THE ARCHITECTURAL FORUM

IN TWO PARTS

ARCHITECTURAL ENGINEERING & BUSINESS

PART TWO

NOVEMBER

1928

Combine

Safety, Silence, Security

with elevator door speed

Perfection in elevator door efficiency is possible through unit installation of Richards - Wilcox Hardware—speed, silence, security and, above all else—safety. Every part—interlocks, checks, closers, hangers, electric door operators—combines all these features. All together, they mean unit control, single responsibility.

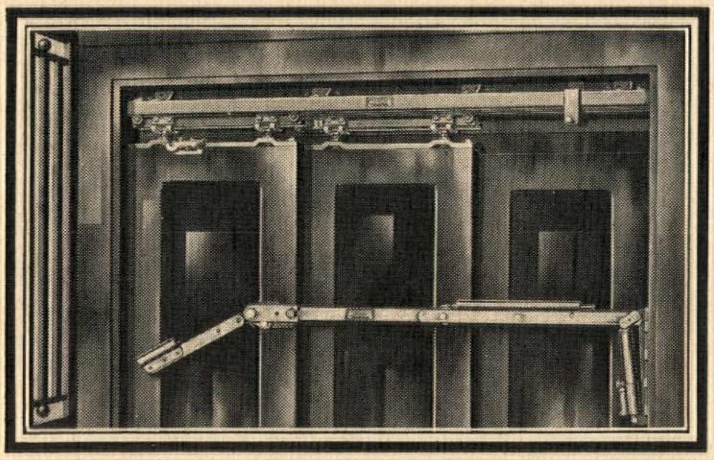
For designs consult our engineers

Richards-Wilcox Mfg. Co.

"A Hanger for any Door that Slides."

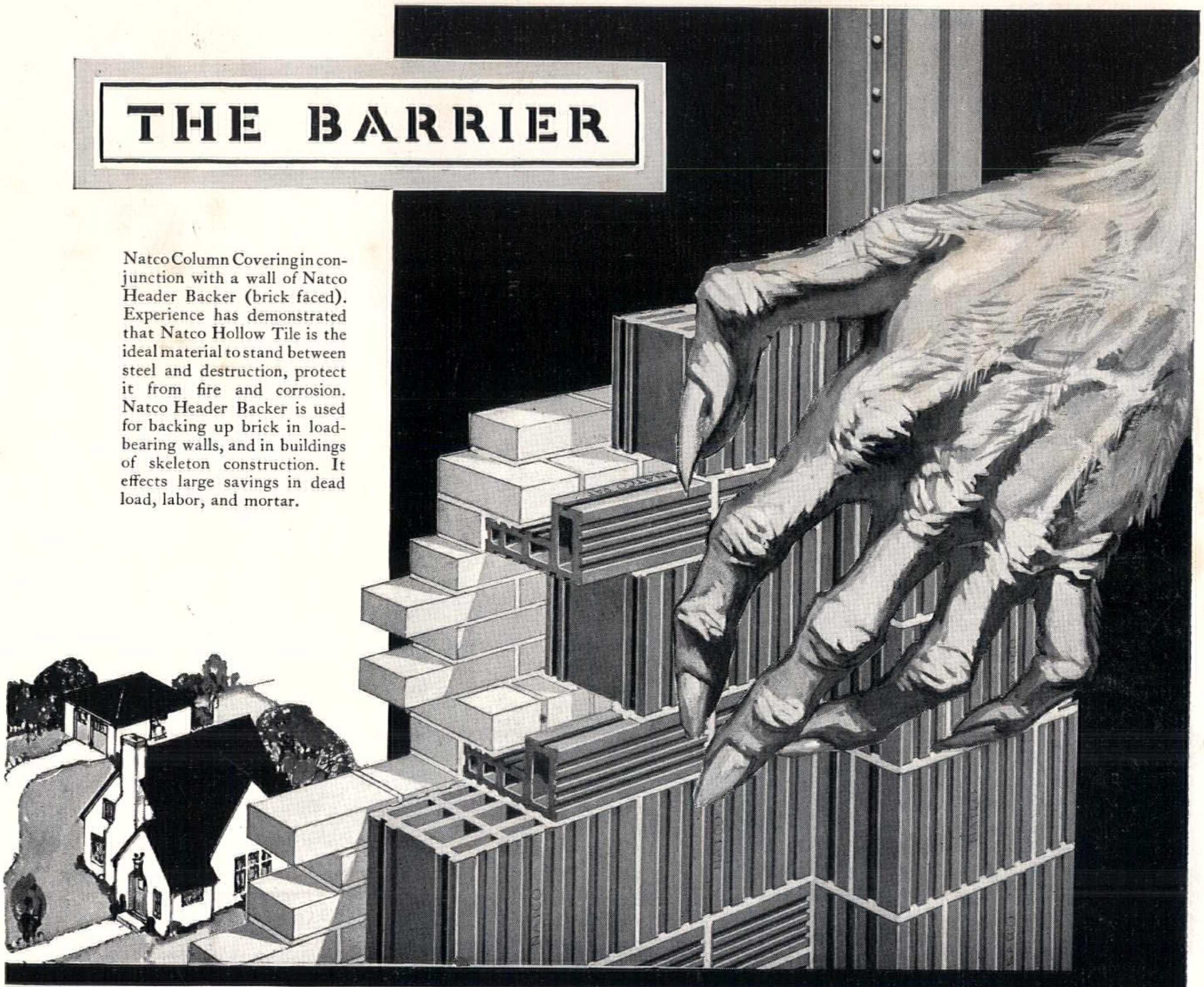
AURORA, ILLINOIS, U.S.A.

New York Boston Philadelphia Cleveland Cincinnati Indianapolis St. Louis New Orleans
Chicago Minneapolis Kansas City Los Angeles San Francisco Omaha Seattle Detroit
Montreal - RICHARDS-WILCOX CANADIAN CO., LTD., LONDON, ONT. Winnipeg



Buildings of Minneapolis and St. Paul that are equipped with R-W Elevator Door Hardware.

Largest and most complete line of door hardware made



Natco Column Covering in conjunction with a wall of Natco Header Backer (brick faced). Experience has demonstrated that Natco Hollow Tile is the ideal material to stand between steel and destruction, protect it from fire and corrosion. Natco Header Backer is used for backing up brick in load-bearing walls, and in buildings of skeleton construction. It effects large savings in dead load, labor, and mortar.

NATCO curbs the clawing hand of decay

THAT structure built of perishable materials is doomed from the day of its completion. Years may pass before it yields—but time, with its weapon, *decay*, will eventually conquer.

Time's attacks are futile against Natco Hollow Building Tile. Molded of special clay, then burned in great kilns, Natco Tile takes on the strength and durability of rock. Structures built of it partake of its permanence.

So that *every* structure may gain in permanence, the Complete Natco Line of Hollow Building Tile provides a unit for *every* building need. For walls—for floors—for roofs—for covering steel work.

Natco curbs the clawing hand of decay—combines economy, convenience, permanence and satisfaction.

NATIONAL FIRE-PROOFING COMPANY

***General Offices:* Fulton Building, Pittsburgh, Pa.**
Branch Offices: New York, Flatiron Bldg; Chicago, Builders Bldg; Philadelphia, Land Title Bldg; Boston, Textile Bldg.
In Canada: National Fire Proofing Co. of Canada, Ltd., Toronto, Ontario.

NATCO

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

HOLLOW BUILDING TILE

LET TRUSCON SERVE YOU

TWENTY-FIVE YEARS OF PIONEERING & LEADERSHIP

Truscon offers for your consideration ◆ years of experience in practical building ◆ a close knowledge of the problems of the modern builder ◆ the only complete line of fireproof building products in the world ever manufactured by one concern ◆ an engineering service covering all problems of modern, permanent building to supplement your own organization ◆ a warehousing service that is nation-wide and puts the entire commodity line within a few hours of any building site ◆ and finally, the basic desire to give every possible cooperation.

TRUSCON STEEL COMPANY, YOUNGSTOWN, O.
Established 1903

Warehouses and Engineering Offices in All Principal Cities

Factories in Youngstown, Cleveland, Los Angeles
The Truscon Laboratories, Detroit, Michigan

The Complete Truscon Line of Steel Building Products includes

STEEL WINDOW PRODUCTS
Pivoted
Continuous
Double-Hung
Donovan Awning Type
Counterbalanced
Projected
Mechanical Operators
Steel Casements
Basement Windows
Steel Frames

STEEL DOORS
Swing and Slide
Vertical Folding
Vertical Lift
Vertical Lift-Swing
Airplane Hangar

STEELDECK ROOFS
Insulated and Waterproofed.

METAL LATH PRODUCTS
A-Metal Laths and
Hy-Rib
Lath Accessories
Metal Trim

STEEL JOISTS
P-G (Plate Girder) Type
O-T (Open Truss) Type

REINFORCING STEEL
Steel Forms
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PRESSED STEEL SPECIALTIES

STEEL POLES
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Waterproofings
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FloorHardeners
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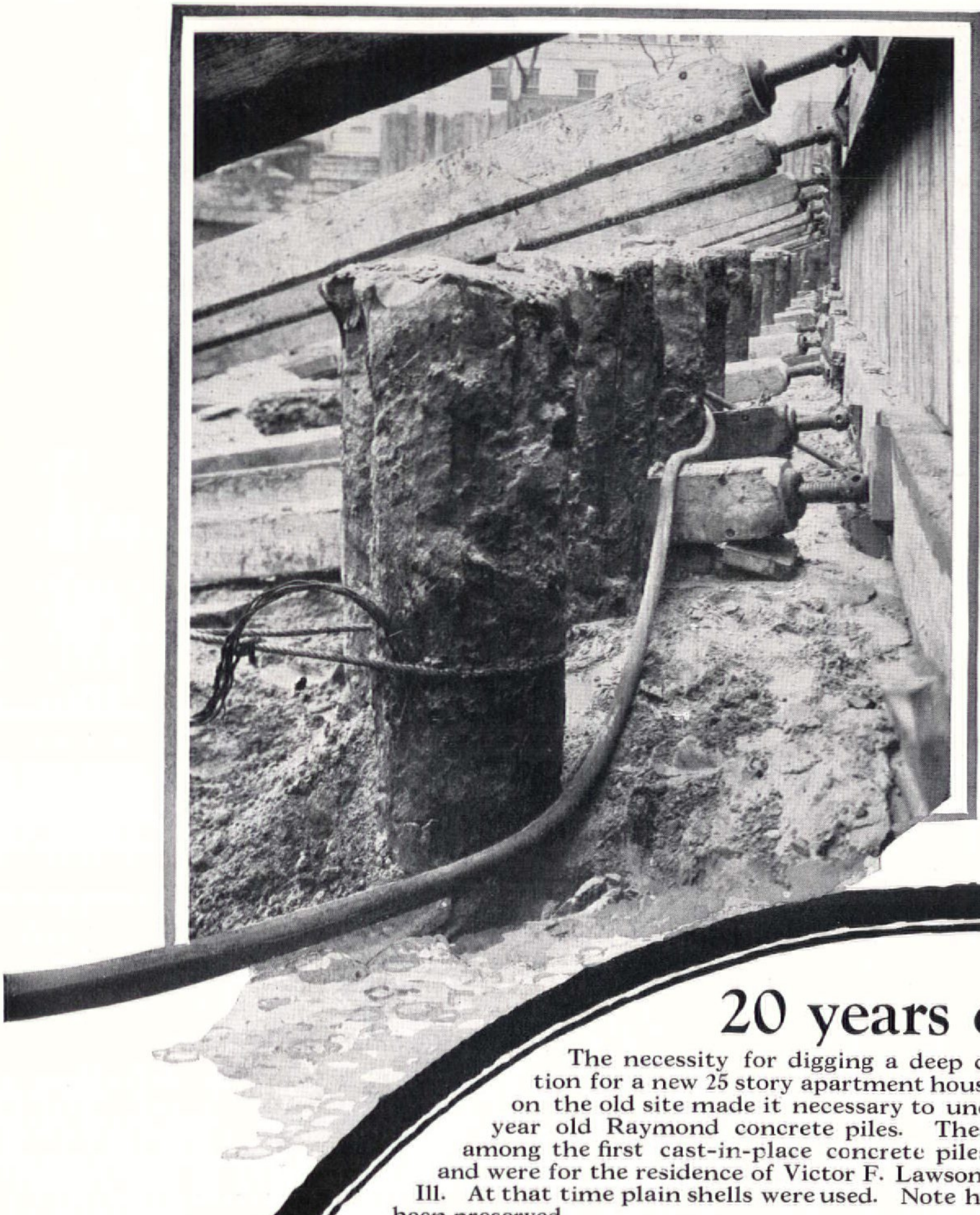

A FORM
FOR
EVERY
PILE

A PILE
FOR
EVERY
PURPOSE

20 years old!

The necessity for digging a deep cellar excavation for a new 25 story apartment house to be placed on the old site made it necessary to uncover these 20 year old Raymond concrete piles. These piles were among the first cast-in-place concrete piles ever placed, and were for the residence of Victor F. Lawson, in Chicago, Ill. At that time plain shells were used. Note how they have been preserved.

Since that time the shell has been improved and we now use a spirally reinforced corrugated shell of sufficient strength to withstand any back pressure encountered.

The shell remains in the ground, as always, thus providing a perfect pile.

RAYMOND CONCRETE PILE COMPANY

New York: 140 Cedar Street
Chicago: 111 W. Monroe Street

ATLANTA, GA.
BALTIMORE, MD.
BOSTON, MASS.
BUFFALO, N. Y.
CHICAGO, ILL.
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MONTREAL, CANADA
LOS ANGELES, CAL.
MIAMI, FLA.
MILWAUKEE, WIS.
PHILADELPHIA, PA.
PITTSBURGH, PA.
LONDON, ENGLAND
PORTLAND, ORE.
SAN FRANCISCO, CAL.
ST. LOUIS, MO.
ST. PAUL, MINN.
WASHINGTON, D. C.
HONG KONG, CHINA

RAYMOND

KEWANEE

STEEL BOILERS

Lower Heating Costs

The "Down Draft"
Fire—draws freshly distilled gases down from the *green* fuel thru the red hot bed of coals so they are completely ignited.

Smoke is unconsumed fuel. A Kewanee Down Draft Boiler is economical because it *is really smokeless.* It burns all the fuel completely, instead of wasting it.

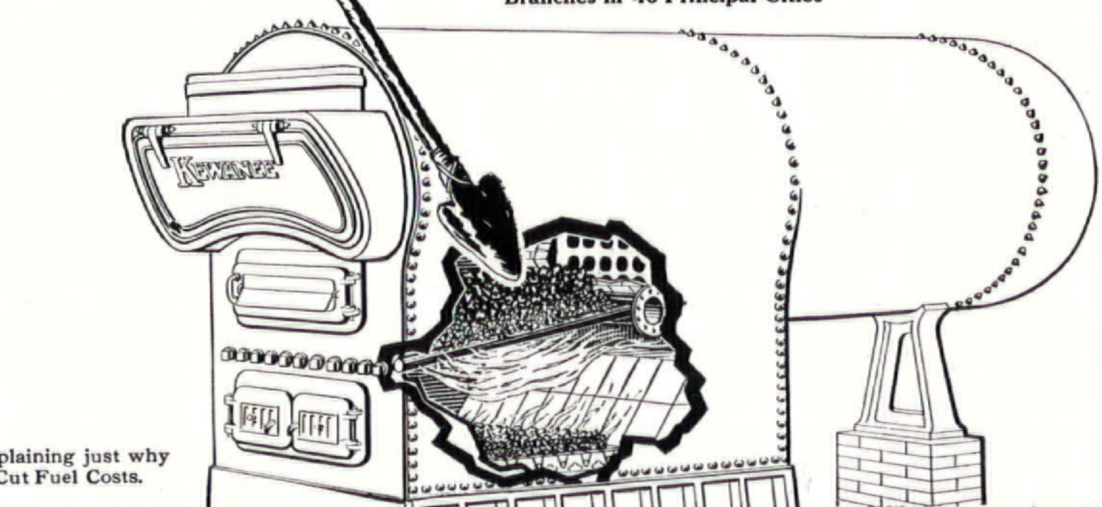
With a downdraft grate the volatile matter is pulled down away from the cooler fuel into the hottest part of the furnace where it is readily consumed.

In an ordinary fire the gases flow up from the hot fire bed through the fresh fuel, carrying combustibles up the stack before they are burned.

Actually two savings are effected in the Kewanee Down Draft Smokeless Boiler. One by the elimination of wasteful smoke—the other by the use of low price soft coal even in the face of the most rigid smoke ordinances.

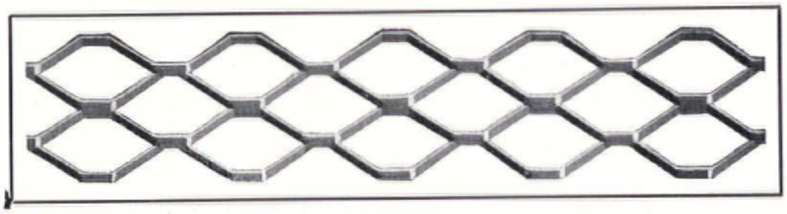
KEWANEE BOILER CORPORATION

Kewanee, Illinois
Branches in 40 Principal Cities



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

KNO-BURN METAL LATH



for twenty years—

and more—the *preferred* base and reinforcing for *ALL* types of plastering work. Supplied cut from Keystone Copper Steel, also, if desired.

NORTH WESTERN EXPANDED METAL CO.
1234 Old Colony Bldg., CHICAGO

One-piece
Gives
Dependability
NO WELDS IN STRESS—one piece of steel—expanded—without rivets, bolts or welds in shear or tension—these are the features responsible for the rapid gain in Bates-Truss Joist popularity.
A simple I-beam section is expanded into a lattice truss web. The expansion increases the depth of the beam—the truss materially increases its strength. The points of contact of the lacing and flange members are simply unsheared portions of the original plain web. By this process, all defective beams are automatically eliminated.
Contractors, engineers, builders should all know about the Bates Expanded Steel Truss. We have prepared a book giving complete information. A copy will be mailed to you upon request.
Bates Expanded Steel Truss Co.
PATENTS
The expanded section is covered by basic commodity and process patents, owned, controlled and operated under exclusively by this company.
PANTAGES THEATRE, Fresno, Cal.
B. Marcus Priteca, Archt.
Earl B. Newcomb, Eng.
BATES-TRUSS JOISTS
Sales, Engineering and Executive Offices
EAST CHICAGO, IND.

The Hallmark of Quality....

AMERICAN RADIATOR HEATING PRODUCTS

WHAT more significant tribute to any product than a practically universal public acceptance—an acceptance so general as to rank it as the acknowledged standard in its field?

Efficiency, operating economy and beauty —developed and improved during forty years of designing and manufacturing experience—have conferred this unique distinction on American Radiator Heating Products.

The finest and most modern buildings in this country are equipped with these perfected products—indisputable evidence of their recognition by America's leading architects, builders and heating engineers.

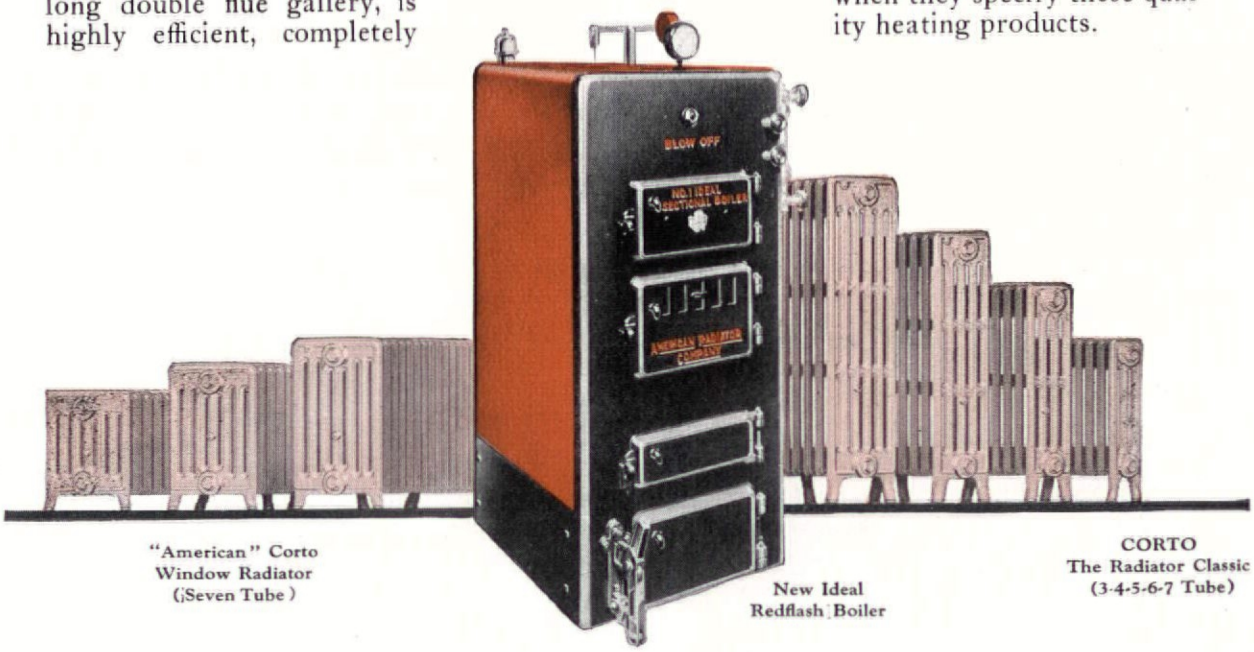
The New Ideal Redflash Boiler

The New Ideal Redflash Boiler, with long double flue gallery, is highly efficient, completely equipped, thoroughly and indestructibly insulated; and all doors and plate work are porcelain enameled, insuring enduring beauty. It burns hard or soft coal, coke, oil or gas.

CORTO
The Radiator Classic

The "American" Corto is the first slender tube radiator manufactured in this country. It is fitted with right and left threaded nipples, the tightest and safest connection known. This famous Radiator Classic—an ideal companion to the Redflash Boiler—is made in both the regular shape and the window radiator, in sizes for every need.

Architects are certain to gain the instant and enthusiastic approval of their clients when they specify these quality heating products.



"American" Corto Window Radiator (Seven Tube)

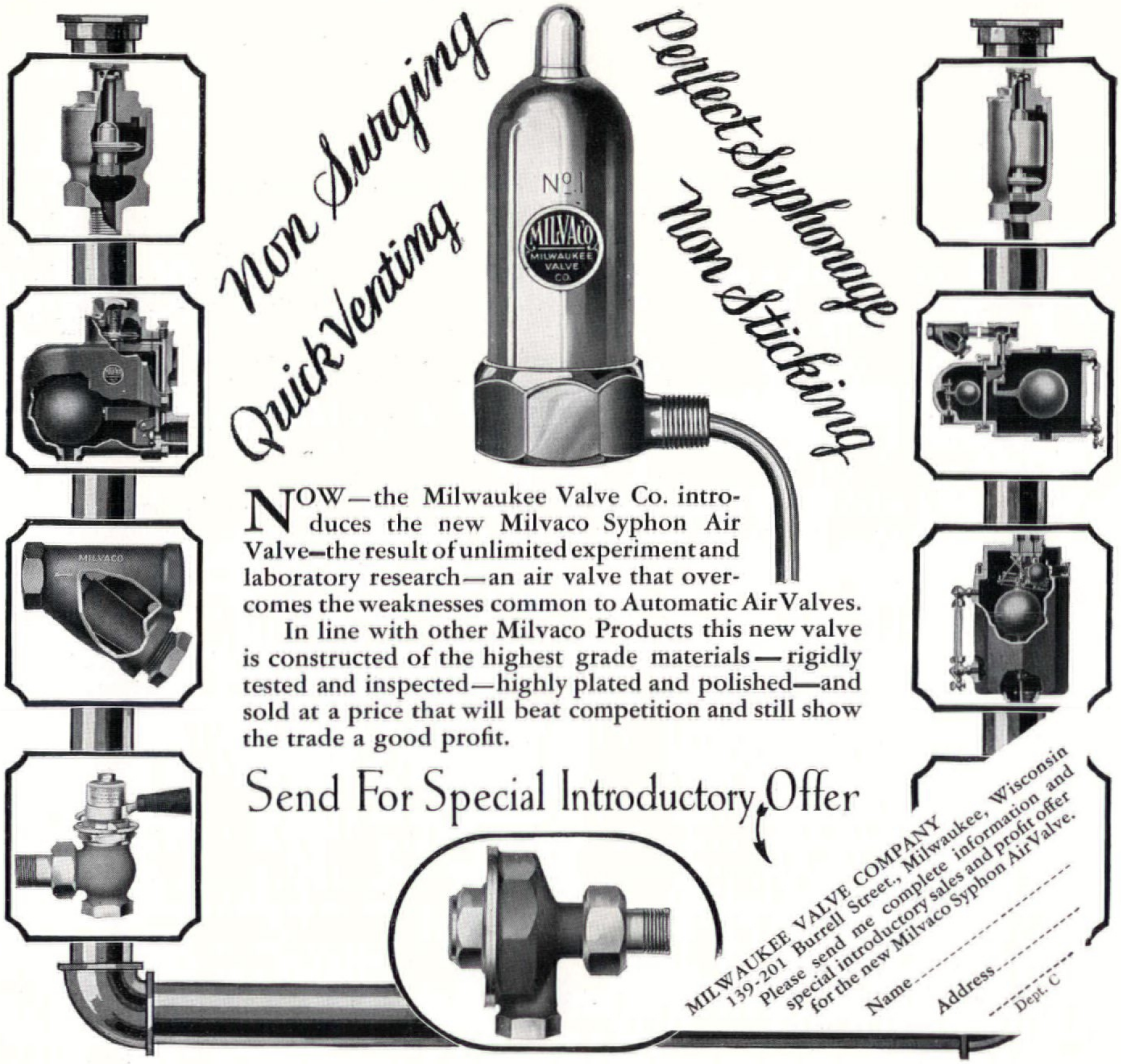
New Ideal Redflash Boiler

CORTO The Radiator Classic (3-4-5-6-7 Tube)

For Descriptive Literature please address Advertising Dept. 411, 40 West 40th St., N. Y. City

AMERICAN RADIATOR COMPANY

Milvaco Syphon Air Valve to complete the line



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

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

Send For Special Introductory Offer

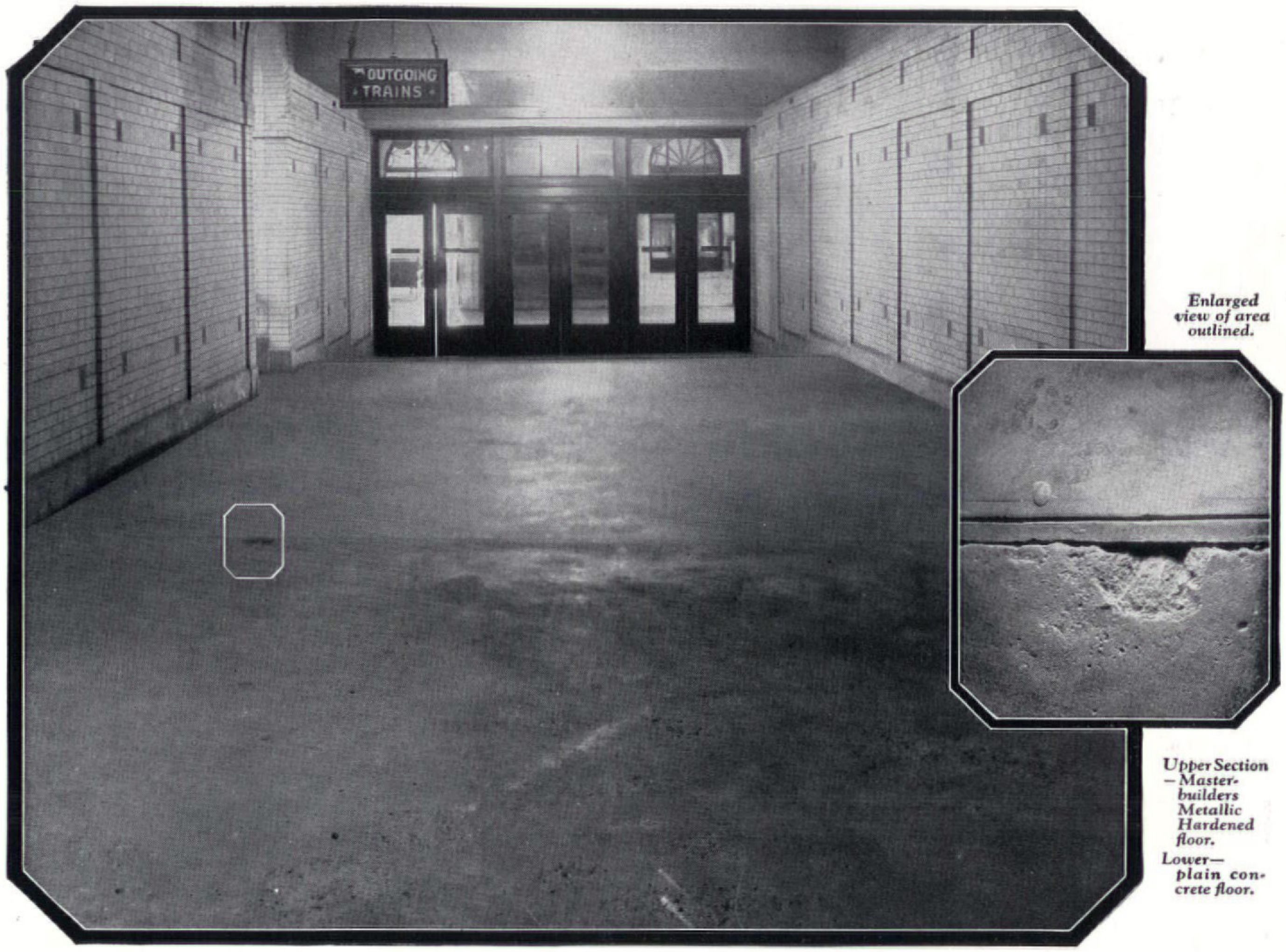
MILWAUKEE VALVE COMPANY
139-201 Burrell Street., Milwaukee, Wisconsin
Please send me complete information and special introductory sales and profit offer for the new Milvaco Syphon AirValve.

Name.......................

Address.......................

.... Dept. C

MILWAUKEE VALVE CO.
MILWAUKEE, WISCONSIN



Enlarged view of area outlined.

Upper Section — Masterbuilders Metallic Hardened floor.
Lower — plain concrete floor.

Corridor in Pennsylvania R. R. Station, Cleveland, Ohio, Masterbuilt Floor in background

What the Pennsylvania Railroad found out

HALF of this corridor has double the traffic of the other half, so when they built it in 1912 the Pennsylvania laid a Masterbuilt Metallic Hardened floor where the heavy traffic comes.

The condition of these two areas today, after a practical test of 16 years, proves the economy of building quality into a concrete floor *when it is laid.*

Not in one or two cases, but in thousands of installations made during the past 17 years, Masterbuilt Floors are daily proving that floor cost, based on the number of years of service, are lowest where Masterbuilt materials and methods have been used.

Startling and illuminating facts regarding floor costs are presented in a survey entitled "PLAIN TALK ABOUT CONCRETE FLOORS", just off the press. In it 400 plant owners and engineers have reported their experiences with cement floor finishes of different types. Every engineer responsible for floor construction or maintenance should have these facts. Copies of this survey will be sent free upon request.

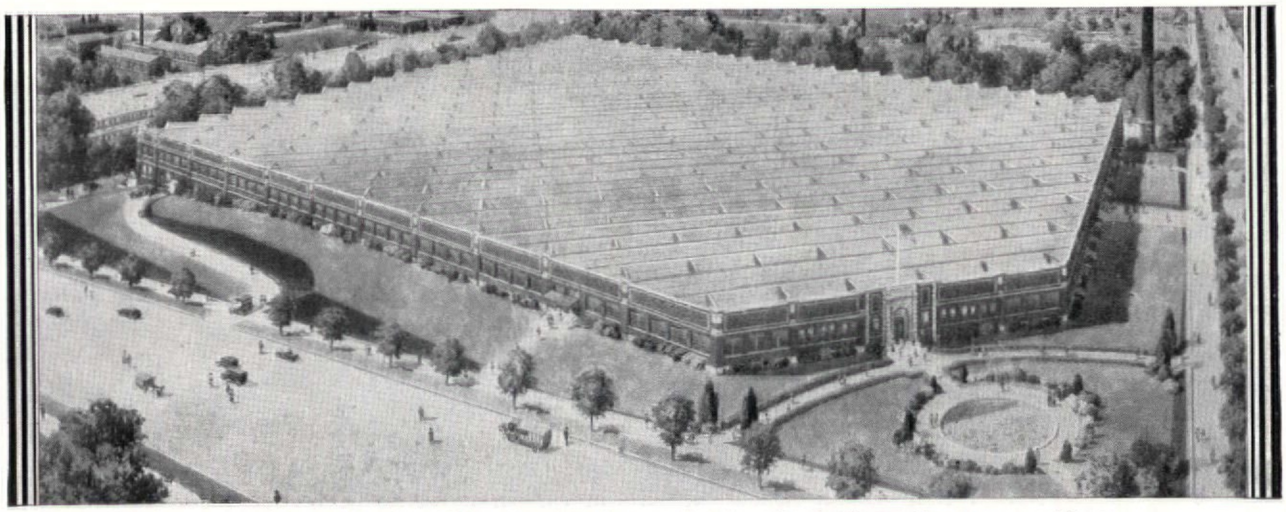
THE MASTER BUILDERS COMPANY, *Cleveland, Ohio*

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

Sales Offices
in 110 Cities

MASTERBUILT FLOORS

Masterbuilt Floors
HARDENED DUST-PROOF CONCRETE



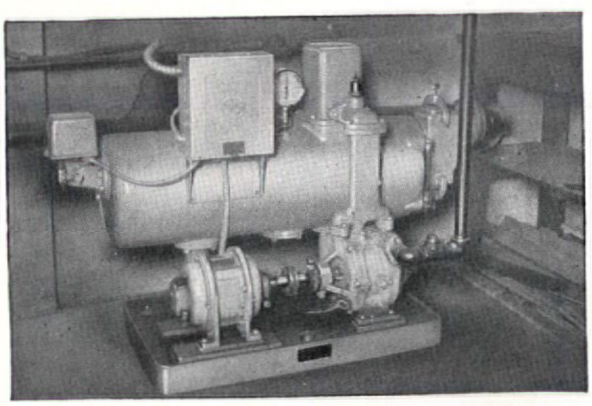
Atwater Kent Mfg. Co., Phila., Pa., Jennings-equipped. The Ballinger Company, architects and engineers, Philadelphia and New York.

14 acres of floor-space heated properly

A Jennings Vacuum Heating Pump determines the practical success of any return line steam heating system.

Whether the system serves over 600,000 sq. ft. of floor space as in the Atwater Kent plant, or an area only a fraction as large, the Jennings Pump facilitates the distribution of controlled heat. Also, it effects savings in power which are sharply reflected in lowered heating and operating costs.

Write for Bulletin No. 37



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

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

Jennings Pumps

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

A factor of SAFETY for lighting plans

Modern building specifications include emergency lighting

EMERGENCY lighting is in effect a *factor of safety* for lights. And today the architect specifies such lighting protection as a matter of course. For lights must continue to burn in many buildings in spite of any current interruption.

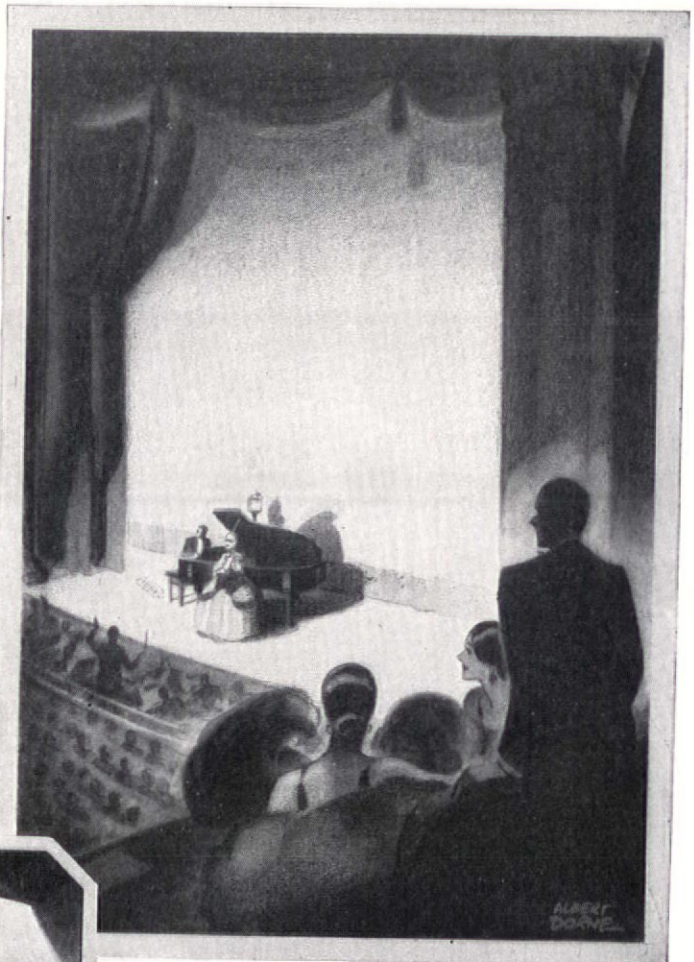
The operating rooms of a hospital, for example . . . An auditorium packed with people . . . Such places cannot be blinded by sudden darkness. Delay, confusion, serious consequences could result.

The varied needs in lighting protection call for emergency lighting at once flexible and reliable.

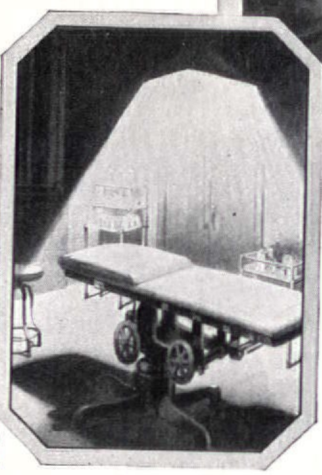
That is why so many architects specify Exide Emergency Lighting Batteries. Their wide range of sizes makes them adaptable to any plan. The devices necessary to control and keep them charged are extremely simple and automatic in operation. And these batteries are unfailingly reliable and long-lived.

We have had forty years' experience building dependable batteries. You are sure of these qualities when you specify Exide Emergency Lighting Batteries: (1) Absolute power dependability, (2) long life, (3) freedom from trouble, (4) low first cost, (5) low operating cost.

A letter will bring an experienced Exide representative to consult with you. This entails no obligation.



Sudden darkness could cause panic here. Exide Emergency Lighting Batteries insure continuous lights in spite of outside current failure.

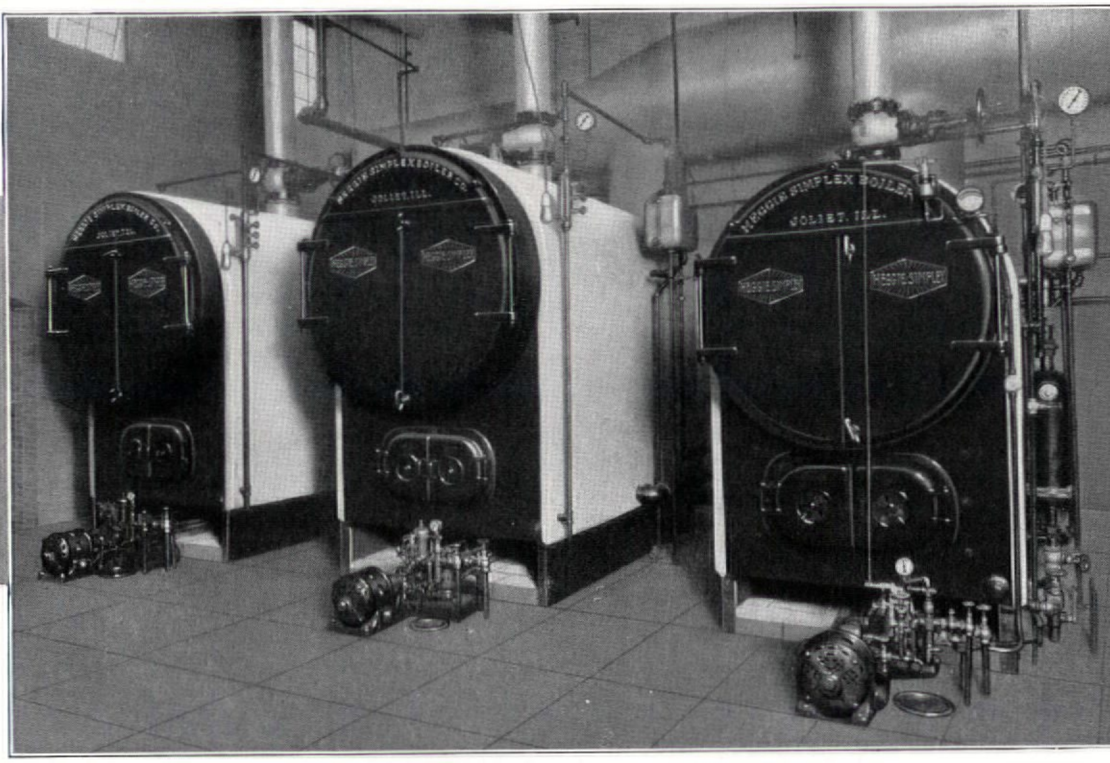


In the hospital operating room —uninterrupted light is vital.

Exide
EMERGENCY LIGHTING BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, Toronto



Three Heggie-Simplex Steel Heating Boilers, oil fired, installed in St. Mary's Seminary, Cleveland.

Economical with Oil

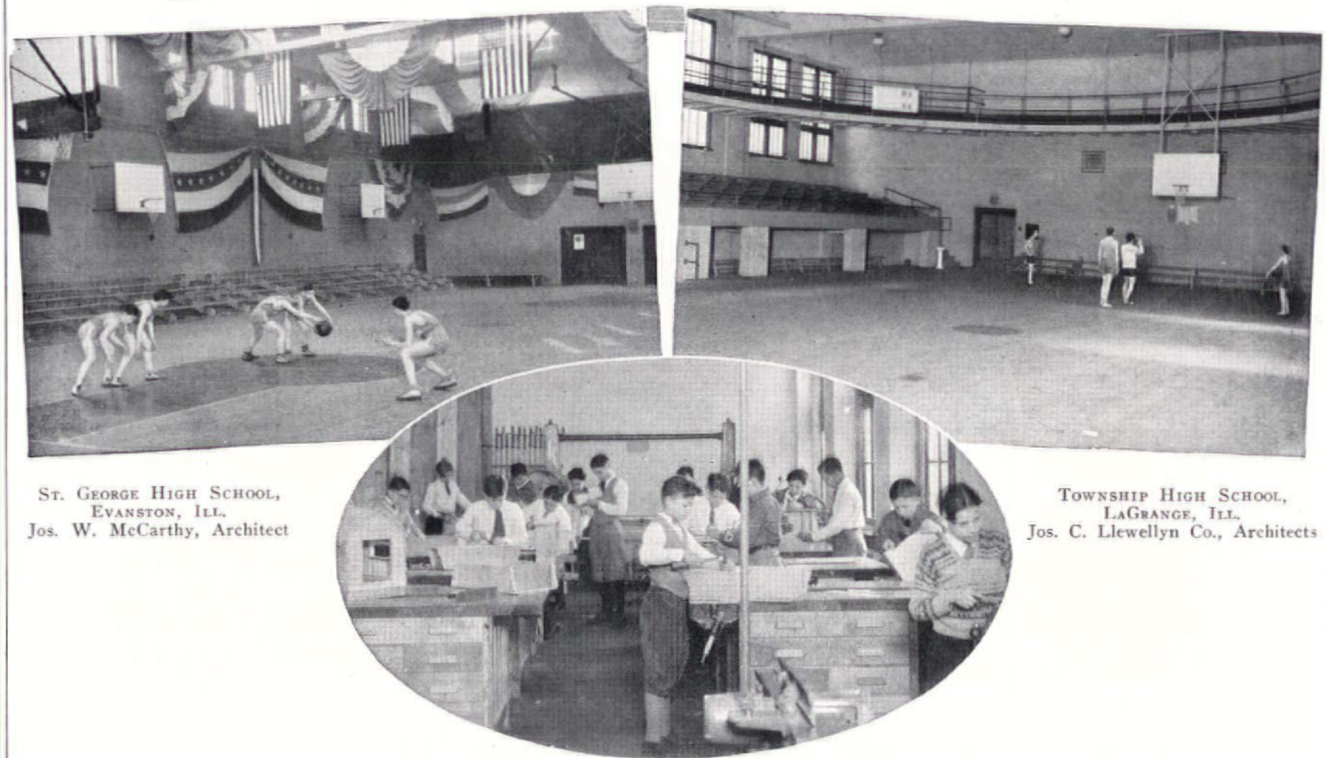
THE huge combustion chamber of Heggie-Simplex Boilers gives oil more room to burn. Their much larger direct heating surface and unrestricted circulation absorb the heat produced with maximum efficiency. Their rear-front-rear flue passage strips the gases of the remaining heat units.

Electrically welded of steel, Heggie-Simplex Boilers provide the crack-proof protection that is essential to automatic firing. Their bases, designed for easy installation of portable grates, make these boilers readily convertible to use with any fuel.

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

HEGGIE-SIMPLEX

ELECTRIC-WELDED STEEL HEATING BOILERS



St. George High School,
Evanston, Ill.
Jos. W. McCarthy, Architect

Township High School,
LaGrange, Ill.
Jos. C. Llewellyn Co., Architects

Hawthorne High School, Yonkers, N. Y.
G. Howard Chamberlin, Architect

Gymnasium Flooring

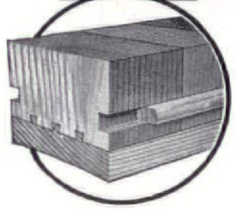
BLOXONEND was originally designed for, and is widely used as heavy-duty flooring in factories. In the last five years, it has also gained national recognition as a superior flooring for gymnasiums and school shops. Numerous architects specializing in school designing specify it for this service.

BLOXONEND is resilient, fast and handsome; maintains its smoothness and attractiveness under all sorts of usage, and lasts a life-time. Being end-grain, its use eliminates the splinter hazard. Sample and specifications gladly furnished on request.

CARTER BLOXONEND FLOORING COMPANY
Kansas City, Missouri

Branch Offices in Principal Cities—See Sweet's

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

Lay's Smooth
Stay's Smooth

Keeping An Eye On the Future

PERMANENCY in construction — the goal of future building supremacy — is today calling for the adaptation of higher quality and more permanent building products. To follow through with the architect in meeting this forward trend, Kalman builds and offers a wide range of products — products that are made according to the latest proven methods and are of a quality that best reveals the true intent of the architect's rendering.

KALMAN

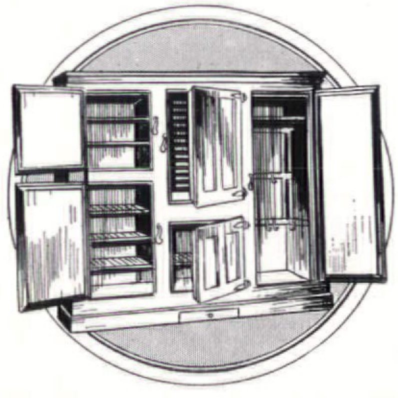
KALMAN STEEL COMPANY

Plants or Offices at

Chicago	Detroit	Pittsburgh	Philadelphia	Kansas City
New York	Boston	Syracuse	St. Paul	Dayton
Buffalo	Baltimore	Milwaukee	Atlanta	Minneapolis
Houston	Columbus	Youngstown	Charlotte	Niles
Newark				St. Louis

Export Office—New York

WORLD'S LARGEST MANUFACTURER OF REFRIGERATORS FOR ALL PURPOSES



In Every Detail As *You* Would Build It

As an architect you are as much concerned with in-built quality as with outward beauty. Especially in the case of equipment from which service of such vital importance is required as refrigerators must deliver.

Inquire where you will, in the field of refrigerator manufacture the name which commands instant and undisputed respect is McCray. This prestige and position has been won by more than a third-of-a-century — 39 years to be exact — devoted to building refrigerators of the highest quality for every business.

In every hidden detail the McCray is built as you architects would build it. Finest materials, expert craftsmanship, soundest methods, everything to insure efficient, enduring service. Pure corkboard insulation is used in every McCray.

Stock models in many sizes and styles to meet all needs in homes, stores, markets, hotels, clubs, hospitals, institutions, florist shops. We also build to order to meet individual requirements. Our engineers will prepare blue prints and specifications based on your sketches, without obligation.

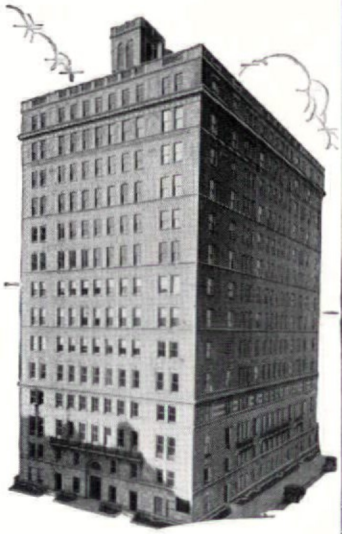
Every architect should have our portfolio on refrigeration for his files, as well as the current catalogs of our various lines. Send now for your copies.

McCRAY REFRIGERATOR SALES CORPORATION
864 Lake St., Kendallville, Indiana

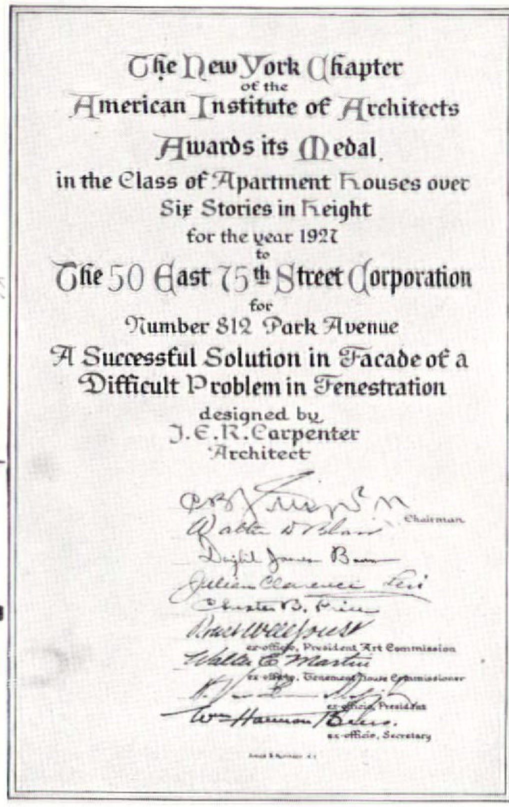
McCRAY REFRIGERATORS

Prize Winning New York Apartments

1927 WINNERS IN "OVER SIX STORIES" CLASS

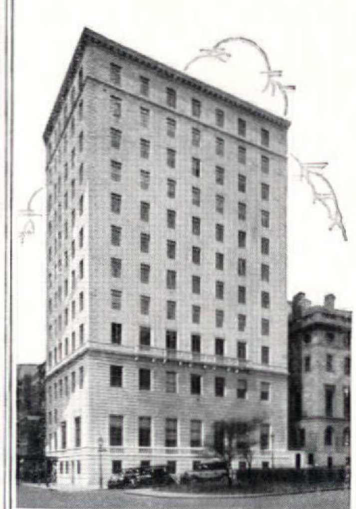


First award in the "over six stories" class to J. E. R. Carpenter, Architect for the apartment house at 812 Park Avenue.



The New York Chapter
of the
American Institute of Architects
Awards its Medal
in the Class of Apartment Houses over
Six Stories in Height
for the year 1927
to
The 50 East 75th Street Corporation
for
Number 812 Park Avenue
A Successful Solution in Facade of a
Difficult Problem in Fenestration
designed by
J. E. R. Carpenter
Architect

Chairman
ex-officio, President Art Commission
ex-officio, Tenement House Commissioner
ex-officio, President
ex-officio, Secretary



Second award in the "over six stories" class to York & Sawyer, Architects, for 660 Park Avenue — a co-operative building.

Third award in the "over six stories" class to Carrere & Hastings for 101 West 55th Street.

KERNERATOR

REG. U. S. PAT. OFF.

THE CHIMNEY-FED INCINERATOR

used in every building

THE New York Chapter, A. I. A., recognizes merit in apartment-house design with annual awards. There are two classes — those of more than six stories and those of six stories or less.

It is deeply significant that every building receiving an award in 1927 in the former class was Kernerator equipped.

In the architectural profession the Kernerator, in comparison with other products, is truly a "standard equipment" convenience. Its *exclusive* design makes it the most efficient incinerator. The service of trained engineers assures the most economical installation and the company behind it guarantees permanent satisfaction for the life of the building.

Hopper doors located on floors above receive garbage, sweepings, tin cans and refuse of all kinds which drops to the brick combustion chamber in the basement. The accumulation is air-dried without odor and is destroyed with an occasional match. No fuel is required. Filthy, offensive garbage cans are banished forever. First cost is the last cost.

See Sweet's, write for new Kernerator catalog No. 17 in ready-to-file A. I. A. Folder 35J41 or phone your local Kernerator representative. Offices in 89 cities.

KERNER INCINERATOR COMPANY
715 East Water Street Milwaukee, Wisconsin

We waited two years to tell America about this *grainless* wood!

Possesses remarkable workability and uniform strength. Very dense and tough. Highly resistive to moisture. Has a very smooth, attractive surface on the face side, and requires no paint for protection. Also takes any finish beautifully. Send for large, free sample.

FOR PANELING

One of the most fascinating chapters in recent industrial history is the story of Masonite Presdwood, the *grainless* wood board from Laurel, Mississippi.

We have waited two whole years to tell this story; waited until our product had conclusively proved in actual use that it was as good as we knew it to be.

This it has done, and today Masonite Presdwood is efficiently serving mankind in scores of ways.

As a lining for safety-deposit vaults, Presdwood plays a vital part in the automatic alarm system of the modern bank.

The builder of a soaring terminal tower, desiring an exceptionally fine, smooth surface, uses Presdwood—for concrete forms.

A Kansas City baker, wanting to keep his bread and rolls perfectly fresh, packs them in Presdwood boxes.

A Nebraska farmer sits down in the evening to enjoy his new radio, and the tension board in back of the loud speaker is Presdwood.

Down on the lower Mississippi, a steamboat paneled inside and outside with more Presdwood.

Out in Hollywood, Masonite Presdwood again—thousands of feet of it used in making movies.

New uses discovered almost every day

Masonite Presdwood uses range from doll houses to bridges and flumes. Advertising signs along the highways, campers' tables, a safety wheel for swimming pools, barbecue stands, theater props, starch trays for candy manufacturers—all these, and many other things of Masonite Presdwood.

In planing mills and woodworking plants, as in so many other lines of industry, the demand for Presdwood is increasing by leaps and bounds. Breakfast nooks are made of it; so are kitchen cabinets, china closets and shelving. Not forgetting counters, show cases, display booths, work-bench tops!

TILE FOR BATHROOMS

Masonite Presdwood is actually a better product than Nature's own material; better in four ways. It is grainless, has greater moisture resistance, is much denser, and is far tougher! Yet it contains no foreign substance, not even a chemical binder. It is genuine wood—and nothing else—wood torn apart and put together again.

Fresh, clean chips are shot from guns at a velocity of about 4,000 feet per second. The long fibres thus produced are packed into hydraulic flat bed presses, and subjected to hundreds of tons of pressure. This super-tough and sturdy material, entirely free from knots and other defects, is then cut by automatic machines into boards four feet wide and twelve feet long.

Advantages of Masonite Presdwood

Masonite Presdwood won't crack, check, split or splinter. It is highly resistive to wear and moisture, and shows minimum contraction and expansion.

It can be used on any woodworking machinery: planer, sander, shaper; and because it contains no grit or foreign substance it does not damage tools.

Comes in convenient size—four feet wide by twelve feet long. Requires no paint for protection. Yet takes any finish: lacquer, paint, stain or varnish.

Why not experiment with Masonite Presdwood yourself? Large free sample will be forwarded promptly on request. Send for it today.

MASONITE CORPORATION

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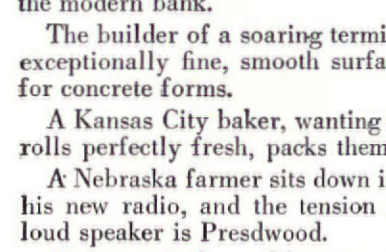

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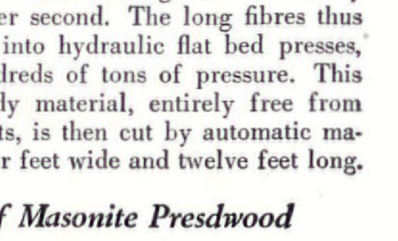

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The honest handiwork and craftsmanship which have made Van Equipment famous for over seventy years, are multiplied a hundred-fold in the new Van Factory. Superlative machines augment the skill of Van craftsmen. Production is on a scale unprecedented in the annals of the industry. New standards have been attained by new methods of manufacture. We doubt if you can find anywhere the equal of Van Equipment for efficiency . . . for economy . . . for everlasting value!

The counter division is one of the most notable features of the Van plant. *Miles of counters* for coffee shops, cafeterias and lunch rooms are built in this one department that is in itself as large as some complete factories. The facilities here include the most modern power machines and precision tools . . . manned by Van craftsmen. Everything that would improve quality, facilitate production and lower costs has been provided.

Behind Van craftsmen are our Engineers . . a greatly enlarged organization represented in many parts of the country. They are experts in the planning of food service establishments and the selecting of equipment for economy, workability and success. Consult them about your plans. Their suggestions (given without any obligation whatever) may be the deciding factor that assures a successful restaurant. They are at your service!

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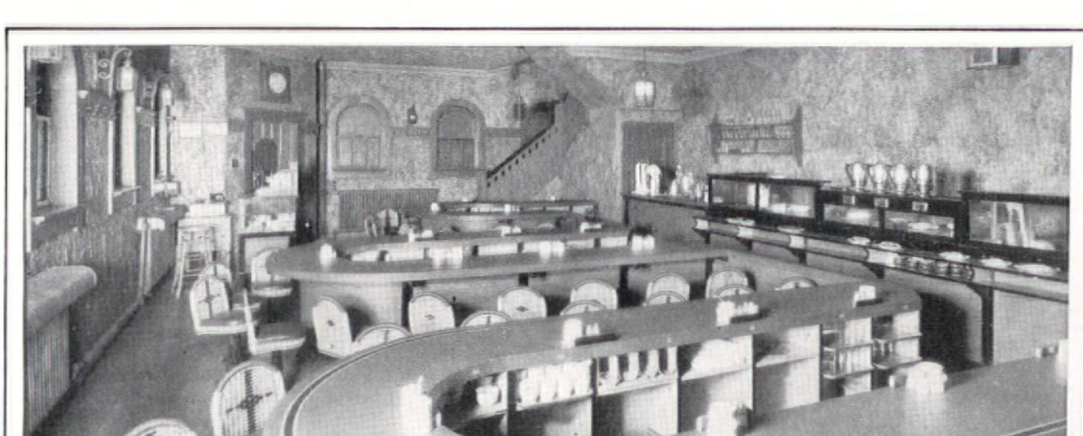

The newer type of counter equipment is exemplified by the Polly Parrot Lunch Room, Lima, Ohio . . . with Van Equipment throughout

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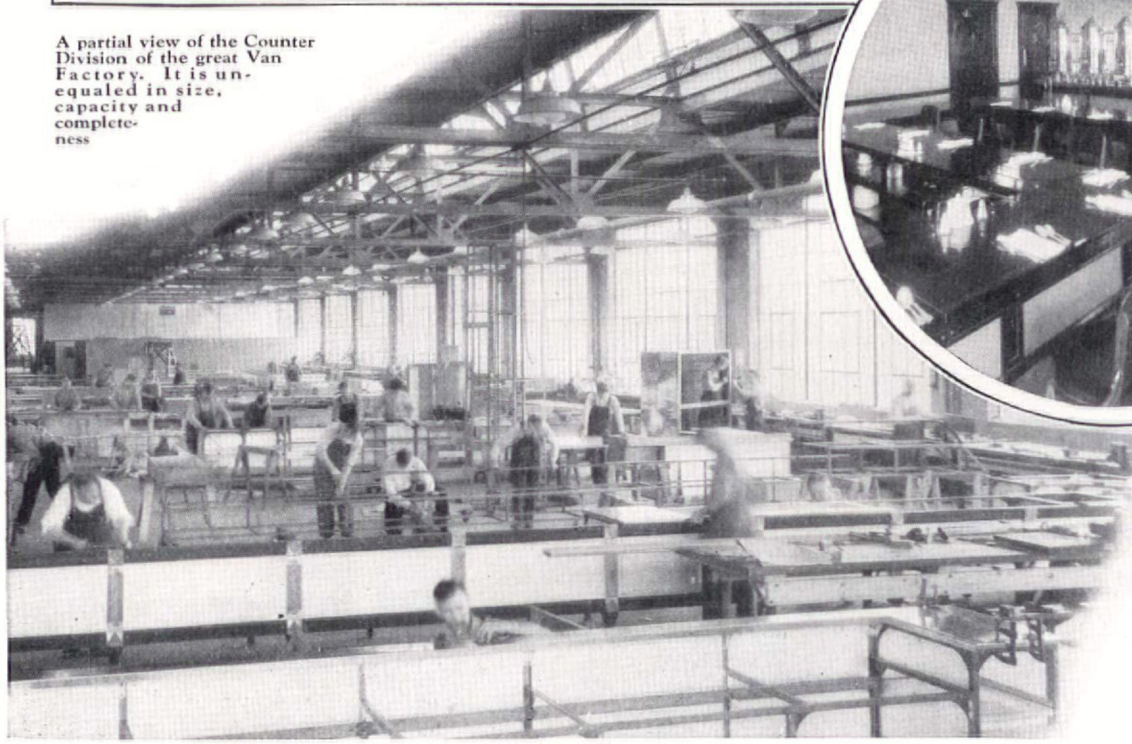
Van Coffee Shop in the McAllister Hotel, Miami, Fla.

Above, Van Coffee Shop in the Allerton Hotel, Cleveland, Ohio . . . typical of many fine Van installations throughout the country



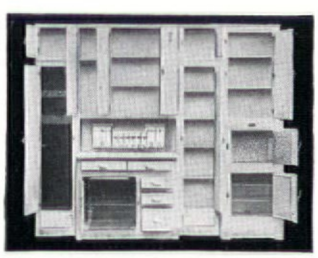
A partial view of the Counter Division of the great Van Factory. It is unequaled in size, capacity and completeness

KITCHEN MAID

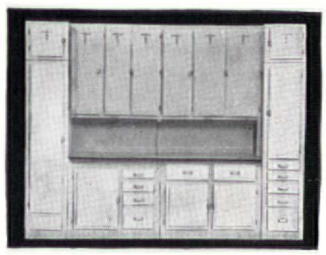
Right: the Dinofold ready to serve four people. Sturdy, rigid, charming in appearance.

Below: the Dinofold—folded up and out of the way in an instant.

FAMOUS DINOFOLD *now a Kitchen Maid Product*



Above: 740X Combination—consisting of seven distinct units.



Above: The Butlery, for serving halls and large kitchens.

Worthy, indeed, of bearing the Kitchen Maid trade-mark—the famous Dinofold becomes, today, a Kitchen Maid product, manufactured and sold by America's largest exclusive makers of built-in equipment for the kitchen.

Dinofold is a charming folding "breakfast nook" consisting of table and seats for four. It folds up as a unit, on a wall, on a door, or in a wall recess—by a single, simple operation! Leaves floor space completely free when not in use.

Dinofold is smoothly lacquered in Olive Green or Mandarin Red with gold striping and antique shading or in Early American Maple, antique shading with green trimming (also available unfinished). A color combination to harmonize with every color scheme!

Let us send you complete information about the Dinofold, as well as the Kitchen Maid catalogue. The latter describes Kitchen Maid Units covering every need of every type and size of kitchen. It tells of the exclusive Kitchen Maid finishes, which include Cactus Green, Dove Grey, Lama Tan, Travertine Ivory and Shasta White. It explains the many unusual Kitchen Maid features—such as sanitary rounded inside corners, smooth doors and concealed hinges. Write us.

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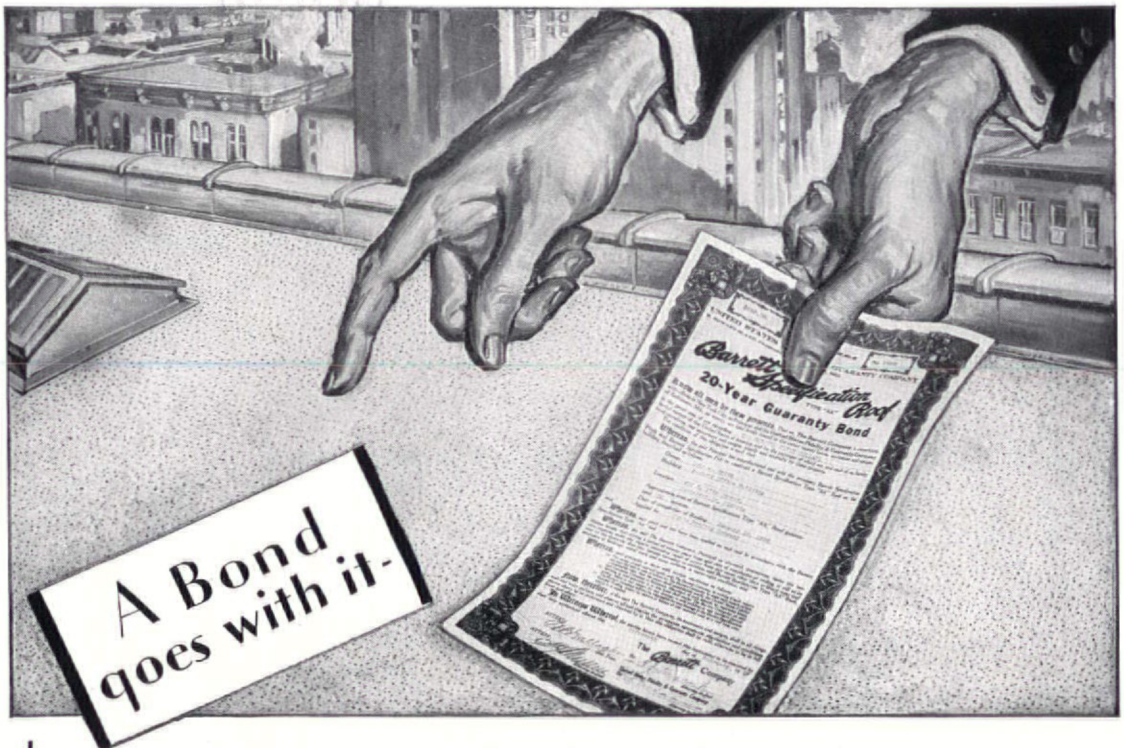

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FOR THE OWNER OF *THIS* BUILDING

WHAT'S the best thing that can be said of a roof—once it's laid? Just this—it's a roof you can forget.

A roof that never raises a rumpus about repairs and maintenance—a roof so trouble-free that you never have to give it a second thought. And this, of course, is exactly what your client gets in a Barrett Specification Roof.

When a Barrett Specification Roof is completed the building owner receives a Surety Bond, guaranteeing him against repair or maintenance expense for the next 20 years.*

Twenty years—that's leaping ahead to 1948, the middle of the century. How can any roof, no matter how finely constructed, last so long?

That question has already been answered. You've read the series of advertisements which appeared in this magazine during the past year. These advertisements showed a number of well-known American landmarks—business buildings that have survived from the 70's, 80's and 90's—roofed with Barrett Pitch and Felt!

And here's a significant fact. These old Barrett Roofs, without repairs, stood weather-tight not merely 20 years but 30, 40 and even 50 years. (Is it thinkable that the Surety Company which bonds Barrett Specification Roofs for 20 years would shoulder this responsibility if it were not for such records?)

Interested in that kind of roof? Then write us for full information.

*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.

Depend on the Barrett Approved Roofer

Throughout the United States and Canada a limited number of roofing contractors have been approved by Barrett to lay the Barrett Specification Bonded Roof. These men have earned a reputation for doing efficient work—a name for absolute dependability.

Good workmanship is a big part of any good roof. Good workmanship is a *certainty* when you provide for a Barrett Specification Roof.

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40 Rector Street, New York City

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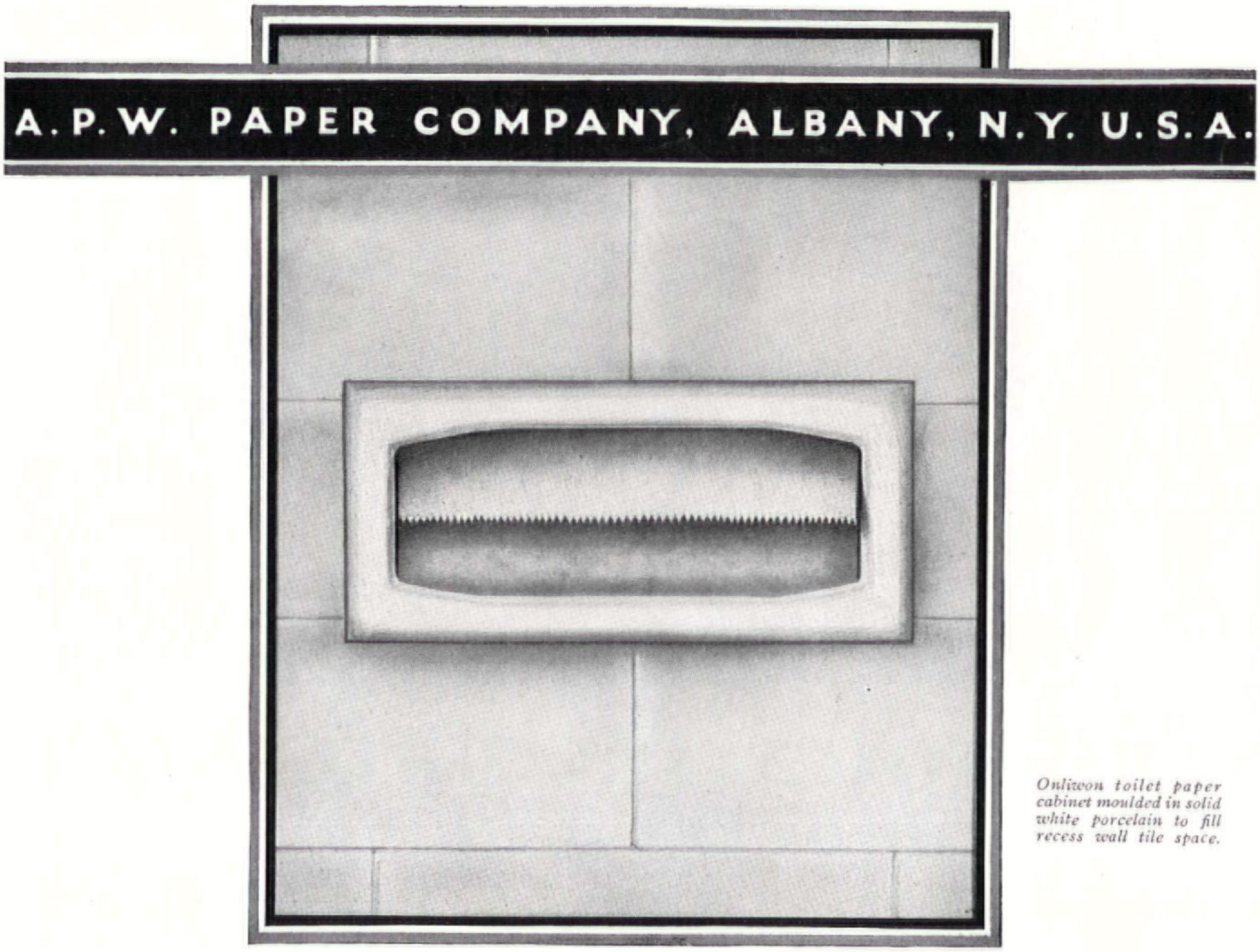
5551 St. Hubert Street, Montreal, Quebec

Barrett Specification Roofs



Onliwon toilet paper cabinet moulded in solid white porcelain to fill recess wall tile space.

Finer paper . . . soft, yet firm

ONLIWON tissue has those qualities required in the bathrooms and lavatories of the finest buildings, hotels and hospitals throughout the country.

It is soft and silky, yet firm and absorbent. And in the Onliwon system two interfolded sheets are served at once—convenient, economical, waste saving!

Onliwon cabinets, too, are beautiful . . . easy to refill, reducing servicing time . . . and built so strongly they last for years.

A. P. W. Paper Company, Albany, New York, U. S. A.

Onliwon

TOILET PAPER AND PAPER TOWEL SERVICE

BOOK DEPARTMENT

"STEVENS MASTER SPECIFICATIONS"

Reviewed by CLIFFORD WAYNE SPENCER

THE writing of specifications is a very important part of the business of planning and erecting buildings, and it is so important that nothing be omitted that it is almost impossible to prepare a really complete set of specifications without having some sort of well organized guide on which to proceed. In many cases this is the product of the specification writer himself and is based on long years of experience. There are, however, guides or master specifications compiled by authorities on the subject which combine the best practices in this field of activity and are published in such form that they can be readily adapted to any particular piece of work by substituting for others certain clauses which apply to the work in hand,—to its type as well as to its extent.

Foremost among such publications is the work known as the "Stevens Master Specifications for Architects and Builders." The 1928 edition of this is now ready and is a most complete guide for the writing of specifications. In the preparation of this work Mr. Stevens has consulted architects and engineers of the entire country. Many of these offered valuable suggestions and rendered great assistance in checking over the work compiled by Mr. Stevens. The specifications are handsomely bound in a loose-leaf imitation leather binder, indexed with thumb tabs for ready reference, and numbered so that the specification writer will be able to simply jot down the numbers of the paragraphs and clauses he wishes to incorporate in the completed specification so that the typist can copy the material directly from the master specification. As is the custom, the material is subdivided into groups covering each class of work. Each of these subdivisions is indexed separately, and all possible contingencies are provided for. The first section contains instructions to bidders, and covers such matters as description of the documents and how they may be obtained, requirement of a certified check as a guaranty of the good faith of the bidder, and the filing of a bond by the successful bidder. It describes how the proposals shall be made and specifies the form to be used. A form is also included for the submission of unit prices to govern in cases of additions or deductions from the contract price made necessary by changes or additions to the original plans and specifications. This list is very complete and includes all kinds of material and labor. The second section contains a specimen copy of the fourth edition, 1925, of "The General Conditions of the Contract for the Construction of Buildings," standard form of the American Institute of Architects. This section

Hotel Planning and Outfitting

EDITED BY

C. STANLEY TAYLOR and VINCENT R. BLISS

Here is a volume which for the first time adequately reviews the entire subject of the modern hotel,—its planning, designing, equipping, decorating and furnishing. It covers every detail, from the beginning of sketch plans to the registration of guests when the house has been completed and opened. All the different types of hotels are dealt with,—the Modern Commercial Hotel, the Residential or Apartment Hotel, the Resort Hotel, and the Bachelor Hotel. The volume is replete with views of hotels in different parts of the country, their exteriors and interiors, and in many instances their plans are included and fully analyzed.

The editors have been assisted in the preparation of the work by widely known hotel architects and interior decorators and by actual operators of hotels,—practical men, experienced in the management of the "back" as well as the "front" of a hotel. The volume's treatment of hotel furnishing and equipping constitutes the final word on this important subject. There are included views of hotel restaurants, cafeterias, kitchens, pantries, "serving pantries," refrigerating plants and all the departments which are necessary in a modern hotel of any type. *The work is of inestimable value to architects and engineers, as well as to practical hotel men.*

438 pages, 8½ x 11¼ inches—Price $10

ROGERS & MANSON COMPANY

383 Madison Avenue, New York

Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM also contains a copy of the A. I. A. Document No. 172, which is "The Standard Construction Classification for Filing Adopted by the American Institute of Architects." Section Three contains supplementary general conditions applying to the particular project for which the specification is being written. The fourth section covers wrecking of the buildings which may be on the site where the new building is to be located. The specification for foundations contained in Section Five covers the four important types of foundations, namely; caisson foundations, concrete pile foundations, composite pile foundations and wood pile foundations. The masonry specification, which occupies the sixth section, does not include concrete, brickwork or hollow tile. These items are usually included in the masonry contract and covered in separate sections of this master specification and may be copied into the general masonry specification in places indicated by the author. The section on stone (Section Nine) covers use of three kinds of stone, granite, exterior marble, and limestone, and a separate section (Section Ten) is devoted to cast stone work. Other branches of the work which are covered in separate sections are terra cotta, waterproofing, structural steel, roofing, sheet metal, miscellaneous iron and wire mesh, ornamental metal, fire doors, steel and metal windows, elevator enclosures, hollow metal doors, carpentry, plastering, glass and glazing, marble and slate, art marble, finish tile, terrazzo, rubber tile, cork flooring, mastic composition, painting and decorating, weather strips, screens, acoustics, insulation, specialties, and store fronts, making 40 sections in all.

The specification is made especially valuable by the insertion of bits of information at the proper places and by the inclusion of advertising leaflets of some of the more prominent manufacturers of building materials. These are placed immediately after the sections in which their particular class of material has been specified and contain much information that will be of use to the specification writer. At the end of the volume are lists of these advertisers, classified both alphabetically and as to kind of material, a detail of considerable value.

STEVENS MASTER SPECIFICATIONS FOR ARCHITECTS AND BUILDERS. Price $7.50. (Free to Registered Architects.) Stevens Master Specifications, Inc., 159 N. State Street, Chicago.

PICTURESQUE ARCHITECTURE IN PARIS, GHENT, ANTWERP, ROUEN, ETC. Drawn from Nature on Stone by Thomas Shotter Boys, 1839. 115 pp., 9½ x 12 ins. Price $8 Net. The Architectural Press, Westminster, London, S. W.

LITHOGRAPHY, the youngest of the family of graphic arts, has long been the family's stepchild. Ever since the discovery of the process by Senefelder, 150 years ago, the easy possibilities it offers for commercial purposes have flooded the markets with cheap color prints, unworthy reproductions of beautiful originals. Thus this particular medium has been brought into such wide disrepute that an unfavorable popular connotation has become attached to the mere word, "chromo,"—a connotation which it by no means deserves. Indeed the art was so generally misused in the past century that it has come to be regarded with mistrust by both patron and artist. Yet it is an art capable of great beauties,—one that might well hold its head high and proudly among the other members of its family.

Those who, recognizing its possibilities, have deplored

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By

Fiske Kimball

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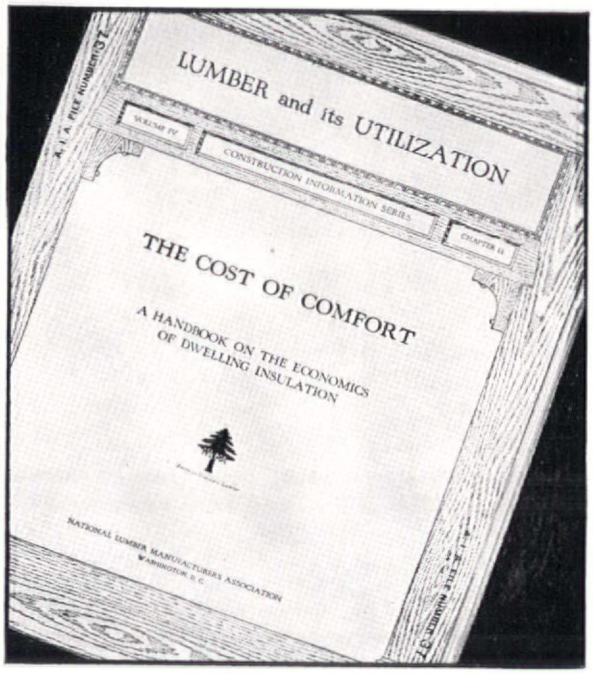

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"The Cost of Comfort" contains 80 pages of helpful information about every phase of heat insulation—34 drawings showing different types of construction and insulation practices for lumber, stucco, brick, hollow tile dwellings . . . construction and heating cost tables for walls, floors, roofs . . . hour-degrees of temperature differences by cities . . . internal conductivities of various building materials—all tabulated for your convenience and comparison. You will find daily use for this book in your office.

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its erstwhile downfall, welcome the appearance in book form of a collection of 26 color prints which prove that the art is once again coming into its own. We refer to a re-issue of the "rare and beautiful delineations of continental cities" made in the nineteenth century by that master lithographer, Thomas Shotter Boys. Mr. Boys made these drawings on stone, from nature, in the first half of the nineteenth century. The collection was published in his life time (1839) with a dedication to the original printer whose skill advanced the art employed, for, after all, the success of lithography depends largely on the printer's taste and ability. The present volume is a re-issue of those drawings in color prints by a process quite new to the public and one which shows a still further advance of the art. It is accompanied by descriptive notes of each plate and an introduction by E. Beresford Chancellor. The book is the sequel to Mr. Boys' "Original Views of London," these being the only two works which that artist ever issued. The "London Views" were re-issued in 1926, and the immediate popularity which they met inspired this re-issue of the "Continental Views," probably likewise destined to favor.

Other great artists have from time to time experimented with lithography. Whistler made its acquaintance in the late seventies, perceiving that herein lay a new field for expression, a field in no wise inferior to those of dry point and etching, in which he was already proficient. Since his day Nicholson, Ricketts, Shannon, Brangwyn and others have done much to elevate the art of lithography to the prestige of its early days. Germans and Austrians have employed artists of established merit to produce color prints, the beauty of which has been recognized the world over, in spite of the fact that they are available for comparatively small sums. Railroads in this country and Europe have seized upon the process to produce color posters of their scenic routes which even the most critical are often forced to admire. All of these owe an obvious debt to the prints of Thomas Shotter Boys. He was the first to invest the art with a humanizing quality by introducing men and women into the scenes, depicting customs and modes of life as well as landscapes. Now in the present issue of his "Picturesque Architecture in Paris, Antwerp, Ghent, Rouen, etc.," the technical process has been carried so far beyond that originally required for polychrome architecture as to make of lithography almost a new art. So fine is the result achieved that the specimens put forth have been mistaken for water color drawing or prints wrought by the hand of the colorer in imitation of the originals. But, as Mr. Chancellor sets forth in his introduction, the drawings are produced in their entirety by means of lithography. "It was expressly stipulated by the publisher," he says, "that not a touch should be added afterward, and this injunction has been strictly obeyed. These are pictures drawn on stone and reproduced by printing with colors. Every touch is the work of the artist; every impression the product of the press." The pictures are printed in oil on paper by a new process. The result is a purity and brilliance of tone in which solidity is combined with transparency. The difference from the usual effect Mr. Chancellor explains: "In mere decorative subjects, the colors are positive and opaque, the tints flat,

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Construction, Planning, Administration

J. O. DAHL

Author of **"Restaurant Management"**

HERE is a work ot enormous value to restaurant owners and managers, architects, chefs, stewards, kitchen engineers and manufacturers, in fact to all in any way connected with institutional kitchens. The author is a well known authority in the hotel and restaurant field. This book is the result of his experience, and of his interviews with literally thousands of experts, over 200 of whom directly coöperated in preparing the work.

It discusses expertly all phases of kitchen design, construction, equipment, and administration. It points out methods of standardizing every branch,—and in the most efficient, economical manner. Filled with practical suggestions and concrete examples, this work will save owners and managers of large kitchens many thousands of dollars. It is indispensable in the equipment of restaurants, hotels, clubs and community houses, and in architects' offices.

Price $5

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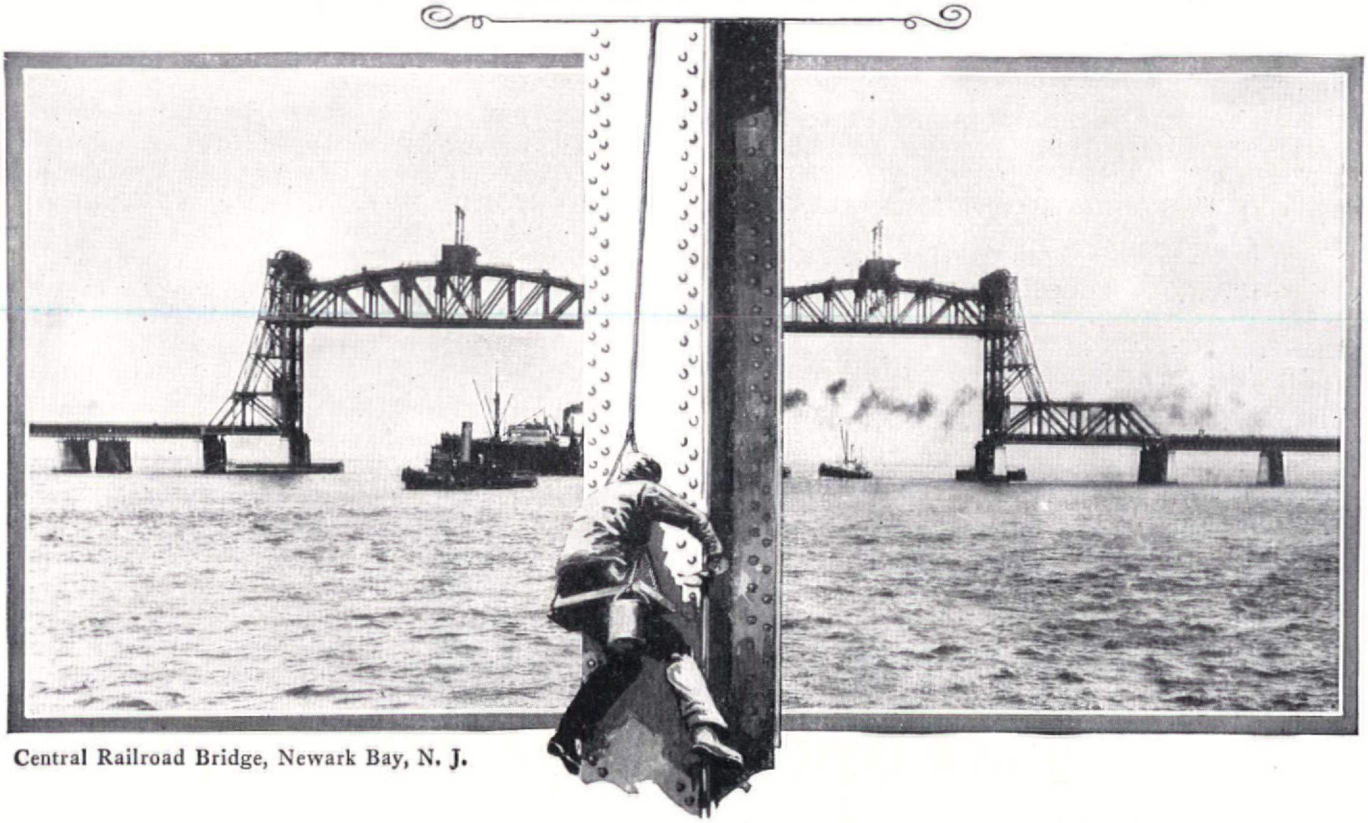

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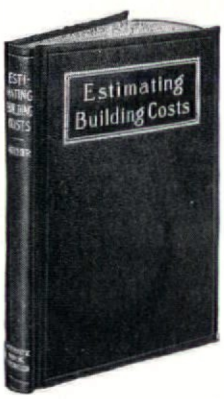
ESTIMATING BUILDING COSTS

By
WILLIAM ARTHUR

Third Revised and Enlarged Edition



This concise and handy volume has been especially prepared for the use of building tradesmen, contractors, material men, technical students and instructors, and will also be found useful to all in any way connected with the construction of houses, barns, stores and small manufacturing buildings. It contains a collection of material data covering all classes of building construction, and arranged for quick reference. A highly practical, useful work.

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and the several hues are of equal intensity throughout; whereas in these views the various effects of light and shade, of local color and general tone result from transparent and graduated tints. The atmospheric appearance of the skies, giving daylight brightness to outdoor scenes, is the best evidence of success." The plates seem to depict true moonlight, true sunlight, true reflections of a snowy scene. The whole is invested with a reality which, in the usual color print, is conspicuous by its absence.

This book is of value to the historian as well as to the artist. It shows the landmarks of a bygone age. Mr. Boys succeeded in portraying vividly pictorial and architectural glories of scenes which since have changed beyond recognition. The present-day tourist might search for them in vain. Just as his "London Views" showed the London of the early years of Victoria's reign (quite different from the London of today), so the "Continental Views" show Paris, Antwerp, Ghent, Rouen, etc. as we no longer know them, lacking landmarks which have been obliterated by the ruthless hands of Time and Change. What man who knows his Paris would recognize the Ile de Cite in the picturesque plate entitled "Notre Dame from the Quai St. Bernard?" Mr. Boys drew it on his stone when he lived there a full century ago. His Paris is Paris before it underwent its Haussmann-izing process. The Rue de la Licorne in which he lived, shown in another plate, has been completely wiped away to give place to the great Place de Notre Dame as we know it today. The same is true of the "Fish Market of Antwerp" which he shows in its original picturesqueness; and of other corners of Ghent and Rouen which he chose to immortalize. They show old modes and customs of living which the historian longs to preserve, invested with a beauty in which the true artist revels.

CHINESE ART. By R. L. Hobson. Text, and 100 plates in color, 9 x 11¼ ins. Price $12.50. The Macmillan Company, New York.

THE influence of the civilization of one country upon that of another and the close relationships which exist between different forms of art lend interest and importance to the effect which intercourse with China has had upon western Europe and to the different arts which the Chinese have brought to such perfection. In a land extremely ancient, a land remote and cut off to a great extent from contact with the rest of the world, there were developed forms of art strangely beautiful and different by far from anything else the world has known; and in this lavishly produced volume the author, who is Keeper of the Department of Ceramics and Ethnography at the British Museum, presents a study of what to most students and even to some scholars constitutes a baffling subject, even after long research.

After an introduction, in which Mr. Hobson briefly surveys the arts of China and the history of the country insofar as it affected the arts, there are presented 100 plates illustrating work of different periods or dynasties, early and late,—illustrations showing pottery and porcelain; jades; lacquers; paintings; rugs; bronzes; furniture, etc. The great care given to the provenance of each of the items places students under obligations to the author, as does also the splendor of the plates themselves, produced as they are in full color and in some instances with gold, adding much to their effect.

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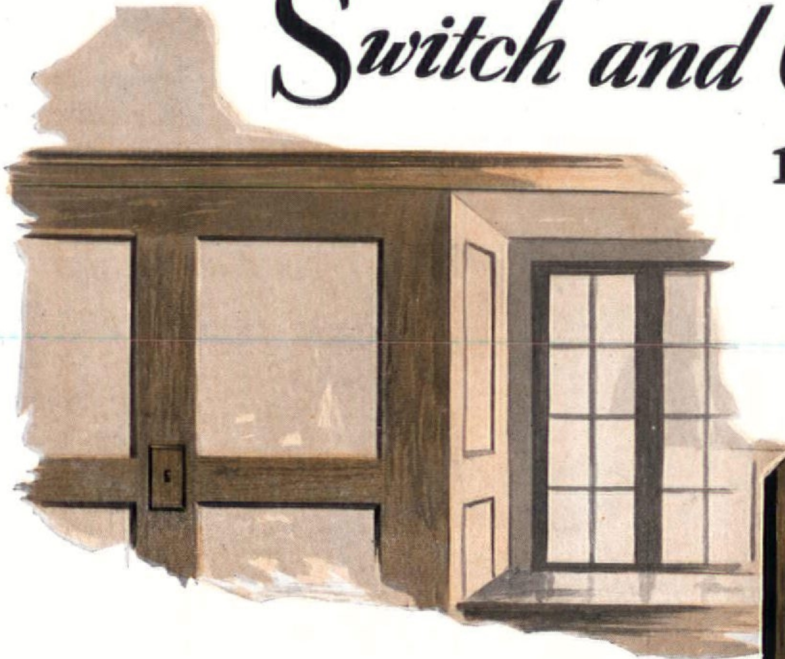

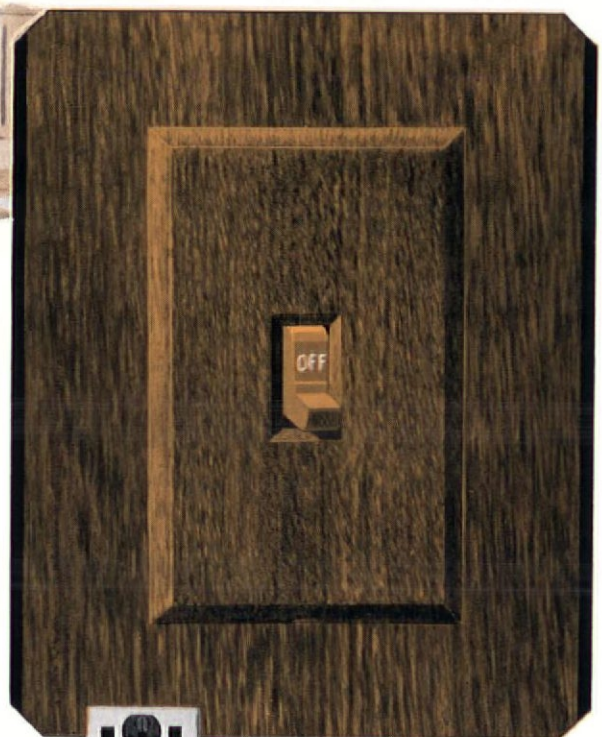

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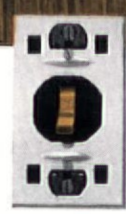

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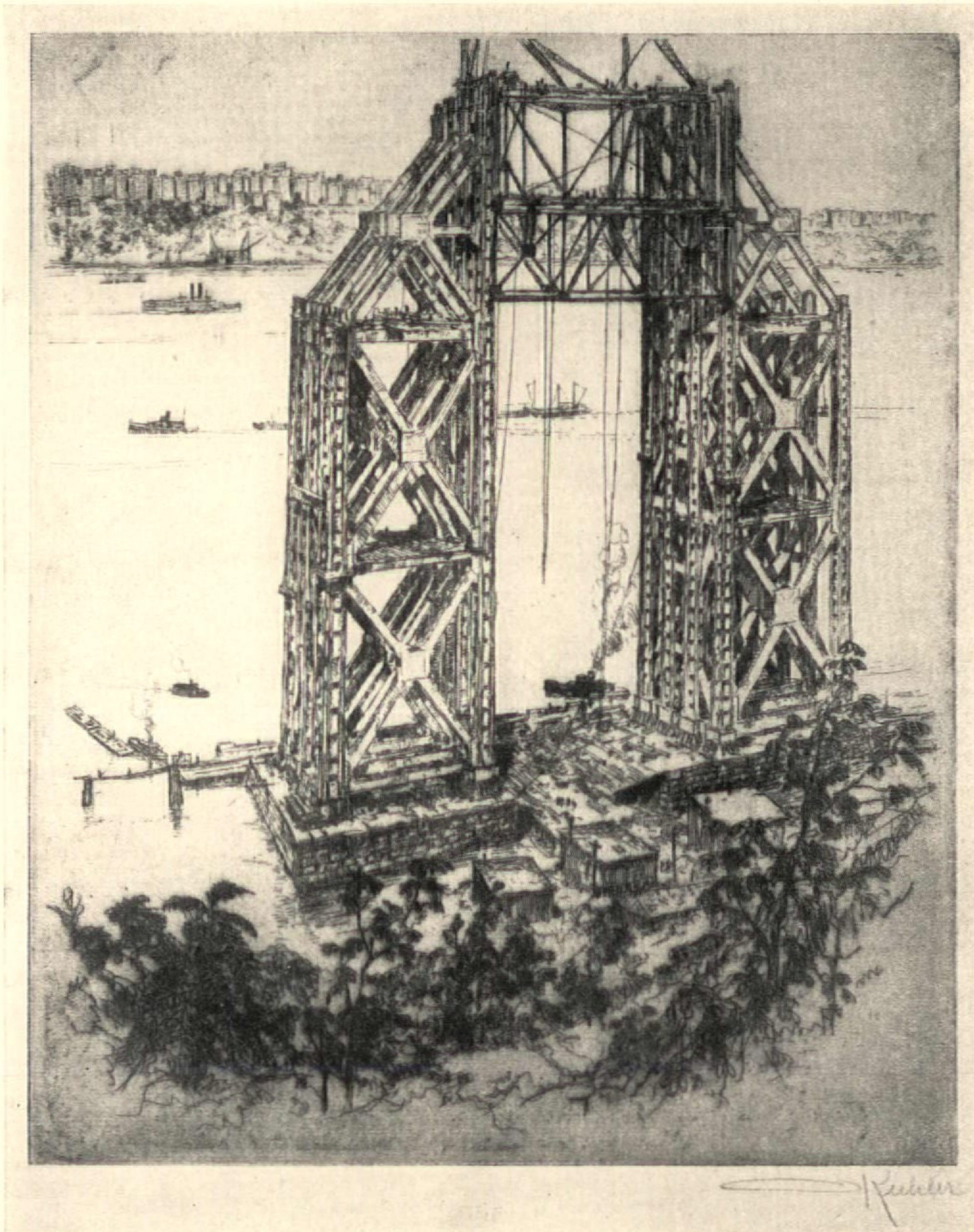

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HUDSON RIVER BRIDGE UNDER CONSTRUCTION

FROM AN ETCHING BY OTTO KUHLER

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER FIVE

NOVEMBER 1928

THE DEVELOPMENT OF THE SUSPENSION BRIDGE

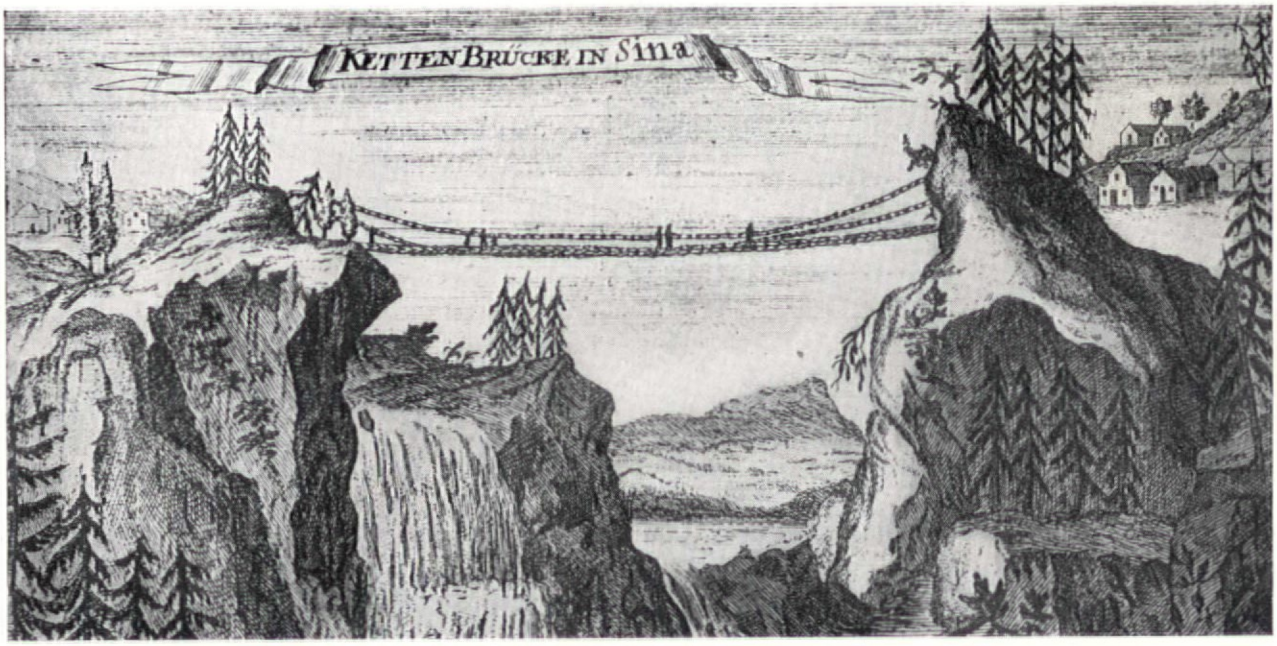
BY
CHARLES A. JOHNSON

THERE is something about a bridge that is inspiring and stirs the imagination. This is especially true of suspension bridges, with their light and graceful cables sweeping across spaces from one tower to another and supporting with their slender vertical cables avenues of progress. It is not known what inspired the first suspension bridge. It may have been a vine trailing from one tree to another that primitive man used to cross a ravine to save himself the labor of scrambling down and up the steep sides to get from one side to the other.

The first suspension bridge of which we have record was built in A.D. 65 in China, in the province of Yunnan, by order of Emperor Ming. It is described as being 330 feet long, with planks resting on the chains. All of the early suspension bridges were of this form, with the floors of the bridges following the catenary curves of the cables. Bridges of this type are found in China, India and other far-off parts of the world. The modern type of suspension bridge is an American invention, and its greatest development has been in this country. The suspension bridge is the oldest and most picturesque type of metal bridge. It is light and graceful; provides a roadway at low elevation with unobstructed view; has low center of wind pressure; dispenses with the use of falsework during construction; uses materials that are easily transported and erected and eliminate the danger of failure during erection. After completion, a suspension bridge is the safest structure known to bridge engineers.

James Finley, of Fayette County, Penn., built a suspension bridge of 70-foot span across Jacob Creek on the turnpike from Uniontown to Greensburg in 1796. The bridge was suspended from two iron chains, one on each side, the lengths of the links being governed by the distances between the suspended floor joists. The chains had a sag of 10 feet, or one-seventh of the span, were supported by masonry towers having the same angle of inclination on each side, and were anchored by large stones on shore. The suspended wood floor was 12½ feet wide without any stiffening truss, and the cost of the bridge was about $600. Finley obtained the first patent on this bridge from the United States government. Modern bridge engineers say that Finley's bridges were remarkably well designed structures for that time, and that he used sound principles of construction. The principal features of his invention consisted in the use of stone abutments, in the introduction of only two chains, one at each side of the bridge, and rigid floor construction. His chains were forged wrought iron links. Up to the year 1801, eight bridges had been built in the United States according to Finley's patent, and between 1801 and 1809 many others were built. The largest of these, the bridge across the Schuylkill at Philadelphia, was 306 feet long and was erected in 1809. This bridge had an intermediate pier with two spans of 153 feet each, and was the first suspension bridge with more than one span. The cables were made of long, iron links from which the floor was suspended by rods. It collapsed in 1811 under an excessive load of cattle, and was replaced by another suspension bridge which fell in January, 1816, under a load of ice and snow. The third bridge on this site was opened in June of the same year and had a single span of 408 feet with a foot-walk only 18 inches wide. This bridge was erected by White & Hazard, who owned and operated a wire mill in the vicinity, and the cables were composed of six ⅜-inch wires. The wood floor was without stiffening and would support only eight persons at a time. The cost was $125, and a toll of one cent was charged for each person. The outstanding feature of this structure was that it was the first wire suspension bridge ever erected in any country. It fell soon after its erection, under a load of snow and ice, and was replaced by a wooden bridge.

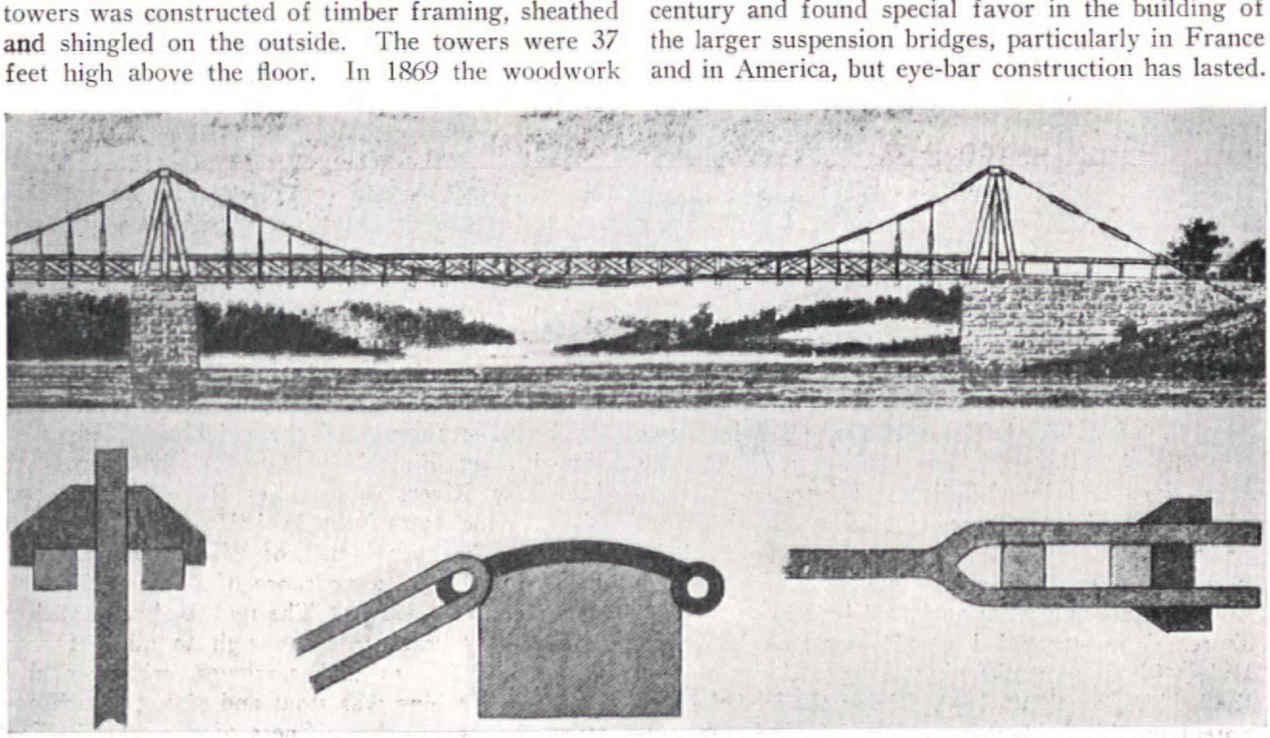
The most famous of the old chain bridges designed after Finley's patent was that across the Merrimac River, three miles from Newburyport, Mass., which was built in 1810. This bridge was built by John Templeman, of Washington. It had a span of 244 feet, a clearance of 40 feet above the water, and cost $25,000. The two roadways, each 15 feet wide, "were strong enough to allow for the passage of horses and carriages, whatever their speed. The railing was stout and strong, which contributed much to the stiffness of the floor." Each



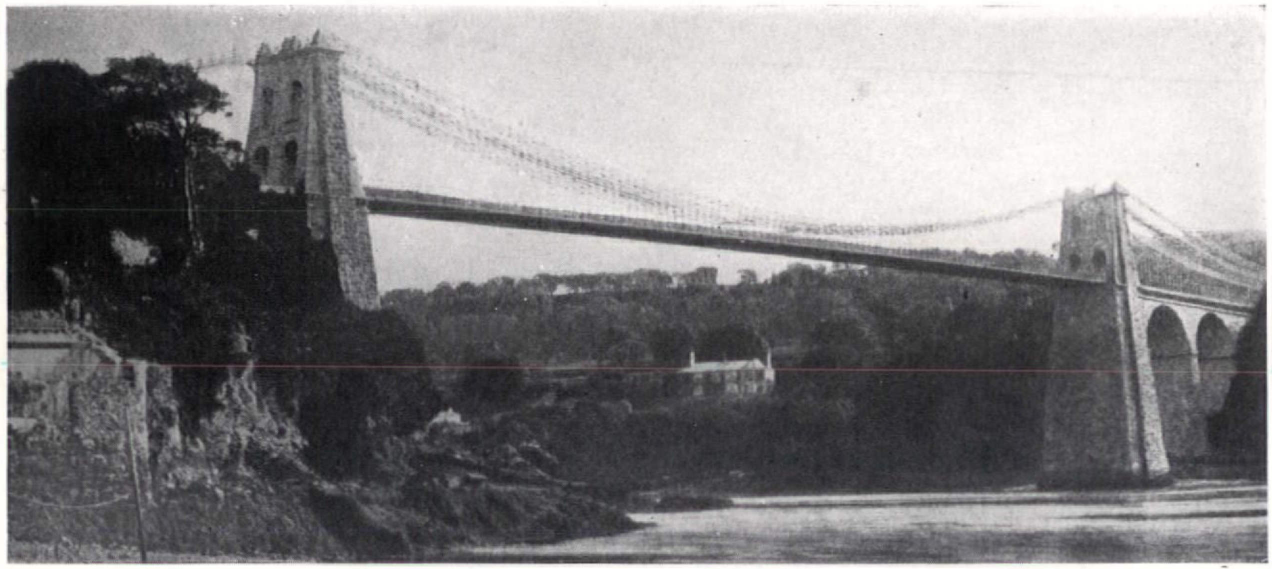
Suspension Bridge, Built A.D. 65 in the Province of Yunnan, China

roadway was supported by two sets of cables, each containing three chains, or a total of 12 chains for both roadways. The links were 27 inches long, made from 1-inch square bars, and the floor supports were 7 feet apart. The chains were forged on the spot, and when it was rebuilt in 1909 they had not been painted for 70 years and were in good condition. When the iron was analyzed it was free from slag, which proves that the purer the metal the better it will resist corrosion. The towers supporting the cables were built of masonry up to the under side of the bridge, and the superstructure of the towers was constructed of timber framing, sheathed and shingled on the outside. The towers were 37 feet high above the floor. In 1869 the woodwork was entirely rebuilt. The anchorages were 100 feet back of the towers. Modern traffic was responsible for the passing of this bridge after a century of service. So strongly had it made its impression on the people that the law providing for its rebuilding specified that it should be rebuilt along the same lines as the old bridge.

In 1811, Sir Samuel Brown, of England, first proposed the use of flat bands or links instead of the square and round bars previously used. In 1818, wrought iron bars were introduced. Wire cables were introduced in the early part of the nineteenth century and found special favor in the building of the larger suspension bridges, particularly in France and in America, but eye-bar construction has lasted.



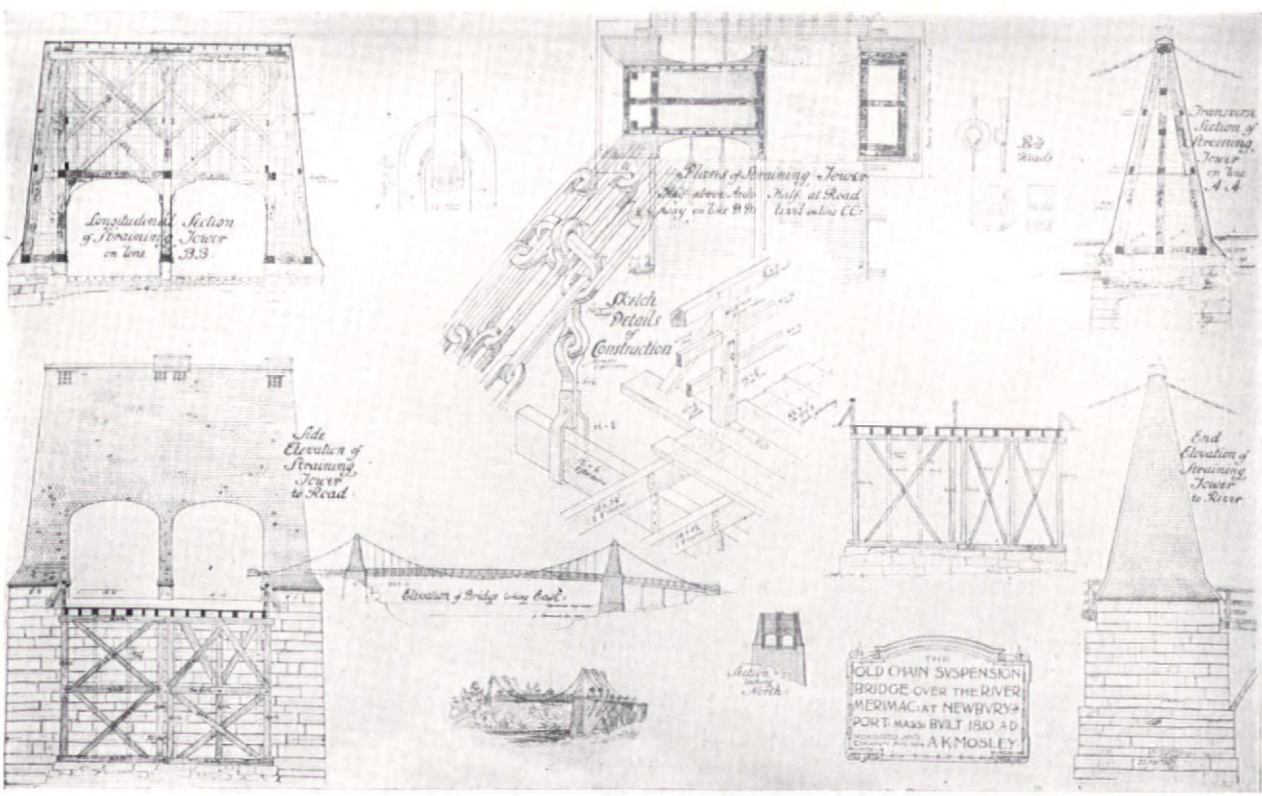
Early Bridge Across Schuylkill, Philadelphia, Built 1809. First Suspension Bridge with More Than one Span



Menai Strait Bridge, Wales, Built 1826; the First Large Suspension Bridge

Suspension bridges usually have either a single span or three spans. The single span has the floor of the central span between the towers supported by the cables, has straight back stays, without suspenders, and the floor of the end spans is supported by steel trusses or columns under the floor. The Williamsburg Bridge is an example of this type. In the three-span suspension bridge the floors of the central and of the end spans are supported by the cables, which makes a much more graceful and symmetrical structure than where the end spans are supported by piers below the floor of the bridge.

The first very large suspension bridge was built in 1826, by Thomas Telford, across the Menai Strait, between the Island of Anglesey and Carnarvonshire, Wales. The central span of this bridge was 580 feet, with side spans of 280 feet, which were supported by four 50-foot stone arches at one end and three similar arches at the other end, making a total length, including the approaches, of 1710 feet. The width of the bridge was 30 feet, having two 12-foot driveways with a 4-foot walk between. The floor was supported by 16 main cables arranged in four sets vertically above one another, one set at each



Courtesy of The American Architect

Details of Chain Suspension Bridge Built in 1810 Near Newburyport, Mass.

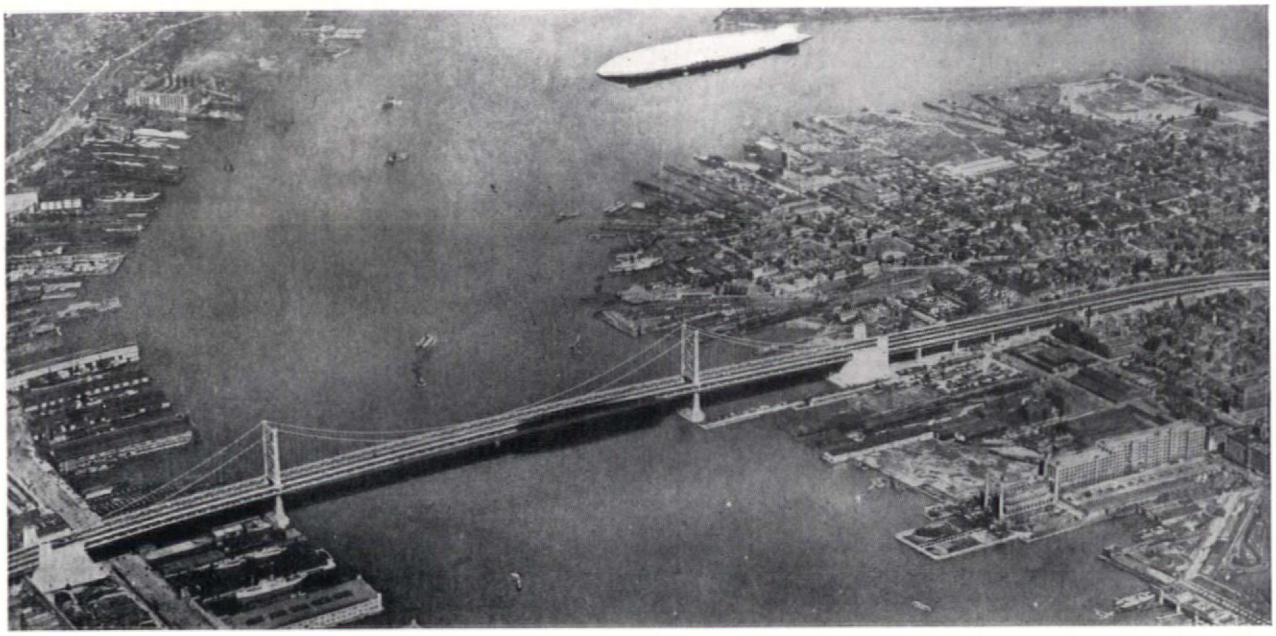
Williamsburg Bridge, New York. Central Span Only Supported by Cables

side of each roadway. The masonry towers were 152 feet high and were 29 feet thick at the level of the roadway. Each chain contained five iron bars, 3¼ inches by 1 inch, 10 feet long, united by 8-inch by 16-inch links and 3-inch pins. This bridge was erected over a century ago and is still in use.

Von Mites in 1828 constructed a chain bridge over the Danube Canal, having a span of 334 feet. The cables were flat bars of open hearth steel, and this was the first use of steel for bridge building in any country. In 1860 this bridge was taken down and replaced with a suspension bridge, designed by Schnirch, having a span of 255 feet, and was notable for being the first and only railroad suspension bridge in Europe. In building the early suspension bridges the wires were formed into strands on the ground, and the strands were then raised up to the tops of the towers. M. Vicat, in 1831, first wove the cable in place during the erection of a bridge over the Rhone. At Fribourg, Switzerland, a bridge was erected over the Saone Valley by M. Chaley in 1834. It had a span of 870 feet and a width of 21 feet, consisting of a roadway 15 feet wide and two 3-foot sidewalks. The floor was supported by four iron wire cables, two on each side of the roadway. In 1880 it was reinforced by adding one more cable on each side. This bridge was recently replaced by a massive viaduct, after nearly a century of use.

John A. Roebling greatly improved the design of wire cable suspension bridges. One of his earliest works of this type was the construction, in 1844, of the Pittsburgh Aqueduct across the Allegheny River. This bridge consisted of seven individual spans, each 162 feet in length, and was supported by two 7-inch wire cables. In 1854 Mr. Roebling accomplished the then thought impossible feat of constructing a combination railroad and highway suspension bridge across the Niagara Falls Rapids. This bridge had a span of 821 feet and was the first long suspension bridge to be constructed with stiffening trusses, assuring a rigid floor. Stiffening trusses had been used a few years before on a small suspension bridge over the Kentucky River at Frankfort, Ky., but the span was only of 200 feet. In 1867 a bridge was built across the Niagara River a short distance below the falls, by Samuel Keefer of Ottawa. It had a span of 1260 feet, and the clear width of the roadway was only 10 feet, which did not permit carriages to pass, and in 1888 it was widened to 17 feet. The cables were of iron wire, which was imported from England, and were supported on wooden towers.

For years John A. Roebling had been studying the possibilities of spanning the East River with a bridge. His production of drawn steel wire made the erection of the Brooklyn Bridge a possibility. All previous suspension bridges' cables were fabricated from wire drawn from charcoal iron, the Brooklyn Bridge being the first in which steel wire was used. The protection of the wire in the cables had been oil, grease or paint. In the Brooklyn Bridge galvanized wire was used, thus introducing zinc for the first time as a protective coating for bridge wire. The Brooklyn Bridge was completed under the direction of Col. Washington Roebling in 1883, and at the time was one of the wonders of the world, far outranking in size any similar structure. Its simplicity, ruggedness and beauty of line have made it a bridge that it is difficult to surpass. The central span is 1595 feet, 6 inches long, with end spans of 930 feet. The total length, including the approaches, is 5989 feet. The width of the bridge is 86 feet and has accommodations for two elevated railroad tracks, two trolley tracks on the 17-foot roadways, and a raised center walk, 15 feet wide. The



Aërial View of Delaware River Bridge, Completed 1928

bridge is supported by four cables, each 15¾ inches in diameter, which are carried on stone towers 278 feet above water. The clearance is 135 feet, as required by the War Department.

The longest suspension span now existing is that of the Camden-Philadelphia Bridge over the Delaware River, completed in 1928. This bridge has a central span of 1750 feet and end spans of 716 feet, 8 inches. The total length, including the approaches, is 8240 feet. The width of the bridge is 128 feet, 6 inches, and it has a 57-foot roadway for six lanes of traffic, four tracks for rapid transit, and two elevated footwalks each 10 feet wide. The bridge is supported by two wire cables each 30 inches in diameter, which are carried on steel towers 380 feet above the water. The clearance under the bridge is 135 feet. This bridge was designed and constructed under the direction of Ralph Modjeski, chief engineer, and Paul Cret, architect.

During the last 25 years no new types of suspension bridges have been introduced, but considerable advance has been made in design. The quality of material has been improved, and its strength has been greatly increased. The testing laboratories which now exist have given engineers more complete knowledge of the materials with which they are working The perfection of the pneumatic caisson has made it possible to build foundations for structures in locations that were considered impossible.

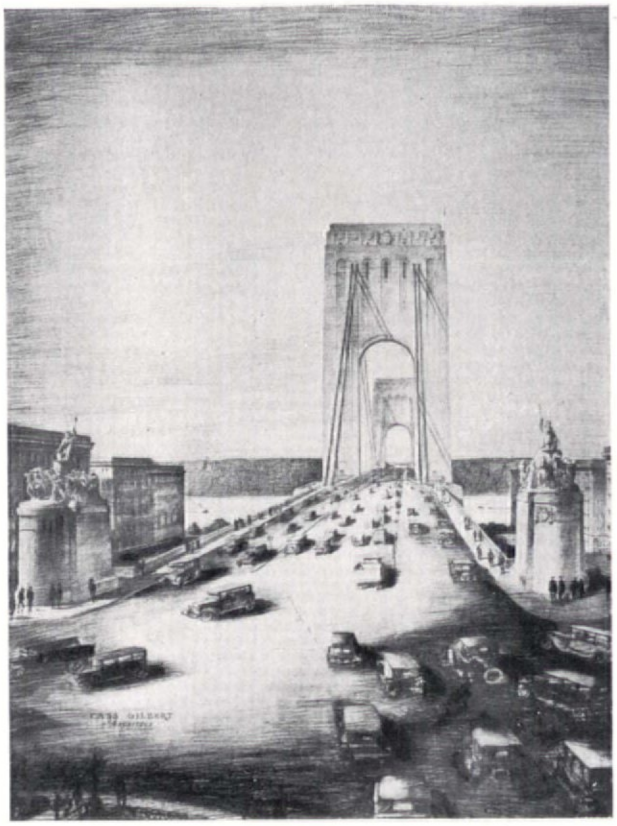
The Port of New York Authority is now building a suspension bridge to cross the Hudson River from Fort Washington Park at 178th Street, New York, to Fort Lee, N. J. This bridge has a span of 3500 feet, which is twice the length of span of the longest existing suspension bridge. The bridge is being designed and constructed under the direction of O. H. Ammann, Chief Engineer of Bridges of the Port of New York Authority, and Cass Gilbert, architect. Some laymen have questioned the feasibility of constructing such a long bridge. Mr. Ammann, in his first progress report on the Hudson River Bridge, says that "engineers familiar with the design and construction of large bridges have pointed out from time to time that the feasibility of building a bridge of as long a span as 3500 feet and more is esentially a question of economy, and that the span length and size of bridge have nothing whatsoever to do with its safety, either during erection or after completion. The feasible limit of span is reached when the amount of metal required to carry a given load becomes excessive in cost, and not because the safety is impaired. The physical limit of span is reached when no amount of metal can safely carry more than its own weight. The latter limit can be mathematically determined for the safe strength of any given material, and has been calculated by various authorities at 10,000 feet and more."

The location of the Hudson River Bridge is well suited to a suspension bridge on account of the high land on both sides of the river at this point, which makes it possible to construct a bridge with comparatively short approaches. The side spans of this bridge are 650 feet long, and the total length including the approaches is 7800 feet.

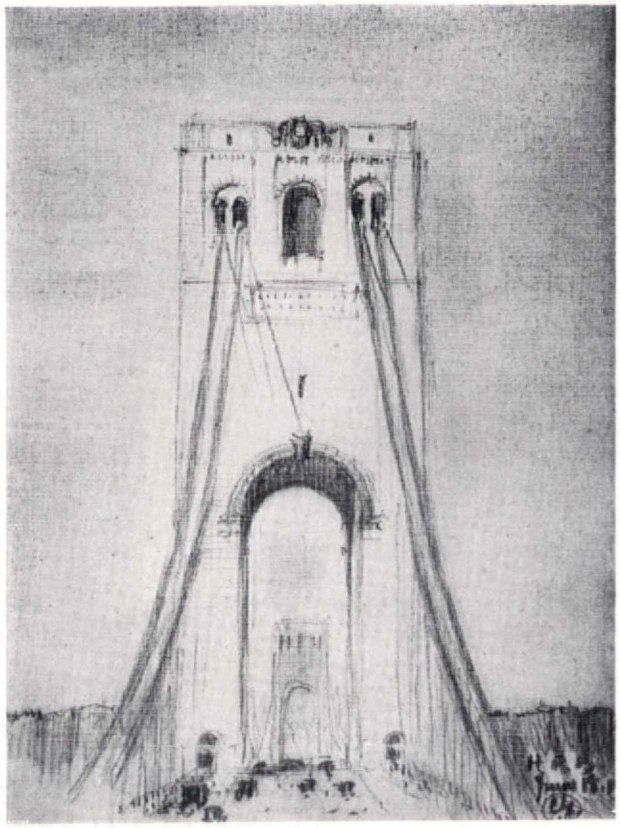
The width of the bridge floor is 118 feet, and there will be a central roadway 40 feet wide for four lanes of traffic, two side roadways each 24 feet wide accommodating two lanes of traffic, two footwalks each 11 feet, 6 inches wide, and a lower level for either four or six lanes of rapid transit as conditions require. The bridge floor will be supported by four wire cables, each 36 inches in diameter.

GENERAL VIEW OF HUDSON RIVER BRIDGE

VIEW OF HUDSON RIVER BRIDGE SHOWING NEW YORK ANCHORAGE AND APPROACH
CASS GILBERT, ARCHITECT
O. H. AMMANN, CHIEF ENGINEER OF BRIDGES, PORT OF NEW YORK AUTHORITY, ENGINEER



Preliminary Perspective of New York Approach, Hudson River Bridge

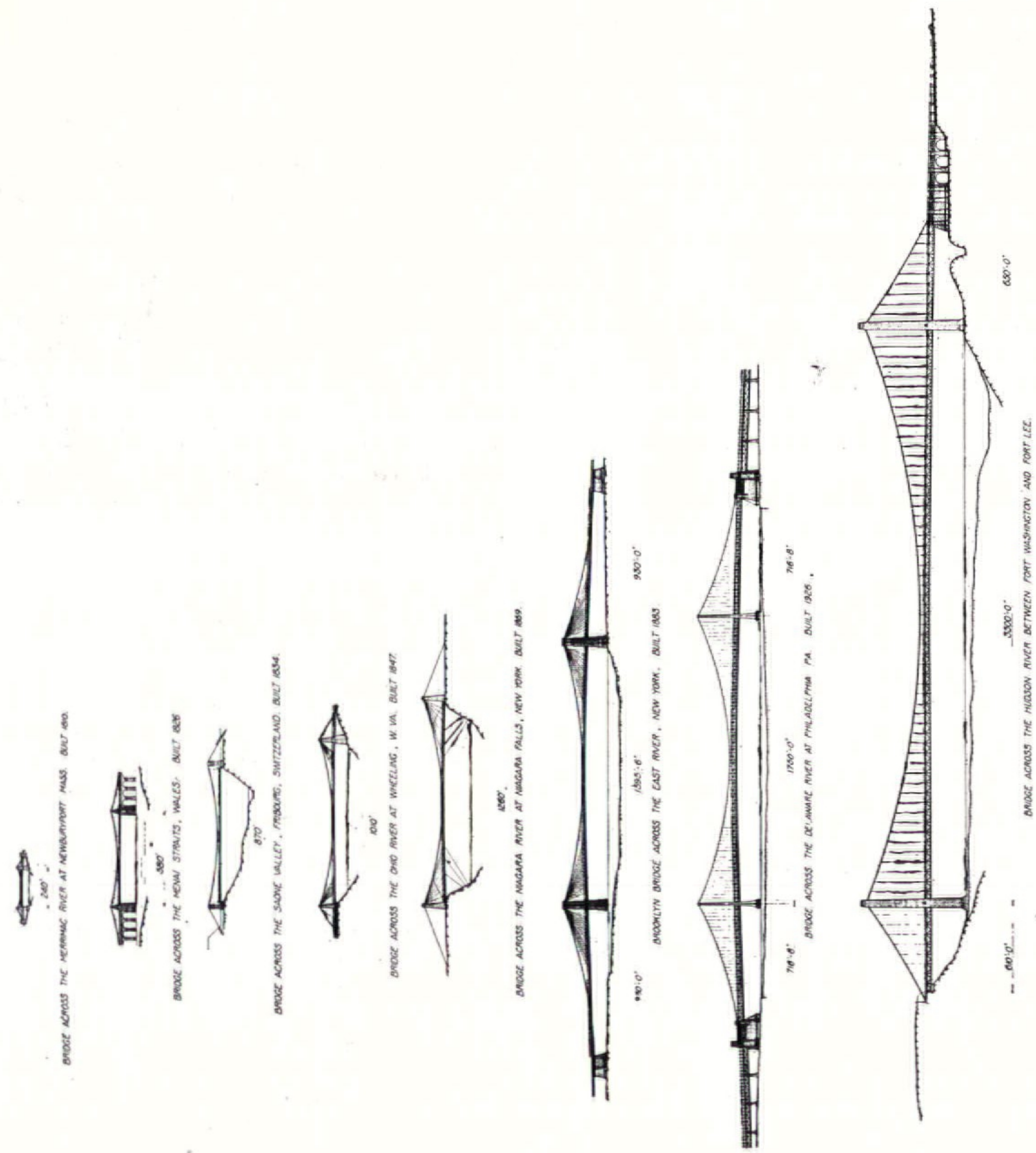


Preliminary Study of Tower Design. Original Sketch by Cass Gilbert, Architect

Each cable will be composed of 26,474 wires or a total of 105,896 wires. The cables will be supported on steel and masonry towers, 210 feet by 65 feet at the base, and 635 feet above the water. Comparing the towers with the Washington Monument, which is 55 feet square at the base and 550 feet high, some idea may be gained of the stupendous size of this structure. The roadway of the bridge is 253 feet above the water at the center of the bridge, and it passes through the towers beneath a great arch 95 feet wide and about 230 feet high. The clearance under the bridge is 213 feet at the center of the bridge, and 195 feet at the towers. The New York anchorage is an almost solid mass of concrete and masonry, 290 feet by 200 feet at the base and 130 feet high, in Fort Washington Park. The New Jersey anchorage consists of steel beams and eye-bars which are buried 240 feet in the solid rock of the Palisades.

The New York approach connects with Broadway, and it crosses Riverside Drive on a series of massive masonry arches about 75 feet high, while at the new Jersey approach the roadway strikes the face at the Palisades about 50 feet below the top of the cliff. From this point it rises at a 4 per cent grade to the plaza at Lemoine Avenue. New highways that are being constructed will care for the tremendous amount of traffic that will be carried over this bridge. Realizing the monumental size and conspicuous location of this bridge, the Port of New York Authority is paying special attention to the architectural treatment of the entire structure and approaches so that it will be handed down to posterity as one of the great monuments of the world.

The effect that a bridge has upon the community was thus admirably expressed by "C.D." in "The Brochure series:" "Of all architectural sins, the building of an ugly bridge is perhaps the most egregious. Structures of other sorts may be overshadowed by charitable neighbors or shrouded with trees and vines; but a bridge, whether part of a river landscape in the country, or a thoroughfare and landmark in the city, always ends the vista and fills the eye. On the other hand, a beautiful city bridge, stately and monumental, often affords, with the sweep of its arches, the only graceful structure among the surrounding marts; while in the country it may complete and humanize, with the touch of man's hand, a natural scene, and thus become an architectural achievement that is a joy more likely to 'endure forever' than most objects to which the trite phrase has been applied; for thoroughfares of travel when once established are inflexibly conservative."



Courtesy, Port of New York Authority

GROWTH OF LENGTH OF SPANS OF SUSPENSION BRIDGES SINCE 1800

STRUCTURAL FEATURES OF SOME MODERN AMERICAN CHURCHES

BY

EMIL PRAEGER, ENGINEER

Of the Office of Mayers, Murray & Phillip, Architects

EUROPE has always possessed a lure for students and lovers of architecture, and especially of church architecture, but the time is not far off, if it is not now here, when Europeans will profit by studying the church architecture of America. Although the ritual of the church service has changed less with time than have many other customs, the method of church building seems to be keeping pace with other changes in methods of doing things which have been taking place in recent times.

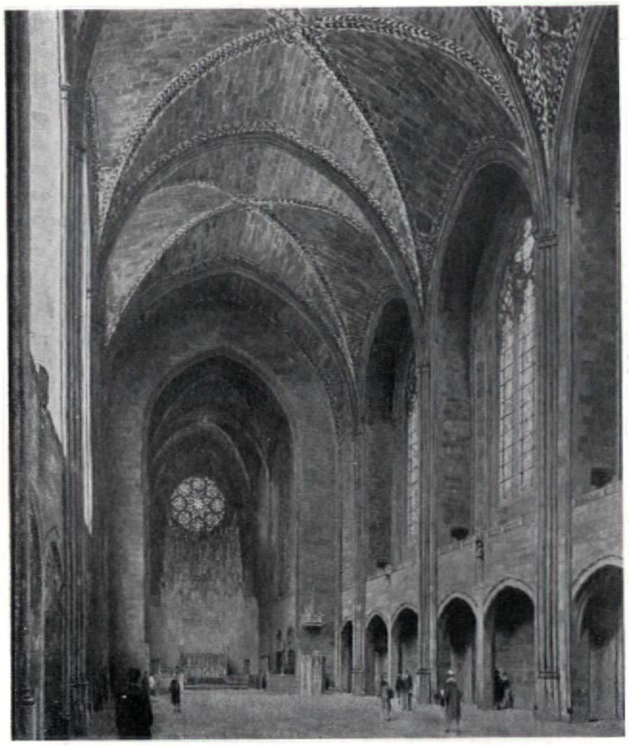
The reasons for this condition are not difficult to determine. In the construction of the mediæval churches, many years and often centuries were spent in finally completing a building. Even in small towns and rural places, the building of a place of worship often represented the chief lifetime labors of a group of workmen, and under these conditions it is not surprising that the workers took an extreme interest in the task, in many instances approaching the attitude of an artist towards his masterpiece. As evidence of this one need only realize that the exquisite carvings of wood roof trusses, pews, chancel and other furniture seen in the old rural churches are the result of the painstaking labors of village or town carpenters and craftsmen.

How different are conditions in this country today, with respect to both rural and urban churches! The village carpenter or mason would find it difficult to supply gasolene for his automobile if he had to depend chiefly on the building of the community church for his life income, and parishioners are too up-to-date to sanction obsolete procedure. It does not follow that there are no examples of well designed small churches in this country; on the contrary, there are some excellent examples, but they are exceptions. In these, moreover, aside from the time element, there have been no great changes in methods of design or construction from those followed by the older church builders. In the larger churches, it is now neither practical nor necessary to build piecemeal, and the method of building is bound to have an effect upon the finished structure. In the cases of the old cathedrals, highly trained engineers were not available to the architects, but internal and external forces and stresses in structural members were understood and considered, although not always adequately. Failures were not unknown, and much knowledge of building methods was gained through this not altogether satisfactory method of "learning." The paths of forces and stresses in a Gothic structure are not as easily defined as is the case in a framed building, and therefore, contrary to a somewhat general opinion, the solutions of their problems are necessarily usually more complicated than is the case with steel framed buildings, the post-lintel-and-truss type.

During the past few years there have been some very excellent churches constructed in this country, and there are now four or five being erected in New York, the construction of which is of interest to the architect as well as to the crowds that watch the steam shovel or steel derrick. These churches may be divided into three constructional classes; namely: (a) Masonry Framed, (b) Reinforced Concrete Framed, and (c) Steel Framed.

The first class represents the traditional method and needs little introduction. Walls, piers and buttresses are constructed of brick or stone masonry, and the roofs are supported by trusses. In some cases there is a ceiling over the nave constructed of stone, tile, or plaster, in which case simple wood or steel roof trusses are used. Where there is no ceiling, the trusses are generally of wood, of the hammer beam type, which exert a thrust on the buttresses in the same manner as do arch ceiling ribs. The Cathedral of St. John the Divine, Cram & Ferguson, architects, now under construction on Morningside Heights, is an excellent example of this class of construction. As an example of the second class, there is the new edifice for the Church of the Heavenly Rest and the Chapel of the Beloved Disciple, now being built on upper Fifth Avenue, of which Mayers, Murray & Phillip are the architects. Of the third class, the "Riverside Church," on Riverside Drive, and the Temple Emanu-El on Fifth Avenue, are examples. The architects for the former are Henry C. Pelton and Allen & Collens, associated, and for the latter Robert D. Kohn, Charles Butler, and Clarence S. Stein, associated; Mayers, Murray & Phillip, consultants. An account of the construction of the latter building was ably presented in the July issue of THE ARCHITECTURAL FORUM.

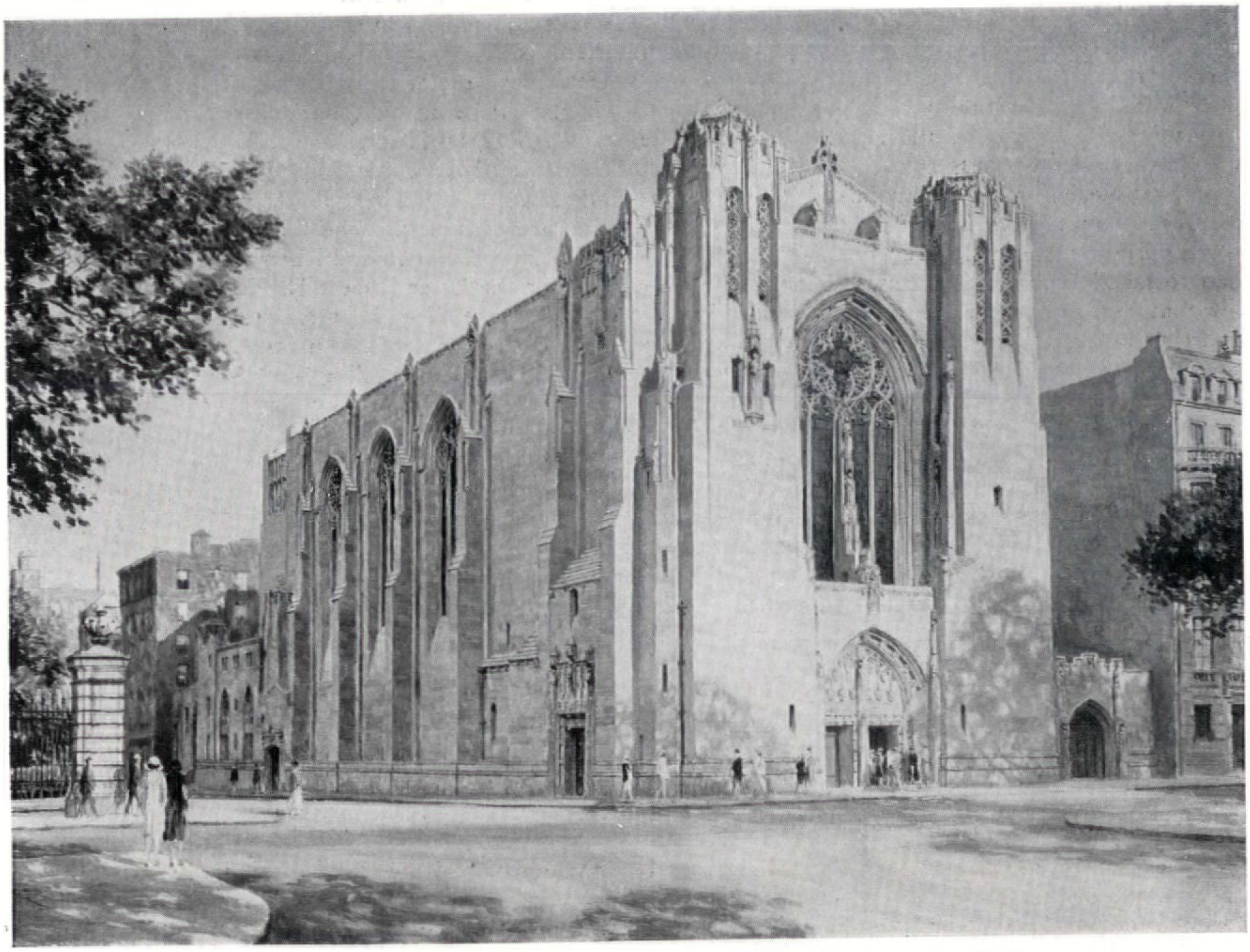
In the case of the Cathedral, the foundations are of concrete, and the nave floor is of tile vaulting. The exterior walls are of granite, and the smaller interior piers are solid granite, while the larger piers have granite cores faced with limestone. The ceiling, a series of structural tile vaults with the first course of an acoustical composition, is supported by limestone ribs. Steel roof trusses and steel purlins support the concrete roof slabs to which is secured the lead-coated copper roofing. While the building is extremely modern in regard to equipment and appointment, the type of construction follows that employed in the older European churches in which masonry buttresses resist the thrust of either the hammer beam trusses or arch ribs. There are, of course, details developed for this building which are not common,—as, for example, the method which will probably be used for supporting the central tower by intersecting stone arch ribs,—but the main



Interior, Church of the Heavenly Rest

difference between the methods of building this and the older structures lies in the time consumed in building and the tools and apparatus employed. Modern tools have made it possible to use stones much larger than could formerly be handled easily, with the result that solid piers of great dimensions are now possible.

In the smaller piers of the Cathedral of St. John the Divine, the blocks are 5 feet in diameter and weigh approximately 4 tons each, while in the larger piers, stones weighing as much as 8 tons each were used for the cores, and these were bonded with the limestone facing. In the European churches a usual method of constructing piers was to build a face stone shell and to fill this shell with rubble masonry. Failures due to this type of construction have been only too numerous, and the recent experience at St. Paul's Cathedral in London should be a warning against use of this method. The steel scaffolding of the nave of St. John's, of an original and unusual design, was developed to meet existing conditions. As the structural tile floor of the nave, which was constructed some years previously, could not have safely supported the heavy constructional loads, it was found necessary to concentrate these loads upon the foundations of the nave piers, and therefore the ordinary timber scaffolding could not be used. The

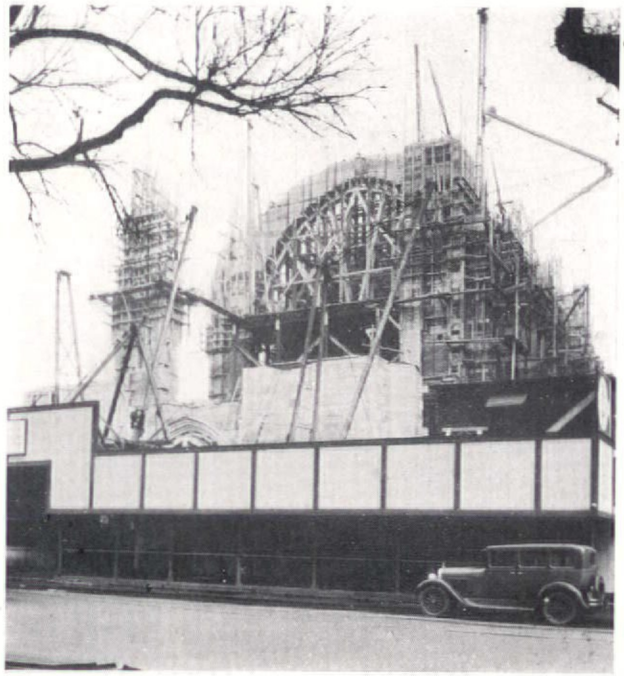


Church of the Heavenly Rest and Chapel of the Beloved Disciple, New York

Mayers, Murray & Phillip, Architects

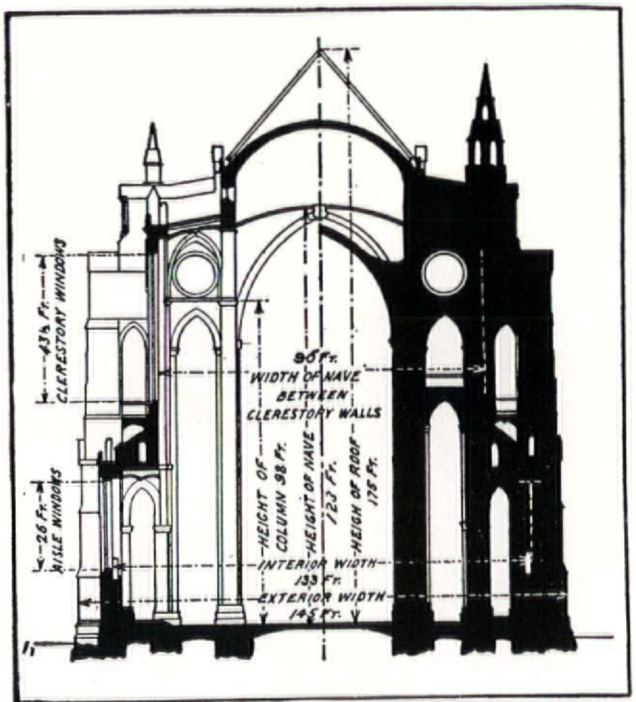
equipment of the stone plants of the Cathedral is modern in every detail, much of the apparatus having been developed to meet the requirements of this particular building. The interest shown by the workmen is unusual for present-day construction work. This care and interest are bearing fruit, and there has been much favorable comment regarding the resulting stonework.

Most large churches in this country have been constructed following the same general principles as St. John's,—for example, St. Patrick's Cathedral and St. Thomas' Church in New York, to name only two. Where special or unusual conditions do not dictate otherwise, there is no objection to continuing the use of older methods of construction, especially for churches of Gothic design. In the construction of the church of today, local conditions may be such as to require a modification of the mediæval methods of construction. In the case of the Church of the Heavenly Rest and the Chapel of the Beloved Disciple, for instance, the imposed conditions were numerous and not easily met. A site had been purchased on the southeast corner of Fifth Avenue and Ninetieth Street, facing Central Park. The building committee was composed of men who, in addition to having an intimate knowledge of church design, had an ambition to build a church which, while

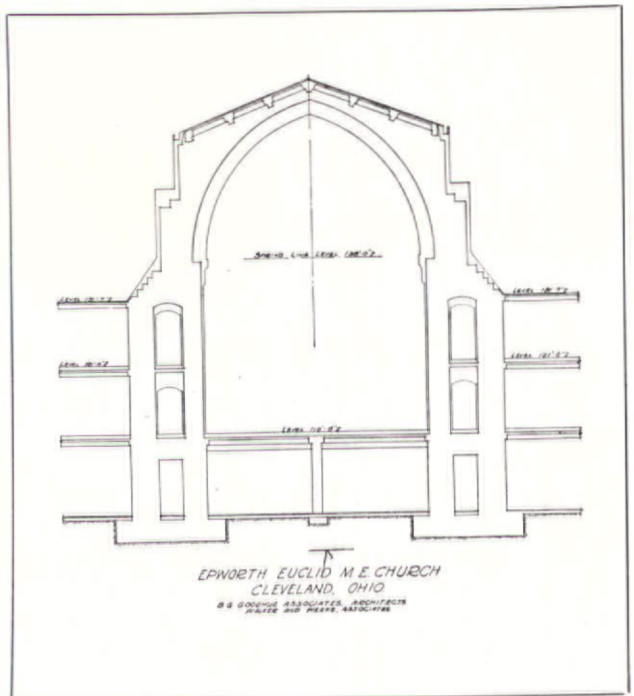


Construction, Showing Formwork for Piers and Arches. Stonework of Front Under Way. Church of the Heavenly Rest, New York

Church of the Heavenly Rest Nearing Completion
Mayers, Murray & Phillip, Architects



Cross Section, Cathedral of St. John the Divine
Cram & Ferguson, Architects

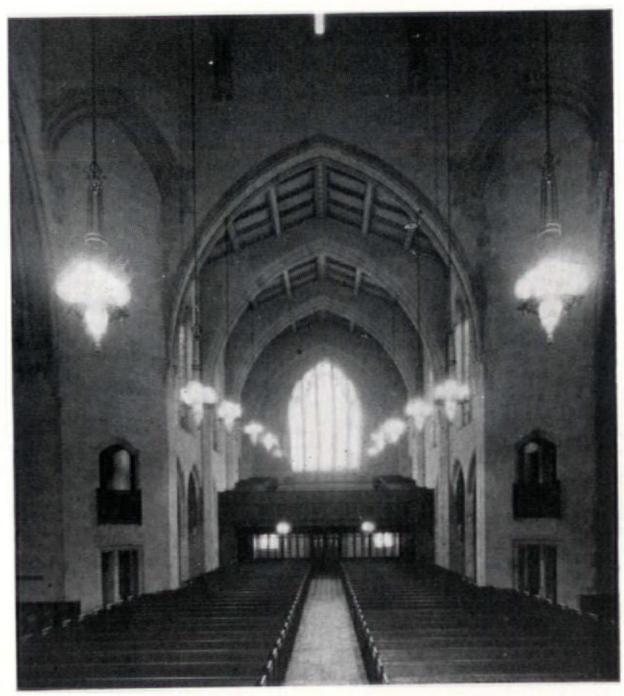


Cross Section, Epworth Euclid M. E. Church, Showing Adjacent Sunday School Floors

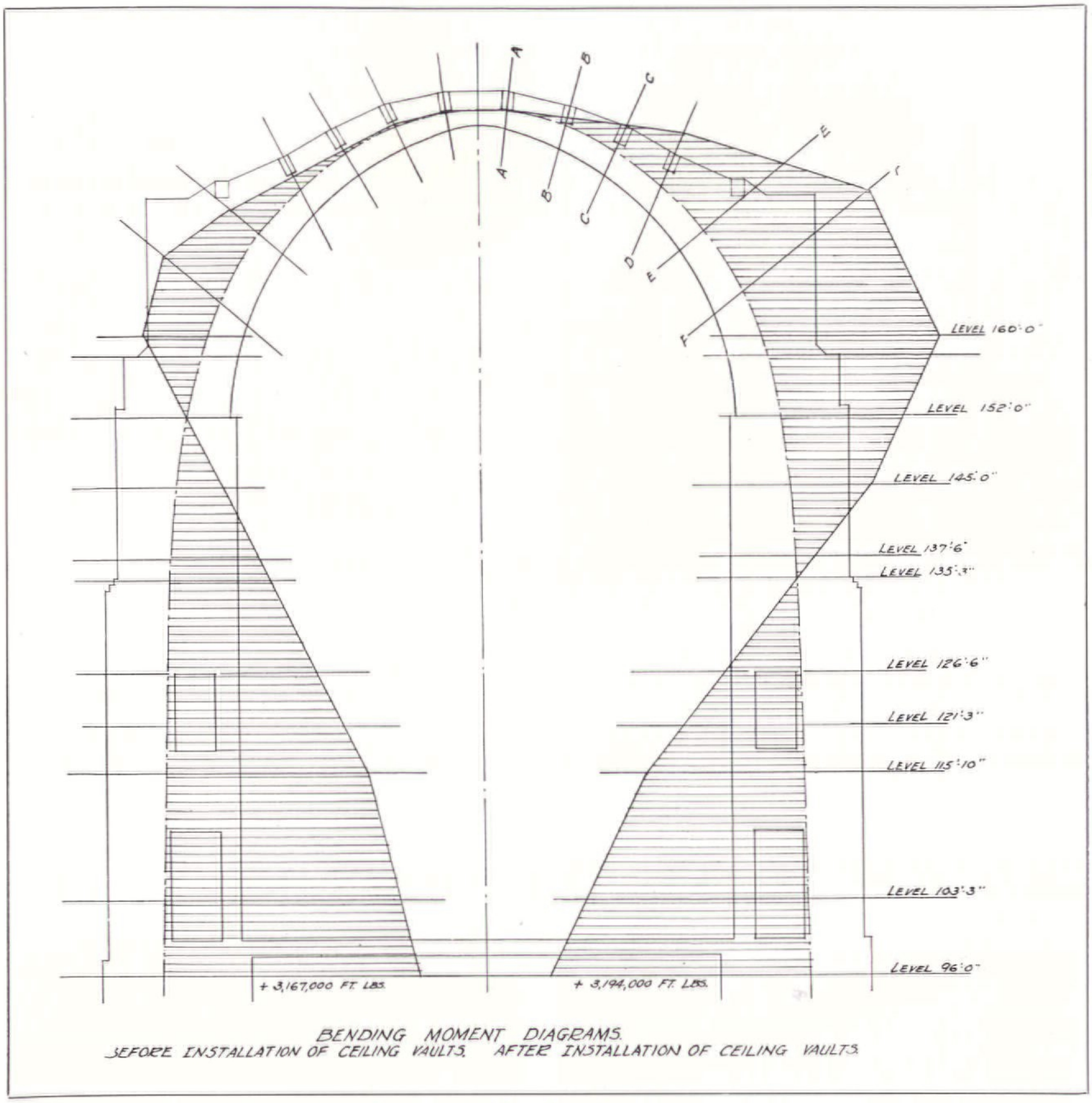
Gothic in character, should be American in style and would typify the spirit and trend of the present. If at this time I pay tribute to the late Bertram Grosvenor Goodhue, whose ambition it was to create an architecture of the present rather than a copy of the past, I trust that I shall be pardoned. It was always gratifying to Mr. Goodhue to have his designs referred to as "American" in style,—a term that was coming into almost general use in connecnection with Mr. Goodhue's buildings at the time of the death of this eminent architect. He has sown the seed of his genius, and those who follow are bound to profit by his influence.

Considerable time was spent on preliminary studies for this church, and many different schemes were tried before working drawings were started. In addition to pencil sketches, perspectives rendered in wash, water color and oil were made. Numerous models were made both with plasteline and cardboard until finally a scheme which met all requirements was evolved. In studying this problem the use of models proved extremely helpful. At first it

Cathedral of St. John the Divine Under Construction



Interior of Epworth Euclid M. E. Church, Cleveland



Section and Bending Moment Diagrams of Nave Ribs, Church of the Heavenly Rest, New York
Mayers, Murray & Phillip, Architects

was proposed to build a tower at the front elevation, but by the study of models it was found that if apartment buildings of the usual height were later constructed adjacent to the site, the church tower would be dwarfed in comparison.

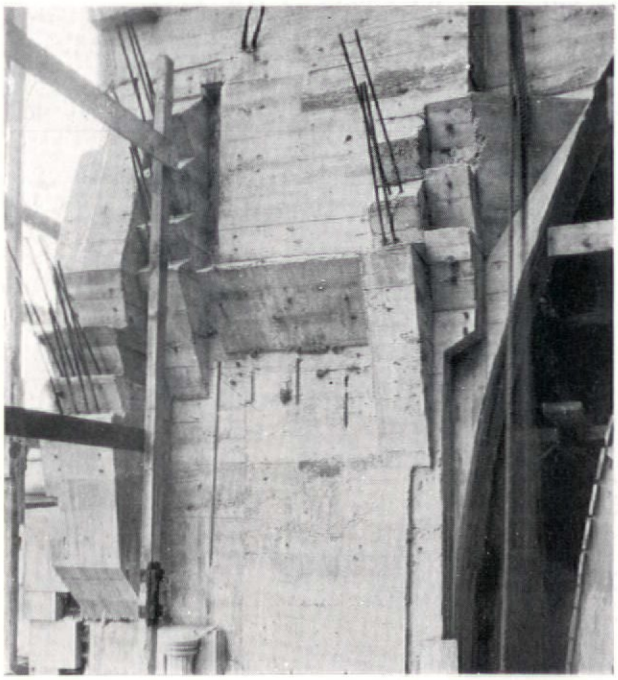
The site selected has a frontage of 100 feet on Fifth Avenue and 255 feet on Ninetieth Street. The church proper will have a seating capacity of 1,000, and the chapel will seat approximately 200. Under the nave there are crypts and a mortuary chapel. At the east of the church is a parish house, which contains the heating and other mechanical equipment in the sub-basement, a gymnasium in the basement, an auditorium on the main floor, while the five additional floors are divided into various guild rooms and offices for the working departments of the church. The parish house is similar in structural requirements to a modern club or office building and was constructed of steel frame with concrete floor arches and with limestone curtain walls; this section presented no unusual problems. The structural problems of the church proper, however, were more difficult of solution. The first condition imposed was that every pew have an unobstructed view of the altar. To accomplish this, all pews had to be placed between the main piers, and this required a clear space between faces of opposite piers of 46 feet. Although there are some few Gothic structures of greater span than this, they are extremely rare. In addition to this requirement, there

Construction, Church of the Heavenly Rest

was a restriction as to the height of the roof line above the curb level. For the central span, as here required and for other architectural reasons, it was necessary that the clear height of the nave ceiling be not less than 80 feet, so that, after allowing for the thickness of the ceiling construction, only 3 feet, 2 inches was available for roof construction at the crown. The usual type of roof construction for Gothic churches consists of wood purlins and wood trusses which form a comparatively light structure. With this type of construction, the vertical reactions of the trusses assist the buttresses in resisting the thrust of the ceiling ribs. This is not the case with the church now under construction, as wood construction is not permitted by the New York Building Department, and poured concrete was used for the roof slabs and beams. The slabs are of special composition with nail-retaining qualities, which material is also here desirable because of its light weight, being only little more than half that of stone concrete. Copper, coated with lead, was used for the roofing, making a light-weight, permanent, and beautiful finished roof. The roof slabs are supported by gravel concrete beams spanning between the main nave ribs. The latter ribs occur at each of the nave piers, and are 28 feet, 4 inches on centers. It was the construction of the ribs and piers which offered the gravest structural problem. In most Gothic churches, the arch ribs support only the ceiling, and the structural roof, as noted previously, is supported independently. Even under these loading conditions, great buttresses are found to be necessary. In the case of St. John's, the clear span between the nave piers is approximately 45 feet, while the distance from the interior faces of these piers to the exterior faces of the buttress is approximately 50 feet. The Liverpool Cathedral, another great modern structure, has a nave width of 40 feet between piers, and a buttress depth of approximately 50 feet. In both instances it is seen that the effective depth of each buttress is greater than the clear span of the supported arch rib.

At Heavenly Rest the entire depth available for each buttress at the base, instead of being greater than the clear span between piers, is less than one-third of this dimension. Considering the fact that the value of desirable city property is constantly increasing, it is probable that few city churches will be constructed in the future with buttresses utilizing a space more than twice the width allotted to pews.

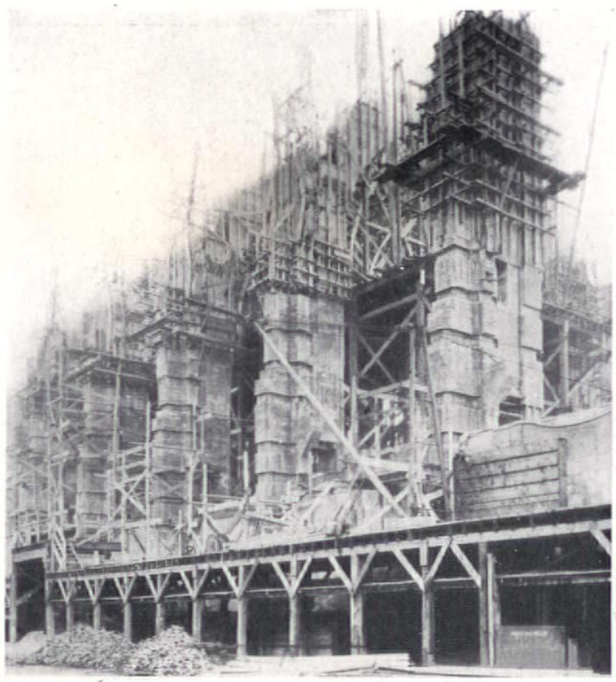
The limitation of height of roof line and the desired height of ceiling made it necessary to devise a scheme whereby the cross ribs would carry the roof load in addition to the ceiling load. The limited depth available for the buttresses, however, made this scheme, if designed according to the usual theories of masonry arch and buttress construction, out of the question. The depth of buttress depends on several factors,—namely, the span and curvature of the arches, the amount of load carried by the arches, the distance from the base to the intersection of arch and buttress axes, and several other factors. Because of the long clear span and the extremely unusual loading conditions just noted, the thrust upon the piers would be much greater than is generally the case, and an enormous depth of buttress would be necessary to resist the thrust of a voussoir or plain concrete arch rib designed for these conditions. At Heavenly Rest, with a greater clear span and greater loading conditions than at either St. John's or Liverpool Cathedral, the total depth of buttress from point of moulding to finish exterior surface



Corbels to Receive Spandrel Wall Arches and Ceiling Vaults is only 15 feet, 2 inches, as compared with 50 feet for the latter structures. In order to meet these conditions satisfactorily, it was necessary to study the structural problem from a different angle, and numerous schemes and extensive calculations were made. The scheme finally adopted, however, entirely satisfies all loading conditions without in any way encroaching upon the original allotted dimensions. It was found necessary to use reinforced concrete and to consider each main pier and arch rib as a continuous bent reinforced concrete beam. In other words, one pier and half the rib between opposite piers are considered as a bent cantilever beam supported at the base, with the free end at the crown. There were other possible methods of solution, but this method proved most desirable.

The piers and ribs have varying amounts of continuous reinforcing, as required by calculations, and opposite piers are tied together with a wide tie at the nave floor, forming a continuous frame. These ties incidentally also act as floor girders. It was necessary to investigate the ribs under two different conditions of loading: first during the erection of the building after the roof was constructed but before the vaulted ceiling was in place; and second, after the structural tile ceiling and its stone ribs took bearing against the piers. The piers and ribs were completed in six or seven pourings, with construction joints designed in accordance with the nature of the stress at the particular section. There is a construction joint about 14 feet on either side of the crown, another near the spring, and others at convenient locations on the piers. Considered as a column, the ribs are subject to direct stress of compression due to dead weight and roof loading. Considered as a beam, the bending moments produce tension on

Tops of Ribs, Roof Slabs and Beams, Church of the Heavenly Rest



Piers Nearly Completed, Showing Recesses for Stone Facing

one side and compression on the other side of the neutral axis. At the crown the only bending moment is that caused by temperature changes and secondary stresses caused by possible deflection. From the crown to the buttresses the bending moment is negative (that is, tension is at the top of the section) and increases in intensity gradually to a maximum at approximately Elev. 162, where it begins to diminish until it changes sign at Elev. 152, before the vaulted ceiling is in place, and at Elev. 134 after the vaulted ceiling is installed. Below this level the sign is positive, or in other words, the bending moment produces tension on the interior and compression on the exterior sides of the piers. It was decided to start the reinforcing 4 feet under the nave floor, so that at this location there can be no tension, and therefore the compressive stress due to vertical loading must at least counterbalance the tension due to bending. Knowing this, the bending moment at the base was determined, and then the crown thrust or tension could be computed. With this known factor the bending moments and shears at any other section could be determined and the stresses in the concrete and reinforcing computed. A rich mix of concrete was used, and very rigid supervision and careful control of material were maintained, especially during the pouring of these principal members. The cement water ratio and other modern methods were followed throughout the work, and laboratory tests showed an unusually uniform resultant concrete.

The interior of the church has a buff sandstone finish, while the exterior stonework is of limestone. Every fifth stone is a bond stone 8 inches thick, and the others are generally 4 inches thick. It was necessary to provide recesses in the concrete piers to receive the bond stones, and these recesses had to be

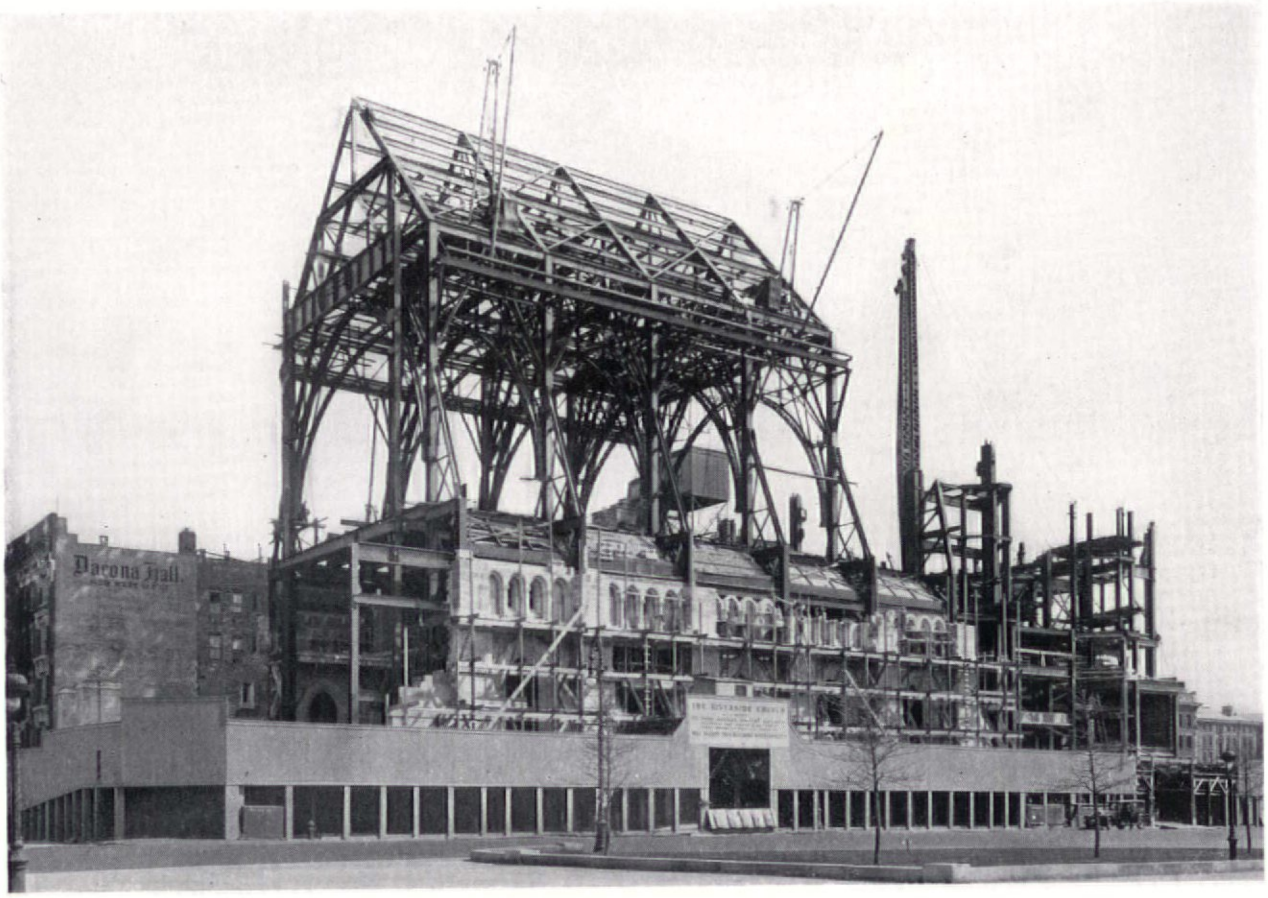
Perspective, "Riverside Church," New York
Allen & Collens, Architects

accurately located before pouring the piers. This required detail drawings showing the exact locations and depths of all stones and the desired provision for bonding them. Dovetail anchor slots and galvanized anchors were also used to insure as nearly a perfect connection of stone and concrete as possible. One inch was allowed for grout between the back of the stone and the face of the concrete. At junctions of concrete piers and brick or stone walls, the concrete was toothed so that the masonry courses bonded exactly with the concrete. Skewbacks were provided on the concrete piers at the springs of all arches, ribs, vaults, etc., and in addition, corbels were provided at different levels projecting into the spandrel walls in such a manner that the weight of these walls was transferred to the concrete piers, thus tying the entire structure together.

Although the stone was not a factor in the structural design, tied and bonded to the concrete piers as it is, it unquestionably adds considerable strength to these members, and can be considered as an additional safety factor. The stonework was not started until after the concrete had been poured for several weeks, during which time the concrete was kept moist (especially in warm weather) by allowing water to trickle over the top of the section last poured.

In view of the fact that there have been a number of buildings constructed in recent years in which the stone facing has cracked quite badly, this subject was given careful consideration. The causes of such cracks may be traced to unequal settlement of the stone due to unequal shrinkage of the mortar joints of the stone and brickwork, differences in the rates of expansion and contraction between facing and backing with the temperature changes, or to other similar causes. Such a movement might load some stones beyond their capacity and therefore cause unsightly cracks. To overcome this condition, a continuous lead shield in which a corrugated lead sheet is inserted was placed in alternate bond courses on top of the bond stones. The thickness of this pressure-relieving pad is ¼ inch, and as the stone joints are ⅜ inch, it was possible to install a leveling bed of mortar either on top of or under the pad, or in both places if found necessary. If there is any unequal movement of stone, this movement will not act over a height greater than the distance between the pressure-relieving pads, and there is more than enough elasticity in this material for it to act as a spring and prevent excessive load coming on any one stone or portion of a stone. The pads are kept back from the face of the stone about ⅛ inch, and this space is filled with a skim coat of pointing mortar. No difficulty was experienced by the stone masons in fitting the various stones into the grooves which had been provided in the concrete piers. As to economy, I am sure that the cost as now built would compare favorably with that of any other method of construction for a church of this size and character. The time required to build this type of frame should, under ordinary conditions, be less than that required for the usual type of masonry construction.

The architectural features have not been touched upon, and these should furnish the basis of some interesting studies in the future. The mechanical details are also in keeping with the best modern practice, and there are many features entirely original with this building. A careful study was made of the lighting requirements, with the result that use of the usual ornamental nave lighting fixtures has given way to use of a system of concealed lighting. In the design and construction of Heavenly Rest, the fact that the architects were endeavoring to build a monument to last for centuries was never lost sight of. Due to New York's climatic conditions, this is a greater problem than the builders of the mediæval European cathedrals faced. The architects feel reasonably sure, however, that this edifice will be structurally sound for ages, and perhaps some day will be pointed out as an example of the church architecture of the early twentieth century. There remain, nevertheless, further opportunities for development. The tile ceiling, while excellent from an acoustical standpoint, adds considerable expense and might be dispensed with under certain conditions. In this case, the structural concrete roof could be designed to form also the finish ceiling with decoration applied directly to the concrete or to an acoustical application, if such material is found necessary. This method of construction was followed in the frame of the Epworth Euclid M. E. Church, recently completed in Cleveland. Here the problem of resisting the arch thrust was not so complicated because the roofs and floors of the Sunday School building adequately take care of these reactions. The arch rib and supporting piers were faced with cast stone resembling limestone.

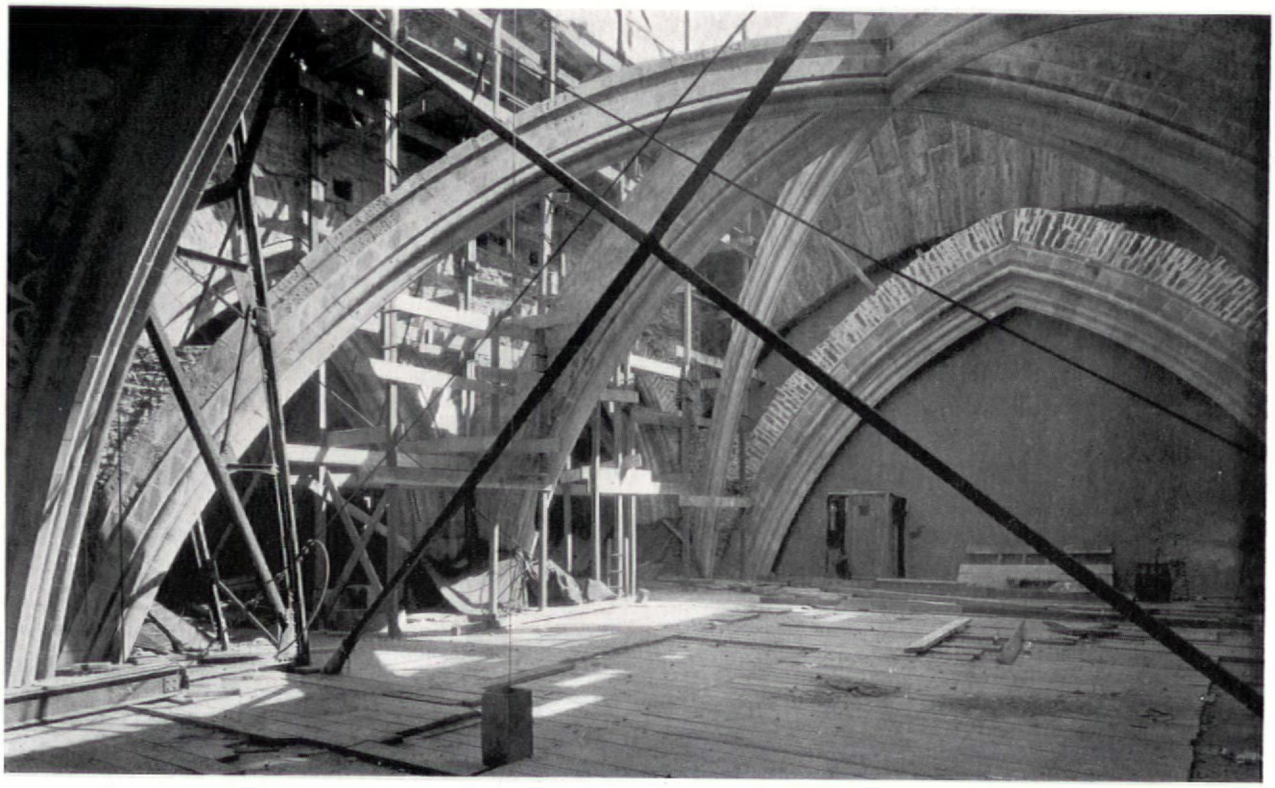


Construction Showing Steel for Roof and Ceiling. "Riverside Church," New York
Allen & Collens, Architects

Mention has been made of two structures in which reinforced concrete, in the form of arches or arch ribs, has played an important structural role. There have been many other buildings designed by the firm with which I am connected, where conditions have been such as to make the use of this type of construction advisable,—for instance, the crossing arches and piers of St. Bartholomew's Church, New York; the Trinity Lutheran Church at Fort Wayne; the chapel for the University of Chicago; and others,—so that it is not an experimental method. Reinforced concrete was used in each case only because it best fitted solving the problem at hand.

As the next step in the development of modern church construction, the possibility of entirely omitting the facing material from the structural piers presents itself. With the advance in our knowledge of reinforced concrete and with improvements in the finished product, as to both color and texture, this step will follow, and indeed it has already been attempted in several churches in California, as well as in Europe. As a still further development, the creation of an entirely new style of architecture might follow, a style developed to fit our special needs and conditions. Reinforced concrete will unquestionably play an important part in this development, as it offers unlimited opportunities to the designer's imagination. At the same time, it is not necessary to throw tradition to the winds, to forget everything that has been accomplished in the past and try to create a new architecture overnight to fit use of this modern material. We should not become slaves to a material but rather develop new forms slowly and as the requirements at hand seem to demand. The recent examples of modernistic French churches built of reinforced concrete are interesting and ingenious, but they are hardly appropriate for present American conditions.

In regard to the third type of church construction,—namely, the steel frame,—I cannot quote from personal experiences, as the office with which I am connected has not used this type of construction to any great extent. However, if steel, stone, brick, wood, or concrete or any other material is best suited to the particular conditions at hand, there is no reason why any or all of these materials should not be used. Steel has proved, beyond dispute, to be one of the strongest and most dependable building materials known. Its strength per square inch, both in tension and compression, is greater than that of any other practical building material. If, by its use, structural problems can be solved which would otherwise prove insolvable, it would be unwise not to use steel for a church, as well as for an office building, even though this material was not used in the construction of mediæval churches and cathe-



Limestone Ceiling Ribs, Weighted with Concrete or Rubble Masonry, Cathedral of St. John the Divine
Cram & Ferguson, Architects

drals. Such use of steel is now being made in the construction of the Riverside Church and in building the Temple Emanu-El. In both instances, maximum capacity was required of the areas available, again rendering use of the traditional methods of construction impossible. In the Riverside Church a total seating capacity of approximately 2,500 was required, and practically all seats had to have an unobstructed view of the pulpit. The total width of the property is only 100 feet, and a clear width of 60 feet between buttresses was found necessary. From the inner face of the buttress on the west to the property line is 22 feet, while the similar dimension on the east is only 18 feet. The height of ceiling above the nave floor is 102 feet. To satisfy these conditions, impossible with stone masonry, the use of structural steel was decided upon. Steel columns extend through the nave piers and support steel ceiling ribs and steel roof trusses. The ceiling is tile of the color and texture of limestone and having excellent acoustical properties. A huge tower is to be supported by heavy steel members, and by thus resorting to use of modern methods and materials, maximum strength is gained with a minimum sacrifice of space. The time required for such building is less than would be needed for solid masonry construction.

The Temple Emanu-El is not a Gothic type of structure, but here again the condition was imposed that all pews have an unobstructed view of the pulpit, and in order to accomplish this for a seating capacity of 2,500, a clear span between nave piers of 77 feet was required, leaving only some 13 feet for the total width of each pier. Steel roof trusses were used to span the nave, and the trusses are supported by steel bents designed to withstand safely the horizontal component of the wind load, as well as the vertical reactions of the trusses. The steel bents are encased in concrete, and the stone facing is then anchored to this frame by means of anchors and anchor slots cast in the concrete.

While commercial buildings have become highly specialized and modernized, church design is also undergoing changes, and how near we are now to the best solution, time alone will tell. The structural features of only a few important churches have been described here, and while these matters are extremely important and at times offer problems difficult of solution, they should not influence or restrict the architect to too great an extent. With advance in our knowledge of structures and structural materials, the architect will be obliged to modify his ambitions less often, and the more capable we become as engineers, the fewer will be the restrictions placed upon the architect. We are now living in an age of specialization, but to obtain the full benefits of specialization, we must also have close coöperation between the various specialists. Without the creative skill of the architect, the engineer would have fewer opportunities to exercise his ingenuity and technical skill. Coöperation between architect and engineer should exist from the inception of the design, as it may be difficult or impossible to compromise after a scheme has been adopted. When such exists, the best results will be obtained.

THE PARABOLIC ARCH AND VAULT

BY
FRANCIS S. ONDERDONK

THE parabolic arch is both logical and beautiful Hundreds of concrete bridges show its dynamic grace. If spanning a void is the main problem of architecture, bridges may be considered as showing us an ideal solution, for where could a form undergo a more severe test as regards its æsthetic value than when placed to serve a utilitarian purpose in a natural setting of rhythm and serene beauty? The parabolic bridge has become a standard type, not only because it is the most economical type, but also because the beholder senses its beauty. If it be acknowledged that sincerity is an essential element of the beautiful, it is significant that bridge builders prefer the parabola. Brick and stone construction would be too cumbersome, steel too skeleton-like to produce such elegant, thrilling arches as those shown in Fig. 8. Only ferro-concrete, with the advantages of steel and stone, can be used in quite this way.

In reinforced concrete, columns and beam, walls and vault become one. For this reason the rigid frame, which in Europe is used so frequently for large halls, is typical of ferro-concrete. This bent has structural advantages due to the continuity of bending. Some designers place such a frame on hinges, while others connect it rigidly with the foundation. The hinged type has columns tapering downward, i.e., growing narrower toward the floor, because stiffness must be increased at the top, and there the column is widest (Figs. 1, 5).

As in former transition periods, the old forms are resurrected in the new material. The now dominating type of frame, two posts connected by a beam, is reminiscent of use of the old materials, just as the V-frame (Fig. 3) is due to the traditional type of roof. Gravity demanded vertical piles of stones or bricks to avoid centering; wood and steel encouraged angular outlines, but "liquid stone" requires no straight lines. Its form can express the structural facts: sides and top, walls and roof are one. The curved haunch (Fig. 3) is much more pleasing than the angular haunch (Fig. 2), which is a product of the "wood centering" style.

The logical type of ferro-concrete "style" is an arch or a vault that springs from the ground or floor, serving in its lower parts as wall, and in its top part as ceiling (Fig. 4). Now the arch which curves out gradually from the base to the crown is parabolic; near the base it is almost vertical, and it then curves more and more until at the top it approaches a semi-circle (Fig. 9).

Structural Advantages of the Parabola. Parabolic arches are economical; with a given load they require the smallest amount of material. The thrust curve of an arch carrying an evenly distributed load,—and that is the most frequent type of load in a building,—is a parabola. A parabolic arch can have a smaller section and less reinforcing than any other arch to support a given load. To quote from J. C. Austin: "The use of the principles of the arch, particularly in reinforced concrete, should be exceptionally well adapted to our structures. It is a fact that, generally speaking, no more than $37\frac{1}{2}$ per cent of the concrete in a straight beam or girder is figured to resist compression, whereas close to 100

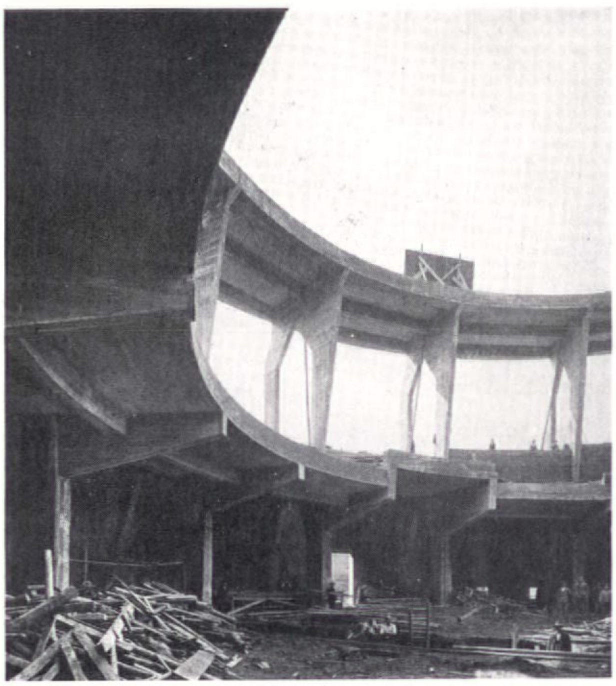


Fig. 1. The Planetarium of the Gesolei Exhibition, Dusseldorf

Fig 2. Lumber Storehouse, Kassel, Germany
K. V. Brocke, Architect

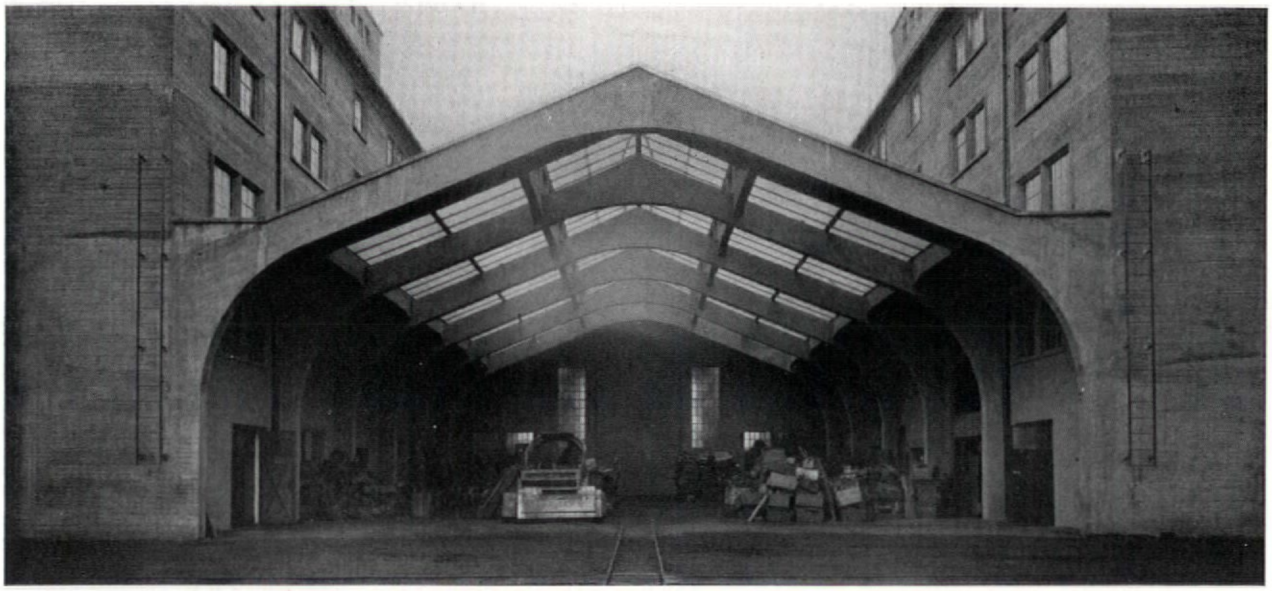


Fig. 3. Covered Lumber Court, Kassel
K. V. Brocke, Architect

per cent of the concrete in an arch is usually effective in resisting compressive stresses. The arch is one of our most economical structural units." Professor C. Korner recommended that vaulted halls be more frequently designed to follow a parabolic curve, because of all simple curves the parabola alone designates the vault of greatest stability, as investigations have proved. The designer of the Breslau *Markethall* (Fig. 9) chose the parabolic arch because it best approximated the line of thrust. If it be admitted that architecture is to a large extent the symbolic expression of the conflict of forces act-

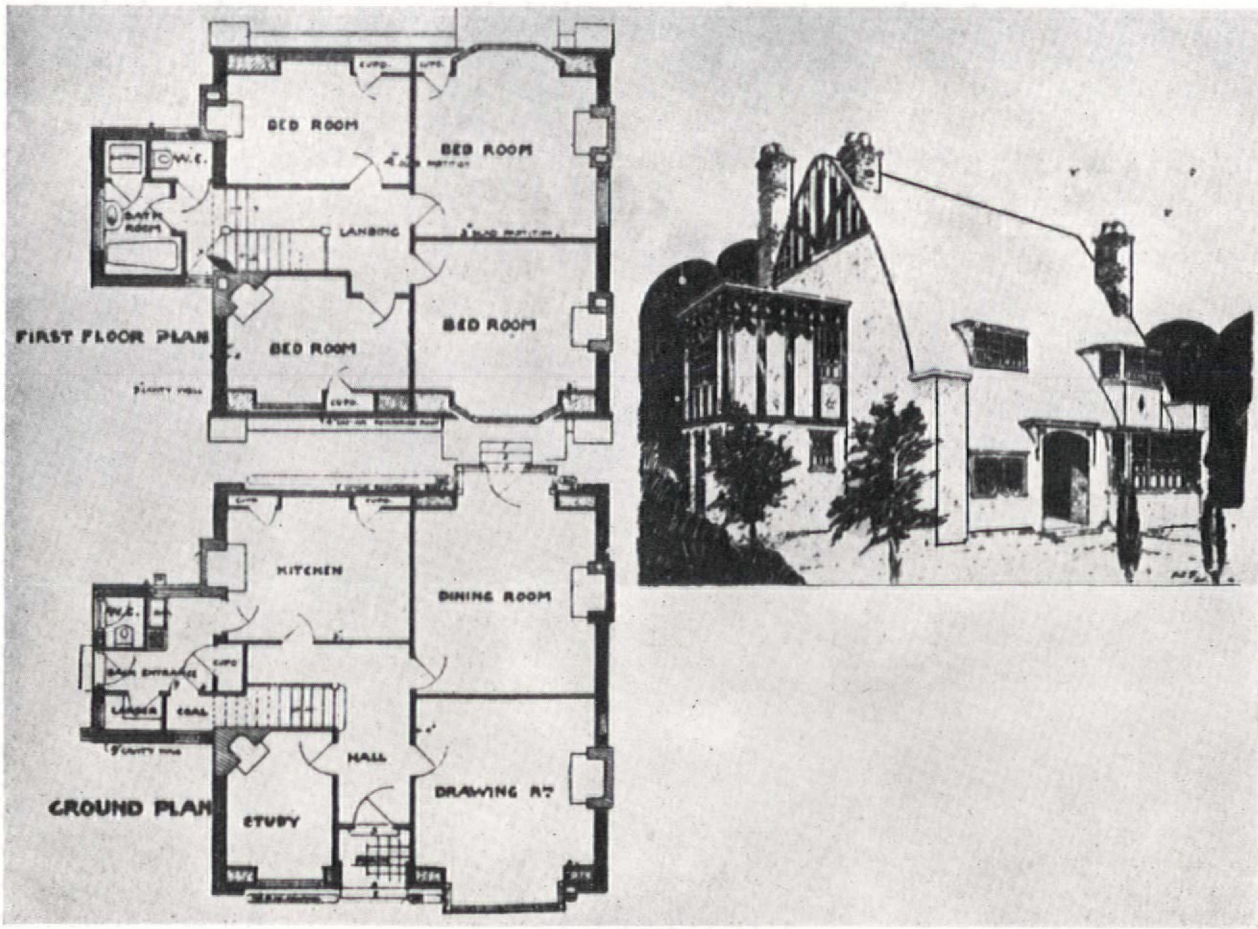


Fig. 4. A Ferro-concrete House in England

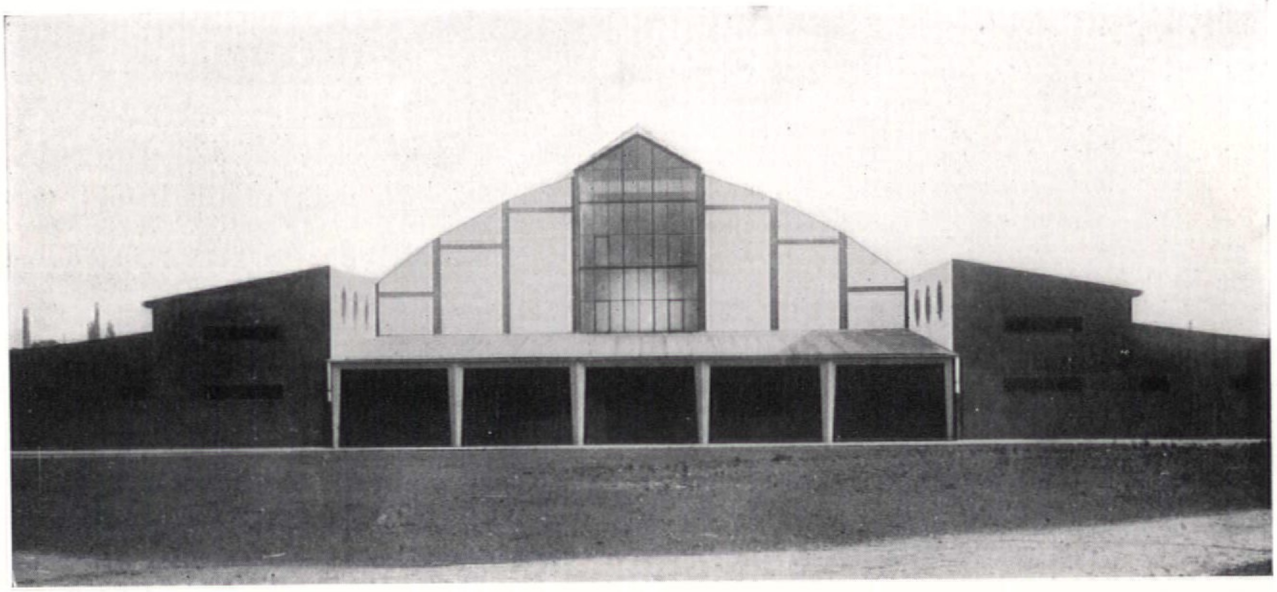


Fig. 5. "City and County" Hall, Magdeburg, Germany
Bruno Taut, Architect

ing in a structure, then the parabola is unquestionably to play an important role. The parabola can be called the resultant between gravity and a constant horizontal force. Gravity creates a parabola when drawing water earthwards, be it pouring from a horizontal spout or thundering over Niagara Falls; gravity creates a catenary,—a curve very similar to a parabola,—when acting on a flexible material of uniform weight, such as a chain or a ribbon. The arches of wood (Fig. 11), brick (Figs. 12, 13 and 14), and stone show that the parabola and similarly shaped curves are being utilized in modern architecture generally and are not restricted to the use of ferro-concrete. The engineer creating a bridge and the architect designing a lofty hall simply "listen in" to nature when they choose a parabolic arch.

The Æsthetic and Symbolic Value of the Parabola. Architects are inclined to disagree when the question of beauty arises. An object that is highly praised by some, is condemned as ugly by others. It will be therefore helpful to investigate the æsthetic qualities of the parabola. Greek art, generally accepted as the highest standard, created the sections of its mouldings as approximate parabolas, hyperbolas and ellipses; the echinus section of the Poseidon Temple in Pæstum, a half-parabola, is one example. The parabola is a curve of changing curvature,—according to John Ruskin a characteristic of all beautiful curves.

Theoretically the parabola is a curve that never ends,—one end of an infinitely long ellipse; comets follow parabolas through limitless space, and the parabolic arch gives the ferro-concrete style something of the infinite swirl and swing of the universe. To be "in tune with the infinite" has always been man's longing; but our age especially admires the great, the limitless. Lindbergh's flight enraptured mankind because he conquered space,—pushed forward the boundaries in man's struggle with the infinite. Technical achievements and records established at the Olympic games satisfy man's longing to extend his limits. The rhythm of rail and wire has already inspired poets and painters. The architectural expression of this new rhythm, of this urge toward the infinite is, I believe, the parabola—the curve that pays us a visit en route from the infinite

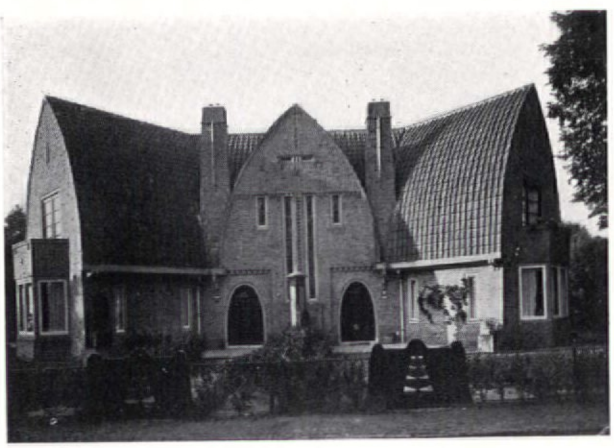


Fig. 6. Twin Villa, Hilversum, Holland
J. van Laren, Architect

Fig. 7. Interior, Exhibition Hall, Magdeburg, Germany

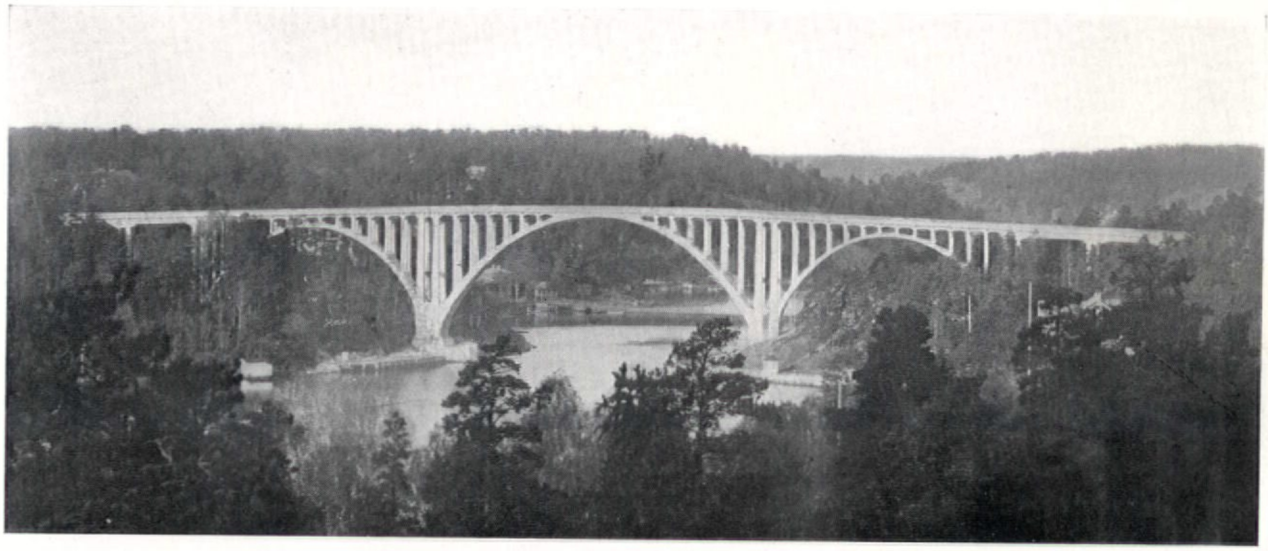


Fig. 8. A Reinforced Concrete Bridge in Sweden

to the finite. As Plotinus' philosophy claims, the apprehension of the infinite in finite figures can produce the impression of serenity. . . . "We have a longing born of the infinite and directed to an infinite desire of the soul which therefore never can fathom itself." We can call the parabola the emblem of man's life; one end here in the finite, the other hidden in the infinite-eternal,—for are we not like comets of hidden origin and unknown destiny? Professor Durant calls our life "our parabola through the world," and A. von Harnack writes: "But where and how the curve of the world and the curve of our own life begins,—that curve of which it shows us a segment,—and whereto this curve leads,—science tells us naught."

Pythagoras considered the realization of simple numerical laws as the source and the essence of the soul's satisfied pleasure in contemplating the beautiful and the true; the parabola's equation is simple. Plato recognized beauty as such in those simple geometrical figures which affect us not by material charm but as representations of spiritual concepts;

Fig. 9. Market Hall, Breslau, Germany
Eng. Kuster, Architect

Fig. 10. Congress Hall, Gothenburg, Sweden

and Plotinus says: "Always that is pleasing which expresses ideas as purely and perfectly as possible. . . . The beautiful object becomes beautiful through the dominance of the spirit, the dominance of the ideal over sensual matter, through participation with reason, which emanates from the divine. . . ." The idea shining through matter is the beautiful, according to Hegel. Another German philosopher, Theodor Fechner, applying these thoughts to the conical sections, called the parabola the symbol of love for the infinite and divine. He compares the focus to the soul, and the rays emanating from it to the periphery he compares to the endeavors of this focus-soul, adding: "The parabola is a serene symbol of love for an ideal, to the non-sensual, to all great and beautiful which,—only attainable in infinity,—entices the soul; all rays sent out by the parabola-focus run in parallel directions to the other focus in the infinite; all desires and thoughts are only directed thereto. On the other hand, no ray which did not emanate from the infinite can fall into the soul. . . ."

Examples. Several large halls which utilize the parabolic arch have been erected in Europe. The airship hangar at Orly consists of a series of parabolic arches connected by horizontal bars forming oblong windows between. The noted German architect, Professor Kreis, designed a pavilion for the

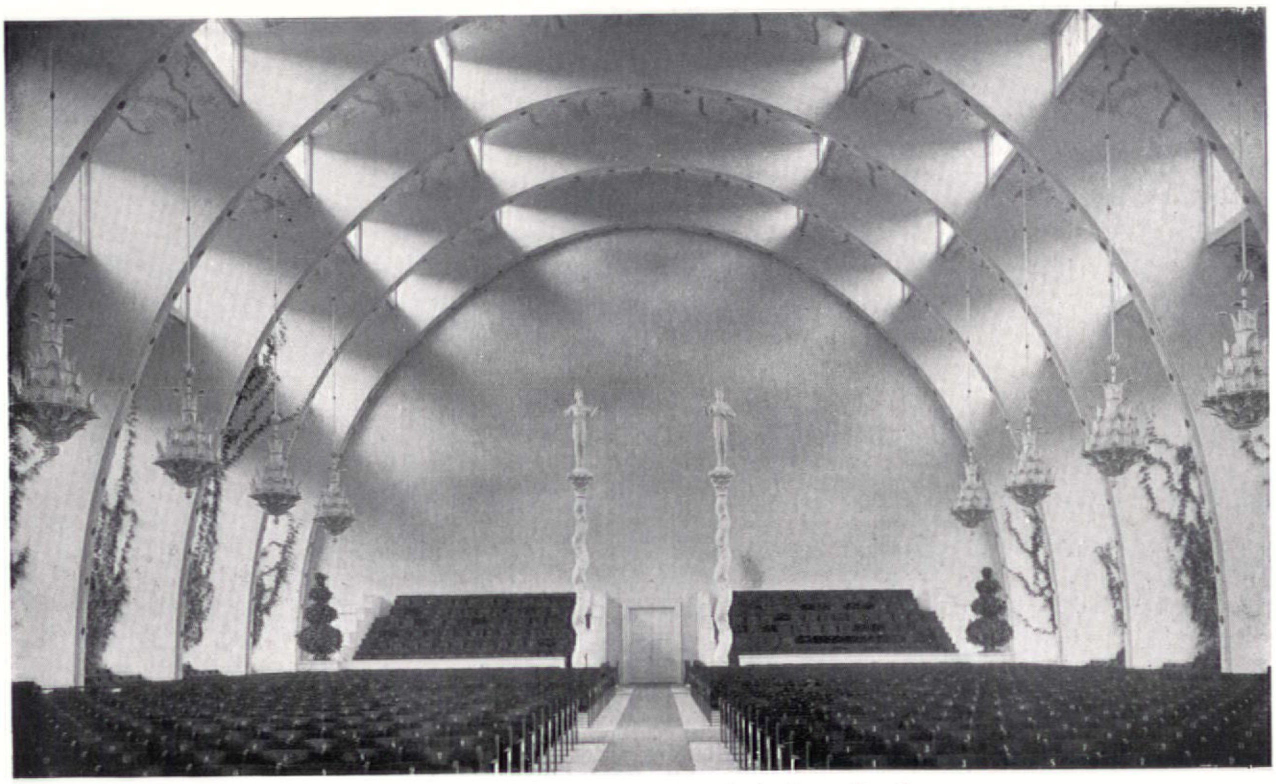


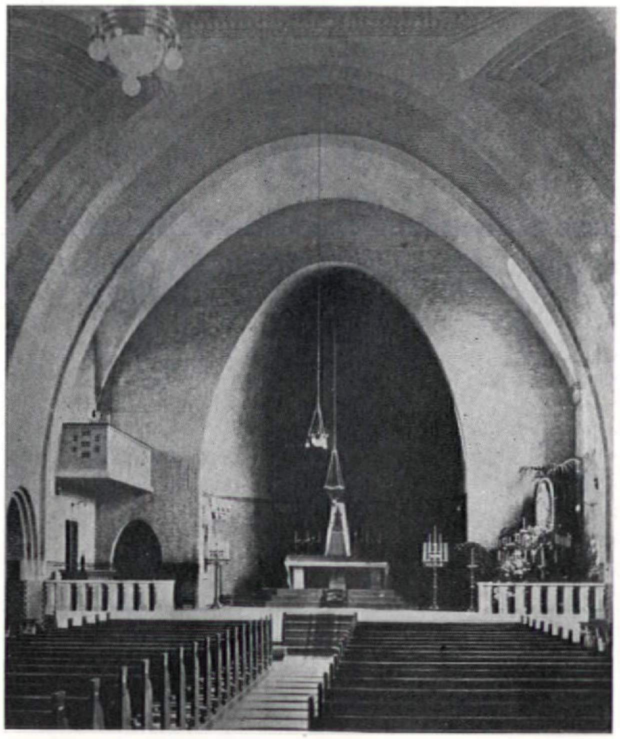
Fig. 11. Interior of Congress Hall, Gothenburg, Sweden

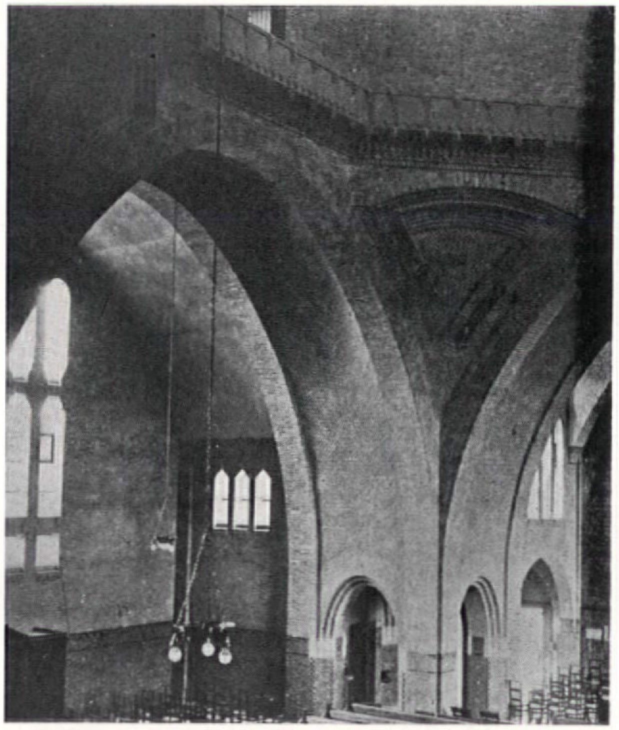
Munich *Farbenschau* featuring an arcade of parabolic arches which demonstrate the charm of unity possessed by that curve. In the interior of the Engelbrekt church, Sweden, Professor Wahlman has made use of the parabola in a group of arches supporting the roof over the four arms at the crossing. He explained that he desired to produce an effect of springiness, such as it seemed impossible to obtain otherwise. These arches are not of concrete, though other parts of the church are. The parabolic arches at the crossing of St. John the Divine, New York, are of huge granite blocks and designed to support a tower; it is significant that they have been incorporated in this otherwise mediæval design. The Congress Hall at Gothenburg, Sweden, is covered by a series of arches which support stepped-back vertical windows (Figs. 10, 11). In Holland the Utrecht Post Office, as well as several churches and apartment houses, has been built with approximately parabolic vaults or doors and windows (Figs. 12, 13). Two Catholic churches recently erected in Germany,—one by Professor Dominikus Bohm in Bischofsheim and the Pallotiner church in Limburg, by J. H. Pinand,—have parabolic vaults as naves. They demonstrate that not only Theodor Fechner sensed the parabola as "the curve of idealism"!

Details of Execution. Parabolic doors can be arranged as sliding or as revolving doors. Parabolic windows can receive an upright center-post, around which two wings turn on hinges, while the upper segment turns around a horizontal transom bar. The almost circular segment at the crown of the parabola admits more light and air than the point of the Gothic arch. When still more light near the ceiling is needed, the spandrels could be pierced and filled with tracery or vertical posts as seen in so many bridges (Fig. 8). The inclined lower portions of the parabolic arch seem to be an obstruction. This may be just prejudice.

Fig. 12. Shops, Hilversum
J. van Laren, Architect

Editor's Note. This article was prepared by the author from his book, "The Ferro-Concrete Style."





Figs. 13 and 14. Interior of Church at Nijmegen, Holland
H. Thunnissen, Architect

BETTER STUCCO HOUSES

PART II

BY

ARTHUR C. ALVAREZ

ASSOCIATE PROFESSOR OF CIVIL ENGINEERING, UNIVERSITY OF CALIFORNIA

UNDER this title in THE ARCHITECTURAL FORUM for August, 1928, the writer called attention to the widespread and increasing use of the timber-framed stucco house because of its many architectural possibilities, ease of construction and comparatively low cost, and he alluded to the great economic value of improvements in structural design whereby its safety in severe earthquakes and hurricanes would be assured and its life under the harsher weathering agencies, such as excessive freezing or rain, greatly prolonged.

The type of structure under consideration is the dwelling of three stories or less in height. In the preceding article, the chief structural factors involved in the selection and preparation of the site and in the design and construction of the foundation and underpinning were presented. The present and a subsequent article will continue to deal exclusively with questions of structural design involved in other parts of this type of building, such as the framing, chimneys, stucco covering, roof covering, openings, all considered from the point of view of increasing the building's resistance to the hazards already mentioned. These questions should be of special interest to architects, because very great benefits are to be derived from giving adequate attention to details of structural design, rather than leaving the matter to the carpenter in charge, as is too often done.

Framing. When the height of a building does not exceed two stories, two methods of arranging floor joists and wall studs are possible,—(1) "balloon" construction, and (2) "story" construction. In balloon construction the studs of the outside walls are continuous from the sill of the concrete foundation to the plate on which the rafters rest. In story construction the frame is erected one story at a time, the continuity of the studs being interrupted at each floor level by wall plates and floor joists, as illustrated in Fig. 8. Balloon construction is not feasible for a structure of more than two stories because of the excessive lengths of studs required, and because the cost of erection would greatly exceed the cost of erection by stories. After describing the two types of construction, their relative merits will be discussed. Erection by stories is employed much more extensively than balloon construction, because it is very much easier to execute from the contractor's point of view.

Framing of Floors and Walls in Story Construction. Floors. Referring to Fig. 3, on page 268, THE ARCHITECTURAL FORUM for August, 1928, the joists *fg* at all floors and roof should be anchored very securely to the plates, *EF*, *AB* and *GH*, rather than be merely "toe-nailed," a common practice, which produces a very weak joint. The structural advantages of such adequate anchorage in case of earthquake or hurricane are obvious. A very effective joistplate joint can be arranged by using a 2 by 6-inch pine splice about 2 feet long, as shown by *e* in Fig. 3, and by *e* also in Fig. 8 of this article. To prevent splitting, the joist should be drilled for four 20-penny nails, properly staggered from joist to splice, and the splice should be drilled for four 20-penny nails to the plate. Thus all nails are arranged with reliable bearing so as to develop their lateral strength in the most effective manner, because at the junction of any two pieces of timber the forces act perpendicularly to the axes of the nails. Wherever great tenacity is required in a nailed timber joint, the designer should arrange the nails and timbers in a similar manner.

In order to insure lateral support, all the joists should be solidly bridged with 2-inch pine, extending from the tops of the splices to the tops of the joists, along all supporting plates, as in *EF*, *AB* and *GH*. At the outside walls, this bridging should be placed just inside the inner line of the wall plate; it will then serve as a header for nailing the ends of diagonal floor boards, which should be run just to but not under the plate. Vertical shrinkage in the floor boards will then have no effect on the stucco. The cross-bridging of joists, as along lines *JK* and *LM* in Fig. 3, is needed to stiffen the floor. This it accomplishes by distributing any concentrated vertical load to at least three adjacent joists, provided the distance between lines of bridging does not exceed 6 feet, approximately. Such cross-bridging would be much more efficient than it frequently is if it were made 2 by 4 inches in section instead of 1 by 4 or 2 by 3 inches, if care were taken to miter the ends of cross-bridging accurately against the sides of the joists, and if the pieces were drilled for two 12-penny nails at each end instead of being rendered practically valueless because of splitting by driving in two 10-penny nails. The 1 by 6- or 1 by 8-inch flooring boards should be laid at an angle of 45 degrees with the sides of the house; two 8-penny nails at each joist are sufficient. Where the floor plan is unsymmetrical, or the floor area is unsymmetrically loaded, earthquakes tend to twist the entire frame about some vertical axis. When the walls are thoroughly braced, diagonal floor boards are of greater assistance than floor boards at right angles to the joists in developing resistance to such twisting. Diagonal floor boards are more effective also because of the bond they produce between walls and partitions that meet at right angles.

Walls. All studs should be spaced not to exceed

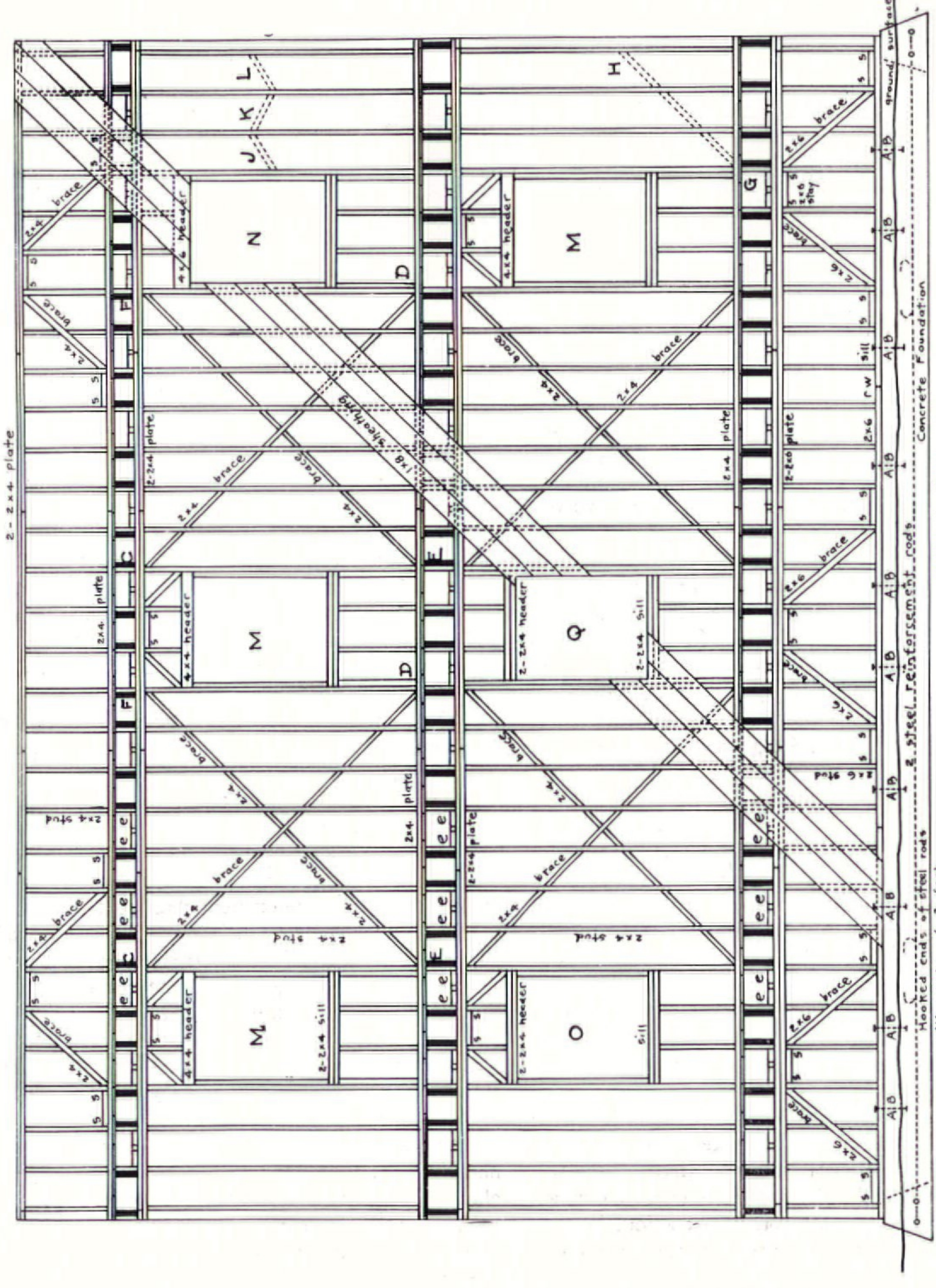


FIG. 8. CONSTRUCTION DETAIL OF THE ELEVATION OF A WOODEN FRAME BUILDING

16 inches. In buildings of one or two stories, 2 by 4-inch studs throughout are sufficient, except that the underpinning of a two-story house should be composed of 2 by 6-inch studs; for three-story structures, 2 by 6- or 3 by 4-inch studs should be used in the first story as well as for the underpinning. Size 2 by 6-inch is preferable to 3 by 4-inch, because there will be relatively less injury when the studs may be notched for plumbing pipes. The upper plate of every story should consist of stud-sized timber, doubled; this facilitates lapping at corners and makes possible long, well nailed overlaps for all straight splices, as shown in Fig. 8, page 746. In each side of each story there should be at least two lines of stud-sized diagonal bracing sloping in each direction, as *CD* and *EF* in Fig. 8. To be effective, this bracing should make an angle with the horizontal not greater than 45 degrees; the smaller the angle, the more effective the bracing, but the line of every diagonal brace should extend continuously from floor plate to ceiling plate, because a brace like *GH* in Fig 8 is only about 40 per cent as efficacious as a brace like *EF*. In the stories above the underpinning, it is better to fit the sections of a diagonal brace between the studs, as shown in Fig. 8, than to cut a great number of studs in order to make the diagonal brace one continuous timber. Stays will then not be necessary at the ends of the diagonal brace which terminate at the plates. Some designers advocate letting into the studs a 1 by 6-inch diagonal brace, but the writer prefers fitting in between the studs the sections of each brace, as just described, because the letting-in involves more tedious carpentering and unnecessarily reduces the cross-section of the studs braced. The studs should not be "toe-nailed" to the plates. Instead, two 20-penny nails should be driven into each stud through each plate; at its ends, to avoid splitting, the plate must be drilled for these large nails. At intervals, 20-penny nails should be driven through the single-stick lower plate to the floor joist system below. At all corners the end studs of both walls should be securely nailed together by 20-penny nails. The sections of diagonal stud braces should be drilled to receive two 12-penny nails at each end, otherwise serious splitting will occur. Depending on the height of ceilings, one or two lines of stiffeners, like *J*, *K* and *L* in Fig. 8, are necessary where diagonal sheathing is used, because these support the studs laterally against the shrinkage stresses developed when the sheathing dries, and thus reduce the possibility of there being cracks in the stucco. Such stiffeners are necessary also in all partitions. The individual sections should be mitered in, so that wedging action will make the joints very tight. Whenever walls or partitions meet, the opportunity should never be neglected to attach continuous studs in each with 20-penny nails. The drilling to prevent injurious splitting of all such pieces as sections of diagonal braces, stays on underpinning plates, joist-plate splices, joist cross-braces, wall stud stiffeners, etc., can be done at low cost by an apprentice carpenter with an electric drill; in the opinion of the writer, it is well justified by the increase in structural integrity thereby imparted to the frame. In the preceding and following descriptions, for simplicity of statement, only "rough" sizes of timber are given, since these are sufficient for structural purposes. Of course all architects are aware of the necessity of the special sizing required to make all such members as joists, studs, plates, rafters, floor boards, sheathing, etc., of uniform dimensions.

Framing Openings. So simple is this matter that no mention would be made of the subject were it not for the fact that the writer has often seen openings framed as poorly as that shown at *Q* in Fig. 8, where the header, which takes considerable loading from the floor above, is supported only by "toe-nailing" at its ends, instead of being supported positively in the manner shown at *M* and *N*. The ends of the sill also should be positively supported, as shown at *M* and *N*, rather than be merely nailed, as at *O* and *Q*. A single-piece header, as at *M*, because it is stiffer, obviously will support more load than the two-piece header of the same size at *Q*. The trussing above the header at *M* affords a much stiffer frame than the use of merely a deeper header, as at *N* only if the diagonals are well fitted and the center stay is snugly wedged into position. For wide openings, if headroom permits 45-degree angles for the diagonals, trussing is preferable to a very deep joist header, because the shrinkage and time sag in the joist header, by withdrawing support from the floor above, will cause cracking of the stucco and interior plastering. In hurricane areas, very substantial shutters must be provided for all glass openings, because it is doubtful if even small panes of heavy glass in heavy metal casement frames could survive the impact of all the debris flying in the air during a storm. If the architectural design permits, rolling steel shutters are very efficient and, when not in use, may be completely concealed. If wooden hinged shutters are employed, the fasteners and hinges must be of heavy wrought metal attached by bolts, not screws, and the hinges should be bolted, not to the sheathing, but through stucco and sheathing to wall studs set for the purpose.

Framing of Floors and Walls in Balloon Construction. Except where openings for windows and doors occur, the studs are continuous from the foundation sill to the roof plate. The studs in any one wall are held at their proper spacing, 12 or 16 inches, just below each level of floor joists, by a 1 by 6-inch ledger board, which should be let into the studs on their inner sides so as to be flush and fit closely, and it should be securely nailed by at least two 10-penny nails to each stud. A ledger board acts as a sill for the joists. The joists should be notched to a depth of 1½ inches over the ledger board and should be securely nailed to the studs by the use of at least three 16-penny nails at each joint; this anchors the joists very effectively to the outside wall framing at each floor level. The top ceiling joists should be similarly anchored and should be continuous clear across the building so as to hold together the tops of opposite walls. The continuity of the studs in the outside walls, however, is not sufficient to give these the lateral rigidity necessary for resistance to strong winds, not to mention hurricanes or earthquakes. To obtain this rigidity, the studs in each wall and story must be diagonally braced in the manner previously described for story construction.

Balloon Construction Versus Story Construction. In order to reduce carrying charges, lumber is moved nowadays with the greatest possible speed from sawmill to contractor, with the result that the timber goes into the frame long before it is adequately seasoned to prevent shrinkage. So it dries and shrinks after it is placed in the building, and, unless provision is made to counteract this shrinkage, it causes very serious cracking of exterior stucco and interior plaster, which often involves considerable injury to costly interior wall decorations. It is well known that, when timber dries, it shrinks longitudinally very much less than it does across the grain. For example, in a building consisting of two stories and basement, the total vertical shrinkage in the outside walls is much less, if the studs are continuous pieces as in balloon construction, than it is if the studs are interrupted at each floor level by joists and plates, because, in drying, green joists and plates will shrink very much. But such joist shrinkage can be counteracted easily without resorting to balloon construction, as will be explained presently. Theoretically, the chief merits of balloon construction are three in number: (1) Structural continuity between stories. (2) Minimum vertical shrinkage in the framing of the outside walls. (3) Convenient spaces for running plumbing pipes from story to story in the outside walls without injury to the frame.

If all the walls of a building were blank walls without openings for windows and doors, balloon construction could be framed very correctly and simply; undoubtedly there would be structural continuity between stories, and the vertical shrinkage occasioned by drying of the continuous studs would be much less than in story construction. But in practice there are some serious disadvantages in the use of balloon construction, as will now appear. Since all houses have numerous openings of various widths in different stories, and since these openings do not necessarily come vertically above one another, and since in many houses the walls of any one side frequently do not lie in the same vertical plane at all stories, frequently only a small fraction of the total number of studs in outside walls can be run through from concrete to rafters in practice, in fact in some designs too small a fraction to make the attempt worth while. Furthermore, in balloon construction it is more difficult effectively to truss the headers above openings, so that sags in the framing above the openings will not occur. Such sags will crack both stucco and interior plastering. Since the irregular location of the openings dictates the position of many of the studs, many extra studs must be introduced in balloon construction to provide at regular intervals for the lateral support of the floor joists. In balloon construction the size of studs in an upper story cannot be reduced without introducing a wall plate 4 inches deep at the break; also, along the walls in which the ledger board is placed, a separate header must be inserted between the floor joists near the inside face of the studs, to support the ends of the floor boards, when they are placed diagonally. Again, since the interior partitions in the several stories ordinarily do not come vertically above one another, it is not possible to apply balloon construction to them, so that, if ballon construction is used in the outside walls, there will be a differential settlement caused by the shrinkage of the joists supporting the interior partitions. This differential settlement will crack the interior plaster at the corners of rooms and in the walls that are perpendicular to the outside walls, and will cause great damage if expensive wall decoration is marred.

If the shrinkage in the outside wall at the joists could be eliminated from story construction, this type of framing would be preferable because of the simplicity of erection from the contractor's point of view and because the details of the framing in various stories can be arranged independently with greater ease. The elimination of this shrinkage can be accomplished in two ways,—(1) the studs of any one story may be run down alongside the floor joists of that story directly to the ceiling plate of the story below; (2) separate uprights of stud size may be adjacent and nailed to the joists wherever the joists rest on the plates of the outside walls or interior partitions, as shown by the sections in solid black in Fig. 8. This amounts to introducing a row of dwarf studs whose height is just equal to the depth of the floor joists. When the joists have shrunk, these dwarf studs will transmit the wall load from floor plate to ceiling plate, and thus prevent the shrinkage of the joists from cracking the stucco. The latter method is preferable to the former. The only remaining possible sources of considerable shrinkage in the frame are the ceiling and floor plates and where interior partitions of different stories do not lie in the same vertical plane, for then the dwarf studs are of no avail. If special care is exercised to get well seasoned plates, the shrinkage from this source should not be a serious matter. If the exterior architecture involves a half-timber design, an exposed timber belt course, interrupting the stucco at the level of the joists, will automatically allow for shrinkage in the plates. But in neither balloon nor story construction is there a simple way of overcoming the effects of shrinkage where interior partitions do not lie in the same vertical plane, excepting by the use of kiln-dried joists, because it is usually not economically feasible to run the studs of interior partitions down to a metal plate support at the bottom of the joists. The equivalent of whatever continuity occurs in balloon construction in practice may easily be obtained in story construction by the use of timber sheathing diagonally laid at 45 degrees. Therefore, in the judgment of the writer, all factors being considered, construction by stories, with the modifications suggested here, is preferable to balloon construction. Erection by stories is used almost exclusively through the Pacific coast district.

Sheathing. Tests made by the writer on numerous wall panels at the Civil Engineering Laboratory of the University of California, and published in the *Bulletin of the Seismological Society of America,* December, 1925, under the title "Wall Bracing in Timber Frame Buildings," showed that when 1 by 8-inch sheathing was nailed solidly to the studs at an angle of 45 degrees with the horizontal, instead of horizontally, the resistance of the wall to earthquakes and hurricanes was increased about 40 per cent, provided the studs were braced also by diagonal stud braces, as shown in Fig. 8. Since such diagonal sheathing bonds the framework of the several stories and the underpinning to such an extent as to cause the entire building to act as a unit, it is strongly recommended wherever resistance to earthquakes or hurricanes must be considered. There should be two 8-penny nails in each 8-inch board at each stud, at each floor and ceiling plate, at each diagonal brace, and particularly at the bolted foundation sill, because diagonal sheathing, as already said, is very effective thus to anchor light timber frame buildings to their concrete foundations to prevent dislodging by a hurricane.

The tests mentioned also indicated that the use of 10-penny nails in the sheathing in place of 8-penny nails did not appreciably increase the resistance of the panels. Diagonal stud bracing should never be omitted simply because the sheathing is attached diagonally. In addition to stiffening the wall, the diagonal stud bracing that lies at right angles to the direction of the diagonal sheathing helps to prevent cracks in the stucco due to shrinkage of the sheathing. End joints in the diagonal sheathing, if required, should always be made on the studs, at points between but not at floor levels. If the end joints in the diagonal sheathing are made at the floor levels, a great opportunity to tie the frame together very securely is lost. At outside corners, the diagonal sheathing should be lapped so as to afford maximum nailing area in the boards for attachment to the end stud of the adjoining wall. Tenacious corner ties between walls are very essential for resistance to earthquakes and hurricanes. It does take a little more labor and material to nail sheathing diagonally than horizontally, but the structural advantages are well worth it. The tests mentioned here also showed than horizontally, but the structural advantages are pended on the diagonal wooden sheathing; the other half came from the diagonal stud bracing. Therefore, where resistance to earthquakes or hurricanes is needed, such wooden sheathing ordinarily should not be omitted, unless a very thick back-plastered Portland cement stucco is used in connection with special heavy reinforcement. Nor should any weaker substitute be used in place of the wooden sheathing, because not only will the rigidity of the wall be diminished, but, because of deterioration in time, such substitute may become a less desirable base for the stucco, which for permanence requires, among other features, a very substantial, immovable base.

There can be no doubt about the relative merits of diagonal and horizontal sheathing, so far as structural advantages are concerned. But their relative merits as a reliable base for the stucco should also be considered. Tests conducted under the auspices of the United States Bureau of Standards seem to indicate that cracks in stucco are likely to develop around window and door openings where green diagonal sheathing is used. This is true probably, because the studding is less able to offer lateral resistance to a 45-degree pull due to the shrinkage of the diagonal sheathing, than it is to withstand a vertical compression such as occurs when horizontal sheathing shrinks. The distortion of the frame occasioned by the shrinkage of diagonal sheathing, nailed on green, would naturally be evidenced by radial cracks at diagonally opposite corners of openings. Such cracking of the stucco can be avoided by using only well seasoned sheathing and many diagonal stud braces placed perpendicularly to the direction of the diagonal sheathing. The type of metal mesh reinforcement also plays a most important role in stucco crack prevention, but this will be discussed in a subsequent article. Even if the sheathing is horizontal, when green boards become seasoned, they will either shrink and pull the nails with them, or, if firmly held by the nails, they will split; in either case there is movement of the base under the stucco,—a very undesirable condition. The writer has seen much stucco remain in good condition over seasoned diagonal sheathing, but adequate seasoning of the sheathing is of paramount importance in preventing cracks in stucco and should always be insisted upon.

THE ARCHITECT AS CONSTRUCTOR

BY
JOHN TAYLOR BOYD, JR.

IS it desirable for an architect to undertake construction work? This is one very important question for the profession of architecture. It is not a new question, as Wilfred W. Beach points out, in his excellent articles on the subject, in THE ARCHITECTURAL FORUM for May, August and October, 1928,—but the constant evolution of the profession brings new factors into the situation, which necessitate considering it anew. One may agree in large part with Mr. Beach's views (although not subscribing to some of his strictures on the ways of contractors). Nevertheless, the question is one for each individual architect to decide for himself, according to his own talents and the circumstances of his practice. The type of competition he is likely to meet from contractors is also pertinent. The subject is most complicated, and there is more to it than both Mr. Beach and I can cover in a few articles. In reading Mr. Beach's words, one gets the impression that he has considered the matter having chiefly in view practice in smaller centers and in smaller buildings. My own views, on the other hand, come from experience in large construction operations in a large city; and in presenting these views, I believe it worth while to emphasize two very important factors. These are (1) the financial aspect, usually a governing factor in business affairs, and (2) the background of economic conditions, which although somewhat intangible, is likely to be, none the less, a determining influence, over a period of years.

The type of practice is all-important. Is it a specialized or a general practice? Since the war there has been a great increase in the tendency among architects toward specialization, and authorities hold that this tendency is in accord with economic trends. Is the practice located in a great city or in a smaller center? In what region of the United States is it? The answers to these questions must influence strongly the decision of the architect who branches out into construction.

One's personal experience colors one's views, and for this reason it may be well for me to describe my own contact with construction. After several years' experience in architectural offices of the conventional type, I served for about six years as one of four principal assistants in an architect's organization, engaged in a fairly large specialized practice, which, by letting sub-contracts direct, constructed a large part of its own designs to the amount of several million dollars' worth of buildings in its most active years. It was a very broad and a very detailed practical experience. It led me to conclude that there are some great advantages, not many disadvantages, and a number of great difficulties, in an architect's undertaking construction.

The Ethical Question. Before entering upon discussion of these, however, there is first to be considered the question of ethics. It is not necessary to quote authorities to uphold Mr. Beach in declaring that, even in the formal regulations of the A.I.A., there is nothing to forbid the practice, *provided* that the architect carries on the activity according to professional ideals, as distinct from commercial ideals. Everyone knows what this distinction is. More specifically, while the Institute will not permit the architect to become a "lump-sum" contractor, it allows him, as owner's representative, to place subcontracts on the basis of a fee for his services, which are professional. Under such conditions, the architect takes over an important part of the functions of the general contractor,—not all the general contractor's functions, however, when these relate to financial guarantee of costs or to financing the operation.

There is, nevertheless, a more intangible but no less important question involved in this question of ethics. "Will not the responsibility of construction be detrimental to art?" asks the doubter. It should not be detrimental to art any more than the existing conventional method is, as seen in a large part of professional practice. Too often, art, to say nothing of high standards of design, which do not quite reach the level of art, is secondary to business. By "business," I mean the usual activity of making contracts, of getting commissions, and a variety of promotional activities, from studying real estate trends, rentals, site values, locations, mortgage conditions, acquisition of a moneyed following, and the forming of syndicates, to the putting through of deals, and the scheming out of ways of financing building operations. This, of course, is a rather damaging answer to the accusation, I fear. It will shock many people on both sides. It will inflame the old school practitioner whose practice lies in the fields of public, domestic, ecclesiastical and institutional architecture where, ordinarily, finance does not affect the architect, and it will disappoint my good friend, C. Stanley Taylor, who rather advocates this business activity. Mr. Taylor would reply that business should not necessarily injure art. Unfortunately, it very often does, if the opinions of a number of observers of architectural practice in New York have any value. So I fear that this important side of the question must be left undetermined for the present, except for a few pertinent observations. The art side is always paramount in architecture, otherwise by definition architecture disappears. If it neglects art, the profession of architecture has no valid excuse for existence. Let us, furthermore, do away with "bunk" and sentimentality. We must recognize that the constant preoccupation with business matters, which is often necessary to provide a steady volume of new business to keep going many large,—and many small,—architectural organizations, has the effect of crowding out art, as well as of developing a view point which is antagonistic to professional progress. The pressure on the architect tends to make him view architecture through the eyes of the real estate broker, promoter, or speculator, whose understanding of business and economics, in turn, may be one-sided,—that of a trader and salesman, not that of the more analytical "constructive" producer who is coming more and more to guide the modern American economic organization. When he holds this point of view, the architect tends to become an opportunist. On the other hand, construction is more closely allied to art than is business, and it reëstablishes the architect in the old role of master builder. In any case, it is well to bear in mind the observation which Julian Clarence Levy makes in these frequent discussions of the ills that beset the profession: "Most of the troubles which arise in professional practice are due to the fact that architecture is at once an art, a profession and a business." Perhaps the only conclusion to be drawn as to this phase of the matter is that American architecture must reach a higher level of art and design if it is to maintain its high standing.

Duplication of Function. To come to the heart of the question of architect versus general contractor, it seems clear that, in practice, there exists a real overlapping or duplication of function as between the two. The pressure of modern economy is to do away with this expensive waste effort. My direct observation of the methods of several large general contractors, and my knowledge of New York building customs, convince me that this duplication is serious. The general contractor claims (1) that he plays a necessary role in a building operation because he possesses a concentrated, exact knowledge of structural details likely to exceed that of the architect; (2) that he handles the huge mass of details of administration to best advantage; and (3) that he provides the necessary financing of the actual erection. In theory, he alone can best carry out these three functions, and hence he is entitled to an undisputed place in the economic organization. Let us see how this claim works out in practice.

The Organizations Compared. I have observed that the organization of an architect who has a large specialized practice in one or two types of buildings is likely to be more expert in its construction details than the organization of a large general contractor who builds all kinds of structures and who is rarely so specialized. I know that this is contrary to the impression spread by an active propaganda, which pictures the architect as "impractical." Actually there are good reasons for my belief. The old style builder, the man who really knows construction as only years of driving nails and laying bricks "on the job" can teach it, the true craftsman builder, the man who can really give to the most practical architect and draftsman points,—this old time character is passing from the great general contractors' office organizations. He is being replaced by executives and office workers of a different type; by men who often know less about construction details than do the men in the architects' organizations. Some of these contractors' men are called engineers, but actually their chief claim to this title is a degree from a professional school of engineering. They have hardly the practical experience which entitles them to be ranked with the old time builder. Even their engineering education has much less specific bearing on building than has the corresponding training in an architectural school. After graduation, these contractors' office men may get a few years' experience in office administration, in work in a field office on a large construction project,—in other words, work of a general character on a variety of building. This can hardly approach the specific, practical value of the experience gained by the graduate of an architectural school in an architect's office, who perfects his structural knowledge in years of planning, detailing, correcting shop drawings, of one type of building. Even more, others in the great contracting companies may lack even the advantages of a vague engineering education. One finds accountants, lawyers, traders, contact men, salesmen, good fellows who have none too practical a knowledge of construction details. Experience and practice teach them much, no doubt, but they often know less than a good architect's man, and very much less than an old time builder, particularly in the vital matter of costs. No one can know costs quite so well as the craftsman-foreman, who has had years of daily experience as a workman, in handling workmen, solving erection problems, and in purchasing materials. After all, the best man in construction work is the man who can "buy the job." This fact should never be lost sight of. My experience is that it is rarer than good administration.

The old time builder no longer dominates many an important construction company. More and more he tends to gather in the ranks of the subcontractors. There he is doubtless more effective, because his concentration on construction tends to unfit him for complicated administrative duties. Of course, there are many fine contracting companies where the simpler organization, comprised of experienced building men, still exists. The chances of an architect's competing successfully with them lies in the advantage of detailed experience gained in a specialized practice. The less successful organizations have many of the weak points listed by Mr. Beach.

The effect of this diminishing expertness in structural matters in a contractor's organization is marked. It piles up a clumsy administration with an expensive salary list, which makes the general contractor a none too efficient intermediary between the architect's office and the subcontractors'. The general contractor's office often seeks to shift its responsibilities to the architect's men. It particularly fails to coöperate with the architect's office in checking. Often this is due to no lack of good will, but rather to insufficient knowledge of building construction. I have observed that plumbing, heating and other mechanical details are frequently mismanaged by general contractors, so much so that many architectural offices of the conventional type let these subcontracts direct in order to save trouble. Therefore, the direct method of dealing with the subcontractor does not add to the architect's difficulties as much as might be supposed. I well recall the sensation of positive relief in my first experience of the direct method. It was as if a veil had been suddenly lifted between myself and the subcontractor,—the man who actually put up the building.

As regards the second function of the general contractor, that of undertaking necessary administrative functions, it needs little further argument to show that if the contractor's men are less expert than either the architect's office or the "subs," his claim to be of service is less valid. The contractor's man is less helpful than would be a good building man in an architect's organization, rendered more expert by a specialized practice and by dealing constantly with designers. In certain classes of buildings of a complicated character, having a mass of special interior details, such as a country house or a hotel, the architect's office must perform in any case a formidable amount of superintendence, and but little added effort is necessary in order to make this superintendence include erection as well as inspection. Particularly unsatisfactory, in most cases, is the employment of a clerk of the works. Having myself performed that function many years ago, I can testify that it is often a fifth wheel,—a bird without wings. When an architect goes so far in adding expense, why not go the whole way and make the clerk of the works a real construction man?

Financing. The third function of the general contractor,—namely, financing,—is difficult to appraise because it varies so extensively in practice. I suppose that most architects have known cases where the general contractor contrived to shift this burden to the subs as much as possible. He did this either by inducing them to accept notes, or else by delaying payment on requisitions after the architect issued his certificates. In New York, among builders of the more speculative "shoe string" type, this practice is being condemned by organizations of subcontractors and material men. It is claimed that the subcontractor is the real speculator in the deal, without having the compensating advantage of a voice in the business. This phase, of course, opens up another and very complicated side of the situation,—that of finance. As everyone knows, the financial side of contracting is always becoming more important. It presents perhaps the greatest obstacle to an architect's engaging in construction. In many cases, the builder's control of capital may be his greatest weapon in competition. The offer of a large subscription to the capital stock in a great proposed new building, or willingness to take a second mortgage, may be worth more to an owner than would be a saving in cost per cubic foot on a straight construction contract. What the owner loses on erection cost, he more than makes up on lower premiums for capital. In these cases the contractor becomes a speculator or investor in the building.

The architect can hardly go as far as this, although, as mentioned previously, he has, in many cases, already gone pretty far in promoting and in attracting a moneyed following. Thus, commissions are sometimes awarded to an architect mainly because he can interest his following in subscribing part of the money required by the syndicate undertaking a building project. In addition, the architect himself may accept part of his fee in preferred stock, second preferred, or common stock. The speculative method of financing which, to greater or less degree, underlies most real estate, leads naturally to such practices, and the individual is obliged to cope with them as best he may, according to the particular circumstances of his personal situation.

This summary of the duplication of functions between architect and general contractor suggests that much duplication exists in certain instances in the three chief functions of structural expertness, administration and financing, which the general contractor undertakes to perform. It indicates that the architect, particularly the architect of specialized practice,—and the trend of the day seems clearly to be towards "specializing,"—has good reason to believe that he is better fitted in many ways to undertake these functions than the contractor is. The chief obstacle is the financial power which many contractors wield in being able to supply capital for an undertaking.

The Economic Element. Nor should one overlook the basic economic element in the question. The economic and industrial development of the United States proceeds at an amazing pace, with bewildering changes. Its goals seem to be specialization, integration, volume production, efficiency. These changes bring gigantic success or overwhelming disaster to any industry, according to its ability to adjust itself to economic changes. The automobile industry and the coal industry are cases in point. It may not be enough to wait until the changes arrive,—it is better to anticipate them, if possible. All this may sound vague, but I have felt for some years that the architectural profession would do well, for its own security, to recognize that point of view. Viewed purely as a profession, architecture can scarcely avoid being affected by the profound movements in American industry; and, to the extent that it is a business, it should be still more prepared for changes in business conditions. More specifically, the profession should, I suggest, consider these possibilities:

(1) Large scale operation, not merely "big" single buildings, but construction by blocks, areas, districts. How otherwise can the modern city develop efficiently?

(2) Elimination of speculative methods, which involve small-scale operation and high costs.

(3) Low costs, to which sounder financial methods

will contribute most, as financing is a large factor.

(4) Prevention of inflation of site values, which cuts down the market for buildings.

All these factors are bound up, one with the other. Strange as they sound to some ears, it will be observed that they express nothing but the accepted doctrines of Big Business. Is it not reasonable to think that they will eventually have an effect on real estate and building?

The Organization Necessary. Turning from these general considerations, the matter of next importance is the type of organization needed by an architect who embarks in construction work. The architect should not copy the expensive, none too efficient organizations found in some of the largest construction companies. His office construction force should be modeled more after the old builders' administrative nucleus; two or three executives who knew construction, with the aid of a bookkeeper and stenographer or two, renting an office of two or three small rooms, handled easily several large projects at once. The architect would do well to add to his office force a designer of structural steel and concrete. This man should spend most of his time in the drafting room, working side by side with the designers and draftsmen, where he can witness a building conceived, born and brought up, lending invaluable assistance to the process. Such a man may be more valuable than one working in a contractor's or consulting engineer's office. He need assist the builders only occasionally, with a little advice, or by undertaking occasional superintendence of complicated foundations or structural details, although generally the builders can administer these. One builder-executive is usually enough. His function is to let contracts, with the occasional assistance of the drafting room in checking and in estimating. Estimating quantities of materials is not difficult. The executive is helped by the specification writer in drawing contracts. With an "outside" construction superintendent, this executive administers the construction work. He needs comparatively little assistance from the accounting department.

As to the stumbling block of mechanical installations, that is not serious in the hands of experienced building men who are constantly engaged in construction of the same one or two types of buildings. As noted, it is admittedly a serious defect in general contractors' organizations. A man who has erected the same type of building 20 times has little to learn about plumbing, electrical and low-pressure steam heating installations from an expert in a general contractor's organization who may also have built 20 buildings, but each of a different kind. Actually, the average building has little that can be called real, professional engineering in it. Sometimes I think we architects fool ourselves by using the word "engineering" in connection with buildings. What is really involved is *purchasing*. The rest is chiefly a draftsman's work. On buildings, a man may have an engineering education, but that does not mean that he acts in a true engineering capacity, as he would in erecting a bridge or a factory. In the average building, the construction man may need, at most, a few hundred dollars' worth of advice on sizes and specifications of mains in piping, details of valving, etc., around tanks, heaters and boilers, as well as some electrical details. This information is supplied also to the drafting room and to the specification writer; and, since costs are paramount, this information may be best obtained by selecting some keen young man in a subcontractor's force or a supply house, dealing directly with him as an independent expert.

The architect's field organization should be likewise simple. Each project has a construction superintendent who reports to the "outside" construction superintendent, and who has the usual clerical and other aid, depending on the size of the undertaking.

In all this discussion of organization, close personal contact and coöperation are essential to efficiency. In any operation so complicated as that of producing a building, where so many different types of men are engaged, there is no substitute for working in the same organization. No talk of "collaboration" can obscure this fact. I can give a striking illustration of the value of this type of organization, in dollars and cents, and its comparison with a contractor's organization. The story would be still better if I could give the names. A client had plans prepared for a group of buildings estimated to cost well over a million dollars to construct. A building company of national reputation was estimating the project on a cost-plus-fee basis. The architect, who had himself undertaken construction work on a large scale, was coöperating with builder and client in the familiar process of "getting the costs down." The architect called me in on the estimates. "See here," he explained, "they have allowed some $53,000 for office overhead. What do you think of that?" This allowance was in addition to the cost of the actual erection, but not including field office. We made a rapid calculation and figured that $15,000 was an outside figure to allow for the work, as based on a similar operation the architect himself was undertaking. This episode is significant in several respects. In the first place, the excess allowance for overhead in the general contractor's estimate would have paid the architect's cost of doing this work, and a fat fee besides. Secondly, when I related this story in a recent conference with two executives of another large contracting firm, they said that the contractor's estimate was "about right," and that their own cost would have been the same. Third, the architect could have erected that building at a lower cost per cubic foot than the general contractor, as well as making a saving to the client on overhead and fee. The client knew this to be true, but nevertheless he employed the general contractor. The reason was that the contractor put capital into the project to the extent of becoming the principal owner. The client's chief interest was in selling the land. The buildings did not sell or rent very well, and expectation of profit was apparently not fully realized. This story presents a very complete picture of the role of architect in construction work.

It is easy to understand that it is an important asset for an architect to undertake construction successfully. It strengthens his organization in a remarkable way, perfects it to an extraordinary degree because of the constant direct contact with builders, and, of course, enables it to give,—or at least to appear to give,—to the client just the service he ought to get. To the public it makes architectural services seem real, as they often do not in conventional practice. This makes for better fees.

It should be apparent that success in construction work depends not only on the architect's forming a strong, permanent organization, but also on supplying that organization with a sufficiently steady volume of work. Otherwise, his organization fails of its purpose, which is to offer a more experienced, more closely knit and more accurate service in competition than that of the general contractor. This purpose is defeated if the organization is not kept busy and is reduced or disbanded, to be again recruited when commissions come in. Such an organization is difficult to obtain and difficult to perfect. It cannot be improvised by constant hiring and firing, as is frequently supposed. For one thing, the construction men should be of a finer, more aggressive type than is the average "practical" or "construction" man in the usual type of office, who is too often a hack, a typical inspector, more plodding than energetic.

There is an additional reason for ensuring steady volume of work. In addition to his formal organization, the architect, to succeed, must acquire a "following" in the local construction world. The subcontractors, supply houses, material men, truckmen, labor leaders, mortgage interests,—all must learn to realize that the architect's organization is a strong factor in the construction field, whose good will is worth cultivating. Without this following the architect will suffer in many ways. In times of a shortage of labor or materials, for instance, the architect's organization will not obtain the needed service. Also, his sources of information will dry up, and he will lose control of costs. Such an organization quickly goes down hill without the architect's realizing what is happening. Like the man whose wife is unfaithful, the architect may be the last to learn about what has happened in his own household.

As suggested in the beginning of this article, the architect's own talent is an important factor. Architecture is an art, a profession and a business. It is rare when an architect omits successfully even two of these spheres in his work, to say nothing of all three. Even in the field of business,—which is always expanding in architecture under the pressure of modern technical and industrial complexity,—even here the architect may be a better salesman than executive. Or in construction he may be a better executive than constructor. Hence the architect's personal relation toward contracting construction may vary. Perhaps sound, well rounded organization is the best general answer to such individual matters. The chief of the construction department should have a major relationship to the architect, if not in the form of a partnership, at least in almost as important a role, one that includes possibly the ability to promote new business or to assist in obtaining new business, as well as to engage in actual erection. The chief in charge of construction should be a most capable, forceful man, of true partnership material. The architect cannot afford to have less, neither can the construction head afford to *be* less.

In conclusion, it seems probable that the question of whether the architectural profession as a body will undertake construction must be decided by the pressure of circumstances, mostly economic, rather than by any theory. On this question, a sound body of opinion holds that the architect has a definite professional role, essential to the proper functioning of the building industry, and that he will do best to keep to that role, whatever be the good results obtained by occasional individuals' competing with contractors. As proof of their contention, they cite the statistics showing that architects control a vast majority of building projects of any size. They also point to the historical evolution of the modern American architect out of the contractor, and they look upon any return to earlier conditions as a step backwards. This conservative view is sound, and it puts the burden of proof on the pioneers. They have on their side the truth that there is much duplication between the architect and general contractor today, and that the client objects to paying two people to do the same thing. At present, in the division of fees, the architect is likely to get the short end, as illustrated by the fact that, although the architect is today in charge of construction work, he barely gets a living wage in return for his huge technical and business responsibility. Unless he speculates he has almost no chance for those "killings" sometimes possible in business. Furthermore, the business complexity is growing. It seems to have arrested, if not actually pushed down, that splendid artistic achievement in architectural standards, which is the very life blood of the profession. The promoter-architect or real estate architect is coming more noticeably to the fore in recent years. Is he any more of an architect than is the builder-architect? Again events must decide. One may suggest that if American large-scale methods ever do spread into the building world, we shall see startling changes in the practice of architecture. Among them may be a drastic elimination of competing organizations. There may also occur, in the attendant financial reorganization, a condition of less real estate and more technology in architecture. The designer may be more closely allied with the carrying out of his designs than is now generally the case.

THE RELIGHTING OF THE FIRST CHURCH OF CHRIST, SCIENTIST, BOSTON

BY

R. B. BROWN, JR., and KARL ANTON PIEZ

FOR the last ten years the officials of the First Church of Christ, Scientist in Boston had been considering proposals for relighting the "Mother Church" in a more adequate manner. A knotty problem was presented, involving modification of existing equipment, installation of new luminaires according to good lighting principles and in harmony with the architectural design, and in addition a novel application of various systems used in modern illuminating engineering practice. The solution of this special problem, through the coöperation of the church authorities, the engineers, the manufacturers of the equipment, and the electrical contractor, has many fascinating and instructive aspects.

The "Mother Church" is a conventicle type of building, in which attention is generally directed to the reader's platform in front of the congregation. However, interest may be focused upon any part of the auditorium, as various members arise to address the congregation, and adequate illumination, though brightest on the platform, is needed everywhere else in the huge auditorium. The church is of Italian Renaissance design, with the great central dome flanked by two smaller semi-domes. The building itself has a frontage of 236 feet, is 144 feet deep, and the extreme height is 224 feet,—3 feet higher than the Bunker Hill Monument. The first story is of New Hampshire granite and Tennessee marble, above which limestone has been used. The dome, semi-domes, and cupola are of cool gray, semi-glazed terra cotta. Limestone and marble are used as the interior materials, with very elaborate plaster ornamentation. Carved and colored marble also forms part of the wall decoration. The woodwork is mahogany. The auditorium has splendid proportions, and seats five thousand persons.

The original system of lighting was installed in 1906. At that time the main auditorium was lighted by eight massive bronze chandeliers, each having 73 exposed lamps. In the semi-domes, bare lamps on 8-inch centers were concealed above the cornices, and the ceiling pieces under the balconies and elsewhere contained clusters of three or more bare lamps. On the walls about the auditorium were torcheres equipped with many lamps, usually in pyramidal forms.

Booms Used in Refinishing Interior

Since this initial installation was made, every advance in illuminating engineering naturally emphasized the need of an improved lighting system. The fixtures containing the exposed lamps were obviously out of place, and the lamps themselves, being replaced through the years by more and more efficient units, became sources of harsh glare. Proposals for a design of a new lighting system for the main auditorium had long been considered, and many specialists had been consulted on the problem. The proposals were various, such as to secure:

1. An improved design of the eight existing chandeliers.
2. Indirect lighting from eight fixtures.
3. Indirect lighting from coves.
4. Indirect lighting from one fixture.
5. Floodlighting through windows.
6. Floodlighting through new false skylights.

In each of these plans the semi-domes were to be cove-lighted as formerly, and all supplementary luminaries were to be retained around the auditorium, after having been so changed as to provide comfortable light. The real problem was to light the central area of 8,800 square feet with a dome ceiling 108 feet high, 90 feet in diameter, and starting 75 feet from the floor.

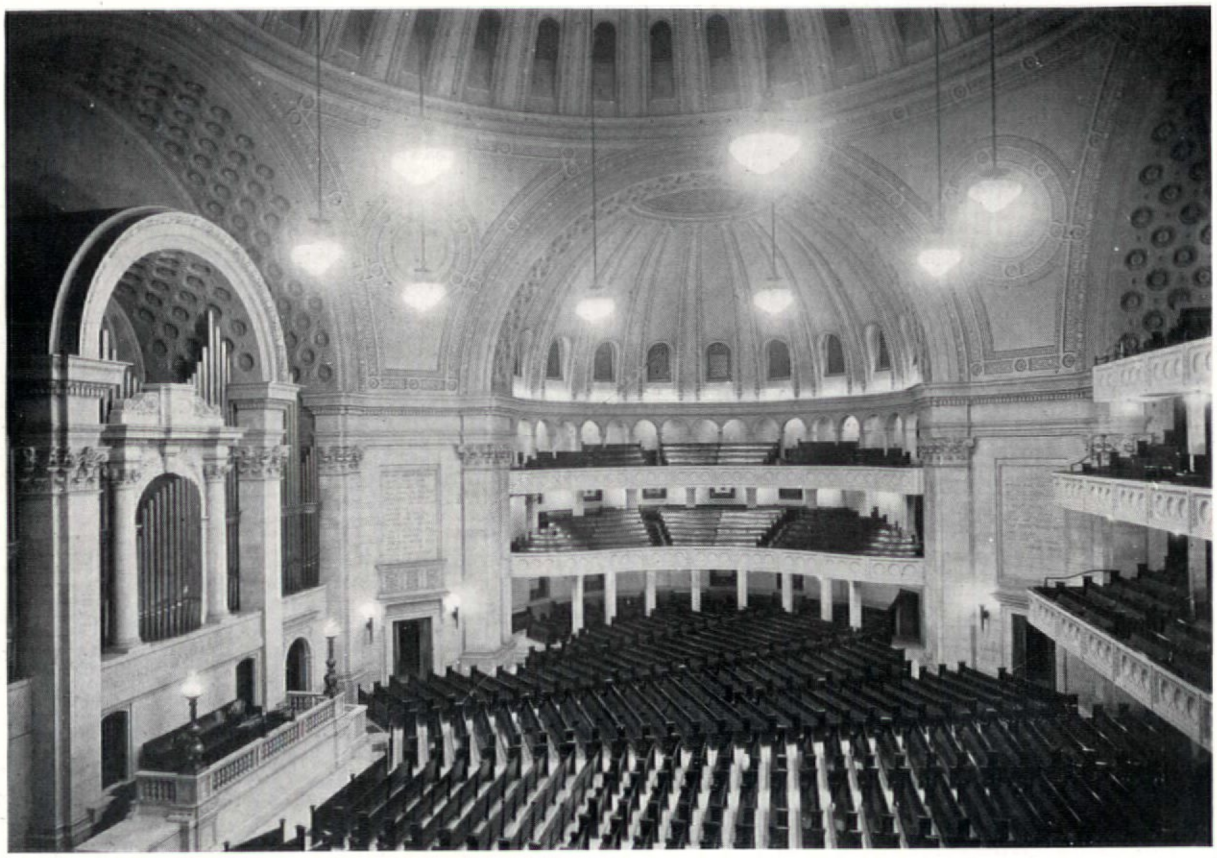
It was decided that a scheme of floodlighting was the ultimate solution, preferably a scheme which would give a desirable cove lighting effect. The plan adopted consists of floodlighting the central dome itself through the oculus. The light is directed from just below the skylight glass down upon the walls of the plaster dome, and from there indirectly to the floor of the auditorium. The advantages of this scheme are that:

No changes were necessary in the architecture.

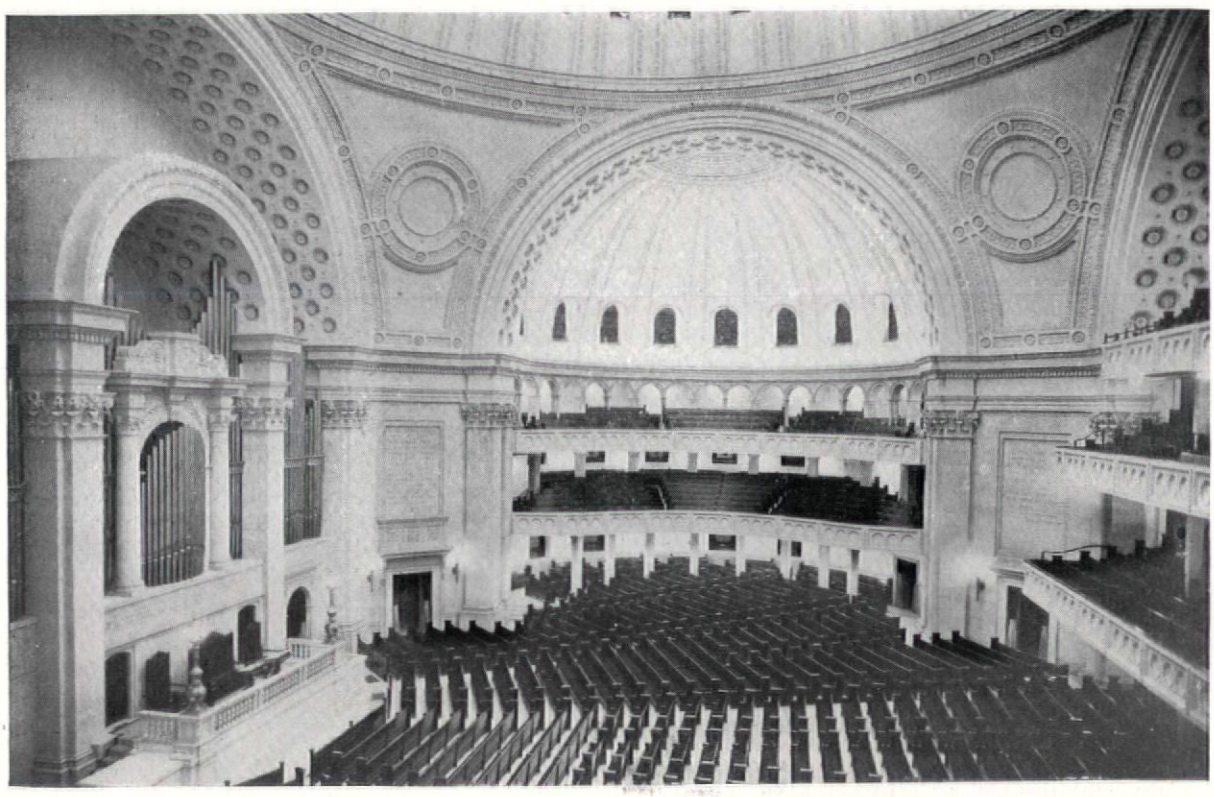
A most desirable effect is attained.

The lighting equipment is entirely concealed, yet readily accessible.

Standard floodlighting equipment is used, and both the initial and operating costs were reasonable.

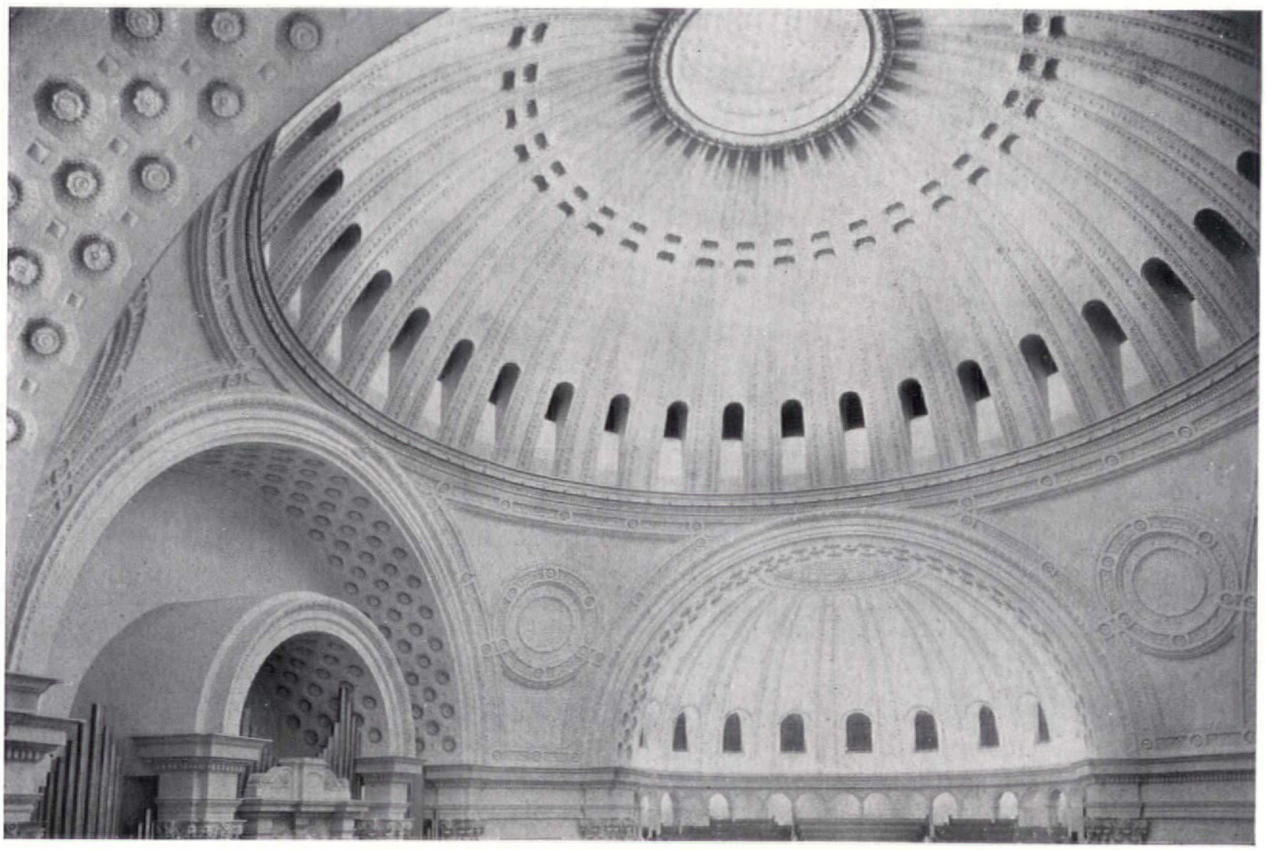


MAIN AUDITORIUM BEFORE RELIGHTING

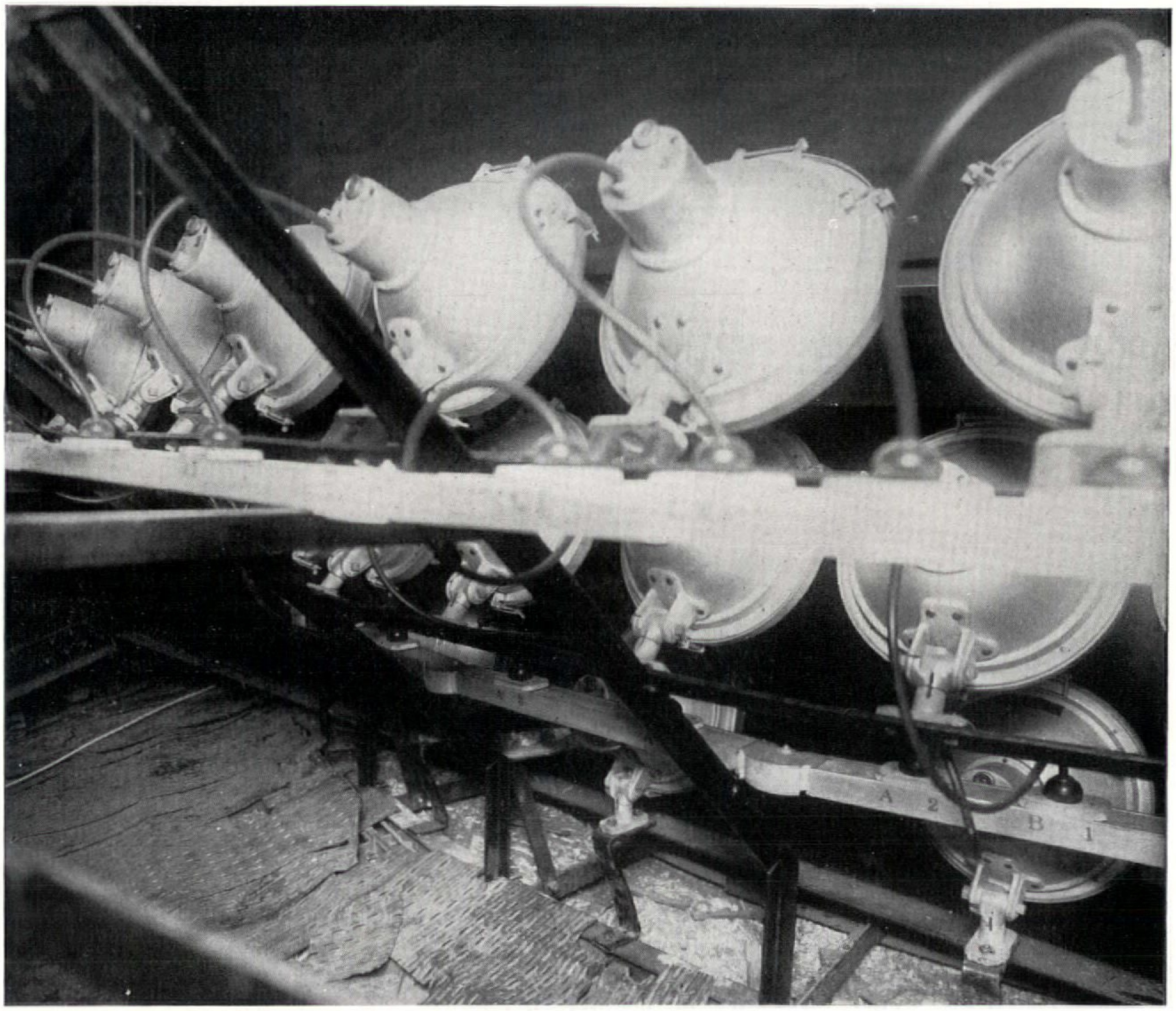


EFFECT PRODUCED BY NEW LIGHTING ARRANGEMENT

VIEW OF CENTRAL DOME BEFORE RELIGHTING



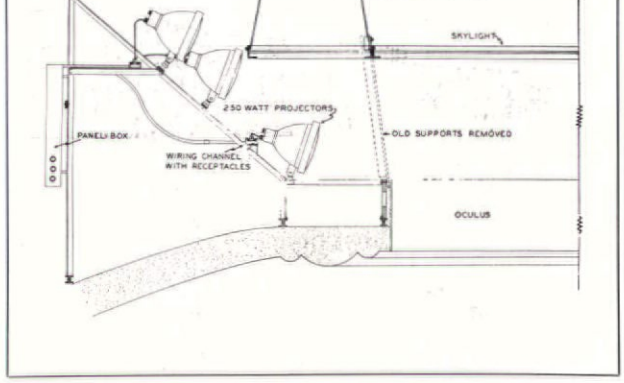
CENTRAL DOME RELIGHTED



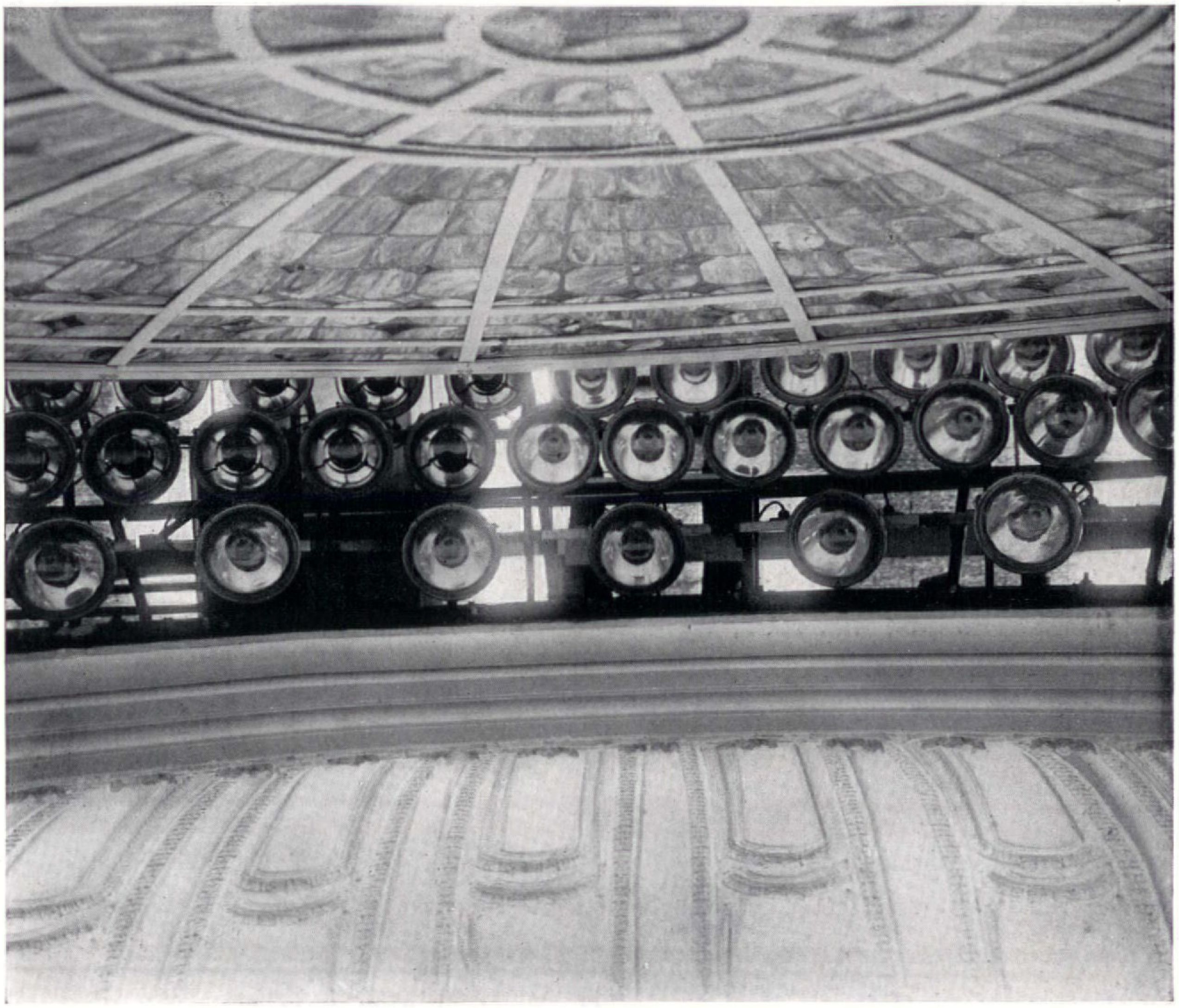
Projectors Mounted Above the Oculus for Lighting the Dome

In deciding upon the actual layout in terms of wattage, the reflecting factor of the plaster dome under reasonably clean conditions was found to be 48 per cent. Considering the area to be 10,000 square feet, and thus giving an adequate factor of safety, the designers arrived at the figure of 4 watts per square foot or a total of 40 kilowatts necessary in order to provide the auditorium with sufficient illumination. To insure evenness in the spread of light over the entire dome, it was decided to use small units, and 250-watt projectors, having a beam spread of 12 degrees with lamp at focus, were selected. The comparatively large number of small units gave the advantage of directing the light from at least five projectors on any one point in the dome. The projectors were mounted on a special steel circular framework in three tiers. The skylight glass above the oculus itself was widened 30 inches to hide the projectors from the line of sight. It was found desirable to transmit direct light downward through the glass for the sake of appearance. Twelve 500-watt floodlights give enough brightness to the glass.

For the two semi-domes, a new and efficient cove-lighting installation was made, using 50- and 100-watt inside frosted lamps alternated, located in groups. The throw of the 50-watt and 100-watt in-

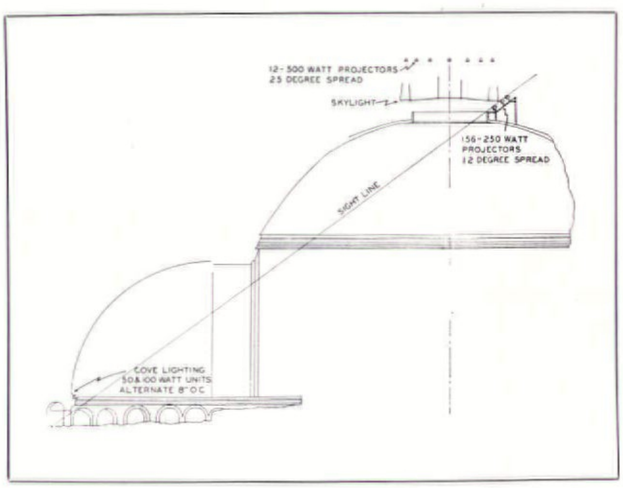


Method of Mounting Projectors



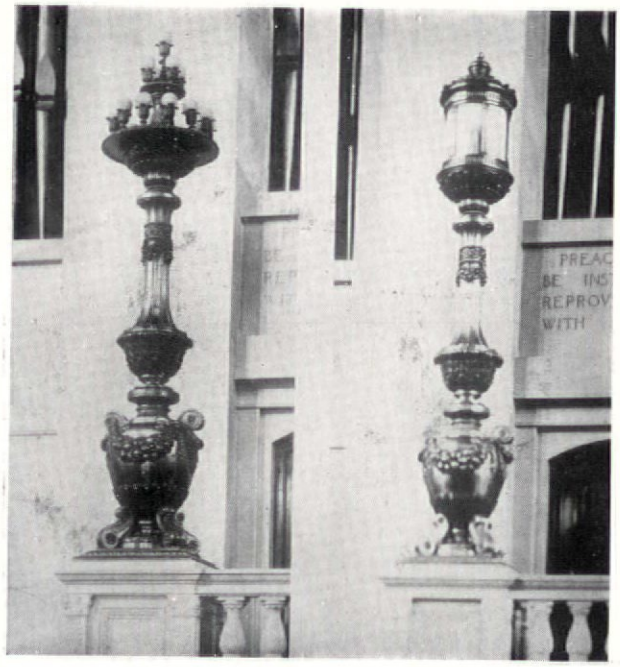
Projectors Installed for Lighting Through the Oculus of the Dome

side frosted lamps was alternated in the groups. The throw of the 50-watt lamps is straight up, and that of the 100-watt lamps is tilted slightly forward. Silvered glass reflectors were used on the old outlets. On the pedestals lighting the reader's platform and on the torchere brackets around the walls of the auditorium, new tops were installed in order to overcome glare. In addition, various other types of luminaires were designed and made for the spaces under the balcony, in the colonnades at the rear of the side balconies, on the rear auditorium wall, and on various stair walls. Totally indirect lighting from suspended fixtures was also adopted for the Sunday School room.

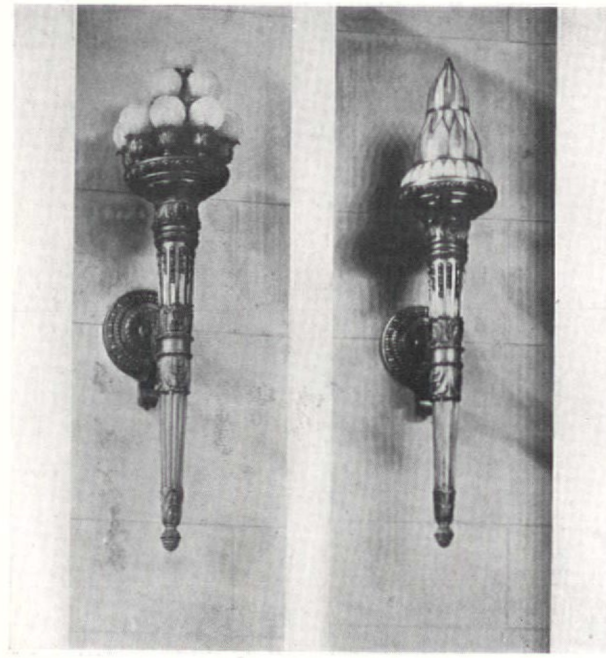


Lighting Scheme, Main Auditorium

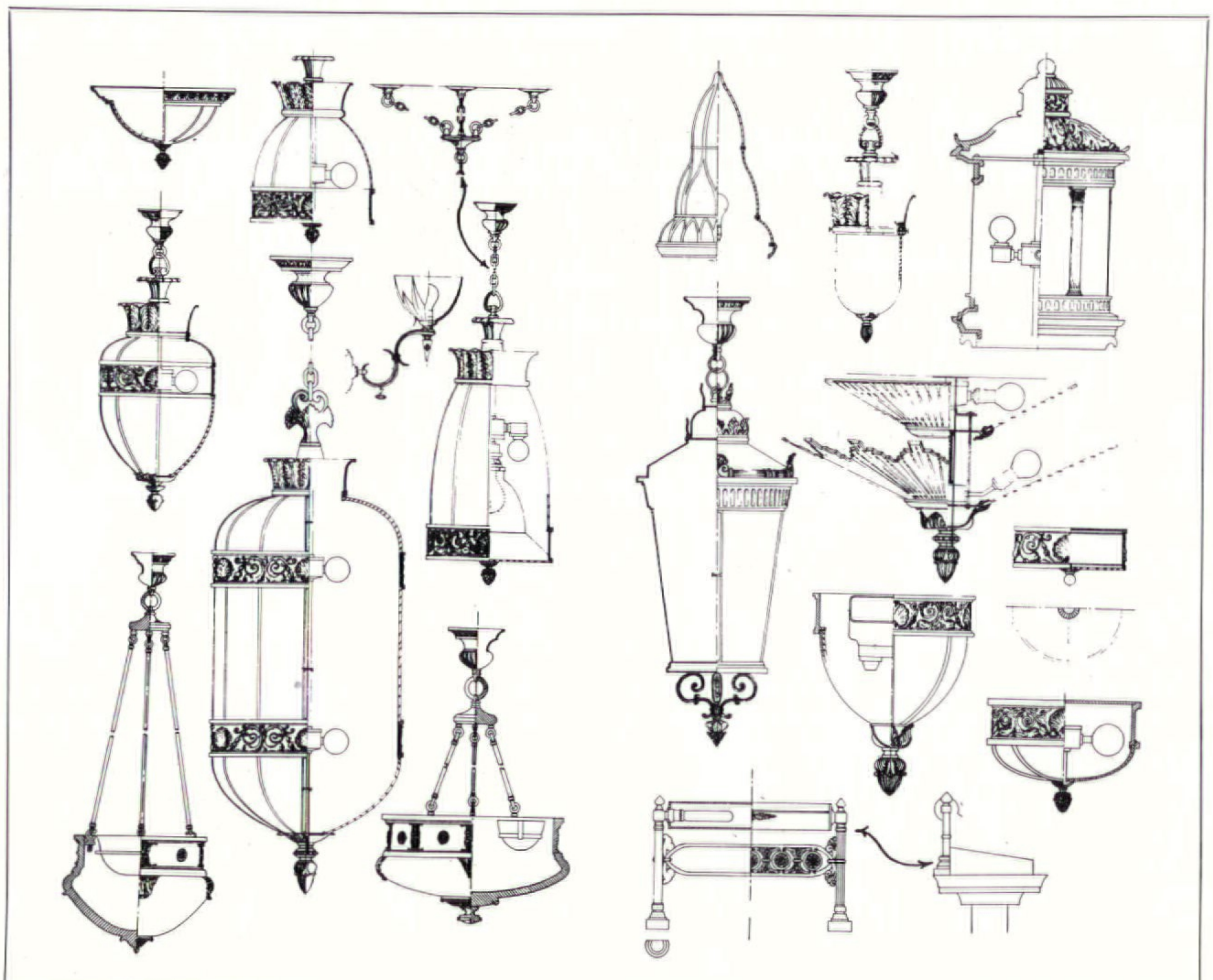
The result of the main auditorium lighting is an even illumination on the main floor of the church at a level of 7-foot candles, which is unusually high for church lighting at present. This may be cut down one-quarter or one-half, since the projectors are on three circuits. The cove lighting in the dome and the semi-domes may be switched one-third, two-thirds, and full intensity. The flexible lighting scheme which has been adopted is entirely in keeping with the type of service in the church. All the luminaires are of appropriate design, and the indirect lighting effects reveal the full beauty of the entire interior.



PLATFORM LAMPS, OLD AND NEW



TORCH BRACKETS, OLD AND NEW



DETAILS OF THE VARIOUS NEW LIGHTING FIXTURES
FIRST CHURCH OF CHRIST, SCIENTIST, BOSTON

THE CLIENT, THE ARCHITECT AND THE CONTRACTOR

PART I. THE CLIENT

BY

CLINTON H. BLAKE

FOR many years I have been called upon to advise alike the owner, the architect and the contractor. As a result, I have had rather unusual opportunities for becoming familiar with their attitudes, the one to the other, and with their conceptions of their respective rights, liabilities and duties. A very large percentage of the misunderstandings and difficulties which arise between them is due, not to any conscious desire on the part of anyone to be unfair, but rather to certain fundamental misconceptions of the obligations which each of them owes to the others. If these misconceptions can be removed, and if there can be brought home to these three chief participants in the building operation a true understanding of their respective rights and liabilities, the benefit to each of them will be considerable. My purpose here is to point out, so far as I may, some of the major points of misunderstanding and misconception.

Year by year the architect and owner, broadly speaking, are approaching, I believe, a more thorough understanding and accord. Year by year, also, there has been a corresponding betterment in the understanding of the contractor and in the relations existing between him and the architect and owner. While there are many points of irritation and misunderstanding, in a very large percentage of cases the difference will be found, on analysis, to have resulted from one of a comparatively few causes. In the main, the difficulty heretofore has been that the architect has to a certain extent isolated himself in his professional atmosphere, that the owner has made too little effort on the other hand to understand the professional attitude and point of view of the architect, and that the contractor has failed to realize, as generally as he should, the potentialities for good to him in a closer and more whole-hearted coöperation between his organization, the architect, and the owner. It is not my purpose here to engage in a technical legal discussion, but rather to point out in general the points of misconception and the causes of differences between these several parties. A fuller understanding on their parts of their legal obligations and rights is naturally desirable. They should be able to attain this, however, without the confusing admixture of legal red tape and discussion. Where necessary, in the future as in the past, they can secure legal advice and unload their worries upon their attorneys. The really important thing is that they should so clarify their understandings of the respective positions which they hold in the building operation and of their rights and liabilities in general, that controversies between them will *not* develop to a point were legal action will be involved.

1. The Point of View of the Owner. The ordinary client's conception of the ordinary architect is at once flattering and disparaging. On the one hand, he attributes to the architect abilities in discounting the future and in securing perfect results far beyond the point of reason. On the other hand, in many cases he believes the architect to be an eccentric, artistic soul, possessed of temperament and ability, but wholly lacking in business understanding and often even in common sense. This latter conception is giving way rapidly, as a result of the increased understanding among architects of the business and practical elements involved in the practice of their profession. It has been and is responsible, however, in repeated cases, for the failure of an owner to employ an architect, where he might otherwise do so, and for many of the instances where owners undertake to plan and erect their own houses, with the aid of a builder and without securing any trained architectural advice. Such a proceeding is not in the interests of either the owner, the architect or the contractor. The architect is a vital factor in any properly conceived and carried out building operation. His participation in such an operation benefits the owner and the contractor alike. Not only does it result obviously in the securing of a better and more valuable result, but it contributes to the situation, in the person of the architect, the balance wheel which goes far to remove needless causes of irritation between the owner and the builder and to insure to each of them fair treatment.

The client's conception of the architect as an artistic soul, largely lacking in practical understanding and common sense, is, of course, wholly unjustified. I have had occasion elsewhere to express and to reiterate my firm opinion that artistic and business ability are not incompatible. In repeated instances we find architects possessed of the highest artistic training and ability who are, at the same time, possessed of sound business sense and judgment. The architect of today must face business practicalities and conditions to a far greater extent than ever before. The complexities of modern life and of modern business structures, the adoption of building laws and zoning ordinances, the complications involved in labor conditions and in the material market, all make it essential than any successful architectural organization include business as well as artistic and technical capabilities. As architects have more and more become aware of this fact and recognized the need of business training and ability in their profession, so they have correspondingly broken down to a large extent the old misconception of the owner and brought to him a realization of the fact that the modern architect may be quite capable of exercising business practicality and understanding in his handling of the client's problems.

The flattering misconception of the architect by the owner is, curiously enough, more destructive of accord between them than the uncomplimentary conception which we have just discussed. The client in many cases holds, firmly fixed, the idea and opinion that the architect, as a result of his technical training, is necessarily omnipotent in many ways. He believes that the architect can tell him the exact cost of a proposed building; that he can foresee to a nicety the cost of labor and material; that he can foretell exactly how the completed whole will appear; and, above all, that he can and will so oversee the work as to provide a 100 per cent complete and satisfactory structure. Such a conception, while flattering to the architect, is full of dynamite. He will be far better off, in proportion as he can bring the client to understand that he cannot foretell accurately the costs of labor and materials; that he cannot guarantee a perfect building, either artistically or mechanically; and that he can but do his best, with the special training which he has had and with due diligence, to approximate the ideal which the owner has in mind.

The average owner, in his attitude toward the building operation, falls into one of two errors,—either he feels that he is competent and called upon to tell the architect how things should be done, or else he throws all responsibility upon the shoulders of the architect and expects the latter to accomplish a splendid result, without real coöperation from him. If the owner must follow one of these courses, instead of the common sense middle road, it is preferable, certainly, that he should leave matters in the hands of the architect, rather than endeavor unduly to dictate the action to be taken. I know of nothing more irritating or demoralizing to the friendly relations of the parties and the good of the project than a client who is forever fussing over details, changing his mind, issuing new instructions, and acting generally as if he were himself quite competent to act as architect or contractor, or both. In handling a client of this kind, the architect is called upon to use tact and discretion, and above all to have a sense of humor. He must use tact in order that he may not unduly irritate the client. If the client be given his head to some extent and allowed to talk, he will usually in the end meet the recommendations of the architect, if the latter does not endeavor to force them upon him too strenuously in the first instance. The use of discretion by the architect in this connection is, however, necessary. He cannot safely ignore the client's requests for changes. He must be careful to keep the record quite clear and be in a position at any time to show that where the work has been continued in accordance with his recommendations and after contrary suggestions by the client, this has been done only after the latter has acquiesced and finally approved.

The client has commonly a misconception, also, of the professional status and obligations of the architect. Very nearly without exception, the client will hold the point of view that the architect's sole obligation is to him; that the architect is employed by him and must act solely as his representative and adviser, and that he owes no obligations to anyone else in connection with the building operation. It is perhaps a natural thing that the layman should have this misconception of the architect's duties and responsibilities. It results probably from the fact that he regards the architect exactly as he would a lawyer or a physician,—as one whose sole obligation, aside from engaging in ethical and honest practice, is to his client. The fact is, of course, that the architect, while his primary obligation is to the client, has nevertheless a very real and important obligation to the contractor. The client loses sight entirely, ordinarily, of the quasi judicial functions which the architect, in his supervising capacity especially, is called upon to perform. He fails to realize, until he is educated so to do, that the architect is called upon time and again to make, in effect, a judicial and fair determination in questions involving interpretations of the plans and specifications, the character of the work done, the issuing of certificates and the like. The architect should not and cannot safely or properly be the advocate of the client alone. Where the contractor is in the right, the honest architect will support him.

When all is said and done, 90 per cent of the misunderstandings between owner and architect have to do with changes in plans, with supervision, or with questions of cost. In part, these misunderstandings result from a misconception on the part of the architect with respect to his proper rights and functions in these matters, and in part from a misconception with respect thereto on the part of the client. I shall have occasion to discuss in a succeeding paper the ways in which the architect errs in this connection. For the present, we are interested in the attitude of the client. With respect to changes, the layman has very generally the idea that his architect, without any increase in his fee, is supposed to make any and all changes in the studies and drawings which the client may from time to time desire; that it is part of his professional duty to make, within reason, any number of preliminary studies and to continue turning out studies and drawings and specifications, until he has produced those which meet fully the requirements of the client.

Given a client who knows his own mind with reasonable definiteness and who is himself reasonable, the architect will not have so much difficulty on this point. Given the ordinary client, however, who starts out with a more or less indefinite idea and insists thereafter, alone or in collaboration with his wife, on successive modifications of it, and the architect is presented with a real problem. He must satisfy the client or break with him. At the same time he must, in justice to himself, either receive additional compensation for his extra services in making the changes or so limit the changes made that they will not seriously reduce his profit. The owner is gradually being educated to an understanding of this situation by the employment of contracts between owner and architect and by the slow but general improvement in a better understanding by the layman of the architect's status and methods. The layman ordinarily has no conception of what it costs the architect to produce studies and working drawings, not to mention details. He may be somewhat impressed by detailed drawings, but he is ignorant, as a rule, of the sums which must be expended to produce the finished drawings which are placed before him for his approval. To him they are merely mechanical drawings, which might be produced readily in a few hours' time. He has little conception of the amount of time which has gone into their production, of the costs of draftsmen and office overhead, and of the amount of time which the architect or his assistants in design and construction have given to the study of the particular problem in hand. It is natural that the client should have this point of view. Every professional man labors under the same handicap. Where a lawyer draws a contract, the client, unless he has been compelled to attend conferences during the time that it has been in preparation, sees only the finished work and does not realize the hours of research and the time given to preliminary drafts and changes which are responsible for the final document. The client of the architect has the same point of view. This again is a matter of education. Gradually the client will secure a better understanding of what it costs to produce his work and to maintain and operate a modern architectural office and organization.

The second chief point of misconception by the client relates to supervision. It is not at all an extreme statement to say that the client ordinarily holds the point of view that the architect, by reason of his training, should be and is able so to supervise the work as to insure substantially a perfect result. He has the point of view that the architect's fee covers whatever service is necessary in this connection. He has little, if any, conception of the wide difference between ordinary architectural supervision and the supervision of a resident superintendent or clerk of the works. Here again the misconception of the client is gradually being removed. The Institute's form of contract and other contracts in use have specifically directed attention to the difference between ordinary and constant supervision. In time, the client will gradually come to recognize and appreciate this difference. At the present time, however, in a very large majority of instances, the client is still of the impression when he goes to the architect, and unless he has had prior experience in building matters, that it is the duty of the architect personally or through his organization, and without extra charge, to supervise the driving of each nail and the placing of each shingle.

One of the most common and dangerous misconceptions held by the owner relates to the cost of construction. Here again the owner is wont to endow the architect with powers of divination which he does not and cannot in reason possess. On the one hand, the owner expects that the architect can design a building to fall within any cost upset figure which he may give. On the other hand, he believes that the architect can give an accurate estimate of what the building will cost when erected in accordance with the plans and specifications presented to the owner for his approval. The client is wrong on both of these points. It is possible, of course, for an architect to be so conservative in the plans as to insure a building of a cost less than a given amount. Unless, however, he allows a very liberal margin for this purpose, he cannot be sure that the structure will not exceed the limit named. The best that he can do in the ordinary case is to design the building in accordance with his best judgment and, if the bids received exceed the limit, suggest changes and cuts which will reduce the cost to a figure below the specific amount. The owner cannot ordinarily understand why the architect cannot approximate the cost more closely in the first instance. One of the chief difficulties lies, also, in the fact that, after the more ambitious plan has been presented to him, the owner is loath to agree to the prunings and changes in the plans which are necessary to meet his financial requirements. This is only human nature, but it does not help the architect or work for a better understanding between owner and architect.

With regard to the giving by the architect of cost estimates, the owner is under a particular misapprehension. He believes, ordinarily, that the architect should, by reason of his experience in his profession and his technical training, be able to estimate with reasonable exactness the cost of the work called for by the plans and specifications. While he realizes probably, as a business man, the uncertainties of the labor and material markets, he nevertheless believes that the architect is so trained as to be able accurately to gauge these conditions and to give a substantially accurate estimate of cost. When it develops that an estimate given by the architect is over-conservative and that the cost is less than he has estimated, no harm is done. When, on the other hand, as is much more likely, the owner receives a bid far in excess of the estimated figure, his reaction in too many cases is that the architect does not know his business and that he has been misled into going ahead with sketches and plans for work which is beyond his financial resources. Under these conditions, he will either call off the project and object to paying the architect for the work already done, or he will proceed with the work and have changes made in the plans and specifications, but feel that he is not under any obligation to pay for the time involved in making these changes.

Another cause of irritation and difficulty for which the owner is often responsible results from his undertaking to give directions with regard to the work direct to the contractor or workmen and without the knowledge of the architect. Ordinarily, there is no intention on the part of the client to go over the head of the architect in taking action of this kind. In giving instructions to the contractor he has little realization of the difficulties which may arise as a result. The contractor also is to some extent at fault, if he accepts instructions from the client without the approval or confirmation of the architect. On the other hand, it is quite natural if the owner, who is the principal in the transaction and the person with whom his contract is made, comes to the contractor and gives him a definite order, that the contractor should execute it. The client, by giving orders direct rather than functioning through the architect, seriously impairs the latter's authority.

This is not the most serious side of the matter, however. The more important thing is that the client, in ordering changes, has no conception of what they will entail. A change which to him as a layman appears comparatively simple, may result in other serious structural changes. These, in turn, result in "extras." Before the matter is concluded, the client in all probability will be blaming the architect for the very extras which resulted from the orders given by the client himself. Having employed the architect as his professional adviser, the client should support him in that position and, in his own interests as well as in fairness to the architect, submit to the architect and not to the contractor any suggestions or requirements which he may have. The architect will then be in a position to advise the client whether they are in his opinion reasonable and practical and what their general effect, both as to design and as to cost, will probably be. Often the client will realize that his suggestions are impractical and will drop them. Where they are approved by the architect, the latter will supervise their execution far more intelligently and effectively than the client could do.

The client, the owner and the contractor have each a well defined part to play. Each of them should keep within the limits of his own sphere of activities. The more completely this can be brought about, the less friction there will be and the better will be the results secured. The ordinary client is fair minded and reasonable. He desires nothing which is not right, and does not consciously intend to demand of his architect anything which is unfair. If he can, by slow but sure education, be brought to understand more fully the duties and limitations and problems of the architect, he will gradually revise his conception of the duties which the architect owes to him and of their respective rights and liabilities. The education of the client in this respect rests largely in the hands of the architectural profession. There can be no question that time given to forwarding such education in public and written discussions and in such other ways as may be possible, will remove many of the more dangerous points of irritation between architect and client and result in substantial benefit to each of them in the form of a better understanding and enhanced mutual good will and coöperation. I can conceive of no more worth while service which a publication such as THE ARCHITECTURAL FORUM, read by architects, contractors and laymen alike, can perform than to take an active and constructive part in promoting a better understanding by these three parties to the building project of their respective rights and liabilities. Such an understanding cannot fail to result in a general betterment of building trade conditions, in an increase in the effectiveness and authority of the architect, and in benefit to all concerned.

As a matter of fact, the owner is quite justified in feeling that the architect should be qualified and prepared to protect him with respect to many details of business administration in connection with the work. In the nature of things, the owner cannot be expected ordinarily to know what the building laws and local ordinances require. He cannot be expected to know the zoning and similar requirements as the architect is presumed to know them. He is not expected to be acquainted with fireproofing and other similar ordinances. The owner can rightly demand more of the architect than that the latter translate into plans the owner's desires. He can and should demand that the architect know whether those desires can legally be carried out, and that if there be any conflict between them and the requirements of the state or municipality in which the work is done, the architect should so advise him.

This does not mean that the owner can expect the architect to be his lawyer. It does not mean that the architect is obliged to advise the owner in matters relative to the building contract and he like which are properly matters for the owner's attorney. It is difficult to lay down exactly the dividing line. In general, however, it may be said that the owner is justified in expecting intelligent advice from his architect on those business or legal requirements which relate to the legal filing and approval of the plans. If the architect undertakes to prepare plans for a client, he is expected to so draft them that they *are* legal and such as the proper authorities will approve.

On the other hand, the owner cannot expect the architect to act as his guardian on all points connected with the work. On matters not clearly related to the architect's services, the owner must protect himself. The architect must use reasonable skill and diligence. He is not expected to be omniscient. He should be prepared and equipped to advise upon and attend to the business and legal requirements connected with his professional services. Beyond that the owner is his own keeper.

SANITARY DESIGN IN MODERN BUILDINGS

HOT WATER SYSTEMS

BY

HAROLD L. ALT

THE furnishing of an adequate supply of hot water for a building is one of the most uncertain problems involved in plumbing design. Types of buildings vary in purpose, and each building of each type varies from others in its requirements. The hot water system for a school will not be the same as that for an apartment house, nor will an office building have the same system as a church. Industrial buildings constitute a problem all by themselves; institutions, laundries, kitchens and bath houses must be considered individually, and the best possible judgment must be used in each case. No two authorities agree on the quantity of hot water which will be used in the various types of buildings, because there is so much variation between the amounts used.

Various rules have been evolved for computing the probable hot water demand for a structure, but there is nothing to guarantee that the occupants of a building are going to be governed in the slightest by the arbitrary assumptions made,—and which must be made,—in the original calculations. One method which seems to have at least a basis of common sense is to calculate the hot water required for the maximum use of each kind of fixture, and then to multiply this by a percentage of "probable" use for normal conditions and to allow *double* this for "peak" conditions. It will be noted that this method resembles that used for determining the sizing of cold water pipes. To apply this rule it is assumed that the maximum possible use of hot water in a lavatory is about a half-gallon of hot water for each user, and that an average washing in the lavatory would require about a minute and a half. Then the maximum number of gallons it would be possible to use in a lavatory per hour would be:

$$60 \div 1\tfrac{1}{2} \times \tfrac{1}{2} \text{ gal.} = 20 \text{ gal. per hour.}$$

A sink is taken at about 30 gallons per hour, and a slop sink at 20 gallons per hour; a bath is assumed as requiring 20 gallons for each user and that two baths per hour would keep the bathroom pretty busy; showers have been found to require as high as 300 gallons per hour when they are in constant use. This gives the maximum possible rates of water consumption in gallons per hour for each kind of fixture:

Fixture	*G.P.H. Max.*
Lavatories	20
Sinks	30
Baths	40
Showers	300

It is necessary to determine what percentage of maximum use is likely to be encountered in the particular building being considered. Shower baths are the most lavish users of hot water, and their use must be most carefully considered. The quantity of water used in a shower in a private bathroom or in a hotel room bath, for instance, would be quite different from that used for a swimming pool shower, because in the first case there would be only one or two users, who would probably not utilize the shower more than four times per day, while in the second case there might be a hundred users. This is why the "percentage of use" must be considered. The "peak" demand must also be taken into account. If the hot water were drawn off at a constant rate all during the day, there would be no object in using a storage type of heater; a continuous heater without storage would do just as well. But the hot water demand fluctuates, and the storage tank builds up a surplus of hot water during periods of low demand to have this available to carry over short periods of exessive demand. One authority says that the actual average hot water consumption for various fixtures located in different buildings is about as shown in this list. In using this schedule it should be noted that the quantities given are for net average use, and that no "percentage of use" factor need be employed.

Gallons per Hour (Average Use)

	Lavatories (Private)	*Lavatories (Public)*	*Baths*	*Showers*	*Sinks*
Residences	2½	x	10	50	5
Apartments	1¾	3½	7	35	3½
Hotels	3½	16	14	70	14
Schools	1¼	x	x	75	2½
Clubs	3	9	12	120	12
Gymnasiums	4	16	16	225	x
Hospitals	2¼	9	9	x	9
Public Baths	5	30	60	x	
Y. M. C. A.'s	3¾	15	30	x	15
Office Bldgs.	1	3	x	x	x
Shops (Indus.)	4½	27	36	270	18
Laundries	5	20	x	x	x

This table will also be an aid in checking up the "percentages of use" to see if the percentage assumed brings the net average use about to that shown in the table. It should be remembered that the ordinary peak load approximates *twice* the average demand.

The Storage Water Heater. This is usually a tank in which heating coils are installed, commonly termed the "multi-tube" type of storage heater (see Fig. 1). It not only serves the purpose of storing up hot water during periods when the full capacity of the heater is not required but also serves to reduce the boiler load for heating the hot water. Assuming an average hot water demand of 1000 gal-

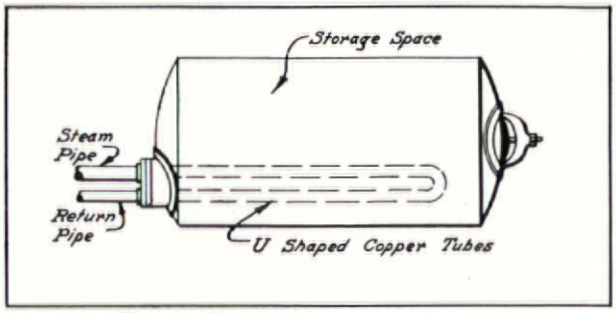


Fig. 1. Hot Water Storage Heater

lons per hour and a peak demand of 2000 gallons per hour, what would be the boiler load without storage and with storage? In the first case, with the water raised 100° Fahr. in temperature and taking a square foot of radiator surface as represented by 240 B.t.u., the boiler capacity used in square feet without storage will be

$$\frac{2000 \times 8\frac{1}{3} \times 100}{240} = 7944 \text{ sq. ft.}$$

but in the second case with storage provided of, say, 1250 gallons, and assuming that this 1250 gallons has been heated at some previous time of low demand, it will be necessary to heat only 1000 gallons per hour, making the boiler load under this condition

$$\frac{1000 \times 8\frac{1}{3} \times 100}{240} = 3472 \text{ sq. ft.}$$

or just half as much. Care must be exercised, however, to make the storage capacity sufficient to last over the *entire period* of peak load, because if it will not do this the reserve water will all be drawn out before the end of the peak period, as will be seen by assuming a water heater with 1250 gallons storage and 1000 gallons per hour heating capacity. If the peak load of 2000 gallons lasts only one hour, this heater will be sufficient, as it heats 1000 gallons and draws another 1000 gallons from its reserve during the first hour of the peak, leaving 250 gallons of hot water in the heater at the end of the first hour. During the second hour the heater will heat another 1000 gallons, but even after using the remaining 250 gallons in storage there will be a shortage of 750 gallons, and the hot water supply will fail almost immediately after the first hour period is completed. In actual practice it has been found impossible to draw out the entire storage without causing a general cooling of all the water in the tank, and for that reason a reserve of about 25 per cent of the total storage must be retained in the heater and *not used*.

Proportioning Heating and Storage. The relative quantities of heating capacity and storage capacity may be said to be represented by the equation:

$$\text{HC} + \text{SC} = \text{Peak Load} + 25 \text{ per cent of SC}$$

and this is based on the peak load, lasting about an hour as it generally does. HC (heating capacity in g.p.h.) should not be made less than the normal average demand as estimated, and storage capacity (SC) in general is made to equal the difference between normal demand and peak demand for the number of hours necessary to carry over from one period of low demand to another period of low demand. To illustrate, the peak load is generally double the normal load, and, based on this, what

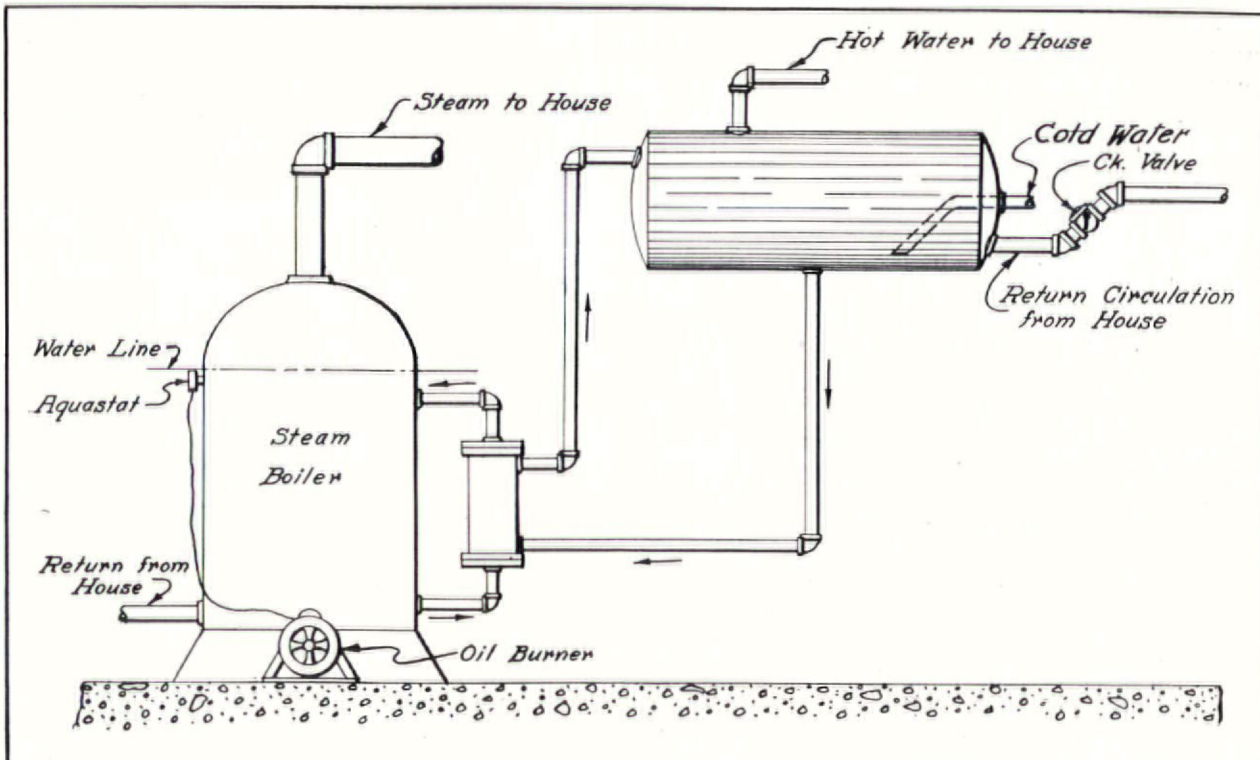


Fig. 2. Boiler and Storage for Domestic Hot Water

would be the combinations permissible for a normal demand of 1000 g.p.h.? If the peak load extends only over one hour, then the heating capacity must be sufficient to carry the normal demand or 1000 g.p.h. Substituting this in the equation, the result is

$$
\begin{aligned}
1000 + \mathrm{sc} &= 2000 + 25\%\ \mathrm{SC} \\
\mathrm{SC} - 25\% \text{ of } \mathrm{SC} &= 1000 \\
75\%\quad \mathrm{SC} &= 1000 \\
\mathrm{SC} &= 1350 \text{ gal. storage.}
\end{aligned}
$$

Then the heating capacity would be 1000 gallons per hour, and the storage capacity 1350 gallons. Should the peak demand extend over two or three hours, the SC must be doubled or trebled until the storage gets to a point where it is not desirable to further increase the size of the tank, at which time the HC must be increased.

To illustrate, suppose space conditions or some other reason made it undesirable to provide a heater of sufficient size to carry 1350 gallons, and instead only a 500-gallon storage could be obtained. What would be the necessary increase in heating capacity to give the same service? In this instance the SC is fixed at 500 gallons, and substituting this in the equation the result is:

$$
\begin{aligned}
\mathrm{HC} + 500 &= 2000 + 25\% \text{ of } 500 \\
\mathrm{HC} &= 2000 + 125 - 500 \\
\mathrm{HC} &= 1625 \text{ g.p.h. to be heated.}
\end{aligned}
$$

Checking this over against the previous proportion, it is found that during the peak hour the first heater with 1000 HC and 1350 SC gives

1000 gal. heated + 1000 gal. from storage equals 2000 gal, for use, while with 1625 heating capacity and 500 storage capacity, and the second heater gives

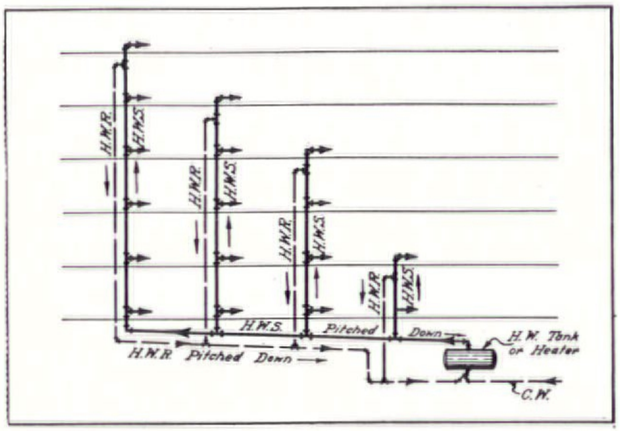


Fig. 4. The Upfeed Hot Water System

1625 gal. heated + 375 from storage equals 2000 gal. for use and in each case 25 per cent of the storage still remains untouched in the heater. The boiler load in the second case is higher during the peak hour than previously, owing to insufficient storage being provided. From this there may be deduced the general principle that if the heating capacity plus three-quarters of the storage capacity equals the peak load, the hot water supply will be sufficient provided that the heating capacity at least equals the normal load, and also provided that the storage is sufficient to carry from one time of low demand until the next.

The Instantaneous Heater. In some cases where the heating demand is a constant and continuous load, the instantaneous water heater is used. The most common use of such a heater is for a swimming pool, where the water is pumped through the heater at a constant rate. In the ordinary building the instantaneous heater is seldom used, since prac-

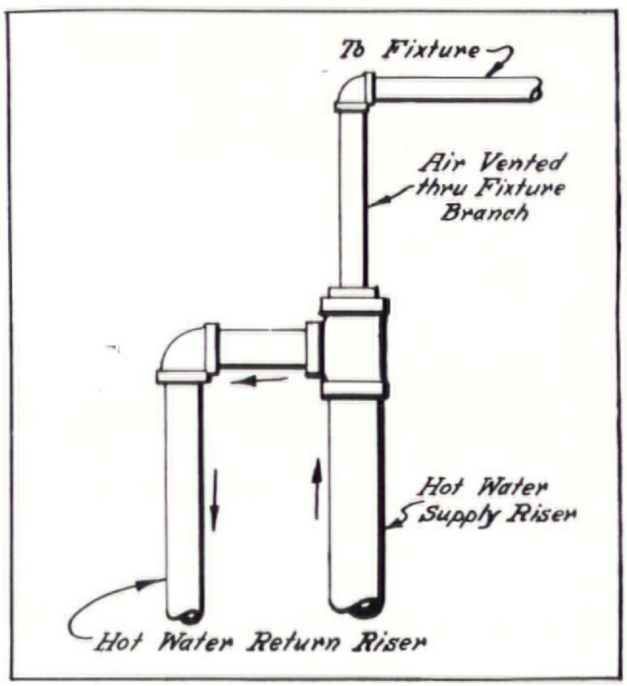


Fig. 3. Connection at Top of Riser

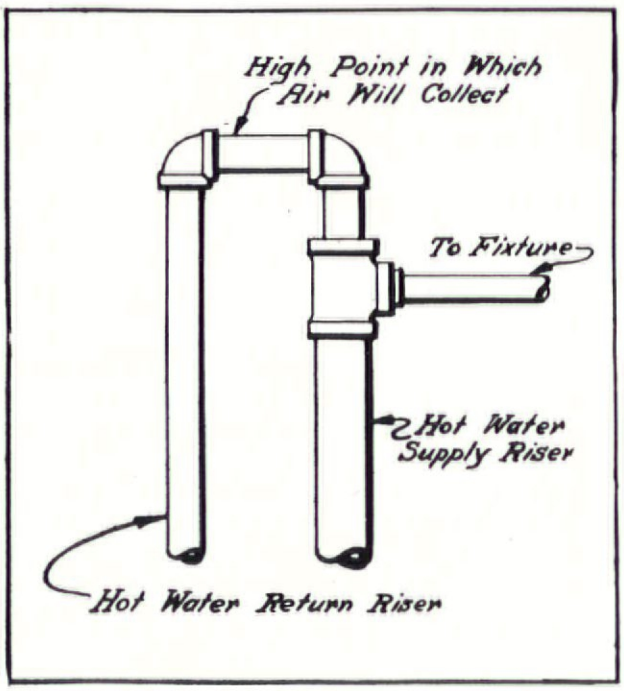


Fig. 5. Wrong Connection at Top of Riser

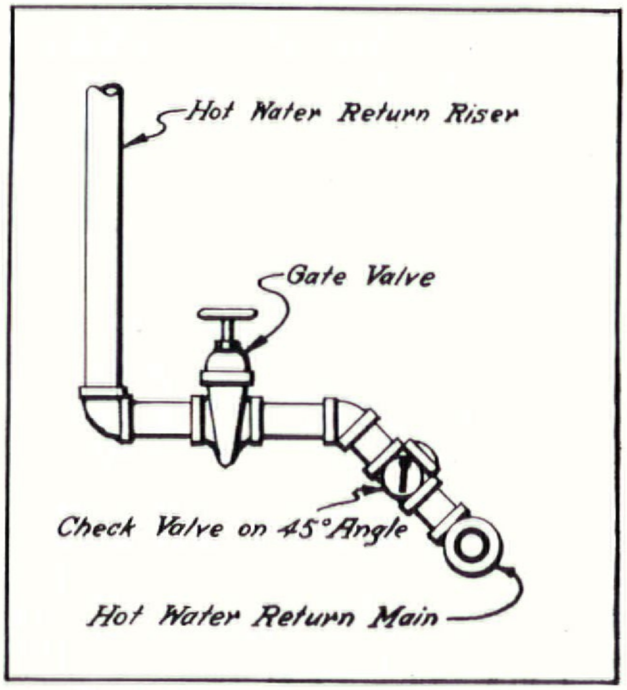


Fig. 6. Gate and Check Valve Connections

tically all building demands for hot water are of a fluctuating character. Small heaters of this type are used to advantage in residences and they are quick-acting; in some cases turning on the hot water faucet starts the heater in action.

Summer Supply. While there is very little difficulty usually in obtaining steam for heating water during the winter, in the summer season when no heat is on in the building it is sometimes a problem to know just what to do in order to care for this condition economically. In a very small building or in a structure where the number of plumbing fixtures is limited, use of an automatic gas water heater of the storage type with thermostatic control is probably the best solution. In larger installations, a small cast iron steam boiler to supply steam to the coils in the tank may be used.

Another method which has come into vogue recently with the advent of oil burners is to use one of the oil-burning boilers during the summer with an indirect heater in which the water for domestic service is heated. This is illustrated in Fig. 2. The oil burner may be controlled by an aquastat placed on the boiler. This turns on the oil burner whenever the temperature of the boiler water goes below 200° Fahr. and shuts it off whenever the boiler water reaches 210° Fahr. In this way no steam is produced, and the boiler water is kept at about 205° Fahr.

The little indirect heater consists of an iron casting or shell which is connected by circulation lines to the boiler, so that the water in the indirect heater is also kept hot. Inside the casing of the indirect heater is a copper coil, which is connected by circulation lines to the storage tank or heater. If the indirect heater is set below the water line of the boiler,—as it should be,—hot water will be obtained as long as the main steam boiler is not allowed to get cold. This arrangement will do equally well for winter use by simpy cutting out the aquastat control on the main steam boiler and switching over to pressure control for the oil burner.

System of Circulation. The arrangement of pipes to carry the hot water to the point where it is to be utilized must next be considered. In every installation of any size, a circulation system should be employed on the basis of convenience to the user as well as of economy of water consumption. The circulation line should be carried within 18 inches of the fixture outlet whenever possible. Hot water circulation is obtained by gravity, except in very rare cases where a pump may be used. Gravity is particularly feasible in tall buildings, whereas a forced circulation by means of pumping is necessary only in low buildings covering a large area, such as one-story industrial shops, etc. Circulation by gravity is obtained in two ways,—first, by what is known as the "upfeed" system, in which supply lines are carried up and return lines are carried back down to the basement, with both supply and return mains located in the basement; and second, by what is known as the "overhead downfeed" system in which all outlets are taken from returns supplied from an overhead main located at the top of the building, the main being fed from a single main supply riser from which there are generally no branches. The bottoms of all the returns are connected and are carried back to the hot water heater, thus completing the circuit.

The Upfeed System. In the upfeed system (Fig. 4) it will be noted that each group of fixtures, since the groups come over one another, is supplied from a special hot water riser, and that in order to have this riser circulate, a branch is taken off the top and carried back to a return main in the basement, this return main usually paralleling the supply main. The hot water outlet from the heater or tank is connected to the supply main, and the return main, after picking up all the circulation lines, is run back and united with the cold water makeup line, both being carried into the hot water tank or heater through a common pipe connection.

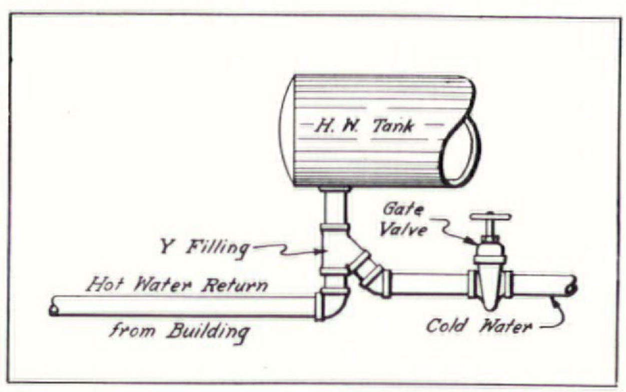


Fig. 7. Good Connection of Cold Water Supply

In "sizing" this supply pipe, the supply risers are sized first, and then the main supply is made large enough to carry the risers, increasing in size as it approaches the heater. In order to secure good results, it is necessary to pitch the supply up continuously from the heater to the last riser in order to prevent air from accumulating and interfering with the circulation. Any horizontal offsets in the riser must also be pitched up in the direction of the flow. At the top of the riser, air relief is usually provided through a fixture connection as illustrated in Fig 3. If the top of the riser is connected into the return circulation line, as shown in Fig. 5, the top of the loop will become filled with air, and circulation will cease. As the tendency to circulate is produced only by the difference in the weights of the columns of water standing in the supply pipe and in the corresponding return pipe, and as this difference in weight is dependent on the small amount of temperature difference, it will be understood how a very small quantity of air pocketed in the line at any point will interfere most seriously with the circulation. The return main is pitched downward in the direction of flow. Owing to usual returns being connected into one main return, it is necessary that each return line (which is usually made of ¾-inch size) be connected into the main return through a check valve, and of course a gate valve. In order that the tongue of the check valve shall offer as little resistance as possible to the circulation, it is desirable to set the check valve on a 45 degree angle so that the tongue will hang vertically, as shown in Fig. 6.

The circulation may be accelerated by connecting the cold water make-up into the hot water return through a "Y" fitting, so as to get the benefit of the injector-like action caused by the inflow of cold water whenever a faucet is opened, as shown in Fig. 7, instead of connecting the cold water line to the tank, where the inflow of cold water does not aid in helping the circulation. Regardless of the size of supply riser, a ¾-inch return circulation line is always sufficient to keep the supply line hot, since the only function of this line is to allow the water in the pipe

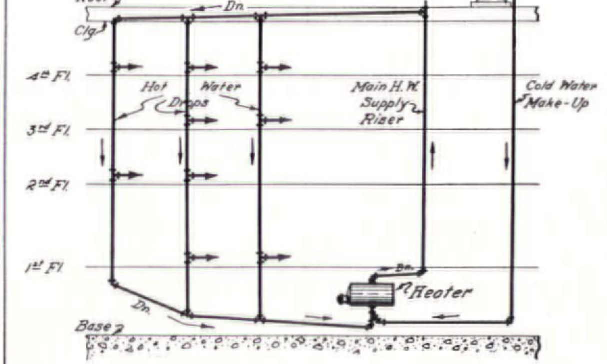


Fig. 8 Overhead Downfeed Circulating System

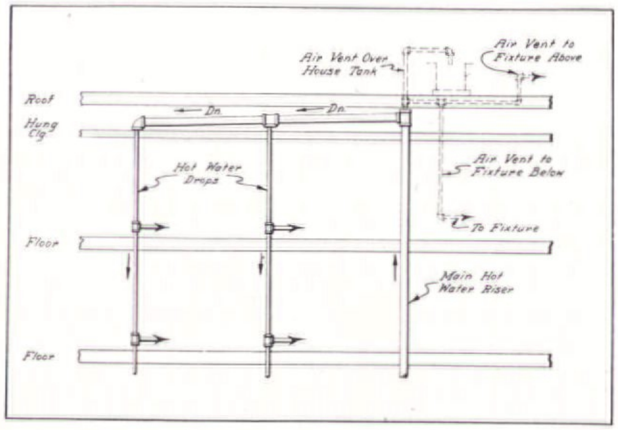


Fig. 9. Three Methods of Venting the Circulating Hot Water System

to flow back to the heater when no water is being used; when water is being drawn from the faucets in any quantity, the line will stay hot; but when no water is drawn off for a long period, the entire contents of the pipe will cool down unless circulation provision is made.

Overhead Downfeed System. In this system of circulation, all the hot water is carried to the top of the building in one main hot water riser and is there distributed horizontally to the various hot water drops which proceed down through the various floors, supplying the fixtures at each level. At the bottom, each drop is connected into a hot water return main which is carried back to the source of supply. Fig. 8 shows a typical circulation system of this character. Better results and less short-circuiting will probably be found in the overhead downfeed scheme, than in the upfeed type. One of the advantages gained in using the overhead downfeed system is that if the hot water tank is located anywhere near the main riser, the heater or tank may be kept comparatively high, owing to the small amount of upward pitch necessary in the short run to the riser; in the upfeed system the supply piping must slope up continuously from the tank or heater to the farthest riser in the building, often encountering low beams, resulting in the heater or tank being considerably depressed in order to maintain the proper pitch on the supply pipe.

Too much emphasis cannot be laid on the importance of pitch in circulating hot water lines; beginning at the tank or heater, the main supply must grade up to the main riser, which runs vertically and usually extends up to the high point on the system from which a small air vent,—of either ¾-inch or 1-inch pipe,—is carried up to, and spilled over into, the house tank. This air vent may also be carried up to a fixture at some higher level, or it may be taken off the top of the riser and then returned to supply some fixture below, the air rising into the top of the bend where it does not interfere with the circulation, and being forced down and out of the fixture outlet when the faucet is opened from time

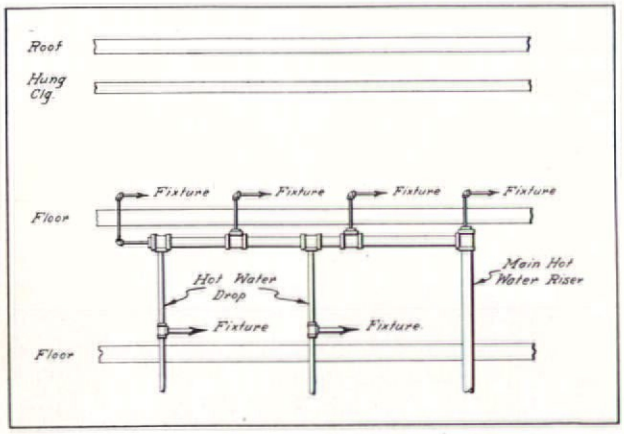


Fig. 10. Venting at Fixtures Above Hot Water Main

to time by the flow of water going to the fixture. These three methods of venting are illustrated in Fig. 9. Where possible, it is better to run the horizontal distribution main on the ceiling or in the furred ceiling under the top floor, and not under the roof as is usually done; this permits economy in piping and covering, a shortening of water travel, and air venting at numerous points; venting occurs wherever a fixture is located on the floor above, as shown in Fig. 10.

Hot Water Pipe Sizing. Hot water lines may be sized on the same basis and by the same methods as used for cold water lines as already explained. The sizes will not run as large as the cold water lines because, (a) all fixtures do not require hot water; (b) there are no connections of over ¾-inch size; (c) the hot water is not used as much as the cold water in most buildings.

In batteries of lavatories, showers, etc., where a large number of fixtures of the same kind are supplied with both hot and cold water, the hot water supply is usually made the same size as the cold water. It should also be remembered that, as all the hot water withdrawn from the system has to be replaced by cold water makeup coming into the heater or tank, the size of this cold water connection will have to be sufficient to supply the total hot water demand at peak load. It frequently works out that the combined area of all the ¾-inch returns when added to the area of the cold water makeup line will exceed the hot water supply pipe area; but the circulation proceeds when no makeup is entering the system, and consequently both lines do not necessarily deliver at their full capacity at the same time.

Hot Water for Showers. Shower baths require particular protection against excessive temperature water in all cases, but particularly when arranged in batteries for the use of children, as occurs in high schools, swimming pools, and some institutions. If the shower installation is sufficiently large to justify a separate hot water heater thermostatically controlled, so that the maximum temperature of water delivered to the hot water side of the showers does not exceed 100° to 110° Fahr., this is the best answer. Where this seems unduly expensive or structurally unwise, hot water may be taken from the central system and run through a thermostatic mixer where a certain amount of cold water is automatically added, the cooled water entering a "mixed" water line which is used for the hot side of the showers. Further protection may be obtained by inserting a thermostat in the mixed water line with a stop valve so that all mixed water is shut off as soon as the mixer fails to work properly and the temperature exceeds the desirable safe limit. This is illustrated in Fig. 11. In single showers, the use of the thermostatic mixing valve is efficient if a "mixed" water line cannot be obtained for the hot side. In kitchens, laundries, and industrial processes requiring special high-temperature water, it is advisable to use a separate heater or,—if high-pressure steam is available,—to use a thermostatic mixer specially designed for this purpose.

All hot water lines, both supply and return, should be covered with insulation, and the radiation from circulating lines should be allowed for in determining the heating load of the hot water heater.

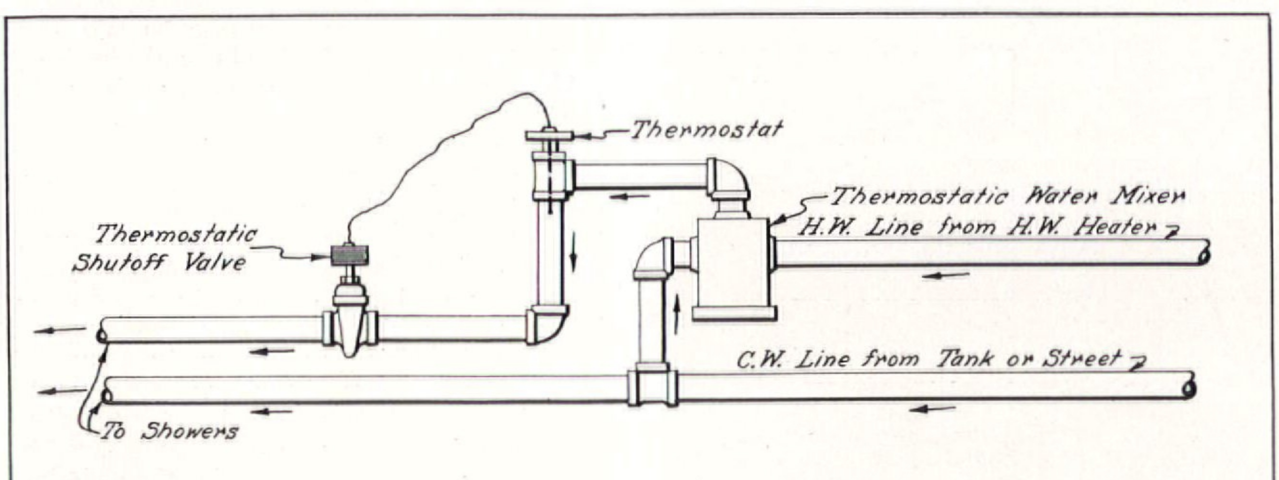


Fig. 12. Thermostatic Shutoff for Shower Supply

HOUSES OR STAGE SCENERY?

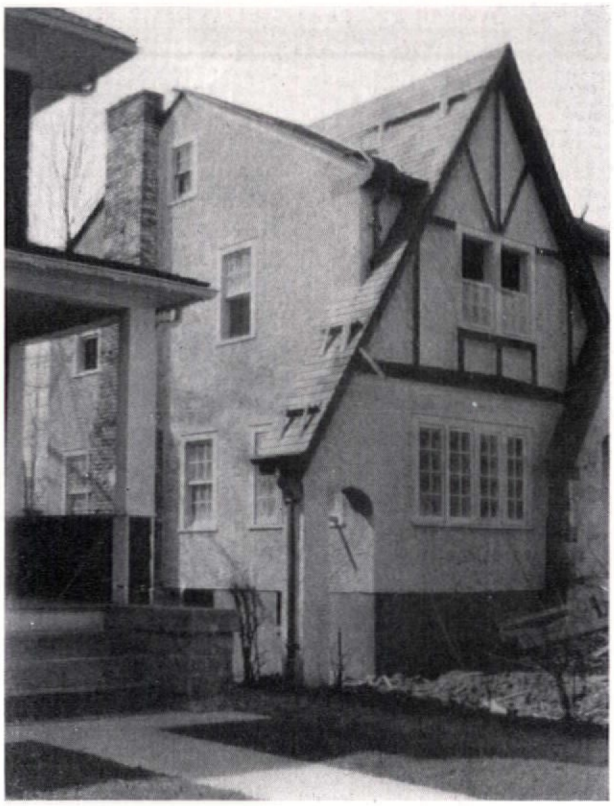
BY

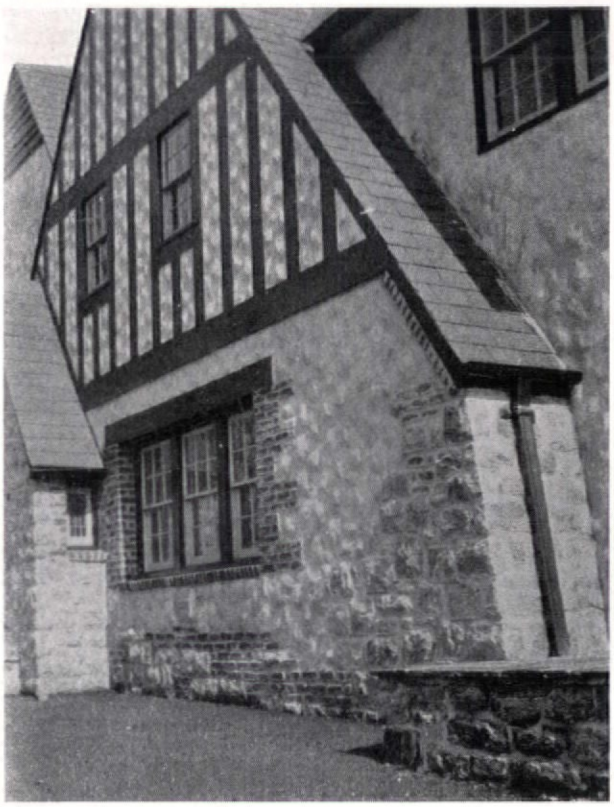
H. VANDERVOORT WALSH

WE are going through a very strange period in our domestic architecture. It is a make-believe era. We seem to want to live in dream houses, in quaint, old fashioned houses, in fantastic castles. In the working parts of our homes we demand practicality, but we try to clothe it with a veil of unreality. Perhaps life, with all of its grind today, is too wearing on our nerves, and we think of home as a retreat from the cold, bitter facts of our existence. Whatever be the cause of this feeling, the evidence is growing on every hand that people are demanding houses that reflect, not our own age, but some other past age. But this desire to live in a house that looks two, three, or four centuries old seems to be stimulated by the great number of magazines which publish soft and appealing illustrations of picturesque homes. Houses that are unreal, that are built like stage scenery, look very well in illustrations, for pictures are, after all, quite unreal. I believe these alluring views have helped to lead people on to imagining their homes as places of escape from life. They have stimulated them to want mediæval houses, for what dwellings are so romantic, so picturesque, so like the houses we read about?

American architects, sensing this some 20 years ago, were trying to design houses as they were built in the middle ages. In their trips through Europe, they were carried away by the picturesque quality of the very old English cottages and manors, and by the half-timber buildings in the towns, the houses of Normandy, and the quaint peasant homes along the French country roads. The urge to reproduce them was tremendous, and so they tried it, but failed. Their houses were hard and unromantic. The timbers which they put into them, in imitation of half-timber construction, were obviously sawed and planed planks of wood, veneered onto the faces of the walls. The stucco between the timbers was smooth and finished, like a piece of good, mechanical plaster work. The roofs were true, for rafters were cut straight by mechanical saws. The shingles or the slates were square and shiny, with perfect machine cutting. The whole appearance of their houses was as far away from that of the old, mediæval dwellings, which they had seen, as America is from Europe. Instead of being appealing, like a castle in a dream, they were cruel reminders of the hardness of a mechanical age!

But man is resourceful in his search for the things of his dreams. Some clever architects discovered that with a little trickery they could remove this hardness of the machine. Instead of using straight sawed planks, veneered onto the exterior to imitate the half-timber construction, these planks were subjected to a hacking process. The carpenter was instructed to rough up on the surface with his adz. The straight edges of the planks





Stage Scenery or Architecture?

were cut to wavy profiles, such as a solid timber would have had had it been adzed to shape from a tree. At a distance, when these doctored boards are nailed in place, they look like the real old thing; they seem to be heavy timbers, cut down from the nearby woods and set in place after having been shaped by axe and adz. The stucco placed between them (only about an inch thick and on metal lath!) was also subjected to a roughing process to make it look like solid, hand-laid masonry, such as was stuffed between the large timbers of the frame. It was gobbed on with a careless trowel and roughed up with a scratching stick and bespattered with the colors of old age. The illusion was perfect,—for those who knew a little about half-timber houses and had traveled in England. Atmosphere was acquired by a few dollars judiciously spent in getting good mechanics to work in a slovenly manner.

Now the architect had turned the trick. The half-timber house took on a beauty, under his direction, that was in harmony with the style. A touch here and there of a little stain; a broken stone or tile placed carefully; old vines and shrubbery cleverly located at critical points, finished the picture. His intellectual and moneyed client who had traveled and knew the periods of the various styles of architecture, applauded. A scholar and an artist, this architect must be! Such a romantic place to live! Such a relief from the world of mechanical things! So picturesque, so quaint! It was a triumph for the profession. Manufacturers were quick to catch the idea, and supplied the architects with the materials.

In ten years our domestic architecture, of the better class, took on a dignity and charm that Europe needed hundreds of years to acquire. Photographs of ancient masonry and brickwork were given to American-Irish masons, and they were told to build walls as nearly like them as possible. These good hearted men tried, in spite of the ridicule of their fellow laborers. Measured drawings of ancient buildings multiplied in all the periodicals. Studies with camera and pencil were made of the textures on old materials, so that the hard, machine-made thing could be hacked, clubbed, cut, cracked and smeared into a thing of beauty. And now the public has taken the doctrine of faking seriously. It has learned to love the spirit of the antique. It pretends to hate anything that is made by machine. If it cannot have a real hand-made product, it must look as though it were hand-made. The speculative builder has sensed the taste, and met the demand.

Never has there been such a conglomeration of construction materials as we are getting in the majority of our houses today. Riots of color in the roughest of stucco; plaster walls smeared with "plastic paint," a material never known before the age of American faking, are seen multiplying by the thousands. Oak timbered ceilings are made out of plaster or asbestos sheets in imitation of famous oak ceilings of old England, perfect reproductions for the untrained eye and almost deceptive to the trained; imitation wrought iron strap hinges on front doors, hinges which end at the edge of the door, the door itself swinging on common butts; old, battered lanterns, lighted by modern electric lights; yellow pine, pounded with a hammer and stained to look like ancient oak,—the fakes are innumerable and growing in number every day. Our houses are wild with "picturesque" things, stunts, curves and gable ends that swing down to the ground with no houses behind them. Everywhere we see houses of the old English farmhouse type, erected by speculators from the plans of "architects" who sell the designs, relinquishing all further interest in the development of the schemes. Many young architects turn these plans out on the side, as pot-boilers, getting from $50 to $75 per set. When such houses are turned over to the mercy of the builder, he develops them with his own choice of building materials that give the roughest kind of textures. He thinks he is simulating the work of the best architects, but this matter of using machine-made materials in imitation of the hand-wrought product requires the dexterity of a prestidigitator and the skill of the scenic painter to simulate reality. Although the design may have much in its favor,—suitable plan, and pleasant proportions of parts, etc.,—when this doctoring of materials is carried on by the uncouth builder, the results are monstrosities.

The sins of the professional architect have trebled themselves. His delicate art of retouching materials has grown to be a commercial necessity. Our magazines are filled with colorful advertisements, showing roof tiles, bricks, stucco, plastic paints, floor tiles, plaster ornaments, wrought iron hardware, and many other materials which are sold in a faked condition. Machines have been made which will stamp the touch of the craftsman all over the material. Each wrought iron object can have the same marks of the hammer of the craftsman in the same places, reproduced a thousand times. Wooden beams for the ceiling can be run through machines with revolving knives that will indent the surfaces like the cuts of a hand-swung adz,—only the machines will chip regularly every 2 inches, producing a marcel-wave texture. Plaster surface can be given the appearance of ancient work by covering it with plastic paints, and smearing it.

All this effort, all this added expense, is the result of the leadership of architects who have insisted on designing their houses in those styles which were developed during the days of no machines and when craftsmen worked with their hands. They have set the fashion, and the little fellows have copied, and the manufacturers of building materials have redesigned their machines to produce the kind of product that the fashion demands. Now is it not about time that architects of good taste recognized this dishonest use of building materials? Is it not time to begin building without disguise of materials produced by machines? Ought we not frown on use of all those styles of architecture which depend for effect on stage scenery, which imitates the work of the hand craftsman and the patina of age.

BUILDING FUTURE REAL ESTATE VALUES INTO HOMES

BY

TYLER STEWART ROGERS

UNDER the pressure of routine problems of design and specifications, of getting commissions and of executing them, there is a perfectly natural tendency on the part of some architects to neglect some of the fundamental problems which underlie all successful architectural practice. Particularly this is true of the economic aspects of building operations, which frequently become submerged under considerations of design features, clients' demands and ideas, and matters of expediency. The basic value of an architect's service lies almost wholly in the fact that it should produce a recognizable value, indeed a commercial or market value, greater than its cost, and consequently greater than of the building the owner could achieve without the architect's help. This article is concerned with the fundamental importance of constantly creating future real estate values in the designing and construction of homes.

Such neglect of this important matter as may be evidenced in the typical modern home arises in a very natural way. Today there is almost unprecedented interest in architectural styles, and home builders are vying one with another to create something particularly fine (or unique) in every style from the mediæval to the extreme modern. The vagaries of style popularity are dominating all architectural problems. The danger lies in the inpermanence of the popularity of styles, especially of those of the more eccentric and hybrid character,—and impermanence is a luxury few can afford in the development of a home. The vast majority of residences designed by architects are built primarily for occupancy by the clients. Naturally, the latter desire their homes to be designed to meet their particular requirements as to plan, accommodations and equipment, and to accord with their preferences as to style. In establishing his basic requirements, the owner is influenced by the size and composition of his family, his social habits, his hobbies, furnishings, taste, and his conceptions of luxury. Only rarely is he concerned with that future date when the property may change hands. He is building for himself, and "he wants what he wants."

Nevertheless, there is always the economic aspect to consider. Our present mode of living is in itself too impermanent to warrant the thought that an individual home is being built for future generations of the same family. Changes in family requirements for accommodations, a removal of business to another locality, an increase or decrease in the family income, death or the stork, or changes in the neighboring environment may result in forcing the house on the market, contrary to all previous intentions. Very often there is the opportunity to sell at a profit through a substantial appreciation in land values. The average house, built for occupancy, finds its way into the realty market, not once, but usually several times in a generation. At the same time it represents a major investment on the part of the client; an investment, in fact, that usually represents a substantial part of the owner's total estate. To be sure, this works out in an inverse ratio to the size and cost of the dwelling, for those who can build the more costly homes usually invest a smaller percentage of their wealth in the enterprise than those who seek more modest accommodations. It is of the utmost practical importance to conserve the investment and to surround it with every possible protection against depreciation and loss.

From an investment point of view, the minimum requirement is that the property at all times shall have a value equal to the original investment after deducting a fair charge for rent during the period of ownership and occupancy. It is not necessary to anticipate a complete recovery of the initial cost, for a building is not like a bond having a fixed recoverable value; depreciation, obsolescence, and maintenance charges must be anticipated. Only the land normally represents a true investment, having supposedly stable and undiminishing value. If the land enjoys an increment during the period of ownership, that increment represents a speculative return, and strictly should not be considered as an offset to undue depreciation in the value of the dwelling.

It may not seem difficult to so design and construct a dwelling as to meet this minimum economic requirement. There are many influences working at variance to this end, however, not the least of which is the owner's attitude toward his project. Furthermore, the last five years,—in fact the last 15 years,—have seen such inflation of values in real estate that many home owners and even bankers have come to expect at least a modicum of profit from their home building investments in the event of sales, and the economic standard just outlined represents less than a satisfactory outcome of their enterprises. In practice the architect has failed in his work if he has not injected into the project more than average stability in real estate values, barring only those projects in which the owners can afford to neglect entirely the economic phases, and indulge in the pure luxury of building what they want without respect to what other people will pay for it later on. The real test of the architect's product economically is the auction block. Here real estate values are established and measured. When two dwellings of equal size and accommodations reach the auction block together, after discounting land values, the difference in the prices they bring is a real dollar measure of the architect's skill and its value. The difference in price is then due either to matters of design or of construction, or both, and these matters are distinctly within the province and largely within the control of the architect.

There are four factors that influence the market value of a home. They are (1) obsolescence of style; (2) obsolescence of plan; (3) structural depreciation; and (4) neighborhood depreciation or appreciation. Expressed more positively, and with reference to new properties, the factors may be defined as, popularity of style and plan; quality of construction; and desirability of location and site.

Architectural Style; Its Market Value. Style popularity, or the "vogue" of architectural styles, is probably the most important single factor endangering stability in the market values of homes. Recently we have all seen the rise and fall in popularity of early Colonial, English, French, Norman, Italian, Spanish and other more or less readily defined period styles, and today we are watching the development of the "Modernist" style. The vogue changes almost as rapidly as styles in dress and motor cars. Travel, motion pictures, and even the radio, and more particularly the popular home building magazines themselves, have developed a surprising breadth of taste, and have largely wiped away the former regional preferences for one style. There is no longer an adherence to a "native" style; probably there never will be any unified, predominant style. The changing vogues are psychological in their origin; they are likely to run in waves or cycles and can, to all practical purposes, be neglected.

The permanent values in architecture are appropriateness and excellence of design. Considering design features only, those houses which possess the greatest excellence of design for their respective types command the highest prices when on the auction block. Popular appreciation of good design is not as insignificant as many students are led to believe. Appropriateness of design is a factor, for a house unsuited to its locality and environment is discounted in value. This means that the architect, seeking to establish permanent real estate values in the dwellings he designs, must avoid those eccentricities of design which are the outgrowth of either the clients' lack of perception of design values or the architect's ambition to do something unusual,—which frequently means something bizarre.

The owner is very frequently at fault in preventing the architect from doing his best work by insisting upon features of plan arrangement, ceiling heights, and other details which are at variance with good proportion and balance; or by insisting upon the use of materials inappropriate to the design that has been adopted; or more frequently by insisting on subsequent changes in the drawings or specifications to reduce cost, which often ruin the very features upon which the architect places the greatest reliance for achieving a successful and excellent structure. There is plenty of evidence in every suburb to support this statement. Speculative builders endeavor to emulate the more successful designs developed by skilled architects, but in doing so they lack the appreciation of details and refinements which distinguish the work of the real artist. Their products are frequently horrible examples of poor design, even when their inspiration may be drawn from excellent buildings. Those dwellings which retain their values over the longest period of years are those which are conservatively designed. Eccentricities are usually of very impermanent value. They may have vogue for the moment, but as public taste improves and as years go by, the oddities are exaggerated and detract from the value of the property. If one pauses to examine the work of those architectural offices which have achieved the most enviable prestige in the domestic field, one cannot help but note that conservatism is the keynote of their designs. They are rarely guilty of the fault of wasting time or effort endeavoring to achieve something wholly different or unique. Their products almost invariably have high and enduring market value.

Market Value of Intelligent Planning. Planning is extremely important in maintaining market values, and here again the owner's preconceived idea is frequently the most difficult factor to contend with in developing a plan for a house which will be salable later on. In plan the owner is most likely to express his individual requirements to the greatest degree, for while he may be willing to leave matters of style and decoration in the more expert hands of an architect, he feels himself competent to lay out a plan which will meet his own family requirements and personal ideas of convenience and luxury. The usual result is a plan that will fit only his own needs and which will be poorly adapted to the requirements of another owner. This unorthodox type of planning endangers realty values in various ways. If it results in an extended plan with many projections and irregularities, it increases the cost of construction without proportionately increasing the accommodations or the desirability of the structure as a whole. It may be poorly adapted to the more nearly normal requirements of a typical buyer. The social habits and housekeeping habits of the original owner may also be at variance with normal customs, resulting in a plan that is inconvenient and difficult to maintain. It is the architect's business to keep the owner's requirements within the bounds of reason in order that the house may be more truly adapted to average requirements, lest the market value ultimately prove to be far below the initial cost. He should bring these considerations to the attention of his client.

Market Value of Good Construction. Permanence in realty values obviously depends upon sound construction. An attempt to economize on structural details through the use of inferior materials nd poor workmanship is shortsighted "economy" of the worst type. Equally dangerous is the adoption of untried materials, either for the sake of economy or through curiosity to see how they work out. Many of the new products are excellent, but for every one that is good there are several which are merely cheap substitutes of unproved merit. Furthermore, a substantial proportion of the new products are developed to satisfy stylistic trends. For the time being these products may be very much in vogue and yet ultimately have no permanent value, especially when their use has been overdone. An example in point is the present use of plastic paints and other similar products used to achieve special decorative plaster effects. The materials that have been developed for this purpose are highly successful when properly used. Some of them are necessarily better than others, but all of them are susceptible to abuse. There has been a notable vogue for the rough plaster effects characteristic of the "Mediterranean" styles of architecture and some of the more primitive English and early Colonial dwellings. In the hands of a skilled architect these materials may be properly employed with the same restraint that is exercised in the use of many other decorative finishes, but the danger lies in their use under inappropriate circumstances and in exaggerating the effects beyond the limits of good taste. Actually, in the hands of speculative builders and those who have not appreciated the design limitations of these products, they have been so thoroughly abused that they are rapidly becoming in danger of losing their popularity. If this situation develops further, those dwellings which have been finished in this manner may lose something of their market value because such wall finishes are very difficult to remove. Only where they have been used with due consideration to their decorative precedents are they likely to contribute to the stability in market value of the dwellings in which they are employed.

A careful balance must be maintained between that ultra-conservative attitude which uses only tried and proved materials of a generation ago, and the ultra-progressive attitude which adopts without question and without proof the new products which daily enter the building market. Ten years hence a house which lacks those structural features which today are new but which possess such sound merit as to result in subsequent universal employment, will be out of date and subject to loss through obsolescence as compared with another building of equal age in which such materials have been properly employed. A half-dozen materials of this nature might be suggested, including insulation materials, the value of which has already been established beyond question; the use of tiles in bathrooms (preferably with the introduction of some color); and the use of modern heating systems selected for their efficiency and economy of operation and their susceptibility to practically automatic control.

Stabilizing Neighborhood Values. The fourth factor which influences future realty values,—the appreciation or depreciation in neighborhood land values,—may appear to be beyond the control of the architect. To a large extent this is true, except insofar as the architect may advise his client with respect to the selection of the site and contribute to the adoption of sound zoning regulations and other protective methods designed to stabilize realty values and to protect neighborhoods from an undue change in character. Nevertheless, the architect has one important responsibility in this respect, for it is part of his problem to design his client's house in a style and character which is well adapted to the chosen neighborhood and which will fit gracefully into the environment. The introduction of a Spanish type house in a colony of well designed Colonial structures may not only detract from the neighborhood's values but may be so out of place as to immediately penalize the owner, should he be seeking a loan or undertake to sell his property shortly after completion. Likewise, the development of a $50,000 house sandwiched between $20,000 structures endangers the client's investment far more than it enhances the value of the neighboring properties. Preventing such mistakes is definitely part of the architect's responsibility to his client, and in disseminating sound advice on these points the architect is also fulfilling his implied responsibilities to the community.

Realty Values and the Banker. We previously made the statement that the auction block supplies the crucial test of the architect's product, but there is another and more immediate test which frequently measures the value of the architect's services to his client. In the event a new home is to be financed partly on funds secured through a mortgage loan, the architect's drawings and specifications are subjected to the scrutiny of expert appraisers employed by the lender, appraisers whose function is to establish the market value of the completed property. Mortgage loans are not based only upon the cost of a house. The lender is concerned only with the protection which exists above the amount of the mortgage he grants in the event the property is forced upon the market through foreclosure or otherwise; in other words, the auction block value of the property is the only value that interests the lender. Under this critical test eccentricities of design and plan are measured as extravagances which have no value as bases for a mortgage loan. The extra cost of features not in accordance with popular taste and demand is immediately discounted. The appraisers may go further and consider eccentricities as injuring the market value of the property, thus lessening the size of a loan which may be obtained. The same consideration applies to luxurious features, details such as expensive paneling, decorations, etc.

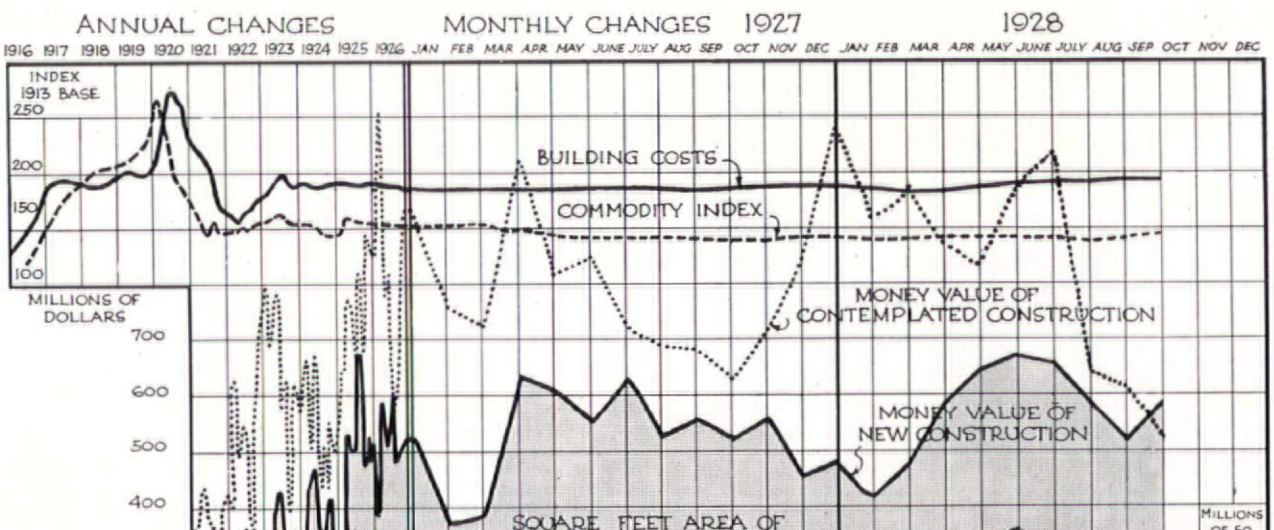
The best general guide to creating future real estate values in homes is to maintain a sane balance in design, plan, and construction so that a due proportion of the investment is devoted to structural details and a reasonable proportion to the matters of plan arrangement, decorative treatment, and finish. If the owner insists upon an unorthodox structure, the architect at least should call his attention to the probability that the ultimate market value of the property may be less than the owner anticipates.

THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

THIS year has been notable for the number of construction records broken month by month and for the cumulative totals during the first eight months of the year; and September construction continues this intensive activity. In the territory east of the Rocky Mountains construction contracts reached a total of $587,674,000, according to the figures of the F. W. Dodge Corporation. The area covered includes the 37 eastern states and represents approximately 91 per cent of the total construction in the United States. This construction total was 13 per cent ahead of the total for September, 1927, and 14 per cent ahead of the figures for August of this year. As a consequence of this activity, the cumulative total for the year represents a 7 per cent increase over the corresponding period of 1927. In analyzing these figures it must be noted that $86,000,000 is accounted for by five extraordinary construction contracts in the industrial and utility fields. A $40,000,000 power development in New Hampshire; a $10,000,000 rayon plant in South Carolina; a $9,000,000 coke plant in Pennsylvania; a $5,000,000 steel mill in Ohio; and subway contracts in New York of $22,000,000 play a part. The eastern states established new records, and the central and western states showed declines as compared with building activity during the preceding month and during the corresponding month of last year.

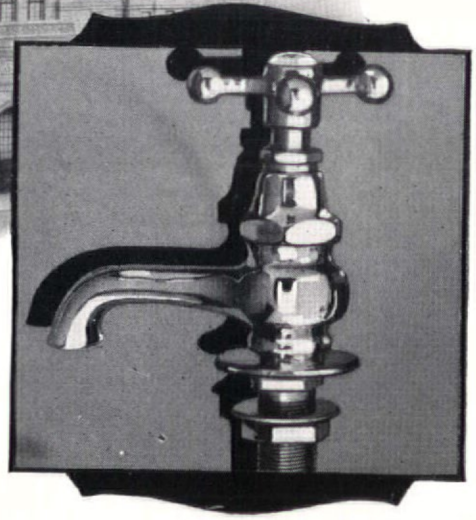
The outstanding items in the September building record include: $202,806,900, or 35 per cent of the total, for residential construction; $119,013,600, or 20 per cent, for public works and public utilities; $114,780,300, or 19 per cent, for industrial buildings; $60,068,000, or 10 per cent, for commercial buildings; $38,800,500, or 7 per cent for educational buildings; and $23,845,700, or 4 per cent, for hospitals and institutions. New projects contemplated and reported in the 37 eastern states amounted to $522,655,600, which is a decrease of 15 per cent from the total reported in August, 1928, and a drop of 17 per cent from the amount reported for September of last year. This decline in new projects, taken into consideration with a similar sharp decline during the preceding month, may be partly accounted for by prevailing high interest rates and a restriction in the money available for construction purposes. An analysis of the regional figures shows several trends which must be considered in the light of the five large contracts just noted. New York state and northern New Jersey showed an increase in September contracts of 22 per cent as compared with the preceding month, and 46 per cent as compared with September, 1927.



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

MEETING ARCHITECTURAL STANDARDS OF QUALITY

Fidelity Philadelphia Trust Co. Building, Philadelphia, Pa., equipped with Solid Nickel Silver plumbing fixtures furnished by the John Douglas Co. of Cincinnati, Ohio. Simon & Simon, Architects.



SOLID NICKEL SILVER PLUMBING FIXTURES by DOUGLAS

Among the fabricators of Solid Nickel Silver equipment is the John Douglas Co. of Cincinnati, Ohio. This company is regularly producing plumbing fixtures which are pressure tight and have all the beauty, lustre and long-wearing qualities afforded by alloys of high Nickel content...Solid Nickel Silver offers advantages that impress architects and builders whose clients demand the best. The physical properties of Solid Nickel Silver—hardness, toughness and strength—resemble those of tough bronze. It combines the beautiful, lustrous color associated with Pure Nickel with the improved wear-resistance characteristic of high Nickel Alloys...When you specify Solid Nickel Silver for quality plumbing, you specify the most modern type equipment.

18%/22 Nickel SILVER

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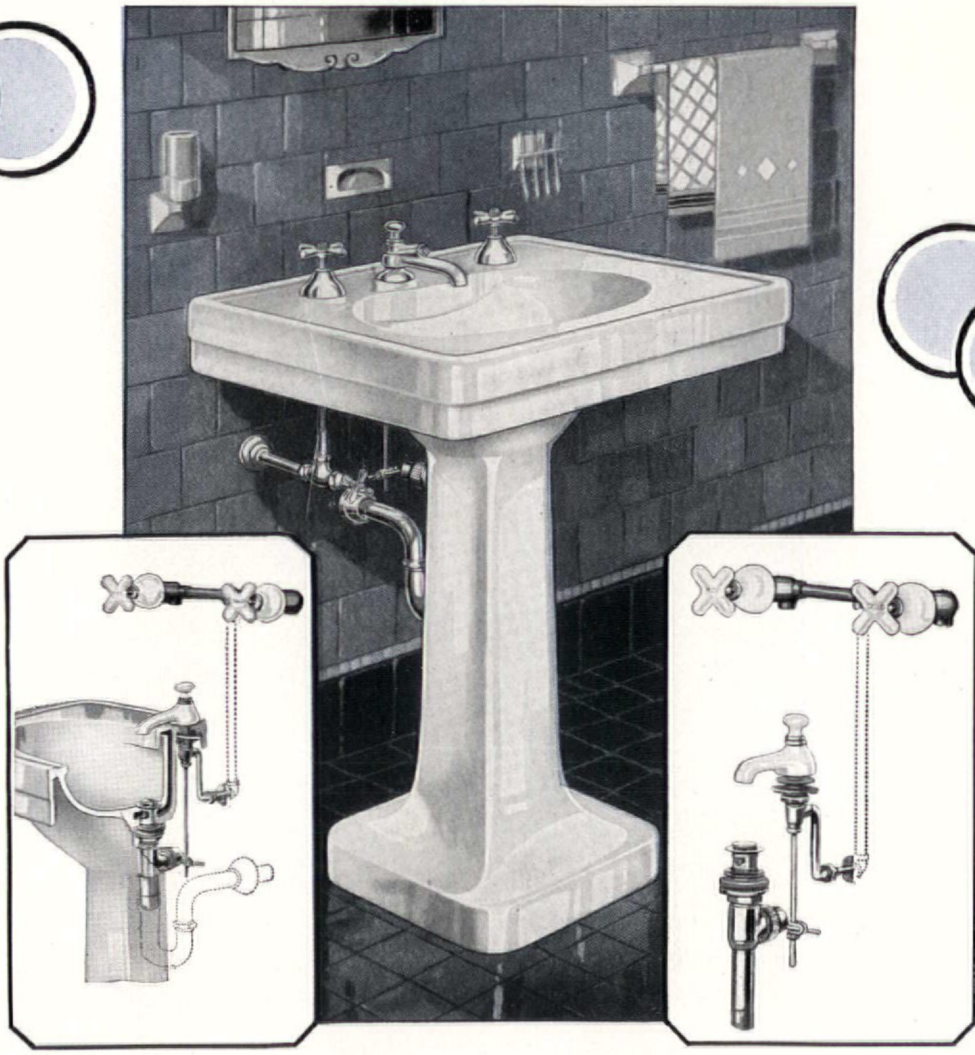

The Mueller G-3616 Lavatory Combination with pop-up drain and built-in valves is the type of fitting that seems to adapt itself most naturally to the modern bathroom. The high grade Mueller red brass of which all invisible working parts are made is a suitable complement for the lustrous vitreous china escutcheons and handles that make up the visible part of this combination.

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The tank is equipped with fittings that are made especially to assist in quiet operation.

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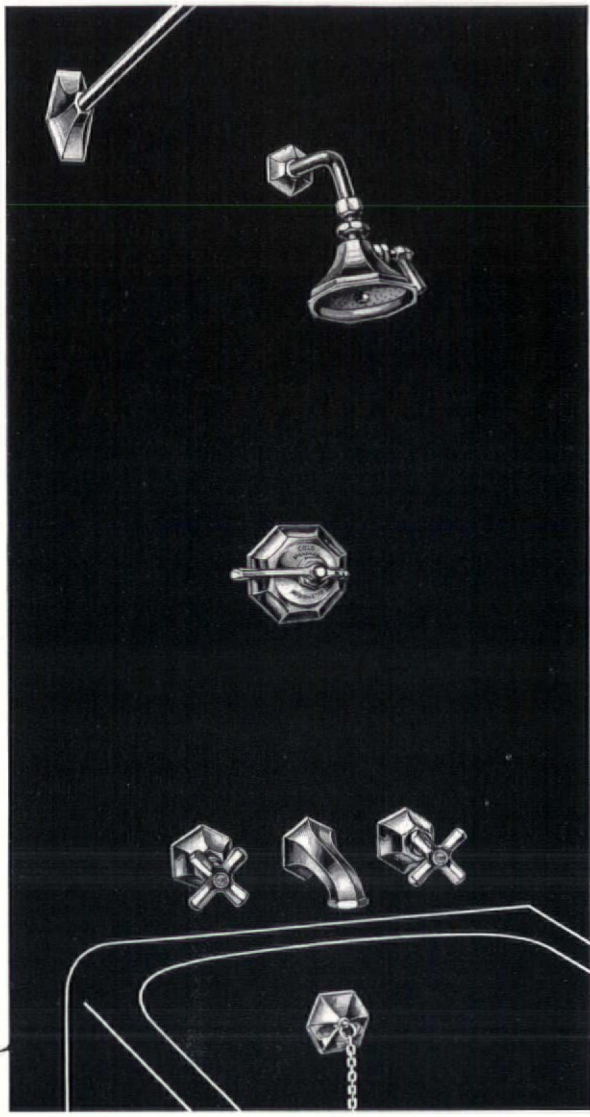

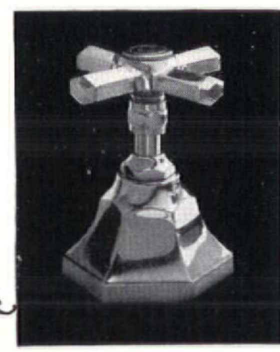

On the choice of forks

Forks of one pattern . . . Knives of another . . . Spoons of a third.

Incongruous, isn't it?

Architects, many of them, are asking themselves if a hodge-podge of fixtures in the bathroom is any less so.

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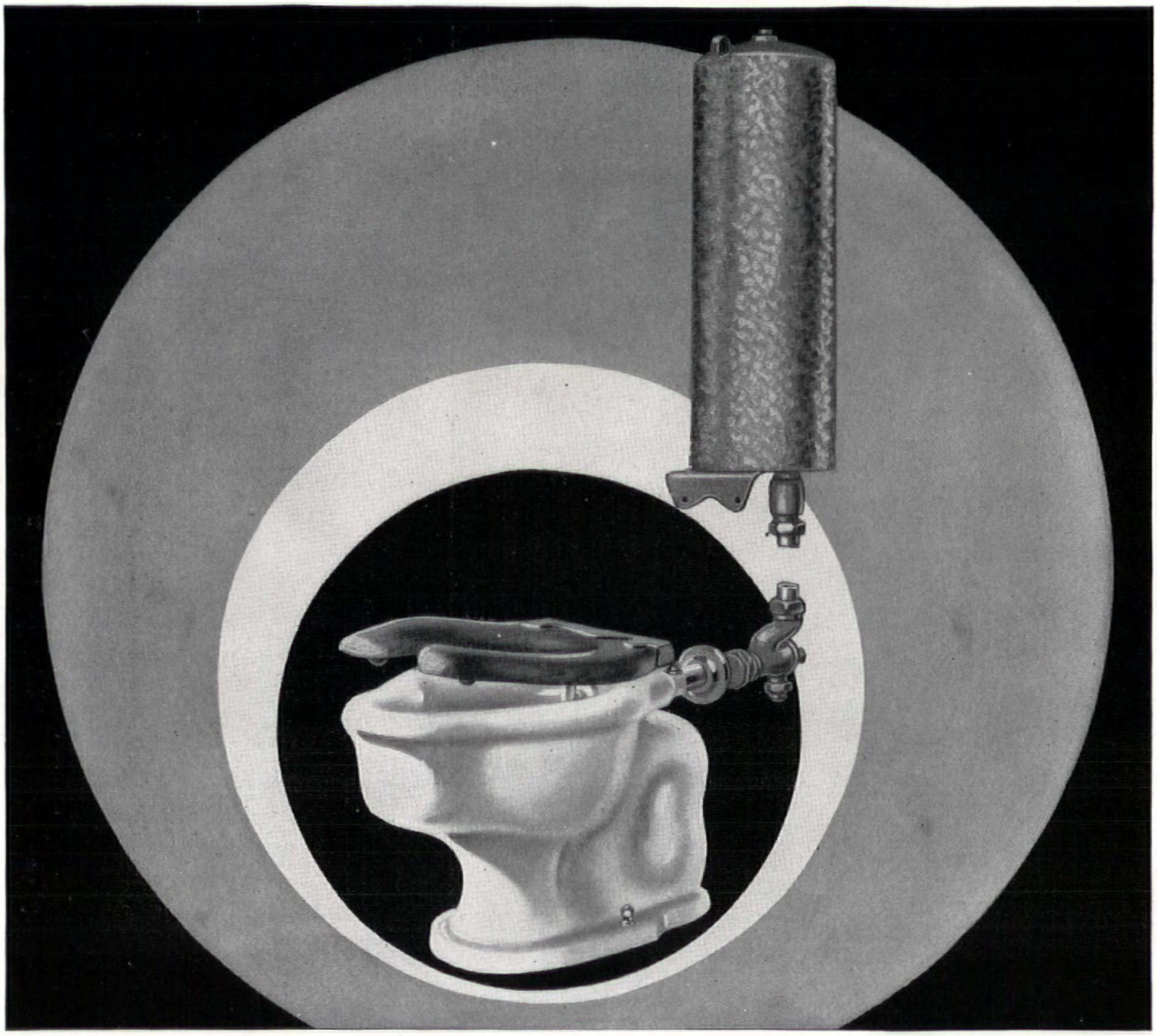

A Style for Every Need . . . . . .
Each with Extra-Heavy Bowl . .
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All Clow Madden Automatics carry the extra heavy Adamantose bowl—weighing as high as 60 pounds—far heavier and stronger than the average. Moreover, this twice-fired Adamantose ware absorbs no stains, shows no cracks or checks.

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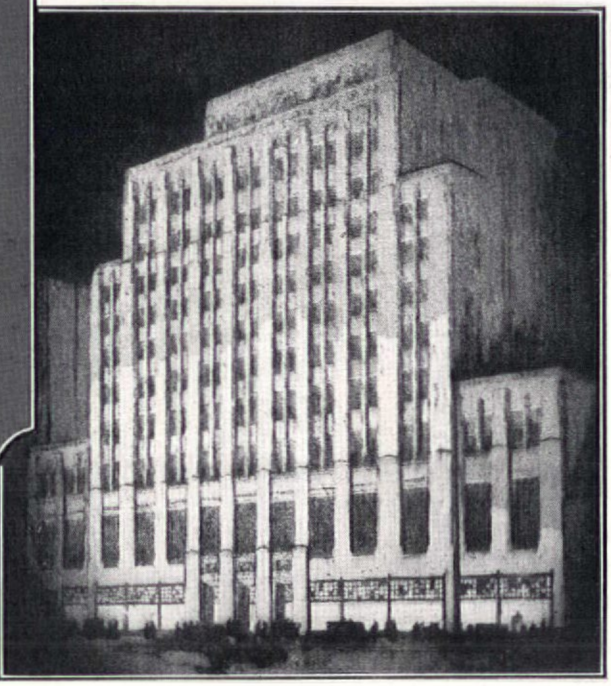

A. Donald Douglass Aquatint study of the Title Insurance Building, Los Angeles.
Architects—John Parkinson & Donald B. Parkinson.

BECAUSE they are finished in CRODON, the chromium plate, 447 Jenkins Radiator Valves installed in the Title Insurance Building, Los Angeles, Cal., will permanently retain their initial lustre and attractive appearance. After years of constant use their CRODON surfaces will be mirror-bright—free from tarnish or corrosion.

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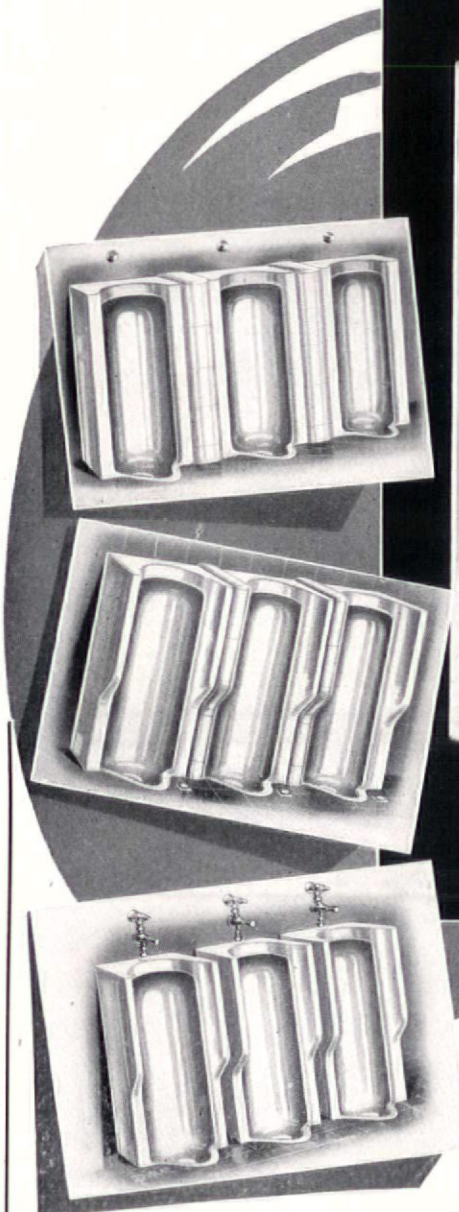

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The same difference that you would understand in considering a water closet or lavatory made of anything but Genuine Vitreous China.

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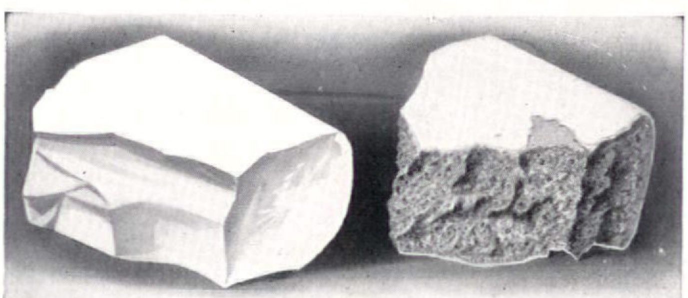

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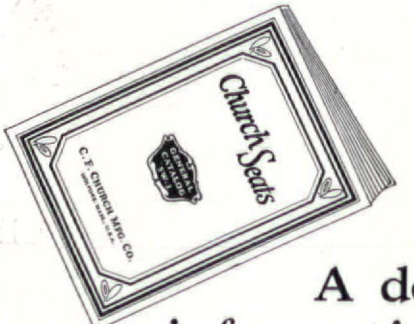

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-a building worthy of its setting
THE site of this superb structure . . . 39 Broadway . . . is said to be the location of the first erection of any kind, by the Dutch, on Manhattan Island (1615). Here General Washington made his home at the time our first Congress was in session and when New York was the Capital of the nation. Once, in the same dwelling lived the first minister of France. History has richly endowed this spot . . . crowning it now with an architectural achievement worthy of its setting. Rising majestically, thirty-six stories into the air, this fine structure may well appear as a fitting monument to three centuries of building progress.
The Harriman Building's high place among modern architectural creations is not based on size any more than on the character of construction . . . stability as well as beauty is reflected throughout. Within this structure are numerous engineering achievements, among them being a modern piping system of unusual efficiency, designed and installed to assure continuous and satisfactory service for heating, water supply, fire protection, sanitation, etc. The major pipe tonnage of this system is "NATIONAL"—The Recognized Standard for Building Purposes.
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Why invite trouble? Make it wrought iron

IT'S useless to argue and storm about what is past, of course; but in Heaven's name, let's not repeat the same folly. After all our experience with pipe failures, I wouldn't for a minute consider anything but genuine wrought iron for the new addition.

We've got to keep down our costs, Mr. Brett, and wrought iron runs about 70% more than cheaper pipe.

Seventy percent more for better pipe doesn't mean a thing to me, Thompson, after the experience we've had. I'd consider it cheap at double the price.

It will amount to five or six thousand dollars on the new job. That's quite a saving, you know, and we've got to trim somewhere.

Yes, I know, but of all the ways of economizing, putting in cheap pipe is the last one I'd favor. Why, Thompson, it must have cost us ten thousand dollars for replacements in the last five years. And it's getting worse instead of better. I'm not exaggerating. The amount of pipe we've replaced can't amount to more than a few hundred feet; but by the time we pay the carpenters, plasterers, tile setters, painters and plumbers, and add our overhead, it runs into thousands of dollars.

I can bear you out there, Mr. Brett. Take the last failure, on the seventh floor, for instance. We replaced about forty feet of pipe. It cost us exactly \$483.50—over ten times more than the cost of the pipe alone.

That's my point. So make it Byers. If we are going to use wrought iron, it might as well be the best; and make sure that there is no substitution. All pipe looks alike to me.

Never fear, Mr. Brett. Nobody is going to put anything over on me. Besides, Byers now has the plain spiral stripe in red; that makes it easy.

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Established 1864 Pittsburgh, Pa.

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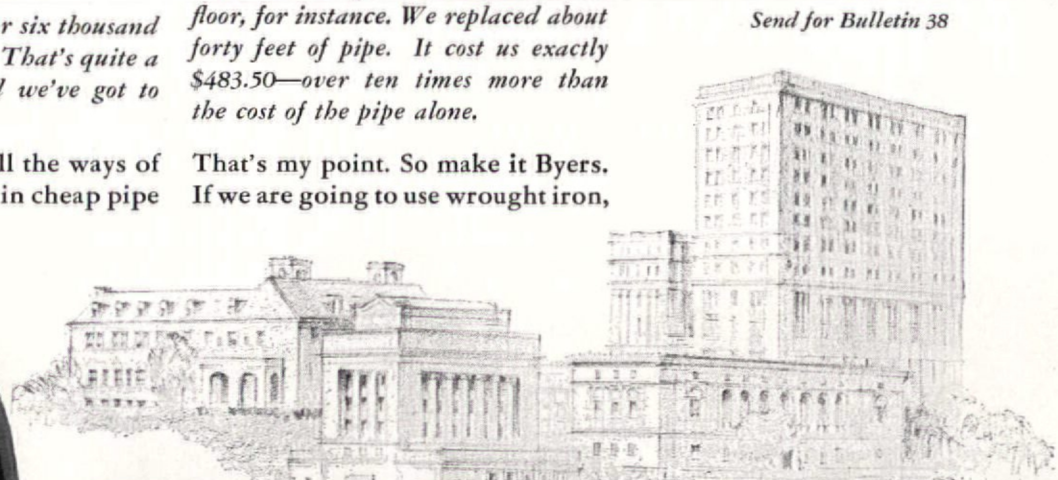

BYERS PIPE

GENUINE WROUGHT IRON

AGAINST lacquered walls in red and gold, against the black of the bath niche tiling gleam fixtures in citrus yellow; in this Mandarin bath the decorative art of the east happily meets the plumbing convenience of the west. Into their setting, as though designed for just this room, fit the *Corwith* lavatory, the *Tarnia* bath, the *Corsyn* closet. The simplest cottage bathroom too is lifted out of the ordinary by Crane fixtures; wherever installed they are always interesting. And they cost no more than substitutes. *New Ideas for Bathrooms* is an illustrated book containing blue prints and full decorating and arrangement information for a series of delightful rooms, with beautiful Crane materials, remarkably reasonable in price. There is a special 48-page architect's edition. Write for it.

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The success of this policy of supplying only one kind of pipe—the best—is indicated by the fact that Cohoes Wrought Iron Pipe is being recommended and used by an ever-increasing number of contractors and builders.
You will find many uses for the handbook "PIPE FACTS" which we will be glad to send you.
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TRANE SELECTED —
for Beautiful New Mayo Clinic
ROCHESTER — MINNESOTA

Climbing sixteen stories into the air and topped by an enormous tower this beautiful structure is an outstanding building of its type.

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Ellerbe & Company, St. Paul

ENGINEER:
N. D. Adams, St. Paul

CONTRACTOR:
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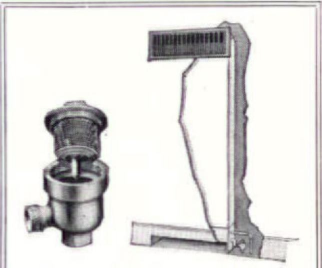
ENGINEERS responsible for the new Mayo Clinic Building, recently erected for the famous Rochester Surgeons—Mayo Brothers — chose with care a heating system that would embody the inherent requirements of the modern clinical building.

A complete Trane Heating System using 698 Bellows Traps and 440 Concealed Heaters was selected. The trap selection was made on the basis of performance of other Trane Traps in Mayo owned buildings. In 1926, the old Mayo Clinic Hospital was outfitted with 260 Bellows radiator traps. Since that time dozens of traps have been installed on replacement jobs throughout various buildings. And now comes this crowning achievement of Mayo Building for which Trane Traps were selected because of known reliability.



Trane Bellows Trap.

Phantom View of Trane Concealed Heater.

Trane Concealed Heaters replace bulky radiators entirely on this installation. Concealed between the walls, out of the way and out of sight they provide adequate heat always under instant control — a prime requisite in a building of this type. Special duct work is so arranged that either room air may be recirculated over the heating unit or fresh air may be drawn in from the outside. In effect, each room throughout this imposing edifice has its own ventilating system—instantly controlled without regard to the rest of the building.

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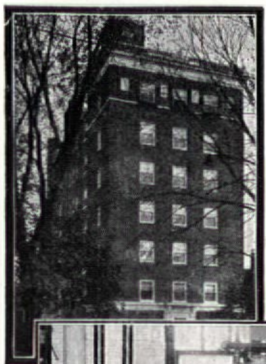
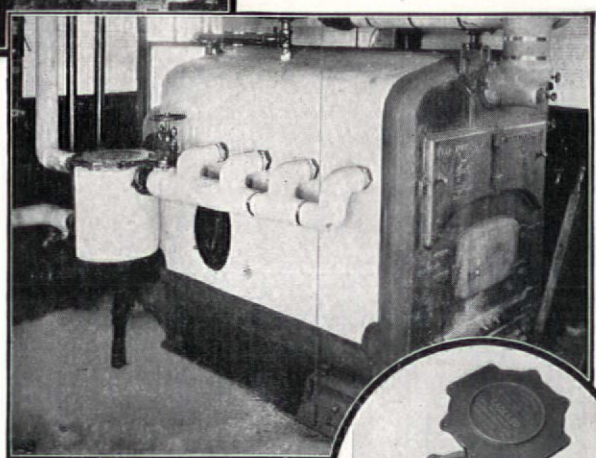
PUMPS, UNIT HEATERS, AND HEATING SPECIALTIES

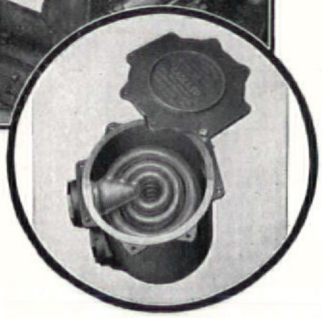
Sizes to Supply HOT WATER

For One Family or One Hundred Families



INDIANAPOLIS, IND.
Windermere Apartments. Plumbing and Heating by Freyn Bros., hot water with the Excelso Triple Copper Coil Indirect Heater Pictured.





Showing how hot water flows thru copper coil and patented ground joint brass connections, insuring absolutely pure and clean water supply.

BIG and little apartments and hotels, business blocks, office buildings, factories—any type or size of building can be effectively and economically equipped with Excelso Water Heaters.

To save the care and cost of separate fire for heating the domestic supply of hot water, connect an Excelso and save the major part of the usual cost, summer and winter alike.

Excelso Products Corporation
DIVISION OF AMERICAN RADIATOR COMPANY
69 Clyde Ave. Buffalo, N. Y.

Sold and Installed by All Plumbers and Steamfitters

EXCELSO WATER HEATERS

Sizes to Heat Water for One Family or One Hundred Families

acids

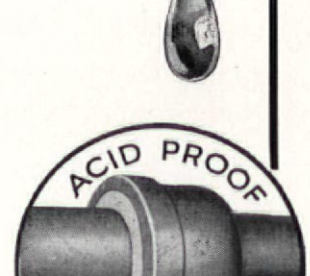
wasted in the drainage system corrode ordinary pipe rapidly

the replacements needed plus the original cost soon exceed the single cost of an acid-proof Duriron installation guaranteed against failure from corrosion for 20 years—
and not needing the guarantee

Duriron pipe is installed the same as e. h. cast iron soil pipe and passes all codes

made only by

The Duriron Company
Dayton
Ohio



The Co-operative Apartment Building, Chicago, Ill., where Youngstown steel pipe insures a permanent plumbing installation.

Architects: McNally & Quinn

Plumbing Contractor: Economy Plumbing & Heating Company.

Specialists in Steel—

at your Service

IF YOU desire sound advice on any question connected with the selection of pipe, electrical conduit or sheet metal, call on the nearest "Youngstown" office. The "Youngstown" organization of representatives are specialists in steel—schooled to serve you in an advisory capacity and to help you with your problems. You will find these representatives, well trained and well versed in steel-lore acquired by broad experience. You will find them anxious to help you without the slightest obligation on your part.

For the new and complex problems, they have at their disposal the facilities of The Youngstown Sheet & Tube Company's modern laboratories and its skilled research engineers, which a telephone call or wire will set in action for your benefit.

Don't hesitate to call upon these specialists in steel—they are there to serve you, and there are no strings tied to this service.

THE YOUNGSTOWN SHEET & TUBE COMPANY

General Offices—Youngstown, Ohio

SALES OFFICES IN 20 CITIES

PIPE SHEETS CONDUIT

YOUNGSTOWN

If It's Sheet or Plate Construction....

THE ARMCO organization maintains a Sheet Metal Service Bureau whose services are available to architects, engineers, and others interested in the economical and efficient application of sheet metal.

Twenty years' experience of the world's largest exclusive producer of special analysis iron and steel sheets for exacting uses, together with the experiences of recognized competent sheet metal craftsmen, are at your disposal through this bureau.

Shall we assist in working out your problems in the specification of galvanized, black or blue annealed sheets or plates? There is no charge nor obligation.

Address ARMCO Architectural Consulting Service, Middletown . . . Or any of the offices listed below.

THE AMERICAN ROLLING MILL COMPANY

Executive Offices, Middletown, Ohio

Export: The ARMCO International Corporation
Cable Address—ARMCO, Middletown, (O.), U. S. A.

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Cincinnati	New York	San Francisco
Cleveland	Philadelphia	St. Louis

ARMCO

ARMCO INGOT IRON RESISTS RUST

Selected List of Manufacturers' Publications

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

The publications listed in these columns are the most important of those issued by leading manufacturers identified with the building industry. They may be had without charge, unless otherwise noted, by applying on your business stationery to *The Architectural Forum*, 383 Madison Ave., New York, or the manufacturer direct, in which case kindly mention this publication.

ACOUSTICS

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

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

BASEMENT WINDOWS

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

BATHROOM FITTINGS

A. P. W. Paper Co., Albany, N. Y.
Onliwon for Fine Buildings. Folder, 8 pp., 3¼ x 6 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, 31 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 pages, 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, 23 pp., 8½ x 11 ins. Illustrated. Price 25 cents. Deals with construction of fireplaces and chimneys.
Skintled Brickwork. Brochure, 15 pp., 8½ x 11 ins. Illustrated. Tells how to secure interesting effects with common brick.
Building Economy. Monthly magazine, 22 pp., 8½ x 11 ins. Illustrated. $1 per year, 10 cents a copy. For architects, builders and contractors.

CEMENT

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

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

Kosmos Portland Cement Company, Louisville, Ky.
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.

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

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.

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

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

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

CEMENT—Continued

Portland Cement Association, Chicago.
Concrete Masonry Construction. Booklet, 47 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.
Town and Country Houses of Concrete Masonry. Booklet, 19 pp., 8½ x 11 ins. Illustrated.
Facts About Concrete Building Tile. Brochure, 16 pp., 8½ x 11 ins. Illustrated.
The Key to Firesafe Homes. Booklet, 20 pp., 8½ x 11 ins. Illustrated.
Design and Control of Concrete Mixtures. Brochure, 32 pp., 8½ x 11 ins. Illustrated.
Portland Cement Stucco. Booklet, 64 pp., 8½ x 11 ins. Illustrated.
Concrete in Architecture. Bound Volume. 60 pp., 8½ x 11 ins.. Illustrated. An excellent work, giving views of exteriors and interiors.

CONCRETE BUILDING MATERIALS

Celite Products Company, Chicago, New York, Los Angeles.
Designing Concrete for Workability as Well as Strength. Brochure. 8 pp. Illustrated. Data on how improved workability in concrete is secured without excessive quantities of water.
Better Concrete; Engineering Service Bulletin X-325. Booklet. 10 pp., 8½ x 11 ins. Illustrated. On use of Celite to secure workability in concrete, to prevent segregation and to secure water-tightness.
Economic Value of Admixtures. Booklet, 32 pp., 6⅛ x 9⅛ ins. Reprint of papers by J. C. Pearson and Frank A. Hitchcock before 1924 American Concrete Institute.

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

Kosmos Portland Cement Company, Louisville, Ky.
High Early Strength Concrete, Using Standard Cosmos Portland Cement. Folder, 1 p., 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.

Northwestern Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill
Northwestern 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

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

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Waterproofing and 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.

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

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 161*

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.

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.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¾ 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.
Baldor Electric Motors. Booklet, 14 pp., 8 x 10½ ins. Illustrated. Data regarding motors.

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

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

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

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

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Power for Buildings. Brochure. 14 pp., 8½ x 11 ins. Illustrated. A publication important to architects and engineers.
Variable-Voltage Central Systems as applied to Electric Elevators. Booklet, 13 pp., 8½ x 11 ins. Illustrated. Deals with and 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 8¾ ins. 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.
Catalog and pamphlets. 8½ x 11 ins. Illustrated. Important data on different types of elevators.

ESCALATORS

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

FIREPROOFING

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

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

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

FLAGSTONES

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

FLOOR HARDENERS (CHEMICAL)

Master Builders Co., Cleveland, Ohio.
Concrete Floor Treatment. File, 50 pp. Data on Securing hardened dustproof concrete.
Concrete Floor Treatments—Specification Manual. Booklet, 23 pp., 8½ x 11 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.

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.

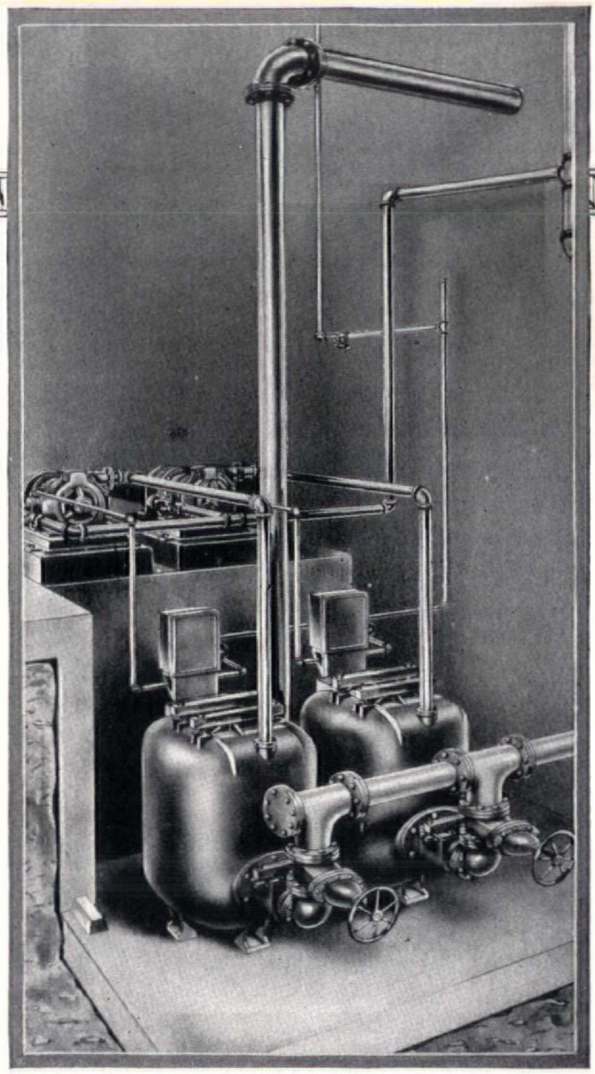
FLOORING

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog. 8½ x 11 ins. 40 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors.
Armstrong's Linoleum Pattern Book, 1927. Catalog. 3½ x 6 ins. 272 pp. Color Plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.
Quality Sample Book. 3½ x 5¾ ins. Showing all gauges and thicknesses in the Armstrong line of linoleums.
Linoleum Layer's Handbook. 5 x 7 ins. 32 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.
Enduring Floors of Good Taste. Booklet. 6 x 9 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 super-quiet, resilient floor.
Resilient Floors in Schools. Resilient Floors in Stores. Resilient Floors in Hospitals. Resilient Floors in Offices. Resilient Floors in Apartments and Hotels. Booklets, 8 pp., 8½ x 11 ins. Illustrated.
Specifications for Resilient Floors. Leather bound booklet, 48 pp., 8½ x 11 ins. Illustrated. Practical working specifications for installing battleship linoleum, cork composition tile and cork tile.

Carter Bloxonend Flooring Co., Keith & Perry Bldg., Kansas City, Mo.
Bloxonend Flooring. Booklet. 3¼ x 6¾ ins. 20 pp. Illustrated. Describes uses and adaptability of Bloxonend Flooring to concrete, wood or steel construction, and advantages over loose wood blocks.



For handling sewage . . where space is limited

EVEN the *duplex* Jennings Sewage Ejector is compact enough to assure ease of installation where space is limited. Two motor driven *Hytor* compressors — two receiving pots—and the automatic controls constitute the entire plant. Altogether there are but few parts, and these are simple in design, providing reliable ejector service at low operating costs.

◆ ◆ ◆

When discharging the pots, the compressors—started by float-switches—pump air directly to the ejectors and force out the accumulated sewage. Because no high pressure air is needed—because air is required only when sewage is being moved—and, because air displaced by incoming sewage passes through the compressor to vent—reciprocating compressors, air storage tanks and intricate valve systems are dispensed with.

Duplex installations are recommended for pumping unscreened sewage from basements below street sewer level in office buildings, apartment houses, hotels and hospitals. Single Jennings Ejectors may be employed where less volume is to be handled. Ejectors are supplied in standard sizes up to 1500 g.p.m. capacity. Heads up to 50 feet. Bulletin 67 contains full information. *Write for your copy.*

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

Jennings Pumps

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

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

FLOORING—Continued

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.

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

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

W. & J. Sloane Mfg., 577 Fifth Ave., New York, and Trenton, N. J.
Linoleum Patterns. Brochure, 10 pp., 8½ x 11 ins. Illustrated. Deals with fine assortment of floor coverings.
Linoleum Floors. Booklet, 42 pp., 8½ x 11 ins. Illustrated. Linoleum Data and Specifications for Architects.
Interior Decoration Service. Brochure, 9½ x 11 ins. Illustrated in color. Valuable data, particularly on flooring.
Linoleum Patterns. Booklet, 8 pp., 9 x 12 ins. Illustrated in color. Deals with a fine line of linoleums.
Linoleum Data and Specifications for Architects. Booklet, 40 pp., 8½ x 11 ins. Illustrated. Deals with choice and specification of flooring materials.
Lockwood, Greene & Co.'s *Engineer*, January, 1928. One issue of a monthly magazine, this issue containing data on use of linoleum.
W. & J. Sloane—Architectural Data Bulletins published every two months, dealing with the installations of Sloane Linoleum.

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, 119 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.
Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

U. S. Rubber Co., 1790 Broadway, New York.
Period Adaptations for Modern Floors. Brochure. 8 x 11 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.
Ars Ecclesiastica 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 theater chairs.

Kittinger Co., 1893 Elmwood Ave., Buffalo, N. Y.
Kittinger Club & Hotel Furniture. Booklet. 20 pp. 6¾ x 9¼ ins. Illustrated. Deals with fine line of furniture for hotels, clubs, institutions, schools, etc.
Kittinger Club and Hotel Furniture. Booklet. 20 pp. 6 x 9 ins. Illustrated. Data on furniture for hotels and clubs.
A Catalog of Kittinger Furniture. Booklet, 78 pp., 14 x 11 ins. Illustrated. General Catalog.

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

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

GARAGES

Ramp Buildings Corporation, 21 East 40th St., New York.
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, 11 pp., 5⅛ x 7⅝ ins. Illustrated. History of manufacture of flat, clear, sheet glass.

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

GREENHOUSES

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

HARDWARE

P. & F. Corbin, New Britain, Conn.
Early English and Colonial Hardware. Brochure, 8½ x 11 ins. An important illustrated work on this type of hardware.

HARDWARE—Continued

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.
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. 65 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.
Distinctive Elevator Door Hardware. Booklet, 89 pp., 16 x 10½ ins. Illustrated.

Russell & Erwin Mfg. Co., New Britain, Conn.
Hardware for the Home. Booklet, 24 pp., 3½ x 6 ins. Deals with residence hardware.
Door Closer Booklet. Brochure, 16 pp., 3½ x 6 ins. Data on a valuable detail. Garage Hardware Booklet, 12 pp., 3½ x 6 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.
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.
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. 8 pp. 8 x 11 ins. Illustrated. Deals with heating for small buildings.
The Dunham Differential Vacuum Heating System. Bulletin 115. Brochure. 12 pp. 8 x 11 ins. Illustrated. Deals with heating for large buildings.

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

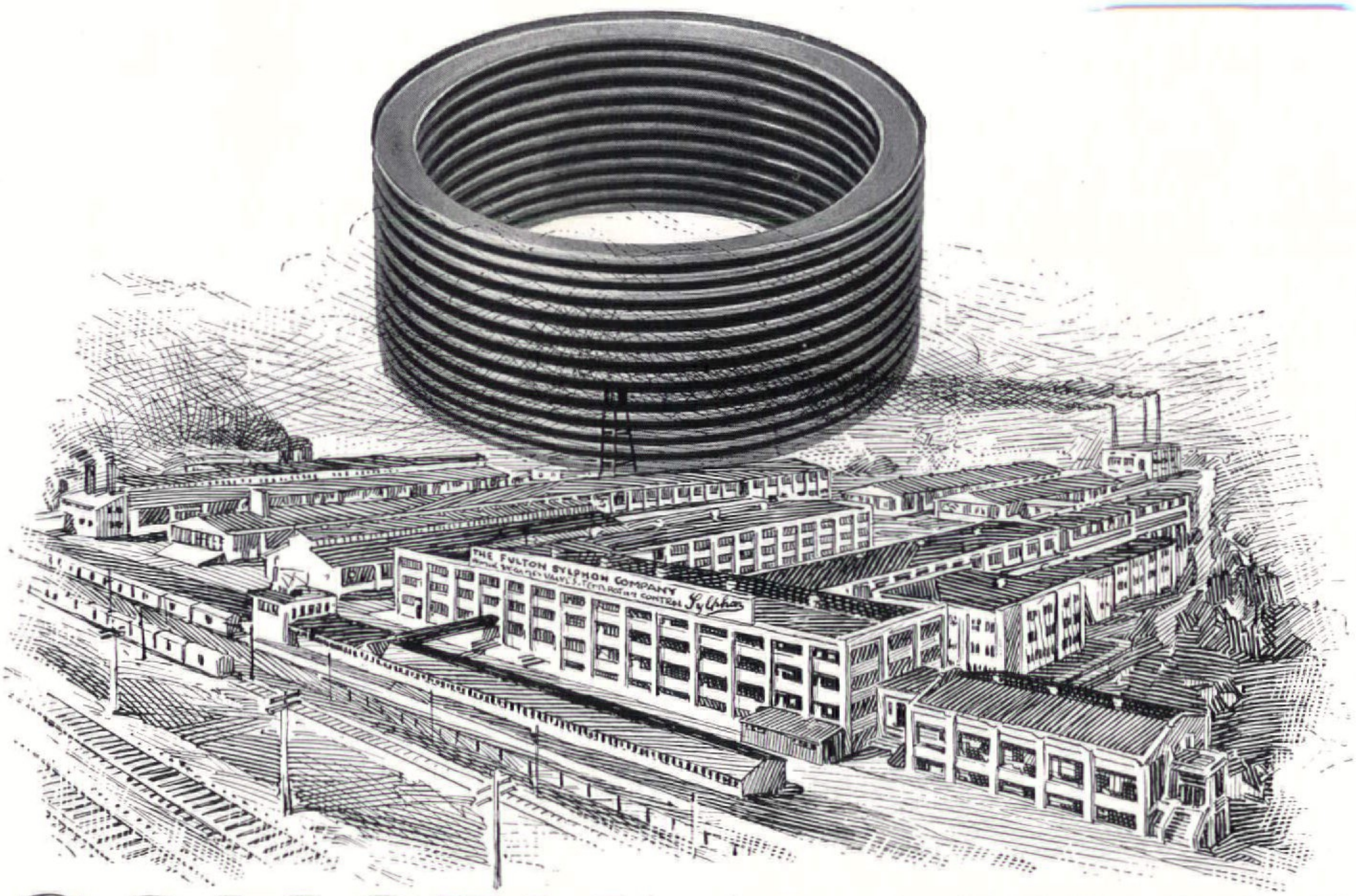
The Fulton Sylphon Company, Knoxville, Tenn.
Sylphon Temperature Regulators. Illustrated brochures, 8½ x 11 ins., dealing with general architectural and industrial applications; also specifically with applications of special instruments.
Sylphon Heating Specialties. Catalog No. 200. 192 pp. 3½ x 6¾ ins.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

S. T. Johnson Co., Oakland, Calif.
Bulletin No. 4A. Brochure. 8 pp., 8½ x 11 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 Fire-box 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. 3 pp. 8½ x 11 ins. Illustrated. Cabinets and radiators adaptable to decorative schemes.



CONCENTRATION

TO conceive and to produce a device which makes for industrial progress and human betterment is a source of much satisfaction.

To so concentrate upon that device and the broadening of its economic usefulness, until it becomes *the pulsing heart of hundreds of different labor saving, comfort giving thermostatic instruments,* is a mark of distinction.

Sylphon TRADE MARK

The Sylphon Bellows originated and patented by this company nearly twenty-five years ago, is the most accurate and durable expansion element known to science.

Built around this Sylphon Bellows, are the various Sylphon Specialties which have attained such extensive and diversified employment. They are covered by over *two hundred American patents* allowed or pending.

The plant of the Fulton Sylphon Company, the largest in the world devoted exclusively to the manufacture of thermostatic instruments, houses adequate special machinery and a small army of expert workmen.

Here in our laboratories, competent forward-looking engineers are continually developing new fields of usefulness for the Sylphon Bellows and solving for users and prospective customers, particular temperature or pressure control problems which involve its use.

Concentration, persistent application, and "doing one thing and doing it well,"—those for nearly a quarter of a century have constituted the key note of superior production inspired by the original and brilliant basic idea.

The original genuine Sylphon Bellows is used only in regulators manufactured by us. Your correspondence will be welcome. Write Dept. F.

THE FULTON SYLPHON COMPANY
KNOXVILLE, TENNESSEE

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

HEATING EQUIPMENT—Continued

McQuay Concealed Radiators. Brochure. 3 pp. 8½ x 11 ins. Illustrated.
McQuay Unit Heater. Booklet. 8 pp. 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.

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

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

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

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

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

Petroleum Heat & Power Co., 511 Fifth Avenue, New York.
Petro Mechanical Oil Burner & Air Register. Booklet, 23 pp., 8½ x 11 ins. Illustrated. Data on industrial installations of Petro Burners.
Present Accepted Practice in Domestic Oil Burners. Folder, 4 pp., 8½ x 11 ins. Illustrated. A reprint from Heating and Ventilating Magazine.

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.

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., 24th St. and Tenth 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.

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.

The Pick-Barth Companies, Chicago and New York.
Some Thoughts About Hospital Food Service Equipment. Booklet, 21 pp., 7½ x 9¾ ins. Valuable data on an important subject.

Wilmot Castle Company, Rochester, N. Y.
Sterilizer Equipment for Hospitals. Book, 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 & Company, Albert, 208 West Randolph St., Chicago, Ill.
Some Thoughts on Furnishing a Hotel. Booklet. 7½ x 9 ins. Data on complete outfitting of hotels.

INCINERATORS

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

INCINERATORS—Continued

A. I. A. File. 12 pp., 8¾ x 10¾ ins. inside. Suggestions for architect on incineration, showing installation and equipment.
Specialized Home Comforts Service Plan Book. 40 pp., 8½ x 11 ins. inside, illustrated. A complete outline of the many advantages of incineration.
Blue Star Standards in Home Building. 16 pp., 5½ x 8½ ins. inside. Illustrated, explaining fully the Blue Star principles, covering heat, incineration, refrigeration, etc.

Kerner Incinerator Company, 715 E. Water St., Milwaukee, Wis.
Incinerators (Chimney-fed). Catalog No. 15 (Architect and Builders' Edition). Size 8½ x 11 ins. 16 pp. Illustrated. Describes principles and design of Kernerator Chimney-fed Incinerators for residences, apartments, hospitals, schools, apartment hotels, clubs and other buildings. Shows all standard models and gives general information and working data.
Sanitary Elimination of Household Waste, booklet, 4 x 9 ins. 16 pp. Illustrated. Gives complete information on the Kernerator for residences.
Garbage and Waste Disposal for Apartment Buildings, folder, 8½ x 11 ins. 16 pp. Illustrated. Describes principle and design of Kernerator-Chimney-fed Incinerator for apartments and gives list of buildings where it 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.

INSULATING LUMBER

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

INSULATION

Armstrong Cork & Insulation Co., Pittsburgh, Pa.
The Insulation of Roofs with Armstrong's Corkboard. Booklet. Illustrated. 7½ x 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. 7¼ x 10½ ins. 24 pp. Illustrated. Deals with a valuable type of insulation.

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

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

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

KITCHEN EQUIPMENT

The International Nickel Company, 67 Wall St., New York, N. Y.
Hotels, restaurants and Cafeteria Applications of Monel Metal. Booklet. 8½ x 11 ins. 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.

Pick & Company, Albert, 208 W. Randolph St., Chicago, Ill.
School Cafeteria Portfolio. 17 x 11 ins. 44 pp. Illustrated. An exhaustive study of the problems of school feeding, with copious illustrations and blue prints. Very valuable to the architect.
School Cafeterias. Booklet. 9 x 6 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.
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.

CORONADO Hotel, St. Louis, Missouri, J. Bradshaw, Architect. Armstrong's Cork Covering was used to insulate all lines of the refrigerated drinking water system.

Cold Lines in the Coronado are Insulated *Permanently*

WHEN the lines for the refrigerated drinking water system in the Coronado Hotel, St. Louis, were insulated with Armstrong's Cork Covering, that job was finished for the life of the lines. Neither owners nor architect need be concerned about insulation repairs or replacement, or sweating pipes.

In both structural and insulating properties, Armstrong's Cork Covering is as permanent as the pipe. It can be walled up in chases with the full assurance that there will never be a time when diminishing efficiency will cause damage to walls and ceilings from condensation and drip.

The use of Armstrong's Cork Covering also makes possible an important initial saving. Its known, definite, and unvarying insulating value enables "line loss" to be accurately determined both for the present and the future without any "margin of safety" in excess refrigerating capacity to take care of diminishing efficiency of the insulation in years to come.

Armstrong Engineers will gladly assist architects, not only on the insulation, but in the actual designing of complete drinking water systems. Armstrong Cork & Insulation Company, 132 Twenty-fourth Street, Pittsburgh, Pa.; McGill Building, Montreal; 11 Brant Street, Toronto 2.

Armstrong's Cork Covering

For Cold Lines, Coolers and Tanks

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

LATH, METAL AND REINFORCING

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

National Steel Fabric Co., Pittsburgh.
Better Walls for Better Homes. Brochure. 16 pp. 7¾ x 11¾ ins. Illustrated. Metal lath, particularly for residences.
Steeltex for Floors. Booklet. 24 pp. 8½ x 11 ins. Illustrated. Combined reinforcing and form for concrete or gypsum floors and roofs.
Steeltex Data Sheet No. 1. Folder. 8 pp. 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with round top chords.
Steeltex Data Sheet No. 2. Folder, 8 pp. 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with flat top flanges.
Steeltex Data Sheet No. 3. Folder. 8 pp. 8½ x 11 ins. Illustrated. Steeltex for folders on wood joists.

Northwestern Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
Northwestern Expanded Metal Products. Booklet, 8½ x 10¾ ins., 20 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plasta-saver and longspan lath channels, etc.
Longspan ¾-inch Rib Lath. Folder 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.
Norwest Metal Lath. Folder. 8½ x 11 ins. Illustrated. Data on Flat Rib Lath.

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

LAUNDRY CHUTES

The Pfaudler Company, 217 Cutler Building, Rochester, N. Y.
Pfaudler Glass-Lined Steel Laundry Chutes. Booklet, 5⅜ 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, Ohio.
Functions of the Hotel and Hospital Laundry. Brochure, 8 pp., 8½ x 11 ins. Valuable data regarding an important subject.

LIBRARY EQUIPMENT

Art Metal Construction Co., Jamestown, N. Y.
Planning the Library for Protection and Service. Brochure. 52 pp. 8½ x 11 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., 24th St. and 10th Ave., New York City.
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.
The Lighting of Schools; A Guide to Good Practice. Booklet, 24 pp. 8½ x 11 ins. Illustrated.
Lighting Specifications for Hospitals. Brochure, 30 pp. 8½ x 11 ins. Illustrated.

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

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

LUMBER

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

MAIL CHUTES

Cutler Mail Chute Company, Rorchester, 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., 5¼ x 6¾ 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 Hurt Building, Atlanta; Senior High School and Junior College, Muskegon, Mich. Folders, 4 pp. 8½ x 11 ins. Details.

METALS

The International Nickel Company, 67 Wall St., New York, N. Y.
The Choice of a Metal. Booklet, 6¾ x 3 ins. 166 pp. Illustrated. Monel Metal—its qualities, use and commercial forms, briefly described.

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior 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.

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, 183 pp., 8½ x 11 ins. Completely covers the subject of doors for interior use.
Roddis Doors for Hospitals. Brochure, 15 pp., 8½ x 11 ins. Illustrated work on hospital doors.
Roddis Doors for Hotels. Brochure, 15 pp., 8½ x 11 ins. Illustrated work on doors for hotel and apartment buildings.

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.

MORTAR AND CEMENT COLORS

Color Card. 6½ x 3¼ 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

A. C. Horn Company, Art Craft Division, 101 Park Ave., New York, N. Y.
Tex-Crete, for One-Operation Fixturing. Booklet, 24 pp. 8½ x 11 ins. Illustrated. A work on decorative plastering.

Jacobson & Co., 241 East 44th St., New York.
A book of Old English Designs. Brochure. 47 plates. 12 x 9 ins. Deals with a fine line of decorative plaster work.
Architectural and Decorative Ornaments. Cloth bound volume. 183 plates. 9 x 12 ins. 18 plates. Price, $3.00. A general catalog of fine plaster ornaments.
Geometrical ceilings. Booklet. 23 plates. 7 x 9 ins. An important work on decorative plaster ceilings.

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Creosote Stains. Booklet. 4 x 8½ 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 formulae 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 formulae for painting metals.
Came Lead. Booklet, 8¼ x 6 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 10¾ ins. Complete specifications for painting, varnishing and enameling interior and exterior wood, plaster, and metal work.

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

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

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.
How to Use Valspar. Illustrated booklet, 32 pp., 3¼ x 8 ins. Deals with domestic uses for Valspar.
How to Keep Your House Young. Illustrated brochure, 23 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.

THE Quiet May Automatic Oil Burner installed in this fine home of Mr. J. V. Hogan, St. Albans Way, Homeland, Baltimore, Md., was approved by the architect—GEORGE R. CALLIS, JR.

Mr. Hogan has complete heating satisfaction and comfort with his Quiet May.

Mr. Callis, Jr., has a Quiet May installed in his own home—proof that his approval of the Quiet May for his client's use is based on thorough investigation—plus actual experience.

QUIET MAY

AUTOMATIC OIL BURNER

MAY OIL BURNER CORPORATION, BALTIMORE, MD.

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

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.

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.

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. 8¾ 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.
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, Inc., Dayton, Ohio.
Duriron Acid, Alkali, Rust-proof Drain Pipe and Fillings. 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 deaerating systems for eliminating or retarding corrosion in hot water supply lines.
"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 ins. 88 pp. This bulletin contains 254 illustrations of prominent buildings of all types, containing "National" Pipe, and considerable engineering data of value to architects, engineers, etc.
Modern Welded Pipe. Book of 88 pp. 8½ x 11 ins., profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

PLASTER

Best Bros. Keene's Cement Co., Medicine Lodge, Kans.
Information Book. Brochure, 24 pp., 5 x 9 ins. Lists grades of plaster manufactured; gives specifications and uses for plaster.
Plasterers' Handbook. Booklet, 16 pp., 3½ x 5½ ins. A small manual for use of plasterers.
Interior Walls Everlasting. Brochure, 20 pp., 6¼ x 9¼ ins. Illustrated. Describes origin of Keene's Cement and views of buildings in which it is used.

PLUMBING EQUIPMENT

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

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog "M." 9¼ x 12 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.

PLUMBING EQUIPMENT—Continued

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. 8¾ x 11 ins., 136 pp., loose-leaf catalog, showing roughing-in measurements, etc.

Maddock's Sons Company, Thomas, Trenton, N. J.
Catalog "K." 10⅜ x 7⅞ ins. 242 pp. Illustrated. Complete data on vitreous china plumbing fixtures with brief history of Sanitary Pottery.

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

PUMPS

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

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

The Trane Co., LaCrosse, 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.
Pumps. Booklet, 8½ x 11 ins. Illustrated. Individual bulletins with specifications on sewage ejectors, and bilge, house, condensation, booster and boiler feed pumps.

Ramp Buildings Corporation, 21 East 40th St., New York.
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

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

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

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.

ROOFING

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

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

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

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

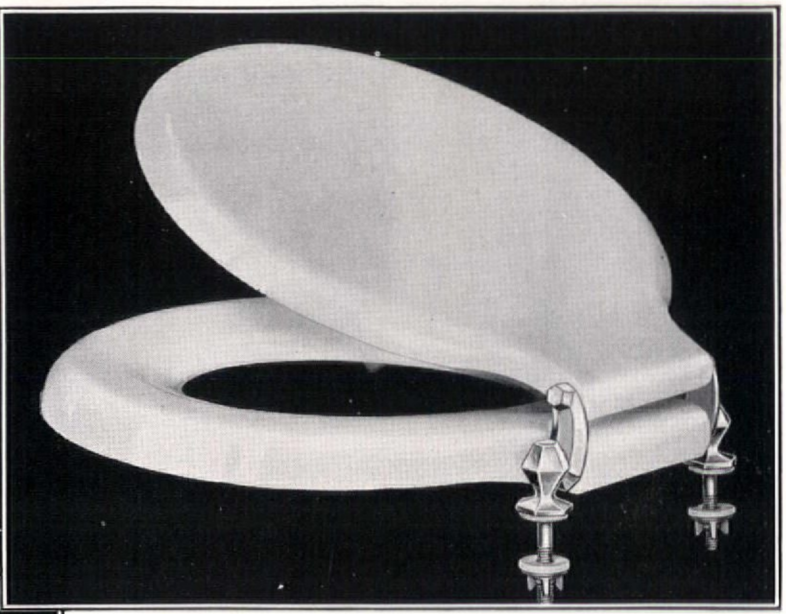
Heinz Roofing Tile Co., 1925 West Third Avenue, Denver.
Plymouth-Shingle Tile with Sprocket Hips. Leaflet, 8½ x 11 ins. Illustrated. Shows use of English shingle tile with special hips.
Italian Promenade Floor Tile. Folder, 2 pp., 8½ x 11 ins. Illustrated. Floor tiling adapted from that of Davanzati 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.

A Brunswick Triumph

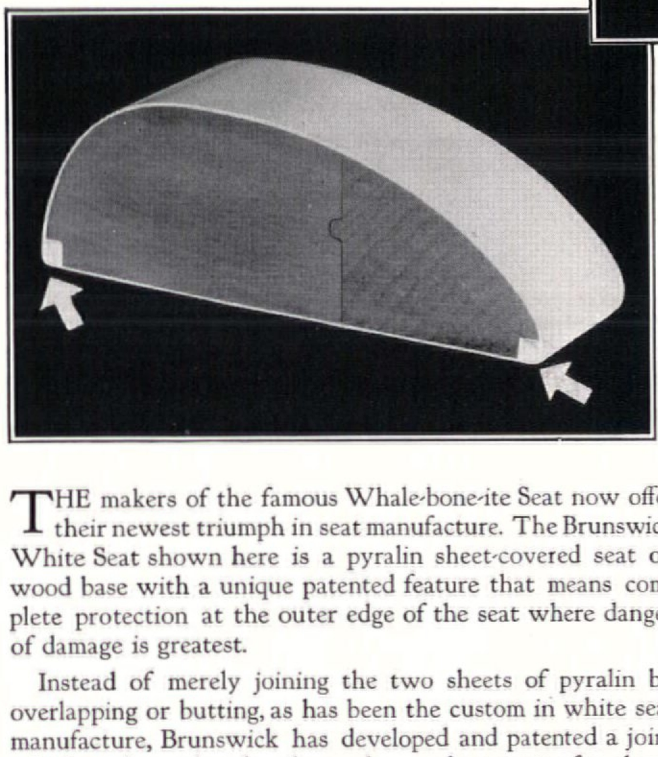
In Seat Manufacture!

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

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



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



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

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

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

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

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

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

Fill In, Clip and Mail

Box 304, Seat Department
The Brunswick-Balke-Collender Co.
623 S. Wabash Ave., Chicago

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

Name..............................

Address..............................

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

BRUNSWICK WHITE SEATS

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

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

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 170*

ROOFING—Continued

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.

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.
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., 8⅝ x 11 ins. Deals with steel cabinets, shelving, racks, doors, partitions, etc.

SKYLIGHTS

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

SOUND DEADENER

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

STAIRWAYS

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

STEEL PRODUCTS FOR BUILDING

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

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

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

STONE, BUILDING

Indiana Limestone Company, Bedford, Ind.
Volume 3, Series A-3. Standard Specifications for Cut Indiana Limestone work, 8½ x 11 ins. 56 pp. Containing specifications

STONE, BUILDING—Continued

and supplementary data relating to the best methods of specifying and using this stone for all building purposes.
Vol. 1. Series B. Indiana Limestone Library. 6 x 9 ins. 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.
Vol. 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 pages, illustrated.
Volume 12, Series B—Distinctive Homes of Indiana Limestone. 8½ x 11 ins., 48 pages, illustrated.
Old Gothic Random Ashlar. 8½ x 11 ins., 16 pages. Illustrated.

STORE FRONTS

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

The Kawneer Company, Niles, Mich.
Store Front Suggestions. Booklet, 96 pp., 6 x 8½ ins. Illustrated. Shows different types of Kawneer Solid Copper Store Fronts.
Catalog K. 1927 Editon. 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.

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, 9⅜ x 12¼ ins., containing a treatise upon the basic principles of color in architectural design, illustrating early European and modern American examples. Excellent illustrations in color.
Present Day Schools. 8½ x 11 ins. 32 pp. Illustrating 42 examples of school architecture with article upon school building design by James O. Betelle, A. I. A.
Better Banks. 8½ x 11 ins. 32 pp. Illustrating many banking buildings in terra cotta with an article on its use in bank design by Alfred C. Bossom, Architect.

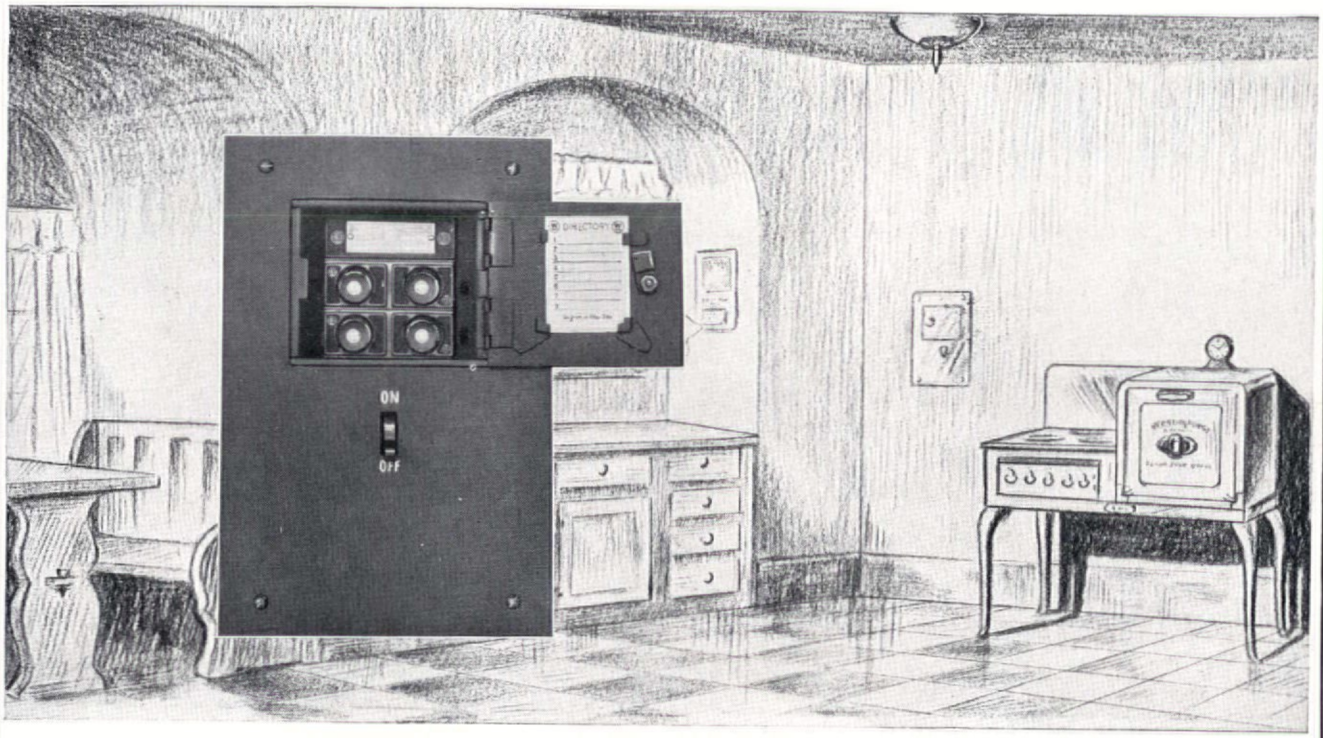
TILE, HOLLOW

National Fire Proofing Co., 250 Federal 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 Uninbacker Tile Bulletin. 8½ x 11 ins. 4 pp. Illustrated.
Natco Header Backer Tile Bulletin. 8½ x 11 ins. 4 pp. Illustrated.
Natcoflor Bulletin. 8½ x 11 ins. 6 pp. Illustrated.
Natco Face Tile for the Up-to-Date. Farm Bulletin. 8½ x 11 ins.

TILES

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

United States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 119 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.
Art Portfolio of Floor Designs. 9¼ x 12¾ ins. Illustrated in colors. Patterns of quarry tiles for floors.



Modern Convenience

in this New Panelboard

Westinghouse

Products for Buildings

Circuit-Breakers
Elevators (Motors and Control)
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Fuses
Insulating Materials
Lamps
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Panelboards
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Stokers
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Turbines
Water Heaters
Watthour Meters
Welding Equipment

THE neatness, convenience and utility of the new Westinghouse CLP panelboard is in keeping with the trend toward greater convenience in the modern household. This panelboard is for use in residences, apartments, hotels or wherever the light and power circuits are combined.

A flush-type trim that can be decorated to match the wall in which it is set, makes it possible to mount the panelboard in the kitchen, hall or other convenient place without marring the beauty of its surroundings.

Lights, range, water heater, refrigerator, now can all be fed through the one panelboard, which provides fusing facilities for all 110-220-volt circuits.

Full details of this new panelboard are given in Leaflet 20367, which may be obtained from the nearest Westinghouse district office.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

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SIGNAL CALL SYSTEMS FOR BANKS

Signal Call Systems are a tremendous asset to banks where it is so important to have executives within immediate call. These Systems place all executives at the finger tips of the switchboard operator. When one fails to answer his telephone she merely presses a button and the code number assigned to that individual is broadcast quietly throughout the bank. The called party hearing his signal answers at the nearest extension and the call is completed without disturbance and without delay. The adjustable chime signal illustrated below is particularly recommended for banks. Its soft mellow tone is always clearly audible but never annoying.

A. I. A. File Reference
Call Systems No. 31-I-31

Architects are invited to write for complete data

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S. W. Straus and Company, an organization noted for its efficiency and progressiveness, has installed a Signal Call System in its beautiful Chicago offices

SIGNAL
ENGINEERING & MFG. CO.
43 SEVENTH AVE., NEW YORK

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 172*

VALVES

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

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

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

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

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

WATERPROOFING

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

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

Master Builders Company, Cleveland, Ohio.
Waterproofing and Dampproofing and Allied Products. Sheets in loose index file, 9 x 12 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 City.
"Permantile Liquid Waterproofing" for making concrete and cement mortar permanently impervious to water. Also circulars on floor treatments and cement colors. Complete data and specifications. Sent upon request to architects using business stationery. Circular size, 8½ x 11 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.

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

WEATHER STRIPS

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

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 174*

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.

Genfire Steel Company, Youngstown, Ohio.
Architectural Details, Casement Windows and Doors. 8½ x 11 ins. 28 pp. A. I. A. File No. 16e. Specifications and construction details.

Hope & Sons, Henry, 103 Park Ave., New York, N. Y.
Catalog. 12¼ x 18½ 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, 20 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.
Architectural Details. Booklet. 8½ x 11 ins. 16 pp. Tables of specifications and typical details of different types of construction.
List of Parts for Assembly. Booklet. 8½ x 11 ins. 16 pp. Full lists of parts for different units.

WINDOW SHADES AND ROLLERS

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

WINDOWS, STEEL AND BRONZE

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

David Lupton's Sons Company, Philadelphia, Pa.
A Rain-shed and Ventilator of Glass and Steel. Pamphlet, 4 pp., 8⅝ x 11 ins. Deals with Pond Continuous Sash. Sawtooth Roofs, etc.
How Windows Can Make Better Homes. Booklet. 3⅞ x 7 ins. 12 pp. An attractive and helpful illustrated publication on use of steel casements for domestic buildings.

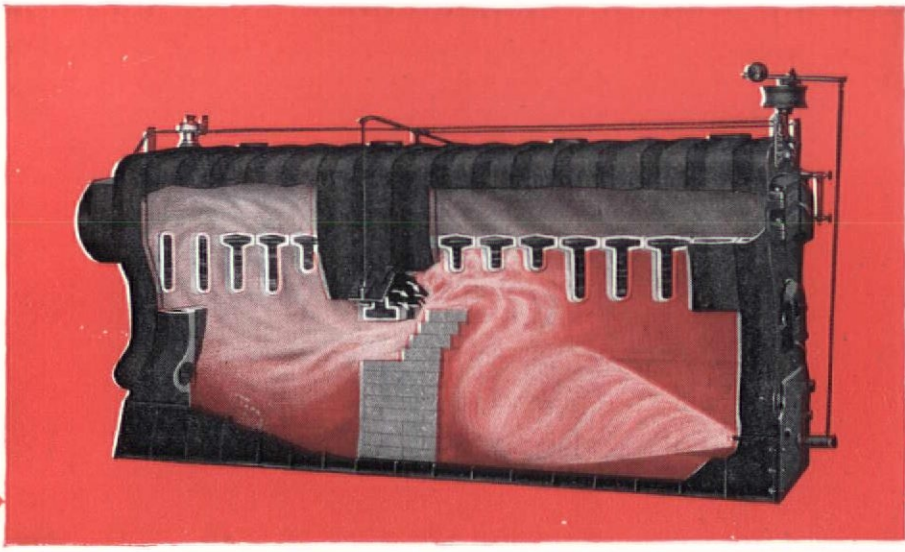
Truscon Steel Company, Youngstown, Ohio.
Drafting Room Standards. Book. 8½ x 11 ins. 120 pages of mechanical drawings showing drafting room standards, specifications and construction details of Truscon Steel Windows, Steel Lintels, Steel Doors and Mechanical Operators.
Truscon Solid Steel Double-Hung Windows. 24 pp. Booklet. 8½ x 11 ins. Containing illustrations of buildings using this type of window. Designs and drawings of mechanical details.
Continuous Steel windows and Mechanical Operators. Catalog 126. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

WOOD—See also Millwork

American Walnut Mfrs. Association, 618 So. Michigan Blvd., Chicago, Ill.
American Walnut. Booklet. 7 x 9 ins. 45 pp. Illustrated. A very useful and interesting little book on the use of Walnut in Fine Furniture with illustrations of pieces by the most notable furniture makers from the time of the Renaissance down to the present.
"American Walnut for Interior Woodwork and Paneling." 7 x 9 ins. Pages illustrated. Discusses interior woodwork, giving costs, specifications of a specimen room, the different figures in Walnut wood, Walnut floors, finishes, comparative tests of physical properties and the advantages of American Walnut for woodwork.

Curtis Companies Service Bureau, Clinton, Iowa.
Better Built Homes. Vols. XV-XVIII, incl. Booklet. 9 x 12 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.

National Lumber Mfrs. Assn., Washington.
Airplane Hangar Construction. Booklet, 24 pp., 8½ x 11 ins. Use of lumber for hangars.



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NATIONAL Super-Smokeless Boilers provide large combustion chambers, perfect combustion, long gas travel—three times the length of the boiler—and efficient heating surfaces for absorbing the intense heat that is usually wasted up the chimney in oil-burning boilers.

*The secondary air supply and control of super-heated air, at just the point where it is needed to assure complete combustion, the spiral travel of the gases, and the progressive increase in combustion area are exclusive features.

These are but a few of the many outstanding advantages of the National Super-Smokeless Boilers. May we give you full details by mail, or through a National Representative.

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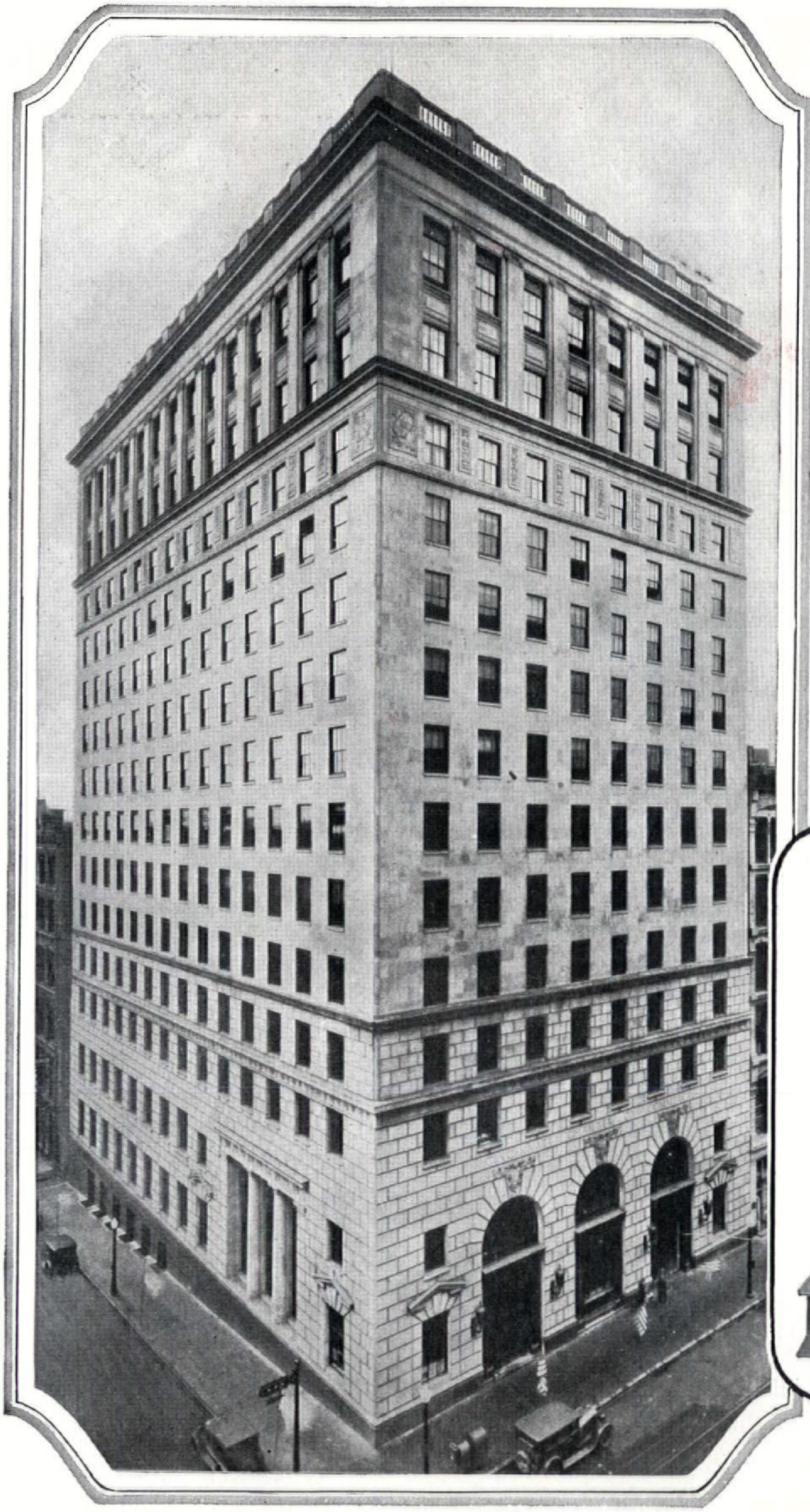
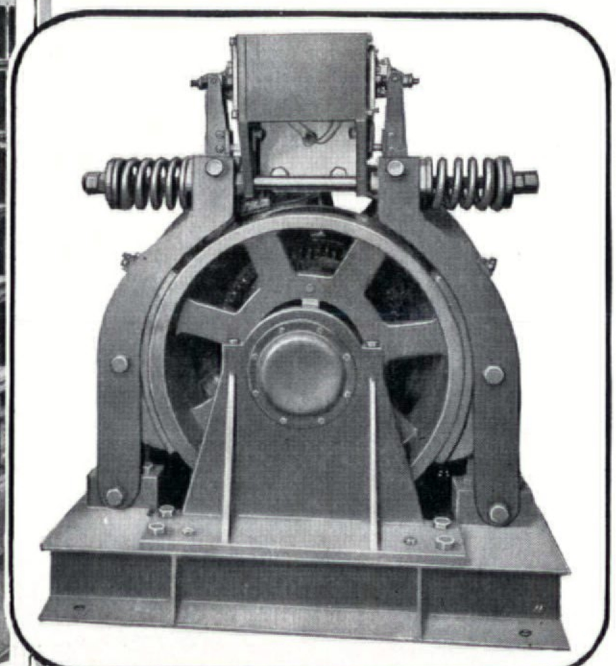


4

Chamber of Commerce Building, Cincinnati, Ohio. Elevator equipment supplied by Warner Elevator Manufacturing Co., Cincinnati

Tietig & Lee, Harry Hake, and Charles H. Kuck, architects



General Electric gearless elevator motor showing brake

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

—Outstanding Contributions *by* General Electric to Elevator Control

1. A system of *automatic speed regulation,* maintaining through a simple device high schedule speed during rush hours, while facilitating accurate landing
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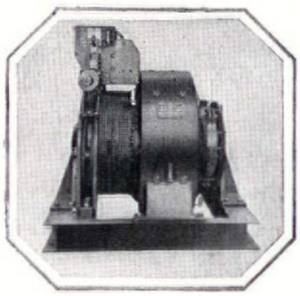
3. Development of motor and control design for *utmost simplicity and lowest maintenance*
4. A simplified and accurately responsive system of *automatic leveling* for building owners who require the highest grade of elevator service

Utmost Simplicity and Lowest Maintenance

Utmost simplicity is an outstanding feature of G-E elevator motor and control design. The small number of parts—constructed of the best materials—make for reliability; the equipment operates for long periods without attention.

The motor frame is of rolled steel; the base and brake are fabricated. The parts are electrically welded and assembled into a compact, substantial unit ideally suited to elevator operation.



General Electric gearless elevator motor

The control devices withstand millions of operations. Actual records prove that, as a result of the simple, sound construction, maintenance costs are almost negligible.

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

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Baker Iron Works, Los Angeles
Gurney Elevator Co., New York
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Pitt Engineering Co., Chicago
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237-31

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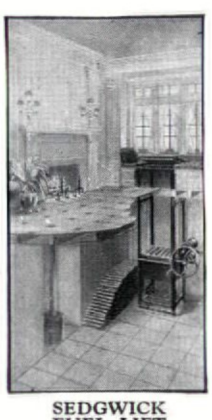
For All Purposes



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The Sedgwick Architects Service Department is maintained to assist you in the proper selection and the writing of specifications for Hand Power Elevator and Dumb Waiter equipment.

New catalog sent on request.

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Manufacturers of "The Invalid Elevator"

A Pledge

To the user this name plate is a pledge of the finest in motors. It is a protection to the judgment of architect, dealer and contractor.

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Write for Bulletin giving interesting information to all motor users.

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OTIS makes electric elevator and dumbwaiter equipment for all types of apartment buildings. Each piece of apparatus is designed for a particular range of service. Therefore there is no necessity for compromise in selecting Otis equipment — every function of Vertical Transportation is provided—and it becomes solely a question of choosing the right Otis machine for the specific project.

Automatic Push Button Type—Generally used in buildings of limited height and floor area. Saves the expense of an operator as it is entirely automatic in operation.

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In all matters relating to Vertical Transportation, Otis engineers are ready to serve you with suggestions and complete engineering data. A telephone call to any of our branch offices will receive prompt attention.

OTIS ELEVATOR COMPANY

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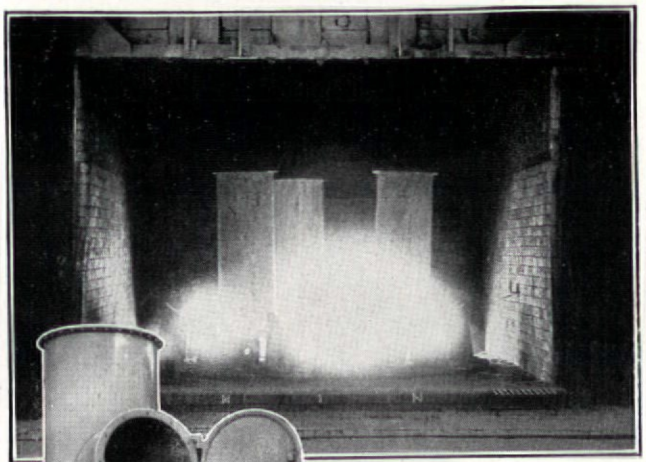
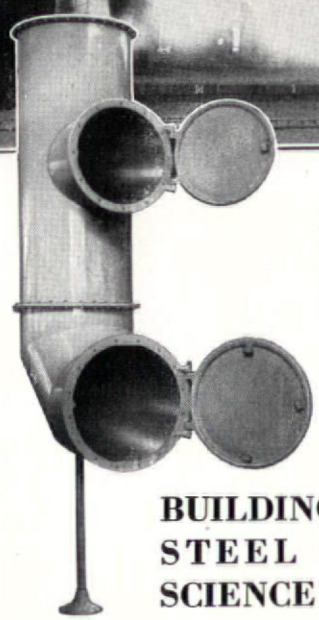


Above is one of the huge enameling furnaces at the Rochester plant of the Pfaudler Co. A group of laundry chute tubes have just been fired, the glass annealing to the steel at a temperature of nearly 2000° F.



The finished chute—sanitary, easy to keep sterile, and durable—the choice of hundreds of modern hospitals and hotels everywhere.

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Since there is nothing easier than glass to keep clean nor anything superior to steel for strength, the Pfaudler Glass-Lined Steel Laundry Chute is the logical type to install in any building where the economy of such service can be utilized. Write for Bulletin 696.

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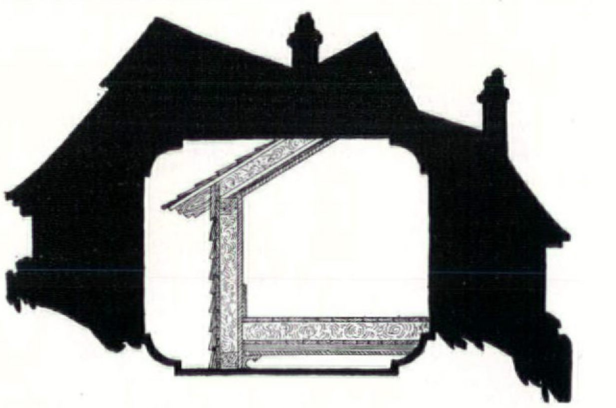

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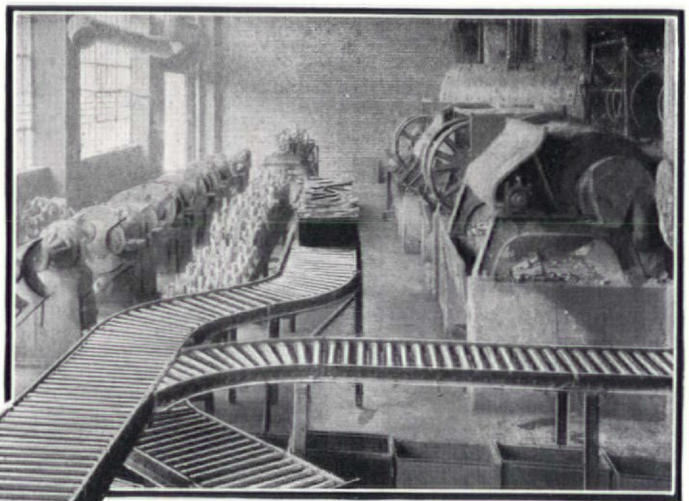

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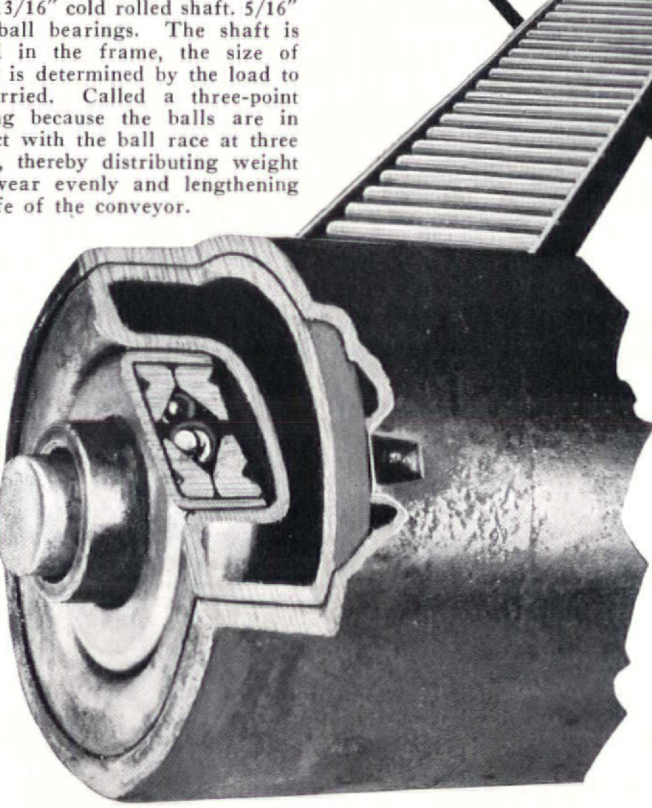

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Kansas City Office, 419 Manufacturers' Ex. Bldg.
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Seattle Office, 321 Lumber Exchange
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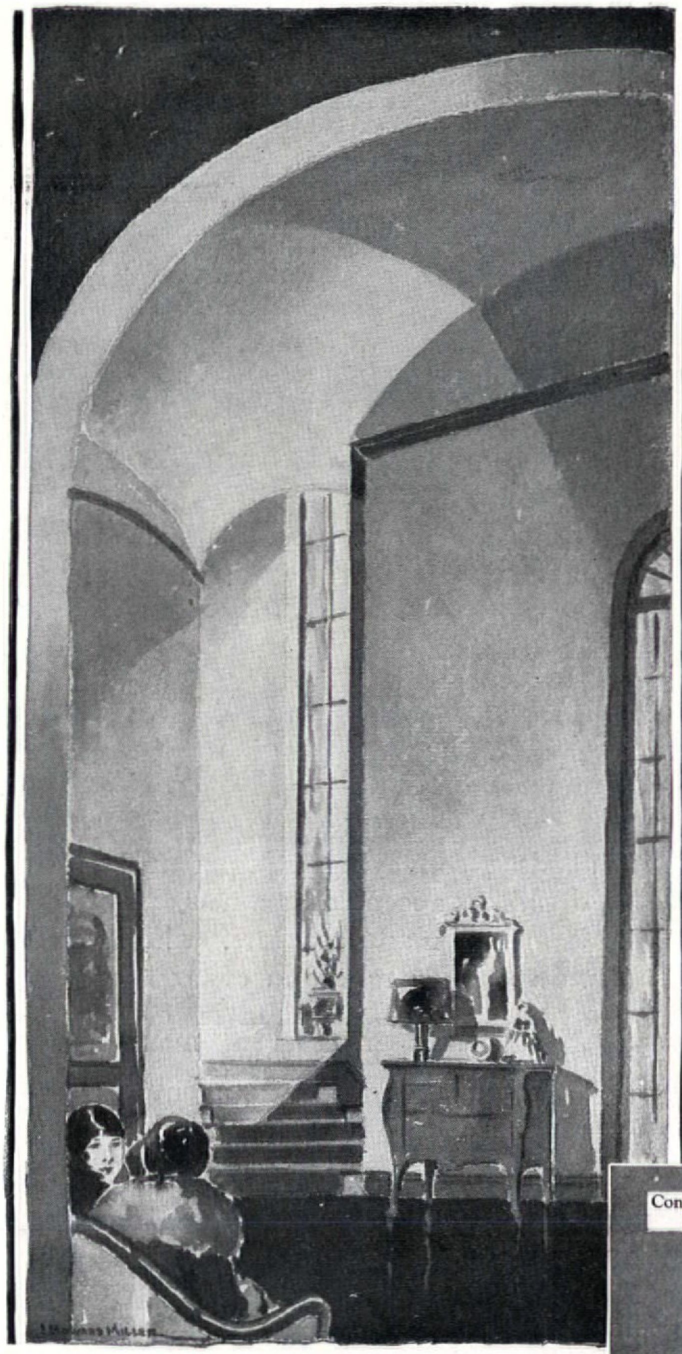

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But the character of a plaster job is revealed only over a term of years. Will it cleave away? Will it stain or disintegrate? Time will tell.

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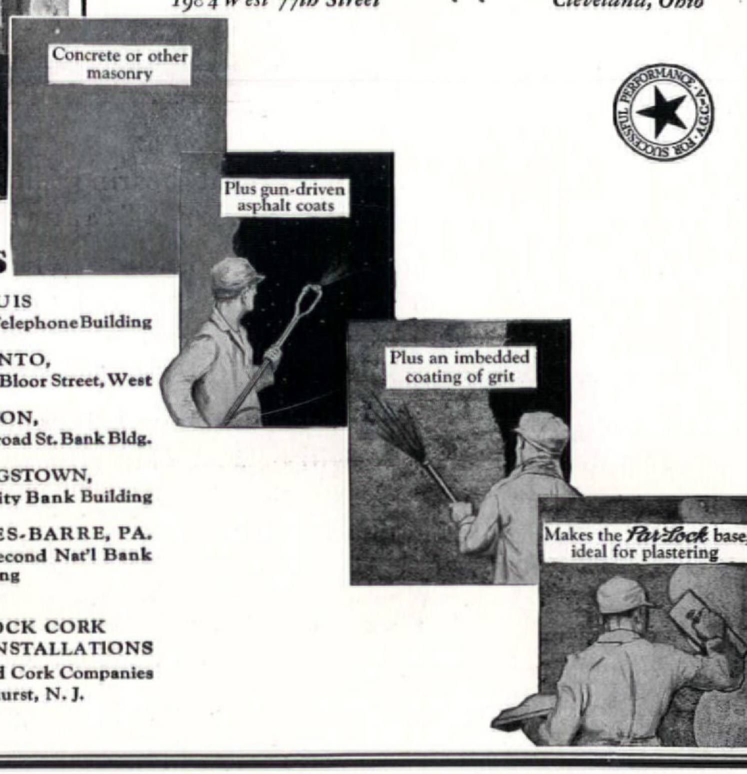

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COLUMBUS,
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DETROIT,
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434 Builders Exchange

NEWARK, N. J.,
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NEW YORK CITY,
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PHILADELPHIA,
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PITTSBURGH,
614 Bessemer Building

SCRANTON, PENNA.
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TORONTO,
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TRENTON,
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PAR-LOCK CORK INSTALLATIONS
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P-27

Is There No Limit to the Scope of Reinforced Concrete?

The versatility of reinforced concrete is immense —geographically *and* physically. North, south, east and west, reinforced concrete has made good. It is used for small buildings, tall buildings—industrial and office buildings, apartments, garages, university units, etc.

Now, we show the beautiful Hotel Peabody, Memphis, Tennessee, of reinforced concrete construction.

The Peabody is Italian Renaissance style of architecture. It is 200 by 323 feet, 12 floors. 1200 tons of reinforcing steel were used.

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Contractors: B. W. Construction Co., Chicago

REINFORCED CONCRETE

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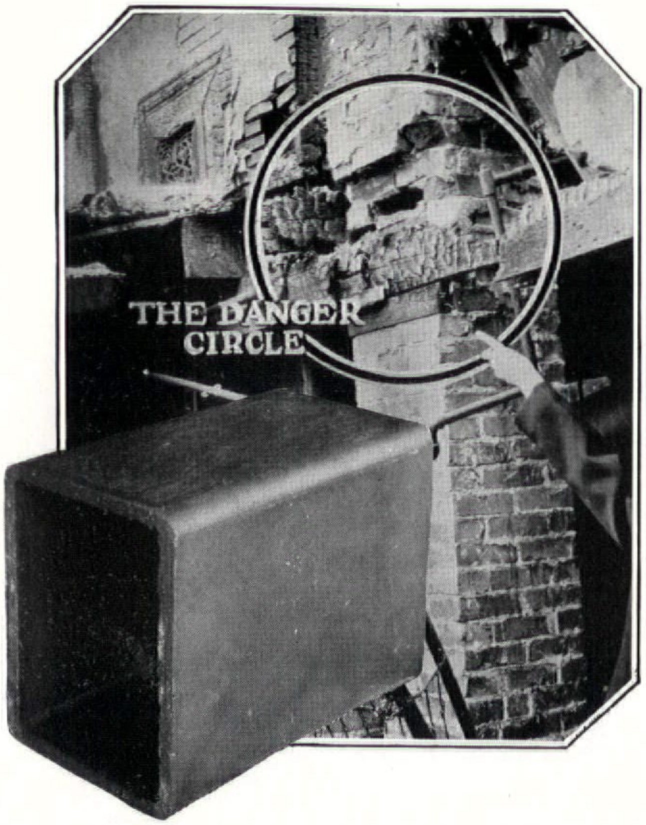
Tribune Tower
Chicago

Rail Steel Bar Association
Builders Building
Chicago



No more chimney fires when every house is built with fire clay flue lining

CLAY PRODUCTS ASSOCIATION
CONWAY BUILDING
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AF11—Gray

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In its perfected form is the outcome of long experience, and is designed to meet the requirements of public use under Postoffice Regulation. It is simple and substantial in design and construction, durable in finish, and has an Architectural quality which is appreciated and much commended by Architects.

Full information, details, and specifications on request.

THE CUTLER MAIL CHUTE CO.
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For Better Service

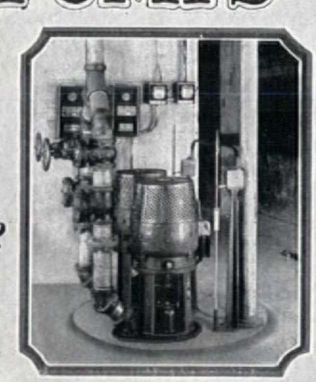

Fig. S-8001

Duplex Set "Weil" Type "B" 4-in. Heavy Duty Vertical Sewage Ejectors, installed in Bus Terminal, Chicago. Three million people are expected to use this building annually.

Write for Bulletin S-800

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BILGE-SEWAGE FIRE-HOUSE CIRCULATING
BOILER FEED CONDENSATION VACUUM
Manufacturers of Better Centrifugal Pumps
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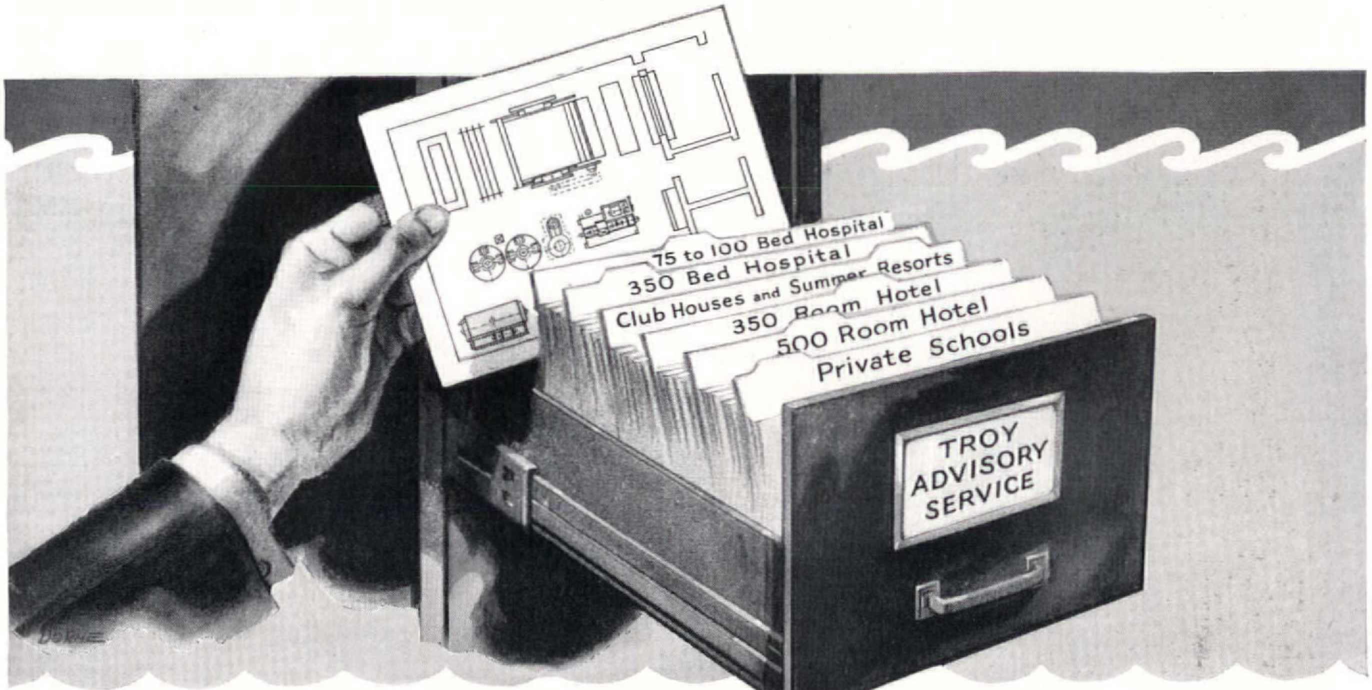

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welcomes the opportunity to cooperate with you

TROY ADVISORY SERVICE will plan, lay out, estimate and prepare specifications for laundry equipment in any type and size of institutional laundry.

Architects who avail themselves of this cooperation have at their disposal a broad knowledge of laundry requirements. They can draw freely upon Troy experience in the consideration of such important factors as efficient arrangement, conservation of power, provision for future expansion and the proper selection and location of each piece of equipment.

Without charge, Troy offers this service to you. Why not take advantage of it in planning your next institutional laundry?

TROY LAUNDRY MACHINERY CO., INC.
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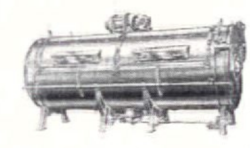
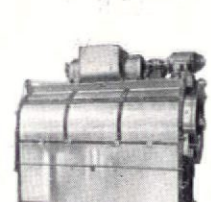
TROY
LAUNDRY MACHINERY

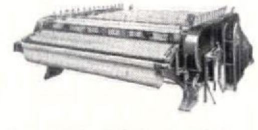


Front view 42 x 94 inch Premier all-monel washer. Type A motor drive.

Marathon Extractor. Belt drive, with angle countershaft attached.



Front view 42 x 90 inch Premier Drying Tumbler Type A motor drive.



Troy Big Eight Roll Flatwork Ironer. Feed side showing motor belt drive.

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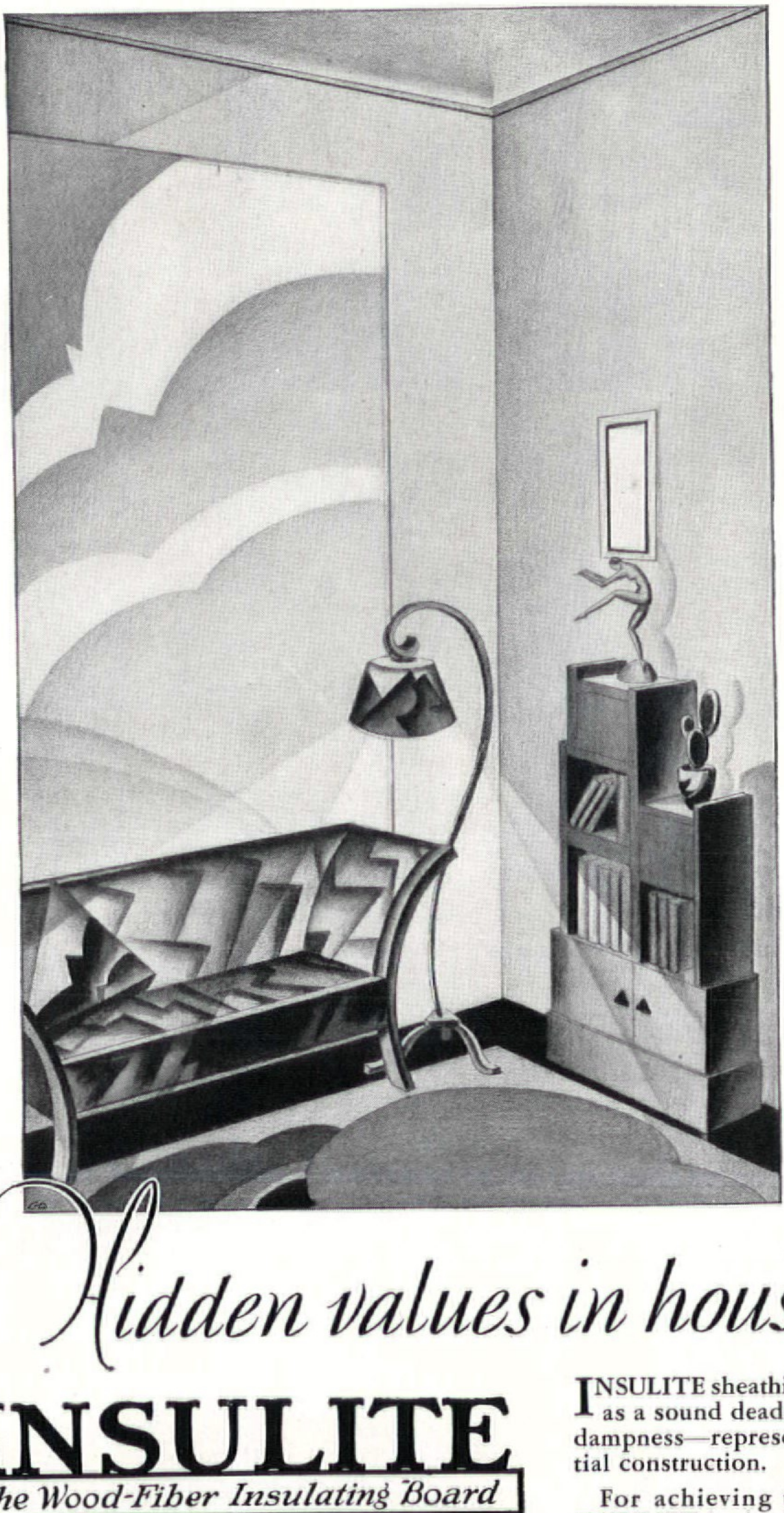

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INSULITE sheathing and plaster base—INSULITE as a sound deadener—as a means of preventing dampness—represent real *hidden values* in residential construction.

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A Proven PRE-CAST *System* of Floor and Ceiling Construction

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Gypsteel floor and ceiling construction has a record of five years' successful use. It gives a construction of definite calculable strength and unequalled fire-resistive properties.

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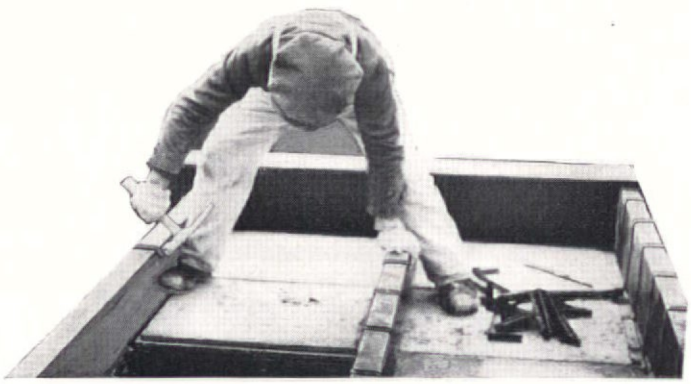
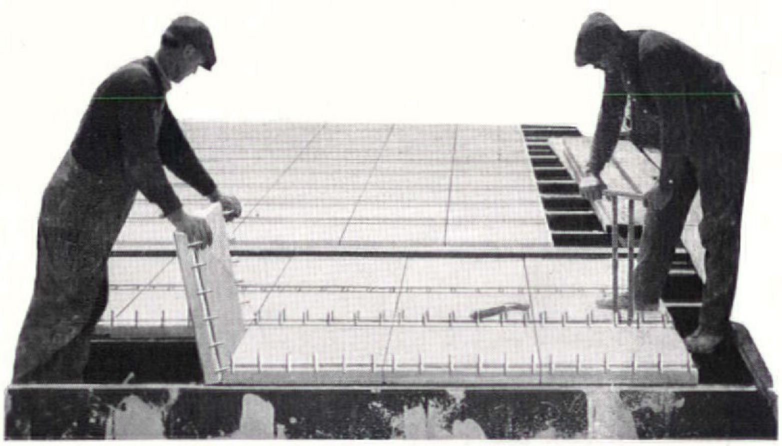
Gypsteel pre-cast floor and ceiling slabs are machine made to insure accuracy. They are constructed of the highest grade calcined Gypsum, correctly reinforced by cold drawn steel rods.

The ceiling slabs are suspended directly from the channels by steel hangers. All joints are completely filled with Gypsum grout, insuring absolute fire protection.

Gypsteel floor slabs are laid directly on the channels. The reinforcing rods projecting from the abutting slabs are tied together. A continuous reinforcement is thus obtained throughout the entire floor area.



Clinching the steel hangers suspending Gypsteel ceiling slabs



Placing Gypsteel floor slabs and tying the extending reinforcing rods

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on this business conference!

Leaders in many fields of industry and trade will meet with the editors and publishers of The Associated Business Papers, Inc., November 15 and 16 at the Roosevelt Hotel, New York, to discuss trends in business and cooperative trade development.

If you cannot drop in for these sessions, as we cordially invite you to, you can—by tuning in your radio—hear Mr. William Butterworth, President of the Chamber of Commerce of the U. S., speak on "Business Cooperation as a Public Asset." The National Broadcasting Company, recognizing the importance of the conference to business, will broadcast this key address over the stations named below.

The editors of this publication, which is a member of The Associated Business Papers, Inc., believe that you will want to be sure to hear at least Mr. Butterworth's contribution to this important conference.

Listen in November 16

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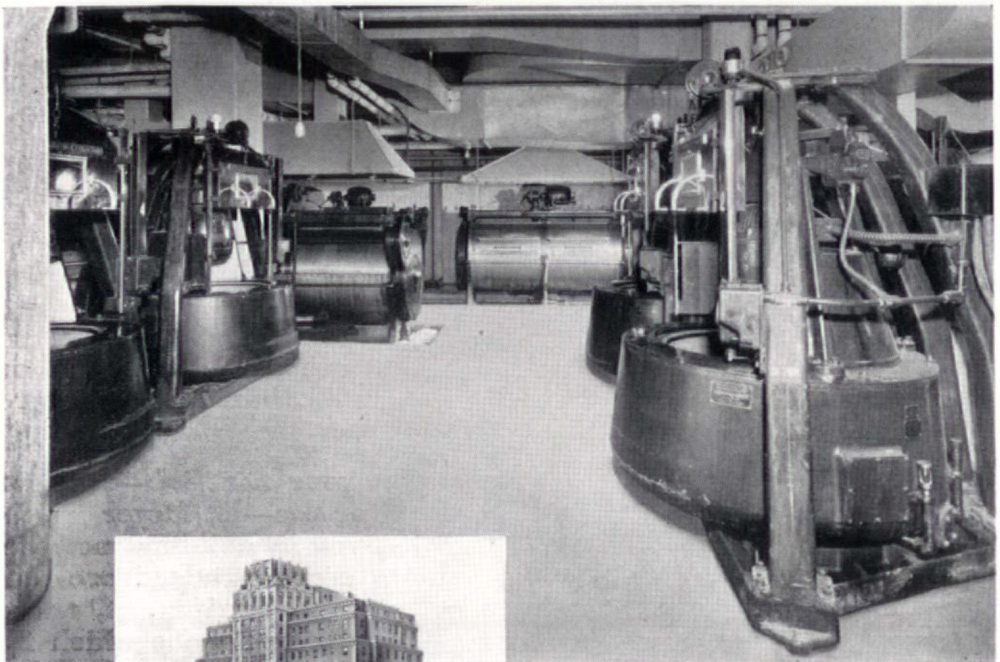
52 Vanderbilt Avenue, New York

The A. B. P. is a non-profit organization whose members have pledged themselves to a working code of practice in which the interests of the men of American industry, trade and professions are placed first—a code demanding unbiased editorial pages, classified and verified paid subscribers, and honest advertising of dependable products.

We hope that you, too, *are using these engineers' helpful services*



A view of Lincoln Hotel's indispensable laundry — one of the many splendid "all-American" installations in the foremost institutions of the country.

No. 50 of a series of advertisements featuring prominent laundry installations.

Lincoln Hotel, New York City, which has its own laundry department, planned and installed with the assistance of the engineers of The American Laundry Machinery Company.

Architects: Schwartz & Gross, 347 Fifth Avenue, New York City.

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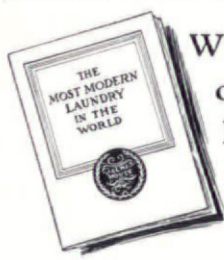

Write for your free copy of "The Most Modern Laundry in the World" You'll find in it many informative facts

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MEYER Steelforms Used in 24

3,000,000 Sq. Ft!

TO HAVE figured in the construction of any one of these famous Chicago buildings would have been noteworthy.

To have been selected by the builders of twenty-four such structures—a selection involving *3,000,000 sq. ft. of concrete rib floor construction* in all—constitutes an overwhelming testimonial to Meyer Steelform supremacy.

When you consider that these twenty-four buildings represent but one small section of Chicago in which Meyer Steelforms were successsfully used . . . and when you further consider that Chicago is but one of the scores of cities from coast to coast in which Meyer Steelforms are being specified on building projects of all sizes . . . then you gain some idea of the nation-wide part Meyer Steelforms are playing in bringing the concrete rib floor to its greatest efficiency.

On your next job—whatever its kind or size—let Meyer Steelforms assist you in building more swiftly, more economically, more durably. The same equipment, the same CECO Super-Service which figured in the erection of Chicago's most famous buildings, are always at your immediate service.

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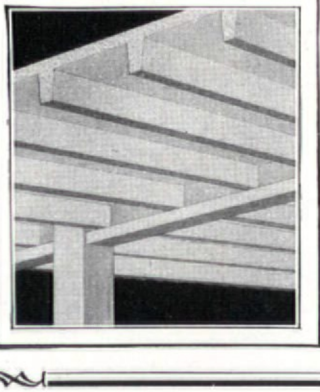

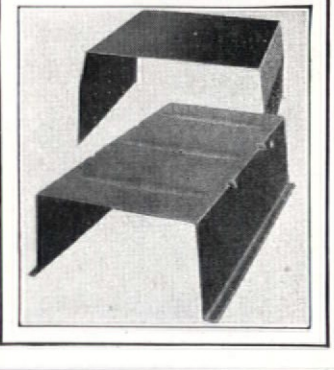

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# of Chicago's Newest Buildings

{ 24 Outstanding Buildings }

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2. De Paul University Bldg.	K. M. Vitzthum	McLennan Constr. Co.
3. 333 No. Michigan Ave. Bldg.	Holabird & Roche	Hageman-Harris
4. Hibbard, Spencer, Bartlett Bldg.	Graham, Anderson, Probst & White	Henry Ericcson
5. Tribune Tower	Howells & Hood	Hageman-Harris
6. Medinah Athletic Club	W. W. Alschlager	Paschen Bros.
7. St. Claire Hotel	Oman & Lilienthal	Paschen Bros.
8. East Gate Hotel	Oman & Lilienthal	Paschen Bros.
9. Furniture Mart	Henry Raeder	Wells Bros.
10. Northwestern University (McKinlock Campus Bldg.)	Childs & Smith	R. C. Wieboldt
11. 122nd Field Artillery Armory	Edgar Martin	Lind Constr. Co.
12. Pearson Hotel	Robt. DeGolyer	Paschen Bros.
13. Seneca Hotel	Robt. DeGolyer	Paschen Bros.
14. Illinois Women's Athletic Club	Phillip B. Maher	Thompson-Starrett
15. Cass Apt. Hotel	Oldefest & Williams	E. W. Sproul
16. 900 No. Michigan Avenue Bldg.	Jarvis Hunt	James B. French
17. Eitel Apt. Hotel	Louis Guenzel	McLennan Constr. Co.
18. Methodist Book Concern	Lieberman-Hein	Mutual Constr. Co.
19. Standard Oil Corp. Bldg.	Ivar Viehe Naess	Lind Constr. Co.
20. The Carpenter's Union Bldg.	Paul Gerhardt	Ebenholtz & Jorgensen

Buildings Not Identified In Picture

St. Vincent Hospital	Holabird & Roche	Dahl Stedman
1430 Lake Shore Drive Apartment Hotel	Robt. DeGolyer	Lind Constr. Co.
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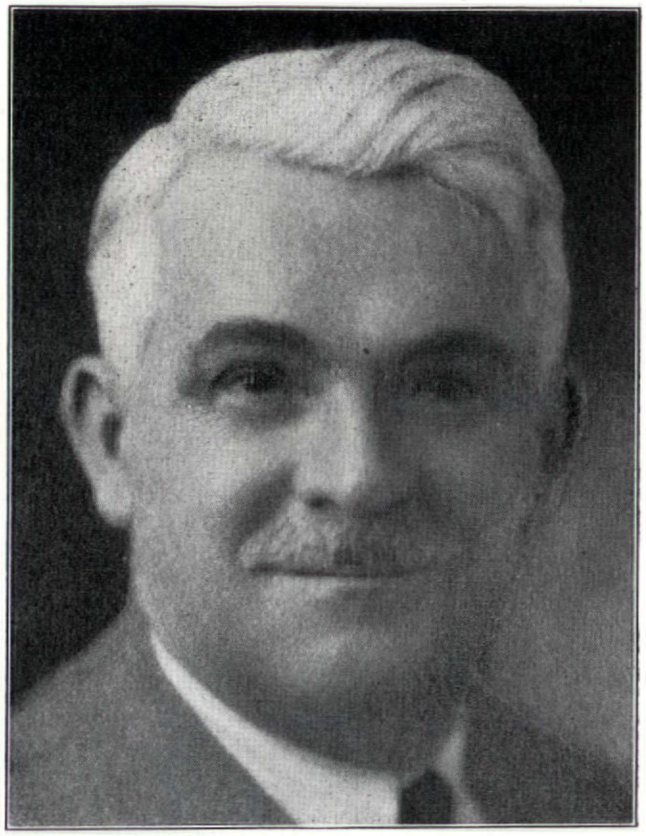
Men who know *say* "Petro"

Architects and builders now accept Petro Oil Heating Equipment for every type and size of heating plant.

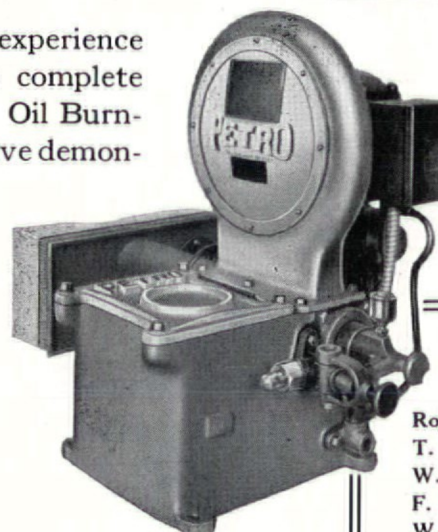


(DuPont Photo)

THOMAS W. LAMB, ARCHITECT, who has gained a nation-wide reputation in the field of theater and fraternal building designs. Among his best works are Keith Albee Theater, Brooklyn; Fox Academy of Music, Keith's 86th Street Theater and the Greater Pythian Temple, New York City. All these are heated by "Petro."

For 25 years Petro Oil Burners have been used with outstanding success in large buildings. These installations have established an enviable record for efficiency, economy and dependability. The engineering excellence of Petro equipment for industrial and commercial uses is well recognized.

The same skill and experience has been applied to a complete line of domestic Petro Oil Burners. For years these have demonstrated the soundness of the Petro principle of making air do the work. Now there is a Petro for every type and size of heating plant to be found in the smallest cottage to the largest skyscraper.



Write today to our engineering department for technical data for any structure you are now planning, or confer with your local Petro dealer.

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Makers of oil burners since 1903

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Fire burns up-hill — Coal rolls down

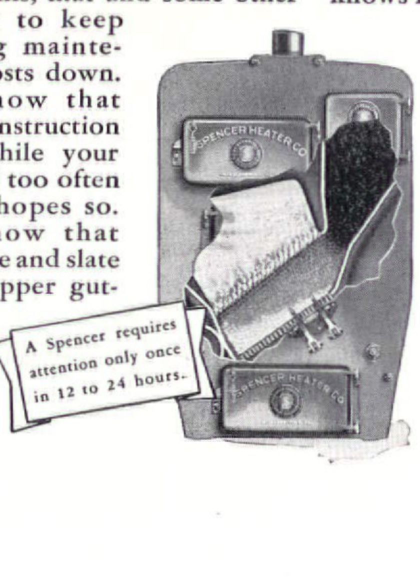
Before America was discovered, the Indians signalled with fires that sent smoke skyward. Even a savage knows that fire burns *up*. In a Spencer Heater is the most modern application of this well-known scientific fact. Spencer Gable-Grates are sloped to make fire burn up-hill, the way it burns best.

Coal at the mine is chuted *down* from tipple to railway car. At your home it is chuted *down* from truck to cellar bin. In the Spencer Heater, it is chuted *down* from a storage Magazine to Gable-Grates, with the automatic slow-flow feed that saves time, trouble and half your annual fuel bill.

These facts make this slow-flow feed save half your client's annual fuel bill

You need not be reminded that fire burns up-hill and coal rolls down. Yet you may have forgotten that the Spencer Heater is the steam, vapor and hot water heater that applies those two simple, scientific facts to the problem of cutting down your client's fuel bills.

You are besieged with requests to specify this, that and some other product to keep building maintenance costs down. You know that good construction saves, while your client all too often merely hopes so. You know that brass pipe and slate roofs, copper gutters and good insulation will save money in the long run—and that is where the Spencer Heater is different.



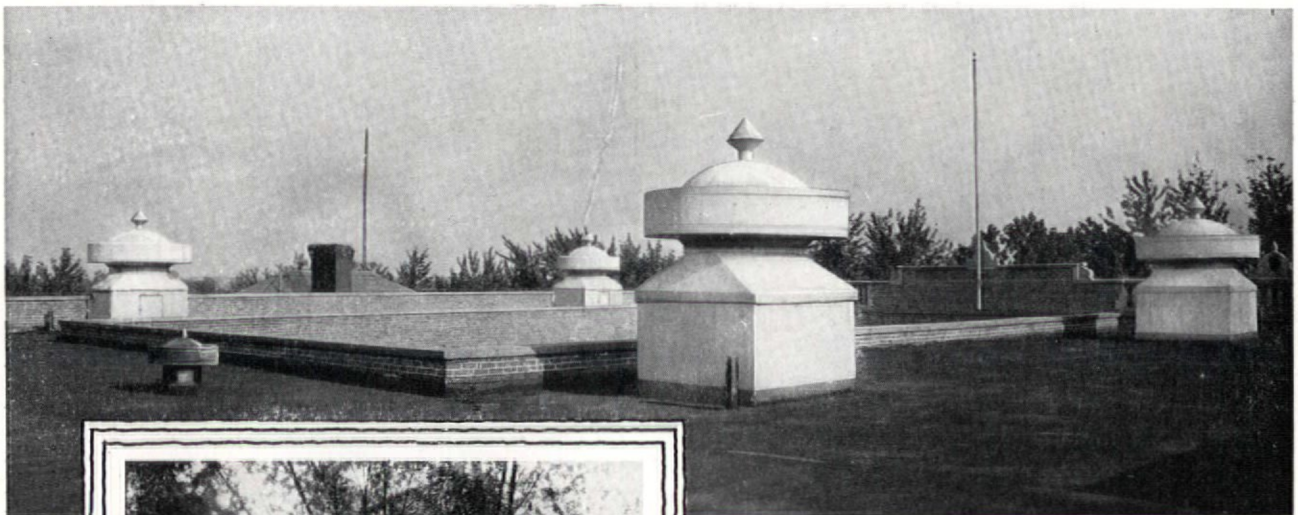
SPENCER HEATERS *steam, vapor or hot water*

The Spencer saving is immediate, actual and obvious. You know that the Spencer saves, and with the first coal bill your client knows it, too. The sloping Gable-Grates in every Spencer burn cheerfully the small sizes of coal and coke that can save as much as half the annual fuel bill. No. 1 Buckwheat anthracite selling at a minimum of $6 less than egg, stove and nut anthracite, has as much heat value as the larger sizes, since it is the same fuel. The same is true of the inexpensive, smaller sizes of other fuels.

You probably remember that the Spencer burns these fuels without blowers, or without mechanical apparatus. Since the Gable-Grate is sloped, fuel stored in the Magazine above it flows down on the Gable-Grate. Fire burns this fuel away, and it shrinks upon the grate as embers. As fast or as slow as the fire bed is lowered, more fuel *must* roll down, slowly, little by little, from the storage magazine, keeping the fire bed uniform in depth and the heat even.

Guaranteed Capacities

Specify the Spencer for use in any home or building. It will save enough to pay its entire cost—and you can know that it will heat enough radiation for your purpose. Arbitrary ratings are abandoned. Spencer efficiency is now measured in an actual guarantee of direct cast iron column radiation in square feet. Write for illustrations of new Spencer Heaters, with guaranteed capacities and specifications. Specify Spencer sectional or steel tubular heaters for every size and type of building. Spencer Heater Company, *Division of Lycoming Manufacturing Company,* Williamsport, Pa.



GENERAL AND ROOF VIEWS OF EUCLID SCHOOL
Schenectady, N. Y.
R. L. Bowen, Architect

PURE AIR FOR SCHOOLS

Hundreds of "Globe" installations in schools in all parts of the United States are rendering excellent ventilating service. Many architects, gratified to find that schools can be properly ventilated so inexpensively, have accepted "Globes" as standard school ventilation.

GLOBE VENTILATOR CO.

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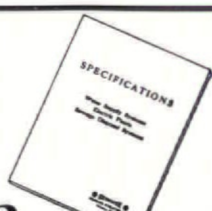


You need this Specification Book

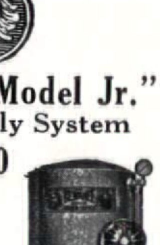
Free This reference book on water supply, electric light and sewage disposal, gives you data and specifications for handling any private utility job from a cottage or bungalow to the largest country hotel, club or estate.

It's free—if requested. If it doesn't answer *all* your problems, KEWANEE engineers the country over are at your service. One of them is near you.

KEWANEE

"Bungalow Model Jr." Water Supply System

Now $103.00



For the average residence this new Kewanee "Bungalow Model" puts in "city water" comforts at a surprisingly low cost. It has the same high Kewanee quality and "Engineered" Excellence as the other 200 Kewanee systems for water supply, electric lighting and sewage disposal. Automatic and requires only occasional oiling.

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442 Franklin St. Kewanee, Ill.

HEAT as you LIGHT

The Modern Way to Heat Industrial Buildings Large or Small

Modine Unit Heater No. 701—the equivalent of nearly two tons of cast iron radiation.

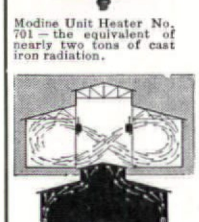

Diagram above shows how the Modine Unit Heater circulates heated air down to working level and keeps it there.

Below — Circulation of heated air with cast iron radiation or pipe coils.

Why not specify factory heating that is just as efficient as modern industrial lighting? The Modine Unit Heater gives this new heating effectiveness.

Suspending from the steam line, the Modine Unit Heater forces heated air down over the entire floor area, insuring complete comfort to every worker. Each Modine is individually controlled.

You wouldn't expect lights strung along the walls to properly illuminate a factory of large floor area—and particularly if such lights were undirected. Such lighting could be no more hopelessly ineffective than cast iron radiation and pipe coils. Let us send you complete facts.

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Modine Unit HEATER

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FOR STEAM-VAPOR, VACUUM, HOT WATER HEATING SYSTEMS

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Hardinge prestige has gained by leaps and bounds since the advent of the new and improved *Hardinge Junior*—a marvelously effective oil burner for average home needs, selling completely installed for only $385 (Tank extra.)

Proportionate reductions on every other Hardinge model, both Domestic and Industrial, have caused leading architects to specify and endorse Hardinge Fuel Oil Heat for almost every heating need.

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Manufacturers of Precision-Built Machines for 38 years

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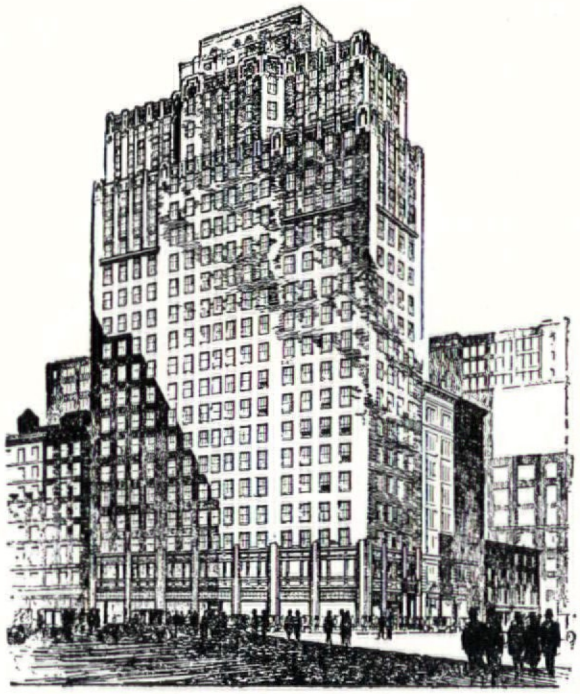


SARCO

Radiator Traps

Used in New Home of Heating & Ventilating Magazine

For a building of this type, up-to-date in every detail, it was only natural that Sarco Radiator Traps should be chosen because of their many superior advantages.

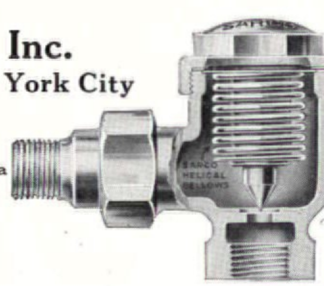
The movement of the helical corrugated tube in Sarco Traps is so slight that it is hardly detectable. And the movement is distributed over the entire area, instead of being confined to a few points. As a result, the lift of the tube and the efficiency of the trap are materially lengthened.

Another feature that adds to the life of this trap is the design which makes it impossible for scale and dirt to collect in the valve.

Sarco Radiator Traps will not air bind, water hammer or freeze.

Other important advantages are explained in our Booklet AK-110. Send for a copy.

SARCO CO., Inc.
183 Madison Ave., New York City



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A Good Heating System

"Click" . . .

goes the client's mind

When you tell him there's a* FUEL-LESS *water heater that will give him hot water—plenty—always

SCORES of architects have discovered Taco. They've tried it out, found that, in the proper size, it gives a continuous supply of clean hot water, without gas or extra fire. Taco heats the domestic water supply from waste heat of the steam heating plant. And now these men specify a Taco with every steam-heating system.

No building is too large—no bungalow too small for Taco water heating.

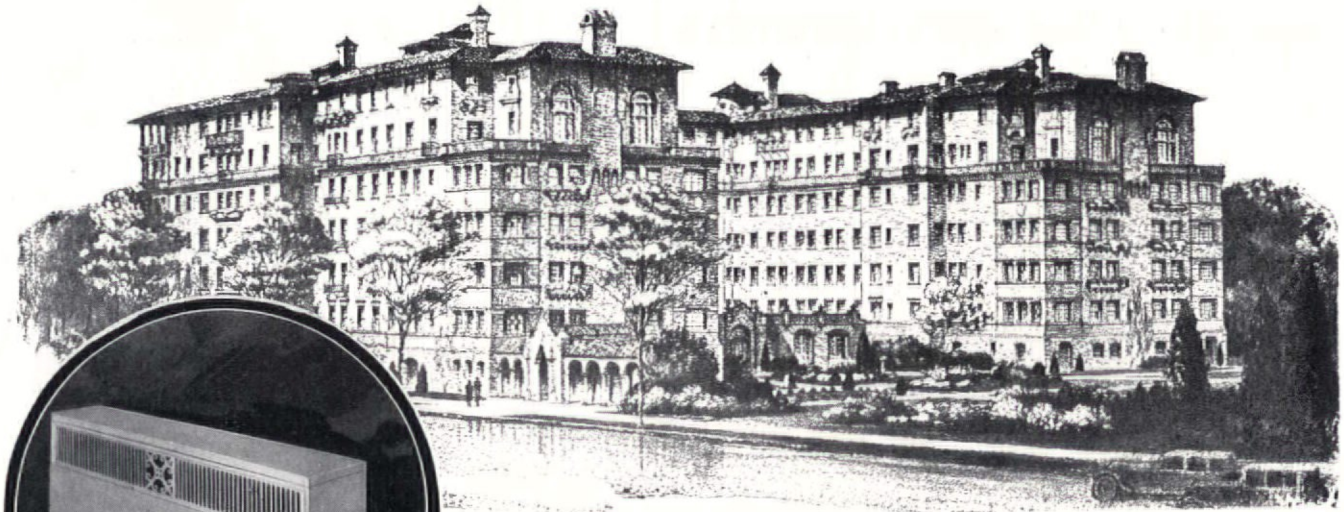
Why not assure every client a never-failing supply of hot water at an operating cost that's next to nothing. If you are not already specifying Tacos you will be interested in the Taco story. Especially the facts concerning the Super Taco, the water heater for big jobs. We will gladly give you all the specifying facts and engineering data — show you how to add the finishing touch to heating specifications. A post card brings you the whole interesting story.

TACO HEATERS, INC.
342 Madison Avenue New York City

Makers of

TACO

Automatic FUEL-LESS *Water Heaters*



E. D. Parmelee, Architect, Barron-Hubert Co., Heating Contractors

Only a beautiful Cabinet can be seen

but inside of it the Copper Heating Unit provides healthy heat with unusual efficiency

Architects, heating contractors and owners *know* that McQuay Radiators help to rent buildings. For their unobtrusive beauty immediately appeals to tenants. Pictured is the Chatsworth Garden, Larchmont, N. Y., for which McQuay Radiators have been selected.

McQUAY *Cabinet* RADIATOR

Economical heating requires complete circulation of the *warmed air*. With the McQuay a flood of air is poured into rooms with sufficient velocity to create positive circulation. This means quicker and more effective heating. It also prevents soiling of walls and drapes, as the heat goes out into the room—not up. A humidifying pan, inside the cabinet, provides the needed moisture.

Practical tests prove that with a McQuay the temperature needed for healthy, comfortable heat is *many degrees less* than required by ordinary radiators. Considerable fuel is thus saved.

In factories, offices, stores, etc., McQUAY UNIT HEATERS get heat where it's needed—quickly and efficiently

McQUAY RADIATOR CORPORATION General Sales Office: Pure Oil Building, Chicago

New York: 2148 Graybar Bldg.

Boston: 164 Federal St. Newark, N. J.: J. F. McLaughlin Co., 738 Broad St. Cleveland: 291 E. 149th St.

V. W. Hunter Tells Why The Grant Building, Pittsburgh

Selected the Dunham Differential Vacuum Heating System

"I am pleased to advise you relative to our reasons for selecting the Dunham Differential System for the Grant Building in preference to other types of heating systems.

"We made a very thorough investigation, and are convinced that it will effect economies and temperature control superior to any other system with which we are familiar. It is necessary from time to time to make some changes in the sizes and location of radiators in a building of this type, and also add additional radiation. This can be done with a Dunham Differential System without unbalancing it, and eliminates the high engineering costs, which would be necessary to properly balance an orifice type system. The higher vacuum produces rapid circulation, and permits steam to be turned on later in the morning and still bring the building up to the desired temperature.

"In operating under higher vacuum, steam temperatures are reduced, which effects uniform inside temperature to satisfy the demand of the outside temperature. We found that the higher vacuum is very easily maintained by using your packless inlet valves.

"Therefore, for the additional cost of your Differential equipment, we are convinced that we have selected the best."

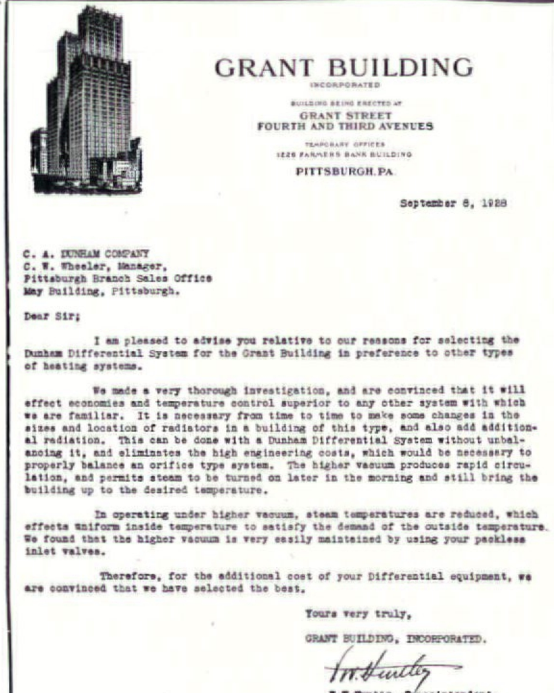
Complete information concerning this System of Heating upon request.

C. A. DUNHAM CO.

DUNHAM BUILDING
450 *East Ohio Street, Chicago*

Over eighty branch and local 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.*

U. S. Patent No. 1644114. Additional patents in United States, Canada and foreign countries now pending.



GRANT BUILDING
INCORPORATED
BUILDING BEING ERECTED AT
GRANT STREET
FOURTH AND THIRD AVENUES
TEMPORARY OFFICES
1226 FARMERS BANK BUILDING
PITTSBURGH, PA.

September 8, 1928

C. A. DUNHAM COMPANY
C. W. Wheeler, Manager,
Pittsburgh Branch Sales Office
May Building, Pittsburgh.

Dear Sir;

I am pleased to advise you relative to our reasons for selecting the Dunham Differential System for the Grant Building in preference to other types of heating systems.

We made a very thorough investigation, and are convinced that it will effect economies and temperature control superior to any other system with which we are familiar. It is necessary from time to time to make some changes in the sizes and location of radiators in a building of this type, and also add additional radiation. This can be done with a Dunham Differential System without unbalancing it, and eliminates the high engineering costs, which would be necessary to properly balance an orifice type system. The higher vacuum produces rapid circulation, and permits steam to be turned on later in the morning and still bring the building up to the desired temperature.

In operating under higher vacuum, steam temperatures are reduced, which effects uniform inside temperature to satisfy the demand of the outside temperature. We found that the higher vacuum is very easily maintained by using your packless inlet valves.

Therefore, for the additional cost of your Differential equipment, we are convinced that we have selected the best.

Yours very truly,

GRANT BUILDING, INCORPORATED.

V.W.Hunter, Superintendent.

Architect, H. Hornbostel. Assoc. Architects, Eric Fisher Wood & Co. Consulting Engineer, Thos. Payne. Heating Contractors, McGinness, Smith & McGinness. Thompson-Starrett Company, General Contractors

VENTO HEATERS
AT THE
"Gateway to a Continent"

Vento Cast Iron Heaters Adopted by Another of the World's Largest and Finest Office Buildings

THE many thousands who marvel at the new New York Central Building, Park Ave., New York, would marvel more could they see the interior refinements of this gigantic structure.

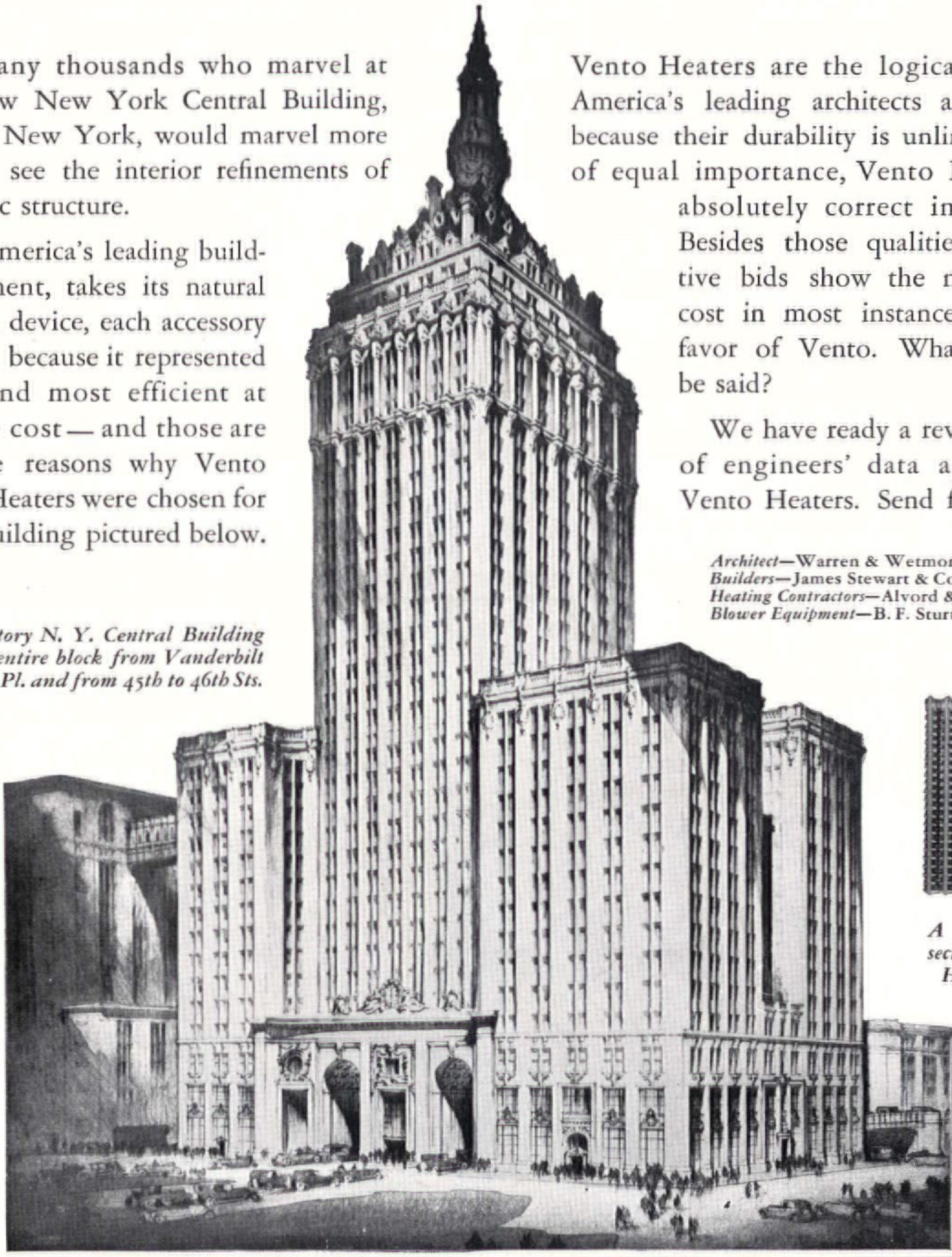
There, America's leading building equipment, takes its natural place. Each device, each accessory was chosen because it represented the best and most efficient at reasonable cost — and those are exactly the reasons why Vento Cast Iron Heaters were chosen for the great building pictured below.

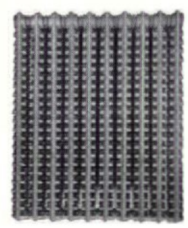
Vento Heaters are the logical choice of America's leading architects and builders because their durability is unlimited. And, of equal importance, Vento Heaters are absolutely correct in principle. Besides those qualities, comparative bids show the net installed cost in most instances to be in favor of Vento. What more can be said?

We have ready a revised edition of engineers' data applying to Vento Heaters. Send for it today!

Architect—Warren & Wetmore
Builders—James Stewart & Co., Inc.
Heating Contractors—Alvord & Swift
Blower Equipment—B. F. Sturtevant & Co.

The new 35 story N. Y. Central Building occupying an entire block from Vanderbilt Ave. to Depew Pl. and from 45th to 46th Sts.

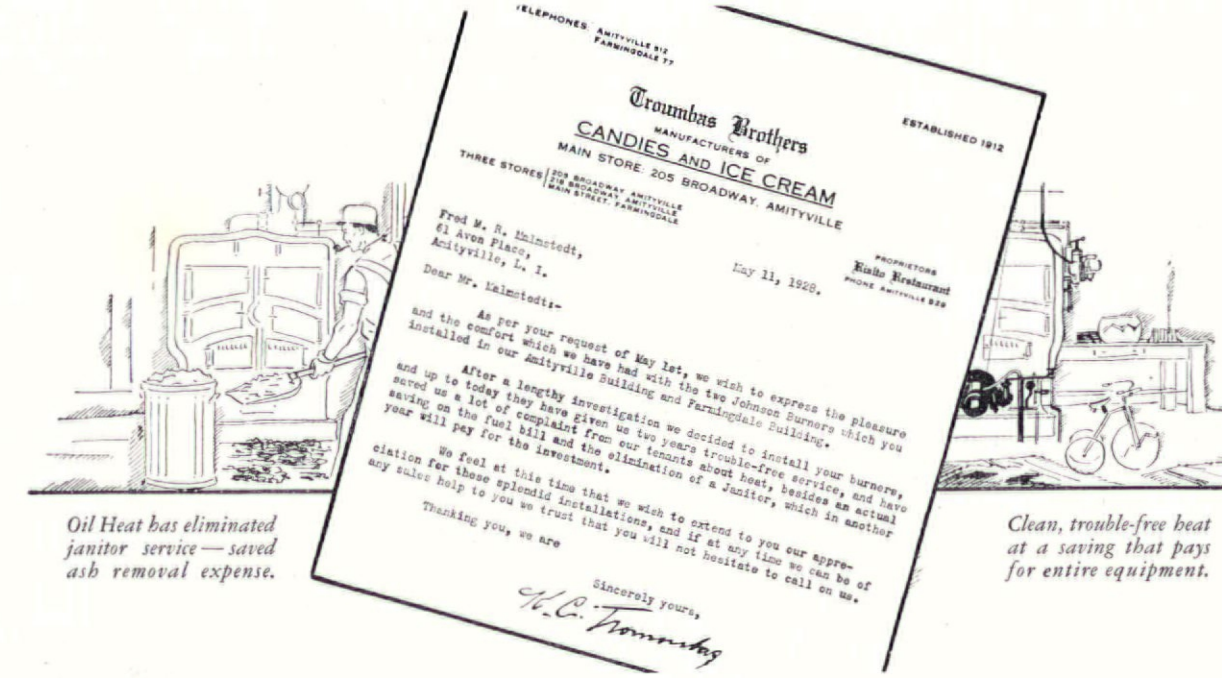




A representative section of a Vento Heating Unit.

AMERICAN RADIATOR COMPANY

816-820 S. MICHIGAN AVE. VENTO DEPT. V-311 CHICAGO, ILL.



TELEPHONES: AMITYVILLE 512
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MANUFACTURERS OF
CANDIES AND ICE CREAM
MAIN STORE: 205 BROADWAY, AMITYVILLE

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MAIN STREET, FARMINGDALE

PROPRIETORS
Rialto Restaurant
PHONE AMITYVILLE 829

Fred M. R. Malmstedt,
61 Avon Place,
Amityville, L. I.

May 11, 1928.

Dear Mr. Malmstedt:-

As per your request of May 1st, we wish to express the pleasure and the comfort which we have had with the two Johnson Burners which you installed in our Amityville Building and Farmingdale Building.

After a lengthy investigation we decided to install your burners, and up to today they have given us two years trouble-free service, and have saved us a lot of complaint from our tenants about heat, besides an actual saving on the fuel bill and the elimination of a Janitor, which in another year will pay for the investment.

We feel at this time that we wish to extend to you our appreciation for those splendid installations, and if at any time we can be of any sales help to you we trust that you will not hesitate to call on us.

Thanking you, we are

Sincerely yours,
K. C. Troumbas

Oil Heat has eliminated janitor service — saved ash removal expense.

Clean, trouble-free heat at a saving that pays for entire equipment.

The Johnson Oil Burner pays for itself

In hundreds of cases Johnson Oil Burners have paid for themselves by reducing fuel costs, eliminating janitor service and ash-removal expense. And these savings continue year after year.

Add to this the dependable, trouble-free, efficient performance for which Johnson burners are famous and you will realize that oil heat is the modern, convenient, economical form of heating.

The preference for Johnson burners is shown in the praises of home owners, builders and operators of large buildings, factories and industrial plants from Maine to California.

For more than 23 years Johnson engineers have built to win this preference. Leading architects and heating engineers realize that Johnson oil burners are scientifically correct. They know they can recommend and use them for every heating purpose.

Our Engineering Department, thoroughly experienced in all phases of heating and power problems, will be glad to assist you in any way.

MEMBER

S. T. JOHNSON CO.
Main Office and Factory, 940-950 Arlington Ave., Oakland, Calif.
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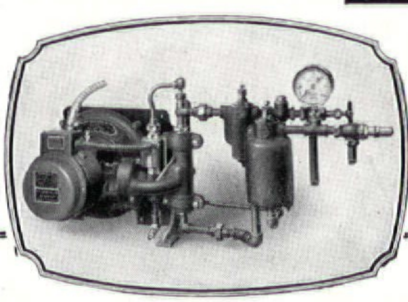
SAN FRANCISCO, SACRAMENTO, STOCKTON, PHILADELPHIA
YOU WILL FIND OUR LOCAL REPRESENTATIVE'S ADDRESS IN YOUR TELEPHONE DIRECTORY



COMBINING simplicity with unusual accessibility Johnson Oil Burners are acknowledged to be an outstanding engineering achievement.

JOHNSON OIL BURNERS

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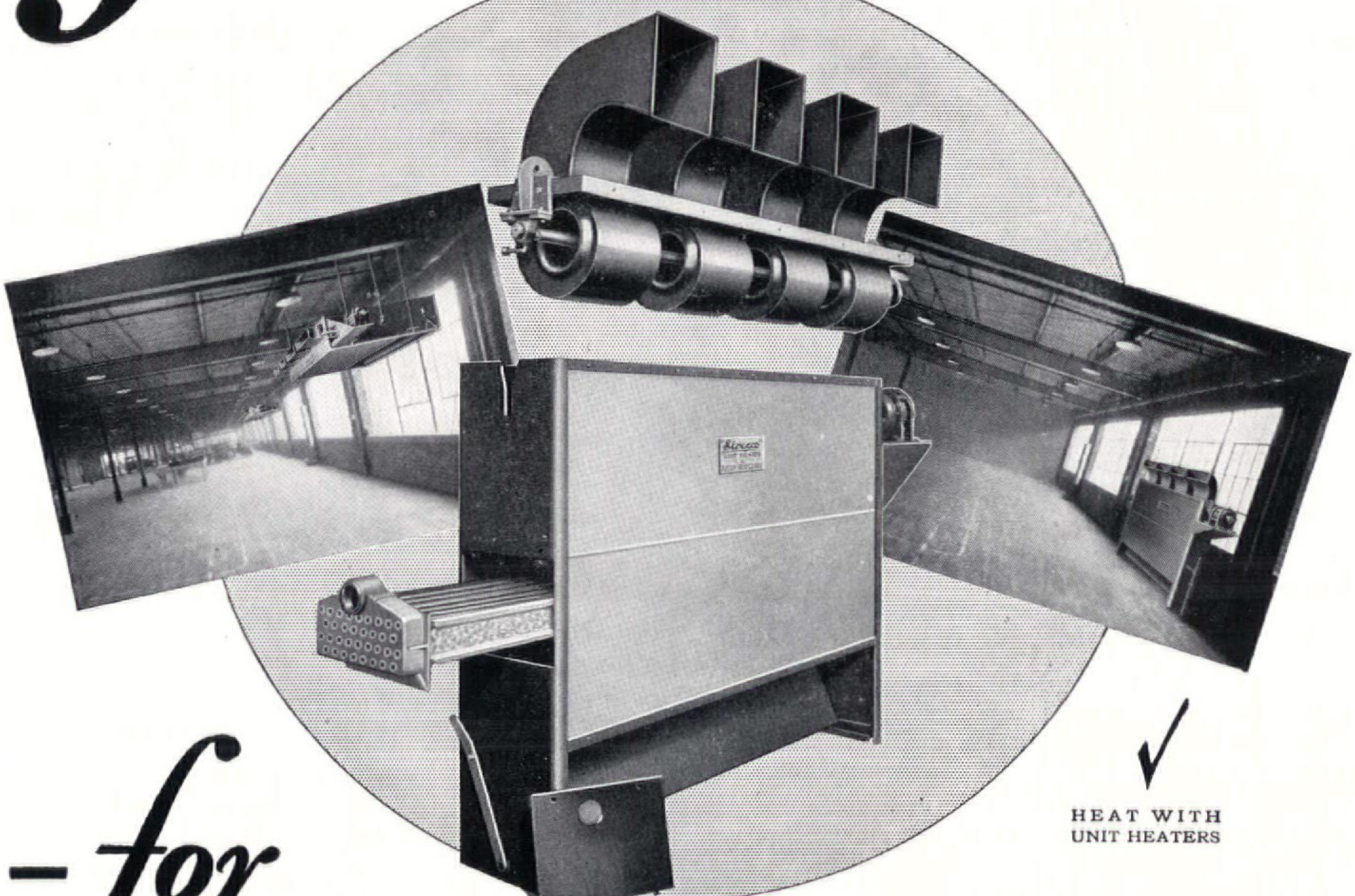
Oil Burner Equipment for Every Heating and Power Purpose

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 low pressure oil burners and pumping equipment. Steam atomizing, natural draft, and whirlwind burners, also electric or steam driven oil pumping and preheating equipment.

forced heat



HEAT WITH
UNIT HEATERS

—for LARGE INDUSTRIAL AREAS

There are two significant reasons why you should have all the facts on the Sirocco Unit Heater . . . first, because it has features of design and construction that heretofore have not been obtainable in any heating equipment, regardless of price or type . . . second, because the Sirocco Unit Heater is a product of American Blower . . . built as only American Blower, with its vast resources, complete facilities and forty-seven years' experience, builds heating and ventilating equipment. The Sirocco Unit Heater is the companion to the world-famous Venturafin Unit Heater . . . it is the *built-to-order* heating unit for large industrial areas . . . that forces heated air where you want it . . . when you want it . . . and as much as you want . . . that actually puts "waste heat" to work — reduces "heat loss" to a minimum, and distributes heated air more evenly in working areas . . . and it ventilates as it heats — or can be used for either heating or ventilating alone. Sirocco Unit Heaters are made in 28 sizes and capacities for both floor and ceiling applications. Mail the coupon today for complete information — no obligation.

C O U P O N

Please send me complete information on the Sirocco Unit Heater for:

Type of Building ________

Name ________

Firm ________

Full Address ________

[806]

American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

AMERICAN BLOWER CORP., DETROIT, MICHIGAN
CANADIAN SIROCCO CO., LTD., WINDSOR, ONTARIO
BRANCH OFFICES IN ALL PRINCIPAL CITIES

REVIEWS OF MANUFACTURERS' PUBLICATIONS

FEDERAL TELEPHONE MANUFACTURING CORPORATION, Buffalo. "Federal Telephone Systems. Catalog 1110."

Interior telephone systems are being used everywhere. Not only are they found in offices, industrial plants, schools, hospitals and other places where many departments must be kept in close touch with one another, but even in residences, and not necessarily in residences of any great size. This booklet illustrates and lists the numerous details of equipment which enter into the creation and upkeep of such a system. The brochure says that the equipment described and illustrated is the result of over a quarter-century's honest efforts, diligently applied to the perfection of telephone apparatus. "This perfection has been reached by employing the best of engineering knowledge for designing, the best material obtainable for manufacture, and the highest skilled mechanics. Each unit is designed and constructed with the sole purpose in view of procuring permanent, highly efficient results. Extreme climatic conditions in all parts of the world have been given consideration. The apparatus will withstand temperatures and high atmospheric humidity. Steel and iron parts are processed to prevent rust, insulating materials are of phenol composition, often referred to under the trade names of micarta, bakelite, formica, etc., and all coils served with a twine armor, thoroughly sealed under a baking process. Each type of apparatus is finished in the most permanent and attractive manner to harmonize with the design and conform to the respective requirements. The various types, designs and arrangements have been developed to meet the general requirements and common practice of different countries."

BLAW-KNOX COMPANY, Pittsburgh. "Steel Universal Street Forms for Curb, Integral Curb and Sidewalk."

It is quite possible that part of concrete's popularity as a structural material, and certainly much of its external use, are due to the ease with which it is used,—to its "flexibility," in fact. To secure good concrete one need only secure an appropriate "mix" and then pour the mix into a form in which it hardens into permanent shape; and in countless instances these forms may be used again and again. Since this principle is so easily applied, there is of course no reason why it should not be used when large areas of concrete are to be made, and this brochure describes and illustrates the steel forms which this large manufacturing firm supplies for the casting of concrete curbs, curbs and gutters, and sidewalks. "Steel face forms are an absolute necessity for smooth, dense, and durable work. They minimize the need for plastering and refinishing. Monolithic finish for concrete curb, gutter, sidewalks, integral curb, etc., is now recognized by most modern specifications as the ultimate in durable construction for work of this kind. The practice of applying a mortar plaster finish over the concrete is rapidly being abandoned. Blaw-Knox Steel Face Forms are made to fit the exact contour and shape of the work. They are perfectly smooth and will enable the user to obtain a neat appearance with minimum labor and refinishing. These face forms require no clamps for installation; they are suspended from the back form by means of angle spacers and can be rapidly set up or dismantled. The angle spacers need not be detached from the face forms." The forms are to be had in a large variety, for use in street work of more or less complicated kinds. "Blaw-Knox Steel Radius Forms are furnished in two distinct types, Flexible and Fixed Radius Forms. Flexible Radius Forms are used for concrete curb, curb and gutter, and sidewalk construction where the radii are subject to frequent variation and change. The Flexible Form is bent to the required radius as it is being set, and then staked in place. Eight standard stake pockets are furnished with each 10-foot length of flexible form. Flexible forms are also made in any special length that may be desired. Flexible Face Forms are provided for concrete curb, but not for combined curb and gutter. Blaw-Knox Flexible Forms are also furnished for sidewalk radius corners in 4-, 5- and 6-inch heights, with a connecting device to join them to the standard Universal Forms where so used."

BONDED FLOORS COMPANY, INC. "Gold Seal Battleship Linoleum; A Bonded Floor." A brochure on good flooring.

The present popularity of linoleum and its wide use as a floor covering are due to its practical qualities no less than to its attractive appearance. Being highly resilient, it is useful in places where there must be much walking and standing, and it minimizes noise where use is made of typewriters, adding machines, and other noise-producing devices. Since it is to be had in tile and marble effects as well as in plain colors and in jaspe, with or without borders, it adds much to the architectural appearance of interiors where it is used. This brochure, together with a number of loose leaf illustrations which come with it, gives one an excellent idea of the wide scope of linoleum's use, for it shows interiors of offices, tea rooms and restaurants, and several banks as well as in some very large buildings in New York and elsewhere. In one New York structure, that containing the home offices of the Equitable Life Assurance Society, some 360,000 square feet of Gold Seal Battleship Linoleum were installed. "The manufacturers guarantee the wearing qualities of their floors, giving a bond which assures such wear. This bond means service. It means that the company's responsibility for its floors does not end when the last workman walks away. Its organization of flooring specialists is always at patrons' service,—ready to see that they get full satisfaction, that every stipulation of the bond is carried out." Finally, this bond is life insurance on a floor. The mere fact that the company can afford to issue such a bond on thousands of floors each year is the best proof that one can count on excellent service from a bonded floor.

HOLOPHANE COMPANY, INC., 342 Madison Avenue, New York. "The Lighting of Schools; Good Practice."

The development of education which has made the American educational system what is perhaps the most successful in the world, is not the result of applying hit-or-miss methods of improvement but is due to earnest, long-continued research and experiment. So too with the buildings which are used as schools, since for decades architects and engineers have been studying the problem, in order to produce the utmost in design, plan and equipment. This booklet is a review or digest of the problem of lighting the school. "Good artificial lighting is one of the most important factors in teaching. This fact is so patent that it is surprising that school boards have only commenced to appreciate its importance. Unwarranted increase in educational cost has aroused widespread interest, and national surveys conducted by disinterested organizations indicate that the greater expense is partially caused by backward pupils, afflicted with defective eyesight caused by the woefully inadequate lighting systems in the classrooms, study rooms, laboratory and other parts of the school, where the eyes of the pupil and teacher are in constant use. Illumination engineers have ascertained that the lighting of many of our school buildings is inferior to that obtained in commercial and industrial establishments. This is truly an alarming condition, because good lighting is just as important in the school as in the store, shop or factory. It must be remembered that if the eyes of the young child are subject to undue strain, faulty vision in later life will surely result. Teachers know that defective eyesight is the cause of frequent absence and low scholarship. Recent surveys have shown that as high as 25 per cent of American school children have defective eyesight. Enormous losses in time and money result from this condition, and these losses will continue if a remedy is not supplied. Needless to say, poor school lighting can be remedied,—*must* be remedied, for it is false economy to erect costly educational edifices, equipped with the most modern appointments in all departments except illumination, when it is so necessary to see in order to learn." What follows is a survey of school lighting by the highly trained research workers of this well known firm. It would be difficult to imagine anything dealing with this important topic more complete and more useful to architects whose work includes the planning of school buildings. The booklet should be had in every office.

KNOW ELECTROL BY THE HOMES IT HEATS

Left: "Hilltop Manor," Suffield, Conn. The home of Mr. George M. Hendee

Below: Residence of Mr. Arthur Moore, Manhassett, L. I.

Your Clients are Entitled to this Complete Oil Heating Service

WHEREVER an Electrol Automatic Oil Burner is installed by an Electrol dealer, he is interested in rendering oil heating service of which the actual installation of the burner is but a part.

He recognizes that each building, each home presents an individual heating problem. The size of the building, number of rooms, and type of heating plant are carefully considered. Then, if he recommends Electrol you know it will give its owner more comfort, convenience and pleasure than he has realized could be derived from any method of heating.

Electrol complete automatic oil heating service embraces:

A Survey of the heating requirements, with a conscientious and candid report covering the possibilities of Electrol in the home or building. Electrol will not be recommended unless it will give full efficiency and complete satisfaction.

Installation by skilled mechanics who have been thoroughly trained by the factory in the correct methods of fitting Electrol to each type of heating plant.

Regulation and Adjustment Service. Constantly available, day or night, if the burner should ever require attention...Wherever Electrol is sold, you will find this complete oil heating service, backed by a sound, large, and growing manufacturing organization.

Electrol is the oil burner with *The Master Control*, an ingenious device which watches over every phase of the burner's operation day and night, like a living sentinel regulating the flow of oil, timing the ignition, governing combustion.

Quiet... All-Electric... Entirely Automatic, Electrol is as fine as engineering skill and exceptionally strong financial resources can produce.

Complete details of this finer oil burner are given in the Electrol regulation A. I. A. Folder, sent on request. Or, if you prefer, consult the Electrol Sales and Service Representative in your city for further information.

Electrol Inc. *of* Missouri, 179 Dorcas St., St. Louis, U. S. A.

Models for Homes of all Sizes

Electrol is made in models for homes and buildings of all types and sizes, large and small. Employs the proved engineering principles of positive automatic electric ignition and mechanical fuel atomization. No gas pilot light is needed. Electrol principles and design result in the highest efficiency of any automatic heating unit operating in a coal burning boiler.

Purchase can be financed along with financing of new building.

ELECTROL

The OIL BURNER with *The Master Control*

Listed as Standard by the Underwriters' Laboratories, and bears their label.

Member of the Oil Heating Institute

This coupon is for your convenience!

Electrol Inc. *of* Missouri
179 Dorcas St., St. Louis, U.S.A.
Gentlemen: Please send the Electrol Regulation A. I. A. Folder.

Name ....

Address ....

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

MAC ANDREWS & FORBES COMPANY, 200 Fifth Avenue, New York. "Maftex; Its Many Uses and Applications."

Particularly interesting is the study of new building materials and the uses to which they are adapted, and no materials which come to the notice of architects and builders possess wider inherent interest than those whose main function is to supply insulation. These booklets,—a series of seven,—deal with a material useful for quite a variety of purposes. "Maftex," the booklets say, is made of licorice root, obtained in several distant parts of the world. In our younger days, most of us were familiar with untreated licorice root and its tough, stringy fibers. The cellular root fibers that remain after the extraction of licorice possess remarkable properties of strength, endurance and resistance to thermal conductivity that make them ideal for products that must be subjected to unusual wear and tear and strain. One brochure of the series deals with use of Maftex because of its sound-absorbing value. In Maftex we find a particularly satisfactory combination of the desirable characteristics of a sound-deadening material. The closely felted structure of the sheet stops effectively the direct transfer of sound impulses by air alone. It is true that the material contains innumerable air cells, but to pass from one to the other the sound energy must be conducted through separating walls which are poor conductors. Every time the sound impulse is required to pass from one air cell to the next, there is a considerable energy loss, and the rate of "decay" or the "absorption" of the sound energy is therefore enormous. The elastic characteristics of the sheet are such that diaphragmatic action is reduced to a minimum. It should be understood, however, that this diaphragmatic effect depends largely upon the manner of supporting the material, and, for this reason, the specifications given in this publication should be followed as closely as possible. Other booklets of the series discuss use of this material for roof and wall sheathing and other purposes.

E. L. BRUCE COMPANY, Memphis. "A Flooring Achievement; Cellized Oak Floor Block." Advantages of their use.

Architects and decorators favor two quite different types of wood floors. One type is that which custom and good taste demand for rooms of early English or American "Colonial" architecture, the floor being made up of planks, preferably of oak, either wide or of random widths, and held in place by wooden pegs. The other type of wood floor is made up of blocks or squares, the sizes of which depend largely upon the size of the room, contrast being had by having the grain of the blocks running in different directions. Floors of this latter type possess something of the decorative value of parquetry, and are particularly appropriate for use in rooms of a somewhat formal character. "Both types have heretofore been limited to those who could afford considerable outlay in the building budget. Design patterns had to be laid in individual pieces; planks had to be laminated or veneered, keyed and pegged to prevent cupping or shrinking,—a condition to which wide boards are especially susceptible, due to atmospheric moisture. Even with every precaution, such floors in time frequently became uneven." This brochure, one of several issued by this firm of floor workers, deals particularly with floors of the block type. "Three or more pieces of beautifully grained oak are manufactured in a unit,—held securely by a steel spline at the back,—and are laid more rapidly and easily than the more usual narrow-face flooring. Three sizes afford ample range of choice, to adjust the design to room area, and may be laid in several interesting patterns, —regular squares,—parallel to the sides of the room; diagonal squares,—in which case a special border is used; half center squares; or combination of sizes, giving a most unusual effect. Several grades of oak afford a range in price, but all are equally sound. The grade has to do with appearance in grain only,—so-called lower grades are strongly grained; higher grades finely grained. Many people prefer the lower and cheaper grades because of their more striking beauty and contrast. Finished in the popular dark tones, such a floor makes a wonderfully rich decorative foundation." This booklet, as well as others issued by the same firm, should be carefully studied by architects.

M. F. Fooshee and J. B. Clark announce their removal to new offices at 1901½ North Harwood Street, Dallas, Tex. The catalogs and publications of manufacturers are desired.

Fred G. Rounds, formerly Associate Professor of Architecture at the State College of Washington and member of the firm of Smith & Rounds, Pullman, Wash., has opened an office for the independent practice of architecture in the Advocate Building, Chehalis, Wash. After January 1, 1929, Mr. Stanley Smith will conduct the Pullman office.

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 October 1, 1928
State of New York, County of New York, ss.:
Before me, a Notary Public, in and for the State and County aforesaid, personally appeared Robert Sweet, 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—Rogers & Manson Co., 383 Madison Avenue, New York, N. Y.
Editor—Parker Morse Hooper, New York, N. Y.
Managing Editor—None.
Business Manager—Robert Sweet, New York, N. Y.

2. That the owners are:
Rogers & Manson Co., 383 Madison Avenue, New York, N. Y.
Stockholders holding 1 per cent or more of the total amount of stock:
Howard Myers, Bronxville, N. Y.
C. Stanley Taylor, New York, N. Y.
James A. Rice, Chicago, Ill.
Robert Sweet, New York, N. Y.
Paul W. Hayes, 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: 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.

ROBERT SWEET,
Business Manager.

Sworn to and subscribed before me this 10th day of October, 1928.
(Seal) STELLA L. BOWMAN,
(My commission expires March 30, 1930.) Notary Public.

VAN RENSSELAER P. SAXE, C.E.

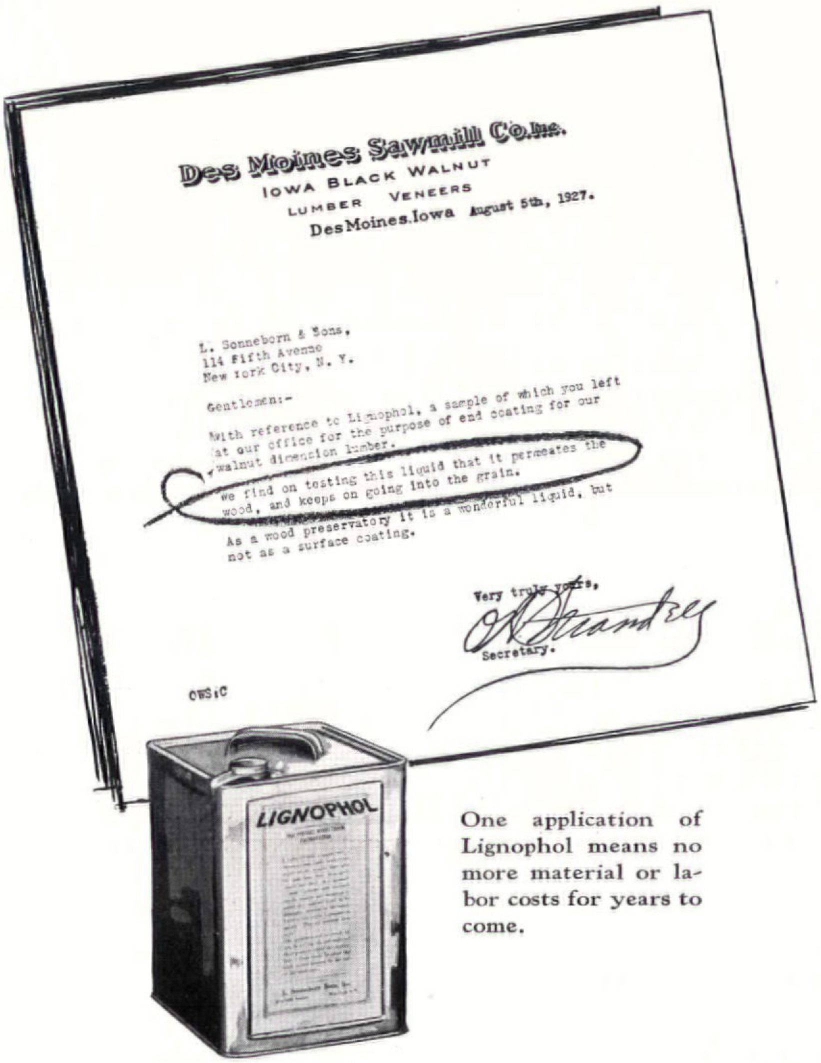
Consulting Engineer

STRUCTURAL STEEL
CONCRETE CONSTRUCTION

Knickerbocker Building Baltimore

LIGNOPHOL

is a penetrating preservative for wood floors


Des Moines Sawmill Co. Inc.
IOWA BLACK WALNUT
LUMBER VENEERS
DesMoines.Iowa August 5th, 1927.

L. Sonneborn & Sons,
114 Fifth Avenue
New York City, N. Y.

Gentlemen:-

With reference to Lignophol, a sample of which you left at our office for the purpose of end coating for our walnut dimension lumber.

We find on testing this liquid that it permeates the wood, and keeps on going into the grain.

As a wood preservatory it is a wonderful liquid, but not as a surface coating.

Very truly yours,

Secretary.

OWS:C

One application of Lignophol means no more material or labor costs for years to come.

ARCHITECTS and Engineers will be interested in this letter, shown here. It proves Lignophol is no mere surface dressing. This penetrating preservative gets into the interior wood cells and fibres, filling them with natural life-giving gums and oils.

Lignophol protects new and old wood floors against splintering, cracking, warping and rotting.

Linseed oil, shellac, varnish and so-called preservatives cannot do this. They quickly evaporate or wear away and must be renewed ever so often.

You can assure your clients that Lignophol for a period of years will keep their floors looking new and strong. They will appreciate its economy when they know that it saves considerable money that would otherwise be expended in frequent renewals and repairs.

Lignophol Wax Finish—for floors in residences, apartments and for dance floors. Produces a medium or high polish. Already contains wax and need only be polished six hours after applied.

Lignophol is manufactured in four standard colors: Natural, Light Brown, Medium Brown and Dark Brown. Easily and quickly applied with long-handled or flat, wide brush at minimum labor cost. One application lasts for years.

Be sure to specify Lignophol—a Sonneborn Product.

Some Other SONNEBORN Products

LAPIDOLITH
The original concrete floor hardener. Adds years to life of concrete floors. Applied like water with a brush. Hardens overnight.

HYDROCIDE
A complete line of water and dampproofing products for walls, copings, foundations.

CEMCOAT
The paint that stays white when others turn yellow. Can be washed again and again. Adheres to brick or concrete as easily as to wood.

L. SONNEBORN SONS, Inc.
114 Fifth Avenue, New York

MAIL THIS COUPON TODAY
L. SONNEBORN SONS, Inc., 114 Fifth Ave., New York
Please send me, without obligation, demonstration samples and literature on: — Lapidolith ......; Lignophol ...... Cemcoat ......; Hydrocide Colorless...... (Check products that interest you.)
Name ......
Address ......
Company ......
Position ......
A.F. 7

INDEX TO ADVERTISING ANNOUNCEMENTS

Part 1—Architectural Design

Part 2—Architectural Engineering and Business

65 GAS REFRIGERATORS...
in this beautiful new apartment in New York City. George Miller, Architect. Oscar Pederson, Builder.

Number of Apartments . . . *Electrolux-Equipped* . . . Mounts Rapidly

Architects finding the Gas Refrigerator signally adapted to apartment dwelling installation

THE finest new apartments now offer gas refrigeration. The list of new Electrolux installations mounts rapidly. And this means architectural endorsement.

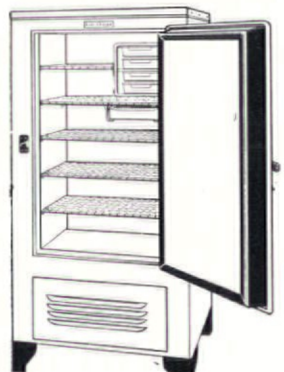
Hardly surprising, when you consider the unique and remarkable features of Electrolux.

Here is a refrigerator that actually freezes by heat . . . that operates simply and silently with a tiny gas flame and a thin trickle of water . . . that has no moving parts to wear, need oiling and servicing, or make any noise.

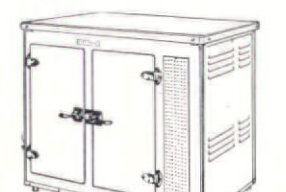
The economy of gas is proverbial, and the total absence of moving parts insures long life and freedom from servicing.

Besides, the cabinet construction of Electrolux is worthy, in every respect, of the advanced freezing unit. Nor has the artistic element been neglected. Electrolux is readily adaptable to your decorative scheme. Electrolux may be had in four charming color finishes (Biscay Blue, Ivory Tan, Silver Grey, Crystal Green) besides the standard gleaming white.

Such refrigeration vindicates the architect's judgment in selecting it. Such refrigeration makes apartments easier to rent. We shall be happy to consult with you without obligation. Just write, Servel Sales, Inc., Evansville, Indiana.

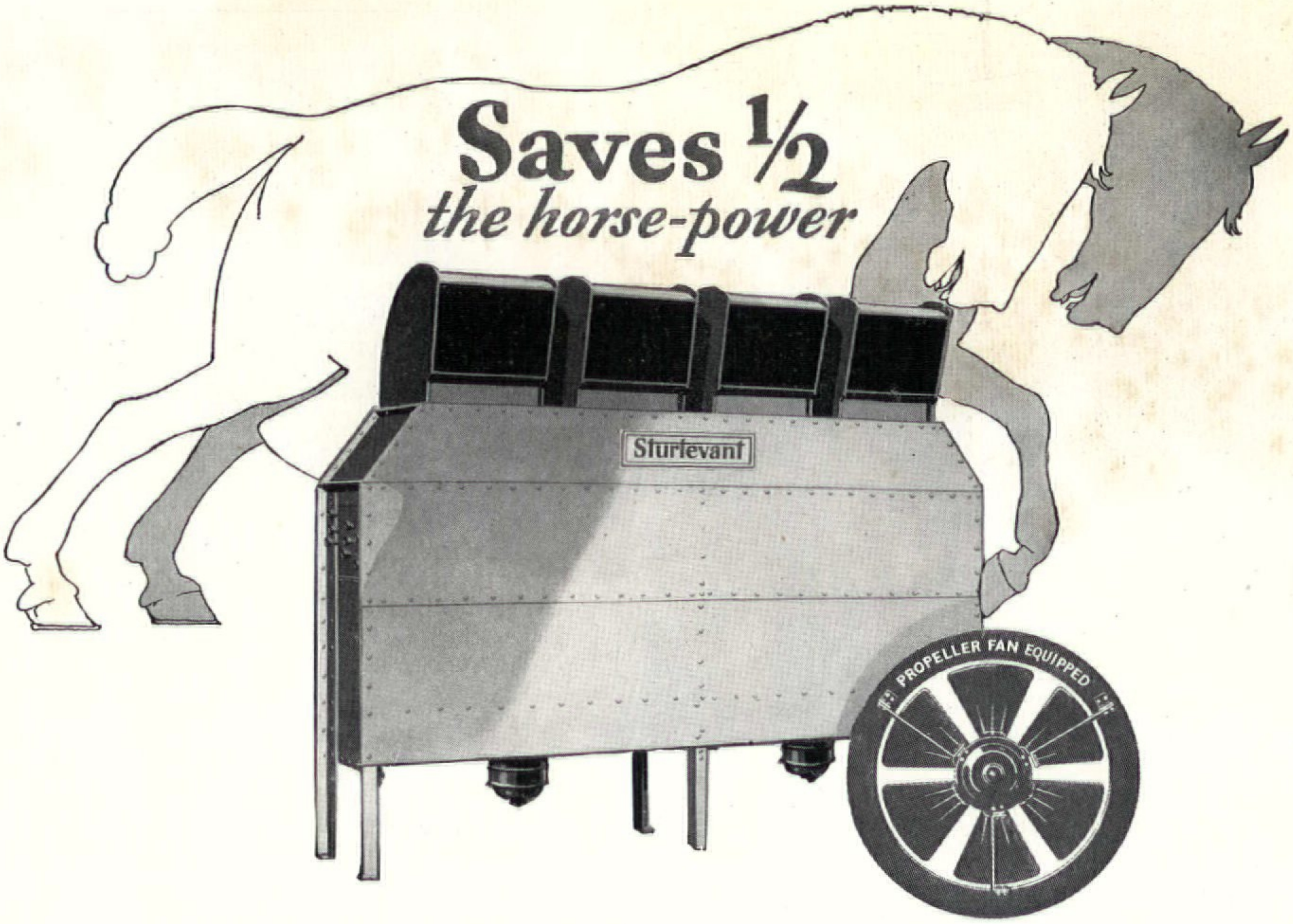


Electrolux—Kitchenette Model—4 cubic feet food storage capacity. Plenty of ice cubes—Ideal for the small apartment kitchen.



An unusual Electrolux Model—the Double Duty. Just the right height to serve as a table or the base for a gas range. A remarkable space saver. Food capacity 5 cubic feet—40 ice cubes.

ELECTROLUX the GAS refrigerator MADE BY SERVEL

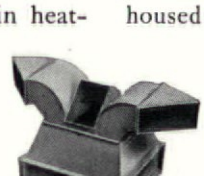


New Economy in Unit Heating!

Motor horse-power cut 50% — current consumption halved — through the use of propeller type instead of centrifugal type fans!

TO equip this new Sturtevant Unit Heater with propeller type fans seemed to be plain common sense . . .
for propeller fans operate at highest efficiency against low resistances . . .
whereas housed centrifugal fans operate at lowest efficiency against low resistances . . .
and the resistance offered by the Aerofin heating element in the Sturtevant Unit Heater is *low*.

Tests were made in the Sturtevant Research Laboratory—undoubtedly the most thorough and accurate unit heater tests ever conducted. Both types of fans were tested under actual unit heater operating conditions. Exacting standards established by the heating and ventilating societies and committees were used.



Sturtevant Tempervane heating unit, overhead type

Result: — Sturtevant Tempervane Heating Units are equipped with *propeller type fans*—for any given air delivery or B. T. U. capacity, the motors required are half the horse-power of those used on similar units equipped with housed centrifugal type fans—current consumption cut 50%!

Investigate this decidedly worth while unit heating economy. Write our main office below and complete information will be promptly furnished.

Tempervane Heating Units are made in both floor and overhead types, for steam pressures up to 350 pounds per square inch.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.
Branch Offices in Principal Cities

Sturtevant *Tempervane* **Heating Units**

REG. U.S. PAT. OFF.

T R A N S I T E

A FIREPROOF

BUILDING MATERIAL

FOR EXTERIOR

AND

INTERIOR

USE

Transite is a building material composed of Asbestos fibres and Portland cement, united under tremendous pressure into a rigid, homogeneous mineral sheet of remarkable permanence. It is fireproof, and is for use where ordinary wood is prohibited by law or by conditions — or where real permanence is desired.

Millions of square feet of Transite Corrugated have been used to provide fireproof, gas-resisting siding and roofs for skeleton frame buildings. But besides this use, Transite in flat sheets is being specified by architects for various exterior and interior purposes.

Transite, whether corrugated or flat, has many superior qualities. It is structurally strong, and resists to the highest degree all deterioration. Transite will not rot, rust or corrode. It is highly resistant to gasses, acid fumes, salt air and other atmospheric conditions which quickly destroy ordinary materials.

We will be pleased to send to any architect a sample of Transite and to discuss possible uses of this high-grade, economical material. Address: Johns-Manville Corporation, 292 Madison Avenue, New York City, New York.

MASTER *of* ASBESTOS

Johns-Manville

TRANSITE

A

Fireproof

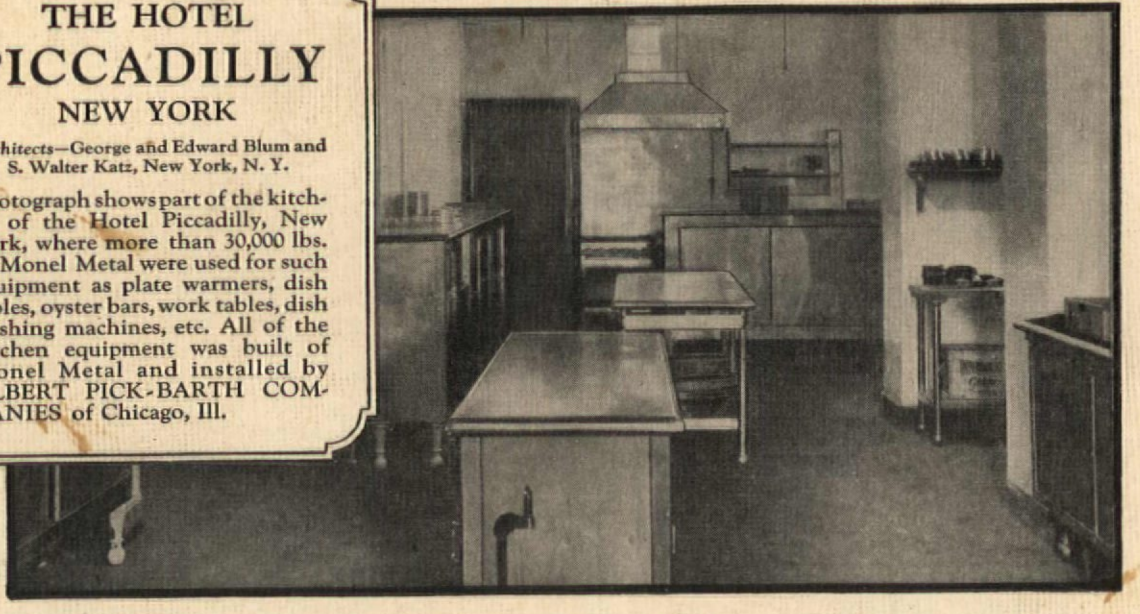
Asbestos

Building Material

THE HOTEL
PICCADILLY
NEW YORK

Architects—George and Edward Blum and S. Walter Katz, New York, N. Y.

Photograph shows part of the kitchen of the Hotel Piccadilly, New York, where more than 30,000 lbs. of Monel Metal were used for such equipment as plate warmers, dish tables, oyster bars, work tables, dish washing machines, etc. All of the kitchen equipment was built of Monel Metal and installed by ALBERT PICK-BARTH COMPANIES of Chicago, Ill.



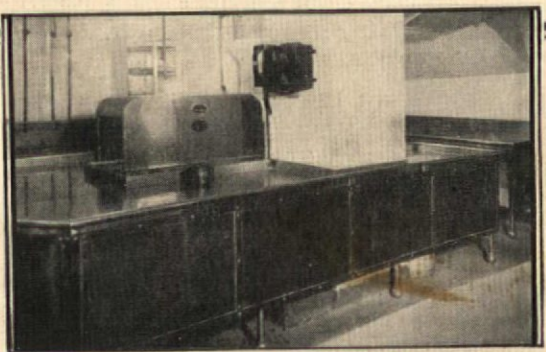
Another noteworthy Monel Metal food service installation

THE HOTEL PICCADILLY takes its rightful place in the forefront of New York's famous hotels.

And the Piccadilly's kitchen with its 30,000 lbs. of Monel Metal takes its place as an outstanding example of what a modern hotel kitchen should be.

Practically every prominent new hotel has a Monel Metal kitchen. Architects and builders welcome the opportunity to install the highest quality equipment—to supply Monel Metal equipment which they know will always look attractive and wear well.

The wide-spread use of Monel Metal in hotels, restaurants and institutions has furnished adequate proof, over a period of years, that Monel Metal may also be safely specified for household equipment.



Another view of the Hotel Piccadilly kitchen showing Monel Metal dish table and dish washing machine. The machine was manufactured by THE CRESCENT WASHING MACHINE DIV. OF THE HOBART MFG. CO. *of Troy, Ohio. It was installed with other Monel Metal equipment by Albert Pick-Barth Companies.*

Your file should contain information about Monel Metal in the home—for sinks, table tops, cabinets, hardware, gates, railings, etc. Write for the new booklet, "Modern Kitchens".

SEND FOR SPECIAL SERIES OF ARCHITECTURAL FOLDERS

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

MONEL METAL

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THE INTERNATIONAL NICKEL COMPANY (INC.) 67 WALL STREET, NEW YORK, N. Y.