THE ARCHITECTURAL FORUM

IN TWO PARTS

PART TWO

ARCHITECTURAL ENGINEERING & BUSINESS

FEBRUARY 1931
FoldeR-Way doors are Standard Equipment for Schools

Wherever they need large openings and disappearing partitions, the specifications should call for R-W FoldeR-Way equipment. The bigger the opening, the greater the need for FoldeR-Way partition doors. So imperative are silence and smooth, easy, trouble-free operation that nothing less efficient than FoldeR-Way equipment is either practical or economical.

R-W school equipment includes school wardrobes of every size and design; hardware for every door that slides; and R-W Compound Key Veneered Doors, specially manufactured for FoldeR-Way installations.

Consult an R-W engineer about any doorway problem. Send today for illustrated Catalog No. 43.

Richards-Wilcox Mfg. Co.

“A HANGER FOR ANY DOOR THAT SLIDES”

AURORA, ILLINOIS, U.S.A.

The preference continues for RAYMOND

Because Raymond Concrete Piles meet every demand for safety and certainty no matter what the subsurface conditions . . . because each pile is protected by a reinforced sheet steel shell that wholly maintains the driving resistance, retains the moisture in the concrete and insures perfect, uniform length, taper and setting.

RAYMOND CONCRETE PILE CO.

NEW YORK: 140 Cedar St.  CHICAGO: 111 West Monroe St.

Raymond Concrete Pile Co., Ltd., Montreal, Canada

Atlanta, Ga.  Kansas City, Mo.  Buffalo, N. Y.  Maracaybo, Ven., S. A.
Baltimore  Los Angeles, Cal.  Milwaukee, Wis.  Caracas, Ven., S. A.
Boston, Mass.  Miami, Fla.  St. Louis, Mo.  Bogota, Colombia, S. A.
Cleveland, Ohio  Pittsburgh, Pa.  Montreal, Canada  Omsi, Tokyo-Fu, Japan
21,000 feet of **Novoid** 2" thick insulate the roof of the New York Telephone Co.'s new Brooklyn building.

**MOISTURE won’t destroy THIS insulation**

**M**ATERIALS that absorb moisture gradually lose their insulating effectiveness. Condensation soon leaves them water-soaked and useless.

Novoid, pure Corkboard is cellular, not fibrous or porous in structure. It will not absorb moisture. It has no “blotting action.” Novoid stays dry and efficient—never gets water-soaked. That’s why Novoid shuts off heat losses indefinitely.

With the flow of heat so definitely checked by the proper thickness of Novoid, the temperature on the under side of the roof is kept above the dew point, and no condensation will ever form to do damage.

Novoid has found a way to combine large and small granules of pure cork into a close-structured corkboard with fewer undesirable voids. This closer structure distinguishes Novoid from all other corkboard.

Send for samples, data, and prices. Test Novoid. Cut it up. See for yourself where the structure of Novoid excels ordinary insulation. Address your request to Cork Import Corporation, 345 West 40th Street, New York City.

**Novoid Corkboard Insulation**

_The close-structured corkboard_
New York's 1931 skyline is filled with tall buildings equipped with Walworth material. Approved Walworth fireline valves and fittings and the plumbing valves throughout this entire building are of the same standard Walworth types which have been supplied for many of the newest and best-known buildings in New York.
They looked again to "ES"

... to extend good elevator service

The true test of service is the answer to the question, "Would you be willing to duplicate the equipment originally installed, should occasion arise to solve the same problem?"

The owners of the Royal Insurance Building answered this in the affirmative. They were so satisfied with the original "ES" equipment that they looked again to "ES" service when they added to their building and installed six new elevators. They knew that the surest way to maintain good service, when business growth called for greater space and facilities, was to duplicate it.

The original "ES" equipment—which is being duplicated—includes an "ES" Complete Signal System; Special Ground Floor Horizontal Electric Light Position Indicators; Flash Light Night Service Annunciator and Starter's Call Back System; Overhead Type Pneumatic Door Operators.

Whether for extending, modernizing or planning new elevator service "ES" engineers are available to help solve your problems.
Kewanee Steel Boilers

A Chinese Coolie can live on a few cents worth of rice a day. So Coolie work, such as it is, costs very little.

A Kewanee Smokeless Boiler, designed and built by American workmen according to American standards, burns the lowest priced coals (even screenings); and does it very thoroughly. It lives on cheap coal yet produces a maximum amount of heat.

This every day fuel saving; plus sturdy steel construction which adds many extra years to the life of a Kewanee; brings its actual cost down to a point that makes it a preferred investment.

If the fuel supply in your city is a problem, investigate the advantages of a Kewanee Smokeless before making a boiler selection.

Kewanee Boiler Corporation
division of American Radiator & Standard Sanitary Corporation
KEWANEE, ILLINOIS
Branches in Principal Cities

MEMBER OF
Steel Heating Boiler Institute

It Costs Less to OWN a Kewanee
The Sun Life Assurance Company of Toronto, Ontario, through its architects, have recently selected a 29 station 4" x 7" oval G&G Atlas Pneumatic Tube System for its new head office building in Montreal, the largest office building in the British Empire...The State Mutual Life Assurance Co. of Worcester, Mass., whose architects are Parker, Thomas & Rice, is now using this tube system...The enormous amount of paper work in an insurance organization entails the continuous transmission of correspondence, forms, policies, telegrams, etc. between departments. The mechanical messenger service provided by the G&G Atlas Tube System prevents delays by eliminating countless foot messengers, keeps aisles clear, elevators free from congestion, speeds deliveries many fold and assures a smooth operating service.

Our Engineering Department is at the service of every architect.


In Canada see Specification Data.

G&G Atlas Systems, Inc.
544 West Broadway, New York, N. Y.
also Chicago and Toronto
BETTER masonry at less cost has made Brixment the world's largest-selling mason's cement:

[1] It costs less than the portland and lime required to make an equal amount of mortar.

[2] No soaking, no slaking. Ready to mix by hand or machine.

[3] Saves bricklayer's time because it's easier to spread and sticks to the headjoint; its unusual plasticity and convenient set help him in striking joints.

[4] Reduces labor in cleaning down the wall because it doesn't slop down over the face of the brick. Louisville Cement Co., Incorporated, Louisville, Kentucky.

CEMENT MANUFACTURERS SINCE 1830

BRIXMENT

for MASONRY and STUCCO
41 MEN

will receive $17,500.00

will be recognized as the outstanding figures in their industry

WILL YOU BE ONE OF THEM?

THE Second Lincoln Arc Welding Prize Competition offers you this opportunity. The $17,500.00 prize money will be awarded to the forty-one persons who submit the best papers describing the redesign of any product or the design of any proposed product to be fabricated by the arc welding process. The division of the $17,500.00 prize money will be as follows:

<table>
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<tr>
<th>Prize Number</th>
<th>Award Amount</th>
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<tr>
<td>First</td>
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<td>Seventh to Forty-first</td>
<td>$100.00 each</td>
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The attention of industrial executives will be focused upon the winners of this competition. This is your chance to prove to your company and other industrial leaders the merits of your ability. Write today for complete information regarding this competition. Address:

THE LINCOLN ELECTRIC COMPANY
P.O. Box 683  •  Cleveland, Ohio
Flame Test Shows Why Benefits of Hot Water Heat Are Achieved in Steam Systems

The unique circulating effect of the Cryer Radiator Control Valve on vapor, vacuum or steam heating systems is strikingly shown by the Flame Test.

The flame of a lighted match or candle held just under the jet of steam issuing from the venturi tube, is drawn into the sleeve around the tube (see above). In actual operation the steam and air mixture in the radiator is drawn into the sleeve from the first section of the radiator, in exactly the same way and then recirculated when it strikes the incoming steam.

This continual circulation of steam, air and vapor, quickly heats the entire radiator evenly and holds it constantly at any temperature between 90° and 212° F., as modulated.

Thus you get full hot water advantages combined with the quickness and flexibility of steam or vapor. Large fuel savings are achieved. An equitable, even heat always attainable.

No other valve or steam system duplicates these two-in-one effects.

New Thermostatic Trap Uses Two Special Alloys

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.

After steam leaves the trap the opening is again uncovered and water can flow out.

Stainless Steel and a Special Bronze Are Used

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

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.
FOR WIRING in the financial heart of the world

Permanence is built into every element of the 50-story One Wall Street Building that rises out of the financial heart of the world... permanence for a generation of business service.

The wiring for this towering structure is protected by "G-E White" Rigid Conduit... made to resist rust, to defy time.

"G-E White" is hot-dipped galvanized. A heavy zinc coating is alloyed onto best-grade mild steel tubing, flexible enough for easy bending without cracking or flaking.

The same superior tubing, enameled inside and out, is "G-E Black." G-E Merchandise Distributors everywhere can supply these permanent conduits—or write Section C-162 Merchandise Department, General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC
Rigid Conduit
KEEP SNOWSTORMS OUT of your building plans

MANY miles away from a building of yours, snow and ice snap local power lines. Current fails. That building is plunged into sudden darkness.

Think of the possible confusion, inconvenience and danger of sudden current failure in such places as hospitals, theatres, schools, auditoriums . . . wherever crowds may gather.

Current failure seldom happens, but once may be too often. Power companies work night and day to give the public dependable service, but they can’t foresee such accidents any more than you. But you can guard against them by including Exide Emergency Lighting Batteries in every public building you plan. More and more architects all over the United States are realizing the advantages of Exides and are specifying them.

Should electric current suddenly be interrupted, for any reason, occupants of buildings you plan need never know, for Exides will keep lights burning brightly. These batteries take over the job instantly and automatically . . . without a hand touching a switch.

Exide Emergency Lighting Batteries are not expensive. And they cost so very little to operate. Write to us today for Emergency Lighting Bulletin. Or we’ll send one of our technical men to call and tell you about Emergency Lighting. No obligation. Act today.

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
THEY KEEP A-RUNNING

CENTURY
Constant Speed
DIRECT-CURRENT MOTORS

The service continuity of these Constant Speed Direct-Current Motors is the result of 37 years spent by the Roth works in perfecting D. C. Motors that "Keep a-Running" in all types of applications.

These motors are also supplied for variable or adjustable speed operation, for general purpose and special applications—with either shunt, compound or series windings for all commercial voltages—in open-type, drip-proof, semi-enclosed and fully-enclosed dust-tight construction.

Built in standard sizes from \( \frac{1}{4} \) to 100 horse power.

CENTURY ELECTRIC COMPANY
1806 PINE STREET - - ST. LOUIS, MO.
40 U. S. and Canadian Stock Points and More Than 75 Outside Thereof
It’s the
Most Sanitary
Dish and Food
Conveyor Made

SANITARY—and easy to keep that way—is the Lamson Trayveyor. It is fully enclosed in a smooth, metal shaft in which there are no crevices or slats to catch dirt. Cleaning is therefore a matter of minutes only.

This feature alone is selling this reliable automatic servant to many leading institutions. But the Lamson Trayveyor offers other equally striking advantages. Its speed, for instance, actually doubles or trebles the usability of the china and silverware.

Another strong feature: Its smooth, steady motion materially reduces dish breakage. Moreover, quick-acting protective devices practically obviate damage due to overloading—and overloading is by far the greatest single cause of trouble with any dish and food conveyor.

Finally, the Trayveyor saves space where space is at a heavy premium, since it operates in a shaft no larger than an ordinary dumb-waiter requires.

If it is an advantage to establish the dining rooms on one floor and the kitchen and dishwashing department on another, then the Trayveyor will be found indispensable.

Automatic, trouble-free, efficient, the precision-built Trayveyor can be had in ascending, descending, reversible, or double-duty models. Write to-day for a practical solution of dish and food conveyor problems.

THE LAMSON COMPANY - Syracuse, New York
A Nation-wide Institution with Offices in Principal Cities

MAIL THIS COUPON
The Lamson Co., Syracuse, N. Y.
I am interested in the Lamson Trayveyor. Please send your new booklet which describes it fully.

Name..............................................Street..............................................
City..............................................State..............................................
A Significant Contribution to Better Prisons...

BAYLEY GUARD WINDOWS

The wide recognition accorded Bayley by leading architects and prison officials is proof that these outstanding and exclusive features mark a new trend in prison construction.

1. Absence of penal atmosphere.
2. Efficient window as well as guard.
4. Assembly of small openings gives adequate daylight, and at same time increases strength of window.
5. Ventilator does not impair safety.
6. Designed in cooperation with prison architects and officials.
7. Available in sizes to fit the smallest as well as the largest wall openings.

*Bayley Guard Windows are available in the Super Bar and the 1 1/2" Standard Tee Bar construction.

Call in the nearest Bayley representative when preparing prison plans and writing specifications. His experience and knowledge are invaluable. Request latest literature. The William Bayley Co., 147 North St., Springfield, Ohio.
After the Erecting Engineer has gone...

After the refrigerating needs of your projects have been studied, the equipment selected, the installation made...

After the erecting engineer has gone... then what?

Then... whether or not your client gets the benefits of efficient refrigeration depends largely on the Compressor.

The York Vertical Single-acting Enclosed Ammonia Compressor is an outstanding York achievement. In design and refinements, in quality of materials and workmanship, in precision and husky construction... in dependability and economy, the York Compressor is unequalled.

Behind this compressor, is York's 50 years experience in pioneering refrigeration...

York's knowledge gained through developing and installing refrigeration for every commercial and industrial use.

The same care in design and manufacture goes into all York equipment...

So, after the engineer has gone, if the refrigeration you specified is York Refrigeration, your clients are assured the dependable service, the economy of operation, the satisfaction they need. Let York serve them, through you. Communicate with the nearest of York's 71 direct factory branches.

YORK ICE MACHINERY CORPORATION
* YORK * PENNSYLVANIA *
Cooled by
Carbondale Refrigeration

To help keep the travelers healthy and comfortable is the job given to Carbondale at the new Cleveland Union Terminal. All refrigerator boxes in the restaurants are cooled by Carbondale exhaust steam refrigerating machines. And during the summer, these dependable machines also serve to cool and condition the air.

Small wonder that Carbondale Refrigeration was chosen for this important service. In The Stevens and the St. George, the world’s two largest hotels, in theatres, markets and public buildings throughout the country, Carbondale has proven its reputation for trustworthy performance.

No matter what the refrigerating need may be, call on Carbondale. The specialized experience of Carbondale engineers is at your service.

THE CARBONDALE MACHINE CO.
Carbondale, Pa.

Branches in principal cities

CARBONDALE AMMONIA COMPRESSION REFRIGERATING SYSTEMS USE WORthingTON "FEATHER VALVE" COMPRESSORS

ABSORPTION AND AMMONIA COMPRESSION MACHINES
RIBBED STEELTEX LATH protects plaster walls and ceilings automatically embeds plaster with steel

Builds lifetime walls and ceilings
RIBBED STEELTEX lath now makes permanent plaster inexpensive ... and brings to plaster the protective qualities that are so desirable ... and necessary.

The reinforcement of RIBBED STEELTEX consists of a network of steel wires (heavily galvanized). This steel network is securely woven onto the heavy backing. Extending across the back of STEELTEX, are rows of V-shaped metal rib stiffeners. These rib stiffeners insure board-like rigidity ... eliminate belly or sag in the sheet ... making it easy to produce a plaster slab of uniform and correct thickness.

RIBBED STEELTEX minimizes plaster cracking hazards Reinforces plaster with embedded steel Insulates against heat and cold Retards sound For any type home or building

Safeguards the investment
RIBBED STEELTEX embeds the plaster with a network of steel. RIBBED STEELTEX, because of its heavy backing, prevents infiltration of air ... eliminates the possibility of unsightly streaks or lath marks from showing to mar the plaster beauty.

STEELTEX insulates against heat and cold, strengthens the structural framework and retards sound.

The specification for the backing of STEELTEX was developed by the Pittsburgh Steel Company's Industrial Fellowship at the Mellon Institute of Industrial Research.

Turn the pages for further details.

MORE THAN A QUARTER MILLION STEELTEX INSTALLATIONS

Ribbed STEELTEX lath is suitable, practical and economical for any type of home or building ... whether large or small ... costly or low-priced. The walls and ceilings of this modern structure, typical of many others, are protected with STEELTEX.

Beautiful, modernistic interiors are costly and precious. Hidden in these walls and ceilings is Ribbed STEELTEX, the modern plaster lath and steel reinforcement. The interior will retain its charm and beauty because STEELTEX builds lifetime walls and ceilings.

Modern homes like this one, require modern construction methods ... ordinary lathing methods today fail short of present-day demands. Ribbed STEELTEX is up-to-date ... it reinforces and protects plaster ... and is more and does more than ordinary lath.

See Sweet's plastering section (volume B, pages 2402 to 2409) ; floor and roof construction (volume A, pages 320 to 322).
SPECIFY RIBBED STEELTEX for plaster - It is more and does more than Ordinary Lath . . . .

**STEELTEX Advantages**

Ribbed STEELTEX makes plaster a lifetime material. Plaster supplies easy . . . and stays put.

*Plaster slab of uniform thickness assured . . . smooth in back as well as front.*

V-shaped metal rib stiffeners produce a level-lathing job of board-like rigidity.

*All plaster functions in the slab . . . no waste in keys or hangovers.*

Furring device assures embossment in the plaster of network of electrically-welded steel wires.

*Network of steel wires strengthens the framework of building.*

Steel reinforcing reduces plaster cracking hazards to the minimum.

*No possibility of lath or joint marks . . . or unsightly streaks . . . showing to mar the plaster beauty.*

Ribbed STEELTEX blankets every room preventing infiltration of air.

*Insulates against heat and cold.*

STEELTEX retains sound.

*STEELTEX makes reinforced, quality plaster economical enough for anyone.*

**Detailed Specifications of Lathing for Plaster**

All interior Walls, Partitions and Ceilings (where so specified and designated plaster) shall be lathed with STEELTEX, as manufactured by the National Steel Fabric Co., Pittsburgh, Pa., (A 2" x 2" 16 gauge, cold drawn, electrically-welded self-furring Galvanized Wire Fabric, to which a tough fibrous backing is secured by means of a 26 gauge V-shaped channel rib).

STEELTEX shall be attached to walls and ceilings with the STEELTEX hook head nail . . . plaster-board nail . . . staples, or 4d common wire nails. On side walls nail every 6"; on ceilings every 4".

Joints shall be broken and shall be so nailed to insure close contact of the overlapping sheets. Each sheet shall be placed so that all joints shall overlap the face of the fabric 1'. Plaster over STEELTEX shall be finished to not less than 3/8" grounds.

**Ready for the job when received**

Ribbed STEELTEX comes packed in easily-handled bundles . . . each bundle contains 46 sheets (50 square yards).

**NATIONAL STEEL FABRIC COMPANY**

UNION TRUST BLDG. PITTSBURGH, U.S.A.

Architects everywhere are specifying Ribbed STEELTEX for plaster . . . it safeguards the investment by producing lifetime walls and ceilings.

**Sign and mail this coupon**

The National Steel Fabric Co., Dept. 55

Gentlemen:—Please send (free) descriptive STEELTEX literature, for floors □ for roofs □ for interior plaster □ for stoves □ for brick and stone veneer □.

Name:______________________

Address:____________________

City:______________________ State:____________________

Printed in U.S.A.
Signs read "Sold" and "Rented" when buildings are equipped with Frigidaire

Anything that cuts building, selling or renting costs is a good thing for architects to put into practice. And some of the shrewdest architects, builders and contractors say that one thing accomplishes all of these results—Frigidaire as part of the kitchen equipment.

Frigidaire cuts building costs by eliminating the necessity of special alcoves or recessed entry ways. It reduces selling and renting expense by quickly locating buyers or tenants who are eager to enjoy modern refrigeration.

For convincing proof, note the way that signs reading "Sold" and "Rented" and "Frigidaire Equipped" always go together—even when other homes and apartments are begging for buyers and tenants.

Before you advise a client about refrigeration equipment, be sure to get the facts about Frigidaire—facts which will show you that Frigidaire is truly outstanding in construction and performance—that it is the last word in Advanced Refrigeration in every way. Mail the coupon.

FRIGIDAIRE CORPORATION
Subsidiary of General Motors Corporation
Dayton, Ohio.

Please send me your Frigidaire Data Book for Architects and Builders.

FRIGIDAIRE CORPORATION,
Subsidiary of General Motors Corporation,
Dept. E-11, Dayton, Ohio.
Please send me your Frigidaire Data Book for Architects and Builders.

Name
Address

FRIGIDAIRE
A GENERAL MOTORS VALUE
modern—

Inset photograph shows two of the Kinnear Rolling Steel Doors used in the new Shell Oil Company Building in San Francisco. Modern in every respect, it was only natural that Kinnear Rolling Doors should be chosen for this magnificent edifice.

YES, modern as the newest building from a standpoint of efficiency, yet not new or untried. Kinnear not only originated the rolling steel door, but has been responsible for every worthwhile improvement in design and construction. You'll find them in skyscrapers, factories, warehouses, terminals—everywhere the best in rolling doors is wanted.

The new Kinnear Rolling Door Catalog is mailed free on request. Kinnear Engineering and Estimating Service is available without charge or obligation.

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

Boston Chicago Cincinnati Cleveland Detroit New Orleans
New York Philadelphia Pittsburgh Kansas City Washington
NEW LUSTRE FOR A FAMOUS NAME... WALDORF ASTORIA

Economic Adjustments

in

FUNCTION AND OPERATION

of our major buildings are constantly taking place. Possibly in no one element is this more manifest than in the problems of heating and ventilating. Here advanced thought is presenting new products and new systems to meet an ever changing need.

Architects and engineers are cooperating in this development, but the recorded research and results are largely to be found in the professional journal, Heating and Ventilating. This should be the standard of reference found in every architect's library.

The subscription price is two dollars a year.

A sample copy sent on request.

HEATING AND VENTILATING, 521 Fifth Avenue, New York City
To make any sleight-of-hand a success... get the onlookers to overlook one or two realities.

You can be your own illusionist,—convincing yourself and reaching some remarkable conclusions,—just by disregarding a few important details... But decisions that stand the test of time must be based on all of the realities that affect the issue; not some of them.

It is especially important to overlook no realities when analyzing steam consumption of heating systems. For correct conclusions and sound decisions it is necessary that every one of the important factors shall be checked and weighed.

Altogether, 45 variable factors may affect the steam consumption of any heating system. We have prepared a "check-list" of these 45 variables to help you check your steam consumption figures and estimates. We will be glad to send you one or more copies of this check-list.

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 vitally important 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

Darting Bros., Ltd., Montreal, Canada

-since 1888-

A Heating System for Every Need and Every Purpose

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.
Diebold Vaults command the admiration of clients and depositors in a bank. They symbolize the security of modern banking and the wealth of a great nation, for the protection of which such mountains of strength and intricate machinery are devised. . . . Diebold engineers offer complete co-operation with the architect in planning details of construction and installation. See Sweets’ Architectural Catalogue for specifications and details. Our field men are always available for consultation.

Diebold Safe and Lock Company . . . Canton, Ohio
Seventy Years of Bank Service
WHEREVER YOU USE PIPE

Specify

TONCAN IRON PIPE

In water lines in buildings; steam and return lines in heating systems; process liquor lines in factories; high over head in mills and power plants, and buried deep in the acid water of mines;—wherever pipe is used, there Toncan Iron Pipe will last longer.

Toncan is an alloy of highly refined Iron, Copper and Molybdenum,—an alloy that has been rigidly tested and proved by the building trades and industry for its extreme resistance to rust and corrosion.

So, wherever you use pipe, whenever severe service says that only the best is good enough, specify Toncan Iron Pipe and experience lower repair and maintenance charges during all the years of its longer trouble-free life.

As Protection to you we mark it BLUE

TONCAN COPPER MOLYBDENUM IRON PIPE

REPUBLIC STEEL CORPORATION

GENERAL OFFICES YOUNGSTOWN, OHIO
THE WORLD'S LARGEST BUILDING HAS MONEL METAL EQUIPPED RESTAURANTS

The Monel Metal equipped restaurants kitchens and soda fountains in Chicago's great Merchandise Mart comprise one of the finest food service installations in the world!

Here inviting beauty and spick and span appearance are always insured by Monel Metal's combination of rust-immunity corrosion-resistance cleanability and steel-like strength.

A 16-page booklet is available illustrating and describing this outstanding Monel Metal food service installation. A copy will gladly be sent on request.

Duparquet, Huot & Moneuse Co. manufactured and installed complete food service equipment of Monel Metal in the Merchandise Mart. In addition to equipment of their own manufacture, Duparquet, Huot & Moneuse Co. installed additional Monel Metal equipment furnished by the following companies:

GLASS WASHERS—G. S. Biskedee & Company, Chicago, Ill.


REFRIGERATORS—-Dry-Kool Refrigerator Co., Niles, Mich.

BAKE OVENS—Edison Electric Appliance Co., Inc., Chicago, Ill.

SODA FOUNTAINS—The Liquid Carbonic Corp., Chicago, Ill.

DISH CONVEYORS—Samuel Olsen Co., Chicago, Ill.


TOASTERS—Savery, Inc.

RANGES—Standard Gas Equipment Corp.


THERMOTAINERS—Water-Center Company, Minneapolis, Minn.

* Soda Fountains were installed by The Liquid Carbonic Corp.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

Monel Metal is a registered trade mark supplied to a technically controlled nickel-silver alloy of high nickel content. Monel Metal is sound, strong, silent, nickel and nickel-mixed alloy by International Nickel.
49 PeerVents installed in the new Sewanhaka High School

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PART I—ARCHITECTURAL DESIGN

ARTICLES

Our Own Education
Louis La Beaume
137

The Adler Planetarium, Chicago
140

Foreign Planetaria
143

EDITORIAL

Policy and Opinion
Kenneth M. Murchison
177

The Sidewalks of New York—and Paris
Kenneth M. Murchison
179

Let the Punishment Fit the Crime
Henry Wright
183

The Architect, the Plan and the City
Roger W. Sherman
217

The Ivory Tower and the Motor-Car
Roger W. Sherman
224

PLATE ILLUSTRATIONS

The Adler Planetarium, Chicago
Ernest A. Grunfeld, Jr.
145

The Downtown Athletic Club, New York
Starrett & Van Vleck
151

St. Madeleine Sophie’s Parish School and Chapel
Henry A. Dagit & Sons
G. H. Pingusson
167

Theatre Des Menus Plaisirs, Paris
G. H. Pingusson
173

Residence of Clarence McK. Lewis, Sterlington, N. Y.
Office of John Russell Pope
185

PART II—ARCHITECTURAL ENGINEERING AND BUSINESS

ARTICLES

The Construction and Equipment of the Adler Planetarium, Chicago
Irwin Clavan
225

The Empire State Building
A. T. North
229

IX. The Mooring Mast
A. T. North
231

The Standard Specification
Harold R. Sleeper
237

The Cooperative Plan
George W. Springsteen
241

The Trial of Fireproof Wood
A. T. North
247

Concrete, Stone and Steel
Office of John Russell Pope
253

St. Madeleine Sophie’s Parish School and Chapel
Office of John Russell Pope
255

Supervision of Construction Operations
Wilfred W. Beach
255

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AMERICAN INSTITUTE OF STEEL CONSTRUCTION

STEEL INSURES STRENGTH AND SECURITY
SPIDERWEB STEEL OF DOME,
ADLER PLANETARIUM, CHICAGO
ERNEST A. GRUNSFELD, JR., ARCHITECT

The white rings are the wooden strips to which the fabric is attached, and the dark lines are ribs of the steel frame from which they are suspended. The angular lines near the center are pipe coils and the broad dark strip is the boiler flue. The picture was taken looking directly up.
COMPOSITE piles made of wood and concrete were used in the foundations of the Adler Planetarium and Astronomical Museum, Grant Park, Chicago. Made land, on which the structure is located, extends from the bed of the lake elevation, —16'0", considering lake level as datum,—to the terrace about the building. Sixty-foot wooden piles penetrate the original bed of the lake 44'0", above which from datum the concrete piles extend to the foundations below the basement floor at elevation + 19'0". The general level of the terrace about the building is + 30'9".

STRUCTURE AND DOMES

All of the structural frame, except the dome, the exterior walls to the first floor level, the first floor and roofs, is made of reinforced concrete. The floors and roofs are of the beam and girder type, some of which are complicated by the unusual shape of the building and other special requirements. The construction of the outer and inner domes are the principal structural items of interest. The hemispherical outer domes of some European planetaria are made of a very thin shell of reinforced concrete in which a network of small rods, so placed as to make a triangular mesh, is used for the reinforcing, which is embedded in gunite by the use of a cement gun. The result is a very thin, dense shell from 2" to 3" thick. This type of construction will be discussed and illustrated in a forthcoming issue of The Architectural Forum.

The outer dome of the Adler Planetarium is of structural steel, having 24 steel ribs formed to an outer radius of 40'7". A 10'0" diameter ring made of a 12" channel is placed at the top of the dome to form an opening for the smoke stack and for other purposes. The ribs are 12½" deep, made of four 2½ x 2½ x ½" angles and 2 x ½" lacing bars. They are approximately 59'0" long, spaced about 10'8" apart at the bottom and 1'4" at the top. Twelve of the ribs are supported on steel columns, the 12 intermediate ribs being supported on 18" I beams attached to the tops of the columns. The ribs are held laterally by straight horizontal struts, five made of two angles and one of a single angle. Diagonal bracing is used where required.

To facilitate the erection of these ribs, a wood framed tower was erected on the first floor in the center of the building. The tower extended up through the center and above the top of the dome and was held in position by guy lines. A derrick boom was attached to the side of the tower and operated through sheaves placed on a crosshead located at the top of the tower. All of the structural steel framing was erected with this derrick. The dome was covered with 1" precast Haydite tiles made by the Federal Cement Tile Company. These tiles were supported by and fastened to horizontal rings of tee irons bolted to the top flanges of the dome ribs. The general design of the Adler Planetarium is discussed in Part One of this issue.
Concrete construction completed and tower for steelwork in place

Steel frame of outer dome completed, ready for inner frame

Installing lightweight concrete tiles, calked with elastic cement

joints between the tiles were calked with elastic cement and the tiles mopped with a heavy coat of asphalt on which a 2" cork board covering was placed. Horizontal wood nailing strips were fastened to the cork, to which the copper roof covering was attached. The cork insulation was used to prevent condensation on the under side of the dome and thus protect the cloth inner dome from being disfigured and damaged.

INNER DOME

The inner dome, on which are projected by the Zeiss Planetarium Projector the 9,000 stars that are visible to the naked eye, is made of a square-woven cotton sheeting finished with a minimum of starch. Echoes of the lecturer's voice or of music are prevented by using the fabric which permits sounds to pass through it into the space enclosed by the outer dome. In European constructions made with smooth, dense concrete outer domes, it is necessary to suspend thin sheet-iron sound-deflector plates which are intentionally disarranged so that they reflect the sound waves penetrating the fabric with little loss of intensity, in random directions so that sound foci cannot be formed. It was not necessary to use these sound-deflector plates in the Adler Planetarium because the Haydite concrete tiles are of a different character from the gunite material used in the European planetaria, and the steel latticed ribs, purlins, lateral bracing and suspension rods for the inner dome serve to break up the sound waves and prevent the formation of echoes.

The inner dome is supported by light steel hangers, which can be accurately adjusted for length. On the lower ends of these hangers are bolted horizontal angle iron rings. Attached to and between these horizontal rings are steel bars radiating from the top of the dome, similar to the parallels of longitude on a globe, which are punched about 19" on centers. The surface of the fabric is 12" from the center line of these radial bars. Supports for the fabric are made of 1" x 1/8" bars crimped to prevent twisting. One end of these bars is bent to house the radial bars before mentioned and bolted thereto, the housing holding it firmly in position; the other end is bent at right angles and punched with two bolt holes. To this end is bolted a 1" x 13/4" wooden strip bent to form a horizontal ring encircling the dome and to it is nailed a corresponding 3/4" x 13/4" wooden strip. The cotton fabric is cut in strips about 22" wide, the edges of which are turned in between the two wooden strips and held firmly in place. These short, crimped steel arms are radial to the center of the hemisphere. The whole arrangement provides true horizontal cir-
cular supports and eventually reduces the chords in the opposite direction to a minimum, so that the fabric very closely approximates a true hemisphere. The steel frame work was arranged to support scaffolding while cloth was being placed in position.

HEATING AND VENTILATION

The heating and ventilating of the Adler Planetarium is divided into several parts. Provisions are made to maintain a sufficient air pressure in the entrance vestibule to prevent the inrush of outdoor air. The entrance foyer and the two cloak rooms are supplied by warm fresh air through ceiling outlets with exhausts in the lower portion of the wall surrounding the Planetarium Chamber. The North and South Exhibit Halls are heated and ventilated in the same manner. Six air changes per hour are furnished in these portions of the building. The Planetarium Chamber has eight fresh air outlets on the south side and eight exhaust outlets on the north side, which are placed about 5'0" above the floor. The fresh air supply capacity is 10,000 cubic feet per minute and the exhaust capacity is 9,000 cubic feet per minute. The library and lecture room have both direct radiation and fresh air supply and exhaust. The executive offices are heated by direct radiation. Four large seven-pipe steam coils are placed about the top of the outer dome and cast iron radiators at the spring line to prevent condensation on its inner surface.

The fresh air inlet is located on the eastern or lake side of the building, being farthest from possible sources of dust. The exhaust outlet is located on the western or city side of the building. The fresh air is washed and further cleansed by passing viscous air filters, because the presence of dust in the fresh air supply would quickly disfigure the white fabric inner dome of the Planetarium Chamber. The vacuum steam system is thermostatically controlled, and fuel oil is used for generating steam.

LIGHTING

An emergency system of lighting is provided, operated by remote control at the main entrance or by an automatic control if the normal source of service should fail. The full connected load can be carried by the emergency batteries for a 60-minute period, which would supply ample light for the orderly evacuation of the building.

The Adler Planetarium was designed by Ernest A. Grunsfeld, Jr., architect. Lieberman & Plein were retained as structural engineers, and Martin C. Schwab as consulting engineer for heating, ventilating, electric work and plumbing. The B-W Construction Company was general contractor for the building.
FRAMEWORK OF DOMES
ADLER PLANETARIUM, CHICAGO
ERNEST A. GRUNSFELD, JR., ARCHITECT

Suspension bars attached to the steel frame of the outer dome support the horizontal steel rings, to which is attached the framework of inner dome. Steam coils installed at top of the dome.

Horizontal wooden rings installed ready to receive the cloth lining of the inner dome, back of which are located the smokestack and the cast iron radiators at the base of the outer dome.

Chicago Commercial Photographic Co.
THE EMPIRE STATE BUILDING
SHREVE, LAMB & HARMON, ARCHITECTS

IX. THE MOORING MAST

BY

IRWIN CLAVAN
OF THE OFFICE OF
SHREVE, LAMB & HARMON

The proposal to provide at the top of the Empire State Building a mooring mast for lighter-than-air craft, first considered by the owners early in the designing of the structure, at once raised the question of practicability. From the beginning, the project has been dealt with entirely on this basis. Technically equipped engineers were called in, authorities in this country and abroad were consulted, private and official agencies were asked to advise, and from all this inquiry a preliminary plan was set up. The mooring mast was to extend not less than 200 feet above the roof of the building's structure; it was to have form and strength sufficient to withstand a horizontal pull of 50 tons at its head, and was to be constructed over such an area and in such manner that stresses resulting from that load and from wind pressures would be transmitted through the building to its foundations nearly 1,100 feet below the base of the mooring mast.

While these fundamental requirements were being met, the owners and architects studied the equipment and mooring operations at the Naval Air Station at Lakehurst, N. J., and the St. Hubert Air Field at Montreal. It was found that the equipment used at the St. Hubert Field, which in turn is patterned after that at Cardington, England, was the more suited to the problem on Empire State. Therefore, insofar as possible, every provision for the installation of that type of equipment has been made, with the essential difference that the ground level of the tower of St. Hubert corresponds to the 86th floor level of the Empire State Building.

From this essential condition arose two sets of influences which have affected the further design of the structure. On the one hand there is the fact that the as yet unsolved problems of mooring air ships to a fixed mast at such a height make it desirable to postpone to a later date the final installation of the landing gear. On the other hand, the location and height of the building itself and the arrangement and equipment of the mast invite the development of certain spaces for use as points of observation, accessible to the public for that purpose without destroying their usefulness or modifying their design as elements of a station for aerial passenger traffic.

The housing of this dual function in a form constituting the terminal motive of the great shaft of the building itself presented a problem in design quite unprecedented. The requirement that the frame, the envelope and the equipment must be devised and placed in accordance with the limi-
tations of the building code of New York, in addition to the necessity of providing for the mechanics of the building centering up above the main roof, further affects the expression of the architectural forms. It is from all of these influences that the observation tower-mooring mast, as it is now being erected, has been derived.

The main roof of the building, 87 feet by 139 feet in area, is reached by taking any one of ten elevators at the ground floor and transferring to either one of two at the 80th floor. These elevators open at the 86th floor to a public lobby, approximately 25 feet square, opening both on the east and west to observation rooms set back from the main wall of the building below. These observation rooms are 24 feet wide and 55 feet long, completely enclosed in glass with the floor raised to such height that there are no obstructions to the view. Connecting with these rooms on the north and south are two observation galleries treated in a similar manner and each measuring 4 feet by 77 feet. The observation rooms and the observation galleries form a complete perimeter of glass-enclosed spaces, raised above the roof and parapet walls of the building. Between the outer walls and the observation rooms and galleries, and below them, are the roof terraces. From the public lobby, an elevator and a stairway rise 167 feet to the upper observation floor level. Here the elevator opens into and is part of a circular room 33 feet in diameter. Glass and metal walls, with a solid metal protection to a height of 33/4 feet, form the exterior walls of the tower and permit an unobstructed view. Above this room is the observation platform, reached by an open-rail stairway whose upper landing is 1,224 feet above Fifth Avenue. This is a circular room 25 feet in diameter. Like the observation floor just below it, this room is finished in chrome steel with the forms of the structural steel frame made a part of the design. Extending around this room and reached from it is an open circular platform 4 feet in width protected by a closed rail 4 feet high and sufficient in area to accommodate 40 people at one time. What a view of New York and its environs will be had here! And the word "environs" in this instance takes in a wide range of territory, for on a clear day with a powerful pair of field glasses one may see the stately buildings of Princeton University 48 miles to the southwest, possibly even beyond to Trenton and the Pennsylvania state line at the Delaware River; to the west Delaware Water Gap; and to the north, West Point and Storm King Mountain will fall within range; up Long Island Sound Bridgeport's factories will dot the horizon, while European steamers will cut the skyline two hours from New York's harbor.

It is on this upper observation platform that passengers from air-craft will be landed when the original purpose for which the tower-mast was built has been realized. For a height of 26 feet above this level there is a cylindrical structure 25 feet in diameter, surmounted by a conical form designed for the installation of portions of the equipment used in mooring operations. Below this level and down to level DD (see illustration) an enclosing shaft of metal and glass, 35 feet on each side, forms the transition between the circular landing top and the rectangular housing.
base between DD and the main roof. This portion of the tower-mast from level 1092 to its topmost point, 1,250 feet above the street, has no functions other than those of the mooring-mast proper; it is designed to permit passengers to disembark at the observation platform, which will be known as the 102nd floor (at level 1224), walk down the short stairway to the observation floor or the 101st floor (at level 1212) and take an elevator to the 85th floor. Here provision has been made to permit the installation of waiting and baggage rooms, ticket offices and customs offices.

All necessary provision has been made as well for the mooring machinery, the "mooring arm" which will be housed under the conical roof at the top, and the winches and control machinery at the base of the tower, levels AA and BB. These levels also provide space for stairways and elevator equipment and for various types of mechanical equipment. Above these levels is a large "plenum chamber,"—level CC,—into which and from which all the air of the ventilated spaces of the building below is dumped, the air having been forced to this level by means of powerful fans located on the 84th floor.

No occupied spaces exist in the shaft above the ventilation equipment and below the observation floor. This section of the tower contains the necessary pipe shaft, elevator shaft and stairway with an iron platform every 21 feet in height for the
Elevation of the dirigible mast, from the first observation level to the peak, the total height of which is 1,250 feet.
proper maintenance of equipment for night illumination.

A novel scheme of night illumination has been adopted. At levels AA, BB, CC and DD there will be horizontal bands of light each 3 feet high and encircling the complete perimeter of those areas. Above these, four vertical strips of light 12 feet wide and 160 feet high will reveal themselves through the illumination through the glass areas forming the middle section of each side of the shaft. Surmounting these is the circular wall of light emanating from the observation platform level, and crowning the whole will be eight powerful "pencils" of light shooting from portholes in the conical form at the very top.

The structural problems involved a number of unusual conditions. The tower and its equipment have a dead weight of 1,050 tons, the steel alone weighing 600 tons; the horizontal pull of the ship was figured in this case at 50 tons, although no ship has yet been built which, under the most extreme conditions, has exerted a pull of over 17 tons. The wind pressure against the surfaces of the tower was assumed at a maximum of 30 pounds per square foot of surface on the exposed face. All of these loads, dead weight, ship pull and wind, had to be carried down through the 1,045-foot height of the building structure, which required the installation of 200 additional tons of steel in the form of heavier column sections and heavier wind-bracing members in the structural steel frame below the tower.

An effort has been made to meet one other possible structural problem. Provision has been made for a possible method of hauling the guide cables used in mooring, similar to those used on the S.S. Patoka to which the Los Angeles has already been moored. For this purpose the exterior wall columns have been carried above the main roof level and designed so that there may be anchored to them 100-foot booms, serving the same purpose as the fairleads and snatch-blocks in use in the landing fields with the present type of mooring mast.

None of this complication of use and design will be apparent in the structure when it comes from the hands of the designers and builders. The steel frame will be enclosed in metal and glass, forming a unit approximately equal to a 20-story building rising 205 feet above its support already 1,045 feet above the street. Rolled steel of a chrome-nickel alloy with cast aluminum winged buttresses will frame the windowed base, shaft and head, and present a gleaming surface to the sky. Within, for the present, all the world may visit, gaze, rest and eat,—and drop souvenir postal cards to the "sidewalks of New York" through a mail chute nearly a quarter of a mile high.
ELEVATION—

1250 FEET

Post & McCord's ironworkers raising the derrick for the last time on the Empire State Building.
THE DUAL ELEVATOR HAS COME

BY

A. T. NORTH

AMERICAN engineers have always possessed the faculty for providing adequate means for satisfying every structural and mechanical requirement. Structural engineers have made possible the increasing heights of steel frame buildings, which are made usable and profitable by the elevator engineers. The progressive development of these two types of engineering has been concurrent. The limit of profitable building heights had been reached, however, because the area of the elevator shafts had become disproportionate to the rentable floor space due to elevator limitations. The height limitations of steel construction have not been reached and it became incumbent on the elevator engineer to reduce if possible, or not increase, the space used for elevator shafts and at the same time provide adequate elevator service. Obviously, it was necessary to increase the capacity of the elevator shaft. The challenge was accepted and the elevator engineers have produced, after several years of intensive development effort, the dual elevator. This type has been installed, successfully operated and tested in the new 11-story office building of the Westinghouse Electric and Manufacturing Company at East Pittsburgh, Pennsylvania.

THE development of the elevator has been signalized by many epochal improvements made to increase safety and speed. It is apparent, however, that the dual elevator is, perhaps, the most important development ever made in elevating because of its great economic value. In buildings of sufficient height the area of the normal elevator shafts can be reduced 50 per cent and the area of rentable floor space increased materially; also three cars can be operated independently in one shaft and the area of the normal elevator shafts reduced 66 per cent.

The dual elevator consists of two elevator cars, one above the other, operated independently in the same shaft. The top car is to be used as an express elevator, traveling without making stops until midway of the building height and from there traveling to the top as a local. The bottom car is operated as a local elevator, making all stops to the midway floor. When the cars begin to descend they make the same stops as when ascending.

THE dual elevator apparatus is so devised that the two cars are prevented automatically from traveling in opposite directions. Another safety precaution is provided in the automatic stopping of one car at the floor level when it comes within two floors of the other car. This is similar to the automatic block systems used in subways. Other automatic safety devices are used to prevent rear end collisions and to stop the cars when any part of the control equipment or the cables break.

Automatic push button control of the standard type is provided for each car and at each floor. The exact position of one car is indicated in the other car for the guidance of the operator and the information of the passengers.

Aluminum was used wherever the reduced weight improved operation. The car sling and platform framing are made of that metal. The saving in weight reduces the power consumption and the stresses in the equipment and supporting structure. The decreased effort required for stopping the lightweight car is an important safety consideration and should be given serious attention on all elevator installations.

The dual elevator materially increases the economic height of buildings by maintaining the correct proportion of elevator area to the rentable area. Its installation in many existing buildings will increase rentable area and thereby reduce the factor of obsolescence. The technique of determining the nature and extent of elevator requirements will not change materially. There will be changes made in plan arrangements.
Plan of Shaft and Top Car. The Hoisting Cables are in the Center of the Shaft and the Compensation Cables are on Either Side of the Car.

Plan of Shaft and Bottom Car. The Hoisting Cables are at Either Side of the Car and the Compensation Cables for the Counterweight are in the Center.

The hoisting cables for the bottom car lead down each side of the top car and are attached to the cross beam of the bottom car at either end on opposite sides of the center line passing through the guide rails. The other ends of these hoisting cables are attached to the outer ends of the top counterweight. The top car hoisting cables are attached at the top center and lead to the bottom counterweight through a slot in the upper counterweight. The two counterweights travel between the same guide rails which are approximately the same distance apart as the car guide rails. Compensating cables from the bottom car are attached to the top counterweight. The compensating cables from the top car pass down either side of the bottom car and attach to the ends of the bottom counterweight. Of necessity, the loading and unloading of the two cars at the bottom of the building is made at two levels slightly above and below the grade level.

Sectional Diagrams of Shaft with the Dual Elevator. The Upper Drawing Shows the Arrangement of the Two Cars, and the Lower Indicates the System of Counterweights. Notice the Cable Rigging. It Permits Independent Action of Either Car in the Same Direction, and Allows Express and Local Service in the Same Shaft. An Automatic Safety Device Stops the Cars Whenever They Approach Each Other Too Closely. Similar in Principle to the Block System in Subway Transportation.
THE STANDARD SPECIFICATION

The Recommendations Contained in the Accompanying Article were Formulated as the Result of a Nation-wide Survey, which Included Sixty Representative Architectural Offices and Fifteen Contractors.

By Harold R. Sleeper
Of the Office of Frederick L. Ackerman, Architect

The architectural specification serves primarily to convey by written word those ideas of the architect which cannot so readily be explained graphically. Furthermore, it is a legal and business document, and its appearance, clarity and make-up are indications of the architect's technical qualifications, office organization and business ability. Almost all that has been written about the specification has been concerned with the manner of specifying a certain material, apparatus or construction. Little is on record regarding the physical aspects, methods of compilation or arrangement. An examination of the works of our best architects shows clearly that little thought or effort has been expended towards improving these qualities.

The specification form should be readily adaptable to all types of work from the smallest residence to the most complex hotel. It is believed that a standardization of practice will do much toward the achievement of clear and direct documents; that a standard form will facilitate bidding and avoid many later disputes in the field; and that the use of a common method of compilation will promote a closer cooperation between manufacturer and architect. A uniform make-up will save dollars to all members of the building industry, to say nothing of worries, headaches and fights. If architects are to survive in a world which quickly swallows, for its own profit, any profession which cannot move to the tempo of modern business, they must be on the alert to adopt every new, practical measure to increase the efficiency of their offices. An attempt at standardization has been made in the development of the New York Building Congress Standard Specifications. These printed specifications are for insertion in toto in each individual chapter as Part B, and though they contain no specific advice as to the physical make-up of Part A, they contain many valuable suggestions as to an arrangement and set-up.

With few exceptions, specifications are used in virtually the same way in every architect's office. It therefore seems desirable, from the standpoint of simplified practice, that some standardization in regard to this utilitarian aspect should be made. The individuality now shown benefits neither the architect, builder or client. The answers to the questionnaire recently sent out to some sixty architects, scattered throughout the country, and to some fifteen nationally known builders have been taken with fifty typical specifications as the basis for the notes and recommendations that follow.

COVER MATERIAL

Since a cover is used primarily as a protection to the contents within, it should be selected for general durability and resistance to soil, the specific material depending upon the use of the volume. In addition, covers must contain certain descriptive information in regard to the material therein and so serve as a title page.

The survey of present day work showed that architects are using: first, a medium weight paper cover; second, a lightweight paper and third, a heavyweight paper. A few are bound in cloth, and others are devoid of any cover. A few large public jobs are bound in heavy cardboard covered with paper, making a veritable book. The heavy covers offer better protection, do not roll, do not get torn or folded and stay open more easily. Some covers were so badly mutilated that the writing thereon was no longer legible.

The cover for a single chapter has distinctly less work to do than the cover of an entire volume.
and each should be considered as a different type of cover. What will serve well for the first may not do for the second.

These uses can again be divided: (1) covers to be used for estimating, (2) covers for use in the office and on the job. Many estimating sets are not used later, and the treatment they receive is very mild. Therefore these covers may be lightweight compared with the cover that stands duty for the duration of the job.

**Recommended Standards**

1. Chapters bound individually
   - (a) for estimating—paper, medium weight (120 lbs.)
   - (b) other uses—cloth, medium weight (linen glazed)
2. All chapters bound in one volume
   - (a) for estimating—cloth, medium weight
   - (b) other uses—heavy cloth (linen glazed)

If an architect uses both single chapters and one volume, he should keep three types of covers on hand. If he uses only No. 1 or No. 2 he will need only two types of stock.

Contractors are enthusiastic about the cloth covers, although used by a minority of architect's offices now, they do not tear easily and paper fastenings holding the contents seldom rip out of place.

**COVER COLOR**

There is little tendency towards standardization in color, the preference displayed for colors being in the following sequence: tan, gray, brown, light buff, green, blue, yellow and cream.

Color serves to hide wear and tear, dirt, grease and grime. It may also serve as a mark of identification. The office of Charles E. Klauder uses the college colors of universities when building for them. For example, a Princeton job cover is orange with a black binding. Thus color serves as an index and makes the selection of the desired volume easy and quick. One contractor urges the use of black, while another suggests that a neutral color be used. The architect that can afford to use color may develop a system wherein each color represents a digit: every ten jobs will then have a distinct color, limited, possibly, to the binding edge.

**Recommended Standards**

1. For the large office with many jobs of large size:
   - Dark gray cover with strip of color on back edge for index purpose.
2. For medium or small office:
   - Dark gray cover.

The gray will soil less easily than tan, as it is more neutral in shade. The most satisfactory grays are those having some warmth in them. The preponderance of tan covers seems due to the fact that printers often have large stocks of that material on hand and usually urge its use.

**BINDING**

The specification should be bound to hold the pages together until it is desired to separate them for subcontractors' bidding. If trade headings are bound separately, the first binding may be permanent. Bindings should not catch in filing, nor should they come undone unless desired. They should be inexpensive, durable, smooth and semi-looseleaf.

Architects are using various methods, most of which are unsatisfactory. Over half of the offices questioned use the paper fastener run through the left side of the volume and bent over on the back. Some use washers front and back; others use a variation of this method, but conceal the fasteners inside of the cover. Others bind the pages at the top. Some specifications, usually for public work, are sewed and bound with glued covers reinforced with linen on the edges.

Fasteners which go entirely through the covers make filing difficult, as the tips of the fasteners catch on hands, papers, and are generally obnoxious. A volume bound at the top has to be held open, and unless it is bent double, requires both hands. If bent double, the cover gets such hard wear that it soon tears at the crease. Sewing and gluing are necessary for some government work, but do not warrant the expense under usual conditions. Separate chapters cannot be given to subcontractors when the specifications are bound in this manner, and in such cases the whole specification is given to each subcontractor, presupposing a printed page and hence a large supply of volumes.

**Recommended Standards**

1. For binders' use:
   - Into single trades, permanently stapled, with three staples on left-hand edge. Stapling machines may be purchased inexpensively.
2. For office and job:
   - Use one volume for mechanical trades and one volume for architectural trades.

The office and job volume should be bound with concealed paper fasteners forming a semi-looseleaf book. Cover must be 4 inches wider than desired with an over-all dimension to allow for the thickness of the contents and to cover the paper fasteners. The covers are made with five folds in the back edge. If the volume is thin, it will be bound between the folds; if thick, one fold may be let out to accommodate the thickness of the book, and the paper fastener will be turned on the back of the book inside of the cover. Paper fasteners should always be used with washers to prevent sheets from being torn.

**SIZE**

Architects do approach a standard as to size. At least seventy-five percent of the architects
whose specifications have been examined use the 8½" x 11" letter size sheet, yet the legal size page is still being used by some of the best and oldest architectural firms. This size is awkward to handle and inconvenient to use, for it does not fit into the usual filing cabinet, nor will it stand upright on a desk. The printed specification is usually smaller, and some are made to fit into a coat pocket. They are lost however in a filing case and would be more convenient if made letter size. Contractors are generally in favor of the letter sized document.

**Recommended Standards**

**Letter size with cover ½-inch larger all around when bound. Cover to have five folds in back requiring 4 inches more in width. This would make the cover over all 21 inches by 11½ inches.**

**TITLE ON COVER**

The secondary use of the cover is to carry the title by which the volume is identified. The survey shows that this is, in general, uniformly done. The word “specification” with the name and address of the architect are found on most covers, and few volumes show in addition a printed index. This is a good idea if cost has no bearing, but should be supplemented with an index inside of the cover for use in case the cover becomes torn or the surface defaced. Owing to its durability, a cloth cover could be used for the index without an additional one inside. Items which are often omitted from the cover are:

1. The date.
2. The number of the copy.
3. Initial of the writer.
4. The number of the job.

These are important in any office, for they serve as a systematic and quick source of information.

A third of the covers examined were printed. Some twenty percent were partly printed and partly typed.

**Recommended Standards**

1. Name and address of building and owner's name.
2. Name and address of architect (engineer's name if mechanical).
3. Copy number.
4. Job number.
5. Date.
7. Trade (if individually bound) or architectural trade or mechanical trade, or both.

A chapter index is recommended when a strong cover is used.

The arrangement should give emphasis to the job name and number, as they are the most important items on the cover.

**NUMBER OF COPIES**

The number of copies that are required have much to do with the selection of the method of reproduction. So before selecting this method a careful estimate of the requirement should be made.

Modern methods of estimating on large work have made necessary the distribution of many sets; this in turn makes it feasible and less expensive to use newer ways of reproduction. It is certain that many architects are spending more than necessary on this item, and in return are receiving poorer results than might be obtained from a cheaper method. From information received, it appears that for large work with an unlimited number of bidders one hundred copies are often required. On large work with a selected list of bidders some fifty copies will suffice. On moderate size work from twenty to thirty copies are used; and, when the work is to be done by a selected contractor on a cost-plus basis, the number of copies may be still further reduced; fifteen or twenty copies may be ample in this case.

**Recommended Standards**

1. Large work, unlimited number of bidders:
   - 3 copies for each bidder.
   - (Hold others for their use if requested).
   - 1 for owner (often several in corporate or state work).
   - 2 for architect.
   - 1 copy for each engineer (if not in architect's organization).

2. Medium sized and small work:
   - 2 or 3 copies for each bidder.
   - 1 for owner (may require several).
   - 2 for architect.
   - 1 for each engineer (if not in architect's organization).

If the documents are to be filed with some "Report" organization for use of subcontractors, one or two copies will usually be sufficient.

**METHOD OF REPRODUCTION**

Specifications must be reproduced accurately and legibly, and at a minimum cost. Often the time available for the actual reproduction work is limited, and the ideal method must be sacrificed for speed. Those methods not requiring proof or copy reading are an advantage and should be considered in the ultimate cost. Permanency is a secondary requirement.

The majority of specifications examined were reproduced by the mimeograph machine in black ink. This method requires that a stencil be cut on a special sheet, placed on a machine, and the copies struck off. Mimeographing may be done in the architect's office. It requires careful checking of the stencil before printing; errors are difficult to correct; and if done by an amateur, the results are not always very legible. The ditto machine, or hectograph method, is very popular...
in the Central and Western states. Many of the large offices there use their own machines and thereby save money. A special carbon paper makes a copy for this machine at the same time that the original copy of the final specifications is made. In other words, it does not have to be typed especially as does the mimeo stencil. The results are not as readable, however, and far from permanent. Very few public stenographers are equipped to do this work, but, it is cheap once the equipment is installed. The printing of each sheet is slow and requires time and care; about 10 or 15 minutes are required to run off 100 copies of one page. The machines cost from $175 to $225.

About the same number of architects appear to use blueprinting as the ditto method. Few use the so-called black and white print, which is a new process similar to blueprinting, except that the paper is white and the letters dark. This reproduction looks like a Vandyke print, yet it costs little more than a blueprint. Blueprints fade, curl and are not especially legible; black and white prints may curl, but they are very legible and do not fade if well done. Both of these may be secured in record time and are true reproductions, requiring no proof-reading of any sort. The black and white process is so new that as yet it may not be obtainable in all cities.

The general practice includes a number of specifications printed on a letter press and a few offset photo-lithographic prints. Printing is used only on the largest work when the expense is not important. Offset photo-lithography method is quite modern; it requires no proof-reading and is accurate and legible. Its drawback is that of high cost if a small number of copies are to be made. It is accomplished, briefly, by photographing the page onto a sheet which is a half negative and the method is not superior to photo-lithography. The photostat copy is expensive, except for a small number of copies. The process furnishes a permanent, exact reproduction which needs no proof-reading. It consists of photographing the copy onto a sheet which is a half negative and which, after developing, may be used as a finished sheet. It is similar to blueprint except that the background is dark brown. This is again photographed onto a white paper which constitutes the final sheet.

**Recommended Standards**

For 10 copies—Ozalid print made from carbon backed typed original.

- **20** —Ozalid print or mimeograph.
- **30** —Mimeograph.
- **40** —Offset, photo-lithography—both sides of sheet.
- **50** —Offset photo-lithography—both sides of sheet.
- **100** —Offset: photo-lithography or printing—both sides of sheet.

**PAPER**

Papers used are dependent to some extent on the methods of reproduction. Blueprint and black and white and photostat papers are obtainable in 16 and 24 lbs. If lighter weight papers are used they are likely to cut the hand in handling. Besides, the thicker paper is able to hold the sensitive solution better, and consequently gives more accurate results. Usually blueprints are secured on the bulky 24-lb. paper unless a special request is made for thin paper.

Paper for both covers and pages come in the following weights as designated by the trade: 13, 16, 20, 24, 32, 60, 120, 240 and 360 lbs. A 32-lb. paper is not necessarily twice as thick as a 16-lb., as the number is a reference to weight and not thickness. The last four weights would be used for covers. The general classifications of paper is as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coated stock</td>
<td>Bonds with special finish</td>
</tr>
<tr>
<td>Bonds</td>
<td>Hair rag in them</td>
</tr>
<tr>
<td>Ledger papers</td>
<td>Mixture of &quot;book&quot; and &quot;bond&quot;</td>
</tr>
<tr>
<td>Book papers</td>
<td>Made of a better grade of pulp</td>
</tr>
<tr>
<td>Newsprint</td>
<td>Low grade of wood pulp</td>
</tr>
<tr>
<td>Special blueprint paper—very stiff with sensitive emulsion.</td>
<td></td>
</tr>
<tr>
<td>Special photostatic paper—made of pulp and linen—not strong with a sensitive emulsion.</td>
<td></td>
</tr>
</tbody>
</table>

If the letter press method of reproduction is chosen, any paper may be used. The photo-litho method cannot be used on a smooth-coated paper, but any of the others may be employed. The mimeograph can be used on a bond paper, contrary to the usual opinion. It also may be used with the thin blotter-like mimeograph paper.

There seems actually to be little wear on the paper of specifications if a good cover is used. It is desirable to use a smooth paper for ease in turning pages and in making ink corrections.

No two papers were found alike in the fifty specifications examined, but the majority were bonds of a cheap grade, usually 16 lbs.

**Recommended Standards**

1. For black and white print—16 lb. paper.
2. For letter press coated (smooth)—16 lb. paper.
3. For offset photo-litho—16 lb. bond.
4. For Ditto—20 lb. bond.
THE COÖPERATIVE PLAN
—ONE ANSWER TO THE LOW COST HOUSING PROBLEM

THE GRAND STREET APARTMENTS
SPRINGSTEEN AND GOLDHAMMER
ARCHITECTS

The Grand Street Apartments Cover an Entire City Block. They are Designed to Meet, Simply and Efficiently, the Demand for Inexpensive and Comfortable "White-Collar" Housing.

FOREWORD

UNDER existing conditions there is no opportunity whatever for the majority of city inhabitants to obtain title to and occupy land and detached houses. In order to make the ownership of land and habitations possible for these people, it is necessary to set up conditions different from those which now obtain in detached house and land ownership. The same reasons that induce the wealthy to purchase ownership of coöperative apartments apply to those of very limited means, —economic and social.

The principal obstacle to ownership of land and habitations of whatever kind is the desire to obtain and enjoy excess profits from the barter and trade in those commodities. Coöperative ownership of land and habitations has been and can be extended, however, to include people of limited means who have the desire to possess them. To stimulate and make possible land and habitation ownership by such persons, the state and city of New York have enacted legislation for that purpose. To limited dividend corporations, the state and municipal taxes are remitted for a period of years. Investment capital has been induced to engage in such operations, notably the Van Cortlandt Park Development in New York, under the management of the Amalgamated Housing Corporation. Seven buildings, five of which were completed in November, 1927, contain 496 apartments embracing 1,958 rooms. Special features include a kindergarten, library, commissary, community hall, and bus service for school children. A dining room and kitchen for the use of the occupants are being constructed in Building No. 3. A large playground is owned and supervised by the Corporation. The law discriminates in certain particulars between the Bronx and Brooklyn and Manhattan, due to different land values.

THE Grand Street Coöperative Apartments, on the other hand, are located in a very congested, high land-value community and are already a successful operation. The general application of this type of housing will require, as does any other type, adequate park facilities for recreation and pleasure, but it will be noted that in the Grand Street improvement ample light and air, a large central courtyard and a roof garden playground are provided. The land is not exploited for excess, speculative profit.

Brick, Textured Stucco and Concrete.
Looking from the Interior Court Toward the Broome Street Entrance
CERTAIN requirements of the owner necessitated a somewhat different room arrangement than might pertain otherwise. No one or two room apartments exist in the building; the number of rooms range from three to five, and each layout is designed to give the maximum of comfort and convenience in both size and arrangement. The type of future tenancy made privacy a necessary feature and required that circulation within individual apartments be possible without passage through any one room. This fact explains the presence of the corridors and the large entrance foyers. Direct access from kitchen to dining room seems a desirable feature where these rooms are adjacent; it saves time, steps and in many cases a probable congestion in the corridor, and would have aided the efficiency of this plan. The group is built about a landscaped interior court; the accompanying plan is one quarter of the development.

SPRINGSTEEN AND GOLDFRIBBER,
ARCHITECTS
It is generally conceded that every well intentioned person is entitled to a suitable habitation and a healthful and peaceable existence. When property ownership is included, these conditions inevitably establish a more stable and better conditioned society. The financing and construction of cooperative apartments for persons of limited means should not be considered altogether as a philanthropic project. They are non-profit projects, but their underlying security and rate of return on the capital investment are as reliable as those of thousands of securities that find a ready market for investment capital. This is the result of favorable legislation, which should be enacted in all states and municipalities where there exist unfavorable housing conditions and ownerships limited in numbers. It is true that the securities of such developments are not associated with exploitations for procuring excess speculative profits; it is equally true that such securities are equal in value to those of any other fixed-rate investment.

The condemnation and demolition of undesirable habitations, some of which are really "slums," and the improvement of the ground in large units will not only provide proper and desirable housing, but will also provide employment for investment capital, for all kinds of persons engaged in the building industry, the purchase of materials of construction, and in every way increase the prosperity, stability and culture of society.

A. T. N.

THE PRACTICAL SOLUTION

BY

GEORGE W. SPRINGSTEEN

OF

SPRINGSTEEN & GOLDFRAMMER, ARCHITECTS

FOLLOWING the war the great demand for and limited amount of housing resulted in an extraordinary attempt to improve the situation. It may not be fair to pass judgment on those housing projects, undertaken when the cost of building construction was at its peak, inasmuch as plans were turned out "overnight" from the architects' offices and in a comparatively short time these buildings were under construction by speculative builders. The builder was not inclined to heed the sage advice to "look ahead," as it was merely an incident in the quick turnover and profit made on his own investment. The wholesale plan of building production continued unimpeded so long as that method provided habitable living quarters regardless of cost. At that time it was possible to disregard the phenomenal increases in rents, which were entirely disproportionate to any standards of previous times, because of the different standard of living and greatly increased scale of wages.

Such abnormal conditions could not continue. Considerable agitation developed to provide both cheaper and better housing, which resulted in legislation known as the State Housing Law (New York) enacted in 1926. The Municipal Assembly of the City of New York (1927) adopted the law and provided that any improvements owned, operated and managed by public or private limited dividend companies organized and operating under the law should be exempt from local taxation for a period of years. This legislation has proved itself to be one of the most constructive undertakings for the purpose of solving the housing problem in this country. It has made it possible to provide the same high standards of housing that are associated with high-priced living quarters, for those who can afford to pay from $9 to $12.50 rent per room per month.

FINANCING AND TAXES

As an outgrowth of this legislation, a cooperative apartment building was constructed by Amalgamated Dwellings, Inc., occupying the city block encompassed by Grand, Broome, Sheriff and Columbia Streets, New York. Primarily, the purpose attained by this undertaking is to furnish inexpensive housing to wage earners who are able to make a minimum cash investment of $150 per room on a total equity of $500 per room and pro rata equity in the ground. Purchasers who are unable to pay the entire sum of $500 per room have been financed through a fund created by Lieutenant-Governor Herbert H. Lehman and Aaron Rabinowitz, member of the State Board of Housing. The purchase capital advanced from this fund is to be amortized during a period of ten years with 6 per cent interest. The operating and maintenance expense is paid by the charge of $12.50 per room per month to each tenant-owner.
THE GRAND STREET APARTMENTS

Above is an Entrance Detail Facing the Interior Court, Shown Below at the Left. Notice the Simplicity of the Detail and the Skillful Combination of Rugged, Plain Materials. Below—A General View of the Grand Street Side.
It is interesting to note that this low cost of maintenance and operation for this project is due to the fact that, being constructed by a limited dividend corporation, it is exempt from city taxes and fees as provided by the laws previously mentioned. Under the provisions of the law, a limited dividend corporation must operate such a project with a maximum return limited to 6 per cent per annum on the invested capital. All surplus over the minimum permitted to insure the security of the project must be passed on to the tenants in the form of rent reduction. Another requirement for the successful cooperative apartment building is that no more than two-thirds of the cost of construction can be paid by funds secured by a mortgage carrying an interest rate of 5 per cent per annum. It is obvious that the problem can be and is solved for those persons who are able financially to comply with the requirements of the Grand Street cooperative project, and it is for this group of potential and actual owners that the immediate future holds great promise. For those persons, however, who are not able financially to pay the $12.50 or even a $9 rent per room per month, the situation is quite grave.

We should not despair of better housing conditions when we consider the rapid and successful strides made to that end between the immediate
post-war time and the present. The problem of providing suitable housing under emergency conditions was entirely new to us. The state and municipality have done what they can within the limitations of the state constitution and city charter, to which powers a capital controlled by unselfish and humane instincts has performed its quota service. Activity in the field of providing better and less costly housing becomes more apparent and effective with the passing of time, and we trust that, with conscientious and constructive endeavor, the opportunity to secure and enjoy better living conditions and housing will manifest itself in the not far distant future.

**STRUCTURE AND EQUIPMENT**

The Grand Street cooperative apartment project is housed in a substantial six-story brick structure, having seven stories on the Broome Street frontage due to the difference of the street grades. The structure is built around a large interior court which is improved with a fountain pool, grass plots, planting of shrubs and walks. The building is equipped with an adequate steam boiler and hot water service plant. The heating system is of the two-pipe vacuum type. Brass pipe is provided for the hot water service and branches from the cold water service. The bathrooms are finished with tile floors and wainscoting. The bath tubs are of the built-in type, provided with shower bath apparatus and curtain rods. Pedestal type lavatories, siphon jet water closets, medicine cabinets and the usual toilet room accessories are provided. Metal trim is provided for all windows and interior doors, floors and baseboards are made of wood. Incinerator receptacles are provided in each stair hall. The chimneys from each incinerator enter into, and the smoke and gases pass through, a brick separator chamber on the roof, which serves to prevent the passage of the gas-entrained solid products of combustion through the top of the chimney to the outer atmosphere.

The corridors and stairways are of fireproof construction, the floors finished in terrazzo. The entrance door to each apartment is provided with a peep-hole fixture which enables the occupant to observe the person in the corridor without opening the door. The kitchen equipment consists of a gas range, sinks, electrical refrigeration, and clothes rack of the usual pattern. The entire construction of the building is substantial, and the mechanical equipment is of good quality, showing no evidence of intention or desire to provide the sub-grade construction and quality that is characteristic of "speculative" multiple dwellings.

Entrances are provided on both Sheriff and Columbia Streets, and a principal entrance on Broome Street, which is in a recessed court enclosed in an iron fence and gates. This court is planted with shrubbery and turf. The Grand Street front is occupied by stores, and the low portion of the building between the corner apartments provides access for sunlight and southern breezes to the large central court yard.

The structure contains a large laundry, community auditorium and a recreational roof garden for the children. Children are thus provided with a safe and healthful playground, which is unusual in that section of the city but which is so essential for the development of sound citizens.

**CONSTRUCTION DATA AND SPECIAL FEATURES**

<table>
<thead>
<tr>
<th>Grand Street Cooperative Apartments, New York</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Date of completion: October, 1930</td>
<td></td>
</tr>
<tr>
<td>Cost of construction, 40 cents per cubic foot</td>
<td></td>
</tr>
<tr>
<td>Total number of apartments: 231</td>
<td></td>
</tr>
<tr>
<td>Total number of apartments per floor: 36</td>
<td></td>
</tr>
<tr>
<td>Number of rooms per apartment: 3, 3½, 4, 4½* 5</td>
<td></td>
</tr>
<tr>
<td>Total number of rooms: 906½</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Apportionment of apartments throughout building:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>44—3's</td>
<td>19%</td>
</tr>
<tr>
<td>65—3½'s</td>
<td>28%</td>
</tr>
<tr>
<td>26—4's</td>
<td>11%</td>
</tr>
<tr>
<td>74—4½'s</td>
<td>32%</td>
</tr>
<tr>
<td>22—5's</td>
<td>10%</td>
</tr>
</tbody>
</table>

Average area of living rooms: 204 sq. ft.  
Average area of dining rooms: 200 sq. ft.  
Average area of chambers: 160 sq. ft.  
Average area of kitchens (including dining alcoves): 129 sq. ft.  
Total number of stores: 15  
Area of stores: 1,400 sq. ft. each  
Elevators: 8 push-button automatic  
Grand coverage: 60%  
Average area per room of building area: 250 sq. ft.  
Average area per room of lot area: 412 sq. ft.  
Height of ceilings: 8’ 9”

(*) Dining alcove designated as ½ room)
THE TRIAL OF FIREPROOF WOOD

BY

A. T. NORTH

FIRE-RESISTIVE construction is handicapped as to economy and effectiveness by building laws that are formulated on assumptions based largely on innumerable standard fire tests. These can be considered as laboratory tests and as such have all of their practical limitations. To complete the knowledge necessary to formulate a scientific fire-resistant procedure, there is a need for information about (1) the performance of materials and constructions exposed to actual conflagration conditions; (2) the actual contribution of combustible parts of construction to conflagration; and (3), the effects produced by the burning of known volumes of combustible contents. This last item has been investigated by S. H. Ingberg, U. S. Bureau of Standards, and his findings are of great importance, though limited in scope.* Existing fire-resistive construction regulations are based on the time-temperature factor, and until the Ingberg combustible-content-temperature factor is given equal consideration, such regulations will be unscientific and wasteful.

THE LEGAL ASPECT

In the City of New York two laws operate to regulate construction of multiple dwellings—the Multiple Dwelling Law (a state statute which superseded the state Tenement House Law in 1929) and the City of New York Building Code. The latter recognizes fireproof wood as an admissible material for doors, trim and finish in fireproof construction. The state law does not, but where it permits any wood in such construction, it allows natural untreated wood. This tolerance, broadly speaking, is limited to flooring, trim and finish. The matter of harmonizing the statute and the ordinance has long been a moot question.

“At the 1930 session of the state legislature an amendment to the Multiple Dwelling Law was introduced which if passed would have brought the requirements of that statute into line with those of the Building Code, thereby requiring in all multiple dwellings exceeding 150 feet in height fireproof wood throughout, or no wood at all. The bill was so loosely worded that fireproof wood would have been permitted in certain places and for certain purposes where the use of any wood whatever would be intolerable. The bill passed both houses over vigorous opposition, but was vetoed by the governor.”

A FACT FINDING INVESTIGATION

“The Multiple Dwelling Law Committee in considering the subject of fireproof wood found a dearth of information about the subject, and its attitude thereto was controlled largely by a profound objection to creating, by legislation, monopolies for specialized processes and materials. The lack of authoritative information supporting or discrediting the claims of the fireproof wood interests sustained this objection and stiffened the Committee’s resolution to resist any recognition of fireproof wood, until thorough investigation should establish its claim to such recognition. The Committee, however, appreciated the potential im-

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portance of the subject and undertook on its own account such an investigation." A special committee on fireproof wood was appointed. The questions which this Committee intended to answer were:

"1. Shall the Multiple Dwelling Law be amended to provide for the use of fireproof wood?"

"2. If the answer to this question is affirmative, shall such provision be made applicable either of both of these conditions in whole or in part: (a) Compel that in future fireproof multiple dwellings wood not now required to be fireproofed be fireproof; or (b) Permit in fireproof multiple dwellings the use of fireproofed wood where no wood is at present permitted?"

The report embraces the results of several separate investigations, and the committee was most fortunate in securing the prompt and effective cooperation of the Columbia University Testing Laboratories under the able direction of Professor Albin H. Beyer, Director of Testing. Because of space limitations the salient features only are quoted from the report.

**WHAT IS FIREPROOF WOOD?**

"Actually no commodity is 'fireproof' in the sense that it will withstand destruction by fire indefinitely. The term 'fireproof' as employed in this report is used in the popular sense, namely, that the product so characterized, as installed, will not itself support combustion though exposed for a substantial period to conflagration temperatures. . . ."

"It is not possible to guarantee a wood product as being non-combustible. Properly fireproofed wood does reduce the possibility of fire. The processed lumber as a mass is substantially non-inflammable. The ordinary timber is treated with chemicals whose functions are three-fold. They give off, when heated, a non-inflammable, fire-extinguishing gas or vapor; they fuse over the wood in a protective coating, and they exclude the oxygen necessary to combustion by obstructing the pores of the wood. . . ."

"Wood which has been only partially impregnated is more practical for any purpose in which the lumber is not to be re-sawed or milled after treatment. It is less expensive and is lighter in weight than fully impregnated wood.

Any wood product may be fireproofed, in a varying degree, except the hardwoods such as white oak, ebony and hickory. Pine, balsam, birch and maple, together with most of the lighter varieties, are made adaptable to treatment.

"The processed wood's chief characteristic is that every pore is a diminutive fire extinguisher, because it exudes, when heated, non-inflammable gas or vapor. The larger the surface used, the more effective is this property.

"Wood processed by standard methods takes shellac, paint and varnish well, and the efficiency of glue joints is not lessened. Partially impregnated timbers retain most of the strength of the natural product, but fully fireproofed wood results in a loss of from 10 to 20 per cent in strength."

"Wood is always an excellent non-conductor of heat, and processing does not destroy this property. Thus a processed door is superior in this respect to one of steel, which conducts heat to a greater extent. A processed door is easier to fit and is therefore better protection against smoke. Processed wood may be sawed, planed and sandpapered, although it has a somewhat dulling effect on tools. Processed wood is, on an average, 20 per cent heavier than the natural product. Processed lumber will resist burning, but not charring. Some fireproofed wood may be ignited at a low temperature, as by a match, as most of the chemicals function only at a higher point. However, many treatments have a combination of chemicals which take care of practically all temperatures.

"It is a weakness of processed wood that it can not be guaranteed absolutely for uniformity or quality, as some pieces of wood are more receptive to chemicals than others. However, the mass of properly treated wood, taken as a whole, is adequately fire-resistant to give complete protection against spread of fire."

**THE FIRE HAZARD OF UNPROCESSED WOOD**

The sub-committee report is voluminous and divided into two sections: First, an analysis of fatal fires in new tenement houses (erected since 1901); Second, an analysis of spreading fires where the means of communication was wood flooring, trim, doors and windows with their casings. These included the number and causes of fatal fires and of spreading fires; types of construction (fireproof or non-fireproof), height of buildings, damage, causes, what woodwork was involved, and damage to woodwork, in New York City.

New York Fire Department records show that there were 11,552 fires in Manhattan, the Bronx and Richmond, 1925 to 1929, in tenements built since 1901. Analysis of these records shows:
Total number of fires .................................. 11,552
Fires confined to source ................................ 10,860—94.0%
Spreading fires .................................................. 692 — 6.0%

These 692 fires were spread:
By dumbwaiter, elevator shafts, hall and stairways, light and air shafts, and pipe recesses... 438 — 3.8%
By lath and plaster partitions... 68 — 0.6%
By windows, doors and trim and wood flooring... 186 — 1.6%

The study of the nature of fire communication showed that the use of wood in fireproof multiple dwellings is responsible for the spread of fire in nine cases in every 10,000 recorded fires.

FIRE-RESISTANCE OF FIREPROOF WOOD

In appraising the fire-resistance of fireproof wood, consideration must be given to the inflammability of the untreated wood. Data contained in the 1915 Proceedings of the National Fire Protection Association give the initial burning or ignition points of several woods. Four air-dried western woods, having average moisture content of 19 per cent, showed initial ignition points from 356° to 405° Fahr., the same woods oven-dried with negligible moisture showing initial ignition points from 348° to 411° Fahr. Five air-dried eastern woods, having average moisture content of 13.1 per cent, showed ignition points of 356° to 405° Fahr., the same woods oven-dried showing ignition points of 348° to 369° Fahr. These tests were considered to be inadequate for the purposes of this survey, and a new comparison of the combustibility of fireproof wood and unprocessed woods commonly used in flooring, trim and finish was undertaken in conjunction with the Columbia University Laboratories.

The standard New York Building Code requirements for the Timber, Crib and Shaving Tests, and the Fire Tube Test devised by M. E. Dunlap, Engineer Forest Products Laboratory of the U. S. Department of Agriculture, were applied to commercial samples of treated and untreated wood. All of the samples were dried to a moisture content of approximately 8 per cent and so maintained. A comparison of the two methods of testing, the Timber and Fire Tube Tests, of the same untreated species, disclosed the fact that combustibility is affected by the species and that certain softwood species, untreated, are considerably less combustible than certain hardwoods. The converse is also true. The New York City law requirements for fireproof wood, as expected, would eliminate all such untreated specimens.

Treated Specimens. Treated samples as tested under the New York City requirements showed considerable variations as to species. The effectiveness of treatment by all manufacturers was indicated by the reduction of glow after extinguishment of flame to considerably below 20 seconds, many of the specimens, both in softwoods and hardwoods, showing no glow whatever. The conclusion as to species of treated wood under different processes are practicable only for chestnut, birch, red oak, soft and hard pines, and poplar.

Comparisons. Tube tests made of such treated wood samples as would unquestionably pass the standard test of the City of New York developed an average maximum temperature of 388° Fahr. and at the end of two minutes the average volume of wood consumed was 20.2 per cent. The average maximum temperature developed in testing all of the treated samples submitted was 535° Fahr., and the average volume of wood consumed was 27.4 per cent. For similar tests made on untreated wood the average maximum temperature was 1476° Fahr., and the average volume of wood consumed was 82.6 per cent.

DOOR TESTS

The subject of doors was brought to the attention of the special committee in the form of a report on certain tests conducted by the Columbia University Testing Laboratories, in New York, May, 1929. A digest follows:

Outline of Tests. The fire application tests were made in accordance with Rule 510 of the Industrial Code of the Department of Labor of the State of New York, Bulletin No. 7, prescribing certain specifications relating to construction and test of fireproof and fire-resisting materials. The test procedure is similar to that prescribed in the rules and regulations for fireproof partitions of the Bureau of Buildings of the City of New York.

The test procedure called for raising the furnace temperature gradually to 1700° Fahr. in 30 minutes and maintaining this temperature for the remainder of the fire application period. Fire was continued until flames appeared on the outside surfaces of the doors under test. The three doors, designated as Doors A, B and C, were practically of the same size, varying in thickness and in construction.

Test Procedure. The doors were erected in the walls of the test house and thermocouples installed as required for standard tests. Temperature readings were taken at intervals of about three minutes.

OTHER TESTS

Tests were made at Columbia University of fireproof wood taken from various buildings in New York City. These eleven buildings were erected between the years 1904 and 1925, and their average age was 15 1/2 years. The Timber
Test applied to these specimens developed only one case of the material as substandard to the present requirements.

Investigation was made as to the corrosive effect of fireproofing chemicals on metals in proximity to fireproofed wood, and no deterioration was found. The average age of the buildings investigated was 17 years. Original surface finishes were not affected by the fireproofing processes, and the processes have no deteriorating effect upon the holding power of screws or glue. Wood floors treated by the fireproofing process heretofore in vogue, when maintained by washing and scrubbing, do not give satisfactory service.

Nine firms are engaged in the production and marketing of fireproof wood, six in New York State, one each in New Jersey, Tennessee and Wisconsin. Four producers use non-patented secret processes.

The technical details of the standard methods used for testing fireproof wood are omitted because of lack of space.

"Obviously, while the tests described in this section are useful in determining the comparative resistance of fire by various woods, processed and untreated, they furnish inadequate basis for determining the action of wood under fire conditions in a fireproof building where the wood is backed against incombustible material. Assuming intensity of heat equal to that used in the tests, it is apparent that large surfaces and greater thicknesses exposed on only one side to such heat will react more efficiently than diminutive fragments placed in a superheated atmosphere affecting all surfaces simultaneously, although in different degrees. This observation applies to both treated and untreated lumber."

COSTS

A comparison of costs for New York City indicates an additional cost of from $90 to $100 per 1,000 feet BM to the cost of untreated lumber.

CONCLUSION

"1. The process whereby wood is chemically treated so that, while retaining in substantial degree the properties of natural wood it resists combustion when exposed to great heat, has been brought to a high degree of efficiency. Those engaged in the industry are to be encouraged to continue its development. In its present stage the processes now recognized, while not preventing the consuming of the wood at temperature which 'incombustible' materials permitted by the Multiple Dwelling Law withstand, effectively prevent the spread of fire. Moreover, the vaporizing of the chemicals with which the wood is impregnated in the presence of heat, tends to lessen the fire hazard in the vicinity of the fireproof wood.

DOOR A was a solid wood door having a fireproof birch core 11/8" thick, with 1/4" veneer of fireproofed plywood on both sides. The door jamb was made of 3/8" fireproof birch.

WHAT HAPPENED

No smoke, flames or discoloration appeared on the outside of this door for 74 minutes of fire application, when several charred spots became visible on the outer surface of the panel. These spots quickly enlarged, and at 751/2 minutes of firing, flames broke through the panel.

WHAT WAS LEFT

After a fire application period of 751/2 minutes the flames broke through the door and consumed practically all of what remained of the door. This door had effectively resisted the application of fire, the temperature of which on one side of the door was 1,497° Fahr. 30 minutes after the test was started and averaged above 1,750° Fahr. for the remainder of the test. No smoke or flames passed through the door, and the temperature on the surface not exposed to the fire reached only 171° Fahr. after one hour and 12 minutes of fire application.

DOOR A was a solid wood door having a fireproof birch core 11/8" thick, with 1/4" veneer of fireproofed plywood on both sides. The door jamb was made of 3/8" fireproof birch.
DOOR B was a furniture steel door with Underwriters' Laboratories label, mounted in a steel door frame labeled "Underwriters' Laboratories Inspected Metal Door Frame, etc." The stiles and top rails were 4½" wide, the bottom rail was 9½" wide, all 1½" thick. The panel consisted of a ½" thick asbestos sheet covered with 0.042" thick sheet metal. The stiles and rails were filled with wood cores covered with 0.042" thick sheet metal. A pressed steel moulding .055" thick was used between the panel and the stiles and rails.

WHAT HAPPENED

After five minutes of fire application smoke appeared on the outside of this door. The smoke rapidly increased in volume and quickly filled the chamber built around the door. After 17 minutes of firing the volume of the smoke decreased somewhat. The door had warped outward about ⅛ inch at the top and the bottom. At 18 minutes of firing the gases generated from the wooden core in the stiles and rails caught fire and were burning with a 6-inch flame between the door panel and the top rail. The flames disappeared after a minute, but reappeared again intermittently after 30 minutes of firing and in much greater volume after 40 minutes of firing. At this time the door had warped outward about 7½ inches at the top. From then on up to the end of the test, flames from 4 to 8 inches in length covered the door at the junction of the center panel and the stiles. The fire was extinguished after 76 minutes of fire application.

WHAT WAS LEFT

After a fire application period lasting 75½ minutes, the door appeared to be still intact. A more careful examination showed that this door had warped to such an extent that it could no longer be closed. The metal sheets comprising the panel had separated from the stiles and rails as much as ⅛ of an inch in some places. All the stiles and rails were bowed. The door casing was still in fair condition. The asbestos sheet in the panel was discolored but intact. The wood filling in the rails and stiles was entirely charred and partially consumed; its strength was entirely gone.

DOOR C was a Kalamein door having 4½" wide stiles and top rail and 10" wide bottom rail. The door panel consisted of a single metal sheet 0.0072" thick, wood core encased in 0.025" thick sheet metal. The moulding consisted of a wooden core covered with a pressed sheet-steel moulding. The door was mounted in a substantial Kalamein frame.

WHAT HAPPENED

Three minutes after fire was started, smoke appeared in considerable volume along the mouldings. The door had warped outward at the top. A bundle of excelsior suspended directly in front of the panel caught fire after 3½ minutes of firing. The gases distilled from the wooden core in the stiles and rails burned freely on the outer surface of the door after 8 minutes of firing, and after 16 minutes of firing the entire door was enveloped in flames, and the test was discontinued.

WHAT WAS LEFT

The solid steel panel of this door which had been subjected to only 16 minutes of fire had warped, and the door could not be closed. The steel plate had entirely separated from the top rail, leaving a clear opening of about ½ of an inch in width. The connections between the rails and stiles were broken completely. The stiles were bowed outward at mid-height. The wooden filler in the stiles and rails was partially consumed, and what remained was completely charred.
2. While several instances of apparent diminution of fire-resistant properties with the passage of time were noted, the properly treated fireproof wood appears to retain those properties effectively.

3. The working of chemicals to the surface of the wood with consequent impairment of finishes has been noted in some cases, but this has not been characteristic where proper methods of processing and kiln drying were used, and where the wood had not been exposed to moisture. In properly treated wood there is no corrosive effect on metals or glue. Darkening of wood is an incident to all types of chemical impregnation. The degree of darkening varies proportionately to the rapidity of kiln drying.

4. There is no way of ascertaining, by any test now used, the uniformity with which a given piece of lumber has been impregnated. Samples cut at random from any piece of lumber may show greater or less resistance than the average resistance of the whole piece. Samples of the same species submitted by different manufacturers showed marked differences in fire resistance. Samples of different woods from the same manufacturer showed marked variations in fire resistance. Laboratory tests is necessary to determine whether the lumber actually furnished on the job approximates required standards. Visual inspection is useless.

5. A variety of wood fireproofing processes is used. They are not, for the most part, susceptible of control by an enforcing government department. All but one are secret. But the standard tests are sufficient to insure a high degree of average fire resistance. For the compilation of information useful in connection with future research, such tests should be made by the enforcing departments at intervals of five years.

6. The limited use of natural wood now permitted by the Multiple Dwelling Law in fireproof multiple dwellings involves a fire hazard so imperceptible as to be incapable of definition. For all practical purposes it involves no fire hazard whatever.

7. The cost of fireproofing natural woods ranges from 36 per cent (for walnut) to 312 per cent (for shortleaf pine) of the cost of the same woods untreated. There is an additional differential for milling and installation. The untreated woods are easier to work and lighter in weight.

8. Fireproof wood should not be required in place of any natural untreated wood not permitted under the Multiple Dwelling Law.

9. The extension of the use of wood in fireproof multiple dwellings has been urged in order to secure greater range of materials and variety of design. The use of unprocessed wood within apartments for underflooring, saddles of doors, kitchen dressers, cabinets, wardrobes and interior trim of windows may be safely permitted. Further extension, while of somewhat doubtful wisdom if natural untreated wood is to be used, may be safely allowed by statute if the wood is processed to the extent required by standard tests.

10. Such extension is predicated upon the condition that the wood, when used for finish, is backed against incombustible material. Under such circumstances it is recommended that, in fireproof multiple dwellings, regardless of height, the use of fireproof wood be permitted within apartments for chair rails, decorative wall paneling, baseboards, moldings and other interior finish, shelving and fireplace mantels; and that decorative wall paneling of fireproof wood be permitted in the main entrance halls of fireproof multiple dwellings when backed against incombustible materials.

11. Windows with their frames and sash, when required to be fireproof, may be of fireproof wood. Such frames and casings will resist high temperatures long after the window glass, however reinforced, is destroyed.

12. Doors of fireproof wood, properly constructed, offer sufficiently effective resistance to fire for all practical purposes and resistance to smoke superior to types now permitted under the Multiple Dwelling Law. It is recommended that doors and their jambs and casings of materials and construction which shall have withstood successfully a one-hour standard fire test in a manner approved by the enforcing department, be accepted as fireproof doors wherever these are required by the Multiple Dwelling Law.

13. When fireproof wood is furnished on the job, it should be labeled or stamped with the name of the manufacturers and year of manufacture in accordance with the rules of the enforcing department, thereby minimizing the possibility of substitution of sub-standard material.

14. Should deterioration tests, periodically made subsequent to installation, reveal diminution of fire or smoke resistance below the standard at date of installation, the equipment should be condemned and its replacement with a standard product required." This report is especially significant inasmuch as it was approved unanimously by the members of the special committee, after careful and judicial consideration of the evidence secured and presented.

NOTE
The examination of the three doors tested was made in the presence of Mr. Cohen of the Bureau of Buildings of the City of New York. These tests were made by these men of the staff of the Testing Laboratories: Albia H. Bayer, Director of Testing; William J. Krefeld, Engineer of Tests; Donald M. Burnmaster, Assistant Test Engineer; John J. Sheota, Assistant Test Engineer.
CONCRETE, STONE AND STEEL

St. Madeleine Sophie's Parish School and Chapel at Germantown, Pa. The general design of this building is illustrated on pages 167 to 172 in Part I of this issue.

HENRY A. DAGIT & SONS
ARCHITECTS

The problem of the structural design of the parish school and chapel of St. Madeleine Sophie was simple, and the solution straightforward. The program called for a school, a chapel and an auditorium to meet the needs of a modern Catholic parish in a suburban location. The T-plan frankly displays the classrooms in the forward wings. The entrance from the street in the center of the facade gives direct access to the central wing in the rear, which includes the chapel on the first floor level and the auditorium on the basement level below it. The slope of the site brings the grade level slightly above the chapel floor on one side and at the level of the basement floor on the other. This permits fenestration along one side to light the auditorium.

Fireproof construction is employed throughout, and ferro-concrete was chosen because of its plastic possibilities, its economy and its durability. The arches of the chapel are 15 feet on centers and have a 46-foot span. The arches have imitation stone joints where, exposed on the interior and on the exterior, the concrete buttresses are completely concealed in a random ashlar veneer. Concrete purlins from arch to arch support the flat slabs of the roof. Two-inch sheathing was nailed to sleepers which run parallel to the rakes of the roof and the slate was nailed to the sheathing.

In making the forms for the arches and roof, holes in the sheathing were left every 5 feet up the roof. A chute above the peak of the roof was used to convey the concrete to each arch and bay. When the concrete filled the first 5 feet of the forms, the openings were sheathed in and the chute was drawn up to the next series of holes. After the forms were removed, the slabs between the purlins were painted a light tone and the purlins decorated in polychrome. The concrete of the arches was left in its natural state. A reproduction of the working drawing of the concrete arches of the chapel is shown on the next page.

A view of the finished interior. The arches are concrete but the window jambs and muntins are of stone. Below— a progress photograph, showing the main arch forming
A few typical details of the structure. The walls are independent of the frame, and are faced with ashlar.

HENRY A. DAGIT & SONS
ARCHITECTS

ST. MADELEINE SOPHIE'S PARISH SCHOOL AND CHAPEL
LIKE other factors of a finished nature, wood trim, both the material and its treatment, is supposed to correspond with approved samples. A superintendent must make himself more or less familiar with the various woods so used, both "in the white" (unfinished and unstained), and after the application of the different kinds of filling, staining, oiling, shellacking, waxing, varnishing, priming, painting, etc. His activities relating to Finish Carpentry are summed up in terms of general oversight, rather than general interference, at least until the wood trim is actually in process of being installed. His inspection will determine if it is the kind and quality of wood called for; if it is moulded and carved in accordance with details and models, or in conformity with stock designs mentioned; if it is thoroughly dry, and free from warp or other imperfections, due to manufacture, storage or handling.

Yellow pine or fir, at the option of the contractor, was to be used for trim in the basement and gymnasiums, except that gum or birch (for enameling) was specified for all toilets and bathrooms. Oak was to be used everywhere else,—quarter-sawn in vestibules, entrance halls, general office, board room and library, and plain-sawed in other locations. Hardwood doors were to have veneered stiles, rails and panels; other doors to have veneered panels and solid stiles and rails, except that the majority of doors in all corridors were to have glass panels.

VENEERS

The general run of present-day veneer stock is cut from the log by the rotary process, and is about 1/30 to 1/16 inch thick. It is formed into 3- and 5-ply sheets (termed "plywood" by the trade) of varying thicknesses for panels, and is applied over cores of softwood to form stiles and rails. Panels may be set flush with stiles and rails on each side to form "flush-veneered" or "slab" doors. Where doors occur between rooms having different wood trim, they are commonly made (if so specified) with the two faces different, to correspond with both kinds of trim. Some architects object to the pattern of the grain in rotary-cut veneer, and insist upon something better in their higher grade work. Such specifications may call for a minimum thickness of \( \frac{3}{8} \) inch or more for all veneers, with "grain selected for its special beauty," in which case a criterion must be established by approved samples.

TRIM INSTALLATION

Installation of wood trim in the school building was started in rooms in the third story on the first Monday after the plasterers had vacated the basement,—a week behind the schedule. This was to be made up, and it was evident that the general foreman and superintendent would have their hands full weeding out poor mechanics from the rush crew of "finishers." Oddly enough they had more trouble with the cheaper trim than with the oak and birch. Mechanics seem to allow their lack of respect for softwoods to reflect itself in tool-marks and other signs of carelessness. After the removal of a few casings, on which the round impress of the hammerhead showed over nearly every nail, the foreman learned to be his own inspector, much to the relief of the superintendent. Perfection of mitered and coped joints was also insisted upon, as was the use of none but long pieces of room mould, though the foreman, at first, appeared to think that this injunction in the specifications meant nothing when applied to a school house. The superintendent also gave close attention to the subject of grounds for base, chair rail, picture moulding, wainscot cap and blackboard trim. Secure nailing for door trim was provided by bucks and finished jambs, but all other grounds had been specially provided, and had been gone over in detail ahead of plastering. Nevertheless, several instances were found of grounds being insufficiently secure for attachment of trim, demanding correction.

Adequate anchorage must also be provided for all manner of wood partitions, wainscoting, wall handrails, counters and the like. In high class work, these and the wood stairs are included in the Cabinet Work, and brought to the site, all or partly assembled. For these, the mill man sends a mechanic to the building for measurements as soon as the planes of plaster surfaces can be determined, and (for stairs) when floor levels have been established. Provisions are made for the absorption of minor discrepancies, but anything of a serious nature must be corrected. For this, there should be no one but the affected contractor responsible.

The countless details in connection with the
finish carpentry and cabinet work of any sizable building may appear staggering to a young inspector, but he has only to see that proper materials are supplied, that they are correctly installed, and duly cared for until final acceptance. Adequate inspection implies a knowledge on the part of the inspector of certain fundamentals of the woodworking trades. He should know whether joints are to be butchered, coped, mitered, halved, housed, tenoned, keyed or dovetailed; whether they are to be nailed, bradded, screwed, bolted, doweled, glued, white-headed, clamped or otherwise reinforced; perhaps left so as to slip and allow for shrinkage.

Nails and brads for finish woodwork have small heads, which are supposed to be driven in (set) about % inch below the finished surface of the wood, and the hole puttied, so as to be practically invisible when varnished or painted over. Since one can never be sure that perfection in this particular will be attained, all face-nailing of high class cabinetwork is forbidden, the joints being glued or secured with concealed fastenings. Where screw heads are to be exposed, they should be round or oval, and fitted with washers. All nails, screws, bolts and similar fastening devices are included in the regular contract for Finish Carpentry, except that screws and washers, if required for window stops or for items of Finish Hardware, are included with such hardware. For window stops, there should be a sufficient number to be spaced about 10 inches apart. They are seldom used for doors because, in such a location, they may be considered a menace to furniture and clothing.

WOOD FLOORS

Selection of types of wood floors by the architect or specification writer is governed by their location, expected service, desired appearance, and other factors. For the porch of a modest cottage, one uses a single thickness of softwood, preferably with no butt joints, and depends upon its being occasionally painted. If hard wear is anticipated, the flooring should be of quartersawn fir or yellow pine, or something else as good. But it is to be remembered that yellow pine is likely to shrink, with resultant open cracks.

Softwood flooring is also used, over a sub-floor, for interior work, where it is intended to lay parquetry, linoleum, carpet, or other covering. For direct wear and where good appearance is to be considered, higher grade wood flooring may be indicated. Heavy-duty wood floors are either of thick long-lived materials, such as paving blocks, or of boards 2½/32 to 1½ inches thick, so laid that aisles and other areas subjected to maximum wear are readily replaceable. In warehouse and factory construction, such boards are generally "jointed" (square-edged), since the wear over a matched joint would eventually work down to the tongue-and-groove, and start splintering, whereas a good square-edged maple, beech or vertical-grain pine board can wear nearly through without going to pieces. Block flooring is generally side-and-end-matched and laid with a filler in the joints, either over a wood subfloor or in mastic applied to a well cleansed dry concrete slab, rough or smooth, but fairly even. For high class work, similar floors are supplied in the better woods, laid in various patterns, with tight joints, and dependent entirely upon the mastic for adhesion.

The woods most commonly used for flooring of the better class are oak, maple, birch and beech. Oak flooring may be either plain- or quarter-sawn, white or red. The names of the grades of the flooring just mentioned have recently been simplified to First, Second and Third, with an additional grade in quarter-sawn oak known as First Grade Sap, and a Fourth grade in the cheaper quality of oak. Yellow pine and fir flooring are supplied in both plain- and quartersawn. Stock face widths are 2½ and 3½ inches; thicknesses, 13/16 inch; either side-matched or square-edged. The latter can also be had in thicker stock. Some manufacturers of softwood flooring are producing it, likewise, with end-matching. The factory grading of wood flooring may be assumed to be dependable as represented, and yet the superintendent has no assurance that the material will reach the building in that state. Either the dealer or contractor can mix the grades, or practice other substitutions. The architect's man is on the site to detect this, if possible, before any flooring is laid, and hence familiarity with grading rules is an essential part of a superintendent's education. For grading rules of various softwood finish and flooring, the reader is referred to the publications of the different lumber associations and to the U. S. Bureau of Standards' "Simplified Practice Recommendation No. 16," issued by the Government Printing Office, Washington (15c).

LAYING FLOORS

When flooring is to be laid directly on wood subfloors, each area should first be tested to make sure that it offers level and solid bearing throughout. Noisy and creaky wood floors are due to oversights at this stage, and to insufficient nailing,—nails either too short or too few. The material in a wood subfloor is not supposed to be good, but it should be good enough for its functions, which are (1) to serve as a temporary floor.
during construction operations; (2) to support and reinforce the finished floor and to provide good nailing therefor; and (3) to act as a foundation for the spread of insulating materials. The character of boards suitable for this purpose, and the proper method of their laying were discussed in Chapter 19, "Structural Carpentry." Although they may have been duly inspected when laid, they must be reinspected before being covered. Subflooring is subjected to a lot of mis-treatment, especially in frame buildings and over pipe locations, and hence may need much solid repairing in order to pass final inspection. Holes and splinterings must be cut out, with cuts along the centers of bearings, not between them, as is easiest.

After the subfloor is pronounced "O. K.," it is covered with a hard-surfaced black waterproof paper, well lapped, free from torn places, and turned up at all edges. This serves the dual purpose of insulation and the retention of scrub water, in case of slight seepage, and hence ordinary rosin-sized building paper is not appropriate for the purpose. If additional insulation is called for, the waterproof paper should not be omitted, though it cannot be demanded unless specified. Finish flooring may be laid directly on the paper or other insulation, or on wood strips laid at intervals of 12 inches, at right angles to the run of joists. The flooring must be driven up close and nailed in the angle, just over the tongue, once every 12 inches, with flooring nails of a size suited to the thickness of the flooring. Only flooring 25/32 inch and thicker should be laid directly on joists, strips or sleepers. If flooring is end-matched and the supports are not more than 12 inches on centers, it is not essential that the joints occur exactly over bearings, but unmatched ends should never be permitted between bearings. Matched flooring less than 25/32 inch thick should always lie directly on the subfloor or insulation, without intervening air space. Parquetry (also called "parquet") and other thin square-edged stock that requires face-bradding should be laid only over double flooring, since the slight springing of subfloor boards between bearings might cause the brads to work loose.

FLOORS OVER CONCRETE

Where flooring is to be laid on sleepers attached to or embedded in concrete, one cannot be too cautious about the condition of the concrete at the time the flooring is laid. It should be thoroughly dry and, if filled in between sleepers, should have been struck off ¼ inch below their top surfaces to avoid contact between concrete and flooring. If the concrete slab rests on the ground, additional precautions must be taken. First, the slab should be waterproof. Even so, it will "draw damp" from the basement air, and hence should be overlaid with waterproof paper on top of the sleepers, and the underside of the flooring be oiled or painted. If one does not adopt all such preventive measures, one may find the finish flooring in such locations swelling and wavy. This is especially true of the close-grained woods, such as maple.

Grooved blocks (pieces of the flooring) should always be used in driving up the matched flooring. If driven by direct application of the hammer, the marks of the head are likely to show along the joints, or the tongues may be so mashed as to prevent close fit with the next grooves. Expert nailing is also needed, to eliminate the edge marks of final blows, the sure sign of work of the poor floor mechanic. These defects are particularly noticeable in softwood floors, and the young inspector may be assured most positively that they are unavoidable, by even the best of carpenters. He is not to believe any such statement. Good carpenters can do good work, if the contract is of a character to demand it. All joints should be well broken (staggered) and not in observable alignment. Short pieces of flooring should be used, as far as possible, in closets, storerooms and small alcoves, and at the wall ends of each alternate run,—never conspicuously placed, in good work. Flooring should run under the base to the face of plaster in all cases, and continuously through doorways, unless thresholds or changes of material intervene. But these refinements should be specified, if they are to be insisted upon.

SPECIAL WOOD FLOORS

In addition to the regular types of hardwood flooring, there are many of special types to be had, in the woods already named, and in mahogany, walnut, chestnut, butternut, cedar, gum, rosewood, teak, etc. Some of these come in random widths to resemble planking, of varying thicknesses; and may be marked by keys, pegs or other features; for all of which the superintendent should have special details and directions to guide his inspection. He has also to deal with all manner of floor coverings, such as linoleum in sheets and tile patterns; cork carpet; cork; rubber and asphalt; mastic tiling, etc., with each of which he must make himself well acquainted, if he is to act as a competent judge of either the material or its use. For example, if a shipment of linoleum or corse carpet is received at the building, he should know that it must not be unrolled until it has remained in a heated room long enough for the temperature to have permeated the entire roll,—say 36 hours. If unrolled while cold, it is likely to crack, the blame for which will rest definitely on some responsible party.
CHAPTER 24—FINISH HARDWARE

A TYPICAL introductory paragraph to a specification for finish hardware reads:

"Under Finish Hardware shall be included all butts, hinges, hinge plates, lock-and-latch sets, door bolts, checks, pulls, push- and kick-plates and bars, holders, transom lifts, sash fasts, lifters, sockets, pivot centers, stop screws and washers, base knobs, etc., for all doors, transoms, windows and cabinet work, together with all screws, kegs, and bars, holders, transom lifts, sash fasts, lifters, base knobs, etc., for all doors, transoms, windows and cabinet work, together with all screws. Furthermore, the superintendent must know whose is the task to properly prepare all surfaces that are to be so covered. The lime compos- man may say that a particular area is neither clean enough nor dry enough nor smooth enough, and that he can't do a thing until it is made right. Maybe it is actually up to him to attend to these matters, but it is just as likely that someone else has left his work improperly finished and must come back and make good.

BLACKBOARDS AND TACKBOARDS

Blackboards are of slate or of some manufactured material especially prepared to receive chalk markings. If the manufactured article is specified, the specification writer must decide whose make and what grade (there being differences in quality and prices), and the superintendent should have the maker's description of what is contracted for, or its permissible substitute. Such boards are ¼ inch thick and in standard sizes up to 4 x 8 feet. The writing surfaces generally contain a certain amount of ground slate, and hence they are known as imitation slate, in distinction from the genuine slate boards. Slated cloth, fastened with tacks or paste, is also used for special purposes. Genuine slate for blackboards should be adequately specified, but it is frequently slighted, and hence the superintendent should know a few things about it in addition to knowing that exposed surfaces must be free from imperfections and be properly finished, and that due grounds and other setting details must be in accordance with drawings. Standard specifications provide that such slate shall be "not less than ¾ nor more than ¾ inch thick. A maximum deviation of 1/16 inch from this thickness will be permitted when an average thickness of at least ¾ inch is maintained." Sizes of slabs should be equalized fairly well throughout each continuous area, 5 feet being the maximum length if not otherwise agreed. If not fixed by law, ordinance or specification, one can properly use 2 feet for the height from floor to top of chalk rail in primary rooms, 2 feet, 6 inches in fourth, fifth and sixth grade rooms; and 3 feet for higher grades, including high schools and colleges. Slabs are 3 feet, 6 inches or 4 feet high, as called for.

Tackboards and bulletin boards are of specified materials, presumably definitely located and detailed, and adequately specified. If they are not, the superintendent must get precise instructions. His interest in window shades may extend anywhere from the ordinary spring roller type to Venetian blinds or the dark shades required for laboratories, lecture rooms and the like, where total light exclusion is demanded. He may also be called upon to pass judgment upon draperies,—even upon stage curtains and scenery. For any such, he must first gain a definite concept of what is supposed to be provided, then ascertain that all requirements have been satisfied and that every contrivance for operating parts is in proper working order. This may prove much more involved than it sounds. A superintendent must have acquired considerable experience before he dare consider himself fully capable of handling all such subjects to completion.
FITTING

Fitting a door, preparing it and its jambs for the application of hardware, is a task for an expert carpenter only. He must first make sure of the “swing” of the door, in order to know which jamb is to receive the butts. The door is first sawed (if necessary) to its approximate required size, care being taken that the original size is sufficiently near the ultimate so that the stiles and rails will not be spoiled in the trimming. This is of prime importance in veneered work, since the hardwood edgings may not be more than $\frac{3}{8}$ inch deep, and too much cutting would expose the softwood core. This should never be permitted. After a door has been sawed to its approximate size (care being taken that the outside stiles and top rail are kept of equal widths), its four edges are further reduced by skillful planing until it is about $\frac{3}{4}$ inch less in width than the distance between rabbets, and about $\frac{1}{4}$ inch less in height than the distance between threshold and head rabbet. If there is no threshold, the bottom of the door should be about $\frac{1}{2}$ inch above the floor, or a sufficient height to enable it to clear carpets and rugs. The front and back edges are beveled (the equivalent of $\frac{3}{8}$ inch in 2 inches) to enable the door to swing clear of its rabbets. Butts should be selected with due consideration for the projection of wainscot cap and other members, in order that the door can be opened at an angle of 180 degrees, if not located in a corner. In lieu of other instructions, the bottom of the lower butt can be placed 9 inches from the floor, and the top of the upper butt 7 inches from the head; and the intermediate butts (if any) equally spaced between. Location of cross rails is ignored in placing butts, except in the case of ornamental strap- or T-hinges.

Butts for doors have loose pins for convenience in removing, but the pins should be of a type that will not work up. Therefore, if the door factory may not provide the necessary boxes, the inspector will hear doors referred to as right- and left-hand, and hence should know that, when he stands facing a door that opens away from him, it is a right-hand door if hinged on the right, and a left-hand door if hinged on the left. If it opens toward him, the reverse is, of course, true. Non-reversible locks can be used only on doors of the “hand” for which they were intended.

TRANSOMS, ETC.

Unless otherwise provided, transom sash are of the same thickness as that of doors in the same jamb, and are of solid wood, seldom veneered. Unless supplied with hardware, they should be nailed or screwed in place. If intended to open, they may be hinged or pivoted, and made to operate with transom lifters, or supplied with one or two chain stays and a ring catch, to be operated with a pole and hook. If not otherwise stipulated, it is proper to hinge a transom at the bottom to open into a room away from the corridor. Fast-joint butts are used for hinged transoms, since loose pins would eventually work out.

Hardware for solid and hollow-metal doors is either of the standard supplied by the makers of the doors or may be purchased with the regular hardware and shipped to the door factory to be applied. Hardware for metal-covered doors is of the same nature as that for wood doors and applied in like manner, by carpenters at the job, who pierce the metal covering as may be necessary for screws and morticing.

FOR CASEMENTS AND DOUBLE DOORS

Hardware for French and casement windows is much the same as that for doors, though on a smaller scale. Due care must be exercised in seeing that the “backset” of the lock (distance from edge of door to center of keyhole) is such as will allow the trim of keyhole and knob sufficient room on the stile. Where hinged doors or casement sash occur in a pair in a single opening, one half, called the bolted or “dead” leaf, must be provided with head- and foot-bolts, either morticed or applied on the surface. The latter offer greater resistance to violence, since morticing cuts away a considerable portion of the stile. This factor should likewise be given due consideration when selecting bolts for double casement sash. Mortice bolts can be placed so as to operate either on the inner face or on the edge of the dead door. The latter method is used where it is desired that the opening be controlled by the key of the regular lock. Com-
bined head and foot bolts (double extension bolts) are to be had, either mortice or surface, operating together by means of a single handle. Exposed bolts of this type are called “cremone” or “cremorne,” and are plain or ornamental. Another variety, called “espagnolette,” is made to revolve, and is fitted with a hook at top and bottom, each of which engages with a fixed pin or socket. Strikes for head and foot bolts must be well anchored. This is a detail too frequently slighted, especially where those for foot bolts are set in concrete, stone, terrazzo or tile. They should be of a special type for the purpose, the best being a short section of pipe rigidly embedded. A hole cut in a metal threshold to receive the end of a bolt is also good.

The meeting stiles of double doors and casements may be rabbeted together, or the dead leaf provided with a full length stop, termed an “astragal.” If rabbeted, the lock must be one with a rabbeted face. If the door opening is one that is much used, neither rabbet nor astragal is needed. The latch may also be omitted, and each door, if single-acting, fitted with a check spring and a pull on one side, and a kick-plate and push-plate on the other. If double-acting, the kick-plates and push-plates are applied both sides. If locking is needed on such a pair, one leaf is provided with head and foot bolts and the other with a dead lock.

All doors in the line of egress from a panic or fire should open outward, and, if requiring locking, it should be in the form of a self-releasing or “panic bolt.” This feature is covered by law in some states and by ordinance in some cities, and hence must be known to both architect and superintendent. Rear store and basement doors frequently occur in obscure courts and alleys, and consequently need more security than is afforded by ordinary hardware, commensurate with the grille protection of adjoining windows. Such a door may be of metal, or of wood in two thicknesses with a sheet of metal between, and held close by means of a wood or metal bar, with ends resting in strong sockets. An ordinary glazed and paneled door in such a location provides easy ingress, even if locked, barred and bolted.

Special doors in infinite variety are provided for every purpose;—side-sliding, revolving, multiple-folding, horizontal-folding, vertical-sliding, overhead, etc., both hand- and power-operated. For each of these, the maker’s description and show drawings should be available. Also, in case of an installation at all complicated, the specifications should provide that the door and equipment must be installed by the manufacturers, or that they are to supervise the setting, and guarantee satisfactory operation.

KEYS

The matter of transfer of keys from contractor’s foreman to the architect’s representative is of much importance. Aside from a single key to the building and one each to the hardware and paint rooms, the superintendent should accept no keys until a formal acceptance of the entire lot is executed. On work of any size, a key drawer or cabinet is provided, and each pair or set of keys for each lock has its individual place therein. On lesser work the keys are mounted on a board or wire ring and so delivered; each one, in any case, tagged for identification. When the building is otherwise ready for final acceptance, the superintendent makes a careful check of all keys, sees that they are of the kind and number catalogued for each lock, and ascertains that there are none outstanding. Unless specifically empowered by the architect to do so, he avoids any overt act that would make either his employer or himself responsible for the keys after they have been checked over. Rather, he merely witnesses the transfer of the keys to the owner or his agent. Vault and safe combinations are even more delicate matters than keys. Their descriptions should be delivered under seal to the owner, or to the superintendent, who passes them on to the owner, with the seals unbroken.

CHAPTER 25—GLASS AND GLAZING

NEARLY all glass in a modern building is customarily included in a single glazing contract or subcontract. Exceptions to this are the glass of vault lights and skylights, though even the latter is sometimes found in a specification with other glass. However, if a skylight contractor is to guarantee his work or be otherwise responsible for it, he should be allowed to complete his installation, including glass. Other exceptions from a glazing contract are the glass in floors and wainscots, and in manufactured articles, such as cabinets and other furniture. The specifications for each of these should say clearly who is to supply the necessary glass, or, in case of doubt, the superintendent should have the question promptly settled.

PROPER PROTECTION

The glazing of skylights was covered in the chapter on Sheet Metal Work (Chapter 20).
The next appearance of glass at a building is likely to be that for exterior windows. The use of these for the purpose of enclosing the building for plastering was discussed in Chapter 23. The chief concern of the superintendent at this stage, on the subject of glass, is to see that proper measures shall be taken for protecting it and to see that there is a distinct understanding all round as to whose is the responsibility for caring for it. Apparently, the best practice makes the general contractor (if there be one) custodian of the glass until his contract work is accepted. In lieu of a general contractor, the duty should devolve upon that other contractor or party who may be responsible for the premises. He should be authorized to make charges for breakage or other glass damage against those known to have caused it; and to pro-rate all glass damage from unknown causes against those contractors (including the glazier) having work in the building at the time of the damage. These charges are ordinarily kept by the foreman in charge. The superintendent should have a clear understanding with him as to whether it is expected to collect the assessments direct, or if recourse will be had to the owner to deduct the amounts from contract prices. In the latter event, the superintendent, as the owner's representative, must make daily entry in his own record of all such charges, as reported by the foreman and duly verified. None but a day-by-day record can be considered truly authentic, and the foreman should be made to understand this most thoroughly. The superintendent may be given the task of keeping such record in the foreman's stead, and must proceed accordingly.

**DAMAGE RISKS**

The major damage to glass during the time of plastering is due to carelessness in handling scaffold plank, and to the splashing of plaster. To guard against the latter, it is well to have all such glass coated on the inside with a soft greasy soap (surgeon's soap) to which plaster will not adhere well. The use of whiting for such coating is not sufficiently protective. Men write on it and rub it off too easily, and dabs of plaster adhere. In a certain large office building, where the plasterer was required to remove plaster from the glass, a final inspection, after the glass had been re-cleaned by the glazing contractor, disclosed an alarming number of scratches, sufficient cause for rejection of a large percentage of the panes. The glass was plate, and hence the replacement cost was high. It was alleged that the glazer's cleaners had done the damage by the use of razor blades; but they were able to demonstrate that, as used, the blades never scratched. Careful investigation by the superintendent revealed that the plaster contractor's cleaners had used wood scrapers for removing the blobs of plaster, and that this had been the direct cause of the scratching, the penalty for which was thereupon assessed by the architect where it belonged. Thereafter that architect made it his practice to specify that all cleaning of glass should be in one contract, either that of the general contractor, the glazier, or of an independent window cleaning concern. He also provided that the same concern should smear the glass with surgeon's soap before plastering was started.

**INSPECTION**

There is little to be gained by an inspection of glass by the superintendent at the time of first glazing. It must be gone over in detail later,—and replacement is no more difficult toward the end of construction operations than at any other time. For intelligent inspection of a glass installation, a superintendent had best wait until it has all been cleaned, then fortify himself by means of a detailed examination of samples of all the glass included in his specifications. In our school building, plate glass was demanded for mirrors and for all vestibule doors, inside and out. Classroom doors had upper panels of chipped plate, with polished discs (requested by the principal, to enable one to survey the room from the corridor without disturbing the pupils). Transoms over corridor doors were glazed with D. S. A glass, as were adjoining openings, located over the blackboards for supplying "borrowed light" to corridors. Interior transoms were hinged, but other partition glass, including that around vestibule doors, in transoms and side lights, was set directly in stops, without sash. Aside from that in doors and skylights, all exterior glass was specified to be D. S. A. There are four regular grades of ordinary window glass known as "AA," "A," "B" and "C" grades, in each of which grades there are two thicknesses called "single-" and "double-strength," customarily termed "S. S." and "D. S." The best understanding of the grading of window glass is to be had from the United States Government Specifications:

"The defects permitted in 'A' quality are faint strings or lines, slight burn, small seeds, small blisters, and light scratches. No light shall contain all these defects, and those present may not be grouped when in the central area of the sheet."

"Strings, lines, or burn specks shall not be of such intensity that they are visible when observing the sheet at an angle greater than 30 degrees between the line of sight and the glass. Waves shall not be visible at an angle greater than 20 degrees with the glass. Blisters shall not exceed 1/4 in. in length unless they occur near the edge of the sheet."

"In general, the central area of the light shall
be practically free from defects, and the appearance of the light as a whole shall be such that there is no perceptible interference with the vision as long as one is not looking through the glass at an acute angle.

“A limited amount of glass, known as ‘AA’ quality, which is especially free from defects, is sometimes selected for special purposes and may be specified if desired. It must be borne in mind, however, that the total amount of ‘AA’ glass produced by the manufacturers does not exceed 3 per cent of the total amount of window glass made.

In general, ‘B’ quality has the same character of defects as ‘A’ quality, but they may be more numerous and heavier. They should not, however, be so numerous as to prevent a considerable portion of each light from being reasonably free from such defects.

“Glass must be cut to dimensions ordered with an allowable tolerance of 1/8-in. per 3/4-in. thickness.”

**THICKNESS AND WEIGHT**

As to thickness and weight of window glass, single-strength runs 10.5 to 12 lights per inch, and has an average weight of 18.5 oz. per sq. ft. Double-strength runs 8 to 9 lights per inch and weighs about 24.5 oz. Heavier thicknesses of window glass are known as “26-oz.” (7.5 to 8 lights per inch), “29-oz.” (6.5 to 7 lights per inch), “34-oz.” (6 to 6.5 lights per inch) and “39-oz.”, which is $\frac{3}{8}$ in. thick. These four thicknesses are called “Crystal Sheet Window Glass.” 26-oz. and 29-oz. glass are produced only in ‘A’ and ‘B’ qualities. 34-oz. and 39-oz. glass are produced in glazing and auto qualities.” ‘C’ grade is a “glass of inferior quality but not containing stones, heavy cords, or other imperfections serious enough to cause breakage in shipment.” Other grades are: “Fourth Quality.—contains such defects as eliminate it from ‘B’ quality standard, but too good to be branded ‘C’; Steel Sash,—specially selected for the requirements of this class of work. Defects so located as not to obstruct light transmission; and Greenhouse,—a special quality selected with reference to the elimination of defects injurious to growing plants.”

Standard sizes of window glass are in multiples of 2 in. up to 40 x 50 in. for single-strength, 60 x 80 in. for double-strength, and 78 x 120 in. in heavier sheets. Sheets of intermediate sizes are deemed fractional and may be charged for at the rate applying to the next larger regular size with, ordinarily, no extra charge for cutting.

To be continued in The Architectural Forum for April

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NOTE: Referring to Chapter 21, “Furring, Lathing and Plastering,” of this series on “The Supervision of Construction Operations,” the attention of the author has been called to certain changes that have been made in the recommendations of the Associated Metal Lath Manufacturers since the said chapter (which appeared in the November, 1930, number of The Architectural Forum) was written. These changes are incorporated in the 1929 edition of the association’s publication, “Metal Lath Construction for Better Plastering and Stucco.” The chief variations from the author’s text (see page 622) are in limiting the use of 2.2-lb. lath to solid partitions, using a minimum weight of 2.5-lb. for other 12” stud-spacing; cutting down the permissible spacing of 3.4-lb. lath supports in ceilings to 19″; limiting the spacing of supports for $\frac{3}{4}$" pencil rods in ceilings to 19” centers; confining the term “running-bars” to the larger members in ceiling construction; and making the sizes of pencil-rods dependent upon their own spacing as well as upon that of their supporting members. The spacing of furring channels for ceilings is also made dependent upon that of their supporting members as well as upon the weight or area of the plaster carried. The general tendency of this latter requirement is to make the assembly of the metal lath and supporting steel stronger and more rigid.

Referring also to the discussion on page 653 of the same issue on the subject of attaching metal lath to masonry, the attention of the reader is called to the fact that the new hardened masonry nails now available have largely eliminated the need for wood nailing strips. It is possible to drive them into almost anything except terrazzo, marble or granite, and lathers may use them freely for attaching metal-lath or corner-beads to concrete or other masonry.

It is important that a specification writer, before tackling this subject, should familiarize himself with the latest literature of the association (including the “Partition Handbook”) which can be had by application to the Commissioner, 1821 Engineering Building, Chicago, Ill.
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For data see our pages in "Sweets"

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A PISTON TYPE FLUSH VALVE is not as good as a DIAPHRAGM TYPE

Architect—Do you mean to tell me that you make a piston type flush valve but you don’t recommend it?

Salesman—That’s exactly what I mean. We make a piston type flush valve—the best valve of its type that years of experience have taught us how to make. It has features that no other similar valve has. It is made of the finest materials, and the workmanship is unexcelled. In fact, I know of no other piston type valve that can compare with our "Jewel". Yet, I do not recommend it in comparison with a Watrous diaphragm flush valve.

Architect—Why not?

Salesman—Because even the very finest piston type valve is used only where a low-cost job is wanted—where price is the consideration rather than continuous, efficient performance.

Every piston type valve uses cup-leather in the mechanism. As you know, cup-leather is not as lasting under water as is a rubber diaphragm. Besides, there is always a certain amount of water slippage past a cup-leather and this affects the quantity of water delivered at each operation.

If you are compelled to use a piston type valve, I can show you a dozen reasons why you should choose the Jewel. But where you want a flush valve that will give uninterrupted, efficient, economical service over a long period of time, by all means install the Watrous diaphragm flush valve. It is unquestionably the most satisfactory flush valve made.

Watrous DIAPHRAGM FLUSH VALVES

The Watrous Diaphragm Flush Valve is a diaphragm type valve with outside regulation without restricting the water way.

It will work in combination with any type of closet bowl and will deliver exactly the proper quantity of water required by each bowl—no more and no less. Thus, efficient sanitation is assured and water waste is eliminated.

The Watrous guarantee is backed by an organization with ample financial resources and a commercial rating of AAA1.

THE IMPERIAL BRASS MANUFACTURING CO.
1238 WEST HARRISON STREET
CHICAGO, ILLINOIS
Seldom a Fall and... NEVER A SPLINTER

THIS illustrates a Bloxonend Floor in the gymnasium of the West Senior High School, Green Bay, Wis. C. C. Reynolds, Architect.

Tough End-grain up

A gymnasium floor of Bloxonend minimizes falls and speeds up gymnastics and games because it provides a sure, safe footing. The end-grain fibres form its surface, positively eliminating the hazard of splinters. The floor is long-lived, resilient, sound-absorbing, takes an excellent finish and stays smooth. Powdered boric acid (easily removed with a damp cloth) makes it just right for dancing. Specified by leading architects for gymnasiums, shops and the better type industrial plants.

BLOXONEND comes to the job in 8 ft. lengths with small tough blocks of Yellow Pine dovetailed endwise onto base-boards. The end-grain fibres form the wearing surface.

Sample and Specifications on Request

CARTER
BLOXONEND FLOORING COMPANY
KANSAS CITY, MISSOURI

Branches in Leading Cities—See Sweet's

The Bull Dog Method Saves Time and Labor

STEP ONE—PLACING CLIPS. Note how easily clips are placed in exactly proper position. Single or double guide board insures correct alignment.

The Bull Dog Method of anchoring wood floors over concrete saves valuable construction time. No fill to dry—no beveling or shimming—sleepers and finished floor are laid at one time.

Other reasons for using The Bull Dog Process are: elimination of dry rot, doubling floor life; reduction of dead load 18,000 lbs. to 1,000 square feet of slab area; permanent and secure sleeper anchorage, preventing buckling, squeaking and doming. The Junior Clip (1/4" wide) may be used with or without a fill (special sizes to order) on the service duty of the floor.) When a fill between the sleepers is desired, any cheap, inexpensive mix such as sand, cinders or cinder concrete can be used.

Millions of BULL DOG FLOOR CLIPS on over 8,000 jobs carry testimony of satisfaction. Made for 2, 3 and 4 inch sleepers. Regular and Junior Styles. Friction tight nailing facilities (nails gratis.) Write for catalog and samples.

THE BULL DOG FLOOR CLIP CO.
108 N. First Ave., Winterset, Ia.
135 Representatives—15 Warehouse Stocks

BULL DOG Floor Clips

REGULAR CLIP—3 sizes, 2, 3 and 4 in. 20 gauge galvanized iron.

JUNIOR CLIP—3 sizes, 2, 3 and 4 in. 18 gauge galvanized iron.

The Bull Dog Buck Anchor

THE Bull Dog Buck Anchor forms a rigid truss in the mortar joint which prevents the movement of the buck in any direction. It eliminates the use of nails, screws, bolts, tie-wires, strips of metal lath and iron, and all pounding against the back sides of the buck. Made in three widths of No. 10 Galvanized Steel Wire: 3 in., 4 in., 6 in. Ten per cent of anchors in packing cases are shorts to take care of spaces too short for the regular size anchor.
OUR CONTRIBUTION TO THE ART OF HEATING AND VENTILATION

The Herman Nelson Wedge Core Radiator is an exclusive feature of all Herman Nelson Heating and Ventilating Products and accounts for their satisfactory performance.

THE HERMAN NELSON CORPORATION MOLINE ILLINOIS
The Univent is the connecting link...

Hand in hand with the nation's educators, the architect is fitting America's youth for the progress of the future. In planning schools, he plans environment in which young bodies and minds can find sound growth.

Aware of his great responsibility—and of his privilege—the architect is becoming more and more insistent upon genuine Univent Ventilation for the schoolroom. For he has found that its results cannot be duplicated by any other system.

The Univent now brings outdoor air into the room—cleans it—tempers it—and distributes it to each occupant of the room with gentle, invigorating air motion, but without drafts.

When you specify Univent Ventilation, you endorse a system not only designed according to the most advanced principles of engineering and hygiene, but one which reduces operation and maintenance costs to the minimum.

Univent Ventilation is applicable to offices, hospitals and all buildings requiring thorough ventilation. Upon request, we will send you our architects' and engineers' edition of "Univent Ventilation."

THE HERMAN NELSON CORPORATION

*Manufacturers of the Univent, for the ventilation of schools, offices, churches and all buildings having an acute ventilating problem - the Herman Nelson Invisible Radiator, for residences, apartments, hotels, offices, and institutional structures - the Herman Nelson Air-Heater, for economical distribution of heat in factories, mills, garages, warehouses, and smaller buildings.
Selected List of Manufacturers' Publications

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

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

ACOUSTICS

R. C. Guastavino Co., 40 Court Street, Boston.
Guastavino Plaster. Brochure, 6 pp., 85/4 x 11 ins. Illustrated.

John Van Range Co., Cincinnati.
Practical Planning for Church Food Service. Booklet, 32 pp., 85/4 x 11 ins. Illustrated.

CONSTRUCTION, FIREPROOF


CONSTRUCTION, STONE AND TERRA COTTA

Cowing Pressure Relieving Joint Company, 100 North Wells St., Chicago, Ill.
Pressure Relieving Joint for Buildings of Stone, Terra Cotta or Marble. Booklet, 16 pp., 85/4 x 11 ins. Illustrated. Deals with preventing cracks, spalls and breaks.

Dampproofing

Minwax Company, Inc., 11 West 42nd St., New York.
Complete Index of all Minwax Products. Folder, 6 pp., 85/4 x 11 ins. Illustrated. Complete description and detailed specifications.

TOCH BROTHERS, New York, Chicago, Los Angeles.
Handbook of Heavy W. Protective Products. Booklet, 49 pp., 85/4 x 7 1/2 ins.

DOORS

The Kawneer Company, Niles, Michigan.

DOORS AND TRIM, METAL

The American Brass Company, Waterbury, Conn.
Anamid Architectural Bronze Extruded Shapes. Brochure, 180 pp., 85/4 x 11 ins., illustrating and describing more than 2,000 standard bronze shapes of cornices, jambs castings, moldings, etc.

Kawneer Company, Inc., 11 West 42nd St., New York.
Bayley Tubular Steel Doors. Brochure, 16 pp., 85/4 x 11 ins.

Kalman Steel Company, Chicago, Ill.
Finishing Door Overlays, A.1.A. File holder with 20 loose-leaf sheets of details and specifications.

The Kawneer Company, Niles, Michigan.

Fire-Doors and Hardware. Booklet, 85/4 x 11 ins., 7 pp. Illustrated. Describes entire line of tin-clad and corrugated fire doors, complete with automatic closers, track hangers and all the latest equipment—all approved and labeled by Underwriters' Laboratories.

Truscon Steel Company, Youngstown, Ohio.
Copper Alloy Steel Doors. Catalog 110. Booklet, 48 pp., 85/4 x 11 ins. Illustrated.

DOORS, SOUNDPROOF

Irving Hamlin, Evanston, Ill.
The Evanston Soundproof Door. Folder, 8 pp., 85/4 x 11 ins. Illustrated. Deals with a valuable type of door.

DRAINAGE FITTINGS


Jossam New Saw Tooth Roof Drain. Folder, 4 pp., 85/4 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.
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—Continued from page 111

DUMBWAITERS
Sedgwick Machine Works, 151 West 15th St., New York, N. Y. Catalog and Service Sheets. Standard specifications, plans, and prices for various types, etc. 464 x 84 ins., 60 pp. Illustrated. Catalog and pamphlets, 8½ x 11 ins. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT


The Bryant Home of Ideas. Contains data and suggestions useful in connection with residence wiring. 8½ x 10½ ins. 16 pp.

"K-VEX" and "K-OX" Bulletin No. 5129. Contains data and specifications pertaining to devices for use in connection with the harnessing of lighting fixtures, making such fixtures portable or removable, soldered joints being eliminated. 8½ x 10½ ins. 6 pp.


Hospital Signal Devices. Bulletin HS-1023. Magnetic Control Type. 8½ x 10½ ins. Illustrated. Be sure to see the complete line of "Ideal" elevator hardware and checking devices, also automatic safety devices.


The House of a Hundred Comforts. Booklet, 40 pp., 8½ x 10½ ins. Illustrated. Discusses the importance of adequate wiring.


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


Electrical Equipment for Heating and Ventilating Systems. Booklet, 24 pp., 8½ x 11 ins. Illustrated. This is "Motor Applications 1927." Time is money.


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

Electric Range Book for Architects (A. I. A. Standard Classification 31 G-6). Booklet, 24 pp., 8½ x 11 ins. Illustrated. Catalog of apparatus for complete line of various types.

Westinghouse Commercial Cooking Equipment (Catalog 208). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Equipment for cooking on a large scale.

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

ELEVATORS
Otis Elevator Company, 260 Eleventh Ave., New York, New York. Catalog and descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.

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

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


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.

ELEVATORS—Continued
Sedgwick Machine Works, 151 West 15th St., New York, N. Y. Catalog and descriptive pamphlets, 40 x 84 ins., 78 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.

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

ESCALATORS

FIREPROOFING


Face Tile Walls. Folder, 8½ x 11 ins. Illustrated.

National Tire and Rubber. Folder, 8½ x 11 ins. Illustrated.

Naco Double Shell Load Bearing Tile. Folder, 8½ x 11 ins. Illustrated.

FLOODLIGHTING

FLOOR HARDENERS (CHEMICAL)
Minwax Company, 11 West 43rd Street, New York, N. Y. Concrete Floor Treatments. Folder, 6 pp., 8½ x 11 ins. Illustrated.


FLOORS—STRUCTURAL

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

Data on flooring.

Service Sheet No. 3. Specifications and Details of Design and Construction for Gypsum Pre-cast Floors and Ceilings. Folder, 8½ x 11 ins. Illustrated.

FLOORING


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


Detailed Instructions for Handling and Laying Linoleum. Brochure, 40 pp., 3½ x 5½ ins. Illustrated.


Comparison of Tests. Folder, 8½ x 11 ins. Illustrated.
These
CHICAGO BUILDINGS
are Jennings-equipped

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<thead>
<tr>
<th>Number</th>
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<tbody>
<tr>
<td>1</td>
<td>Merchandise Mart</td>
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<tr>
<td>2</td>
<td>Chicago Daily News</td>
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<tr>
<td>3</td>
<td>Chicago Union Station</td>
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<td>4</td>
<td>Palmolive Bldg.</td>
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<td>5</td>
<td>Trustees System Service</td>
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<td>6</td>
<td>Willoughby Tower</td>
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<td>7</td>
<td>Mather Tower</td>
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<td>8</td>
<td>Chicago Evening Post</td>
</tr>
<tr>
<td>9</td>
<td>Engineers' Bldg.</td>
</tr>
<tr>
<td>10</td>
<td>Navy Pier</td>
</tr>
<tr>
<td>11</td>
<td>Carson, Firth, Scott &amp; Co.</td>
</tr>
<tr>
<td>12</td>
<td>Chicago Art Institute</td>
</tr>
<tr>
<td>13</td>
<td>First National Bank</td>
</tr>
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<td>14</td>
<td>Northwestern University</td>
</tr>
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<td>15</td>
<td>Drake Hotel</td>
</tr>
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<td>16</td>
<td>Allerton House</td>
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<td>Tribune Tower</td>
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<td>18</td>
<td>Chicago Temple</td>
</tr>
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<td>19</td>
<td>Hotel Sherman</td>
</tr>
<tr>
<td>20</td>
<td>Chicago Motor Club</td>
</tr>
<tr>
<td>21</td>
<td>Illinois Naval Reserve Armory</td>
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<tr>
<td>22</td>
<td>Standard Club</td>
</tr>
<tr>
<td>23</td>
<td>American Fore Bldg.</td>
</tr>
<tr>
<td>24</td>
<td>Goodman Theatre</td>
</tr>
<tr>
<td>25</td>
<td>Adams Express Bldg.</td>
</tr>
<tr>
<td>26</td>
<td>Ampico Hall</td>
</tr>
<tr>
<td>27</td>
<td>Boyce Bldg.</td>
</tr>
<tr>
<td>28</td>
<td>Buckingham Bldg.</td>
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<tr>
<td>29</td>
<td>Burnham Bldg.</td>
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<td>30</td>
<td>Central Life Insurance Co.</td>
</tr>
<tr>
<td>31</td>
<td>Chicago Trust Co.</td>
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<td>32</td>
<td>Chicago Club</td>
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<td>33</td>
<td>Chicago Engineers Club</td>
</tr>
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<td>34</td>
<td>Chicago Eye, Ear, Nose &amp; Throat Hosp.</td>
</tr>
<tr>
<td>35</td>
<td>Chicago Mercantile Exchange</td>
</tr>
<tr>
<td>36</td>
<td>Chicago Title &amp; Trust Co.</td>
</tr>
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<td>37</td>
<td>301 E. Delaware Ave.</td>
</tr>
<tr>
<td>38</td>
<td>Foreman Nat'l Bank</td>
</tr>
<tr>
<td>39</td>
<td>225 S. Franklin St. Bldg.</td>
</tr>
<tr>
<td>40</td>
<td>Furniture Exhibition Bldg.</td>
</tr>
<tr>
<td>41</td>
<td>Globe-Wernicke Bldg.</td>
</tr>
<tr>
<td>42</td>
<td>Henry Apartments</td>
</tr>
<tr>
<td>43</td>
<td>Hober Bldg.</td>
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<tr>
<td>44</td>
<td>Kakelerbode Hotel</td>
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<td>45</td>
<td>Lake Shore Athletic Club</td>
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<td>46</td>
<td>Lawyers Bldg.</td>
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<tr>
<td>47</td>
<td>Madison-Square Bldg.</td>
</tr>
<tr>
<td>48</td>
<td>McCormick Hotel</td>
</tr>
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<td>49</td>
<td>Medical &amp; Dental Arts Bldg.</td>
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<td>50</td>
<td>North Loop Monoramp Garage</td>
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<tr>
<td>51</td>
<td>Northern Trust Co.</td>
</tr>
<tr>
<td>52</td>
<td>Old Colony Life Ins.</td>
</tr>
<tr>
<td>53</td>
<td>Old Dearborn Bank Bldg.</td>
</tr>
<tr>
<td>54</td>
<td>Passavant Hospital</td>
</tr>
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<td>55</td>
<td>Sherman Bldg.</td>
</tr>
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<td>56</td>
<td>Singer Bldg.</td>
</tr>
<tr>
<td>57</td>
<td>A. G. Spalding</td>
</tr>
<tr>
<td>58</td>
<td>Wells Van Buren Bldg.</td>
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The confidence which Chicago architects, engineers and building owners place in Jennings Pumps is evident from the large number of buildings visible in the above photograph which are Jennings-equipped.

Jennings Pumps for building service... Vacuum Steam Heating Pumps, Condensation Pumps, House Service Pumps, Suction Sump Pumps and Suction Sewage Pumps... can be relied upon for years of good service.

Jennings Pumps
THE NASH ENGINEERING CO. 12 WILSON ROAD SOUTH NORWALK, CONN.
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS

FLOORING—Continued

Congoleum-Nairn, Inc., 195 Belgrave Drive, Kearny, N. J.

Facts you should know about Resilient Floors. A series of booklets on floors for (1) schools, (2) hospitals, (3) offices, (4) stores, (5) libraries, (6) churches, (7) clubs and lodges, (8) apartment houses, and hotels. Illustrated.


Sealed Battleship Linoleum. Illustrated. Shows typical installations.

Sealed Treasurite Tiles. Two booklets, 8 and 16 pp. Illustrated.


Goodyear Tire & Rubber Co., Inc., Akron, Ohio.


Stedman Ray-Proof Rubber. Booklet, 12 pp., 8 x 11 ins. Illustrated.

Pardee Tiles. Bound Volume, 48 pp., 8 1/2 x 11 ins. Illustrated. A reprint from Sweet's.

Cutler Mail Chute Model F. Booklet, 4 x 9 1/4 ins., 8 pp. Illustrated.


Distinctive Garage Door Hardware. Booklet, 9 x 11 ins., 66 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.

Distinctive Elevator Door Hardware. Booklet, 90 pp., 10 x 16 ins. Illustrated.

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

Colonial Hardware. Booklet, 12 pp., 8 1/2 x 11 ins. Illustrated. Deals with hardware of the best type for exterior and interior use.

HEATING EQUIPMENT

American Blower Co., 604 Russell St., Detroit, Mich.

Heating and Ventilating Utilities. A binder containing a large number of valuable publications, each 8 1/2 x 11 ins., on these important subjects.

American Radiator Company, 30 West 40th St., N. Y. C.

Ideal Boilers for Oil Burning. Catalog 55 x 8 1/2 ins., 36 pp. Illustrated in 4 colors. Describes a line of Heating Boilers especially adapted to use with Oil Burners.


Ideal Aeola Radiator Warmth. Brochure, 55 x 8 1/2 ins. Illustrated. Describes a central all-on-one-door heating plant with radiators for small residences, stores, and offices.

How Shall I Heat My Home? Brochure, 16 pp., 5 1/2 x 8 1/2 ins. Illustrated. Data on heating and hot water supply.


In-Airid, the Invisible Air Valve. Folder, 8 pp., 3 1/2 x 6 ins. Illustrated. Data on a valuable detail of heating.

The 909 ARCO Packless Radiator Valve. Folder, 8 pp., 3 1/2 x 6 ins. Illustrated.

Bryant Heater & Mfg. Co., 1763 St. Clair Ave., Cleveland, Ohio.


Joyce Heaters & Valve Co., 1 East 46th St., New York, N. Y.

Cory Radiator Control Valve. Bulletin, 8 1/2 x 11 ins. 12 pp. Illustrated. Explains operation and advantages of this radiator control valve on two-pipe vapor, vacuum or gravity steam systems.

C. A. Dunham Company, 450 East Ohio St., Chicago, Ill.

Dunham Radiator Trap, Bulletin 101, 8 x 11 ins., 12 pp. Illustrated. Explains working of this detail of heating apparatus.


Dunham Return Heating System. Bulletin 109, 8 x 11 ins. Illustrated. Covers the use of heating coils of this kind.


Dunham Built Dwyer Unit Heaters. Booklet, 31 pp., 8 1/2 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.
Every building you design has a roof . . .
and every roof can use cork as this mill does

IN a flour mill, the roof must do more than just shed water. In every building, a really good roof stops heat almost as completely as it shuts out rain.

Take the Pillsbury Flour Mill, for example. Where flour is made, the moisture contained in the grain produces a high relative humidity in the mill building. If heat leaks through the roof, the inside surface temperature drops. Moisture in the air condenses, and the condensate drops into the milling machinery. So Pillsbury has insulated the roof with three inches of Armstrong's Corkboard, an effective barrier to the passage of heat.

For office buildings and others where there is no condensation, 1 3/4 or 2 inches of insulation suffices to cut fuel costs and increase tenants' comfort. In any thickness from one inch up, Armstrong's Corkboard supplies an easily laid, permanent insulation.

Cork Products are playing an increasing part in every type of building use. In addition to roof insulation, Armstrong's Corkboard is ideally suited for insulating walls of buildings. Cork serves, too, where low temperatures must be maintained. The new quick-freeze industry relies on Corkboard in thicknesses from 6 to 12 inches to hold temperatures as low as sixty degrees below zero. Armstrong's Corkoustic, the insulating acoustical material, absorbs sound and reduces noise in schools, churches, and public buildings. Cork Machinery Isolation eliminates noise and vibration from all types of machinery. Cork Pipe Covering prevents loss of refrigeration from cold lines. Armstrong's and Nonpareil Insulating Brick line stacks in hotels, apartment houses, and public buildings to keep heat from adjoining rooms.

Architects are continually finding new uses for Armstrong's Cork Products. Cork may be just the material you are looking for to fit some unusual installation. Armstrong engineers are available for insulation advice, and Armstrong research facilities will gladly be placed at your disposal on new and unusual uses. Write to Armstrong Cork & Insulation Co., 900 Concord St., Lancaster, Pa.
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—Continued

HEATING EQUIPMENT—Continued

The Fulton Synphon Company, Knoxville, Tenn.
Synphon Temperature Regulators. Illustrated brochures, 8½ x 11 ins., dealing with general architectural and industrial applications; also specifically with applications of special instruments.
Synphon Heating Specialties. Catalog No. 200, 192 pp., 8½ x 11 ins. Important data on heating.
Hoffman Specialty Company, Inc., 21 West 46th St., New York, N. Y.
Fire Control With the Touch of a Finger. Booklet, 46 pp., 8½ x 11 ins. Illustrated.
How to Lock Out Air, the Heat Thief. Brochure, 48 pp., 4½ x 7¼ ins. Illustrated.
Janette Manufacturing Company, 556 Monroe Street, Chicago.
S. T. Johnson Co., Oakland, Calif.
Johnson Oil Burners. Booklet, 9 pp., 8½ x 11 ins. Illustrated.
McQuay Radiator Corporation, 35 East Wacker Drive, Chicago, Ill.
Data on different kinds of oil-burning apparatus.
Bulletin No. 283. Booklet, 8½ x 11 ins. Illustrated. Deals with Johnson O-Fit or Full Automatic Control.
Kewanee Boiler Corporation, Kewanee, Ill.
Kewanee on the Job. Catalog, 8½ x 11 ins., 50 pp. Illustrated. Showing installations of Kewanee boilers, waters, radiators, etc.
Catalog No. 78, 6 x 9 ins. Illustrated. Describes Kewanee Fire-box boilers with specifications and setting plans.
Catalog No. 95, 6 x 9 ins. Illustrated. Describes Kewanee power boilers and smokeless tubular boilers with specifications.
National Radiator Corporation, 29 East Washer Drive, Chicago, Ill.
McQuay Visible Type Cabinet Heater. Booklet, 4 pp., 8½ x 11 ins. Illustrated. Catalogs and radiators adaptable to decorative schemes.
McQuay Concealed Radiators. Brochure, 4 pp., 8½ x 11 ins. Illustrated.
McQuay Unit Heater. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.
Modine Copper Radiation. Booklet, 28 pp., 8½ x 11 ins. Illustrated. Deals with industrial, commercial and domestic heating.
For a Few Short Years. Folder, 4 pp., 8½ x 11 ins. Illustrated. Heating for garages.
Dairy Plant Heating. Folder, 4 pp., 8½ x 11 ins. Illustrated.
Industrial Heating. Folder. 4 pp., 8½ x 11 ins. Illustrated. Modine Unit Heater. Folder, 6 pp., 8½ x 11 ins. Illustrated.
National Engineering Company, South Norwalk, Conn.
Bulletin 41, 12 pp., 10¼ x 7½ ins. Illustrated in color. Describes construction and operation of the Jennings Return Line Steam Heating Pump.
Bulletin 57, Brochure. 8 pp., 10½ x 7½ ins. Illustrated in color. Deals with Sims T and U Jennings Vacuum Heating Pump for 2500 and 3000 square feet efficient heating.
Bulletin 63, Booklet. 4 pp., 10½ x 7½ ins. Illustrated. Describes in detail the Unit Type Motor Driven Jennings Condensation Pump.
National Radiator Corporation, Johnstown, Pa.
The Crimson Flame. Folder, 6 pp., 4½ x 7 ins. Illustrated. Contributory Brochure Contending to Your Home. Folder, 12 pp., 8½ x 6 ins. Illustrated.
National Jacketed Boiler. Folder, 4 pp., 8½ x 11 ins. Illustrated.
National Super-Smokeless Boiler. Folder, 4 pp., 8½ x 11 ins. Illustrated.
Aero, 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. 66, 6 x 9 ins. Illustrated.
Data on No. 66 Packless Supply Valves and Radiator Traps for vacuum and vapor heating systems.
Equipment Steam Traps and Temperature Regulations. Booklet, 4 pp., 6 x 9 ins. Illustrated.
Sarco Steel 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 Tempervane Heat."}

U. S. Blower & Heater Corporation, Minneapolis, Minn.
Blowers, Heaters and Washers. Booklet, 64 pp., 8½ x 11 ins. Illustrated.

HOISTS, TELESCOPIC

Gills & Geoghegan, Inc. 553 West Broadway, New York.

HOSPITAL EQUIPMENT

Bryant Electric Co., Bridgeport, Conn.
The Frink Co., Inc., 369 Lexington Ave., New York City.
Catalog 436. 7 x 10 ins., 16 pp. A booklet illustrated with photographs and drawings, showing the types of equipment for hospitals as operating table reflectors, linoleum and multifoil condensers, vacuum and gravity ventilators, bed reflectors, radiator reflectors, giving sizes and dimensions, explaining their particular fitness for special uses.
The International Nickel Company, 67 Wall St., New York, N. Y.
Hospital Applications of MonelMetal. Booklet, 8½ x 11¼ ins., 26 pp. Illustrated. Gives types of equipment in which Monel metal is used, reasons for its adoption, with sources of such equipment.
John Van Ranje Co., Cincinnati, Ohio.
Practical Planning for Hospital Food Service. Brochure, 62 pp., 8½ x 11 inches. Illustrated.
Wibout 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

Pick-Bartch Company, Inc., Albert, 1230 West 5th St., Chicago, and 34 Cooper Square, New York.
Some Thoughts on Furnishing a Hotel. Booklet, 7½ x 9 ins. Data on complete outfitting of hotels.

INCINERATORS

Jossan-Graver Incinicators. Folder, 4 pp., 8½ x 11 ins. Illustrated.
Kerner Incinerator Company, 715 E. Water St., Milwaukee, Wis.
Inncinator (Chimney-fed). Catalog No. 18 (Architects' and Builders' Edition). Size 8½ x 11 ins., 20 pp. Illustrated. Describes principles and design of Kerneroff Chimney-fed Incinerators for residences, apartments, hotels, schools, hospitals, etc.; also specifically with applications of special instruments.
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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—Continued from page 116

JOISTS

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Smyser-Royer Co., 1200 Walnut Street, Philadelphia, Pa. Catalog "F" on Exterior Lighting Fixtures. Brochure, illustrated, giving data on over 300 designs of standards, lanterns and brackets of bronze or brass iron.


MAIL CHUTES
Cutler Mail Chute Company, Rochester, N. Y. Cutler Mail Chute Model F. Booklet, 4 ½ x 9½ ins., 8 pp. Illustrated.

MANTELS


MARBLE
The Georgia Marble Company, Tate, Ga.; New York Office, 1328 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 memorials 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, 4 pp., 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. Data on metal lath and similar materials.

MILK WORK—See also Wood
Curtis Companies Service Bureau, Clinton, Iowa. Your Dream Kitchen, Booklet, 11 pp., 7½ x 10½ ins. Illustrated. Fine line of fittings for kitchens, breakfast alcoves, etc.


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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—Continued from page 118

PARTITIONS—Continued

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

PIPE

The American Brass Company, Waterbury, Conn.

American Rolling Mill Company, Middletown, Ohio.

Bethlehem Steel Company, Bethlehem, Pa.
Bethlehem Wrought Steel Pipe, Catalog P. Booklet, 30 pp., 4¼ x 7¼ ins. Illustrated.

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

Duriron Company, Dayton, Ohio.
Duriron A60, Alkali, Rust-proof Drain Pipe and Fittings. Booklet, 20 pp., 4¼ x 6½ ins. Illustrated. Important data on a valuable line of pipe.

Maurice A. Knight, Akron, Ohio.
Knightware in the Princeton Chemical Laboratory. Booklet, 16 pp., 6¼ x 9 ins., illustrated.

National Tube Co., Frick Building, Pittsburgh, Pa.
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“National” Bulletin No. 3. The Protection of Pipe Against Internal Corrosion. 8½ x 11 ins., 20 pp., Illustrated. Discusses the suitability of various causes of corrosion, and details are given of the deactivating and degrading systems for eliminating or retarding corrosion in hot water supply lines.

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Plumbing the Small Bathroom. Booklet, 5 x 8 ins. Discusses planning bathrooms of small dimensions.
Duricon Company, Dayton, Ohio.
Imperial Brass Mfg. Co., 120 W. Harrison St., Chicago, Ill.
Water Faced Flush Valves, Durojet 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 R. 922 pp., 8½ x 11 ins. Illustrated. Loose-leaf catalog showing 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.
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Catalog K. Booklet, 150 pp., 8½ x 10½ ins. Illustrated. Data on showers and equipment details.

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Kewanee Private Utilities Co., 442 Franklin St., Kewanee, Ill.
Nash Engineering Company, South Norwalk, Conn.
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Truscon Steel Company, Youngstown, Ohio.
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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—Continued from page 122

STEEL PRODUCTS FOR BUILDING


Steel Framing for Gasoline Service Stations. Brochure, 8 pp., 8 1/2 x 11 ins. Illustrated.


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Volume 1. Series B. Indiana Limestone Library, 6 x 9 ins., 36 pp. Illustrates giving general information regarding Indiana Limestone, its physical characteristics, etc.


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Herman Nelson Corporation, Miami, Ill.
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Medusa Portland Cement Co., 1002 Engineers' Building, Cleveland.

Minwax Company, Inc., 11 West 64th St., New York.
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Athey Company, 6015 West 65th St., Chicago, Ill.
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Pittsburgh Plate Glass Company, Grant Building, Pittsburgh, Pa.
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William Bayley Co., 147 North Street, Springfield, Ohio.
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Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.

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Lupton Casement of Copper Steel. Catalog C-217. Booklet, 24 pp., 8½ x 11 ins. Illustrated brochure on casements, particularly for residences.

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JOSAM PRODUCTS ARE SOLD BY ALL PLUMBING & HEATING SUPPLY JOBBERS

THERE ARE NO SUBSTITUTES FOR JOSAM PRODUCTS
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 un consumed 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.

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THERE'S NO GUESSWORK WITH THE THERMOTROL
The individual radiator control

Positive control of room temperatures regardless of the whims of winds or outside temperatures—that is the experience of the thousands of Thermotrol users.

It reacts almost instantly to any change and compensates for it with unusual accuracy. It removes the dangers to health and improves personal efficiency by maintaining a comfortable temperature—always.

—and it is thrifty; for not an ounce of steam, in excess of comfort requirements, ever gets by this guardian of heating plant efficiency; just enough, no more—no less.

In homes, hotels, and apartments as well as industrial and commercial buildings, it pays its way—a dozen times over.

STERLING ENGINEERING COMPANY
1640 Holton Street • Milwaukee, Wisconsin

Send for our new catalog, "The Thermotrol!" It's free for the asking

PARAMOUNT IN A DOZEN WAYS AND AN UNMISTAKABLY GREATER VALUE—

The Brownell Standard Electric Welded Steel Heating Boiler commands the admiration because of several highly distinctive points of superiority with which you should become familiar.

The Brownell Automatic Stoker, likewise, takes an advanced position as a more dependable firing mechanism. Illustrated bulletins available upon request.

THE BROWNELL COMPANY, Dayton, Ohio
Established in 1855 Representatives In Principal Cities

BROWNELL
THE BALANCED HEATING UNIT
New York State National Bank
ALBANY . . . . NEW YORK

This building, heated by steam generated by cast iron oil fired boilers, is equipped with Johnson Heat & Humidity Control. The installation consists of 250 Johnson Dual Thermostats, 11 Johnson Model Thermostats and 630 Sylphon Radiator Valves . . . . with wall boxes for future thermostats as required for office additions, extensions, alterations, etc. A Johnson Control Board is in the office of the chief engineer, which is operated to set the thermostats in the building for normal temperature during the day and lower temperature for the night; and in the morning back to normal temperature again . . . . .

Henry Ives Cobb, Architect, New York City.

JOHNSON SERVICE COMPANY
ESTABLISHED 1885
169 E. MICHIGAN MILWAUKEE, WIS.

Inspected Annually Without Charge. 30 Convenient 24 Hours Anywhere.
The All-Metal System.
The All-Perfect Graduated Control of Valves and Dampers. The Dual Thermostat (Night & Day) Control:
Fuel Saving 25 to 40 per cent per year.

JOHNSON HEAT AND HUMIDITY CONTROL
REVIEWS OF MANUFACTURERS' PUBLICATIONS

NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION, Utica, N. Y. "Safeguarding Wiring for Buildings."

With the beginning of use of electricity upon a large scale for lighting and other purposes there began a series of experiments with materials for making the raceways for wires from which they could be withdrawn or in which they could be replaced. First trial was made of paper or cardboard tubing. Later this same material was wrapped in sheathing with thin layers of brass. Then came tubing of very light steel, which still later gave way to full standard weight pipe, now supplied in the form of Standard Rigid Conduit. There is something about this evolution which is today of vital interest to architects, engineers, and contractors. During the last two decades in which Standard Rigid Conduit has been proved to be the most satisfactory raceway for the protection of wiring systems, there have been recurrent attempts to introduce methods designed to cheapen electrical construction by substituting other raceways. In considering these, the tendency of the industry has been to forget many of its earlier experiences, and much of the knowledge gained in those days has been lost. As each new material has been brought into the market, code-making authorities, both national and local, have been forced to establish restrictive regulations concerning the use of these materials for the safety of buildings may be held accountable. They realize that the minimum codes and regulations establish minimum requirements merely sufficient to prevent serious hazards for which no code makers or governing bodies responsible for the safety of buildings may be held accountable. They realize that these minimum requirements do not take fully into consideration the economic factors which relate to the ultimate cost of electrical systems, including expenses due to repairs, maintenance, inadequacy, or interruptions in service. Standard Rigid Conduit, described in this booklet, is the type of raceway now supplied in the form of Standard Rigid Conduit. It is the only type of raceway, the use of which is not limited by restrictive codes and ordinances. It constitutes in itself a simplified standard of the highest economic value.

GENERAL ELECTRIC COMPANY, Schenectady, N. Y. "The Light that Started Sports at Night."

The use of electricity for floodlighting is not confined to buildings. This booklet, one of many being issued by the General Electric Company, deals with such lighting as at base ball fields, golf courses, race tracks, skating rinks, swimming pools, stadiums, and other such places, often of considerable extent. This brochure deals fully with the mechanism used for such lighting, and it offers the service of the General Electric Company's engineering staff to those who require it. "General Electric floodlighting equipment is designed by illuminating engineers of wide experience and years of training. General Electric maintains a large illuminating engineering laboratory at Schenectady, devoted solely to the study of lighting problems. This engineering personnel, with its extensive training and unrivalled laboratory facilities, has developed complete plans and specifications for every type of outdoor floodlighting. These are available to G-E representatives in solving any problem of illuminating athletic fields, for baseball, football, and other sports. Any special problems are handled immediately by the laboratory engineers, and individual recommendations on these problems are sent out to representatives in the field. General Electric equipment is outstanding from the viewpoint of illuminating effectiveness as well as from that of design, construction, and materials used. General Electric has prepared a complete line of all the miscellaneous equipment for floodlighting the various types of outdoor sports. These include towers, wire and cable, switches, transformers, and other apparatus. The last are supplied later as the need arises. General Electric has prepared a complete line of all the miscellaneous equipment for illuminating athletic fields, including the sending of its personnel to the various locations for the installation of commercial offices, warehouses, and service shops, so that the customer can feel that he is in close contact with the manufacturer, regardless of where his installation is made.

BRIDGEPORT BRASS COMPANY, Bridgeport, Conn. "Plumrite Brass Pipe."

There are few details of building which present more vexatious construction problems than piping. In many structures, such as laboratories, hospitals, and some types of manufacturing buildings, the pipes are quickly worn away by acids which destroy the protective action of the sheathing. These pipes are used to supply water they often corrode to the extent that the water which flows from them is the color of rust. The use of brass piping obviates this difficulty, and there have been many instances where the dismantling or remodeling of a building has brought to light brass piping in quite as good a condition as when it was put in. This valuable booklet, issued by the Bridgeport Brass Company, deals with this. It presents an illustration of the well known Vanderbilt residence which until lately occupied the west side of Fifth Avenue between 57th and 58th Streets. Recently this building was torn down to make way for a business structure. "The Plumrite brass pipe which was installed in 1890 was found to be in virtually perfect condition. Noteworthy is the fact that it was salvaged and used again, after almost a half-century of service. Millions of people have marveled at the vast wealth that made such a palatial city home possible. How was given rise to a complexity of requirements which is most confusing, even to those active in the building industry.

Architects, builders, and electrical contractors alike need simple direction based on sound experience. They know that the governing codes and regulations establish minimum requirements merely sufficient to prevent serious hazards for which no code makers or governing bodies responsible for the safety of buildings may be held accountable. They realize that these minimum requirements do not take fully into consideration the economic factors which relate to the ultimate cost of electrical systems, including expenses due to repairs, maintenance, inadequacy, or interruptions in service. Standard Rigid Conduit, described in this booklet, is the type of raceway now supplied in the form of Standard Rigid Conduit. It is the only type of raceway, the use of which is not limited by restrictive codes and ordinances. It constitutes in itself a simplified standard of the highest economic value.

THE WHEELER, OSGOOD COMPANY, Tacoma. "Laminex Doors Will not Shrink, Swell or Warp."

Often, even in work of a costly nature, it is found that the doors "are favorably impressed, owing to condensation of moisture, they shrink, warp or expand. Back of all these troubles with doors, is a fault inherent in wood itself. As wood grows, it develops a network of cells called tracheids. These constitute the main mass of woody tissues which give the wood its strength. After the wood is cut into lumber the cells or tracheids, upon drying, shrink in width but not in length. When they absorb moisture the woods swells. In most uses to which wood is put, this shrinking and swelling are of little importance, but in the construction of a door which should fit an opening to a small fraction of an inch and which gets constant slams, bangs and hard usage, these natural characteristics of wood are the basis of all door trouble. The principal cause of warping," they all agreed, "is handing of doors in new buildings near damp plaster. The trouble is that dampness is often no more detectable than dirt accumulation. The outer surface showed but the slight amount of tarnish that develops on all unleached brass objects after a few days' exposure to the air. The most convincing proof of the absolutely unin­inished usefulness of this pipe is the fact that it was reinstalled in the building when it was remodelled into a commercial building that same year. This structure stands today, and, after ten more years of service without a sign of trouble, its Plumrite brass pipe is paying handsome returns on the investment made in it something more than 33 years ago."
This Modern School teaches a lesson in "Air Hygiene"

...with 34 Sturtevant Unit Heater-Ventilators

These young people are being educated to the value of pure, refreshing air by working in it, every day.

Classroom windows are closed against noise, dust, and drafts... yet the room is always filled with bracing outdoor air, filtered clean and tempered to a constant, comfortable temperature. Here in the Manheim Township School, 34 Sturtevant Unit Heater-Ventilators keep scholars and teachers free from discomfort and distraction. The units are automatically controlled... teachers are free from the constant responsibility of keeping the classrooms "well aired."

Studies of school ventilating problems lead repeatedly to the selection of Sturtevant Unit Heater-Ventilators... for old schools as well as new. Our nearest office would welcome the opportunity to lay all the facts before you.

B. F. STURTEVANT COMPANY
Main Office: HYDE PARK, BOSTON, MASS.
CHICAGO, ILL., 410 So. Michigan Ave. • SAN FRANCISCO, CAL., 681 Mason St.
Branch Offices at: Atlanta; Baltimore; Boston; Buffalo; Camden; Charlotte; Chicago; Cincinnati; 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 at Toronto, Montreal and Gulf, Canadian Representative:
Kipp Kelly, Ltd., Winnipeg. Also Agents in Principal Foreign Countries.

Sturtevant Unit Heater-Ventilator
SUPPLIES OUTDOOR AIR FILTERED CLEAN AND TEMPERED

G. L. SELLERS & SONS CO., Elwood, Ind. “Sellers Kitchen Furniture Units: Modern, Colorful Kitchens.”

Nothing of the vastly improved appearance of the present day kitchen may be due to the fact that the difficulty of solving the servant problem has driven many housekeepers into their own kitchens. Something may likewise be due to the popularity of the “breakfast nook” or “dining alcove” which in many instances is really an adjunct of the kitchen, and the kitchen must therefore be made and kept presentable. But much more is undoubtedly due to the resource and ingenuity of the manufacturers who produce the many details which do so much toward making a kitchen attractive. This well produced brochure deals with just this. The G. L. Sellers & Sons Co. has for many years been in the front rank of firms making the kitchen cabinets which do so much toward making a kitchen practical as well as beautiful, such a cabinet containing the sink, refrigerator, range, and lighting. The illustrations show the appearance of all planned upon highly architectural lines, not nailed together but built upon the mortise and tenon principle, and then enameled in any one of the attractive colors may be desired. The booklet itself is calculated to interest the most indifferent or faddist architect or housekeeper. In numerous full-color illustrations it sets forth and elaborates the decorative possibilities of the modern kitchen,—not only as kitchen cabinets are concerned, but likewise with reference to its walls, ceiling, floor, draperies at windows, and whatever furniture there is.


Floodlighting, being widely practiced at present, means the illumination of an entire building or part of a building by means of projectors which throw light upon the structure from sources which are concealed in one way or another. Tube lighting a building, on the other hand, means the outlining of certain parts of the structure or certain of its architectural details, so that at night they stand out against the surrounding darkness. Both types of illumination are of course exceedingly effective and valuable. This brochure deals with the use of the well known Claude Neon system of lighting. The illustrations show the appearance of quite a number of Neon installations involving use of light of various colors. Part of the brochure deals with the lighting of gardens and of swimming pools, and another part deals with the advantages of using the Neon system as an aid to aviation. On the subject of lighting gardens, the brochure sets forth and elaborates the decorative possibilities of colors devised by landscape architects to keep alive by night the daytime beauty of the landscape and grounds. Claude Neon luminous tubes of green, soft red, or blue, either concealed in a trellis, worked into a bird cage, fitted to the sides of a fountain, or among cascade rocks, give a shadowless glow that harmonizes with the moonlight with charming results. There is neither irritation to the eye nor too brilliant a glare. They are cold lights that do not damage the foliage.

“For subaquatic lighting Claude Neon luminous tubes are ideally adapted. As they are cold lights, no condensation results when they are placed in direct contact with the water in swimming pools. The light is diffused and radiated from the surface of the pool, hiding the source. There is no glare or irritation to the eyes of those in the water. In southern California especially, where the swimming pool holds its appeal during the entire year, many beautiful show places have adopted Claude Neon luminous tubes for illumination. For aviation use, the greater efficiency of the red rays of Claude Neon tubes in penetrating fog, combined with their distant visibility in clear weather, makes them ideal aviation lighting. They have been adopted at many famous airports, notably Croydon, near London. They are economical to operate and have extremely long life. In America, many well known buildings have installed aeronautical beacons upon their roofs, as a guide to night pilots and to identify their buildings. Among them are the Green-baun Building in Chicago; the Penobscot Building in Detroit; Ritz-Carlton Hotel in Atlantic City; Grant Building in Pittsburgh; Rand Building in Buffalo, and so forth.”

DAVID LUPTON’S SONS COMPANY, Philadelphia. “Lupton Steel Products.”

During the many years of this large firm’s career it has been producing household accessories of a vast variety, and the house has long occupied a prominent position in the front rank of manufacturers of such details. This brochure, planned in accordance with the recommendations of the American Institute of Architects, might be described as a general catalog, since it deals with the countless steel products which the Lupton firm manufactures,—doors and windows of many kinds; devices for manipulating such windows and doors; skylights; shelving; partitions; factory equipment; and such sheet metal accessories as gutters, pipes, circles, and hooks. The booklet is filled with valuable data.

SEDGWICK MACHINE WORKS, 150 West 15th Street, New York. “Sedgwick Dumbwaiters and Elevators.”

It is difficult to name a type of building in which there does not exist a possibility for using advantageously one or more of the various types of dumbwaiters and elevators. This new 36-page catalog fully describes and illustrates the many types and arrangements of hand-power dumbwaiters and elevators manufactured by the Sedgwick Machine Works. Important features for ready reference include: (1) Method of selecting proper type of equipment to specific requirements; (2) Detailed layouts in blue print form for all standard sizes; (3) Specifications, and (4) A Condensed Reference Chart showing “Application, Uses, Loads and Sizes.” Some of the special types of equipment described in this catalog are: Fuel Lifts, Trunk Lifts, Book Lifts, Correspondence Lifts, Hospital Lifts and Invalid Elevators.

AMERICAN BRASS COMPANY, Waterbury, Conn. “Anaconda Pipe for Water Distribution.”

There is probably no one item of building upkeep or maintenance more vexatious and troublesome than the wearing out of the pipes which distribute water. "Recent years have witnessed new developments in architectural and plumbing practice directed, for the most part, toward—(a) greater comfort and satisfaction for building occupants, and (b) lowered maintenance costs for building owners. One of the most important of these developments, from the standpoint of beneficial results, has been a pronounced increase in the specification and use of rustless brass pipe for water service and distribution lines. The need for permanent water pipe was not as great a generation ago as it is today. The piping was exposed and easy to get at. Labor costs were lower. Replacements were expected, and relatively inexpensive. Nevertheless, there are many authentic records of nineteenth century brass pipe installations that have justified the foresight of their original owners by a half-century and more of continuous water service,—a flow of clear water at all times. "Rust,—the commonest cause of water pipe troubles,—results in discolored water, reduced flow at the fixtures and leaks in the pipes themselves. With present-day plumbing concealed behind walls and under floors, the repair and eventual replacement of rusted water lines run into serious expense, annoyance and, in the case of commercial buildings, losses of revenue. Such work often involves not only the services of a plumber but those of a carpenter, plasterer and decorator as well. At present-day wage levels, the cost of water pipe renewals can quickly wipe out many times the initial saving that iron or steel pipe seems to offer. Realizing this, it is logical that architects and engineers are turning so generally to use of brass pipe,—to avoid the possibility of future rust troubles in buildings they design.” This brochure deals with the excellent line of brass pipe manufactured by this widely known firm. It is a new edition and contains data not included in earlier issues of the publication.
Simply turning a dial "Balances"

HOFFMAN CONTROLLED HEAT

... with steam pressure on

Adjusting the flow of vapor to each radiator on a Hoffman Controlled Heat job is as simple as A B C. You can secure a perfect "balancing up" of the system without time-wasting guesswork — every radiator, regardless of size or distance from the boiler, heats quickly and evenly.

The No. 7 Hoffman Modulating Valve is the reason. It is the one valve that's externally adjustable to every individual condition. Because the adjustment is both external and visible, the valve may be quickly set with the system in operation. No need to let radiators cool or take valves apart — no need to break connections. A wrench and a moment's time are all that's needed.

You'll especially appreciate the value of these valves on oil or gas fired jobs. Vapor distribution can be so accurately regulated that the thermostat won't shut off the burner until all radiators are uniformly heated.

The patented externally adjusted sleeve of the No. 7 Hoffman Modulating Valve is the feature that makes "balancing" easy. This sleeve enables you to establish a port area that supplies just the right amount of vapor for each radiator. Just loosen the lock nut, set the graduated dial according to radiator size, and tighten the nut. If oversized or unreamed pipes make vapor distribution irregular, a slight readjustment of the dial brings the radiator to normal.

This is one of the many features of Hoffman Controlled Heat that make it superior to all others. Write for our booklet which tells the whole interesting story. Hoffman Specialty Company, Dept. EF-27, Waterbury, Conn.
## INDEX TO ADVERTISING ANNOUNCEMENTS

### Part 1—Architectural Design

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Car and Foundry Company</td>
<td>31</td>
</tr>
<tr>
<td>American Walnut Manufacturers Association</td>
<td>34</td>
</tr>
<tr>
<td>Arby Company</td>
<td>33</td>
</tr>
<tr>
<td>Blain-Sandora Company, Inc</td>
<td>36</td>
</tr>
<tr>
<td>Blank &amp; Company, Frederic</td>
<td>32</td>
</tr>
<tr>
<td>Carey Company, The Philip</td>
<td>39</td>
</tr>
<tr>
<td>Celotex Company, The</td>
<td>53</td>
</tr>
<tr>
<td>Collins &amp; Alkan Company</td>
<td>25</td>
</tr>
<tr>
<td>Columbia Mill, Inc</td>
<td>21</td>
</tr>
<tr>
<td>Congoleum-Nairn, Inc</td>
<td>17, 18</td>
</tr>
<tr>
<td>DaVee Tree Expert Co., Inc, The</td>
<td>57</td>
</tr>
<tr>
<td>DeLong Furniture Co.</td>
<td>41</td>
</tr>
<tr>
<td>Dines Iron Works, J. W</td>
<td>62</td>
</tr>
<tr>
<td>Fornica Insulation Company, The</td>
<td>51</td>
</tr>
<tr>
<td>General Bronze Corporation</td>
<td>24</td>
</tr>
<tr>
<td>General Electric Company</td>
<td>11</td>
</tr>
<tr>
<td>Georgia Marble Company, The</td>
<td>13</td>
</tr>
<tr>
<td>Goodyear</td>
<td>41</td>
</tr>
<tr>
<td>Gustavino &amp; Co., R.</td>
<td>7</td>
</tr>
<tr>
<td>Hamlin, Irving</td>
<td>54</td>
</tr>
<tr>
<td>Hanley Company, Inc</td>
<td>1</td>
</tr>
<tr>
<td>Hauserman Co., The E. F.</td>
<td>16</td>
</tr>
<tr>
<td>Higgins &amp; Co., Chas. M.</td>
<td>54</td>
</tr>
<tr>
<td>Highland Iron and Steel Company</td>
<td>30</td>
</tr>
<tr>
<td>Hood Company, B. Mifflin</td>
<td>12</td>
</tr>
<tr>
<td>Indiana Limestone Company</td>
<td>9</td>
</tr>
<tr>
<td>Johnson &amp; Faulkner</td>
<td>43</td>
</tr>
<tr>
<td>Kawneer Company, The</td>
<td>53</td>
</tr>
<tr>
<td>Kittinger Company</td>
<td>39</td>
</tr>
<tr>
<td>Klein &amp; Co., Inc., Henry</td>
<td>28</td>
</tr>
<tr>
<td>Kokomo Opalescent Glass Co</td>
<td>5</td>
</tr>
<tr>
<td>McKeown Bros. Company</td>
<td>49</td>
</tr>
<tr>
<td>Minwax Co., Inc</td>
<td>14</td>
</tr>
<tr>
<td>National Electric Light Association</td>
<td>51</td>
</tr>
<tr>
<td>National Lead Company</td>
<td>61</td>
</tr>
<tr>
<td>Newcomb Mfg. Company, F. J.</td>
<td>31</td>
</tr>
<tr>
<td>Orange Screen Company</td>
<td>34</td>
</tr>
<tr>
<td>Pardee Works, The C.</td>
<td>26</td>
</tr>
<tr>
<td>Pittsburgh Plate Glass Co.</td>
<td>59</td>
</tr>
<tr>
<td>Portland Cement Association</td>
<td>3</td>
</tr>
<tr>
<td>Rambusch</td>
<td>53</td>
</tr>
<tr>
<td>Reeves Company, Robert C.</td>
<td>51</td>
</tr>
<tr>
<td>Russell &amp; Erwin Mfg. Co</td>
<td>8</td>
</tr>
<tr>
<td>Surgeon &amp; Company</td>
<td>6</td>
</tr>
<tr>
<td>Sheldon Slate Co., F. C.</td>
<td>4</td>
</tr>
<tr>
<td>Southern Cypress Manufacturers Association</td>
<td>73</td>
</tr>
<tr>
<td>Todhunter, Inc</td>
<td>49</td>
</tr>
<tr>
<td>Truscon Steel Company</td>
<td>2</td>
</tr>
<tr>
<td>Western Pine Manufacturers Association</td>
<td>47</td>
</tr>
<tr>
<td>Westinghouse Electric Elevator Company</td>
<td>Fourth Cover</td>
</tr>
<tr>
<td>Wilson Corporation, The J. G.</td>
<td>22</td>
</tr>
<tr>
<td>Yale &amp; Towne Mfg. Co, The</td>
<td>19</td>
</tr>
</tbody>
</table>

### Part 2—Architectural Engineering and Business

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Brass Company, The</td>
<td>99</td>
</tr>
<tr>
<td>American Institute of Steel Construction</td>
<td>96</td>
</tr>
<tr>
<td>American Laundry Machinery Co.</td>
<td>Fourth Cover</td>
</tr>
<tr>
<td>American Rolling Mill Company, The</td>
<td>131</td>
</tr>
<tr>
<td>American Telephone &amp; Telegraph Co.</td>
<td>93</td>
</tr>
<tr>
<td>Armstrong Cork &amp; Insulation Co.</td>
<td>115</td>
</tr>
<tr>
<td>Automatic Electric, Inc</td>
<td>127</td>
</tr>
<tr>
<td>Bethlehem Steel Company</td>
<td>123</td>
</tr>
<tr>
<td>Barber Asphalt Company, The</td>
<td>128</td>
</tr>
<tr>
<td>Bayley Co., The William</td>
<td>76</td>
</tr>
<tr>
<td>Brownell Company, The</td>
<td>134</td>
</tr>
<tr>
<td>Bull Dog Floor Clip Co., The</td>
<td>108</td>
</tr>
<tr>
<td>Byers Company, A. M.</td>
<td>104</td>
</tr>
<tr>
<td>Carbide and Carbon Company</td>
<td>78</td>
</tr>
<tr>
<td>Carnegie Steel Company</td>
<td>129</td>
</tr>
<tr>
<td>Carter Brothers Flooring Company</td>
<td>108</td>
</tr>
<tr>
<td>Century Electric Company</td>
<td>74</td>
</tr>
<tr>
<td>Chess &amp; Sons, James B.</td>
<td>100</td>
</tr>
<tr>
<td>Cork Import Corporation</td>
<td>64</td>
</tr>
<tr>
<td>Cutler Mail Chute Co., The</td>
<td>130</td>
</tr>
<tr>
<td>D. G. C. Trap &amp; Valve Co.</td>
<td>71</td>
</tr>
<tr>
<td>Dicalc Safe and Lock Company</td>
<td>76</td>
</tr>
<tr>
<td>Duriron Company, The</td>
<td>102</td>
</tr>
<tr>
<td>Electric Storage Battery Company, The</td>
<td>73</td>
</tr>
<tr>
<td>Elevator Supplies Company, Inc</td>
<td>66</td>
</tr>
<tr>
<td>Frigidaire Corporation</td>
<td>81</td>
</tr>
<tr>
<td>Fulton Sylphon Company, The</td>
<td>117</td>
</tr>
<tr>
<td>General Electric Company</td>
<td>72</td>
</tr>
<tr>
<td>G &amp; G Atlas Systems, Inc</td>
<td>68</td>
</tr>
<tr>
<td>Grinnell Company, Inc.</td>
<td>90, 91</td>
</tr>
<tr>
<td>Heating &amp; Ventilating</td>
<td>84</td>
</tr>
<tr>
<td>Hoffman Specialty Company, Inc.</td>
<td>39</td>
</tr>
<tr>
<td>Hoffmann &amp; Billings Mfg. Co.</td>
<td>130</td>
</tr>
<tr>
<td>Illinois Steel Company</td>
<td>131</td>
</tr>
<tr>
<td>International Nickel Company, The</td>
<td>88, 105</td>
</tr>
<tr>
<td>Jenkins Bros.</td>
<td>83</td>
</tr>
<tr>
<td>Johnson Manufacturing Company</td>
<td>133</td>
</tr>
<tr>
<td>Josam Manufacturing Company</td>
<td>133</td>
</tr>
<tr>
<td>Kalman Steel Company</td>
<td>123</td>
</tr>
<tr>
<td>Kewanee Boiler Corporation</td>
<td>67</td>
</tr>
<tr>
<td>Kinney Mfg. Co.</td>
<td>82</td>
</tr>
<tr>
<td>Knight, Maurice A.</td>
<td>104</td>
</tr>
<tr>
<td>Lamson Company, The</td>
<td>75</td>
</tr>
<tr>
<td>Louisville Cement Company</td>
<td>69</td>
</tr>
<tr>
<td>McQuay Radiator Corporation...Third Cover</td>
<td>126</td>
</tr>
<tr>
<td>Miller Steel Company</td>
<td>126</td>
</tr>
<tr>
<td>Mills Company, The</td>
<td>119</td>
</tr>
<tr>
<td>Nullvete Corporation, The</td>
<td>132</td>
</tr>
<tr>
<td>Nash Engineering Co., The</td>
<td>113</td>
</tr>
<tr>
<td>National Radiator Corporation</td>
<td>134</td>
</tr>
<tr>
<td>National Steel Fabric Company</td>
<td>78, 80</td>
</tr>
<tr>
<td>National Tube Company</td>
<td>101</td>
</tr>
<tr>
<td>Nelson Corporation, The Herman</td>
<td>108, 110</td>
</tr>
<tr>
<td>Pecora Paint Company</td>
<td>105</td>
</tr>
<tr>
<td>Peerless Unit Ventilation Co., Inc</td>
<td>89</td>
</tr>
<tr>
<td>Pierce, Butler &amp; Pierce Mfg. Corp</td>
<td>132</td>
</tr>
<tr>
<td>Ruff Radio Receptor Co., Inc</td>
<td>106</td>
</tr>
<tr>
<td>Ruggles-Wilcox Mfg. Co., Second Cover</td>
<td>106</td>
</tr>
<tr>
<td>Republic Steel Corporation</td>
<td>87</td>
</tr>
<tr>
<td>Richards-Wilcox Mfg. Co.</td>
<td>128</td>
</tr>
<tr>
<td>Sarco Co., Inc</td>
<td>141</td>
</tr>
<tr>
<td>Spokenman Company</td>
<td>103</td>
</tr>
<tr>
<td>Spencer Heater Company</td>
<td>142</td>
</tr>
<tr>
<td>Sterling Engineering Company</td>
<td>134</td>
</tr>
<tr>
<td>Stewart Company, B. F.</td>
<td>137</td>
</tr>
<tr>
<td>Troy Laundry Machinery Co., Inc</td>
<td>92</td>
</tr>
<tr>
<td>Vosseut Hardware Co</td>
<td>128</td>
</tr>
<tr>
<td>Walworth Company</td>
<td>65</td>
</tr>
<tr>
<td>Warren Webster &amp; Company</td>
<td>85</td>
</tr>
<tr>
<td>Wood Engineering Co., Gar</td>
<td>132</td>
</tr>
<tr>
<td>York Ice Machinery Corporation</td>
<td>77</td>
</tr>
</tbody>
</table>
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