THE ARCHITECTURAL FORUM

IN TWO PARTS PART TWO
ARCHITECTURAL ENGINEERING & BUSINESS

JANUARY 1931
The quietest thing we know (next to a cat stalking a mouse!) is a Rich-Wil Elevator Door Hanger in operation.

It is because the suspended weight of the elevator doors is equally distributed throughout their full travel. That is because the Rich-Wil hanger rides on over-size ball bearings extending the full width of the door, providing perfect alignment.

Extreme quiet and long service are thus assured. Friction is reduced to a minimum. Adjustments are quickly and easily made by simply loosening two nuts.

R-W equipment meets every elevator door requirement. R-W closers pay for themselves in valuable space saved. Standardize on R-W hangers, closers, checks, interlocks, the PowR-Way elevator door operator, and R-W signal systems of all modern types.

Consult an R-W engineer at any time without obligation. Send for R-W catalog No. 44.
Now you can specify **Temlok** in either **INCH** or **HALF-INCH THICKNESSES**

**ARMSTRONG'S** Temlok, the new low-cost fibre board for roof insulation, will be made from now on in **both inch and half-inch thicknesses**.

This is for your convenience.

The Armstrong Cork & Insulation Company recommends the solid-inch of roof insulation. But—if you prefer an inch of insulation in laminated half-inch layers, you can specify this. Or, where you deem a half-inch thickness adequate, you will be able to get Armstrong's Temlok in that size.

This range of thicknesses adds another advantage to the many features of Temlok. Fabricated from the heartwood of Southern pine, it is priced within the scale of other fibre insulations. It has extremely low conductivity—only .31 B. t. u., per square foot, per inch thickness, per degree Fahrenheit temperature difference, per hour, at 60 degrees mean temperature.

Also, Temlok’s moisture absorption is less than that of any other fibre board. And it provides a strong, secure base for roofing.

We shall be glad to send you complete information and a sample of Armstrong’s Temlok. There is no obligation, of course.

**Armstrong's** Just write to Armstrong Cork & Insulation Company, 900 Product Concord St., Lancaster, Pa.

**Armstrong's Temlok**

Roof Insulation that's so Economical and Efficient
MODERN BUILDINGS REQUIRE MODERN METHODS FOR REMOVING ASHES, GARBAGE, RUBBISH

The raising of cans of ashes or garbage, and bales of rubbish, is now being accomplished with G&G Telescopic Hoist equipment in buildings of all kinds throughout the country. 2010 schools in 44 states use this equipment. 189 Bell Telephone buildings and hundreds of hospitals and churches are G&G equipped, as are 614 bank buildings.

The low cost of operating G&G Electric Hoists has influenced much of this popularity. In one case, 15½ tons of ashes were raised in one kilowatt hour. In another instance 85 round trips of a filled can were made for one cent current cost. We shall be glad to submit complete test data showing how really economical is the operation of G&G Electric Hoists.

Safety is another important factor, especially with school officials. With this equipment, the sidewalk opening is never left unguarded. Accidents due to carelessness cannot happen.

We have been asked how long this equipment will function without replacement. We do not know. We do have file records of many hoists that have been continuously on the job for fifteen to twenty years and more.

See our Catalog in Sweet's Arch'tl. Catalog 1931 Ed., pp. 6342-49
In Canada see Specification Data

GILLIS & GEOGHEGAN

544 WEST BROADWAY

NEW YORK, N. Y.
A FORM for EVERY PILE
A PILE for EVERY PURPOSE
—regardless of length

It rests securely upon
RAYMOND CONCRETE PILES

It is significant that for this beautiful structure, termed “the last word” and “the world’s finest theatre,” these world-famous piles were selected as a foundation . . . so many experienced Architects, Engineers and Owners say they are “the last word” in concrete pile dependability.

RAYMOND CONCRETE PILE COMPANY

NEW YORK: 140 Cedar St.  CHICAGO: 111 West Monroe St.
Raymond Concrete Pile Co., Montreal, Canada
Branches in Principal Cities
Beating the kickers to it

by providing good elevator service

Human beings are inconsistent—they'll wait hours in crowded lines for the ball game but start a riot at a few seconds delay in elevator service.

Rather than attempt the hopeless task of changing human nature, the Consolidated Gas Company, in their great Boston office building, cater to it—by providing elevator service that meets even the most unreasonable demands. They appreciate the value of the good will they can build among their tenants just as they recognize that good will is a priceless asset among the countless thousands which depend on them for power and light service.

Step into the lobby of the Consolidated Gas Company Building. Note how effectively and quickly the five passenger elevators handle the traffic. These elevators serve seventy elevator entrances equipped with ES side Arm Pneumatic Door Operators, Car Gate Operators and Interlocks. The signal system for the five cars consists of a Complete Flashlight Signal System with Flashlight Night Service Annunciator, Starters Call Back System and Horizontal Ground Floor Electric Light Indicators. The service car is equipped with Mechanical Indicators at all openings to indicate to waiting passengers the position of the car in the hatch.

ES equipment was chosen on the basis of its performance in other modern installations. ES engineering service is available to help you provide good elevator service.
Type "R" STEEL BOILER for Smaller Buildings

COMPARE the new Kewanee Steel Boiler with any other small heating boiler made, and it is quickly seen that the buyer certainly gets more by investing in Kewanee. The sectional view shows some of the unusual Kewanee features. Ask for Catalog Number 88.

- **(1) SHELL**—All is one piece of thicker and heavier steel plate. Floor quality, giving great strength, unusual reliability and long life.
- **(3) DOOR SHEET**—Welded on three sides and corner to corner to keep the heat inside the boiler.
- **(4) DOUBLE PASS TUBES**—Accessories from either end. Long gas travel and ample capacity to store all of the heat from gases.
- **(5) FLOOR DOORS**—Built for Exeter Water Heater
- **(6) WATER CONTENT**—Large—circulation rapid. Water line in gauge permanently. Generous steam space prevents water freezing up into mains.
- **(7) REGULATOR**—Automatic control back of boiler instead of in front. A single red operation draft door to base and check in rear to two-way smoke hood which has damper also.
- **(8) FURNACE**—Ample openings for flames to expand and swirl; combustion chamber. Extra height so combustion can be completed.
- **(9) CROWN SHEET**—Arched, right-side-up, self-cleaning and draining
- **(10) BASE**—Heavy cast iron base good for heavy or light pressure heating boilers. KEWANEE GUARANTEES—flashed by 90 years' experience in boiler building!

**KEWANEE BOILER CORPORATION**

division of American Radiator & Standard Sanitary Corporation

Branches in Principal Cities

KEWANEE, ILLINOIS

MEMBER OF STEEL HEATING BOILER INSTITUTE
"I'm finally convinced, Lad, that now is the time for us to start using arc welding. I understand that welds produced by a shielded arc are welds that we can stand behind."

"Right you are, Pop, if we use the Lincoln 'Fleetweld' process. It is the only manual process with a completely shielded arc that produces welds economically. In this process the shielded arc precludes practically all possibility of oxides and nitrides forming in the weld metal. Consequently welds produced by the Lincoln 'Fleetweld' process have a tensile strength of 60,000 to 75,000 lbs. per square inch — 10,000 to 20,000 lbs. stronger than mild rolled steel. And these welds are ductile. When pulled they will show a 20% to 30% elongation in 2 inches. Welding with the Lincoln 'Fleetweld' process costs less because you can weld two or three times faster with it than with any other manual welding method. Of course in many cases where production warrants automatic welding, the Lincoln 'Electronic Tornado' process will produce the same quality welds with a shielded arc but more economically."

THE LINCOLN ELECTRIC COMPANY
Department No. 4-1 Cleveland, Ohio
World's Largest Manufacturers of Arc Welding Equipment

This test bar of steel plate welded by the Lincoln 'Fleetweld' process broke when subjected to pull of 54,000 lbs. per square inch. The weld was machined flush with plate and two .182 in. diameter holes drilled through weld before testing. The stress imposed on the weld was 60,900 lbs. per square inch which stretched the holes to 17/64 in. diameter, an elongation of more than 40%. A simple test of the greater ductility of welds made by the Lincoln 'Fleetweld' process. Both welds were made on a straight piece of steel plate which was then bent as shown.

LINCOLN
"Stable-Arc"
WELDER

Lincoln "Stable-Arc" welder, motor-driven portable truck type, for use where electric power is available.
UNLESS the bricklayer is given good, rich, mortar, he cannot do quick, neat, economical brickwork. One part Brixment, three parts sand, makes a mortar plastic like a straight lime mix and strong as the brick itself.

It is unusually easy to spread, and when the bricklayer throws up a head-joint, the mortar sticks to the brick. Louisville Cement Company, Incorporated, Louisville, Kentucky.

CEMENT MANUFACTURERS SINCE 1830
Mills: Brixment, N. Y. and Speed, Indiana

BRIXMENT
for MASONRY and STUCCO
Quick Heating

ASSURED

IN THIS

WISCONSIN

CHURCH

QUICK heating has been assured in the First Congregational Church of Madison, Wisconsin, by insulating the roof with Novoid Corkboard. The warm blanket of cork cuts down the rapid loss of heat through the roof. It holds the heat inside and makes it possible to bring the building up to a comfortable temperature in less time and with less fuel. And it can be held at that temperature easily and economically.

Roofs insulated with Novoid Corkboard are an essential in churches and other intermittently used and heated buildings. Not only does Novoid Corkboard assure quick heating and saving of fuel in winter, but it keeps the buildings cooler in summer. Cork keeps sun’s heat out as effectively as it keeps in furnace heat.

COMPLETE DATA IMMEDIATELY AVAILABLE

For samples, prices and further information regarding Novoid Corkboard, write Cork Import Corporation, 345 West 40th Street, New York City.

Novoid Corkboard Insulation

For Churches and other Public Buildings
TODAY, TELEPHONE CONVENIENCE IS PLANNED IN ADVANCE

MODERN HOMES, built for comfort and convenience, have telephones throughout ... in living room, library, kitchen, garage, bedrooms, nursery ... wherever time and steps can be saved by quick communication.

Many architects, in planning new or remodeled residences, now specify conduit for telephone wiring within the walls and floors. In this way, it is possible to provide telephone outlets at the most convenient locations in each of the important rooms. All wiring is completely concealed, thereby giving greater freedom from certain types of service interruption. Moreover, the home owner may use any number of outlets at a time, and can readily expand or rearrange his service to meet changing requirements.

Your local telephone company will be glad to assist you in planning the telephone arrangements for any of your projects. There is no charge for the service. Just call the Business Office.
Equipped throughout with
AMERICAN SASH CHAIN

"500 Fifth Avenue Building"
Corner of 42nd St. and 5th Ave.
New York City

Architects: Shreve, Lamb & Harmon
Builders: C. T. Wills, Inc.
2017 Campbell Metal Windows

THERE are four silent workers in each window . . .
four lengths of dependable chain. Dependable
because the material is the very best quality. Depend­
able because American Sash Chain is uniform in
strength and size, link for link.

You are safe when you specify American Sash Chain.

Write for full particulars.

AMERICAN CHAIN COMPANY, Inc.
BRIDGEPORT, CONNECTICUT

District Sales Offices:
Boston, Chicago, New York, Philadelphia, Pittsburgh, San Francisco
Is there a place in Your plans for USELESS EXIT LIGHTS?

POWER fails—lights go out. It may be in a hospital where an operation is being performed ... it may be in a theatre where crowds will become panicky ... it may be in school auditoriums where programs will be interrupted.

This may not happen today or tomorrow; but when it does, will the foresight in your plans protect? Or will important light units fail with the power because no emergency lighting system was provided for? Will intended useful exit lights turn out to be USELESS EXIT LIGHTS?

Architects all over the United States are learning the advantages of an Exide Emergency Lighting Battery—and are specifying it for all kinds of buildings where crowds gather.

Include an Exide Emergency Lighting Battery in every building YOU plan and be safe.

An Exide Battery instantly and automatically takes over the entire emergency load when current fails—without so much as a throw of the switch.

And Exides are not expensive to buy ... their maintenance cost is surprisingly low.

Find out more about Exide emergency batteries. Write for our Emergency Lighting Bulletin, or consult Sweet's Catalog, Pages D 5810-11. Better yet ... have an Exide representative call. He has some interesting facts to tell you. Write today. No obligation.

Exide EMERGENCY LIGHTING BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE
Exide Batteries of Canada, Limited, Toronto
Now—Rolled in the Central West

...for the

Illinois Steel

Subsidiary of United States Steel
The Central West now has a source of its own for the production of the popular C.B. SECTIONS, previously manufactured only by Carnegie Steel Company at Pittsburgh. Illinois Steel Company, at South Chicago Works, manufactures a complete series of C.B. SECTIONS. Production facilities for these Sections include a new open hearth plant, soaking pits, rolling mill, and ample storage facilities located adjacent to mills for the production of American Standard structural shapes. Thoroughly modern facilities for preparing and shipping C.B. SECTIONS assure expeditious service.
THE WISDOM OF SPECIFYING RUBER-OID BUILT-UP ROOFS

Architects specify the type of built-up roof that best suits each building. Whether that choice is Asbestos, Coal Tar Pitch and Felt, or Asphalt, The Ruberoid Co. can afford to be impartial. Ruberoid has them all.

Ruberoid’s flexible specifications meet any condition of climate, atmosphere, unusual wear or roof design. Their price range makes them attractive for any work. Their service record is proved over a long period of years.

To safeguard the architect, the builder and the owner, RUBEROID Built-up Roofs are guaranteed both as to workmanship and material for 10, 15 or 20 years, according to the specification used. This guarantee is backed by a National Surety Bond. These guaranteed or bonded roofs are applied only by approved roofing contractors of known skill and reliability.

For ready reference, you will find a complete catalog of RUBEROID Built-up Roof specifications in 1931 Sweet’s. Should you desire extra sets of these specifications, or face a roofing problem resulting from unusual conditions, there is an engineering department at each Ruberoid office listed below. Simply write or phone. Your inquiry will receive our prompt attention.

The RUBEROID Co.

ROOFING MANUFACTURERS FOR OVER FORTY YEARS
Sales Divisions: RUBEROID MILLS—CONTINENTAL ROOFING MILLS
SAFEPACK MILLS—H. F. WATSON MILLS—ETERNIT

10 Horse Power Century Type SCN Squirrel Cage Induction 3 and 2 Phase 60 Cycle Motor—Across-the-line-Start.

SIMPLICITY OF STARTING

No current-limiting starting equipment is required on Century Type SCN Squirrel Cage Motors in 30 horse power and smaller sizes, because their starting current is within NELA recommendations... Any approved switch or starter may be used. As a result, they take full advantage of the line current—no current is dissipated in starting equipment—installation is simplified and maintenance costs are low.

Century Squirrel Cage motors are built in all standard sizes from ¼ to 250 horse power.

CEN TURY ELECTRIC COMPANY
1806 PINE ST. • ST. LOUIS, MO.

40 U.S. and Canadian Stock Points and More Than 75 Outside Thereof

CENTURY MOTORS
FOR MORE THAN 27 YEARS AT ST. LOUIS

SINGLE PHASE, THREE PHASE, AND DIRECT CURRENT MOTORS

MOTOR GENERATOR SETS, ROTARY CONVERTORS, FANS AND VENTILATORS
...sound construction with low-cost service

Your sheet and plate construction can be as sound and durable as the rest of the structure. Both in original cost and upkeep, Armco INGOT IRON is decidedly the economical metal.

Your assurance of long, dependable service lies in Armco INGOT IRON's splendid twenty-five year performance record—the longest record of actual service of any low-cost, rust-resisting sheets and plates. Here is a metal that's proved by impartial time and rigorous service.

Metal lath, cornices, marquises, window frames, skylights, heating and ventilating ducts, stacks—these are some of the places where Armco INGOT IRON serves long and economically. But let an Armco Engineer tell you more of this interesting story. He is only as far from you as your telephone.

TUNE IN—The famous Armco Concert Band broadcasts every Thursday night
WJR—700 K. Cincinnati
Nine to nine-thirty, E.S.T.
NEW YORK CITY
LOWER MANHATTAN

1798
Before the use of Elevators.

1876
22 years after Elisha Otis made the first Safe Elevator.

1908
A few years after the Otis high-speed gearless electric elevator was perfected.

1930
6 years after the introduction of Otis Signal Control Elevators.

ITS GROWTH IN 132 YEARS

Presented to illustrate an outstanding example of the effect which the seventy-six years development of the Otis Elevator Industry has had on the cities of the World.

OTIS ELEVATOR COMPANY
OFFICES THROUGHOUT THE WORLD
"...this DOOR FRAME actually becomes PART OF THE WALL..."

"...it is unique in this result. The Frame closely engages the tile—The wall anchors are positive in their function—The plaster is bonded and reinforced over the sides of the Frame—Plaster cracks cannot occur."

"...and it is foolproof in construction—The anchors are visible—The plaster loops are formed to permit inspection of tile setting."

Aside from the greater beauty of doorways without standing trim—Kalman Steel Door Frames provide 15 structural advantages that cannot all be found in any other construction.

KALMAN STEEL COMPANY
Albany • Atlanta • Baltimore • Boston • Buffalo • Chicago • Cleveland
Columbus • Dallas • Dayton • Detroit • Houston • Milwaukee • Minneapolis
Newark • New Haven • New York • Niles • Philadelphia • Pittsburgh
St. Louis • St. Paul • Syracuse • Washington, D. C. • Youngstown
Export Office: New York

KALMAN STEEL DOOR FRAMES
Since coffee is the most important single item on the menu . . . you really should recommend the

PETERSEN URN

Pyrex Glass Lined and Equipped with "Tomlinson" Faucets

The "Petersen" Coffee Urn makes perfect coffee, according to the newest scientific principles of coffee-making. Fresh coffee is available for a much longer period due to the patented air chamber between the coffee jar and water jacket, which maintains an even temperature of approximately 200° Fahrenheit.

The "Petersen" Urn is easy to operate—cannot overfill the coffee water compartment. It extracts the maximum coffee flavor, with the least amount of tannin. It saves space—does the work of a two urn battery! Fitted with "Tomlinson" No-Drip Faucets.

There is no repouring with the "Petersen" Urn. It saves time and labor, and at the same time produces better coffee!

We make no extravagant claims for the "Petersen" Urn. Instead, we refer you to its many enthusiastic users.

The "Petersen" Urn is of the very heaviest and finest construction, presenting a handsome appearance in any service. The body is extra heavy cold rolled copper, heavily nickedled. The bottom is even heavier. The cover is hinged, which prevents it from being thrown around and possibly dented. The spray head is silver plated and may be swung out of the way or removed and cleaned. Made with Pyrex glass liner and fitted with "Tomlinson" No-Drip Faucets. With each urn is included filterator and filter cloth.

The "Petersen" Urn is also offered in a two-jar size—does the work of a three-urn battery.

The "Petersen" Urn may be purchased through your equipment jobbers, or direct from The John Van Range Co.
For the New Day

This, Sir, is the day of change.
Architectural forms and architectural materials that were good enough twenty years ago, are not always adequate now.

Yesterday's champion may trail the pack today.
And be forgotten tomorrow.

Into this age of constant searching for new and better materials, the new series genuine Type “B” Von Duprin device brings a wholly new conception of exit service. Modern in line, stronger, more reliable than any devices known a few short months ago, these new Von Duprins are finding their rightful place on the doors of the noblest structures of today.

VONNEGUT HARDWARE CO.
Indianapolis, Ind.

Listed as Standard by Underwriters’ Laboratories
WHERE STONE AND STEEL BLEND WITH THE BLUE

Aquatint etching of the Empire State Building, New York, N. Y., the world's tallest building—Shreve, Lamb and Harmon, Architects—Fred. Brutschy, Consulting Plumbing Engineer—Meyer Strong & Jones, Inc., Consulting Heating Engineer—Starrett Bros. & Eken, Inc., General Contractor—J. L. Murphy, Inc., Plumbing Contractor—Baker Smith & Co., Heating Contractor... Jenkins Valves were selected for both the heating and plumbing of this monumental structure... Jenkins Bros., New York—Boston—Philadelphia—Chicago—Houston
Even a Casual Reading

of

HEATING AND VENTILATING

by an architect's staff gives the assurance that no problem of air conditioning will ever be approached in that office on any but the most modern basis.

Clients have a right to expect familiarity with the most advanced heating and ventilating practice, even though actual design and installation remain strictly within the province of the engineer specializing in that field.

The subscription price is two dollars a year.

A sample copy is at your service.

HEATING AND VENTILATING, 521 Fifth Avenue, New York
An average is reliable and useful only when you are certain that it includes all the factors that it should... “all present or accounted for”. And especially is this true in judging heating system steam consumption figures. There are no less than forty-five separate variable factors that may affect the steam consumption of any heating system. To allow any one of them to be overlooked, forgotten or disregarded may lead to faulty conclusion or false decision.

We have prepared a “check-list” of these 45 variable factors to help you check your steam consumption figures and estimates. Write for one or more copies. We will be glad to send them gratis to anybody.

Engineers, architects and heating contractors will find the related subjects of heating steam consumption analysis, estimating and heating cost accounting, as presented by Warren Webster & Company, of vital interest. A request for further details will bring a Webster steam heating specialist to discuss this vital subject.

A Heating System for Every Need and Every Purpose

Heating requirements vary so widely that no one type of heating system can be expected to provide the greatest return on the dollar invested in the heating equipment for all types and sizes of buildings. Realizing this, Warren Webster & Company have consistently developed an entire group of Webster Systems of steam heating to provide a heating system for every need and every purpose.

Webster MODERATOR System provides “Controlled - by - the-Weather” heating and makes possible new methods of operation and new standards of economy. Can be applied to any existing steam heating system of sufficient size.

IMPROVED Webster Vacuum System provides distribution balanced from the start—the supply of steam to each radiator is so equalized that all radiators get steam at the same time and in substantially the same proportion, regardless of distance from the boiler. May be supplemented by HYLO Vacuum Variator, permitting manual control by building operator. Applicable to new or existing installations.

IMPROVED Type “R” System for residences and larger buildings as well, combines advantages of steam heating with advantages of hot water, but without limitations. Meets fully the operating requirements of newer fuels, newer types of radiation and newer thermostatic controls. Also provides better-than-ever heating service with old radiation and old controls.

Full details of any or all of these systems will be furnished on request.

Warren Webster & Company, Camden, N.J.

Pioneers of the Vacuum System of Steam Heating

Branches in 60 Principal U. S. Cities

Darling Bros., Ltd., Montreal, Canada

-since 1888-

Webster

Systems of Steam Heating

This is one of a series of advertisements discussing the factors affecting heating steam consumption. The purpose of the series is to call attention to the methods of heating steam consumption analysis, estimate and heating cost accounting developed by Warren Webster & Company to provide a reliable basis for comparing heating system efficiency. Actual detailed facts and figures of steam consumption of a number of Webster Systems of Steam Heating, prepared in accordance with these methods, are available for your examination.
SCIENCE PRODUCES

A New

G-E RIGID CONDUIT

THE talent of metallurgists, chemists and engineers combined to produce the new G-E Rigid Conduit.

It is more ductile for quicker, easier installation—longer lived because the zinc coating is more elastic and does not flake off at bends.

Now it meets every requirement of architect, contractor, owner... and safeguards wiring permanently in any type of construction.

G-E Rigid Conduit—is made in two types: "G-E White" is hot-dipped galvanized outside and in. "G-E Black" is made of the same high grade steel tubing, enameled.

Get it anywhere from G-E Merchandise Distributors—or write Section C-163, Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

RIGID CONDUIT
BOOK DEPARTMENT

COLONIAL IRONWORK IN OLD PHILADELPHIA

A REVIEW BY
OLIVER SEMPLE BARTON

It can hardly be said of ironwork that overmuch has been written of it, so far as the United States are concerned, and this latest work will command immediate attention. Perhaps no form of craft work possesses a stronger appeal for the architect. Iron has been a most useful material since the earliest days and has always been closely associated with architecture, either giving protection in troublous times or decoration in later days. The author of this work presents a volume of plates and drawings devoted exclusively to the ironwork of colonial Philadelphia and of the same city during the early days of the republic, a work of the utmost value to the architect and one which will be welcomed by anyone interested in craftsmanship in iron. The introduction by Fiske Kimball is sympathetically and historically in harmony with the work of the author and voices an appeal to architects to make themselves responsible for the craftsmen employed to carry out their ideas of coordination between a building's structure and its embellishment, be it of iron or what not.

The city which saw the birth of American independence and which was for many years the nation's capital emerged from the ordeal of the Revolution vastly better off than either New York or Boston. William Penn had founded well, and the city was the home of wealth, culture and prosperity, and the Quakers supplied a large part of the funds that made possible the embellishment of their city. Its civil and ecclesiastical architecture as well as the purely domestic and business houses afforded, almost without exception, backgrounds for some of the finest wrought iron of colonial days. The plates and drawings presented here help one to realize how much we are indebted to the citizens of Philadelphia for such a splendid "survival of the fittest" of the ironworker's art. The young town had been begun on the banks of the Delaware River, and during its first century of existence there had been erected many buildings of note displaying not only an English influence but much of a strongly native character. To this day we are indebted to their builders for sound construction and use of enduring materials. The builders were influenced by the needs of a young and isolated life, and today the ironwork reveals its part in the development of new ideas, beauty and good taste, resulting in a series of heirlooms full of charm and dignity, a delight to architects, artists and all who have a desire for a more sincere appreciation of the dignified and aesthetic, in both architecture and the allied crafts.

The illustrations in this volume lead us to live over the life of colonial days when men and women passed in and out of beautiful buildings or lived a life of charm and comfort in houses which were something apart from absolute English type, something which gave a less limited view of existence and its possibilities. Mr. Wallace has run his gamut with a keen eye for the development of ironwork, from the solidity of square bars and plain railings of the early period up to the time of the Revolution. To the earlier time belong the fences of St. Paul's and the gates of Christ Church burying ground and others. The sturdy fence and graceful gates of St. Peter's and the careful consideration of correct detail and proportion in the comprehensive draftsmanship displayed in the drawings of William Allen Dunn help one to a better understanding of the fine qualities of the earlier work. Much of it was influenced by English ideals, as both plates and drawings indicate. Careful consideration of the illustrations proves that much attention was paid to proper spacing and that thought was given to soundness of outline and construction.

Withal a free flowing is true of all curves and spirals, while spikes and finials surmounting both gates and rails are frankly what they were intended for,—protection as well as to give a proper finish. It is evident that the author has a keen feeling and interest for his subject, for the care taken in the selection of examples for reproduction gives added charm and assurance to his work.

Following the earlier types there came what might be known as the work of the "middle period," when a certain lightness and grace of pattern were displayed in nearly all examples chosen. The introduction has well mentioned the fine stair balustrade of "Solitude" on the Schuylkill, and the balcony and railings of the Stephen Girard Warehouse. These latter in particular call for

Unless otherwise noted, books reviewed or advertised in THE ARCHITECTURAL FORUM will be supplied at published prices. A remittance must accompany each order. Books so ordered are not returnable.
Selected Books on Architecture

Colonial Iron Work in Old Philadelphia
By Wallace and Dunn

This splendid collection of photographs and measured drawings will prove a welcome addition to the library of every architect, for its carefully selected examples are certain to give helpful suggestions on every problem of design. The book shows the evolution in the use of iron for ornamentation from the plain square bars of the pre-Revolutionary Powel railing, through the graceful, simple curves of the Solning railing, and the Dirard balcony, to the Greek Revival period with its ornaments and even ensembles in cast iron.

Both the photographs and measured plates are clearly printed in large size, so that every detail may be easily seen. Profiles and sections are also given.

150 full page plates, 200 figures, 40 full page measured drawings, cloth. Price $15.00.

Mexican Houses
By Garrison and Rustay

The houses in this volume are carefully selected examples of the Minor and Domestic Architecture of the country. These are 45 plates of measured drawings of small houses. These show not only plans, facades, elevations, and details, but are complete with notes on the color materials and ornamentation.

Over 200 photographs illustrate interiors as well as exteriors, facades, patios, gardens, doorways and windows, and some splendid examples of wrought iron work, use of glazed tiles for wall treatments, dados, fountains, niches, and kitchens.

174 full page plates, 10 x 13 1/2 inches, with 8 pencil sketches, and 45 full page measured drawings, cloth bound. Price $15.00.

American Theatres of Today—II
Edited by R. W. Sexton

This second book is devoted to a discussion of the various phases of the plan, design, and equipment of the modern theatre building. Chapters on various subjects have been contributed by men who stand at the head of their profession in the several fields. There are one hundred and sixty-six pages, 123 of which are full page plates, illustrating plans, sections, and exterior and interior views of the most recently designed theatres in this country. The text, too, is illustrated in many cases by specially prepared drawings.


164 pages, 10 x 13 inches, over 300 figures, cloth. Price $13.50.

Gargoyles, Chimeres, & Grotesque in French Gothic Sculpture
By L. B. Bridaham

This book contains about six hundred clear examples of sculptural ornament being shown in their original architectural setting, which makes this an important source book for architecture as well. All classes of details are treated, such as capitals, brackets, pinnacles, gargoyles, chimeres, rymphs, sculpture, symbolic and non-symbolic work in stone, and stall details, misericordes, and civic carvings in wood. Many of the photographs are of work which has been destroyed during the World War, therefore representing the only records of such sculpture. An introductory text gives the historical setting in which such sculpture was born, and indicates the forces responsible for its existence.

250 pages, 9 1/2 x 12 1/2, 600 figures, cloth. Price $18.00.

American Commercial Buildings of Today
By R. W. Sexton

The latest developments in the design of commercial buildings in this country are given in this new work. The illustrations are divided into four groups: Skyscraper Office Buildings; Private Business Buildings; Stores and Shops, and Banks—Interiors and Exteriors. Each group is preceded by an article in which the problems of design are described and suggestions made to aid their logical solution.

There are over three hundred pages of photographs of exteriors and interiors, details, plans, scale drawings, and sketches. The buildings illustrated are modern in that they are of recent conception and may be said to be characteristic of today.

324 pages, 9 1/2 x 12 1/2 inches, over 300 full page plates, cloth. Price $18.00.

Sent Prepaid on Receipt of Price.
Architectural Forum, 521 Fifth Avenue, New York

 Unless otherwise noted, books reviewed or advertised in The Architectural Forum will be supplied at published prices. A remittance must accompany each order.

Colony Iron Work in Old Philadelphia

Edited by R. W. Sexton

This work contains about six hundred clear examples of sculptural ornament being shown in their original architectural setting, which makes this an important source book for architecture as well. All classes of details are treated, such as capitals, brackets, pinnacles, gargoyles, chimeres, rymphs, sculpture, symbolic and non-symbolic work in stone, and stall details, misericordes, and civic carvings in wood. Many of the photographs are of work which has been destroyed during the World War, therefore representing the only records of such sculpture. An introductory text gives the historical setting in which such sculpture was born, and indicates the forces responsible for its existence.

250 pages, 9 1/2 x 12 1/2, 600 figures, cloth. Price $18.00.

American Commercial Buildings of Today

By R. W. Sexton

The latest developments in the design of commercial buildings in this country are given in this new work. The illustrations are divided into four groups: Skyscraper Office Buildings; Private Business Buildings; Stores and Shops, and Banks—Interiors and Exteriors. Each group is preceded by an article in which the problems of design are described and suggestions made to aid their logical solution.

There are over three hundred pages of photographs of exteriors and interiors, details, plans, scale drawings, and sketches. The buildings illustrated are modern in that they are of recent conception and may be said to be characteristic of today.

324 pages, 9 1/2 x 12 1/2 inches, over 300 full page plates, cloth. Price $18.00.

 sent Prepaid on Receipt of Price.
Architectural Forum, 521 Fifth Avenue, New York

Unless otherwise noted, books reviewed or advertised in The Architectural Forum will be supplied at published prices. A remittance must accompany each order.

HIGHWAY TRAFFIC.

REGIONAL SURVEY OF NEW YORK.

Volume III. By Harold M. Lewis in consultation with Ernest P. Goodrich. 172 pages, 8 1/2 x 11 ins. Illustrated; cloth, Price.$3. Published by Regional Plan of New York and Environments.

THE relation of highway traffic to buildings may not be apparent when one is blockaded on a highway in the country where visible buildings are few in number, but these traffic blockades in country roads are as time-consuming and inconvenient as many urban traffic blockades. In urban communities, traffic congestion has
Cryer Thermostatic Radiator Trap Has Rugged Construction

Full Details of How the Cryer Thermostatic Trap Operates

The Cryer Thermostatic Radiator Trap on the return end of the radiators of any two-pipe low pressure steam, vapor or vacuum heating system, allows water, air and gases to pass from the radiator into the return line, while preventing steam from doing so.

If only condensed water and gases are in the trap, at a temperature less than that of steam, the volatile liquid in the metallic bellows and the bellows itself expand slightly, but not enough to close the opening between the plug on the end of the bellows and the seat through which the contents flow into the return line.

When steam is in the trap, it causes sufficient expansion of the bellows to close the opening between the plug on the end of the bellows and the seat, thus preventing steam from flowing into the return line.

New Trap Uses Special Alloys for Bellows and Seat

In making the Cryer Thermostatic Radiator Trap a special bronze alloy for the bellows, and stainless steel for the seat are used.

On these two parts of any thermostatic trap depends mainly its satisfactory service.

The special alloys used in the Cryer Thermostatic Radiator Trap are exclusive with that trap. They insure its functioning uniformly and without waste or noise on any low pressure steam, vapor or vacuum system. It is designed for operation at up to 5 lbs. pressure (maximum limit 10 lbs.) and with any practicable vacuum in the return line.

The Cryer Thermostatic Radiator Trap is standard for use on all forms and types of radiation, and in conjunction with any radiator inlet valve of any type whatsoever. Together with the Cryer Radiator Control Valve it provides "hot water" heat on steam systems, as described in column 1.

Cutaway view of Cryer Thermostatic Radiator Trap, showing special alloy bellows and stainless steel seat.
Selected Books on Architecture

American Apartment Houses, Hotels, Apartment Hotels of Today
By R. W. Sexton

Probably at no time in the history of the world has the style of architecture in a country changed so radically during such a short period of time as it has in the United States during the last two decades. This is particularly true of the plan of the multi-family dwelling—the apartment houses, hotels, apartment hotels. Just two years ago, Mr. Sexton prepared a book entitled "American Apartment House Plans of Today." This book recorded the progress that had been made up to that time in the development of a type of building which had been evolved to relieve the perplexing housing problem with which the larger cities were confronted.

This companion volume contains a new collection of apartment houses included in this second volume is a collection of hotels and apartment hotels gathered from all parts of the country. Every building is illustrated by exterior views and typical floor plans. There is also included an assortment of photographs of interiors in these several types of multi-dwellings.

There are plans of over one hundred and fifty apartment houses, fifty hotels, fifty apartment hotels and fifty pages of interiors.

328 pages, 10 x 13 inches, over 600 figures, cloth. Price $18.00.

New Building Estimators' Handbook
By William Arthur

A real help in preparing bids for modern construction based on more than 50 years' experience. Residences, churches, apartment houses all other types of building are fully analyzed with labor and material figured chiefly in hours and quantities. All the data was taken from actual cost records of work done in various sections of the country. Many of the examples have been illustrated and conditions are fully described. Wherever possible the author has arranged the data in tabular form for quick reference and the 600 tables mean a big saving of time to the user. A glance at the following chapters will give some idea of the wide scope of this Estimator's Guide. The new 36-page index affords quick access to any item.


1,030 pages, 5 x 7 inches, 467 figs., flexible fabric. $6.00.

Building Estimator's Reference Book
By F. R. Walker, With Supplement

A notther authoritative guide to present day labor and material costs. All data being given on a basis of work done the same as in Arthur's book. Walker has analyzed examples of large structures so that it will prove more helpful to the city estimator. The new edition covers every operation from excavation to elevators and brand new information on Cendere Concrete Building Units, Van Guider Concrete Walls, all kinds of Insulation and Wall Shrouding, French and Spanish Tile Roofs, Rough Slate Roofs, Art Metal Doors and Trim, Metal Elevator Enclosures, Linoleum Floors, Rubber Tile, Foreign and Domestic Marble Freight and Passenger Elevators, Mechanical Refrigeration, Stokers, Types of Steel Joints. A vest pocket book giving 200 pages of selected data is given free with each reference book. This is not sold separately.

1,800 pages, 4½ x 6½ inches, illustrated, fabricoid. $10.00.

Estimating Construction Costs
By G. Underwood

This new book is reviewed at length on Page 46, Part 1 of this issue. A feature of it is the manner in which costs of labor and materials are presented in chart form. These costs are based on what might be called an average cost of production. Each of the following chapters is devoted to an explanation of manner in which the charts were computed, with full information regarding the data involved.


620 pages, 6 x 9 inches, illustrated, fabricoid. Price $6.00.

Send Prepaid on Receipt of Price.

Architectural Forum, 521 Fifth Avenue, New York

Unless otherwise noted, books reviewed or advertised in this ARCHITECTURAL FORUM will be supplied at published prices. A remittance must accompany each order. Books so ordered are not returnable.
Hoffman-Economy

Return Line Vacuum Pump

Jet-type vacuum producer used in these pumps is the simplest and most dependable method for exhausting air and vapors. It has no moving parts and never wears out. Hotter water can be handled than with other types.

Why go to Tom, Dick and Harry for different types of pumps, when Hoffman's complete line will take care of your requirements for every heating purpose. Whether for high or low pressure, vacuum or air-line systems, here is a complete source of pump supply.

You can install any of the Hoffman-Economy Pump models with the assurance that it will satisfactorily do the job for which it is intended. A study of actual operating conditions has led to numerous improvements that exactly suit these pumps to every kind of modern heating systems.

The Return Line Vacuum Pump, illustrated above, typifies the Hoffman-Economy high standard of excellence. It employs a jet-type vacuum producer, the simplest and best known method of exhausting air and vapors. There are no close clearances on the pump and, because the vacuum producer has no moving parts, it never wears out. Almost boiling water is handled with complete efficiency. Exceptionally low inlet in most cases makes a pump pit unnecessary.

For complete technical information on Hoffman-Economy Pumps and all Hoffman specialties, write for our catalog.

Hoffman Specialty Company, Inc., Dept. EF-26, Waterbury, Conn.

Hoffman-Economy Pumps
have fallen a ready victim. Too many and altogether too large hotels have been built to cater to towns' ambition or civic pride. Many a large town or small and unimportant city has a pretentious hotel building, named usually after some local or historical celebrity (a further concession to civic vanity) which is not and probably never will be profitable to its owners or operators. Even in New York, with its vast volume of transient business, there is an over-supply of hotels, and many excellent houses in a desperate effort to secure patronage are offering "hotel accommodations and service at rooming house rates."

Hotel men and hotel associations are fully aware of the danger and are attempting to call a halt in the building of unnecessary hotels. This volume by the Director of Operations, Associated Hotels, Inc., is an examination of the many factors which regulate the conducting of hotels, and as such it well merits the study of those who contemplate the building of hotels, those who supply the funds, and the architects and builders who plan and construct them. The volume is the result of wide study, experience and research, and it deals with every phase of the problem as it affects profitable operation of a hotel.


A RADICAL departure is made in this work from the usual exposition of estimating by other authors. Estimating construction costs is of such great importance in the building industry and in architecture that an improvement in working data deserves careful consideration. The usual estimating manual presents its data in the form of tables, and when several factors are involved the process of determining the item of cost or quantity is somewhat involved and likely to be in error.

Mr. Underwood presents a method of measuring quantities of material and cost of labor by the use of graphic charts only. The material charts are confined to determining the cost of material per unit of quantity, such as the cost of sand per 1,000 bricks laid in 5/8-inch mortar joints for varying prices of sand up to $5 per cubic yard. The basis of such a chart is 4/10 cu. yd. of sand for 1,000 bricks. Other charts show the cost of cement and lime. Mortar joints are given for 3/4-inch and 5/8-inch mortar joints. The costs of other materials used in construction are given in similar charts.

The labor charts are for 8-, 9- and 10-hour days, based on a unit of labor per man per day and covering a wide range of wage scales. The only variable would be the basic unit of work performed or material required. While Mr. Underwood's assumptions in these respects appear to be reasonable and safe under normal conditions, it is possible for some contractors to have experience data which justify a different basic unit of labor.

The use of a chart in a bound volume may not always be convenient, and that is one reason why architects and, more especially, engineers, prepare their own working tables for desk use. The material and labor charts are so simple and similar in form that charts for desk use could be made at small cost. Such charts could be made for basic factors different than those employed by the author. In fact, this work presents a new method which should relieve estimating of some burdensome labor in determining the material and the labor costs per unit.

The Georgian Period

Students' Collection from Original Edition
Edited by WM. ROTCH WARE

EVERY architect should have a good reference to the Georgian or Colonial architecture in America. This volume is recognized as the standard authority on the subject. It was prepared at great expense by a corps of men who actually photographed and measured each house.

This "Students' Collection" comprises 100 plates, carefully selected from the 450 in the complete edition. They are from the original printing and show every detail clearly. The photographs, which were reproduced by the Heliotype process, are large enough to show every detail of the ornamentation. The measured plates not only show the scaled drawing of the whole mantel, cornice, doorway, or whatever it may be, but also give all the profiles or sections, and larger sized details of all important points.

When you are looking for a suggestion for exterior treatment of the house, church, hall, gateway, cornice, or for a stairway, mantel, cabinet, iron grille, etc., you are certain to find a great many charming examples on each subject from which to make your selection.

100 Plates 10 x 14 inches, 28 Pages Text, Portfolio. Price $15.00 delivered.

ARCHITECTURAL FORUM BOOK DEPARTMENT
521 Fifth Avenue, New York
No ARCHITECT is sold by Extravagant Claims

He will judge a new material for himself!

Bi-FLAX is a new material, the only material of its kind. It is our belief that extravagant claims will never sell you this new material ... that as a competent judge you will study Bi-FLAX, and formulate your own opinion of its value.

We can tell you about the distinctive features of Bi-FLAX. That Bi-FLAX is the only insulated plaster base material in which the insulation functions as insulation alone, and as a result ... Bi-FLAX has maximum insulation value. That Bi-FLAX combines the high insulating value of Flax-li-num with flat expanded painted metal lath, and is the only insulating plaster base of steel that provides a positive mechanical key.

We could tell you of many other features of Bi-FLAX, but we feel that in the final analysis, Bi-FLAX will only gain your approval and acceptance when you have examined it yourself.

The attached coupon is for your convenience. It will bring you a sample of Bi-FLAX ... that you may examine this new building material, the only one of its kind.
Nowadays people expect

"Something to be done about it"

MARK TWAIN once said that everybody talked about the weather, but nobody did anything about it. That was back in the nineties.

York, as pioneer in refrigeration, has naturally been long engaged in design and manufacture of complete air conditioning equipment for every type of service.

York's viewpoint with regard to a particular type of equipment is without prejudice because York manufactures all types.

York experience and air conditioning equipment are at the service of Business, and the Public generally, through you.

There are 71 conveniently located direct factory branches, the nearest of which will be glad to serve you.

YORK ICE MACHINERY CORPORATION

You, as consultants, are at the gateway of this growing public consciousness of healthful air, at proper temperature and humidity... all the year round. You can enhance and guide it. York desires to offer you complete cooperation in line with this objective and is in a position to do so.

Refrigeration and Air Conditioning are inseparable.

York Refrigeration
PART I—ARCHITECTURAL DESIGN

Cover Design: Terrace, Villa Helm, Neuilly-sur-Seine  From a Water Color by Waldo Midgley

Main Lobby, Empire State Building  From a Water Color by J. Floyd Yerrell  Frontispiece

ARTICLES

The Empire State Building
VII. The General Design  William F. Lamb  1
Policy and Opinion
Community Apartments  Francis S. Onderdonk  43
Common Brick House Competition  81

PLATE ILLUSTRATIONS

Architect

Slights System Service Building, Chicago  Thielbar & Fagard  9-20
St. Paul's Church, Chestnut Hill, Pa.  Zantzinger, Borie & Medary  21-40
Worcester Pressed Steel Co., Worcester, Mass.  J. D. Leland & Company  49-54
English Cotswold Houses  55-66
House of Lockwood Barr, Esq., Pelham, N. Y.  Electus D. Litchfield  67-72
Women's Club, Ridgewood, N. J.  George S. Knaif  73-78
Sculpture for a Modern Building  79-80
Common Brick House Competition  82-88

PART II—ARCHITECTURAL ENGINEERING AND BUSINESS

Steel for Tower, Empire State Building  From a Photograph by Browning Studios  Frontispiece

ARTICLES

Annual Forecast of Architecture and Building, 1931  C. Stanley Taylor  89

The Empire State Building
VIII. Elevators  Bassett Jones  95
Tower Bracing  David Cushman Coyle  100
Contractors—Pure and Impure, But Never Simple  Kenneth M. Murchison  103
St. Cloud Hospital, St. Cloud, Minn.  A. T. North  105
Learning the Trends from the Facts  Edward P. Simon  115
The Question of Size
A Re-Approach to the Study of Zoning  A. B. Randall  117
Determining Apartment Rentals  Leonard Cox  123
The Supervision of Construction Operations  Willyd W. Beach  129

KENNETH K. STOWELL, A.I.A., Editor
ARTHUR T. NORTH, A.I.A.
ROGER W. SHERMAN
JOHN C. FISTERE

CONTRIBUTING EDITORS

Kenneth M. Murchison
Rexford Newcomb

LEXTER R. FOUNTAIN, Advertising Manager

The Architectural Forum is published monthly by National Trade Journals, Inc., 521 Fifth Avenue, New York, Wheeler Sammons, Chairman of the Board; H. J. Bligh, President; E. J. Rosencrans, Treasurer.

Ail Copies Mailed Flat

THE ARCHITECTURAL FORUM  VOl. LIV, No. 1  JANUARY, 1931

CONTENTS

THE ARCHITECTURAL FORUM is published monthly by National Trade Journals, Inc., 521 Fifth Avenue, New York, Wheeler Sammons, Chairman of the Board; H. J. Bligh, President; E. J. Rosencrans, Treasurer.


Trade supplied by American News Company and its Branches.

Copyright, 1931, by National Trade Journals, Inc.
A crowded city pleads for space . . . swiftly, floor on floor, the sure steel climbs—and thirty-five or forty city "plots" stand where there was one before.

Structural steel not only multiplies the precious bit of ground. It increases rentable floor area. Its great strength is not handicapped by excessive bulk, so interiors may be larger without conspicuous construction members. Steel comes to a job ready to go into place. It is unaffected by rain, freezing or intense heat. Erected quickly, wherever and whenever men can work, it saves time, labor, interest charges.

More and more homes, small apartment and mercantile houses, small industrial plants and small as well as large bridges are being built with structural steel. Architects and builders are realizing that the employment of steel merely to give strength and security to weaker materials is a compromise with its many advantages when used in the form of structural shapes.

Before building anything, find out what steel can do for you. The Institute serves as a clearing house for technical and economic information on steel construction, and offers full and free co-operation in the use of such data to architects, engineers and all others interested.

The co-operative non-profit service organization of the structural steel industry of North America. Through its extensive test and research program, the Institute aims to establish the full facts regarding steel in relation to every type of construction. The Institute's many publications, covering every phase of steel construction, are available on request. Please address all inquiries to 200 Madison Avenue, New York City. In Canada, to 710 Bank of Hamilton Bldg., Toronto, Ontario. District offices in New York, Worcester, Philadelphia, Birmingham, Cleveland, Chicago, Milwaukee, St. Louis, Topeka, Dallas, San Francisco and Toronto.

"SKYSCRAPER HANGAR IN A METROPOLIS," BY HUGH FERRISS. AN ENLARGEMENT, ON SPECIAL STOCK FOR FRAMING, WILL BE MAILED WITHOUT CHARGE TO ANY ARCHITECT, ENGINEER OR BUSINESS EXECUTIVE.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

STEEL INSURES STRENGTH AND SECURITY
STEEL FOR THE TOWER, EMPIRE STATE BUILDING
SHREEVE, LAMB & HARMON
ARCHITECTS
THE ANNUAL FORECAST of ARCHITECTURE AND BUILDING 1931

NEVER in the ten years since THE ARCHITECTURAL FORUM inaugurated its annual survey and forecast has the subject of future building activity been so important to the architectural profession. Will the architect's business be better in 1931? That is the question which is of paramount interest.

The forecast for 1931 is the most difficult which has yet been undertaken because we are now riding in the aftermath of a "red figure panic." This forecast is therefore based upon an unusually broad and careful investigation which this year was encouraged by the United States Department of Commerce because of official recognition of the stabilizing values of increased activity in the building construction industry.

The results of this survey are, to some extent, encouraging. It looks as though business will improve gradually. There will be no phenomenal recovery, but the year 1931 promises to be the beginning of a better business cycle for architects. In order that architects may judge for themselves and perhaps apply some interesting comparisons to their own business, we are presenting the major results and deductions together with graphic and tabular data.

SOURCES

A CAREFULLY developed questionnaire was sent by THE ARCHITECTURAL FORUM to every architectural office in the country asking for detailed information covering types and values of buildings actually being planned or under definite consideration for the year 1931. A similar questionnaire was sent to a large number of mortgage sources in every part of the country to uncover money conditions in relation to building finance. Investigators visited the government departments, particularly those which might be the source of new construction programs for 1931, and a series of personal interviews was conducted with contractors, engineers and others who qualified to render valuable opinions. But the architect is the advance guard of the building industry,—the first person to know of the building project outside the owner's immediate circle. He is, therefore, the primary source of information as to the future building activity and that is why the major activity of this survey is directed to architects. He is also the first to receive actual money from the new building project.

In considering the architect's business for 1931, it must be remembered that a substantial part of his income will be derived from projects planned during that year, although the actual letting of contracts may not take place until the following year. This condition will be particularly significant in connection with publicly financed work where the authorization of planning may occur in 1931, although actual construction in some instances will not begin until the end of the year or in the 1932 building season. The architect's income in 1931 will perhaps have in it a larger proportion than usual of fees emanating from the planning stages of various projects, particularly those which may fall in the publicly financed groups and in the institutional fields.

REASONS FOR INCREASE OVER 1930

THERE are six sound reasons for anticipating an improvement in business for the architect in 1931.

1. Volume of building arising through normal channels will probably equal that of 1930.
This graphic review provides for a rapid comparison of building activity by years from 1922 to 1928 and by months in 1929 and 1930. It shows the following: (a) volume of construction; (b) money spent for new buildings; (c) money value of contemplated buildings indicated by plans filed; (d) index of building costs; and (e) index of general commodity costs. Based on figures from U. S. Department of Commerce, F. W. Dodge Corporation and Engineering News-Record.

COMPARISON BETWEEN ACTUAL NEW BUILDING CONSTRUCTION IN 1930 AND FORECAST FOR 1931 IN TWENTY BUILDING TYPES

This comparison indicates only projects which were constructed from architects' plans. The figures for 1930 do not include engineering or other projects where architects' services were not employed. This particularly applies to the field of dwellings under $10,000 and to the industrial field.

<table>
<thead>
<tr>
<th>BUILDING TYPES</th>
<th>ESTIMATED CONSTRUCTION 1930</th>
<th>TOTAL CONSTRUCTION 1931</th>
<th>1930 FORECAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive</td>
<td>$86,984,700</td>
<td>$17,396,940</td>
<td>$104,381,640</td>
</tr>
<tr>
<td>Banks</td>
<td>59,200,800</td>
<td>5,920,080</td>
<td>65,120,880</td>
</tr>
<tr>
<td>Apartments</td>
<td>308,042,700</td>
<td>77,010,675</td>
<td>385,053,475</td>
</tr>
<tr>
<td>Apartment Hotels</td>
<td>104,300,000</td>
<td>12,516,000</td>
<td>116,816,000</td>
</tr>
<tr>
<td>Clubs, Fraternal, etc</td>
<td>44,877,800</td>
<td>13,463,340</td>
<td>58,341,140</td>
</tr>
<tr>
<td>Community &amp; Memorial</td>
<td>35,856,200</td>
<td>5,585,620</td>
<td>41,441,820</td>
</tr>
<tr>
<td>Churches</td>
<td>72,876,200</td>
<td>14,575,240</td>
<td>87,451,440</td>
</tr>
<tr>
<td>Dwellings (Below $20M)</td>
<td>78,200,000</td>
<td>15,640,000</td>
<td>93,840,000</td>
</tr>
<tr>
<td>Dwellings (Over $20M but $50M)</td>
<td>87,400,000</td>
<td>8,860,000</td>
<td>96,260,000</td>
</tr>
<tr>
<td>Hotels</td>
<td>53,346,300</td>
<td>3,630,000</td>
<td>76,230,000</td>
</tr>
<tr>
<td>Hospitals</td>
<td>157,426,600</td>
<td>31,485,320</td>
<td>188,911,920</td>
</tr>
<tr>
<td>Industrial</td>
<td>341,236,900</td>
<td>14,328,690</td>
<td>357,615,590</td>
</tr>
<tr>
<td>Office Buildings</td>
<td>216,671,800</td>
<td>43,334,360</td>
<td>260,006,160</td>
</tr>
<tr>
<td>Public Buildings</td>
<td>120,269,400</td>
<td>12,026,940</td>
<td>132,296,340</td>
</tr>
<tr>
<td>Schools</td>
<td>351,524,500</td>
<td>70,304,900</td>
<td>421,829,400</td>
</tr>
<tr>
<td>Stores</td>
<td>193,141,900</td>
<td>13,519,933</td>
<td>206,661,833</td>
</tr>
<tr>
<td>Theaters</td>
<td>27,449,000</td>
<td>4,117,350</td>
<td>31,566,350</td>
</tr>
<tr>
<td>Transportation</td>
<td>74,360,000</td>
<td>3,715,000</td>
<td>78,075,000</td>
</tr>
<tr>
<td>Welfare, Y.M.C.A., etc</td>
<td>23,690,000</td>
<td>1,180,000</td>
<td>24,870,000</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>$2,511,354,800</strong></td>
<td><strong>$407,948,908</strong></td>
<td><strong>$3,179,787,200</strong></td>
</tr>
</tbody>
</table>

(1) Based on figures from United States Department of Commerce and F. W. Dodge Corporation.
2. Publicly financed building will add volume and stimulus. The building programs of the federal, state, county and municipal governments will be definitely under way.
3. Greatly decreased costs of building.
4. Improvement in mortgage conditions and financing of building.
5. Demand for institutional and residential buildings is increasing.
6. Better construction is being demanded by owners and financial interests, eliminating support for speculative "jerry-building" and thereby increasing the demand for competent architectural service.

VOLUME OF BUILDING

To indicate the potential building activity of 1931 as being approximately equal to that of the past year, there will be found herewith a tabular comparison of actual building construction of the year 1930 and potential building activity as derived from the forecast figures. This comparison is made in twenty building types and the figures do not include those structures which were not designed by architects, such, for instance, as a large proportion of dwellings costing less than $10,000 and about half the industrial construction of the country. They serve, therefore, as a basis for comparing past and probable activity in relation to the architect's own business and can be used in general to indicate the building types in which architects are most likely to find work during the coming year. An examination of this tabulation shows the following major trends.

The comparisons between actual construction in 1930 and the forecast figures for 1931, as obtained from architectural offices and other sources, show the following:

<table>
<thead>
<tr>
<th>BUILDING TYPES</th>
<th>CHANGE OF ACTIVITY AS FORECAST FOR 1931</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive</td>
<td>Very slight increase, if any</td>
</tr>
<tr>
<td>Banks (individual buildings)</td>
<td>Practically the same as 1930</td>
</tr>
<tr>
<td>Apartments</td>
<td>Decrease about 18%</td>
</tr>
<tr>
<td>Apartment Hotels</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Churches</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Community and Town Halls</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Hotels</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Hospitals</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Industrial</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Office Buildings</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Public Buildings</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Schools</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Theaters</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Transportation</td>
<td>Increase about 18%</td>
</tr>
<tr>
<td>Welfare, Y.M.C.A., etc.</td>
<td>Increase about 18%</td>
</tr>
</tbody>
</table>

1931 PREDICTIONS BY DISTRICTS IN TWENTY BUILDING CLASSIFICATIONS

<table>
<thead>
<tr>
<th>BUILDING TYPES</th>
<th>N. EASTERN STATES</th>
<th>N. ATLANTIC STATES</th>
<th>S. EASTERN STATES</th>
<th>S. WESTERN STATES</th>
<th>MIDDLE STATES</th>
<th>WESTERN STATES</th>
<th>TOTAL U.S.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive</td>
<td>$9,216,800</td>
<td>$61,916,500</td>
<td>$1,574,400</td>
<td>$11,885,900</td>
<td>$850,114,300</td>
<td>$13,390,600</td>
<td>$113,098,500</td>
</tr>
<tr>
<td>Banks</td>
<td>4,161,500</td>
<td>31,570,000</td>
<td>922,500</td>
<td>1,508,800</td>
<td>21,094,500</td>
<td>3,931,900</td>
<td>63,189,200</td>
</tr>
<tr>
<td>Apartments</td>
<td>18,310,600</td>
<td>140,771,500</td>
<td>6,428,800</td>
<td>21,076,800</td>
<td>71,796,100</td>
<td>55,165,000</td>
<td>311,548,800</td>
</tr>
<tr>
<td>Apartment Hotels</td>
<td>2,214,000</td>
<td>37,761,000</td>
<td>697,000</td>
<td>18,757,500</td>
<td>45,944,200</td>
<td>22,357,300</td>
<td>123,731,000</td>
</tr>
<tr>
<td>Clubs, Fraternal, etc.</td>
<td>7,931,000</td>
<td>37,896,000</td>
<td>3,383,300</td>
<td>8,122,800</td>
<td>21,537,100</td>
<td>6,068,800</td>
<td>94,399,000</td>
</tr>
<tr>
<td>Community and Town Halls</td>
<td>5,785,100</td>
<td>31,287,100</td>
<td>2,086,900</td>
<td>4,715,000</td>
<td>11,287,300</td>
<td>22,299,900</td>
<td>77,461,300</td>
</tr>
<tr>
<td>Churches</td>
<td>15,061,500</td>
<td>55,257,700</td>
<td>5,403,800</td>
<td>9,444,300</td>
<td>40,272,100</td>
<td>13,935,900</td>
<td>119,375,100</td>
</tr>
<tr>
<td>Dwellings (below $10,000)</td>
<td>9,229,100</td>
<td>38,544,100</td>
<td>4,792,900</td>
<td>10,479,600</td>
<td>30,385,100</td>
<td>13,763,700</td>
<td>107,194,500</td>
</tr>
<tr>
<td>Dwellings (10,000 to $20,000)</td>
<td>10,266,400</td>
<td>34,628,600</td>
<td>5,514,500</td>
<td>8,540,300</td>
<td>28,905,000</td>
<td>11,881,800</td>
<td>95,736,600</td>
</tr>
<tr>
<td>Dwellings (over $20,000)</td>
<td>6,519,000</td>
<td>24,374,500</td>
<td>5,986,000</td>
<td>6,676,300</td>
<td>19,434,000</td>
<td>11,910,500</td>
<td>74,591,300</td>
</tr>
<tr>
<td>Hotels</td>
<td>7,091,000</td>
<td>29,113,700</td>
<td>15,612,700</td>
<td>11,897,800</td>
<td>23,155,900</td>
<td>11,921,400</td>
<td>106,774,500</td>
</tr>
<tr>
<td>Hospitals</td>
<td>33,257,000</td>
<td>61,501,700</td>
<td>9,987,600</td>
<td>21,344,300</td>
<td>58,728,000</td>
<td>23,029,900</td>
<td>207,826,000</td>
</tr>
<tr>
<td>Industrial</td>
<td>16,539,500</td>
<td>108,233,600</td>
<td>4,292,700</td>
<td>10,750,200</td>
<td>59,413,100</td>
<td>31,951,300</td>
<td>225,270,400</td>
</tr>
<tr>
<td>Office Buildings</td>
<td>23,866,100</td>
<td>63,591,000</td>
<td>4,346,000</td>
<td>33,189,000</td>
<td>151,270,300</td>
<td>51,730,800</td>
<td>331,993,400</td>
</tr>
<tr>
<td>Public Buildings</td>
<td>19,192,100</td>
<td>224,602,800</td>
<td>7,125,800</td>
<td>19,466,800</td>
<td>130,892,500</td>
<td>25,071,300</td>
<td>426,350,800</td>
</tr>
<tr>
<td>Schools</td>
<td>42,924,500</td>
<td>155,682,600</td>
<td>16,502,500</td>
<td>41,524,900</td>
<td>144,282,700</td>
<td>45,195,400</td>
<td>444,012,800</td>
</tr>
<tr>
<td>Stores</td>
<td>4,813,400</td>
<td>25,030,300</td>
<td>2,427,200</td>
<td>17,412,700</td>
<td>29,757,800</td>
<td>11,152,900</td>
<td>90,794,500</td>
</tr>
<tr>
<td>Theaters (under $10,000)</td>
<td>7,728,500</td>
<td>39,060,700</td>
<td>2,583,000</td>
<td>13,653,000</td>
<td>13,694,800</td>
<td>5,617,000</td>
<td>84,337,000</td>
</tr>
<tr>
<td>Transportation</td>
<td>1,947,500</td>
<td>37,720,000</td>
<td>1,086,500</td>
<td>3,321,000</td>
<td>7,892,500</td>
<td>3,075,000</td>
<td>55,042,500</td>
</tr>
<tr>
<td>Welfare, Y.M.C.A., etc.</td>
<td>3,792,500</td>
<td>16,066,400</td>
<td>205,000</td>
<td>615,000</td>
<td>6,005,900</td>
<td>6,295,500</td>
<td>35,518,300</td>
</tr>
</tbody>
</table>

TOTAL VALUE OF NEW BUILDINGS $243,845,700 $1,199,539,300 $100,959,100 $274,073,700 $971,143,200 $389,923,200 $5,179,787,200

New Construction Under Architects' Supervision as Shown Above $3,179,787,200
Probable Additional Work for Architects' Under Government, State, County and Municipal Emergency $800,000,000
TOTAL NEW BUILDING FROM ARCHITECTS' PLANS $3,179,787,200
Buildings Not Designed by Architects $960,000,000

TOTAL ESTIMATED CONSTRUCTION FOR 1931 $4,939,787,200
 Apartmeit Models  
Club & Fraternal  
Community & Memorial  
Churches  
Dwellings (Below $50,000)  
(Over $50,000)  
Hotels  
Hospitals  
Industrial Buildings  
Public Buildings  
Schools  
Stores (Including Warehouses)  
Theaters  
Transportation (Railway & Airports)  
Welfare—YMCA, etc.
Note: A small volume of hotel construction in 1930, also projected hotels, will find financing difficulties and it is probable that the forecast figure is high.

This comparison will serve to indicate to the architect what seem to be the best fields in which to seek work for the year 1931. The importance of working closer to financing institutions is indicated, particularly for the residential fields where the greatest volume of money will be available.

FIVE YEARS' ACTIVITY IN 7 MAJOR BUILDING TYPES

These charts indicate the monthly expenditures of money over a period of five years for each type of building. Note how the residential field, which includes dwellings, apartments and hotels, contributed to the 1930 shrinkage of total volume.
### 1931 Mortgage Money Forecast

Graphic interpretation of reports from 86 major building centers. Upper chart shows relative availability of money through six major mortgage sources. Lower chart shows relative preference by loaning interests on the four major building types in six divisions of the U.S. See also mortgage money condition map on next page.

### Publicly Financed Building

Late in 1929 a definite program was started by the federal government to encourage publicly financed building construction as a most powerful force working toward the alleviation of unemployment and the stabilizing of tottering economic balances. The federal government began to formulate huge appropriations to be used for the construction of federal buildings of all kinds and in all parts of the country. Toward the end of 1930, official announcements appeared to the effect that several hundred millions of dollars would be appropriated for new building expenditures in the year 1931. In the referendum votes of last election, over a half billion dollars was appropriated for state construction activities of which at least $300,000,000 is to be expended for new building. A large part of this money has already been specifically appropriated and announcements will soon be forthcoming as to the actual types of buildings and locations where such developments will take place. In all it is quite probable that well over a billion dollars will be put into action in the year 1931 through these publicly financed programs. Practically all of this work will be of the type which architects are called upon to design. While it is true that much of the work will be carried out through various governmental architectural bureaus, strong influences are being applied to cause the distribution of the work to local architects. Architects everywhere will be well advised to seek all possible information as to local activities of this nature and to pursue the proper methods of contact with those who control these programs.

### Decreased Cost of Building

Of utmost significance in connection with the encouragement of new planning through normal sources is the greatly decreased building cost. The decrease amounts to from ten to twenty per cent in different parts of the country. Several industrial buildings have just been refigured and show a decreased total cost of approximately 18 per cent as compared with a year ago. Figures for high priced residential work (houses costing from $80,000 upward) in certain sections are from 11 to 14 per cent less than last year. Some of the larger contractors have stated that specific office buildings show similar decreases in cost. Residential construction costs in general have been decreasing correspondingly.

It is obvious that this is the time to build and that owners can enjoy unusual savings by going into the market within the next few months. It would seem apparent that this condition will help to bring building activity for new plans or bring into action plans which have been lying dormant in various stages of development.
FORECAST OF MORTGAGE MONEY CONDITIONS IN 1931

The map indicates the result of the survey, showing:
— (a) dark sections—improved mortgage money conditions expected; (b) lighter sections—probably about the same as 1930; (c) white sections—no improvement anticipated—money difficult.

MORTGAGE CONDITIONS

In order to get diversity of opinion, every type of financial concern was questioned, including savings banks, trust companies, mortgage companies, investment bankers and building and loan associations. Responses were obtained from practically every large center in the country—eighty-six cities in all being involved in this survey. The graphic charts here shown indicate conditions.

In regard to second mortgage money, it was found that little help was indicated for the speculative builder who, as a rule, requires a large amount of secondary financing in order to carry on. Of the replies received, 85 per cent stated that secondary financing for the average speculative proposition would be very difficult to obtain. There seems to be almost a conspiracy toward the elimination of "jerry building." This does not mean that sound, legitimate operations will not be financed, but it does seem to threaten a paralyzing blow to the type of construction which has been anathema to the architect and detrimental to his business. The conclusions which we have drawn from this mortgage money survey are: (1) there is considerably more money available now for building purposes than there was a year ago; (2) there is an obvious preference shown for loans on dwellings due to a desire to diversify security and the fact that much of the available mortgage money is in the hands of sources favoring this type of loan; (3) a reasonable assurance of a fair amount of funds for sound commercial projects in those localities which are not now suffering from an overbuilt condition; (4) mortgage money conditions will continue to improve in a sound though gradual manner; (5) a growing demand by financial interests for architectural service to insure quality in construction.

QUALITY CONSTRUCTION

There is a trend toward better planning and construction of all types of buildings, particularly those requiring mortgage financing. Lending institutions have recently been forced to examine their collateral more carefully and in many instances they have found buildings deficient in plan, construction and equipment, with consequent high operating costs and rapid depreciation. They have found that it does not pay to "economize" by eliminating competent architectural service or by cutting fees or limiting the service which the architect renders. This will mean more work for architects and the adequate fees which come from better appreciation of the value of services rendered.

With this presentation we leave the 1931 forecast in the hands of the architect himself. It is our opinion that an improvement will begin to be evident in 1931, probably toward the end of the first quarter and more definitely in the second quarter of the year. The factors and trends which have been here set forth seem to indicate that there will be increased activity for the architect, at an even earlier time than that of almost any other business.

C. STANLEY TAYLOR.
JANUARY • 1931 • THE ARCHITECTURAL FORUM • 95

THE EMPIRE STATE BUILDING
SHREVE, LAMB & HARMON, ARCHITECTS

VIII. ELEVATORS

BY

BASSETT JONES*

It is too early to say all that might be said about
the elevators in the Empire State Building.
In several respects the elevator requirements of
this building were beyond the apparatus avail-
able at the time the building was planned, so, in
this regard, new apparatus had to be designed
and built to meet the conditions.
The proper time to discuss these matters is
after the equipment has been put in operation and
any operating difficulties that may develop cor-
corrected. Progress in any art always involves
development, and, during the past decade, of no
mechanical art has this been more true than in
elevators.

THE GENERAL PROBLEM

During this decade rapidly increased economic
pressure, plus the zoning laws, have brought about
a constantly accelerated growth in the size and
height of buildings, both of which, at the present
time, have reached a maximum in the Empire
State Building.

Ten years ago the zoning laws had brought
about the design of tower type buildings built
upon comparatively small ground area. This led
to a restriction in the area of the upper floors
that, coupled with the distances traveled and the
corresponding time consumed, presented an ele-
vator problem that resulted in the development
of the semi-automatic, high speed, signal-operated,
push button elevator, new in the Standard Oil
Building at 26 Broadway but now common in by
far the largest number of tall buildings since built
countrywide. Thus high speed was attained with
safety. It then became possible to obtain good
elevator service in such buildings without using
so many elevators that the space occupied by
corridors and hoistways reduced the available
rentable yield or occupiable space below the
economic limit.
The subsequent competition in height of build-
ings soon reached a new limit. Buildings erected
on a limited ground area resulted in a tower of
small plan area that would permit only the
installation of a small number of elevators. Yet
the owner often wished to build a tower of more
floors than such a number of elevators of any
practical high speed could serve and render the
desirable character of service. This, and other
economic factors limiting the height of a build-
ing on any given ground area, led to the pro-
jecting of large tower type buildings on large
ground areas, which, due to the enormously
increased number of passengers that had to be
handled in a given time, in its turn introduced
new elevator problems.

If the elevator cars were merely increased in
size so as to handle more passengers per car, a
limit in the practical size of cars was soon
reached. If the number of elevators was cor-
respondingly increased, then the resulting sacrifice of
yield area interposed a limitation, and again
a limit was placed on building height.

These problems have all led to the installation
of elevators operating at much higher speeds than
were considered at the time the first signal-opera-
tion elevators were installed, and to the discussion
and projection of the double-decked elevator, the
duplex elevator (or two independent elevators
operating in a single hoistway), and to the "plaza
floor." The latter scheme consists in dividing the
building horizontally into two or more super-
posed buildings, so far as elevators are con-
cerned, each elevator separately. The main
terminal landing, or "plaza floor," in each such
division of the building is served by large fast
express elevators from the street level and making
no other stops.

PRELIMINARY DISCUSSION OF THE
EMPIRE STATE BUILDING

All of the above new possibilities were discussed
with the owners of the Empire State Building.
They were advised that it did not seem wise to
introduce any radical departure from tried ele-
vator practice in a building of this character and
in one where speed of completion was considered
to be of such economic importance. No such
entirely new method or equipment can be expected
to work, entirely and completely, directly it is
installed. Generally, it is a long distance from

*Of Meyer, Strong & Jones, Inc., Consulting Engineers
for mechanical and electrical equipment of the Empire
State Building.
DIAGRAM OF ELEVATOR BANKS

EMPIRE STATE BUILDING
the blueprints of new designs of machinery and a machine operating as desired. The adjustments and part replacements required to make the machine do what is expected of it take time and interfere with operation. Yet the only proper test of the design is to put it into operation under service conditions, and with elevators this means experiment with an occupied building. Least practical will these experiments be in a building of diversified occupancy where the traffic cannot be controlled and directed by the owner, as is possible in a one-purpose building where the tenants are the owner's employees and where the owner himself has understanding of the technical problems involved and patience enough to go along with the ironing-out process.

Therefore it was decided to lay out the elevator plant for the Empire State Building on the basis of a tried and accepted method. This, of course, put a limitation on building height that, in the future, will be removed where one or all of the proposed new methods, double-decking, duplexing, and the "plaza floor" can be wisely employed.

Large as are the ground area and tower section of the Empire State Building, the practical ultimate limit of the elevator method, using a single-deck high speed car in a hoistway, all cars running to the street level, proved to be eighty floors. This result was obtained by the repeated determination of elevator plant based on repeated modifications of plan, coupled with first cost and operating cost estimates,—indeed, the only way in which such a result can be obtained free from large probable error.

Throughout these preliminaries there existed the necessary close cooperation between the owner, the architects and the engineers.

SOME DETAILS OF EQUIPMENT

Even this height of building could only be attained by the use of the largest practical cars traveling at the highest speed attainable and apparently practical at the present time, anticipat-
load in two. Each half of the load will be applied between two different sets of guide fastenings. This requires that the guides be fastened between floors in addition to the usual fastenings at the floor levels. Additional vertical steel members are used to carry the intermediate fastenings.

In order to bring such high speed cars to a quick stop under emergency conditions without resulting injury to the passengers, the so-called "mononuiss" construction has been used throughout. Ordinarily, the mechanical safety attached to every passenger car, which grips the guide rails when the car reaches a predetermined excess speed, thus acting like the emergency brake setting on a railroad car, must be so set that it will bring the fully loaded car to a stop within a reasonable distance. Then, if the car contains but one or two passengers and so weighs much less than when fully loaded, the safety, properly set for full load in the car, will bring the lightly loaded car suddenly to rest. To avoid this, the whole moving system, car, counterweight and ropes, is tied together as a unit and all brought to rest simultaneously. Thus the load in the car is but a small part of the whole system, and one safety setting will bring it to rest practically in the same distance independently of car load. The safeties are of a type that can easily be reset, provided the system is intact, merely by reversing the car motion.

For elevators of such high rise,—between 800 and 1,000 feet,—traveling at such high speeds, the depth of pits and length of overhead run-bys determined on the basis of the old and usual methods for bringing an elevator car to an emergency stop short of the bottom and top of its hoistway, are impractical. Furthermore, very elaborate tests of such final emergency stopping devices that function independently of the car safeties have proved the inadequacy of such methods and such devices for such speed-load combinations. This has led to the development and use of radically different methods and devices for providing ultimate safety, and which do not require great depth of pits or length of top run-by. Such greatly improved and more certain ultimate safety equipment, now well tried out, will be used in the Empire State Building. Such devices were first employed relatively so long ago as in the Chicago Tribune Tower in Chicago, where structural limitations in pit depths rendered the older devices useless. The elevators in the Empire State Building will be safer than any elevator of much slower speed and less duty that has yet been installed.

The danger of injury to the passenger at the landing, due to improper relative manual operation of both car and landing door, which accounts for over 90 per cent of the elevator accidents in the United States, is eliminated by the use of automatic stops and interlocking of the operation of both car and door necessary to make practical the operation of the modern high-speed elevator.

THE PLANT

Having determined by suitable statistical methods the demands that will be made on the elevator plant, the number of elevators of proper passenger capacity and duty and their proper arrangement in banks and groups of floor served can be determined by calculation. It then becomes a problem to fit this proper arrangement into the building within the practical limitations of plan and construction. Generally the ultimate result is more or less of a compromise, but, unless the most desirable arrangement is first set up, the amount of any compromise is indeterminate and may result in wholly unsatisfactory equipment.

Working on this basis, the ultimate elevator plant now being installed in the Empire State Building is shown diagrammatically on the riser diagram and in the accompanying table of data. There are 58 passenger elevators arranged in seven banks. There are four high-speed freight or service cars serving above the ground floor, and two large slow-speed freight cars serving basements and ground floor.

The arrangement of the passenger cars in banks, as to number of cars in a bank and the floors served, is of course a compromise within proper limits between the ideal arrangement and the requirements of plan and of construction. The proper simultaneous development of building, steel and elevator plans avoided the common error of attempting to fit an elevator plant into a previously fixed building arrangement and steel layout. The essential space requirements of the elevator equipment were established before the detail structural drawings were begun and a mutually satisfactory compromise reached so that the proper number of proper size and shaped cars could be installed, arranged in proper banks so disposed as to provide reasonably easy access to and egress from the cars.

Of recent tower buildings, the Empire State Building is unique in that the tower proper begins at the fifth floor, where a major setback occurs. At the fifth floor the yield area is about 69,000 square feet. At the sixth floor the yield area is about 30,000 square feet. In this way, ample light and air are obtained on all floors. This also has the result of reducing the number of floors having very large yield area to the five lowest, which, due to the short travel, makes it possible to serve these lowest floors with a small bank of large elevators. The framing of these lower floors is such that additional elevators can be introduced into the
yield area about the central core where tenants may so desire.

But at that, the cross section of the tower, even at the 80th floor, with a yield area of over 18,000 square feet, is larger than the ground floor area of many other tower type buildings. When fully occupied by the probable class of tenancy that will rent in a building of this type in this locality, keeping the future of this district in mind, the total occupancy is estimated at about 19,000.

The maximum, five-minute traffic peak for this class is about 2,400. Elevators must be provided easy of access, capable of moving this number of persons in five minutes. In order to accomplish this with a minimum practical number of elevators, many of which have a hoist exceeding 500 feet, the elevators must move fast, if each car is to complete a number of round trips and receive a number of loadings during this peak period.

It results that the three, high-rise, banks, with hoists respectively of practically 600, 770 and 950 feet, must be rated at a speed of at least 1,000 feet per minute. The occupancy to be served by these banks is large, requiring large cars rated at 3,500 pounds load. No such loads had been previously moved at this speed in passenger service, so here special hoisting engines and roping were required together with special safety arrangements. Even at this, the highest rise bank required the use of ten such elevators, the largest number it is practical to operate as a single bank, and only then because the round trip time is long enough to prevent undue accumulation of cars at the bottom terminal.

The lower rise banks do not require such speed, but the two lowest banks do require what now seem to be the largest practical size cars for this service, rated at 4,000 pounds load. Had it been decided to increase the number of large floors above the fifth floor, a condition would soon have been reached where double-decking would have provided the only practical solution.

Above the 80th floor, which had been decided upon as the topmost floor to which it was economically sound to provide regular elevator service by a whole bank, are five floors of smaller area served by shuttle elevators from the 80th floor. The often-seen mistake of running part of the highest rise bank to these floors was not made. This always upsets the schedule and makes it practically impossible for the bank to render good service at any of the floors it serves. In such high-rise, high-speed elevators, figured to the minimum possible number, the schedule becomes of vital importance. If the cars are not dispatched on time and maintain the proper spacing, at least to an approximate degree, the cars rapidly get bunched, and the service becomes very poor. A few seconds difference in time means a long distance in travel. Here we are dealing with a vertical railroad system, in which it is almost true that cars must run on a time-table.

To take care of this situation a very complete interchangeable automatic dispatching system will be installed that makes it possible to adapt the dispatching system to the kind of service required during different periods of the day. A complete auxiliary telephone system providing for easy communication between operators, starters and machinery rooms has been installed.

In a building as large as the Empire State Building the matter of handling freight, furniture, food, milk, drinking water and the like becomes a serious problem. In addition, the delivery of mail almost assumes the aspect of a mail car matter. Provision has been made for fast, large, service and freight cars and for the possibility that one car will be devoted almost exclusively to postal distribution.

The elevator contract for this building is the largest one-building contract ever let. The magnitude of the work involved is so huge that the elevator manufacturers have established in the field what amounts to a construction organization separate from their regular New York organization. They have cooperated in every possible way, in engineering, in design and in development of the necessary new equipment, without which cooperation it would have been impossible to feel certain of success in such an undertaking.

The following may serve to indicate the magnitude of the installation.

The total number of landing entrances to the elevators is 1,239.

The total length of both car and counterweight guide rails is 27 miles.

The total length of hoisting ropes, compensating ropes and safety ropes is 120 miles.

The total length of the hoistways is nearly seven miles,—about the distance from the Battery to 110th Street,—and this vertical railroad, considered as a single track line, has a one-way traffic capacity, fully loaded but without undue crowding, of 30,000 persons an hour! This, because the elevators can carry 15,000 persons going in one direction in 30 minutes.

The total load capacity of all the elevators taken together is 225,000 pounds (100 long tons),—practically the capacity of a train of ten standard flat cars. Conceive that this train of ten, fully loaded, flat cars is being lifted vertically at a speed of ten miles an hour, and some idea of the power required can be formed. While these figures may mean little, they perhaps furnish a scale for the reader who is not familiar with elevator facts.
THERE are three ways of tackling the intangible in this life, all leading to satisfactory results. They are religion, art, and pseudo-science. The last is especially worthy of consideration. Take astrology, for instance. The fate of men and nations can be predicted with absolute certainty through observation of the position of sun and planets. What could be more satisfactory? The client is pleased, the practitioner is paid, all's well with the world.

It is much the same way with the bracing of tall buildings. There is an elaborate theory that governs the whole subject,—several of them, in fact. One can design roughly after the manner of Fleming, or one can plunge boldly into the depths of the slope deflection method and (given an imaginary building) come up panting in a year later to receive one's Ph. D. There are also half-a-dozen intermediate schools of thought, all of whose disciples enjoy in common that peace of soul which a well organized pseudo-science offers to its devotees. They are like the German mathematicians who recently built a concrete dome 250 feet across and 4 inches thick. The sheer beauty of a perfect mathematical equation drugs the mind so that it is no longer conscious of this unpleasant world filled with gyp contractors, thunderstorms, politicians, sulphur fumes, nervous old ladies, and similar intangible factors.

The only reason for preferring astrology is that as a rule the predictions of the astrologist are sufficiently postulated to give him time either to die or to escape before they are put to the proof. A building, however, is too apt to be built before the death of those responsible for it; and if it is unsatisfactory it is just too bad.

THERE are of course some types of structures that are braced for safety, or should be, and for those types the common theory is satisfactory, and as close to the facts as the nature of the case requires. Two-story houses in hurricane districts obviously need bracing. At Miami in 1926, a large number of them were blown all over the place. The same may be said of radio towers, train sheds, armories, straw hats, silk umbrellas, circus tents, and similar structures. It is an error, however, to infer that, because a small or light building is liable to be blown away, a larger one would be treated the same way, only more so. Before starting to design the building it is very desirable to have a rough idea of what we are trying to accomplish. As soon as we get beyond a few stories in height, we are generally out of the class of structures liable to be blown over, and we are met with an entirely different set of requirements. The first, and often the only requirement, is that of the law. In New York the law requires bracing for all buildings over 100 feet in height. The majority of such buildings are so wide, and so filled with partitions, that no practical reason exists for the use of bracing, other than the laudable desire of the authorities to have the building look legal. In such cases the bracing is purely cosmetic, and certain types of detail which are of no great value as bracing are very properly used for this purpose. This applies particularly to top and bottom angles, which give an appearance of stiffness without interfering with the architectural finish.

IT is therefore advantageous, when designing buildings of this second type, to be fully conscious of the nature of the design, and the reasons for its use. A considerable amount of harm has resulted because of inexperienced persons assuming that top and bottom angles, or
similar devices, were being used effectively to stiffen a particular building, when in fact they were put in solely for looks. As a result some men may have had several years experience in the use of such bracing without knowing that it is merely an optical illusion. Two good examples of this danger appeared in Miami at the time of the hurricane; both were buildings which because of their shape and their light walls, really did require bracing for safety. One was designed by an engineer who used a commonly accepted detail, in ignorance of the fact that it is only half as strong as it looks. His building cracked its walls badly, and had to be reinforced with additional braces to remove the more or less justified fears of the public. The other was a case of "free engineering:" here a draftsman in a steel company used angle connections of practically no strength at all in a slender building where serious bracing was obviously required. Similar designs have been used in New York hundreds of times, with entire justification, because of the nature of the buildings involved. But in the instance mentioned the connections were called on to carry actual stresses, a function for which they were not suited. If the wind had happened to strike the building flatwise instead of endwise, it would probably have attained the distinction of being the only steel-framed office building ever to have been blown down. As it was, it was condemned after the storm, and cut down to a lower height.

If it is wise to know what one is about when designing medium-sized buildings, it is even more essential when dealing with high and slender towers. This third class is even more subject to misunderstanding and pseudo-scientific obfuscation than the second. For here we get definitely out of the range of mechanical solutions and into the field of subjective experiences and the human nervous system. The problem of the tall tower, in a word, is to make it so stiff that the tenants will never feel the motion. To brood portentously over a complex mathematical egg, and finally emerge with a mere assurance of safety, is to flap the ears in a solemn manner. What really matters is whether the tenants will give the building a bad name, after experiencing their first thunder squall.

It is not sufficient to take the simple bracing details of a typical nineteen story apartment, with its perfectly naive theory of loads and stresses, and extend the same principles to a sixty story slender tower. The bracing in the ordinary apartment building often carries no stress whatever, while that in the tall tower will be seriously loaded. It is therefore possible to deceive oneself completely as to the deformations that will occur, taking the ordinary building as a basis of comparison. Because of the technical connection between deformation and relative stress, it is also possible to compromise even the safety of the structure, where X-bracing is used in connection with the more common details.

The design of a tall tower for comfort is a
problem in mathematics, to be sure, but it is much more than that. It involves the judgment of the engineer on the imponderable characteristics of the particular building: its exposure to wind, the tunnel and eddy effects of other towers, the material and arrangement of walls and partitions, the slenderness ratio, and the intelligence of the owners as affecting the possibility of a frivolous attitude being taken toward the question of stability.

All these factors having been considered, the engineer is in a position to choose a nominal unit load. This load is expressed in pounds per square foot, but its real meaning is quite different. It is a highly abstract quantity, and exists only in relation to another equally abstract number, the so-called "theoretical deflection per story." The latter, which may be as much as a quarter of an inch, is a number which expresses the engineer's opinion of the proposed occupants of the building and their degree of nervous sensitivity. In a ritz apartment the psychology is apt to be different from that in an office, a store, or a restaurant; and the theoretical deflection varies accordingly. A good illustration of the abstract quality of all these factors is the effect of walls. The law requires that all wind stresses be carried by steel, but anyone who omits the masonry walls on a high tower without a corresponding change in the unit load or in the allowed deflection will furnish a valuable example to those interested.

Having determined the unit load and the deflection per story, the designer may safely proceed to mathematics, provided he keeps track of what he is about, and does not mistake an abstract number for a concrete fact. In the end, if he has chosen his factors wisely, and if he knows the mathematics, and if the owner and the architect have been willing to give him a fair scope, the chances of a stiff and substantial building are good.

Here, you see, we are choosing between pseudo-science and art. The relevant factors in the design of a tall tower are some of them impossible to measure, others not even material at all; there are two ways to deal with data of this kind. The easiest is to ignore them and substitute wind loads and steel stresses out of the city code. Then by kicking up a pother over the distribution of the stresses and emitting a dense cloud of Phis and Thetas, one can please all parties without straining the mind. The resulting building, as the vibration tests show, may be good or bad or very bad, according to luck.

An art, on the other hand, is concerned with combining material and mental factors so as to produce a desired impression on the minds of human beings. Parts of its technique can be learned from books, but in great measure it requires genius and experience. The art of sky-scraping is still in its infancy, but owing to a happy combination of vision, native genius and good luck, it has already produced some very good examples along with the very bad, to serve as a background of experience for the future.
THE art of contracting for the erection of buildings has changed quite a bit since the World War. Commercialism is rearing its Medusa-like head more and more. New conditions have arisen, and the contractors, like all other good American citizens, must meet and conquer. Besides having to be more efficient, more zealous and more omniscient than ever before, the modern contractor is, more often than seldom, called upon to assist in the financing of new projects. And he does it not only to clinch the job in the first place, but because he has found out that there is money in it for him.

He has become aware that under the old system the banker or the bond house or whoever hands out the wad gets the most profit out of it, and he now affiliates himself with some responsible financial house with a look-in on some of the French dressing or gravy, or perhaps he does the banking.

THE ALMIGHTY DOLLAR

Any contracting firm which can help out the owner of a piece of property by doing his secondary financing is in a much better position to get the job than is the pure but bankerless builder. And that is why I sometimes feel sorry for the small fellow who announces that he has started in the building game but who has not tied himself up with some mammonly partner. This kind of builder will have to content himself with small jobs, with alterations and with country houses, but that is not the way leaders in the contracting business think it should be prosecuted in these modern days. Unless he wants to be always a small contractor forsooth (and, by the same token, there will always be small jobs for the small contractors), the building builder should either marry a girl whose old man is a retired capitalist and who believes in his son-in-law, or get somebody with a great roll of cash to help him over the jumps.

One of my friends is the head of a building corporation that earns its livelihood by competitive bidding. This young fellow is always busy: he is always excited; he is bidding on four or five things at the same time; and he is always losing a $200,000 job by $180! Or, in those delicious moments when he is the lowest bidder, the Board of Selectmen decides to take some of the alterations, and my friend again loses the job by $84.37!

But he likes it. The game is something like golf. There is always that ray of hope dangling before his eyes that he may do the next hole in three, or be able to hit the ball on the nose.

A FEW DON'TS

Those architects who try to put through a building operation by means of subcontracts are really entitled to the pity and sympathy of their confreres. In the first place, few architects are properly set up for such a project. Architects' superintendents are not building superintendents, and the building superintendent that an architect gets to carry out a subcontract job is generally one of a crowd of floaters, which class of employees can get the architect into plenty of trouble.

It does not seem natural that an architect can do the actual construction work for a client at a saving which might offset the general contractor's fee. Certain it is that the architect, when he lets himself in for this sort of thing, is doing nothing but hunting trouble. Has he an estimating department? Is he au courant with the prevailing prices on all subcontracts? Has he any other jobs being done by the same subcontractors, so that the subcontractor may combine his superintendence and overhead on two jobs close to each other? Where is his transportation department? And who meets the general payroll each week?

The modern up-to-date American general contractor is entitled to the admiration of the architectural world for his capacity, his looking-forwardness and his faculty for administration.

IT'S LIKE RUNNING A WAR

When you come to analyze it, the administration of a speedy, complicated and difficult building operation is amazing. There are a myriad of things to contend with. Everything necessary to be delivered on a certain day is there that day. And the gang that handles it is there as well, overalls on, waiting for it. As to delivery of materials at the building, that too is more onerous than it used to be, because our street traffic no longer admits of great piles of brick and dirt and broken stone taking up half the roadway. The placing of the ground floor slab in jig time is of paramount importance, serving as it does a mul-
ticiplicity of uses, one of which is to keep the architect from falling into the cellar. Anyhow, taking it by-and-large, putting up a modern skyscraper or a big hotel in a few months' time is a man's job, and it belongs to the contractors,—not to the architects. There is a great pile of dollars yet to be made in real estate and in buildings, and that is where the architect should take stock of himself and consider investing his surplus cash. Not in Wall Street, my brothers, where nobody knows what they're really doing until they are broke, but in city property which, if well situated, has comparatively little chance of declining in value. Then, in the development of that city property along well studied lines is where the architect should shine.

YES, WE ARE LEARNING ALL THE TIME

A few architects have taken advantage of their opportunities and have invested in building opera­tion, but they could be counted, here in New York at least, on one's fingers. The rest of them, when they get anything laid up, either buy their wives chinchilla coats, or go downtown and ask their stock brokers to recommend something. And what does a broker know? Nothing, my friends; or if not nothing, then next to nothing. "Rock Island is well thought of," or "Castor Oil is due for a rise," or "They're going to cut a melon in Transcontinental Food." That is the kind of stuff that is handed out to the prospect. The builders who are also bankers can, as I said before, put over a deal with consummate ease compared to the contractors who have to go out­side for their money. But they have to wear smoked glasses day and night. They are beset by propositions of every kind, propositions for which trusting architects have drawn up elaborate sets of drawings, added to which are the promoters' works of art in the way of financial set-ups.

But the questions of demand for space, junior financing, cubic cost, and other little items of in­terest and taxes often turn themselves into such bacteria of trouble that the whole thing resolves itself into a total waste of time for all concerned. That seems to be the fate of 19 out of 20 projects which find their way into the developing room of a big building organization or an architectural office which has the reputation of going into deals.

HE MAY DO A LITTLE CHOOSING

Would you bring your boy up to be an architect? Well, I believe I would, if he exhibited any tendencies that way, and also, if I had one. He needn't expect to die rich, nor will he ever be the President of the United States, but he will have a good time out of life and should enjoy a reasonably happy social position. But would I bring him up to be a builder? That is another matter. He would have to look up to, or pretend to look up to, the architects from whom he is trying to get a job, and that might kill him off early in life. Then besides, he would proba­bly be in a fight with the unions most of his life, and that is not so pleasant either. He is blamed for everything that they think the architect should be blamed for, and he always has to pay for some mistakes made by some mysterious draftsman.

INDIGESTION

Perhaps some day the big builders will swallow up the architects. This pretty little how-d'ye-do has been a matter of discussion time and time again. A few big companies like the Fred F. French aggregation seem to get along very well with their own architectural forces, but one cannot help thinking that every once in a while a little bird's-eye viewing wouldn't do any harm. There is no doubt that the big concerns, if they wanted to cut out the architects from their field of vision, could easily get very competent designers to head their departments for $15,000 or $20,000 a year,—perhaps less. The companies, however, with but few exceptions, prefer to sidestep that question entirely, just like the politicians on the Prohibition question, and remain in a receptive mood to the blandishments of the architectural profession, to give or take as the case might be. In the old days there used to be a feeling of distrust in the building industry between the archi­tects and the contractors, but happily that condi­tion is entirely a thing of the past, and nowadays architects and builders may be seen walking hand in hand up Fifth Avenue and eating out of the same plates in low-priced restaurants.

HE NEED NOT KNOW BRICKLAYING

A big contractor is something like a big chef. Does a big chef cook? He does not. He is a business man. It is his business to make the kitchen pay. And if it does not pay, it is up to the chef to find out why it doesn't pay and to stop up all the leaks. He might go up to the range occasion­ally to taste the sauces, and so might the big contractor go over to his buildings from time to time to see whether the job is moving along as it should move. But the big contractor need not necessarily be an expert builder. He is a financier, an organizer, a pusher, an analyst of men, a diplomat. It is he who is responsible for the tremen­dous stride of the building industry of the United States. Without his genius of organization and of driving capacity our great skyscrapers and mammoth commercial structures would not be possible today. If he had not devised ways of erecting these structures in ten or twelve months, the interest charges and fees would eat them up, and the projects would fall by the wayside.
THE ST. CLOUD HOSPITAL

PLANNED AS A COMPLETE UNIT, IT COMBINES BOTH GENERAL AND SPECIAL FACILITIES

BY

A. T. NORTH

HOSPITAL service is provided in all large cities by both general and special hospitals. The St. Cloud Hospital is so located, however, that it was planned and equipped to provide all of the things that are now considered necessary for a complete modern hospital. As St. Cloud is an important Minnesota railroad center, its location is strategic in the possibilities of serving a large contributory territory.

Grounds of sufficient area were provided, permitting the orientation for exposing all parts of the building to the sun, the two principal wings extending from the central portion in a northeastern and southeastern direction. The contour of the ground was such that this plan arrangement was constructed with a minimum of excavation for the basement and sub-basement floors. The principal front (west) is on the higher ground, facing the highway with an ample lawn area between. The rear front (east) faces the lower ground along the Mississippi River providing sufficient area for the outdoor use of the patients and employes. The site was well selected for benefits to the patients and employes and for effecting certain economies in building construction.

The spacious grounds were used to store all of the coarse materials such as brick, stone, sand, gravel, cement, reinforcing steel and form lumber. The foresight of the contractors in purchasing the materials in ample time for prompt delivery, their storage and use without delays, and the well-nigh perfect organization of the contractors' forces, contributed to an unexpectedly low cost of construction.

The exterior walls to the floor lines above adjacent grades are faced with seam-faced, random, ashlar granite, which was obtained from the rejected stone piles at quarries located from three to ten miles from the site. The retaining walls around the rear driveways and at the terraces, some of which are high, were faced with the same material. The stones were split and squared by the stone masons at the wall. The use
of stone trim, except for the window sills, was confined almost entirely to the principal elevation and in just sufficient amount and placement to enhance the appearance of the building. Although this brick structure is of large dimensions, the shape of the plan and the discriminating use of brick surfaces in different planes give to it an appearance of appropriate distinction.

Much of the concrete work was executed in cold weather, which entailed considerable expense for artificial heat, canvas, fuel and labor. The upper stories were concreted in December and the roof and roof structures in early January. The temperatures were low, as was to be expected in that locality. In the total cost of construction, as stated, is included that of considerable road construction consisting of a concrete foundation and brick pavement, pavement of delivery courts and service driveways, retaining walls with all of the required grading. The large smokestack with granite base was also included.

The walls of the Chapel are finished with face brick, stone trimmings, mosaic panels and ornamental glass windows. The concrete ceiling is decorated in colors, and the wainscoting are made of marble and wood. The walls of the entire culinary department and basement corridors, wherever food is transported from the ranges to the elevators and dumbwaiters, are faced with light tan glazed brick. An unusual amount of glazed tile was used in the operating department, delivery rooms, baths, toilets and floor serving pantries. There are metal dust chutes and laundry chutes in each wing leading to the sub-basement. Mechanical refrigeration is provided, wherever required, throughout the building, including the laboratory boxes, body case and refrigerated drinking water. The ceilings of all corridors, and of many of the rooms where required, are finished with sound-absorbing materials. City water system and a deep well provide two sources of water. The

Rear view of the hospital and grounds. Looking from the east across the Mississippi River. (Below) A portion of the sub-basement plan.
laboratories, operating department, delivery rooms, diet kitchens, autopsy room, record rooms and similar places are all finished with the best of materials and a liberal amount of fixed furnishings and equipment was included in the building cost as given.

The hospital has now become classed as a business enterprise, which should not only earn sufficient revenue to meet the operating expenses and fixed charges but also to earn a profit. It is not now considered to be entirely a charitable enterprise. As a result of the two conceptions of the hospital, formerly they were often designed for monumental architectural effect,—especially if a memorial hospital,—as well as for hospital purposes. At the present time hospitals are designed to be effective buildings operated for a profit. Local or other conditions may cause it to be impossible to operate a hospital profitably and necessitate deficits being made up by contributions by persons or financial support by governmental authorities. It should be the purpose of the architect to design a hospital structure in the most economical manner consistent with durable construction and efficient operation.

The plan is an essential factor in economical operation, not only in eliminating waste space but in correlating the parts so that operation is effected with a minimum of labor expense, fuel and power. As the plan contributes more largely to efficient operation than any other factor,—the plan is fixed when the building is constructed and inefficient management can be
corrected.—it is always interesting to make a study of the plan and the relation of the parts or departments to each other.

In the St. Cloud Hospital, the boiler and engine rooms and laundry are placed at the extreme end of the central wing, the engine and boiler room floors are below the sub-basement level. Aside from the laundry, the linen room, garbage dump room, receiving department for supplies, linen sterilizing rooms, and bedrooms for help, the remainder of the sub-basement is used for storage rooms. The contour of the ground made it impossible to daylight some of these storage spaces, which does not detract from their usefulness.

The basement floor, central wing, contains the kitchen, serving room, refrigerators and other rooms associated with the preparation and storage of food, and over the laundry and boiler room are located four private rooms for contagious disease patients, nurse and service rooms, all isolated from the remainder of the hospital.

The south wing contains the dining rooms, locker room, dormitory and toilets. On the south side of the central portion is the ambulance entrance, adjacent to which are the emergency operating room, detention room and other rooms, common to that entrance. The north wing is used by the Sisters of the Order of St. Benedict for their special purposes. Some dark storage space is provided on this floor also.

The central portion of the first floor is used for the general administrative offices, Chapel, the Bishop's and the interns' quarters. The north and south wings contain private rooms for patients, serving pantries and utility rooms. The second, third and fourth floors are typical in containing private rooms, serving pantries, utility rooms, a two-bed and a three-bed ward, linen, repair and flower rooms, and surgical dressing room. The fifth floor is typical except that in the south room is located the maternity department with delivery, labor, preparation, incubator, waiting and nursery rooms. There are also six two-bed rooms on this floor.

The sixth floor is occupied entirely by the operating rooms and the various laboratories. Three major and one minor operating room, with all of the accessory rooms, are located in the south wing. Special operating rooms, hydriatic room, general and special laboratories, library and staff meeting room, occupy the central position. The north wing is occupied by the dental diathermic, ultra-violet, galvanic, x-ray, fluoroscope, radio-graphic and cast room, with all of the necessary accessory rooms. The seventh floor, or pent house, contains a large solarium, women's rest room, smoking room and elevator lobby. A solarium is located also at the end of the
The Reception Lobby, looking toward the Main Entrance door.

The Altar in the Chapel Sanctuary. The door leads through a Sacristy to the entrance Loggia.
north and south wings, from the first to the fifth floors inclusive. All roofs are finished to be used as promenades.

The owners propose to build other buildings in the future, one to be a convent for the Sisters, the other a nurses' residence. The quartering of Sisters and nurses in the hospital is a temporary expedient. However, all the spaces at present occupied by Sisters and nurses have been built in accordance with hospital requirements and it will only be necessary to install and connect serving and utility room plumbing, cooking and refrigerating fixtures in rooms set aside for the purpose in the portions for the use of patients. Ultimate normal patient capacity is 225, 189 private or single bedrooms and 36 in thirteen wards of two beds to five beds each. Every private or single bedroom is adequate for two beds. If two or more patients cannot pay the charge for a single room, something that constantly happens in hospital practice, a number of single bedrooms will be occupied by two patients without overtaxing the culinary department, laundry and any other service.

The plan is designed for two extensions in front, joining at right angles and symmetrical to the wings already constructed. Near the two obtuse angles of the plan, rooms of corridor width are placed in the present wings to be used eventually as corridors leading to the future wings.

The building contains all of the services required for modern medical practice, and is Class A, according to the rating of the College of Surgeons and the American Hospital Association.

Certain plan and cost data will be of interest to show the relation of different use areas and elements of cost. In appraising the cost, the topography of the ground, the market conditions of material and labor, and the scope of the hospital facilities must be considered. The relative areas for the different elements of the plan will pertain to a complete hospital, including housing the nurses and Sisters in the same building. It should be noted that there is an unusual amount of storage space in the basement which, owing to the unusual contour of the ground, was secured with a minimum of cost. It was not a normal condition.
PLAN AND COST DATA

ST. CLOUD HOSPITAL, ST. CLOUD, MINN.

SCHMIDT, GARDEN & ERIKSON, CHICAGO, ILLINOIS, ARCHITECTS

Contractor: Mutter Construction Company, Fond du Lac, Wisconsin.
Size of Ground: 573' 0" x 1500' 0". Ground area, 862,500 sq. ft.
Six floors above grade, two basements. Contents, 2,574,000 cu. ft.*
Floor areas above grade, 167,960 sq. ft.; below grade, 32,915 sq. ft.
Capacity: Beds for patients, 225; wards, 36; private rooms, 189.

FLOOR AREAS

<table>
<thead>
<tr>
<th>Area</th>
<th>Square Feet</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wards</td>
<td>3,140</td>
<td>2.50%</td>
</tr>
<tr>
<td>Private rooms</td>
<td>30,200</td>
<td>26.00%</td>
</tr>
<tr>
<td>Stairs, elevators, shafts</td>
<td>5,600</td>
<td>4.60%</td>
</tr>
<tr>
<td>Public corridors, including corridor partitions</td>
<td>28,300</td>
<td>24.50%</td>
</tr>
<tr>
<td>Offices, lounges, entrances</td>
<td>2,015</td>
<td>1.60%</td>
</tr>
<tr>
<td>Operating and all rooms pertaining to them</td>
<td>7,560</td>
<td>6.50%</td>
</tr>
<tr>
<td>Clinics</td>
<td>520</td>
<td>0.40%</td>
</tr>
<tr>
<td>Pharmacy and laboratories</td>
<td>1,200</td>
<td>1.00%</td>
</tr>
<tr>
<td>Kitchen, dining rooms, serving rooms and food storage</td>
<td>8,100</td>
<td>7.00%</td>
</tr>
<tr>
<td>Laundry and linen rooms</td>
<td>2,770</td>
<td>2.20%</td>
</tr>
<tr>
<td>Boiler, engine and fuel rooms</td>
<td>7,990</td>
<td>6.50%</td>
</tr>
<tr>
<td>Nurses', interns', help's quarters, including corridors</td>
<td>16,120</td>
<td>14.00%</td>
</tr>
<tr>
<td>Solaria</td>
<td>3,950</td>
<td>3.20%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>**100.00%</td>
<td></td>
</tr>
</tbody>
</table>

*A.I.A. Standard Measurement.

COST DATA

- Insulation ........................................... 2,850.00
- Lath and plaster .................................. 88,532.00
- Granite and cut stone .............................. 71,502.00
- Marble ................................................ 18,040.00
- Miscellaneous iron ................................ 21,563.00
- Sound-absorbing material ......................... 31,532.00
- Metal toilet partitions ............................ 652.00
- Painting .............................................. 28,465.00
- Electric fixtures .................................. 10,181.65
- Hardware .............................................. 16,065.23
- Weatherstrips ....................................... 3,430.00
- Steel furniture, bronze tables, door plates ... 30,488.65
- Dumbwaiters ......................................... 8,464.00
- Incinerators ........................................ 4,080.00
- Window screens ...................................... 8,383.00
- Elevator entrance units ............................. 7,735.00
- Metal cases and shelving ........................... 50,000.00
- Chapel and lobby ..................................... 23,529.00
- Total net cost, materials and labor: $1,416,168.67

*Items not included in the general contract.
LEARNING THE TRENDS FROM THE FACTS

BY

EDWARD P. SIMON

Edward P. Simon is a Member of the Well Known Firm of Philadelphia Architects, Simon & Simon. He is a Member of the American Institute of Architects, and of the Architectural League. In Addition he is Vice-President of the Philadelphia Building Congress.

The major portion of a speech before the Philadelphia Building Congress at a dinner to Secretary Lamont, December 9, 1930.

MOTORING through the woods of Maine several years ago I was uncertain as to the proper road to reach my destination, and accosting a stranger asked him a number of questions regarding the roads thereabouts and the names of the nearest villages. To all my questions his answer was "I don't know"; finally, in desperation, I asked him what he did know. After quite a pause he said, "Well, I know I'm not lost." It would seem to me the building industry finds itself in the position that both the stranger and I occupied at that time. He knew where he was, and I knew where I wanted to go.

I may well start with the question: How can we best take steps to ascertain where we are going and thereby aim to cure certain ills which today afflict the building industry? This same question is being asked throughout the world today, as is evidenced by the report of the proceedings of the International Congress of Architects, held at Budapest, in September. I quote from their proceedings: "The Reform of Professional Architectural Instructions to Conform to the Exigencies of Practical Life: 'Considering the economic conditions of today, as well as the radical changes in production since the World War, the Congress deems it necessary that a more complete instruction should be given in finance, economics and the working of organizations than formerly.'"

Without detriment to the architects' artistic conceptions, the compositions should be studied with an idea of their actual execution, especially from an economic point of view.

THE PRICE OF ECONOMIC ERRORS

The economic structure of buildings has changed no less than the physical during the last fifty years. Formerly, the typical building enterprise concerned one man or a small group; if a manufacturer or a merchant needed a new factory or store he paid for it out of the profits of his business. Today, almost every building of importance is owned by a great body of investors. A mistake in building economics seventy-five years ago affected only one enterprise; a mistake in building today reaches far beyond the building into the pockets of thousands of direct investors.

For example, had Harper & Brothers in 1854 sunk more capital in the building they then erected in Franklin Square, New York, than their publishing business could afford, their consequent losses would have affected only Harper & Brothers. When, however, an Empire State Building is erected in 1930, representing an investment of approximately $50,000,000, its financial success directly involves the fortunes of thousands of people, many of whom may never even see the building.

An uneconomic building in 1930 is obviously much more serious to the public than was the same type of building in 1854. The shift in ownership and financing has affected a complete dependence of every branch of the building industry upon every other branch. I do not mean the obvious fact that the work of architects, engineers and contractors is all inter-related; but in the most inclusive sense, the fortunes of realtors, bankers, designers, builders and investors hinge upon the success of every sizable building project.

INEVITABLE RELATIVITY

In the long run, realtors cannot flourish at the expense of bankers, nor operators at the expense of contractors. Every unsound enterprise means direct loss, not only to the owners and builders of that particular building, but to every sound project in the neighborhood as well, because the soundly financed projects must meet the competition of lowered rents in the foreclosed projects. It's like the rain—

"That falls alike
Upon the just and unjust feller;
But most upon the just, because
The unjust has the just's umbrella."

Now no investor or contractor courts loss. Losses in building occur because owners ignore or do not understand all the elements in modern building economics. A wrong estimate spells disaster, and that wrong estimates are as common as right ones is attested by the general state of the building industry throughout the country. The Associated General Contractors of America vouch...
for the statement that there have been 50 per cent of failures in cycles of five-year periods in the building industry.

OUT OF STEP

The situation, I grant you, is unduly severe and dependent on many factors possibly not fully capable of control and elimination, yet this alone is not the basic cause of affairs. Many of these projects could never have been an unqualified success under even boom conditions. In other words, the present distress in the building industry is by no means due entirely to the general business depression. Col. W. A. Starrett, writing in 1928, at the peak of prosperity, said:

"When an industry ranks among the first two or three in a great industrial nation, and no one engaged in it makes more than a living except indirectly, something is wrong. The answer is that building, while conducted with high technical efficiency, is economically the most disorganized major activity known to modern business, agriculture perhaps excepted. Building and farming linger in the economics of the 19th century, whence all but they have fled."

But it is not so much where we are, but where we are going that counts. The entire human family can be divided generally into two great groups—those who are interested in where we are, and those whose chief concern is where we are going. The former believe that deviation from tradition spells disaster. They fulfill a certain function in society by preserving values that have already been won; but the others, that look to the future, the prophets that are interested in where we are going, they are the ones who effect progress.

CURBING LOSSES

Nothing will so stimulate building as reducing the likelihood of losses in buildings. Today we cannot escape the fact that many building operations have fallen far short of their expected possibilities. But this direct loss, often a very severe one, is still only a small part of the widespread damage. Foreclosed properties and their improvements, sold under the hammer or taken over by the mortgage holders, with the previous equity eliminated, may be rented at lower rates; and these rentals affect and jeopardize other neighboring properties which may have been economically conceived and soundly financed. In other words, one's neighbors and what they do, can endanger not only our lives and safety, but also our pocket books.

Further curtailment in avoidable losses will react very definitely not only towards reducing building costs but likewise the interest required on funds invested in the builders' industry. Just as life insurance companies have found that health research and health education, by increasing longevity, can reduce insurance rates, so the building industry will discover that economic research and economic education, by reducing risk to capital, can lower building losses.

WHO HAS THE FACTS?

The question is asked: How can the architect, the builder, the contractor, the investor, get the facts vital to his enterprise? Why should it not be possible for a new owner to profit by the experience of the former owner? Why should not the architect be in a position to secure from one source accurate and comprehensive information as to the many factors which it is his task to consider, whereas today it is necessary for him to collect his information from many sources, many of which are questionable?

Why should not the banker be in a position to learn accurately the actual cash investment which the prospective builder is prepared to invest in his own enterprise, and why should it not be possible for the builder to determine in advance the financial responsibility both of the owner and the sub-contractor? What would it mean to the legislator if he had at his disposal a reliable fund of information as to the real property values, the relative congestion of various areas, and above all, business trends? And no less important, what would be the value of such a source of information to the City and State Engineering Departments?

Some of these facts which should be available to all, are known only to the designer, others only to the realtor, and still others only to the banker. Obviously it is impossible for one individual or one isolated organization to cover the whole field. The task of getting a comprehensive picture of all phases of the building industry cannot be delegated to the banker any more than it can be represented as strictly an architect's problem. It is a problem which we all must face, for it is in this age of dynamic building economies, increasingly vital to the success of all.

POOLING THE INFORMATION

It would seem that the banker should pool his information with the materials man, the banker with the architect, the electrical contractor with the plumbing contractor. It is industry's problem—one problem of applying scientific principles to an industry which has fallen behind in the march of progress. I believe that the problem of co-ordinating and pooling our information, the question of developing a fund of knowledge which will make it possible for all those interested in the industry to know with a great degree of accuracy where his money is coming from, is not impossible of solution. I believe that reasoning men, brought together by a common interest, can find a way out.
THE QUESTION OF SIZE
A RE-APPROACH TO THE STUDY OF ZONING

BY A. B. RANDALL

BY first discarding all old data, opinions and pre-conceptions,—endeavoring to ascertain what were the desirable things that should be expected of height and bulk regulations,—how far these were being affected by the present laws and what improvements might be suggested,—Mr. Ford, General Director of the Regional Plan Association, inaugurated a re-approach to zoning. In this he endeavored to draw conclusions from the data available and follow them through to a logical conclusion exactly as is done in the solution of an algebraic equation which, after the original equation is set up, leads on regardless of the opinion of the calculator. The original equations are naturally the difficult ones; but, although they must take into account the very complex workings and the many ramifications of present-day urban life, they divide themselves into certain groups, even though the data and the relations of cause and effect within the group often are highly controversial.

Included among those things which are to be desired and which should make the city more livable are: light, air, outlook, privacy, freedom of movement and the avoidance of congestion, as well as various and sundry amenities that have their effect on the general wellbeing.

These are large equations to set up in any study, and Mr. Ford felt that the data inserted in them from the available facts were more often a mere sounding than a finished product, but revealed lines of attack and paths for later exploration.

SOCILOGISTS’ VIEW

Thus, while definite recommendations were drawn up from the findings, Mr. Ford felt that they were tentative at best and matters which should have further analysis and study before their full adoption. The sudden and untimely death of Mr. Ford last summer has cut short his plans for further investigation along these lines. The general basis, except for constitutional legality, is still a subject for much controversy. The sociologist, desiring better conditions of living for the community, tends to deplore the skyscraper and all the evils that attend its presence in our intensively used districts; while on the other hand there is the viewpoint of the property owner, often with a building showing an inadequate return on his investment, together with ever mounting taxes and the falling off of income in his building.

The sociologist, in cooperation with medical authorities, has made valuable studies of the requirements and features which should be afforded for human habitation and the quarters in which human beings may work efficiently. These studies stress particularly the need of sunlight, light, air, outlook and freedom from congestion both in the prevention of disease and for the full enjoyment of living. These factors have direct effect not only on the physical, but also the psychological, wellbeing of the inhabitants of our communities.

ECONOMISTS’ VIEW

The viewpoint of the property owner and the economist advances a directly opposite line of thought, and questions whether it will be possible under existing conditions to construct buildings to meet the requirements and the things desired by the sociologist and the zoning enthusiast in such a way that the owners and the others connected with the building industry can obtain a sufficient return on their investments, and also that the masses and the general majority of people shall be able to pay for proper accommodations. In addition to this they deny emphatically all the imputations of evil that have been heaped on the skyscraper, and declare it to be a monument to efficiency and a boon to the community.
Furthermore it is maintained that, were the city spread out to double its size and were all our buildings correspondingly less in height, there would be exactly the same pedestrian traffic on the streets, and even additional vehicular traffic.

Mr. W. D. Heydecker and Mr. E. P. Goodrich, in Survey Volume VII of the Regional Plan of New York and Environs, present in collected form not only most of the data that have been amassed through years of work by others but also much highly valuable and original material, based on their own researches and analyses that they have collected. This forms what is probably the most outstanding work on the subject of requirements of the human being in the matter of living and working quarters.

THE SKYSCRAPER

Messrs. W. C. Clark, Vice President and Economist of S. W. Straus & Co., and J. L. Kingston, architect, in their book, "The Skyscraper," published by the American Institute of Steel Construction, present the economic side of the picture, as based on conditions found in the erection of a multi-story building on a site in the intensively used center of one of our choicest districts. They show that, on land at peak prices, it is only possible to erect very tall buildings under the present-day conditions of land values, rentals and building costs. Likewise they lay to rest (let us hope, permanently) certain superstitions that it is most unprofitable to erect skyscrapers. In fact their work contains a notable understatement of the case of the skyscraper in certain particulars. The National Association of Building Owners and Managers, vitally interested in the matter of height and bulk regulation, has had a committee, of changing personnel, over a period of many years, studying the aspects of this question, and their proceedings contain pertinent data.

CONFLICTING OPINION

Any reader taking up the subject will find masses of conflicting data, suppositions and opinions. The reader will agree in turn first with those who would improve the living conditions of the masses, and then with the building owners and managers; he will wonder how the model buildings of the sociologist can be erected either to show a profit on valuable land and at current rentals or, if running at a profit, conjecture who the tenants may be and how they could afford to meet the rentals required.

"WHITE COLLAR" HOUSING

That the problem is an acute one is evidenced by the conferences called by President Miller of the Borough of Manhattan, to endeavor to institute the construction of moderately priced apartments within the range of the pocketbook of the "white collar" classes, so-called, and thus prevent a yearly exodus of the population. Is the answer to be some form of curtailment or leveling of land values, in order to make this possible, or will the American principle of mass production—of which the construction of the skyscraper is but another form—make this possible, and still provide suitable quarters?

Mr. Ford considered these two and many other intermediate points of view in his research study, and on this subject wrote:

In view of these facts and tendencies, we have felt for some time that there must be an entirely new approach to the subject of determining the most effective height, bulk and form for city buildings.

There must be available data that would prove quantitatively the dollars and cents value of sunlight, light, air, privacy, outlook and freedom of movement. If such data were available, then it would be possible to so frame a zoning control over height, bulk and form as to assure the maximum light, air and outlook and freedom of movement consistent with an assured and reasonable return on the investment. This is the problem to which we have set ourselves in this study, to see what the best recent experience of the most intelligent and farseeing builders would warrant in the way of such control, with a particular view to seeing if the right kind of zoning might not be used to protect the rule-of-thumb builder and the blind follower of precedent against himself.

We want to see if the building regulations can be so developed that they not only protect the neighbor, but protect the builder himself against the uneconomic types of building and too early obsolescence. This is our problem, and it applies not just to the larger cities, but to all, large and small.

CHAOTIC COMPETITION

There is no doubt whatever but that in the growth of cities many sites have been marred by the erection not only of ugly buildings but by forms of development which were either unsuccessful at the outset or soon became so. Some buildings were erected covering the major parts of their plots. This enabled their owners and the tenants of the building to enjoy light, air and outlook over other lower and usually older buildings. In time these buildings were overshadowed by even higher neighbors, and the race for a place in the sun continued until, with keen competition, (often only for an advertising value), and darkness, losses of rental value or high vacancies overtook the hindmost. Not only were changes in style and in the character of space, service and accommodations factors of obsolescence, but these losses of light, air and outlook, combined with mounting
taxes as the values of land increased with the advent of more and larger buildings, caused a form of economic obsolescence to render buildings valueless many years before they would be physically useless. In certain cases, even where a farsighted owner endeavored to protect his future by covering a smaller percentage of the plot than was customary, he had no full assurance that some neighbor would not build to the limit and, using the light and air he had provided, add nothing to the common fund of these desirables. It was clear that, for the common good and the mutual protection of all concerned, some form of cooperation and mutual recognition of rights was needed.

THE ECONOMIC APPROACH

It was therefore a question, granting the present height and bulk regulations for buildings as having a very definite purpose and use, how well these regulations were serving their purposes, and what effect they were having on buildings in the most intensively used and valuable districts. These districts, where the situation tends to become acute, are the clinic in which it is necessary to study symptoms, avenues of approach to the cure (if any) and the steps to be undertaken in preventing the difficulty.

Granting the findings of the zoning experts, the medical authorities and the sociologist, as far as they go, that there are value and necessity for light, air, outlook, privacy and other amenities, the necessity for any given amounts is not conclusively proved for all types of conditions; it is possible to study the matter from another viewpoint—the economic approach. This indicates that there is a recognition of the money value, or premium, set upon these things in the market today. This economic recognition, although affected by other factors and conditions, is relatively definite as compared with the quantitative exactness of the medical testimony, and is definitely reflected in the rentals that people will pay for various types of space.

RENTAL FACTORS

This variation of rentals with exposure, orientation and height above the street is very obvious in apartments, hotel rooms and the usual offices. In all cases where any type of unit is located on small courts or under the shadow of high adjacent walls, a very materially lower rental value exists. Where such units are located facing the open and high up in the building, with an abundance of sunlight, light, air and a commanding outlook, rentals are at a premium, as shown by a study of rental schedules of office buildings and apartment houses. The building manager recalls the time when the uppermost floors of his building were looked upon with suspicion and distrust by tenants; now the reverse is becoming true. Any rental policy is the reflection of the desires and the demands of tenants at the time, based on the consensus of their recognition of values. Public opinion is the cause and rental schedules the effect.

Rental differences clearly indicate that space having sunlight, light, air, outlook, freedom from the noise, dust and heat of our streets, and an increased sense of privacy may command anywhere from 50 per cent to 200 per cent rental over that obtainable for space without these conditions.

In the Wall Street district of New York, space 50 to 70 feet from the nearest window may command $3.50 per square foot per year; when so-called "outside" space will bring from $5 to upwards of $7.50, depending on whether it is on a lower story or in a tower. There is of course in addition the factor of prestige, exclusiveness and the general scarcity of space in the summits of our tallest buildings which adds to rental value. Nevertheless, the values of the things desired and demanded by the zoning enthusiast is too widespread in buildings where adequate vertical transportation is afforded, to be seriously discounted on the basis of prestige and advertising value to the tenant. Apartments and their rental schedules show the same tendency and conditions.

This recognition of the value of natural light and the other factors has been materially aided by the zoning laws and height and bulk regulations.
We may legitimately ask what effect these height and bulk regulations have had on the buildings and their construction in order to utilize the values which they have materially aided in creating. It is evident that there is a great deal left still to be desired.

UNEXPECTED EFFECTS

The present height and bulk regulations have brought about an unexpected condition. In many cases the condition of tenants is unimproved, and occasionally even worse than formerly. Under the provision that a tower can occupy only a quarter of the lot area, owners use all the building bulk and net rentable area possible under the law in order to show a return on the investment; and have increased the sizes of plots developed in order to obtain a tower of practical size, thus creating space remote from the windows and all natural light and air in lower stories. This is detrimental to working and living conditions, unless the space is well lighted by artificial means and mechanically ventilated,—a profitless procedure for the building owners.

Analysis of several of the latest New York skyscrapers shows that the levels between the ground floor zone and the base of the tower contain a very large proportion of the total usable areas of the buildings, but produce a much smaller relative proportion of the total revenue of the project. With a more limited size plot, either no tower has been erected, or the tower's proportions make it comparatively unprofitable. The present laws thus tend to penalize the owners of small and moderately sized plots to a greater degree than the owners of larger plots.

Under present laws the street is safeguarded from being unduly shut in by buildings; but the spaces between buildings back to back are far less open, where there is need of even more openness.

There is a trend among advanced builders to consider the form of a building more than mere height and bulk regulations. They have recognized the possibility of a greater income in relation to cost in well planned buildings having less bulk than the zoning laws would permit in the lower and base portions of their buildings; thus they create "quality" space, obtain a high rate of rental return, and save the amounts of construction cost that would be incurred by the creation of inferior building space. Thus, while they may show a lesser amount of gross revenue, the expenses, operating, interest and so forth, are less to an even greater degree; and the net income shows a higher rate of return on the capital invested.

Height limitation alone would appear to serve no useful purpose, and it should be obvious that this type of limitation would not tend to ameliorate any condition in the present city. Would it not be better for the people to live in even higher buildings, if they occupied a lesser proportion of their plots, and thus be afforded more light, air and outlook than are now afforded in the low structures which often occupy an unduly large proportion of their sites? Is it necessary that we should conform ourselves to the ideas and the states of civilization of London, Paris, and Berlin? Is squallor to be found in the skyscraper, and is the low building of some six to eight stories possessed of some peculiar and unusual form of civic virtue?

TRAFFIC DENSITY

Considerable thought and attention were given to the matter of building bulk and its effect on the density of traffic. In this matter all past evidence tended to show that, as buildings became larger and higher, they had a greater occupancy; and that this occupancy and their visitors tended to clog the streets and the transportation facilities at certain "peak" times. The available past data seemed to indicate that the most intense concentrations of traffic were found where the buildings were of moderate height, particularly in the theater and the retail shopping districts, and not in the locations pre-empted by the skyscraper office and apartment building. The National Association of Building Owners and Managers had clearly brought out this point, and their findings were corroborated in several additional reports compiled by other bodies and individuals.

Mr. Ford arranged an analysis of over half a dozen representative buildings involving different purposes or uses, and then compared the traffic found to and from their doors with their bulk and usable space. Certain past analyses had indicated that an office building would have to be 32 stories high to create as much traffic as an eight-story department store, or some similar relationship. However, the results obtained showed that the data obtained were insufficient and too conflicting to prove conclusively any such rules. The theater was not studied, but office, store, loft and apartment buildings were analyzed on a comparative basis, taking several examples of well known buildings in each group. In each case the daily, door-traffic, peak count, often during only a few minutes, was related or converted to an hourly rate and then compared to the total net or usable area in the building—or sales area in the store,—and to the volume of the building.

RESULTS OF TRAFFIC ANALYSIS

The results of this analysis showed that the apartment house had comparatively the least pedestrian traffic and next in the order of increasing traffic volume were the bank building, the office building and the loft building, while the maximum occurred in the department store. Obviously, the large theater, opera house or...
athletic park grandstand would exceed even this, but they were not analyzed in the comparisons.

The point of most particular interest in this matter was that results showed that even the same types of buildings varied greatly and indeed differed as much from one another as they did from other types of buildings. This would lead one to the natural conclusion that it would be difficult and almost impossible to set up any definite rule for the regulation of building bulk and area on the basis of the particular type or use for which it might be designed, since the possible variation would be as great within its own class as it might be if used for some other purpose.

It may be believed that bulk and area of buildings, within the class of a given use, would be almost synonymous and that the only marked variation would come about from very inefficiently planned buildings. The building height alone has little effect on the massing of large numbers of people on a street, since in most cases elevators cannot be designed to move the normal occupancy in one direction in less than three-quarters of an hour. Bulk and usable areas are thus the pertinent factors. When height and bulk of buildings become too great for the capacities of surrounding streets, additional levels must be provided, or when discomfort of large numbers of people congested at one time on the street reaches a degree that is really serious, it will be necessary to exercise some form of voluntary "staggering" of office and working hours that will relieve the matter. This should at that time be relatively easy to effect, since it will be to the interests of all concerned.

PEAK CONGESTION

Study of the peak of congestion in different types of uses of buildings showed that the loft building had its peak considerably earlier than the office building and in fact would be likely to be coincident only with the peak of the store employes. In looking over the peaks of office buildings, they were unlikely to conflict greatly with other buildings, and indeed were, in general, more or less individual, some showing this peak at 1 p.m., others at 8:45 a.m., still others—occupied by brokers and so forth—as late as the morning as 9:45, while in some cases the only marked peak would occur at a little after 5 p.m. This showed that the various businesses have already adapted or are adapting themselves to a helpful staggering of arrivals and departures. In the case of department stores there is the employes' peak of traffic, which occurs either later or earlier than those of the customers, and, due to the fact that the majority of store employes are fed in the store at noon, there is no peak load on the streets from them at that time.

The store peaks of the customers occur after 10 and usually end before 4 in the afternoon. This load tends to be very much more constant and at a very much higher rate when compared to the area or the cubic foot volume of the store, than is the load caused by the office building. Some spots, having the greatest or very great pedestrian traffic congestion, have this, absolutely irrespective of the heights of the adjacent buildings, and in may such cases these buildings are generally of relatively low height.

SKYSCRAPER SAFETY

The matter of safety in skyscraper office buildings under conditions of fire, storm and earthquake was reviewed and, rather than any discovery of increased elements of danger in the tall building, it was found that quite the reverse was indicated. A recent occurrence interestingly illustrates this point: an advertiser, who desired to call attention to fire hazard, published a picture of a tall office building with masses of smoke about it. It was most impressive and well calculated for the effect intended. However, the National Association of Building Owners and Managers did not believe that it was good business to alarm unduly the tenants or prospective tenants of skyscrapers, and therefore, challenged this bit of sensationalism, with the result that it was acknowledged that the actual fire depicted
was in a lumberyard many blocks from the office building. The advertisers were unable to cite any instance of menace from a skyscraper and, in the study made, it was only possible to find instances of where they had been bulwarks in stopping conflagrations among low and non-fireproof buildings. The few known fires in tall buildings have been confined to a few floors or even units. People above and below the fire have actually had no reason, other than curiosity, to cease their work.

The truth of the matter is that the skyscraper, under greatly stricter scrutiny and regulation than its lower neighbor, is by far the safer place.

HEALTHFULNESS

In the matter of comparative healthfulness of working and living quarters, there was no evidence to show that the tall building was less healthful than its lower neighbor. In fact, tests of the relative amounts of dirt, dust and gases in the air at any time on different levels of the skyscraper show conclusively that the higher levels have far better conditions than those found near the street level. Previous discussion has brought out the consensus of popular opinion regarding upper level space on the basis of light, air and outlook. There is no indication whatever that this is incorrect, provided they do not have to walk up or down.

MR. FORD'S CONCLUSIONS

Mr. Ford's general conclusions in the matter of the height and bulk regulation were that, in all types of buildings, it would be very much to the advantage of the people living and working in them, as well as to the advantage of the owners who would have to earn a fair return on the investment, and for the building industry, in order that sufficient capital would be directed to create this necessary form of wealth, that they be permitted to be constructed to sufficient height, bulk and area required by conditions; and that the space should be developed in an economical manner, which would both assure space of good quality and eliminate the construction of unnecessary and profitless space, as is so often done in the buildings planned and conceived under the present laws. Building form is thus of paramount importance. Such “directive zoning” would indicate the desirability of increasing the proportion of space that may be occupied by towers and decreasing the areas and the building bulk permitted in the portions of the building above the ground floor zone, as previously described, and extending in height to the base of the tower.

The tentative basis on which this has been worked out in Mr. Ford's recommendations would be that towers could occupy an unlimited percentage of the plot up to twice the maximum wall height at the street line, provided they stay at least 40 feet away from the lot lines and at least 40 feet away from the center line of streets. In the event of a tower of abnormal size, the distances from street and lot lines would be increased in certain proportions. Above this limit set, towers would be allowed to occupy only 25 per cent of the plot area as in the present law.

Rear yard of a 20-foot minimum depth would be required, proportionally larger with the height of the building at the rear line and in accordance with the district in which the building is located. Inner courts would be prohibited unless equal in size to at least two rear yards back to back. In order further to increase the light and air that would be available in the base of buildings immediately above the ground floor zone, there would be the requirement that side yards or courts should be located at a height above the street equal to its width. These would have a minimum width of 10 feet and a maximum of 40 feet, being controlled by the height of the building.

A series of directive regulations of a generally similar nature but adapted to the districts and the uses were set up for various types and districts of apartment houses, tenements or multi-family dwellings.

It is too long a matter to describe these or the suggested changes in the regulations in the business or the other districts, as these occupy many pages of text, tables and isometrics of building form in the book mentioned. The outstanding fact remains and is of paramount importance that these changes and amendments suggested are all based on a study of both the desired things as formulated by the sociologist and the planner of cities, and also by the requirements of building economics. Of course it is not possible to go to the extremes that might be indicated by considering only one phase of the conditions. If the sociologist only were consulted, a type of building might be indicated which could not show a profit, or which the majority of our population would be unable to occupy due to excessive rentals. If the building owner were given full sway, he might incline to be ruled too greatly by dollars-and-cents considerations, particularly at the present time, and advocate the construction of undue building bulk concurrent with an excessive percentage of the plot covered, thus resulting in a structure that might tend to become obsolete before its day, due to the construction of other larger, higher and better buildings.

Based upon such a premise, it is to be hoped that these findings and the various ramifications and details of the study will serve as a directive aid to city planners, zoners, sociologists, building owners, managers and architects.
THE tendency of modern multi-family dwellings toward the so-called “minimum coverage” type is growing greater every day. So far most of the proponents of this type have laid the greater emphasis on the savings made in primary construction cost and have more or less neglected the question of the rental value of such apartments. As a result many fine projects have had to be abandoned because not even the undoubted saving in primary cost could absorb the high cost of land when the occupancy was reduced so low.

It is high time that there was an attempt to produce a scientific technique for rent appraisal that will more accurately show the real rental values than the present method of relying solely on the real estate broker’s guess as to what they will be.

An examination of a large number of rent schedules and plans shows that the collective experience of real estate brokers recognizes varying rental values for different apartments based on their different exposures to light, air and sun, but does nothing to determine very accurately what those values may be. So widely divergent is opinion in these matters that it is impossible to arrive at any set of factors that can be plotted on a curve similar to those which may be plotted for all sorts of cost factors. Even if there were any agreement perceptible this latter task would still be difficult in view of the obvious fact that the rent of any given apartment may well be affected by a half-dozen separate factors at the same time.

It is obvious, therefore, that if any satisfactory technique is to be established it can only be done by a sort of trial and error method. This means that from the examination of many schedules and plans some possible quantity is determined for each factor. These factors are then reapplied to schedules and plans and the results compared to see how far from the conventionally derived rents the thus-determined rents will be. If the variations are too great the quantities must be changed and tried again, and so on, until something is finally found that seems to answer.

Before, however, this can even be attempted the factors which are to be considered must first be themselves determined. If every possible factor were to be taken account of, the list would be ridiculously long and the necessary computations entirely too cumbersome to be practical at all. Analysis of hundreds of buildings shows that the very large theoretical number may be reduced to an actual ten or twelve.

The first is the number of baths. Many people fail to realize that it costs just as much to construct a bath-room in a one-room apartment as it does in a four-room. As a general rule this different proportion of cost of bath to total cost is not properly expressed in the rents. There must be therefore a factor for baths having such a value that this difference in cost ratio may be reflected in the final rental value.

The same thing is equally true of kitchenettes, dining alcoves, bed closets with beds, dressing closets where special fittings are used, and in the higher price classes pantries and servants’ halls.

As the list of these factors must not be made too long, no value need be assigned for such things as ordinary closets, foyers, vestibules, and corridors on the basis that such things occupy, as a general rule, a more or less constant percentage of the floor space in varying sizes of apartments. There is one notable exception to this rule: the case of one-room and two-room apartments. A special factor must be assigned to these two types of apartments to take care of this discrepancy.

Proceeding from the interior to the exterior of the apartment it is obvious that the first and most important factors should be those for sun, light and air. A little research shows that these three may all be combined in one factor by differentiating between the cardinal points of the compass.

The next most important factors affecting an apartment from the outside are outlook, quiet, and cross-ventilation. There is always a certain social and psychological advantage in apartments facing a street and, of course, in those which face a yard of sufficiently generous size to assume the aspect of a private garden or park. The value of quiet has been often underestimated, but is now becoming recognized for the very potent factor that it is. In order to cut down the number of factors employed, cross-ventilation may be arbitrarily taken care of by allowing the full value for each frontage of an apartment where there is more than one and adding them all together.
instead of trying to pro-rate the factors to the actual length of each frontage.

Finally we must have a factor to take account of the height of the apartment above the street. All real estate brokers seem to be more or less agreed as to the relative desirability of apartments at varying heights but differ widely as to the actual amount of rent increase that should be charged.

TAKing all of the factors discussed into account, we find that the rent for any given apartment may be said to be the result of the interpolation of the correct values for the various factors in the following formula:

\[ G = \left( P + B + D + G + K + FR \right) \times \left( 1.00 + N + E + S + W + Q + V \right) \]

where the letters have the significance shown in the following table:

- **G**: Gross rent of apartment.
- **P**: Primary rent per room (per month or per year).
- **R**: Number of rooms in apartment.
- **B**: Number of baths (to be multiplied by rate for same).
- **D**: Number of dining alcoves (also pantries, service halls to be multiplied by rate for same).
- **C**: Number of bed closets with beds (times rate as above).
- **K**: Number of kitchenettes (times rate as above).
- **F**: Amount per room extra for height above street.
- **N**: Premium (if any) for N exposure.
- **E**: Amount per room extra for outlook.
- **S**: Amount per room extra for S exposure.
- **W**: Amount per room extra for W exposure.
- **Q**: Amount per room extra for quiet.
- **V**: to be added to 1 and 2 room apartments.

Having gone this far the next problem is to find the correct values for the different factors. The first of these, **G**, is to be found, and depends on all the others.

**P**, the primary rent, can be determined only by comparison with market values in the neighborhood in which the project is contemplated. In the middle range of apartment houses on New York City side streets, it lies as a rule somewhere between three-hundred and four-hundred dollars. As will be shown later **G** may be taken as a known quantity and **P** unknown, in which case the equation is simply solved for the value of **P**.

**R**, the number of rooms, should include all ordinary rooms, such as Living Room, Dining Room, Library, Chamber, Kitchen, Maid's Room, and any other room which may legally be so used. It does not include Dining Alcove, Foyer, Pantry, Kitchenette, Bath, Lavatory, Servants' Hall, Gallery, etc.

**B**: There seems to be a more or less general agreement that a bath has about one-quarter the rental value of a room. As the size and quality of rooms rise, so do the size and appointment of baths. Therefore a value of **P/4** is assigned as the rent of a single bath. The total rental of baths therefore is represented by **BP/4**.

**D**: The same general values of rental that applied to baths may well be applied to Dining Alcoves. As apartment rooms get beyond a certain size and quality, Dining Alcoves disappear, to be replaced by Dining-Rooms. Therefore the total rental value of Dining-Alcoves is represented by **DP/4**.

**K**: Applying the same principle to bedclosets with beds, their total rent value is **CP/4**.

**F**: Applying an average of the values given by managers for this factor to existing buildings and rent schedules shows that $20.00 per room per year may be added for the third, fourth, fifth, sixth and seventh floors successively, and $10.00 per room per year per floor for each floor above the seventh, to and including the fourteenth. Above that point no material addition is expected unless there are set-backs or pent houses with terraces where $50.00 per room per year may be added. If, of course, set-backs or pent houses occur below the fourteenth floor, the $50.00 addition should be made at that point too.

These figures seem to hold good for the medium range of fireproof elevator buildings. In the very highest grades these figures may well be doubled. For the cheaper grades of building one-fourth of the standard is enough until the so-called "minimum rental" class is reached, where $1.00 per room per floor is probably enough. It must not be lost sight of that this factor is cumulative. An apartment of four rooms on the fourth floor receives a premium of $160.00 and one on the seventh floor of $400.00. This increment factor can be still more accurately determined by using the curve in the accompanying graph, Fig. 1. From this we see that the premium for the four room apartment on the fourth floor should be $200.00 instead of $160.00 while the seventh floor apartment remains $400.00.

**N, E, S, W.**: In reckoning the factors to be added to the primary rent for value of exposure, there are two things to be considered. The first is the amount of daylight in the apartment and the second is actual sunlight. These quantities do not appear to increase in a similar geometrical ratio with the distance away of an opposing wall, but in a geometrical one. Furthermore, the height of the opposing wall surely has a distinct bearing. Also, had we not already taken into account the height of the apartment itself above the street that would also have to be considered. Any accurate determination of the rate of increase in light and sun is tremendously complicated, and it is doubtful if even then the actual values could be reflected in the rents. These values may however be approximated from a study of rent schedules, and certain tendencies established. These
are expressed in the form of rough curves in the accompanying graph, Fig. 2. These are based on the assumption that E and W exposures give some sunlight, while N exposure gives none.

From these curves we see that an apartment facing for example North on a sixty foot street where the opposite wall is 100’0” high is worth four to five percent more than a similar apartment facing a wall less than 40’0” away. If it faces South on the same street it is worth 17.5% more than if it looked North and faced a 100’0” wall less than 40’0” away. The unit in this system is always the poorest apartment in the building.

Outlook should also be figured in at this point. To the above figures should be added, so practice suggests, about 15% when the apartment faces a street, park, river, etc. The increase of the N, E, S, W factors proper with the increase in distance of opposing walls will take care of, for example, an attractive view of a river, or park.

Q: In thickly populated urban centers no factor for quiet should be included unless one facade of the building abuts immediately upon such an element as an elevated line, docks, bridge or some other such arterial traffic route which produces either more than a usual amount of noise during the day or some unusually continuing or intermittent noise during the night. A fair allowance for this factor seems to be 5% for apartments separated from noise producing element by one range of rooms; 10% for other apartments having windows within 1000’’ of noise source; and 15% for all other apartments.

V: This last of the variable quantities must be inserted to take care of the fact that the fairly constant ratio of foyer, closet and corridor space to room space is thrown out of line when it is applied to one-room and two-room apartments. To make up for what would otherwise be a loss, the broker assigns a percentage increase which averages about 30% for one-room and 20% for two-room apartments.

A couple of typical examples are worked out to show just what happens. The first is a four-room front apartment on the fourth floor of a building which is on an interior lot on the north side of a sixty-foot street. It consists of Living Room, 2 Chambers, 2 Baths, Kitchen and DINING Alcove. The building opposite is ten stories or 100’0” high. The second example will be a one-room apartment on the 10th floor of a building on an interior lot. This apartment faces East into a side court where the opposite wall is 150’0” high and 250’” distant. It consists of a Living Room with Kitchenette, Bath, and Bed Closet with bed. In both cases P equals $300.00.
Example 1: \( G = \) to be found
\[ P = 300.00 \]
\[ R = 1 \]
\[ B = 2P/4 = P/2 = 150.00 \]
\[ D = P/4 = 75.00 \]
\[ C = 0 \]
\[ K = 0 \]
\[ F = 300.00 \text{ (from Fig. 1)} \]
\[ N = 0 \]
\[ E = 0 \text{ (Fig. 2)} \]
\[ S = 32.5\% : 17.5\% \text{ (from Fig. 2)} + 15\% \]
\[ W = 0 \]
\[ O = 0 \]
\[ V = 0 \]

Substituting these quantities in the formula given above:
\[ G = (1200.00 + 150.00 + 75.00 + 200.00) \times 132.5\% = 2153.12 \text{ or figured to nearest } \$25.00, \$2150.00 \]

Example 2: \( G = \) to be found
\[ P = 5300.00 \]
\[ R = 1 \]
\[ B = P/4 = 1325.00 \]
\[ D = 0 \]
\[ C = P/4 = 1325.00 \]
\[ K = P/4 = 1325.00 \]
\[ F = 135.00 \text{ (from Fig. 1)} \]
\[ N = 0 \]
\[ E = 0 \text{ (Fig. 2)} \]
\[ S = 0 \]
\[ W = 0 \]
\[ O = 0 \]
\[ V = 30\% \text{ (one-room apartment)} \]

Substituting these quantities in the formula:
\[ G = (300.00 + 1325.00 + 135.00) \times 130\% = 858.00 \text{ or figured to nearest } \$25.00, \$850.00 \]

So far only the method of finding the gross rental for a single apartment has been considered. It is, however, obvious from the above examples that the gross rent for any number of apartments \( A \) is:
\[ G = \left( PR + B + D + G + K + FR \right) \times (A.00 - N + S - W + O + V) \]
where all the symbols represent the sums of the various factors for each apartment and \( A \) represents the number of apartments.

Having cited examples of the application of this method to a single apartment, an example will now be shown of its use in comparing two different plans for a given piece of property. The property in question is an interior lot 100' x 100' on the S. side of a 60' street. It is abutted on the E and W by ten story buildings. Behind it to the south is a fifteen story building. Plan A (see Fig. 3) has a total of seven apartments or 23 rooms. Plan B (Fig. 3) has only six apartments or 20 rooms. A scrutiny of market conditions shows that \$300.00 per room is about the highest primary rent that can be obtained in that locality. The land cost (say \$20.00 per square foot) is the same for both buildings.
How then can Plan B compete with Plan A, except on the basis of desirability of apartments which must be reflected in the rents? It is necessary therefore to make an exact comparison of the rents. For this purpose any floor (say the sixth) is taken. For this floor then the following are the quantities to be substituted in the rent formula:

\[
\begin{align*}
G &= \text{to be found} \\
R &= 23 \\
B &= \frac{9P}{4} = 875.00 \\
D &= \frac{7P}{4} = 525.00 \\
C &= 0 \\
F &= 85.00 \text{ (Fig. 1)} \\
E &= 0.035 \text{ (Fig. 2)} \\
S &= 0.105 = 2 \times 0.0525 \text{ (Fig. 2)} \\
W &= 0 \text{ (Fig. 1)} \\
V &= 0 \text{ (Fig. 1)} \\
N &= 0.57 \times 3 \times 0.15 \text{ (Fig. 2)} \\
\end{align*}
\]

For this floor then the formula becomes:

\[
G = \frac{(6900 + 4750 + 3125 + 1700 + 1950 + 1950) \times 8.08}{11,606.34 + 81,244.40} = 81,244.40
\]

This small difference in rent taken with the much smaller primary cost will show, even excluding land the same in both cases, a greater return on the equity for Plan B than Plan A contrary to what seemed at first sight to be the case. The rental for each separate apartment being found, a rent schedule for comparison may be made as follows, reading to nearest $25.00:

\[
\begin{align*}
\text{(A)} & \quad \text{Apt. A} \quad 4D2 \quad (1200 + 150 + 75 + 340) \times 119\% = 2,100.00 \\
& \quad \text{B} \quad 3D1 \quad (900 + 75 + 75 + 255) \times 119\% = 1,550.00 \\
& \quad \text{C} \quad 4D2 \quad \text{(same as A)} \times 119\% = 2,100.00 \\
& \quad \text{D} \quad 2D1 \quad (600 + 75 + 75 + 170) \times 120\% = 1,100.00 \\
& \quad \text{E} \quad 2D1 \quad \text{(same as D)} \times 120\% = 1,100.00 \\
& \quad \text{F} \quad 4D2 \quad \text{(same as A)} \times 105.5\% = 1,850.00 \\
& \quad \text{G} \quad 4D2 \quad \text{(same as A)} \times 105.5\% = 1,850.00
\end{align*}
\]

\[
\begin{align*}
\text{(B)} & \quad \text{Apt. A} \quad 4D2 \quad (1200 + 150 + 75 + 340) \times 134.5\% = 2,375.00 \\
& \quad \text{B} \quad 3D1 \quad (1200 + 75 + 75 + 255) \times 134.5\% = 1,550.00 \\
& \quad \text{C} \quad 4D2 \quad \text{(same as A)} \times 134.5\% = 2,375.00 \\
& \quad \text{D} \quad 4D2 \quad \text{(same as A)} \times 111\% = 1,950.00 \\
& \quad \text{E} \quad 4D2 \quad (300 + 75 + 75 + 75 + 85) \times 137.5\% = 850.00 \\
& \quad \text{F} \quad 4D2 \quad \text{(same as A)} \times 111\% = 1,950.00
\end{align*}
\]

Certainly this difference of less than 5 percent is justified by the difference in the value of the various apartments according to the light and air they receive, and surely by the difference of nearly 15 percent in the cost of land and buildings in the two cases.

So far, in considering all this question of comparison of plans, \( P \) has been taken as a known quantity. There will be times, however, when \( G \) will be the known quantity and \( P \) the unknown. For example a loaning institution is asked to make a loan on a proposed building. The promoters' set-up shows a gross rental of so many thousands of dollars, but does not give any further information than that this amount represents so many rooms at an average of so much per room. The loaning institution, suspecting that this average rental is too high for this particular building in the locality proposed, must have some method for finding the primary rent which is a really fair standard of judgment. This may be found by the same methods of analysis as before, by simply rearranging the original formula, including in it the values of \( B, D, C, \) and \( K \) in terms of \( P \). Therefore, if

\[
A.G. = \frac{(PR + P (B + D + C + K) + FR) (A.00 + N + E + S + W + Q + V)}{4} \]

\[
W + Q + V \quad \text{then} \quad P = \frac{4 (A.00 + N + E + S + W + Q + V - FR)}{4R + B + D + C + K}
\]

in which all the terms are derived as before.
As an example let Plan A, Fig. 3, be considered as a 10-story building of which the gross rent is stated to be $110,000.00, and assume that apartment B on the first floor is lost in order to provide entrance and elevator lobbies. Then the various quantities necessary for a solution will be as follows:

\[ G = 110,000.00 \]
\[ P = \text{to be found} \]
\[ R = 227 \times (10 \times 23) - 3 \]
\[ B = (0.10 \times 7) - 1 \]
\[ D = (0.9 \times 10 \times 7) - 1 \]
\[ C = (1.10 \times 7) - 1 \]
\[ F = \text{see Fig. 1} \]
\[ \text{and find } FR = (23 \times (26 + 50 + 62.5 - 1 - 85 + 100 + 115 + 126 + 135)) \]
\[ N = 5.51 \times (10 \times 0.57) - 1 \]
\[ E = 0 \]
\[ S = 1.10 \times (10 \times 0.11) \]
\[ W = 4.00 \times (10 \times 0.40) \]
\[ Q = 0 \]
\[ A = 69 \times (10 \times 7) - 1 \]

Substituting these quantities in the formula given above

\[ \frac{110,000.00 \times 69}{908 + 89 + 69} = P \]

the purely arithmetical solution of this equation gives as a result \( P = 297.38 \). This then is the standard of judgment desired and enables a direct comparison of value with similar buildings of the same sort in the same neighborhood.

If it is desired to carry this comparison still further toward complete accuracy, the value of \( P \) should be reduced to a price per square foot of Living Space. This Living Space is defined as the floor area of all rooms as defined above under the explanation of \( R \). The aggregate of this space in the building, divided into \( P \), times \( R \), gives the price per sq. ft. of Living Space. When this has been found the rental of any apartment is determined as before, substituting for \( PR \) in the formula \( L.S. \) the number of sq. ft. of Living Space in the apartment, times the price per sq. ft.

As an example, assume that Plan A in Fig. 3, has its apartments planned as follows:

<table>
<thead>
<tr>
<th>Apt. A</th>
<th>LR</th>
<th>22'-11&quot;x13'-6&quot;</th>
<th>309.98</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ch</td>
<td>15'-9&quot;x11'-0&quot;</td>
<td>173.25</td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>16'-10&quot;x12'-0&quot;</td>
<td>201.99</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>9'-3&quot;x7'-0&quot;</td>
<td>64.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>749.97 x 10 = 7499.70 sq. ft.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Apt. B</th>
<th>LR</th>
<th>22'-6&quot;x13'-0&quot;</th>
<th>292.50</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ch</td>
<td>15'-8&quot;x11'-3&quot;</td>
<td>173.44</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>8'-9&quot;x5'-0&quot;</td>
<td>43.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>509.69 x 9 = 4586.61 sq. ft.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Apt. C</th>
<th>Same as A</th>
<th>749.97 x 10 = 7499.70 sq. ft.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Apt. D</td>
<td>LR</td>
<td>22'-4&quot;x12'-0&quot;</td>
<td>264.00</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>8'-3&quot;x6'-6&quot;</td>
<td>53.62</td>
</tr>
<tr>
<td></td>
<td></td>
<td>317.62 x 10 = 3176.20 sq. ft.</td>
<td></td>
</tr>
</tbody>
</table>

| Apt. E | Same as D | 317.62 x 10 = 3176.20 sq. ft. | |

Compare this with the rent schedule as originally found for this plan. The difference in total rent for the floor does not enter into the problem as it is simply the result of reading all rents to the nearest $25.00 and will disappear when the schedule for the entire building is made out.

By the use of this method apartments could be kept from being priced too low or too high, and each is given a rental which is a direct reflection of the actual accommodation provided.

Doubtless a study of this system may reveal other uses of the relations set down, but enough has been said to show the practical value of an actual measuring stick for rent appraisal as against mere opinion. The chief value in its use, however, would seem to be that which provoked it; the necessity for a more accurate method of appraising the rental value of different plans for the same lot, where the question of the number of rooms or apartments provided is a vital one.

It seems safe to say that a more general adoption of some such system of rent appraisal would do much to further a decrease in bulk and lot coverage of multi-family dwellings in congested and semi-congested areas where land values are high. Such a general adoption must of course result in some modification of the factors used herein as study may prove them wrong, but the whole system, being relative, would not be affected. In any case the time has come when multi-family dwellings must be appraised as scientifically as office-buildings and this system is offered as a suggestion leading towards the eventual creation of better and cheaper living accommodations.
Supervision of Construction Operations

By Wilfred W. Beach

Chapter 21, Continued. Furring, Lathing and Plastering

Outside masonry walls, on the inside of which plaster is to be directly applied, must first be effectually treated to render them dampproof. Any moisture seeping through not only stains the finished plaster surface, but damages the decorating and tends to cause disintegration of the plaster. To obviate this, exterior walls are either furred or treated with a "plaster bond" dampproof paint, which must serve the dual purpose of repelling moisture and bonding the plaster to its backing. Furring is effected either by building porous (or semi-porous) clay tile against the inside surface of the wall, or by attaching vertical wood or metal strips at regular intervals for the receipt of lath and plaster. If strip furring be used, it is essential that it be of a size that will hold the lath a sufficient distance from the wall to prevent the plaster keys coming in contact with the wall surface. If such a surface is rough or irregular, it is necessary to "shim" (block or wedge) out the furring to a perfectly vertical plane at a proper distance to guarantee safe procedure.

An awkward feature of plastering against strip furring is the difficulty of preventing an accumulation of droppings from packing the lower portion of the furred space. It is not unusual to observe a series of discolorations above the base against outside walls in occupied rooms, where furring had been used to prevent such damage. There are only two efficient ways of guarding this, neither of which is commonly mentioned in specifications. One is to coat that portion of the wall back of the base, to a height of about 2 feet, with dampproof paint; the other to omit the lath and plaster back of the base, to a height of about 2 feet, resulting in a space insulation or its equivalent to prevent their being susceptible to the deposit of condensation.

The chief objections to this are that: (1) The painting is too frequently carelessly applied and under improper conditions; (2) The paint medium used is not always the most suitable; (3) The perfect inspection of such work is very difficult; (4) In cold climates, outside walls need airspace insulation or its equivalent to prevent their being susceptible to the deposit of condensation.

Specifications are more or less definite on the subject of enclosing a building (with muslin, boards, storm sash or regular sash in all openings) for protection of drying plaster in both hot and cold weather; but it is left to the superintendent to see that such protection is removed promptly in hot weather after the plastering has set; also that there is sufficient heat maintained for proper drying in cold weather. Frozen plaster is likely to disintegrate, and hence may have to be removed. In fact, none of the necessary precautions should be slighted in the least degree.

Interior plaster and exterior stucco are of many varieties, brands, makes and for many purposes. Ordinary interior plaster is either lime mortar or some form of "hard wall" or "patent" plaster, chiefly gypsum derivatives. As to mixing the ingredients, methods vary. The most common procedure is to add sand and water to the plaster ingredients, methods vary. The most common procedure is to add sand and water to the plaster material at the site; but some makers claim added advantage in having the sand premixed. In localities where volume of business warrants, there are concerns that deliver lime mortar in the plastic form, ready to be applied. All prepared plasters contain fibrous material, mostly cattle hair, as a necessary binder. The recommended specifications of the National Lime Association (Washington) say that: "Hair shall be clean cattle hair or suitable fiber and must be well beaten and thoroughly separated." If lime mortar be mixed at the site, this element must be added in the mortar box. There are standard specifica-
tions for proportioning all the ingredients for lime plaster, varying according to the coat for which it is intended and the surface to which it is to be applied.

For hard wall and patent plasters, instructions for proportioning and mixing the sand and water are given either in the architect's specifications or in the printed directions of the manufacturers, and from these there must be no deviation. This is equally true of methods of application. In general, interior plaster is put on in two coats over gypsum block or other masonry surface; and in three coats over wood or metal lath, or plaster board. Makers of hydrated lime specify three-coat work on masonry surfaces; and, where plasterers have been able to impose their demands upon the public, they insist upon three coats in all cases. The first coat on lath is called a "scratch coat," and is roughly troweled on, to cover all surfaces to a thickness of from 3/8 to 3/4 inch, and with just enough pressure to force it through the lath and form adequate keys. It is roughly scratched while still plastic, to afford good adhesion for the second or "brown coat," which should be applied after the first coat has begun to set, but is still not too dry. If it has become so, it must be sprinkled sufficiently to prevent its suction ruining the next coat. On the other hand, if the second coat is applied while the first is still too green, the keys of the first coat may be impaired. In cheap work, the scratch and brown coats are sometimes combined, but still considered two coats, and hence, if one wants the scratch coat applied independently, it should be so specified. Where combined, the total thickness of plaster is slightly reduced, thus saving some weight, as well as expense.

In two-coat work on masonry, the brown coat is applied directly to the tile, brick or gypsum, or to the bond coat on concrete. If, however, the masonry surface shows inequalities, the hollows should first be filled in with patches of scratch coating. The thickness of the brown coat on all work is established by the grounds, screeds and metal beads. "Screeds" are dabs of plaster set to serve as guides where the distance between grounds is greater than the length of the "rod," which is the plasterer's straightedge. Grounds are placed by the carpenter:—3/4 to 5/8 inch thick for two-coat work, and 3/4 to 5/8 inch for three-coat work, depending upon specification requirements. The brown coat is filled out to these guides, except just enough to leave room for the finish coat.—3/8 to 5/8 inch. A very thin finish coat is called a "skim coat," and is sometimes specified in cheap work, in which case, the brown coat is filled flush with the grounds. True planes are essential for the brown coat and are obtained by expert manipulation of the darby and rod.

The "darby" is a long two-handed trowel. A steel trowel of rectangular form is used to make first application of all plaster, and to give a smooth finish to a putty coat. A somewhat similar trowel, made of wood and called a "float," is used to produce a sanded or float finish. For certain variations of this, the float is covered with burlap, carpet or other material; or the plasterer makes impressions with his palm on the plastered surfaces,—or does any one of a number of other things to produce the kind of finished surface that is called for. This is frequently required to be in accordance with an approved sample, which may either be on hand when the plastering is estimated, or may be described in the specifications and prepared by the plasterer after he gets to the building. Special surfaces of putty coats are sometimes similarly provided for, in place of the regular smooth troweling.

Lime putty is produced by soaking hydrated lime in clean water for at least 12 hours; and it can also be made from slaked lump lime, or from materials supplied by the makers of hard wall and patent plasters, who issue the necessary directions for their use. Instructions for making putty from hydrated lime are to be had from the National Lime Association, for either the hard troweled coat or the white sand finish. For either finish, enough must be mixed each day for next day's work. Coloring matter is sometimes used in sand finish, and should be mixed most thoroughly with the dry sand and lime, using the greatest care to secure exactly the same proportion of ingredients in each batch.

In addition to the regular finishes already mentioned, there is an infinite variety of special finishes, including Keene's cement, Portland cement, and the various imitations of stone, such as travertine, Caen stone, scagliola, etc. Each of these (except cement) is applied, strictly in accordance with the maker's directions, over the regular brown coat. Specifications for Keene's cement plaster call for a certain amount to be added to the lime of the scratch and brown coats. Portland cement plaster is generally mixed with sand in ratio of 1 to 3, as for mortar, with a small admixture (5 to 15 per cent) of lime or inert ingredient, for better plasticity. The troweled finish coat may be as rich as 1 to 2, or even 1 to 1½, as for floor finishes. Cement plaster may be applied directly to lathed or masonry surfaces, or against scratch or brown coats of lime plaster, but not to gypsum. Care should be taken that the first and each successive surface that is to receive Portland cement plaster is properly moistened, to make adhesion certain. The successive coats are troweled or floated on, 3/8 to 5/8 inch thick, until the required total thickness has been attained; each coat (except the
last) left rough, and the next applied soon after the initial set has taken place. Finish coats of Portland and Keene's cement plaster are frequently used for wastecoating in bathrooms, kitchens, etc., and may be marked or scored in imitation of tiling. Imitation stone joints in plaster are sometimes cut through the surface and pointed.

In general, the characteristics of exterior plastering are similar to those of interior work, but a much more durable material is demanded. For this reason, architects specify materials that are known to fulfill such demand, and they are applied only as the manufacturers direct. There have been too many failures of such coatings, due to the use of improper materials, inadequate precautions against discoloring, poor workmanship, insufficient attention to adhesion, incorrect finishing, etc. There is but one right course to be followed,—to use proper materials, properly proportioned and mixed, and correctly applied to surfaces that are in the right condition. Although the dictionary's meaning of stucco is practically the same as that of plaster, the plaster industry has definitely established the application of the word "stucco" to exterior work, and "plaster" to interior, and hence they are only to be so used in the building industry. Neither term indicates use in building construction is too extensive for the limitations of this treatise. For more comprehensive discussion, the reader is referred to "Building Construction" by W. C. Huntington, C.E., (John Wiley & Sons), to the publications of the manufacturers of lime, cement and gypsum products, and to the descriptions of their materials and the specifications for their use as they appear in the annual editions of Sweet's Architectural Catalogs.

Every building superintendent must have a working knowledge of plaster and stucco materials and their ordinary usage. He must also know where to go for needed information relating to every kind and type of unusual plastic materials and finishes. He continually adds to his knowledge and experience, but can hardly hope to know it all. Moreover, materials and customs vary in different localities, and from year to year in any locality. Those who have to do with them must constantly preserve an open-minded attitude on all such subjects.

But, even with all possible knowledge gained by study and experience at his command, and with the exercise of all due precaution, no superintendent can be expected to give 100 per cent perfect supervision to all the plastering on an operation of any size. There are too many possible imperfections that cannot well be detected until after the scaffolding has been removed and the work can be inspected at close range,—and after the finish coat is dry. Chief of these are:

1. Inequalities of surface, especially along the lines of junctions of two applications, such as around patches and at the meeting of work at different scaffold heights.

2. Bent corner beads and other metal members, damaged during or after plastering, by shifting scaffold, or through other carelessness.

3. General waviness of surface, including too much fullness around openings and other places where trim is to be applied.

4. Insufficient adhesion between coats.

5. Improper setting and drying, manifest in surface checks, cracks, crazing, cat faces, etc. ("Cat faces" are small clusters of short cracks.)

6. Lime spots, due to insufficient slaking of lime. Cat faces are sometimes due to this fault.

7. Cracks due to settlement of supporting construction.

8. Defects in straight line corners and curves, especially in arches, run moulds, bull noses, coves and other special work.

9. Insufficient support and attachment of ornament, and poor matching and alignment of members that should have perfect continuity.

10. Miscellaneous damage after completion.

Any of the foregoing or other defects, if at all serious, may constitute a sufficient reason for rejection of the affected area; even an entire work, if the deficiencies are too prevalent. In the event of defects in the supporting construction (Item 7), it must be determined just where lies the responsibility. The plasterer is responsible for the proper condition of all areas which he covers by lath or plaster, except in instances of settlements, such as are caused by the shrinkage of wood joists, or other deformations beyond his control. This is a point for the superintendent's keen discernment, as is also the question of who is responsible for damages to finished work (Item 10). Regarding the latter, the generally accepted procedure makes it the duty of the superintendent to post himself, if possible, as to who caused the damage, then to issue an order for its repairing, and to see that the cost thereof is charged against the proper party; or, for repair of damages of unknown origin, to issue like orders, and to make entry of the cost in a common account, the aggregate of which is later to be prorated among all those contractors and subcontractors (including the plasterer) whose employees were at work in the building after the plastering was partially completed. Obviously, none should
be assessed against those who have finished their work and removed their forces. Inasmuch as charges for plaster patching are ordinarily made on a time-and-material basis, or at a fixed rate per square yard, it is essential that the superintendent verify the report of the plaster foreman regarding such repairing, at the end of each day’s work, or at the completion of each patch, if the accounts are to be dependable.

Assessments against subcontractors should, of course, be charged to their principals, since the architect is not supposed to have direct dealings with subcontractors. In some localities, plastering contractors’ associations have very positive rules relating to charges for patching. Both architects and superintendents who find themselves operating in places thus controlled, should be familiar with such matters and govern themselves accordingly. If the superintendent discovers a discrepancy between such rules and his contract stipulations, he must promptly advise the home office and have the matter adjusted.

However, after all is said and done regarding a plastering contract, it resolves itself into a question as to whether or not the finished work is acceptable. Any criticism made by an inspector prior to completion must be regarded largely as advisory, since it is the condition of the final product in which he is most concerned. If corrections amount only to minor patching, the matter is not serious, but, if large areas are faulty, approval of the entire work may be withheld. In that event, it is a question for the architect to settle with the contractor direct. To obviate delays, or for other reasons, factors of expediency may enter into the subject, and decision becomes an issue depending upon the terms of the contract, the owner’s major interests, etc., quite beyond the office of the mere superintendent. Nor should he be taken to task for defects discovered in the finished work, except as he might fail to report them. Unless the superintendent has erred by exceeding his authority in any particular, the contractor is solely to blame for having produced something that is not acceptable according to the terms of the contract.

CHAPTER 22
MARBLE AND TILE

Marble, tile and terrazzo, as used for the finished surfaces of buildings, are merely forms of masonry veneer applied to floors, walls and ceilings, both inside and out. Stone, terra cotta, brick and various imitations of masonry materials are similarly used, either as veneer or incorporated structurally in the walls. These latter materials have been treated in these articles under their respective headings; and a discussion of terrazzo will be found under Chapter 12 — “Finished Concrete Surfaces,” of which terrazzo is merely a refined form.

Marble is a comprehensive term applied generally to any limestone of sufficient density to take a polish. It is quarried in many locations distributed the world over. The marbles in use in North America are known as domestic and imported. The former are produced from districts from Mexico to Alaska, and the latter are derived chiefly from western and southern Europe. For convenience, marble is (or always should be) specified to conform to approved samples. The superintendent has to see that it does so conform. However, there are certain faults, prevalent in many marbles (especially in those of the more beautiful colors and figurations), and he must be able to discriminate between flaws that are not condemnable defects and those that are.

Having inspected the marble as to kind, quality and veining, the superintendent is next concerned as to its finish. This may be in various degrees of smoothness, from dull-honed to highly polished and waxed; also exemplified by the sample. For unpollished work there are several stones other than marble that are used for wainscoting, mantel facings, etc., such as travertine, Caen stone and Indiana limestone. Any of these for such and similar interior work may be included in a marble contract.

Except in purely decorative areas, where little or no wear is anticipated, stone for floor slabs and stair treads should be selected for its especial hardness. Some of the domestic marbles, such as the coarse-textured Georgia white and gray, are acceptable for this service, as are also soapstone and slate, which are often used for stair treads. Slate and various limestones are similarly used for coarse flagging. Marble may be rendered in parti-colored designs, composed of pieces of any desired size, and including pictorial mosaics. Tesserae (mosaic pieces) are roughly cubical, ordinarily about ¼ inch each way, though as small as ½ inch for finer designs. Larger pieces of floor marble are ½ inch or more in thickness; sometimes 1½ inches for pieces 12 inches square and larger. For flagging, the thickness of blocks ranges from 1¼ to 2½ inches. All thicknesses of slabs for either floor or vertical work should either be specified or shown by detail; otherwise
one must be content with 3/4-inch stock in most cases. These and other dimensions should be clearly set forth in shop drawings, a copy of which should be in the hands of the superintendent.

For wainscoting and other wall covering, 1/2-inch slabs are generally used; for free-standing partitions, 3/4- to 1 1/2-inch stock, depending upon the size of the member. Base, cap and other special trim must be as detailed. The thickness of standing marble is usually disguised at exposed edges, either by the use of thicker corner pieces, or by a combination of miter and quirk which provides a small (3/8-to 3/4-inch) reentrant angle in place of the full square corner. If neither of these features is called for, the architect must see to the marble merely lapped at such corners, with visible 3/4-inch edges.

Erection of standing marble immediately follows plastering, and precedes the laying of finished floors. The planes of finished vertical surfaces are either established from those of the plastering or by some other positive reference approved by the man in charge. This needs careful foresight, as does also the condition of all items that are to be concealed by marble. Wall slabs are blocked out from the backing by means of cleats of plaster of Paris (never solid-backed), and are held in place by brass or bronze anchors or copper wires, and by brass or bronze dowels, and bedded in plaster of Paris. In the case of free-standing stall partitions and the like, concealed fastenings are generally considered inadequate, and hence bolted angle clips are used, ordinarily of some white metal or nickel plated brass. Such partitions may be housed into one another and into the wall slabs, or may have butt joints. The latter are cheaper and more common, and will be used unless otherwise stipulated. Close joints, about 1/4 inch, are the rule for all marble work. They are rendered in plaster of Paris or non-staining cement, white or some desired color. The rigidity of slab work is of prime importance and must receive the closest attention of all concerned. Good mechanics produce finished marble work that is practically perfect, and nothing short of this is to be tolerated in this department of first class building. If any piece is insecure or out of place or alignment, or

<table>
<thead>
<tr>
<th>KIND OF TILES</th>
<th>THICKNESS</th>
<th>SHAPES AND SIZES</th>
<th>COLORS</th>
<th>SURFACES AND GLAZED</th>
<th>GENERAL USES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERAMIC MOSAIC</td>
<td>1/16&quot;</td>
<td>Square - 2 1/2 x 2 1/2</td>
<td>Unglazed</td>
<td>Floors</td>
<td></td>
</tr>
<tr>
<td>ENAMELED MOSAIC</td>
<td>1/8&quot;</td>
<td>Ovoid - 2 1/2 x 2 1/2</td>
<td>Unglazed</td>
<td>Swimming Pools</td>
<td></td>
</tr>
<tr>
<td>DULL GLAZED MOSAIC</td>
<td>1/8&quot;</td>
<td>Hexagon - 2 1/2</td>
<td>Unglazed</td>
<td>Range Baths</td>
<td></td>
</tr>
<tr>
<td>FAIENCE MOSAIC</td>
<td>1/8&quot;</td>
<td>Trapezoid - 2 1/2 x 1 1/2</td>
<td>Unglazed</td>
<td>Kitchen Sinks</td>
<td></td>
</tr>
<tr>
<td>PLASTIC MOSAIC</td>
<td>1/8&quot;</td>
<td>Any Shape or Size Less Than 2 1/2 Square Inches in Area</td>
<td>Unglazed</td>
<td>Interior</td>
<td></td>
</tr>
<tr>
<td>VITREOUS TILES</td>
<td>1/8&quot;</td>
<td>Square - 3 x 3.5 x 3</td>
<td>Unglazed</td>
<td>Walls</td>
<td></td>
</tr>
<tr>
<td>GLAZED</td>
<td>1/8&quot;</td>
<td>Ovoid - 3 x 3</td>
<td>Unglazed</td>
<td>Fireplaces</td>
<td></td>
</tr>
<tr>
<td>DULL GLAZED MATT GLAZED</td>
<td>1/8&quot;</td>
<td>Hexagon - 3</td>
<td>Unglazed</td>
<td>Floors</td>
<td></td>
</tr>
<tr>
<td>SEMI-VITREOUS TILES</td>
<td>3/16&quot;</td>
<td>Square - 3 x 3</td>
<td>Unglazed</td>
<td>Fireplaces</td>
<td></td>
</tr>
<tr>
<td>DULL GLAZED MATT GLAZED</td>
<td>3/16&quot;</td>
<td>Ovoid - 3 x 3</td>
<td>Unglazed</td>
<td>Walls</td>
<td></td>
</tr>
<tr>
<td>PLANT</td>
<td>1/16&quot;</td>
<td>Square - 3 x 3</td>
<td>Unglazed</td>
<td>Fireplaces</td>
<td></td>
</tr>
<tr>
<td>PAVING TILES HYDRAULIC</td>
<td>1/16&quot;</td>
<td>Ovoid - 3 x 3</td>
<td>Unglazed</td>
<td>Floors</td>
<td></td>
</tr>
<tr>
<td>WHITE GLAZED TILES</td>
<td>1/16&quot;</td>
<td>Square - 3 x 3</td>
<td>Unglazed</td>
<td>Fireplaces</td>
<td></td>
</tr>
<tr>
<td>DULL GLAZED TILES MATT GLAZED TILES</td>
<td>1/16&quot;</td>
<td>Hexagon - 3</td>
<td>Unglazed</td>
<td>Walls</td>
<td></td>
</tr>
<tr>
<td>ENAMELS</td>
<td>1/16&quot;</td>
<td>Hexagon - 3</td>
<td>Unglazed</td>
<td>Fireplaces</td>
<td></td>
</tr>
<tr>
<td>PLASTIC TILES</td>
<td>1/16&quot;</td>
<td>Obtainable in all the above and special shapes and sizes</td>
<td>Unglazed</td>
<td>Walls</td>
<td></td>
</tr>
<tr>
<td>FAEANCE</td>
<td>1/4&quot;</td>
<td>Square - 2 1/2 x 2 1/2</td>
<td>Unglazed</td>
<td>Fireplaces</td>
<td></td>
</tr>
<tr>
<td>QUARRY TILES</td>
<td>1/4&quot;</td>
<td>Square - 2 1/2 x 2 1/2</td>
<td>Unglazed</td>
<td>Fireplaces</td>
<td></td>
</tr>
</tbody>
</table>
possessed of any sort of defect (other than inherent faults as in the approved sample), it must be made right. Of most particular importance is the anchoring of small pieces of trim, especially casing plinths and thresholds. These are so often inadequately secured that some architects permit them to be attached by means of screws having exposed heads and washers, rather than take the chance of finding them loose, months later.

Imitation marble (pre-cast terrazzo) is set and secured in the same manner as marble, but is often specified with other terrazzo. In localities where marble, tile and terrazzo are installed by different contractors, all three trades may be due to work independently in some small room at one time. The pre-cast terrazzo man may even add to the confusion. To obviate this, some architects group these trades, making one individual responsible for the measurements, shop drawings and sequence of the work of all.

MARBLE for floors has each piece bedded solid and the joints (usually about \( \frac{3}{8} \) inch) rendered full, all in non-staining cement mortar. The customary depth for underbed for mosaic and \( \frac{3}{4} \)-inch marble-block flooring is 2 inches. This should be increased for thicker marble, and due consideration should also be given in the formation of the structural slab to all intended ramps, slopes for drainage, etc., as otherwise some awkward cutting must be done to provide sufficient depth for a proper setting bed. Then, too, the usual precautions must be taken to have the slab roughened, moistened and coated with grout or bonding cement, since the finish surface material, be it marble, tile or terrazzo, must attach firmly to the slab. Although it is generally assumed that floors of this kind are waterproof, such is not necessarily the case, nor are they so regarded by architects or others familiar with such construction. Where actual waterproofness is needed, as under shower baths stalls, flower beds and the floors and sides of tanks, fountains, etc., located over finished ceilings, lead safing is installed between the structural slab and the underbed of the finished material.

Such safing and its drainage should be carefully detailed, to be included with Plumbing. There are many other materials, including various kinds and thicknesses of glass, metal inserts, etc., which are used in somewhat the same manner as marble for floors and wall coverings, and these may be included in a marble contract or let separately. Each such material must be treated as intended by its producers, and both the product and its application inspected accordingly.

**Tile** is applied to floors, walls and ceilings, as an ornamental or useful covering, for the same general purposes as marble, but by another craft. Whereas standing marble and that for ceilings and soffits depends entirely upon metal anchorage for its security, tile is cemented in place in all cases, unless one makes an exception of certain special tile arch construction. The accepted backing for tile is masonry (brick or hollow tile, not gypsum blocks) or metal lath with rigid supports, not more than 12 inches apart. It is immaterial, in so far as construction is concerned, whether or not plaster is applied back of marble, but it is not customary to use lime or gypsum plaster back of tiling. Instead, the tile setter lays his bed of Portland cement mortar directly against the lathed or masonry surface. In the case of tile flooring laid over wood joist construction, it is necessary to provide a concrete setting bed under the tile setter's mortar setting bed, the former not less than 1 inch thick and laid over waterproof paper turned up at all edges. It is also advisable, in new work of this kind to use narrow unmatched boards for the subfloor under the concrete setting bed, and to lay them \( \frac{3}{4} \) to \( \frac{3}{8} \) inch apart to allow for swelling, in case they should happen to get wet. Inasmuch as there are more potential causes for cracking of tile floors in wood frame buildings than in those of more stable construction, it is advisable to use more preventives to guard against such mishaps. One safeguard is to embed a wire mesh in the concrete bed. This is particularly necessary in areas larger than about 16 square feet. Some specification writers also call for a sand cushion to form a cleavage plane over the structural slab, in which case due allowance must be made (not less than 2\( \frac{1}{2} \) inches) for the combined thickness of sand cushion, concrete bed, mortar bed and tile. The concrete setting bed is merely a means for bringing the under surface up to a proper level, and is not needed if the customary 2 inches is allowed for ordinary tiling, or 2\( \frac{1}{4} \) inches for quarry tile.

Specifications for this work are thoroughly standardized by the Associated Tile Manufacturers (Beaver Falls, Pa.) and issued as "Basic Specifications for Tilework, Publication No. K-300." These are in general use by architects and should be familiar to every building superintendent.

THERE is wide variation in the kinds and designs of tile, and hence specifications are explicit as to what is demanded. Approved samples, showing type, design and color range should always be at the job for comparison, together with diagrams showing the intended layout. For the characteristics and uses of tile, the reader is referred to Page 133, "Condensed List of Tiles," compiled by the Associated Tile Manufacturers. As to terms, whereas the dictionaries give ceramics and keramics the same meaning, the tile industry has chosen to apply "keramics" to the entire field, and has narrowed the usage of
“ceramics” to tiles smaller than $\frac{3}{4}$ inches, of all shapes, used to form mosaics of regular or irregular pattern or special design, for either floors or walls. Ceramic tile may be glazed or unglazed, and may be colored through the body or in the glaze only. Glazed tiles (other than faience) do not wear well, and hence are seldom used in floors, except as needed to supply small bright spots in a color design. Nearly all standard tile, shown in catalogs and carried in stock by dealers (tile contractors), include an extensive line of “trimmers” of all sorts, from which one may select the needed shapes for almost any purpose.

The body of a tile may be either hand- or machine-pressed, of moist or dry clay, the latter variety being known as “dust-pressed.” Ordinary glazed wall tile has a dust-pressed body, termed “bisque,” after its first firing. The face of the bisque is dipped, by hand or machine, in the glaze, and is then refired to produce the desired surface. This may be either bright glazed (enameled) or dull glazed (matt finished). Glazed tile may be had in white or any one of a number of solid colors and shades. These colors are materially affected by the firing, and hence there is a certain degree of variation in all the shades, even in the white. One must know in advance just what are to be the limits of such color range, and establish them by the samples. The regular grades of tile are “Select,” “Standard” and “Commercial.” They are graded at the factory, and a certificate is issued with each barrel of tile sent out; hence a superintendent is spared the burden of trying to do his own grading, which is to be considered a task for experts only. He should, however, insist upon getting the certificate, and must be sure that it applies to his particular shipment. In addition to the regular grades, tile are sold in various colors, shades and thicknesses up to $12 \times 12 \times \frac{3}{4}$ inches, and is chiefly used for the paving of walks, decks, large hearths, etc., interior or exterior, and is, in some makes, produced with a full line of trimmers.

The smaller sizes of tile (ceramics) are assembled at the factory as mosaics, either in designs or “allover” patterns, and pasted face-down on heavy paper, with due allowance (approximately $\frac{3}{4}$ inch) for joints. The pieces so mounted are laid while still attached to the paper, care being taken by the setter to so match the joints between the pieces that there is no appreciable distance between his and those spaced at the factory. Standard specifications allow $\frac{3}{4}$ inch for joints for vitreous and semi-vitreous tile, glazed and unglazed, for walls and floors; $\frac{3}{8}$ inch for flint and hydraulic tile; $\frac{3}{4}$ inch for faience and other plastic tile; and $\frac{1}{2}$ inch for quarry tile. The latter are somewhat irregular in shape and are frequently laid with joints even wider than $\frac{1}{2}$ inch. These are commonly troweled smooth, either flush with the surface of the tile, or slightly concave. Commercial tile of all kinds may also pos-
sess irregularities, and hence cannot be laid with joints as close as those for selects and standards.

Being a finished product, tilework, after the tile itself has been passed upon, is either accepted or rejected at completion. Imperfections are easily discernible and are (except in cheaper grades, in which slight defects are permissible) promptly ruled out. The more common of these are: (1) irregular jointings; (2) bad cutting of fillers, or poor judgment in their location and size; (3) use of defective tiles; (4) loose tiles; (5) poor attachment of setting bed to backing; and (6) imperfect planes, alignment and angles. In the interest of the economy that is obviously intended when tile of commercial grade is specified, the superintendent should not be too critical of such work and thus defeat that intent. Certain minor imperfections that would not be encountered in better grade tile may have been unavoidable in laying the commercial.

CHAPTER 23—FINISH CARPENTRY

U NDER the heading "Structural Carpentry" (Chapter 19), there was given a general idea of separation between that branch of woodworking and the finish work with which we are now to deal. The important features of this are not so much a question of whether this or that item is in one classification or the other, but that every needed item is taken care of, and that none is included more than once. In our school building, the subcontract for Finish Carpentry included all door and window frames, exterior and interior, but did not include structural bucks for interior openings. It included wood finish floors and their coverings, but not the matched roof sheathing.

Delivery of exterior frames is made as soon as the building has advanced to a stage where they are about to be needed and can be properly cared for. They must be inspected at once, measured and compared with details. Their exterior dimensions must be such as to fit the openings for which they are intended; and, in cases where sizes of glass are also indicated on the drawings, these are likewise to be accommodated. Our superintendent cautioned the mill foreman about tackling the staff beads on the outsides of the frames, so that they would be easily removable for calking. Regardless of his warning, he found about half of the staff beads solidly nailed, when he called to inspect the frames, prior to priming. He told the foreman to have these nails driven through, and the members tacked back on with fewer nails, with beads projecting. If delivered at the site as originally attached, the superintendent knew from experience that the beads might be carelessly pried off and damaged.

Weather stripping is sometimes incorporated in the carpentry specifications, sometimes made a separate contract or subcontract, sometimes omitted, perhaps to be done a year later, after the sash may be assumed to have done with shrinking. In any event, both weather stripping and calking, if included in the original construction, should be done as late in the contract stage as feasible, in order that continued shrinking thereafter may do the least possible harm. The superintendent should make himself thoroughly conversant with what is demanded in each of these factors; then see that each of them, as well as of staff beads, frames, sash and all other affected parts is in first class condition when the calkers and weather strippers are through.

BEFORE plastering was completed, wood finish began to arrive from out of town. Specifications forbade this being stored in the building during plastering, except in a room specially prepared to receive it. The boys' gymnasium was to contain no plastering, and hence it was cut off from the remainder of the building by filling the doorways with matched sheathing. Temporary radiators were installed, and the room was rendered quite dry before the first finish was delivered. Where no such provision is made, all wood finish must be kept out until the entire building is dry; otherwise one may later have to condone shrinkage cracks, and perhaps slight warping of affected members. In large buildings, delay from this cause is avoided by completing by stories or sections, temporarily cut off to facilitate drying. The room assigned to receive wood finish is ordinarily treated as a paint room and given over to the care of the contractor or subcontractor for this branch of the work.

To be continued in The Forum for February
These two kinds of Brass Pipe were developed because Water Varies in Corrosiveness

Anaconda 85 Red-Brass Pipe for highly corrosive water
Anaconda 67 Brass Pipe for normally corrosive water

All water contains minerals and compounds absorbed before it reaches the reservoir. These compounds vary in their action on water pipe. In some localities, they make water highly corrosive—in others, normally so. Even within a radius of 25 miles, the water supplies may differ considerably in degree of corrosiveness.

Brass pipe outlasts ferrous water pipe under all conditions. But because of these compounds in water, not all brass pipe alloys give equally satisfactory service everywhere. Continuing its efforts to be of service to architects, the American Brass Company has developed two alloys of Anaconda Brass Pipe to give adequate service under any local water condition.

For normally corrosive waters—Anaconda 67 Brass Pipe. This pipe contains 67% copper. It is guaranteed structurally sound and physically perfect. It is semi-annealed and seamless.

For highly corrosive waters—Anaconda 85 Red-Brass Pipe. This pipe contains 85% copper, and is offered as the best corrosion-resisting pipe obtainable at moderate cost. It, too, is fully guaranteed.

Seventeen years of careful research in the laboratory and in actual use have demonstrated the necessity for, and the efficiency of, these two brass pipe alloys.

A Service for Architects
The Technical Department of The American Brass Company is prepared to help determine the character of any local water supply and to recommend the alloy of Anaconda Brass Pipe that will best meet specific conditions. The American Brass Company, General Offices: Waterbury, Connecticut.

Anaconda Brass Pipe
For Hot and Cold Water Lines
WHEN YOUR CLIENT INSTALLS
SPEAKMAN ANYSTREAM SELF-
CLEANING SHOWER HEADS HE
WILL NEVER HAVE
EITHER OF THESE
INCONVENIENCES...

The Hotel Gibson in
Cincinnati proved this when
they installed 707 of these
modern shower heads . . .

Afterward they wrote of the heads:

"They have created splendid comments
from our guests and have eliminated
all of our shower troubles."

The Speakman Anstream Self-cleaning Shower Head has six tapered plungers, each of which has a series of tapered slots. By turning the lever handle these plungers are moved in or out and allow the bather to have all degrees of shower volume and force. When the plungers are extended their entire length, pipe scale and sediment which could easily stop up an ordinary shower head are flushed out instantly.

These new heads can be installed with Speakman or any other kind of shower. They are finished in Speakman Chromium Plate. Literature giving complete details of their construction will be mailed promptly — also a celluloid mechanical model.

SPEAKMAN COMPANY
Wilmington, Delaware
SPEAKMAN
SHOWERS & FIXTURES
A great modern hospital lays exacting requirements upon those who build it. Within its walls, temperature, air, light, noise, vibration, and whatever else has influence must be controlled in the interest of the skilled work that is to be done, the precise use of delicate instruments that are to be employed, the sensitive processes of nature that are to be invoked, for the restoration of health. All these provisions must be guarded. No makeshift devices, no compromises of quality in material or thoroughness in workmanship, can be tolerated. It is an evidence of merit for any equipment or any product to find important use in such a building.

In the magnificent structures that make up the Columbia Medical Center in New York, NATIONAL was used for the major pipe tonnage. Superior special processes (applied to butt-weld sizes ½ to 3-inch) make it Scale Free and give a uniform, dense surface to resist corrosion. Serving in many of the finest buildings in the country—NATIONAL has proved worthy of the confidence that has made it—

*America's Standard Wrought Pipe*

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
Subsidiary of United States Steel Corporation

NATIONAL PIPE
**ARCHITECTURE PRESERVED**

The beauty created by Architects and constructed by Engineers today, need not become the antique fragments of the future. For every destructive effect of water on building walls or foundations, TOCH BROTHERS offer the responsible and economical protection of their “R.I.W.” products. For every problem of structural preservation, they offer the scientific resources of their laboratories and the recommendations of their experts.

The Authority of Accomplishment

**TOCH BROTHERS, INC.**

(ORGANIZED SINCE 1848)

Water-proofing and Damp-proofing Products, Cement Compounds and Technical Paints

NEW YORK CHICAGO

443

Fourth Ave. 2600

Federal St.

Refer to SWEET’S Architectural and Engineering Catalogue.

---

**THE COWING JOINT**

Insures These Great Towers of La Salle Street Against Cracks and Spalls.

The value added to a building by the Cowing Joint is recognized by architects generally.

The Cowing Joint preserves the beauty by preventing cracks and spalls. It saves maintenance cost, reduces tuck-pointing, is neat, will not squeeze out, it endures.

See “SWEETS”

Cowing Pressure Relieving Joint Co.

226 W. Superior St. Chicago, Illinois

---

**KEWANEЕ**

High Pressure WATER SYSTEMS

SEWAGE DISPOSAL SYSTEMS

CENTRIFUGAL PUMPS

Our 30 Years Experience—and Helpful Bulletins on these subjects—are at your service. WRITE.

Kewanee Private Utilities Co.

442 Franklin Street

Kewanee, Ill.
ONE LEAKY PIPE

In this business age of specialization, competent counsel and scientific information are essential. This is why A. M. Byers Company, in presenting the message of Byers Genuine Wrought-Iron Pipe to the general public, stresses the importance of following the recommendations of recognized architects and builders.

Leading architects and builders know that in any “pipe prescription” Byers Genuine Wrought-Iron Pipe is a basic feature. As an architect or builder, you know the places where actual service has demonstrated the superiority of Byers Genuine Wrought-Iron Pipe. You know also the error of substituting unsuitable materials in these places. A statement we make to the public is this: When specified and installed by building-specialists for definite purposes, Byers Genuine Wrought-Iron Pipe is the utmost in service and durability — and present and future economy!

Important: We want you to use Byers Genuine Wrought-Iron Pipe in those services for which it is best suited. In every home there are specific places for Byers Pipe. We accept as a business responsibility preservation of its traditional superiority in its proved field of service. Whatever your pipe problem, we will be delighted to place the facilities of our organization at your disposal in helping to solve them. Look for the Spiral Stripe! Write to us. A. M. Byers Company, Pittsburgh, Pa. Established 1864.

BYERS GENUINE WROUGHT-IRON PIPE
AN INVESTMENT — NOT AN OUTLAY
used . . . . .
. . . and endorsed by
UNITED ELECTRIC RAILWAYS CO., Providence, R.I.

WINNER 1st Award, Class A
Bus Transportation Maintenance Award for 1930 . . . . . . . .

So do all firms who will be satisfied with nothing short of the BEST . . . And there is a very good reason for this: Kinnear originated the interlocking steel rolling door . . . Kinnear's entire 12-acre plant devotes its entire energies to perfecting one product—ROLLING DOORS . . . and every Kinnear door is made and engineered "to order". Send for your free copy of the Kinnear catalog and details of Kinnear Engineering and Estimating Service available without cost or obligation.

THE KINNEAR MANUFACTURING CO.
400-440 Field Avenue, Columbus, Ohio, U. S. A.

THE CUTLER MAIL CHUTE
Is backed by—
An experience of forty-eight years.
A factory equipped and operated for our own work exclusively.
A force of experienced erectors in the field.
A determination to keep our product and service up to the highest possible standard.

Correspondence invited.

CUTLER MAIL CHUTE CO.
GENERAL OFFICES AND FACTORY
ROCHESTER, N. Y.
You Can Rout the Ghostly Legions With Your Plans and Specifications

Of all weapons that can be used against the hideous legions, that wait to attack faulty or poorly designed plumbing installations, there is none so sure, so deadly as exact plans and specifications.

When these specifications call for plumbing and fixtures designed to meet and defeat the particular hazards of the job, the careless operation and heavy wear that will be encountered—the battle for sanitation at low through-the-year costs is more than half won.

To get such plumbing into specifications is neither difficult nor costly.

The Clow Soldier of Sanitation stands ready at all times to help you select the proper fixtures, to work out the most economical layouts. At his finger tips is the accrued knowledge of Clow's 52 years of specialized plumbing experience.

At his back is the most complete line of specialized plumbing fixtures in the world, developed to meet particular needs in schools, hospitals, industrial plants, public buildings and similar installations as well as the smallest bungalow.

When you specify such fixtures, your plans and specifications become a sword that ghostly enemies cannot withstand.

CHICAGO

PREFERRED FOR EXACTING PLUMBING SINCE 1878

Consult your architect
INTERIORS

tend more and more to abandon dependence upon surface treatment and furnishings alone and to take their character from structural elements forming a part of the building itself.

Interior decoration thus becomes a responsibility of the architect to a greater degree than ever before. The quality of the decorative achievement depends very largely upon architectural limitations imposed by the general design.

Many architects find GOOD FURNITURE AND DECORATION, the professional journal in this field, a helpful instrument in their work. It acquaints them with advanced practice in the treatment of interiors and with the materials and techniques at the disposal of the modern decorator.

GOOD FURNITURE AND DECORATION is five dollars a year. A sample copy awaits your request.

The address is 521 Fifth Avenue, New York
MEETING ARCHITECTURAL STANDARDS OF QUALITY

UNIVERSITY OF ROCHESTER NEW COLLEGE FOR MEN

THESE MODERN BUILDINGS HAVE SOLID NICKEL SILVER PLUMBING FIXTURES BY DOUGLAS

The adoption of Solid Nickel Silver plumbing fixtures for the handsome new buildings of the University of Rochester suggests that every detail has been carefully specified so that this widely-watched building project may be in keeping with the highest architectural standards of today. Comparable in both beauty and physical properties to Pure Nickel and high alloys of Nickel, Solid Nickel Silver fixtures retain their lustrous, clean-looking appearance under severe use. They are corrosion-resisting and easily kept bright. Because of its hardness, toughness and strength, resembling tough bronze, Nickel Silver increases the wear-resistance of valve seats, and produces fixtures which are not easily marred or broken during installation or use. Solid Nickel Silver fixtures are being specified for both large and small installations where beauty, endurance and practical wearing qualities are of prime importance.
Saves Their Money

Now is a moment when an architect can as easily make a friend for life as a foe.

All Cabot's house building specialties are planned and manufactured in the true spirit of New England thrift—the thriftiest thrift in the world!

Highest quality materials, simplest and most efficient manufacturing methods; put these two things together, mark the finished product at a fair and reasonable price, hold the goodwill of the customer by supplying service at all times—and you have a formula for business success that has kept Samuel Cabot, Inc., alive and growing for generations.

You save your client's money when you deal with such a firm; and every satisfied client can bring you a dozen more.

Clip Coupon below, or write to

Cabot's Quilt

141 Milk Street, Boston, Mass.
Gentlemen: Please send me your new Building Specialties Handbook

BLOXONEND is the only factory flooring that combines the essential qualities of durability, resiliency and lasting smoothness. It is made of Southern Pine, the tough end grain forming the wearing surface.

The use of Bloxonend invariably is responsible for a saving in maintenance and production costs. Its smoothness minimizes wear and tear on trucks and means faster and safer trucking. A comfortable working surface assured.

Bloxonend comes in 8 ft. lengths and is laid over old or new concrete or wood floors without interrupting operations.

Write for Descriptive Booklet "A".

CARTER BLOXONEND FLOORING COMPANY
KANSAS CITY, MO.
Representatives in all principal cities
NOT ONLY—

WHO

BUT ALSO

HOW MUCH

— AND THEN

WHY

Seek out not only where DURIRON is used, but how extensively, and with what history. No Duriron Drain Pipe in service for which we recommend it has ever failed because of corrosion. Calked joints stay tight. Experience among those named right here points to the basic economy of specifying "Duriron Throughout" as original equipment. Temporary plumbing is out of place in a building created for generations to come.

For data—Our Catalog is filed in Sweet’s

THE DURIRON COMPANY, Inc., 446 N. Findlay
Street, Dayton, Ohio

Sales Offices in 36 Principal Cities

DURIRON

ACID

PROOF

DRAIN-PIPE

Among the Users of Duriron Drain Pipe

BETH ISRAEL HOSPITAL, New York City
Louis Allen Abramson, Architect
James & Bauman and A. E. Hausen, Engrs.

FIFTH AVENUE HOSPITAL, New York City
Vander & Sayer, Architects

Mt. SINAI HOSPITAL, Cleveland, Ohio
Charles R. Green, Architect
Mayer & Valentine, Engrs.

MICHAEL REESE HOSPITAL, Chicago, III.
Schmidt, Gordan & Martin, Architects

PASSAVANT HOSPITAL, Chicago, III.
Hochard & Reche, Architects

STATE OF MAINE HOSPITAL, Bangor, Me.
Coffeige & Carleom, Architects

HURLEY HOSPITAL, Flint, Mich.
Thielbar & Puyaard, Architects

JEWISH HOSPITAL ST. LOUIS, Mo.
Crahan, Anderson, Probst & White, Architects

UNIVERSITY OF BUFFALO
McKim, Mead & White, Architects

UNIVERSITY OF ILLINOIS (now building), Urbana, III.
James M. White, Architect

AMHERST COLLEGE, Amherst, Mass.
Charles A. Platt, Consulting Architect

VILLA NOVA COLLEGE, Villa Nova, Pa.
Paul Monaghan, Architect

WEST TEXAS TECHNICAL SCHOOL, Lubbock, Tex.

CHRYSLER MOTOR CAR CO. CHEMISTRY LABORATORY, Detroit, Mich.
Smith, Hinchman & Grylls, Architects

AMHERST COLLEGE, Amherst, Mass.
McKim, Mead & White, Architects

UNIVERSITY OF KENTUCKY, Lexington, Ky.
Coolidge & Shattuck, Architects

HENRY FORD SCHOOL OF NURSING, Detroit, Mich.
Albert Kahn, Inc., Architects

UNIVERSITY OF INDIANA (now building), Bloomington, Ind.

UNIVERSITY OF PENNSYLVANIA, Philadelphia

J. T. Windrim, Architect
And Why Not?
The first wall that was ever built was probably nothing but a barrier. The first mortar was undoubtedly just a binder. Now, a wall has an added function. It must contribute to a studied effect. That's why bricks have become beautiful; and that's why mortar— once drab and muddy and generally wretched— has blossomed out into colors and become one of the architect's most useful mediums. A good instance—eight buildings of the State Home for Insane* at Wichita Falls, Texas.

* Built of Acme Autumn Blend Full Range RuFs, with Pecora Black Mortar Stain, furnished by the Ft. Worth Builders' Supply Co., Inc., of Ft. Worth, Texas.

Manhattan Towers Hotel
New York City
Powerizer Centralized Radio Equipped

There is at this time no standard for sound and centralized radio systems in buildings. Different hotels whether already erected or in the course of planning and construction have different problems.

A school is another problem, a hospital is still another.

We would be very glad to send you a typical specification of any type of building on which we have had experience. We would suggest that you use our questionnaire which we will be glad to send you together with other literature which we are issuing from time to time.

Radio Receptor Company, Inc.
106-A Seventh Avenue, New York, N. Y.

Licensed by the Radio Corporation of America and Associated Companies
OUT of the dim mists of antiquity come myths of giants . . of Atlas who upheld the blue vault of heaven . . of Hercules and his twelve stupendous tasks . . of Goliath and Cyclops and a host of others.

Today another race of giants shoulder the world’s work. Carnegie Beams are the modern giants of the earth. Introduced less than four years ago, they have been conspicuous in recent notable construction. The Empire State Building, the Chrysler Building, the new Waldorf-Astoria, Hotel New Yorker, the Irving Trust Company Building, the Koppers and Grant Buildings in Pittsburgh, the Penobscot and Fisher Buildings in Detroit, the Department of Commerce Building in Washington, Strawbridge & Clothiers Store in Philadelphia, the Carew Tower in Cincinnati, No. 1 LaSalle Street and the Palmolive Building in Chicago . . these and countless others are borne on the broad shoulders of Carnegie Beams. Such widespread usage is the best indication of their adequacy to the needs of architects and designers. Their broad flanges present advantages applying to any type of construction involving the use of Structural Steel, regardless of size or type of architecture.

C B’s (Carnegie Beams) are ready to serve you. They’re fit for any job.
QUESTION:

What is the importance of proper lighting in the institutional laundry?

ANSWER:

Both as an aid in producing quality work and a safeguard against accident, proper lighting is essential in the institutional laundry. Without it operators cannot be sure of the perfect finish of the work. They may overlook faint stains, rough-dry spots and other defects.

A well lighted laundry may be defined as one in which the work is at all times, during handling by employees, in full, unchanging light without shadows or glare.

In providing for proper illumination, the location of all laundry equipment should first be determined and the lighting planned accordingly. Particular attention should be paid to inspecting, assorting, and packing rooms. Too much reliance should not be placed in windows which on sunny days frequently cause glare. In the institutional laundry, where daylight cannot be the controlling factor, it is better, in fact, to eliminate windows entirely. If white and diffused, ample artificial light is, in the end, more satisfactory.

Consideration should be given to the painting of walls, columns, ducts and equipment. Flat diffusing white, mill white or aluminum paint should be used. All painted surfaces should be frequently cleaned. Lamps and reflectors should be designed for easy and periodical cleaning. Troy Advisory Service can give valuable assistance on lighting problems.
Selected List of Manufacturers' Publications
FOR THE SERVICE OF ARCHITECTS, ENGINEERS, DECORATORS, AND CONTRACTORS

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

ACOUSTICS


ASH HOISTS
Gillis & Geoghegan, Inc., 544 West Broadway, New York.

G & G's Telescopic Hoist catalog, 8½ x 11 A. I. A. Standard Classification 201, contains complete descriptions, method of selecting correct model to fit the building's needs, scaled drawings showing space requirements and specifications.

ASH HOISTS—TELESCOPIC
Gillis & Geoghegan, Inc., 544 West Broadway, New York.

G & G's Telescopic Hoist catalog, 8½ x 11 A. I. A. Standard Classification 201, contains complete descriptions, method of selecting correct model to fit the building's needs, scaled drawings showing space requirements and specifications.

BRICK

General catalog, 16 pp., 8½ x 11 ins. Illustrated. Bradford Red. Folder. 8 pp., 3 x 8 ins. Illustrated.

CABINET WORK


CARPET

Clement
Carney Company. The, Mankato, Minn. A Profitable Combination of Cash and Economy. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on valuable line of accessories.

Louisville Cement Co., 315 Guthrie St., Louisville, Ky.


Portsmouth Steel Company, Chicago, Ill.

Concrete Masonry Construction. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Contains complete technical description of BRIXMENT for brick, tile and stone masonry, specifications, data and test results. Describes entire line of tin-clad and corrugated fire doors, complete with hardware. Includes 180 pp., 8½ x 11 ins., illustrating and describing more than 2,000 standard bronze shapes of cornices, jamb casings, moldings, etc.

William Bayley Co., 147 North Street, Springfield, Ohio.

Rayley Tubular Steel Doors. Brochure, 16 pp., 8½ x 11 ins. Illustrated.

Kalman Steel Company, Chicago, Ill.

Finishing Door Openings. A.I.A. file holder with 20 loose-leaf sheets of details and specifications. Complete Index of all Minwax Products. Folder, 6 pp., 8½ x 11 ins. Illustrated.

The Kawneer Company, Niles, Michigan.

Practical Planning for Club Food Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

DOORS

The Kawneer Company, Niles, Michigan.


Lupton Steel Industrial Doors. Brochure. 8 pp., 8½ x 11 ins. Illustrated. Details and specifications.

DOORS AND TRIM, METAL

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

William Bayley Co., 147 North Street, Springfield, Ohio.

Rayley Tubular Steel Doors. Brochure, 16 pp., 8½ x 11 ins. Illustrated.

Kalman Steel Company, Chicago, Ill.

Finishing Door Openings. A.I.A. file holder with 20 loose-leaf sheets of details and specifications.

The Kawneer Company, Niles, Michigan.

Details sheet, 8½ x 11 ins., with A.I.A. File No. featuring Heavy Welded Bronze Doors.


DOORS, SOUNDPROOF

Irvings Hamlin, Evanston, Ill.

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

DRAINAGE FITTINGS


Jossam New Saw Tooth-Roof Drain. Folder, 4 pp., 8½ x 11 ins. Illustrated.
SELECTED LIST OF MANUFACTURERS’ PUBLICATIONS—Continued from page 115

DUMBWAITERS
Sedgwick Machine Works, 211 West 15th St., New York, N. Y.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 8% x 11 ins., 60 pp., Illustrated.
Catalog and pamphlets, 8% x 11 ins. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT
Bryant Electric Co., Bridgeport, Conn.
Catalog No. 31. Complete catalog of wiring devices 8% x 10% ins. 152 pp.
An Electrical Specification. Contains information and data useful in connection with the writing of electrical specifications. Illustrated. 8% x 11 ins. 12 pp.
The Bryant Home of Ideas. Contains data and suggestions useful in connection with residence wiring. 8% x 10% ins. 16 pp.
"KXAX" and "HOXAX" Bulletin No. 01226. Contains data and specifications pertaining to devices for use in connection with the wiring of homes. Illustrated. 8% x 10% ins. 30 pp.
Hospital Signal Devices. Bulletin HS-622-RP. Complete information on hospital signal devices. Full catalog type. 8% x 10% ins. 46 pp.
Hospital Signal Devices. Bulletin HS-1021. Magnetic Control Type. 8% x 10% ins. 30 pp.

The Electric Storage Battery Co., Philadelphia.
Emergency Lighting and Emergency Power Data. Booklet, 12 pp., 8% x 11 ins. Illustrated.

General Electric Co., Merchandise Dept., Bridgeport, Conn.

The House of a Hundred Comforts. Booklet, 40 pp., 8 x 10% ins. Illustrated. Deals on importance of adequate wiring.

Ward Leonard Electric Co., Mt. Vernon, N. Y.
Modern Color Lighting. Booklet, 46 pp., 8% x 11 ins. Illustrated. Valuable work on the subject.

Electric Power for Buildings. Brochure, 14 pp., 8% x 11 ins. Illustrated. A publication important to architects and engineers.

Variable-Voltage Central Systems as Applied to Electric Elevators. Booklet, 12 pp., 8% x 11 ins. Illustrated. Deals with an important detail of elevator mechanism.

Modern Electrical Equipment for Buildings. Booklet, 8% x 11 ins. Illustrated. Many useful applications many useful applications.

Electric Equipment for Heating and Ventilating Systems. Booklet, 24 pp., 8% x 11 ins. Illustrated. This is "Motor Application Circular 7079."

Westinghouse Furnaceats. Catalog 236. Booklet, 64 pp., 8% x 11 ins. Illustrated.
Beauty; Power; Silence; Westinghouse Fans. (Dealer Catalog 45.)


Westinghouse Commercial Cooking Equipment (Catalog 230). Booklet, 10 pp., 8% x 11 ins. Illustrated. Equipment for cooking on a large scale.

Electric Appliances (Catalog 44-A). 22 pp., 8% 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, 8% 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, 8% x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.
Escalators. Booklet, 8% x 11 ins., 22 pp. Illustrated. Describes use of escalators in subway stations, theaters and industrial buildings. Also includes elevators and dock elevators.
Elevators. Booklet, 8% x 11 ins., 24 pp. Illustrated. Describes hydraulic or "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, 8% x 11 ins., 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.

ELEVATORS—Continued
Catalog and pamphlets, 8% x 11 ins. Illustrated. Important data on different types of elevators.

ESCALATORS
Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Escalators. Booklet, 32 pp., 8% x 11 ins. Illustrated. A valuable work on an important item of equipment.

FIREPROOFING
Concrete Engineering Co., Omaha, Neb.
Handbook of Fireproof Construction. Booklet, 54 pp., 8% x 11 ins. Valuable work on methods of fireproofing.

Concrete Steel Company, 2 Park Avenue, New York, N. Y.
Economical Fireproof Floors for Suburban Buildings. Folder. 4 pp., 8% x 11 ins. Illustrated.
Hymersteel Steel Joint. The Joint with the Twin-Teed Chords. Booklet, 24 pp., 8% x 11 ins. Illustrated.


FLOOR HARDENERS (CHEMICAL)
Minwax Company, 11 West 42nd Street, New York, N. Y.
Concrete Floor Treatments. Folder, 4 pp., 8% x 11 ins. Illustrated.


FLOORS—STRUCTURAL
Concrete Engineering Co., 2 Park Avenue, New York, N. Y.
Havemeyer Steel Joint. The Joint with the Twin-Teed Chords. Booklet, 24 pp., 8% x 11 ins. Illustrated.

Truscon Steel Co., Youngstown, Ohio.
Truscon Flexinite Construction. Illustrated Booklet, 8% x 11 ins., 16 pp. Illustrations of actual jobs under construction. Lists of properties and information on proper construction. Proper method of handling and tables of safe loads.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-Cast Fireproof Floors. Booklet, 36 pp., 8% x 11 ins. Illustrated. Data on flooring.

Schenley Sheet No. I: Specifications and Details of Design and Construction for Gypsteel Pre-Cast Floors and Ceilings. Folder, 8% x 11 ins. Illustrated.

FLOORING
Armstrong Cork Co. (Flooring Division), Lancaster, Pa.


Linoleum Layer’s Handbook. 5 x 7 ins., 26 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.


Blimo’s Linoleum Styles for 1930. Booklet, 64 pp., 8% x 11 ins. Illustrated.

Detailed Instructions for Handling and Laying Linoleum. Brochure, 46 pp., 8% x 11 ins. Illustrated.

Blimo’s Linoleum Floors and Where You Will Find Them. Booklet, 8 pp., 8% x 11 ins. Illustrated. Concerns use of Texta. Folder, 8% x 11 ins. Illustrated.

REQUEST FOR CATALOGS
To get any of the catalogs described in this section, put down the title of the catalog desired, the name of the manufacturer and send coupon to THE ARCHITECTURAL FORUM, 521 Fifth Avenue, New York.
These Philadelphia buildings are Jennings equipped.

1. Chester Grille, 39th & Locust St.
2. Penn Athletic Club
3. Barclay Apartments
4. Warwick Hotel
5. Gulf Refining Building
6. Lewis Building
7. Atlantic Refining Bldg.
8. Fox Theatre Building
9. Pennsylvania RR., Broad Street Station and other buildings
10. Chancellor Court Apartments
11. Franklin National Bank Bldg.
12. Fox Theatre Building
13. Strawbridge and Clothier
15. Packard Building
17. Y M C A, Naval Annex
18. Hahnemann Hospital
19. Mitten Building
20. Bell Telephone Company
21. City Hall Annex
23. U. G. I. Building
25. Public Ledger Building
26. Independence Hall
27. Stanley Theatre
28. R. C. A Victor Corporation
29. Robert Morris Hotel
30. Schmidt's Brewery
31. Curtis Institute of Music
32. Philadelphia Electric Co. Substation
33. Pennsylvania Sugar Company
34. Land Title Building
35. Architects Building
36. Central Medical Building
37. Warburton House
38. Farm Journal Building
39. 600 Walnut Street Building
40. Liberty Title & Trust Company
41. Frank & Seder
42. Office Bldg., 47th & Sansom St.
43. Rittenhouse Apartments
44. Office Bldg., 50th & Sansom St.
45. Engineers Club
46. Jefferson Hospital
47. Maryland Casualty Company

Airplane photo of Philadelphia's business section.

Serving these Philadelphia buildings

In fifty important buildings in Philadelphia's business section, the heating systems are served by Jennings Vacuum Heating Pumps. Other Jennings Equipment installed in these buildings includes House Service Pumps, Condensation Pumps, Sump Pumps and Pneumatic Sewage Ejectors.

Philadelphia architects, engineers and building owners know that Jennings Pumps can be depended upon to give long, efficient service with a minimum of attention. Nash Engineering Company 12 Wilson Road, South Norwalk, Conn.
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—Continued from page 116

FLOORING—Continued


GREENHOUSES


GLASS CONSTRUCTION


GYPSUM

Structural Gypsum Corporation, Linden, N. J. Service Sheet No. 1. Specifications and Details of Design and Construction for Gypsum Fireproof Pre-Cast Floors and Ceilings. Folder, 8 1/2 x 11 ins. Illustrated. Service Sheet No. 2. Specifications and Details of Design and Construction for Gypsum Fireproof Pre-Cast Floors and Ceilings. Folder, 8 1/2 x 11 ins. Illustrated. Service Sheet No. 3. Specifications and Details of Design and Construction for Gypsum Fireproof Pre-Cast Floors and Ceilings. Folder, 8 1/2 x 11 ins. Illustrated. Service Sheet No. 4. Specifications and Details of Design and Construction for Gypsum Pre-Cast Assembled Slab Roofs. Folder, 8 1/2 x 11 ins. Illustrated. HARDWARE


HARDWARE—Continued


HEATING EQUIPMENT


REQUEST FOR CATALOGS

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

Name __________________________  Business __________________________
Address __________________________

You may never design a **PLANETARIUM** or a **QUICK-FREEZE PLANT**.

Each requires a different insulation, but these unusual Armstrong installations may help you with other jobs.

FEW people can tell you what a planetarium is. So far as we know, there's only one in the United States—the Adler Planetarium in Chicago. It's a miniature universe, with planets and stars in exact duplication of the solar system. Intricate machinery causes each to move in its actual orbit in relation to the others.

Controlled temperature and freedom from ceiling condensation are essential in such a building. So the architect, Ernest A. Grunsfeld, Jr., called on the Armstrong Cork & Insulation Company—and the practical answer given by Armstrong engineers was a 2-inch layer of Armstrong's Corkboard on the building's dome-shaped roof, providing ideal insulation.

HOW TO HOLD 50°F BELOW ZERO? Just as interesting, in another way, are two plants recently built for the quick-freezing of foods. Cudahy Brothers Packing Company of Milwaukee freezes meats; Vita Fruit Products, Inc., of Lodi, California, fruits. In each case, this freezing is done at 50 to 60 degrees below zero—mighty cold temperatures to maintain.

Armstrong engineers advised 12 inches of Armstrong's Corkboard on walls and ceiling. Because of cork's efficiency, these freezing rooms are now permanently insulated to hold low temperatures.

**CUSHIONING A FACTORY FLOOR.** In Canada, the Canadian Goodrich Company, Ltd., found itself faced with the problem of installing heavy, vibrating machinery on the third floor of its new building. Placed over beams, column bases, and floor joists, Armstrong's Cork Machinery Isolation cushions the whole third floor. Vibration cannot harm this building now.

We could mention many similar installations. Each day sees some new question, some new situation. For these and other Armstrong Insulation Products serve many purposes—in ways that might never occur to you. Next time you are confronted with a puzzling installation—and what architect isn't?—see if cork won't do the job. Put it up to Armstrong engineers. Their experience may suggest just the method you are looking for. Write to Armstrong Cork & Insulation Company, 900 Concord Street, Lancaster, Penna.

**Armstrong's Cork Products**

CORKBOARD...CORK COVERING...CORKOUSTIC...CORK MACHINERY ISOLATION...INSULATING BRICK
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—Continued from page 118

HEATING EQUIPMENT—Continued

The Fulton Syphon Company, Knoxville, Tenn.
Syrups and Temperature Regulators. Illustrated brochures, 8½ x 11 ins., dealing with general architectural and industrial applications; also specifically with applications of solvent special instruments. Syrups, Heating Specialties. Catalog No. 200, 199 pp., 3½ x 6½ ins. Important data on heating.

Hoffman Specialty Company, Inc., 22 West 66th St., New York, N.Y.
Heat Controlled With the Touch of a Finger. Booklet, 46 pp., 9½ x 6¼ ins. Illustrated.

How to Look Out Air, the Heat Thief. Brochure, 40 pp., 3 x 7½ ins. Illustrated.

Janetto Manufacturing Company, 556 West Monroe Street, Chicago.
More Heat from Any Hot Water System on Less Fuel. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with the use of the “Hydro-Flame.”

S. T. Johnson Co., Oakland, Calif.

Kewanee Boiler Corporation, Kewanee, Ill.
Kewanee on the Job. Catalog, 8½ x 11 ins., 80 pp. Illustrated. Showing installations of Kewanee boilers, water heaters, radiators, etc.

Catalog No. 78, 6 x 9 ins. Illustrated. Describes Kewanee Firebox Boilers with specifications and prices. Price List No. 79, 6 x 9 ins. Illustrated. Describes Kewanee power boiler and smokeless tubular boiler specifications.

McQuay Radiator Corporation, 250 East 84th Street, Chicago, III.
McQuay Visible Type Cabinet Heater. Booklet, 4 pp., 8½ x 11 ins. Illustrated. Cabinets and radiators adaptable to decorative schemes.

McQuay Convector Radiators. Brochure, 4 pp., 8½ x 11 ins. Illustrated.

McQuay Unit Heater. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.

Modine Mfg. Co., Racine, Wis.
Modine Copper Radiation. Folder, 28 pp., 8½ x 11 ins. Illustrated. Deals with industrial, commercial and domestic heating.

A Few Short Years. Folder, 4 pp., 8½ x 11 ins. Illustrated. Heating for garages.

Direct Heating. Folder, 4 pp., 8½ x 11 ins. Illustrated. Direct Heating. Folder, 4 pp., 8½ x 11 ins. Illustrated.

National Heating Supply. Folder, 4 pp., 8½ x 11 ins. Illustrated. Modine Unit Heater. Folder, 6 pp., 8½ x 11 ins. Illustrated.

Nash Engineering Company, South Norwalk, Conn.


Bulletin 63. Booklet, 4 pp., 10¼ x 7½ ins. Illustrated. Describes in full the Unit Type Motor Driven Jennings Condensation Pump.

National Radiator Corporation, Johnstown, Pa.
The Crimson Flame. Folder, 6 pp., 4½ x 7 ins. Illustrated. Comfort Brings Contentment to Your Home. Folder, 12 pp., 3½ x 6 ins. Illustrated.


Arco, the National Radiator Sizes and Ratings. Booklet, 16 pp., 8½ x 11 ins. Illustrated.

Sarco Company, Inc., 183 Madison Ave., New York City, N.Y.
Steam Heating Specialties. Catalog No. 6, 6 pp., 8 x 10 in. Illustrated. Data on Sarco Packless Supply Valves and Radiator Traps for vacuum and vapor heating systems.

Equipment Steam Traps and Temperature Regulations. Booklet, 6 pp., 8 x 10 in. Illustrated. Deals with Sarco Steam Traps for hospital, laundry and kitchen fixtures and the Sarco Self-contained Temperature Regulation for hot water service tanks.

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

U. S. Bloower & Heater Corporation, Minneapolis, Minn.
Heating and Washers. Booklet, 64 pp., 8½ x 11 ins. Illustrated.

HOISTS, TELESCOPIC


Ash & Green, Inc., 875 and 875½ ins. Illustrated. Hoists for removing ashes from basements.

HOSPITAL EQUIPMENT

Bryant Electric Co., Bridgeport, Conn.


The Frink Co., Inc., 369 Lexington Ave., New York City.
Catalog No. 7, 10 ins. 38 pp. A booklet illustrated with photographs and drawings, showing the types of light for use in hospitals, as operating table reflectors, ward reflectors, bed lights and microscopic reflectors. Also for special uses.

The International Nickel Company, 67 Wall St., New York, N.Y.
Hospital Applications of Monel Metal. Booklet, 8½ x 11¼ ins. 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.

John Van Range Co., Cincinnati, Ohio.
Potter and Brumfield Hospital Food Service. Brochure, 62 pp., 8½ x 11 ins. Illustrated.

Wilmot Castle Company, Union Trust Bldg., Rochester, N.Y.
The Hospital Sterilizer Data Sheets. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Data on planning sterilizer installations.

HOTEL EQUIPMENT

Pickard & Company, Inc., Albert, 1200 West 35th St., Chicago, and 34 Cooper Square, New York.
Some Thoughts on Furnishing a Hotel. Booklet, 7½ x 9 ins. Illustrated. Gives complete outfitting of hotels.

INCINERATORS

Jossam-Graver Incinerators. Folder, 4 pp., 8½ x 11 ins. Illustrated.

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


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

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

Estate Type Kernerator. For Estates and Country Homes. Booklet, 8 pp., 8½ x 11 ins. Illustrated.

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 7½ ins. Illustrated. Armstrong’s Corkboard. Warehouses, fruit cellars, etc.

Cork Import Corporation, 345 West 42nd Street, New York.
Novoid Cork Covering for Cold Pipes, Coolers and Tanks. Folder 8½ x 11 ins. Illustrated. Describes and describes use of insulation for structural purposes.

Cork Import Corporation, 345 West 42nd Street, New York.
Novoid Cork Covering for Cold Pipes, Coolers and Tanks. Folder 8½ x 11 ins. Illustrated. Describes and describes use of insulation for structural purposes.

Structural Gypsum Corporation, Linden, N. J.

REQUEST FOR CATALOGS

To get any of the catalogs described in this section, put down the title of the catalog desired, the name of the manufacturer and send coupon to The Architectural Forum, 521 Fifth Avenue, New York.
**Where Everybody is HEAT Happy**

**COMFORT MAKES HIGHER INDIVIDUAL EFFICIENCY**

Sylphon No. 875 Automatic Radiator Valves bring heat harmony to any steam heated apartment, home, office, or factory building. They save fuel also by preventing room temperature fluctuating and repeated adjustment. These new Sylphon complete control units, responding to slightest changes in the air temperature, automatically regulate the steam flow to the radiators.

Once the marked thermostatic head is set, they maintain that constant degree of warmth desired by the occupants of each room. Without any further radiator attention Sylphon Radiator Valves hold one room "Cool," one "Medium" and another "Hot" and so on with the whole thermometer range of comfort as the selective limit.

**THE AUTOMATIC RADIATOR VALVE**

Banishes Fuel Wasting, Fluctuating Temperatures

Room temperatures never get "too Hot" or "too Cold" when a Sylphon 875 Radiator Valve is on guard. It is a combination Packless Valve and Thermostatic Control Unit, easily installed, inexpensive and without electrical or mechanical accessories to get out of order. Its use prevents uneven wasteful and injurious heat. Architects may specify these Sylphon Radiator Valves with perfect confidence in their lasting efficiency. Both angle and globe types fully described in our literature.

WRITE NOW FOR BULLETIN AA 250
SELECTED LIST OF MANUFACTURERS’ PUBLICATIONS—Continued from page 120

LAUNDRY MACHINERY—Continued

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

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


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

LIGHTING EQUIPMENT

The Frink Co., Inc., 309 Lexington Ave., New York, N. Y.

Catalog 415, 8½ x 11 ins., 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screening and partition reflectors, double and single deck reflectors and Polarlite Sign.

Gleason Tichauq Glass Co., 67 West 46th St., New York, Fragment of Celestialite. Catalog, 24 pp., 7 x 9 ins. Illustrated. Data on lighting for offices, schools, hospitals, etc.


Smysr-Royer Co., 1700 Walnut Street, Philadelphia, Pa.

Catalog 171, on Exterior Lighting Fixtures. Catalog, illustrating driving data on over 300 designs of standards, lanterns and brackets of bronze or cast iron.

Todhunter, 119 East 57th St., New York, N. Y.

Lighting and Fixtures. Catalog 175, 24 pp., 8½ x 11 ins. Illustrated. Fine assortment of lighting fixtures.


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

MAIL CHUTES

Cutler Mail Chute Company, Rochester, N. Y.

Cutler Mail Chute Model F. Booklet, 8½ x 9¾ ins., 8 pp. Illustrated.

MANTELS

Henry Klein & Co., Inc., 40-46 West 23rd Street, New York City.

Drywood Mantels. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Fine line of mantels, particularly for residences.

Todhunter, Inc., 119 East 57th St., New York, N. Y.

Georgian Mantels. Brochure, 12 pp., 8½ x 11 ins. Illustrated. Excellent work on mantels based on Georgian precedent.

MARBLE

The Georgia Marble Company, Tate, Ga.; New York Office, 1338 Broadway.

Why Georgia Marble Is Better. Booklet, 3½ x 6 ins. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc.

Convincing Proof. 3½ x 6 ins. 8 pp. Classified list of buildings and educational institutions in which Georgia Marble has been used, with names of Architects and Sculptors.

Burt Building, Atlanta; Senior High School and Junior College, Muskegon, Mich. Folders, 4½ x 8½ x 11 ins. Details.

METALS

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

Monel Metal Primer. 8 folders, 4 pp., 8½ x 11 ins. Illustrated. Valuable data on use of monel in kitchens, laundries, etc.

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.

Your Dream Kitchen. Booklet, 11 pp., 7¼ x 10½ ins. Illustrated. Fine line of fittings for kitchens, breakfast alcoves, etc.

Gartmann-Sanders Company, 2155 Elston Ave., Chicago, Ill.

Column Catalog, 7½ x 10 ins., 40 pp. Illustrated. Contains prices, columns 6 to 30 ins. diameter, various design and illustrations of columns and installations.

The Pergola Catalog. 7½ x 10 ins., 64 pp. Illustrated.

REQUEST FOR CATALOGS

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

This outstanding example of modern architecture, housing two department stores, a hotel, an office building, a garage and a host of shops, has 58 separate roof surfaces, each protected by a Carey Built-up Roof.

Carey Roofs are selected for important structures because they possess definite advantages. Built of perfect bonding Carey felts and asphalts, every application step is controlled by rigid specifications. Carey Approved Roof Contractors perform the work, and the finished roof is bonded for 10 or 20 years, according to the type roof selected.

The Carey Specification Book, containing complete data on built-up roofs for all styles of construction, will be mailed on request.
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—Continued from page 122

MILL WORK—Continued

Klein & Co., Inc., Henry, 11 East 37th St., New York, N. Y.

Two Dwiroo Interiors. Folder, 4 pp., 6x5 x 9 ins. Illustrated. Use of moulding for paneling walls.

A New Style in Interior Decoration. Folder, 4 pp., 6x5 x 9 ins. Illustrated. Deals with interior woodwork.

Dwiroo Period Mouldings in Ornamented Wood. Booklet, 28 pp., 6x5 x 9 ins. Illustrated. How Dwiroo Period Mouldings in Ornamented Wood Set a

New Style in Decoration. Folder.

Roddus Lumber and Veneer Co., Marshallfield, Wis.

Roddus Doors, Catalog G. Booklet, 34 pp., 5x4 x 9 ins. Illustrated. Price list of doors for various types of buildings.

Roddus Doors, Catalog G. Booklet, 34 pp., 5x4 x 9 ins. Illustrated. Completely covers the subject of doors for interior use.

Roddus Doors for Hospitals, Brochure, 16 pp., 6x5 x 9 ins. Illustrated work on hospital doors.

Roddus Doors for Hotels, Brochure, 14 pp., 6x5 x 11 ins. Illustrated work on doors for hotel and apartment buildings.

ORNAMENTAL PLASTER


PAINTS, STAINS, VARNISHES AND WOOD FINISHES

Medusa Portland Cement Co., 1902 Engineers' Building, Cleveland. "How to Paint Concrete and Masonry Surfaces." Booklet, 16 pp., 8x5 x 11 ins. Illustrated.

Minwax Company, Inc., 21 West 42nd St., New York.


National Lead Company, 111 Broadway, New York, N. Y.

Handy Book on Painting. Booklet, 35 x 354 ins., 100 pp. Gives directions and formulae for painting various surfaces of wood, plastic, metals, etc., both interior and exterior.

Red Lead in Paste Form. Booklet. 6x5 x 7 ins., 16 pp. Illustrated. Directions and formulae for painting metal surfaces.


Tock Brothers, New York, Chicago, Los Angeles. Architects' Specification Data. Sheets in loose leaf binder, 8x6 x 11 ins., dealing with an important line of materials.

PARTITIONS

Circle A. Products Corporation, New Castle, Ind.

Circle A. Partitions Sectional and Movable. Brochure. Illustrated. 8x5 x 12 ins., 12 pp. Full data regarding an important line of partitions, along with Erection Instructions for paritions of different three types.

Irving Handlon, Evanston, Ill.

Handlon's Folding Partitions Made from Hamlin's Evanston Soundproof Doors, Sectional and Movable. Folder, 4 pp., 8x5 x 11 ins. Illustrated.

Hamblen Company, E. F., Cleveland, Ohio.

Movable Steel Partitions for sub-dividing office and industrial spaces. Folders on complete line, 8x5 x 11, giving full data on the different types of steel partitions with details, elevations and specifications. Also 40-page Architects' Portfolio AIA—2RA3, containing 20 full page plates of practical office layouts.

Hollow Steel Standard Partitions. Various folders, 8x5 x 11 ins. Illustrated. Give full data on different types of steel partitions, together with details, elevations and specifications.

Henry Klein & Co., 25 Grand Street, Elmhurst, L. L. N. Y.

Telesco Partition. Catalog, 8x5 x 11 ins., 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions, cuts of buildings in which it is used. Hinged Galleries for sub-dividing office and industrial space. Folders on complete line, 8x5 x 11 ins. Illustrated. Data on brass and red brass doors.

Telesco Office Partition, 25 Grand St., Elmhurst, L. L. N. Y. (See Henry Klein & Co.)

PARTITIONS—Continued


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

Structural Gypsum Corporation, Linden, N. J.

Service Sheet No. 4. Specifications for Gypsum Partition File. Folder, 8x5 x 11 ins. Illustrated.

Tecoio Office Partition, 25 Grand St., Elmhurst, L. L. N. Y. (See Henry Klein & Co.)

PIPE

American Brass Company, Waterbury, Conn.


Amoco Pipe For Water Distribution. Booklet, 30 pp., 8x5 x 11 ins. Illustrated. Data on brass and red brass pipes.

American Rolling Mill Company, Middletown, Ohio.

How ARMCO Dredging Products Cut Costs. Booklet, 16 pp., 8x5 x 9 ins. Illustrated on dredging pipe.

Bethlehem Steel Company, Bethlehem, Pa.


Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.

Catalog A. 4 x 85x ins., 700 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

Duriron Company, Dayton, Ohio.

Duriron Acid, Alkali, Rust-proof Drain Pipe and Fittings. Booklet, 6 x 85 x 11 ins. Illustrated. Important data on a valuable line of pipe.

Maurice A. Knight, Akron, Ohio.

Knightware in the Princeton Chemical Laboratory. Booklet, 16 pp., 8x5 x 35x ins. Illustrated.

National Tube Co., Frick Building, Pittsburgh, Pa.

"National" Bulletin No. 6. Structural Gypsum Corporation, Linden, N. J.

"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8x5 x 11 ins., 88 pp. Illustrated. In this bulletin is summed up the most important research dealing with piping in all types of buildings. The text matter consists of seven investigations by authorities on the subject.

"National" Bulletin No. 3. The Protection of Pipe Against Internal Corrosion, 8x5 x 11 ins., 20 pp. Illustrated. Discusses various causes of corrosion, and details the system of protecting internal corrosion in hot water supply lines.

"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8x5 x 11 ins., 88 pp. Illustrated. In this bulletin are summed up the most important research dealing with piping in all types of buildings. The text matter consists of seven investigations by authorities on the subject.

Modern Welded Pipe. Book of 88 pp., 8x5 x 11 ins., profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

Walworth Company, Stalter Office Building, Boston, Mass.


PLASTER


Information Book. Booklet, 24 pp., 5 x 9 ins. Lists grades of plaster manufactured; gives specifications and uses for each grade.


Interior Walls, Everlastings. Catalog, 20 pp., 6x4 x 91/4 ins. Illustrated. Describes origin of Keene's Cement and views of buildings in which it is used.

Structural Gypsum Corporation, Linden, N. J.


PLUMBING EQUIPMENT

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.

Catalog M. 99x 12 ins., 184 pp. Illustrated. Shows complete line of plumbing fixtures for Schools, Railroads and Industrial Plants.

REQUEST FOR CATALOGS

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

To help clarify and crystalize the function of air conditioning ... as applied either to increase human comfort, or to facilitate a manufacturing process ... is the intent of this bulletin.

Theoretical problems are presented and solved. Calculations of the many factors to be considered, in design and installation, are given in detail. Tables and charts, essential to an accurate determination, are included in Carbondale's Air Conditioning Bulletin.

You will find this literature of considerable interest and assistance. As many copies as needed are yours for the asking. Sign and mail the coupon!

Carbondale Refrigeration

ABSORPTION AND COMPRESSION AMMONIA SYSTEMS AND CO2 COMPRESSION SYSTEMS

THE CARBONDALE MACHINE COMPANY
CARBONDALE, PA. Dept. A. F. (1-1-31)

Please send......copies of the Carbondale Air Conditioning Bulletin

Name
Address
City State
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—Continued from page 124

PLUMBING EQUIPMENT—Continued


Imperial Brass Mfg. Co., 1300 W. Harrison St., Chicago, III. Water Closet Flushing Valves, Duplex Water Closets, Liquid Soap Fixtures, etc. 8½ x 11 ins., 136 pp., loose-leaf catalog, showing roughing-in measurements, etc.

Kohler Company, Kohler, Wis. Catalog K. 8½ x 11 ins. Illustrated. Loose-leaf catalog containing complete line of plumbing fixtures and accessories.

New Beauty and Utility in Plumbing Fixtures. Booklet, 36 pp., 6 x 9 ins. Illustrated. Shows well-arranged bathrooms, kitchens, etc.


PNEUMATIC TUBE SYSTEMS


Service Sheet No. 4, Specifications and Details of Design and Construction for Gypsteel Pre-Cast Assembled Slab Roofs. Folder, 8½ x 11 ins. Illustrated.

McCoy Steel Company, Milwaukee. MiCOR Architectural Sheet Metal Guide. Booklet. 72 pp., 8½ x 11 ins. Illustrated. Metal tile roofing, skylights, ventilators, etc.

Milcor Sheet Metal Handbook. Booklet, 128 pp., 8½ x 11 ins. Illustrated. Deals with rain-carrying equipment, etc.

American Brass Co., The, Waterbury, Conn. Facts for Architects About Screening. Illustrated folder, 9½ x 11 ins. Gives actual samples of metal screen cloth and data on fly screens and screen doors.


"Ancient" Tapered Mission Tiles. Leaflet, 8½ x 11 ins., 4 pp. Illustrated and contains also a partial list of users.

Federal Interlocking Tile and Glass Tile. 4 pp., 8½ x 11 ins. Illustrated and describes complete roof or precast concrete slabs requiring no composition covering.

Heintz Roofing Company, 1925 West Third Avenue, Denver, Colo. Plymouth Slingile Tile with Sprocket Hips. Leaflet, 8½ x 11 ins. Illustrated. Shows use of English slingile tile with special hips. Italian Promenade Floor Tile. Folder, 2 pp., 8½ x 11 ins. Illustrated. Floor tile 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.


Refrigeration

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

REINFORCED CONCRETE—See also Construction, Concrete

Concrete Steel Company, 2 Park Avenue, New York, N. Y. Modern Concrete Reinforcement. Booklet, 32 pp., 8½ x 11 ins. Illustrated.


RESTAURANT EQUIPMENT


REQUEST FOR CATALOGS

To get any of the catalogs described in this section, put down the title of the catalog desired, the name of the manufacturer and send coupon to The Architectural Forum, 521 Fifth Avenue, New York.
The new HAVEMEYER STEEL JOIST

In the type of buildings in which fire is most to be feared — hospitals, schools, hotels, apartment houses and residences — the Havemeyer Steel Joist offers a high degree of fire protection. Used in the construction of floors and roofs, Havemeyer Steel Joists form an effective barrier against the spread of fire from floor to floor.

Still other advantages of the Havemeyer Steel Joist are found in its economies, both as to the time and cost of construction and in the substantial, rugged qualities of the finished floor.

Write for new literature fully describing Havemeyer Steel Joist floor construction.

Executive Offices:
2 PARK AVE.
New York City

District Offices:

Concrete Steel Co.
SELECTED LIST OF MANUFACTURERS’ PUBLICATIONS—Continued from page 126

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

SHOWER STALL DOORS
The Kawneer Company, Niles, Mich.
Folder with AIA. File No. featuring new Shower Door, finished in Solid Bronze, Chromium Plated or Solid Nickel Silver.

STEEL PRODUCTS FOR BUILDING
Bethlehem Steel Company, Bethlehem, Pa.
Steel Joists and Stanchions. Booklet, 72 pp., 4 x 6¼ ins. Dataprint No. 63, 80 pp., illustrated.
Bethlehem Structural Shapes. Bound Volume, 368 pp., 8½ x 11 ins. Illustrated.

Steel Frame House Company, Pittsburgh, Pa. (Subsidiary of McKeen-Marshall Corp.)
Steel Framing for Dwellings. Booklet, 16 pp., 8½ x 11 ins. Illustrated.
Steel Framing for Gasoline Service Stations. Brochure, 8 pp., 8½ x 11 ins. Illustrated.
The Arc Welding of Structural Steel. Brochure, 32 pp., 8½ x 11 ins. Illustrated. Deals with an important structural process.

STONE, BUILDING
Indiana Limestone Company, Bedford, Ind.

Volume 1. Series B. Indiana Limestone Library. 6 x 9 ins., 36 pp. Illustrated. Describes and illustrates the use of stone for houses of all types of houses.


Old Gothic Random Ashlar. 8½ x 11 ins., 16 pp. Illustrated.

STORE FRONTS
Bracco Manufacturing Co., 525-35 South Wabash Ave., Chicago, Ill.
Catalog No. 35. All-Metal Construction. Brochure, 20 pp., 8½ x 11 ins. Illustrated. Deals with store fronts of a high class.

Catalog No. 34. Series 302. Standard construction. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Complete data on important type of building.

Detail Sheets. Set of seven sheets, 8½ x 11 ins., printed on tracing paper, giving full-sized details and suggestions for front and store front.

Daviss Solid Architectural Bronze Sash. Set of six sheets, 8½ x 11 ins., printed on tracing paper. Full-sized details and suggestions for design of special bronze store front construction.

The Kawneer Company, Niles, Mich.
Catalog M, 1929 Edition, 64 pages, 8½ x 11 ins., with the AIA. File No. The complete list of manufacturers. General Catalog.

Detail Sheet and descriptive folder, 8½ x 11 ins., with AIA. File No., featuring “B” Store Front Construction, designed along modernistic lines.

Book of Installations featuring modern fronts. Booklet, 32 pp., 8½ x 11 ins.

Detail Sheets. Set of seven sheets in Portfolio, 8½ x 11 ins. AIA. File No.

Detail Book of Sash and descriptive folder, 8½ x 11 inches, with AIA. File No., featuring “B” Store Front Construction, designed along modernistic lines.

National Terra Cotta Society, 230 Park Avenue, New York, N. Y.
Terra Cotta Store and Store Fronts. Booklet, 15 pp., 8½ x 11 ins. Illustrated.

TELEPHONE SERVICE ARRANGEMENTS
All Bell Telephone Companies. Apply nearest Business Office, or American Telephone and Telegraph Company, 195 Broadway, New York.
Planning for Home Telephone Conveniences. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

TERRA COTTA
National Terra Cotta Society, 39 West 44th St., New York, N. Y.

TIMBERLE TILE VAULTS
R. Guastavino Co., 40 Court Street, Boston.
Timber Arch Construction. Booklet, 8 pp., 8½ x 11 ins.

TILE, STRUCTURAL CLAY
Norton Vitrite Bulletin No. 116. 40 pp., 8½ x 11 ins. Illustrated. Shows standard charts, sizes and shapes, actual installations, etc.

Norton Header Backer Tile Bulletin. 8½ x 11 ins. 4 pp. Illustrated.
Norton Un shader Tile Bulletin. 8½ x 11 ins. 4 pp. Illustrated.
Norton for Buildings. 8½ x 11 ins., 6 pp. Illustrated.


TILES

Faience Tiles for Bathrooms. Folder, 4 pp., 8½ x 11 ins. Illustrated. Ask for Form A-303.


Flintcraft Files. Folder, 4 pp., 8½ x 11 ins. Illustrated. Machine-made floor or wall tile. Ask for Form A-262.

Hanley Quarry Tile. Folder, 4 pp., 8½ x 8 ins. Illustrated.

Pardee Tiles. Bound volume, 48 pp., 8½ x 11 ins. Illustrated.

TRUSSES
McKown Bros. Co., 523 South Keeler Avenue, Chicago.
Truth in Architecture. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Fabricated Wood Trussing. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Timber Trusses. Folder, 4 pp., 8½ x 11 ins. Illustrated.

VALVES
Cran Co., 536 S. Michigan Ave., Chicago, Ill.
No. 51. General Catalog. Illustrated. Describes the complete line of the Crane Co.

C. A. Dunham Co., 65 East Ohio St., Chicago, Ill.
The Dunham Packless Radiator Valve. Brochure, 12 pp., 8 x 11 ins. Illustrated. Data on an important type of valve.

Jenkins Brothers, 80 White Street, New York.


VENETIAN BLINDS
Colombia Mills, 225 Fifth Avenue, New York.

REQUEST FOR CATALOGS
To get any of the catalogs described in this section, put down the title of the catalog desired, the name of the manufacturer and send coupon to THE ARCHITECTURAL FORUM, 521 Fifth Avenue, New York.
KNIGHT-WARE Waste Lines in Columbia Presbyterian Hospital Centre

The above photo was taken in the 10th floor laboratory and shows quite clearly the method of hanging KNIGHT-WARE Pipe and Fittings. There were 96 Outlets on this floor. KNIGHT-WARE was used exclusively in this structure for all Acid Proof Waste and Ventilating Lines.

KNIGHT-WARE Pipe and Fittings possess certain requisites that have made them first choice in acid proof waste, drain and ventilating line equipment for University and Plant Chemical Laboratories, Hospitals, Newspaper Buildings and others having an acid or corrosive waste.

KNIGHT-WARE has long been recognized because of its absolute acid and corrosion proof qualities, regardless of the strength or temperature of the corrosive.

KNIGHT-WARE is tough and durable and resists abrasion to the highest degree. Acid Proof Chemical Stoneware should not be confused with common sewer pipe, stoneware or other ceramic wares which have a tendency to be weak and brittle.

KNIGHT-WARE Pipe and Fittings are easily and economically installed. They are hung much the same as any other pipe, one hanger only being required per Fitting or length of Pipe. The bells on KNIGHT-WARE Pipe are deep and well corrugated and our method of joint packing assures you of a perfectly acid and leak proof joint and one that will stand far in excess of any pressure that will be experienced in your waste lines. Joints may be easily and economically made.

All considered, you will find KNIGHT-WARE Acid Proof Pipe and Fittings most economical and, as for permanency, will outlast the building itself.

Complete information will be furnished upon request.

MAURICE A. KNIGHT
OFFICE AND PLANT
AKRON, OHIO

New York City
804 World Building
Beekman 1657

Chicago
230 N. Canal Street
Franklin 4658

San Francisco
Merchants Exchange Building
Douglas 375

Niagara Falls
309 United Office Bldg.
Niagara Falls 507

Philadelphia
1600 Arch Street
Rittenhouse 6300-6301

St. Louis
1st National Life Bldg.
Main 1784

Montreal, Que.
1307 Notre Dame Street, West
Main 2625
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—Continued from page 128

VENTILATION
American Blower Co., Detroit, Mich.
American H. S. Fans. Brochure, 28 pp., 8\(\times\)11 ins. Illustrated on an important line of blowers.

Duriron Company, Dayton, Ohio.
Acid-proof Exhaust Fans. Folder, 8 x 10\(\frac{1}{2}\) ins., 8 pp. Data regarding fans for ventilation of laboratory fume hoods.

Specification Form for Acid-proof Exhaust Fans. Folder, 8 x 10\(\frac{1}{2}\) ins.

Orange Screen Company, Maplewood, N. J.
Window Ventilator, Filters the air. Folder 4 pp., 8\(\times\)11 ins. Illustrated.

WATERPROOFING
Medusa Portland Cement Co., 1002 Engineers' Building, Cleveland.

Minwax Company, Inc., 11 West 42nd St., New York.
Weatherproofing Stadia. Folder, 4 pp., 8\(\times\)11 ins. Illustrated. Transparent Waterproofings for All Masonry Walls and Surfaces. Folder, 4 pp., 8\(\times\)11 ins. Illustrated.

Data Sheet on Membrane Waterproofing. Folder, 4 pp., 8\(\times\)11 ins. Illustrated.

Toch Brothers, New York, Chicago, Los Angeles.
Architect's Specification Data. Sheets in loose leaf binder, 8\(\times\)11 ins., dealing with an important line of materials.

WEATHER STRIPS
Athey Company, 6031 West 45th St., Chicago, Ill.
The Only Weatherstrip with a Cloth to Metal Contact. Booklet, 16 pp., 8\(\times\)11 ins. Illustrated. Data on an important type of weather stripping.

WINDOW GLASS
Pittsburgh Plate Glass Company, Grant Building, Pittsburgh, Pa.
Transparent Window Glass With the New Pastel Surface. Booklet, 16 pp., 8\(\times\)11 ins. Illustrated.

WINDOWS
William Bayley Co., 147 North Street, Springfield, Ohio.
Bayley Pivotale Windows. Booklet, 24 pp., 8\(\times\)11 ins. Illustrated. Sections, hardware, and other details, and illustrations of installations.

Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Blue Book. Brochure, 75 pp., 8\(\times\)11 ins. Illustrated. Discusses casements, particularly for residences.

The Kawneer Company, Niles, Michigan.
Circular, 8\(\frac{1}{2}\) x 11 ins., with A.F.A. File No. featuring full size details and specifications of Sealair In-swinging windows. The only windows available in non-ferrous metal and steel.


Lupton Commercial Projected Windows. Brochure. 24 pp., 8\(\times\)11 ins. Illustrated. Details and specifications.

WINDOWS, CASEMENT
Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Casements. Booklet, 14 pp., 8\(\times\)11 ins. Illustrated. Discusses casements, particularly for residences.

Fenestra Screen Casements. Brochure, 16 pp., 8\(\times\)11 ins. Illustrated.

Decorating With Casements. Booklet, 18 pp., with inserts in color 6 x 8\(\frac{1}{2}\) ins. Deals with use of decorations, particularly draperies, with casement windows.

Lupton Casement Hardware. Catalog C-227. Booklet, 24 pp., 8\(\times\)11 ins. Illustrated brochure on casements, particularly for residences.

WOOD FINISH
Minwax Company, Inc., 11 West 42nd St., New York.
Color card and specification for Minwax Flat Finish. Folder, 4 pp., 8\(\times\)11 ins. Illustrated. Deals with a penetrative, preservative stain finish giving stain and soft wax effect.

WINDOES, CASEMENT—Continued
Lupton Creates a Complete Casement. Folder, 8\(\times\)11 ins. Illustrated data on a casement providing for screens, shades and draperies.

Lupton Heavy Casements. Detail Sheet No. 101, 4 pp., 8\(\times\)11 ins. Details and specifications only.

Casement Window Hardware. Booklet, 24 pp., 8\(\times\)11 ins. Illustrated. Shows typical installations, detail drawings, construction details, blue-prints if desired. Describes AIR-way Multi-fold Window Hardware.

Architectural Details Booklet, 8\(\times\)11 ins., 16 pp. Tables of specifications and typical details of different types of construction.

List of Parts for Assembly. Booklet, 8\(\times\)11 ins., 16 pp. Full list of parts for different units.

WINDOW SCREENS
William Bayley Co., 147 North Street, Springfield, Ohio.
Bayley Pivotale Windows Screened. Booklet, 8 pp., 8\(\times\)11 ins. Data on screening and window ventilation.

Atto Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Screen Casements. Brochure, 16 pp., 8\(\times\)11 ins. Illustrated.

WINDOWS, STEEL AND BRONZE
William Bayley Co., 147 North Street, Springfield, Ohio.
Bayley Steel Window Inserts. Booklet, 8 pp., 8\(\times\)11 ins. Illustrated. Suggestions on correct use of inserts.

A Rain-shed and Ventilator of Glass and Steel. Pamphlet, 4 pp., 8\(\times\)11 ins. Deals with Pond Continuous Sash, Sawtooth Roofs, etc.


Truscon Steel Company, Youngstown, Ohio.
Drafting Room Standards. Book, 8\(\frac{1}{2}\) x 11 ins., 120 pages of mechanical drawings showing drafting room standards, specifications and construction details of Truscon Steel Windows, Steel Lintels, Steel Doors and Mechanical Operators.


Continuous Steel Windows and Mechanical Operators. Catalog 126. Booklet, 32 pp., 8\(\times\)11 ins. Illustrated.

WOOD—See also Millwork
American Walnut. Booklet 7 x 9 ins., 46 pp. Illustrated. A very useful and interesting little book on the use of walnut in Fine Furniture with illustrations of pieces by the most notable furniture makers from the time of the Renaissance down to the present.

American Walnut for Interior Woodwork and Paneling. 7 x 9 ins., 24 pp., 8\(\times\)11 ins. Illustrated. Discusses interior woodwork, giving costs, specifications of a specimen room, the different figures in Walnut, Walnut floors, finishes, comparative tests of physical properties and the advantages of American Walnut for woodwork.

Wood Conversion Company, Cloquet, Minn.
Nu-Wood Insulating Board and Insulating Lath. Booklet, 24 pp., 8\(\times\)11 ins. Illustrated.

True Insulation for Your Present House. Brochure, 12 pp., 5 x 7 ins. Illustrated.


House Construction that Pays for Itsel. Brochure, 22 pp., 5\(\frac{1}{2}\) x 7\(\frac{1}{2}\) ins. Illustrated.

REQUEST FOR CATALOGS
To get any of the catalogs described in this section, put down the title of the catalog desired, the name of the manufacturer and send coupon to THE ARCHITECTURAL FORUM, 521 Fifth Avenue, New York.
ALERT in all other phases of business management, many executives fail to give full consideration to their problems of interior communication. The result is, that employees are only partially efficient. Their working day can be measured more nearly in miles of travel between departments than in actual accomplishment.

Organizations which have installed Strowger P-A-X avoid this wasteful mileage, besides reaping many additional benefits in efficiency and utility from the use of this leading type of automatic interior telephone equipment.

More than 2000 business organizations, both large and small, now depend daily upon the "step-saving" advantages of P-A-X. In every instance in which P-A-X is used, time is not only employed more profitably, but a more thoroughly coordinated organization has resulted. The fact that P-A-X achieves a tremendous increase in the number of daily phone calls immediately from the hour it enters into use, shows that its great usefulness is not restricted to the more important calls, but includes the less important ones as well.

Strowger P-A-X puts an end to employees scurrying about the office and plant as message carriers. Being automatic, P-A-X gives always lightning-like action; it never fails; it accelerates organization procedure, and is trouble-free in operation.

If you desire complete information on Strowger P-A-X, write for illustrated literature.

Strowger P-A-X is available in capacities to suit the requirements of large and small organizations—from a half dozen telephones or less, up to several hundred. Studies gladly made without obligation to determine the type best fitted to your conditions.
This Attractive New School Has The Modern Security of NAILCRETE

NAILCRETE—the original nailing concrete—is specified as the nailing base for floors and roofs in many of the country's finest buildings because of its safety, durability and economy. Nailcrete is fire-proof, rot-proof and impervious to heat, cold or moisture. Furthermore, when used under wood floors it eliminates sleepers, sleeper clips, fill and underflooring.

THE NAILCRETE CORPORATION
105 West 40th Street New York

A New Metal Cornice by Milcor

with expansion metal wings

B EING made of metal, this cornice will not crack. Having the famous Milcor expansion wings at each side, it cannot pull away from the plastering.

An invisible joint has been perfected . . . by depressing the cornice, at the joint, the exact thickness of the metal. Precision in manufacture assures a perfect fit. The mitre joint on the new Milcor cornice saves time and labor on the job. It is formed at the factory . . . and always fits perfectly. Send for sample sections and complete information.

MILCOR STEEL COMPANY
MILWAUKEE, WIS., 1405 Burnham Street — CANTON, OHIO
Chicago, Ill. Kansas City, Mo. La Crosse, Wis.

GAR-WOOD

BALANCED HEATING UNIT

Every advantage of automatic oil or gas heat at less than the cost of coal.

Responsible organizations now distributing through the heating trade should investigate the Gar-Wood franchise. Write the factory for details.

GAR-WOOD ENGINEERING CO.
4196 Belleview Ave., Detroit, Mich.

Gentlemen: Send me, without cost or obligation, a copy of "A New Principle of Generating Heat at Low Cost."

Name _____________________________
Address __________________________
City ___________________________ State ________
Before the tenants moved into the building, the LAUNDRY was ready for work!

WhEN the very first plans were being made for the Mutual Benefit Life Insurance Company Building, Newark, N. J., American Laundry Machinery Company engineers were in conference with the architects. Working out floor dimension problems, estimating mechanical requirements, investigating sources of water and power. And, before the tenants moved into the building, the laundry department was ready for work.

It has been the privilege of our engineers to work with architects in the planning of laundries of every size, from the biggest multi-story commercial plant to the smallest institutional department. If you have a laundry-layout problem of any kind, bear in mind that "American" service is at your disposal, any time.

The American Laundry Machinery Company

CINCINNATI, OHIO
There's a National Heating System for Every Building Need

National Bonded Super-Smokeless Boiler

The Standard of Performance Comparison

Swirling, twisting, spinning, the white hot gases pass through the Super-Smokeless, scouring the flues, converting the black, smoke-laden curtain of unconsumed gas and fuel that goes up the stack in ordinary boilers into heat and economy.

Showing a proud record of 15 years of sterling service—endorsed by architects, engineers, trade and users—the Super-Smokeless is one of the line of outstanding National Boilers, each backed by a performance bond, that provides an efficient, dependable, time-tried heating unit for every building need. The National Line is fully illustrated in the National Heating Guide—if you haven’t a copy, write for it.

National Radiator Corporation
Johnstown, Pa.

National
Made-to-Measure Heating Systems

Copyright 1930, Nat. Rad. Corp.

The Finest Heating Boiler that Unrestricted Effort Can Achieve

A welded steel design that presents features obtainable only in the Brownell. An unparalleled combination of advanced design, carefully selected materials and unquestioned workmanship.

Recommended for heating requirements in homes, apartments, hospitals, country estates—wherever the demand for uniform, ample and economical heat must be met in the most approved manner.

Larger fire box
Greater radiant heating surface
Faster steaming
Special provision for auxiliary hot water in hot weather and odorless incineration.

THE BROWNELL COMPANY, Dayton, Ohio
Established in 1913

Brownell
The Balanced Heating Unit

PeerVent
Heating and Ventilating Units

You can specify PeerVent Units with complete confidence. They are positively silent in operation, highly efficient, and dependable. Peerless Units built nineteen years ago are still giving perfect satisfaction. The latest PeerVent is improved throughout—better radiator, better motor, better fans, and better controls. Write for Peerless Catalog.

PEERLESS UNIT VENTILATION CO., Inc.
Pioneers in Unit Ventilation
BRIDGEPORT, CONNECTICUT
Resident Engineers in Principal Cities from Coast to Coast
WHEN HEAT IS **Controlled**

--- working conditions are right

**HEAT WITH UNIT HEATERS**

It is easy to maintain an even temperature—not too hot, not too cold—throughout a building . . . to keep workers comfortable and contented, after Venturafin Unit Heaters are installed and heat becomes controlled.

Equipped with an individual three-way heat control switch, each Venturafin Unit forces heated air at LOW, MEDIUM or HIGH speed—at exactly the required velocity to correct irregularities of temperature in a building. Individually adjustable streamline air-jet deflectors direct heated air in one or several directions simultaneously. Venturafin Unit Heaters force heated air where you want it, when you want it and as much as you want.

Many are the unusual advantages offered by the Venturafin Method of Heating—cold corners and heat pockets disappear . . . no more wasteful heating of ceiling areas first . . . drafts are eliminated . . . absences of workers because of colds, headaches and similar ailments are reduced, and efficiency increased.

Venturafin Units are ideal for heating factories, shops, stores, garages, and many other types of buildings. They are easy to install and can be used on high, medium or low pressure steam applications. We shall be pleased to furnish you complete data direct from the factory, or upon application at any of our nation-wide sales and service offices.

**AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN**
**CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO**
**BRANCH OFFICES IN ALL PRINCIPAL CITIES**
RODDIS LUMBER & VENEER COMPANY, Marshfield, Wis. "Roddis Flush Doors in School Buildings."

There is probably no building of any kind which receives harder usage than school structures, and material of any kind which goes into a school building must be strong, durable and the best of its kind if it is to properly serve its purpose. This booklet deals with the well known Roddis Flush Doors as they apply to such structures.

"School buildings in all parts of America are equipped with Roddis Flush Doors,—in large and small cities, townships, villages and country districts. Roddis Flush Doors are preferred universally for school buildings, because they possess every prescribed essential in school building codes and requirements, and afford important advantages no other door provides. Roddis' completely solid, cross-unit, five-ply construction positively prevents warping, sagging, shrinking, checking and separating throughout all the years the door is in use. The moisture in the climate is too low."

Practically all distracting and annoying noises from corridors and classrooms fail to penetrate the solid, five-ply Roddis flush door. There are no thin, vibrating panels to transmit sounds, so that quiet is assured for the individual period of study, recitation or lecture in each of the rooms.

THE WILCOLATOR COMPANY, 17 Nevada Street, Newark. "The Aqualator."

If an interior of any kind is to be comfortable in cold weather, it is necessary that it be supplied with two things,—heat and humidity; one is not enough. Any good heating installation with proper ventilation not only transmits in sign and substance the main structure and possess attractive door beauty besides. Roddis' completely solid, cross-unit, five-ply construction positively prevents warping, sagging, shrinking, checking and separating throughout all the years the door is in use. The moisture in the climate is too low.

Practically all distracting and annoying noises from corridors and classrooms fail to penetrate the solid, five-ply Roddis flush door. There are no thin, vibrating panels to transmit sounds, so that quiet is assured for the individual period of study, recitation or lecture in each of the rooms.


Modern buildings of many kinds provide opportunities for the effective use of metal screens or grilles. One of the most popular of these uses is over the openings of hot air ducts or else used to conceal heating radiators when they are not in use and the walls are not needed. There are other uses to which grilles may be put. This brochure illustrates and describes a large variety of such screens, or grilles, their designs being chosen with care and taste and worked to the intents of different kinds. The booklet also deals with all the other utilities manufactured by the firm.


Many architects find difficulty in impressing upon their clients the importance of proper insulation. Most building appropriations are limited, and to get a house up at all it is necessary to stretch the amount available to the very utmost, and the walls stand as the most important barrier against the passage of heat. Roddis flush doors are preferred universally for school buildings, because they possess every prescribed essential in school building codes and requirements, and afford important advantages no other door provides. Roddis' completely solid, cross-unit, five-ply construction positively prevents warping, sagging, shrinking, checking and separating throughout all the years the door is in use. The moisture in the climate is too low.

THE WILCOLATOR COMPANY, 17 Nevada Street, Newark. "The Aqualator."

If an interior of any kind is to be comfortable in cold weather, it is necessary that it be supplied with two things,—heat and humidity; one is not enough. Any good heating installation with proper ventilation not only transmits in sign and substance the main structure and possess attractive door beauty besides. Roddis' completely solid, cross-unit, five-ply construction positively prevents warping, sagging, shrinking, checking and separating throughout all the years the door is in use. The moisture in the climate is too low.

Practically all distracting and annoying noises from corridors and classrooms fail to penetrate the solid, five-ply Roddis flush door. There are no thin, vibrating panels to transmit sounds, so that quiet is assured for the individual period of study, recitation or lecture in each of the rooms.


Modern buildings of many kinds provide opportunities for the effective use of metal screens or grilles. One of the most popular of these uses is over the openings of hot air ducts or else used to conceal heating radiators when they are not in use and the walls are not needed. There are other uses to which grilles may be put. This brochure illustrates and describes a large variety of such screens, or grilles, their designs being chosen with care and taste and worked to the intents of different kinds. The booklet also deals with all the other utilities manufactured by the firm.


Many architects find difficulty in impressing upon their clients the importance of proper insulation. Most building appropriations are limited, and to get a house up at all it is necessary to stretch the amount available to the very utmost, and the walls stand as the most important barrier against the passage of heat. Roddis flush doors are preferred universally for school buildings, because they possess every prescribed essential in school building codes and requirements, and afford important advantages no other door provides. Roddis' completely solid, cross-unit, five-ply construction positively prevents warping, sagging, shrinking, checking and separating throughout all the years the door is in use. The moisture in the climate is too low.

Practically all distracting and annoying noises from corridors and classrooms fail to penetrate the solid, five-ply Roddis flush door. There are no thin, vibrating panels to transmit sounds, so that quiet is assured for the individual period of study, recitation or lecture in each of the rooms.

THE WILCOLATOR COMPANY, 17 Nevada Street, Newark. "The Aqualator."

If an interior of any kind is to be comfortable in cold weather, it is necessary that it be supplied with two things,—heat and humidity; one is not enough. Any good heating installation with proper ventilation not only transmits in sign and substance the main structure and possess attractive door beauty besides. Roddis' completely solid, cross-unit, five-ply construction positively prevents warping, sagging, shrinking, checking and separating throughout all the years the door is in use. The moisture in the climate is too low.

Practically all distracting and annoying noises from corridors and classrooms fail to penetrate the solid, five-ply Roddis flush door. There are no thin, vibrating panels to transmit sounds, so that quiet is assured for the individual period of study, recitation or lecture in each of the rooms.
WHEN rooms like this...infrequently used...are heated by ordinary radiators, they often must be kept constantly heated so that they will be comfortable whenever a meeting is called.

But with Sturtevant Speed Heaters, it is unnecessary to heat such a room until just before a meeting convenes. Then, with steam up, it takes Speed Heaters only a few minutes to circulate heat to every part of the room. A single Speed Heater does the job of ½ to 5 tons of cast iron or pipe coil...and in addition, directs heat down where it is needed...keeps it there.

Exceptional efficiency and economy account for the installation of hundreds of Sturtevant Speed Heaters in stores, factories, offices, warehouses, garages, auditoriums and similar places.

Have you copies of these two interesting, valuable books: "The Speed Heater" (a short talk on a radically new development in heating equipment), and "Complete Data" for architects? Our nearest office will be glad to send them.

B. F. STURTEVANT COMPANY
Main Office: HYDE PARK, BOSTON, MASS.
Chicago, Ill., 419 No. Michigan Ave. • San Francisco, Cal., 681 Market St.
Branch Offices: Atlanta; Baltimore; Boston; Buffalo; Camden; Charlotte; Chicago; Cleveland; Dallas; Denver; Detroit; Hartford; Indianapolis; Kansas City; Los Angeles; Milwaukee; Minneapolis; Newark; New York; Omaha; Pittsburgh; Portland, Me.; Portland, Ore.; Rochester; St. Louis; San Francisco; Seattle; Washington, D. C.
Canadian Office: Toronto; Montreal; Galt. Canadian Reps.: Kipp Kelly, Ltd., Winnipeg. Agents in Foreign Countries.
special industrial problems, the most common use of ven­

The serious importance of ventilation than in schools which

has been fabricated as cheaply as possible that the
twisted out of all reason to fit conditions not at all in char­
too costly to be developed in stone, and has been warped and
warped and

architect has begun to study terra cotta with a rational and
logical eye, designing for his material, its advantages and
limitations, his modern manufacturer has begun to ex­
perience with a view to realizing the best that is in his

product. The revolutionary change in the point of view

is one side and at one end. When BI-FLAX is ap­

narrow expanded metal lath and Flax-li­

narya. The insulation does not touch the plaster base. It

Staid the value of a material which is

thermal insulation and is no way a part of it. It functions as insula­tion

is frequently necessary

the value of insulation for protecting a building warmer in winter and cooler in

am. are convinced of the importance of providing in a build­

The Burlington Testing Laboratory, Burlington. "The

PITTSBURGH TESTING LABORATORY, Pittsburgh. "The

ITHE HERMAN NELSON CORPORATION, Moline, Ill.

Quite as important as heating is the matter of securing ade­quate ventilation. Many people who profess to have a

high value for fresh air are peculiarly susceptible to drafts

or even to the slightest noticeable movement of air, the re­

result being that they are unwilling to open windows, which

is the usual means of securing ventilation. Unless

there is use made of some system of admitting air without

there being any perceptible air current, a room is practically

sealed up, and the same air, breathed again and again, is

extremely injurious to the room’s occupants. The places

in which bad ventilation (or none at all) is most objectionable

are offices, small restaurants and schoolrooms, to say

nothing of sleeping cars and places where there are many

people. This booklet deals with the excellent system for se­
curing ventilation made and sold by the Herman Nelson

Corporation. “Costs of installation and maintenance are al­
ways to be considered, and are frequently deciding factors.

Since the Herman Nelson System requires no extra plant
capacity or fuel to operate, and involves very little incidental
installation expense, it may often be employed where venti­
lation by another method would be impractical or prohibitive
in cost. This is particularly true in the case of existing
buildings. Moreover, temporary installations are feasible
because the character of the equipment is such that the ap­
paratus may readily be changed or moved. There are cases
where ventilation may prove a good investment from a mere
com­fort standpoint, as in theaters and rest rooms. In

the majority of cases, however, ventilation must be regarded
from the more serious angle. No better example is afforded
of the serious importance of ventilation than in schools which
are crowded with pupils engaged in work and study for long
periods of time every day. Aside from the removal of nor­
mal body heat and odors, ventilation is frequently necessary
for the removal of objectionable odors, fumes or dust. Where
this is the case, exhaust ventilation is usually employed, and
the subject needs little discussion. Aside from a variety of
special industrial problems, the most common use of ven­
tilation of this special character is in toilets, kitchens, etc.”

Max Maser, interior designer, is occupying new offices at
1235 Spruce Street, Philadelphia.

Terra cotta in the recent past has been looked upon as a

building material for its qualities and not to carry out a design which, to be
honest, should be executed in other materials. It will be
manufactured not as cheaply as possible but with due regard
for the excellent characteristics of the material and the pro­
cesses that go into its making.” The booklet is full of ideas.

THE HERMAN NELSON CORPORATION, Moline, Ill.
“Herman Nelson System of Ventilation.”

At a recent meeting of the Architects’ League of Holly­
wood, L. G. Scherer was elected president, Verner B. Mc­
Curt vice-president, and J. A. Murrey secretary-treasurer.
The League is entering upon what promises to be a year of
very active endeavor.

Lawrence C. Licht announces the opening of offices at 4
North Dear Street, Englewood, N. J.

Howard Steitz announces his removal from the Wilder
Building to the Architects’ Building, 212 East End Avenue,
Rochester, N. Y.

Samuel Z. Moskowitz desires the catalogs and other publi­
cations of manufacturers sent to his two offices,—51 Riverside
Drive, New York, and 63 Hazel Street, Wilkes-Barre, Pa.

PITTSBURGH TESTING LABORATORY, Pittsburgh. “The

The proper inspection of materials, of fabrication and of
construction is always essential to the proper execution of a
building contract. The inspection bureau is employed by the
architect, engineer or owner to inspect and test those things
which are susceptible of variation of quality or workman­
ship. The value of this independent inspection lies in the
financial disinterestedness of the inspection bureau, in the
technical qualifications of the inspectors, and in the possession
of the necessary scientific apparatus and other facilities
required for the work in hand. There is also the certainty
that the tests and inspections will be conducted according to
the best standards or by any accepted program. Testing and in­
spection give insurance against loss caused by the improper
execution of contracts which is of the same value as insur­
ance against loss by any other cause,—fire, burglary or accident.

FLAX-LI-NUM INSULATING COMPANY, St. Paul.
“Bi-Flax, an Insulated Metal Lath.”

Architects and builders well know the value of metal lath,
and are convinced of the importance of providing in a build­
ing of any type against passage of heat through its walls,
thus rendering a building warmer in winter and cooler in
summer. In view of this it should not be difficult to under­
stand the value of a material which is both metal lathing and an
insulating substance. Such is “Bi-FLAX,” dealt with
in this brochure. “BI-FLAX is a combination of diamond
mesh expanded metal lath and Flax-li-num. But although
the two are a single unit, they are separated by waterproof
paper. The insulation does not touch the plaster base. It
is in no way a part of it. It functions as insulation only.
BI-FLAX is furnished in sheets of convenient size, 24 x 48
inches. The metal lath extends 1 inch beyond the Flax-li­
um on one side and at one end. When Bi-FLAX is ap­
plied, the sheets of insulation butt tightly together behind
the metal lath which in this way overlaps at all joints.”

138

REVIEWS AND ANNOUNCEMENTS

FEDERAL SEABOARD TERRA COTTA CORPORATION, 10 East 40th Street, New York. “Terra Cotta Futurities.”

Lawrence C. Licht announces the opening of offices at 4 North Dear Street, Englewood, N. J.

Howard Steitz announces his removal from the Wilder
Building to the Architects’ Building, 212 East End Avenue,
Rochester, N. Y.

Samuel Z. Moskowitz desires the catalogs and other publi­
cations of manufacturers sent to his two offices,—51 Riverside
Drive, New York, and 63 Hazel Street, Wilkes-Barre, Pa.

At a recent meeting of the Architects’ League of Holly­
wood, L. G. Scherer was elected president, Verner B. Mc­
Curt vice-president, and J. A. Murrey secretary-treasurer.
The League is entering upon what promises to be a year of
very active endeavor.

Lawrence C. Licht announces the opening of offices at 4
North Dear Street, Englewood, N. J.

Howard Steitz announces his removal from the Wilder
Building to the Architects’ Building, 212 East End Avenue,
Rochester, N. Y.

Samuel Z. Moskowitz desires the catalogs and other publi­
cations of manufacturers sent to his two offices,—51 Riverside
Drive, New York, and 63 Hazel Street, Wilkes-Barre, Pa.

At a recent meeting of the Architects’ League of Holly­
wood, L. G. Scherer was elected president, Verner B. Mc­
Curt vice-president, and J. A. Murrey secretary-treasurer.
The League is entering upon what promises to be a year of
very active endeavor.

Lawrence C. Licht announces the opening of offices at 4
North Dear Street, Englewood, N. J.

Howard Steitz announces his removal from the Wilder
Building to the Architects’ Building, 212 East End Avenue,
Rochester, N. Y.

Samuel Z. Moskowitz desires the catalogs and other publi­
cations of manufacturers sent to his two offices,—51 Riverside
Drive, New York, and 63 Hazel Street, Wilkes-Barre, Pa.

At a recent meeting of the Architects’ League of Holly­
wood, L. G. Scherer was elected president, Verner B. Mc­
Curt vice-president, and J. A. Murrey secretary-treasurer.
The League is entering upon what promises to be a year of
very active endeavor.

Lawrence C. Licht announces the opening of offices at 4
North Dear Street, Englewood, N. J.

Howard Steitz announces his removal from the Wilder
Building to the Architects’ Building, 212 East End Avenue,
Rochester, N. Y.

Samuel Z. Moskowitz desires the catalogs and other publi­
cations of manufacturers sent to his two offices,—51 Riverside
Drive, New York, and 63 Hazel Street, Wilkes-Barre, Pa.
Milwaukee County Court House Building

Completely Equipped with Johnson Control

All of the heating and ventilating equipment in this building is automatically controlled by the Johnson System of Temperature Control. The direct radiation is controlled by the Johnson dual thermostats which operate the valves on the direct radiators so as to maintain a normally even temperature in the offices and rooms during the day and by means of a switch under control of the engineer automatically operating the valves at a lower temperature during the night. There are ten main mechanical ventilating systems all equipped with Johnson control. The thirty court rooms are heated by indirect systems of heating and ventilating controlled by Johnson thermostats operating on mixing dampers. The Judges’ Chambers are provided with individual heating and ventilating systems employing unit ventilating machines completely controlled by Johnson thermostats. All fresh air intake, recirculating and exhaust ducts are provided with Johnson dampers which are operated by pneumatic switches under control of the engineer. Architects: Albert Randolph Ross, New York and Milwaukee. Heating and Ventilating: Wenzel & Henoch, Milwaukee. John Messmer, Superintendent of Buildings, Milwaukee County.

JOHNSON SERVICE COMPANY

ESTABLISHED 1885

149 E. Michigan

MILWAUKEE, WIS.

Albany
Atlanta
Baltimore
Boston
Buffalo
Chicago
Cincinnati
Cleveland
Dallas
Denver
Des Moines
Detroit
Greensboro, N. C.
Indianapolis
Kansas City
Los Angeles
Minneapolis
New York
Philadelphia
Pittsburgh
Portland
St. Louis
Salt Lake City
San Francisco
Seattle
Calgary, Alta.
Montreal, Que.
Winnipeg, Man.
Toronto, Ont.
Vancouver, B.C.

HEAT AND HUMIDITY CONTROL

Each Johnson Installation Made By Johnson Mechanics Only...
INDEX TO ADVERTISING ANNOUNCEMENTS

Part 1—Architectural Design

Alberene Stone Company.................................................. 55
American Car and Foundry Company................................. 37
American Walnut Manufacturers Association.......................... 38
Armstrong Cork Company.................................................... 4
Athey Company................................................................. 16
Bagues Incorporated........................................................... 45
Bakelite Corporation............................................................ 51
Bayley Company, The William............................................... 59
Best Bros., Kerne's Cement Co............................................... 53
Blackstone-Sandora Company, Inc.......................................... 19
Colsetex Company, The....................................................... 12
Collins & Aikman Corporation.............................................. 25
Columbia Mills, Inc., The.................................................... 104
Compound & Pyrocone Door Co., The..................................... 16
Corbin, P. & F................................................................... 32
Dalhousie Metallic Door Company, The.................................. 7
DeLong Furniture Co............................................................. 43
Debois Fence & Garden Co..................................................... 28
Federal Cement Tile Company............................................... 6
Flake Iron Works, J. W........................................................... 49
Formica Insulation Company, The.......................................... 12

Frink Corporation, The......................................................... 22
General Bronze Corporation.................................................. 30
Georgia Marble Company, The............................................. 15
Hanley Company, Inc............................................................ 1
Hausserman Co., The E. F..................................................... 24
Higgins & Co., Chas., M........................................................ 14
Hood Company, B. M............................................................. 9
Indiana Limestone Company.................................................... 10
International Nickel Company, Inc....................................... 13
Johnson & Faulkner............................................................... 40
Kawacor Company, The....................................................... 18
Kittinger Company.............................................................. 39
Klein & Co., Inc., Henry........................................................ 34
Lupton's Sons Co., David....................................................... 10
McKown Bros. Company....................................................... 10
Mimex Co., Inc................................................................. 62
National Electric Light Association....................................... 63
National Lead Company........................................................ 20
National Terra Cotta Society................................................. 3
Newcomb Terra Cotta Company............................................. 5
Northwestern Terra Cotta Company....................................... 57
Orange Screen Company..................................................... 16
Pandex Works, The............................................................. 17
Pittsburgh Plate Glass Co..................................................... 64
Portland Cement Association............................................... 22
Rambusch................................................................. 18
Reeves Company, Robert C................................................... 27
Republic Steel Corporation................................................... 21
Russell & Erwin Mfg. Co..................................................... 8
Sheldon Slate Co., F. C......................................................... 31
Soss Manufacturing Company.............................................. 20
Southern Cypress Manufacturers' Association......................... 47
Sundana Rubber Flooring Company...................................... 27
Todhunter, Inc................................................................. 57
Truscon Steel Company....................................................... 2
Ward Leonard Electric Co.................................................... 14
Weber Co., Inc., F............................................................. 14
Westinghouse Electric Elevator Company................................ 5
Wright Rubber Products Co................................................... 12

Part 2—Architectural Engineering and Business

American Blower Corp....................................................... 135
American Brass Company, The............................................. 101
American Chain Company, Inc............................................. 74
American Institute of Steel Construction, Inc.......................... 98
American Laundry Machinery Co., The................................... 132
American Rolling Mill Company, The................................... 80
American Telephone & Telegraph Co..................................... 121
Armstrong Cork & Insulation Co.,..... 63
Automatic Electric, Inc....................................................... 131
Brownell Company, The..................................................... 134
Byers Company, A. M............................................................ 105
Cabot, Inc., Samuel............................................................ 110
Carbendale Machine Co., The.............................................. 125
Carry Company, The Philip................................................... 122
Carnegie Steel Company...................................................... 123
Carter Bloxomand Flooring Company..................................... 110
Century Electric Company................................................... 79
Clow & Sons, James B.......................................................... 107
Concrete Steel Co............................................................... 127
Cork Import Corporation..................................................... 72
Cowling Pressure Relieving Joint Co....................................... 91
Cutler Mail Chute Co., The.................................................. 106
D. G. C. Trap & Valve Co.................................................... 91
Darrin Company, The.......................................................... 111
Electric Storage Battery Company, The................................ 75
Elevator Supplies Company, Inc........................................... 68
Flax-Li-Num Insulating Company......................................... 95
Fulton Sylphon Company, The............................................. 121
General Electric Company................................................... 88
Gills & Geoghegan.............................................................. 66
Hamlin, Irving................................................................. 106
Heating & Ventilating......................................................... 86
Hoffman Specialty Company, Inc.......................................... 93
Illinois Steel Company......................................................... 76, 77
International Nickel Company, The..................................... 109
Jenkins Bros................................................................. 85
Johnson Service Company................................................... 139
Kalman Steel Company....................................................... 82
Kewanee Boiler Corporation................................................. 69
Kewanee Private Utilities Co.............................................. 104
Kinnear Mfg. Co............................................................... 106
Knight, Maurice A.............................................................. 129
Lincoln Electric Co., The.................................................... 70
Louisville Cement Company................................................ 71
Marsh & Co., Jas., F............................................................ 81
McQuay Radiator Corporation.............................................. 122
Lyons Brothers................................................................. 104
Rayonier Concrete Pile Company......................................... 67
Richards-Wilcox Mfg. Co., Second Cover................................. 70
Ruberoid Co., The............................................................. 78
Sarmco Co., Inc............................................................... 141
Sears, Roebuck & Co.......................................................... 102
Shustevest, Co., B. F........................................................... 137
Toch Brothers................................................................. 104
Troy Laundry Machinery Co., Inc.......................................... 154
Van Range Co., The.......................................................... 83
Vonnegut Hardware Co........................................................ 84
Warren Webster & Company............................................... 87
Wood Engineering Co., Gar............................................... 132
York Ice Machinery Corporation........................................... 96

Nailcement Corporation, The................................................. 132
Nash Engineering Co., The.................................................. 117
National Radiator Corporation............................................. 134
National Tube Company..................................................... 102
Ottis Elevator Company...................................................... 81
Peeora Paint Company........................................................ 112
Peerless Unit Ventilation Co., Inc......................................... 134
Pierce, Butler & Pierce Mfg. Corp......................................... 142
Radio Receptor Co., Inc...................................................... 112
Raymond Concrete Pile Company......................................... 67
Richards-Wilcox Mfg. Co., Second Cover................................. 70
Ruberoid Co., The............................................................. 78
Sarmco Co., Inc............................................................... 141
Sears, Roebuck & Co.......................................................... 102
Shustevest, Co., B. F........................................................... 137
Toch Brothers................................................................. 104
Troy Laundry Machinery Co., Inc.......................................... 154
Van Range Co., The.......................................................... 83
Vonnegut Hardware Co........................................................ 84
Warren Webster & Company............................................... 87
Wood Engineering Co., Gar............................................... 132
York Ice Machinery Corporation........................................... 96
Even in these days of frantic striving for low first cost, regardless of ultimate economy, the opportunity comes to every Architect, Engineer and Contractor, to create that outstanding monument to his skill for which all those other jobs have seemed but a preparation.

When only the best of everything is good enough, when lasting beauty and utility are the primary considerations, then it becomes a matter of writing air-tight specifications, that will leave no room for substitutions, particularly in the hidden things.

In the case of Heating Systems, many have solved the problem by installing

**SARCO Radiator Traps**

The NAME alone guarantees a quality product of outstanding merit.

There is only ONE TYPE of Sarco Trap, made in different sizes which are specified according to published capacities.

All employ the Sarco helically coiled multiple bellows, made from seamless phosphor bronze tubing. All have self-aligning, conical valve heads, making line contact with the seat. No cast iron is used.

Write for our booklet AK-75

SARCO COMPANY, Inc.
183 MADISON AVE.  
NEW YORK, N. Y.

BRANCHES IN PRINCIPAL CITIES
guaranteed
to deliver its full rated
HEATING CAPACITY

THE Pierce Eastwood boiler represents years of research and experience in the development of efficient heating equipment. Scientifically designed flues which insure maximum heat absorption are an important feature, contributing to exceedingly high operating efficiency.

Pierce boilers and radiators are available in sizes and designs to meet every heating requirement. Write for your copy of the 1931 Pierce Fitter—it describes the complete Pierce line and contains lists of all Pierce branches. Or see AIA File No. 30.

PIERCE, BUTLER & PIERCE MFG. CORP.
41 East 42nd Street New York
Branches in Principal Cities
Manufacturers of Heating Equipment since 1859

AMES IRON WORKS—Division of Pierce, Butler & Pierce Mfg. Corp., manufacturers of Una-flow Engines, Steel Boilers and Road Rollers.


PIERCE EASTWOOD
BOILERS & RADIATORS
In New York's Newest Buildings

MODERN RADIATION by McQUAY

New York's leading architects, builders, and heating contractors repeatedly specify McQuay All-Copper Radiation for the newer buildings of the metropolis. They do so because of the durability of this modern method of heating ... because non-corrosive copper eliminates all upkeep cost ... and because seamless copper heats in one-fifth the time required by cast-iron radiation. Too, the beauty of McQuay installations is another factor in this selection ... for homes, apartment buildings, hotels, hospitals, and office buildings throughout the country.

McQuay Cabinet Type Radiator, containing the seamless, all-copper heating element.

McQuay Concealed Type Radiator, containing the seamless, all-copper heating element.

A complete set of McQuay Catalogs in a suitable binder is available for your files and will be sent at your request.

McQUAY RADIATOR CORPORATION
General Offices: 1600 BROADWAY, N. E., MINNEAPOLIS, MINN.
MARSH presents a modern Packless Radiator Valve... new in beauty and in simplicity of design

In keeping with the modern trend of interior decoration, the new Marsh System Unit Radiator Valve combines beauty with mechanical perfection. The simplicity of its lines, the two-tone polish and satin chrome or nickel body finish, crowned by a Bakelite control wheel of distinctive proportions, place this new unit abreast of the modern trend.

The Marsh System Unit Radiator Valve is truly packless. Its simple packless feature is not subject to deterioration, wear or cracking. The principles upon which it is constructed have proven themselves to be as sound as they are new. It is perfectly adapted to the requirements of any forced hot water heating system as well as vacuum, vapor and one-pipe heating systems. A glance at the illustration will convince you of its simplicity and superiority of design. Write for Bulletin No.150.

JAS. P. MARSH & CO.
Est. 1865
(Division of Commercial Instrument Corporation)
Home Office: 2073 Southport Avenue
Chicago, Illinois
551 Fifth Ave., New York City
Bendix Bldg., Los Angeles
2539 Pennsylvania Ave., N. W., Washington, D. C.
Sales Offices in principal cities