideration.

Write for new 4 color Catalog on Modine Cabinet Heaters.

Originators of
COPPER RADIATION

USED IN PLACE OF CAST IRON RADIATION SINCE 1922

Manufacturers of
MODINE UNIT HEATERS

MODINE MANUFACTURING COMPANY 1718 RACINE ST., RACINE, WIS.

Your Decision on Heating and Ventilation Is Important . . . Investigate Carefully

Investigate near-by installations of PeerVent Units—in schools and other buildings. Find out how well PeerVent Units are liked—how noiselessly and efficiently they operate under varying conditions . . . Consider, too, the proven durability of PeerVent Units. Units built by this Company *eighteen years ago* are still in service and giving perfect satisfaction. The latest PeerVent machines are therefore the result of long experience—backed by the pioneer manufacturers of heating and ventilating units . . . Write for Catalogue to the Peerless Unit Ventilation Co., Inc., 718-34 Crescent Ave., Bridgeport, Conn. Please mention whether you would like to see our local sales representative.

PEERVENT

HEATING AND VENTILATING UNITS

How an architect may judge an OIL BURNER

THE final yardstick for measuring oil heat is the type of service the burner gives your client. If the burner you advise gives dependable, day-in-and-day-out service at low cost of operation . . . if the owner can forget everything but its steady, healthful warmth it is a success. Your judgment will never be questioned.

Let the experience of more than 80,000 owners of Williams Oil-O-Matic be considered. Williams pioneered the oil burner . . . now more homes are heated by Oil-O-Matic than any other make of burner. Williams Oil-O-Matic is 10 years and more than 80,000 owners *beyond experiment* . . . Oil-O-Matic must be good to make good in this conclusive manner. That's your best guide in specifying an oil burner.

Entirely automatic . . . thermostatically controlled . . . built husky . . . thrifty of its economy fuel . . . unusually quiet . . . dependable. That's Oil-O-Matic—that's why you need never hesitate in recommending it.

"Hit of the Air"—Williams Sync-O-Matics

Two Nights Each Week. Tune in Tuesday on Station WJZ and associated NBC stations at 10 o'clock Eastern Standard Time. Tune in Friday on WGN, Chicago, 8:30 Central Standard Time.

WILLIAMS OIL-O-MATIC HEATING CORP.
Bloomington, Illinois

WILLIAMS OIL-O-MATIC HEATING

Listed as Standard by Underwriters' Laboratories

master of domestic heating problems

WILLIAMS DIST-O-MATIC HEATING

Listed as Standard by Underwriters' Laboratories

genuine Williams warmth for small homes

Is the Williams Architects Manual on file in your office? If not mail this coupon NOW.

A. F.—5-9

Williams Oil-O-Matic Heating Corporation
Bloomington, Illinois

Please send me the Williams Architects Manual on Oil Heat—no obligation.

Name.....

Address.....

City and State.....

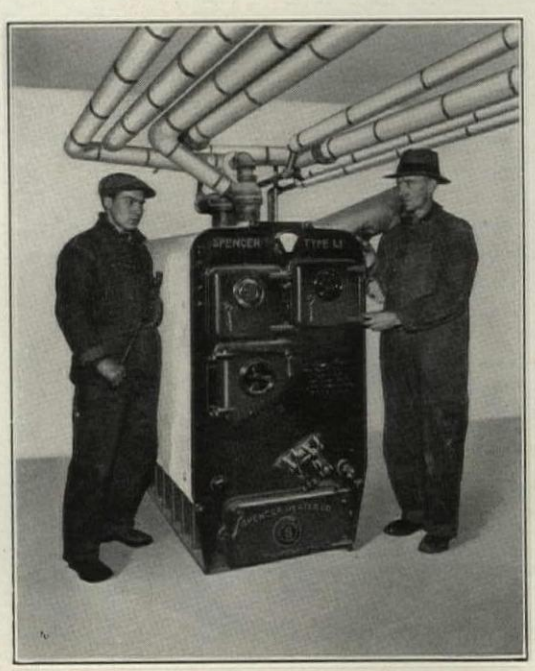
One more way the owner can save replacement expense by consulting the architect

Here's a house—a gem of a small home design.

Down below is a heater—installed in less than three and one-half hours.

In between the two pictures is a story.

Mr. Anton Wagner built the house in the beautiful college town of Swarthmore, Pa. He installed hot water heat. Last autumn expert steam fitters replaced the original heater with the Spencer L-107W Heater illustrated below.



Nearly half the sales of Spencer Heaters are made to home owners who replace heating equipment after their homes are built. These property owners have to learn by experience that a Spencer will pay its way —and pay its way so fast and easily that it will soon return to them in fuel cost saving the entire cost of the new heater.

The architect knows the Spencer Heater as a quality made, precision built heating plant. Its sections meet metal to metal in a tight joint that eliminates the possibility of corrosion building up between sections. It is an efficient heater, with grate areas, combustion depth, and fire and water travel so balanced that they get from any fuel as much efficiency as any other heater.

In addition to all this, the Spencer is a magazine feed heater that requires attention only once or twice a day. It is made with the sloping Gable-Grate that lets fire burn up-hill. The fire that burns up-hill will burn No. 1 Buckwheat anthracite, pea, and buckwheat coke, the small sizes of graded bituminous coals—all the small size fuels that cost so little.

With all of its high quality, its precision construction, a Spencer costs but little more than ordinary heaters. With its fuel cost saving—as much as half the ordinary bill for heat—it quickly pays its entire cost.

Architects know that Spencer Heaters, whether in bungalows or sky-scrapers, give property owners the lowest cost heater they can buy. Write for illustrations and descriptions of the newest L-type and J-type Spencer Heaters, and they will be sent to you with actual capacities of all Spencer cast iron sectional and steel tubular heaters guaranteed in square feet of cast iron column radiation. Spencer Heater Company, Williamsport, Pa.

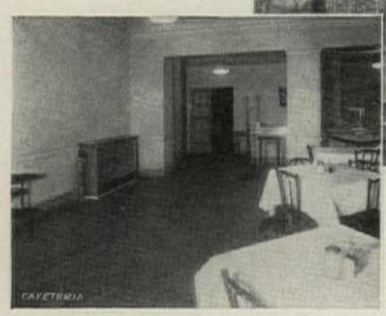
SPENCER SAVES

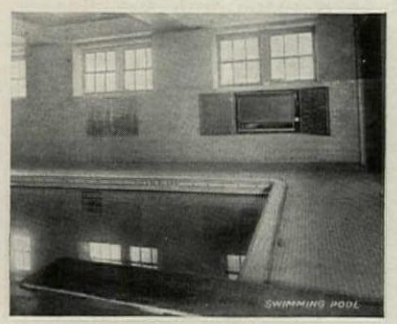
SPENCER
steam, vapor or hot water
HEATERS

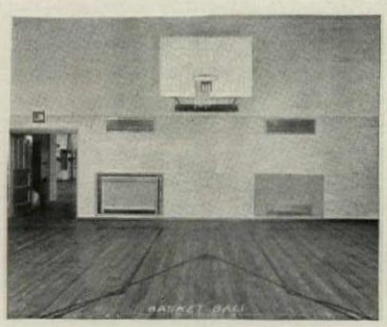
Architects: Perkins-Chatten and Hammon, Chicago

Engineer: James B. Lund, Chicago

Heating Contractors: Kohlbry - Howlette Company, Chicago







Chicago "Y" shows how Unit Ventilators should be used

As one engineer said, "It is one of the slickest unit ventilator jobs I have ever seen."

There are 27 Sturtevant Unit Heater-Ventilators in various parts of the building. In most cases they are "built in" and present a particularly good appearance. They are used for rapidly heating up rooms that are not continually in use . . . for bringing in outdoor air, filtering it clean and delivering it comfortably warmed (in winter) to the ever-popular "pool" . . . and for keeping "gym" and basket ball court at exactly the desired temperature without taking up an inch of space or making any obstruction.

Sturtevant Unit Heater-Ventilators offer to Architects, Engineers and Contractors a flexible system of heating and ventilation easily adopted to almost every situation. They are compact, handsome in appearance and SILENT! They can be used in old as well as new buildings — no expensive duct work necessary.

It would be a pleasure to send you a new Data-Catalog showing many actual installations in schools, public buildings, clubs, churches, offices, showrooms, shops and residences. It is a helpful book . . . our nearest branch office will mail you a copy on request — no obligation whatsoever!

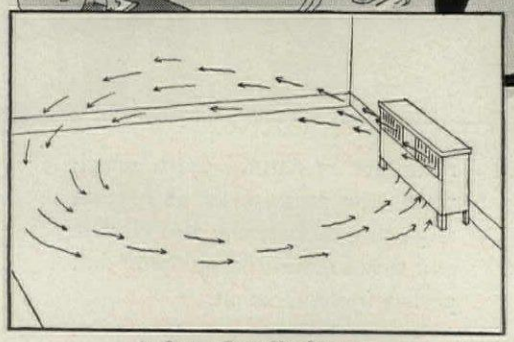
B. F. STURTEVANT CO.

Plants and Offices at: Berkeley, Cal., Camden, N. J., Framingham, Mass., Galt, Ontario., Hyde Park, Mass., Sturtevant, Wis. *Canadian Representative:* Kipp Kelly, Ltd., Winnipeg, *also Branches in Principal Cities and Agents in Foreign Countries.*

Sturtevant

REG. U.S. PAT. OFF.

The Silent Unit Heater-Ventilator



A *Complete* Radiator—
not just a cover

Gets the heat "clear across" the room

Even a piping hot radiator can't properly heat a room unless the warmed air is circulated. With a McQuay (See diagram at left) the warmed, air is driven into the farthest corners—keeping every spot in the room at practically the same temperature.

Notice that the McQuay Radiator takes air from near the floor, heats it, and then sends it out into the room, *in a horizontal direction,* with sufficient initial velocity to keep a constant flow of heated air moving into every corner.

A humidifying pan provides the moisture needed for healthy, comfortable heat.

Due to the complete circulation, and the greater heating effectiveness of moist air, comfortable warmth is maintained with lower radiator temperatures.

McQUAY Cabinet RADIATOR

Clean: It sends the heat *out—not up.* So it can't "smudge" the drapes, curtains and walls.

Attractive: The graceful, unobtrusive cabinet of heavy furniture steel can be painted or enamelled any color desired in harmony with the decorative treatment of the room. Or, it may be finished to match the woodwork. Its beauty has an appeal that actually helps rent and sell apartments and homes.

Indestructible: The copper heating unit (entirely enclosed by the cabinet) is immune from rust and corrosion, will not "clog," and is as near everlasting as a radiator can be made.

Prices and Specifications from any Heating Contractor

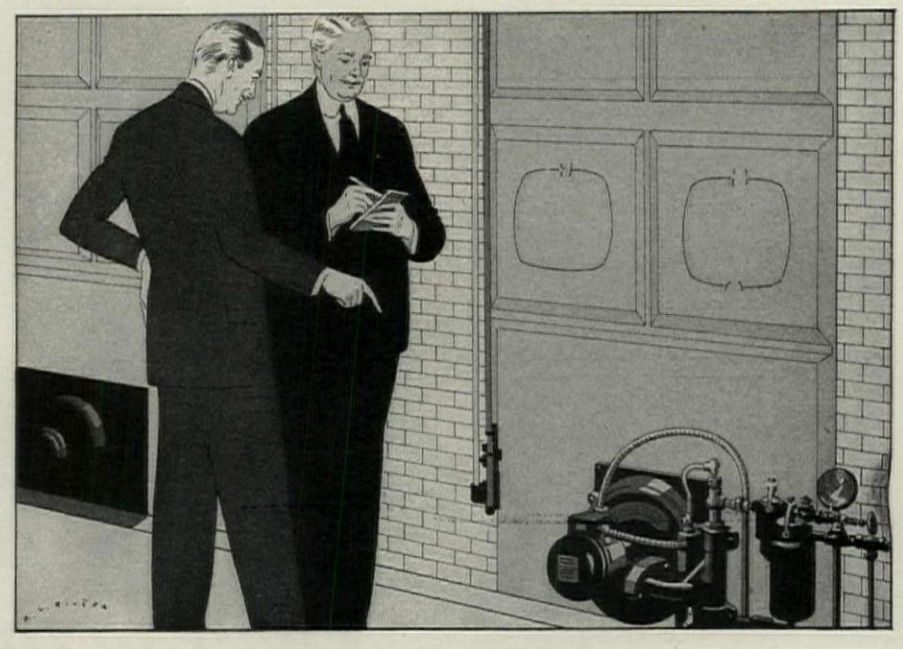
McQUAY RADIATOR CORPORATION General Sales Office: Pure Oil Building, Chicago

Boston: 10 High Street Cleveland: 291 E. 149th Street New York: 2148 Graybar Building

Newark, N. J.: J. F. McLaughlin Co., 738 Broad Street Pittsburgh: Bushnell Machinery Co., Century Building

"These Oil Burners paid for themselves" ~ ~

Vick's Chemical Company gets "perfect satisfaction" with Johnson automatic oil burning equipment



A high standard of efficiency has been set at the Philadelphia plant of the Vick Chemical Company, where exacting temperature control is essential in the manufacture of Vick's VapoRub. The superintendent of this factory writes:

"We have used the equipment for about two years with perfect satisfaction, during which time the saving in fuel and labor alone has been more than enough to pay for our two installations, aside from eliminating all the dust and also the storage space for coal."

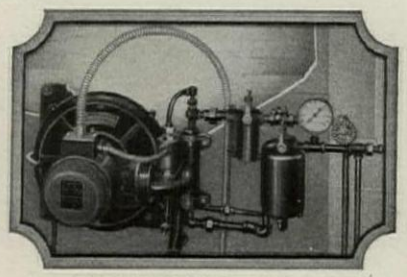
There is no longer any necessity for boiler room extravagance. Heat supplied by Johnson Oil Burners is efficient because there is no waste in banking fires; no unburned fuel to fall into the ash box. Fuel is burned only when heat is needed. Labor costs are reduced because one man can easily take care of an entire battery of boilers. Ash removal expense is entirely eliminated.

For Every Heating and Power Purpose

In homes, large buildings, factories and industrial plants Johnson oil burning equipment is receiving enthusiastic endorsement from coast to coast. Johnson Rotary Burners, with either manual, semi-automatic or full automatic control, are made in three styles and six sizes—giving a range of from 250 to 27,800 square feet of steam radiation or the equivalent. We also manufacture natural draft, whirlwind, low pressure air and steam atomizing oil burners; also electric and steam driven oil pumping and preheating equipment.

And each product, fully guaranteed, is the result of more than 23 years experience in the exclusive manufacture of oil burning equipment. Our Engineering Department will be glad to help you in the solution of your heating or power problems.

Separately Bound Copies of our Catalogue in Sweet's for drafting room use will be mailed on request.



Awarded Gold Medal, Sesqui-Centennial Exposition, Philadelphia, 1926, for "Excellence of workmanship and completeness of design"

JOHNSON OIL BURNERS

Listed as Standard by the Underwriters' Laboratories

S. T. JOHNSON CO.

Main Office and Factory, 940-950 Arlington Street, Oakland, California

Factory Branches

SAN FRANCISCO, SACRAMENTO, STOCKTON, PHILADELPHIA

The world's largest apartment building, The Beresford, in New York City, will be heated by *The* Dunham Differential Vacuum Heating System

THE world's largest and most beautiful apartment building, The Beresford, at 81st and 82nd Streets and Central Park West in New York City, will be occupied by tenants of international repute in the fields of banking, industry and commerce. No expense has been spared to provide a structure not only of commanding external beauty and dignity, but of incomparable luxury, comfort and convenience within.

The Beresford Apartments are twenty stories in height, with the addition of a pent house and three towers which will be used as observatories and from which an extensive view of the city may be obtained. The architecture is modern Barocke, in stone, brick and terra cotta, and the design provides garden terraces in the set-back upper stories.

Suites of from 4 to 18 rooms will be available in The Beresford, room sizes being from 22 x 38 feet for living rooms, 20 x 24 feet for dining rooms, 17 x 26 feet for chambers and with galleries of 12 x 30 feet. The furnishings throughout will be unsurpassed in richness and beauty.

A Dunham Differential Vacuum Heating System is being installed in The Beresford Apartments, the selection of this system indicating the care with which the owners and builders (H. R. H. Construction Corp.) sought, and found, for their building, the most satisfactory form of steam heating that modern engineering has thus far developed.

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

Look for the name DUNHAM

This nameplate identifies a genuine Dunham Thermostatic Radiator Trap.

U. S. Patent No. 1644114. Additional patents in the United States, Canada and foreign countries now pending.

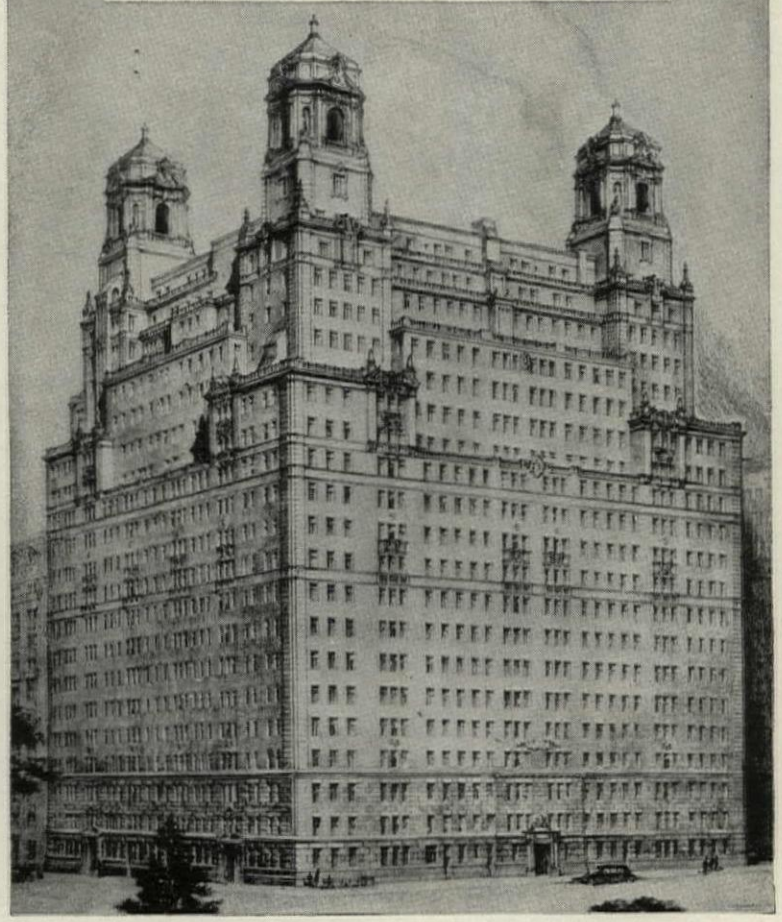
C. A. DUNHAM CO.
DUNHAM BUILDING
450 East Ohio Street, Chicago

Regarding The Beresford Apartments' Heating System

The heating system is upfeed. The supply risers and returns are anchored at the 4th, 11th and 18th floors with swing expansion loops concealed in the ceiling space below the 8th and 14th floors.

Low pressure steam will be generated in five boilers. The steam is supplied to two heating zones, one zone covering the north and west sides and the inner courts which are open to the west, and has a total load of approximately 57,000 sq. ft. The second zone covers the south and east sides, having a total load of approximately 28,000 sq. ft. The steam pressure in each zone will be controlled by Sub-atmospheric Control Valves (actuated by two thermostats for each zone) working thru the Dunham Alternate Control Panel. The valves for each zone are located in the boiler room. The returns for each zone are carried back separately to the Dunham Differential Vacuum Pumps which are cross connected for emergency service.

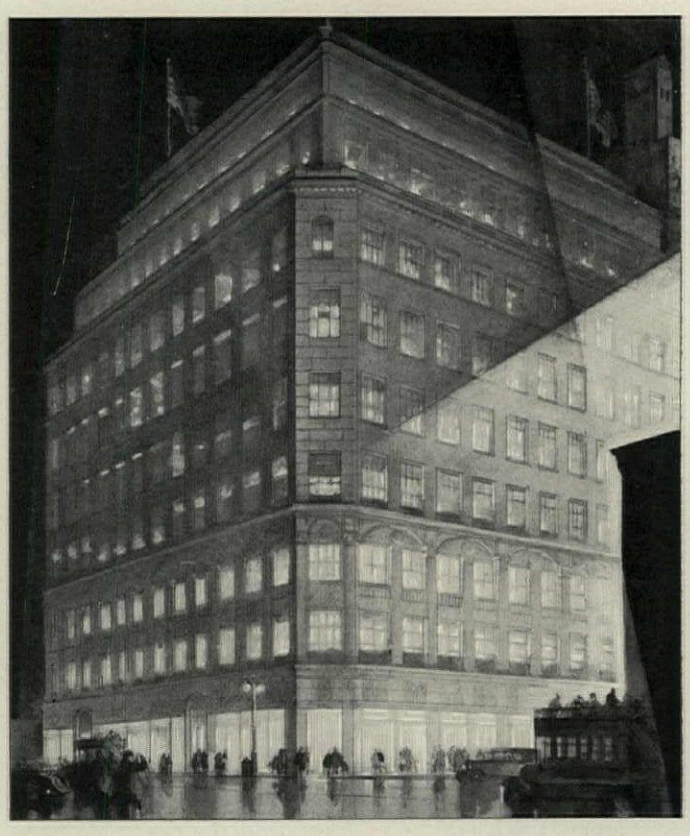
The hot water storage heaters are independent of the heating system. They are suspended above the boilers and the condensate is returned by gravity to the low pressure boilers.



Architect: Emery Roth *Heating Contractor:* Raisler Heating Co.
Consulting Engineers: Eadie, Freund & Campbell

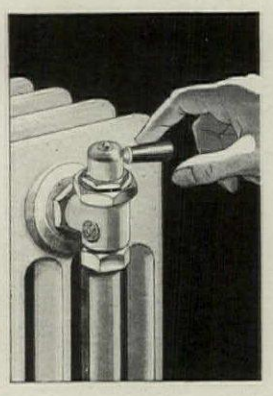
In ZERO *weather*

a 12 *ounce pressure heats this building*



3 *ounces heat this home . . .*

with FINGER-TOUCH CONTROL



The Hoffman No. 7 Modulating Valve may look like other similar radiator valves. But this valve's flexibility, its custom-made port, and its ability to work perfectly for years, are apparent only on minute examination.

This modern time-tested system is *guaranteed* to deliver ample heat always under control. More flexible than electric light, completely automatic yet unencumbered by mechanical devices—Hoffman Controlled Heat.

With any standard boiler and radiators, whether fired by coal, oil or gas, it is easy to add the equipment that makes it a Hoffman Controlled Heat system. This equipment places precise controls over boiler and radiators at every point necessary to assure automatic, amazingly safe and flexible operation. This system automatically adjusts itself to the hour-to-hour need for heat. Only as the call for heat increases does the supply of steam accumulate. Close comparative check-ups on fuel costs prove drastic savings in operation.

This heating system delivers to each room as much or as little heat as is required, without effect on the temperature of other rooms. Women's scanty attire demands more heat in some rooms—men's woolen garb requires less in other rooms.

Hoffman Controlled Heat installations are guaranteed in writing by a long-established, conscientious maker. Hoffman Specialty Company also offers expert engineering counsel.

We have published a fact-full booklet describing in charts, pictures and words the operation of this system. You are cordially invited to write for a copy. Address Hoffman Specialty Company, Inc., Dept. EF-5, Waterbury, Connecticut.

HOFFMAN
CONTROLLED HEAT

Residence of Mr. Hamilton C. Rolfe, The Highlands, Seattle, Washington

When the choice of an oil burner rests with you ~ ~ ~

What better recommendation can you find than Electrol's long record of distinguished performance?

Architects everywhere report that the home builder is no longer asking for advice on the subject of heating with oil. Today, his question is, "Which oil burner shall I install?"

And architects, in ever-increasing number, are putting the stamp of their professional judgment on Electrol. For Electrol has proved itself worthy by outstanding performance extending over more than a decade.

Electrol's record of dependability has been made in homes and buildings of all types and sizes. It has been successfully heating some of the country's finest residences, built by architects of unquestioned reputation. A distinguished product serving an exacting clientele.

Electrol owners enjoy the comfort of entirely automatic heat, electrically operated and controlled. They enjoy the convenience of this new form of home heating secure in the knowledge that their oil burner will operate year after year practically without attention.

Quiet . . . All-Electric . . . Entirely Automatic, Electrol embodies the most advanced, proven principles of oil heating. It provides a constant temperature, thermostatically maintained. And it is regulated and safeguarded in its every operation by the exclusive *Master Control*.

We have an A. I. A. folder which thousands of architects are keeping in their files. If you have not received a copy, we shall be glad to supply you with one. Write us or ask the Electrol dealer in your city.

ELECTROL INCORPORATED
179 Dorcas Street, 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 OIL HEATING INSTITUTE

REVIEWS OF MANUFACTURERS' PUBLICATIONS

C. A. DUNHAM CO., 450 East Ohio Street, Chicago. "The Dunham Handbook No. 414." A handbook on steamfitting.

Specification writers and those members of an architect's staff who are responsible for the installation of equipment have frequent use for a handbook on the details of steamfitting and plumbing. Though containing 270 closely printed pages, this handbook is of a size to fit the pocket. It deals with the extensive assortment of equipment details manufactured by this widely known house,—details for heating installations, pumps of various sorts, traps suitable for many purposes, and data on many more or less related subjects. Page 5 of the handbook lists the cities and towns in the United States in which there are branch sales offices.

STEEL JOIST INSTITUTE, Detroit. 'Steel Joists."

The first steel joists were manufactured from sheet steel as early as 1855, and numerous buildings were constructed with such joist from that time until 1908, when the quantity production of pressed steel joists was started. Up to 1923, all joists were of the solid web type, but in that year the production of open web joists was started, and the expansion of the industry in the following years was rapid. About 40,000,000 square feet of steel joist floors and roofs are now being constructed annually in the United States, and the possible field of usefulness is only partially developed. As with every new product, the introduction of steel joists met with certain resistance due to the unfamiliarity of architects, engineers and building officials with the proper methods of designing and erection and because of a misunderstanding regarding the fire-resistive properties of the material. In the early days of steel construction, proper methods of fireproofing were not understood, and there were numerous failures of steel members in fires. This led to a reaction on the part of building authorities who began to require sufficient fireproofing to resist a four-hour fire test. Such a requirement is fair enough for a heavy mercantile building, well filled with combustible material, but it is excessive for most light occupancies. The Bureau of Standards has found that it takes 10 pounds of wood, paper or similar combustible substances to sustain a fire equal in its destructive action to a standard one-hour fire test, 20 pounds for a two-hour fire test, and 40 pounds for a four-and-one-half hour fire test. In an ordinary apartment having incombustible walls, partitions and floor construction, if we weigh all the combustible, including the wood top floor, doors, window frames, trim and furnishings, it will be found that the total is less than 10 pounds per square foot of floor area. The same is true of most offices, hotels, residences, schools, theater auditoriums, halls, hospitals, sanitariums and similar buildings. If, therefore, the floor construction of such buildings is capable of withstanding a two-hour fire, it is amply safe for all purposes. Steel joists, protected with a good ceiling of metal lath and plaster, will withstand such a fire, as has been shown by actual tests. In fact the fire resistance of steel joisted floors is equal to that of many types of concrete floors, and the damage in an ordinary fire is much less than that of many types of concrete floors. As these are becoming better understood, the use of steel joists is increasing because of the numerous advantages which they offer to the builder. The lightness of steel joist floors results in great economy in steel framing; the open-web joists are very convenient for installing piping; the saving in form work is a very great item, especially in buildings where the forms cannot be re-used. The use of steel joists is particularly attractive to builders in small cities where it is difficult to obtain skilled carpenters and reinforcing steel placers. Naturally, there has been a variety of opinions as to the proper methods of designing and erecting steel joist floors, and in order to standardize these methods, an association of steel joists manufacturers was formed in the spring of 1928, known as the Steel Joist Institute. Frank Burton, formerly commissioner of the department of buildings in Detroit, and at one time president of the Building Officials Conference, was retained as consulting engineer. As a result of a thorough study of the problems of steel joist construction, a standard specification has been prepared covering the vital points of design, erection and use of steel joists, which it is hoped will be of value to architects, engineers and building officials. Copies of the specification may be obtained from the Steel Joist Institute, Detroit.

DAHLSTROM METALLIC DOOR COMPANY, Jamestown N. Y. "Dahlstrom Steel Partitions." A type now available.

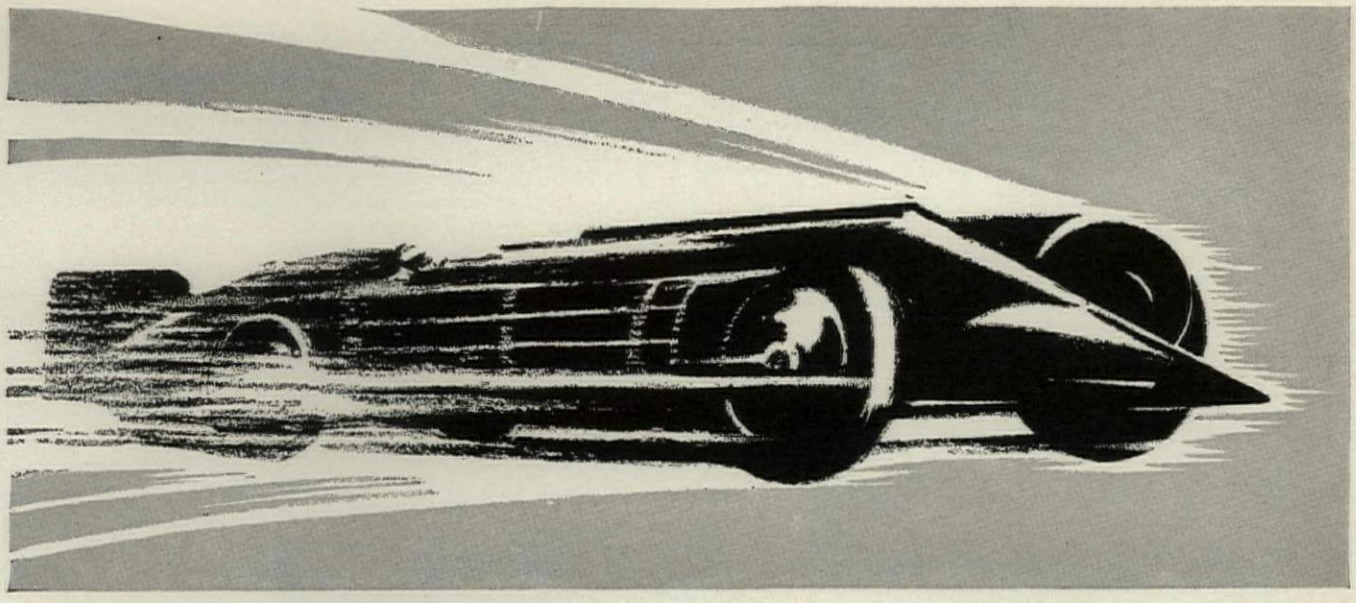
Rapid expansion is the order of changing business conditions of today. Entire floors now replace the small offices of yesterday. Partition walls of tile and plaster or wood must be recovered and rebuilt on account of new arrangements, either with the same materials or with those better adapted to conditions and more flexible. The rapid changes have brought a demand for a finer and more refined division of office and inter-office areas. Recently a new steel partition has been perfected, and placed on the market. This partition is designed to serve the user in the most efficient manner, and be changed as necessary throughout the building.

THE COLUMBIA MILLS, INC., New York. "Window Shades."

Beautiful buildings deserve the best of shades. Poor shades and lack of proper color selection can detract from the appearance of a building with such disastrous effects that the choice of proper quality and colors is of the utmost importance. Many years' experience and close coöperation with the architectual profession have resulted in the production of specific grades of cloth for particular services. In this way are the private home and fine public building supplied with weatherproof, cleanable shades that allow the sunlight to filter through, toned into warm, soft colors. For schools, office buildings, hospitals and in any place where the shade will be subjected to continuous hard usage, a cloth heavier in weight and opaque is recommended. Where complete exclusion of light is essential, for dark rooms, projection rooms and similar places, a cloth is provided, with the exterior colors painted over a solid black base, allowing for the exclusion of light without sacrifice of color scheme. This brochure contains samples of these specific grades of cloth, with illustrations of accessories and installations. The company's architectual service department offers its expert assistance in solving shade problems and in preparation of specifications for buildings of any type.

PRATT & LAMBERT, INC., New York, Buffalo, Chicago. "Specification Manual; Painting, Varnishing, Enameling."

Much of the disappointment and dissatisfaction which so frequently result from operations involving use of paint, varnish, enamel, and similar materials is due to the widespread lack of information regarding their use which exists; even architects and their specification writers, who might be expected to be well informed, sometimes are not, and their lack of knowledge often lays heavy responsibility on the painters who are supposed to obey their instructions. All this is fully realized by the manufacturers of these materials, and to promote the proper use of their wares several of the best known manufacturers issue printed directions so carefully prepared that it would seem as though no one could fail to profit by them. This brochure, for example, deals with the proper use of the materials made and marketed by Pratt & Lambert, Inc. The preface to the Specification Manual says: "In the preparation of this Specification Manual on painting, varnishing and enameling, we have endeavored to make it practical in the fullest sense of the word. It is our hope that the architect will find this book concise, definite and as clear as it is possible to make any finishing specifications. In its compilation we have combed the resources of the industry and have drawn on our own experience gained in the manufacture and use of varnishes, enamels and kindred products, which covers a period of intensive study extending over more than 75 years. The facts in this manual, their presentation and arrangement, are the result of considerable thought, bearing in mind the convenience and preference of the architect. For example, in the forepart of the manual will be found the specifications, just where we believe the architect wants them, although we might prefer to have the descriptions of the products appear first. The specifications and description of products have been separated so that the architect is not obliged to read through several paragraphs of descriptive text in which he may not be interested when his entire thought is being given to the specification. We have tried to apply the same principle throughout the book, realizing that the architect wants definite information, readily accessible, which he can use."



*231.36 miles per hour *for 70 seconds*

Wear—noise—mechanical breakdowns—shorter life—are the costly accomplices of speed also in ventilating equipment.

The Sirocco Fan is the original multi-blade fan. It is the result of 30 years' constant improvement and refinement. It is a slow speed fan, which delivers more air per revolution than any other fan of the same size.

In addition to quiet operation, the slow speed principle of the Sirocco Fan assures long life, dependable operation, and freedom from vibration. Complete catalog and technical data may be obtained from any American Blower Branch office . . . without obligation.

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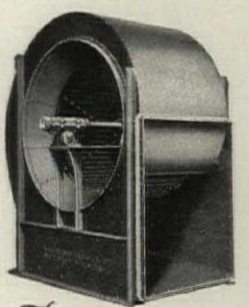
CANADIAN SIROCCO CO., LIMITED, WINDSOR, ONTARIO
BRANCH OFFICES IN ALL PRINCIPAL CITIES

(867)

* Sport-loving England won a world's speed record at Daytona Beach, Florida. Major H. O. D. Segrave proved his steel nerves. The designer of the glistening, twelve-cylinder "Golden Arrow" showed his mechanical genius.

But the sensational speed of 231.36 miles per hour lasted for less than five miles—for scarcely a minute and ten seconds. The terrific speed . . . the monstrous, deafening roar . . . the tremendous strain in spite of the car's special construction—these were too great for this $170,000 wonder-machine to withstand longer without fear of accident.

Below is shown one of the numerous sizes and types of the Sirocco Fan manufactured by American Blower. For a given capacity, the Sirocco Fan operates at a lower speed than any other fan.



The Sirocco FAN

American Blower

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

REVIEWS AND ANNOUNCEMENTS

JACOBSON & CO., 239 East 44th Street, New York. "The General Catalogue, Volume 2." Use of decorative plaster. One who has long followed the development of modern use of the architectural ornament of past ages has frequently marveled at the comparatively small extent to which the resources of ornamental plaster are drawn upon. There is scarcely a country of Europe in which old buildings do not show amazingly successful examples of the plaster worker's skill,—not necessarily as an imitation of something else, since in many instances use of a material other than plaster would have been obviously impossible if only from a structural point of view. Many an old city or town in England, for example, will show, still existing after centuries of exposure to weather, the most admirable examples of plasterwork,—parging,—in gables or even covering entire facades, the ornament adapted with rare taste to the character of the structure, and the size and shape of the area treated. The interiors of these same buildings often show equally beautiful examples of the craftsman's skill in the form of plaster ceilings or ornamental overmantels, not to mention friezes and even entire wall areas. In England and indeed in all countries of Europe, the most marvelous examples of the skill of old plaster workers are still existing, for the guidance of the plaster workers of today.

It was just said that comparatively little use has thus far been made in America of the marvelous possibilities of parging,—but only *comparatively*, and since a small group of architects widely known for their taste and discrimination have pointed the way, use of this beautiful means of decoration is distinctly on the increase. That this is true is abundantly proved by the second edition of the general catalog of a firm which specializes in the production of plaster ornament. With taste and discrimination this firm has searched the world for the best of its kind, and its productions leave nothing to be desired in the matter of taste in selection or in that of execution. This beautifully produced volume of more than 250 plates presents a vast array of architectural fittings which the firm is prepared to supply,—ceilings, of different periods, particularly the beautiful all-over patterns associated with Tudor, Elizabethan or Jacobean interiors; centerpieces, rosettes, corners, finials and bosses; friezes, garlands, beads and mouldings; pendants, caps for pilasters and columns, brackets and corbels, niche shells and panels for different purposes; and for use as grilles for various uses designs from many sources have been skillfully adapted. The architect will be fortunate in having the volume.

Harry T. Miller, formerly of the firm of Farrell & Miller, has opened offices at 5300 Wilshire Boulevard, Los Angeles.

Charles Harris announces the opening of offices in the Standard Life Building, Decatur, Ill. He desires catalogs and other publications.

S. N. Crown and Associates announce the opening of new offices in the Willoughby Tower, Madison Street and Michigan Avenue, Chicago.

Carlos R. Villanueva announces the opening of an office at Cruz Verde a Velasquez, Caracas, Venezuela. He desires the catalogs and other publications issued by manufacturers.

Errata. Due to a lack of complete information, errors were made in giving proper credit in the March issue of THE FORUM. On page 320, the credit for designing the National Presbyterian Church, Washington, should have read, "Cram & Ferguson, Architects; George Oakley Totten and Edward P. Mellon, Associate Architects." On page 368, the credit for designing the First Presbyterian Church, Greensboro, N. C., should have read, "Hobart B. Upjohn, Architect; Harry Barton, Associate Architect." On page 23 of the advertising section, C. Grant La Farge should have been credited with the design of the tile floor in the Cathedral of St. John the Divine, an illustration of which was used in the advertisement for The C. Pardee Works.

Leonard J. Toole, Builders' Building, Charlotte, N. C., desires the samples and publications issued by manufacturers.

Leo J. Devlin, 821 Market Street, San Francisco, has retired from active practice and asks that advertisers remove his name from their mailing lists.

The firm of Warner, McCornack & Mitchell on October 15, 1928, became that of Warner & Mitchell, with offices in the Bulkley Building, Cleveland.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE ARCHITECTURAL FORUM

Published Monthly at New York, N. Y., for May 1, 1929

State of New York, } ss.:
County of New York, }

Before me, a Notary Public, in and for the State and County aforesaid, personally appeared Howard Myers, who having been duly sworn according to law, deposes and says that he is the business manager of THE ARCHITECTURAL FORUM and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager, are:

Publisher—National Trade Journals, Inc., 521 Fifth Avenue, New York, N. Y.
Editor—Parker Morse Hooper, 521 Fifth Avenue, New York, N. Y.
Managing Editor—Kenneth K. Stowell, 521 Fifth Avenue, New York, N. Y.
Business Manager—Howard Myers, 521 Fifth Avenue, New York, N. Y.

2. That the owners are:

National Trade Journals, Inc., 521 Fifth Avenue, New York, N. Y.
Charles L. Bowes, Care A. D. Ranstead, 327 North Menard Street, Chicago, Ill.
Joseph E. Browne, 521 Fifth Avenue, New York, N. Y.
Goldman Sachs & Co., 30 Pine Street, New York, N. Y.
F. B. Keech & Co., 52 Broadway, New York, N. Y.
Miss Rosalie Onorato, Care J. L. Onorato, 836 Union Street, New Orleans, La.
Pearl & Co., 71 Broadway, New York, N. Y.
H. J. Redfield, 521 Fifth Avenue, New York, N. Y.
John T. Wilson, 521 Fifth Avenue, New York, N. Y.
Rupert T. Zickl, Care Bond & Goodwin, Inc., 31 Pine Street, New York, N. Y.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also, that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities, than as so stated by him.

HOWARD MYERS,
Business Manager

Sworn to and subscribed before me this 8th day of April, 1929.
(Seal) MADELINE DIETRICH,
(My commission expires March 30, 1931.) Notary Public

LAPIDOLITH used throughout on all concrete floors of National City Bank, New York City.—*Architect:* McKim, Mead & White—*Contractor:* Geo. A. Fuller.

Every concrete floor in the new New York Life Insurance Bldg., New York City, is treated with LAPIDOLITH. — *Architect:* Cass Gilbert—*Contractor:* Starrett Bros.

The Dodge Bldg., New York City, has Lapidolith-protected concrete floors. — *Architect:* Sharpe, Brady & Peterkin—*Contractor:* Charles L. Frazer.

Every concrete floor in the Paramount Bldg., New York City, is granite-hard and dust-free because of LAPIDOLITH. — *Architect:* Rapp & Rapp — *Contractor:* Thompson, Starrett Co.

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LIGNOPHOL—The penetrating preservative for wood floors. Saturates the wood cells and fibres with natural oils and gums. Prevents checking, cracking, warping, splintering, dry or wet-rot.

HYDROCIDE COLORLESS—The invisible liquid chemical waterproofing that penetrates stone, brick or concrete, caulking the pores permanently against rain, snow or moisture. Will not abrade, crack or run.

KAUKIT—An elastic caulking and glazing compound that seals cracks and fissures around window frames, mortar joints, etc. Will not sag or run.

CEMCOAT—A tough exterior or interior wall coating that is water-repellent. Stays white after other paints turn yellow. Can be washed over endlessly.

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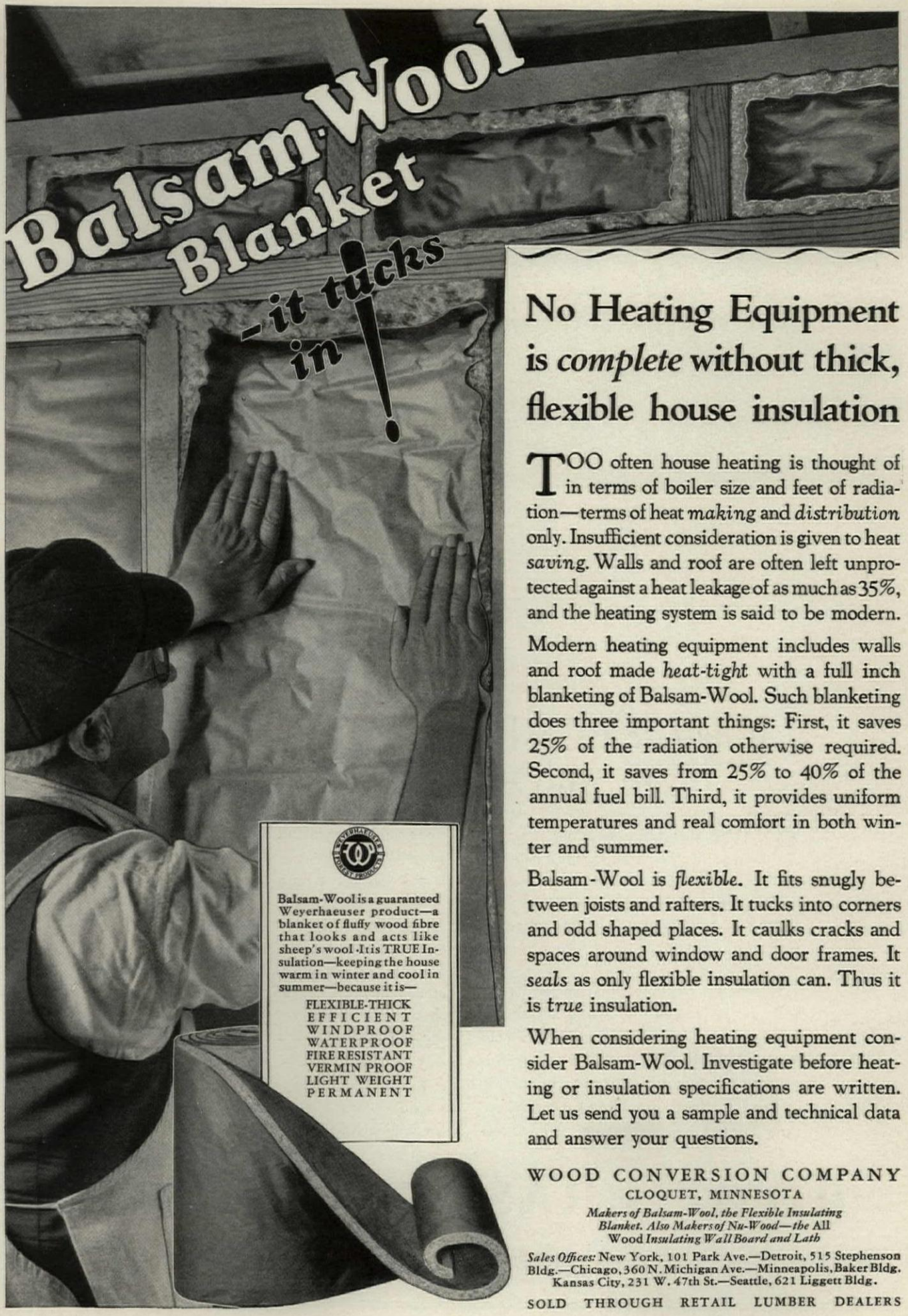
PART 2—ARCHITECTURAL ENGINEERING AND BUSINESS



No Heating Equipment is *complete* without thick, flexible house insulation

TOO often house heating is thought of in terms of boiler size and feet of radiation—terms of heat *making* and *distribution* only. Insufficient consideration is given to heat *saving*. Walls and roof are often left unprotected against a heat leakage of as much as 35%, and the heating system is said to be modern.

Modern heating equipment includes walls and roof made *heat-tight* with a full inch blanketing of Balsam-Wool. Such blanketing does three important things: First, it saves 25% of the radiation otherwise required. Second, it saves from 25% to 40% of the annual fuel bill. Third, it provides uniform temperatures and real comfort in both winter and summer.

Balsam-Wool is *flexible*. It fits snugly between joists and rafters. It tucks into corners and odd shaped places. It caulks cracks and spaces around window and door frames. It *seals* as only flexible insulation can. Thus it is *true* insulation.

When considering heating equipment consider Balsam-Wool. Investigate before heating or insulation specifications are written. Let us send you a sample and technical data and answer your questions.

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CLOQUET, MINNESOTA

Makers of Balsam-Wool, the Flexible Insulating Blanket. Also Makers of Nu-Wood—the All Wood *Insulating Wall Board and Lath*

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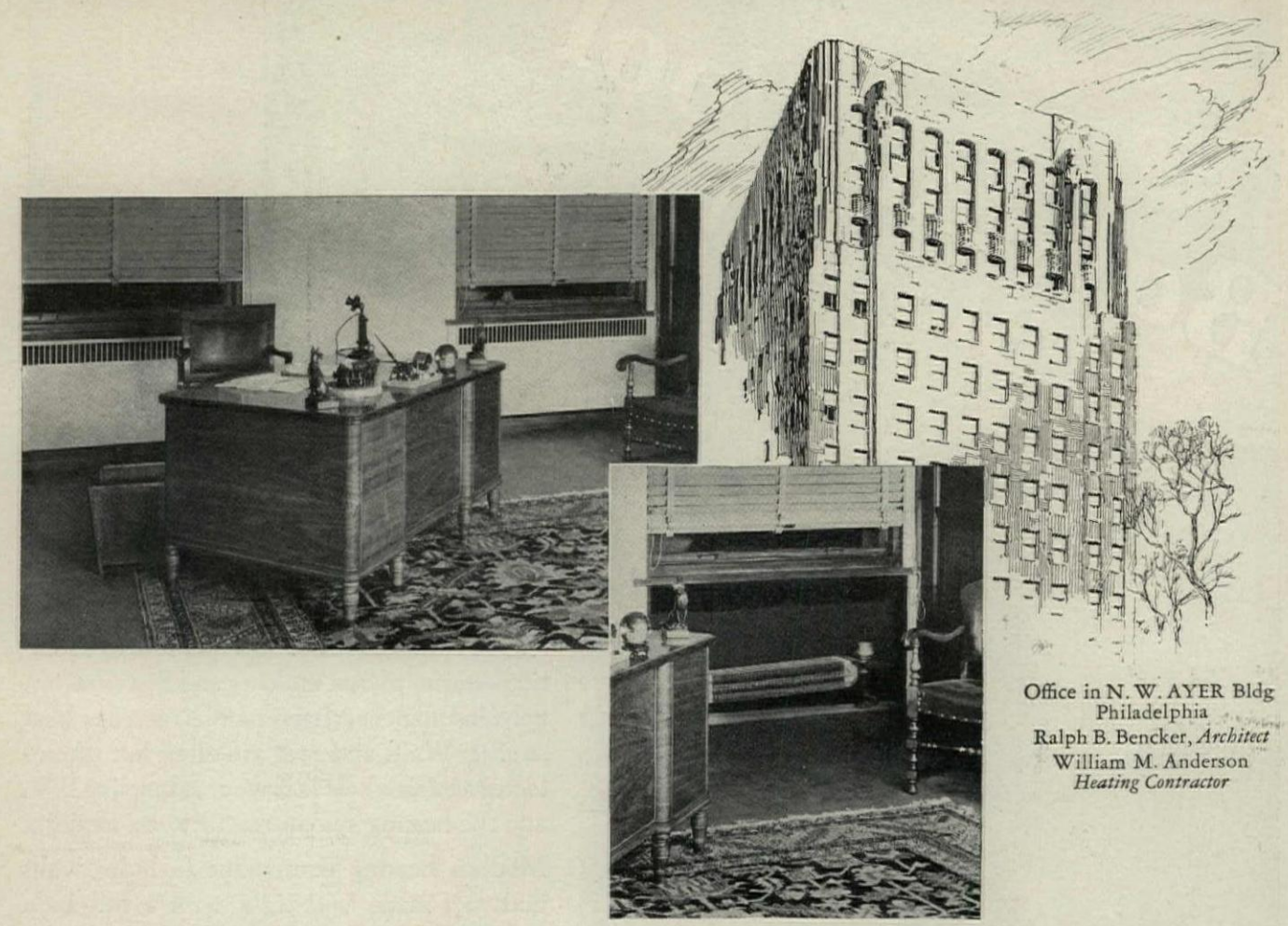

Office in N. W. AYER Bldg
Philadelphia
Ralph B. Bencker, *Architect*
William M. Anderson
Heating Contractor

Why Use ROBRAS 20-20 Radiators In An Office Building?

BECAUSE this office building must be modern in all equipment; must be modern because it was built to house a modern business, the advertising agency of the great N. W. Ayer and Company, ROBRAS 20-20 Radiators were used.

In modern building, old-fashioned radiators are no more to be tolerated than gas for lighting. With these ROBRAS 20-20 Radiators in-the-wall, out-of-the-way, it is possible to get more square feet of heating surface in any given space than has ever before been possible. That is because the brass sections can be assembled in so many variably shaped formations.

For instance, ROBRAS 20-20 Radiators can be used in recesses as little as 2¼″ deep and from 18″ to 70″ in length. They can be set up in one or two tiers as many sections deep as the space allows. They are assembled at our factory to fit any spaces your plans show as available. They are then shipped to the job ready for the heating contractor to install.

For further information, consult Sweets Catalog, your A.I.A. File No. 30-c-4, or send for Engineering Data Sheet.

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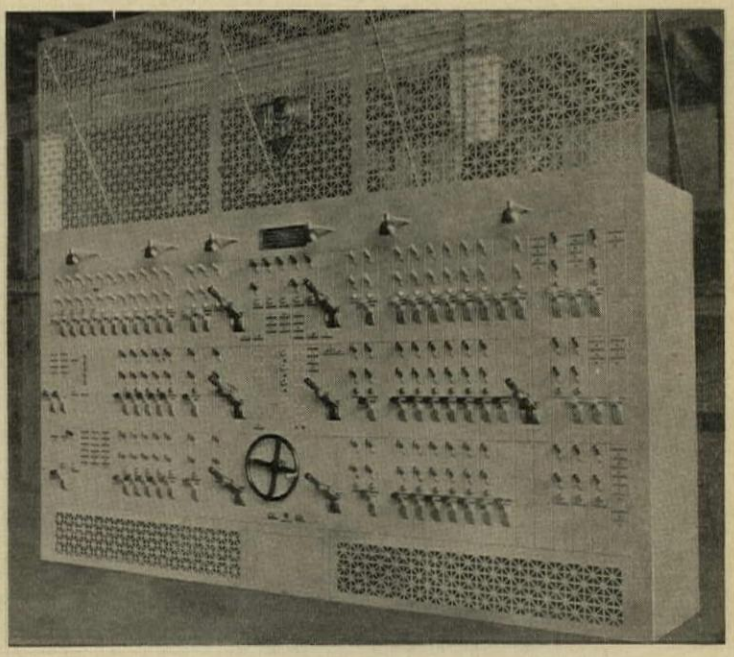
ONE EAST FORTY-SECOND STREET , , , NEW YORK CITY

Pre-Set Selective Theater Switchboard Installed in Keith's Rochester Theater, Rochester, N. Y.
Architect: A. H. Graven, Chicago.
Electrical Contractors: Fishback & Moore, New York City.



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--and the show is on

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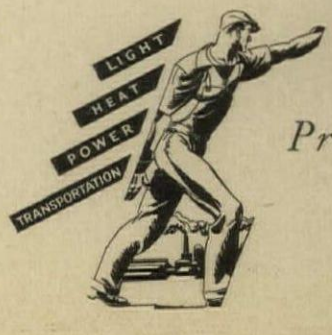

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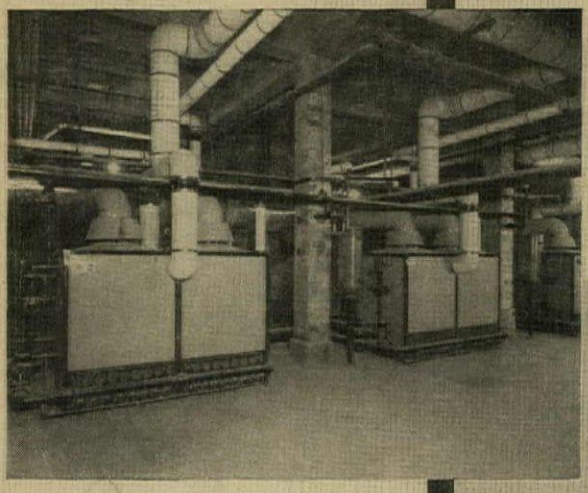

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