THE ARCHITECTURAL FORUM

IN TWO PARTS

ARCHITECTURAL ENGINEERING
&
BUSINESS

PART TWO

JULY

1928

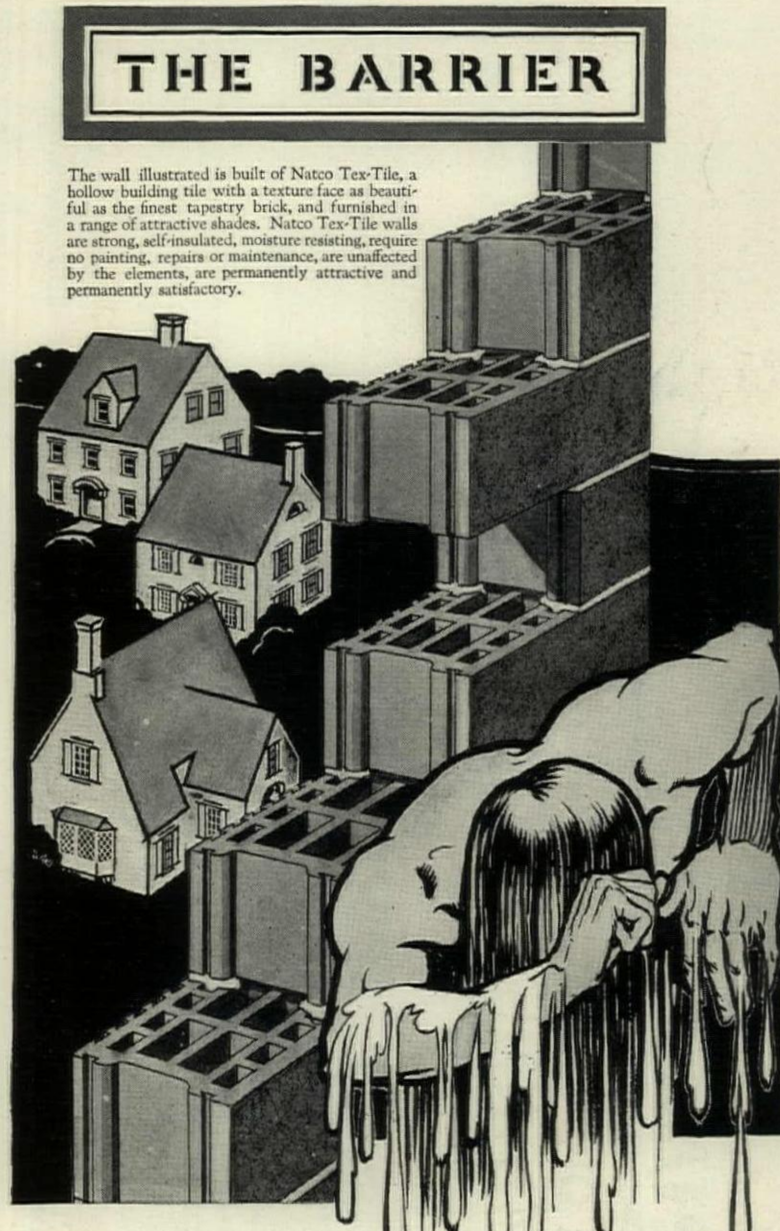
Indianapolis buildings that are equipped with *Richards-Wilcox* elevator door hardware.

DAMPNESS FINDS "NO THOROFARE" WHEN IT ENCOUNTERS NATCO

LOW ABSORPTION characterizes all hard-burned, dense Natco Hollow Building Tile. Moisture won't seep through; won't be taken up from drying plaster, stucco, or mortar, weakening it; won't be absorbed to freeze in winter, disintegrating the wall.

In every wall of Natco Double Shell Tile moisture stops are automatically established, that break all vertical and bed joints. Dampness finds no thoroughfare.

Whether you use Natco Header Backer, in connection with brick facing; Natco Double Shell Load Bearing in connection with stucco; Natco Tex-Tile or Combed Face, for finished face walls; you'll find that with these double shell units in Natco's Complete Line of Hollow Building Tile, you can build walls that effectively resist the passage of moisture—stop it where it starts.



The wall illustrated is built of Natco Tex-Tile, a hollow building tile with a texture face as beautiful as the finest tapestry brick, and furnished in a range of attractive shades. Natco Tex-Tile walls are strong, self-insulated, moisture resisting, require no painting, repairs or maintenance, are unaffected by the elements, are permanently attractive and permanently satisfactory.

NATIONAL FIRE-PROOFING COMPANY

General Offices: Fulton Building, Pittsburgh, Pa.

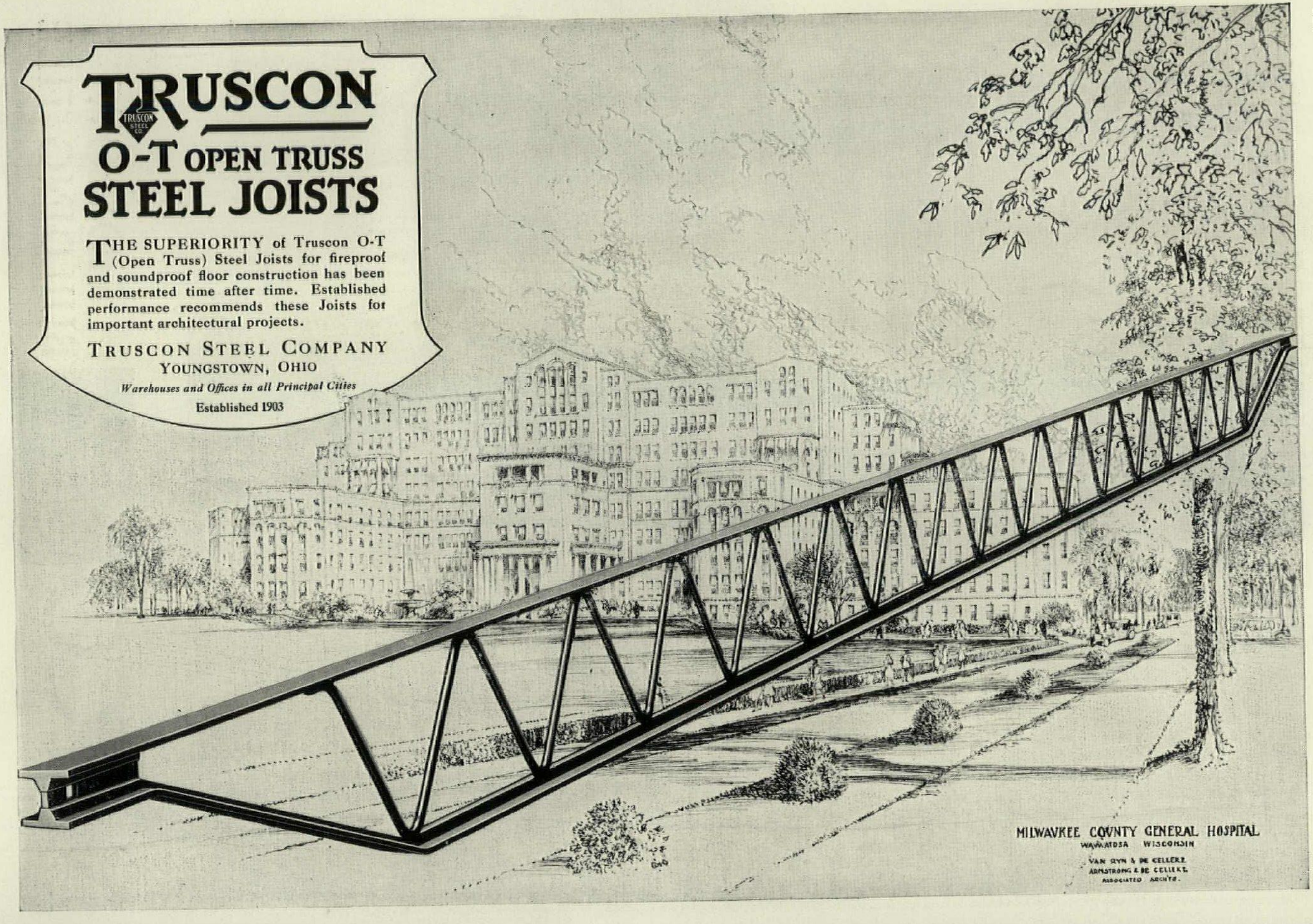
Branch Offices
New York, Flatiron Bldg.; Chicago, Builders Bldg.; Philadelphia, Land Title Bldg.; Boston, Textile Bldg.

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

NATCO

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

HOLLOW BUILDING TILE


TRUSCON
TRUSCON STEEL CO.
O-T OPEN TRUSS
STEEL JOISTS
THE SUPERIORITY of Truscon O-T (Open Truss) Steel Joists for fireproof and soundproof floor construction has been demonstrated time after time. Established performance recommends these Joists for important architectural projects.
TRUSCON STEEL COMPANY
YOUNGSTOWN, OHIO
Warehouses and Offices in all Principal Cities
Established 1903
MILWAUKEE COUNTY GENERAL HOSPITAL
WAUWATOSA WISCONSIN
VAN RYN & DE GELLEKE
ARMSTRONG & DE GELLEKE
ASSOCIATED ARCHTS.

RAYMOND

A Pile driven with 82' 6" leads

that require two flat cars to move it from one position to another is no everyday sight on a foundation job. But this is typical of the special equipment developed by this organization for rapid, effective pile driving—the same organization that developed the famous Raymond Method of pouring concrete piles into driven, spirally reinforced tapering steel shells and leaving each shell in the ground.

RAYMOND CONCRETE PILE COMPANY

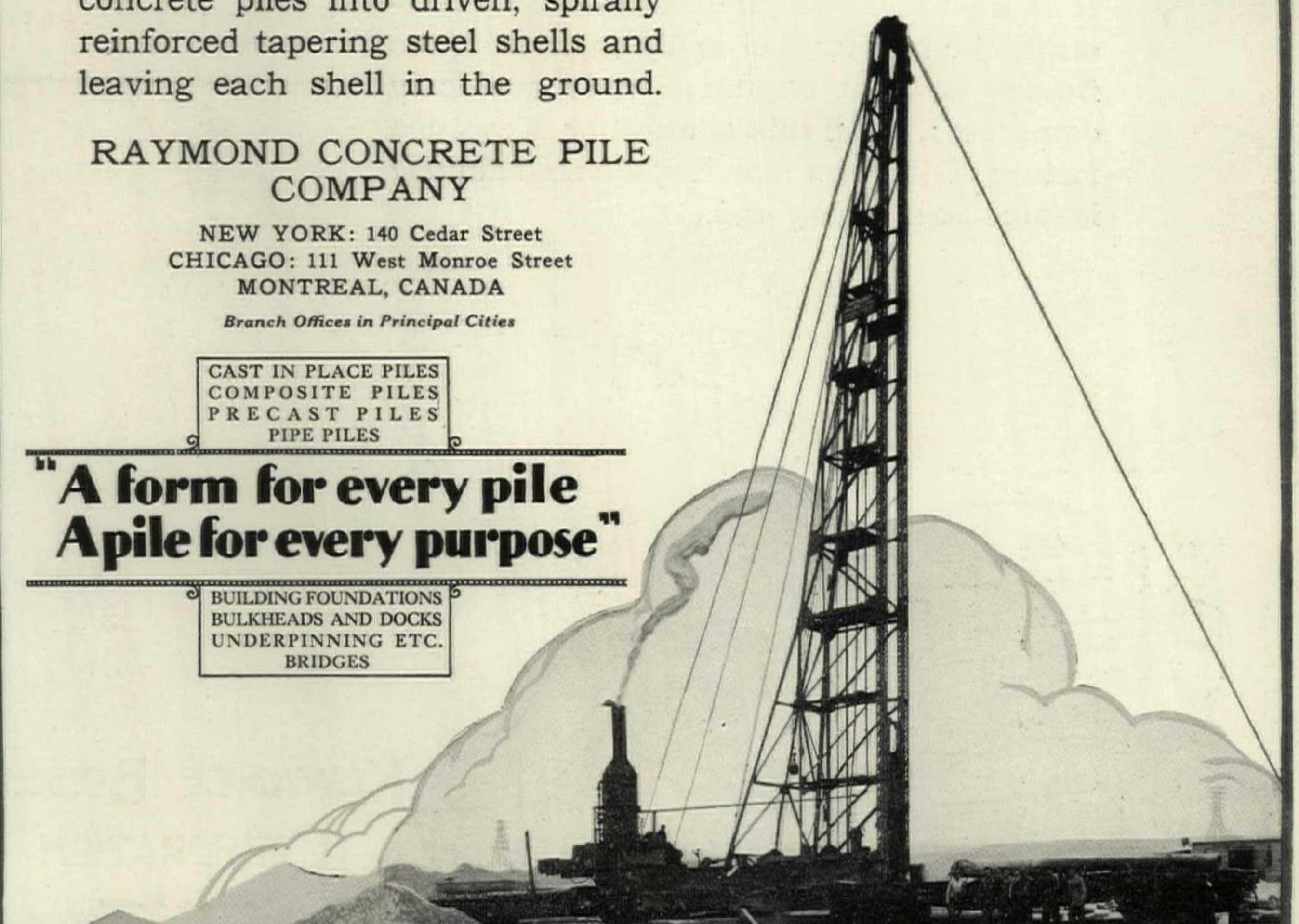
NEW YORK: 140 Cedar Street
CHICAGO: 111 West Monroe Street
MONTREAL, CANADA

Branch Offices in Principal Cities

CAST IN PLACE PILES
COMPOSITE PILES
PRECAST PILES
PIPE PILES

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

BUILDING FOUNDATIONS
BULKHEADS AND DOCKS
UNDERPINNING ETC.
BRIDGES



for Lower Heating Costs

KEWANEE

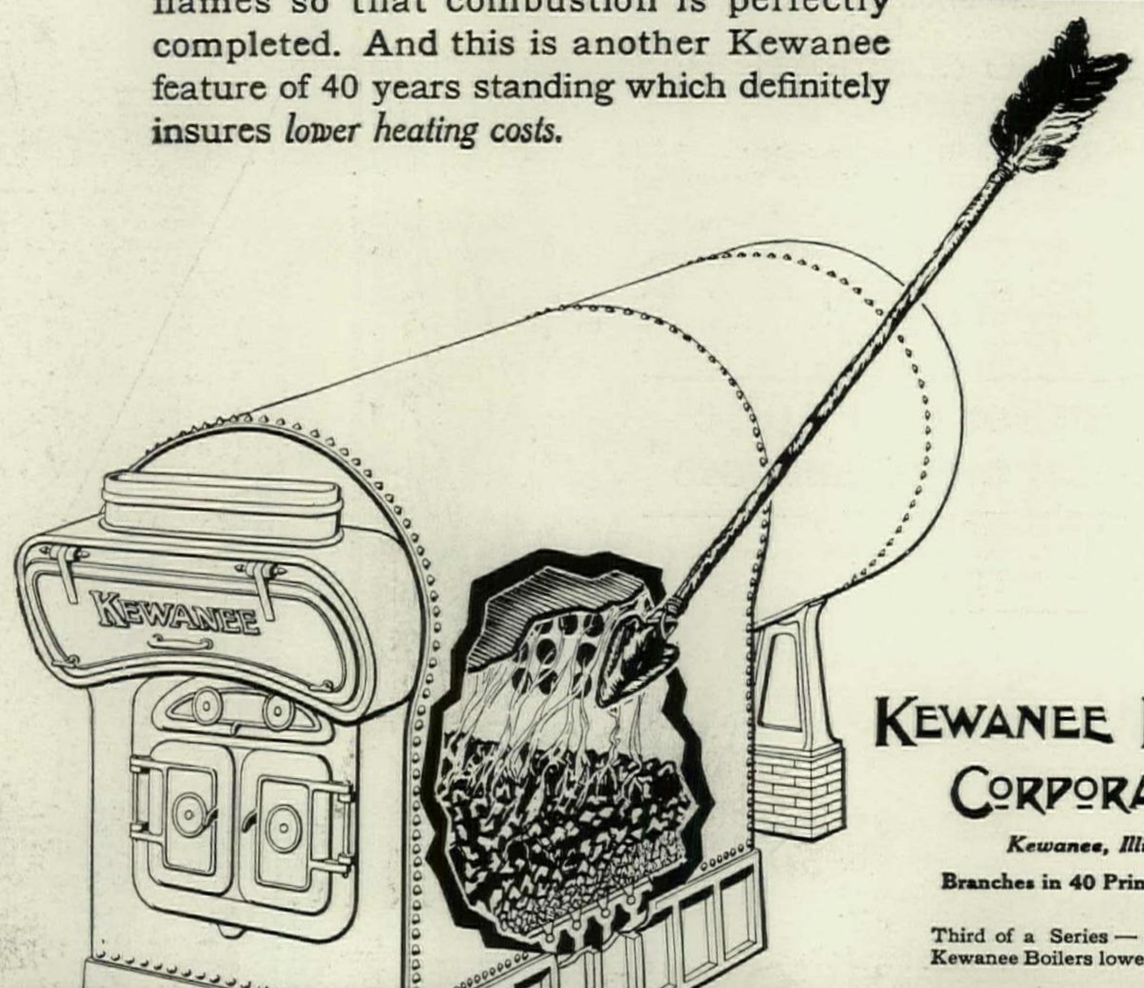
STEEL BOILERS

Burning fuel must have a lot of air—also generous space in which the air can mix with the hot gases.

A high and wide firebox lets the air penetrate the blazing fuel and mingle with the flames so that combustion is perfectly completed. And this is another Kewanee feature of 40 years standing which definitely insures *lower heating costs.*

HIGH FIREBOXES

The spaciousness of a Kewanee Steel Riveted Firebox is never 'skimped' —there is always ample room for a radiant heat giving fire.



KEWANEE BOILER CORPORATION

Kewanee, Illinois

Branches in 40 Principal Cities

Third of a Series — explaining why Kewanee Boilers lower heating costs.

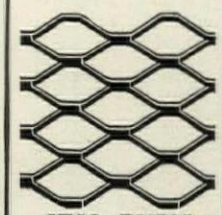
★ NORTH WESTERN

METAL LATH

FOR LOW OR HIGHER COST WORK From the many types of steel plastering bases in the complete North Western line, your specification writer is enabled to specify the kind exactly suited to the price limitations of the work on hand. For small home construction his selection would probably be the economical flat rib NORWEST or PLASTA-SAVER. For an elaborate piece of ornamental plastering, he would undoubtedly specify KNO-BURN.

Such careful selection accrues to the benefit of the designer as well as to the financial advantage of the client. It will be facilitated by having in your files a copy of our—

PLASTA-SAVER
1/8" RIB LATH



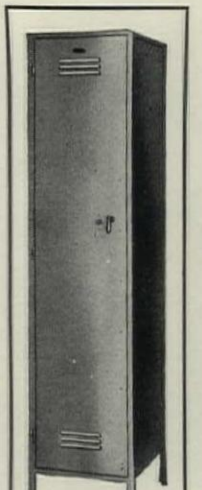
KNO-BURN
METAL LATH

A. I. A. Metal Lath Reference Portfolio containing samples, specifications and tables. Sent FREE

NORTH WESTERN EXPANDED METAL CO.

1234 Old Colony Bldg., CHICAGO

STEEL LOCKERS, SHELVING, ETC.



Standard Type

FEDERAL-NORWEST LINE A complete line of Steel Equipment —lockers, shelving, blue print cabinets, etc. Highly favored by architects because of its strength and simplicity, its special patented features, sensible pricing and its adaptability.

REPRESENTATIVE INSTALLATIONS FEDERAL-NORWEST Lockers and Shelving are used by such notable concerns and organizations as the Stevens and the La Salle Hotels, Chicago, Detroit Schools, Olympia Fields Golf Club, Diamond Chain Co., Western Clock Co., Ovington, etc., etc. Endorsed by hundreds of satisfied users. Our Storage Engineers gladly advise on any contemplated installation. Descriptive literature on request.

NORTH WESTERN STEEL PRODUCTS CO.

Subsidiary North Western Expanded Metal Co.

1234 Old Colony Bldg., CHICAGO

★
METAL LATH
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KNO-BURN
PLASTA-SAVER
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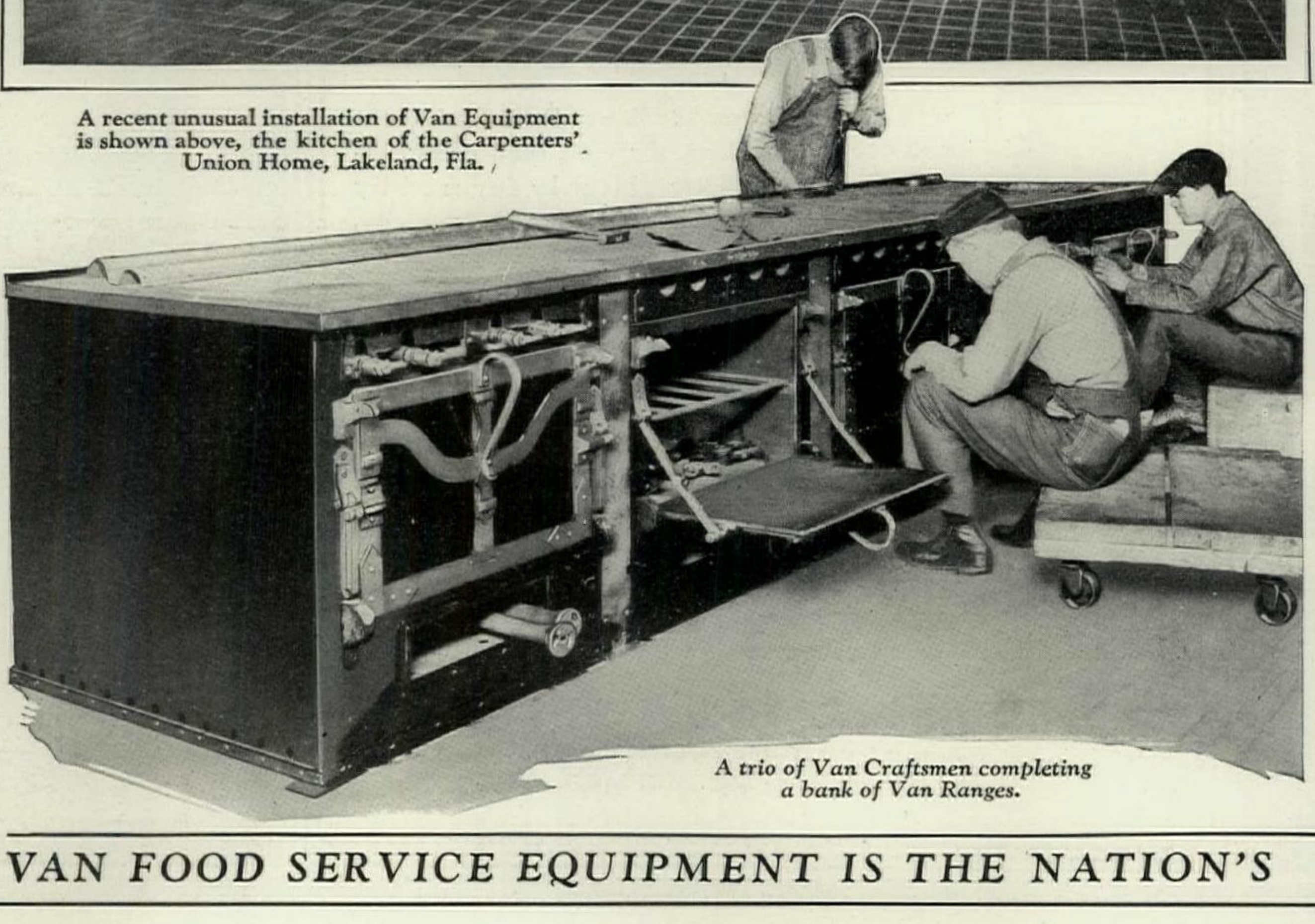
=
STEEL-
LOCKERS
SHELVING
BINS
ETC.

A recent unusual installation of Van Equipment is shown above, the kitchen of the Carpenters' Union Home, Lakeland, Fla.

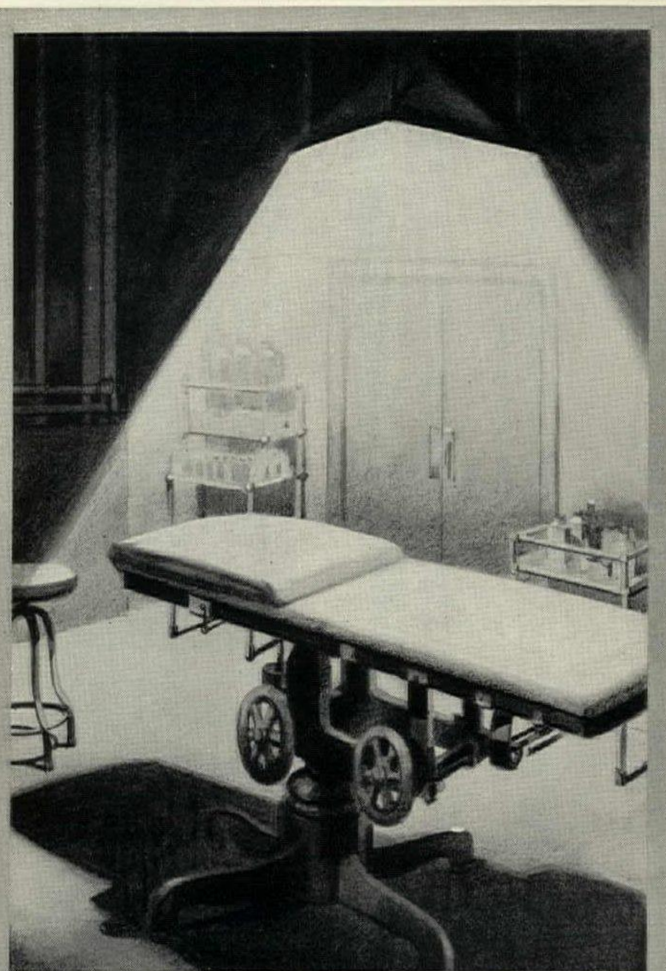


A trio of Van Craftsmen completing a bank of Van Ranges.

VAN FOOD SERVICE EQUIPMENT IS THE NATION'S

Emergency Lighting for a single OPERATING ROOM... An Entire THEATRE

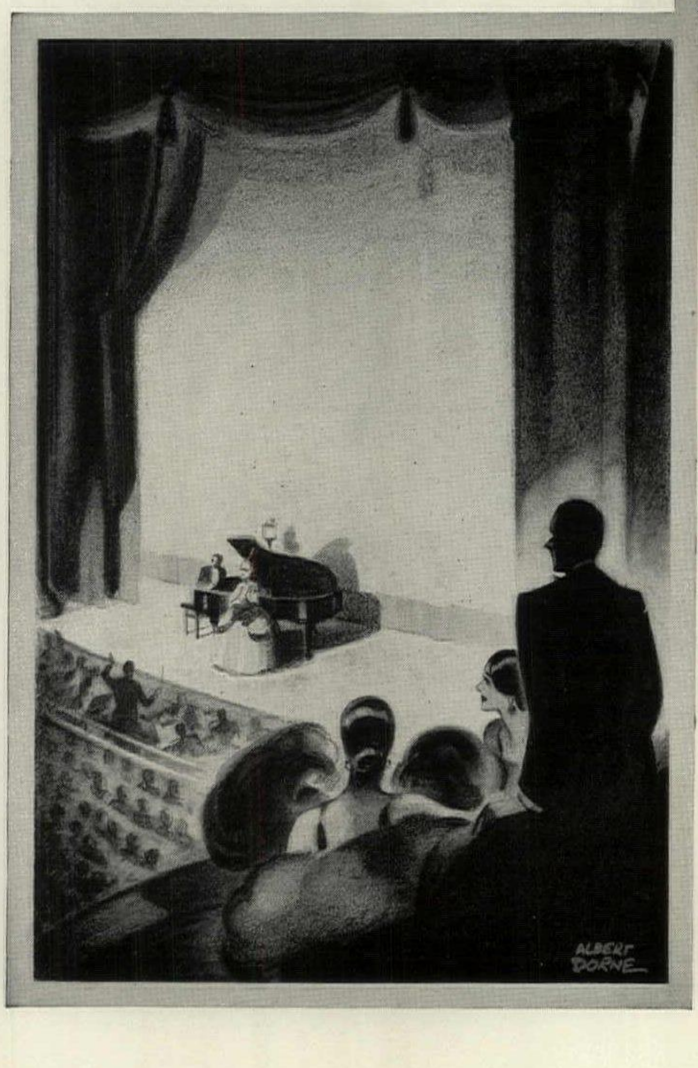
This lighting protection is adaptable to any requirements



LIGHTING protection requirements vary. Your plans for a single operating room would not specify the same emergency lighting as for an entire theatre.

Exide-equipped emergency lighting fits any building plan. It can be installed for just those rooms that must have protection against light failure. Or it can be used to protect every room in the building. Battery units are available in sizes that exactly suit the job.

Exide-equipped emergency lighting is simple and easy to install. Its operation is automatic. Should the regular power fail, lights draw current instantly from the Exide Battery. This happens without a hand touching a switch. Nor is an expert electrician needed to care for such a system.



Unfailing reliability

Exide Batteries for emergency lighting are made by the world's largest manufacturers of storage batteries for every purpose. Theirs is the knowledge and experience of forty years of battery making. The outstanding qualities of the Exide Battery for emergency lighting are: (1) power dependability, (2) long life, (3) freedom from trouble, (4) low first cost, (5) low operating cost.

These are some of the reasons why so many architects specify Exide Emergency Lighting Batteries.

Special architectural service

An experienced Exide representative is available to consult with you on emergency lighting specifications. This entails no obligation. Please write.

The Electric Storage Battery Company, Philadelphia.

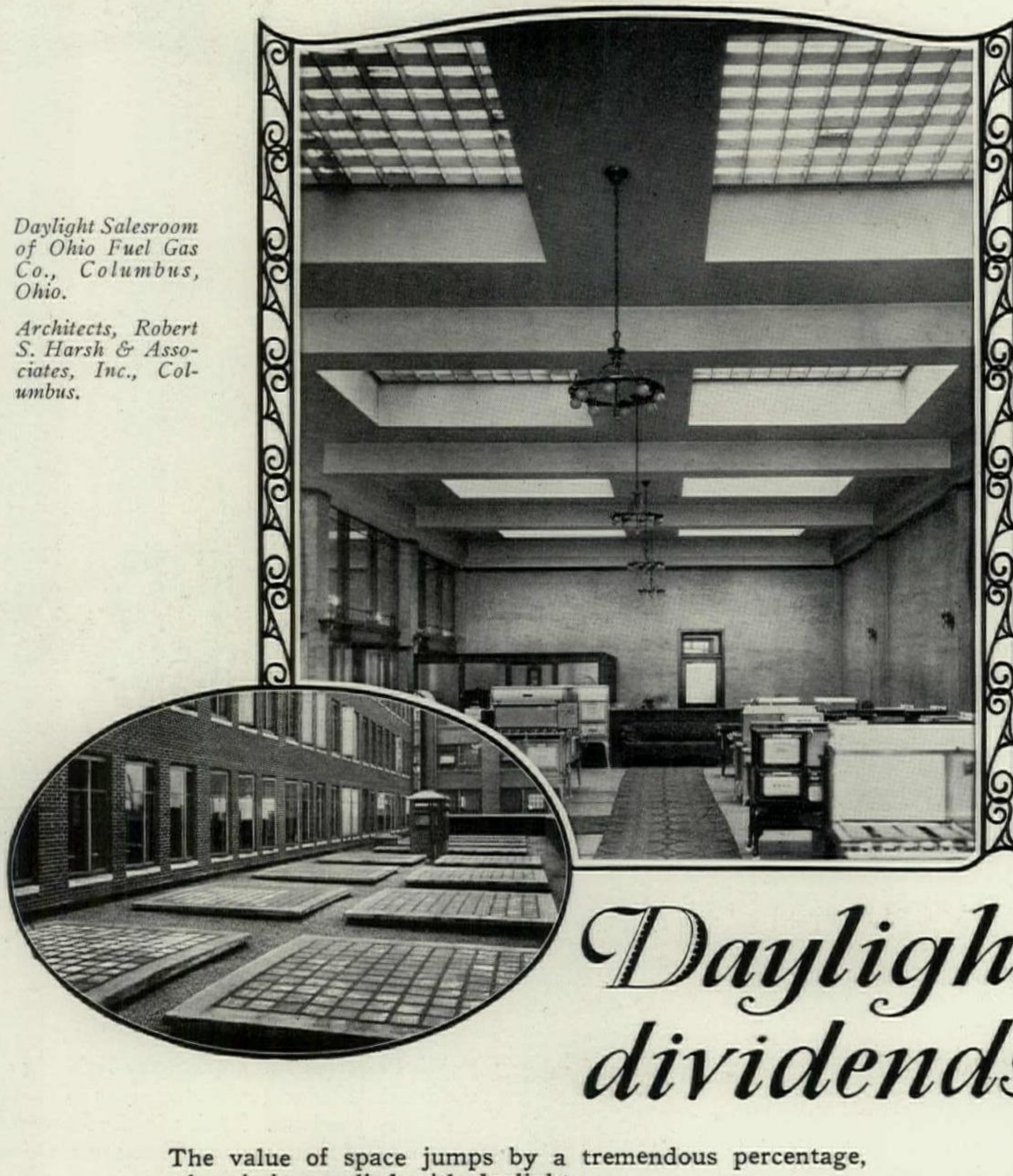
Exide Batteries of Canada, Limited, Toronto.

Exide

EMERGENCY LIGHTING BATTERIES

Daylight Salesroom of Ohio Fuel Gas Co., Columbus, Ohio.

Architects, Robert S. Harsh & Associates, Inc., Columbus.



Daylight dividends

The value of space jumps by a tremendous percentage, when it is supplied with daylight.

Grauer new type roof lighting is as solid in construction as the walls. Raised above the roof as in the illustration, or flush with the roof and used as a floor, or set at an angle,—safety is absolute for those on it or below it.

Grauer Transparent Roofing for offices and shops (specified by many leading architects) assures trouble-proof lighting for decades—leak-proof, fire-proof, burglar-proof. Grauer Sidewalk Lights give the same service to your basements,—greatly increasing the income, with just a little upkeep trouble or expense.

Let us tell you more about it in our "Skylight Bulletin" and "Sidewalk Light" Bulletin.

MANUFACTURING
Red Asphalt Flooring
Sanitary Cove Base and Tile
Sidewalk Lights
Skylights
Floor Lights

Albert Grauer & Co.
1408-17 th ST. DETROIT, MICH.

INSTALLATION
Graustic Floors
Composition Floors
Rubber, Linoleum, and Cork Tile
Cement Floor Finish

Illustrated specifications of Grauer Products are in Sweet's Architectural Catalog

Kernerator-equipped residence of Mr. Frank Holton, Pres., Frank Holton & Co., Band Instrument Mfgr., Elkhorn, Wis. Edmund D. Funston Co., Architects, Racine, Wis.

Suggest the Kernerator *for* Garbage and Waste Disposal

Once Overlooked, They Can Never Have It

KERNERATOR convenience or garbage-can drudgery? Right "on your boards" you decide this question for your client. For the Kernerator must be built in — it cannot be installed later. And for that reason, we urge you to suggest it, as hundreds of America's leading architects and builders do.

Few of your clients realize, unless you tell them, that the Kernerator *must* be decided upon before mason work is started. They write to us, letter after letter, asking about installing a Kernerator in their homes. We tell them it is too late — and their disappointment often brings a second letter. We have some of these letters which we wish you could read.

The Kernerator costs nothing to operate (the waste itself being fuel for its own destruction). It requires but a few minutes' attention weekly. It handles *all* waste — not only garbage, but tin cans, crockery, paper, sweepings and the like. Metal and glass objects are flame-sterilized for removal with the ashes. It is the original, flue-fed incinerator, built by the pioneers of the industry.

See Sweet's, write for Kernerator catalogs in ready-to-file A. I. A. Folder 35J41 or phone your local Kernerator representative. Offices in 89 cities.

KERNER INCINERATOR COMPANY, 715 E. Water St., *Milwaukee, Wis.*

KERNERATOR

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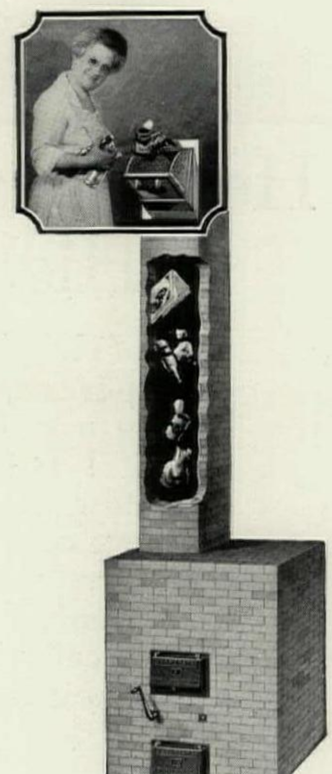
THE CHIMNEY-FED INCINERATOR

54

Garbage and Waste Disposal without Leaving the Kitchen



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

You ask for BALANCED INVESTMENT and PERFORMANCE

Apartment Hotel, 180 E. Delaware Place, Chicago
Architect and Engineer: B. Leo Steif & Co. *Heating Contractor:* Schampel & Dougherty

NATIONAL HEATING EQUIPMENT PROVIDES EVEN MORE

WEIGHING first cost of heating equipment against operating expense, the architect rightly solves the problem by demanding *balanced investment and performance*—and National Products always provide it.

But with National Products you get even more. You find here a comprehensive line of outstanding boiler and radiator products, developed by six great companies. You find a united responsibility that does not quibble or compromise, that is intent only on upholding the standards involved in *National Quality.* You find tremendous manufacturing and warehousing facilities that make deliveries subject to your wishes, rather than to plant limitations. You find strategically located offices, that make *National Service* instantly available when you want it.

Balanced investment and performance—a complete line of boilers and Aero radiation—unit responsibility—unexcelled service—all these are yours, when you specify National Products.

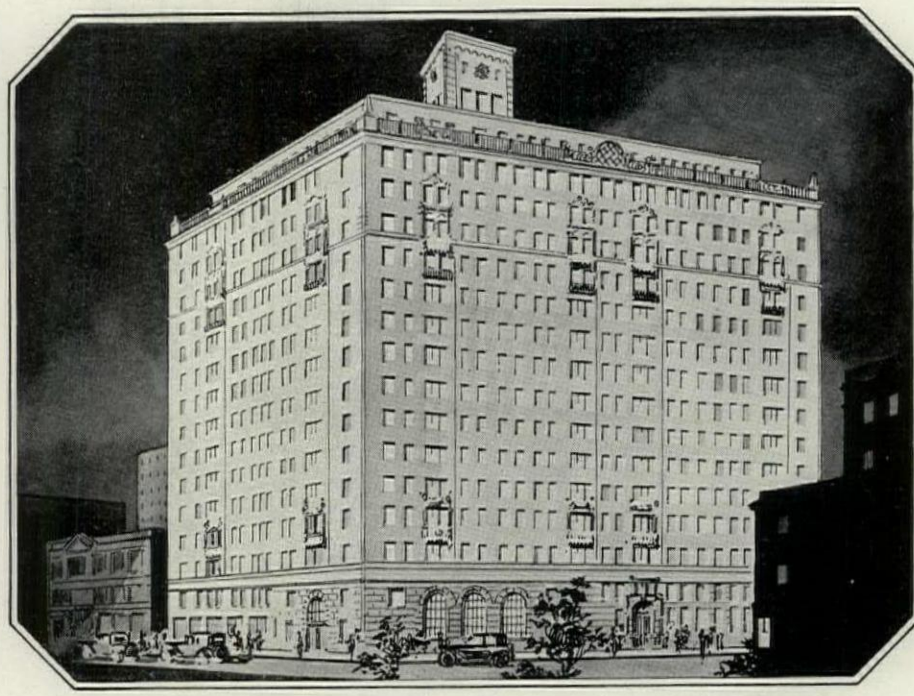
NATIONAL RADIATOR CORPORATION

MANUFACTURER OF RADIATORS AND BOILERS

Ten Plants devoted to National Service through these Branch Offices and Warehouses:

Baltimore, Md.—2622 Frisby St. Boston, Mass.—93-97 Oliver St. Buffalo, N. Y.—259-265 Delaware Ave.
Chicago, Ill.—2445 N. Keeler Ave. Cleveland, Ohio—935 E. 63rd St.
Cincinnati, Ohio—Spring Grove and Elmira Avenue Indianapolis, Ind.—431 W. Georgia St.
Johnstown, Pa.—221 Central Ave. Louisville, Ky.—1126 W. Breckenridge St.
Milwaukee, Wis.—124-130 Jefferson St. New York, N. Y.—55 W. 42nd St. Omaha, Neb.—108-112 S. Tenth St.
Philadelphia, Pa.—121 N. Broad St. Pittsburgh, Pa.—1509 Arrott Building Richmond, Va.—3032 Norfolk St.
St. Louis, Mo. —1042 Central Industrial St. Washington, D. C.—2205 Fifth Street, N. E.

172 Gas Refrigerators *in this new building*



2670 Broadway, the new apartment house at 106th St. and Broadway, New York City. Boak & Paris, Architects. Frymier & Hanna, Builders.

Architects of great new apartment house specify Electrolux for every apartment

ONE hundred and seventy-two families . . . people accustomed to all the refinements of modern living . . . will occupy the magnificent apartment building at 106th St. and Broadway, New York City.

The architects anticipated the exacting requirements of the prospective tenants. For automatic refrigeration, they specified Electrolux!

Its startling new principle . . . *heat that freezes* . . . gives Electrolux indisputable advantages over all earlier methods of refrigeration. A tiny gas flame does all the work . . . maintains an even, constant cold at the temperature desired.

There are no moving parts. It is perfectly silent. It never wears out. And it is absolutely safe. Yet, with all these advantages, Electrolux is amazingly inexpensive to operate . . . and it costs no more to install than other refrigerators of equal insulation and storage capacity.

Electrolux may be had in four new color harmonies, besides the gleaming white finish. These are: Biscay Blue, Crystal Green, Ivory Tan, and Silver Grey. A wide range of sizes and prices will suit your exact needs.

We will cheerfully send you detailed specifications on standard models, or information on special sizes. Just write to: Servel Sales, Inc., Evansville, Indiana.

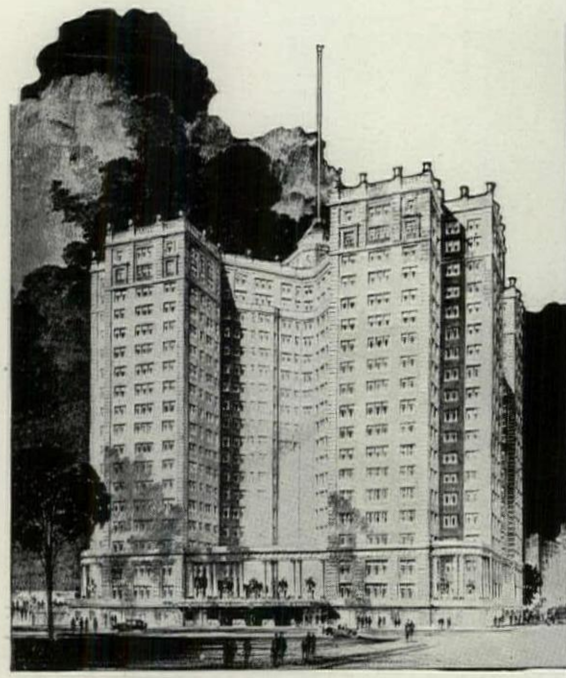
The Kitchenette Model Electrolux—*4 cubic feet storage capacity, 36 ice cubes. 143 apartments in this new building have been equipped with this model. The remaining 29 apartments have a larger model, the Chef.*

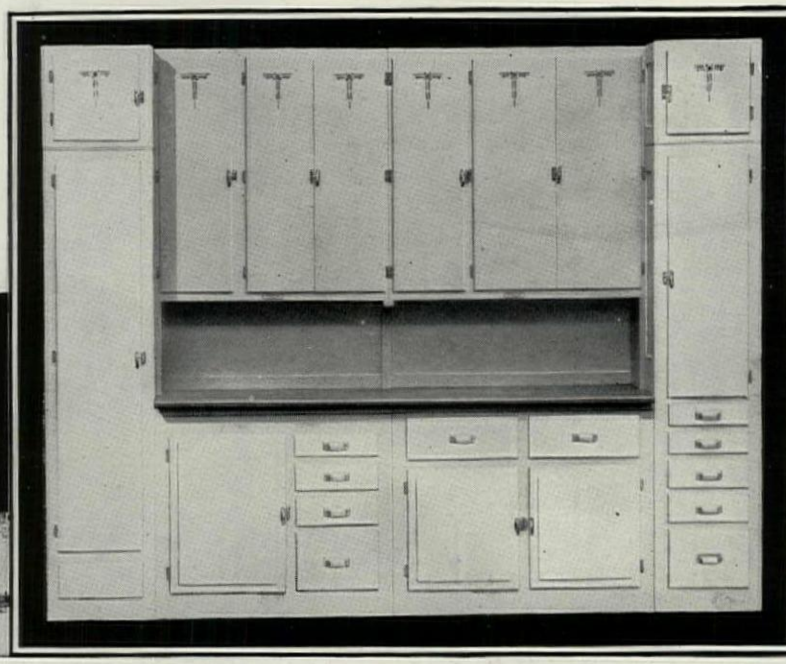
ELECTROLUX REFRIGERATOR

MADE BY SERVEL

KITCHEN MAID

STANDARD UNIT SYSTEMS





Edgewater Beach Apartments, Chicago, Illinois, *under construction. Architect: Benjamin H. Marshall. Associates: Lewis B. Walton, Warren B. Ewer, Frank T. Kegley.* Kitchen Maid Units *specified for kitchens throughout.*

Units that *"dovetail"* into your plans . . .

No matter what size or shape of kitchen you are planning, you may be certain of this: there are Kitchen Maid Units to "dovetail into your plans." In a unique degree, these units offer variety and flexibility.

Select one unit or any number. Each is complete in itself—may be installed singly or as part of a unit combination—in recess or against the wall.

There are large units for spacious homes—compact units for kitchenettes. All are built of seasoned hardwood lumber—by America's largest exclusive makers of built-in kitchen equipment.

Kitchen Maid Units are the only equipment providing sanitary rounded inside corners, smooth five-ply doors, and concealed hinges. They are finished in choice of Cactus Green, Dove Gray, Lama Tan, Travertine Ivory and Shasta White.

Despite their excellence of design, materials and workmanship, these standardized units cost no more installed than old-fashioned built-in cupboards. Coupon brings catalogue, dimensional drawings, prices.

WASMUTH-ENDICOTT COMPANY
1807 Snowden Street, Andrews, Indiana

"Let the Kitchen Maid Be Your Kitchen Aid"

KITCHEN MAID
STANDARD UNIT SYSTEMS

Representatives in all Principal Cities

If in Canada, address Branch Office Waterloo, Ontario

WASMUTH-ENDICOTT CO.
1807 Snowden St., Andrews, Ind.
If in Canada, Address Branch Office, Waterloo, Ont

Please send catalogue and full information about Kitchen Maid Units to:

Name..

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

Walls and ceilings plastered on Masonite Insulating Lath remain smooth and even. It holds plaster with a grip so tenacious that it will not break under a pull of one thousand pounds per square foot.

Send for full reports of these Masonite Tests

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

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

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

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

MASONITE CORPORATION
Dept. 678, 111 W. Washington St., Chicago, Ill.
Mills: Laurel, Mississippi

Masonite
THERMOSTATIC WOOD FOR
STRUCTURAL INSULATION
Made by the makers of MASONITE PRESDWOOD
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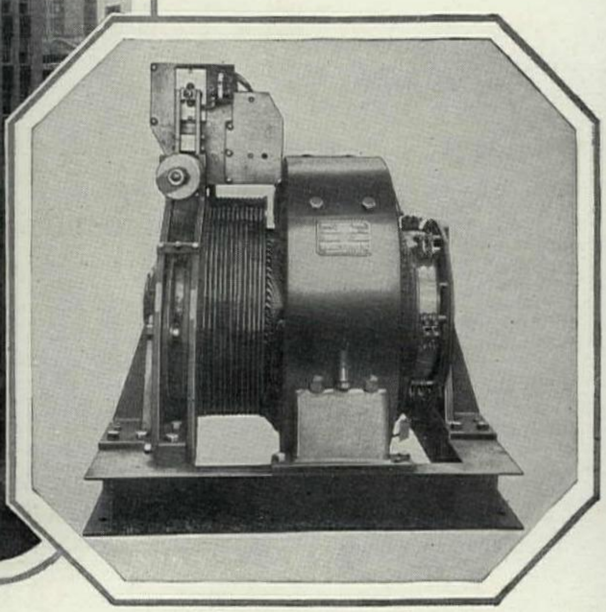
© M. F. Co.

4

Lake-Michigan Building, Chicago. Elevator equipment supplied by Pitt Engineering Company. Architects—Alfred S. Alschuler, Inc.



G-E gearless elevator motor

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

Outstanding Contributions *by* General Electric to Elevator Control

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

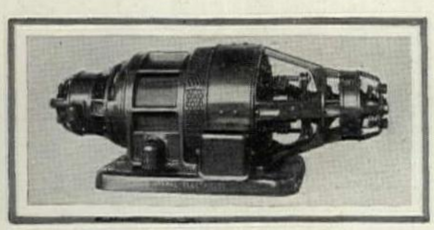
2. A system of *automatic control of acceleration and retardation,* resulting in minimum time consumed, combined with maximum comfort

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

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

Automatic Speed Regulation

An original contribution to elevator operation is the G-E system of automatic speed regulation. A simple, sturdy, rotating device is secured to the generator of the variable-voltage set, without added relays. This system, applied to high-speed gearless traction elevators, obtains both the maintenance of high uniform speed under full load — insuring the handling of maximum traffic during rush periods—and at the same time automatically compensates for gravity and momentum at landing speeds, so as to produce constant drift and make accurate landings possible with simple car-switch control.



Variable-voltage set

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

American Elevator and Machine Co., Inc., Louisville
Baker Iron Works, Los Angeles
Gurney Elevator Co., New York
Montgomery Elevator Co., Moline
Pacific Elevator Co., San Francisco
Pitt Engineering Co., Chicago
Warner Elevator Manufacturing Co., Cincinnati

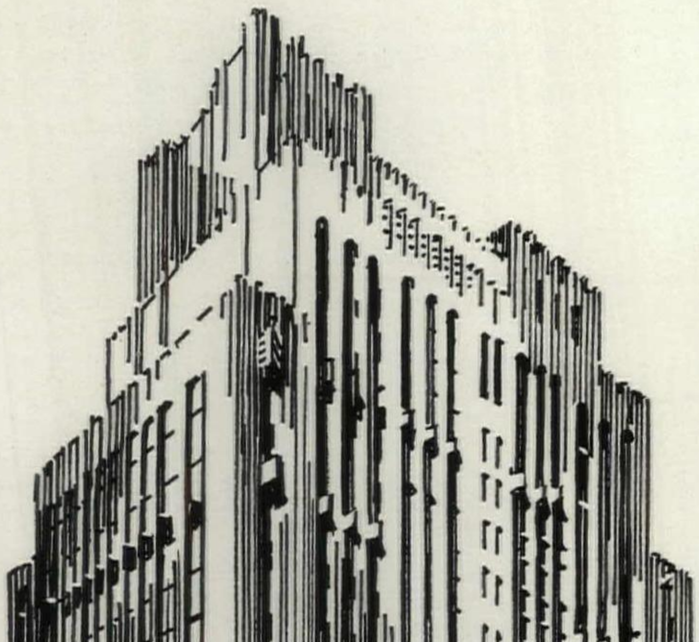
237-29

ELECTRIC

SALES OFFICES IN PRINCIPAL CITIES


One-piece
Dependability
MODERN construction calls for modern methods. The Bates-Truss Joist is of one piece steel without rivets, bolts or welds in shear or tension.
In the patented Bates construction, no material is cut from the web of the original structural section. The process simply transforms the web of an I-beam section into an expanded lattice truss web. By this method, the depth of the beam is increased and the strength is far greater than in the former I-beam. The points of contact of the lacing and flange members are simply unsheared portions of the original plain web.
In construction you should know all about the Bates Expanded Steel Truss. A copy of the Bates-Truss Joist catalog with complete loading tables will be sent you upon request. It is an engineering treatise on joists.
BEST 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.
BATES-TRUSS JOISTS
Sales, Engineering and Executive Offices: EAST CHICAGO, INDIANA

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.

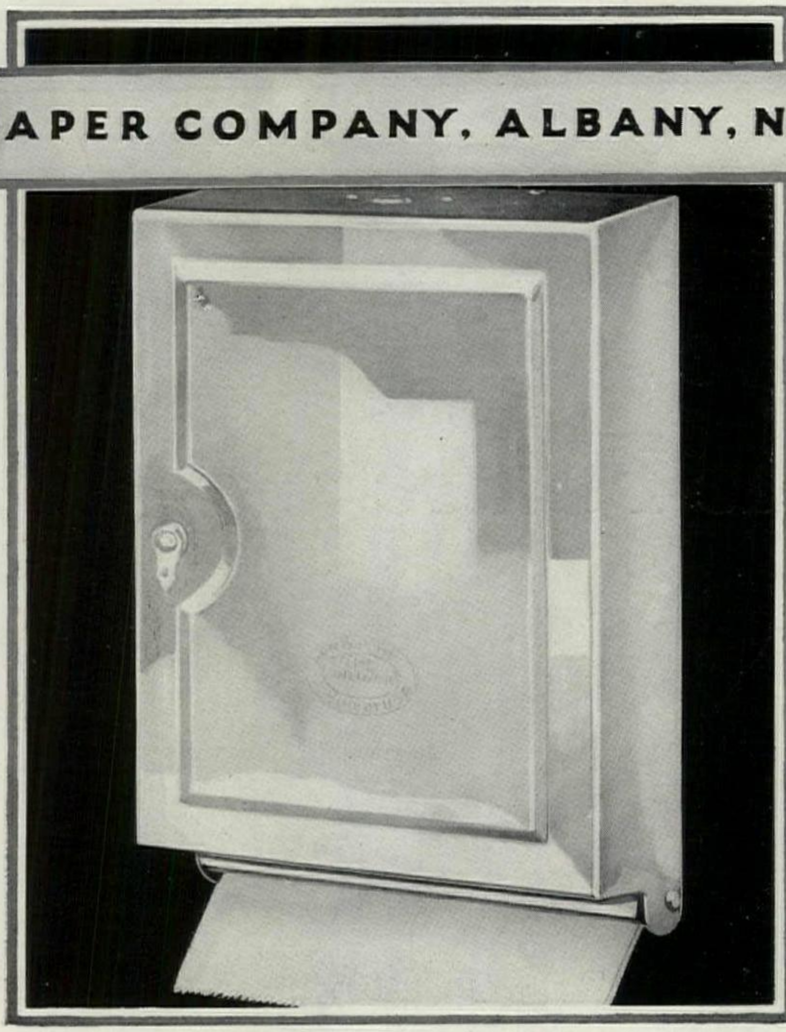
KALMAN

KALMAN STEEL COMPANY

Plants or Offices at

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

A. P. W. PAPER COMPANY, ALBANY, N. Y. U. S. A.



Onliwon toilet paper cabinet in pressed steel; finished in nickel silver, gun-metal or white enamel, with Yale lock and contents indicator.

For these Four Reasons

. . . insist on Onliwon

IT'S wasteful to spend more for toilet paper service when the Onliwon system offers you the best at low cost.

Beautiful cabinets—in a variety of types, carefully built . . . never out of order. Easy to refill, reducing servicing time.

Finer paper—soft, yet firm and absorbent. Fewer sheets suffice.

Economy—two interfolded sheets served at one time. No waste. Reduces greatly the actual amount of paper used.

Nationwide service—through our warehouse and distributors permits prompt delivery.

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

Onliwon

TOILET PAPER AND PAPER TOWEL SERVICE

BOOK DEPARTMENT

A VALUABLE WORK ON USE OF STEEL

Reviewed by FRANK W. SKINNER, CONSULTING ENGINEER

STRUCTURAL steel is the essential element of modern construction. In order to maintain and improve its function, the American Institute of Steel Construction, Inc., was organized in 1921. This organization is composed of steel constructors of the United States and Canada who represent practically the entire responsible industry, exclusive of that controlled by the operators of the rolling mills. It is the purpose of the American Institute of Steel Construction, in coöperation with the United States Department of Commerce, to improve the methods of designing, fabricating, and erecting structural steel; to eliminate waste in building construction; to reduce building costs by the use of its standard specifications for structural steel and for fireproofing the steel for buildings; and to make knowledge of structural steel in all its phases available for the benefit of the architectural and engineering professions. These beneficial and impartial objectives will be notably promoted by the use, among all designers and builders of framed structures, of this exceptionally complete and reliable handbook, that, within its specified limits, covers steel construction in the most practical and economical way, clearly presenting standards and principles of advanced practice coördinated with the best theoretical, mechanical and commercial considerations and the latest technical developments.

This book not only gives complete data regarding strength, properties, functions, standards and dimensions of the most important and indispensable of all construction elements but it gives exclusive useful tables of great mathematical and industrial value, together with the latest specifications and information not otherwise conveniently accessible to the designer and computer. It is unique in that it gives essential data of competitive products so as to facilitate impartial selections, and it is, withal, so simply and effectively presented and so conveniently arranged that it can well take the place of several other handbooks in common use and become a great saver of time and trouble to every designer. It is a sort of glorified commercial shape book, developed to a high degree of usefulness, impartiality and completeness on an extension of the familiar lines of the old rolling mill publications, whose essential features are supplemented by much fundamental designing data of the highest value covering ordinary requirements for selection, proportioning, detailing, fabricating and construction in a remarkably clear and simple manner that presents reliable convenient working formulæ and tables purged of all complexities and applicable with a minimum of arithmetic and algebra, which of course means saving of time.

The volume includes the signed conclusions of eleven

Any book reviewed may be obtained at published price from The Architectural Forum eminent steel engineers and builders with a large amount of classified and tabulated data most convenient for rapid and effective use. In the first part are standard specifications for the manufacture, properties, inspection, testing, stresses, and fabrication of structural steel for buildings, and a complete fireproofing specification defining fire temperatures and hazards and the materials and application of insulation. The maximum live loads and various allowances permissible for different parts of a building are given, and there is a concise history of the development of steel and iron with valuable data concerning their physical properties that are of importance to every designer. The accompanying code of standard practice is intended to eliminate those errors, misunderstandings, losses and delays that so often occur in the relations between engineers, architects, builders, contractors, dealers and owners; it makes fair definitions and provisions governing most cases subject to misunderstanding or variation, such as requirements for plans, specifications, bids, and contracts, classification of materials and members, workmanship and standard practices, inspection, delivery, delays and extra work.

Part Two commences with an admirable discussion of the properties of sections, followed by 70 pages of important mathematical tables including Moments of Inertia, Areas and Weights, Engine Loadings, Deflections, Functions of Numbers, Trigonometrical Formulæ and Tables, Decimal Equivalents and Lengths of Circular Arcs. Part Three is devoted to general building materials, their strength and specific gravities and to the properties of American Standard Yard Lumber and Timber, Safe Loads for Timber, Columns, Unit Stresses for Structural Lumber and Contents of Storage Warehouses. Part Four is a comprehensive and thorough treatise of Structural Shapes and Details with clear and concise explanations and examples of specification formulæ illustrated with diagrams and tables that describe, explain and emphasize the essential considerations and methods of determination and selection and computation for structural shapes and members with data so conveniently arranged that a great amount of fundamental information can be quickly secured by inspection. Angles, Channels, Base Plates, Rivets and Bolts are treated in general, and very convenient comparative tables are given of American Standard, Carnegie, and Bethlehem Beams and a Summary of them, also of Bethlehem, Carnegie, Plate and Angle, and Plate and Channel Columns.

This work gives a maximum of the most universal and indispensable working information in the most convenient form for rapid use, with a minimum of computation or studying of requirements and applications. It cannot fail to be a great time-saver and promote greater facility and higher quality of design and more economical, safe and rational use of steel for all structural purposes. It combines in one handy volume most, if not all, of the information needed by the steel designer and much for the designer's use at desk or drawing table.

STEEL CONSTRUCTION; First Edition, Second Printing, March, 1928. 391 pp., 5½x8 ins. Price $1.50, American Institute of Steel Construction, Inc. 285 Madison Avenue, New York.

FORTY YEARS OF LANDSCAPE ARCHITECTURE. Frederick Law Olmsted, Sr. Edited by Frederick Law Olmsted, Jr. and Theodora Kimball. 575 pp., 5½ x 8½ ins. Illustrated. Price $7.50. G. P. Putnam's Sons, New York.

THE prolonged effort by certain groups of citizens to save Central Park from the state of neglect and deterioration into which it has fallen, and the present activities of the city to restore the park, give a certain timely interest to the second volume of "Forty Years of Landscape Architecture." The Sage Foundation—Regional Plan Committee in making a contribution toward the cost of this publication, recognize its value as a statement of the original policies and ideals in matters pertaining to the design and administration of Central Park. It is a careful piece of research into the choice of site and design, and of the mere location of the park in its relation to the rectangular street plan.

Early discussions of possibilities are fully related, as are the details of construction and management and the political history during the period from 1850 to 1880, in which the firm of Olmsted & Vaux was officially connected with the work. Chapter XIII, written by F. L. Olmsted, Jr., constitutes an act of filial devotion expressed in a rationalistic defense of his father's theory as embodied in his first important work. It is, besides, an effort from the heart to erect bulwarks for the defense of the romantic, naturalesque style against the ever-increasing trend, plainly evident, toward classicism.

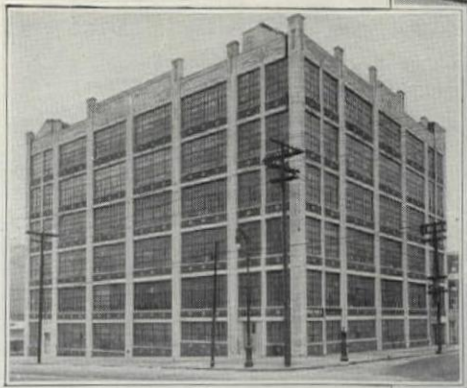
In publishing many of the written communications and reports of F. L. Olmsted, Sr. to the park commissioners, it has been the evident intent of the editors to select those which would emphasize the definite purpose of the designer and to illustrate his methods of control and management, upon which the successful accomplishment of his ideal so largely depended. His conception of the function of Central Park is thus expressed by his son: "The dominant and justifying purpose of Central Park was conceived to be that of permanently affording, in a densely populated central portion of an immense metropolis, a means to certain kinds of refreshment of the mind and nerves, which most city dwellers greatly need and which they are known to derive in large measure from the enjoyment of suitable scenery." What suitable scenery may be is clearly a matter of personal feeling, but it was the belief of the designers that the naturalesque landscape style as developed in England seemed to fulfill this definite purpose, and we see in it the prevailing romantic tendency which existed in all forms of art at that time. That these landscape qualities were attained with a high degree of effectiveness under difficult conditions is a remarkable achievement, and gives strong testimony to the devotion and ability of those who planned the park and are responsible for its design.

The history of the first 30 years of Central Park shows the necessity (if the original ideal is to be maintained) not only of adequate financial support but of a more or less autocratic control on the part of those responsible for its maintenance. To what degree the Olmsted theory of the character and function of Central Park can be maintained under present conditions depends upon the feeling of the patrons of the park, and F. L. Olmsted, Jr. has elsewhere expressed his belief

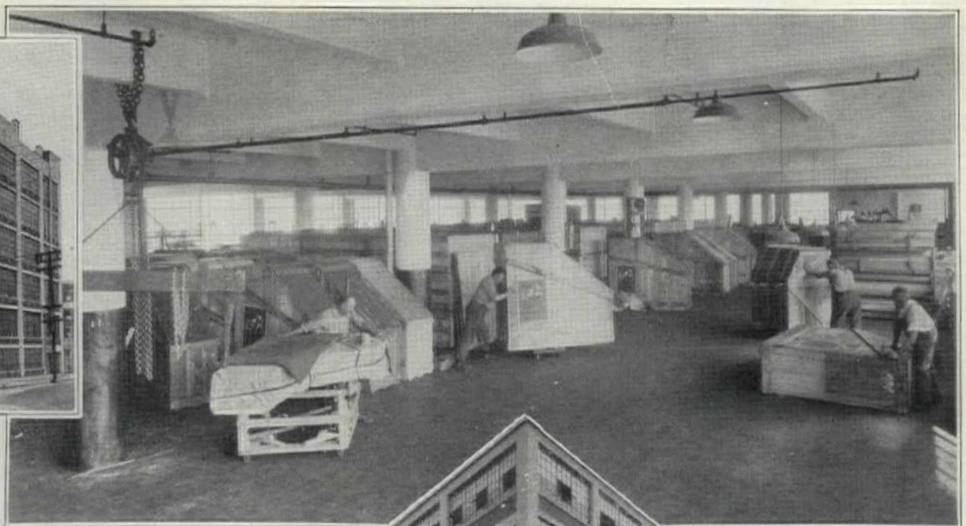
that the park is out of harmony with its surroundings and cannot simulate rural scenery when skyscrapers are always in view. The demand by many people for children's playgrounds and the necessities of automobile traffic are indications of encroachment upon an area in the city which was designed for a purpose in its nature wholly incompatible with these things, and they are additional reasons for the present difficulty of fitting the rationalized conception to the facts. Wide thoroughfares and supervised neighborhood recreation grounds are recognized necessities, scantily provided in New York and sadly missed. As long as Manhattan suffers from these defects in its physical equipment, Central Park will continue to be in danger of injury, if not of actual destruction, which as a matter of fact has actually been begun in the Heckscher Playground. Judging from appearances, too many of the users of the park today are not appreciative of the qualities which are the essence of its character, and others resent the restrictions which are so necessary to preserve the rural type of scenery. Scenes soft and lovely of this kind are not suitable for congested populations or for intensive use.

One is led by Mr. Olmsted's argument to suppose that money and skill can restore the refreshing "verdurousness" of the original pastoral and romantic scenery, but the question arises, why do it if it means that the public must view this "verdurousness" through iron fences as if they were monkeys looking out from a cage, and if a large force of trained keepers must be on hand to prevent any use of attractive corners and wide meadows? When the preservation of the park is accomplished, what will be done to compensate New Yorkers for the loss of many of the much longed-for forms of recreation which the designers expected to provide, but which will be imposible in a perfectly preserved scene? Idle contemplation from the other side of a fence is no compensation to most people,—to those who frequent Central Park.

On the whole, the book has tended to strengthen the conviction in the mind of the reviewer that the perpetuation of the original plan is incompatible with present needs and political conditions. The automobile and skyscraper age has brought about changes which inevitably affect the plan and nature of a large recreation ground in a city, and this should be recognized by readjustments, without destruction of the entire scheme. There must be a critical point in the increasing use of a naturalesque park when the number of users is so great that the beauty of the naturalesque scene is destroyed by their very presence. For some the point is soon reached; for others it may never be reached, because they may prefer the crowd to the verdure. The refreshment of the spirit, whether one prefers crowds or verdure, may be the same, the choice depending entirely upon one's predilections for romantic dreaming or for hard-minded contemplation of things as they are and must be, but if a compromise can be made so that a large part of the naturalesque woods and meadow can be preserved and large additional facilities be provided for walking, for gatherings, and for the freer use in certain parts, both the soft- and the hard-minded may be partially satisfied. Lacking this reasonable compromise, it is safe to predict the destruction of the park by complete formalization.

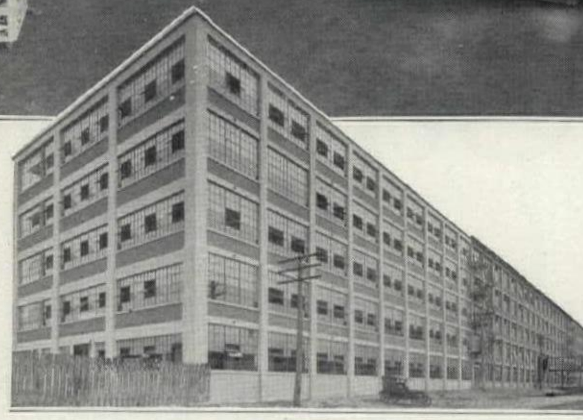


Weber Piano Co., New York City. Worn concrete on three floors covered with Bloxonend without interrupting operations.



Above—
Shipping room, Steck Piano Co., Boston. Only one man necessary to move these crated pianos. Note size of casters. This demonstrates the smoothness of Bloxonend.

RIGHT—
An exterior view of the Geo. Steck Piano Co., Boston. Three floors of this huge new factory addition equipped with Bloxonend.



Brambach Piano Co., New York City. Plant floored throughout with Bloxonend.

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Lays Smooth Stays Smooth

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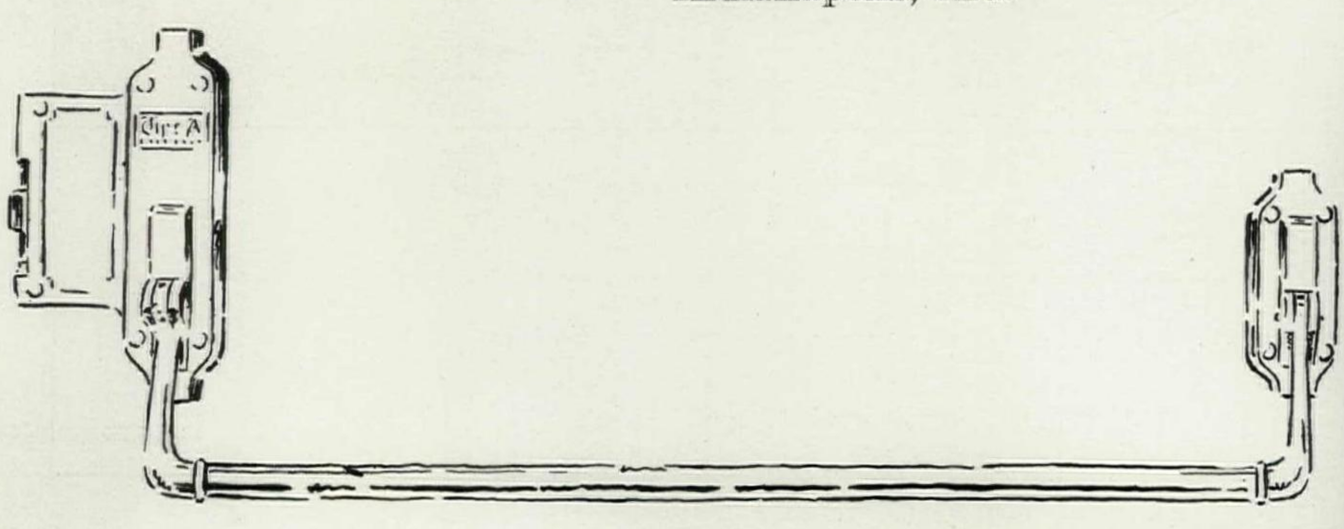

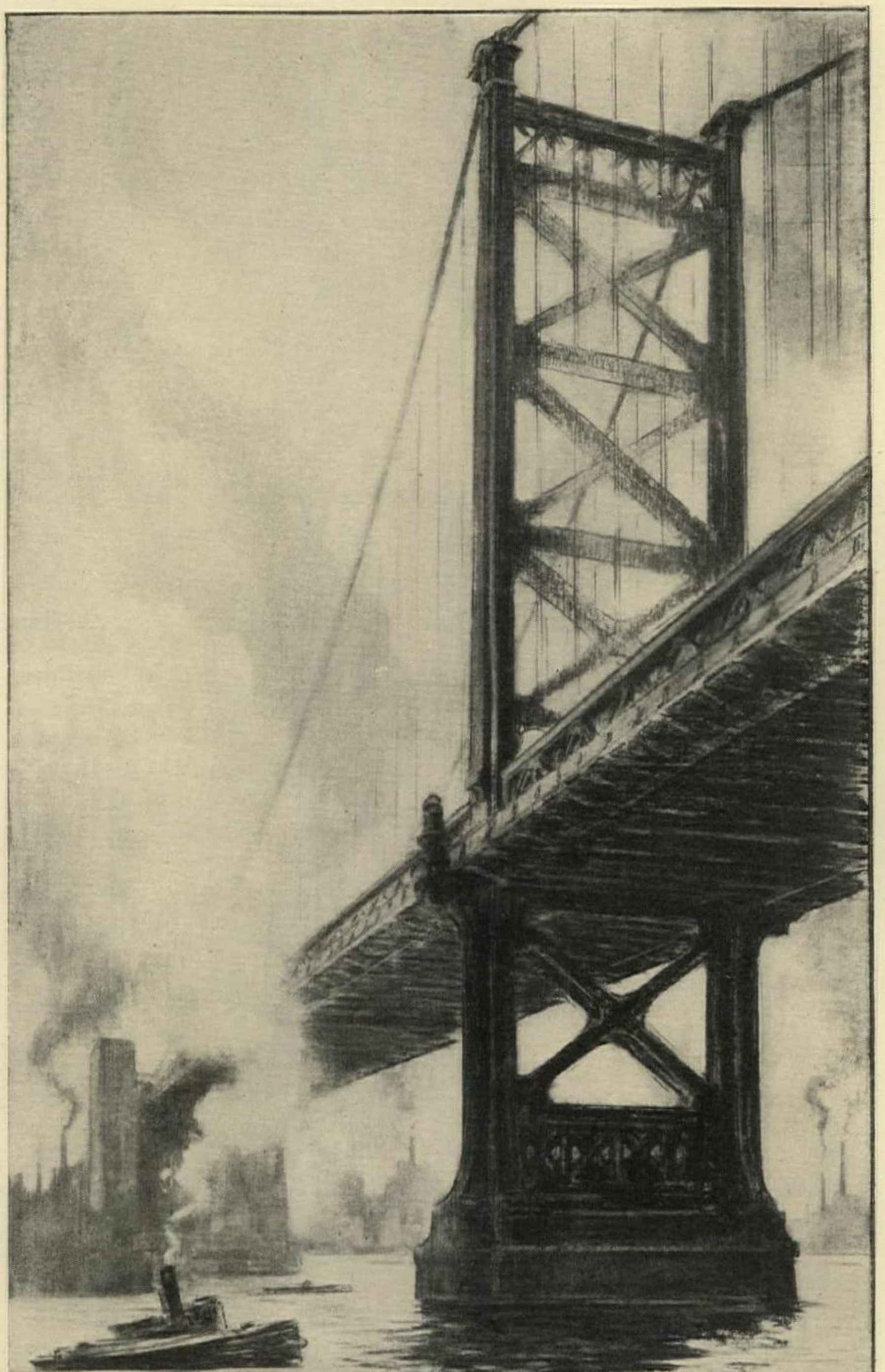

THE DELAWARE RIVER BRIDGE

PAUL PHILIPPE CRET, ARCHITECT

From a Preliminary Sketch by F. Walter Taylor

THE
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THE ARCHITECT AS COLLABORATOR WITH THE ENGINEER

BY
PAUL PHILIPPE CRET

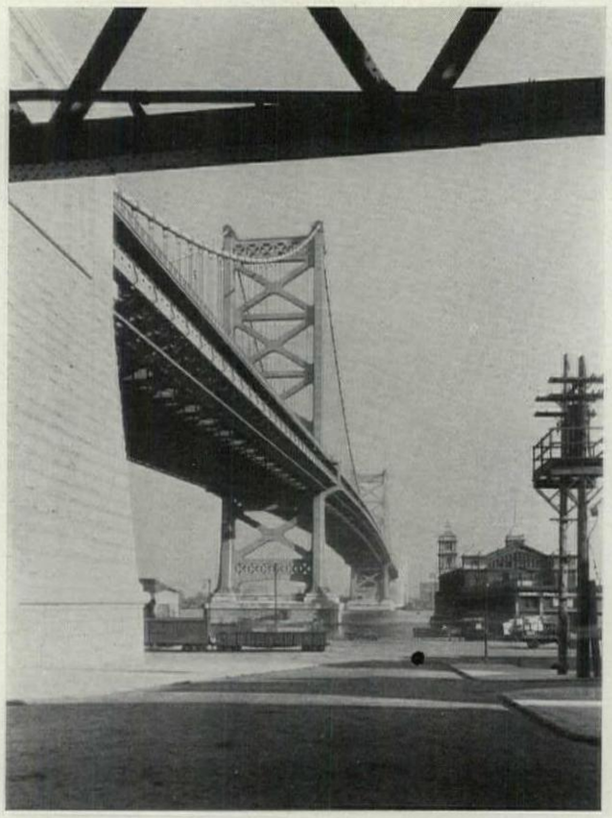
THERE lurks in humanity, whose curious role has always been that of the destined antagonist of nature, a persistent dissatisfaction with nature's inert obedience to its own laws; a dissatisfaction that is active and noble in certain aspects, and in others, foolish and blind,—the source of human power and of human weakness in equal parts. What, for instance, is this paradoxical attitude of mind which combines a clear perception of the laws of progress with a stubborn tendency to look backward, and to see in the past the ideal toward which society ought to be—and is not—proceeding?

Thomas Huxley once observed that Herbert Spencer's idea of a tragedy was a "Theory killed by a Fact." But Spencer was not advancing a mere theory when he defined evolution (that is to say, progress) as the development of the homogeneous into the heterogeneous. He was describing a fact which must, indeed, have been observed long and frequently before his own time for his statement of it to be accepted with such delight as a brand new Truth. In our enlightened day, the high school graduate can glibly inform us that the tendency of all natural organic development is from unity to multiplicity of function, from the homogeneous to the highly differentiated; the full grown man, contemplating our world, and comparing it, by the light of history, with the worlds of other civilizations, sees the law operating in every field of life and action. But it is a law of incessant change, eternally bringing to birth new conditions, eternally forcing him to new adjustments, new ideas, new problems; he is uncomfortable and uncertain, and oppressed at times with an impatient nostalgia for the familiar past. Yet nowhere does he see any example of nature contradicting itself, changing its mind midway, as it were, and remitting the pitiless pressure which forces him on to the future, and to experiences which he cannot foresee.

In this century, when human society finds itself feverishly conscious of its own extraordinary complexity, the idea of a reunion of the separated and highly differentiated parts of its own machinery becomes a dream in which restless and confused imaginations seem to find a fitful repose. A generation whose vast demands upon itself have split the old professions into multitudes of professions, and multiplies them daily with fresh needs for specialization, dreams of its superman who will unite in a supreme genius the knowledge that every day becomes more intricate and more detailed. And the dream becomes all the more cherished as the hope of its realization becomes more futile.

In the year 1747 the institution of the *Ecole des Ponts et Chaussees* in Paris signalized the definite division of the hitherto united professions of engineering and architecture into two distinct professions. Up to that time the engineer, as a specialist in building problems, did not exist. The great bridge builders, for instance, of the seventeenth and eighteenth centuries,—Ducerceau, the Mansarts, Gabriel, Gauthey, Pitrou, and Peronnet (who was the creator of the modern stone bridge),—were architects primarily, trained in architecture, which included what we would now call engineering as one of its branches. That they were masters in both fields is amply proved; the Chapel at Versailles, the *Ecole Militaire,* the Place de la Concorde testify to their ability as architects; the *Pont Neuf,* the *Pont Royal,* the bridge at Blois, and the bridges of Peronnet, which have served as models throughout Europe, to their skill as engineers. Occasionally they had their failures,—as is illustrated by a story at the expense of Jules Hardouin Mansart, which has furnished consolation and a certain ignoble pleasure to several generations of rising architects; the same Mansart, incidentally, whose collaboration with Frere François recalls the tradition of the *"freres pontifs,"*—the brotherhood of bridge builders of the middle ages. Mansart had built a bridge across the Loire. Some time later, when he was at the court of Louis XIV, an official from the district appeared at court for an interview with the king. At the end of the audience, Mansart, whose childish vanity or love of praise was a well known weakness, strutted up to the official and inquired:

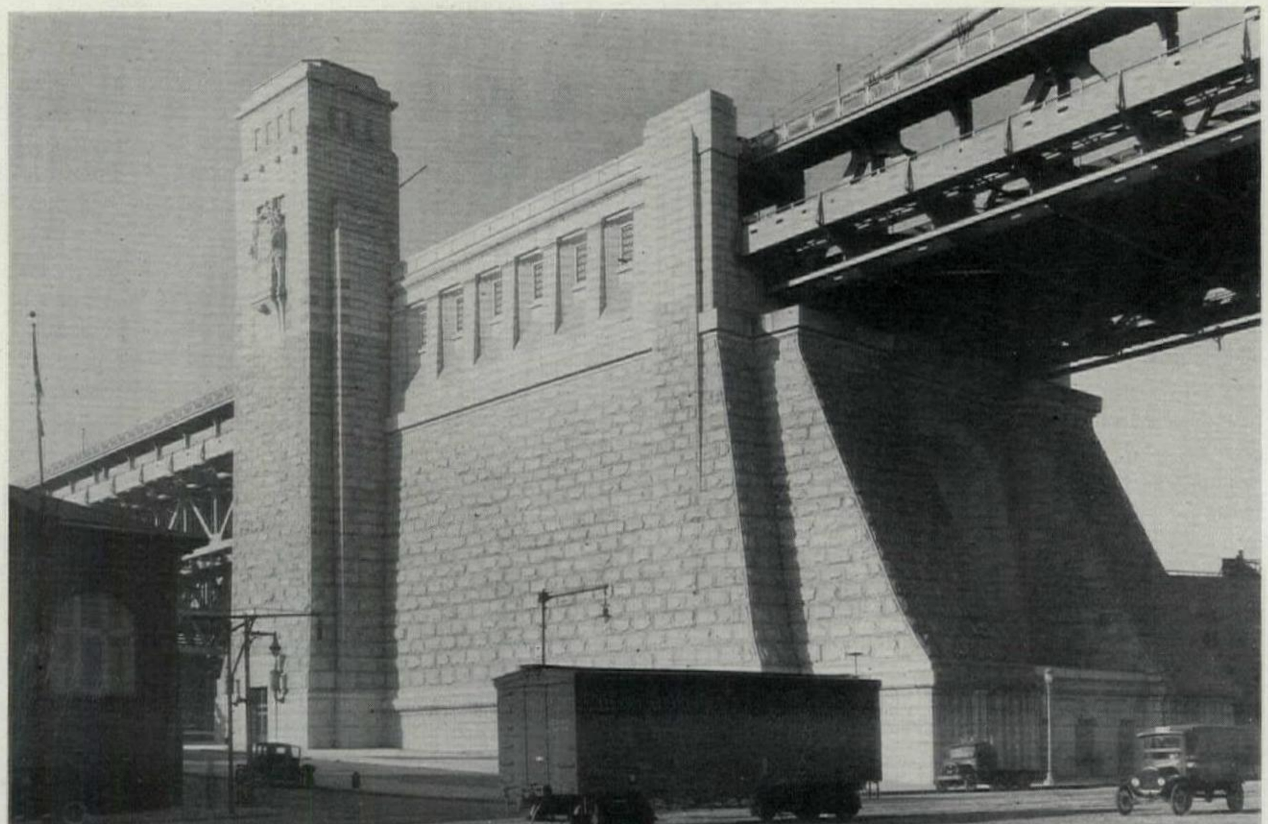
"And how goes the bridge?" "Well," replied the other drily, "at the rate at which it was going when



The Delaware River Bridge from the Shore

I left, it is probably at Nantes by this time." Nevertheless, however we may relish a story that restores such men to the human scale, it is to these consummate masters of an ambidextrous profession that we look backward. Their bridges of stone, sturdy and beautiful, will outlast our bridges of steel, and their stately and ample building is not easily surpassed.

At the same time, it must be remembered that their problems were not our problems; nor could they have foreseen, even dimly, the conditions that have developed since their time. Within the last 60 or 75 years the development of steel as a factor of construction has given rise to the necessity for mathematical calculation so complicated and so highly specialized as to have become an individual profession in itself; and every branch of engineering has grown and been subdivided in turn, so that today it is not simply "the engineer" but the mechanical engineer, and the electrical engineer, and the structural engineer, etc., each a specialist in a profession as distinct from other professions of the same family as architecture is from engineering. For a single man to attempt to make himself master of the entire field of modern mechanical mathematics would be little short of lunacy. How, then, can the architect, faced every day with the growing complexity of his own work, hope to unite the necessary proficiency in mechanics with the necessary proficiency in his own province? The increasing diversity of taste in plan-



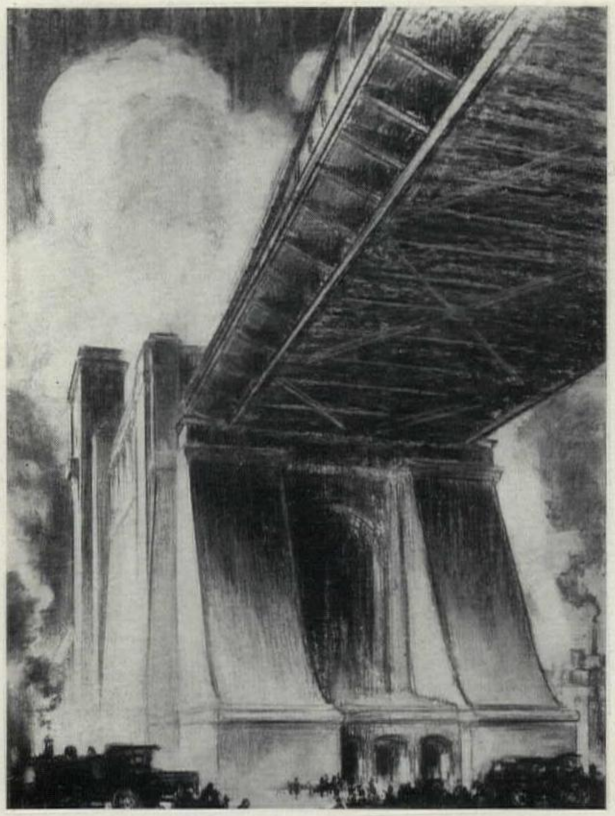
Photos. John Wallace Gillies, Inc.

Anchorage and Pylon, Delaware River Bridge
Paul Philippe Cret, Architect

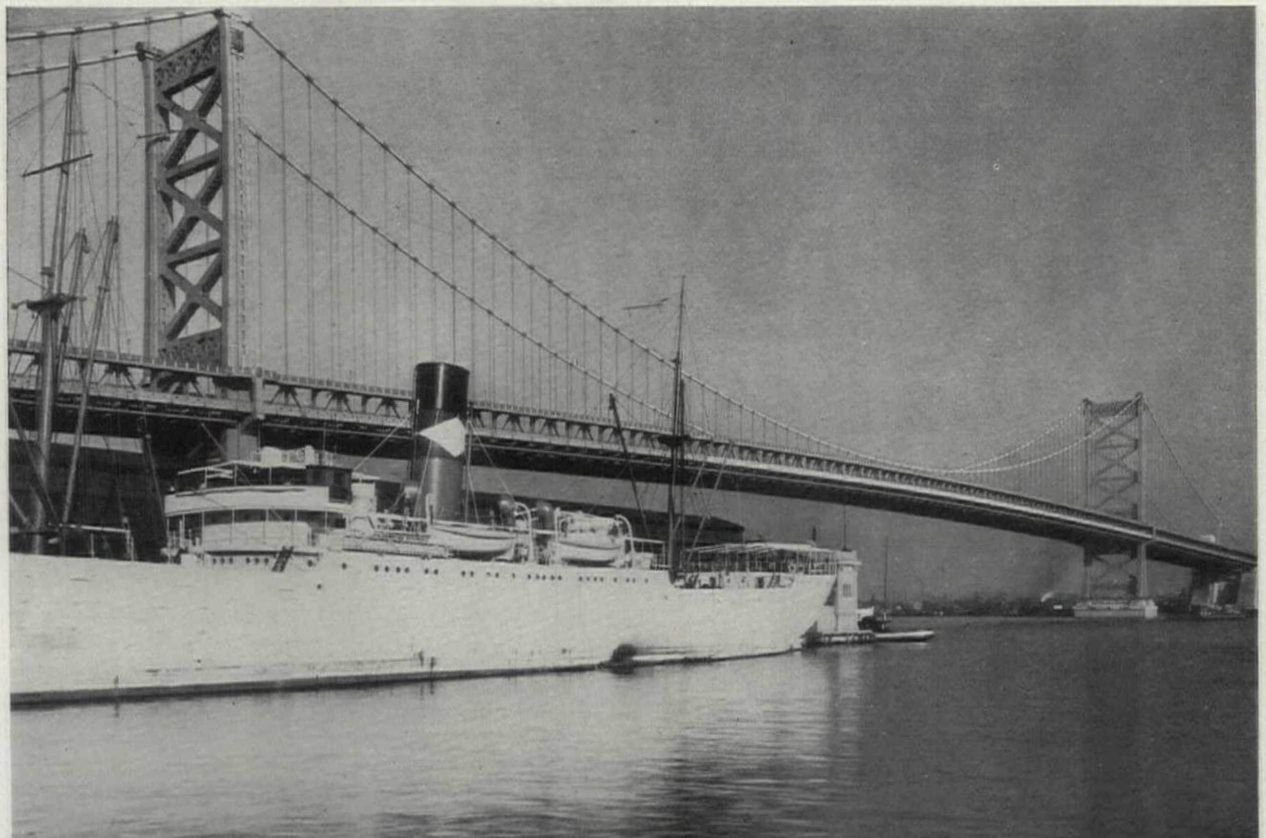
ning and in the use of materials and the necessity of directing a large staff of minor artisans and tradesmen force him to forget even such mathematics as he has learned in order to devote himself exclusively to the problem of æsthetics.

No, it is futile to look backward. Not only has the unity of the old profession been severed, but with each day the hope of reuniting the separate departments of architecture and engineering becomes more vain. Nevertheless, the two professions remain complementary to each other,—individual, impenetrable each to each, yet indissolubly connected, for good or ill. Such is the situation that has given rise to a complaint that is widely made today.

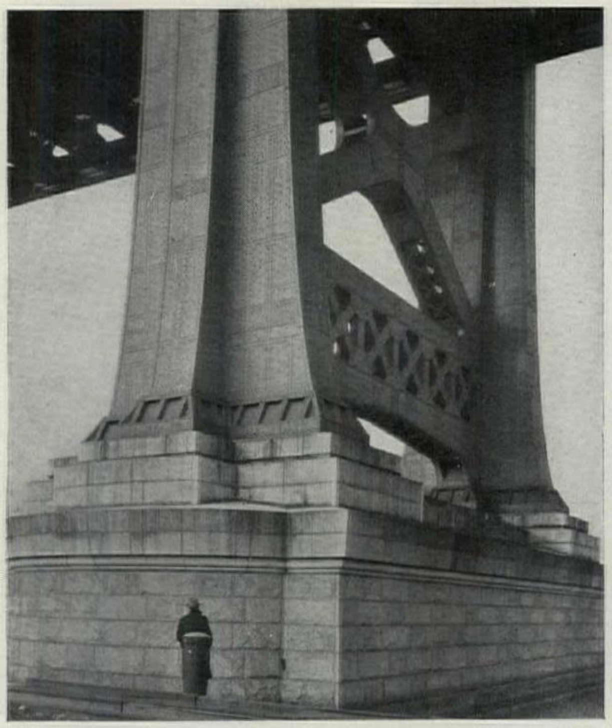
It is argued that this "division of labor" and intense specialization in two professions that are basically interdependent, must entail a serious disadvantage: namely, an inevitable absence of unity,—the unity which is the *sine qua non* of æsthetic value,—in a construction which cannot be conceived as a whole, and worked out in every organic detail in the mind of a single creator. However convincing the argument may sound, the remedy of the evil is not likely to be found in the reappearance on a super-scale of the architect-engineer; but, on the other hand, the evil itself may not be as real as it seems. It is even possible that so far from being a menace to an æsthetic ideal, this division, which has given rise to a powerful new influence in modern



Preliminary Sketch of Anchorage, by F. Walter Taylor



General View of the Bridge from the Water Front
Paul Philippe Cret, Architect



The Base of a Pier

View from the Footwalk

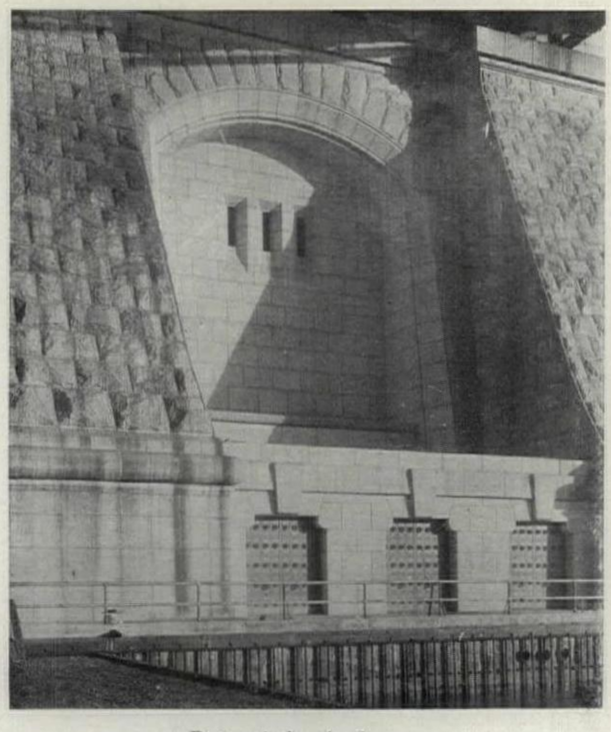
construction, may be the source of a renewed beauty, of an architecture more chaste and vigorous than we have known for many years.

In the full tide of the Victorian age,—that bewildering era when beauty, unhappily confounded with an idea of genteel falsehood, was believed to lie in the successful dissimulation of truth, when "polite" language was a tangle of ladylike euphemisms, and homely objects of utility were monstrously disguised to resemble anything under the sun but what they really were,—Taine remarked that strength and dignity of design were attained not by dissembling but by emphasizing structural purpose. The observation was less a forecast of a new ideal of beauty than a redefinition of a vital element of beauty, which has always been present in fine examples of architectural design. In recognizing the possibilities of beauty latent in the sheer mechanical frame of a construction, we have discovered nothing new. The "new" influence that has come from modern mechanics, from the creation around us of forms evolved by the effort to realize absolute utility and absolute economy, has simply aroused us to a fresh realization that "the laws of number are the laws of order and reason," and that beauty is as much the child of cold reason as of imagination. The Greeks knew this, and the Egyptians before the Greeks; the great architects of later times were those who had not forgotten it.

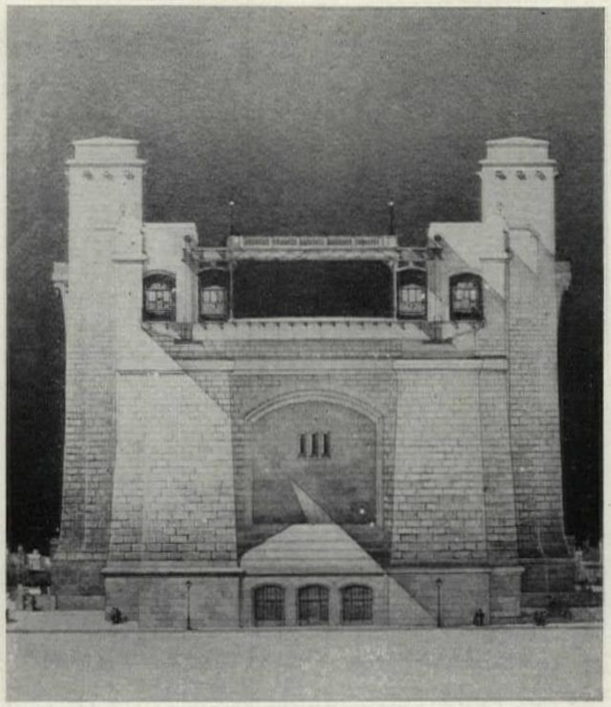
Le Corbusier says: "The Engineer, inspired by the law of economy, and guided by mathematical calculation, brings us into harmony with the laws of the Universe."

But in the enthusiasm which many of us feel for the austere and logical forms which are developed by mechanical mathematics, and in the reaction against the mawkish, the illogical, the senselessly elaborated and meaningless architecture that has been developed out of a feeble sentiment for the "quaint," and a timid respect for popular taste, we must guard against a tendency to make a fetish of the rigid forms that are produced by pure mechanics. *"Dum vitant stulti vitia, in contraria currunt,"*—foolish people, while they are avoiding one vice, rush upon its opposite.

In the cold, simple, and intensely practical forms that have been created to meet the clear-cut demands of utility, there are logic and clarity; in them we see the vigorous starkness of purpose fulfilled, to the exclusion of every other objective. But though we look upon them with a sense of intellectual satisfaction, it is without emotion. We recognize in the concrete expression of mechanical law, the presence of the self-same laws that control and direct universal forces. But though the imagination is stirred, it is not satisfied. Logic and clarity and strength, although they are elements of the beautiful, are not all there is to beauty. Until they are emphasized by subtle modifications of lines and structural proportions,—until a sense of harmony, of rhythm and accent fuses them into an æsthetic unit, they remain mute; they are seen, but they are not felt. To quote again what M. Louis Dimier has said: "The necessities of construction, even supplemented by what M. de Baudot calls economic and social necessities, will never suffice to build an edifice. For of course these ideas have only a limiting and corrective value; they are not creative and fruitful. What is fruitful is the conception of form; it is design which emanates neither from geometry



Base of the Anchorage



Section Drawing of the Bridge

nor from mechanics, but from the imitative arts."

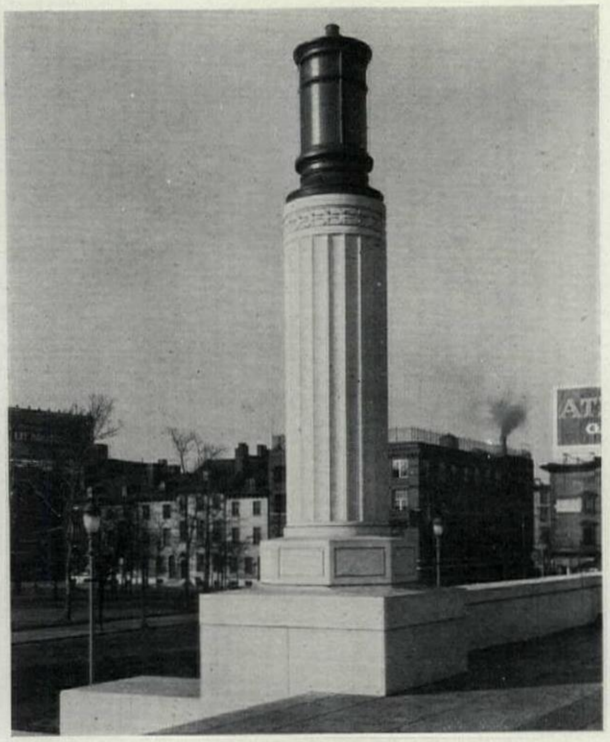
In brief, the architect is not relieved of his task. Architecture remains an art, serving an intense and ineradicable human craving, which art alone can satisfy. Moreover, an architecture which is deduced solely from the necessities of construction is not architecture, because it is not art,—it fails completely to evoke the emotional values latent in a mere manifold of mechanical factors. "Architecture begins where the calculations end."

Thus we return to the æsthetic problem. The architect and the engineer must perform a sort of *duo,* each contributing his share of special knowledge in the creation of a structure which is to be both a mechanical unit and an æsthetic unit. To the engineer, the proof of the value of his work lies solely in its durability and precise fitness for a utilitarian purpose. Æsthetics are "not in his line." Yet it is he who gives the skeleton of the construction. Obviously, therefore, the architect is limited by mechanical conditions imposed upon him from the beginning. Nevertheless, he must control these limitations, and with them, rather than in spite of them, express an organic harmony of design between the mechanical and architectural factors of the structure. "The architect, by establishing a relationship of forms, realizes a pervading order which is the pure creation of his mind; by these forms, he affects our senses intensely, arousing the perception of plasticity; by the relationships which he creates, he awakens in us profound resonances, he gives us a sense of order which one feels to be in accord with the order of the universe, and which we perceive as beauty."

The entire mechanical unit must be intensely realized by the architect before he can endow it with character and significance,—animate it so that it speaks to the imagination and stirs the emotions. Then he may begin his labors, mindful of the truth that Taine has noted,—that strength and dignity of design are attained not by dissembling, but by emphasizing structural purpose. Furthermore, the mechanical restrictions themselves are not wholly inflexible, and the mechanical solution is not necessarily arrived at independently of all æsthetic consideration. The mathematician, working to reconcile a number of mechanical conditions, may find not one, but several solutions,—all equally adequate to meeting the requirements. Obviously there arises a question of choice which may be guided not by mechanical, but by æsthetic considerations. Again, details, such as the shape and thickness of certain beams, or the proportions between certain parts of the steel structure which have no bearing on the mechanical adequacy, can be determined according to their relation to the architectural problem. Details,—yes; because a fundamental change is not necessary to render a form *significant;* but the knowledge that must be drawn on, to effect these minor changes, so vital to the beauty of the whole, is gathered only after long training in æsthetics.

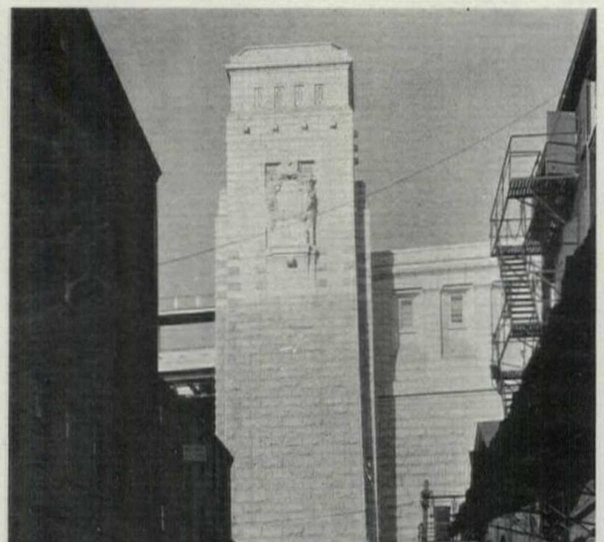
Thus, the architect, collaborating with the engineer, finds that even in the construction of the framework itself, he can exert an influence toward the architecural design that he is to develop. On the other hand, for him to ignore the influence of the mechanical design would be a fatal step in the direction of defeating the whole æsthetic purpose. He cannot allow himself to forget, for instance, that the "spirit" of a steel form is not the "spirit" of

Flag Pole Base and Lamps



Lighting Standard at Philadelphia Plaza

stone. In the middle of the last century Labrouste was among the first to realize the truth of this important canon of modern architecture, and to experiment in designs peculiarly adapted to the strength and simplicity of the steel frame. The "beauty of iron" is not the "beauty of marble" or granite. The cartouches and architectural mouldings of the stone vocabulary lose all meaning as the ornamentation of a metal form. The piers of a steel bridge are—the piers of a steel bridge; to conceive them as a "portal," and so to develop them architecturally as a Roman city gate, or triumphal arch, would be a fatal contradiction of their function. Always, the clear and at the same time imaginative interpreta-

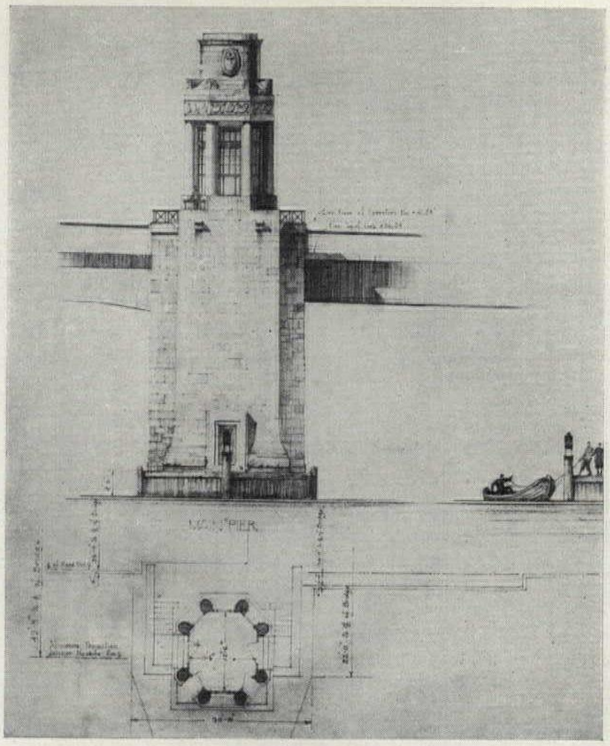


Anchorage Pylon from a Side Street

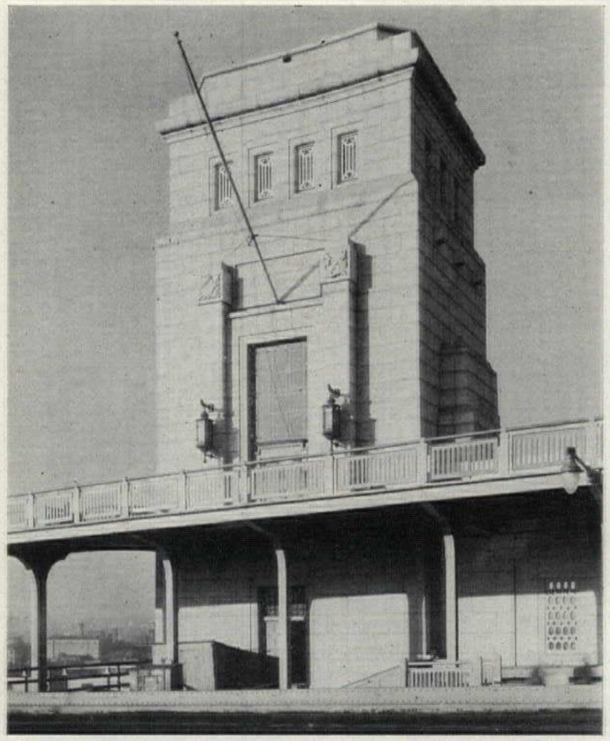
Sketch of a Coat of Arms for Pylon

Delaware River Bridge, Details

Paul Philippe Cret, Architect

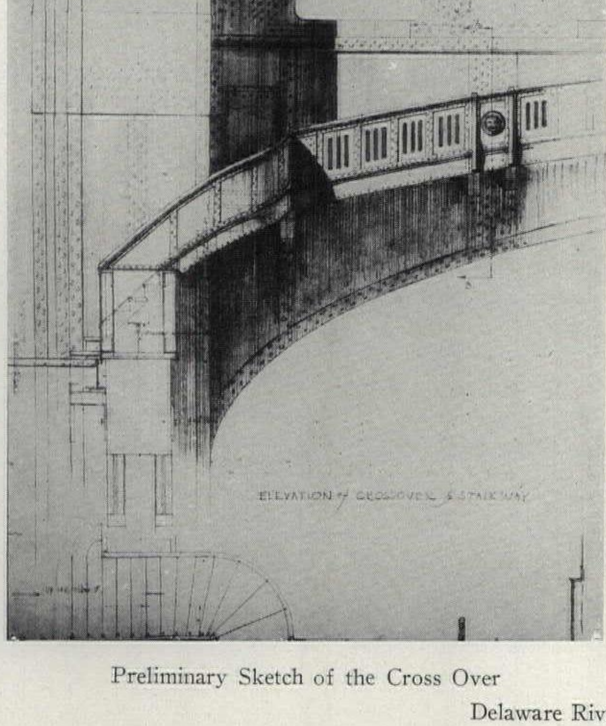


Main Pier, University Avenue Bridge
Paul Philippe Cret, Architect

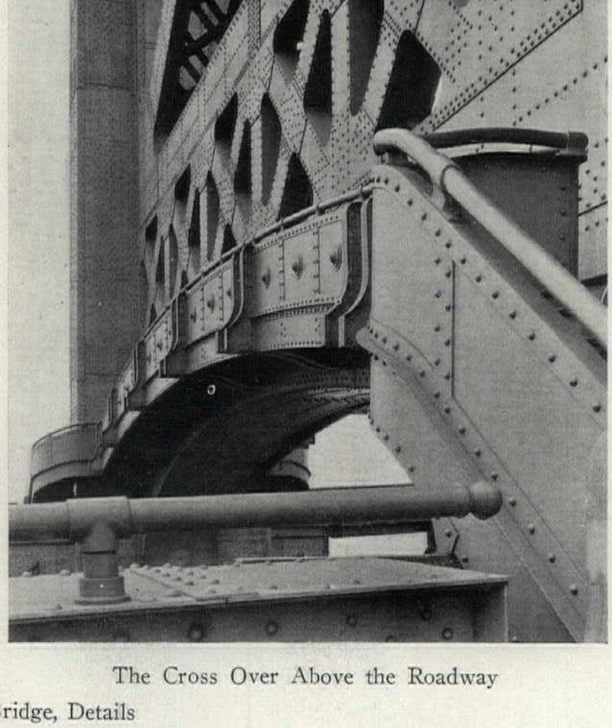


Pylon Tower, Delaware River Bridge
Paul Philippe Cret, Architect

tion of structural function must be sought, as where the angle of opposing lines can accent the sense of powerful resistance to strain, or where the massing and modeling of stone or concrete can convey an intensified feeling of solid and immovable repose. The architect must have no fear of simplicity; he must have the daring to sacrifice the facile commonplaces of stereotyped trimming; he must be ready to forget even the beautiful forms that stock his mental arsenal; he must have the courage to eliminate—and eliminate; a glance at any engraving of the Parthenon may convince him of the value of such sacrifices. His task is not to decorate, but to interpret—to clothe, if you will, but to clothe in a



Preliminary Sketch of the Cross Over



The Cross Over Above the Roadway

Delaware River Bridge, Details
Paul Philippe Cret, Architect

vesture that reveals rather than in a garment that conceals.

In the end, the problem reduces itself to the necessity for a sensitive perception of the character and spirit of metal construction. Up to a point we may cling to the rules; but beauty is an outlaw, eluding the grasp of intellect or of industry, and yielding only to an incommunicable instinct in man which is as lawless as itself. The dogmatist who seeks too conscientiously to obey the canons of an æsthetic theory will fall as far short of achieving a beautiful thing as the indifferent and slipshod workman. There is no justice in art, and the artist knows no conscience but his own instinct. But it is this instinct which, violating law in a spirit of holiness, brings into being the new forms, which, strange and disturbing as they may be at first, in time are seen to be eloquent expressions of a true perception.

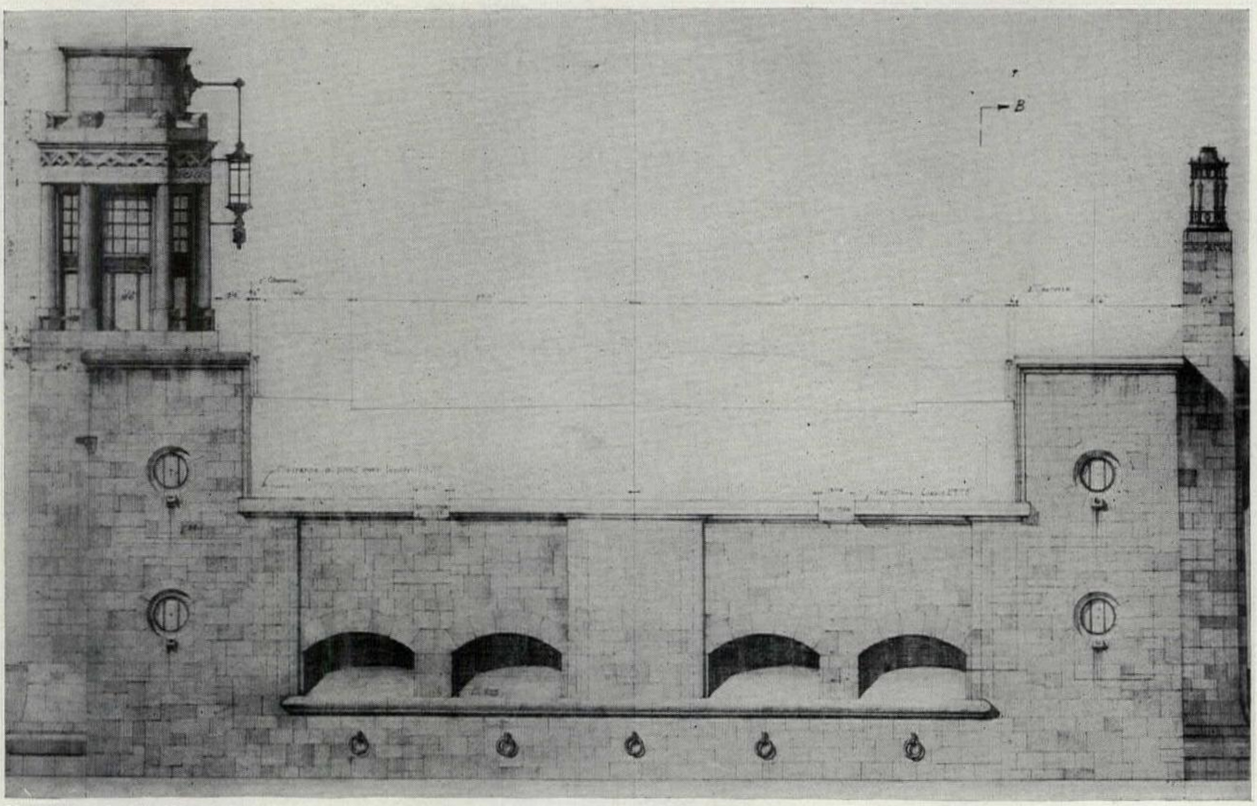
And, finally, it should be remembered that to the creative mind, every change and displacement that time and circumstance develop are elements that enrich rather than limit the means of creation. The creative instinct remains a constant force, strong enough to encounter even the problems that it views with alarm, and insistent enough to master them.

The illustrations accompanying this article are from photographs and drawings of the Delaware River Bridge between Philadelphia and Camden, and of the University Avenue Bridge in Philadelphia. They were selected to illustrate an attempt to harmonize the stonework with the steel construction, and to give architectural value to the steel forms without having recourse to useless members or ornament. It was thought by both the engineers and the architect that, in most cases, ornamentation does not readily become an integral part of the design, but remains, as it were, "tacked on," detracting from the austere beauty of the steel members.

The architect wishes here to acknowledge that his collaboration with the engineers of the Delaware River Bridge, Messrs. Ralph Modjeski, Chairman of the Board; George H. Webster; and Lawrence A. Ball; and with the engineers of the University Avenue Bridge, Messrs. Vogelson, Chief of the Bureau of Engineering; and Noyes, Engineer of Bridges; has been of great assistance to him in restraining the tendency of the architectural "Old Adam" to relapse into too much architecture; and also that his constant intercourse with men of the highest professional merit was a most pleasant experience to him. He realizes that his contribution to the common undertaking is of small value compared with theirs, and claims only the merit of having tried earnestly to understand their points of view in this worthy achievement.

Statistical Data:

Total length of bridge and approaches	9,570	feet
Length of bridge proper	3,535	"
Length of main span	1,750	"
Width of bridge	128	"
Clearance above high water	135	"
Height of towers	380	"
Cost	$36,000.000	



Drawn by J. H. Hough

Sketch of Main Piers, University Avenue Bridge, Philadelphia

Paul Philippe Cret, Architect

ILLUMINATION IN THE PHILADELPHIA MUSEUM OF ART

BY

C. E. WEITZ

ELECTRICAL ENGINEER

ALL of the treasures handed down to us from the past appeal to just one of our senses,—sight. The prime essential in museums, therefore, is that the objects of art may be well seen; this, of course, means that they must be well lighted. As we contemplate art or architecture, we find that each historic period wrote its own chapter, and our present viewpoint is a composite of lessons from the past. In the matter of lighting, however, though the subject is as old as the human race, very little can be safely taken from the past. Modern illumination is a new art, born of the science of the present generation. Its progress is measured in years, not in centuries.

Natural Daylight versus Artificial Daylight. While it is possible to design a building with primarily daylight illumination, it may mean a considerable compromise architecturally. Efforts in this direction have resulted in a distinct type of modern factory building with glass walls, but such a departure would hardly be considered for any building of the monumental type. Furthermore, the lighting requirements of an art museum are such that natural daylight illumination is limited to some extent to that obtained from skylights. With skylight construction, elaborate louver systems are essential to control the direct sunlight and also to overcome the natural tendency toward a maximum illumination on the floor rather than on the walls. Such skylight and louver installations are not only expensive initially but they inevitably impose severe restrictions on the design of the artificial lighting system. The large areas of skylight make the room hot in summer and give rise to expensive heat losses in winter. Questions of leakage, and of the cracking of glass, due to constant expansion and contraction, necessitate an efficient system of maintenance. Again, the latest researches have shown that the fading and discoloration of the pigments in paintings can be minimized, if not eliminated altogether, by the use of artificial light. It was logical, then, that those who have given the art museum problem the most thought should have reached the conclusion that provision of artificial lighting, with its constant quality and 24-hour availability, should be the first and foremost element as far as illumination is concerned.

Daylight Illusion. An illusion of natural daylight in the Philadelphia Museum is obtained through the use of "daylight" incandescent lamps, exclusively. These lamps, with their blue glass bulbs, correct the light of ordinary bulbs to a color not coldly white but of a hue which approximates that of natural light indoors which has been mellowed somewhat by window draperies and the tone of the interior decorations of the room. Nearly one thousand lamps are used to light the portion of the museum now completed. The lamps range in size from 60 to 1000 watts, each definitely and designedly contributing its part to the lighting ensemble. Some are used in floodlight projectors above artificial skylights, others in coves concealed in ceiling ledges, while

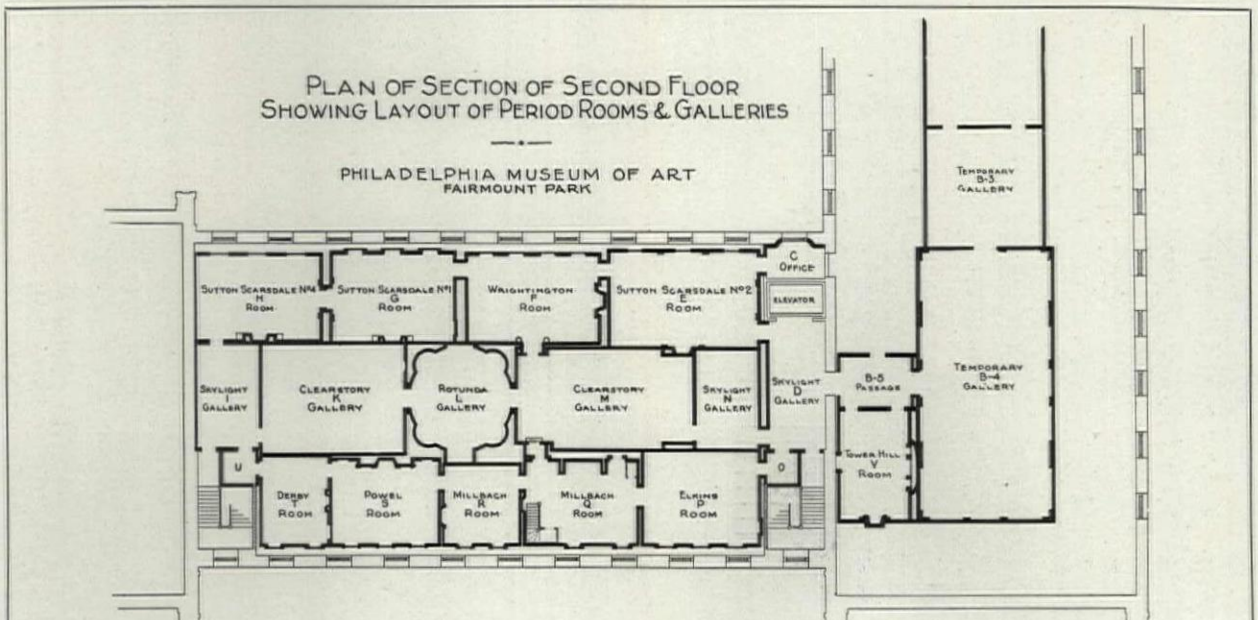


Fig. 1. Plan Showing Fenestration Unrelated to Interior

Fig. 2. Artificial Lighting of Large Gallery

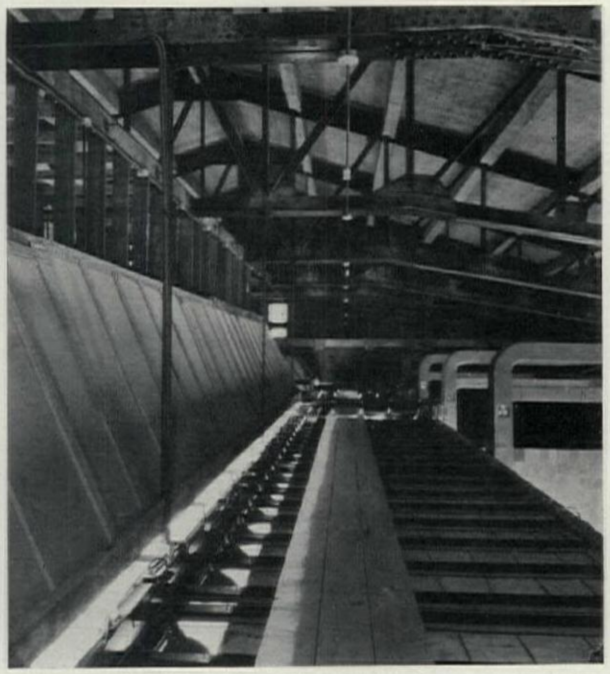


Fig. 3. Mounting of Projectors for Lighting at Left

others are parts of artificial windows,—but not one lamp is exposed to view.

The function of light is to reveal, and as such it should seem to pervade the whole. It should quietly play its part rather than intrude itself upon us. It was with this conception that the lighting problem of the various galleries of the new Philadelphia Museum was undertaken. No matter what words are used to describe the lighting effects, the lighting was planned not to introduce any mystic or esoteric effects, but purely as an unconscious illusion of normal daylight as an unobtrusive part of the whole. Let it be said further, however, that the technique employed is new and unusual, simply because usual methods have often left much to be desired in contributing the subtle but all-important part light should play. The most conspicuous feature of the lighting is the absence of those faults which most of us have been led by long experience to feel are necessary evils of a paintings display,—too strong a light, too weak a light, or dazzling light thrown back from the surfaces of the paintings by reflections of the light sources themselves. How refreshing to find these customary faults non-existent in the Philadelphia Museum! One writer described the lighting as one "of soft, steady daylight everywhere. While the sky was a sooty gray outside, with no hint of the sun, within the rooms a clear, diffused illumination gave the illusion of a June day, with the sun behind light,

Illumination of Large Gallery Wall. Ceiling Reflections Absent friendly clouds,—and done in such a fashion as to reveal the witcheries of carved panels and painted canvases which transported visitors to the far-off days of the Georges." And that is the effect which those planning the lighting strove to secure. They sought to have the lighting as natural as possible in the many galleries as well as in the period rooms, and it was obtained by unusual arrangements of lighting devices. To supplement some settings, additional light was so directed as to render the most advantageous viewing of the displays.

Five Systems Employed. The portion of the Museum opened to the public for the first time in the latter part of March, consists of a section along the north and east sides of the third or main floor. The main hall at present consists of a series of four temporary galleries, occupying a space approximately 30 by 180 feet; the northeast wing comprises three main sections,—a central series of large and small galleries flanked on either side by a series of period rooms. The arrangement of the various galleries is shown in Fig. 1. The lighting for the galleries has been designed specifically as a part of the architectural treatment, which divides into five general types.

Lighting the Temporary Galleries. The large temporary galleries along the north side are partially ceiled with glass, through which comes a glow of light, soft and diffused. A typical gallery is shown in Fig. 2. Each skylight section is boxed in by a large housing, painted white inside to reflect the light from a number of daylight lamps within. These lamps are mounted well above the glass to give an even distribution of light and to avoid casting apparent bright spots on the skylight. But little dependence, however, is placed on the skylights for the strong, steady light that is essential for the gallery walls. Consequently only enough light comes through the skylight to make the glass softly luminous. Bounding the glass ceiling area on all four sides are beams dropped a foot below the ceiling and extending both lengthwise and crosswise of the room about 5 feet from the walls. In general appearance these beams are no more than supporting members of the ceiling structure, but their primary purpose is to form the housing for the source of the gallery wall illumination. The sides of these drop beams toward the walls are of stippled glass sections behind which are concealed projectors so adjusted as to direct a flood of white light on the picture areas. These projectors, each using a 200-watt daylight lamp, are spaced 2 to 3 feet apart along the beams and are mounted on swivel joints for aiming as desired (Fig. 3). Each plays its own part in the lighting of a definite portion of the wall area of the galleries.

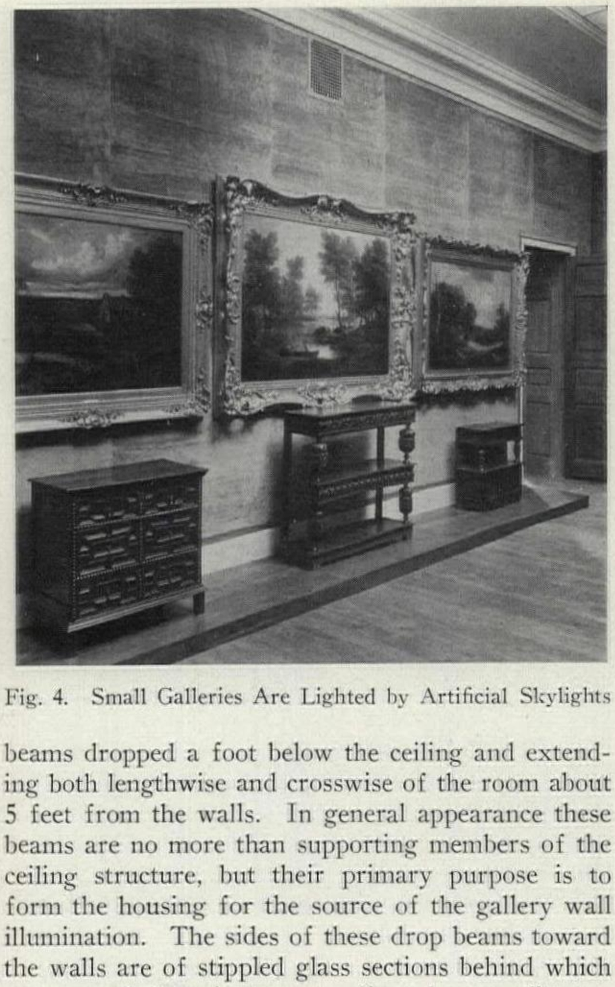


Fig. 4. Small Galleries Are Lighted by Artificial Skylights

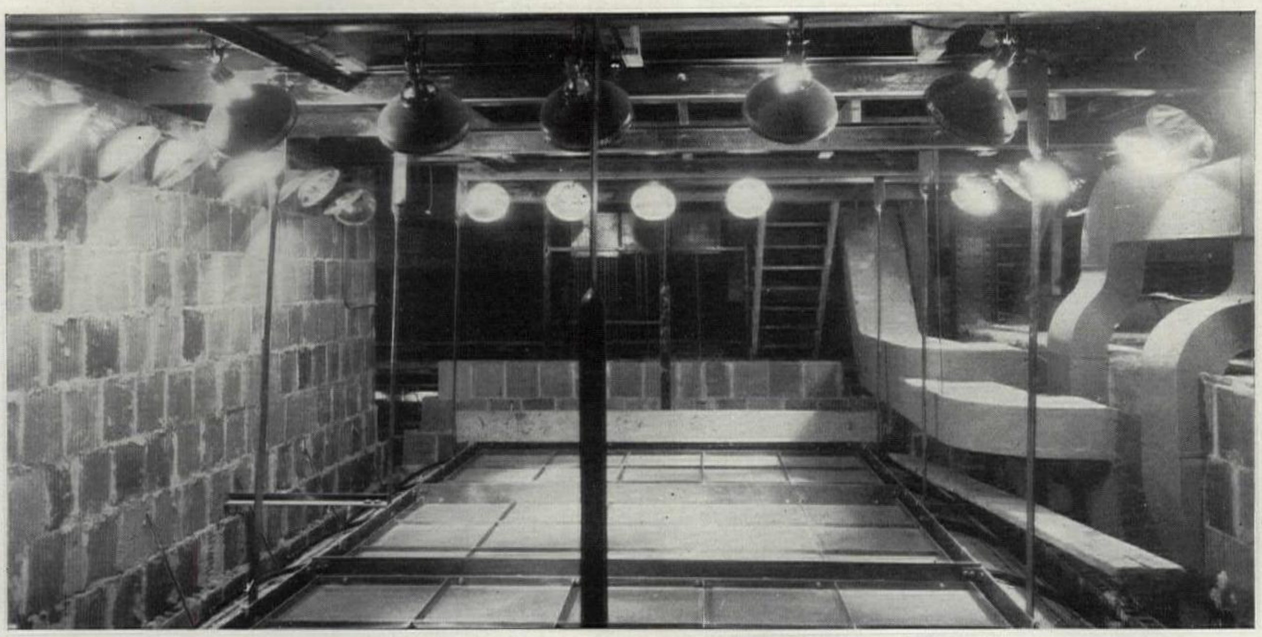


Fig. 5. Projectors Above Skylight Over Small Gallery

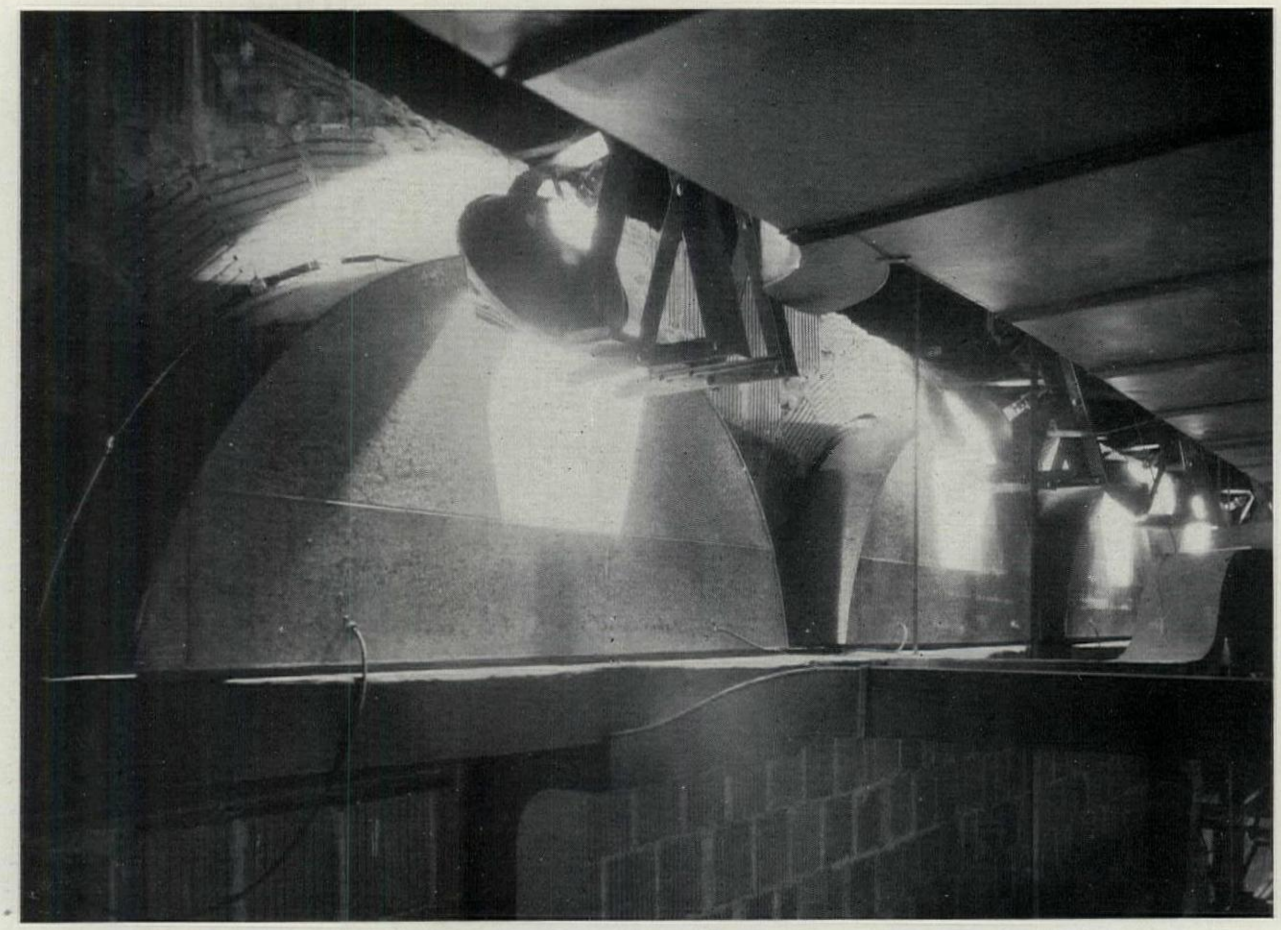


Fig. 6. Location of Projectors Behind the Clerestory Lunettes

Three Small Galleries Have Artificial Skylights. In the wing adjoining the large temporary galleries there are three small galleries,—D, N, and I, shown in Fig. 1. They are paneled in velvet of royal scarlet, warm golden brown, and glossy gray. These galleries have skylight construction, but being of smaller sizes do not permit or require the exact lighting treatment just described. Instead, the skylight is the only source of light, but unusual emphasis is given the paintings on the walls by a battery of 28 floodlights above each skylight on all four sides. Each floodlight has a concentrated distribution of light, and is directed at the desired angle toward the walls rather than toward the floor, so that the paintings are adequately lighted and the wall coverings glow with natural velvety luster. A typical gallery of this construction is shown in Fig. 4, while a view of the equipment installed is shown in Fig. 5.

Cove Lighting for Rotunda Dome. The rotunda, which forms the central portion of the northeast wing, is lighted from a concealed cove at the base of the vaulted dome,—daylight lamps, of course. But aside from an effect that is striking, the application is not at all uncommon. This lighting does, however, emphasize the delicate colorings and patterns in the ceiling, while the dome is crowned by a luminous panel behind which can be placed spotlights to highlight statuary in the niches which face a life-sized bronze of Washington standing at the center of the rotunda floor (Fig. 10).

Thousand-Watt Projectors Light Clerestory Galleries. The clerestory galleries, as the name implies, have high arched ceilings as in the nave of a church, with semi-circular windows high up along each side. These galleries join the rotunda on either side. The larger of the two is 26 by 28 feet, and has three windows on each side. Each window is divided into seven radial sections fitted with ribbed glass. Behind the center panel of each window, on both sides of the room, are 1000-watt projectors which direct a cross-spread of light upon the picture area of the opposite wall. The other six panels of each window are backed up with a sheet metal housing within which are several 200-watt daylight lamps to make the entire window luminous. Fig. 6 shows where the projectors are located. A view of one of these galleries is shown in Fig. 7. The effect is that of natural daylight streaming in through the clerestory.

Unusual Lighting Methods in Period Rooms. Perhaps the most unusual treatment is manifest in the period rooms,—particularly so if we seek to emphasize the departure from architectural precedents so increasingly necessary if the full potentiality of lighting is to be gained. There are four English rooms of the period from 1724 to 1754, taken in their entirety from Sutton-Scarsdale and Wright-

Fig. 7. Clerestory Lunettes in Large Gallery

ington Hall, also a room from Treat House, Upminster, and a Tower Hill room. There are four American rooms, one from the Powel house, Philadelphia, where Washington, Lafayette, and Franklin stopped when they came to Philadelphia. There, too, dashing British officers entertained, while Washington and his men lay at Valley Forge. Another room is from the Derby house, Salem, and there are two Pennsylvania Dutch rooms from the Muller house, Millbach, Pa.

These rooms indicate the scope and excellence which will make the new Museum famous throughout the world of art. They are originals, transplanted with meticulous care to this new and stately building which crowns Philadelphia's acropolis. There are the golden brown fumed oak wainscotings of Sutton-Scarsdale with the tragic, deathless loveliness of Lady Hamilton looking down from one great canvas, surrounded by other Romneys, Gainsboroughs, and Raeburns of the McFadden collection. Since these rooms are set bodily within the walls of the Museum, use of natural daylight alone was impracticable; still, if the rooms were to retain their character and charm, the daylight effect was necessary. Strong shafts of direct sunlight through these windows, while producing a very natural effect, might be bright enough to obliterate details of paintings along certain sides of the rooms. When these rooms were reconstructed within the Museum, a small space was provided between the building's walls and the outside walls of the rooms. This allows some diffusion of natural daylight to filter in through the inner windows, but by dropping white curtains outside the rooms' windows a soft diffused artificial light is reflected into the rooms. Daylight lamps mounted around the outer edges of the window frames direct their light to these curtains, and this is particularly true of the Tower Hill Room, giving a pleasing daylight effect. In this case, as will be noted by reference to the plan shown in Fig. 1, the windows actually look out upon the walls of the temporary gallery which have been curved around and direct into the room the light from concealed lamps.

Though such a scheme creates the illusion of natural lighting, it is not satisfactory as the primary lighting in those rooms. To light, effectively and unobtrusively, the wainscoting and the paintings which grace the walls, a scheme similar in principle to that described for the temporary galleries is used. Instead, however, of beams dropped from the ceiling to conceal supplementary equipment, we find a unique departure from architectural precedent. In order to accommodate floodlight projectors to light the walls predominantly, the architects have, in effect, taken a sharp knife and cut through the ceilings about 4 feet from the walls all around. Then the

Fig. 8. The Sutton-Scarsdale Room

inner edges of this incision are bent down about 6 inches, leaving the central portion of the ceiling in a gracefully curved arch. This allows a band of stippled glass to be inserted,—or a cove, if one will,—into the ceiling, behind which are mounted floodlights which sweep the walls. The drawing in Fig. 9 shows this, while Fig. 8 shows the lighting results as obtained in the Sutton-Scarsdale Room.

The question was asked of Mr. Borie, one of the architects, how, in architects' parlance, this type of ceiling would be designated. He naïvely answered, "Plaster." And, so it seems, the Philadelphia Museum shows architectural departures in reference to illumination results at almost every turn. This pioneering spirit in an architectural way evidences faith in the plans of the lighting of the Museum.

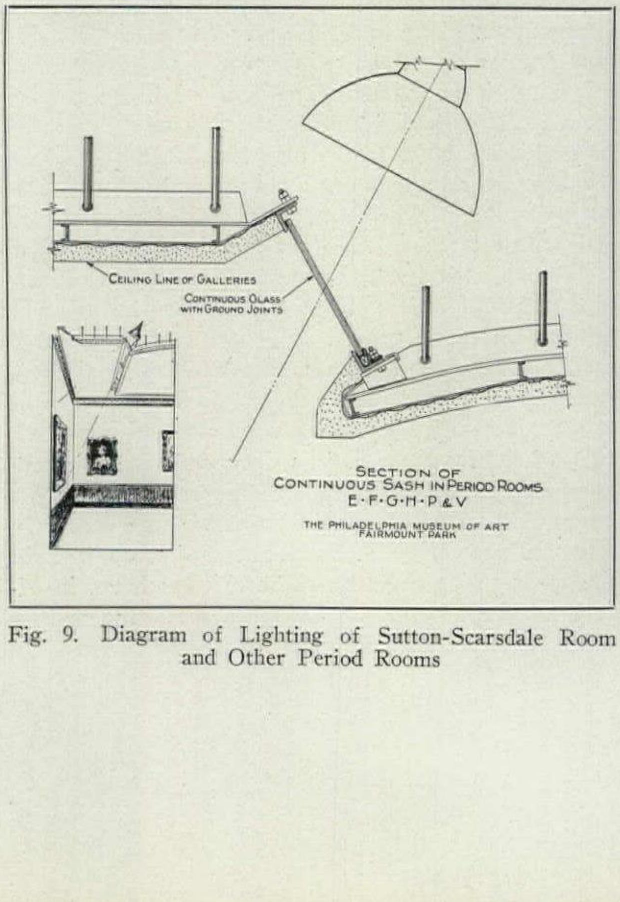


Fig. 9. Diagram of Lighting of Sutton-Scarsdale Room and Other Period Rooms

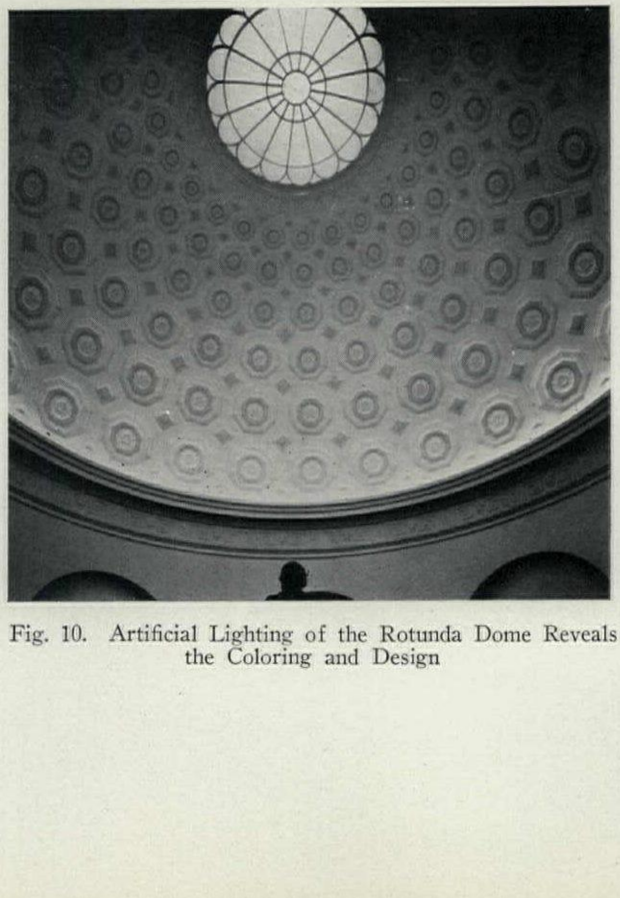


Fig. 10. Artificial Lighting of the Rotunda Dome Reveals the Coloring and Design

THE STRUCTURAL FRAME OF THE NEW TEMPLE EMANU-EL BUILDING

BY

EUGENE W. STERN

CONSULTING STRUCTURAL ENGINEER

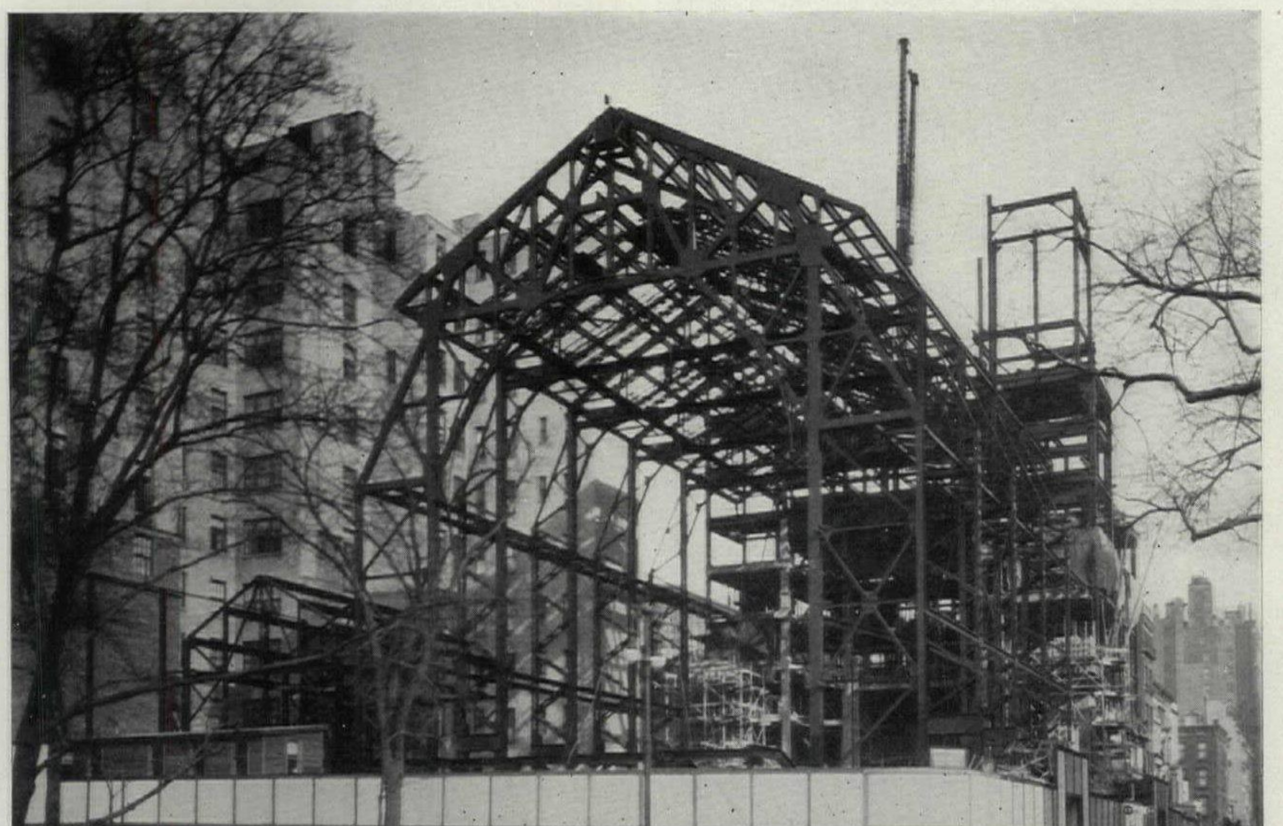
THE structural frame of the new Temple Emanu-El building in New York is principally of steel construction, but portions are of reinforced concrete as well as masonry, the material chosen being that best adapted to suit the particular condition.

General Description. The structure is in reality a group of three buildings,—the Temple proper, the Beth-El Chapel, and the Community House. The Temple proper is a large auditorium, 100 feet by 176 feet, seating in all 2,500 people, of whom over 2,000 are accommodated on the main floor and the remainder principally in the west gallery. All seats are so placed as to provide a view of the ark and the pulpits. Of the total length of the auditorium, about 25 feet are taken up by the sanctuary, which is separated from the main body of the auditorium by an arch about 40 feet in width.

To the north of the Temple is the Beth-El Chapel, about 50 feet by 100 feet, a two-domed structure with a separate entrance from Fifth Avenue. This chapel has been planned to seat about 325 persons, the only gallery being a small choir gallery at the west end.

To the east of Temple Emanu-El is the Community House, which is an eight-story building, 100 feet deep. The main body of the structure is about 50 feet in width and has an entrance vestibule and elevator tower, placed on the 65th Street side between the Temple and the Community House. The tower is about 175 feet high to the top of the stonework. The Community House contains, on the ground floor, a large auditorium; on the second floor, the offices of the Temple and the library; and on the next five floors, classrooms; while the eighth floor includes the rabbis' studies, trustees' room, etc.

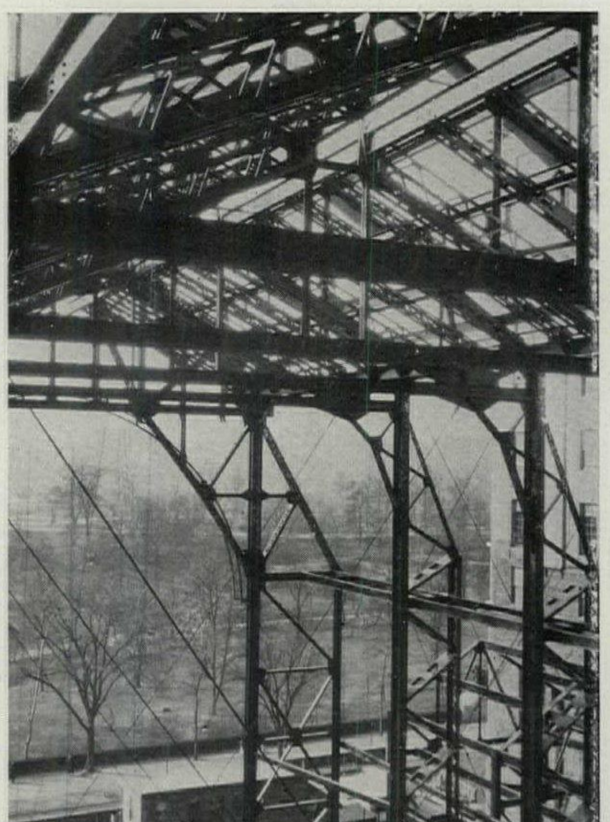
Temple Emanu-El. The nave of the Temple is 77 feet wide, 147 feet, 6 inches long, and 103 feet high, from floor to ridge of ceiling. The columns supporting the trusses are built in the form of a trussed frame 8 feet deep, designed to carry 30 pounds per square foot horizontal wind pressure. The roof trusses, spaced 27½ feet apart, have trussed top chords, the tops of which are in the plane of the roof and the bottoms in the plane of the ceiling, as may be seen in these illustrations. The bottom chords of these trusses are horizontal members and are exposed. The web members of the trusses are not visible, being hidden by the ceiling, as they are in the space between the ceiling and the



Photos. Richard Southall Grant

The Frame of Temple Emanu-El from Fifth Avenue

The Main Roof Trusses



Looking Toward Central Park

roof. This design of truss, having a system of triangular web members which supports both the roof and ceiling, is readily analyzed for stresses, being statically determinate, and was quite the most economical design that would meet the conditions of the problem. The walls are of masonry, reinforced concrete and brick faced with limestone, and are self-supporting, except the clerestory, which is carried on reinforced concrete girders at a level of 61 feet above the first floor. These girders are supported on reinforced concrete columns.

The front of the building on Fifth Avenue has a reinforced concrete frame and arch, 108 feet high, from the street level to the roof, which carries the load of the roof to the foundations. The stone facing supports itself and is anchored to the concrete. In the basement of the Temple there is a banquet room, of 50 feet clear width between the columns which support the main floor. By using a cantilever system of floor beams it was possible to support the first floor on 20-inch beams about 9 feet on centers.

Bracing. Adequate bracing, both vertically and horizontally, has been provided, some of which is temporary and will be removed after the reinforced concrete and masonry work of the enclosing walls are completed. In general, the bracing consists of 1-inch rods with turnbuckles, and struts made of two channels riveted together in the form of a T.

Chapel Beth-El. The structural frame of the Chapel is quite simple, there being nothing unusual in the problem of supporting the roof and the domed

Main Roof Trusses as They Will Appear When Finished

ceiling, which is hung from trusses. The decorative masonry of the interior is practically all self-supporting or carried on reinforced concrete construction.

Community House. This building is eight stories in height and is designed for a future extension of two stories. The first story provides an auditorium with gallery, and it was, of course, necessary to have this space free of exposed columns. To accomplish this all the interior columns which carry the upper floors were supported at the third floor on a system of trusses, whose depth is the full story height of the second story. There are three trusses 14½ feet deep and one plate girder 10 feet deep, which support the framing of all floors above the auditorium. These trusses, therefore, carry heavy loads, and one of them has a span of 47½ feet and supports 1100 tons. In the design of these trusses the details are so arranged that in all field connections the rivets are in double shear, thus reducing the number of field rivets to a minimum, and allowing the use of smaller gusset plates at the connections,—an important matter, inasmuch as door, corridor, and window openings had to be provided for in the design of the web system of these trusses. In Truss T-1 the main top chord compression member is a box section made up of four 15-inch channels, 55 pounds per foot, with 22-inch cover plates 1¼ inches thick. All steel trusses and connections of columns to trusses were assembled in the shop, and all holes for field connections were reamed or drilled through the solid metal. This proved to be very satisfactory in every way and saved materially in the cost of erection, as

Supports and Bracing

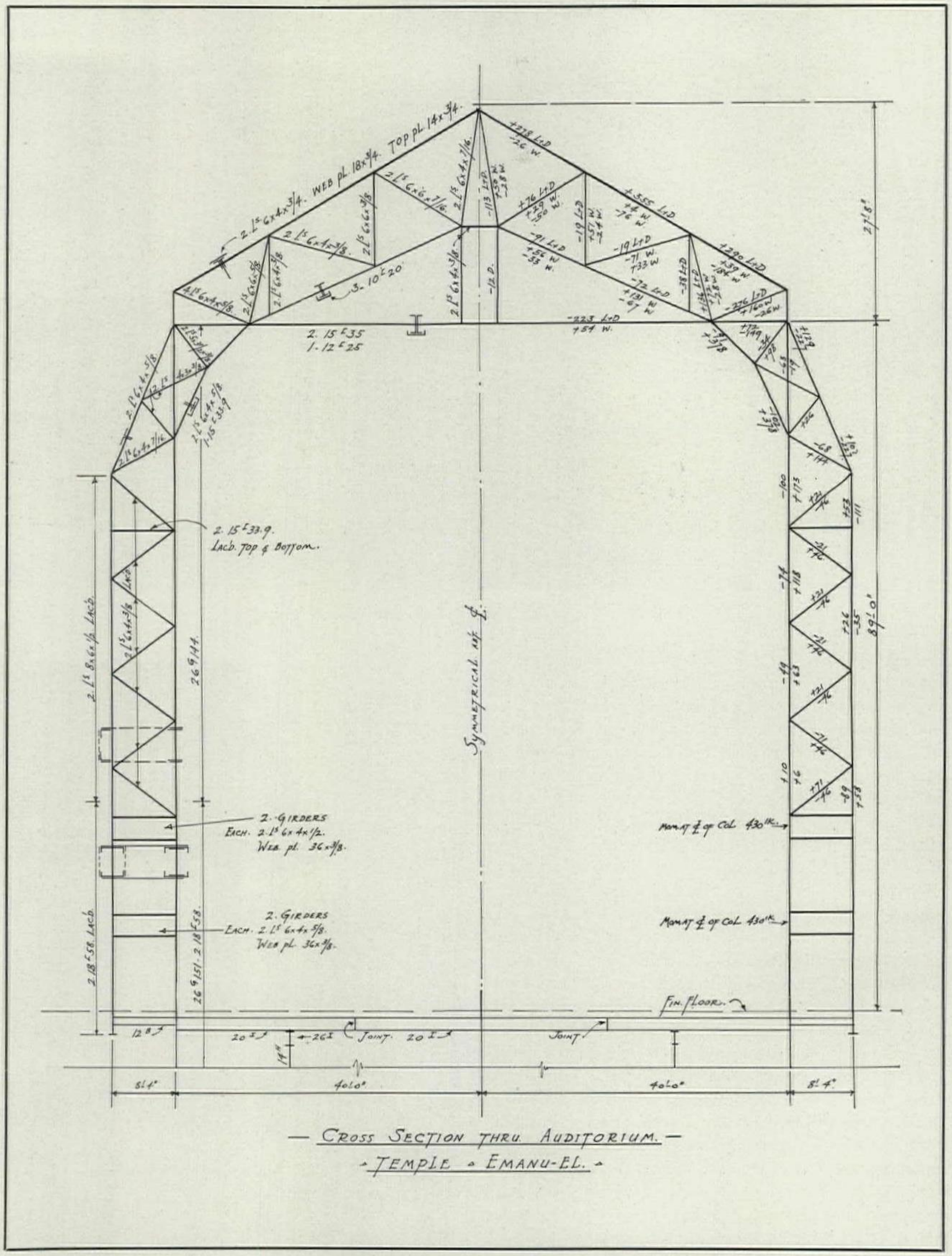
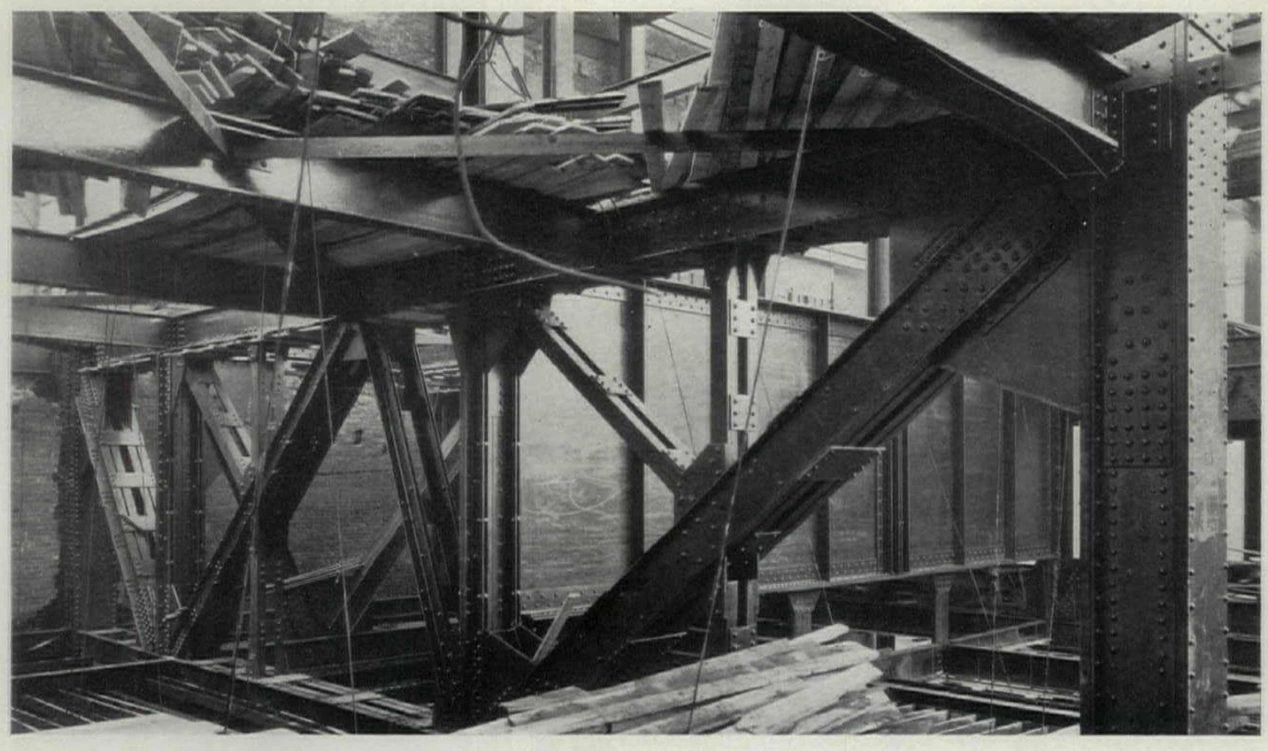


DIAGRAM OF STRUCTURAL FRAME OF THE AUDITORIUM
TEMPLE EMANU-EL, NEW YORK
ROBERT D. KOHN, CHARLES BUTLER AND CLARENCE S. STEIN, ASSOCIATED, ARCHITECTS
EUGENE W. STERN, CONSULTING STRUCTURAL ENGINEER



View of Truss Supporting Community House

the pieces were fitted together in the field without any reaming or drifting.

Floor Construction. Owing to the difficulty of obtaining clean anthracite cinders in New York, it was deemed undesirable to use cinder concrete in the floors. Stone concrete of 1:2:4 mix, and combination tile, one- and two-way systems, and reinforced concrete floors have been used throughout. In the Temple the main floor slab is 4-inch reinforced concrete, supported on steel beams spaced about 9 feet apart, the reinforcing consisting of ⅜-inch round bars spaced about 5 inches on centers placed diagonally in two directions so as to accommodate the openings for ventilating sleeves. The roof consists of a 3½-inch reinforced concrete slab on which there is a 2-inch layer of nailing concrete in which are 2 by 3-inch wood nailing strips spaced about 2 feet apart, to which the covering of copper is attached. In the Chapel Beth-El the floor construction is entirely of reinforced concrete with reinforced concrete girders and hollow tile concrete ribbed floor slabs. The floors of the Community House are similar, consisting of one- and two-way hollow tile and concrete ribbed slab systems on steel girders.

Robert D. Kohn, Charles Butler and Clarence S. Stein, associated, were the architects, and Mayers, Murray & Phillips the consulting architects. The author was the structural engineer. The structural design of the building was planned solely to meet the architectural and structural requirements.

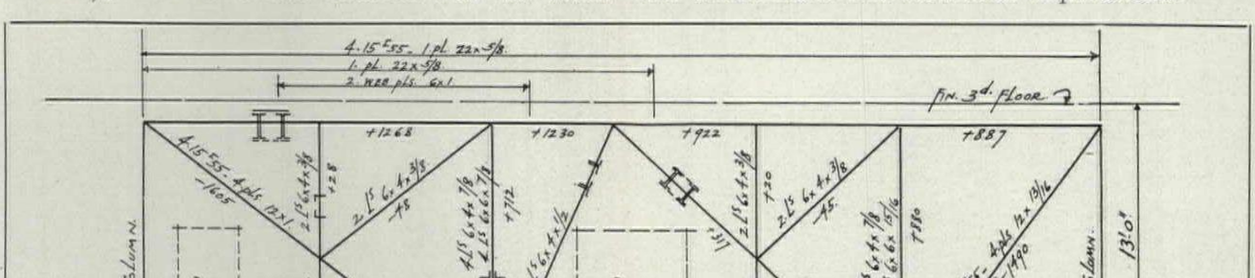
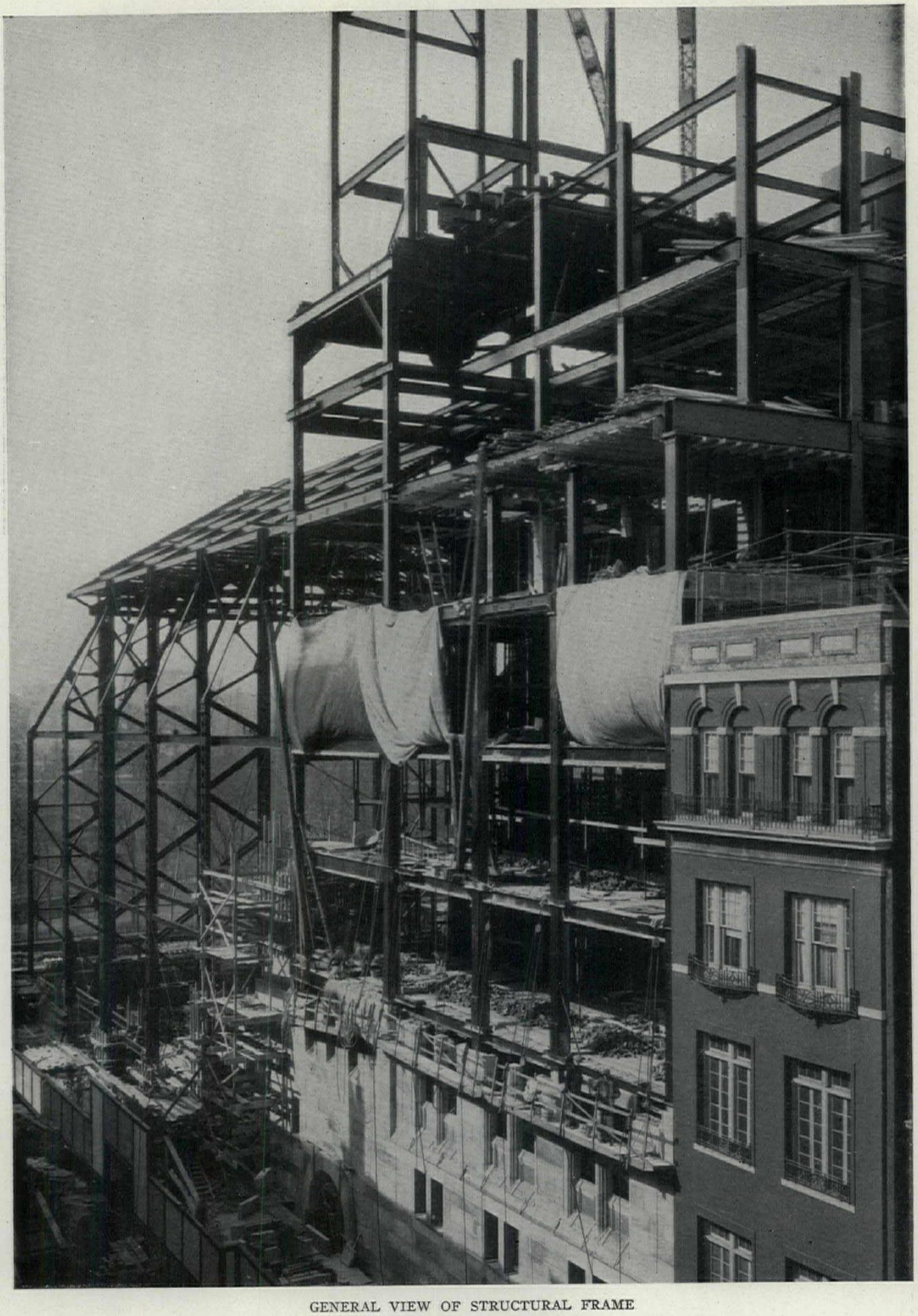


Diagram of Truss Supporting Community House



GENERAL VIEW OF STRUCTURAL FRAME
TEMPLE EMANU-EL AND COMMUNITY HOUSE

CHOOSING AND SPECIFYING LUMBER

BY

G. E. FRENCH and A. T. UPSON

ENGINEERS, NATIONAL LUMBER MANUFACTURERS' ASSOCIATION

LONG before King Solomon called on Hiram of Tyre for cedars of Lebanon and sent four score thousand woodsmen into the mountains of Judea to cut and hew timbers for his temple, wood was one of the most extensively used and important building materials. It still is. Not until the second decade of the twentieth century, however, was there available exact knowledge of its physical and mechanical properties.

Today conditions are different. As a result of the present keen competition, which is the life of modern business, lumber manufacturers, lumber distributors, engineering organizations, and research departments of the federal government have seen fit to lift the mystic veil enshrouding the properties of wood so that it may be compared property for property with competing materials. With this have come lumber standardization, plans for grade marking lumber, better merchandising, and the free advisory and consulting service of organized lumber manufacturers for the specifiers and consumers of their products in matters of lumber specification, procurement, and utilization. The aim of this article is to place before architects the technical information developed through research by such organizations as the American Society for Testing Materials, the U. S. Forest Products Laboratory, the Department of Commerce, and various trade associations, in a form that will be of practical assistance to them in the selection of woods, the designing in wood, and in writing the subsequent specifications. Wood is a product of nature, and no two creations of nature are exactly alike. Between the extremes there is considerable difference. The variations in lumber, except in rare instances, are readily discernible, however, so that it is possible to select, sort, and grade wood for a particular use with the assurance that the material will give satisfactory service. It is this service, this selection of the right kind, the proper grade, the right size of lumber for each of a multiplicity of uses, that is claiming the closest attention of progressive lumbermen, and this service is being offered the architect today.

Structure of Wood. Wood is a highly complex material, composed of masses of various types of tube-like cells. Some of these cells are thin-walled and adapted to the passing of liquids in the growing tree; others serve as food storage cells; and still others function primarily as strength tissue. Most of these cells have their long axes parallel to the main axis of the tree. In some species, however, as high as 25 per cent of the cells may have their long axes at right angles to the main axis, extending out like radii from the pith or center of the tree. These are known as "wood rays" and play an important part in the properties of wood. They also impart the beautiful figure to quarter-sawn boards of such woods as the oaks and gums. These variations in cellular structure, these anatomical differences, are responsible for the character and individuality of our different species of woods. It is due to these characteristic cellular differences that some species have a beautiful figure or grain, that some are resistant to impact, that some have great stiffness, that some are resonant, and that still others are capable of being bent and shaped into many forms, all demonstrating wood's great adaptability.

In the hardwoods or broad-leaved trees, such as oaks, maples, birches, elms, and basswood, the mixture of various types of cells is rather heterogeneous throughout each annual layer of wood laid down about the tree, though some have more uniformity than others. In the softwoods or needle-leaved trees, such as the pines, spruces, and firs, there is considerable uniformity in the type of cells. In the springwood they are usually large and thin walled. Later in the year the cells formed are smaller in diameter and have much thicker walls. The percentage of summerwood thus formed in Douglas fir and southern yellow pine, is readily discernible to the unaided eye, and is one of the most accurate criteria by which to judge the relative strength values of pieces of either species. Structurally there is little difference between sapwood, the living portion of the wood in a tree, and heartwood, the matured portion; and contrary to general belief, there is practically no difference in mechanical properties of otherwise similar materials. Sapwood is less resistant to decay than heartwood, but incidentally it is more readily treated with artificial preservatives. Straight-grained material, so desirable where strength is required, has the long axes of the cells parallel to two adjacent sides of the board or timber into which it is cut. Frequently the direction of these fibers is not parallel to the axis of the board, due either to the distortion of the fibers around a knot, that portion of a branch contained within the tree trunk; to non-uniform growth of the trunk of a tree; or to improper manufacture in the sawmill. Such material is termed "cross-grained," and when the slope of grain is pronounced it is unsuitable for use in heavy duty construction. The limits of permissible cross grain are defined in structural grading rules.

Knots in lumber may be either "tight" or "loose." Knots formed during the growing life of a branch are tight because of the close union between the fibers of the branch and those of the stem. When the branch dies, this close bond or union ceases, and the tree merely grows around the stub of the dead branch. This type of knot is known as "loose" or "not firm," inasmuch as such knots may fall out during lumber seasoning processes. Knots in a quarter-sawn surface of a board are termed "spike" knots because of their long, slender appearance. Knots on a flat or plain-sawn board are oval or round. The locations and sizes of knots in material where strength is of primary consideration are important and always rigidly controlled by inspection rules. Lumber may contain other defects, some of one kind in one species, of another in others. Many of these have little no no damaging effect on the use of the piece, because their prevalence is also rigidly controlled by grading rules.

Dryness of Lumber. Lumber manufacturers today are devoting more thought, more skill, and more technical study to the seasoning of lumber than to any other one problem in its manufacture, due to the close relationship existing in wood between the degree of dryness and its various physical and mechanical properties, and suitability for various uses. When a tree is cut in the forest, sapwood may contain a greater amount of water by weight than wood substance. In the heartwood, water may be present to the extent of from 30 to 50 per cent of the oven dry weight of the wood. Boards cut from such material immediately begin to lose their moisture by evaporation. The percentage of water retained in the board depends entirely upon the humidity of the air to which it is subjected. In air with a relative humidity of 90 per cent, lumber will have an average moisture content of 22 per cent; at 60 per cent relative humidity, a moisture content of 12 per cent; and at 30 per cent relative humidity, a moisture content of 6 per cent. If the humidity of the surrounding air changes materially, then the moisture content of the lumber changes also. The rate at which this change takes place depends to some extent on the species involved, the protective coating of the wood, the dimensions of the piece in question, and the temperature and circulation of the air in contact with the wood. It is slow in any event. Change in moisture content is important as far as the properties of lumber are concerned. Loss of moisture below 25 per cent of the oven dry weight of the wood is associated with a decrease in size but with an increase in strength properties. The converse of this also holds true. The rate of change in moisture and method of change is also important. Too rapid a change in moisture content may cause uneven drying with subsequent warping or checking. The seasoning of lumber is, as a result, work which must be carefully supervised.

Frequently heard these days is the complaint "lumber is not seasoned as it used to be." It isn't! It is seasoned far better by the better mills of today than ever before. It is done accurately and under the supervision of skilled operators. There are two real reasons for the complaints mentioned. One of these is that many builders refuse to pay the slight additional cost of properly seasoned lumber and take chances with green lumber. Another reason is that the conditions to which lumber is subjected in the modern home are far more exacting than ever before. It is easy to recall the period when one or two rooms in a house were heated by a stove in the winter and the rest of the rooms were cold. Humidities were not low, and air-dried lumber would change but little even in the heated rooms during the winter. Living standards have changed. It is now quite generally the custom to heat all of the house to 70 or 75°. Relative humidities of 30 per cent or lower obtain for long periods with subsequent loss of moisture and shrinkage of wood not properly seasoned for these new conditions. It is not that lumber is poorer than it used to be or that it is not seasoned well; it is usually the fault of some individual who refuses to study the influence of this new era of well heated homes upon the requirements for dwelling houses. Lumber must be properly seasoned to stand the new conditions. Lumber conditioned by the manufacturer for particular uses can be shipped a long distance in box cars without appreciable changes in moisture content. Considerable responsibility therefore rests with the retail distributor and with the contractor. Kiln-dried flooring and finish should always be stored in closed, rainproof sheds. If a few steam coils are present, so much the better. Such stock should not be taken to a building until the windows and doors are in and the plaster has lost most of its moisture. If such precautions are taken, joints in the trim will remain tight and snug. Floors will not open up or squeak. The good service expected of lumber will be had.

Durability. The question, "what is the length of life that may be expected of wooden buildings?" cannot be answered in a simple statement of the number of years. Much depends on the species used, the possibility of there being insect and fungus attacks, mechanical injury and wear, the conditions under which it is used and permitted to be used, and so on. In Sweden lumber has long been abundant and extensively used as a building material. Today there are many Swedish buildings, built entirely of wood, put up in the latter part of the seventeenth and in the eighteenth centuries. Along our eastern coast in the older settled parts of this country there are many wooden structures from 100 to 200 years old. Frequently it is not deterioration of the material which determines the life of these buildings. A large number of our old houses have been torn down to make way for new buildings with modern improvements and conveniences, or for business structures. Obsolescence, therefore, accounts for much of the change from one type to another, from one material to another,—not depreciation of the material itself. The long natural life of some species, such, for example, as cypress, redwood, the cedars, and others, even under adverse conditions, is proverbial. The life of certain other species under conditions favorable to decay, is shorter. The sapwood of practically all species is not as resistant to decay as heartwood. A listing, however, of the various species according to their relative durability is impractical because as yet there has been devised no scale for measuring this property. But a knowledge of decay will go far toward eliminating trouble from this hazard.

Decay. This may be caused by any one of several fungus organisms. These organisms put out thread-like roots or *hyphæ,* which pierce the cell walls, rendering the wood first brash and, in the most advanced stages, worthless. Decay can develop only where the temperature is satisfactory, where there is sufficient moisture, and where there is a certain amount of air. If any one of these three conditions is not favorable, fungi cannot develop. In normal building practice one condition that can be readily controlled is the supply of moisture. It is impossible for decay to develop in timber the moisture content of which is below 20 per cent if the fungi have no outside source of available water. Air-dry material, in any of the well developed sections of this country, will have less than 20 per cent moisture content. The problem therefore is to design structures so that moisture will drain quickly from all portions of the wood members and as far as possible to provide for a circulation of air around such members. This free air movement will keep the lumber below the critical moisture content. It is likewise important to see that wood members of structures do not come in contact with other wood members which are in contact with a supply of water unless the latter are treated with a preservative.

Preservation of Wood. Fortunately, scientific research has provided us with practical means for arresting the progress of decay or entirely preventing it, even under most adverse conditions, in woods normally not resistant to decay. This is brought about by rendering wood toxic to decay by impregnating it with a preservative material. There are two general types of preservatives on the market,—those which will not leach out of treated material even though such material be soaked in water for long periods of time, and those which will leach out if permitted to remain in water for an extended period. Creosote is the outstanding example of the non-leaching preservative. It is the most commonly used preservative in this country at present and is efficient against both fungus and insect attack. There are various methods of applying it, depending on the species of wood and the use for which it is intended. It is perhaps unnecessary to discuss it in detail here, but full information can be secured from the American Wood Preservers Association, 10 South La Salle Street, Chicago. A disadvantage of creosote is that it is oily and black. It should not be used where people will rub against it, nor should it be used where it is the intention to paint the wood. Where these two qualities are not objectionable, creosote is usually the preservative preferred at the present time in this country,—a preservative widely used.

Zinc chloride, a common preservative, second in importance to creosote, will leach out of treated material under certain conditions. It is, however, effective against both insects and fungi. Wood treated with it is clean and can readily be painted. Other meritorious preservatives such as certain salts, zinc meta-arsenite, and sodium fluoride, are also used in this country. Any of these preservatives will give splendid results when properly used. Zinc chloride, certain salts and sodium fluoride should not be used where treated material is subjected to a continuous leaching action of water. Under such conditions, creosote, zinc meta-arsenite, or a similar preservative should be used. Paint has long been considered a preservative by the layman. As a matter of fact, paint is not a preservative in the sense that it renders wood immune to fungus and insect attack. It does have preservative action in that it retards the weathering of wood exposed to the elements, protects it to a large degree from mechanical wear, and retards the absorption of water from the air. If a sufficient amount of moisture is present in the wood before painting, decay can progress behind the finest coat of paint. No plans or specifications for permanent wood construction should be considered unless they have been carefully checked to insure all members against decay, either through cutting off all sources of moisture necessary for the development of decay-causing organisms, or through the specifying of either naturally decay-resistant woods or properly treated material for members where hazard due to decay is otherwise unavoidable.

Mechanical Properties. In the selection of the kind of lumber for a given purpose, two considerations should be given precedence over the factor of cost. Consideration should be given, first, to securing members of the proper species and dimensions to satisfy the demands of strength and stiffness. Next should come attention to those requirements other than stress values, such as hardness and nail-holding strength which must be met in the design of the project. During recent years the U. S. Forest Products Laboratory has carried on an exhaustive series of tests of all commercial domestic species of lumber. A large number of these tests were made of small, clear pieces. To determine the influence of knots, shakes, checks and other types of defects, however, a sufficient number of tests were made of timbers of large sizes to establish the relation of these defects to strength properties. These data were used in the establishment of American standards for structural grades, generally accepted by the trade. The stress values in Tables 1 and 2, included here, determined by the U. S. Forest Products Laboratory, have been accepted by the American Society for Testing Materials, the American Railway Engineering Association, and the Bureau of Standards of the Department of Commerce. It is to be noted that different values are recommended for timbers of the same grade and species for different locations with respect to degree

TABLE 1

ALLOWABLE UNIT STRESSES FOR STRUCTURAL LUMBER AND TIMBER

Allowable Unit Stress in Pounds Per Square Inch

Spices of Timber	Average Weight per cu. ft. at 12% M. C.	American Standard Grade	Bending Stress, In Extreme Fiber: Usually wet 4" & thinner	Usually wet 5" & thicker	Occasionally wet 4" & thinner	Occasionally wet 5" & thicker	Continuously dry All sizes	Horizontal Shear	Compression Stress, Parallel to Grain: Usually wet	Occasionally wet	Continuously dry	Compression Stress, Perpendicular to Grain: Usually wet	Occasionally wet	Continuously dry	Modulus of Elasticity
Cedar, western red	23	Select	670	750	710	800	900	80	650	700	700	125	150	200	1,000,000
		Common	570	600	600	640	720	64	520	560	560				
Cypress, red	32	Select	800	900	980	1100	1300	100	800	1000	1100	225	250	350	1,200,000
		Common	680	720	830	880	1040	80	640	800	880				
Douglas fir (Coast type)	34	Dense Select	1050	1165	1370	1515	1750	105	990	1165	1285	235	265	380	1,600,000
		Select	950	1065	1240	1385	1600	90	905	1065	1175	215	240	345	
		Common	750	800	980	1040	1200	72	680	800	880	200	225		
Douglas fir (Mountain type)	30	Select	620	700	800	900	1100	85	700	800	800	200	225	275	1,200,000
		Common	530	560	680	720	880	68	560	640	640				
Fir, (commercial white)	27	Select	710	800	800	900	1100	70	650	750	800	200	225	300	1,100,000
		Common	600	640	680	720	880	56	520	600	560				
Hemlock, west coast	28	Select	800	900	980	1100	1300	75	800	900	900	200	225	300	1,400,000
		Common	680	720	830	880	1040	60	640	720	720				
Hemlock, eastern	28	Select	710	800	800	900	1100	70	600	700	700	200	225	300	1,100,000
		Common	600	640	680	720	880	56	480	560	560				
Larch, western	36	Select	800	900	980	1100	1200	100	800	1000	1100	200	225	325	1,300,000
		Common	680	720	830	880	960	80	640	800	880				
Oak, (commercial white & red)	46	Select		1000		1200	1400	125	800	900	1000	300	375	500	1,500,000
		Common		800		960	1120	100	640	720	800				
Pine, southern yellow	39	Dense Select	1050	1165	1370	1515	1750	128	990	1165	1285	235	265	380	1,600,000
		Select	950	1065	1240	1385	1600	110	905	1065	1175	215	240	345	
		Common	750	800	980	1040	1200	88	680	800	880	200	225		
Pine, Norway	33	Select	710	800	890	1000	1100	85	700	800	800	150	175	300	1,200,000
		Common	600	640	760	800	880	68	560	640	640				
Pines, lodgepole, pondosa, sugar, Calif., Idaho & no. white,	27	Select	670	750	710	800	900	85	650	750	750	125	150	250	1,000,000
		Common	570	600	600	640	720	68	520	600	600				
Redwood	30	Select	710	800	890	1000	1200	70	750	900	1000	125	150	250	1,200,000
		Common	600	640	760	800	960	56	600	720	800				
Spruce, red, white, Sitka	27	Select	710	800	800	900	1100	85	650	750	800	125	150	250	1,200,000
		Common	600	640	680	720	880	68	520	600	640				
Tamarack, eastern	37	Select	800	900	980	1100	1200	95	800	900	1000	200	225	300	1,300,000
		Common	680	720	830	880	960	76	640	720	800				

TABLE 2

SAFE LOAD IN POUNDS PER SQUARE INCH OF CROSS SECTIONAL AREA OF SQUARE AND RECTANGULAR TIMBER COLUMNS (*Dry Locations*)

Ratio of Length to Least Dimension L/d

Species of Timber	American Standard Grade	L/d 10 lbs.	L/d 12 lbs.	L/d 14 lbs.	L/d 16 lbs.	L/d 18 lbs.	L/d 20 lbs.	L/d 25 lbs.	L/d 30 lbs.	L/d 35 lbs.	L/d 40 lbs.	L/d 50 lbs.
Cedar, western red	Select	700	686	674	656	629	592	438	304	224	171	110
	Common	560	553	547	538	524	505	425				
Cypress, red larch, western	Select	1100	1063	1030	981	909	810	526	365	268	206	132
	Common	880	861	843	818	781	729					
Hemlock, west coast	Select	900	885	872	852	823	783	614	426	313	240	153
	Common	720	712	706	696	680	660	573				
Hemlock, eastern Fir, com'l. white	Select	700	689	678	664	641	611	482	335	246	188	121
	Common	560	554	549	542	530	515	449				
Oak, white and red	Select	1000	982	967	943	908	860	658	457	336	257	164
	Common	800	790	783	771	753	728	625				
Pines, Calif., Idaho & no. white, lodgepole, pondosa, and sugar	Select	750	733	718	695	663	617	438	304	224	171	110
	Common	600	591	583	572	556	532	434				
Pine, southern yellow Douglas fir	Dense Select	1285	1251	1222	1176	1112	1022	702	487	358	274	175
	Select	1175	1149	1127	1093	1045	975	702				
	Common	880	870	861	847	826	796	675				
Pine, Norway Spruce, red, white and Sitka. Douglas fir (mountain type)	Select	800	786	774	753	726	688	526	365	268	206	132
	Common	640	632	627	617	602	582	500				
Redwood	Select	1000	972	947	910	856	781	526	365	268	206	132
	Common	800	786	773	754	726	688					
Tamarack	Select	1000	976	955	923	877	817	570	396	291	223	142
	Common	800	788	777	761	737	706	566				

of dryness. In moist situations, treated material should be used to prevent decay. Tests have shown that creosote in itself does not weaken wood perceptibly, although the strength of wood can be influenced by carelessly performed treating processes. These strength data are of particular value to the architect. They have been reworked, for example, into tables showing the permissible maximum spans for joists and rafters of different sizes in the different species. These are obtainable from the National Lumber Manufacturers' Association, Transportation Building, Washington. Careful use of these authentic stress values in the designing of buildings leads to real economies, because the maximum utility value of lumber is realized.

Frequently factors other than the stress value listed in Tables 1 and 2 have an important bearing on the practicability of a given species for a given use. The degree to which it will "work" when in place, the ease with which it can be worked with tools and can be glued, its hardness, and its nail-holding strength, frequently determine the suitability of a wood for a given purpose. Wood from this angle is presented in Table 3. These observations are based on actual tests in the laboratory and the judgment of men long experienced in the use of wood. Attention is particularly called to the footnotes attached to Table 3 as an aid in the proper interpretation of the table. The Roman numerals do not necessarily indicate degrees of difference, and the values should be used with judgment. A sample piece full of knots, for instance, will not work as well as a clear specimen of any species listed.

TABLE 3

TABULATION OF CERTAIN PROPERTIES OF THE MORE IMPORTANT COMMERCIAL WOODS

Species	(1) Specific Gravity	Volumetric Shrinkage Green to Oven Dry	(2) Side Hardness	(3) Ability to Stay in Place	(4) Workability	(5) Nail Holding Ability	(6) Ease With Which Wood Can Be Glued
SOFTWOODS							
Cedar, Port Orford	.41	10.7	700	II	I	IV	II
Cedar, western red	.31	8.1	380	II	I	IV	II
Cedar, white	.29	7.0	340	II	I	IV	II
Cypress	.41	10.7	550	II	II	IV	II
Douglas fir (coast)	.45	12.6	810	II	II	III	I
Fir, balsam	.34	10.8	500	III	III	IV	II
Fir, western white	.35	10.2	460	III	II	IV	I
Hemlock, eastern	.38	10.4	490	IV	III	III	II
Hemlock, west coast	.38	11.6	620	II	II	III	I
Larch, western	.48	13.2	870	IV	II	III	II
Pine, Calif., white	.38	10.0	460	I	I	IV	I
Pine, Idaho white	.39	11.5	420	II	I	IV	I
Pine, loblolly and shortleaf	.50	12.6	860	II	II	III	I
Pine, longleaf	.55	12.3	1020	II	II	III	I
Pine, Norway	.44	11.5	600	II	III	IV	II
Pine, pondosa	.38	10.0	460	I	I	IV	I
Pine, sugar	.36	8.4	460	I	I	IV	I
Pine, white	.36	7.8	470	I	I	IV	I
Redwood	.41	6.3	520	II	I	IV	I
Spruce, red & white	.37	12.0	540	II	II	IV	I
Spruce, Sitka	.34	11.2	530	II	II	IV	I

TABLE 3 (Continued)

TABULATION OF CERTAIN PROPERTIES OF THE MORE IMPORTANT COMMERCIAL WOODS

Species	Specific Gravity	Volumetric Shrinkage Green to Oven Dry	Side Hardness	Ability to Stay in Place	Workability	Nail Holding Ability	Ease With Which Wood Can Be Glued
HARDWOODS							
Ash, white	.52	12.6	1320	I	I	I	III
Aspen	.36	11.1	460	II	II	IV	II
Brasswood	.33	15.8	450	II	I	IV	I
Beech	.54	16.2	1190	III	II	I	V
Birch, yellow	.54	16.8	1320	II	II	I	III
Cherry, black	.47	11.5	1030				
Chestnut	.40	11.6	580	I	I	IV	I
Cottonwood	.37	14.1	480	IV	II	IV	I
Cucumber	.44	13.6	790		II	IV	I
Dogwood	.64	19.9	2530	I	III	I	V
Elm, white	.44	14.4	870	II	III	II	I
Gum, black	.46	13.9	850	IV	III	II	II
Gum, red	.44	15.0	720	III	II	II	I
Hickory, shagbark	.64	16.7		II	III	I	IV
Maple, hard	.56	14.5	1430	II	II	I	III
Maple, soft	.48	12.5	990	II	II	II	V
Oak, red	.56	14.2	1310	III	II	I	III
Oak, white	.60	15.8	1370	II	II	I	I
Sycamore	.46	14.2	810	IV	III	II	II
Walnut, black	.51	11.3	1080	I	II	II	I
Yellow poplar	.37	11.4	450	II	I	IV	I
Mahogany				I	II	II	I

(1) Based on green volume and oven-dry weight.

(2) Side hardness load in pounds required to imbed a ball .444 inches in diameter one-half its diameter in wood.

(3) Represents a gradation from those woods which possess the greatest ability to stay in place under conditions of actual use (Class I) to those species which do not possess that quality to the same extent.

(4) Represents a gradation from those woods that can be worked with comparative ease (Class I) to those which present some difficulties in this respect (Class IV.)

(5) Represents a gradation from those which have the greatest nail holding power but have the greatest tendency to split (which necessitates the use of smaller nails) to those having the least nail holding ability but which are less likely to split.

(6) Woods in Class I are known to be used commercially in glued construction. Class II includes species about which little is known but which are not believed to be difficult to glue. Class III includes woods which are known to need a little more attention in gluing than Class I woods in order to get best results. Class IV includes woods which are known to present real difficulties in gluing. Class V includes those species about which little is known but it is believed they would present some difficulties in view of their similarity to species of known properties.

These are approximate values only.

Commercial Sizes of Lumber. A lack of appreciation of the manufacture of lumber on the part of the layman has been responsible for much questioning as to why the American Standard 1-inch yard board is 25/32 of an inch thick when dressed. The lumber manufacturer sets his saw, for example, to cut logs into boards exactly 1 inch thick. Due to the unavoidable variation in every mechanical operation, however, some pieces may be just under and some just over 1 inch thick. Before these boards are wanted by the consumer, they must be seasoned and usually brought to both uniform size and smooth finish. In these operations of sawing, seasoning, and dressing, 7/32 of an inch of lumber is required. The board originally 1 inch thick is hence 25/32 of an inch thick when it reaches the consumer, seasoned and dressed and ready for use. The seasoning process, however, increases the

TABLE 4

AMERICAN STANDARD LUMBER SIZES

(The thicknesses for any one item apply to all widths for that item, and the widths for any one item to all thicknesses for that item.)

Product	Rough Green Sizes (Board Measure)		Dressed Dimensions		
	Thickness	Width	Thickness: Standard Yard	Thickness: Standard Industrial	Width (Face Width Worked)
	Inches	*Inches*	*Inches*	*Inches*	*Inches*
Finish	..	3	5/16	..	2 5/8
	..	4	7/16	..	3 1/2
	..	5	9/16	..	4 1/2
	..	6	11/16	..	5 1/2
	1	7	25/32	26/32	6 1/2
	1 1/4	8	1 1/16	..	7 1/4
	1 1/2	9	1 5/16	..	8 1/4
	1 3/4	10	1 7/16	..	9 1/4
	2	11	1 5/8	1 6/8	10 1/4
	2 1/2	12	2 1/8	..	11 1/4
	3	..	2 5/8	..	..
Common boards and strips	1	3	25/32	26/32	2 5/8
	1 1/4	4	1 1/16	..	3 5/8
	1 1/2	5	1 5/16	..	4 5/8
	..	6	..	..	5 5/8
	..	7	..	..	6 5/8
	..	8	..	..	7 1/2
	..	9	..	..	8 1/2
	..	10	..	..	9 1/2
	..	11	..	..	10 1/2
	..	12	..	..	11 1/2
Dimension and joists	2	2	1 5/8	1 6/8	1 5/8
	2 1/2	4	2 1/8	..	3 5/8
	3	6	2 5/8	..	5 5/8
	4	8	3 5/8	..	7 1/2
	Over 4	10	Off 3/8	..	9 1/2
	..	12	..	..	11 1/2
Flooring	..	2	5/16	..	1 1/2
	..	3	7/16	..	2 3/8
	..	4	9/16	..	3 1/4
	1	5	25/32	..	4 1/4
	1 1/4	6	1 1/16	..	5 3/16
	1 1/2	..	1 5/16	..	..
Bevel siding	..	4	7/16 (Min.) x 3/16	..	3 1/2
	..	5	10/16 x 3/16	..	4 1/2
	..	6	..	..	5 1/2
Rustic and drop siding (shiplapped)	..	4	9/16	..	3 1/8
	..	5	3/4	..	4 1/8
	..	6	..	..	5 1/16
	..	8	..	..	6 7/8
Rustic and drop siding (D. & M.)	..	4	19/16	..	3 1/4
	..	5	3/4	..	4 1/4
	..	6	..	..	5 3/16
	..	8	..	..	7
Ceiling	..	3	5/16	..	2 3/8
	..	4	7/16	..	3 1/4
	..	5	9/16	..	4 1/4
	..	6	11/16	..	5 3/16
Partition	..	3	3/4	..	2 3/8
	..	4	..	..	3 1/4
	..	5	..	..	4 1/4
	..	6	..	..	5 3/16
Shiplap	1	4	25/32	..	3 1/8
	..	6	..	..	5 1/8
	..	8	..	..	7 1/8
	..	10	..	..	9 1/8
	..	12	..	..	11 1/8
Dressed and matched	1	4	25/32	..	3 1/4
	1 1/4	6	1 1/16	..	5 1/4
	1 1/2	8	1 5/16	..	7 1/4
	..	10	..	..	9 1/4
	..	12	..	..	11 1/4

strength of wood to such a degree that the wood lost in smoothing the surfaces of a board is compensated for. The dressed board of 25/32 of an inch is therefore as strong as a 1-inch green board, and in addition is smoothly finished, ready for use. The development of standard sizes for commercial lumber is recent, begun in the year 1922 under the direction of the Secretary of Commerce at the instigation of leaders in the lumber industry. Previous to that time the lumber sizes of one association did not necessarily correspond with the sizes of another. Much depended on local conditions. The owners of some mills saw fit to manufacture heavy lumber. Others preferred to manufacture thinner material. Standardization has reconciled these differences, and it is now possible to order and secure lumber manufactured to American Standard sizes from mills in any part of the country. The economies made effective by this standardization of lumber sizes, to the manufacturer, to the distributor, to the architect, and to the consumer, are quickly apparent.

The green or nominal sizes and the dressed sizes of American Standard yard lumber are given in Table 4. The dressed dimensions for structural lumber are 3/8 of an inch less than the nominal sizes for material from 2 to 4 inches in thickness and 7 inches or less in width. For widths of 8 inches or more of lumber 2 to 4 inches thick, and in lumber of all dimensions 5 inches and thicker, the dressed sizes are 1/2 inch less than nominal. Uniform workings for flooring, siding, ceiling, partition, and dressed and matched material, and standardized patterns for mouldings are both incorporated in the American Standards. The mouldings present good architectural design and are economical to produce. They are known as the "7,000 Series," and catalogs can be obtained on request from local lumbermen or from the National Lumber Manufacturers' Association.

Measurement and Shipping Provisions. Not only do the American Standards for Softwood Lumber cover manufacture, sizes, patterns, and workings as just discussed, and such lumber qualities or grades as will be described later, but they also cover the important features of universally accepted commercial species and nomenclature; uniform methods of description, measurement, and tally; practical shipping provisions; and standard association inspection services. Some of these aspects of the national standards for lumber enter into specification writing and are therefore of direct interest to the architect.

Grades of Yard Lumber. The untold value of our timber resources lies not alone in their vastness and the fact that they can be and are being renewed, but in the quality and the great variety of different species of trees. There are, in fact, 1,177 different known trees making up our forests. Of these 480 grow to merchantable size. Many produce lumber of similar characteristics, quality, or utility value, bringing about the recognition in commerce of 60 or more individual species or groups of different species of hardwoods, and 30 or more individual species or groups of similar species of softwoods. This gives the architect and the consumer of lumber a wide variety from which to select the woods most suitable for his needs. The very fact, however, that there are so many quality woods available, each varying in one or more properties from the others, made the standardization of grades of softwood yard lumber more difficult than the unification of yard lumber sizes or any of the other aspects of lumber standardization so far described. In fact, variations in methods of manufacture, in inherent quality, and in prevailing types of defects, give rise to differences in general utility value among the soft-

TABLE 5

SYNOPSIS OF AMERICAN STANDARD LUMBER BASIC GRADES FOR YARD LUMBER

Grade	*Quality*	*Chief Uses*
A Select	Practically free from defects.	Highest type of natural finished interior trim and woodwork, of flooring in some woods, of ceiling and partition, and of exterior siding.
B Select	Small defects, principally knots or small pitch pockets, and slight manufacturing defects.	Excellent quality of natural finished interior trim and woodwork, and the highest type in many woods; excellent flooring and for other interior uses, and for painted exterior trim and siding.
C Select	Slightly more and slightly larger defects than in B Select, not exceeding medium in size or character, with some manufacturing and seasoning defects, all coverable by paint.	Best quality painted interior trim and woodwork, exterior uses, and often serviceable for natural finished interior trim.
D Select	More and larger defects than in C Select; none causing waste or detracting from a finished appearance when pointed.	Universal grade for those uses always painted, and particularly where only one side and two edges of the piece show.
No. 1 Common	Tight knotted, sound stock with size of defects and blemishes limited, not necessarily as perfectly manufactured as Select lumber, but always usable without waste.	Suitable for the highest type of general utility and construction, both in boards and dimension; often suitable for painted exterior trim, and in products such as flooring, ceiling, and siding for interior uses not required to be of highest quality.
No. 2 Common	Allows somewhat larger and coarser defects than No. 1 Common, mostly tight with occasional loose knots and decay discolorations, and some imperfections in manufacture, and usable without waste.	Suitable for general utility and construction purposes both in boards and dimension; and the most suitable grade for construction not of the highest type, or of a temporary character.
No. 3 Common	Allows larger and coarser defects than No. 2 Common, and occasional knot holes, decay and wane. Permits some waste in its use.	Suitable for temporary construction, many parts of small buildings, and in some woods for sheathing and similar purposes in the best construction.
No. 4 Common	Admits the coarsest defects such as decay, holes, and wane, and permits waste in its use.	Suitable for many uses but not of particular interest to the architect.
No. 5 Common	Must hold together in ordinary handling	(Suitable for many uses but not of particular interest to the architect.)

woods which, it was found, could not be completely reconciled by standardization.

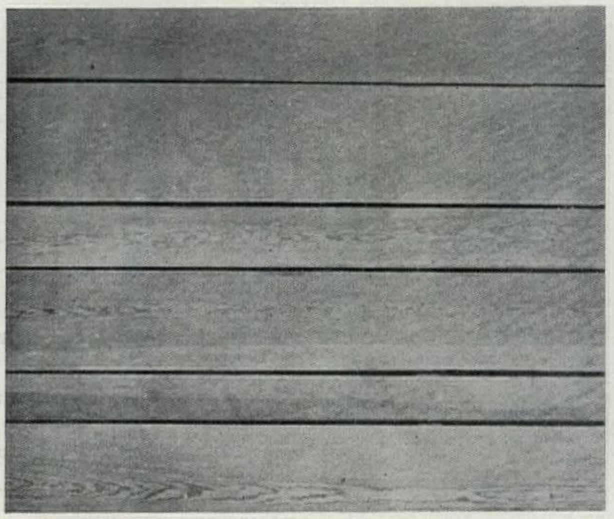
Prior to lumber standardization, manufacturers sorted lumber according to their own ideas and markets. Often the definitions and terminology of grades were indefinite and unlike. From this rather chaotic state, groups of manufacturers producing a limited number of woods compiled and published association grading rules for their own woods. This was the first step toward national standardization and represented great improvement over conditions obtaining early in the history of the lumber industry. With these association grading rules as a guide in the lumber standardization movement, which was instituted and carried on by all branches of the industry itself under the encouragement and auspices of the Secretary of Commerce and with the aid of the Department of Agriculture, basic grade classifications applicable to all softwoods cut into yard lumber and factory lumber were formulated. Association grading rules have now been brought into general conformity with these basic classifications, so that all commercially important softwoods are now available in American Standard grades.

Specifying the Correct Grade. Along with grades of structural lumber described here, yard lumber grades are of vital interest to the architect. Yard grades are based on the number, size, and character of the defects permissible in each piece. These are determined by the requirements of the majority of uses for each grade. The use-value of different woods is dependent upon the respective physical and mechanical properties and methods of manufacture, prevailing types of defects, etc., of the different woods. Consequently, in making selection of the proper wood or woods and the most suitable quality for a given use, the architect must take both the quality of the grade and the utility value of the wood into consideration. The foregoing discussion and tabular data are designed to supply information on the comparative utility values of the different woods. As a guide to the architect in selecting the general grade quality of material applicable to his needs, Table 5 has been prepared. It is an amplification of the American Standard basic grade classifications for yard lumber and describes in general terms the character of each yard grade of the commercially important softwoods and some of its chief uses.

Grades of Structural Lumber. The American Standards also incorporate basic provisions for the selection and inspection of softwood dimensions and timbers where working stresses are required. The grading of such material is different from the grading of yard lumber, in that not only are the number, form, and size of defects considered but also their location with respect to the different faces and ends of the pieces. In addition, the comparative density of the material is important. The influence of defects gives rise to two basic structural grades,—Select and Common. More serious limitations are placed on defects permissible in the former than in the latter. When, however, the factor of density is added, two more grades are made possible, one of which, besides being of Select material, is dense, and the other, besides being of Common material, can likewise be dense. The Standards now provide for three of these grades,—Dense Select, Select, and Common. Dense Select material is the highest grade. It must average either on one end or the other, six rings of annual growth per inch, and in addition one-third or more summerwood. If 50 per cent is summerwood, 5 rings per inch are sufficient. It is found only in southern pine or Douglas fir, and is requisite for uses where great strength and stiffness are required, such as for bridge timbers, beams and posts in heavy timber mill constructed buildings, etc. The second grade is Select. It must have the rings of the Dense grade but not the summerwood. It is suitable for a large number of general construction purposes, and is available in all softwoods producing structural material. The other American Structural grade is Common and is not selected for either number of rings per inch or per cent of summerwood. It is suitable for a great many structural uses where strength is a consideration but not a prime requisite. It is also available in all structural woods. The density rule of rings per inch and percentage of summerwood may also be applied to material otherwise of Common quality, giving rise to a grade of Dense Common.

The importance of the effect of certain defects and their location in the piece varies, however, according to the character of the use. The limitations with regard to permissible defects are somewhat different, therefore, in material used as joists or planks, as beams or stringers, or as posts or timbers. These different use requirements are likewise recognized in the American Standards, so that in each of the three Standard grades just mentioned there are three so-called use-grades of the character just described. The employment by the architect and lumber specifier of the proper structural grade, therefore, requires judgment.

Advisory and Consulting Service. Progressive lumber manufacturers throughout the country have realized for some time that if lumber is to render its maximum service, they must make available to the architect who specifies lumber, technical advice and consulting service of a staff of engineers and specialists familiar not only with the problems of the users of lumber but also versed in the properties and uses of lumber in their various special fields. During the past year such a group of trained men has been brought together. An expert is stationed in each region to discuss the architect's problems, to advise in regard to the kind and size of lumber, the sources of good lumber, and the proper way to specify and procure it.



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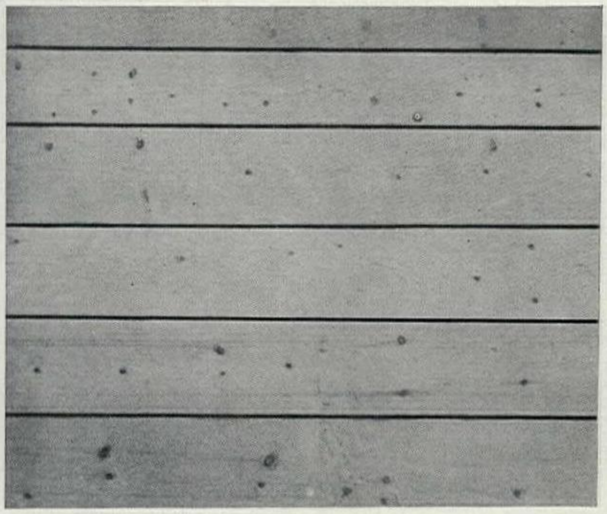


No. 1 Common

No. 2 Common

No. 3 Common

Some Typical Grades of Yard Lumber

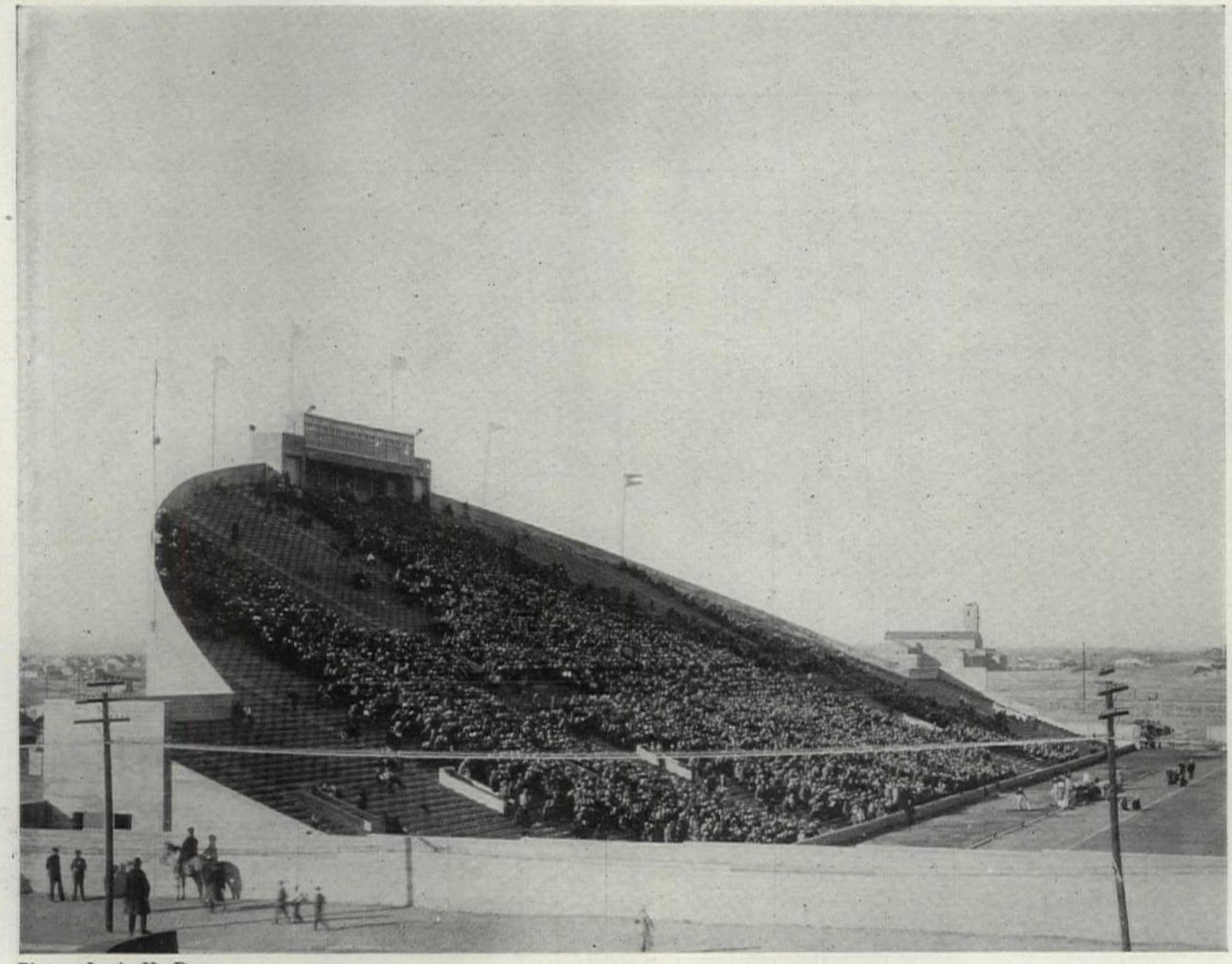
THE UNIVERSITY OF DENVER STADIUM

W. E. & A. A. FISHER, ARCHITECT

GAVIN HADDEN, CONSULTING ENGINEER

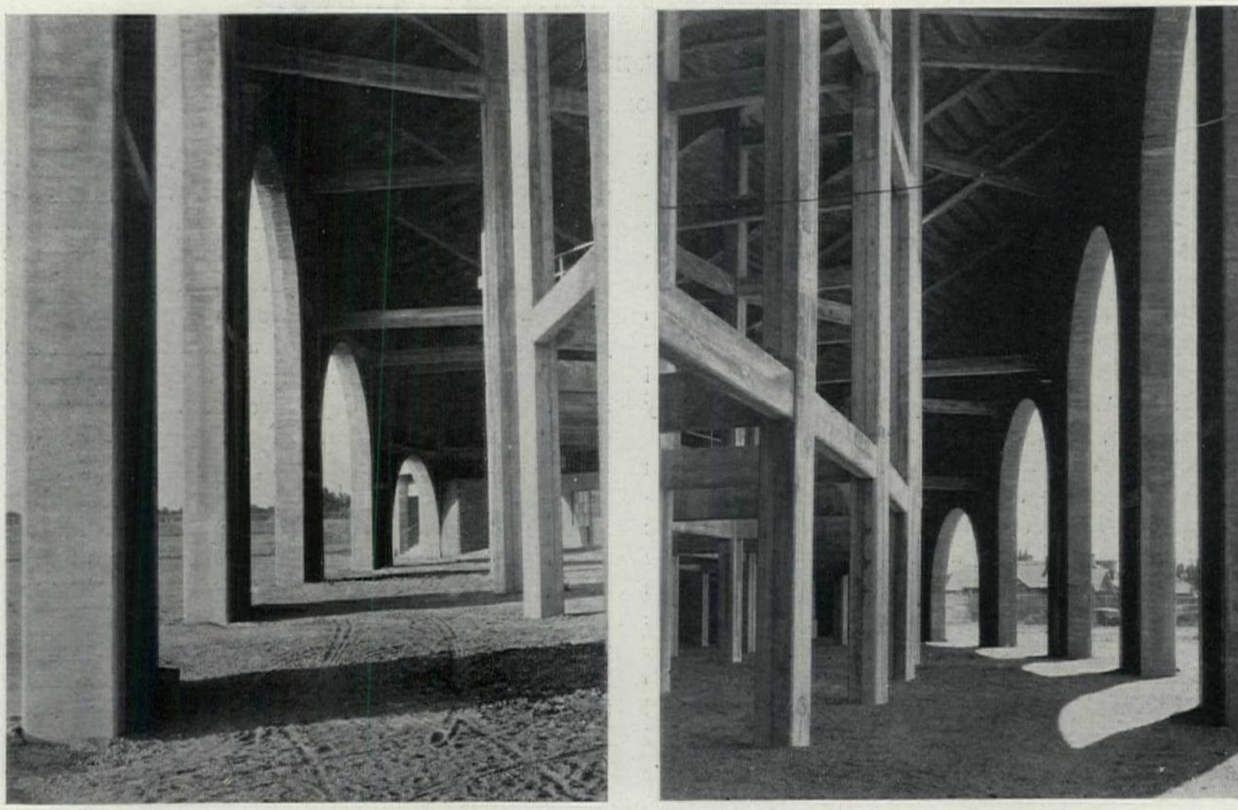
THE University of Denver Stadium, shown in the accompanying illustrations, has at present about 31,000 permanent seats for football and track games. The structure is built in two parts, located on opposite sides of the arena, and the completed west side alone seats about 25,000 spectators. With the completion of the east side, therefore, the capacity will be increased to about 50,000 seats, and still further increases may readily be made, temporarily or otherwise, at the ends of the arena.

The design of this structure shows the modern tendency to differ widely from such ancient examples as the Roman Colosseum or the Panathenaic Stadium in Athens to meet more adequately the conditions and requirements of the modern games for which it is principally used. Not long ago there was a definite architectural prejudice against the division of a monumental structure of this kind into two separate parts without making physical and structural connection at one end or at both ends of the arena. Such connections were regarded as necessary for the attainment of unity in design, and it is only recently, comparatively speaking, that the realization has been reached that the field or arena itself is properly the central feature of the design. The arena itself, with its playing field and running track, forms a connecting link between the two structures, just as surely as the nave of a cathedral may form the connecting link between two lofty disconnected spires. Still further departure from ancient precedent is found in the form of the completed part of this structure. Spectators at football games, for whom this structure is primarily intended, generally desire seats located as close as possible to the 50-yard line of the gridiron and as close as possible to the center of the field. This has resulted in principles which determined previously the design of such structures as the Cornell Crescent at Ithaca, the Brown Stadium in Providence, and also more recently the Dyche Stadium at Evanston, and the Municipal Stadium at Asbury Park. The exterior wall, which in plan forms a circular curve centered

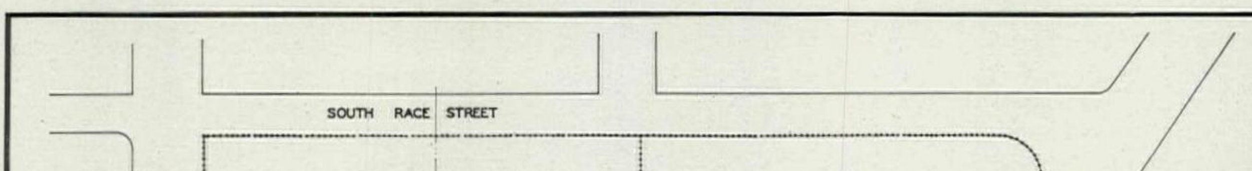


Photos. Louis H. Dreyer

View of the Stadium from Asbury Avenue

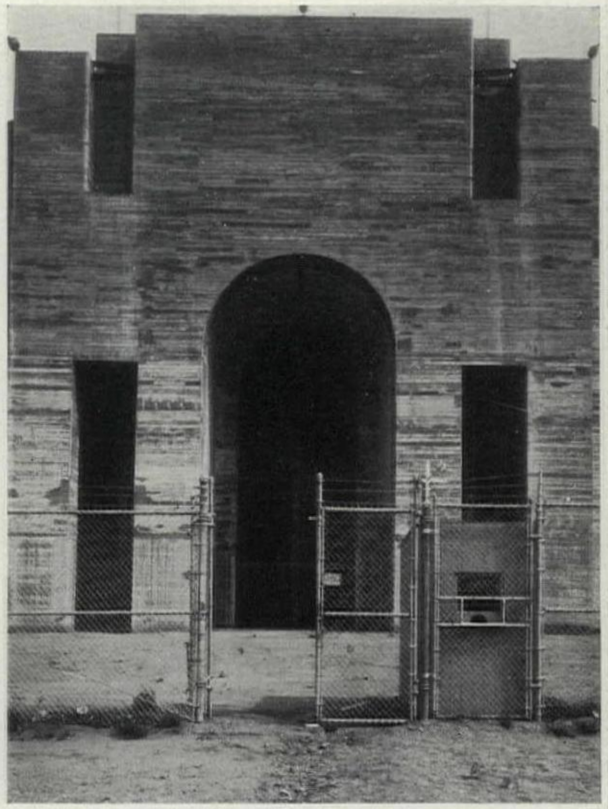


VIEW SHOWING SIMPLICITY OF CONSTRUCTION



GENERAL PLAN, DOTTED LINES SHOW POSSIBILITY OF ENLARGEMENT

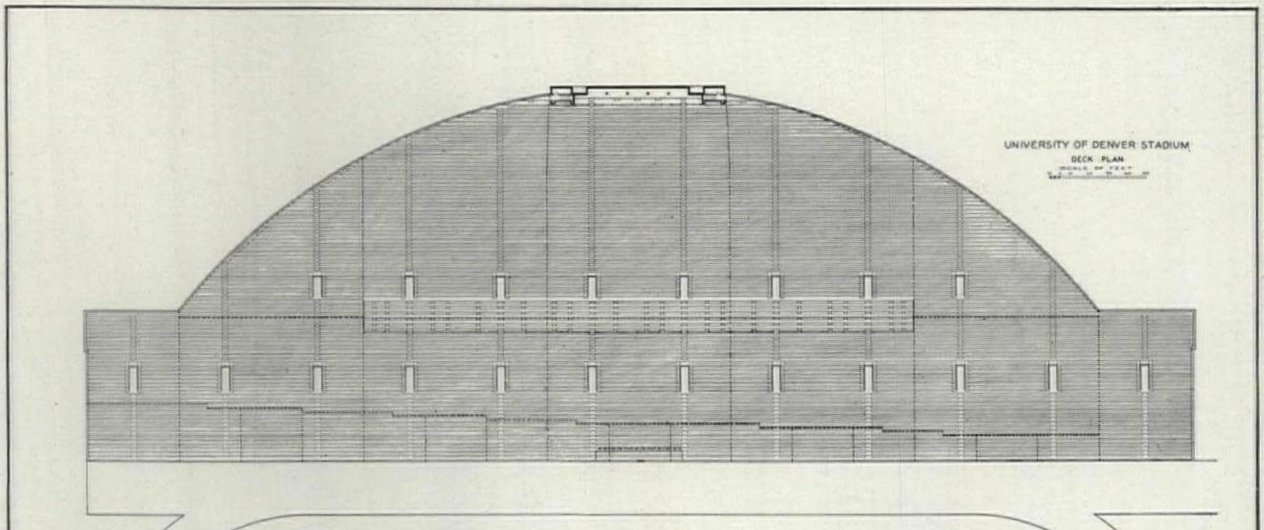
Entrance to Portals



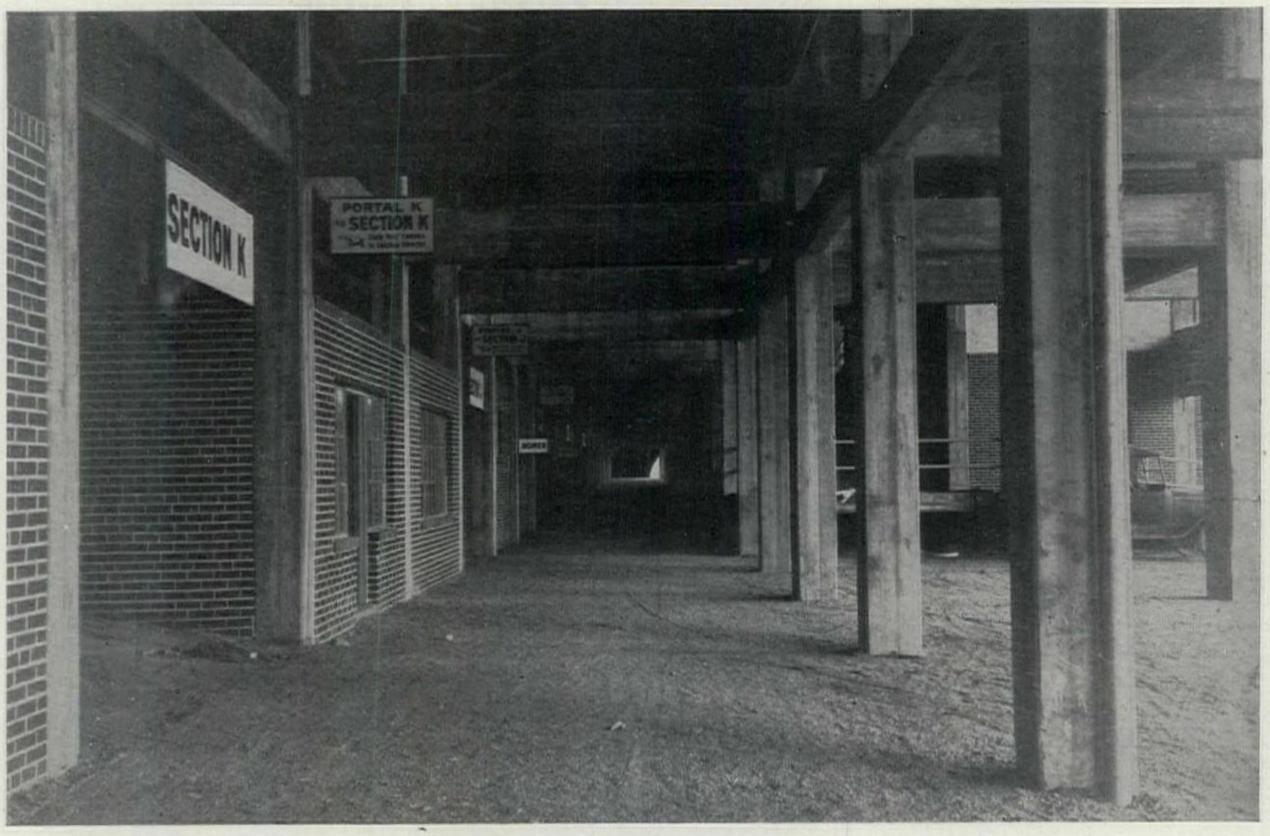
Gate and Entrance

on the middle of the football field, terminates the rising tiers of seats and thus forms a curved skyline which is the most distinctive feature of the arena, particularly well suited to the use of reinforced concrete, of which the structure is built. Still further distinction is added to the skyline curve in its exterior elevation by the continuous succession of ascending and descending arches piercing the outside wall.

An interesting lesson has been learned from recent use of the stadium, which serves still further to prove the soundness of this design. The private boxes, as shown clearly in the plan, are located in two longitudinal rows, part way up the stand, extending approximately from goal line to goal line. There has been so much demand for the centrally located boxes, and so little demand for those nearer the

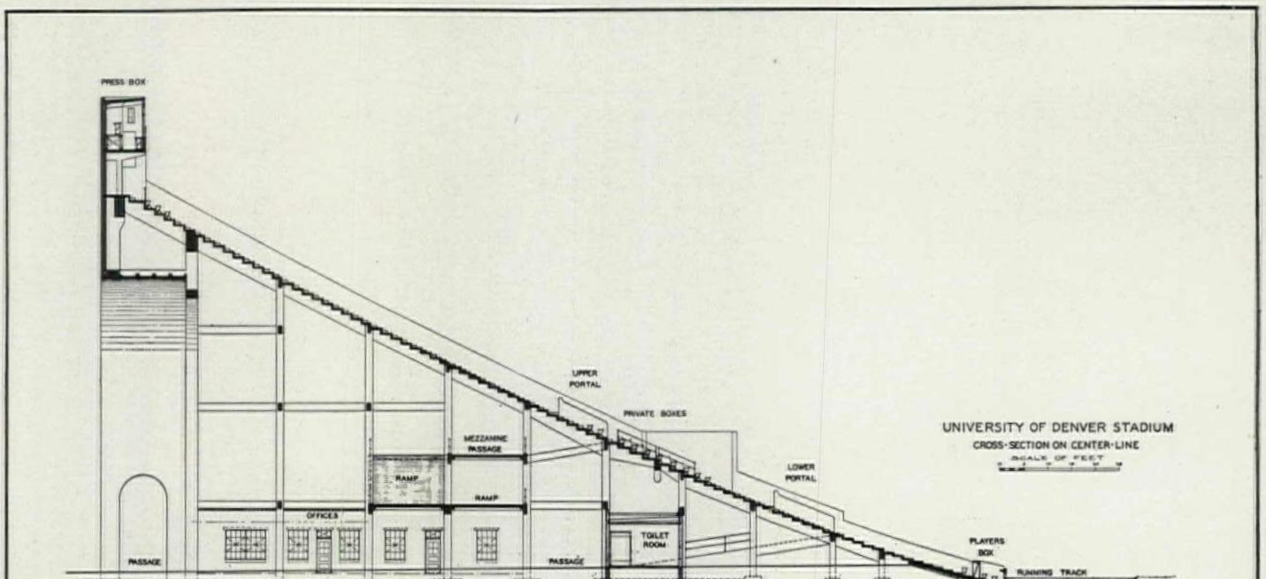


Plan of Stadium; Press Box at Top; Private Boxes in Center



Space Under Stands, Used for Offices, Team Rooms and Service

ends, that it indicates definitely that the same general principles might well be followed in box location as in the location of the ordinary seats, placing a proportionally greater number of boxes opposite the central part of the field. The drawing of the cross-section of the stadium shows that the first row of seats is close to the level of the track and field. This enables the spectators to obtain a good view of all runners on the running track, even though this first row of seats is located close to the boundary of the track; this arrangement of seats at the same time reduces the distance of the average and maximum view at football games. The running track itself was designed according to the best practice, developed and improved from experience elsewhere, and the excellence of the results was attested by the



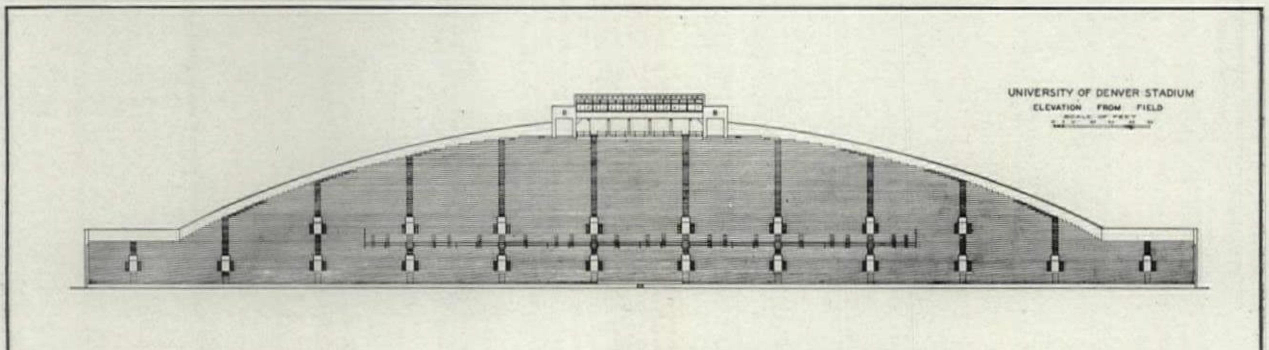
Cross-Section on Center Line of Stadium

The Large Protected Press Box

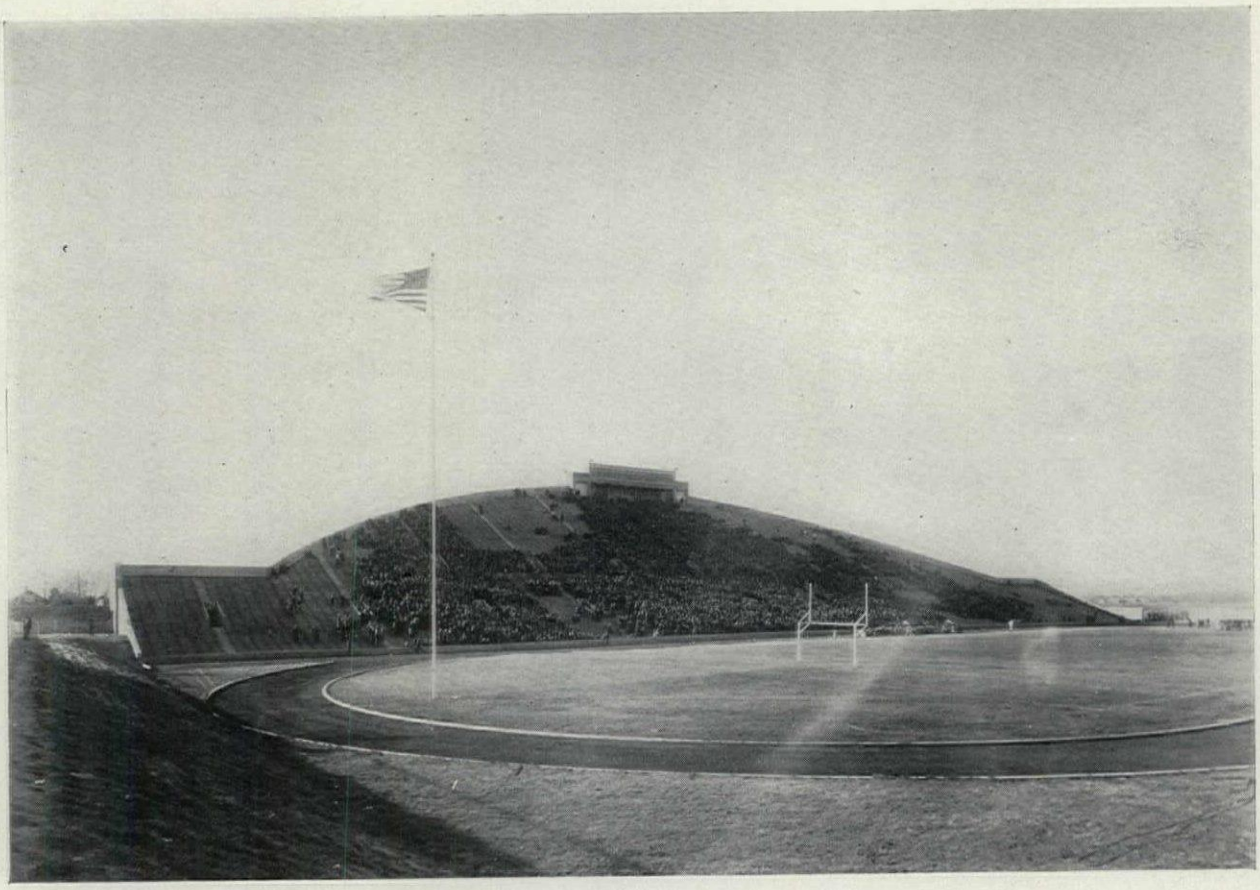
records attained at the very first of the track meets.

The entrances and exits are located in two longitudinal rows at intermediate elevations on the deck. The upper portals are fewer in number than the lower and serve only the upper part of the deep central portion of the deck. As all except one of the lower portals are reached by ramps extending up from the ground under the structure, nearly all the spectators can go to and from their seats with comparatively little exertion, the only steps being those located in the aisles in the deck. The circulation facilities have been carefully designed to provide safety, comfort and convenience, and the entire stadium can be emptied of a capacity crowd in a few minutes without there being undue congestion.

Other interesting features of this structure, some of which are shown in the illustrations, are the press box, with its many conveniences; the players' boxes; the expansion joints; the drainage system; and the extensive use for interior rooms which has already been made of a large part of the space under the seating deck. In addition to the space required for the ramps and passages for the circulation of spectators, the completed part of the structure houses spectators' toilets, rooms for players, a large lounge room, coaches' and trainers' rooms, a laundry and dry room, a caretaker's room, administration offices, and a dining room and kitchen for training tables. One important use of the stadium is for civic events, some of which may require only a small stage or arena, and the form of the structure makes it also particularly advantageous for such purposes, since a majority of the seats are concentrated within a small distance of one spot.



Elevation from the Field



VIEW OF THE STADIUM FROM THE FIELD

VIEW IN A ROOM UNDER STADIUM SEATS

EQUIPMENT OF THE SMALL HOUSE

BY

URBAN F. PEACOCK

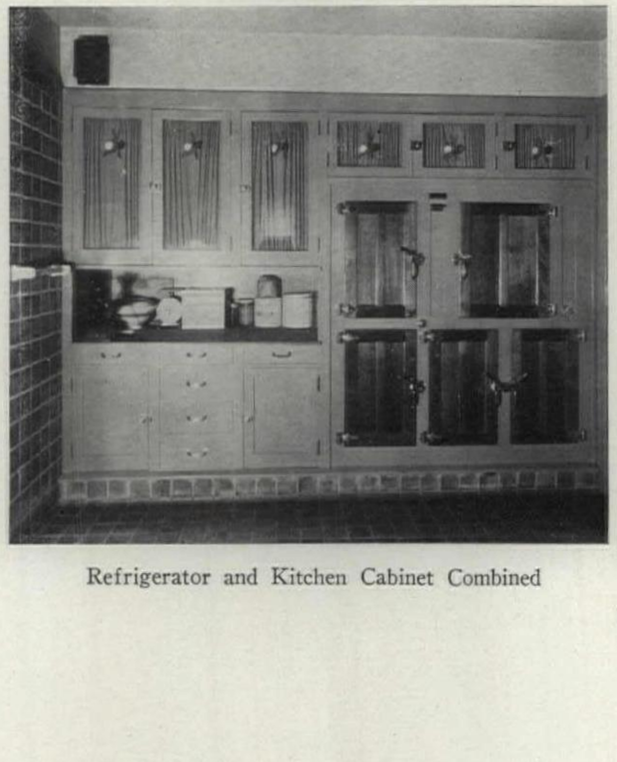
OF PEACOCK & FRANK, ARCHITECTS

DUE to changed economic conditions, planning the average house today presents to the architect a problem entirely different from what it did a generation ago. Today the architect's responsibility is not limited to supplying artistic design, style or appearance; these must be provided, of course, but along with them he must consider the increased demand for modern facilities for health and comfort. Nor is it enough that the architect provide only such of these facilities as are demanded by his client. He must also anticipate the needs of his client and tactfully call attention to them, all of which is strictly in keeping with the modern demand for service and the trend of modern practice.

The growing desire for comfort and efficiency has been more pronounced with reference to the planning of the medium priced house than with the larger and more expensive residence. The reasons underlying this demand are obviously brought about by the rise and rapid increase in the number of a class of highly specialized technical workers,—the doctor, the lawyer, the professor, the engineer, the department head, the junior executive, etc.,—in a word, the great class of men who are trained but who have to work at small salaries during the earlier years of their careers. They belong to the class whose incomes range from $5,000 to $15,000 a year, a group which, income tax returns show, has grown enormously in the last decade. The medium priced home represents, usually, the life-long ideal of these people. It has been the goal of the man and his wife, usually a well bred woman, since the days when the salary had to be carefully budgeted, to make it cover the monthly expenditures. Enduring the discomforts of living in quarters in a district where rents were commensurate with the size of the pay check, a man of this type and his wife have had the thought of home constantly before them. "When we build a home of our own" has been a daily phrase in their household. All of their dreams have centered about it. They have worked and economized for years in order to achieve it. Happiness, to these people, is symbolized by "a home of our own."

The architect should remember, in dealing with this type of clients, that he is not dealing primarily with the man. He is dealing with the man and his wife,—and the wife is going to have a great deal to say in the matter. Naturally, planning a home for them entails more than style or design. They want the artistic, of course, but that is not all; first of all they want *comfort*. During the years of discomfort which the wife has undergone in rented houses, she has formulated a very definite idea of what a home of her own was to be when she and her husband could afford to build it. She has subscribed to magazines which deal with home building, and from them she has learned a great deal about style and various types of architecture, home equipment and planning. In her mind's eye she has already built the home about which she now consults the architect, and she demands that he give her something which agrees with it. In order to do this, the architect must attack the problem of home planning from the wife's point of view. In other words, he must begin with her three major considerations: comfort, style and efficiency. The arrangement of all the rooms, in fact, must be made to conform to her artistic taste and her demand for modern convenience.

The plan of the house in general must be such that it saves her or her servants as many steps as



Refrigerator and Kitchen Cabinet Combined

Range in a Well Appointed Tile Kitchen

possible. The kitchen must be conveniently located with reference to both front and rear entrances; the bathrooms must be convenient to the bedrooms. There must be a lavatory on the first floor, located so that the children can get to it and to their play room without going through the main rooms of the house when they come in from out of doors. There will be no left-handed sink in her kitchen; interior doors will swing the right way; the cupboards will be located in the most convenient places; there will be an incinerator, and the modern electric refrigerator will conform to her desire to reduce the number of necessary steps to a minimum. There must be a sufficient number of base plugs in the proper places for floor lamps, vacuum cleaner, iron, toaster and other electrical appliances. Ornate mouldings which catch dust and are difficult to clean must go into the discard. Interior door sills are no longer desired, because of the hindrance they present to cleaning, and the danger they represent in tripping. Modern heating cabinets skillfully concealed in the paneling or beneath windows and cupboards may replace the ugly, old radiators, for the modern woman has read about them and wants them.

She demands proper ventilation and frequently is familiar with the various devices that have been created to improve it, particularly in the kitchen and in the sleeping rooms. Women, particularly those who read the current magazines, have become fairly well versed in knowledge of modern home management, and their education in this direction is reflected very noticeably in architecture. She knows about insulating the house against the winter cold. The heating plant is not a mystery to her; she knows that she can heat economically without the shoveling of coal. Thus it is the business of the architect to be well posted on the devices which have been designed to make the house more comfortable, more efficient and more liveable. Architects must know what all these devices are, what they provide, and what it costs to install them, and they must be able to tell their clients in detail just what they will accomplish; and while it is not the duty or even the function of the architect to attempt to promote the installation of these devices, it is his business to give the client what he or she wishes, and it is his duty for the sake of his profession to be able to assist the client in properly planning the house and to safeguard him or her against overlooking things which the architect knows will be wanted when the new house is completed and occupied.

Such a house must be equipped with all modern devices, both those in general use today and those which will be generally demanded tomorrow. Of all the defects or inconveniences which may creep into a finished modern house, probably the worst is improper heating. Defective heating may be brought about by lack of radiation, not enough boiler capacity, improper distribution of radiation, or lack of heat control. The steady development of the principle of heat control has brought this country to a point where almost everyone has heard of automatic heat regulation and the assurance it gives of health and comfort. A few years ago the average man or woman planning a medium priced house would never have thought of asking for automatic heating control. In the last four or five years particularly, it has shown a remarkable growth. People have come to recognize the regulator as a device which will render comfort, and in climates where sharp temperature changes are frequent, people understand that the uniform temperature assured through automatic heat regulation is a real protection to health.

Many people have heard of automatic heat regulation but are not entirely familiar with its principles. They do not understand that even though heat regulation is not immediately contemplated, the wiring at least should be installed at the time the house is wired for electricity, thus saving bother and worry at some later date. The architect must be able to explain in detail just how an automatic heat regulator can be installed in the house. The family may have one or two small children for whose health the mother is very much concerned. Dr. C.-E. A. Winslow, Professor of Public Health, Yale University, has shown that childhood illnesses and the incidence of contagious diseases are closely correlated with room temperatures. In an extensive study of the subject he found that children kept in rooms in which the temperature was above 68° Fahr. showed a much greater susceptibility to disease than did children kept in rooms where the temperature was maintained at 66° or 68°. The results of research have been widely published in women's magazines, and a woman of the type being considered here is probably familiar with them.

Devices which have to do with refrigeration, control of humidity, ventilation, heat regulation, etc., are coming into general demand among modern home builders. The last five years have seen this demand double, treble and quadruple. The architect, therefore, who is keeping abreast of the progress of his profession, must familiarize himself with the best and latest that is being offered, for their importance in the home is coming to be looked upon as fully as great as the importance of design or decoration. Comfort and health are assuming importance in daily life. They are becoming major considerations in home planning. The architect, therefore, must consider them and place upon them the emphasis which they are receiving in the minds of this generation. Economic conditions have given rise to higher standards of living. Demands must be catered to, and architects must know and meet them.

OFFICE PRACTICE

THE ARCHITECT'S BUDGET

AN ADDRESS BY

EDWIN BERGSTROM

THE SIXTY-FIRST CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS, HELD IN ST. LOUIS, MAY 16-18, 1928

ARCHITECTURE is a busy profession. Without doubt there enter into it more of business and detail of business administration than enter into any other profession. It is not a true profession in the sense that the other fine arts are professions. The musician, painter and the sculptor create with their own hands their finished art, but the architect would make a sorry showing if he should build his dreams. Of all professions, his alone must depend upon others to give form and substance to his art. Architecture is further differentiated from the other professions. The architect creates his art to satisfy a definite need; the sculptor and painter to satisfy their own imaginations. There must be definite need for his creation before the architect can begin his work of art, and simultaneously there must be furnished a sum of money, with which and within which the architect must work.

Architecture, we know, is a collaborative profession, a coördination of efforts to create a work of art to fulfill a definite need within a definite cost. The mind of the architect must interpret the need from another mind, apply it to his imagination, translate the concept to other minds, and direct still other hands to give it form and substance and make it fulfill the need for which, and satisfy him for whom, it was created. Nor is this all. We hear a great deal about the delightful collaboration with the other arts, but no one stresses the less delightful collaboration with the countless laws and ordinances and rules and regulations and codes and municipal authorities. It is trite to reiterate these things, but merely to do so proves how inherent an element of architecture is business.

There are still a few architects who can practice architecture in its simplest terms,—and how delightful that is! But a civilization so complicated as ours, so essentially urban in its thoughts, requires for its comfort, if not for its needs, so many material things that a superman could not be expected to have knowledge of them all. Yet the architect must know and coördinate all these material things and bring about a synchronized collaboration of the trades in order that the work of each will be properly incorporated in his conception.

All this collaboration is expensive. Each collaborator must be compensated and derive a profit for his labor, and the architect, too, must live. Mostly there is little left after the architect has paid his collaborators. To create his art the architect must act as architect, engineer, agent, trustee, supervisor, buyer, collaborator, coördinator, executive, and administrator,—obviously he cannot collect a fee for each function, nor does any fee he receives ever seem to be an adequate fee, in the general run of things.

With these myriad responsibilities and duties the architect must conduct a business, no matter how much he desires to suppress that idea. How he conducts it, will be the gauge of his business standing. Generally he gives his time so freely to others that he has little of it left for the intensive study of his own business and its cost. He does not watch his production and other costs with the care that good business demands. He is prodigal of his time and wasteful of his money. Engaged in a business which is notable for its fluctuations and quick upsets in volume, the architect is seldom adequately prepared for reverses and prolonged periods of stagnation. When business is good he must expand and build up an organization; overnight he is compelled to disband it and to economize,—fortunate if he can do this. How often we see the successful architect wearing himself out finding commissions to keep his organization going. He becomes a slave to it,—and finds himself in the anomalous position of working to keep his draftsmen busy and his overhead paid, with nothing left for himself but worry and strain and what fame may come of an artistic success.

Of all professional men, the architect should be most concerned with costs. Usually the architect is more familiar with building costs than he is with the costs of carrying on his profession and creating his art. How many architects know what it really costs them to get to the point where working drawings can be begun or even preliminary sketches made? How many know what working drawings cost, sheet by sheet, job by job? How many know what supervision costs,—supervision adequate to ensure the workmanship and materials to which the owner is entitled? How many know what these costs should really be? With what other costs can they be compared?

As an impractical dreamer, the architect is accepted by the business world; as a business man to whom it would entrust the spending of its money, he has not the entire confidence of that world.

Standardization of architecture is an abomination; standardization of procedure and accounting of the business of architecture is very helpful to success. The Institute has not developed a standard form of accounting whereby an architect may ascertain by actual comparison with other architects what true costs should be. Architects in the United States, in the aggregate, are receiving fees of not less than $80,000,000 per year. I have not the slightest doubt that more than 10 per cent of that sum is wasted annually by the architect in his own offices through neglect and failure to apply sound business methods.

Orderliness in design is axiomatic with the architect; orderliness in his business and in his time is not so fixed a virtue. The artist points thumbs down on schedules and budgets and anything regular or regulated, yet these things are essential to good business. They are necessary to conserve time; they are imperative if we would not waste our money. Our most limited and most precious asset is time. To conserve it is a duty we owe to ourselves and to our families. Our business day should be organized and every hour of it scheduled. Each day we have things to do. We should list them in the order of their importance, with the most important at the top, and then tackle and do each of them in turn and in that order. We must work against time. We should set aside each day so much time for the drafting room; so much for specifications, for accounting; so much for supervision; so much for conferences and callers; for correspondence; for reading on architecture, construction and the allied arts; and, lastly but most important, for constructive thinking about our business. So far as possible, we should fix positive and regular hours, especially for our conferences, calls and correspondence and our thinking. We should make those hours the same for each day. Regularity and regular hours must be acquired, no matter how monotonous or distasteful it may be to do so. That you can be found in your office each day at the same time for conferences, calls and callers is a sound business asset; it gives you a business standing, and you have created an invaluable credit. Do not let one period overlap the other, nor let callers disturb you except within the hours you have set for conferences. Keep telephones away as well, if you have a tactful secretary. Arrange conferences to fit your schedule of time; you will be surprised how this can be done without losing the commission. Your time may be as valuable as your client's.

I repeat,—conserve your time; schedule your hours exactly. Begin this when you begin your practice, when it seems unimportant to do so. The habit established in the lean years will be worth innumerable dollars when you become busy, and of inestimable value to your health and happiness. You will be surprised how much more quickly your decisions will be given; how much more concentrated will be your thinking; how much more time you have for the amenities of life and for your family, if you have found and use the secret of conserving your time and making it work for you. Above all, do not let anything persuade you to give up the hour of constructive thinking about your business. Take that hour early in the day if you can, when you are fresh. It is the most necessary hour of the day to you! Do nothing but think; if you have no very definite problem, think just the same. Let nothing interrupt you.

Budgeting our time is perhaps the most important thing we can do to ensure our business success. Budgeting our finances is the next most important thing to do. Once you have learned to conserve your time, and have acquired the habit of regulated and regular thinking, the budgeting of your finances will come naturally and inevitably. The budget is the control, and the means of lower costs in producing your drawings and documents. Men work for money and for glory. Money means profits, and profits are the reasons for business. I do not speak of profits in the pure accounting sense. Profits can be ensured only by insisting that cash outgo always shall be less than cash income. Business is conducted at present on a monthly basis; if your total expenditures have been less than your cash income, month by month, your business has made a profit. If there is no profit, you run the risk of financial embarrassment, loss and failure. The budget should control the distribution of all money you receive into your business. If you hold within that budget, it ensures cash profits.

To make your financial budget, you must first know costs. To fix the price which you should charge for your services, you must know costs. To know costs, you must first determine expenses.

The architect should fix a salary for himself, as a fundamental element of expenses. Salaries are for the expenses of daily living; profits for investment and surplus. Salaries should be considered as income; profits may be considered as capital. Salaries should be paid regularly month by month; profits must be deducted in cash from each payment received by the architect before any part of that payment is used for any other purpose. Profits are illusive; if not deducted first, they have a way of disappearing altogether. It is fundamental to set aside profits first. Profits should be banked separately from other funds, as savings. One-half of the profits should be considered as business surplus and be kept in the business and invested in first class securities. One-half may be considered as dividends and invested in securities or real estate or such other forms of investment as may please you. Income derived from the investment of surplus should be added to surplus; income from dividends should be put back into capital, but it may be added to salary.

Costs are direct expenses plus distributed expenses. Expenses are direct when they can be definitely identified as having been incurred solely for any item of costs; they are distributed expenses when they cannot be definitely identified as a proper charge against any single item of costs. An expense should be considered as a distributed expense only when the cost of determining the direct charge would be greater than would be the margin of error if the expense were arbitrarily segregated into parts and each part made a direct charge to the item. Expenses should be distributed monthly. Distributed expense is ordinarily called "overhead."

Costs in the business of architecture fall into five major divisions: (1) Development Cost, incurred prior to the time when the contract between the owner and architect is executed; (2) Production Cost, incurred to produce the preliminary sketches, working drawings, specifications and contract documents; (3) Supervision Cost, incurred in the field during construction; and (4) Administration Cost, incurred for general office expenses. These four become the cost divisions of the budget. Development Costs, Production Costs and Supervision Costs are always direct charges. Administration Costs are always overhead and are distributed to the other three major cost divisions. Each major cost division may also have its own overhead to be distributed within itself. The fifth major division of the budget is Profits. Profits plus Development Cost, plus Production Cost, plus Supervision Cost, plus Administration Cost, equal total business income. Set up the fifth division first in the budget; deduct it from income. What is left of income are costs. This is fundamental.

The next step is to fix these Costs in money. When that is done, if the costs so fixed prove to be greater than the balance you have left of income after deducting Profits, you can do either of two things,—reduce costs or face a loss of profit. A loss of profit will start you on the way to worry, fear and insolvency; to reduce costs may mean lowering the quality of service you render your client. If you lower the quality of your service, your action will affect the standing of the entire profession, affect your own standing, and clearly indicate that a day of reckoning is in the offing. You cannot do either of these things if you would preserve your business integrity, protect your family and ensure your own happiness and that of others dependent upon you. You may lessen, but not forego, the Profits. Therefore, Profits being fixed, if you cannot reduce major costs without lowering quality of service, it is evident that the income is too small and must be raised.

Unalterably this means that for business success in the profession, costs must be accurately determined and should be locally and nationally comparable, and profits must be stable and maintained. Quite plainly, too, it indicates that our present system of fees is unscientific and fundamentally inaccurate. I believe and hope that there will come a time when the Institute will provide in its Standard Documents, complete bookkeeping and budget forms, which if used by the members, will fix a uniform and standard method of setting up our accounts, determining the costs of service, and afford a means of comparing our costs. Inevitably, this will lead to the discarding of the present fee system of charges and the adoption of a method of charging for services which will be fundamentally and economically sound. I believe this would be a true service which the Institute could render to the profession, and that it would go far to eliminate the enormous economic waste and the inequitable charges for services that now obtain in the profession.

How are these four major costs fixed? An accurate estimate for budget purposes cannot be had except through years of experience. The beginner in the practice of architecture at present has no basic data available to permit him to fix these costs at all accurately. This information should be available to him, in some form. If it were, he could start his business and professional life on an economically sound basis. This would be good for the profession at large. The "infant mortality" in our profession, is unduly large. Perhaps it might be reduced by the right economic start. Budget costs should be built up, item by item, into an aggregate total and not vice versa. The more accurate the items, the less the contingency for failure.

Development Costs vary greatly and cannot be standardized. They should include every item of expense chargeable to a project prior to the signing of the contract with the client. Advertising of every form, dues to business organizations, all such kinds of expenses as the architect would not incur if he did not think it would help his business, should be charged to it. Immediately any development expense is incurred looking toward securing a commission, the tentative project should be set up on the books as an account and given an account number. Development expenses incurred in getting that commission should be charged directly to that account so far as practicable, and it should be charged with its share of the development overhead and its proportion of Administration Costs. If the salary of the architect has been properly apportioned between the Development, Supervision, Production and Administration Costs, the Development Cost will be quite accurately determined. I guarantee that every one of you who does not so keep his accounting will be astounded at the cost of procuring commissions. The Development Costs should be charged each month to the tentative project. When the contract for services is signed, the Development Cost heretofore charged to the tentative commission, becomes a direct charge, to become a part of its final cost; otherwise. Development Costs should always be charged off periodically.

I seem to have wandered into accounting, a subject not within the limits of this paper, but one which should be amplified and determined before an accurate budget can be set up.

Production Costs are kept in some form or other by every architect. Usually he figures up his outgo for draftsmen and other tangible items, adds something for overhead, and carries the total as a cost. This can be only approximately right. Production Costs can be closely estimated and fixed for budget purposes. Immediately the contract with the owner is signed, the architect should use his hour of constructive thinking to plan the progress of the work through his office. During that hour and others like it he should plan the drawings to be made and list and give a number to each. He should plan what is to be placed on each drawing. This list of drawings, marked with its estimated number of drafting hours, goes to the drafting room and should not be varied from nor other drawings be made unless they become absolutely essential. Once the sheets are so planned, with the proper cost data at hand, the probable expense of making each sheet can be quite accurately fixed. In no other way can Production Costs be set up with any pretense to accuracy. If this procedure or some other system as accurate is not followed, a budget cannot be set up. To follow this procedure is to set a firm control on drafting, and only thus can drafting room expenses be maintained within the budget estimates. Too much care cannot be exercised by the architect in preparing the Production Costs for the budget.

Supervision Costs are the easiest to estimate. The direct expenses of superintendents, clerks, inspectors, testing, reports, and traveling, are easily determined items. The principal distributed expenses within this major division of cost are the architect's salary and the allocation of the Administration Costs which have been transferred to its Supervision Costs. These are usually estimated too low, principally because the supervision and superintendence furnished by the architect in the usual run of things is woefully inadequate.

Administration Costs are not difficult to determine. All items of Administration Expense are overhead and must be distributed. Therefore they should be kept as few in number as possible. By applying the rule for determining overhead, this is quite easily done, and the distributed charges can be made much smaller in volume than is usually likely to be the case.

Each of the five major items of the budget is thus determined. To go further into their makeup is impossible in this paper, except in one instance. In each of the four major cost divisions, set up a cash reserve. This is the safeguard of your budget. It must be sufficient to cover your errors of judgment in making up the budget, and sufficient to cover the additional expenses which will creep in, in spite of the best made budget. Set aside this cash reserve in each division out of the first income received; if not all, at least its full proportion. I said before, first deduct profits from income,—now I say, deduct cash from the balances in each major cost division and set it aside as a cash reserve in each division. Make this reserve what you think is right, then usually double it. It is better to be right than sorry. Keep these reserves intact as cash to the close of the work so far as you can. Each raid you make on these cash reserves is a barometer of the condition of your costs. If you maintain these reserves intact, your profit is assured. These cash reserves should guarantee money for current operations at all times.

Such is the Architect's Budget,—a budget of his *time* and of his *finances*. In the budget of his time, the hour of constructive thinking is just as important to time as the cash reserve is to finance. Therefore, I repeat, budget your time, budget your finances, set aside your hour of thinking, your profits, your cash reserves. They form a guarantee of your success.

Rendering by Schell Lewis

Perspective of House Designed Within Definite Cost Limits

Lyon & Taylor, Architects

DEVELOPING SKETCH PLANS FOR SMALL HOUSES TO MEET BUDGET REQUIREMENTS

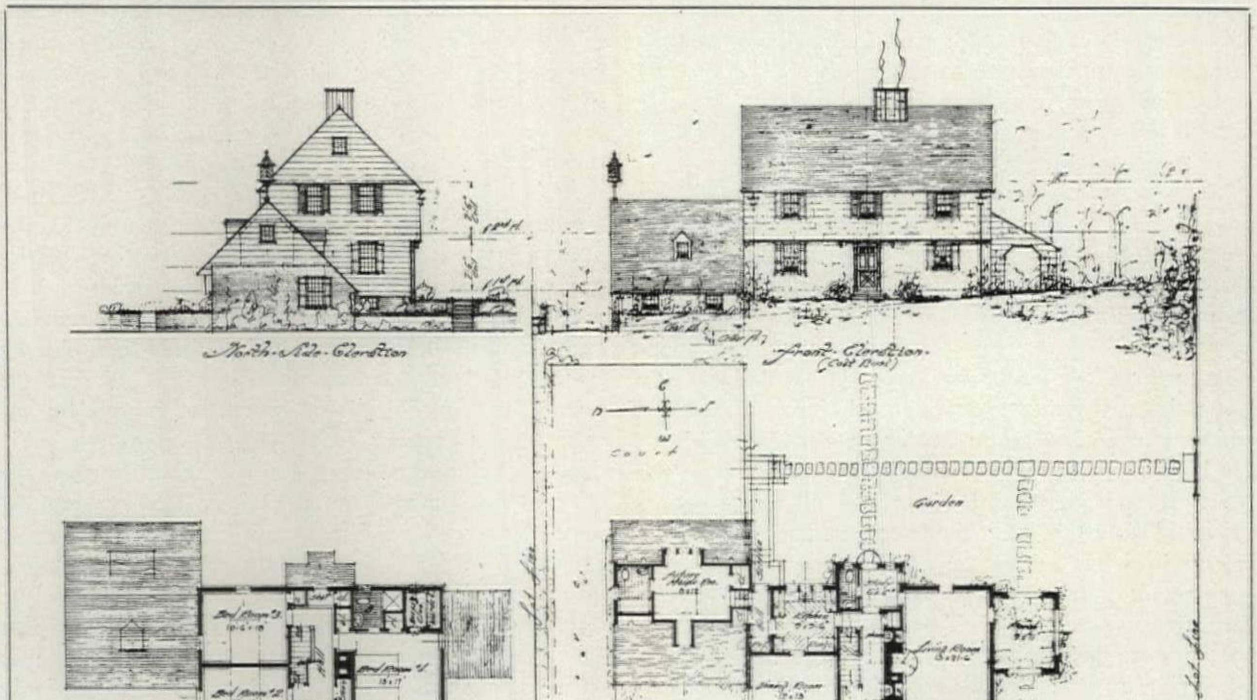
BY

C. STANLEY TAYLOR

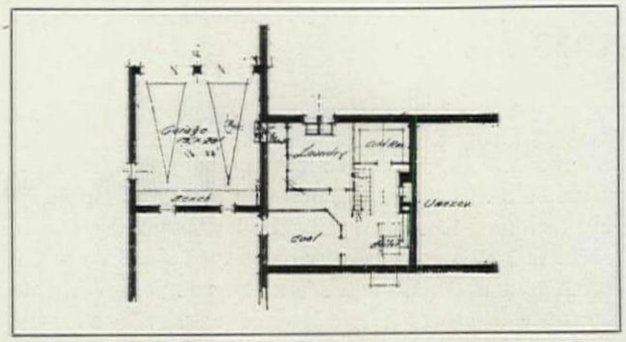
PROBABLY the most difficult problem encountered in normal architectural practice is the development of plans for small houses which can be successfully built within predetermined cost limits. The average client seeking a small house usually has very limited funds available for his purpose and usually has ideals all out of line with his budget limitations. To reconcile the owner's conception of room sizes, plan and arrangements and general architectural design to a rigidly restricted cost limit is the familiar and unwelcomed task of every architect engaged in the domestic architectural field. No matter how far apart the client's tastes and the size of his pocketbook may be, it is distinctly the architect's responsibility to help him secure a house that will meet his needs without plunging him into serious financial difficulties.

Frequently an architect is commissioned to design a small house without any definite cost limit being established by the owner, beyond an admonitory warning that he does not want to spend too much for his home. The owner's main thoughts are centered around matters of style, room sizes and arrangement, and little conveniences he hopes to incorporate in the plans. The owner's wife has dreamed of this new home; her thoughts are mostly of color schemes, architectural features and very practical housekeeping equipment. Costs are in the background until the architect, having faithfully developed sketches which seem to meet his client's wishes, is asked what the house will cost. Then trouble usually starts; the architect is often accused of extravagance or of ignorance of costs; eventually the sketches must be redrawn on a totally new basis with less confidence and good will on both sides, and at a loss to the architect of the good talent and time wasted. The better method is to discuss costs at once and to fully acquaint the owner with the nature of the problem he presents and with whatever necessity there may be for making some concessions in his space requirements or in his cost limits before sketches are undertaken. A frank and complete discussion of this troublesome matter, even before the architect is actually commissioned for the work, is far more advantageous to the owner and architect alike than its neglect until after the client is committed to a program beyond his means, or before the owner's ideas are so fixed with respect to the type of house he desires that he often makes an unwise investment.

The architect who follows this better course soon



Sketch Plans Made to Meet a Definite Budget
R. C. Hunter & Bro., Architects



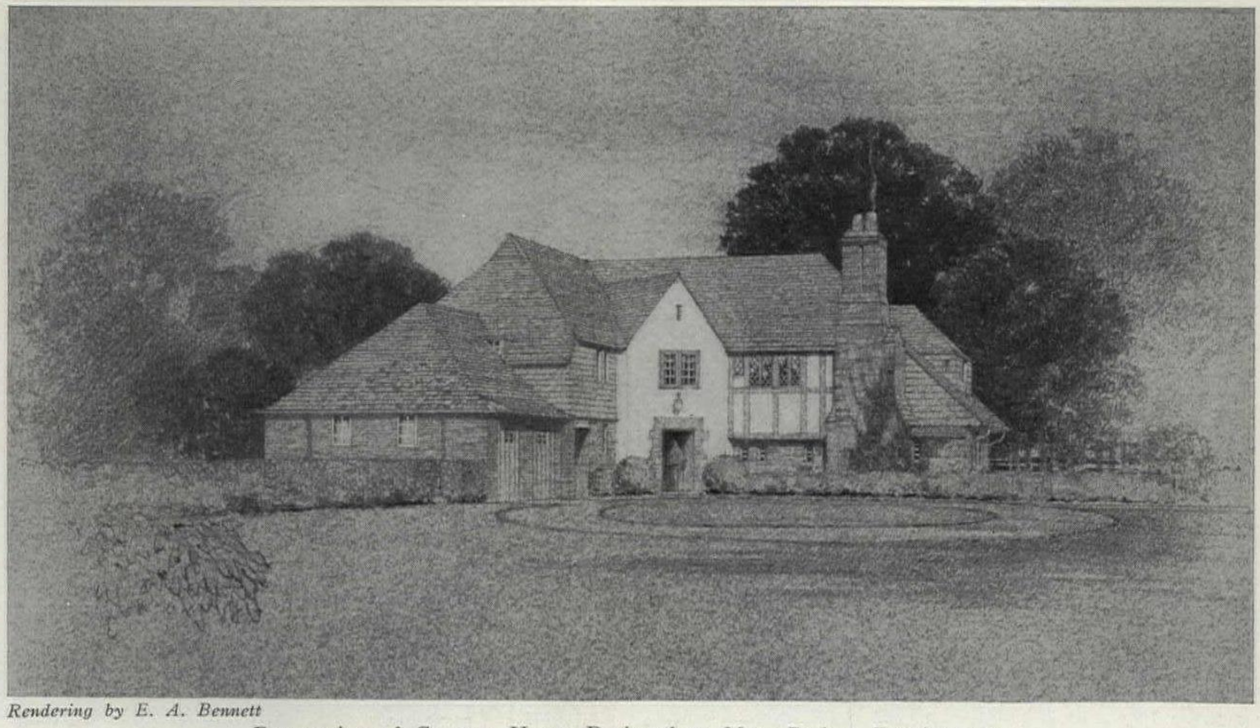
Cellar Plan of House Shown on Page 137

acquires a reputation for integrity and skill which ultimately will carry him farther in this field than the architect who permits his client to overlook his actual financial limitations for the sake of procuring a house that pleases his fancy without respect to its cost. The architect who completes any project after a long series of struggles and arguments with his client is seldom recommended to others in a like position. He earns a reputation for being an extravagent designer, no matter how much care he has exercised to keep the costs fairly close to the owner's ideas. Even a 5 or 10 per cent overrun may result in serious dissatisfaction on the part of a client who has established at the beginning of the undertaking his actual financial limitations, whether or not the architect is aware of his maximum allowance. A 5 per cent saving within the owner's original budget, on the other hand, will usually leave a lasting favorable impression with the client and will lead him to frequent commendation of the architect's talents and good judgment, and earn for the latter a prestige which may become the foundation for an extensive and steady practice.

Of course, it may be argued that the small house field is never profitable; that it is one which architects enter only as a means of establishing themselves in business; and that a reputation for economical building in this field merely leads to more commissions of this unprofitable type without opening up fields of larger endeavor. It is undoubtedly true that small house architecture for the standard minimum fee is actually burdensome to the architect. A higher fee must be charged in order to pay the cost of well developed plans and adequate supervision. When the fee is made commensurate with the labors involved, domestic architecture in the lower price ranges may pay an adequate income. There are many successful architects whose reputation has been developed entirely around their excellent work in designing small houses. Their practice has grown from this prestige into larger fields, and they have profited in all branches of this practice. Their success has invariably been built upon excellence of design plus intelligent handling of costs.

Aside from the ethics of the situation and the architect's moral obligation to render a complete and intelligent service to his clients who must build within limited budgets, the problem so frequently arises in ordinary practice that some definite means of meeting the situation must be devised. In spite of controversies over the value of cubic foot costs as a guide in estimating the costs of new buildings, no substitute has yet been found that better equips the architect to control the development of his sketch plans within predetermined cost limits. In the New York district, which is probably the highest priced area in the country for home building, many offices have found that they never exceed 60 cents per cubic foot for quality development of small houses embodying sound construction systems and high grade materials in all details. Other offices frequently build within a 50-cent limit, and occasionally some of the very best designers succeed in designing houses that actualy cost from 40 to 45 cents. The difference of a few cents per cubic foot even in a small house rapidly mounts into dollars; nevertheless, the experienced architect soon acquires a definite knowledge of his limitations and can quickly judge the approximate cubic foot cost of a dwelling after outlining its general style and equipment features.

Th first step, therefore, is to translate the owner's idea of space into a probable gross volume for the completed building. It has been established by a number of careful checks that approximately one-half of the gross volume is actually available in the net space devoted to living purposes. Using this as the first guide, therefore, the client may be requested to give the number of rooms he desires and the approximate size of each, together with the ceiling heights for the typical floors. By adding a reasonable amount for closets, hallways and bathrooms, but disregarding basement and attic space and space loss due to the thickness of walls and floors, a net volume of living space may be quickly estimated. Doubling this total would give very quickly the approximate gross cubage of the structure before any plans are attempted. At once the architect is in a position to tell his client that those space requirements will probably come within or will undoubtedly exceed his budget limitations, for the total cost can be checked by multiplying the gross volume by various prices ranging from 40 to 60 cents per cubic foot as the architect may deem suitable for the type of construction and the prevailing local costs. At once the question of reconciling space and cost is presented to the client. A general explanation usually is sufficient to convince the client of the absolute necessity for some adjustment in his requirements. Obviously, the architect who has made no sketches cannot be accused of designing more expensively than some competitors. When the owner realizes that the estimates are based on various cubic foot cost figures, he realizes at once the necessity for modifying his ideas as to quality of finish and equipment and for making concessions in room sizes, arrangements and the general architectural style. This establishes a frame of mind which leads to a satis-



Rendering by E. A. Bennett

Perspective of Country House Designed to Meet Budget Requirements
Lyon & Taylor, Architects

factory and open discussion of costs throughout the project. No troublesome details enter into the problem at this stage. The whole picture is viewed broadly, and the architect is usually permitted at once to either increase the budget limitations or to prepare sketch plans which will definitely fall within a predetermined cost regardless of the room sizes necessary to achieve this end. If a hopeless situation is encountered, the client may be lost for the moment, but the architect has wasted no time, and in the long run has made a friend who is more than likely to come back when his financial situation is improved or is almost certain to recommend the architect to others; this is far better for the client than if he foolishly undertakes the construction of a house under the guidance of a less ethical designer and pays the severe penalty of considerably exceeding his budget limitations.

At this stage the architect can usually also introduce a discussion of financing methods and may frequently enable an owner to find means of borrowing funds, permitting him to have the house he desires without requiring an initial investment beyond his means and without unduly burdening himself with financing and carrying charges. A sound knowledge of the mortgage market is invaluable to the architect engaged in this work. Assuming that the first discussion has resulted in an approximate agreement as to the size and cost of the finished structure and that the architect has been engaged to prepare sketch plans, he is then committed to a program of carrying out his design work on a basis that will insure his client of a reasonable margin of safety when contract figures are ultimately secured. Again cubic foot cost figures are used as the guide, and the margin of safety is secured by adopting in the early stages a unit which is large enough to permit considerable variation in final details. If the architect is accustomed to building for 50 cents per cubic foot, it is best to compute the maximum volume that can be built within the established budget on a basis of from 53 to 55 cents per cubic foot. The gross volume thus established is then translated in the sketch plans by converting volume to square foot floor areas and using these as a guide for the general dimensions of the floor plan.

Reconciling these volume and area limitations to the development of a successful and workable plan requires the exercise of a great deal of ingenuity and skill. Usually in small house architecture the space problem compells relatively low cost construction in addition to the efficient use of every square inch of floor area. Low cost construction in turn calls for simplicity in plan arrangement and for the adoption of an architectural style which may be consistently followed using low cost materials and stock designs for windows, doors and both exterior and interior trim. It involves the use of carefully planned systems of mechanical equipment, including the concentration of plumbing lines, the careful distribution of radiators, and the selection of an efficient and inexpensive heating plant as well as the careful placement of electrical outlets. A thorough knowledge of building materials is an essential part of the architect's equipment; and equally thorough knowledge of practical construction methods is valuable in preparing drawings and specifications that will permit economical construction without sacrificing quality and durability. Fortunately, the architect who is a close student of small house design and construction is finding himself constantly assisted in his efforts to provide maximum volume within reasonable cost limits through the introduction of new materials and construction methods. The building field is rapidly being enriched with new products which save space, make possible more rapid construction, or which actually cost less than the usual materials, the use of which has prevailed through custom for many years. Insulating products are being introduced which combine the functions of sheathing and a plaster base in one material. Thin partitions are being developed permitting plastering on both sides of the partition core composed of a single structural material. New composition flooring materials are showing economy over the more expensive tiles for bathrooms and kitchens, and some of these are even taking the place of higher grades of hardwood flooring; stock patterns of windows, doors and standard trim are being so vastly improved in design as to find ready acceptance by architects in place of specially detailed items which not only contribute to the cost of the structure but add to the architect's burden in preparing the drawings and supervising their construction and installation. Marked improvements are being made in heating systems; and quality plumbing fixtures are available which contribute to space saving and to economical installation. The importance of keeping closely in touch with introduction of new materials and new developments cannot be over-estimated for the architect who is to succeed in the small house field.

Unfortunately, the greatest aid in planning small houses within limited budget requirements must be developed by the architect for himself through experience. Cubic foot cost figures are not available through any medium of exchange on a basis which makes them reliable and useful to those not fully familiar with all the circumstances surrounding the particular building upon which they were developed. Undoubtedly the time will come when a standard system of maintaining cubic foot costs will come into general use. This system will not only report the cost based upon a uniform method of computing volume, but will require that the figures be accompanied by a detailed outline of the features of the building and of the construction materials employed, so that others may properly interpret the figure when applying it to other structures of similar or varied nature. For the present, the architect can rely only upon figures developed in his own practice. The adoption and maintenance of a uniform system for figuring cubic foot costs from completed buildings will soon provide the office with data of constantly increasing value.

The basic requirements for a cubic foot cost record system, proved by experience approximately correct, are:

(a) The volume of each building must be computed on a uniform basis. A standard system for figuring volume should provide for a quick method of measuring the volume of footings and foundations and a standard method of adjusting the volume of open porches and minor structures. Footings are usually figured by taking the basement area and multiplying it by 1 foot of depth below the finished basement floor. Open porches are usually figured at from one-third to one-half of their volume if outside the main walls of the building and at their full volume if within the main walls. Bay windows, dormers and other minor architectural features are figured at their full volume in careful computations or are neglected when they do not exceed 3 or 4 per cent of the total volume of the structure. A standard system on this point should be established.

(b) A uniform basis for computing cost is of vital importance. The cost normally should include builder's fee or profit and represent the total cost of construction including all subcontracts, but should be exclusive of architect's fee and of items not directly pertaining to the cost of the building itself, such as grading, planting, driveways, walks and detached garages. If possible, cubic foot cost should invariably be figured on the basis of actual contracts awarded, so as to eliminate the confusion developing through extra costs chargeable to changes made by the owner during the construction period or to unforeseen contingencies which might arise through encountering rock in the foundation work or through delays due to strikes or other extraordinary causes.

(c) The figure given should be accompanied by the date upon which the general contract was awarded, for this usually indicates the prices at which materials and labor are purchased. In a fluctuating market a variation in the date of six months might make a difference of several per cent in a building's cost. Location is of equal importance, unless the architect's practice is entirely confined to a restricted area.

(d) The record should contain a brief description of these major points: total volume; total cost; approximate area of ground floor plan (and if possible the actual size of the ground floor to indicate the approximate perimeter); general style of architecture; construction of exterior walls; mechanical equipment; total number of rooms and baths; and finally, the record should contain a statement as to whether the general quality of construction was (a) low cost, (b) moderate or average cost, or (c) extra quality. Every one of these details is important.

The consistent maintenance of a system of records of this type by many architects engaged in this field would form a basis for a most invaluable exchange of data through the architectural press. Eventually, such an exchange will be accomplished, and when this occurs architects will be able to estimate with increasing accuracy the cost of buildings from their sketch plans and will render improved service to their clients through eliminating the grave danger of exceeding budget limitations, with all the difficulties involved.

MECHANICS' LIENS

BY
CLINTON H. BLAKE, JR.

THE mechanics' lien is an American invention. Formerly in England and in this country there prevailed, and still prevails in England, what is known as the "common law." This is nothing more or less than the law of precedent built up not by statute and the enactment of laws but by the decisions of the courts. When, for example, in the early days of English law, one person trespassed upon another's land, the latter applied to the courts for damages, and the courts, considering the general common sense of the case, declared that the person trespassing must pay damage to the man upon whose land he came, on the theory that the land owner was entitled to the enjoyment of his land without being compelled to allow others to use it. When a similar case next arose, the court followed the precedent thus set down in the previous decision, and so in time this rule of law as to trespass became established. The same course was applied to all other legal questions which arose, and the law was laid down by these precedents, and the law which they established became known as the "common law." In America the common law was originally in force and is still in force in various jurisdictions. Gradually, however, we departed from observance of the common law custom and built up a body of statutory law. The tendency today, as every student of legislation knows, is to cure everything possible by legislation, and an appalling number of statutes are being constantly enacted, accordingly.

One of the fruits of this statutory development was the "mechanics' lien" legislation. Its inception dates back to 1803, when the first mechanics' lien law, apparently, was adopted by the state of Pennsylvania. For some time the mechanics' lien statutes were directed solely to the protection of mechanics and had none of the broader provisions for the protection of workmen, subcontractors and materialmen which now generally characterize them. Gradually the idea of protecting by lien all those who had contributed materially to the enhancement of the real property value involved gained in favor and was adopted generally by the different states. Gradually, also, the scope and extent of the relief afforded by lien laws have been extended, and at practically every legislative session new bills are introduced, the purpose of which is materially to increase the liberality of the lien laws and to extend their benefits to those not heretofore covered by them.

The old idea that the lien statutes were for the protection of the simon pure mechanic only has been almost universally done away with, and the state legislatures are steadily broadening the scope of lien legislation, so as to bring within its benefits practically all those who have, by their labor, contributed to the enhancement of the value or improvement of the real property involved. At the same time it must be understood always that the mechanics' lien is fundamentally a claim against the property, rather than a claim against the owner of the property personally. The theory upon which all of the lien statutes, substantially without exception, proceed is that the property of the owner has been enhanced in value by the labor of those claiming the liens and that therefore it is equitable and proper that the property should be subjected to a lien for the amounts due them.

Owner's Liability. Radical as this legislation is in one sense, it has nevertheless in its development recognized that it would be unfair to expose the owner to a lien claim without strict limitations as to amount and liability. In the better jurisdictions, two main limitations will be found. In the first place, the lien must be predicated upon the consent of the owner, express or implied, that the work be done; in the second place, ordinarily, the total amount recoverable on lien claims will not be allowed to exceed the total unpaid balance due to the contractor at the time the liens are filed. The reasonableness of each of these limitations is obvious. If a lien could be established for work done without the consent of the owner, it would be possible for claimants to do work on his property which he has not wished to have done and then subject the property to a lien for the value of the work. If, also, it were possible to hold the property for all sums due without regard to the unpaid balance of the contract price, the owner would be repeatedly placed in a position where, having paid to the general contractor or other contractors substantially the full value of the improvement made, he finds that his property is subject to liens for a large proportion of the total cost, due to the failure of the contractors to take care of their subcontractors or materialmen.

The provisions of the New York lien law and the decisions of the New York courts on this point are typical of the sounder point of view. The lien law in this connection provides that:

"If labor is performed for, or materials furnished to, a contractor or subcontractor for an improvement, the lien shall not be for a sum greater than the sum earned and unpaid on the contract at the time of filing the notice of lien, and any sum subsequently earned thereon. In no case shall the owner be liable to pay by reason of all liens created pursuant to this article a sum greater than the value or agreed price of the labor and materials remaining unpaid, at the time of filing notices of such liens, except as hereinafter provided."

The New York Court of Appeals, in considering this same point, has decided that:

"The settled construction of the Lien Law is that, except in case of fraud, the owner cannot, under any of its provisions, be compelled to pay any greater sum for the completion of a building than by his contract he has agreed to pay. The effect of the statute is simply to take from the owner money actually owing by him on his contract and to apply it in payment for the labor and materials which sub-contractors or materialmen have contributed toward the performance of the same contract."

In other words, the mechanics' lien, under this rule, attaches primarily to whatever sum, if any, at the time the lien is filed may be due to the contractor. In many of the states, the lien of the sub-contractor is based upon the legal theory of "equitable subrogation." This, translated into plain English, means merely that by the lien there is transferred to the lienor the claim of the contractor against the owner up to the amount of the balance then due or which may become due thereon.

Owner's Consent. With regard to the consent of the owner upon which the lien, as already noted, must under the usual rule be predicated, there is a wide divergence in the provisions of the various lien statutes. The principle is generally recognized as sound, but the states differ materially in the degree of consent or approval which their legislatures and courts interpret as sufficient to bind the owner. It has been stated broadly that some contract to which the owner is a party and which covers the work for which the lien is claimed is a necessary prerequisite to the validity of the lien. This does not mean, however, that to sustain the lien, there must be a written contract signed by the owner covering the work and embellished with legal acknowledgments and seals. The contract may be formal or it may be informal. The consent of the owner may be expressed most definitely in writing, or it may in some cases be implied. There must, however, as a general rule, be some understanding on the basis of which, whether it be by express agreement or by implication, the courts can say that the owner has approved, adopted or ordered the work. It will be in every case a question of fact dependent upon the peculiar facts of that case.

In the limited space here available, it is impossible to discuss in detail the variations between the different state statutes, and the legal interpretations by the varying states of facts which are held to constitute an agreement by the owner that the work be done. It may be stated broadly, however, that the tendency has been and is to be increasingly liberal in the interpretation of what constitutes a contract by the owner sufficient to sustain a lien. Some statutes require that such a contract shall be in writing. More and more, however, the states are recognizing the right of the lienor to sustain his lien in the absence of a written contract. Where this right is recognized, the courts or statutes proceed upon the assumption that the owner might contract for the work or approve it by implication just as surely as if he had made a formal contract. If it can be shown that the owner has consented that the work be done and has allowed it to be proceeded with, without objection and with his approval, this conduct on his part in many of the states is construed as an agreement by him that the work be done. Even in the jurisdictions which have most clearly recognized an implied consent by the owner as sufficient to sustain the lien, the lienor cannot safely predicate his lien upon the mere fact that the owner knew that improvements were being made and did not object to them. In some cases this might be sufficient to subject the property to the lien, and in some it might well be insufficient. For example, in New York it has been held that the mere general consent of the owner that a lessee in possession of the premises may at his expense make alterations and repairs, does not constitute within the meaning of the New York statute that "consent" by the owner which is necessary to sustain a lien; and that the fact that the owner knows that the work is going forward and even expresses satisfaction with the progress made and the work done does not subject the property to a lien, where he is in the position of a landlord and has no control or supervision over the performance of the contract. On the other hand, it has been held by the New York courts that a lien can be sustained in a case where a tenant has ordered work done and the plans for the work have been submitted to and approved by the owner.

This whole question of consent by the owner is difficult and somewhat technical. Where the work is done at the order of the owner himself, there can be no question. Where, however, the work is done without such an order but by the order of a tenant, the validity of the lien will depend in most states, and certainly in New York, upon the ability of the one asserting it to establish with reasonable clarity the fact that the owner knew of the work, that he approved it and consented to its being done, and that his course was such as to amount to an implied agreement on his part that it should be done.

The Court of Appeals of New York, on this question of consent, has thus stated the requirements:

"While it is doubtless true that the consent required by the Lien Law need not be expressly given, but may be implied from the conduct and attitude of the owner with respect to the improvements, which are in process of construction upon his premises; still the facts from which the inference of a consent is to be drawn, must be such as to indicate at least a willingness on the part of the owner to have the improvements made, or an acquiescence in the means adopted for that purpose, with knowledge of the object for which they are employed."

* * * *

"We may, therefore, fairly deduce from the decisions of this court upon the question now under consideration these various propositions: (1) That no express consent is necessary on the part of the owner in order to bring the case within the statute providing for mechanics' liens. (2) That a consent may be implied from the conduct and attitude of the owner with respect to the improvements which are in process of construction upon his premises. (3) The facts from which the inference of consent is to be drawn must be such as to indicate at least a willingness on the part of the owner to have the improvements made or an acquiescence in the means adopted for that purpose, with knowledge of the object for which they are employed. (4) The omission of the owner to object to improvements made upon his premises by a tenant, when he has knowledge of the circumstances under which they are being made, is always an important fact bearing upon this question."

On the other hand, the same court has laid down the rule that, in order to establish under the statute a consent by the owner, it must be shown that his consent has been an "affirmative affirmation" in procuring the making of the improvement or that the owner had possession and control of the premises affected by the improvement and consented to it in the expectation that he would reap the benefit of it. The fact that the owner actually receives the benefit will go far to establish the fact that he has approved the work in the expectation that he will receive this benefit. If, being informed of the intended improvement and knowing that the work is being carried on, he stands by and allows it to go forward and receives the benefit of it, his consent will ordinarily be implied and the lien sustained. On the other hand, it has been held that it is not necessary that he should actually eject the contractor as a trespasser to escape lien liability, and that, if he forbids the performance of the work, his consent will not be implied, because he has not taken ejectment proceedings or physically removed the contractor from the property.

Performance of Contract. Assuming that the necessary contract by the owner or approval and consent by the owner have been established, it is necessary that the lienor establish a number of other fundamental points to sustain the lien. The lienor must prove in the first place that he has performed his contract, or that the owner has prevented his performing it or waived any failure to perform which there may have been. Performance in this connection does not mean performance to the point of perfection. The courts here invoke the rule of "substantial performance." If the work has been substantially completed in all essential particulars, the lien will be allowed and will not be defeated because some minor defects or omissions are apparent. If a few fixtures, for example, have been omitted, the value of which can easily be determined and is relatively small, the contractor will be granted his lien for the full amount less a reasonable allowance for making good the existing omissions. In the second place, the lien must be filed within the time limited by law, which time, of course, will depend upon the statute applicable in each state and will vary in accordance with the differing state laws.

Approval of Work. Where other conditions are present, as for example, where the approval of the architect is a condition precedent to recovery by the contractor or where, in the case of a municipal lien, a departmental approval or certificate is required, the contractor must produce the required approvals or certificates before he can sustain his lien. In a word, he must, in order to sustain it, produce the same proof which the courts would require him to produce in establishing the indebtedness of the owner in a suit by the contractor against him under the contract, if no lien had been filed. The lien is merely an additional remedy in the nature of security and does not give to the contractor the right to recover, in the absence of proper legal proof and evidence that the work has been done and that the value of the work is the amount which he claims.

Probably the greatest variation between our state lien laws is to be found in those provisions of the laws which have to do with the liens of subcontractors and materialmen. In some states they are granted direct liens by statute. In other states their liens are on the basis of "subrogation," which I have already mentioned. Where this doctrine is in effect, the subcontractor or materialman, to establish his lien, must show that the contractor with whom he dealt was himself entitled to a lien, and that there still remains due some unpaid balance from the owner to the contractor which can be applied to the satisfaction of the lien.

When we come to the subcontractors or materialmen of a subcontractor, we are naturally getting still farther removed from the primary obligation between the owner and the original contractor. For many years, those with whom the subcontractor dealt were considered too far removed from the building operation to be accorded any lien rights. The liberalizing process which we have noted, however, has in large measure removed this bar, and today those performing labor or furnishing materials to the subcontractor may now generally successfully avail themselves of lien protection.

Limitations Imposed. State legislatures have generally recognized, however, the danger of throwing open too widely the lien door to the entire line of subcontractors and materialmen and have, in the wording of the lien statutes, set up safeguards and limitations which must be observed, if the lien is to be sustainable. In some cases it is provided that the contract must be recorded. The recording of it may be essential to the lien of the contractor himself, or to the lien of the materialmen or subcontractors, according to the particular statute involved. In New Jersey, if the contract and specifications are filed in the office of the county clerk of the county in which the work is being done and before the work is commenced, the liability of the owner will be limited to the contractor, and the subcontractors and materialmen will be precluded from enforcing mechanics' liens. It is important that this provision be held in mind by architects practicing in New Jersey and that they advise owners before the work is commenced to file the contracts and specifications, so as to secure this protection. There has been some question under the New Jersey decisions with respect to the effect of filing the contract after the work has been commenced. Under the more recent decisions, the only safe course to follow is to have the papers filed before any work whatever has been done. Otherwise, even if the filing takes place after an insignificant portion of the work has been done and before the work on which the lien is claimed has been commenced, the owner may not be able to set up the filing as a bar to the lien claim. For example, if the excavation for the cellar has been started before the filing date, a carpenter whose work has not been commenced until after the filing has taken place may nevertheless, it seems, assert a lien and plead that the filing of the contract and specifications is ineffectual because it did not take place before the commencement of the work.

Architect's Lien Rights. The liberal tendency which has been responsible for broadening the scope of the lien laws so as to take in subcontractors and materialmen and the others whose work has contributed to the improvement of the property involved, has been responsible also for extending the protection of the lien laws to architects. Under the earlier laws, the architect had no lien rights. As the laws developed, it was held that, to the extent of the value of services performed by him in the nature of supervision, he might maintain a lien. Gradually this right in many of the states has been extended and amplified. The next step was to grant to the architect a lien for the full amount of his services, including the preparation of the plans and specifications, provided he had supervised the work. Having reached this point, it was entirely logical and equitable that the statutes should be so amended and interpreted as to give to him a right to file a lien, whether he had supervised the work or not, provided that the work performed by him had benefited the property and been used in connection with its improvement.

This rule has been definitely established in New York state. Under the present lien law in that state, the architect may file his lien for the agreed or reasonable value of his services in preparing the plans or specifications, even if he has not been called upon to supervise the work. Of course, if his contract has required him to supervise the work and his failure to do so has been due to a breach of the contract on his part, a different question is presented. To establish his lien, he must show that he has performed his contract and, if he has breached it, naturally his right to the lien will fail in consequence. The next logical step will doubtless be a provision which will give to the architect a lien for the preparation of plans and specifications for the improvement of real property, even if the work is not proceeded with. In fact, efforts have already been made in New York to amend the lien law to this end. There is much to be said for the suggestion. The architect who has, at the request of an owner, prepared plans and specifications, has certainly done work for the improvement of the real property. If the owner elects not to use the plans and specifications, it may well be urged that he should not, by the mere failure to use them, be able to deprive the architect of his lien right. In order to assert this right, the architect should, however, be compelled to show, in all fairness, that the plans and specifications as prepared are such as were ordered by the owner and then they are in proper form. Doubtless the argument which has prevented this final extension of the law with respect to architects is that to so amend the statute would open the door in some cases to unjust claims and encourage the preparation of plans without proper authority, for the purpose of forcing an owner to make payment for them under threat of having his property encumbered by a lien. There is something to be said for this point of view. On the other hand, the lien on the property can always be removed on the filing of a bond. Where this is done, the bond takes the place of the real estate as security, and the matter can then be thrashed out in court and the property left free from the lien.

Probably the chief reason that the architect has not been given the right to assert a lien where the building has not been proceeded with arises from a failure of the state legislature to properly appreciate the difference between the character of the services rendered by the architect and the services rendered by the ordinary contractor or materialman. Obviously, a contractor or materialmen cannot be a party to the improvement of real property, unless the project is actually undertaken. If the work is not started, he is not called upon to perform labor or furnish materials. With the architect it is different. If he has agreed to prepare plans and specifications and does propare them, he has immediately made available to the owner material which can be used for the improvement of the property. He has, in fact, performed labor for the improvement of the property and improved it in the sense that he has laid out the scheme for the work of improvement and the specifications under which it is to be carried forward. Under a statute which gives a lien for work done "for the improvement of real property," as distinguished from work done "in the actual improvement of" real property, services of this character might well, and logically, be made the basis of a lien. It is a question of time only, I think, before this result will be secured, in some jurisdictions at least.

Jurisdictional Difficulties. It must be borne in mind at all times that the lien statutes vary materially according to the jurisdiction in which they are in force. No lienor can safely file a lien in one state on the basis of the requirements of another state. There is as much difference between the lien laws of the various states as there is between the divorce laws of the various states. While many of the considerations which have led to the agitation for a uniform divorce law do not, of course, apply to lien legislation, there is much to be said in behalf of the proponents of a uniform lien law. Increasingly, under modern industrial conditions, contractors and materialmen and architects, also, are being called upon to perform services in states other than the states in which their offices and chief activities are centered. If a uniform law could be made available, it would greatly simplify lien procedure.

In this connection, the Department of Commerce, through "The Standard State Mechanics' Lien Act Committee" has been active. It has just issued, as I write, a second tentative draft of a proposed uniform mechanics' lien act, and submitted it for general consideration and comment. The Act as submitted is well worth the reading of every architect, and shows clearly the careful consideration which the Committee has been giving to this subject. Special consideration has been given to the problem of how best to secure the protection of the owner against liens and at the same time fairly recognize the rights of the contractor and materialman. Various remedies have been suggested and, as is natural, some have tended to make the owner a collection agency for subcontractors and materialmen, and others, on the contrary, to set up too stringent provisions for his protection. Much good, will, I am sure, result from the work of this Committee and, if, with the coöperation of bodies such as the American Institute of Architects and associations of contractors, it should bring about a uniform law so drawn as to be liberal and yet not over-radical, the result would do much to simplify a somewhat confused situation. Certainly it would bring about a far more accurate understanding of lien legislation and of the respective rights of the owner, contractor, materialman and architect in connection with it.

The Architect's Interests. Pending the dawn of the millennium in this respect, the practicing architect will do well to acquaint himself generally with the provisions of the lien laws applicable in the jurisdiction in which his practice is carried on. He should do this both in his own interest and in the interests of his clients. He may wish to avail himself of the protection of the law, and in every project of any size he will be called upon to consider his client's protection in any event. The more thoroughly he understands the provisions of the lien law, the more competent he will be to advise his client and to protect the latter's rights and interests. It may perhaps be true that his legal duty in this connection will be accomplished if he suggests to his client that the latter should have his attorney advise him in connection with any lien considerations and the steps to be taken under the contract for his protection against liens. On the other hand, the architect whose conception of his duty is somewhat broader and who goes out of his way to advise his client and to protect him from lien complications, will build up, as a result, good will and confidence on the part of his clients, the benefits of which cannot easily be over-estimated.

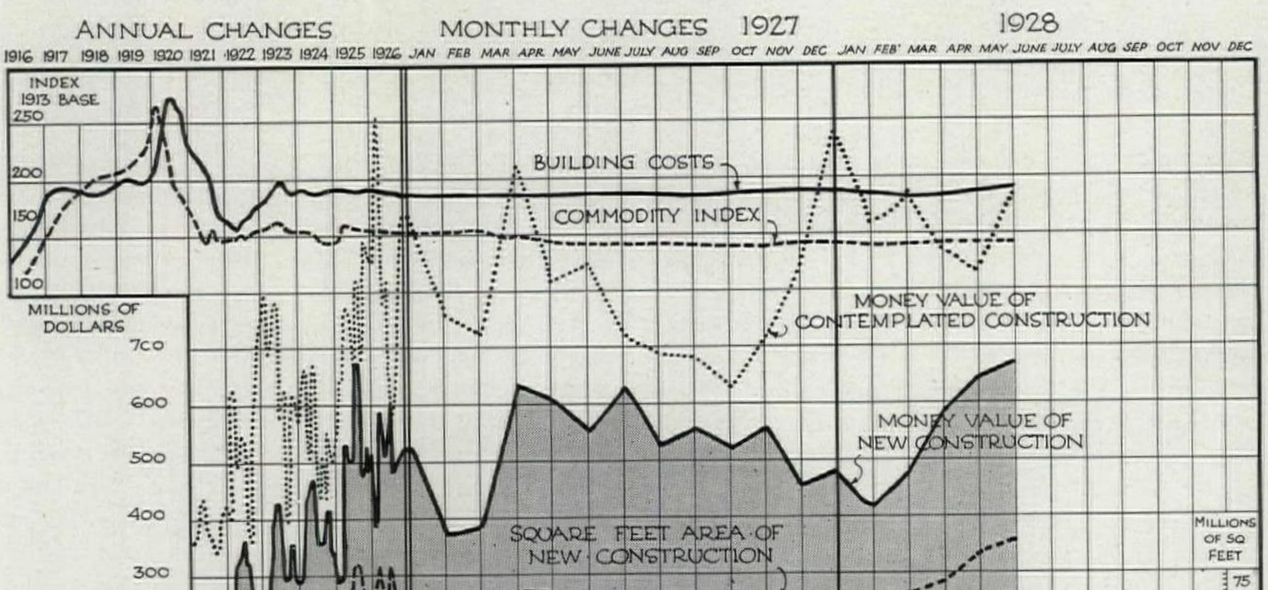
In any event, the architect should see to it, in drafting the contract and specifications and in advising with respect to them, that the owner is protected by the insertion of proper provisions for the withholding of the final payment and for the submission by the contractor, with his requisitions, of statements and receipts showing the payments made to subcontractors and materialmen. If the architect certifies payments without these precautions and allows the owner, on the basis of these certifications, to pay out monies to the contractor when the contractor has not in turn properly taken care of his subcontractors or materialmen, he may well be held to account by the owner for negligence. The only safe course for him to follow is to exercise special care throughout the operation in checking the outstanding claims of subcontractors and materialmen and in being entirely satisfied with respect to the condition of their accounts, before issuing certificates. The architect is in a position to protect the owner in this connection. This protection he should be diligent in giving, as a fulfillment of the obligation which he owes and as a matter of ordinary good business in his own interests for it is to his own interests to have a good reputation.

THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

FOR two consecutive months all construction records in the 37 states east of the Rocky Mountains have been broken, according to reports of the F. W. Dodge Corporation. In April, building and engineering work contracted for in these states (representing about 90 per cent of the total country) amounted to $643,137,100. In May the total was $668,097,200. Only six times prior to April have the month's totals exceeded $600,000,000, these being in August, 1925, March and August, 1926, and March, April and June, 1927. Similarly, the totals for the year to both April and May constituted new records. In April the total for the first four months of the year was $2,128,204,100, which exceeded the values for the similar period to 1927 by 6 per cent. In May the year's total rose to $2,796,301,300, which is 9 per cent over the first five months in 1927 and 7 per cent over the same period in 1926.

In April three sections of the country saw records broken; the New England States, where the value of construction for the month was 9 per cent over last year and 10 per cent over last month; the Middle Atlantic States, where two large contracts totaling $27,500,000 were largely responsible for an increase of 40 per cent over April, 1927, and 47 per cent over March, 1928; and the Central Western States where April totals for this year were 13 per cent over April, 1927, and 7 per cent over last month. In May four districts broke all former records for the month. New York state and northern New Jersey showed a 22 per cent gain over the preceding month and a 33 per cent increase over the same month last year. The expenditure of $184,555,000 in contracts made this also the highest monthly total since December, 1926. The New England States continued to show unusual activity, with a May total of $60,229,800, which is the record monthly total for the district, and which represented an increase of 30 per cent over April, 1928, and of 45 per cent over May, 1927. The Middle Atlantic States also established a new record for May with $76,937,300 worth of contracts, which was 38 per cent ahead of May, 1927, but was 25 per cent under the total for last month, for reasons already indicated. In the Central Western States the total, $192,868,300, was a 27 per cent increase over May, 1927, and 3 per cent ahead of April, 1928. For the 37 eastern states, analysis of the month's totals shows that 43 per cent of all contracts in April and May were for residential construction. Increased activity in public works, industrial and commercial buildings is indicated in these interesting figures.



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.

COSTS AND SPECIFICATIONS

BY

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THE silence which settled over the little group of tourists in a corner of an ancient and lovely cathedral was shattered by the exclamation: "I wonder how much the damned thing cost"! So are many of our dreams shattered when measured by the modern standard of value,—money!

The only way in which the architect's ideas can find tangible and concrete expression is by means of drawings and the written word in the form of specifications. Drawings are limited almost entirely to their function of illustrating the design and dimensions of each individual portion of the work. The specifications are capable of expressing accurately the multitude of conditions which require consideration to carry out the architect's ideas in conformity with modern methods of transacting business. An essential qualification of a specification writer is the ability to obtain the best possible value for the money available. In this respect he bears a striking resemblance to the purchasing agent, and like him should be thoroughly familiar with the market conditions affecting building materials. The specification writer should also be an expert on the qualities and grades of the multitude of materials which enter into the construction of a building. The selection of the proper material for a given purpose is the result of years of experience and the proper contacts with authorities on the various phases of building construction.

A specification which has been loosely compiled and which contains meaningless paragraphs will add to the cost of the building, for the reason that it will create a condition where the owner will pay for many things which he will not receive. Under these conditions, an experienced contractor will estimate to cover himself from loss, no matter what the architect's future interpretation will be. When a specification is carelessly compiled and indicates that the architect is ignorant of the proper administration of a building project, the contractor will often feel that he can "crash the gate," and again the owner will pay for many things which he will not receive. Many contractors work on the theory that the best defense is a good offensive; therefore, when a carelessly compiled set of specifications and a poor set of plans are encountered, these contractors will take the aggressive to protect their interests, generally with considerable success, so that again the owner will pay for many things which he will not receive.

The architect's position in the modern business structure is sound and conforms to the established economic theory that design, plan and supervision should be detached from that of execution. The architect's position can be maintained only while he works in conformity with this economic principle, which should result in the preparation of carefully compiled specifications and accurately detailed plans, so that the contractor will confine his energy to execution only and will not invade the architect's and engineer's sphere of design and selection of materials. The success of a project will depend generally upon a logical plan and a scientific and business-like selection of materials, with the element of cost balanced against desirability for the purpose. The cost of a product should include the initial cost plus the cost of maintenance. The money spent in the construction of a building becomes an item of overhead which will be chargeable to the taxpayer, tenant, merchant or manufacturer, depending upon whether the building is for public use, tenant use, sales, or manufacturing purposes. Successful business executives are constantly striving to legitimately reduce overhead, for the reason that this charge must be added to the price of the commodity which will be manufactured or sold. If this overhead charge is excessive, it will impose a handicap on the commodity when in price competition with one which enjoys an overhead charge of lesser amount. This economic theory is not inconsistent with good architectural design, because it conforms exactly to the theory that good architecture should accurately express the purpose for which the building was constructed. Our modern architectual design at its best recognizes this theory, and is producing truly American architecture which accurately expresses the spirit of the age and the purposes for which buildings are constructed. A specification carefully compiled will take into consideration each and every angle from which the building can be appraised, so as to cover and include all contingencies. A specification so compiled will earn the respect of all affected and will form an instrument used as a means of trade and agreement to the end that all affected will enjoy its protection. This type of specification definitely establishes the liabilities of each individual affected, to the end that the operation will proceed smoothly to completion to the satisfaction of all concerned. This should be the ideal of all specification writers.

The most desirable material for a given purpose is frequently not the most expensive material. The familiar expressions: "Do not use nickel-plated lath," and "Do not gold-plate the job," express the thought. If the market is carefully investigated, there will be revealed the fact that considerable sums of money can be saved without injuring the character of the work in any respect, and in fact often improving it. Buildings in which expensive materials are used in service and storage portions are victimized generally by carelessly compiled specifications with the familiar clauses: "All trim shall be mahogany"; "All floors shall be terrazzo"; "All balustrades shall be bronze as per detail"; and similar clauses which the supervisor interpreted exactly as written, irrespective of the location. The value in quality and money between the different grades of a given material should always be kept in mind, as very often the difference in price between the different grades is out of all relation to the difference in quality between them. This condition is due largely to the specification writer's requiring the very best grade of a given material in almost all instances, which results in a demand which causes a premium to be placed on the particular grade, while a slightly inferior grade, perfectly suitable for the purpose, will clutter the market. As an example, the difference in price between "A" dense heart rift yellow pine flooring and "B and better" dense heart rift yellow pine flooring, is out of all relation to the price difference between them. The price difference between "AA" quality window glass and "A" quality is out of all relation to the quality difference. A light of double thick "AA" quality window glass, 24 inches by 30 inches, has been quoted at $1.56 at warehouse, New York. A light of "A" quality glass has been quoted at $1.05. The difference in quality between these two grades of glass is so slight that it cannot be established by the average supervisor of construction. Expert graders of glass will not agree on more than 70 per cent of the "AA" quality glass. "A" dense heart rift long leaf yellow pine flooring 13/16 of an inch thick, has been quoted in the metropolitan territory at $130 per thousand. "B and better" dense heart rift yellow pine flooring has been quoted at $110 per thousand. These prices cover flooring delivered at the site. There is very little difference between these two grades, as "B and better" flooring contains 50 per cent of the "A" quality. Therefore, in ordinary cases the "B and better" would be the logical flooring to use, as the differences are of such a nature that they cannot be detected except by an expert. Similar and more exaggerated examples could be given at length.

When considering the item of cost, it is well to bear in mind that the difference in prices of raw materials will not bear the same relation when incorporated within the bulding. Let us consider an ornamental metal grille. The price difference between rough cast bronze and cast iron is about 10 to 1, whereas the price difference between the same grille in cast iron and bronze would be about 4 to 1, the proportion being cut down for the reason that the cost of the models and patterns would be the same in either case. It is possible to design an ornamental metal grille so that the cost of the model and pattern, coupled with the item of breakage for cast iron, would be so great as to compensate for the price difference between the metals. These examples are given to illustrate the proportional differences in cost between materials delivered at the site and the same materials incorporated within the building.

Example. Wrought iron pipe will cost approximately 40 per cent more than steel pipe. The cost of the pipe material for a plumbing system on an 11-story office building was 25 per cent of the cost of the entire piping system, exclusive of the finished plumbing fixtures, which reduced the percentage cost of the wrought iron pipe over steel pipe to 7 per cent in place, the percentage of additional cost being reduced for the reason that the items of labor, valves, pipe covering, painting and similar work were the same in either case.

Example. A light of double thick "B" quality window glass, 14 inches by 18 inches, will cost about 20 cents at the warehouse. A light of ⅛-inch or ¼-inch polished plate glass of the same size will cost about 52 cents at the warehouse, which is 160 per cent more than the double thick "B" quality glass. It will cost approximately 20 cents to glaze either light of glass, or 40 cents for the "B" quality and 72 cents for the plate glass, a price difference of 80 per cent between them.

Example. Strip copper in sheets is worth 25 cents per square foot based on 16-ounce copper. Galvanized iron is worth 5½ cents per square foot in sheets, which is less than one-fourth of the cost of the copper. Plain copper cornice or moulded work will cost approximately 65 cents per square foot in place. The same work in galvanized iron painted would cost approximately 40 cents a square foot,—about two-thirds of the cost of the copper work.

When other materials are involved it will frequently be found that the cost differences between the two classes of work will not be anywhere nearly as great as if the other materials were not involved. For instance, galvanized iron skylights are quoted at approximately $1.20 per square foot, whereas copper skylights are quoted at approximately $1.70 a square foot. In this case the difference between them will be reduced, due to the fact that the other materials, such as, glass, puttying, labor, painting, etc., are the same in either case. For this reason galvanized iron skylights, except for highly speculative work, is a poor buy. The specification writer should investigate very carefully the element of cost, as it affects all substituted or sub-standard materials. He should carefully analyze and check all statements made in relation to the ultimate costs of these materials. I am quite familiar with more than one case where substituted and sub-standard material will cost in place as much as the standard material which they were designed to replace. When asking for prices, the price quoted will very often be f. o. b. factory, when it is customary to quote the same material in place. The price will often be quoted so as not to include some essential item of finish which will materially increase the price.

The materials used in the constructoin of a building can be roughly divided into two portions,—one raw materials, and the other manufactured materials. Raw materials, which comprise generally wood and stone in their multitude of sub-divisions, are products of nature, and as such are not subject to adulteration or alteration in quality, except such as will occur during growth or formation. The specification writer and the supervisor of construction should be thoroughly familiar with the various kinds and grades of these materials and their adaptabilities for different purposes; for this reason it is unimportant from whom these materials are purchased. Steel, cement, copper and tin may also be classed under this heading, for the reason that their quality is stabilized by the equipment and resources behind them. When specifying manufactured materials, a different condition occurs, for the reason that the processes of manufacture are technical, and it is difficult to establish the quality of a given material without laboratory tests. When called upon to specify paints, asphalts, waterproofing compounds, mastic and rubber flooring, etc., it is better to spend energy investigating the manufacturers and to select one of recognized standing and integrity and then let him take care of the responsibility for the success of the material. Questioning whether it were possible to determine the quality of two kinds of rubber tile outside of a laboratory, I consulted with three experts on rubber and two purchasing agents, and they all agreed that it was not possible to establish the quality of the two rubber floor tile outside of a laboratory, despite the fact that there is a 60 per cent price difference between them. The company behind products of this nature is of more importance than the product itself. To prevent any question in the estimator's mind as to whether the material specified is the proper material for the purpose, it is important that proper selection be made, so that the product and grade will be logical for the purpose.

To bring out the various questions which should be answered before selecting a given material, these examples are given:

Brick Work. There are two basic types of brick, —common brick and face brick. Common brick has been defined as a "moulded solid unit of burned clay, the standard size of which is 2¼ by 8 inches, not specially treated to produce either color or texture." Face brick can be defined as "a solid unit of burned clay specially treated to produce either color or texture." This treatment may consist of varying the process of manufacture, such as scoring the face or repressing the brick. It can also be obtained by different burning methods or by adding substances to the clay to produce special color effects. The grading of common brick varies with the locality. In the metropolitan district, which consists of New York and adjacent territory, bricks are graded as: Light Hard or Salmon Brick; Hard Burned Hudson River Common Brick; and Lammy or Arch Brick. Light Hard or Salmon Brick are brick somewhat underburned and of lighter color than the regular run, but are sufficiently strong for ordinary use, except that they will not stand exposure to the weather. Hard Burned Hudson River Common Brick are the standard brick normally sold, and upon which all market quotations are based. Lammy or Arch Brick are the overburned brick which are often darker in color than the regular run, and are usually misshapen, varying from a slight degree to what are sometimes called "swelled" or "burst" brick. Physically, these brick are equal to the standard brick, except that their shape is distorted, and their use is usually confined to the exterior facing of the building to obtain architectural effects. The demand for these bricks often causes a premium to be placed on them.

Probably the best known common brick is the "Harvard" brick, so called because of its extensive use in the buildings of that university. Harvard brick is a New England common brick, and is a moulded open-yard, water-struck, wood-burned brick, sorted for color and handled with tongs. There is a definite trend back to use of common brick for facing purposes, due to the various architectural effects which are possible with the use of the different grades of common brick. Face brick, as we now know it, is a comparatively modern product, and does not possess the architectural background that common brick possesses, and it is not as economical, either in the cost of the brick itself or in the cost of laying. Many effects can be obtained with common brick by the use of the different bonds of brickwork and the use of different jointing. Instead of using special headers for effect, the heads can be broken off, which will cause a difference of texture and color with the stretcher brick. Investigation will reveal many other effects possible with common brick which will reduce the cost of the work materially.

Face brick is manufactured in various colors and textural effects, and in addition it will vary considerably in physical properties. The specification writer should look carefully into the cost of laying the different types of face brick, as those which have a very low rate of absorption are what a brick layer calls "floaters," and will cost considerably more to lay than brick with a relatively high rate of absorption. It is now becoming generally known that a brick with fair absorptive qualities will help produce a dry wall, due to the fact that it will bond better to the mortar and that the water will mushroom across the face of the brick and allow the heat and sun to absorb the moisture through the brick, whereas a brick of low absorptive value will not bond well to the mortar, and the water will find its way through the mortar joint into the interior, as it cannot be absorbed through the brick. The best grade of face brick is generally selected for color and mechanical properties, brick of one shade and perfect mechanical properties being the most expensive. This class of brick is often desirable for the interior of a building, but it should be used rarely for the exterior facings, due to the fact that it is not considered proper to produce a dead wall of one shade. Also a brick of perfect mechanical properties leaves much to be desired in the texture and general effect of the wall surfaces. With these considerations in mind, much can be saved in the selection of the face brick.

In laying brick, the character of brickwork has considerable to do with the cost of the finished work.

Face brick laid from an outside scaffolding is very much more expensive than brick laid from an inside scaffold, or "overhand brickwork" as it is known in the trade. Face brick should always be laid from outside scaffolds, for the reason that the mason can see what he is doing and can judge the effect of his work. When laying the brick from the inside of the wall, the mason cannot see whether the joints are plumb or not, nor can he judge the effect of the work he is doing. The estimator for brick work is interested to know whether all the headers used in Flemish, English, Dutch or cross bond will be through headers, or whether every third or fourth header will be a through header. It is customary to have the same number of headers in this class of work as would be used in common brickwork, with every sixth course a full header bonded to the backing. Care should be used to carefully specify all special angle brick, ground brick or moulded brick, and exactly where they will occur; if not, the contractor will assume that standard brick clipped on the site will be used for these purposes.

The cost of the different classes of common brick will vary considerably in the locality in which the brick is purchased. It will also vary considerably depending upon the demand for the particular kind of brick. At the present moment in the neighborhood of Newark, Lammy or Arch Brick have been quoted as high as $40 per thousand, when the standard Hard River Brick were being quoted at $18 per thousand delivered at site. The difference in cost of the various classes of common brick is so variable that it should be obtained from local dealers in the different localities. There are some sections of the country where common brick are not selected but are delivered as kiln run, which is just as they come from the kiln without any selection at all. The New England Brick Manufacturers' Association are grading their brick now as Merchantable Brick, consisting of 50 per cent suitable for facing and 50 per cent suitable for backing; Common Face Brick, consisting of brick from the body of the kiln suitable for facing; Selected Common Face Brick, consisting of brick specially selected to meet architects' specifications; and backers, which consist of all brick suitable for backing-up purposes. The grading went into effect January 1, 1928. Face brick will vary considerably in price and to such an extent that it is almost impossible to furnish any definite price data in relation to them. It is, therefore, important that the specification writer consult with the local face brick dealer for information in connection with the prices on face brick.

Cut Stone. There are various types and grades of stone used for building purposes. The type and kind of stone will vary somewhat in the locality in which the stone will be used. Limestone is used to a far greater extent than any other stone for building purposes, and for this reason it will be used as an example of some of the considerations which should be given to the question of cut stone when specifying. There are various grades of limestone. The standard grades are: Select Buff, Select Gray, Standard Buff, Standard Gray, and Variegated. The cost of limestone will vary according to the grade specified, the first named being the most expensive and the other grades in the order listed. There are also some special grades of limestone where unusual veins of stone are encountered in the quarry. A very hard grade of limestone is also quarried, which is suitable for door sills and exterior steps. It is well to keep in touch with the local stone yards so as to be familiar with the price variations between the different grades. All of the grades mentioned, with the exception of the hard limestone, have about the same physical properties, so that the selection of the particular stone for a given purpose should be for effect desired and not on a price basis, unless price is the dominant factor. Variegated stone has been used with considerable success for buildings of Gothic architecture, whereas select buff is more suitable for Classic architecture.

Here is a price list on the different grades of Indiana limestone, and is the cost per cubic foot of the stone in blocks, f. o. b. cars New York:

Grade of Stone	*Scabbled*
Statuary Buff	$1.92
Select Buff	1.67
Standard Buff	1.57
Coarse Buff	1.42
Rustic Buff	1.42
Select Gray	1.57
Standard Gray	1.47
Coarse Gray	1.32
Variegated	1.47
Old Gothic	1.32

Contractors in the metropolitan territory are estimating limestone at about $5.25 per cubic foot for ashlar work and approximately $5.50 for plain moulded work. This will give some idea of the relation that the cost of the stone delivered will have to the cost of the stone in place. The finish of limestone has a bearing on the cost. Stone used just as it comes from the saw or planer is the least expensive, while special hand-tooled effects are the most expensive. Between these two extremes there are many desirable finishes, such as shot sawed; tooled; planer finished, with the edge of the tool broken to create the effect of hand-tooled work when set. Various finishes can be used upon the same building with good effect. About 30 years ago, prior to the general use of machinery for finishing and sawing stone, this work was almost always done by hand, and machine-cut stone was not considered the proper thing among the architects of the day. It was during this period and earlier that rusticated ashlar was in vogue. This type of work would be extremely expensive today, because it would have to be hand-finished after it was sawed, unless there were enough scrap around the quarry to supply the particular demand. When specifying cut stone, it is important to specify who will furnish the anchors. It is also important to specify the thickness of the ashlar and whether the ashlar will be back-checked at the columns, window jambs and corners, or whether the 4-inch ends of the ashlar can show at these points. When electric or other outlets occur on columns, it is important to indicate these on the details and specify that these should be cut or drilled by the stone contractor, which can easily be done at the shop. If these outlets have to be drilled at the site, considerable expense will result.

Carpentry and Mill Work. An investigation should be made of the kinds and grades of timber which are used locally. Wood used extensively in certain localities will be cheaper than in localities where it is not stocked. Along the eastern Atlantic sections, particularly along the shipping points, there is a considerable quantity of Douglas fir timber. In other localities yellow pine will be in demand. Care should be taken that the proper and exact grade for a given purpose is specified and that this grade be according to recognized established grading rules. These rules should be investigated so that the proper grade be selected for a given purpose. The difference in price between Prime long leaf dense yellow pine and Select Structural dense long leaf yellow pine is out of all relation to the quality difference between them. Ninety-nine per cent of Prime would grade as Select Structural. When specifying yellow pine, it is well to specify the locality in which the timber shall be cut. For instance, very little virgin growth yellow pine is cut in the eastern states, with the exception of a small portion of Florida. By far the best pine comes from Mississippi, Louisiana or Texas. The quality difference between this lumber and the second growth lumber in the eastern states may make it well worth while to specify the western lumber, as this is virgin timber having a slower growth, and therefore it is more dense in structure.

The lumber industry maintains what is known as "inspection service," by which at a slight fee the lumber delivered can be re-inspected so that the architect may be sure that the lumber delivered is what is specified. In case of dispute as to the grade of lumber delivered, it is customary to require an inspection, in which case the loser generally pays the cost, which is in the neighborhood of 50 cents a 1000 board feet. Many architects are unfamiliar with the standard sizes of rough lumber as it comes from the saw mills, and do not seem to have a clear idea of the sizes it will be after it is kiln dried and finished ready for the building. Lumber for millwork is sold by the inch, and the price quoted will be per 100 lineal feet, so that when quoting $1.50 an inch for a particular kind of wood, that means $1.50 per square inch of cross section of stock from which the moulding will be cut per 100 lineal feet, and not the cross section of the actual size of the moulding. Therefore, it is very important for the detailer and specification writer to bear in mind standard sizes of finished lumber, which are about as given here.

Rough lumber will be sawed in the mill to the thickness of 5/8 inch, 3/4 inch, 1 inch, 1½ inches, 2 inches, 2½ inches, 3 inches, 4 inches, 6 inches, and in 2-inch units for thicknesses thereafter. The widths will be in units of from 2 inches up to 14 inches, the narrow boards being more numerous than the wide boards. Lengths in lumber will run in even feet from 6 up to 16 feet, though more 8-, 10- and 12-foot lengths can be had than the 14- and 16-foot lengths. The thicknesses of the lumber quoted are in the rough stock as shown. These thicknesses will shrink or work off in the manufacture, so that 1-inch lumber will finish approximately 13/16 inch thick; 2-inch lumber 1¾ inches thick; and 2½ inches thick will be worked from thicker lumber. The shrinkage in width will vary with the different woods, so that when a 7/8-inch moulding is detailed it will require a 1¼-inch stock to produce it. Sash in doors are 1⅜ inches, 1¾ inches, 2¼ inches and 2¾ inches thick. If large quantities of a given moulding are required, it will cost no more to have this moulding detailed and specially run than to use a stock pattern. But if a small quantity of a given moulding is required, it is much better to use a stock pattern in order to save the set-up charges.

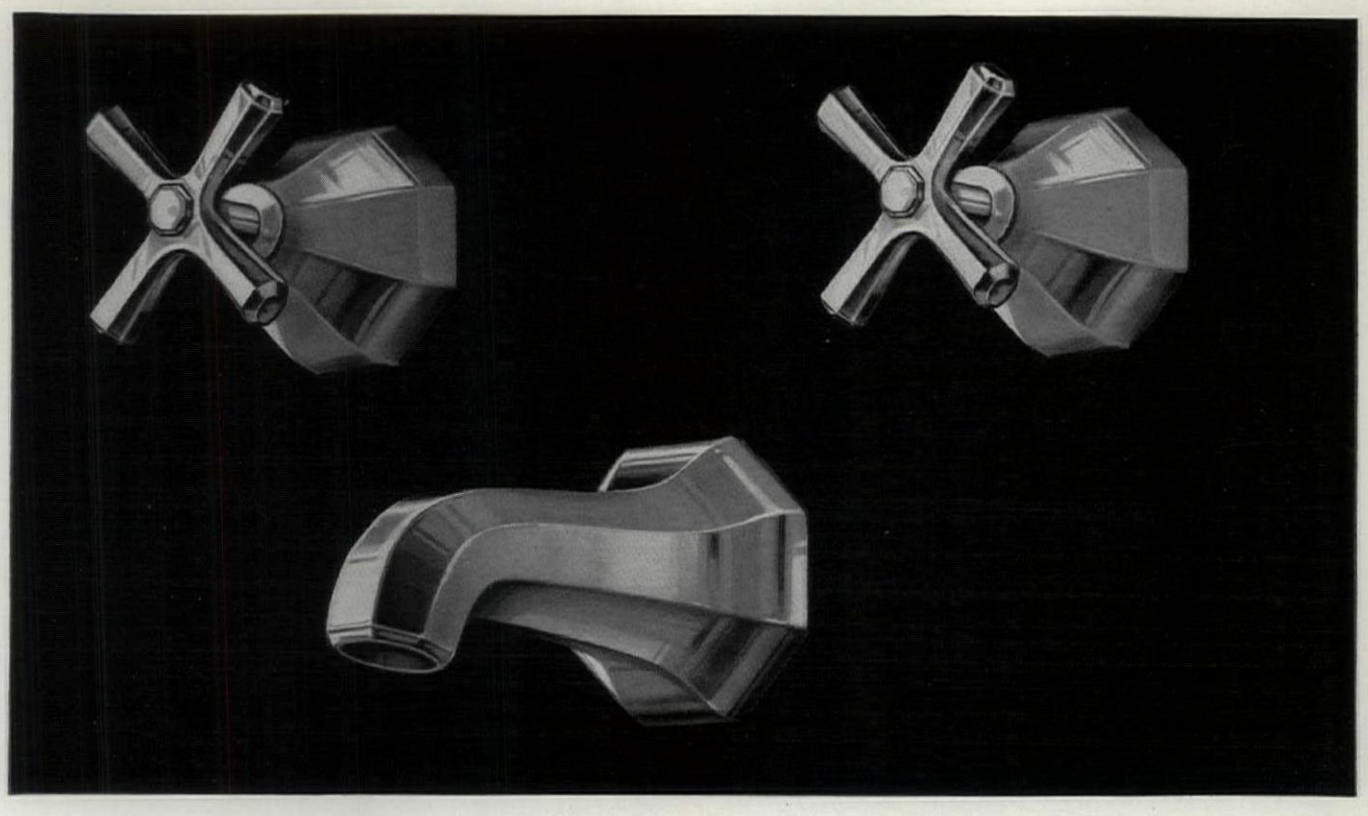
It is unwise to specify that window boxes will be made of clear white pine or cypress throughout, with Georgia pine pulley stiles and parting strips. Such a frame would be a waste of money, the requirement being that the sills, outside mouldings and exposed portions of the box be of white pine; the pulley stiles and parting beads being yellow pine, and the rest of the frame of good, sound, merchantable lumber free from large, loose knots, shakes or similar defects. In specifying the size of the pulleys, it is well to get a sample and lay it over the detail and see whether the center of the sash cord will actually fall in the center of the box. If the pulley is too large or too small, the weight will drag against either side of the boxed frame. I find very few draftsmen who pay any attention to this when detailing. Window frames and sash should always be detailed. Few stock frames and sash are made that are really substantially built and weatherproof. By detailing them, a greater variety of sizes can be obtained as well as a stronger and better frame and sash.

The exact character of interior finish should be clearly specified. The types generally required are: "Straight Mill Run Job," which consists of the trim being delivered in lengths and then put together at the site; a "Made Up Job," which consists of the door jambs, window and door trim, mantels and similar work built complete in the shop and delivered ready to set in place in one unit; a "Mill Cabinet Job," which requires the assembling of fine grade veneering, trim, wainscots, etc., in the mill, building up in complete units, and delivering it at the site where the carpenter sets it up and the painter finishes it; a "Strictly Cabinet Job," which requires the complete construction of all of the woodwork in the shop of the cabinet maker. It also covers the building up of the special veneerings which are required to produce the effect desired.

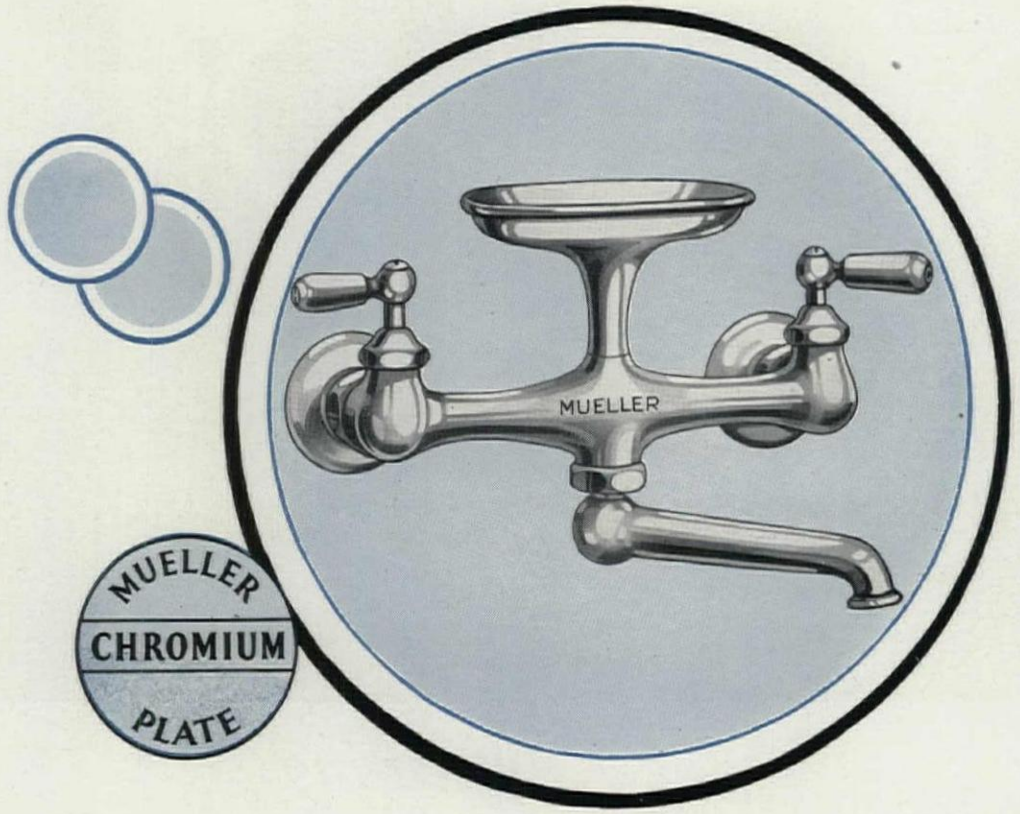
When a fine cabinet project is encountered, it is always well to select the exact flitches of the wood beforehand from a reputable hardwood dealer. These woods are then filed in the architect's office and are referred to by name, grade and sample, so that the cabinet maker will know exactly the type and kind of wood to estimate upon. It is particularly important to take care of this item in rare woods, for the reason that there is a great difference of opinion as to what might be required. For instance, when specifying English Oak the question is whether oak from England is required, in which case a tree is selected in which the sap has stopped running and which is about dead. Wood of this type costs considerably more than what is known as Commercial English Oak, and this same principle rules in more or less degree with all types of hardwood. It is, therefore, important to consult with a hardwood broker and select the exact wood wanted for this type of work, and to obtain comparative prices.

Summary. An attempt has here been made by means of a few examples to give some idea of the different conditions which must be considered before the preparation of a specification for a given trade. The examples by no means cover all of the considerations. They are merely intended to give some idea of the procedure required to establish just what should be used for a given purpose. The specification writer should carefully consider the far-reaching effects of his specifications and should remember that the element of cost can never be disregarded but that it affects the earnings not only of the developer of the project, but the multitude of people in all walks of life who invest in modern mortgage bonds. It also affects the tax-payers in various communities where public buildings are being built. To keep faith with these people and at the same time to erect proper buildings, calls for the very best and for all of the efforts that an architect has at his command. This responsibility must be met and should not be shirked, for if the architect does not rise to leadership and assume this responsibility, it will be assumed by others not as capably trained or as well fitted for the work, to the end that the control of specifying will gradually pass out of the hands of the architect, which will seriously affect the practice of architecture in America.

Jefferson School, Maplewood, N. J.
Guilbert & Betelle, Architects



FAUCETS ARE THE



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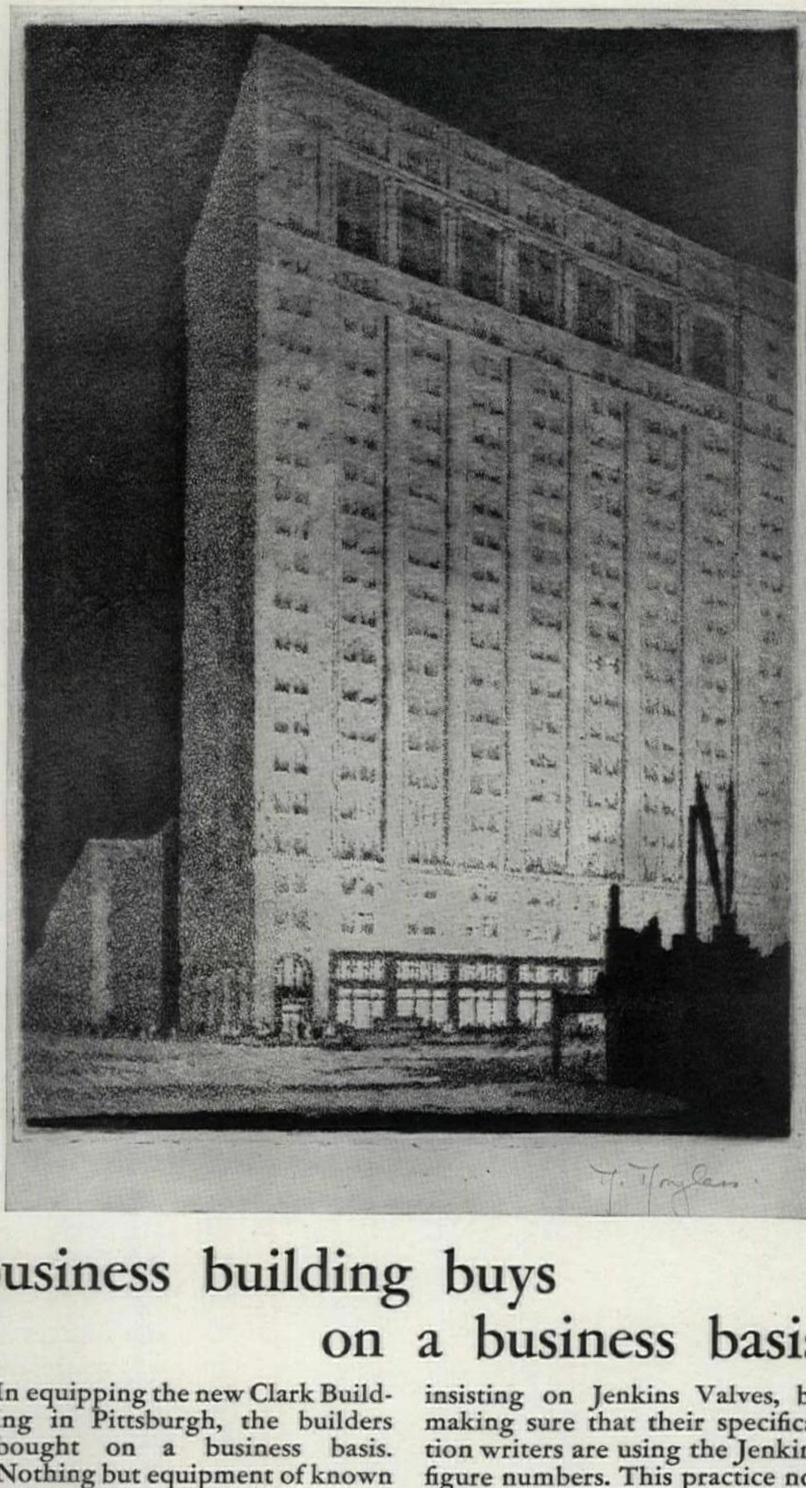

A Donald Douglass Aquatint Study of the Clark Building, Pittsburgh, Pa.

* * *

Architects and Engineers, Hoffman-Henon Co., Philadelphia, Pa.; Heating Contractors, George H. Soffel Co., Pittsburgh, Pa.

A business building buys on a business basis

Fig. 325 Jenkins Standard Iron Body Gate Valve, screwed

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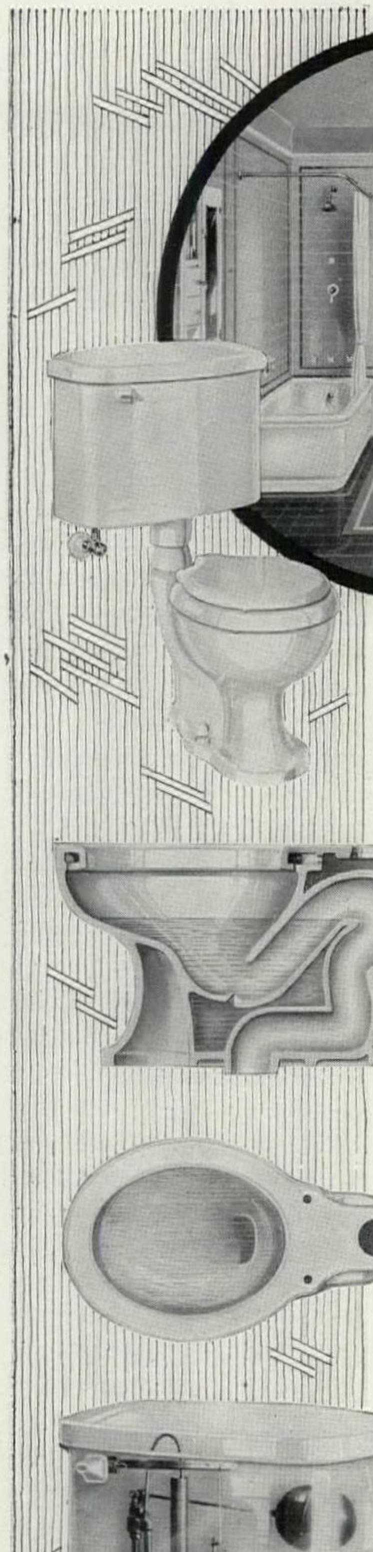

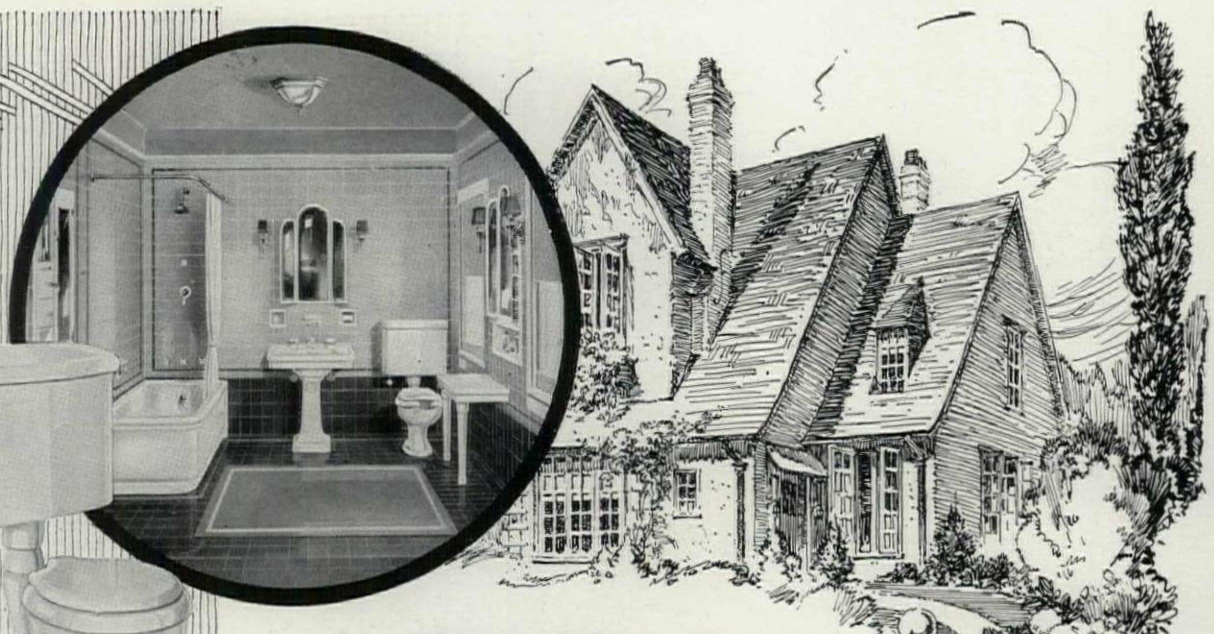
B. A. BAYNA

THE glazed Chinese wall paper in this spirited bathroom was the palette which suggested its color range: The lacquer red of the glass enclosed shower, the peacock green of the tile and the mirror trim, the Sarancolin marble of the gold-legged Neumar lavatory and Neumar dressing table, the Java tan porcelain enamel of the Tarnia bath standing free of the walls. Many other color schemes and a variety of room arrangements are illustrated with pictures and blue prints in *New Ideas for Bathrooms.* A special architect's edition of this handsome helpful book has been prepared, containing forty-eight pages and detailed descriptions and data for twenty out-of-the-ordinary bathrooms. It will be sent to you on request, without any obligation. Ask the Crane branch in your city or write the general office.

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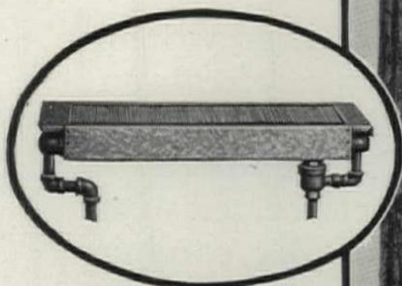

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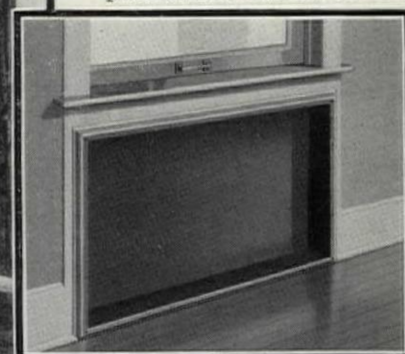

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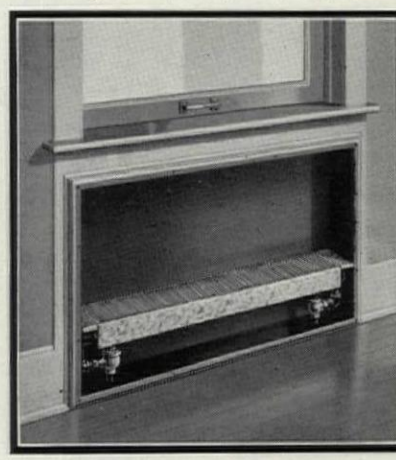

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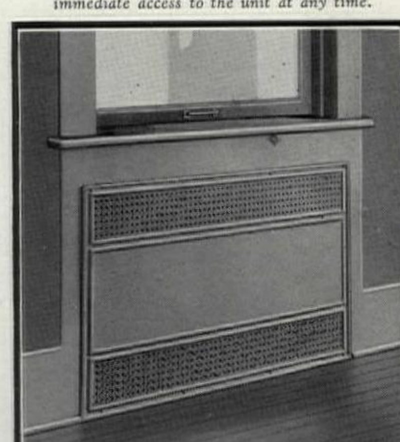

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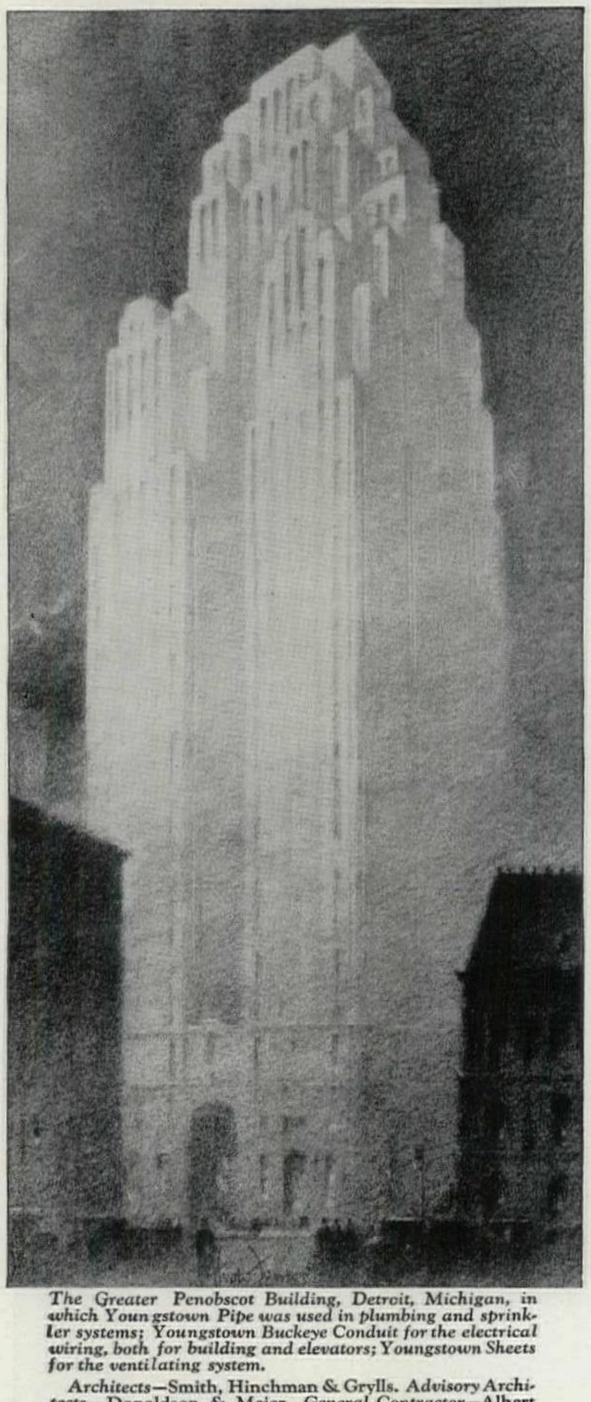

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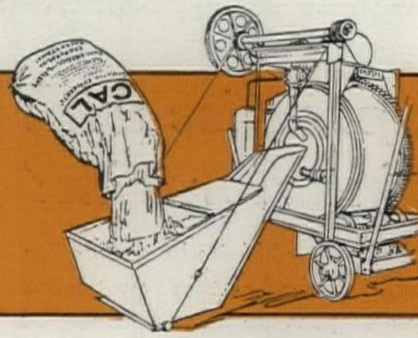
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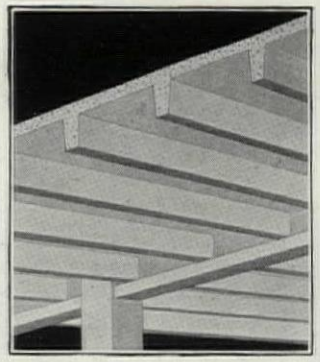
A Ceco Product

MEYER STEELFORMS



Fisher Building, Detroit
Architect—Albert Kahn
Contractors—H. G. Christman-Burke Co.

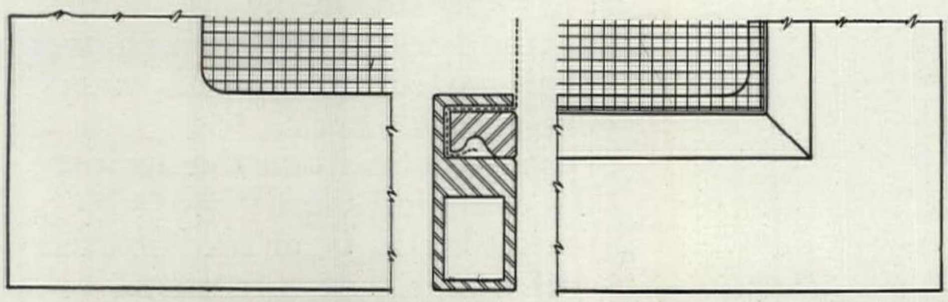
These Remarkable ALUMINUM FRAME *SCREENS* *are as nearly* PERMANENT as it is possible to make Screens because Aluminum Will Not Rust or Corrode

Light-weight—easily handled when stored or put back into windows.

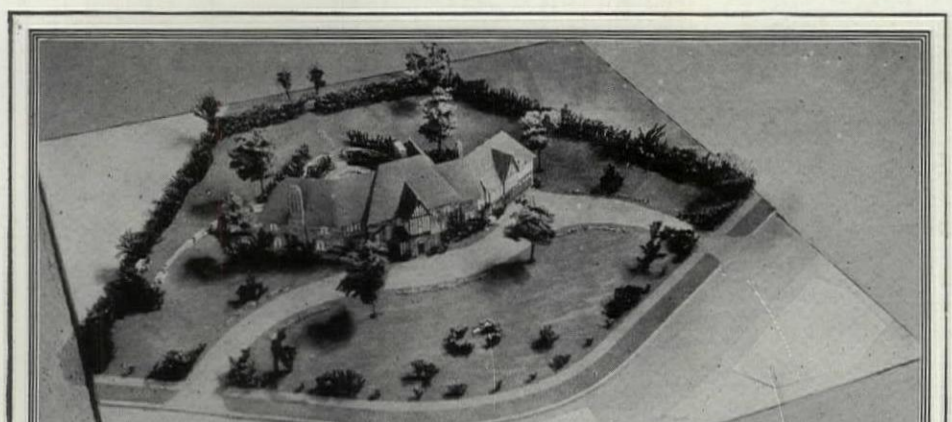
Extruded Aluminum Frame with perfect welded corners.

Installed by Orange Screen Company mechanics. Satisfactory operation guaranteed.

Any finish desired,—bright or dull aluminum, or any applied color.



F. S. Section, and elevations of extruded Aluminum Frame Screen with Welded corners . . . section and elevation at right show mortised lock moulding which holds screen cloth in vise-like grip



MODEL OF THE REV. CHAS. L. CANDEE RESIDENCE, WESTOVER HILLS, WILMINGTON, DEL.

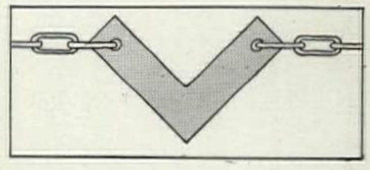
Orange Screens were installed in the Rev. Candee's residence by our own mechanics. Our Aluminum Frame Screens were chosen as the finest screens obtainable, yet their moderate price makes them a logical choice for the smallest cottage.

ORANGE SCREEN COMPANY

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

Orange Aluminum Frame Screens

The alloy used in the manufacture of Orange Aluminum Screens was developed for our use by the Aluminum Company of America, and is exclusive with the Orange Screen Company. It is one of the strongest no-ferrous alloys—lightness, great tensile strength, elasticity, and rigidity—it is unsurpassed for metal screen frame construction.



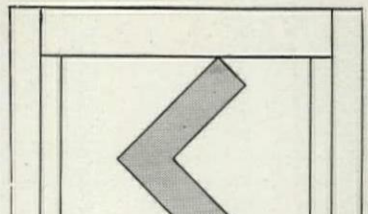
Welded Corner

(sides 3½" long)

Used as a link in a coupling, as shown above, it took a pull of several hundred pounds to distort the aluminum corner, and even then the distortion did not occur at the "weld."

It Won a Contract

A compression test of a similar corner yielded the same gratifying results that were obtained when the "corner" was put under tension. The splendid showing made by our Aluminum frame in this test, conducted by a large industrial firm considering our product, resulted in their placing an order for our screens for their new plant.



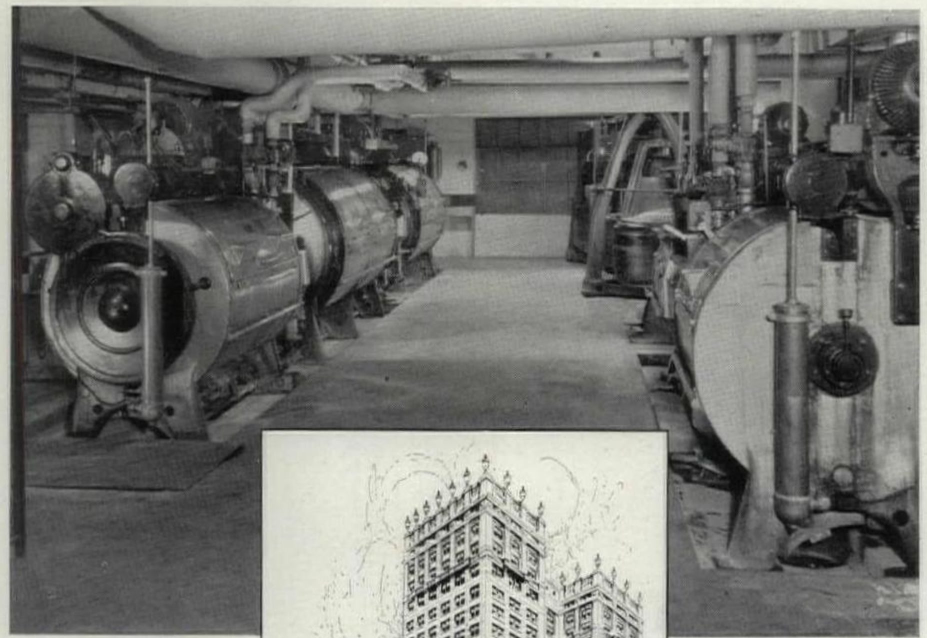
Service and Dependability

Write to our Maplewood, N. J. office for information or estimates and we shall instruct our nearest branch office to take care of your inquiry.

Orange Aluminum Frame Screens are manufactured and sold on a guarantee by the Orange Screen Company, a company which is backed by financial responsibility and 18 years of manufacturing experience.

No. 46 of a series of advertisements featuring prominent laundry installations

A *Complete* Laundry Department *in the* Original *Plans*



FORT SHELBY HOTEL
Detroit, Mich.

The modern, dependable, and all-"American" laundry department in the Fort Shelby Hotel, Detroit, Mich. An indispensable department—planned and installed in collaboration with engineers of The American Laundry Machinery Company

Architect, Albert Kahn, Incorporated, Marquette Bldg., Detroit, Mich.

IT seems to be a matter of general practice nowadays for architects to include a complete laundry department in the original plans for hotels, hospitals, and institutions.

For they know that such a department, operated under the building's own officials, always pays its own way. They know, too, that a surprisingly large number of these laundry departments are "American" equipped—from washers to presses.

The "American" engineers who planned the laundry department in the Fort Shelby Hotel, at Detroit—as well as scores of others, large and small—will be glad to confer with you about institutional laundry practice. They will show you blue-prints and sample layouts—give you helpful information about equipment and floor-space requirements. Surely you will want to avail yourself of this "American" service.

THE AMERICAN LAUNDRY MACHINERY COMPANY
Norwood Station, CINCINNATI, OHIO

THE CANADIAN LAUNDRY MACHINERY CO., LTD.
47-93 Sterling Road, Toronto 3, Ont., Canada

Agents: BRITISH-AMERICAN LAUNDRY MACHINERY CO., LTD.
Underhill St., Camden Town, London, N. W. 1, England

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., 10 x 12½ ins. Important data on a valuable material.
U. S. Gypsum Co., 205 W. Monroe St., Chicago, Ill.
A Scientific Solution of an Old Architectural Problem. Folder 6 pp., 8½ x 11 in. Describes Sabinite Acoustical Plaster.

AIR FILTERS

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

BANK VAULTS

Macomber Steel Co., Canton, Ohio.
Bank Vault Reinforcing. Folder, 8 pp., 8½ x 11 ins. Designing Data and Insurance Rating.

BASEMENT WINDOWS

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

BATHROOM FITTINGS

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

BRICK

American Face Brick Association, 1751 Peoples Life Building, Chicago, Ill.
Brickwork in Italy. 298 pages, size 7½ x 10½ in., an attractive and useful volume on the history and use of brick in Italy from ancient to modern times, profusely illustrated with 69 line drawings, 300 half-tones, and 20 colored plates with a map of modern and XII century Italy. Bound in linen, will be sent postpaid upon receipt of $6.00. Half Morocco, $7.00.
Industrial Buildings and Housing. Bound Volume, 112 pp. 8½ x 11 in. Profusely illustrated. Deals with the planning of factories and employes' housing in detail. Suggestions are given for interior arrangements, including restaurants and rest rooms. Price $2.
Common Brick Mfrs. Assn. of America, 2134 Guarantee Title Bldg., Cleveland.
Brick; How to Build and Estimate. Brochure, 96 pp., 8½ x 11 ins. Illustrated. Complete data on use of brick.
The Heart of the Home. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Price 25 cents. Deals with construction of fireplaces and chimneys.
Skintled Brickwork. Brochure, 15 pp., 8½ x 11 ins. Illustrated. Tells how to secure interesting effects with common brick.
Building Economy. Monthly magazine, 22 pp., 8½ x 11 ins. Illustrated. $1 per year, 10 cents a copy. For architects, builders and contractors.

CEMENT

Carney Company, The, Mankato, Minn.
A Remarkable Combination of Quality and Economy. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on valuable material.
Cement Gun Company, Inc., Allentown, Pa.
Gunite Bulletins. Sheet 6 x 9 in. Illustrated. Bulletins on adaptability of "Gunite," a sand and cement product, to construction work.
International Cement Corporation, New York.
Incor Cement. Brochure, 12 pp., 8½ x 11 ins. Illustrated. Data on a perfected, early strength Portland cement.
Kosmos Portland Cement Company, Louisville, Ky.
Kosmotar for Enduring Masonry. Folder, 6 pp., 3½ x 6½ in. Data on strength and working qualities of Kosmortar.
Kosmortar, the Mortar for Cold Weather. Folder, 4 pp., 3⅜ x 6½ in. Tells why Kosmortar should be used in cold weather.
Lawrence Cement Co., New York, Boston and Philadelphia.
Dragon Super Cement. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Data on a vaduable waterproof material.
Louisville Cement Co., 315 Guthrie St., Louisville, Ky.
BRIXMENT for Perfect Mortar. Self-filing handbook 8½ x 11 inches. 16 pp. Illustrated. Contains complete technical description of BRIXMENT for brick, tile and stone masonry, specifications, data and tests.
North American Cement Corporation, 285 Madison Ave., New York.
The Cal Boon. Brochure. 32 p. 6 x 9 ins. Illustrated. Use of Cal in Portland Cement mixtures.
Pennsylvania-Dixie Cement Corp'n., 131 East 46th St., New York.
Celluloid Computing Scale for Concrete and Lumber, 4⅝ x 2½ ins. Useful for securing accurate computations of aggregates and cement; also for measuring lumber of different sizes.
Portland Cement Association, Chicago.
Concrete Masonry Construction. Booklet, 47 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.

CEMENT—Continued

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

CONCRETE BUILDING MATERIALS

Celite Products Company, Chicago, New York, Los Angeles.
Designing Concrete for Workability as Well as Strength. Brochure. 8 pp. Illustrated. Data on how improved workability in concrete is secured without excessive quantities of water.
Better Concrete; Engineering Service Bulletin X-325. Booklet, 16 pp., 8½ x 11 ins. Illustrated. On use of Celite to secure workability in concrete, to prevent segregation and to secure water-tightness.
Economic Value of Admixtures. Booklet, 32 pp., 6⅛ x 9⅛ ins. Reprint of papers by J. C. Pearson and Frank A. Hitchcock before 1924 American Concrete Institute.
Concrete Surface Corporation, 342 Madison Ave., New York.
Bonding Surfaces on Concrete. Booklet, 12 pp., 8 x 11 in., illustrated. Deals with an important detail of building.
Dovetail Anchor Slot Co., 149 West Ohio St., Chicago.
Dovetail Masonry Anchoring System. Folder, 4 pp., 8½ x 11 ins. Illustrated. Data on a system of anchoring masonry to concrete.
Kosmos Portland Cement Company, Louisville, Ky.
High Early Strength Concrete, Using Standard Kosmos Portland Cement. Folder, 1 p., 8½ x 11 in. Complete data on securing high strength concrete in short time.

CONCRETE COLORINGS

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

CONSTRUCTION, FIREPROOF

Master Builders Co., Cleveland, Ohio.
Color Mix. Booklet, 18 pp., 8½ x 11 ins. Illustrated. Valuable data on concrete hardener, waterproofer and dustproofer in permanent colors.
National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Fire Proofing Bulletin 171. 8½ x 11 in. 32 pp. Illustrated. A treatise on fireproof floor construction.
Northwestern Expended Metal Co., 1234 Old Colony Building, Chicago, Ill.
Northwestern Expanded Metal Products. Booklet. 8½ x 10¾ in. 16 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plaster-Sava and Longspan lath channels, etc.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins., contains actual samples of several materials and complete data regarding their use.

DAMPPROOFING

Philip Carey Co., Lockland, Cincinnati, Ohio.
Architects' Specifications for Carey Built-Up Roofing. Booklet. 8 x 10¾ in. 24 pp. Illustrated. Complete data to aid in specifying the different types of built-up roofing to suit the kind of roof construction to be covered.
Carey Built-Up Roofing for Modern School Buildings. Booklet 8 x 10¾ in. 32 pp. Illustrated. A study of school buildings of a number of different kinds and the roofing materials adapted for each.
Genfire Steel Company, Youngstown, Ohio.
Waterproofing Handbook. Booklet. 8½ x 11 ins. 80 pp., A. I. A. File No. 7. Illustrated. Thoroughly covers subject of waterproofing concrete, wood and steel preservatives, dusting and hardening concrete floors, and accelerating the setting of concrete. Free distribution.
The Master Builders Co., 7016 Euclid Ave., Cleveland.
Waterproofing and Damp Proofing Specification Manual. Booklet. 18 pp. 8½ x 11 in. Deals with methods and materials used.
Waterproofing and Damp Proofing. File. 36 pp. Complete descriptions and detailed specifications for materials used in building with concrete.
Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.
Specification Sheet, 8½ x 11 in. Descriptions and specifications of compounds for dampproofing interior and exterior surfaces.
The Vortex Mfg. Co., Cleveland, Ohio.
Par-Lock Specification "Forms A and B" for dampproofing and plaster key over concrete and masonry surfaces.
Par-Lock Specification "Form J" for dampproofing tile wall surfaces that are to be plastered.
Par-Lock Dampproofing. Specification Forms C. F. I. and J. Sheets 8½ x 11 ins. Data on gun-applied asphalt dampproofing for floors and walls.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 173*

DOORS AND TRIM, METAL

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

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

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 in. 60 pp. Illustrated.
Catalog and pamphlets, 8½ x 11 in. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT

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

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

General Electric Co., Schenectady, N. Y.
"Electrical Specification Data for Architects. Brochure, 36 pp., 8 x 10½ ins., illustrated. Data regarding G. E. wiring materials and their use.
"The House of a Hundred Comforts." Booklet, 40 pp., 8 x 10½ ins. Illustrated. Dwells on importance of adequate wiring.

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

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

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Power for Buildings. Brochure, 14 pp., 8½ x 11 ins. Illustrated. A publication important to architects and engineers.
Variable-Voltage Central Systems as applied to Electric Elevators. Booklet, 13 pp., 8½ x 11 ins. Illustrated. Deals with an important detail of elevator mechanism.
Modern Electrical Equipment for Buildings. Booklet, 8½ x 11 ins. Illustrated. Lists many useful appliances.
Electrical Equipment for Heating and Ventilating Systems. Booklet, 24 pp., 8½ x 11 ins. Illustrated. This is "Motor Application Circular 7379."
Westinghouse Panelboards and Cabinets (Catalog 42-A). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Important data on these details of equipment.
Beauty; Power; Silence; Westinghouse Fans (Dealer Catalog 45). Brochure, 16 pp., 8½ x 11 ins. Illustrated. Valuable information on fans and their uses.
Electric Range Book for Architects (A. I. A. Standard Classification 31 G-4). Booklet, 24 pp., 8½ x 11 ins. Illustrated. Cooking apparatus for buildings of various types.
Westinghouse Commercial Cooking Equipment (Catalog 280). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Equipment for cooking on a large scale.
Electric Appliances (Catalog 44-A). 32 pp., 8½ x 11 ins. Deals with accessories for home use.

ELEVATORS

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

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

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.

FIREPROOFING—Continued

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

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

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

FLAGSTONES

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

FLOOR HARDENERS (CHEMICAL)

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

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

FLOORS—STRUCTURAL

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

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

FLOORING

Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Armstrong's Cork Tile Floors. Booklet, 7¾ x 10½ in. 30 pp. An illustrated work on cork flooring.
Linotile for Home Floors. Brochure. 7½ x 10½ ins. 27 pp. and colored enclosures of floor installations.

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog. 8½ x 11 in. 40 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors.
Armstrong's Linoleum Pattern Book, 1927. Catalog. 3½ x 6 in. 272 pp. Color Plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.
Quality Sample Book. 3½ x 5¾ in. Showing all gauges and thicknesses in the Armstrong line of linoleums.
Linoleum Layer's Handbook. 5 x 7 in. 32 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.
Enduring Floors of Good Taste. Booklet. 6 x 9 in. 48 pp. Illustrated in color. Explains use of linoleum for offices, stores, etc., with reproductions in color of suitable patterns, also specifications and instructions for laying.

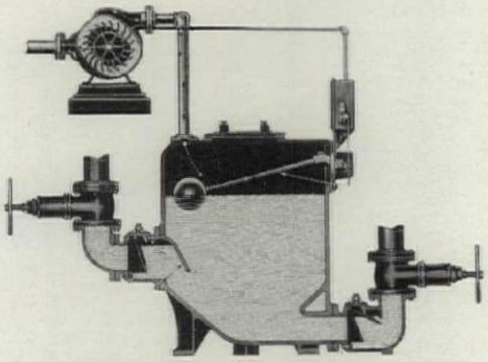
Barber Asphalt Co., Philadelphia.
Specifications for Applying Genasco Asphalt Mastic. Booklet. 8 x 10½ in. Directions for using Asphalt Mastic for flooring.

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

Bonded Floors Company, Inc., 1421 Chestnut St., Philadelphia, Pa.
A series of booklets, with full color inserts showing standard colors and designs. Each booklet describes a resilient floor material as follows:
Battleship Linoleum. Explains the advantages and uses of this durable, economical material.
Marble-ized (Cork Composition) Tile. Complete information on cork-composition marble-ized tile and the many artistic effects obtainable with it.
Treadlite (Cork Composition) Tile. Shows a variety of colors and patterns of this adaptable cork composition flooring.
Natural Cork Tile. Description and color plates of this super-quiet, resilient floor.
Practical working specifications for installing battleship linoleum, cork composition tile and cork tile.

Carter Bloxonend Flooring Co., Keith & Perry Bldg., Kansas City, Mo.
Bloxonend Flooring. Booklet 3¼ x 6¼ in. 20 pp. Illustrated. Describes uses and adaptability of Bloxonend Flooring to concrete, wood or steel construction, and advantages over loose wood blocks.
File Folder, 9¾ x 11¼ in. For use in connection with A. I. A. system of filing. Contains detailed information on Bloxonend Flooring in condensed, loose-leaf form for specification writer and drafting room. Literature embodied in folder includes standard Specification Sheet covering the use of Bloxonend in general industrial service and Supplementary Specification Sheet No. 1, which gives detailed description and explanation

No air valves! to complicate the operation of the ejector



Sectional view of the Jennings Sewage Ejector, complete with compressor. Supplied in capacities to 1500 g.p.m. Heads to 50 feet.

THE Jennings Sewage Ejector is of the pneumatic type. That is, air, compressed to the necessary working pressure by a Nash Hytor Compressor, is used as the motive power to pump the accumulated sewage from a pot to the sewer.

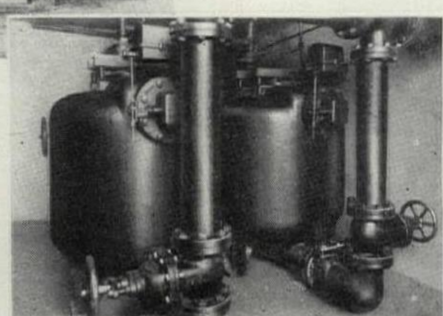
Two distinctive improvements in ejector design are to be noted. Air is compressed, delivered, and used *only when* required. There is no air storage tank. Nor any need for one.

Air valves are avoided. At best, such valves are intricate devices likely to get out of order. They are known to leak during idle periods, causing a serious waste of costly high pressure air. The use of high pressure air reduced for low pressure ejector service is an inefficient practice.

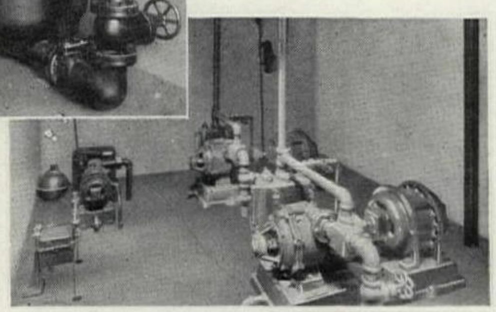
By avoiding complicated air valves and the difficulties they involve, the Jennings Sewage Ejector makes possible simpler, more economical operation. Write for Bulletin 67.

THE NASH ENGINEERING CO.
12 Wilson Road, So. Norwalk, Conn.

A typical installation in a suburban community.



Each of these two units has 150 g.p.m. capacity.



Nash Hytor Air Compressors supply compressed air to Jennings Sewage Ejectors.

Bulletins promptly mailed on request. State whether you are interested in: return line and air line heating pumps — condensation pumps — compressors and vacuum pumps for air and gases — standard and suction centrifugal pumps — house service pumps — sewage ejectors — sump pumps.

Jennings Pumps

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

FLOORING—Continued

of an approved method for installing Bloxonend in gymnasiums, armories, drill rooms and similar locations where maximum resiliency is required.

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

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

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

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

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

United States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 119 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.
Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

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

FURNITURE

American Seating Co., 14 E. Jackson Blvd., Chicago, Ill.
Ars Ecclesiastica Booklet. 6 x 9 in. 48 pp. Illustrations of church fitments in carved wood.
Theatre Chairs. Booklet. 6 x 9 in. 48 pp. Illustrations of theater chairs.

Kensington Mfg. Company, Showrooms, 41 West 45th St., New York.
Illustrated booklet indicative of the scope, character and decorative quality of Kensington Furniture, with plan of co-operation with architects, sent on request.
Photographs and full description of hand-made furniture in all the period styles, furnished in response to a specific inquiry.

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

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

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

White Door Bed Company, The, 130 North Wells Street, Chicago, Ill.
Booklet. 8½ x 11 in. 20 pp. Illustrated. Describes and illustrates the use of "White" Door Bed and other space-saving devices.

GARAGES

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

GLASS CONSTRUCTION

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

Libbey-Owens Sheet Glass Co., Toledo, O.
Flat Glass. Brochure, 11 pp., 5⅛ x 7⅝ ins. Illustrated. History of manufacture of flat, clear, sheet glass.

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

GREENHOUSES

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

HARDWARE

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

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

McKinney Mfg. Co., Pittsburgh.
Forged Iron by McKinney. Booklet, 6 x 9 ins. Illustrated. Deals with an excellent line of builders' hardware.

HARDWARE—Continued

Forged Lanterns by McKinney. Brochure, 6 x 9 ins. Illustrated. Describes a fine assortment of lanterns for various uses.

Richard-Wilcox Mfg. Co., Aurora, Ill.
Distinctive Garage Door Hardware. Booklet. 8½ x 11 in. 65 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.
Distinctive Elevator Door Hardware. Booklet, 89 pp., 16 x 10½ ins. Illustrated.

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

HEATING EQUIPMENT

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

American Radiator Company, The, 40 West 40th St., N. Y. C.
Ideal Boilers for Oil Burning. Catalog 5⅛ x 8½ in. 36 pp. Illustrated in 4 colors. Describing a line of Heating Boilers especially adapted to use with Oil Burners.
Corto—The Radiator Classic. Brochure 5⅛ x 8½ in. 16 pp. Illustrated. A brochure on a space-saving radiator of beauty and high efficiency.
Ideal Arcola Radiator Warmth. Brochure 6¼ x 9¼. 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., 5¼ 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.

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

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

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

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

Illinois Engineering Co., Racine Ave., at 21st St., Chicago, Ill.
Vapor Heat Bulletin 21. 8½ x 11 in. 32 pp. Illustrated. Contains new and original data on Vapor Heating. Rules for computing radiation, pipe sizes, radiator tappings. Steam table showing temperature of steam and vapor at various pressures, also description of Illinois Vapor Specialties.

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

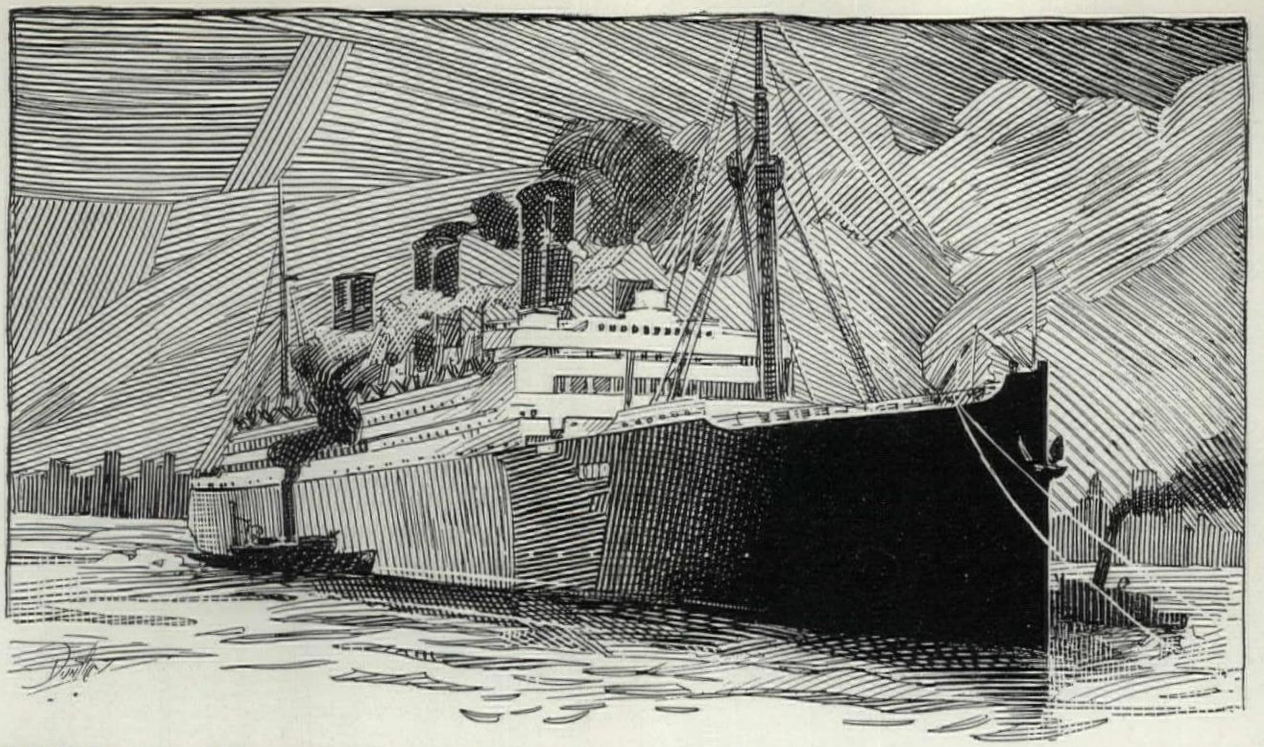
Kewanee Boiler Corporation, Kewanee, Ill.
Kewanee on the Job. Catalog. 8½ x 11 in. 80 pp. Illustrated. Showing installations of Kewanee boilers, water heaters, radiators, etc.
Catalog No. 78, 6 x 9 in. Illustrated. Describes Kewanee Firebox Boilers with specifications and setting plans.
Catalog No. 79.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

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

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

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

Molby Boiler Co., Inc., New York and Lansdale, Pa.
Molby Heating Boiler. Booklet, 24 pp., 4 x 9 ins. Illustrated. Deals with well known line of boilers.



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The motor element in all Sylphon Instruments is the most accurate, durable and flexible temperature control unit known to science.

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Sylphon Automatic Control of temperatures or pressures of air, liquids or gases has proven itself an economic necessity and has been *an important factor* in the promotion of human health and comfort and industrial progress.

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The name Sylphon on a Temperature or Pressure Regulator is an assurance of *positive, safe and everlasting efficiency.* It signifies a guarantee backed by the resources of the largest manufacturer of thermostatic instruments in the world.

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They provide safe control of fuel oil burners, and the Sylphon Damper Regulator, now factory equipment on thirty-five leading makes of boilers, affords comfort and fuel saving in countless homes.

Some possible application of Sylphon Temperature or Pressure regulation comes to your mind. Let our engineers assist in solving your particular problem—all without obligation on your part. We welcome correspondence. Just mail coupon or write if you prefer.

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THE FULTON SYLPHON COMPANY Sylphon AUTOMATIC TEMPERATURE CONTROL

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 176*

HEATING EQUIPMENT—Continued

Chimney Construction. Booklet, 26 pp., 6 x 9 ins. Data recommended by National Board of Fire Underwriters.

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

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

Petroleum Heat & Power Co., 511 Fifth Avenue, New York.
Heating Homes the Modern Way. Booklet, 8½ x 11¾ ins. Illustrated. Data on the Petro Burner.
Residence Oil Burning Equipment. Brochure, 6 pp., 8½ x 11 ins. Illustrated. Data regarding Petro Burner in a bulletin approved by Investigating Committee of Architects and Engineers.
Petro Mechanical Oil Burner & Air Register. Booklet, 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.

Reznor Mfg. Co., Mercer, Pa.
Heating by the Ultimate Method. Folder, 4 pp., 8½ x 11 ins. Illustrated. Data on gas heating.

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

HOSPITAL EQUIPMENT

The Frink Co., Inc., 24th St. and Tenth Ave., New York City.
Catalog 426. 7 x 10 in., 16 pp. A booklet illustrated with photographs and drawings, showing the types of light for use in hospitals, as operating table reflectors, linolite and multilite concentrators, ward reflectors, bed lights and microscopic reflectors, giving sizes and dimensions, explaining their particular fitness for special uses.

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

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

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

HOTEL EQUIPMENT

Pick & Company, Albert, 208 West Randolph Street, Chicago, Ill.
Some Thoughts on Furnishing a Hotel. Booklet, 7½ x 9 ins. Data on complete outfitting of hotels.

INCINERATORS

Home Incinerator Co., Milwaukee, Wis.
The Decent Way. Brochure, 30 pp., 5¼ x 7¼ ins. Illustrated. Equipment for residence use.
A. I. A. File. 12 pp., 8¾ x 10¾ ins. Specifications for incinerators.

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. 8 pp. Illustrated. Describes principle and design of Kernerator-Chimney-fed Incinerator for apartments and gives list of buildings where it ahs been installed.
Sanitary Disposal of Waste in Hospitals. Booklet. 4 x 9 ins. 12 pp. Illustrated. Shows how this necessary part of hospital service is taken care of with the Gernerator. Gives list of hospitals where installed.

INSULATING LUMBER

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

INSULATION

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

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

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

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

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

JOISTS

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

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

KITCHEN EQUIPMENT

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

McDougall Company, Frankfort, Ind.
Kitchens for Homes and Apartments. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Views and plans of conveniently equipped kitchens.
File Folder. Service sheets and specifications useful in preparing kitchen layouts.
Domestic Science Kitchen Units. Brochure, 8 pp., 8½ x 11 ins. Illustrated. Deals with flexible line of kitchen equipment.

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

LABORATORY EQUIPMENT

Alberene Stone Co., 153 West 23rd Street, New York City
Booklet 8¾ x 11¼ in., 26 pp. Stone for laboratory equipment, shower partitions, stair treads, etc.

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

LANTERNS

Todhunter, Arthur, 119 E. 57th St., New York.
Hand Wrought Lanterns. Booklet, 5¼ x 6¾ in. 20 pp. Illustrated in Black and White. With price list. Lanterns appropriate for exterior and interior use, designed from old models and meeting the requirements of modern lighting.

LATH, METAL AND REINFORCING

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

National Steel Fabric Co., Pittsburgh.
Better Walls for Better Homes. Brochure. 16 pp. 7¾ x 10¾ ins. Illustrated. Metal lath, particularly for residences.
Steeltex for Floors. Booklet. 24 pp. 8½ x 11 ins. Illustrated. Combined reinforcing and form for concrete or gypsum floors and roofs.
Steeltex Data Sheet No. 1. Folder. 8 pp. 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with round top chords.
Steeltex Data Sheet No. 2. Folder. 8 pp. 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with flat top flanges.
Steeltex Data Sheet No. 3. Folder. 8 pp. 8½ x 11 ins. Illustrated. Steeltex for folders on wood joists.

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

Insulation of Roofs a Profitable Investment

ONE of the advantages of insulating a roof with Armstrong's Corkboard is the protection it affords the top floor from summer heat.

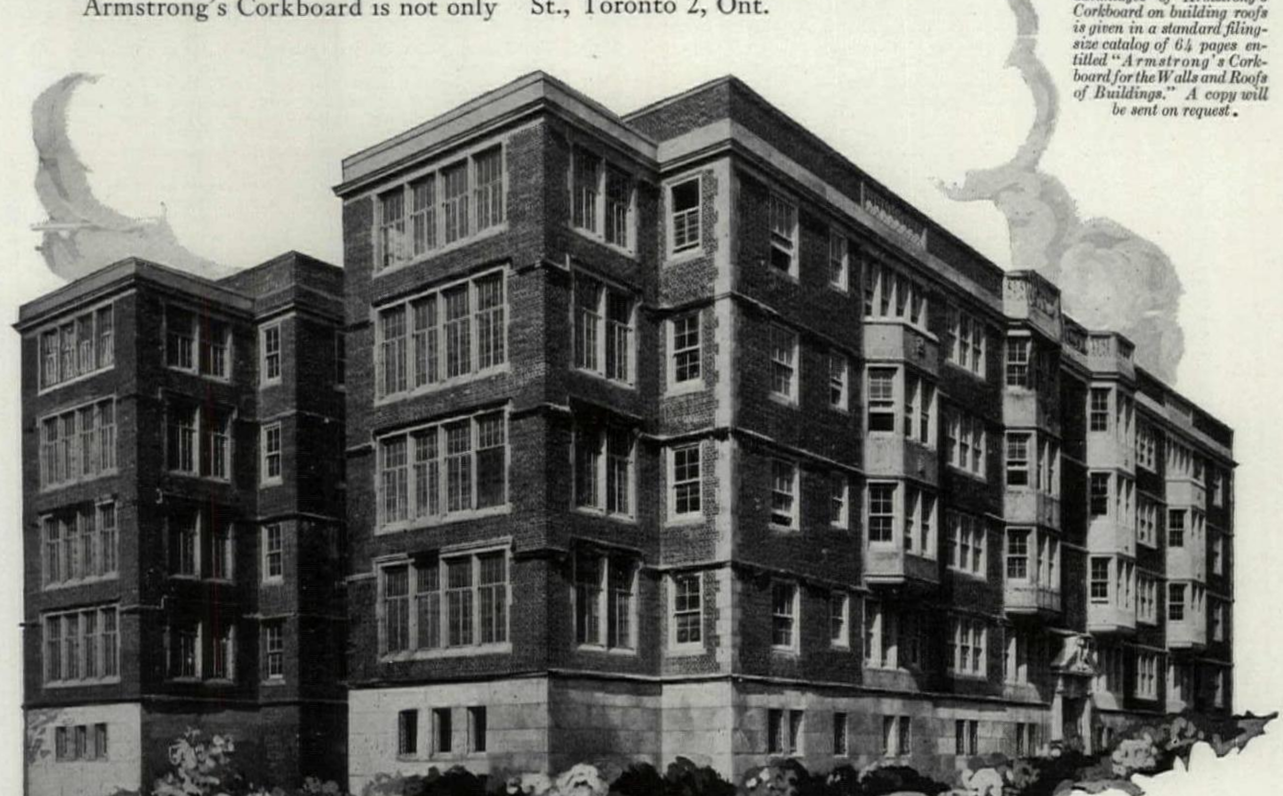
This feature is of particular importance in office buildings and apartment houses where the space under the roof is used for offices or living rooms. Ordinary roofings have little resistance to the transmission of heat, and air spaces between the roof and the ceiling are of little value. As a result, top floors are usually unbearably hot in summer, a totally unnecessary condition which can be easily corrected by insulating the roof with a single layer of Armstrong's Corkboard.

The insulation of roofs with Armstrong's Corkboard is not only a distinct advantage, but a profitable investment financially. It makes top floors comfortable winter and summer and, therefore, desirable the year round, and increases their rental value.

An important consideration in the insulation of such roofs is the specification of an adequate thickness which should be from 1 to 2 inches. Corkboard insulation has this advantage, that it is made in 1, 1½, and 2-inch thicknesses and can, therefore, be applied in a single operation and at low labor cost as compared with thin materials built up to these thicknesses. Armstrong Cork & Insulation Company, 132 Twenty-fourth St., Pittsburgh, Pa.; McGill Bldg., Montreal; 11 Brant St., Toronto 2, Ont.

For Your Files

Complete information regarding the use and resultant advantages of Armstrong's Corkboard on building roofs is given in a standard filing-size catalog of 64 pages entitled "Armstrong's Corkboard for the Walls and Roofs of Buildings." A copy will be sent on request.



Briggs Apartment Building, Detroit, Mich. Insulated with 11,000 square feet of Armstrong's Corkboard. Albert Kahn, architect

Armstrong's Corkboard Insulation

for the Roofs of All Kinds of Buildings

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 178*

LATH, METAL AND REINFORCING—Continued

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

Truscon Steel Company, Youngstown, Ohio.
Truscon ¾-inch Hy-Rib for Roofs, Floors and Walls. Booklet, ½ x 11 in., illustrating Truscon ¾-inch Hy-Rib as used in industrial buildings. Plates of typical construction. Progressive steps of construction. Specification and load tables.

LAUNDRY CHUTES

The Pfaudler Company, 217 Cutler Building, Rochester, N. Y.
Pfaudler Glass-Lined Steel Laundry Chutes. Booklet, 5⅜ x 7⅜ in. 16 pp. Illustrated. A beautifully printed brochure describing in detail with architects' specifications THE PFAUDLER GLASS LINED STEEL LAUNDRY CHUTES. Contains views of installations and list of representative examples.

LAUNDRY MACHINERY

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

LIBRARY EQUIPMENT

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

LIGHTING EQUIPMENT

The Frink Co., Inc., 24th St. and 10th Ave., New York City.
Catalog 415. 8½ x 11 in. 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screen and partition reflectors, double and single desk reflectors and Polaralite Signs.

Gleason-Tiebout Glass Co. (Celestialite Division), 200 Fifth Avenue, New York.
Next to Daylight Brochure, 19 pp., 4 x 8½ ins. Illustrated. Deals with a valuable type of lighting fixture.
Celestialite Circular No. 40. Folder, 4 pp., 3½ x 6 ins. "What Nature does to the Sun, Celestialite does to the Mazda lamp."
Attractive Units in Celestialite. Folder, 12 pp., 3¼ x 6½ ins. Illustrates Decorated Celestialite Units.
It Has Been Imitated. Folder, 4 pp., 10 x 13 ins. Data in an important detail of lighting equipment.

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.

LUMBER

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

MAIL CHUTES

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

MANTELS

Arthur Todhunter, 119 E. 57th St., New York, N. Y.
Georgian Mantels. New Booklet. 24 pp. 5¼ x 6¼ in. A fully illustrated brochure on eighteenth century mantels. Folders give prices of mantels and illustrations and prices of fireplace equipment.

MARBLE

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

MEMORIALS

Georgia Marble Company, Tate, Ga.
Today for Tomorrow. Bound volume, 77 pp., 9½ x 12½ ins. Lavishly illustrated.

METALS

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

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodword. Standardized Book. 9 x 11½ in. 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.
Better Built Homes. Vols. XV-XVIII incl. Booklet. 9 x 12 in. 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.
Curtis Details. Booklet, 19¾ x 23½ in. 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.

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

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

MILL WORK—Continued

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

MORTAR AND CEMENT COLORS

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

ORNAMENTAL PLASTER

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

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

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

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

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

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

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

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

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

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

PAPER

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

PARTITIONS

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

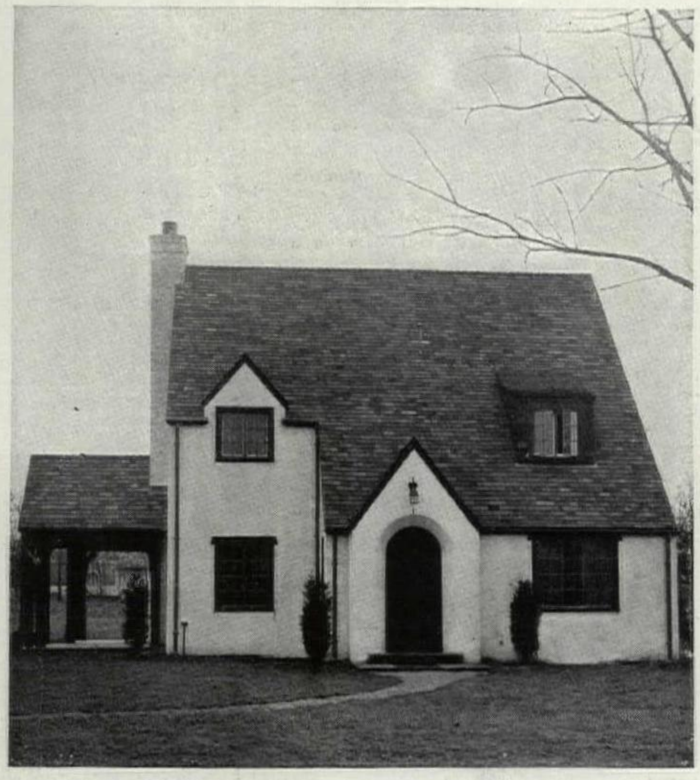
Hauserman Company, E. F., Cleveland, Ohio.
Hollow Steel Standard Partitions. Various folders, 8½ x 11. Illustrated. Give full data on different types of steel partitions, together with details, elevations and specifications.

Improved Office Partition Company, 25 Grand St., Elmhurst, L. I.
Telesco Partition. Catalog. 8¾ x 11 in. 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions, cuts of finished partition units in various woods. Gives specifications and cuts of buildings using Telesco.
Detailed Instructions for erecting Telesco Partitions. Booklet. 24 pp. 8½ x 11 in. Illustrated. Complete instructions, with cuts and drawings, showing how easily Telesco Partition can be erected.

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

U. S. Gypsum Co., Chicago.
Pyrobar Partition and Furring Tile. Booklet. 8½ x 11 in. 24

Where HIGH PRAISE *does not imply a high price*



Know Electrol by the Homes It Heats

The attractive small home of Mr. Arthur Moore, 18 Summit Drive, Manhasset, Long Island.

The fine things which owners and architects are saying about the Electrol Automatic Oil Burner might imply that it is high in price. . . . Such is not the case.

Electrol is priced within reach of all. Regardless of the size of your client's home or purse, there is an Electrol that sells at a price he can afford. A model for every heating requirement.

You undoubtedly know that automatic oil heat, in its highest development, supplies a degree of home comfort far ahead of other heating methods—with conveniences which are almost priceless. . . . But if your mind still carries any unanswered questions on oil heating, a careful consideration of Electrol features and records of performance will give you a new conception of how dependable an oil burner can be. Quiet. Economical in operation. All-Electric. . . . Entirely automatic. Never the need to turn a hand—yet every room always at the desired temperature, no matter how cold or changeable the weather.

The Oil Burner with The Master Control

Electrol, with its *Master Control*, has made dependable automatic heat a certainty. *The Master Control* watches over every phase of the burner's operation day and night, like a living sentinel, regulating the flow of oil, timing the ignition and governing combustion.

Wherever Electrol is sold you will find a complete oil heating service backed by a sound, large and growing manufacturing organization. Whenever you specify Electrol you know that the burner will be correctly installed. The men who do the work have been carefully trained at the factory.

Purchase of Electrol can be financed along with the financing of the new building. . . . Let us send you the Electrol Regulation A. I. A. Folder containing full information and all details on Electrol Oil Burners. Or, if you prefer, consult the Electrol Sales and Service Representative in your city. Electrol, Inc. *of* Missouri, 179 Dorcas St., St. Louis.

Electrol is accorded the enthusiastic praise of owners everywhere. It has given them a new conception of how dependable an oil burner can be.

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The OIL BURNER with *The Master Control*

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 180*

PARTITIONS—Continued

pp. Illustrated. Describes use and advantages of hollow tile for inner partitions.

PIPE

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

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

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog "A". 4 x 6½ in. 700 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

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

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

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

PLASTER

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

PLUMBING EQUIPMENT

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

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

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

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

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

Eljer Company, Ford City, Pa.
Complete Catalog. 3¾ x 6¾ in. 104 pp. Illustrated. Describes fully the complete Eljer line of standardized vitreous china plumbing fixtures, with diagrams, weights and measurements.

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

Maddock's Sons Company, Thomas, Trenton, N. J.
Catalog K. 10⅞ x 7⅞ in. 242 pp. Illustrated. Complete data on vitreous china plumbing fixtures with brief history of Sanitary Pottery.

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

PUMPS

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

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

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

RAMPS

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

REFRIGERATION

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

REFRIGERATORS

Lorillard Refrigerator Company, Kingston, N. Y.
Lorillard Refrigerator, for hotels, restaurants, hospitals and clubs. Brochure. 43 pp. 8 x 10 ins. Illustrated. Data on fine line of refrigerators.

REINFORCED CONCRETE—See also **Construction, Concrete**

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

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

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

ROOFING

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

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

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

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

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

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

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

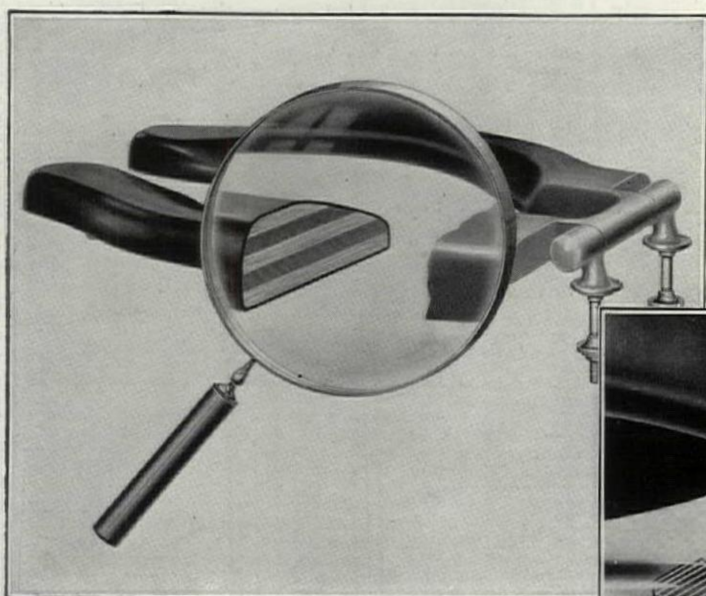
U. S. Gypsum Co., Chicago.
Pyrobar Roof Construction. Booklet. 8 x 11 in. 48 pp. Illustrated. Gives valuable data on the use of tile in roof construction.
Sheetrock Pyrofill Roof Construction. Folder. 8½ x 11 in. Illustrated. Covers use of roof surfacing which is poured in place.

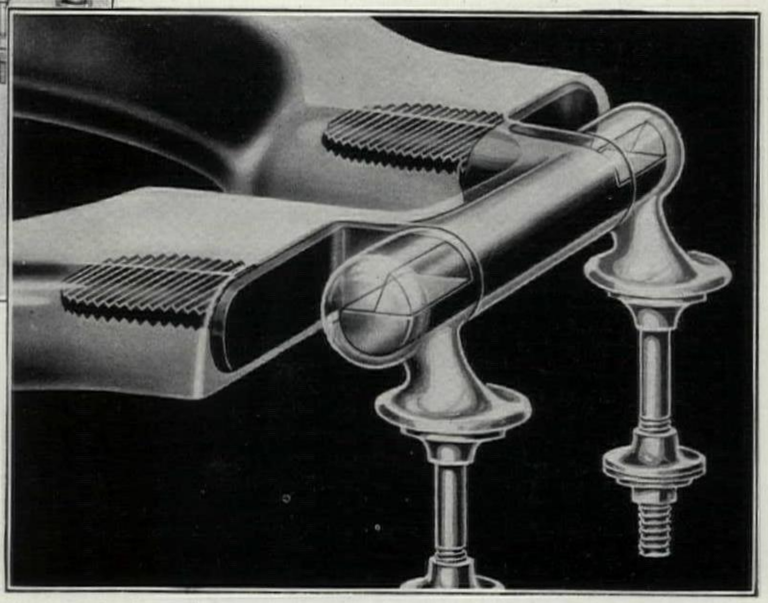
SASH CHAIN

Smith & Egge Mfg. Co., The, Bridgeport, Conn.
Chain Catalog. 6 x 8½ in. 24 pp. Illustrated. Covers complete line of chains.

SEWAGE DISPOSAL

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





SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 182*

SCREENS

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

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

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

SHELVING-STEEL

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Steel Shelving. Catalog D. Illustrated brochure, 40 pp., 8⅝ x 11 in. Deals with steel cabinets, shelving, racks, doors, partitions, etc.

SKYLIGHTS

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

SOUND DEADENER

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Deadening Quilt. Brochure 7½ x 10½ ins., 28 pp. Illustrated. Gives complete data regarding a well-known 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 in. 32 pp. Illustrated. Standard specifications for Cement Stucco on Herringbone.
Rigid Metal Lath and interior plastering.
Fireproofing Handbook. 8½ x 11 ins. 32 pp. Illustrated. Describes the full line of products manufactured by the Genfire Steel Company.

Ingalls Steel Products Co., Birmingham, Ala.
Construction Details. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Important data on building with steel.
Standard Specifications for Reinforced Concrete and the Ingalls Truss Floor. Brochure, 8 pp., 8½ x 11 ins. Authoritative specifications covering much construction.
Ingalls Trusses. Booklet, 12 pp., 8½ x 11 ins. Loading values and details.

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.

Steel Frame House Co., Pittsburgh.
Steel Framing for Dwellings. Booklet, 16 pp., 8½ x 11 ins. Data and details.

STONE, BUILDING

Indiana Limestone Company, Bedford, Ind.
Volume 3, Series A-3. Standard Specifications for Cut Indiana Limestone work, 8½ x 11 in. 56 pp. Containing specifications and supplementary data relating to the best methods of specifying and using this stone for all building purposes.
Vol. 1. Series B. Indiana Limestone Library. 6 x 9 in. 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.
Vol. 4. Series B. Booklet. New Edition. 8½ x 11 in. 64 pp. Illustrated. Indiana Limestone as used in Banks.
Volume 5. Series B. Indiana Limestone Library. Portfolio. 11⅝ x 8¾ in. Illustrated. Describes and illustrates the use of stone for small houses with floor plans of each.
Volume 6, Series B—Indiana Limestone School and College Buildings. 8½ x 11 in., 80 pages, illustrated.
Volume 12, Series B—Distinctive Homes of Indiana Limestone. 8½ x 11 in., 48 pages, illustrated.
Old Gothic Random Ashlar. 8½ x 11 in., 16 pages, illustrated.

STORE FRONTS

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

STORE FRONTS—Continued

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

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

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

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

TERRA COTTA

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

TILE, HOLLOW

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Wall Construction Bulletin 174. 8½ x 11 in. 32 pp. Illustrated. A treatise on the subject of hollow tile wall construction.
Standard Fireproofing Bulletin 171, 8½ x 11 ins., 32 pp. Illustrated. A treatise on the subject of hollow tile as used for floors, girder, column and beam covering and similar construction.
Natco Double Shell Load Bearing Tile Bulletin, 8½ x 11 ins., 6 pp. Illustrated.
Natco Unibacker Tile Bulletin, 8½ x 11 ins. 4 pp. Illustrated.
Natco Header Backer Tile Bulletin, 8½ x 11 ins., 4 pp. Illustrated.
Natcoflor Bulletin, 8½ x 11 in. 6 pp. Illustrated.
Natco Face Tile for the Up-to-Date Farm Bulletin, 8½ x 11 ins.

TILES

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

Unites States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 119 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.
Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

VALVES

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

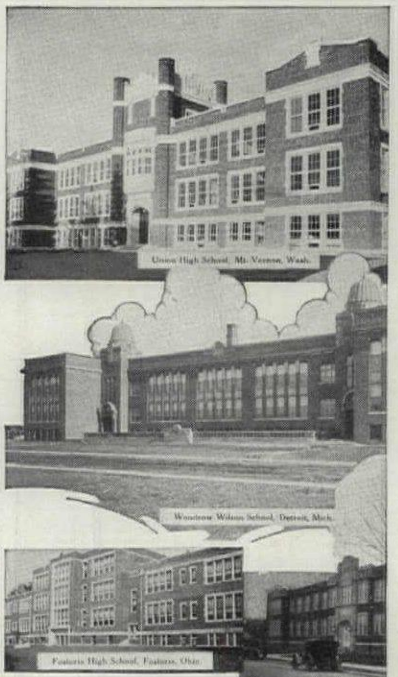
C. A. Dunham Co., 450 East Ohio St., Chicago.
The Dunham Packless Radiator Valve Brochure, 12 pp., 8 x 11. Illustrated. Data on an important type of valve.

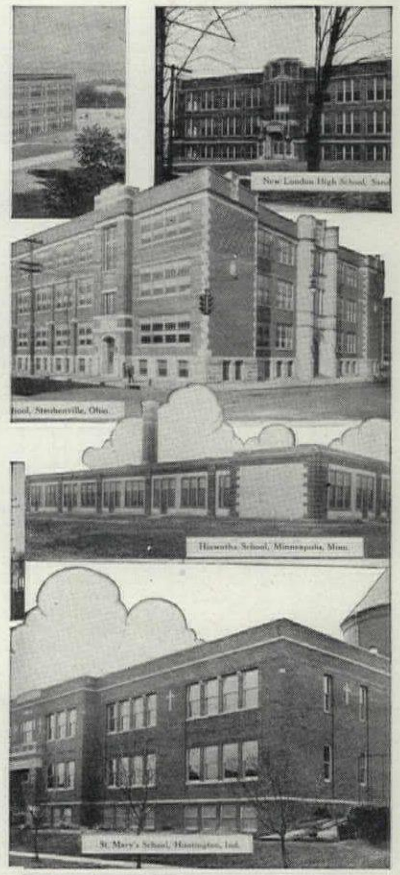
Illinois Engineering Co., Racine Ave., at 21st St., Chicago, Ill.
Catalog. 8½ x 11 in. 88 pp. Illustrated.

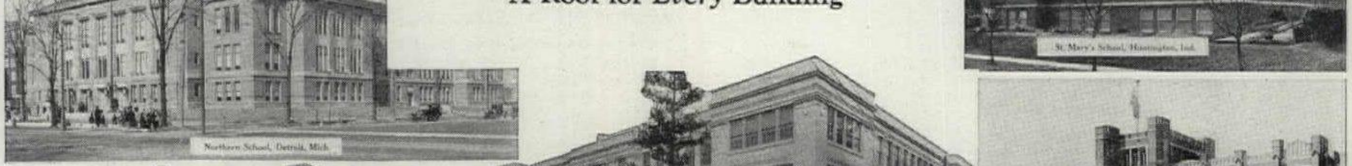
Jenkins Bros., 80 White St., New York.
The Valve Behind a Good Heating System. Booklet 4½ x 7¼ in. 16 pp. Color plates. Description of Jenkins Radiator Valves for steam and hot water, and brass valves used as boiler connections.
Jenkins Valves for Plumbing Service. Booklet. 4½ x 7¼ in. 16 pp. Illustrated. Description of Jenkins Brass Globe, Angle Check and Gate Valves commonly used in home plumbing, and Iron Body Valves used for larger plumbing installations.

VENETIAN BLINDS

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







SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 184*

VENTILATION

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

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

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

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

WATERPROOFING

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

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

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

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

WATERPROOFING—Continued

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

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

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

WEATHER STRIPS

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

WINDOWS

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

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Pivoted Sash, Catalog 12-A. Booklet, 48 pp. 8⅝ x 11 in. Illustrates and describes windows suitable for manufacturing buildings.

WINDOWS, CASEMENT

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

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 186*

WINDOWS, CASEMENT—Continued

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

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

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

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Casement of Copper-Steel. Catalog C-122. Booklet 16 pp. 8⅝ x 11 in. Illustrated brochure on casements, particularly for residences.
Lupton Heavy Casements. Detail Sheet No. 101, 4 pp., 8½ x 11 ins. Details and specifications only.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Casement Window Hardware. Booklet. 24 pp. 8½ x 11 in. Illustrated. Shows typical installations, detail drawings, construction details, blue-prints if desired. Describes AIR-way Multifold Window Hardware.
Architectural Details. Booklet, 8½ x 11 in. 16 pp. Tables of specifications and typical details of different types of construction.
List of Parts for Assembly. Booklet, 8½ x 11 ins., 16 pp. Full lists of parts for different units.

Truscon Steel Co., Youngstown, Ohio.
Architectural Details. Booklet. 8½ x 11 ins. 16 pp. Tables of specifications and typical details of different types of construction.
List of Parts for Assembly. Booklet. 8½ x 11 ins. 16 pp. Full lists of parts for different units.

WINDOW SHADES

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 in. Deals with Pond Continuous Sash, Sawtooth Roofs, etc.

WINDOWS, STEEL AND BRONZE—Continued

How Windows Can Make Better Homes. Booklet. 3⅝ x 7 in. 12 pp. An attractive and helpful illustrated publication on use of steel casements for domestic buildings.

Truscon Steel Co., Youngstown, Ohio.
Drafting Room Standards. Book, 8½ x 11 in., 120 pages of mechanical drawings showing drafting room standards, specifications and construction details of Truscon Steel Windows, Steel Lintels, Steel Doors and Mechanical Operators.
Truscon Solid Steel Double-Hung Windows. 24--pp booklet, 8½ x 11 in., containing illustrations of buildings using this type of window. Designs and drawings of mechanical details.

WOOD—See also Millwork

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

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

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

West Coast Lumber Trade Extension Bureau, Seattle, Wash.
"Durable Douglas Fir; America's Permanent Lumber Supply." Booklet, 32 pp., 7 x 11 ins. Illustrated. Complete data on this valuable wood.
"Douglas Fir Wall Hanger." Metal-bound hanger, 31 x 32 ins. An attractive advertisement for Douglas fir.
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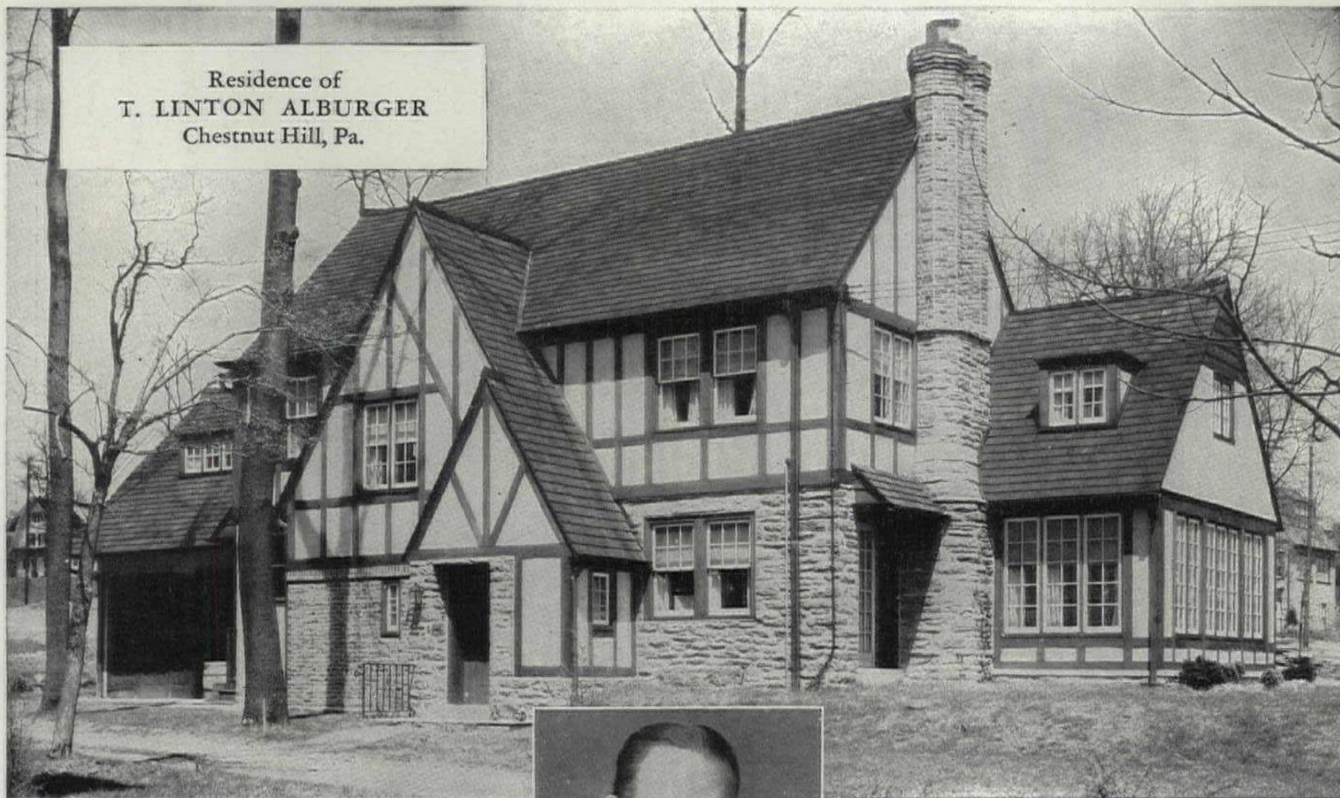

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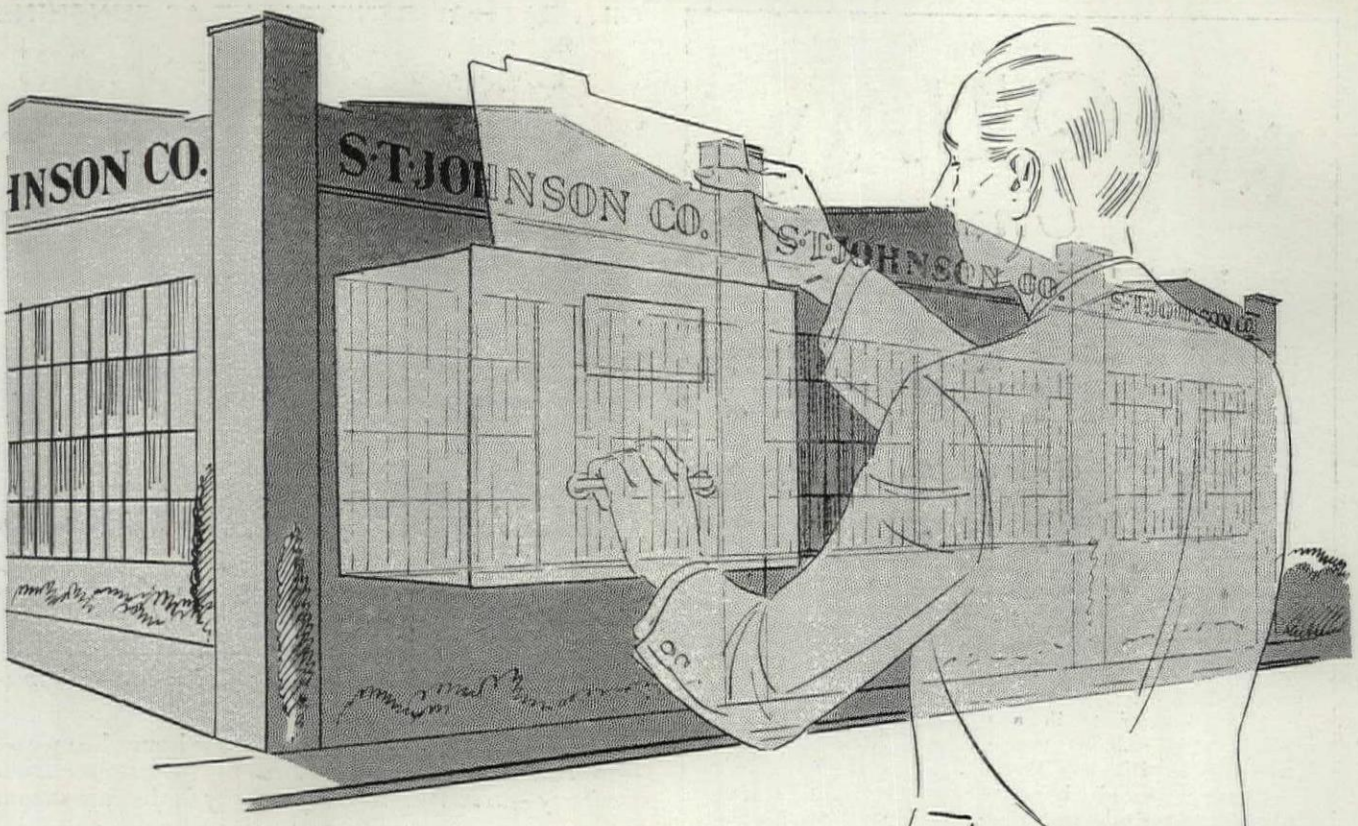

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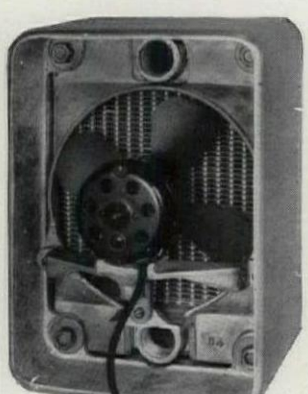

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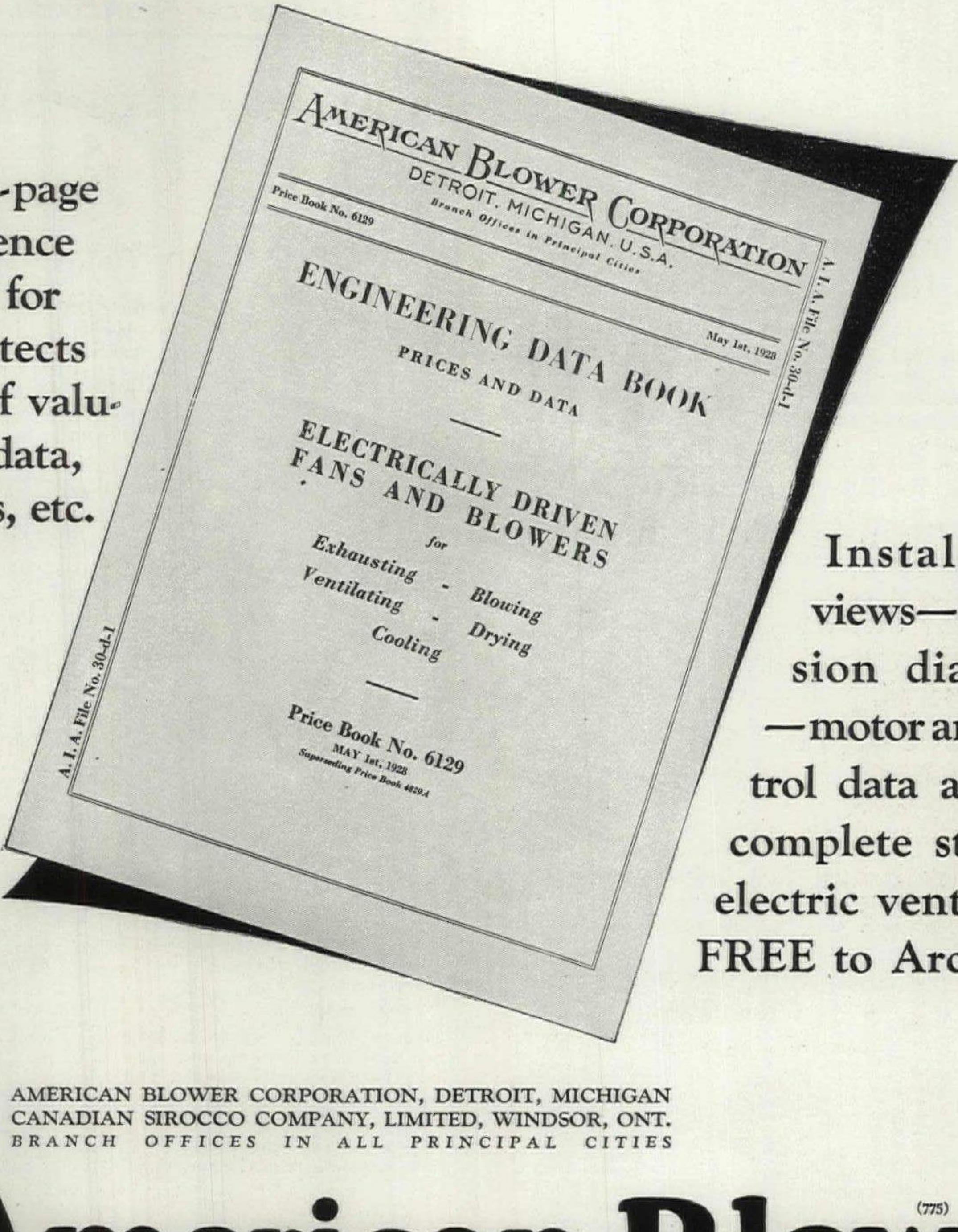

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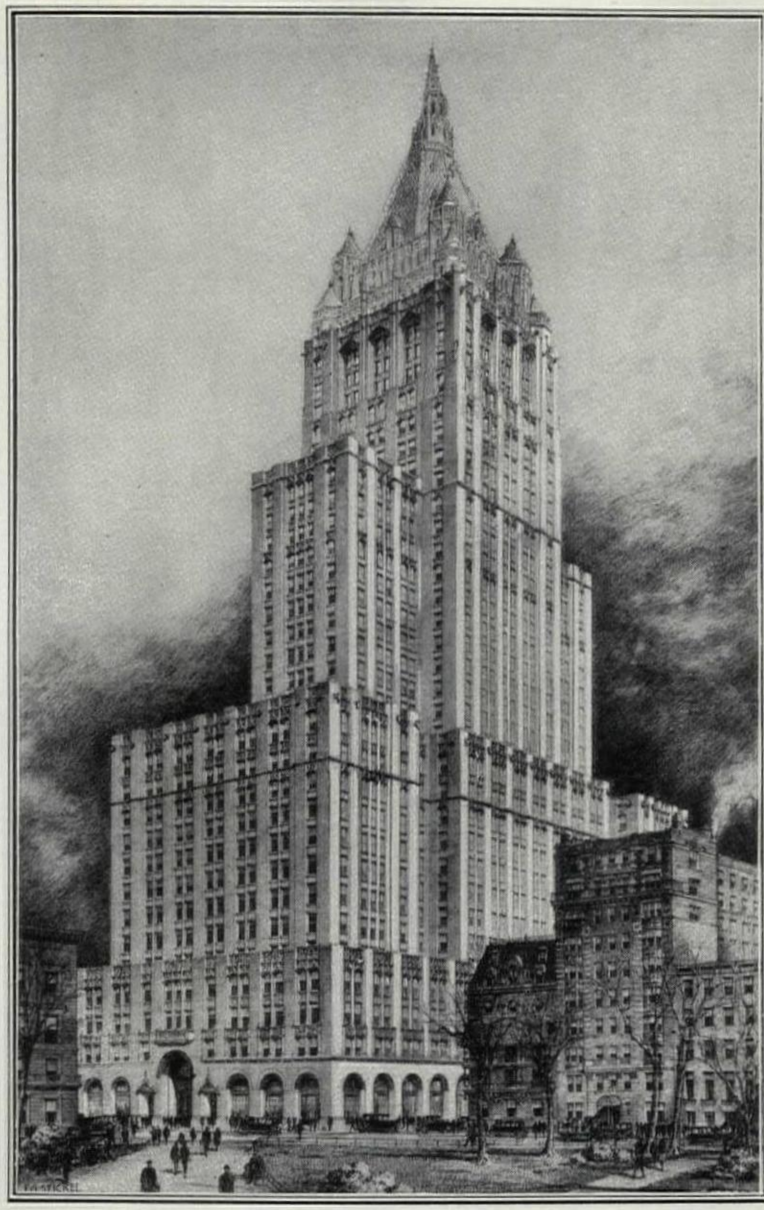

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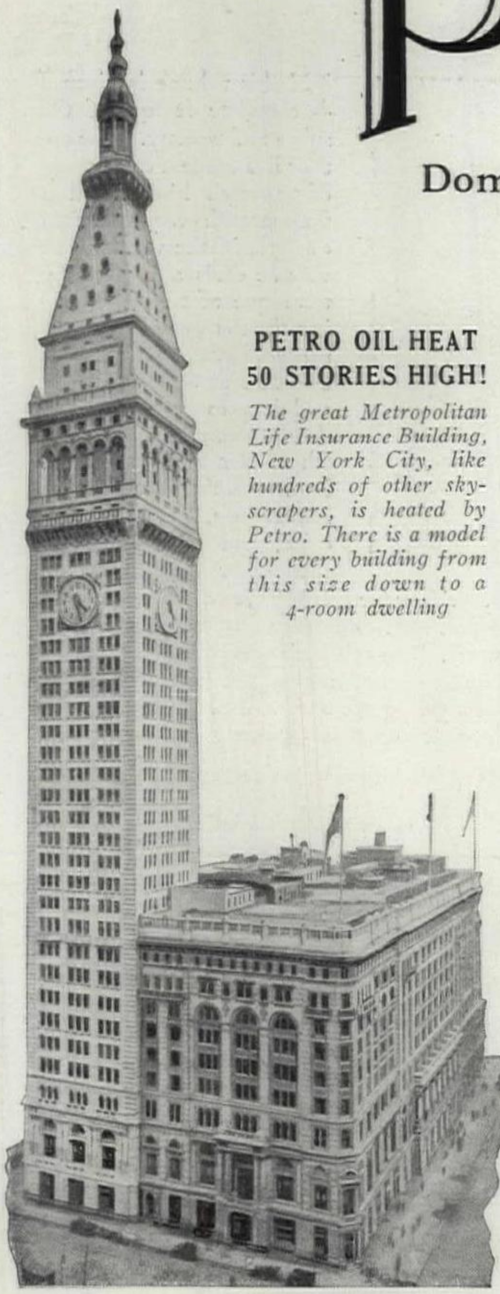

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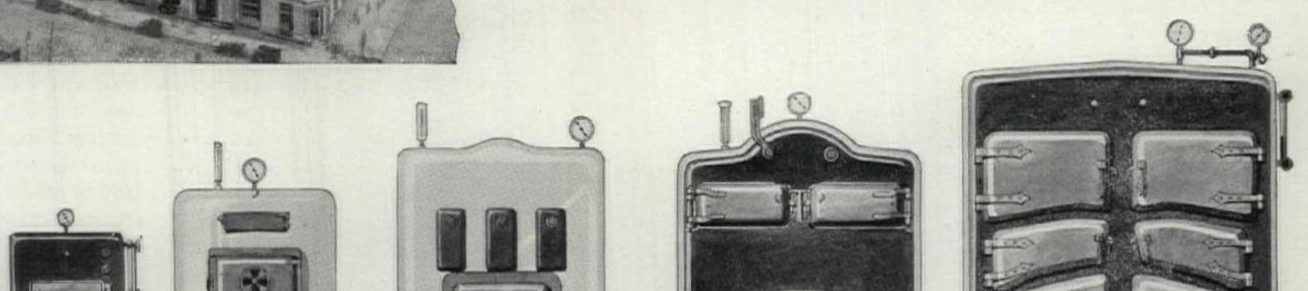

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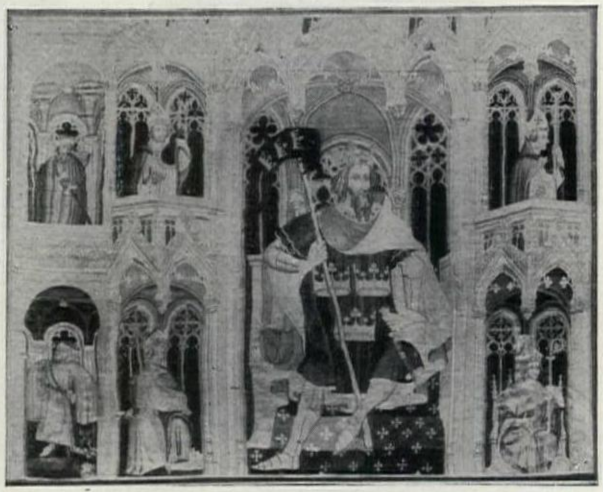
The Practical Book of Tapestry

By George Leland Hunter



THE intimate connection between tapestry and architecture as well as the frequent use of architectural motifs in tapestry design gives to tapestry and its history an interest to architects which is strong. Primarily associated with the Gothic age, which saw what were perhaps the most brilliant of its triumphs, tapestry has been identified with the development of all of western Europe and with the different periods —the Renaissance, early and late; the Baroque age; the eras of the different Louis; and in later days with the various places where looms have been set up and where present-day workers are engaged in creating by use of old-time methods those marvelous weaves which add to any surroundings where they are placed a richness of decoration which confers dignity and splendor to the place where they are used. No study is more absorbing than that of tapestry.

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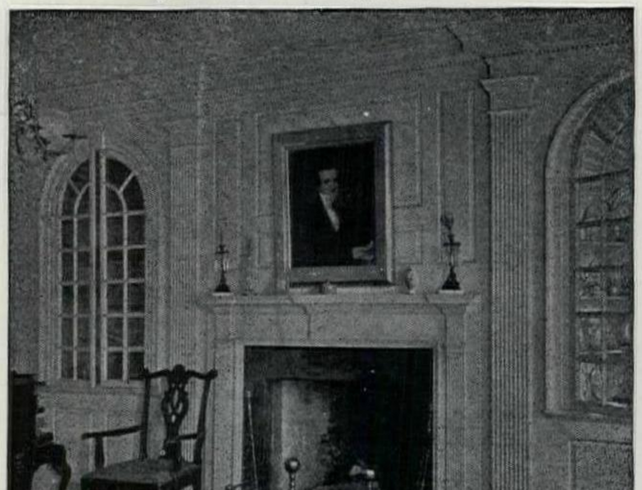
Photographs and Measured Drawings of the Colonial and Early Federal Periods

By LEIGH FRENCH, Jr., A. I. A.



INTERIOR woodwork during the Colonial and early Federal periods was exactly what is demanded for "Colonial" interiors today. The character of workmanship in the colonies insured craftsmanship of excellent quality, and this, together with design carefully studied from the simpler contemporary English work, resulted in woodwork which it would be difficult to improve upon. For this reason close study is being made of such old American interiors as still exist, and measured drawings make possible the reproduction today of much of the finest woodwork of the seventeenth or eighteenth century. These forms, while they involve not a little subtlety in the details of design, demand merely the use of simple mechanical processes which are not beyond the skill of any reasonably proficient woodworker, sometimes of an ordinary carpenter.

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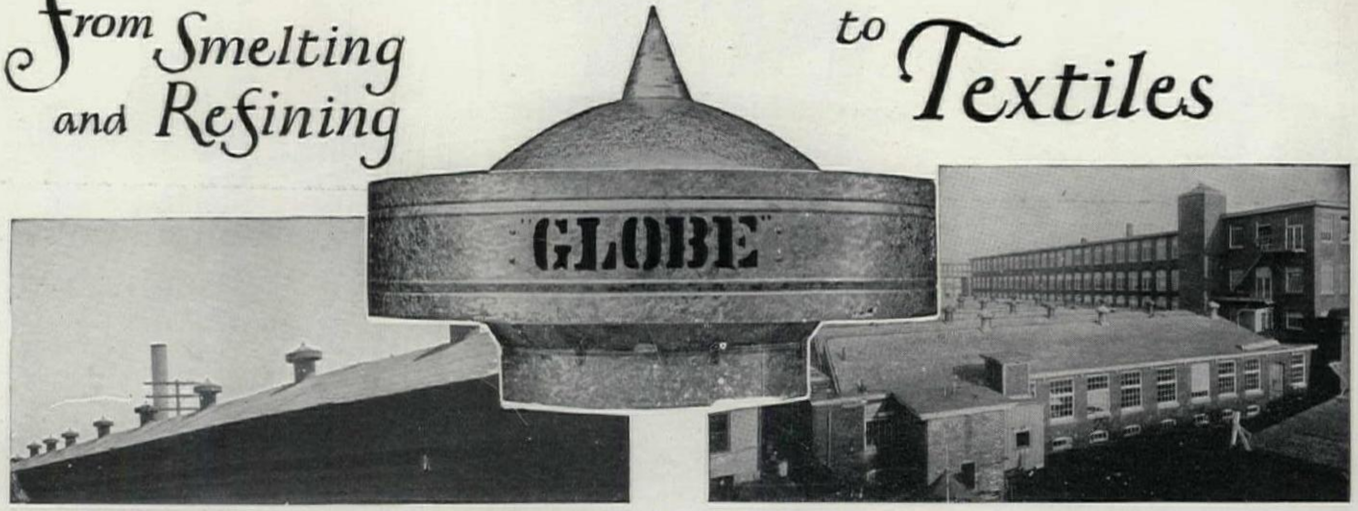

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"GLOBE" Ventilators

The "Automatic Alternator"

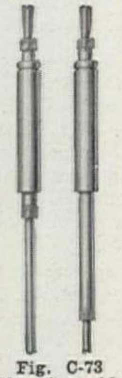

Fig. C-73 Showing Alternator in Open and Closed Positions.

for Duplex House, Sump and Sewage Pumps

1—Automatically transfers the operation from one pump to another, thereby
—equalizing the wear on both pumps.
—increasing the life of both pumps.

2—It prevents rusting of idle pump, thereby
—avoiding constant blowing of fuses.
—possible burning out of motors and starters.

3—It keeps both pumps in good running order, thereby
—maintaining a much higher efficiency.
—saving operating expense and repair bills.

CHICAGO PUMP COMPANY

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BILGE-FIRE-HOUSE-VACUUM

2336 Wolfram St. Chicago

Phone Brunswick 4110

Tall . . . Very Slender, Yet Resists Full Pressure of Lake Winds

The Flamingo Hotel, 5510 South Lake Shore Drive, Chicago, is an interesting example of the great rigidity and strength of reinforced concrete construction.

This tall, slender building (21 stories with tower 216 feet above grade, 150 feet long and only 50 feet wide) must resist the full sweep of Lake Michigan winds.

Exterior stair courts at the narrow ends of this building further affected the slenderness. Proper wind bracing required heavy girders and specially designed columns of reinforced concrete.

The Flamingo was started September 17, 1926—the concrete structure was completed January 16, 1927.

We repeat: *reinforced concrete assures strength, speed, permanence, beauty and economy.*

Architect:
William Reichert
Engineer:
Bert M. Thorud
Contractor:
John A. Lundstrum Company

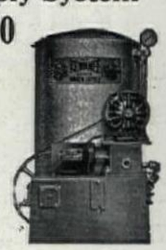
REINFORCED CONCRETE

Concrete Reinforcing Steel Institute
Tribune Tower
Chicago

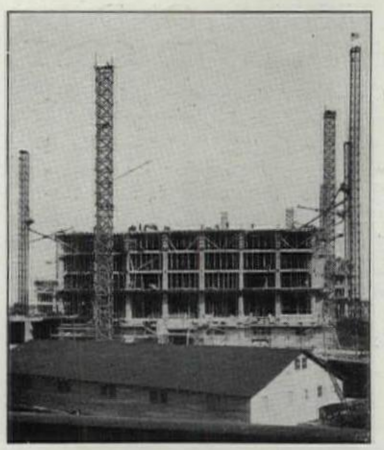
Rail Steel Bar Association
Builders Building
Chicago

TEMPLE EMANU-EL, Fifth Ave. and Sixty-fifth Street, New York
Robert D. Kohn—Charles Butler—Clarence S. Stein, *Architects Associated*
Mayers, Murray & Phillip, *Consultants*

North Section of Wrigley Bldg., Chicago, Ill.



The photographs shown here were taken during the installation of Havemeyer Bars in the Mail Order Building of Sears, Roebuck & Co., Boston. George C. Nimmons, Architect; Hegeman & Harris Co., Contractors



HAVEMEYER REINFORCING BARS

are proving their *advantages* on this large SEARS, ROEBUCK job

Splendid construction speed is being maintained by Hegeman & Harris Co., *Contractors*, on the new building for Sears, Roebuck & Co., in Boston and Cambridge, Massachusetts.

Part of the story—and an important part to the builders—is the fact that Havemeyer Bars were delivered in exact accordance with the contractors' schedule, beginning with a shipment *four days* after the contract was signed.

Two separate reinforced concrete buildings designed by George C. Nimmons, *Architect*, are using 4661 tons of Havemeyer Bars. The large mail order building in Boston required 4200 tons. The rest were used for the retail store in Cambridge.

Such cooperation with builders is a feature of Concrete Steel Service. In back of it is a national warehouse system, complete equipment for cutting and bending bars to specifications, and a first hand knowledge of what the contractor needs to facilitate his work.

The Havemeyer Bar is universally recognized by architects, engineers and contractors. It is a deformed bar rolled round or square and scientifically designed to produce a constant cross section. Made of new billet steel, a uniformly high quality product is assured.

Havemeyer Spacing and Holding devices simplify the correct placement and inspection of reinforcement. Other time and labor saving specialties, Havemeyer Trusses for floors and roofs, Havemeyer metal lath and fireproofing products, and Havemeyer Barmats and concrete road products complete the Concrete Steel Company's line.

As a further service, Concrete Steel Company maintains engineering departments at every district office. The advice of these experienced engineers is at your disposal at any time. They will gladly cooperate with you in preparing designs and estimates for any type of concrete construction. Write us for catalogs.

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Warehouses: Birmingham, Boston, Camden, Chicago, Detroit, Kansas City, New York, St. Paul, Washington, Youngstown.

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Architects may safely specify Hardinge because of its long continuous record for high-class performance. Our two models, Industrial and Domestic, in 12 different sizes and combinations enable specific treatment for any heating problem.

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REVIEWS OF MANUFACTURERS' PUBLICATIONS

BIRD & SON, INC. East Walpole, Mass. "Specifications for the Paroid Built-up Roof." Its importance in building.

Those responsible for the accuracy of specifications in an architect's office well know the value of having reliable directions for use of a building material ready at hand when specifications for that particular material must be prepared. This useful folder, which is of a form and size for placing directly in an architect's data files, covers use of this widely known type of Bird roofing, of two weights ("Standard" and "Extra Heavy") and for use whether applied over sheathing or over concrete or tile. The sheets deal with the correct preparation of the foundation surface, with the important details of flashings about chimneys or walls, and particularly with the application of the different substances which go to the building up of the roofs.

THE HART & HEGEMAN MFG. CO., Hartford. "Electrical Wiring Devices."

Wiring necessary for various uses of electricity in buildings of many types necessitates use of a great variety of fittings, details and devices, and their use upon a vast scale have created a business of very considerable extent. Here, for example, is "Catalog S" of the Hart & Hegeman Mfg. Co., one of the large firms producing these fittings. The booklet lists, illustrates and describes in different sizes and capacities every detail which could possibly be required in an electrical installation of any kind, and in fact even to give the names and uses of these devices might easily occupy this entire page of The Forum. The brochure is undoubtedly absolutely necessary to electricians and electrical contractors, but it also possesses a high value to architects and their specification writers, as well as others interested in wiring.

NATIONAL LIME ASSOCIATION, Washington. "The Fallacy of Unnecessary Strength."

Supplying structural strength in building materials, important as it is, can be, and frequently is, overdone. Good building demands the furnishing of adequate strength, and a little more for safe margin, but instances are many in which strength of structures far in advance of anything which could possibly be required has tended to discourage building by adding unnecessarily to its cost. This brochure is a helpful study of varying degrees of strength required in mortar used in masonry. It considers also the cost of materials and the cost of labor, since the amount of masonry which a workman can construct is governed by the workability of the mortar used. The brochure makes plain the fact that lime mortar continually increases in strength. It gradually changes into limestone surrounding the sand grains, creating a binder which is even more permanent than the units it holds in place, a highly important factor in masonry.

PORTLAND CEMENT ASSOCIATION. "Concrete Masonry Construction." Important data on the subject.

Recent years have witnessed a phenomenal increase in the use of concrete block, building tile, and concrete brick. The rapidly growing popularity of these concrete building units has not been confined to any particular type or class of construction, but extends throughout the field of residential, commercial and public structures,—wherever the advantages of permanent and fireproof buildings are understood and appreciated. The popularity of concrete masonry construction is due in a large measure to its general adaptability for construction purposes. It is employed regularly for the construction of exterior load-bearing walls, non-load-bearing walls, curtain walls and partitions. Individual units meeting standard specifications are capable of carrying from 10 to 30 times the loads ordinarily imposed upon them in building construction, thereby providing wall strengths substantially in excess of usual requirements. This booklet gives much useful information on the value of concrete masonry construction, and it discusses important details regarding actual building, details which are made plain by diagrams. It also gives the specifications recommended for use of these materials by the Portland Cement Association.

NATIONAL BUILDING UNITS CORPORATION, Philadelphia. "Sound Absorption of Cinder Concrete Units."

The works on acoustics as well as the articles or essays on the subject which are published by the architectural and building publications deal to a great extent with merely the *surfaces* of interior walls; less is said regarding the materials of which walls are constructed, though logically this would seem to have a decided bearing on the matter. This valuable study of the subject deals with the sound-absorbing characteristics of cinder concrete building units and particularly with the outcome of tests made at the University of Toronto to ascertain the coefficient of sound absorption for cinder blocks, plain or else covered with plaster of different types. The tests were made in buildings of several kinds and intended for many widely different uses.

BONDED FLOORS COMPANY, INC., New York. "Gold Seal Treadlite Floor." Excellence had by their use.

Improvement in no variety of building material has been more marked during the past few years than in flooring. The demand of architects and interior decorators for flooring materials which would possess character, dignity and distinction has been amply met by manufacturers, and the result is that there are now upon the market floor coverings which meet every demand which architecture could make and which are to be had at costs which are rendering their use general. This brochure and the various enclosures which come with it deal with several varieties of the widely known "Gold Seal" floorings: "Treadlite Tile"; "Marble-ized Tile"; "Battleship Linoleum," and "Cork Tile," describing each and illustrating the excellent appearance of floors so covered, at a cost by no means great.

RODDIS LUMBER AND VENEER COMPANY, Marshfield, Wis. "Roddis Doors."

The manufacture of doors for buildings of different kinds has been developed into a business of large proportions. The time has passed when it was supposed that a fine door must necessarily be made of one thickness of wood; scientific methods have evolved a method of using various thicknesses of carefully selected wood, soft or hard, treated by certain processes, and then so treated with glue under pressure and surfaced with veneers that they are not only far superior to the old fashioned door but are calculated to withstand the wear to which doors in many places are subjected. This brochure describes the highly interesting business of manufacturing Roddis doors,—gathering the raw material from many different sources, and countless processes to which the material is treated before a finished door is ready for use. The brochure illustrates and describes many different types of doors.

CONCRETE SURFACE CORPORATION. 342 Madison Avenue, New York. "Bonding Surfaces on Concrete."

Architects and builders accustomed to working with concrete know the difficulty (and importance) of securing a strong and dependable bonding between a concrete structure and the stone, marble, brick, stucco, or other material which is used as a "facing." The top surface or form-skin of a poured slab is likely to be so rich in cement that it is perpetually thirsty for water, and being thus active it constantly changes in nature and in dimensions, and to such a degree that the permanent retention or adhesion of an applied material is not possible. It is necessary to secure a body of clean sand and clean stone affording a mechanical clinch between the aggregate particles in order to insure a dependable bonding between concrete and a surfacing material. This brochure dwells upon the value of "Bonding Con-Tex," a material intended to be used upon concrete in the plastic stage,—that is before it has taken a hard set. Its elements, controlled by a perfected process of dialysis, stop the setting of a thin surface layer of the concrete which is easily brushed away, exposing clean sand surfaces, free of any cement covering and ready for bonding with any applied material. This booklet, in fact, gives many helpful suggestions.

fire burns up-hill COAL ROLLS DOWN

Men light cigars and cigarettes from underneath, for fire burns *up.* Pipes are hard to light, for men must work and puff to create an artificial draft to pull the flame down. Spencer Gable-Grates are sloped to make fire burn up-hill, the way it burns easiest and best.

When coal piles up at the bottom of a chute, workmen take a shovelful away from the bottom to start the flow again. Fuel in the Spencer Magazine flows down by gravitation till the Gable-Grate is full. Fire burns fuel away to make room for more, and more rolls down automatically.

Client "Good Opinion" climbs when you keep heat costs down

You need not light a cigarette or trail a truck to know that fire burns up and coal rolls down. You need not hunt for tables of statistics to know that the one big item in the up-keep of a house or building is the annual cost of heat.

Yet you probably never realized to what extent these two, simple, natural laws can be put to work to help you save your clients money, and increase his good will, unless you know the Spencer.

Flat grates and sloping gables

Before the advent of the Spencer, it was necessary to confine specifications to flat grate heaters, automatically compelling your client to buy the most expensive fuels and feed them to the heater the hardest way. Flat grate heaters require fuel in large sizes, and must be surface fed. Spencer Heaters are built especially to burn the smaller sizes of coal and coke, with the Gable-Grate that is sloped to make the fire burn up-hill. The water-jacketed Magazine holds a 24-hour fuel supply that feeds by gravitation to the Gable-Grate as fast or as slow as the fire requires.

Save home owners the tiresome trouble of firing a "boiler" many times a day. Save big building owners the cost of a night fireman. Save everybody who owns a building, as much as half his annual bill for heat. Spencer Heaters are designed, tested and approved for burning No. 1 Buckwheat anthracite at half the cost of larger sizes, and for burning by-product pea coke or any non-coking, graded fuel, at proportionate savings, and they have been doing just that for more than thirty years.

Guaranteed capacities

Spencer Heaters are patented. They are guaranteed. Their capacities are guaranteed. You need not allow for over-rating. Spencers have paid for themselves, and are now making net annual savings for home and building owners everywhere. Specify them in any building, from skyscraper to bungalow, to save your clients money on the biggest up-keep item in their annual budget. Write for illustrations, specifications and guaranteed capacities of the new Spencer Heaters. Spencer Heater Company, Williamsport, Pa.

Cast Iron Sectional and Steel Tubular types for any size building

SPENCER SAVES

SPENCER *steam, vapor or hot water* HEATERS

REVIEWS AND ANNOUNCEMENTS

WALLACE & TIERNAN CO., INC., Newark. "Swim in Drinking Water." Valuable data on bathing pool equipment.

Widespread pollution of bathing beaches has without doubt had much to do with popularizing the outdoor or indoor swimming pool. Unless the same objection urged against the bathing beach were to be brought against the swimming pool, however, it was necessary of course that there be found some means of purifying and keeping purified the water with which it is filled. Invention and sanitary science have brought this about, and it is now not only quite possible but also comparatively simple to so treat the contents of a pool that it is as pure as the water which science and skill unite in supplying to drinking fountains. This booklet, for example, issued by a firm widely known for the excellence of its systems for cleansing water, deals with just this. The water within a pool is constantly being replenished, and what overflows is used again and again, circulated continuously through the purification system and regenerated, purified and completely sterilized before it is forced back into the pool. Properly operated filters remove every impurity, and the requisite sterilizing is done by chlorinization. The booklet abounds in data important to architects as well as owners of public or private bathing pools.

DIEBOLD SAFE & LOCK CO., Canton, O. "Diebold Fireproof Vault Doors." Important data on the subject.

Building a practical storage vault calls for the taking of certain well defined precautions. Not only must its walls, roof and floor be built of materials having sufficient fire-resisting qualities to withstand action of a severe fire, but the same walls, roof and floor must possess such heat insulating qualities as will prevent destruction of the contents by high temperatures transmitted to the vault's interior. Then again, the foundations, or if not the foundations then the structural steel supports on which it rests, must be so protected that they will uphold the vault and protect it against injury from the impact of falling building members and such contents of a building as safes, machinery, etc., this provision also involving independence of the vault from the building's structure, at least to such an extent that failure of the building would not cause failure of the vault as well. One more necessary detail is the use of properly protected doors, an excellent line of which is illustrated and described in this brochure, the booklet also giving data on vault construction. An entire page is devoted to listing banks and other buildings where Diebold Fireproof Vault Doors are in use. The booklet contains highly important data.

KOHLER OF KOHLER. "For Modern Homes the Modern Sink." Valuable data on an important detail of equipment.

Experienced housekeepers have been known to say that no single modern invention,—not even the electrically operated iron,—has brought quite the satisfaction to the household that has followed the use of the dishwasher. This brochure, one of the many issued by the Kohler Company, deals with its "Electric Sink," which quickly performs what used to be drudgery three times each day. The Electric Sink comes in many patterns and numerous sizes. Set in the center of the dish-washing compartment in the Electric Sink is a metal cylinder with a thousand perforations. "Inside this cylinder revolves a screw—the 'impeller'—which catches up the water, lifts it, and hurls it in stinging jets through these thousand openings. These jets beat upon the dishes. They are thrown back by the walls of the compartment. They wash clean the front and back of every plate, the inside and outside of every cup or glass, between the tines of every fork. This 'spray tower'—circulating over 300 gallons of water a minute—is unique. It is a Kohler invention. No other method is so instantly and so utterly effective. Because of it, in the Electric Sink the dishes are not submerged, even partially, in dishwater. No 'high-water' mark can be left—no greasy deposit. There is no swirling or centrifugal action of the water which might slight the dishes in the center of the compartment. The Electric Sink washes all of the dishes, and it washes them beautifully clean." The booklet should be in the equipment files of the office of every architect and most engineers.

SOLVAY PROCESS COMPANY, Syracuse, N. Y. "Solvay Calcium Chloride in Concrete Construction."

Architects, engineers and builders whose work involves use of concrete know the value of a material which hastens the hardening of concrete without affecting adversely its final set and strength. This brochure dwells upon the advantages which follow the use for this purpose of calcium chloride. It also gives the results of many tests of the material made in connection with Portland cement by the U. S. Bureau of Standards, the American Society for Testing Materials, U. S. Engineers, and Lewis Institute. Solvay Calcium Chloride is a dry, white, flaky chemical, extremely hygroscopic, and it dissolves in water almost instantly. It not only gives early strength and hardness to concrete but at the same time densifies it, makes it more thoroughly waterproof, and aids in making the concrete resist freezing at winter temperatures. The booklet quotes a paragraph from a bulletin issued by the Portland Cement Association: "The only chemical recommended as an addition to the mixing water is Calcium Chloride. This material possesses the property of lowering the freezing point of water and accelerating the setting of the concrete. It is used by being dissolved in the mixing water, in which it is readily soluble."

Harrison E. Baldwin announces the opening of new offices in the Trust Building, 205 Church Street, New Haven.

Gerald Joseph O'Reilly, formerly of the firm of Pfeiffer & O'Reilly, Miami, has opened an office at 11 East 44th Street, New York. He desires publications and samples.

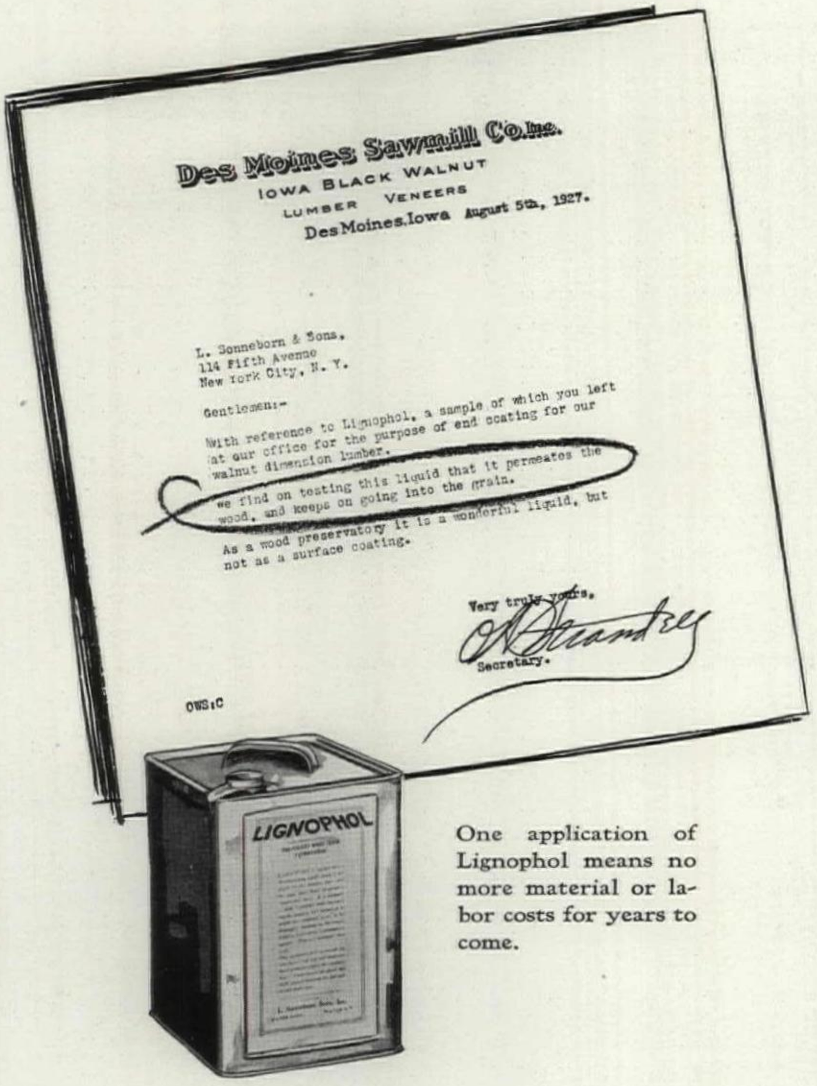
Swartz & Ryland (Fred L. Swartz and C. J. Ryland) architects and engineers, announce their removal from the Rowell Building to the Brix Building, Fresno, Cal. They will be glad to receive catalogs and other publications from manufacturers who comply with the A.I.A. suggestions.

The Department of Building Construction, of Massachusetts Institute of Technology, is desirous of obtaining catalogs, bulletins, data and trade publications on any of the phases of building construction or materials, in order to build up a catalog file for reference. It would appreciate obtaining such matter, and would like to have it mailed to Professor Walter C. Voss, Old Town Road, Wellesley Farms, Mass.

An Omission. In Part II of the June issue of THE ARCHITECTURAL FORUM an article was published entitled "Bank Screens," by Charles A. Holmes. In this article a type of counter screen was discussed in which a bronze railing instead of an upper screen is used above the counter, and movable working shelves are installed under the counters. John Poole has asked us to announce that he holds the United States patents covering this type of bank screen and counter, which fact was omitted by Mr. Holmes.

LIGNOPHOL

is a penetrating preservative for wood floors



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.

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Part 2—Architectural Engineering and Business

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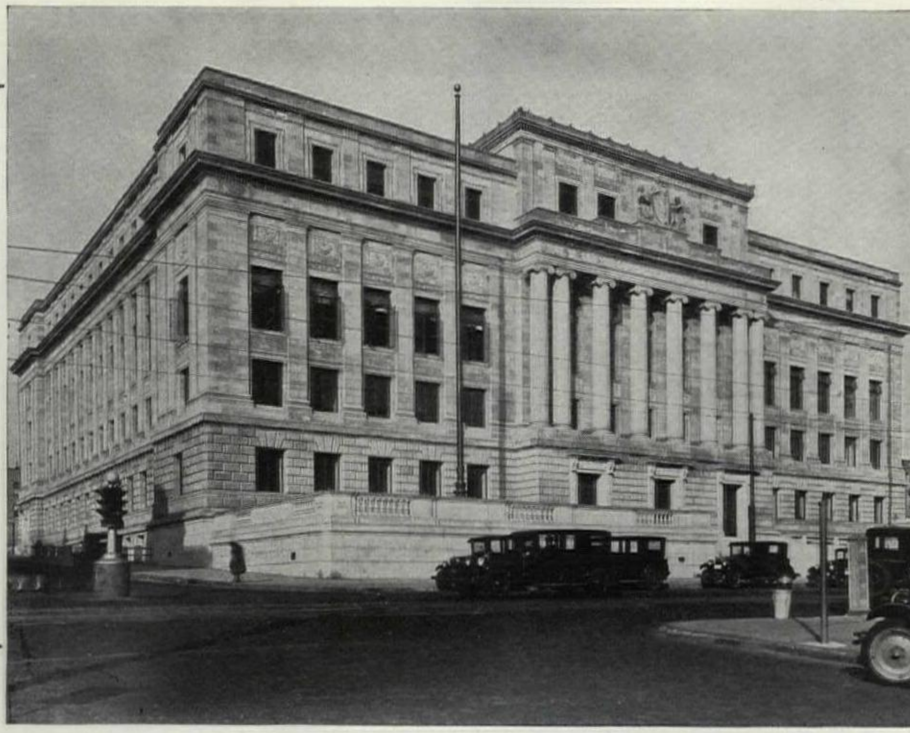
Architects—Guilbert & Betelle.
General Contractor—Niewenhous Co., Inc.

Par-Lock Applied by the Par-Lock Appliers of New Jersey, Inc.



P-23

Par-Lock Safeguards Priceless Records

PROTECTED not only against fire and theft, but also against deteriorating effects of dampness, the priceless public records of Essex County, New Jersey, repose in the vaulted security of the new Hall of Records.

Everyone of its extensive series of stone concrete vaults is directly plastered within over the protective Par-Lock Plaster Key (Specification "B").

Beside this, interior wall surfaces of the building itself are sealed with Par-Lock Specification "I" and then furred.

Par-Lock—the one effective combination of damp-proofing and plaster key is emblematic of good construction everywhere. The nearest Par-Lock Applier will serve your forthcoming needs.

THE VORTEX MANUFACTURING CO., *1984 W. 77th St.*, CLEVELAND, O.

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PLASTER KEY

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CLEVELAND, 218 Hunkin-Conkey Bldg.
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DETROIT, 2544 First National Bldg.
KANSAS CITY, MO. 2035 East 19th Street
MINNEAPOLIS. 434 Builders Exchange
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NEW YORK CITY, 50 Church Street
PHILADELPHIA, 1700 Walnut Street
PITTSBURGH, 614 Bessemer Building
SCRANTON, PENNA. Cedar Avenue
ST. LOUIS 906 Chemical Building
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TRENTON, 339 Broad St. Bank Bldg.
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PAR-LOCK CORK INSTALLATIONS
United Cork Companies Lyndhurst, N. J.

All these things in one

1. *Compact*—Valve housed in bowl at back making one compact and complete unit.
2. *Design*—A graceful syphon jet bowl with square base and extended lip, having a deep seal, large water surface and long rim opening.
3. *Quiet*—Very much quieter in operation than the usual flush valve bowl.
4. *Metal Concealed*—The valve and most of the nickeled work is concealed saving the usual cleaning and polishing upkeep.
5. *Valve*—A stock type valve especially adapted to the bowl. A valve of proven merit with national distribution and reputation. A cap above the valve permits ready access for attention to the valve.

Plumbing fixtures of Eljer China are similar in texture to the finest French Table China—but with the added toughness necessary to withstand rough usage. Acid-proof and rust-proof.

THE following perfect description of the Eljer Carlton fixture, No. 545, was coined at some time before William the Conqueror forsook short pants in favor of a suit of armor and a battle axe: *"Multum In Parvo"—much in little space.* That's the Carlton, with all the good points of a hundred types and designs rolled into one and produced by Eljer in vitreous china, as white and hard and impervious to stains as the finest French Table China. Everything you want is here: remarkable quietness; efficient action; grace of line; ample size—everything!

And it's backed by willing service that fills orders right on the dot, thus saving costly delays and temper-trying uncertainties.

Send for the Eljer catalog, with the Carlton and scores of other Eljer designs, regular and special, fully described. Eljer Company, Ford City, Pa. Plants at Ford City, Pa. and Cameron, W. Va.

ELJER

VITREOUS CHINA PLUMBING FIXTURES