THE ARCHITECTURAL FORUM

IN TWO PARTS

ARCHITECTURAL ENGINEERING & BUSINESS

PART TWO

DECEMBER

1928

HOSPITALS REFERENCE NUMBER

PRICE $3

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

NATCO BARS DISSATISFACTION

A JOB to *go* right from start to finish—to *stay* right year after year in service—needs Natco, the Complete Line of Hollow Building Tile. The varied Natco products fill every building need. Here are a few.

Natco Double Shell Load Bearing Tile for stuccoed structures. It bonds tightly with stucco on one face, plaster on the other. No warping, rotting, or rusting; the stucco sticks.

Natco Header Backer and Natco Unibacker for brick faced structures. They save dead load, labor, mortar, and time—provide so intimate a bond that full bearing value is allowed on the total thickness of the wall.

Natco Tex-Tile and Natco Combed Face for finished face structures. Available in attractive shades for laying up an insulated, load bearing wall.

Natco Vitritile for finished interiors. A sanitary, beautiful tile, with one or both faces glazed, for interior load bearing walls and partitions. (Also furnished kerfed, or split for furring.) Easy to clean.

Natco assures dependable deliveries—a responsibility that does not quibble or compromise—speedy, economical construction—a long span of completely satisfactory service. In construction as in use, Natco bars dissatisfaction.

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General Offices: Fulton Building, Pittsburgh, Pa.
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NATCO

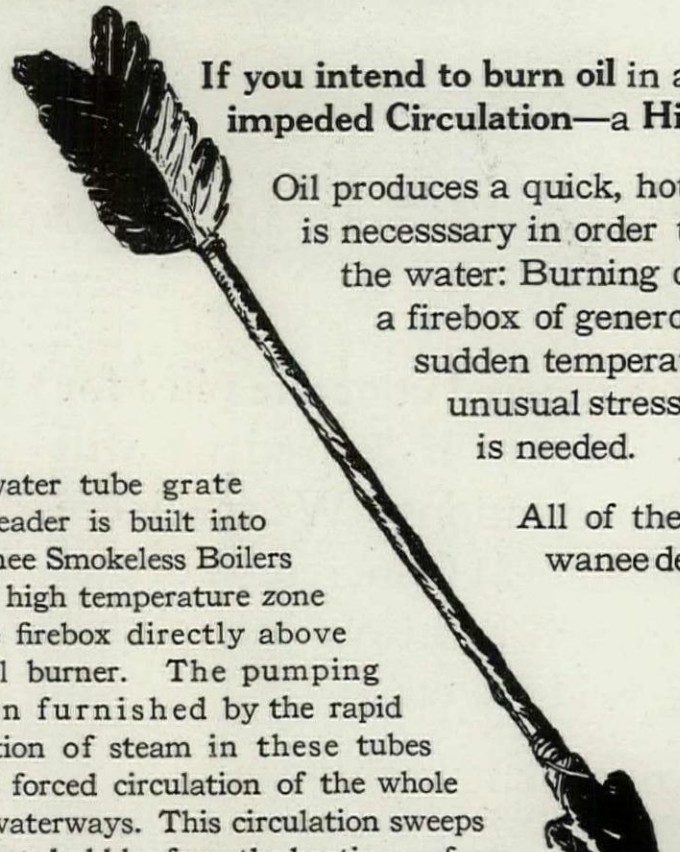
NATCO
THE *COMPLETE* LINE *of* HOLLOW BUILDING TILE

HOLLOW BUILDING TILE

KEWANEE

STEEL RIVETED BOILERS

Equally Efficient with Coal or Oil

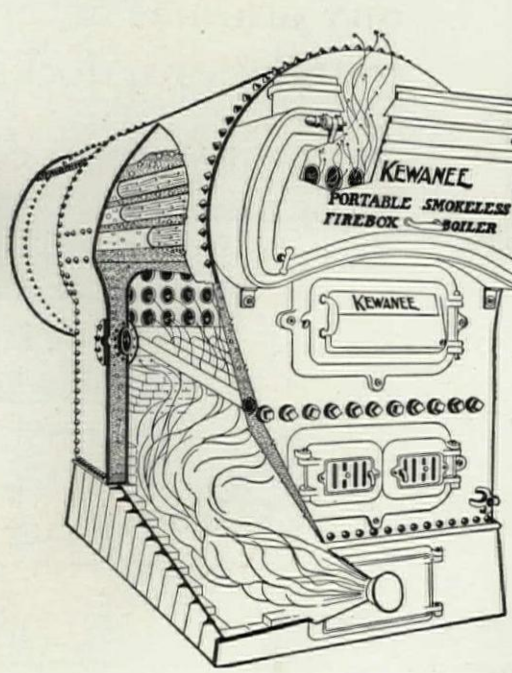


If you intend to burn oil in a boiler, three things are vital: **Unimpeded Circulation**—a **High Firebox**—and **Great Strength.**

Oil produces a quick, hot fire: **Free and Rapid Circulation** is necesssary in order that the heat may be absorbed by the water: Burning oil requires lots of air—demanding a firebox of generous proportions. And naturally the sudden temperature changes from burning oil put unusual stress on the firebox—so **Great Strength** is needed.

All of these essentials are provided by Kewanee design and steel riveted construction.

The water tube grate and header is built into Kewanee Smokeless Boilers in the high temperature zone of the firebox directly above the oil burner. The pumping action furnished by the rapid formation of steam in these tubes causes forced circulation of the whole large waterways. This circulation sweeps the steam bubbles from the heating surfaces and thus maintains the most effective condition for the transfer of heat.



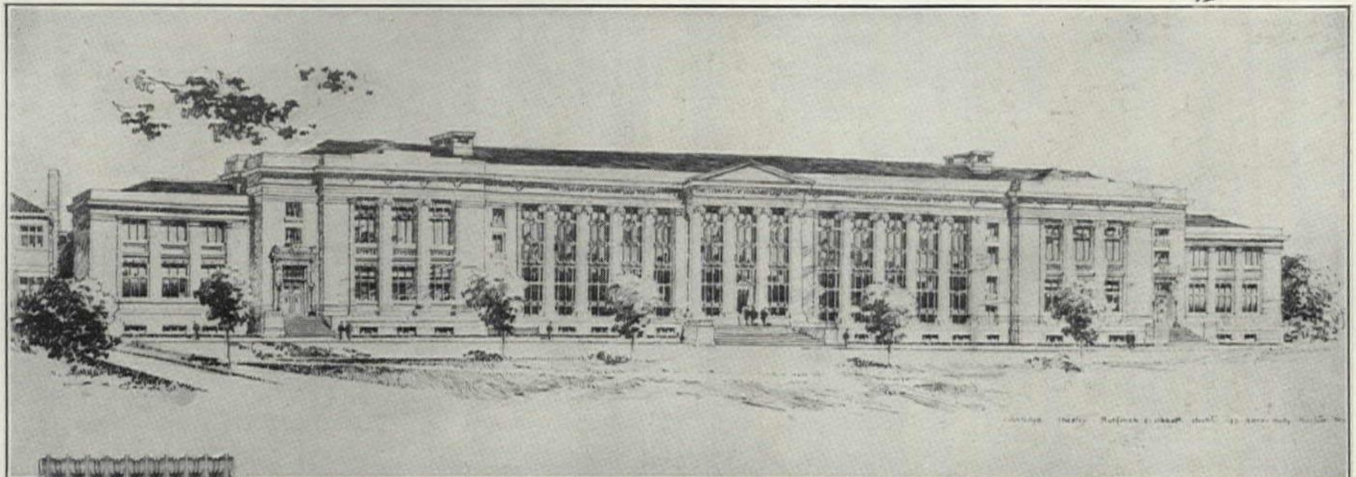
Ask for special data on burning oil in Kewanee Boilers

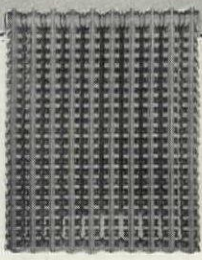
KEWANEE BOILER CORPORATION

Kewanee, Illinois *Branches in 40 Principal Cities*

STEEL HEATING BOILERS RADIATORS WATER HEATERS
TANKS AND WATER HEATING GARBAGE BURNERS

The beautiful new Vento equipped Library of the Harvard Law School
Architects: Coolidge, Shepley, Bulfinch and Abbott, Boston, Mass.
Engineers: Densmore, Le Clear & Robbins, Boston, Mass.
Job: The Library of Harvard Law School, Harvard University, Cambridge, Mass.
Blower Company: B. F. Sturtevant Company
Heating Contractor: Jas. S. Cassidy, Cambridge, Mass.
Square Feet of Vento, 11,579





A representative section of a Vento Heating Unit.

A *World*-F*amous* I*nstitution* C*hooses* VENTO HEATERS

WHAT led the engineers for Harvard Law School to choose Vento Heaters for its splendid new library? Nothing else but the desire for the best heating equipment available at reasonable cost!

And it is for this reason that dozens of America's finest buildings are similarly equipped with Vento Cast Iron Heaters.

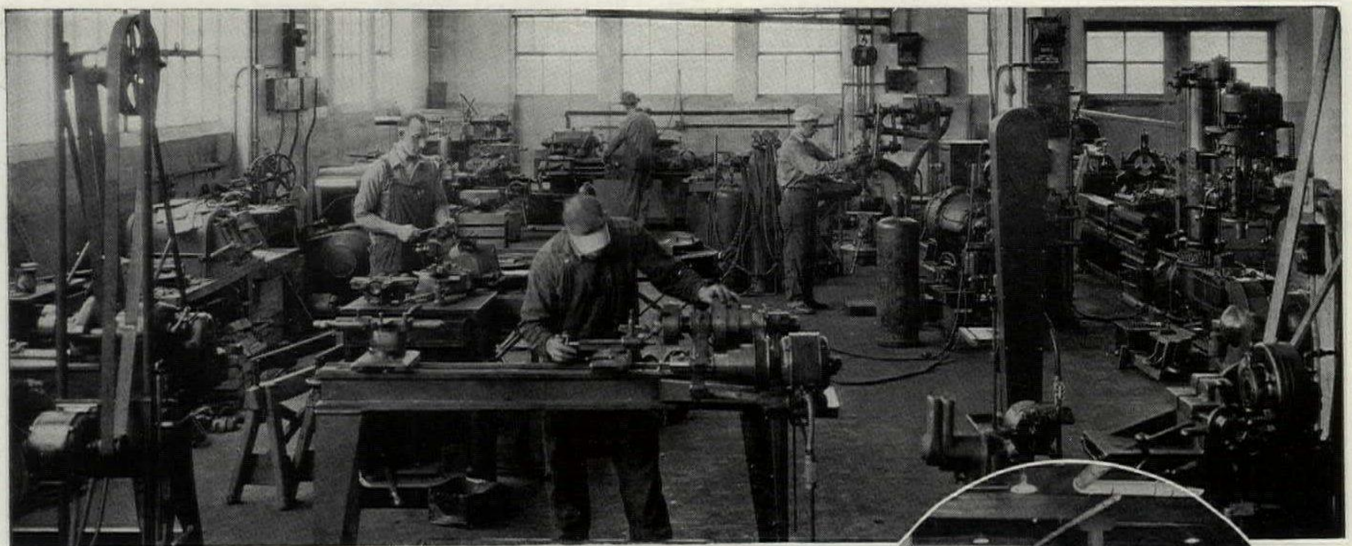
After all, there is no substitute for quality and performance. And when these two factors are joined to fair prices and lifetime wear, no argument can stand against them.

Consider: Vento Heaters are absolutely correct in principle: they are built with infinite care to last as long as the building. Yet comparative bids show the net installed cost in most instances to be in favor of Vento.

Know more about Vento Heaters. Send today for our revised edition of engineers' data applying to this superior equipment.

AMERICAN RADIATOR COMPANY

816-820 S. MICHIGAN AVE. VENTO DEPT. V-312 CHICAGO, ILL.



WESTINGHOUSE ELECTRIC & MANUFACTURING CO., EMERYVILLE, CALIF.
Bernard J. Prack, Architect and Engineer

BIRD & SON (ROOFING MANUFACTURERS)
Chicago, Ill.

SEFTON MFG. CORP.
Chicago, Ill.

A Versatile Floor

Leading elevator manufacturers recommend BLOXONEND FLOORING for freight elevators; nationally known industrials use it on factory areas; prominent school architects specify it for shops and gymnasiums. Its end-grain surface resists wear indefinitely and *stays smooth.* Inherently resilient, clean, odorless, dustless and sliver-proof, BLOXONEND makes the ideal floor for all surfaces exposed to trucking or excessive footwear. Write for specifications and sample.

Carter Bloxonend Flooring Co.
Kansas City, Missouri

Branch offices in leading cities—See Sweet's

Other Users Include

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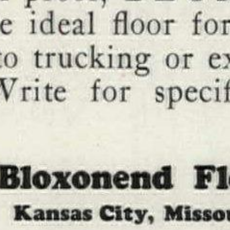
BLOX-ON-END
FLOORING



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

Lays Smooth
Stays Smooth

for any type or size of installation from One Manufacturer

REGARDLESS of size or type of heating installation—the Milwaukee Valve Company has systems and specialities that work economically and efficiently.

Heating engineers and contractors know from experience that they can build prestige and make profits with Milvaco equipment.

One manufacturer—one guarantee, means satisfaction to all.

For 27 years the Milwaukee Valve Company has also been specializing in the manufacture of the unexcelled line of "Milwaukee" standard brass valves, packed type radiator valves, gate, globe, angle, check valves, etc.

Write for complete information

Dept. C.

MILWAUKEE VALVE CO.

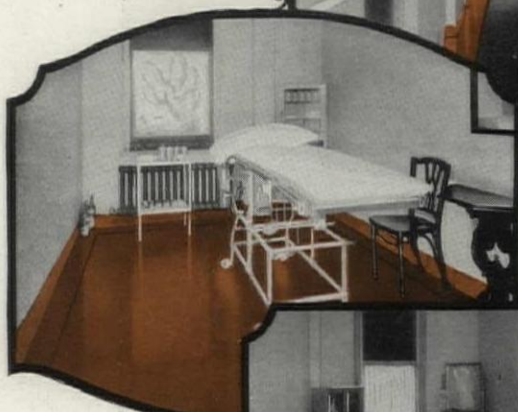
MILWAUKEE, WISCONSIN

OFFICES IN ALL PRINCIPAL CITIES

Where hard type floors serve best

Hospital for Joint Diseases, New York
Buchman & Kahn, *Architects*

Colormix border and base
Jamaica Hospital



Jamaica Hospital, Jamaica, L. I.
M. L. and H. G. Emery, *Architects*

Nurses' Room
Hospital for Joint Diseases

EFFICIENCY and economy demand hard-type floors in certain areas of the modern hospital. Colored, hardened COLORMIX concrete floors meet these requirements so completely that they have become a recognized standard for such areas as are pictured here. They are recommended by the A. H. A. Committee on Floors in their Bulletin No. 47.

COLORMIX is the original integral colored hardner and waterproofer which produces non-absorbent, dust-proof surfaces of tile-like beauty, gloss and hardness, easily kept clean and sanitary. Nine attractive colors available at a cost but a few cents a foot more than ordinary concrete.

Typical installations to which you may refer include The Hospital for Joint Diseases, N. Y. C.; St. Joseph's Infirmary, Louisville; Glockner Sanitarium, Hot Springs; Providence Lying-In Hospital; Asbury Hospital, Minneapolis; Jewish Hospital, St. Louis; and many others. Send for "The Colormix Floor Handbook" in colors and samples of Colormix concrete—free on request.

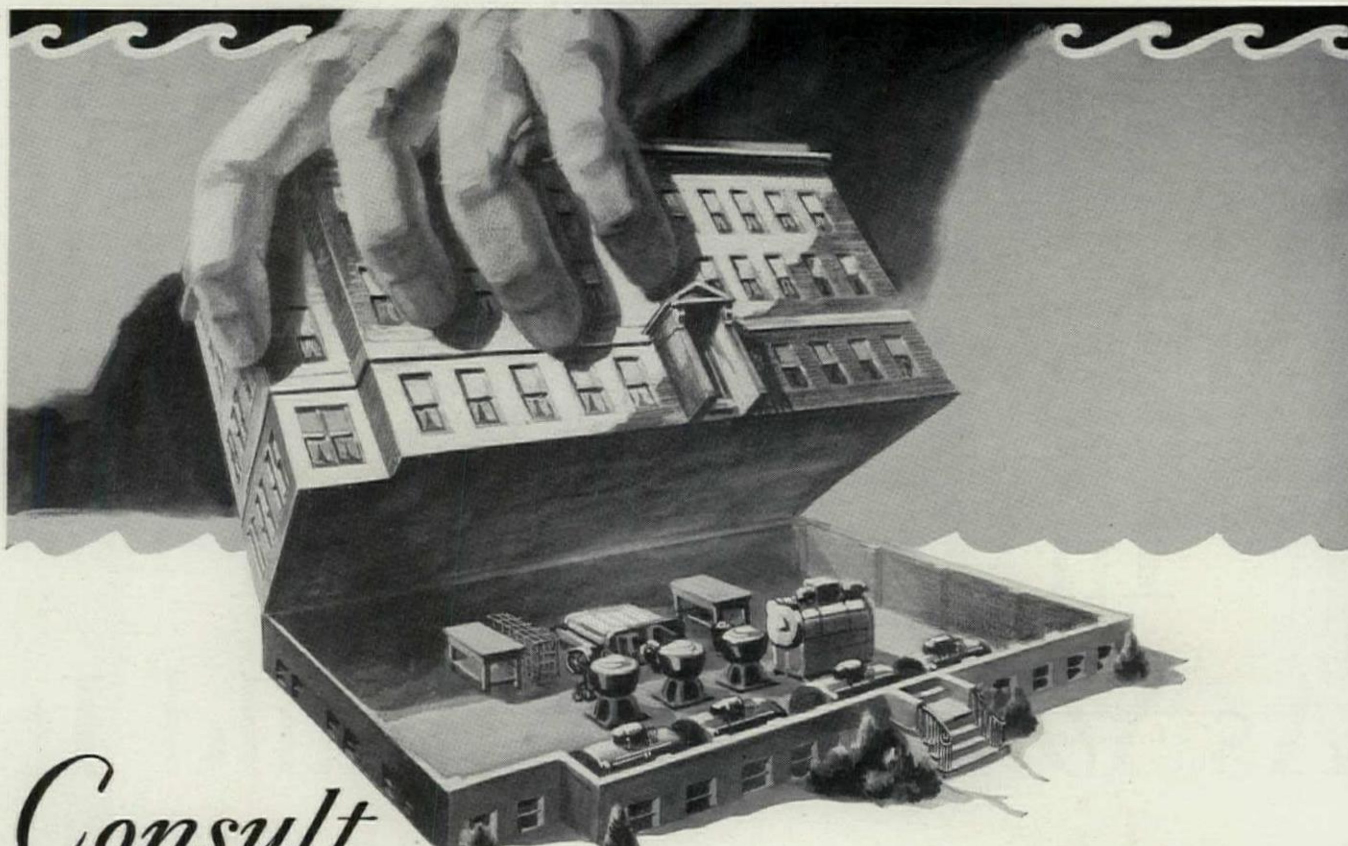
Corridor on service floor
Hospital for Joint Diseases

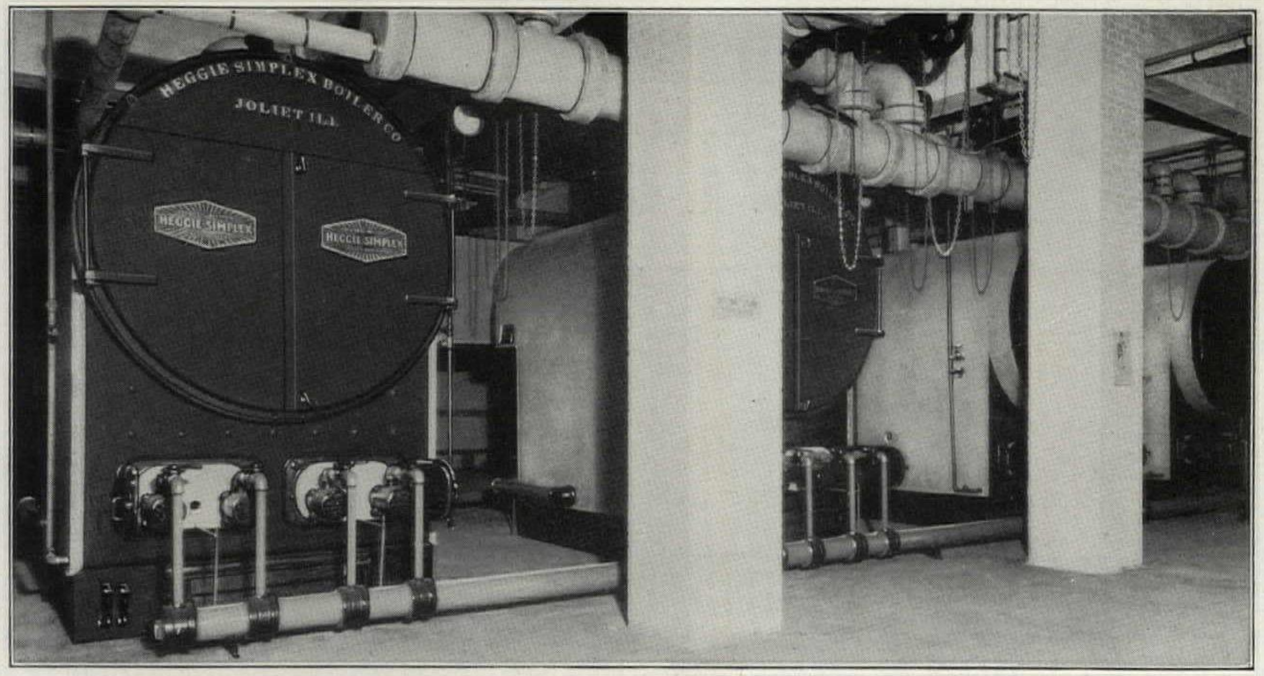
Stairways
Jamaica Hospital

Laundry in Hospital for Joint Diseases

Sales Offices in One Hundred Cities | THE MASTER BUILDERS COMPANY, Cleveland, O. | Factories at Cleveland and Irvington, N. J.

COLORMIX FLOORS





Four Heggie-Simplex Steel Heating Boilers, gas fired, in the Charleston High School, Charleston, W. Va.

Gas Meters Run Slower With These Modern Boilers

HEGGIE-SIMPLEX Boilers having as much as 38% of their heating surface in the fire box—are especially fitted for use with gas. Their rear-front-rear flue passage traps what heat has not already been absorbed in the combustion chamber. Water circulating freely around both the firebox and flues transfers heat to the outlet with maximum efficiency.

Electrically welded of steel, these boilers provide the crack-proof protection, essential to automatic firing. Designed for easy installation of grates, they are readily convertible to use with any fuel.

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

HEGGIE-SIMPLEX

ELECTRIC-WELDED STEEL HEATING BOILERS

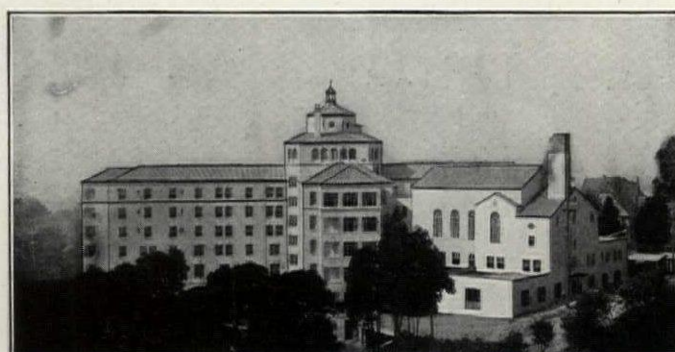
METAL LATH

U. S. Veterans Hospital—Chillicothe, Ohio
Arch.—U. S. Quarter Master Dept.

North Western Metal Lath Lessens "Upkeep," —Retards Depreciation

Architects having hospital work on their boards are invited to critically inspect the plastering in any of the nationally known institutions in which North Western Metal Lath has been used. The marked absence of cracks, streaks and other plastering defects bespeaks sound judgment on the part of the designer in his choice of a plastering base. And the attractive interiors and economy in decorating and repair costs are of course very satisfactory to the hospital authorities.

Providence Hospital and Nurses Home—Oakland, Calif.
Arch.—R. A. Harold, Sacramento, Calif.

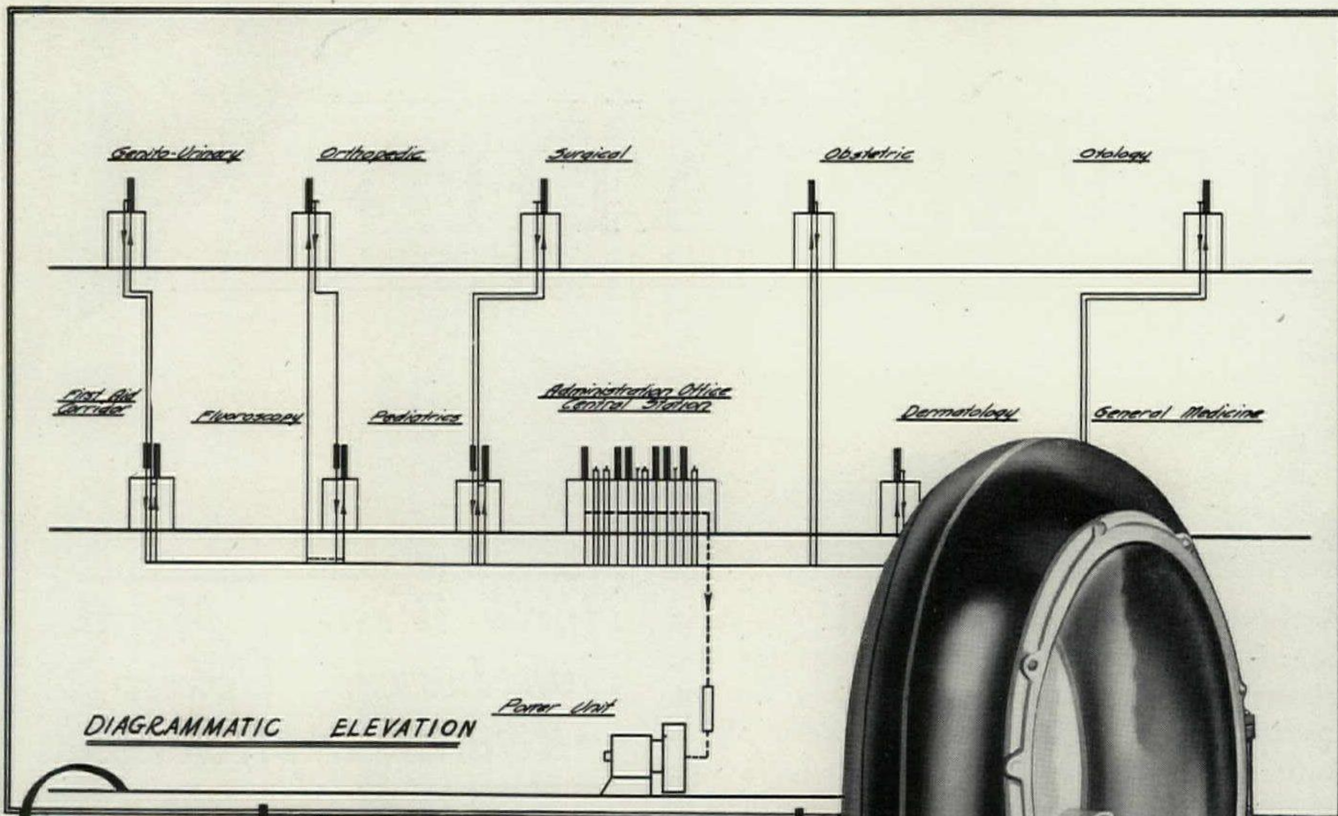


Metal Lath for Every Building Need

Contained in the North Western line you will find the one "best" plastering base for the work you have in hand. May we send you samples, together with our Recommended Specifications?

EXPANDED METAL CO.

CHICAGO, U. S. A.



Combining speed *and* careful handling

In the Hahnneman Hospital and Medical College in Philadelphia, you'll find a four-inch combination pneumatic tube system as shown above. It has the sub-stations operated directly from the central pneumatic tube stations. It is a Standard Conveyor System operated by the Allen-Billmyre Power Unit. An analysis of this installation will be sent promptly on request to any responsible architect.

This system is used for carrying chart records, miscellaneous hospital records, letters and medicine in liquid and powdered form. Glass containers are whisked hundreds of feet and gently deposited safe and sound at their destination, all in a few seconds. For saving time and doing the job efficiently, you can't go wrong in specifying Standard Pneumatic Tube Systems.

STANDARD
CONVEYOR COMPANY

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New York Office, 420 Lexington Avenue
Chicago Office, 549 West Washington Street
Philadelphia Office, 3110 Market Street
Cleveland Office, 1108 Hippodrome Building
Buffalo Office, 908 Ellicott Square

Kansas City Office, 419 Manufacturers' Ex. Bldg.
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Los Angeles Office, 335 So. San Pedro St.
Seattle Office, 321 Lumber Exchange
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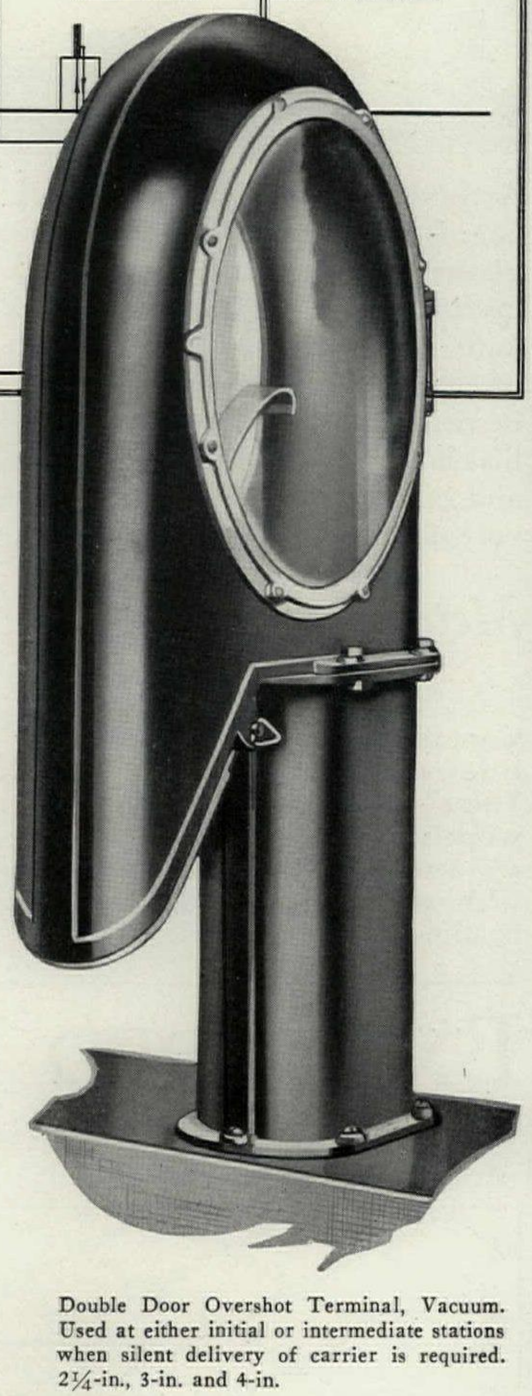
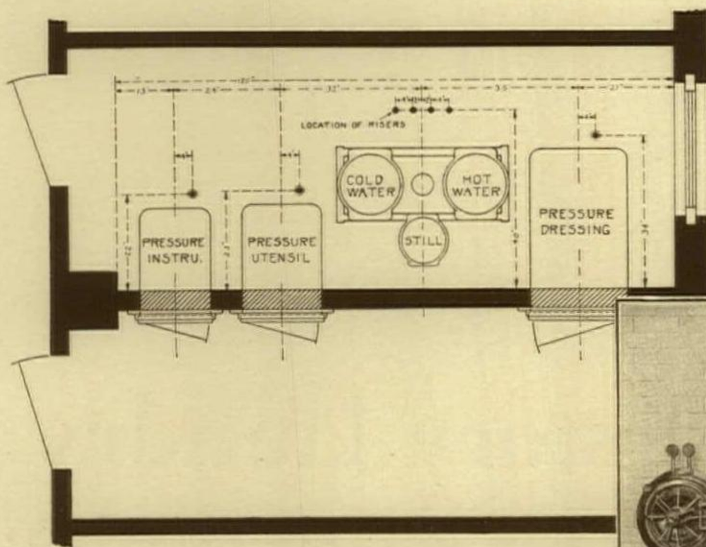
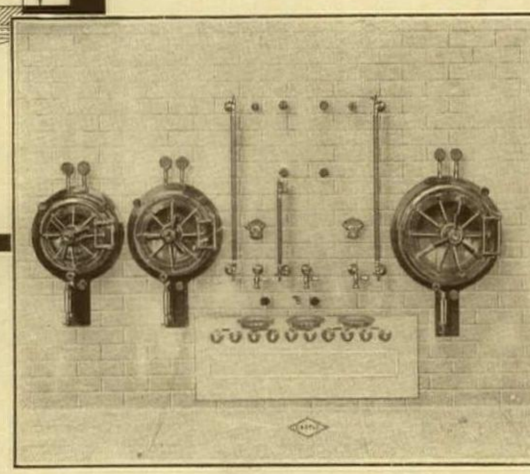


Double Door Overshot Terminal, Vacuum. Used at either initial or intermediate stations when silent delivery of carrier is required. 2¼-in., 3-in. and 4-in.

CASTLE STERILIZERS





Engineering Service on Sterilizer Installations

Hospital Sterilizers must be planned before contracts are let, though the actual sterilizer contract may be a separate later matter. The plumbing and steam fitting specifications must be definitely correct in their sterilizer provisions at the very outset.

Help in making these is part of Castle engineering service. Our men are on call to deliver plans and specifications showing all roughing-in requirements for plumber, steam fitter and electrician. These working drawings are correct according to sterilizer requirements and meet the strictest codes of sanitation.

Recent Installations:

Columbia Hospital, Astoria, Oregon
Doernbecker Hospital, Portland, Oregon
Polyclinic Hospital, Harrisburg, Pa.
Memorial Hospital, Philadelphia, Pa.
Butterworth Hospital, Grand Rapids, Mich.
City Receiving Hospital, Detroit, Mich.
Baby Hospital, Oakland, Calif.
Georgetown University Hospital, Washington, D. C.
Strong Memorial Hospital, Rochester, N. Y.
Brownsville & E. New York Hospital, Brooklyn, N. Y.
Methodist Hospital, Dallas, Texas
Hurley Hospital, Flint, Mich.
Cleveland Clinic Hospital, Cleveland, Ohio
St. Joseph's Hospital, Baltimore, Md.
Mass. General Hospital, Boston, Mass.

CASTLE

1209 University Avenue *Rochester, New York*

Wilmot Castle Co., Rochester, N. Y.

You may send the data which concerns architects to:

....

....

Problem" off Your VAN Equipment

REMEMBER one thing about kitchens in the beginning, and you can forget most things about them from that time on --- Specify Van Equipment! You and your client will then be sure of that trouble-free reliability and unfailing efficiency which go a long way toward guaranteeing success. And there will be no worries about speeding up service, replacing worn out equipment, or taking "time out" for repairs!

If you aren't planning a whole new kitchen —you can do wonders to an old one with the judicious addition of Van Equipment. A new range, coffee urn, dish warmer . . . whatever you need can be added at a minimum of expense, with a maximum return for the investment. Van Equipment meets any appropriation — keeps the operating budget low year-in-and-year-out!

The careful buyer compares before buying. We urge you to compare Van Equipment *with any other!* Judge it for price, construction, quality and appearance. Investigate its method of manufacture. Then ask users. We welcome any comparison. We know that you and your client will want Van Equipment and will be—like all Van users—even more enthusiastic as time goes on.

THE ALBERT PICK-BARTH COMPANIES

ALBERT PICK & COMPANY
1200 W. THIRTY-FIFTH STREET, CHICAGO, ILL.

L. BARTH & CO., INC.
COOPER SQUARE, NEW YORK, N. Y.

THE JOHN VAN RANGE CO., CINCINNATI, OHIO, *Manufacturing Division*

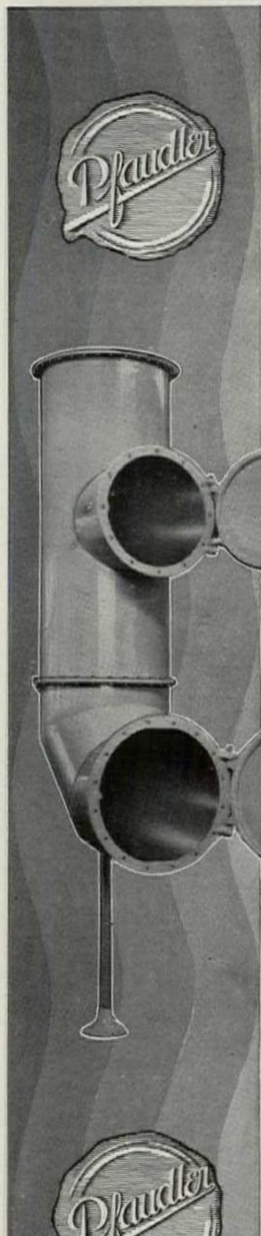
Coffee Shop Equipment is one of the specialties in the Van plant, where miles on miles of counter are constructed annually. This view shows the recently installed counter of the Hotel Baker, St. Charles, Ill.

THE HOTEL BAKER,
St. Charles, Illinois.
Wolf, Sexton, Harper & Trueax, Inc., Architects

For seventy years and more, Van Equipment has been built up to a standard. Every piece must measure up to the same rigid requirement! This is your assurance of superlative quality.

FLUSHED OUT with hot water

THE ONLY LAUNDRY MODERN HOSPITAL



HOW IS THE GLASS-LINED CHUTE CONSTRUCTED?

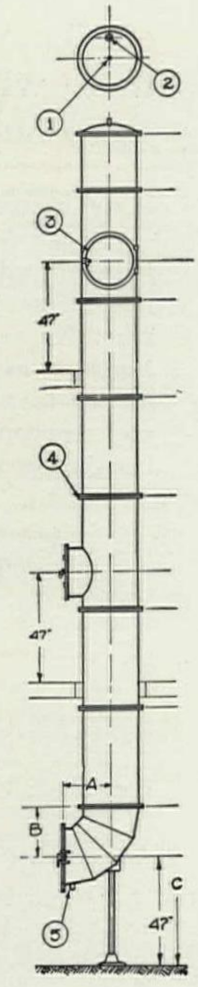
ONE detail of modern hospital and hotel construction, important because it is economical, is the proper type of laundry chute to specify. Experience proves that every single Pfaudler chute installed during the last fifteen years has met requirements *exactly*. And what architect is not interested in recommending a proven product to his client?

The superiority of the Pfaudler chute is founded on the basic materials used in its construction. It is built of open-hearth steel, ⅛" in thickness onto which is fused a genuine glass enamel. This provides a degree of rigidity and sanitation equalled in no other chute. As long as the building stands so will a Pfaudler chute!

Made in two standard diameters, 18" and 24" inside, in 6' sections, the glass-lined chute may be obtained to meet the requirements of any building regardless of height.

The door throats are welded (not riveted) onto the tube proper, thus eliminating seams. The door frame assembly for both bottom elbow and service doors are reversible for either left or right hand swing. The doors are made of paneled aluminum, finished in gray "Duco."

A spray nozzle on the top section permits the ejection of hot water against the entire interior circular surface of the chute for cleaning purposes. In addition it also may be sterilized with live steam, a practice very desirable in hospitals.

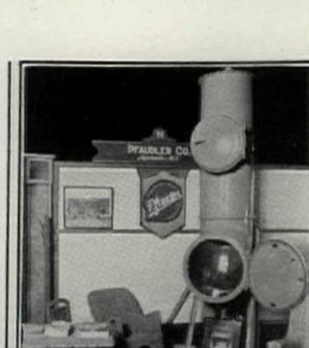


≡ *Key to Diagram* ≡

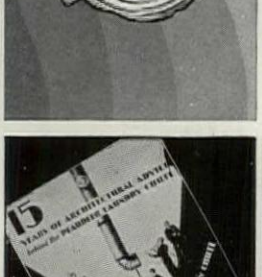
1—¾-inch nipple connection to flushing nozzle for joining to water service pipe. 2—3-inch coupling for ventilator pipe. 3—Dished aluminum door finisheo-in gray "Duco." 4—Standard "Pfaudlerite" gasket. 5—2-inch standard pipe outlet drain connection.

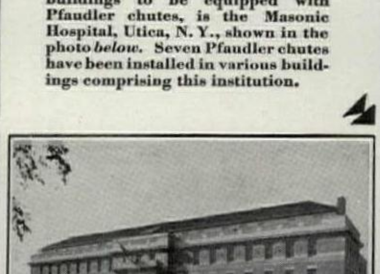
Dia.	18"	24"
A	20⅜"	20⅜"
B	18"	22"
C	65"	69"

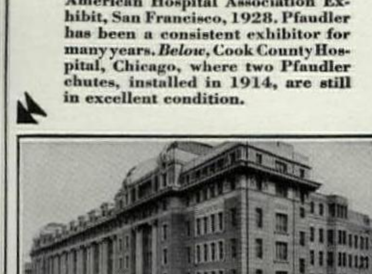
One of many recent institutional buildings to be equipped with Pfaudler chutes, is the Masonic Hospital, Utica, N. Y., shown in the photo *below*. Seven Pfaudler chutes have been installed in various buildings comprising this institution.



Left, view of the Pfaudler booth American Hospital Association Exhibit, San Francisco, 1928. Pfaudler has been a consistent exhibitor for many years. *Below*, Cook County Hospital, Chicago, where two Pfaudler chutes, installed in 1914, are still in excellent condition.







BOOK DEPARTMENT

"THE THEORY OF STRUCTURES"

Reviewed by FRANK W. SKINNER

PROFESSOR SPOFFORD'S long theoretical researches and experience as professor of civil engineering at the Massachusetts Institute of Technology, justly famed for its unusually high standards and thorough training in scientific and mathematical subjects, plus his distinguished record of design and construction in his consulting capacity, have well qualified him as an authority on the principles and methods of analysis and computation of bridges, buildings, roofs, arches, trusses, and girders that are essential elements of a large proportion of architectural and engineering construction. His thoroughness, clear thinking and writing, keen analysis and simple, direct methods, accurate, workable results and complete treatment of fundamentals, illustrated by everyday examples that demonstrate applications, make this volume not only authoritative, but exceptionally convenient and attractive both for study and for application to practical problems.

While it is primarily a comprehensive textbook for the technical student, it is exceptionally useful to the busy architect, engineer and designer who may follow it implicitly, and rely on it for rational and accurate methods of computation easily understood and efficiently applied. Its broad engineering field also covers features not usually specialized in by architects but which are here discussed and accessible in case of need. The chapters on Outer and Inner Forces, Laws of Statics, Reactions, Shears and Moments, Influence Lines, Concentrated Load System, and Graphical Statics, if carefully assimilated, afford adequate knowledge for the appreciation, understanding and solution of most ordinary stress problems. Especially valuable to the architect are the chapters on Framed Bents for High Buildings; Design of Columns and Tension Members; Beam Design, Plate Girder Design, and Space Framework; while the chapters on Three-hinged Arches, and on Masonry Arches with Fixed Ends, although specifically prepared for bridge work, are equally applicable to the principles involved in arches for walls, roof trusses and other architectural details. Chapter IV gives very simple explanations of shear and moment formulæ by which the strength of steel, concrete and wooden beams may be computed, and handbook tables checked or verified give an easy and rapid check on a large proportion of the members of ordinary floor construction. A convenient list of commercial dimensions of beam timbers and examples of computations for wooden steel beams is included. Chapter V presents a thorough discussion of

Any book reviewed may be obtained at published price from The Architectural Forum single and multiple-web plate girders and the formulæ necessary for the computation of stresses and the proportioning of rivets, splices, stiffeners, flange plates, connection angles and fillers, besides consideration of practical details and illustrative problems that can be easily followed and applied for long or heavy spans in public and industrial or commercial buildings, etc. Chapter VII summarizes truss theory and the analytical and graphical methods of analysis and computation, determination of shear stresses and shear methods; it gives diagrams of typical trusses and examples of problems in stress determination, besides covering features most likely to occur in architectural work.

The discussion of three-hinged arches in Chapter X includes data on influence and stress tables that can be applied to long-span armory and auditorium trusses, etc. There is in Chapter VI a brief discussion and an explanation of popular formulæ for short and long columns. It shows principal types of riveted columns, briefly investigates eccentric forces, flexure and thrust, dimensions and cross sections, and illustrates methods of design and computation. Chapter XVI on Space Framework deals with structures composed of end-connected bars lying in more than one plane, which, owing to the arrangement of members, cannot be solved by division into several planar structures, and is devoted chiefly to computations of stresses and reactions in tripods, pyramids, frustums, polygonal rings and the Schwedler dome, illustrated by the solution of sample problems. Chapter XXI, the last in the volume, develops, explains and applies approximate methods of determination of stresses due to lateral forces, such as those from wind pressure, earthquakes, machinery vibrations, etc., in portal type framed bents of tall buildings where diagonal bracing is omitted and where the girders are rigidly fastened to the columns by connections capable of transmitting large bending moments through the columns to their foundations. These methods are based on assumptions that there are points of contraflexure of columns and girders and that the direct unit stresses and shears in columns are proportionate to the comparative locations of the columns with reference to the direction of the wind.

Data especially valuable to structural engineers and bridge engineers are given in other chapters that discuss bridge trusses with secondary web systems, trusses with multiple web systems, lateral and portal bracing, transverse bents and viaduct towers, skew bridges, lateral bracing trusses, transverse bents in mill buildings, long-span bridge types, cantilevers and equations of conditions, riveted truss joints, bridge pins and the arrangement of members on pins, statically indeterminate girders and trusses, continuous girders, three-moment equation, theory of least work, slope deflection theorem, redundant members and temperature stresses, swing bridges, masonry dams, earth pressure, cohesion and friction, and surcharged walls.

The volume is neither elementary nor complex; it does not abound in short cuts, easy approximations or long tables giving general results by inspection or interpolation. It does not serve as a handbook of arbitrary, empirical or commercial information for the non-technical designer incompetent to analyze and compute. It is a book easily digested by a designer familiar with simple computations and analysis who will find it a guide to the

You will want to know about the National Lumber Consultants . . .

SERVICES of the National Lumber Consultants, a staff of 100 trained men organized to help wood consumers get the best results from this material, are constantly available to architects all over the country. The Consultants group consists of architects, engineers, construction experts and wood technologists—men qualified by experience and training to assist you with your unexpected lumber problem.

How Consultants can serve you

You may want specific information on the successful use of short length lumber . . . the right size joists for an unusual type of span . . . proper grade of lumber to meet a particular requirement. A Consultant can bring this information to you. Another time you may want to know the insulating value of lumber for a certain type of construction . . . the latest way of preventing deterioration . . . the possibilities of a certain wood for interiors. As specialists in their line, these men are constantly on call to amplify further your own broad knowledge of lumber and its uses.

There is no charge whatever for this service. You may feel free to call on it at any time.

There is a Consultant near you

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THE THEORY OF STRUCTURES. By Charles M. Spofford, 587 pages, 6 x 9 ins. Price $6. McGraw-Hill Book Company.

PRACTICAL COLOR SIMPLIFIED. By William J. Miskella. 113 pp., 5¾ x 9 ins. $3.50. Finishing Research Laboratories, Inc.

ARCHITECTURE and interior decoration, if they are to entirely serve their proper functions, involve much use of color; unless they make use of the resources which color affords, architecture largely fails to meet its opportunities, and decoration becomes thin and anæmic. Americans have been said to be "afraid of color," and to be given to adopting cautious and tentative schemes which involve little of its use, the result of which leaves much to be desired. It is only during the past few years that color, so far as America is concerned, may be said to have come into its own, due of course to a better understanding of color and use of its resources to create that vitality which it is one of the purposes of architecture and decoration to supply. This volume is a valuable addition to a series of handbooks on the use of color. It deals with the subject in a way which is direct and logical, and one of its parts discusses the use of color and lighting in theaters and display windows, which of course are largely dependent upon lighting and color.

REAL ESTATE QUESTIONS AND ANSWERS. By I. Flapan. 342 pp., 6 x 9 ins. Price $5. Prentice-Hall, Inc., New York.

THE development of many an architect's practice has come to involve considerably more than was imagined even a few years ago. Securing excellence of design and planning, important as it is, no longer constitutes the sole or even the chief end of an architect's endeavors, for securing the best and most efficient equipment of many kinds is now of as great if not greater importance, and lately the architect has been forced to enlarge the range of his activities by adding the exercise of other functions which touch even when they do not at least partially cover what is generally regarded as the province of the real estate operator. The client in many instances now looks to his architect for guidance through a maze of detail and technicality regarding the acquisition of property and its improvement. This involves matters of title, contract, payment, profitable investment, loans, bond issues, leases, etc., and added to all this there comes what constitute logically the architect's proper functions,—the designing and planning of what is to be built. The architect, even though he may have at his beck and call the best of counsel and many of the adjuncts of big business, may well learn from whatever source he may.

This work, prepared by a member of the New York Bar, who is also manager of the Bronx County Mortgage Company, while intended primarily for the laity in general or for those who are about to enter the field of real estate, is filled with matter of interest to the architect. The author discusses, intelligently, the legal principles involved in real property in addition to the everyday problems of the practical side of real estate. The book

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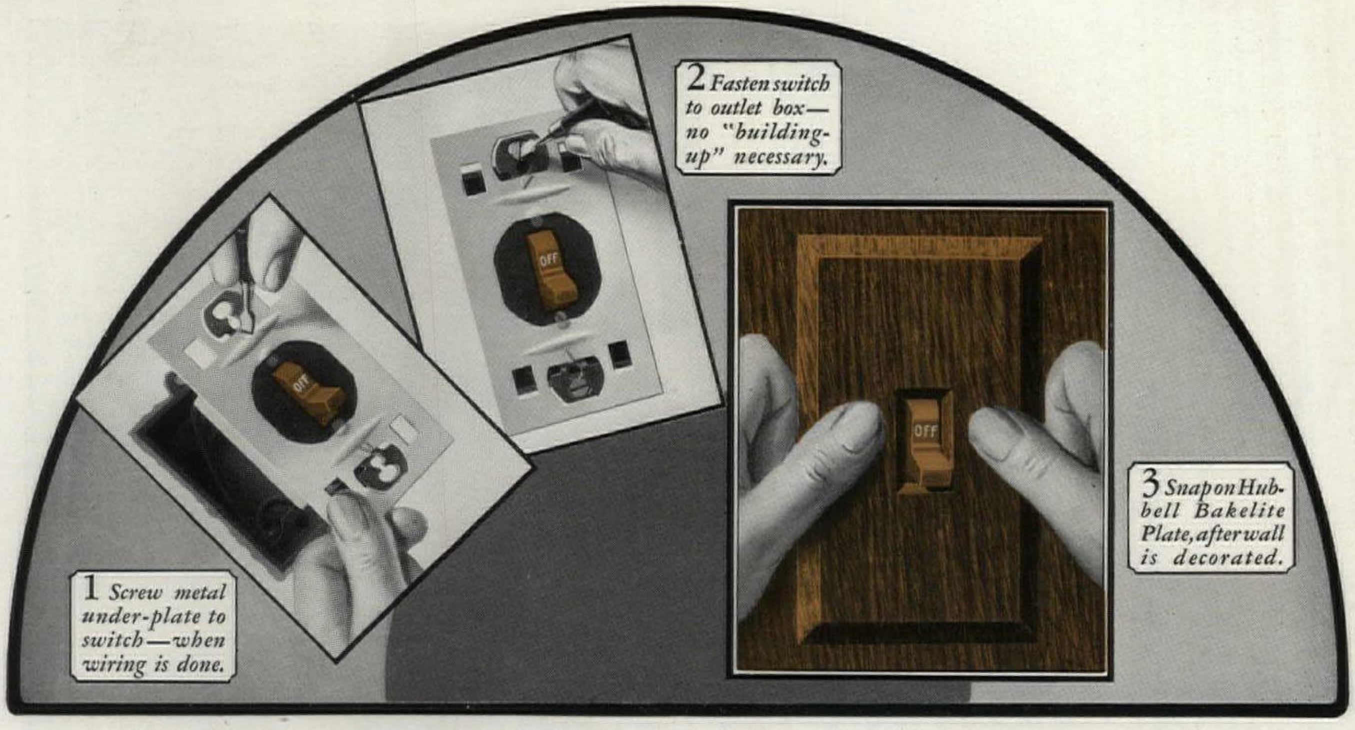
BUILDING THE HOUSE OF GOD. By Elbert M. Conover. 217 pp., 6 x 8½ ins. Price $2.50. The Methodist Book Concern, New York, Chicago and Cincinnati.

THE designing of churches, along with the designing of structures for purposes secular, shows steady improvement. One has but to look back over the past one or two decades to realize that there were then hardly more than two or three American architects who possessed more than casual interest or more than average ability in the construction of churches, and those few were concerned chiefly, if not solely, with commissions of large extent involving considerable cost; the church of small or medium size was left to chance, with results which were not always encouraging. At present there are many architects whose church work is of great excellence, and the architectural publications are constantly presenting illustrations and plans of small churches,—sometimes very small,—which are admirable.

Many of the large religious bodies, realizing perhaps the need of improvement in church design and sensing the drift of public opinion, have established "departments of architecture" from which, under the supervision of trained architects, plans and designs are supplied to congregations about to build. This volume, issued by the Methodist Book Concern, is a review or survey of the activities of such a department, giving illustrations of many churches of varying sizes, and abounding in suggestions likely to be of value and interest to building committees and others concerned with the erection and equipment of churches and their accessory buildings. The volume lacks, however, the names of the architects who designed the churches illustrated.



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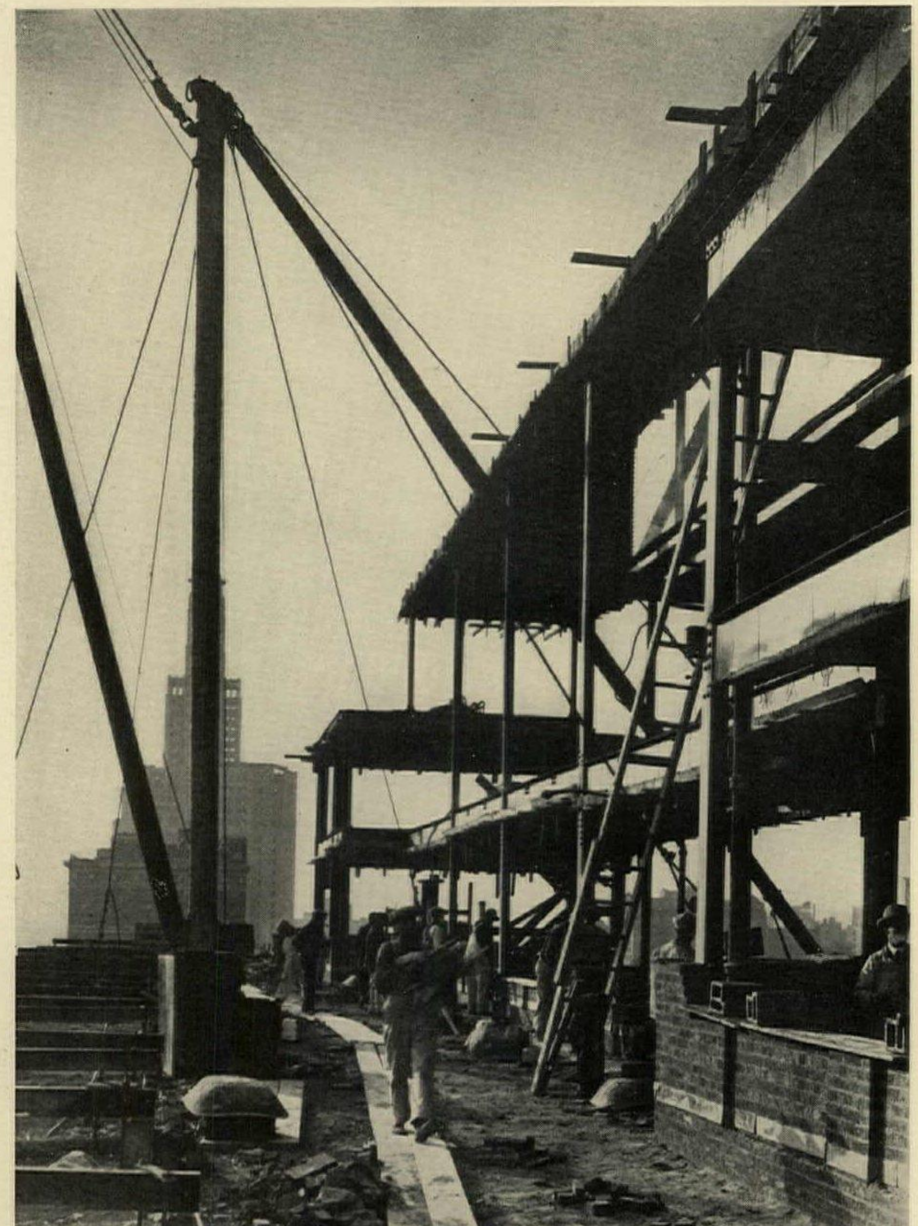

THE MODERN HOSPITAL UNDER CONSTRUCTION

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THE
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VOLUME XLIX

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DECEMBER 1928

HOSPITAL DETAILS AND FINISH

BY
EDWARD F. STEVENS

WHILE the architectural plan of the hospital with its correlation of one department with another, its protection of the patient from disturbing elements, etc., is most essential and necessary, the intimate details of finish, hardware, plumbing fixtures, floors and decorations have much to do with the comfort and well being of the patient and indirectly with the success of the institution. However fine the exterior design, and this is essential, each department must dovetail with another, and the essential parts of this dovetailing are the details and finish.

Perhaps there is no more discussed detail of the hospital than the floors, and most careful statistics have been compiled by hospital committees as to the wearing qualities, suitable colors, fitness of position, etc., of various materials. Many floor materials have been developed, tried and "found wanting." Others have proved satisfactory for a period of years, only to develop serious defects in manufacture until the hospital architect is "put to it" to know how to advise wisely. No material can be equally good for every place, but a material should be selected, (*a*) for its suitability for the location, (*b*) for color effect, (*c*) for its lasting qualities,—and just a few of these are mentioned here.

Cement. Perhaps more floors and bases are made of Portland cement than of any other material, principally because of its cheapness combined with its hygienic qualities; when properly treated it is very satisfactory, particularly for basements, room bases, and borders to floors where other materials are used for centers.

Terrazzo. No more enduring floor has been found than terrazzo,—a combination of marble chips and Portland cement,—which can be produced in many colors, and when combined with tiles or marble insertions, most satisfactory designs can be secured; when laid on reasonably small areas of from 10 to 20 feet, with metal separations, the result is generally satisfactory. Various forms of magnesite floors are used with varying results, depending on material and workmanship. For special uses, no better floor can be secured than one of the mastic or, as it is sometimes called, "plastic linoleum" type, and similar material made in tile form, pressed to a hard surface, makes perhaps the most ideal laboratory and utility room floor.

Linoleum. For the patients' rooms, where resiliency and warmth of color are needed, there is no more suitable and inexpensive floor than linoleum, and with the varying colors and patterns now to be had, most pleasing effects may be obtained. When properly laid by experienced men, a most enduring floor is secured.

Rubber Tiles. With the vast possibility of color effects, use of combinations of designs and patterns has become almost universal for corridors, entrances, and in fact almost any place not affected by dampness from below. One of the great advantages of the rubber floor is the simplicity of care required and its freedom from noise,—two really important items in a well regulated hospital. Added to its need of little care is its resiliency, which acts as a sound absorber.

Tile in its various colors, shapes and sizes will many times prove to be the only satisfactory material for use in a solution of the floor problem. Perhaps no more satisfactory floor for the kitchen can be had than the so-called "quarry tile," or for the operating room than the vitreous flint tile.

Marble will always be used for general floors where the strictest economy is not necessary. Care in selection of a close grain structure is essential. In the smaller hospitals, where frame construction may be necessary, the common practice is to use a wood floor of some hard material like maple or birch. Whatever be the floor material, care and upkeep must be considered for permanency. With the floors should also be considered the wall material, and here tile is the universal favorite for walls of operating rooms and certain service rooms; but even the finished tilework loses its dignity as a hygienic finish if not kept on a line with the frames and plaster, and this is done by allowing a recess of sufficient depth for tile setting, for while the projecting tile may finish with a beautifully moulded cap, there is always the feeling of something forgotten by the architect.

WALL TREATMENT. The methods of wall treatment possible are as varying as the treatment of floors, and like floors they depend upon the clients' pocket books. For the walls of the kitchen and laundry, where steam is a factor, some vitreous surface is desirable,—either enameled brick which may be built with the construction, or glazed tile, which may be laid after construction. While it is desirable to extend the glazed surface to the ceiling, if for economy or other reason only a portion of the wall is tiled, the plaster line should continue on the same plane with the tile, and the door and window frames should be of sufficient width to receive the extra thickness. In such rooms as sink rooms, serving kitchens and toilets, especially back of plumbing fixtures, and in sterilizing rooms, the entire height, where possible, should be faced with tile, and at slight extra expense color can be used to advantage in panels and friezes. The walls of the operating rooms are more easily cleaned if they present a glazed surface. Light gray, buff or green are colors much used, and even the dark gray, with the equipment and gowns of the doctors and nurses of the same color, has become with some surgeons very popular.

Marble, especially fine grained marble, is not only a hygienic, but also a highly artistic wall material. For the wall treatment of toilets and shower baths, marble may be used with economy. Built-in metal cabinets of new and hygienic construction are beginning to replace plastered walls for clothes closets and cupboards and are vastly more flexible.

Vitreous slabs of opaque white or colored materials are made that are impervious, attractive and sanitary. They are available in large sizes, involving but few joints, and may be used in many places.

Rubber tile makes not only a serviceable dado, but acts as a resilient buffer for beds and food carts. It should, however, be set even with plaster lines.

Terrazzo, either pre-cast or built-in-place, gives excellent wear.

Stucco, in the form of imitation stone, or applied in various forms and colors, provides simple and artistic wall treatments for entrances and official rooms.

Of course, the most common treatment of walls is with *plaster,* preferably of the hard variety, and when it is not subjected to rough usage it is a durable material. The most common method of treating plaster is with *paint,* and with well dried walls and a selection of the proper colors, with or without decoration, it is quite satisfactory.

The day of plain white walls is, let us hope, gone by, and decoration in the form of "sanitary" wall fabrics is now being used to good effect at low cost, so that the private room of the hospital may be as artistic as the private bed chamber of the home. Simple decorations for the children's wards and play rooms may be made by the pasting of paper figures on the walls and then treating them with varnish. The hanging of pictures upon the walls of the sick room is generally "taboo," but simple and artistic treatment may be obtained by making a slight insert in the plaster and securing with glue one of the many really beautiful colored prints, which is then varnished over.

FINISH. While rounded corners do not make a hospital, the absence of sharp angles, both interior and exterior, in finish and bases, has a tendency to

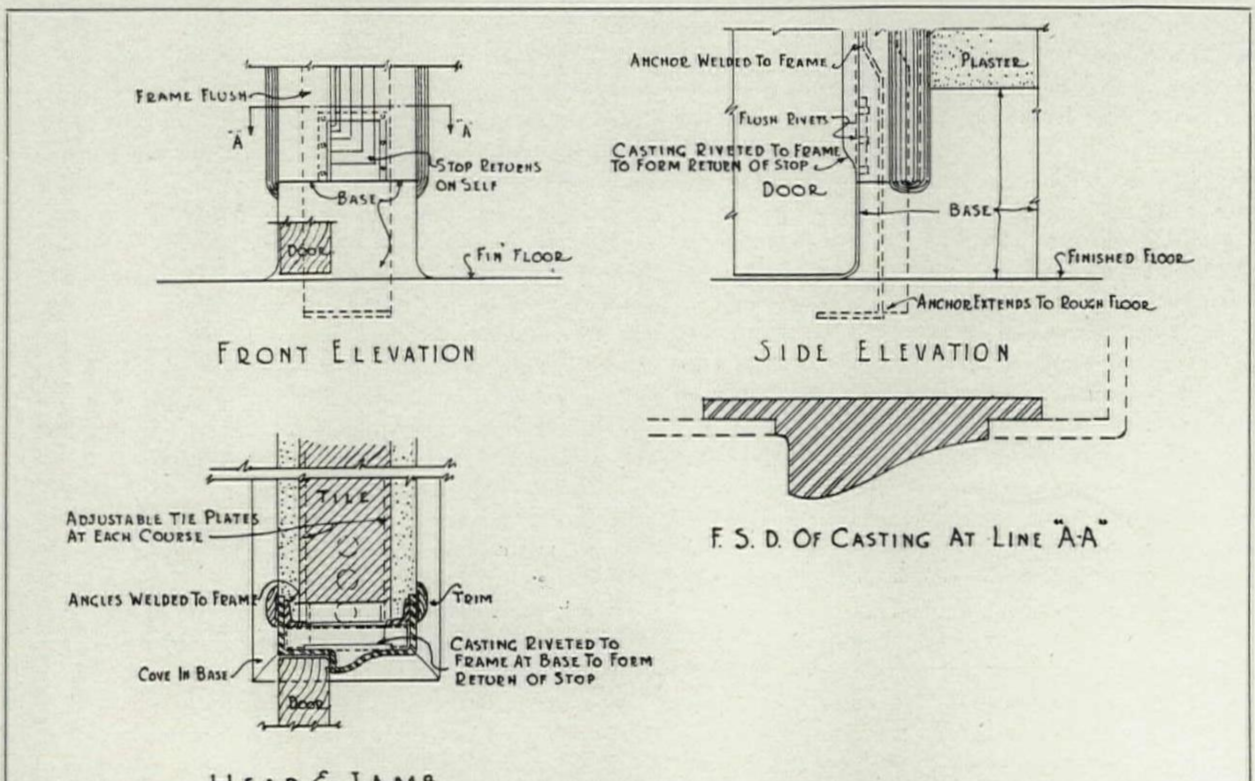


Fig. 1—Section Through Metal Hospital Door Frame, Showing Method of Carrying Wall Base Across the Face of Jamb

lessen the labor of the care of the building and to make it more hygienic from every standpoint. This "rounding" process should be carried out at the floor if nowhere else. The door jamb, instead of being carried to the floor with the rebates and mouldings, should be stopped at the height of the base, and the base material, whatever is used, carried through and the projecting finish, if any, carried to base. If small, it can be limited at the base (see Fig. 1), or if a more elaborate finish is used, finished to a plinth of the base material. Some of the standard details used in the writer's practice are here shown. (Figs. 1 and 2).

Windows form an important function in the lighting and ventilating of a hospital, and their detail is important. The placing of the windows on the plan so as to allow room for the bed without the necessity of crossing the window should be observed. The designing of the window frame and finish so that the room may receive fresh air from outside without producing a draft should always be considered, and where practicable reëntering angles and flat sills should be eliminated. A simple finish (without reëntering angles) may be used. (See Detail, Fig. 4). The sill at the bottom of the window may be straight or projecting above the stool, giving, when the window is slightly raised, a direct-indirect opening for fresh air, the deflection allowing the air to enter without draft. This method also provides for the entrance of air at the meeting rails of the sash. (See Fig. 4).

Doors. The flat or "slab" type doors have become widely used in the up-to-date hospital, and by the use of inlay they can be made as attractive as the more elaborate panel effect. The door frames should be of substantial material to resist the effects of frequent passage of the beds, the wheel stretchers and the food wagons, and steel jambs with or without mouldings have become almost universally used and are considered in the light of economy, although wood jambs in less frequently used doors may be installed. (See Fig. 1). Cabinets and cupboards open and free from contact with walls not only provide for utensils, but make possible frequent and thorough cleaning with the least effort.

Nurses' Stations. Around the nurses' station of the floor should be gathered as closely as possible the various details, such as the linen cupboards, the chart cases, the nurses' call annunciator, and within easy reach, the sink or workroom, the room for cut flowers, etc., and an accompanying cut shows one method efficiently worked out. (Fig. 3).

Sink Rooms, Sub-sink Rooms and Toilets. On all patients' floors the nurses' workrooms, commonly known as the "sink rooms," should be planned with ample spaces for the various details of equipment necessary for a properly functioning hospital,—bedpan hopper, sterilizer and storage racks, the slop sink, the ice box for cracked ice, the hot plate, cup board for specimens for laboratory examination, etc. The smaller sub-sink room need not have elaborate equipment, but merely a toilet for patients, which may be combined with a bedpan washing device, and as circumstances may dictate, a small sterilizer and pan rack. Where sub-sink rooms are placed between wards, the service is greatly simplified. (Fig. 5). Toilets connecting with patients' private rooms are

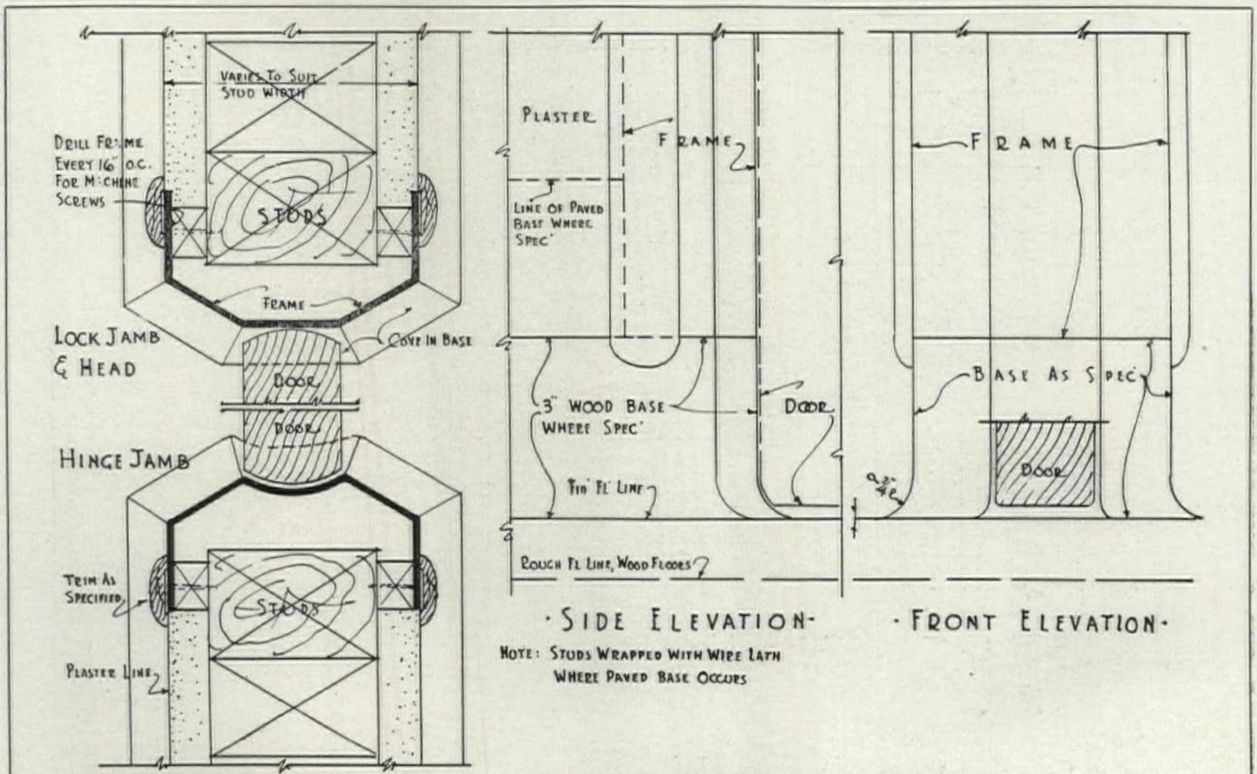


Fig. 2—Double Swing Door Frame, Showing Visual Cut Off at Hinge Side of Door and Integral Base Across Face of Jamb

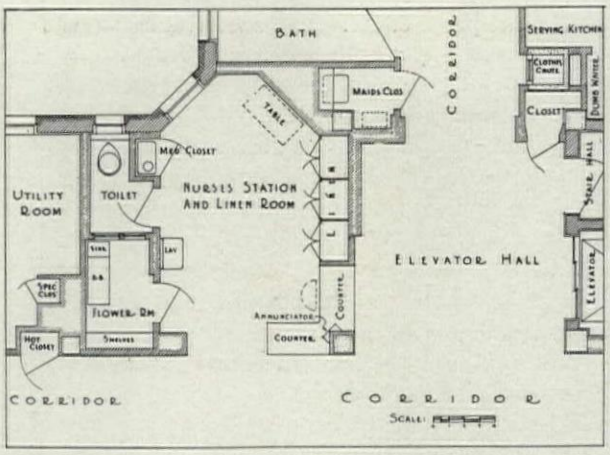


Fig. 3—Nurses' Station at Grosse Pointe Cottage Hospital Showing Proximity to Adjoining Utilities

now looked upon as essential in private room service. These may be for the individual room or with one toilet serving two adjoining rooms, where with special interlocking hardware absolute privacy may be maintained and space and economy in construction gained. With this same plan showers and baths may be used to accommodate either room. (Figs. 6 and 21). Where a bath is desired for infrequent use, one may be planned to connect with two rooms, and by the use of one door only it may be used with absolute privacy to serve each room at will. (Fig. 7).

The increasing demand in the more modern hospitals for smaller units has brought into use cubicle divisions in open wards. These divisions, when considered in making the layout and provided with separate window and heating units, provide a maximum amount of privacy in the ward and at the same

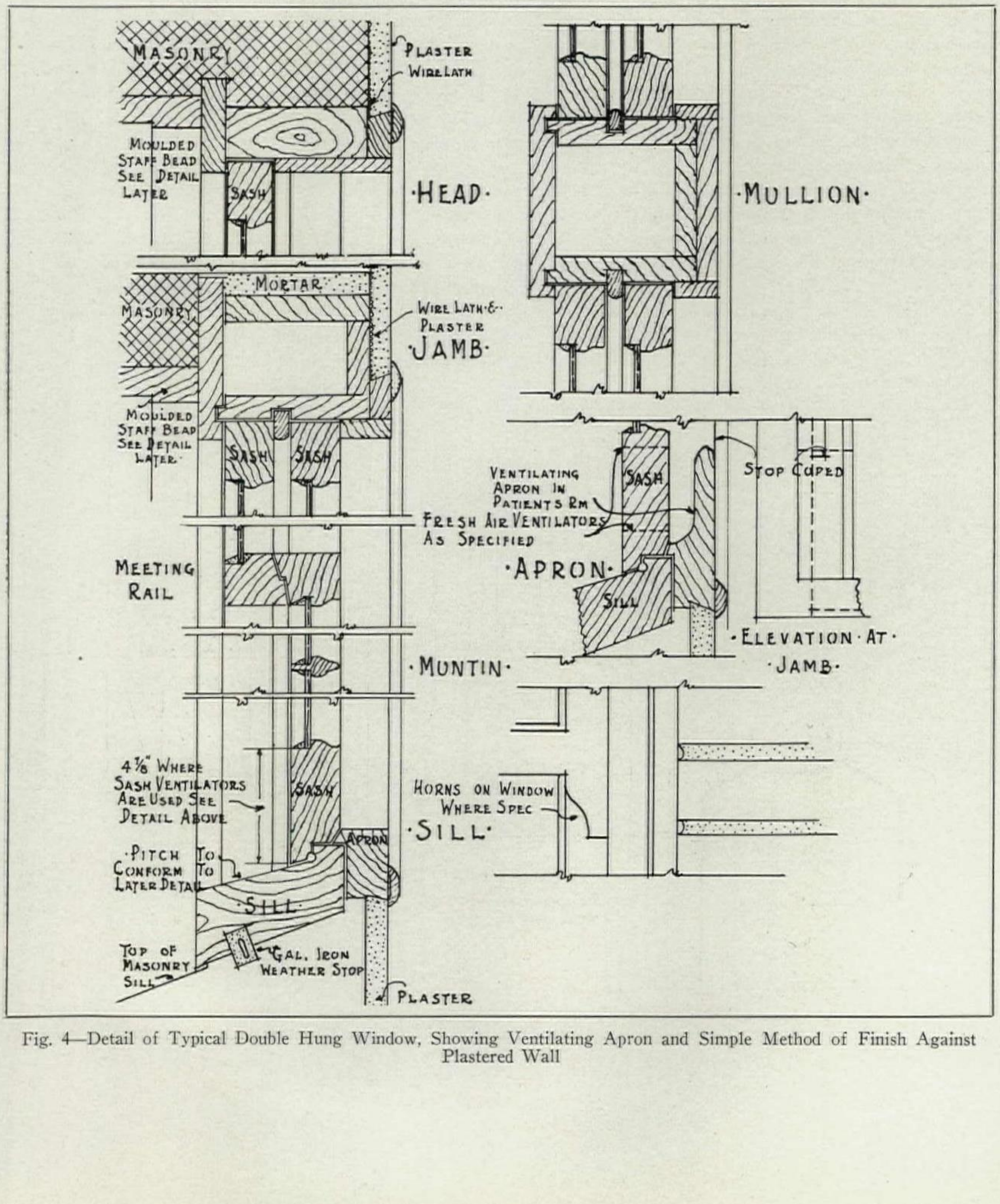


Fig. 4—Detail of Typical Double Hung Window, Showing Ventilating Apron and Simple Method of Finish Against Plastered Wall

time give the nurse complete surveillance of the ward from the nurses' station (Fig. 5), and when provided with sliding panels (Fig. 9) at the bed height it is possible for patients in adjoining beds to "visit" as readily as in the open ward. It is advisable to keep the bottom of the cubicle screen up a few inches from the floor and down from the ceiling for air circulation, and the connecting ties from one cubicle screen to another will provide for separating curtains for complete isolation. The material for the cubicle partitions may be solid plaster on steel frame, steel frame with asbestos lumber panels, or steel frame and panels, but if steel partitions are used, it is advisable to have "filled" panels to absorb the metallic ring of metal. When cubicle partitions are used for children's wards, it is customary to use glass in the upper panels, making possible a more

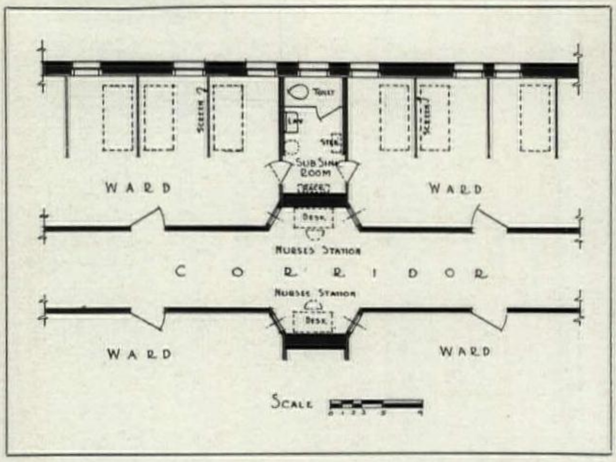


Fig. 5—Small Cubicled Wards, Showing Sub Sink Rooms and Nurses' Station Controlling Two Wards and Corridor

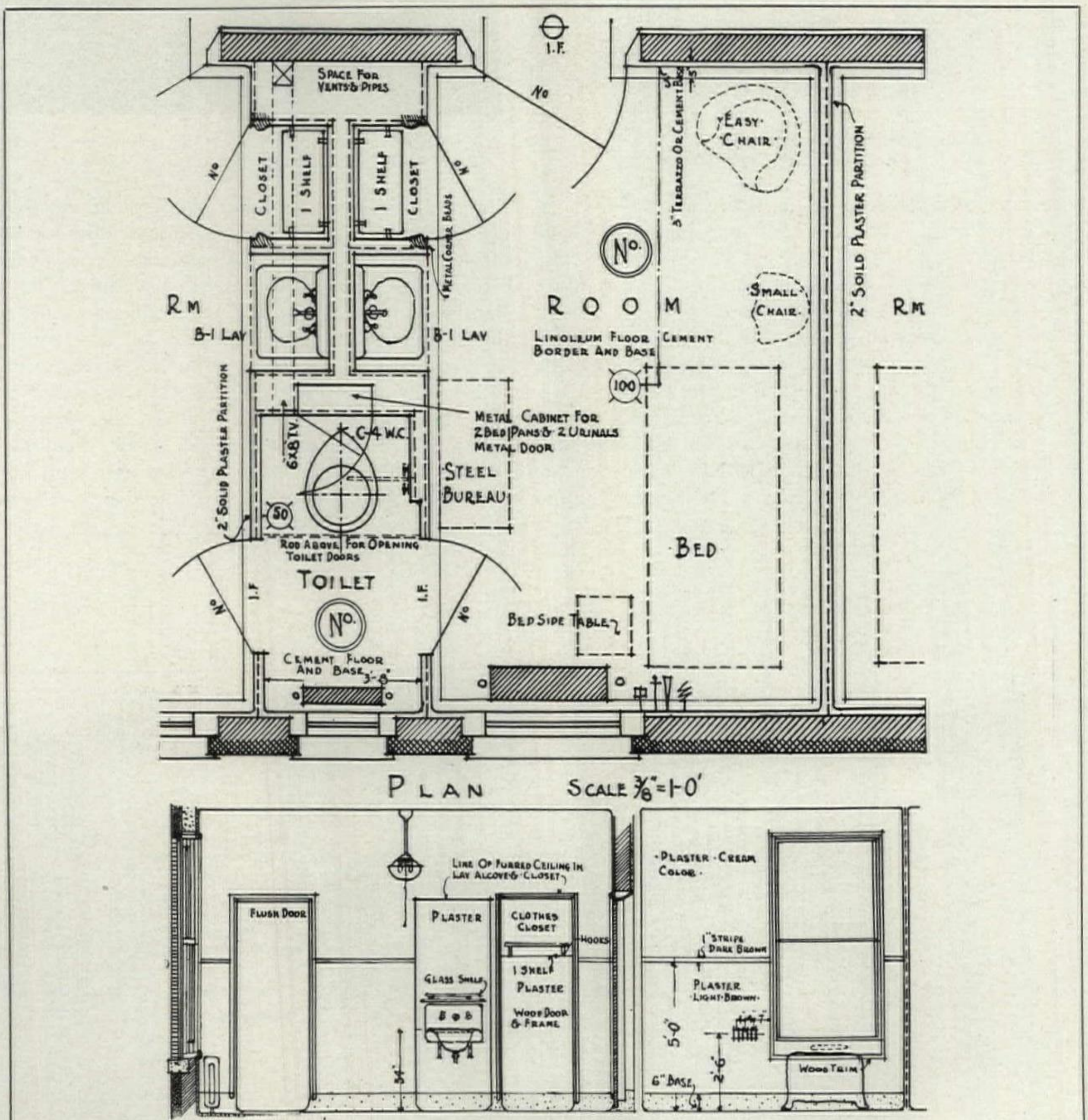


Fig. 6—Typical Arrangement of Private Rooms with Direct Toilet Connection, Showing Bed Pan Washing Device and Metal Cabinet for Utensils

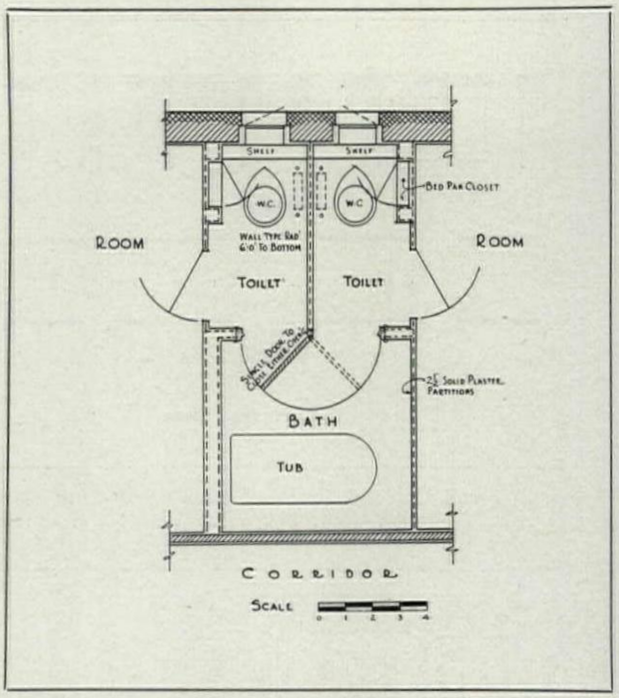


Fig. 7—Plan Showing Private Rooms with Common Bath Controlled by Single Door

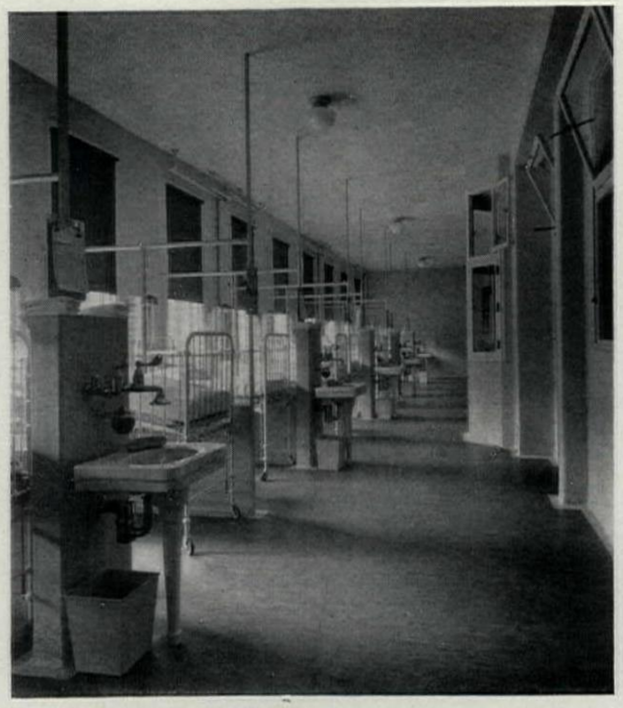


Fig. 8—Children's Ward, Showing Glazed Cubicles, Scrub Up Bowls and Corridor Observation Window

complete surveillance of the entire ward. (Fig. 8).

Hardware. The click of metal against metal, whether it comes from the cogs of a motor, the rattle of metal utensils or the action of door hardware, is among the sounds most annoying to the patient, and to minimize noise should be the aim of the architect. There are no more annoying sounds than the clicking of the door latch and bolts to a door. It is common to see the latch bolt "muzzled" by a towel or a rubber strap, but some of us think the latch bolt may well be eliminated in the construction and the door be held in place by a silent roll striker or by a self-closing, silent door check. The use of the friction hinge, or friction drag, for holding the door in any position and preventing slamming, sometimes accomplishes the same results. Whatever be the hardware used, it should be possible to enter and leave the patient's room noiselessly, and with the hands otherwise occupied; with this in view, use of the hook handle (Figs. 10 and 11) has given universal satisfaction. With the use of the self-closing check it is necessary to provide some "hold back" device, but it should be so applied as not to interfere with the ready opening of the door. Where it

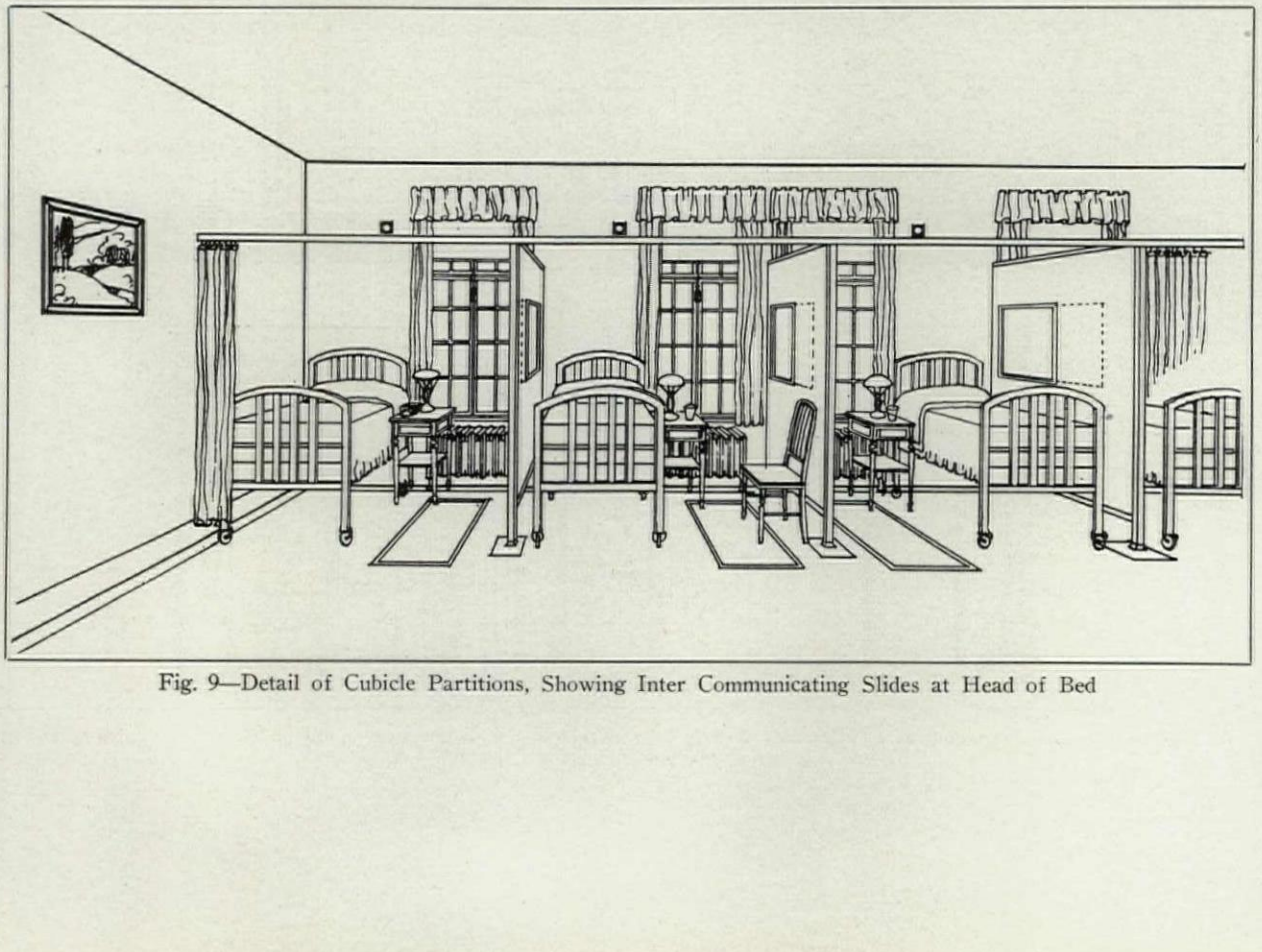


Fig. 9—Detail of Cubicle Partitions, Showing Inter Communicating Slides at Head of Bed

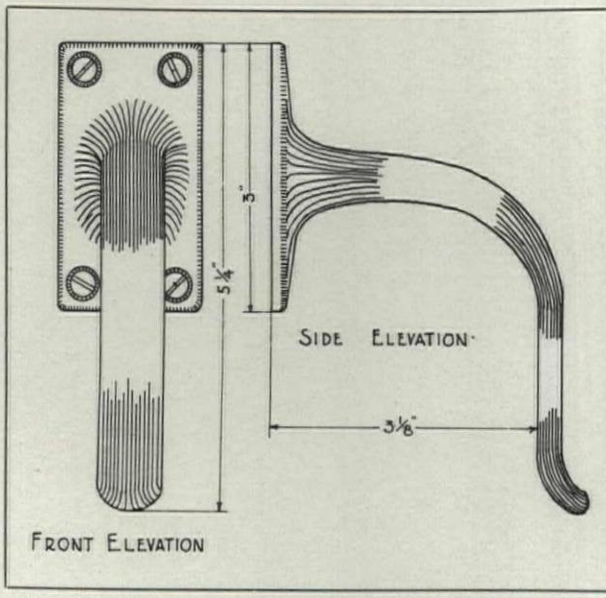


Fig. 10—Elevation of Hook Handle Used for Patients' Doors

Fig. 11—Interior Playroom, Grosse Pointe Cottage Hospital

is desired to swing the door in both directions, the floor checking hinge may be used to advantage, and by using a concave jamb on the hinge, the sight line at the hinge side is cut off. (See Fig. 2).

The noise from the elevator doors often causes great annoyance, and as these can be made to work without noise, great care should be used in the selection of the elevator fronts as well as of the elevator doors. As the openings in the hospital elevator must be wide enough to allow the passage of 3-foot beds, the three-fold sliding door would seem to be the most practical. There is no more important detail in the hospital than the elevator, for upon its smoothness of working, reliability and finish depends the comfort of the patient during transit from one floor to another. The possibility of securing perfect landing, exactly level with the floor, so that beds may be rolled from elevator to corridor without a jar, is to be desired, and the extra cost of necessary equipment is warranted in most cases.

Heating. Insofar as the system of heating is concerned, whether it be hot water or steam, direct, indirect or direct-indirect, choice depends largely upon the type of hospital, climatic conditions and the clients' pocketbooks, but the extent of exposed surfaces of heating units should be considered along with other hospital details. If exposed radiators are used, the surfaces should be easily cleanable, and if set up on single legs or hung from the walls, the ease of cleaning is greatly facilitated (Fig. 12). The use of the direct-indirect radiator allowing for the introduction of fresh air and also ease of cleaning, has been made in certain localities where a greater amount of fresh air than can be admitted by the window is needed. This method of heating is particularly adapted to the operating room, where the

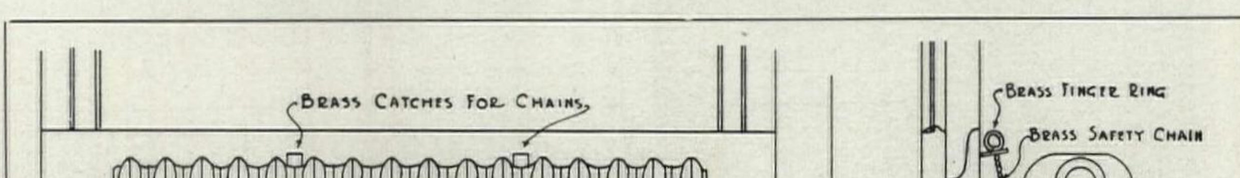


Fig. 12—Detail Showing Fresh Air Duct, Dampers and Method of Supporting Radiators

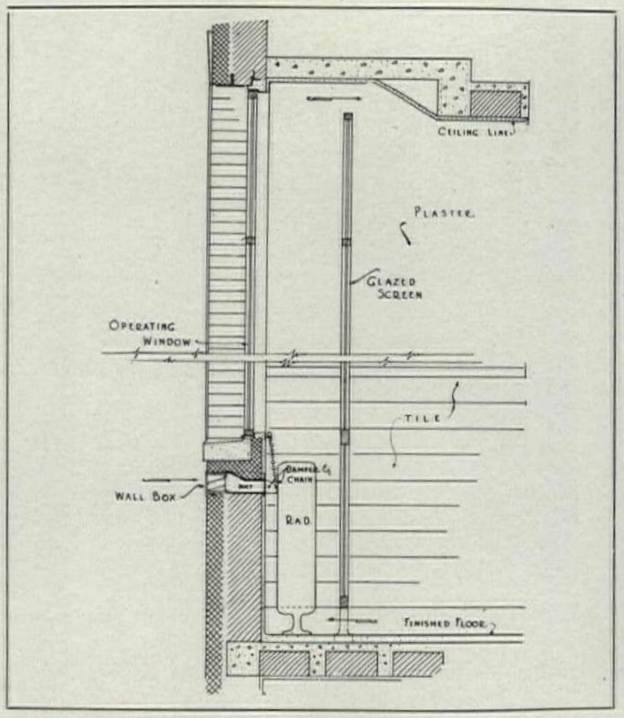


Fig. 13—Operating Room Window, Showing Method of Heating and Ventilating

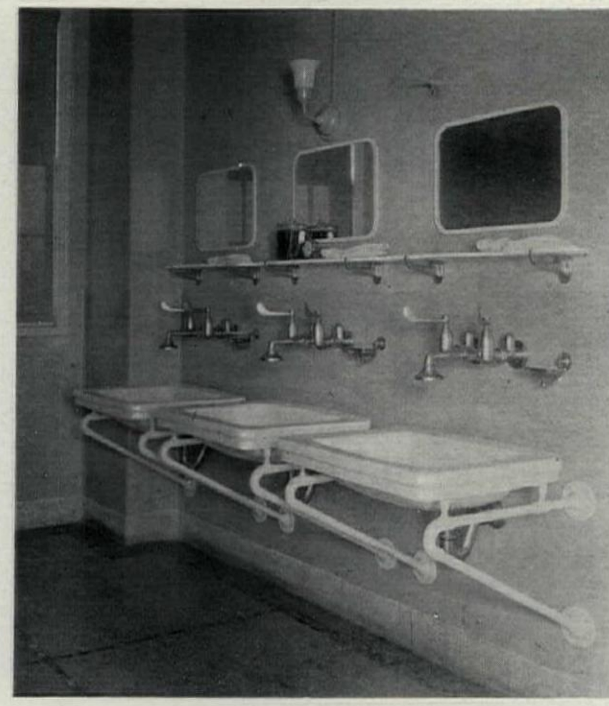


Fig. 14—Central Surgeons' Scrub Up Basin, Showing Elbow Valve, Spray Nozzle, Etc.

radiator may be placed between the outer window and the window screen. (See Detail Fig. 13). Where ventilators occur, for the sake of hygienic cleanliness, it is the opinion of the writer that all grilles and register faces should be omitted and the ducts finished like the wall, and "get-at-able" at all times for cleaning.

Plumbing. A volume might be written on hospital plumbing, from the sewer to the last spigot, but as this subject is covered more fully elsewhere in this issue of THE FORUM, and as the writer is touching only on details and presumably interior details, he will mention a few only of the hygienic precautions which should be taken, and these are illustrated with a few diagrams. The most common piece of plumbing that may be used in every patient's room is the basin, and as this basin is used by the patient, the nurse and the doctor alike, it should have all of the elements for carrying out the strictest hospital technique and should have (*a*) absence of a concealed overflow, (*b*) possibilities of cleaning the drain pipe to the waist line of the trap, (*c*) possibility of drawing hot or cold water through an outlet sufficiently raised above the bowl to allow of filling pitcher or basin, and (*d*) control valves which may be when needed controlled by elbow or wrist. Such a basin simply made should be placed in every patient's room, dressing room and wherever water for cleaning the hands is needed in the hospital.

Fig. 15—Detail of Private Room Toilet, Showing Bed Pan Washing Device

The surgeon's scrub-up bowls may be more elaborate with sprinkler head and large elbow valves (Fig. 14), but with the same principle of construction. Fixtures with "integral overflow," "pop-up waste," fixed standpipes, or any device which could allow a "flow back" from the previous contents of the fixture, should be avoided and the plumbing should be laid out to avoid any possibility of there being syphoning of sewage water into the fixtures or into the water supply. This precaution is very vital in connecting the sterilizers to water and drain systems. In no case should the water and drain connection be made through one pipe. The water should be brought over the top of the sterilizer. In many of the English hospitals the drain of the sterilizers, or any fixture in the operating section of the hospital, drains to an open gutter and thence to the house drain. With water sterilizers this pre-

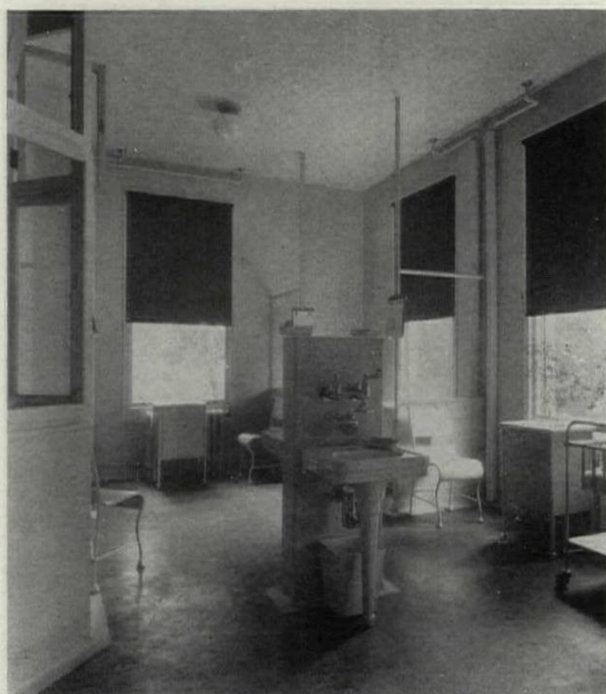


Fig. 16—Infants' Ward, St. Luke's Children's Hospital, New Bedford, Mass., Showing Glazed Cubicles and Scrub Up Bowl

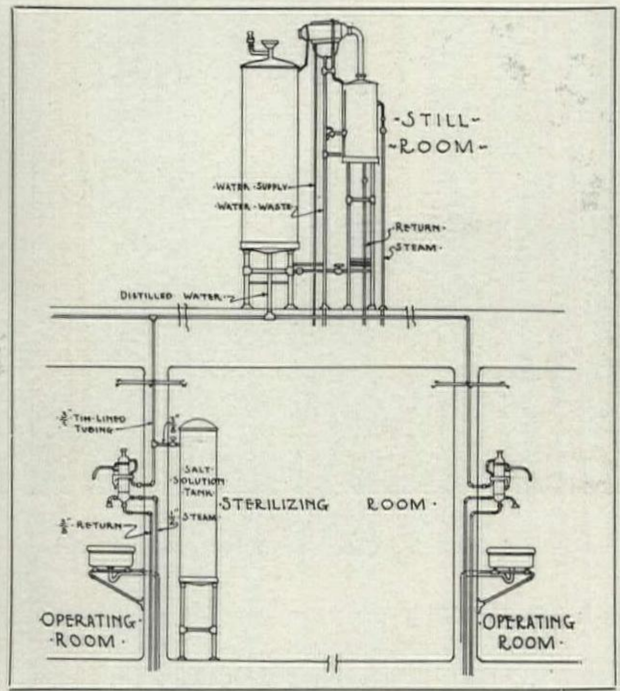


Fig. 17—Section Through Typical Water Distilling Plant for Supplying Distilled Water to All Surgical Connections

caution is more essential than with boilers, and the writer believes that the interests of the hospital are safeguarded to a greater extent if all water used for surgical and drinking purposes is first distilled and conducted by gravity through sterilized pipes to various parts of the institution and locally reheated or re-cooled for use. (Fig. 17). The autoclave or pressure form of sterilizer is now being used very largely for instruments and basins, and when it is "built-in," very little heat is thrown out.

Sound. While the writer has mentioned some of the visible details which go to make up the efficiency of the hospital, the invisible detail of providing for a certain amount of sound absorption adds so materially to the comfort of the patient that providing it is unhesitatingly recommended. This subject is treated more fully in another article in this issue. Sound absorption may be effected either by wall or ceiling treatment, but the use of absorbing material on the walls is subject to more or less objection, owing to its being of necessarily porous material,—it has been found that if the ceilings, which are less likely to collect dust, are treated, a sufficient amount of absorption is effected to make the hospital quiet for patients. It is as great a mistake to reduce the institution to the state of absolute quiet of oppression as to have it too noisy. For the purpose of securing this sound absorption, various materials consisting of loosely pressed fiber of cane, of mill shavings, of felt, etc., are used in slabs and fastened to the ceilings; or materials in the form of plaster of a fibrous nature. All have their value, for if from 30 to 50 per cent of the sound waves are absorbed, very little disturbance is felt. It has been found that if the ceilings of the corridors, the sink rooms, the serving kitchens, nursery, etc., are protected, there is little need to carry the protection very far elsewhere, for the disturbing noises of the hospital emanate from these sources,—from the washing of utensils, from the crying of infants, from the clicking of hardware, and from thoughtless talking in the corridors.

Color and Decoration. With the detail ever so fine, the floors ever so smooth, the air and the water ever so pure, the absence of color may mar the psychological effect on the patient, so that use of

Fig. 18—Nurses' Station, Showing Chart Desk, Nurses' Annunciator, and Linen Cupboards

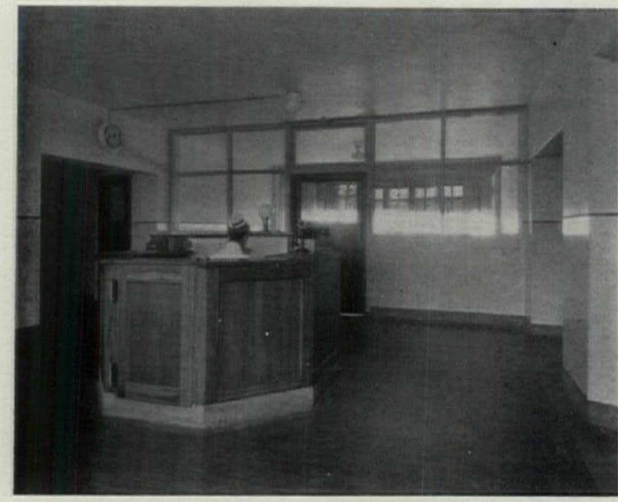


Fig. 19—Central Nurses' Station, Showing Nurses' Call Annunciator; the Charting Cases Are Within the Enclosure

Fig. 20—Cubicles, Scrub Up Bowls, General Ventilation and Decoration of a Hospital Ward

color,—and the *proper* color,—becomes most essential. Upon this use of color depends largely the "beauty of the hospital," as was so fittingly expressed by Father Moulinier at a recent meeting of the American College of Surgeons in Boston, but as this subject is being discussed elsewhere in this Hospital Reference Number, the writer will be pardoned if he refrains from going further into the subject. One example is shown, however, of the possible decoration of a children's playroom (Fig. 11).

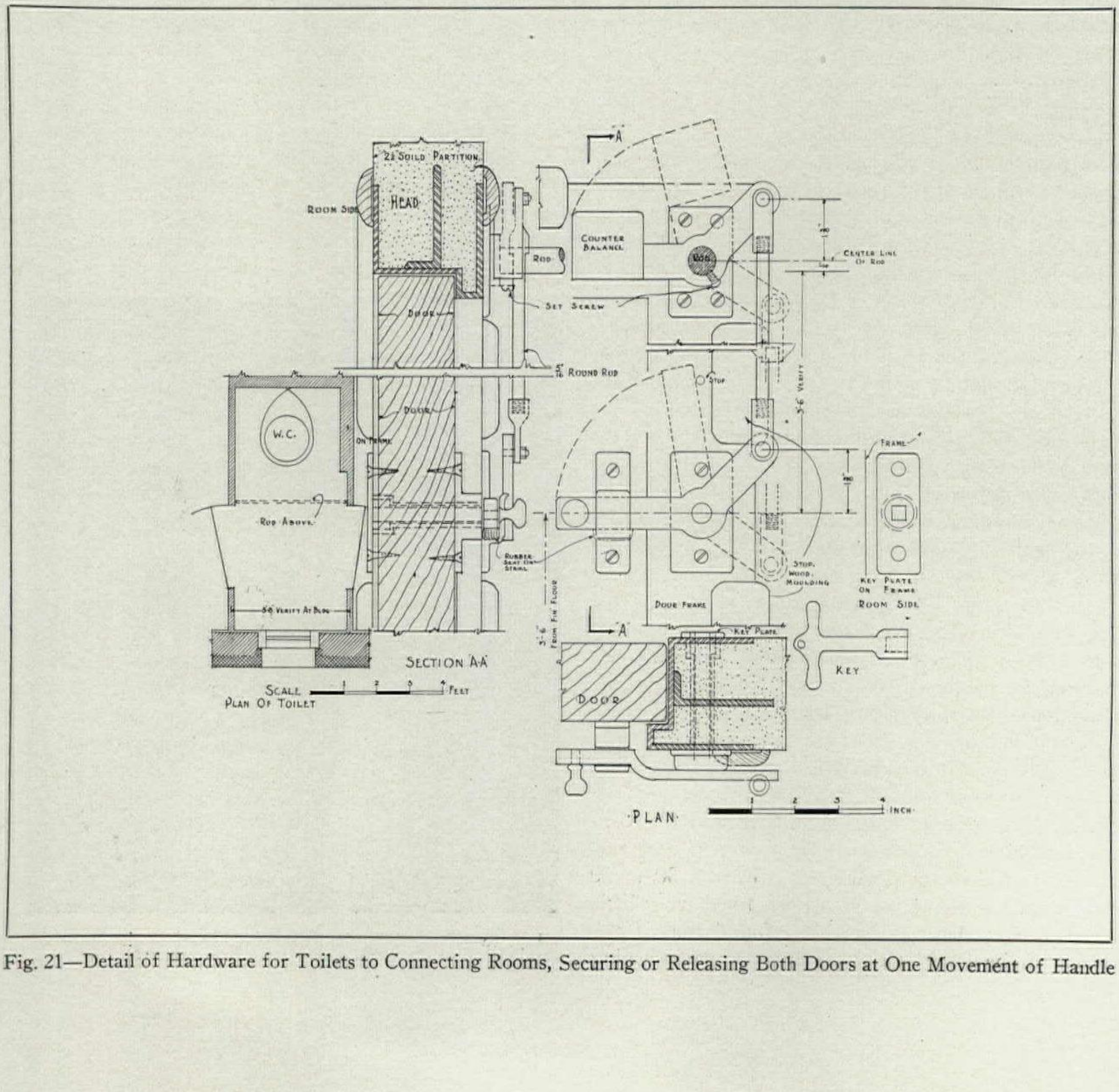


Fig. 21—Detail of Hardware for Toilets to Connecting Rooms, Securing or Releasing Both Doors at One Movement of Handle

HOSPITAL CONSTRUCTION IN WARM CLIMATES

BY

MYRON HUNT, ARCHITECT

THE logical reasons which usually underlie the decision to erect a tall building, for any use whatsoever, might be said to be caused by a restricted site; the high valuation of land; the saving of expense, particularly when construction and floor re-subdivision story by story can be standardized; the cost of foundations in cold climates, where frost extends 4 or 5 feet into the ground; the conservation of heat rising through the building; modern fireproof engineering and construction methods; and not the least of many considerations, the possibility of capitalizing the modern freight and passenger elevator.

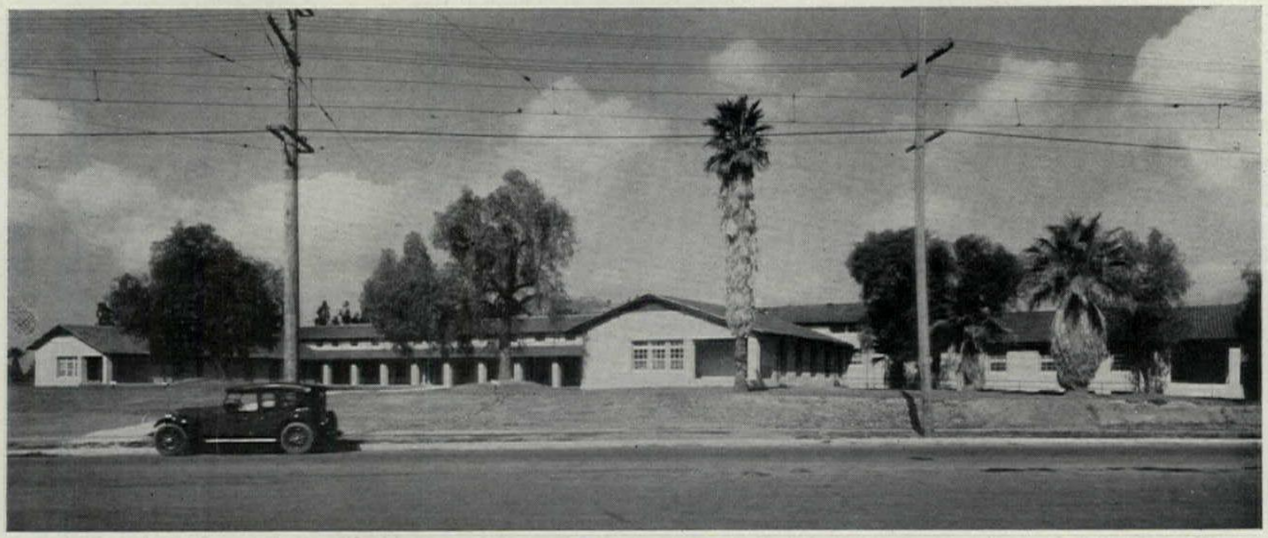
In planning even a small hospital in a cold climate a sufficient number of such considerations will usually obtain to indicate a vertical rather than a horizontal development. In perhaps one third of the area of the United States, however, climatic conditions, with lower average land values, are such as to warrant the serious consideration of the advantages of one-story construction in the erection of a small hospital of say 100 beds and less. Some 20 years ago the writer built in Los Angeles County the first California school building planned on a large scale as a wholly one-story structure. It proved a success as a general scheme. Today in the country districts of the southwest, and largely in suburban districts, the one-story elementary school with its unglazed outside corridors in the form of long porches and its ventilation on two sides of every room, is quite the general rule. There is an actual reason for the California "bungalow," as there has proved to be good reason back of the erection of moderate-sized one-story schools, libraries, and more recently hospitals, in the southwest. Frost extending deep into the ground need not be provided against. Steam heat and its conservation are of less importance than the desire to produce airiness and the desire to move from the garden or grounds into any part of the building at will; and no snow drifts are encountered to make it necessary to set the first story high above the ground level. Under the conditions just suggested, the original expense can actually be reduced, and the upkeep cost of stairways and elevators may be eliminated; the land area, however, must be greater; contemplated expansion can more easily and economically be provided for, and the hospital can be made to look less institutional,—more domestic.

The spread-out plan, even for a 60- to 80-bed hospital, would at first appear to be probably a financial luxury, and certain to involve much walking from department to department. Experience,—the actual measurement of the average number of steps to be taken by the staff,—has, however, proved otherwise, up to 80 and perhaps, on some sites, 100 beds; this means up to a size which necessitates two nursing stations, and in some cases for three such executive centers of nursing activity. For instance, let us take the one-story building at Riverside, built as a two-station, 70- to 80-bed hospital with plans for future expansion, if need be, to a three-station hospital, caring for from 100 to 120 beds. This might have been considered vertically in a cold climate, perhaps as planned in this way. Basement: heating plant; refrigeration and other mechanical apparatus; incinerator; mattress sterilizer; laundry; storage; perhaps the morgue, etc. First story: perhaps the kitchen with its various adjuncts, including the service dining rooms which should perhaps have occupied more space than might have been available; emergency receiving and executive offices. On this floor, unless it had one-story wings, it would have been impossible to have included various desirable local stores; the physicians' and nurses' locker rooms; social service department; and certainly there would not have been space for physiotherapy, which, with its necessity for easy access from the street and the necessity of looking toward possible and almost certain extension, should not be tucked away in the basement. The second story would perhaps have contained from 28 to 33 medical beds. The third story might have contained the maternity department, which however, would have had to be cut down to fewer beds than would have been needed if the creche and its adjuncts, and particularly if the labor and delivery rooms, were kept on the maternity floor. The fourth floor: surgical beds. Here conditions in the community were such as to seem to require more surgical beds than beds for any other department, and a standard vertical building would not have had the surgical beds all on one level. Fifth floor: operating unit, with various laboratories and surgical work rooms, with perhaps labor and delivery rooms. Sixth floor: doubtless a sun parlor; and an intermediate seventh floor could easily have been argued for in order to take care of expansion which could not have been taken care of economically by the future additions horizontally in any vertical scheme or plan.

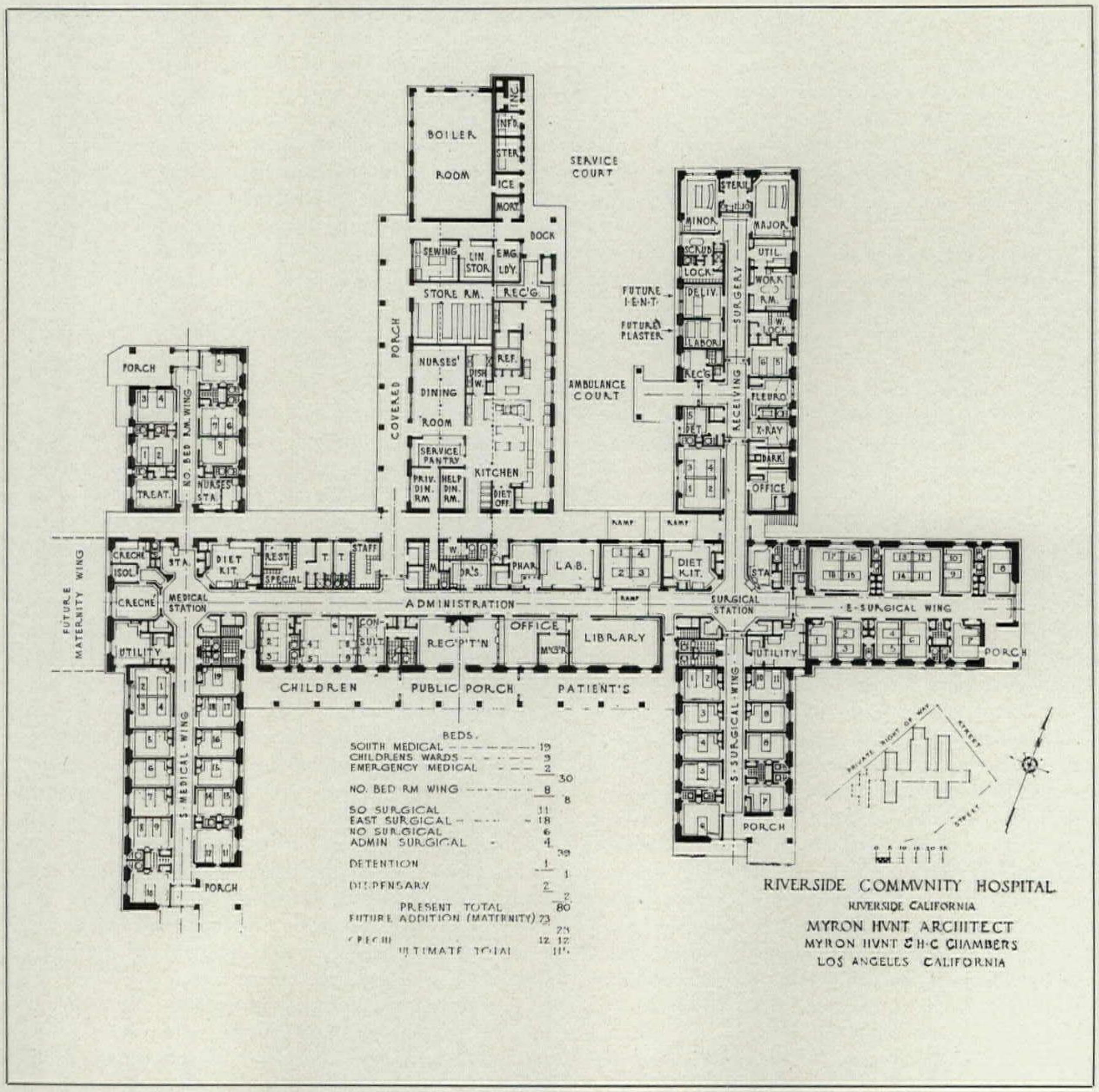
If it had proved desirable, in the Riverside problem, to put their requirements into a five-, six-, or seven-story and basement building, the difficulties to be solved from the standpoint of the inter-relationship of departments might be enumerated as arising from:

1. The desire to keep the kitchen and all service dining rooms out of the basement in a climate and locality where land valuation has developed no sufficient precedent for the basement arrangement; in other words, where it would have been very unpopular, as well as inconvenient.

2. The desire to get the out-patients' department, and the present with the future expanded physiotherapy department, where they would be accessible



RIVERSIDE COMMUNITY HOSPITAL, RIVERSIDE, CAL.
MYRON HUNT, ARCHITECT



from the street. It is, however, to be noted that in this particular instance a hillside location was utilized, and these departments are in reality in a wholly exposed basement.

3. The desire to have in this community an emergency operating and receiving service separated from the main operating room unit, even in this small plant, although it continues to be adjacent to the regular surgical nursing service group.

4. The desire to have the X-ray and other laboratories close to both the emergency and regular operating units.

5. The desire for a large central first-story room for use not only of the board of directors, but also for the use of the local medical society.

6. The desire to get physicians' and nurses' rest rooms and also the dieticians' office near the central executive control.

7. The desire on the part of the board of directors of the hospital to provide an osteopathic unit which was to be in the building separate from the main structure, but with food service from the main kitchen.

8. The desire to have surgical beds on the same floor as the operating rooms, coupled with the apparent necessity for a larger number of surgical beds than of either medical or maternity, at present.

9. The desire to provide economically for a future maternity unit which should add 40 or 50 per cent to the total bed capacity at present required.

10. And the natural and usual desire to keep the ward corridors from being general utility and visitors' runways.

The climatic opportunity being assumed, it appeared possible to solve more of these problems in a one-story than in a many-storied plant and, strange to relate, at less expense despite the use of good construction. This expansible community hospital, general in type, carrying some 80 beds, was actually built for substantially $3000 per bed, and when the plant is some day completed, the per bed cost will be cut another $250 or more. This was accomplished in a small general hospital, in which, if one segregates the actual square foot area that is available to be occupied by patients (wards and patients' rooms), and sets this area against all the areas otherwise used, one will find that the 80 beds occupy only 22½ per cent of the floor area of the entire hospital.

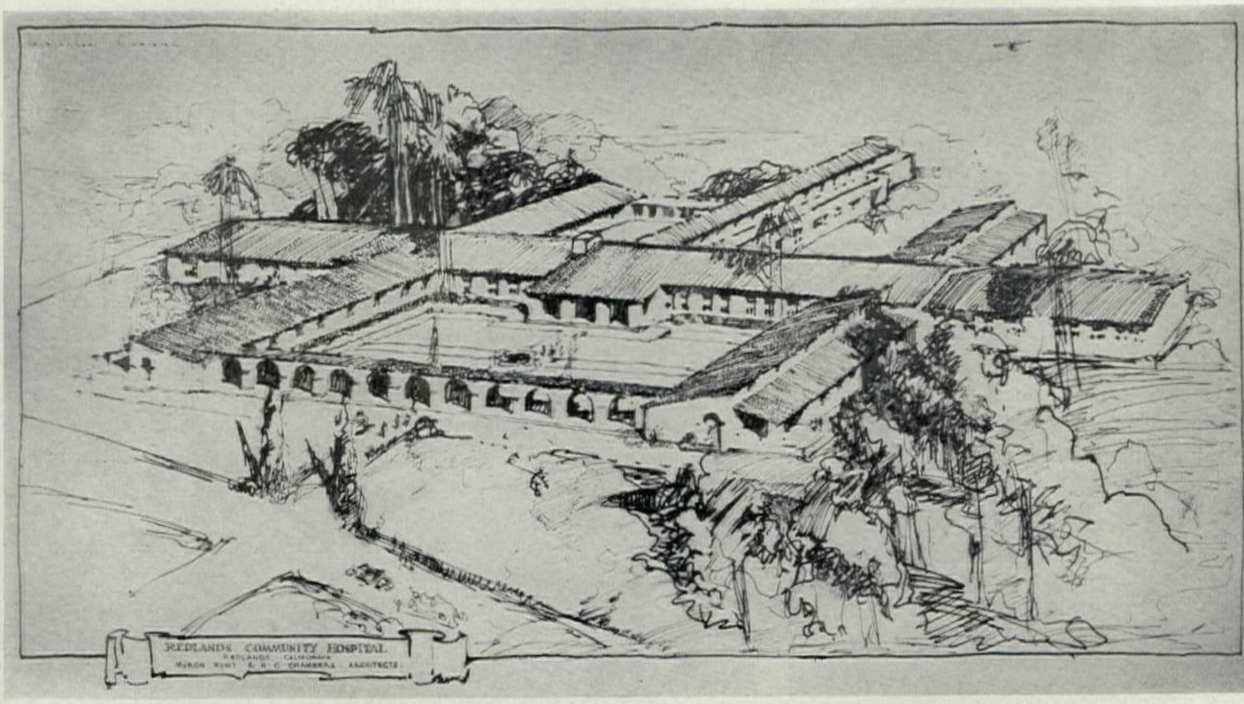
This always seems incredible, but a check of any reasonably complete general hospital of from 150 beds down to 70 beds, with all the departments to some extent represented, and all the space taken into account (that the visitors and the physicians and even the nurses seldom see,—but which must be counted in), such a check will seldom show that the actual rentable patients' space will exceed more than from 20 to 25 per cent of all space. Corridors, nursing units, kitchens, boiler and incinerator room, laundry, executive, storage, and out-patient departments, in addition to stairways, elevators, surgery and many minor units, add up in area enormously. Naturally this statement does not apply to a special hospital or to hospitals, which, not being general community hospitals, do not have at least the rudiments of the numerous departments which go with even a small general hospital, erected to supply as nearly as possible all the requirements of a district.

Since the erection of the Riverside Hospital, two others have been developed,—that at Upland (The San Antonio Community Hospital), and one now being built at Redlands, along similar lines. One is smaller and the other practically the same size as the Riverside. One has fewer departments, offices and social requirements, and the other has more such general units. More bed space per total area has been obtained, but only by curtailing units which seem more or less necessary in a self-contained and complete community hospital.

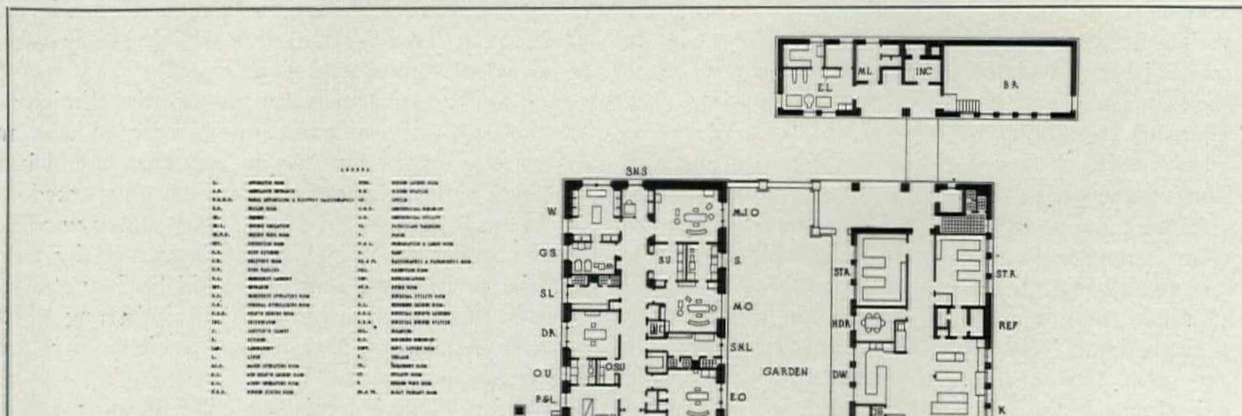
The construction of these buildings is: (1) reinforced concrete for foundations, exterior walls and for all that portion of the basement which extends above ground and is completely lighted; (2) concrete floors throughout, with terrazzo finish and cement base board; (3) concrete porches; (4) metal trim at door openings; (5) tile roofs; (6) interior partitions, except for cross wall fireproof partitions at intervals, made of wood studs with metal lath and plaster,—this wood, of course, a compromise, largely justified however by the comparative safety which comes with a one-story building.

The amount of area saved through the elimination of stairways, elevators, and fire escapes added some 15 per cent to the number of beds that would have been available had these structures been worked out vertically. This method of one-story attack upon the small hospital problem has also been used by us at Artesia, at the Boys' and Girls' Aid Society at Altadena, in the Pasadena General Physiotherapy Building and Dispensary, and in the Pasadena City Contagion Hospital.

Sufficient experience is available to show conclusively that in warm climates and within certain limitations, economy of construction and of operation and efficiency in general may obtain in such hospitals. The principal characteristic of the construction of these buildings is a thick, hollow, reinforced concrete exterior wall, affording fire resistance from the outside, an appearance of stability as in the case of the early buildings of California, and insulation as a result of the hollow in the thick exterior wall. Such a wall is composed of a 4-inch outer wall of reinforced concrete and a similar 4-inch inner wall with cross-webs at windows and at intervals in long unbroken walls, leaving a hollow space which reduces the cost of construction and has proved to be magnificent insulation against heat from without and at the same time a great conserver of artificial heat within. The construction is carried on through the use of collapsible forms in the case of these hollow walls. It has been developed to such an extent through the southwest, since the building by the writer of the Flintridge Country Club ten years ago, that it has become a standard method of construction.



SKETCH OF COMPLETED REDLANDS COMMUNITY HOSPITAL, REDLANDS, CAL.
MYRON HUNT AND H. C. CHAMBERS, ARCHITECTS



PROVIDING FOR HOSPITAL EQUIPMENT

BY

H. E. HANNAFORD

OF SAMUEL HANNAFORD & SONS, ARCHITECTS

THERE is probably no type of building in which the matter of planning for equipment plays such an important part as in a hospital. The planning of the building itself is highly complicated, and the purposes of the hospital, down to its minutest details, should be definitely pre-determined with the architect by those who will subsequently operate and manage the building. Each separate department should be allocated and arranged in accordance with its proper functions, and these functions must be clearly visualized. It is always preferable to have in charge of the work an architect who has had thorough hospital experience and who is fully conversant with departmental needs and hospital technique in all of its phases and who understands the equipment.

If a hospital is to render complete and intelligent service, the matter of equipment becomes one of paramount importance, and all equipment items should be considered as an integral part of the building and should be taken care of in the original planning and not left for subsequent consideration. For the purpose of this article, it is not our intention to consider the mechanical plant,—ventilating system, ordinary plumbing fixtures, elevators, plant for mechanical refrigeration, clock system, telephone system, nurses' and doctors' call system, linen chutes and incinerators,—as equipment. While it is true that all these might perhaps be considered as equipment items, they seem to the writer to be more parts of the building itself, and the subject matter of this article will be confined to other types of equipment.

Equipment seems to classify itself logically into two general types: 1. Built-in or fixed equipment, requiring structural provision to accommodate its proper placing in the building, or requiring plumbing, heating, ventilating or electrical connections to make it effective. 2. Movable equipment (which is usually just as essential as built-in or fixed equipment), the position of which must be accurately pre-determined and proper floor or wall space allowed for its subsequent placing. In general, *built-in or fixed equipment* items consist of kitchen equipment; laundry equipment; refrigerators; laboratory and pharmacy equipment; built-in cases, counters, bins and shelvings of all kinds; sterilizing equipment; special plumbing fixtures (such as plaster sinks, disposal sinks, bed-pan washers, infants' baths, etc.); X-ray equipment; physio and hydrotherapy equipment; lockers; instrument cabinets; dental chairs, etc. *Movable equipment* items are, in general, beds; dressers; chairs; desks; movable tables; filing cases; operating tables; examining tables; basin, instrument and irrigator stands; anæsthetizing equipment; dressing stands; bassinets (in the nursery); tray cars (in the kitchen); sorting tables and truck tubs (in the laundry); and a host of other items, all vitally necessary to the successful functioning of the hospital, and for which places must be found and proper provisions made.

From the foregoing, it can be readily seen that the matter of pre-determining the location of and providing for all equipment items becomes a matter of tremendous importance. It is not good practice, ever, to assume a room or department size and then try to put the equipment in it. The use of the room must be definitely foreseen and the equipment arranged so as to function to the best advantage in the most economical space, and from this arrangement the room size can then be determined and made a part of the finished plan. To illustrate this point, let us consider a small X-ray suite and its equipment. First of all, the walls (and also the floor and ceiling of patients' rooms below and above the X-ray department must be lead-lined; doors must be lead-cored; windows must be provided with lightproof shutters or shades. The equipment to provide for consists of the X-ray machine proper; control room; a radiographic and fluoroscopic table; plate changer; stereoscope (for viewing of films); film storage cases; provisions for overhead high-tension wiring, etc. In the dark room in connection with the X-ray department, provision must be made for a five-compartment developing sink (with hot, cold and ice water supplies); work counter with film and chemical storage space below; film rack for drying films; fan for film drying; five electric light outlets provided with light-safe fixtures; light-tight, lead-lined transition box in wall between dark room and X-ray room to permit passage of cassettes containing exposed films to dark room for developing. Provision must be made for dark room with automatic sprinkler system. The foregoing are minimum requirements for a very small X-ray department, and the architect should work with the Roentgenologist of the hospital in laying out this department so as to provide for every equipment item necessary for this important department.

Movable equipment is very often closely related to other equipment, and the proper arrangement and location of the movable equipment are very important. Frequently one goes into a hospital where the matter of purchasing and placing equipment has been left to a later time, and one sees then the real importance of giving the equipment consideration along with the general planning of the building. This is particularly true with such pieces of equipment as require water, waste, vent, steam or electrical connections, as these connections should be located and run at the time of constructing the floor slabs and installing the partitions. By following this procedure, a tremendous amount of subsequent cutting, and patching, with their resultant "extras," will be eliminated, and the

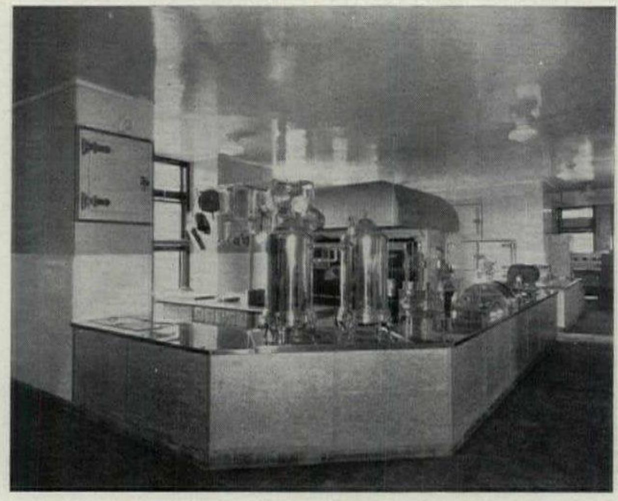


Fig. 1. Main "Centralized" Type Hospital Kitchen

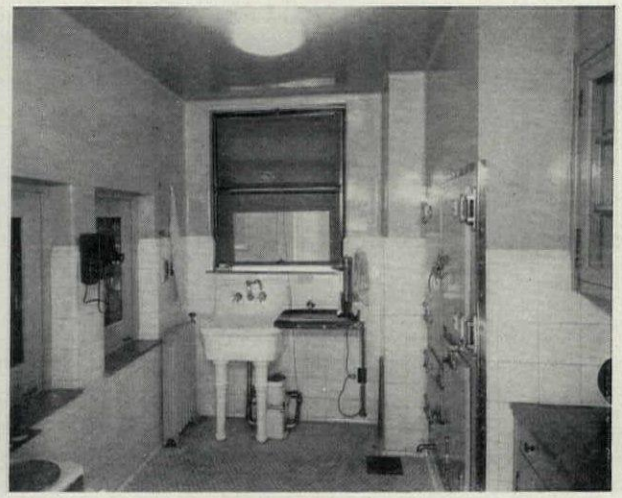


Fig. 2. A Small Floor Service Pantry

equipment will fit into the finished building in a neat and orderly way.

All of the matters discussed in the foregoing paragraphs may seem so obvious as to make them practically unnecessary, but the writer has seen so many hospitals in which, for some reason or other, the matter of equipment was not given consideration at the time the general drawings were made, that it seems advisable to touch upon a few of the more important points in connection with planning both the building and its equipment as a unit. Equipment will not "just place itself," and inasmuch as it is a vitally important part of the building, there seems to be no reason for not taking it into consideration at the very outset of the problem. As was said before, it

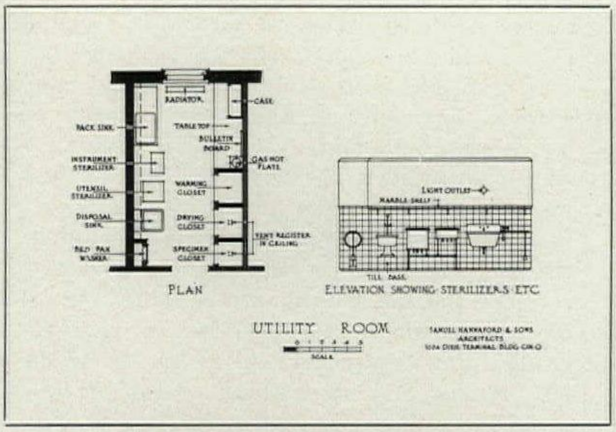


Fig. 3. Utility Room on Patients' Floor

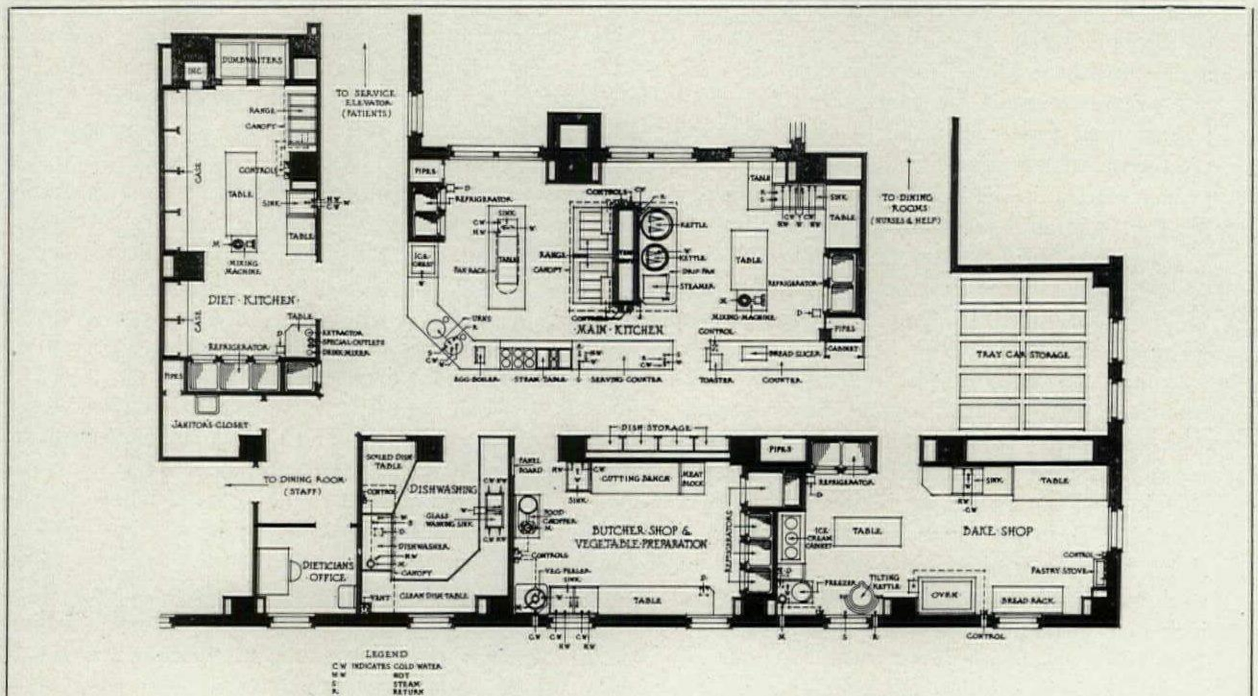


Fig. 4. Plan of the Kitchen Shown in Fig. 1.
Samuel Hannaford & Sons, Architects

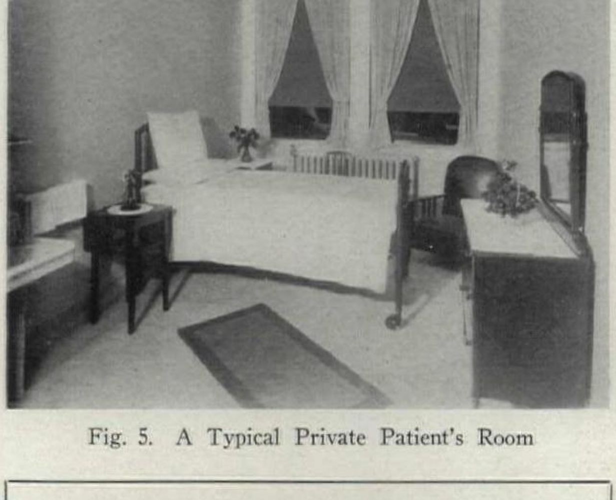


Fig. 5. A Typical Private Patient's Room

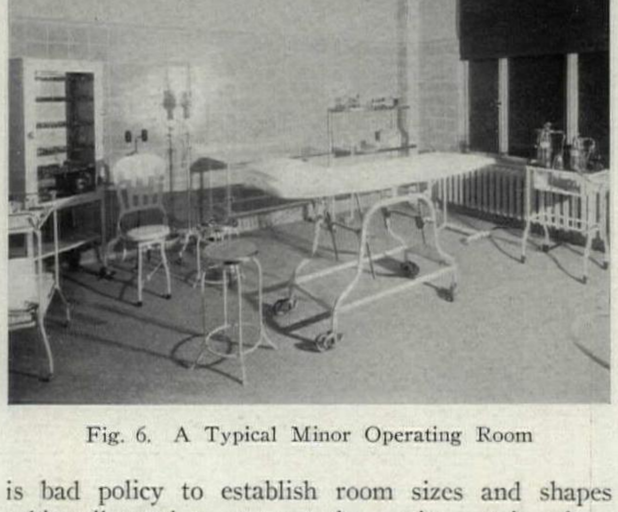


Fig. 6. A Typical Minor Operating Room

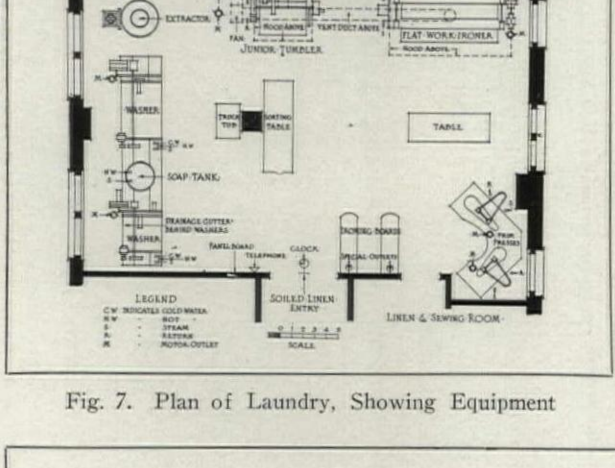


Fig. 7. Plan of Laundry, Showing Equipment

is bad policy to establish room sizes and shapes arbitrarily and try to get the equipment in afterwards. The consequences of this method of procedure are usually that either the room is unnecessarily large, thus wasting cubic contents and increasing maintenance expenses, or the room is so small as to develop cramped and poorly arranged equipment, thus cutting down the efficiency of the room and involving consequent maintenance cost, due to this decreased efficiency. This point seems of sufficient importance to warrant its being given emphasis in this article.

One of the fundamentals in developing any hospital project is, in the writer's opinion, an early determination of the administrative and operating policy of the hospital. This should be most carefully

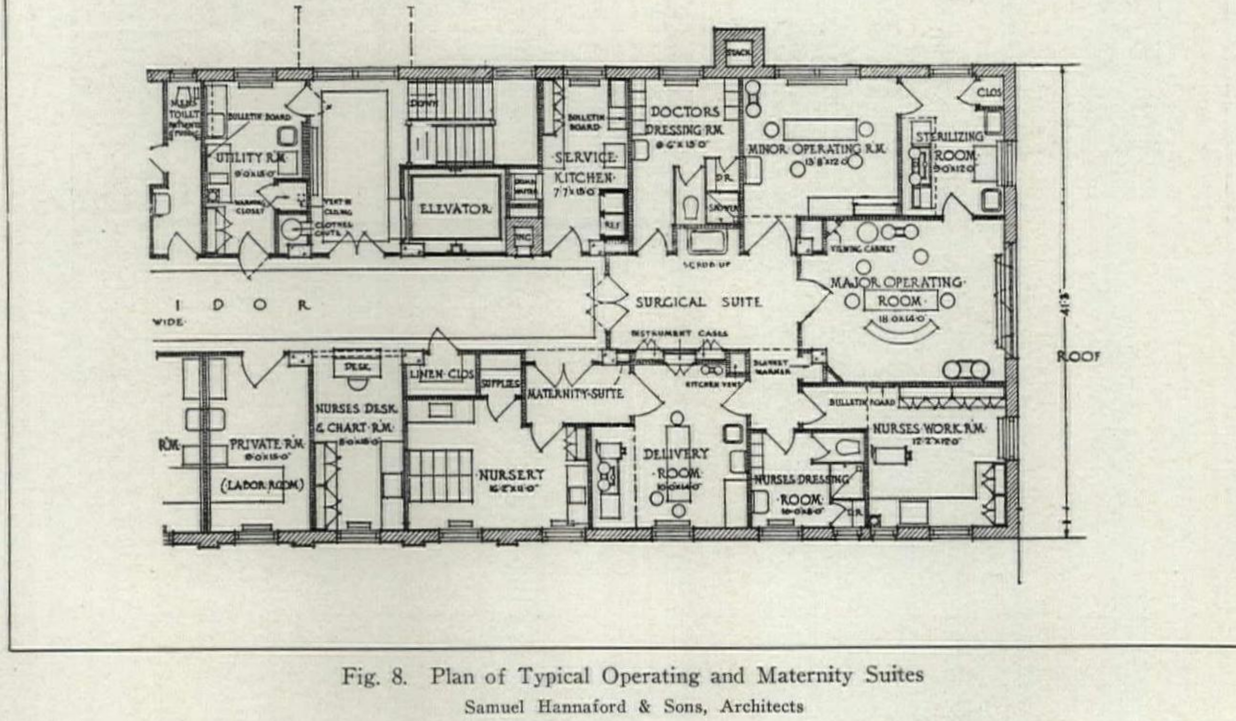


Fig. 8. Plan of Typical Operating and Maternity Suites
Samuel Hannaford & Sons, Architects

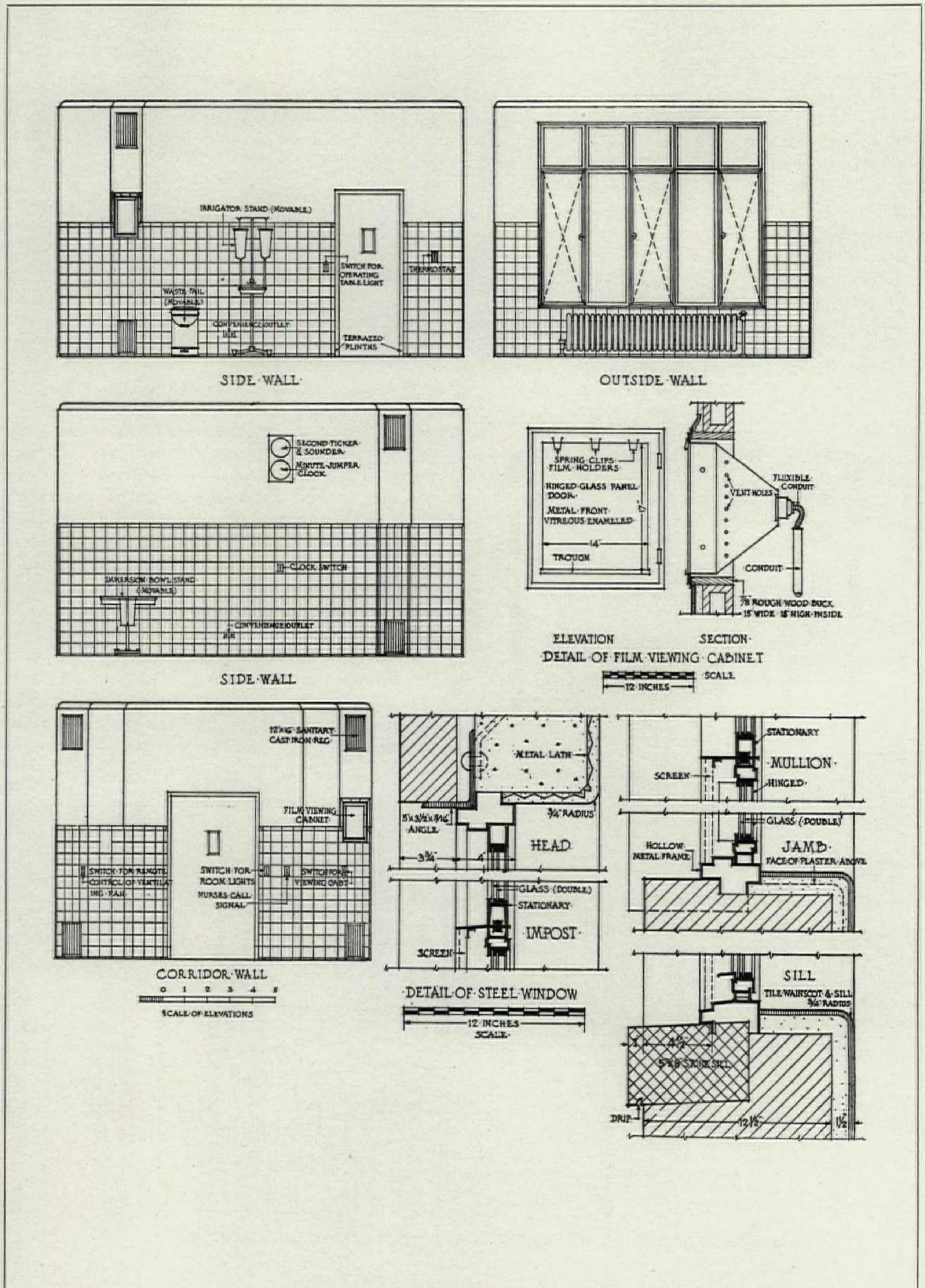


Fig. 9. Elevations and Details of a Typical Major Operating Room
SAMUEL HANNAFORD & SONS, ARCHITECTS

worked out by those who will be entrusted with the hospital's management; and this policy, once established, should be rigidly adhered to. This predetermination of policy has a very important and definite bearing, which cannot be overstressed, upon every least portion of the hospital building. As a rule, when one sees a hospital which has been planned without a completely pre-determined administrative and operative policy, one sees a hospital which is not functioning as it should. Its arrangement is probably not efficient, the equipment has not been properly thought out or located, and the entire building seems unsatisfactory. The fault would appear to lie in two quarters: 1. Those who were to have the management of the hospital in their charge failed to visualize the administrative program and consequently failed to anticipate the needs of the various departments. Or (2) the architect employed did not have sufficient hospital experience to know what the various departments would require, and was not aware of the vital importance of planning for equipment and planning to meet the requirements of a definite administrative policy.

The various illustrations in connection with this article are designed to show some of the salient features discussed herein. Figs. 1 and 4 show the layout of a main kitchen of an average-sized hospital. The type of food service determined upon by the hospital authorities was, in this case, the "centralized" type, using food trucks from the main kitchen and distributing trays from these trucks to the various patients' floors. This was an important decision to make, as it naturally affected the general kitchen layout. By properly studying the kitchen service, the equipment was placed and all service connections of every sort run to proper locations as the building progressed. A great deal of equipment was designed to be set up on sanitary bases having tiled facings, and the sizes and locations of these bases were pre-determined and the bases constructed before the equipment was delivered. The completed kitchen is very efficient and satisfactory, and all equipment was placed and connected up without any changes, cutting or patching whatever.

Fig. 2 shows a small floor service pantry in the same hospital as the main kitchen just described. Inasmuch as the central tray service system of food distribution had been determined upon, these floor service pantries could be greatly reduced in size, as there is on actual preparation of food in this pantry for the various patients. The sizes and shapes of the rooms were determined entirely by the equipment layout, and all provisions to receive equipment and all service lines to properly service the equipment were installed as the building went up.

Fig. 3 shows a typical utility room on a patients' floor. Here again all equipment was carefully laid out; the size of the room was determined from the equipment arrangement. The other illustrations are practically self-explanatory in showing equipment.

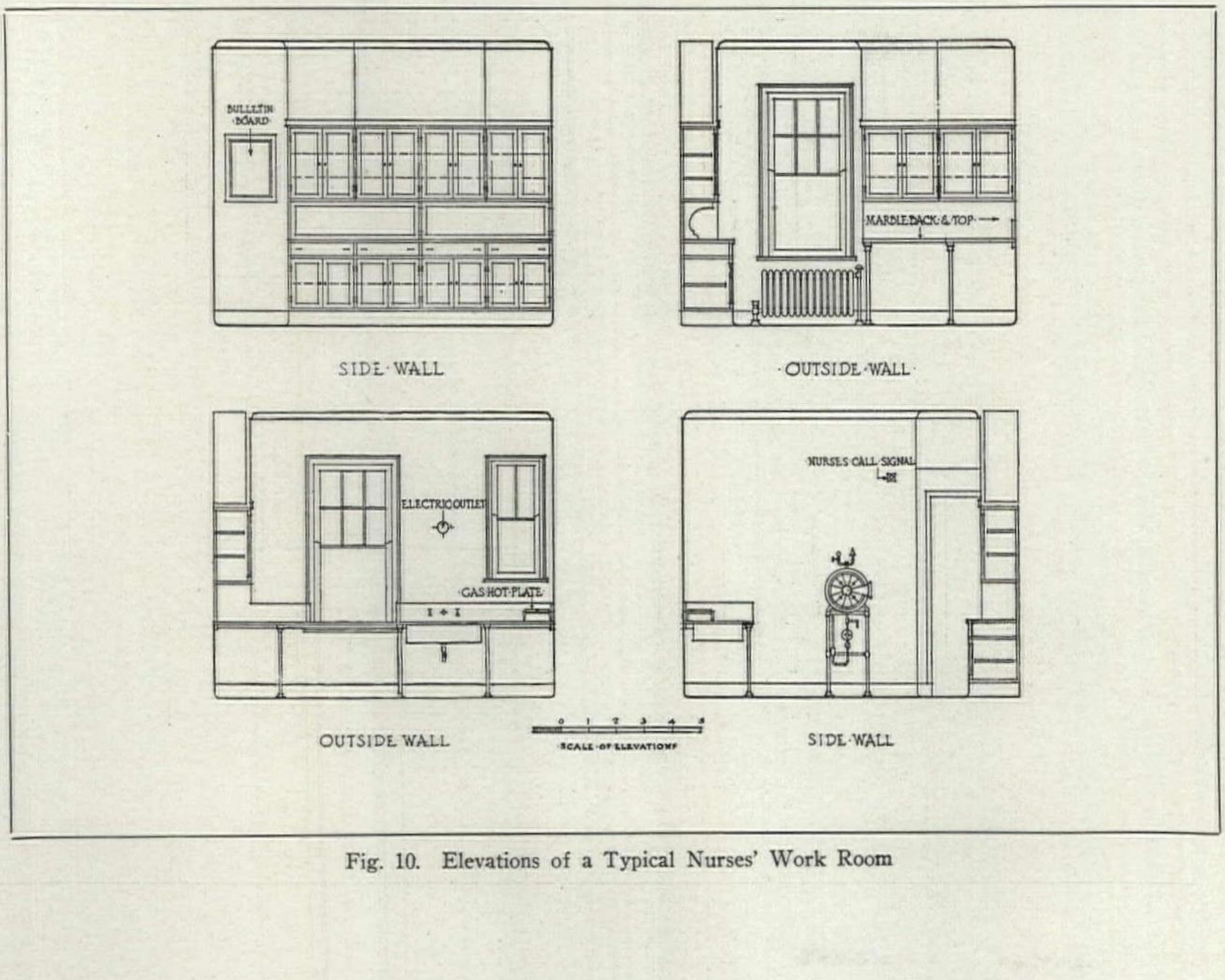
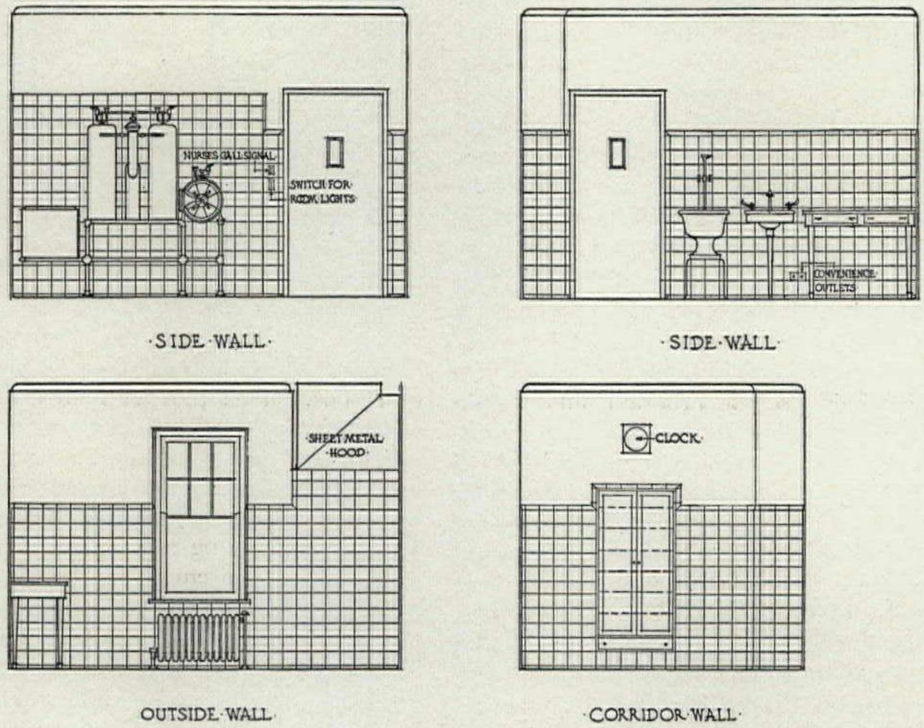
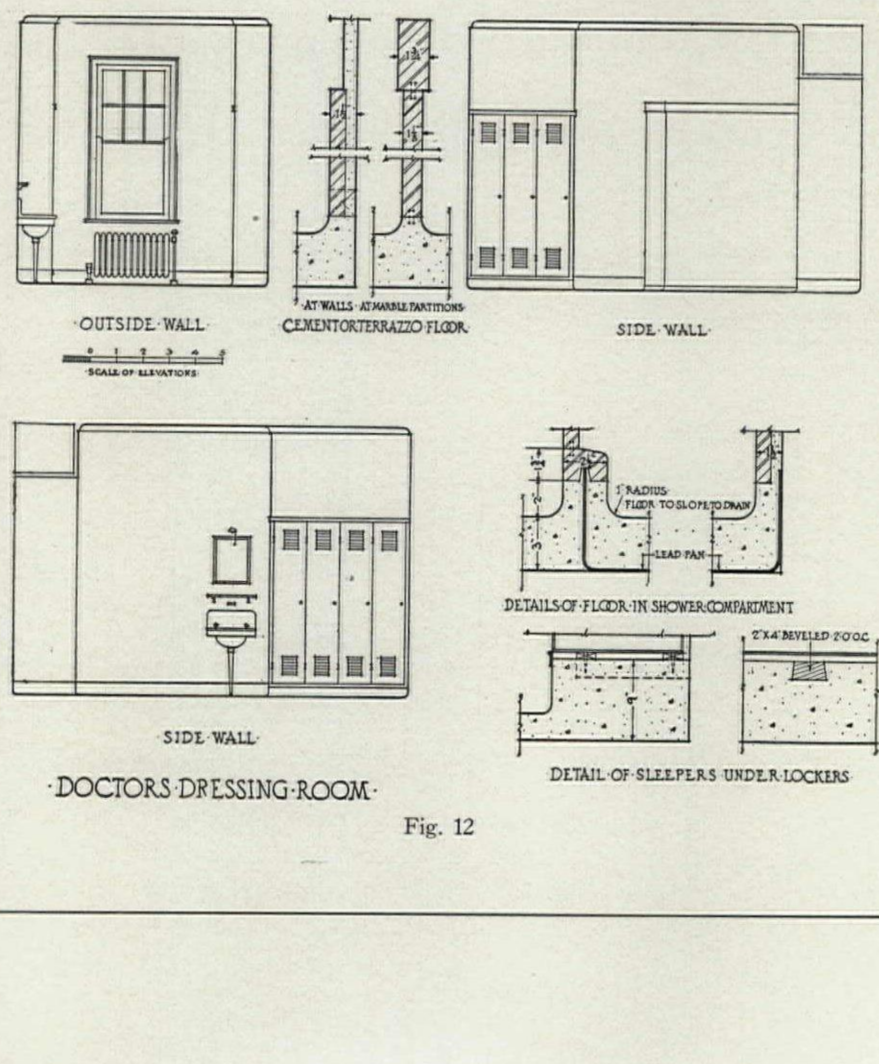


Fig. 10. Elevations of a Typical Nurses' Work Room



·DELIVERY · ROOM·

Fig. 11



·DOCTORS·DRESSING·ROOM·

Fig. 12

AN OUTLINE OF CONSIDERATIONS ON HOSPITAL PLANNING

BY

ISADOR ROSENFIELD

OF KOHN, BUTLER, STEIN AND ASSOCIATED ARCHITECTS

IT is generally conceded that hospital planning is more complex and technical than that of any other type of building. The units comprising a hospital are small, and their use and equipment are so diversified that it is exceedingly difficult to coördinate them into workable unity.

Before an architect begins to plan a hospital, he must be fortunate in either of these ways: he must have a client who thoroughly understands the problem in all its ramifications; or else he must himself have a complete grasp of hospital procedure. Seldom is the owner or the architect equipped with the necessary knowledge to properly determine the requirements and to coördinate them into a complete whole. For that reason, owners employ consultants, or the architect himself often engages the consultant. Whoever is charged with the function of determining the requirements, experience shows that unless many questions are asked, some plan features may never be brought out, and thus be inadvertently omitted. The accompanying outline is intended to serve as a guiding list of hospital considerations in the hope that it may bring out items that might otherwise be forgotten, and that it may provide useful data and information in regard to many details. It is not intended to cover every conceivable requirement or variation of requirement. The writer is well aware of the many points that could be included to amplify the present outline. In order to cover this subject in greater detail, more space would be required than is possible here.

Type of Ownership. (a) Governmental; 1. City. 2. State. 3. County. 4. Federal. (b) Civic; 1. Independent Association. 2. Industrial. 3. Fraternal. 4. Denominational. 5. Individual or Partnership.

Kind of Hospital. (a) General; 1. Teaching. (b) Special;

Children.	Convalescent.
Maternity.	Chronic.
Communicable Disease.	Cancer.
Surgical.	Eye, Ear, Nose, Throat.
Psychiatric.	Cardiac.
Tuberculosis.	Preventorium.

Size, Number of Beds Required. 1. Medical and surgical beds,—one for each 200 of population. Proportion between the two will vary to some extent with the degree of industrialization of a given community. 2. Maternity,—one for every *primipara.* Add one bassinet for every maternity bed. 3. Tuberculosis,—one for every annual death. 4. Communicable diseases,—one for each 2,000 of population. 5. Convalescents,—12 to 15 per cent of total number of beds, as determined here.

Another and cruder method of arriving at the number of beds required is based on these figures:

(a) Number of sick people in average community equals 2 per cent of population.

(b) Number of sick requiring hospital care equals 20 per cent of all sick.

(c) Add 20 per cent for vacant beds. It is necessary to provide vacant beds for "peak loads" and for epidemic or catastrophic situations.

(d) Add 12 to 15 per cent to these figures for convalescents.

Note: The methods described here do not take into consideration local conditions which may alter the proportions to a greater or lesser extent.

Estimate of Cost. 1. Cost per bed depends on type of patient accommodations and the extent of treatment facilities.

2. Cost per cubic foot depends on nature of construction, sizes of units, extent of equipment requiring connections, locations, etc.

3. Probably the best way to estimate the cost is to prepare preliminary plans and specifications and to obtain an estimate from a contractor experienced in the type of hospital building contemplated.

4. These references to cost per bed do not include cost of housing the personnel.

In the average good hospital there is one nurse for every two patients. This is for a two-shift day. More nurses are required for a three-shift day. The non-professional staff and servants form a group about as large as the nursing staff. Therefore, unless a part of the staff or servants is to live outside, it is necessary to provide housing and recreational facilities for a number of persons approximately equal to the number of patients' beds.

Selection of Site. General Location,—country, suburb or city. Accessibility,—for patients, personnel, supplies, visitors. Extent of Site,—cost, type of buildings, (i. e. cottage, pavilion or multi-story); possibilities for future extension. Latitude and orientation to sunlight. Shape and topography of terrain. Non-proximity to disagreeable surroundings. Availability of water, sewage disposal, gas and electricity.

Type of Buildings—

Cottage Plan. Pavilion Type. Multi-story Buildings. Combination of These Types.

Type of Construction.

Fireproof. Semi-fireproof. Frame Construction.

It is generally conceded that patients should not be housed in any but fireproof buildings, even if the buildings are only one story high.

Criteria of Sound Hospital Plan. (a) Utility. (b) Diversity. (c) Facility of Operation. (d) Flexibility. (e) Health. (f) Economy. (See article on "Introduction to Hospital Planning," by Dr. S. S. Goldwater, Modern Hospital Year Book, 1926.)

Departments and Services in a General Hospital:

Medical	Genito-urinary.
Surgical.	Nutrition.
Obstetrics and Gynecology.	Orthopædics.
Pediatrics.	Contagious.
X-ray and Radium.	Tuberculosis.
Laboratory and Pathology.	Social Service.
Physio-therapy.	Pharmacy.
Dermatology.	Dental.
Neurology, Psychiatry.	Medical Records.
Eye, Ear, Nose and Throat.	Medical Staff.
	Nursing Staff.
	Male and Female Servants.

Accommodations and Provisions Will Be Needed Also for:

Administration.	Autopsy and Morgue.
Patients and Out Patients.	Preparation of Food.
Services.	Laundry.
Operating.	Storage Facilities.
Delivery.	Heating Plant.
X-ray.	School of Nursing.
Physio-therapy.	Housing of Nurses.
Laboratories and Drug Room.	Housing of Staff.
	Housing of Servants.

Details To Be Considered

Administration. (a) Lobby,—information desk . . ., public toilets . . ., public telephones . . ., conference rooms . . . (b) Business Offices,—general and private . . ., board room with or without serving pantry . . . (c) Professional Offices,—medical director . . ., record room . . ., superintendent of nurses . . ., admitting room and bath . . . (d) Social Service, staff room . . ., consultation rooms . . ., library . . ., staff toilets . . ., ambulance entrance . . ., emergency room . . .

Patients' Quarters. Wards,—for men, women, children, maternity, new-born infants. Separating or quiet room, one for each ten ward patients. Cubic feet of space required per patient in the ward; for adults, 800 to 1,000 cubic feet,—for children, 500 to 800 cubic feet,—for infants, 200 to 300.

Proportion of window area to floor area, 1/5 minimum. Separation of patients within ward: (a) By portable screens. . . . (b) By fitted or fixed screens. . . . 1. "Riggs" or "Spanish" method? . . . 2. Cubicle method, with or without curtains? (c) With curtains on curtain rods or wires? 3 Semi-private rooms, 2 to 4 patients.

Private Rooms. Minimum size, 8 feet, 6 inches x 12 feet. Standard size, 9 feet x 14 feet. With lavatory in each room? With private toilet? With private bath? With space for a cot for special nurse or patient? Rooms en suite for "group nursing"?

Children's Ward. Partition between ward and corridor should contain as much glass area as possible. Children's beds, separated by glazed screens? . . . Rooms specially decorated? . . . Closets, wardrobes, or lockers? . . . Size? . . .

Extra-ward Facilities. 1. Individual balconies or porches? . . . 2. Common balconies or porches? . . . 3. Solaria? . . . 4. Sitting rooms in the case of use by chronics and convalescents? . . . 5. Open decks? . . . 6. Glazed or open porches? . . . 7. Visitors' rooms? . . .

Services

1. Corridors,—minimum width for children's wards, 7 feet; minimum width for adults' wards, 8 feet. Corridors may be narrower if they have frequent broad spaces sufficiently wide to permit turning around of beds. Corridors should not be monotonously long. Bends in corridors serve to reduce noise. Natural light and ventilation of corridors are important. Grouping certain services about a common vestibule opening from corridor reduces traffic and noise.

2. *Stairs.* There should be at least two sets of stairs as far removed from each other as possible. Consult local laws governing stairs in hospitals. Naturally lighted stairs are preferred. Minimum width of run, 3 feet, 8 inches, no winders; avoid long runs. Stairs forming organic parts of buildings are preferred to fire escapes. Wall rails are as important as well railings. Risers should not exceed 7½ inches; tread minimum, 10 inches. In children's hospitals. 6- or 6½-inch risers are preferred. Thickness of masonry required for enclosing stairs? . . . Fireproof, self-closing doors? . . . Extent of wire glass in doors permitted? . . .

3. *Elevators* are desirable even in two-story buildings. Push-button control *vs.* hand-operation . . .; economy *vs.* safety? One elevator for all purposes? . . . Separate elevator for service? . . . Elevator for service? . . . another for patients . . ., still another for public? . . . Consider grouping elevators for economic advantages. Safety devices? . . . Emergency stop button and emergency bell? . . . Thickness of walls required for enclosing shaft? . . . Fireproof doors,—swinging, self-closing, folding, or disappearing two- or three-speed doors? Maximum area of wire glass allowed? . . . Standard finished dimensions of shaft large enough to accommodate a bed are 6 feet, 6 inches x 8 feet, 6 inches. Reduced and even speed of elevators for patients. . . . Micro-leveling device? . . . Overhead *vs.* basement location of elevator machinery? . . .

4. *Baths and Toilets.* Modern practice requires a lavatory in every patient's room or ward. Such provision is regarded as necessary to carry out aseptic technique rather than for patient's comfort. If bath or toilet immediately adjoins the room or ward, the lavatory may be placed in bath or toilet. This is less costly and perhaps better for the appearance of ward or room, but it is false economy because the lavatory should be within sight and easy reach of doctors and nurses. Except in case of private baths, the toilet should be in a separate compartment from bath. In case of congregate baths, bathing facilities should be in separate room, but there should be intercommunication between baths and toilets. In small compartments, doors should swing *out,* for if otherwise it would be hard to help a patient fainting in compartment. Private toilet, with or without goose neck for bed pan washing? . . .

5. *Utility Room.* There should be at least one major utility room for each "nursing unit," centrally located, with sub-utility rooms at frequent intervals to save steps, particularly for bed pan technique. A good size for utility room is 9 feet x 14 feet. Utility room should contain:—

Bed pan washer, or hopper, or washer and sterilizer combined? Built-in or free-standing? . . .

Utensil sterilizer, steam, gas or electricity?
Instrument sterilizer, steam, gas or electricity.
Hot closet.
Hot plate, operated by gas or electricity.
Ice box (cracked ice).
Sink, drainboard, wash tray.
Table.
Bunsen burner outlet; electric utility outlet?
Shelf for solutions . . .; in hot closet?
Space for soiled linen receptacle.
Bed pan rack . . ., heated?

Sub-utility room should contain fixtures necessary for bed pan technique. Doors to utility and sub-utility rooms to be double-acting with sight windows.

6. *Serving Pantry.* "Bacon Plan" hospitals have no serving pantries, but frequent, special lifts for food trays . . . "Bulk Service" requires steam table or electric steam table . . . "Tray Service" does not require space for steam table . . . If light cooking is required, provide hot plate,—gas or electricity . . . If dishes are washed in serving pantry, is a dish washer wanted or a sink? . . . Steam or hot water? . . . If sterilization of dishes is required, steam is necessary (in contagious wards) . . . Kitchen dresser,—open shelves, or glazed front? . . . Wood or metal? . . . Sink,—single or double drain boards? . . . Refrigeration,—ice or mechanical? . . . Local unit . . . or central plant? . . . Towel closet heated by steam or by gas? . . . Doors, double-acting with sight windows . . . Food delivered by dumbwaiter or elevator? . . .

7. *Surgical Dressings.* Special room . . . or portable wagon? . . . In alcove off corridor . . . or in utility room? . . . If in separate room, provide surgeons' sink, instrument sterilizer, instrument case, portable wagon for bedside dressing.

8. *Clothes Chute.* Metal . . . metal, glazed . . ., vitreous tile? . . . Opening from utility rooms,—corridor . . ., special closet . . ., or slop sink closet? . . . Doors kept locked? . . .

9. *Incinerator Chute.* Desirable from delivery rooms, serving rooms, etc.

10. *Linen Room and Supply Closets.* Metal . . . or wood shelves? . . . Counter shelf 2 feet wide, 3 feet high . . . Shelf under counter 16 inches wide . . . Four shelves over counter 16 inches wide . . . Shelves solid . . . or slatted for ventilation? . . . If solid, they should be supported on metal knees 1 inch out from wall . . .

11. *Nurses' Station,* to command view of elevators and corridors. Rail enclosure . . . or alcove . . . or separate room? Medicine closet . . . or built-in cabinet? . . . Running water in closet . . . or outside lavatory? . . . All medicaments in one closet . . . or separate closet for narcotics and poisons? Special measures to safeguard narcotics . . . Space for desk . . . If nurses' toilet is wanted, the best location is adjoinng nurses' station. Sitting room for special nurses? . . .

12. *Slop Sink Closet.* One . . . or more to a floor? . . . Minimum door width 2 feet. Depth sufficient to take a 2 x 2-foot slop hopper . . ., work space in front for orderly or house maid . . . Hopper with . . . or without back? . . . The nozzle should be braced and have a pail hook . . . There should be at least two shelves over hopper . . . A row of hooks for brooms, mops, etc. . . .

13. *Flower Room.* Separate room or in connection with bath? Sink . . ., drainboard . . ., cabinets or shelves for vases . . ., etc.

14. *Stretcher and Wheel Chair Space.* In corridor . . ., in wards . . ., or in separate alcove off corridor? . . .

Operating Department

In a wing of first floor . . . or top story? . . . If in first story, this department should adjoin ambulance entrance . . . Number of major . . . and minor operating rooms?

. . . "Operating amphitheater"? . . . Other rooms in this department are:—Sterilizing room . . ., Nurses' workroom . . ., Anæsthetizing room . . ., Scrub-up space . . ., Recovery rooms . . ., Surgeons' dressing room . . ., Laboratory . . ., Observation facilties . . ., Orderlies' room . . ., Nurses' toilet . . .

1 *Major operating rooms* may be about 18 x 24 feet; minor operating rooms about 14 x 16 feet. Ceiling height should be about 12 feet. Orientation to north desirable. Surgeons' sink and instrument sterilizer in each room? . . . Instrument cabinet in room . . . or outside? . . . Built-in . . . or free-standing? . . . Floor drain? . . . Ejector operated by running water? . . . Skylight lighting . . . *vs.* window light . . . Wall finish,—marble . . ., tile . . ., cement plaster . . . or . . .? Floor finish,—tile . . ., terrazzo . . ., treated cement . . . or . . .? Brass strips in floor grounded to pipe to prevent explosions of anæsthetics, due to static electricity . . . Means of darkening eye-operating room . . .

2. *Sterilizing Room.* Located between two major operating rooms . . . or en suite with workroom? . . . Water still . . ., dressings sterilizers . . ., utensil sterilizers . . ., instrument sterilizers . . ., sink and drain board . . . If distilled water piping system is desired, still may be best located in pent house . . .

3. *Nurses' Work Room.* Long table, cabinets and cupboards . . . Blanket warmers? . . .

4. *Anæsthetizing Room.* Finished like typical patient's room . . . Not within sight of operating rooms, if possible . . . No fixed equipment required.

5. *Surgeons' Scrub-up.* In operating department corridor . . . or in alcove within sight of operating rooms? . . . Scrub-up sinks,—knee control . . ., elbow control . . ., or foot pedal control? . . .

6. *Recovery Rooms.* Required if operating service is in connection with large wards . . .

7. *Surgeons' Dressing Room.* Lockers . . ., lavatory . . ., toilet . . ., shower . . .

8. *Laboratory.* Desirable when main laboratory is not close to operating department . . .

9. *Observation Facilities.* Amphitheater? . . ., gallery between each pair of operating rooms . . ., stand in each operating room? . . .

Delivery Department

(a) Labor room or rooms? . . . Lavatory in each . . .

(b) Delivery room or rooms? . . . Equipped much like a minor operating room . . . North light preferred . . .

(c) Sterilizing room like that in operating department, often combined with functions of nurses' work room of operating department . . .

(d) Surgeons' dressing room should, in addition to items already enumerated, have space for a cot . . .

Laboratories

Laboratories and Drug Room or Pharmacy. Good natural light a factor; north light preferred. Location between in-patient and out-patient departments preferred. Small laboratory, all functions in one room . . . Sometimes combined en suite with pharmacy . . . Large laboratories subdivided into branches, as—Routine . . ., Chemistry . . ., Bacteriology . . ., etc.

Essential Features of Laboratories. Counter tops of stone . . . or wood? . . . Cupboards . . ., cases and shelves . . ., for chemicals . . ., instruments . . ., reagents . . ., etc. Sinks for washing . . ., and preparation of stains . . . Gas outlets for Bunsen burners . . . and autoclaves . . . Electric outlets for centrifuge . . ., incubators . . ., etc. Refrigeration,—ice . . . or mechanical? . . . Metabolism laboratory?

X-Ray Department

The location should be dry and accessible to both in- and out-patients. A *small department* should have (a) combination fluoroscopy . . ., radiography . . . and treatment room . . . (b) Office and interpretation room . . . (c) Developing room . . . (d) Waiting space . . . *Large Department.* (a) One . . . or more radiography rooms . . . (b) One . . . or more fluoroscopy rooms . . . (c) Deep therapy room . . . with machine in separate and extra-insulated room . . . (d) Light treatment room . . . or rooms . . . (e) Viewing room . . . (f) Office . . . (g) Developing room . . . (h) Waiting space . . . (i) Dressing rooms . . . (j) Plate storage room . . . (k) Toilet in connection with gastro-intestinal work . . .

Ceilings. Ceiling height not less than 10 feet in clear of all beams, pipes, etc.

Insulation. Floors . . ., doors . . . and partitions to height of 7 feet (but not exterior walls) insulated with lead? . . . With barrium plaster? . . . Thickness of insulation? . . . Method of fastening lead to partition? . . .

Color of fluoroscopy room walls and ceilings? . . . Color of walls and ceiling in developing room?

Prevention of shock to operator by use of rubber mats? . . . Conducting away of static electricity by use of terrazzo floors with brass strips grounded to water pipe . . .

Dark Room Entrance by maze . . . special revolving door . . ., or specially rabbeted door? . . . Manner of introducing fresh air without admitting light . . ., and of conducting away of foul air? . . .

Electric Current. Characteristics of? . . . Independent line from transformer? . . .

Physio Therapy

Facilities in each organized section; office . . ., dressing cubicles . . ., treatment cubicles . . ., or common room? . . . Rest room with . . . or without cubicles? . . . Toilets . . .

1. *Hydrotherapy and massage* may require any of these details; needle bath . . ., douche . . ., sitz bath . . ., mud baths . . ., continuous baths . . ., electric water baths . . ., salt . . ., sand . . ., carbondioxide . . ., or sulphur baths . . ., massage . . ., hot and cold packs . . ., corrective gymnastics . . ., swimming pool . . .

2. *Artificial Heliotherapy.* Bedside treatment . . . or separate department? . . . Individual lamps? . . . Congregate arc lamps? . . .

3. *Natural Heliotherapy.* Usually combined in one department with artificial heliotherapy. Direct sun treatment . . ., shade treatment . . ., protection from view . . ., protection from wind . . ., treatment under glass which transmits the ultra-violet ray . . ., kind of glass? . . .

4. *Occupational Therapy.* Bedside work? . . . Special shops? . . . Storage of materials . . ., instruments . . ., and appliances . . .

Other Provisions

Autopsy and Morgue. Location in basement . . ., near elevators . . ., exit not visible to patients . . . Autopsy room equipped with autopsy sink . . ., table . . ., cabinet . . ., floor drain . . . Morgue separate . . . or combined with autopsy room? . . . Morgue equipped with table . . ., sink . . ., floor drain . . ., body refrigerator . . . Mechanical refrigeration? . . . Number of boxes? . . .

Out Patient Department. In same building with hospital . . . or separate building? . . . If in separate building, how connected to main hospital? . . . Covered passage . . . or tunnel? . . . To what extent will diagnostic and treatment facilities of main hospital be available for out-patient department? . . . Arrangement of diagnostic and treatment facilities should be such as to be available without duplication for both hospital and out-patient department. If in same building with main hospital, provide separate entrance . . ., waiting room . . ., information office . . ., cashier's office . . ., toilets . . ., detention rooms for patients with symptoms of contagious diseases . . . dressing rooms, lockers, and toilets for out-patient staff. Diagnostic and treatment facilities are not re-enumerated, as it is assumed that either the hospital facilities will be utilized or that a separate set of facilities will be provided . . . For possible clinics see list of "Services and Departments," page 909. Ascertain schedule of clinics and what rooms, if any, could be used for more than one clinic at different times.

Typical examination room should have: Examining table . . ., desk . . ., lavatory . . ., cabinet for supplies . . ., one or more dressing cubicles . . .

Special Rooms. 1. *Surgical dressing room* shall have: Simple operating table . . ., sterilizers . . ., surgeons' sink . . ., supply cabinet . . ., instrument cabinet . . . 2. *Dental room,* —one or more chairs with the other usual equipment . . . Small work room . . . 3. *Eye room* large enough to have a 21-foot range at least in one direction . . . Windows arranged for complete darkening . . . Sink . . ., sterilizer . . ., cabinet . . . Dark room . . . 4. *Ear, nose and throat room,*—examination cubicles . . . Sink . . ., sterilizer . . ., cabinet . . . Small dark room . . .

Housing of Personnel

1. *The Superintendent.* (a) Separate dwelling . . . location . . ., capacity . . ., private garage? . . . (b) In wing

of staff house . . . separate entrance . . ., number and disposition of rooms . . ., relation to staff house? . . .

2. *Internes and House Staff.* (a) In separate building? . . . relation to other buildings . . . Provision for members with families? . . . Common sitting room . . ., library . . ., reception rooms? Single rooms . . . or suites? . . . With study? . . . Congregate . . . or individual baths? . . . Dining room . . . and pantry? . . . (b) In hospital building? . . . Location adjoining operating . . . or delivery department? . . . Single rooms . . . or two in a room? . . . Running water in each room? . . . Common bath? Tub or shower? . . . Sitting room? . . .

3. *Nurses.* In separate building preferred . . . Location, . . . relation to hospital buildings . . . Connection to hospital by covered passage? . . . (a) *Undergraduate Nurses,*— One . . . or two in a room? . . . Running water in each room? . . . Wardrobes or closets? . . . Mirror on closet door? . . . Baths . . . and toilets . . . in separate rooms, but connected by door . . . Showers? . . . One tub or shower for each 5 or 6 nurses, one water closet for 5 or 6 nurses. 1 lavatory for each 4 nurses. Kitchenette on each floor? . . . Sitting room . . . adjoining kitchenette? . . . Sewing room? . . . Linen room . . . or closet on each floor . . . Slop sink closet on each floor . . . (b) *Supervisors,* instructors and other assistants of professional grade. Two bedrooms en suite with common bath . . . Common sitting room for this grade? . . . Distribution of suites in building for effective supervision . . . (c) *Superintendent of Nurses.* Living room . . ., bedroom . . ., bath . . ., private porch? . . . (d) *General Features.* Common living room with kitchenette . . . Reception rooms . . . Public toilets . . . Gymnasium with swimming pool? . . . Showers, . . . common locker room . . . or individual dressing rooms? . . . Sleeping porches? . . . (e) *Administrative Features.* Lobby with entrance from street . . . Separate exit to permit going to hospital . . . without passing through lobby. Matron's office . . . Post Office, in-and-out board . . . (f) *Training School.* In separate building . . . or in nurses' residence? . . . Relation to nurses' residence . . . Auditorium or assembly hall . . . Large lecture room . . . Small lecture rooms . . . or classrooms . . . Demonstration room with these features in alcoves or separate rooms: 1. Bed care demonstration. 2. Utility demonstration. 3. Serving kitchen demonstration. Laboratories,—chemistry,—biology,—bacteriology,—dietetics . . . Massage room? . . . Library? . . . Study rooms? . . . Offices for instructors? . . . Storerooms and closets for equipment and materials? . . . (g) *Separate kitchen and dining room* . . . or in connection with hospital plant? . . . (h) *Infirmary for Sick Nurses.* Location? . . . Typical nursing unit? . . . Single rooms for those seriously ill? . . . Wards for convalescents? . . . Examination room for school physician? . . . (i) *Provisions in Basement.* Trunk room . . . Nurses' personal laundry? . . . "Beauty shop"? . . . General stores? . . .

4. Housing personnel of non-professional grade. Location? Over garage . . . or service building . . . or in separate building? . . . Relation to other hospital buildings? . . . Division between male and female servants? Horizontal or vertical? . . . Provisions for flexibility? . . . One or more in a room? . . . Congregate baths and toilets . . . (See nurses' baths for schedule of fixtures.) Common sitting room, . . . kitchenette? . . . Post Office . . . and package room? . . . Personal laundry? . . .

Kitchen and Services

Kitchen. Type of service required? . . . Location in upper . . . or lower story? . . . Food storage rooms, . . . refrigeration . . . Mechanical refrigeration . . . or ice? . . .

(a) *Main Kitchen.* 1. Preparation space,—vegetable preparation, sinks . . ., parer . . ., tables . . ., meat preparation, block . . ., sink, . . . grinder, . . . table . . .; fish . . . ice cream machine, salt box . . ., table . . . 2. Daily supplies and refrigeration. 3. Ranges, . . . broilers, . . . bake ovens . . ., soup kettles . . ., vegetable steamers . . ., hood . . . hood lights, . . . hood steam jet for fire extinguishing . . . 4. Cook's table, . . . *bainmarie,*—plate warmer, . . . steam . . ., egg cooker . . ., toaster . . ., sink. 5. Salad table . . ., bread slicer . . ., coffee, milk, cream and hot water urns . . . 6. Pot sinks . . ., table . . ., mixer. 7. Dish washing,—soiled dish table . . ., garbage pails . . ., silver sinks . . ., dish washer . . ., clean dish table . . ., shelving for dishes, etc. 8. Serving table . . ., tray trucks . . ., tray setups . . . 9. Cold water. . . . 10. Space for food carts.

(b) *Diet Kitchen.* 1. Ranges . . . 2. Refrigeration . . . 3. Sinks . . . 4. Tables.

(c) *Dietitian's Office,* commanding view of kitchen. Equipment,—desk . . ., files . . ., telephone . . .

(d) *Dining Rooms.* 1. For nurses . . . one or more sittings? . . . Cafeteria . . ., or waiter service . . ., or convertible for either? . . . 2. For staff . . . waiter service? . . . 3. For male and female servants . . . in one or in separate room? . . . Cafeteria service? . . . 4. Separate dining room for superintendent and distinguished visitors? . . . 5. Dining room for out-patients and visitors?

Store Rooms. Storekeeper's office . . ., receiving room . . ., receiving entrance.

Food storage,—groceries . . ., staple vegetables . . ., meat . . ., perishable vegetables . . ., fruit . . ., dairy products . . ., eggs.

Furniture storeroom . . ., and carpenter shop.
Bedding storage . . . and fumigation room.
Patients' clothing.
Soiled linen room.
Dead records room.
Drug room.
General supplies.
Ice-making machine . . ., ice tank . . . and ice storage bin.
Storage for screens . . ., ladders . . ., hose . . ., shovels . . ., etc.

Miscellaneous Facilities (usually provided in basement). 1. Locker room . . . with toilet and shower facilities for special nurses. 2. Locker room . . . with toilet and shower facilities . . . for servants; separate facilities for male . . . and female help. 3. Housekeeper's office. 4. Machinery room or rooms.

Laundry. Location where noise of machinery will not disturb patients. or interfere with diagnostic procedure. *Elements,*—receiving and sorting space . . ., washing . . ., drying . . ., and ironing space . . ., clean linen room . . ., sewing room . . ., supply room or closet . . ., servants' toilet. *General Considerations,*—One-story . . ., *vs.* two-story plan . . ., rotation of working process . . ., light and ventilation . . . , nature of motors . . ., characteristics of available current . . ., type of machine control,—i.e., single panel with individual motors . . ., or single motor with continuous shaft? . . . Available steam pressure? . . . water pressure? . . . *Machinery and Equipment,*—Mattress disinfector? . . . Sterilizing washers? . . . Wood washers . . ., copper washers . . ., or monel metal washers? . . . Sorting trucks . . ., Soaking tubs . . ., Water softeners? . . ., Soap tanks . . ., Starch cookers . . ., Extractors . . ., Drying tumblers . . ., Drying racks . . ., Flatwork ironers . . ., prim presses . . ., hand ironers . . ., Sewing machines . . ., foot . . ., or electrically operated? . . . Tables . . ., shelving for handling and storing clean linen.

HOSPITAL BUILDING COSTS

BY

CARL A. ERIKSON

OF SCHMIDT, GARDEN & ERIKSON, ARCHITECTS

THE only proper introduction to this subject would be a thousand or more pages discussing and illustrating hospital planning and detail. As that privilege would, no doubt, be denied me, I must content myself by saying that hospital costs are pretty largely determined by the ideals, purposes, and purse of the sponsors. It is hard on me to be denied the privilege of explaining why, but easier on anyone who chances to read this article. It is difficult to convey information of this kind in such a way that it will not be misunderstood or misinterpreted; just the necessary definitions would probably exhaust the entire space assigned to me. It would be easy to becloud this subject with vaporings as useless as spent steam on a frosty morning. But I know that architects would like information that they can "put their teeth into."

I propose to discuss the questions in regard to costs in the order in which they usually come up in our practice. The first question is always "What does a hospital cost per bed?" Similar questions are constantly being asked about the cost per seat of schools, theaters, and churches, and of the cost per room of apartments, hotels, etc. It does no good to tell your client that such figures are valueless,—he still wants to know the answer. The architect experienced in any one of these classes of buildings can extract enough information from the client in a few moments to give a figure that is within 25 per cent of the correct amount by comparison with the costs per room, per seat, or per bed of buildings similar to that described by the client. Every architect, no doubt, qualifies such answers in every possible way. "What does a hospital cost per bed?" raises three additional questions at once: (1) What kind of a hospital? (2) What is to be included in costs? (3) What is a bed? There are as many different kinds of hospitals as there are of women's hats. A teaching hospital in a large city is far more expensive than a hospital serving a small town and its environs. A hospital consisting of large wards is far less expensive than one consisting of rooms for private patients. One with a large out-patient department will obviously cost more per bed than one without an out-patient department.

For the purposes of this article, I have included in the costs everything that is permanently attached to the building except sterilizers and laundry and kitchen equipment. The costs do not include any planting, roads or landscaping, nor do they include the architect's fee. The costs of laundry, sterilizers and kitchen equipment will be from 3 to 6 per cent of the other building costs. Loose equipment, including X-ray, laboratory, linens, etc., will add from 10 to 18 per cent to the basic building costs.

In all costs and calculations we give here, we do not include the costs of nurses' homes or of servants' quarters. Such buildings vary greatly in size in proportion to the bed capacity of the hospital. In many cases, no servants' quarters are included. In others, only a very few servants are housed, while an occasional hospital makes ample provision for them. Such housing must be estimated separately. The number of nurses to be housed also varies greatly,—as well as the method of housing. In an occasional hospital, the number of nurses may be as high as one nurse to a patient, and then descends the scale to some county institutions with one nurse to six or ten patients. A nurses' home of an approved type will contain from 2,800 cubic feet per nurse to 6,000 cubic feet. If of fireproof construction, the cost of the building would be somewhere between 35 and 90 cents per cubic foot, depending on location, height, finish, detail, etc.

A bed, as we count it, is any bed *normally* in place except those bassinets in the nurseries of the maternity department. We have found that the space occupied by resident personnel, such as internes, nurses, executive staff or sisters, within the hospital, could in most cases be occupied by an equal number of patients. As the number of such residents varies greatly, we find that the most accurate of these very crude cost-measuring devices is the cost of *all* beds (except nursery).

The costs per bed for ten hospitals (including power house and laundry but not nurses' or servants' quarters) designed during the last five years were:

Hospital	*Per Bed*	*Per Patient*
No. 1	$5,447	$6,370
" 2	3,290	3,430
" 3	9,750	10,450
" 4	5,750	6,025
" 5	5,380	7,040
" 6	4,700	5,100
" 7	3,814	4,525
" 8	2,902	4,191
" 9	7,268	7,822
" 10	5,820	6,040

If the nursery beds were added in the bed count, the costs would be reduced by from zero in one case to 25 and 30 per cent in others. If the potential or emergency capacity is figured, the costs per patient's bed would shrink another 25 per cent in some cases. Many figures lower than any of those given here are frequently quoted. Before worrying very much about them, the architect should first find out how the beds are counted, what kind of a hospital it is, and what the costs include. We have made similar inquiries so many times that we place little credence in low costs per bed. During the past five years, we have built a structure (called a "hospital" by its owners) for less than $2,000 per patient's bed. It is not an acute disease general hospital, and so it is not included. During the same time, we have built private-patient additions to hospitals that would have cost between $15,000 and $18,000 per bed had they included all of the necessary dependencies within the additions. What little dependence the architect or his client can place on "cost per bed" is evident.

The logical approach to any building project is in the setting down of the things that should go into the building,—in other words, the preparation of a program. Sometimes this comes to the architect rather fully developed by a consultant. More frequently, he must prepare it himself with such information as he can obtain from his clients and their advisers. Sketch plans should then be developed, and they will indicate the size or cubic contents of the building. As a guide, I have selected ten from among our recent hospitals and give the number of cubic feet per bed, and per patient:

Hospital	*Per Patient's Bed*	*Per Bed*
No. 1	10,250 cu. ft.	8,746 cu. ft.
" 2	6,250 " "	5,800 " "
" 3	11,540 " "	10,800 " "
" 4	9,350 " "	8,940 " "
" 5	13,400 " "	10,250 " "
" 6	8,540 " "	7,860 " "
" 7	7,600 " "	6,410 " "
" 8	10,440 " "	7,220 " "
" 9	8,000 " "	7,660 " "
" 10	7,840 " "	7,560 " "

It might be well to add here that our definition of the cubage is identical with that of the A.I.A. as given in Document 234,—"the actual cubic space enclosed within the outer surfaces of the outside or enclosing walls and contained between the outer surface of the roof and the finished surfaces of the lowest floor." Is it possible to draw any general conclusion from the contents per bed or per patient's bed? The average would be of no value. About all that can be said is that a hospital of less than 7,000 cubic feet per patient is very tightly planned, with a minimum of space assigned to the auxiliaries.

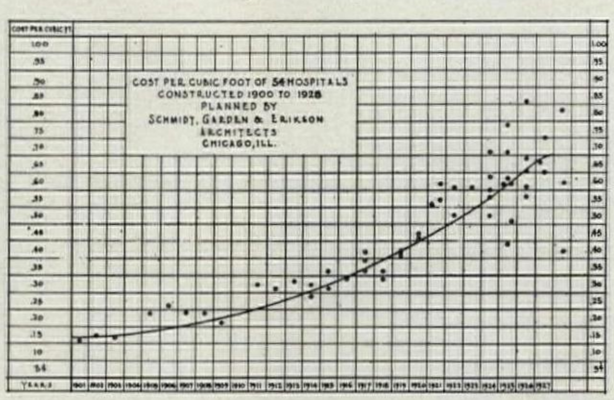


Chart 1. Cost of 54 Hospitals, per Cubic Foot, 1900 to 1928

The costs of any building might be expressed algebraically thus:

(a, b, x = y):

if a = the volume,

b = the materials and method of installation,

x = cost of construction and installation,

y = total cost.

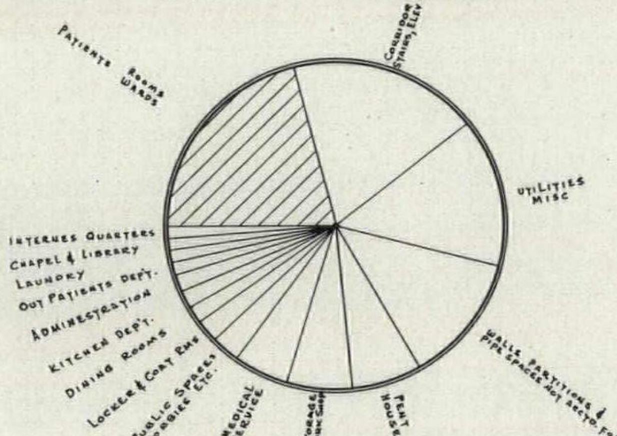
The volume of the building has been roughly determined by the preliminary sketches. The architect will, no doubt, have a general idea of the client's wishes in the matters of detail and finish. It is not necessary to remind architects of how vitally their decisions in such matters will affect the cost of any building. Nor is it necessary to remind the architect of the importance of considering such matters as the location, kind of foundations, etc., in estimating the costs per cubic foot.

In the equation a, b, x = y, the contractor expresses the volume by accurate quantities of brick, pipe, etc., and x by the quoted prices of materials and estimated cost of labor required to install them, to which is added a profit (maybe). But the contractor will have before him voluminous drawings and specifications accurately describing the work to be done. The architect has before him four or five sheets of small-scale sketches. He expressed b, x, by costs per cubic foot. But the cost per cubic foot is very illusive. First, it is affected by the location of the project. Building costs are higher in New York and Pittsburgh than in Philadelphia, higher in Chicago than in Detroit, and higher in Detroit than in Battle Creek, Mich., and they fluctuate from time to time (with any appreciable change in the rates of labor or costs of material). An explanation of why this is so needs the combined efforts of an economist, a contractor, a psychologist, and finally a psychiatrist. But the cost per cubic foot is also importantly affected by the planning of the building. The "plump" building costs less per cubic foot than the "lean" structure. That is a matter of arithmetic. A building with high stories costs less than one with low stories,—again a matter of arithmetic. One with large, unfinished basements and attics costs less than one with none,—this time a matter of common sense. A "tightly" planned building (i.e., with small rooms and intensive use of all spaces) costs more per cubic foot than one liberally planned. One of the lowest cubic costs of our recent hospitals was not only in an unusually low-building-cost area, but was also very liberally planned as the 10,250 cubic feet per bed show. This high content per bed was not due to extraordinary liberality of the services, but due to such things as 10-foot corridors and private rooms averaging about 10 feet x 17 feet. Of course, the greater number of stories, the greater the cost per cubic foot.

When dealing with such an extraordinarily complicated building as the hospital, it is difficult to draw conclusions from the costs per cubic foot. In order to do so, it is necessary to know the buildings intimately. Hence, while we give here a diagrammatic

An Analysis of Space Assignment of a Mid-Western Hospital Schmidt, Garden & Erikson Architects Nov. 1928				
177 Total Patients Beds Exclusive of Nursery 177				
		Square Feet Net Area	Square Feet per Patient	% of Gross Fl. Area
Patients Rooms & Wards		28,000	158.5	20.6
Utilities & Miscellanious		19,500	110.	14.4
Medical Service				
X-Ray	1060			
Laboratories	624			
Pharmacy	468			
Autopsy	312			
Birth Dep't.	1814			
Operating Dep't.	2622			
Ambulance Entrance	984			
Occupational & Physio Theropy	347			
		8,200	46.5	6.1
Out Patients Dep't.		1,700	9.6	1.3
Lobbies, Public Space Etc		3,500	19.7	2.6
Chapel & Library		1,500	9.6	1.1
Administration		1,900	10.8	1.4
Locker & Coat Room		2,600	14.7	1.9
Internes Quarters		1,500	9.6	1.1
Kitchen Dep't.		2,400	13.5	1.8
Dining Rooms		2,400	13.5	1.8
Laundry		1,800	10.	1.3
Power House		9,600	54.2	7.1
Store Rooms & Work Shops		8,700	49.	6.4
Corridors, Stairs & Elevators		25,000	141.2	18.5
Outside Walls, Pipe Spaces & Interior Partitions	Not accounted for above	17,000	96.	12.6
		135,300	766.4	100. %

Graphic Analysis



ANALYSIS OF HOSPITAL SPACE ASSIGNMENTS, NUMERICALLY AND GRAPHICALLY

Trades	Skeleton				Wall Bearing			
								Average
Masonry, Conc. & Tile	36.	34.6	30.0	35.8	33.9	33.3	28.2	32.8
Cut Stone & Terra Cotta	4.0	2.6	1.5	1.1	3.0	2.9	4.2	2.7
Steel - Structural	3.0	3.1	1.7	5.5	3.3	1.6	3.6	3.1
Ornamental Iron & Bronze								
Elevator Doors				.1		1.2		
Hollow Metal Doors	1.7	1.3	3.9	.7	In Sheet Metal	.1	2.7	2.2
Steel Frames						2.2		
Hollow Metal Wind.	In Sheet Metal	In Sheet Metal		In Sheet Metal				
Carpentry & Hardware	11.1	8.0	7.0	7.7	17.4	8.0	6.8	9.3
Lath & Plaster	5.0	10.0	7.5	4.8	8.5	8.0	6.6	7.5
Sound Absorbing Mat.	.2		2.1	In Plaster				
Roofing & Sheet Metal	1.3	1.6	1.7	1.5	2.0	2.4	2.1	1.8
Painting	2.5	2.4	2.0	1.7	3.5	1.5	2.5	2.4
Glazing	.9	.6	.4	.5	.8	.6	1.	.7
Marble	1.4	1.7	.5	.5			1.3	.8
Tile	1.1	.5				1.1	3.4	
Rubber Tile	1.0			6.7			.8	7.1
Terrazzo	4.1	6.8	5.9		7.8	5.9	4.8	
Metal Cases Etc.	.1		.5	1.7		.5	2.1	.8
Refrigerators	.5	1.0	.7	.6	0.5	.7	1.	.6
Screens	.7	.7	.8	.5	In Carpentry	.3	.5	.5
Weather Strips	.2	.2		.1	0.4		.2	.2
Miscellanious	.1	.2					1.	.05
Light Fixtures	.9	1.0	1.0	1.	1.2	1.5	1.2	1.1
Total Architectural	75.8	76.	68.8	72.	81.2	73.3	73.6	74.4
Plumbing		8.7	10.8	9.1	9.0	8.4	7.6	8.7
Heating	18.1	7.5	10.4	7.7	5.8	8.8	8.6	9.
Ventilating			1.6	1.6			2.	
Wiring	2.9	3.5	3.	3.4	1.7	4.8	5.9	3.6
Elevators	2.1	2.7	3.2	3.7		2.1	1.6	2.5
Dumbwaiters					1.1	.4	.3	
Refrig. Machine	1.1	1.6	2.1	1.6	1.2	2.	1.5	1.6
Incinerators	In Masonry		.5		In Masonry		.3	.4
Total Mechanical	24.2	24	31.2	28.	18.8	26.7	26.4	25.6

Figures Given Above Are Percentages of The Total Cost. No Nurses or Helps Quarters Included.
Schmidt, Garden & Erikson Architects
November 1928

HOSPITAL COSTS ANALYZED TO SHOW PERCENTAGES BY TRADES chart of the costs per cubic foot of hospitals, it is with a realization that they can be only a very crude guide. No additions are included,—no matter how large they may be,—for they are not comparable to the complete hospital unit.

The ascending curve of cubic-foot costs, shown on Chart 1, is explained in part by the rise in costs of building, and in part by the better buildings now commonly erected,—and also by the improvement in the quality of finish and details now considered necessary in the modern hospital. With hospitals costing so much, it is obvious that rigid economy of the use of space is necessary. An interesting study was made in our office a few years ago to determine the percentage of space utilized for various departments. The hospital was erected in the middle west a few years ago. It houses 177 patients (normally, largely in private rooms, many with private or communicating toilets). It provides for 31 babies in the nursery of the maternity department. Provision has been made in most of the departments to care for an additional 50 to 100 patients should they be needed. I cannot say that this is a typical mid-western hospital, for we have not made similar calculations for other hospitals. It is interesting to note that only 20.6 per cent of the gross area developed within the outside walls is used in the patients' rooms and wards.

Here is another interesting comparison that is passed along for whatever it may be worth. It concerns the private-room floors of six hospitals designed between the years of 1923 to 1925 and gives the area per room of these floors.

Epworth	257 sq. ft.
Christ's	259 " "
Illinois Central North	287 " "
Mt. Sinai	324 " "
St. Agnes'	386 " "
Washington	494 " "

The difference between 257 square feet and 494 square feet per room may occasion some raising of eyebrows, but it need not, for each one of these hospitals is economically planned for the purpose intended.

Another interesting comparison between the ward floor and the private-room floor of a hospital now under construction is that the ward floor has 52 beds divided into 24 beds in 4-bed wards, 20 beds in 2-bed rooms, and 8 private rooms. The private-room floor has 28 private rooms.

Ward floor	52 patients	250 sq. ft. per patient
Private rooms	28 "	465 " " " "

And yet the statement is frequently heard that private rooms cost no more than ward beds! Its absurdity is manifest.

To show where the hospital building dollar goes, we have prepared a tabulation of the percentages of costs for the various trades. We do not include in these totals the cost of laundry machinery, kitchen equipment or sterilizing equipment. The buildings vary in cost from 47 cents to 72 cents per cubic foot, and all are of fire-resisting construction with reinforced concrete floors. Four are of skeleton concrete construction; three are wall-bearing with interior columns of skeleton construction.

Many of the differences in the percentages can be readily explained, but in some cases they "surpass all understanding." I have presented the percentages of the total costs rather than of the cubic foot costs, for, as said before, Duluth costs cannot be compared with Chicago or Pittsburgh costs.

The architect with but little experience with hospitals is likely to underestimate their costs. He will make comparisons with hotels and perhaps conclude that the hospital will not cost as much. In this he will make a grievous error. A carefully detailed hospital will probably cost from 10 to 25 per cent more per cubic foot than a hotel that is in any way comparable.

As I said at the beginning, this is a hard assignment. I doubt whether I have helped anyone with his problem. The records I have given here are a faithful transcription from our own records, but they will be of little value to anyone unless they are accompanied by plans and specifications,—in other words, with that intimate knowledge of the project which comes from living with it day by day. Yet we have found our estimates of cost, based on these and many other similar projects, uncannily accurate in predicting cubic foot costs. Sometimes they are wrong,—as often our estimates are too high as they are too low. Yet the hard assignment made by the editors of THE FORUM is as nothing compared to the assignments being daily given to architects. What will this hospital cost? The architect has before him a few preliminary sketches,—a hazy idea of the client's ideas as to finish, etc., and upon this he is expected to predict within a small percentage what a building will cost from two months to a year later. When the completed working drawings and specifications are submitted to the contractors for tenders, 30 to 50 per cent variations in the figures submitted are commonplace. Yet, if an architect's estimate is that much too low, he often finds himself bitterly condemned because he hasn't the gift of prophecy! About the only thing that the architect can definitely promise a hospital client is the extent of the cubic contents after preliminary studies have been approved. He will find that this requires eternal watchfulness or he will find a foot added there, something here, etc., as the working drawings progress. He will often find that the cubic contents are like a balloon,—constantly being blown up,—and when the bids come in, the balloon bursts and the architect finds himself without a parachute. Never be without one! Notify your client daily, if necessary, of the state of inflation of the cubic contents!

THE LIGHTING OF HOSPITALS

BY

KIRK M. REID

RETROSPECTION, we may safely conclude, has always been held in somewhat ill repute. In Biblical times, Lot's wife looked back at blazing Sodom and promptly became a pillar of salt. In the middle ages an Italian gentleman by the name of Dante could imagine no worse punishment for those who dared to pose as prophets than that they be sentenced to wander through Hades with their heads reversed on their necks,—permanent retrospection, as it were. And now, in this era of rapid locomotion and building for the future, paying too much attention to the past is usually considered to be a sign of old age or lack of creative ability. Yet, in order to get a general view of the subject of hospital lighting, we ought to devote a few moments to past practice.

It quickly becomes evident that the early methods of hospital lighting will not afford the inspiration derived from a Parthenon or a Reims Cathedral. Quite the reverse. Until a very few years ago the hours for operating were confined to the period during which there was good daylight, and woe to the unfortunate patient who had to have an emergency operation at night! The light sources were feeble enough at best, and to complicate matters they had to be kept far enough away from the wound to avoid contagion from the gaseous or solid products of combustion. While the development of the incandescent lamp in 1878 made available a light source free from all emanations, these early lamps had to be located fairly close to the operating area in order to provide enough light for the surgeon, and the lighting equipment was a potent dust collector. Because of the primary importance of asepsis, all sorts of schemes were tried to eliminate the necessity of having lighting equipment suspended above the operating table. One installation, now obsolescent, consisted of a battery of lamps in reflectors mounted outside of the operating room skylight. Another plan involved the use of a number of mirrors to re-direct to the operating table beams of light projected from an arc lamp in an adjoining room. But the usual operating room light, consisted of one large incandescent lamp, or a number of small lamps, in a reflector located above the operating table and directing the light down to it.

The subject was constantly receiving attention, but constructive ideas about hospital lighting seemed to be lacking. In 1922, to cite an actual example, there was a joint meeting of the Illuminating Engineering Society of England and the Royal Society of Medicine. After listening to one of the lighting experts tell his full story of the then "modern" methods of hospital lighting, a prominent physician remarked that he had expected to be told that his present lighting practice was wrong, but he found that nothing very new had been put forward, and certainly nothing in any sense revolutionary. To one acquainted with the noteworthy developments which had, by that time, been made in other fields of illumination, this apparent lack of progress in hospital lighting is hard to explain. Judging from the account of this London meeting and from other printed matter on the subject, it seems that the year 1923 marked the real beginning of good artificial illumination in hospitals. True, there were a few commendable installations before that time, and there have been a number of mediocre installations since; but commencing in 1923 the trend has been distinctly upward. There is a better understanding of the problem, and good lighting systems have been developed.

At this point we might pause and draw two general conclusions based upon the foregoing retrospection. First, the science of hospital lighting is still in its infancy, and, as it is true in the case of any comparatively new development, architects are in an ideal position to render valuable service to hospital authorities by making a careful study of the problem before drawing up lighting specifications. Second, past practice is of little or no value as a guide; in any hospital which was built more than half a dozen years ago and has not since been re-lighted, the lighting facilities are almost certain to be obsolete. Further, the lighting of even a new hospital should not be used as a model without making sure that it really represents good practice.

Light for Operating Rooms. Few subjects are so fraught with brickbats for the hapless author as is *color quality of light* for hospital operating rooms. Widely different views exist among those who are recognized as experts in the matter of color quality. This is quite indicative that there are several more or less conflicting factors involved, and until investigations have been made to obtain more definite data, the balancing of these conflicting factors is largely a matter of opinion.

In stating the principal requirements to be met by a lighting system for an operating room, surgeons seem to agree that the operating table should be supplied with a comparatively high intensity of light, approximately white in color. There are, of course, other requirements. The light should be properly directed and sufficiently diffused to penetrate a deep incision without objectionable shadows from the surgeon's head or hands; no glaring light sources should exist within the field of view; the light should be steady and reliable; the temperature rise on the operating table should not be excessive; and the lighting equipment should not collect or disseminate dust. These latter requirements, while unquestionably important, are not quite as fundamental as the two first mentioned, and furthermore, they do

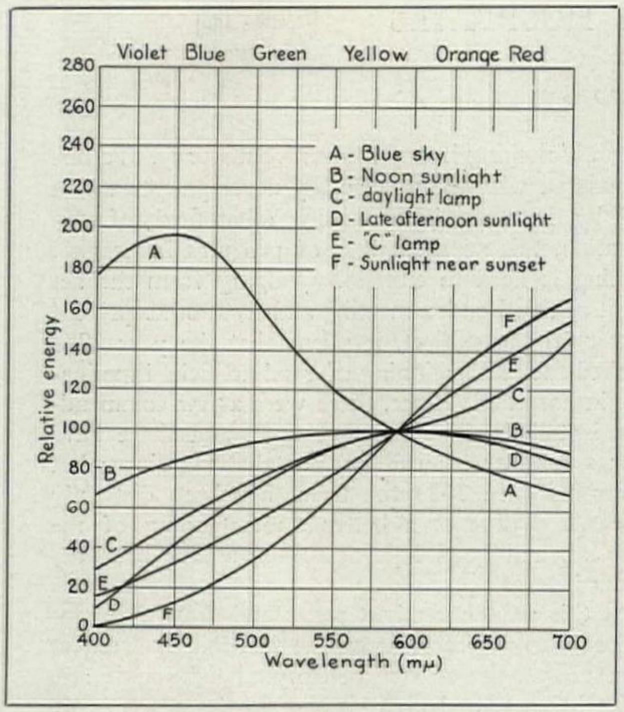
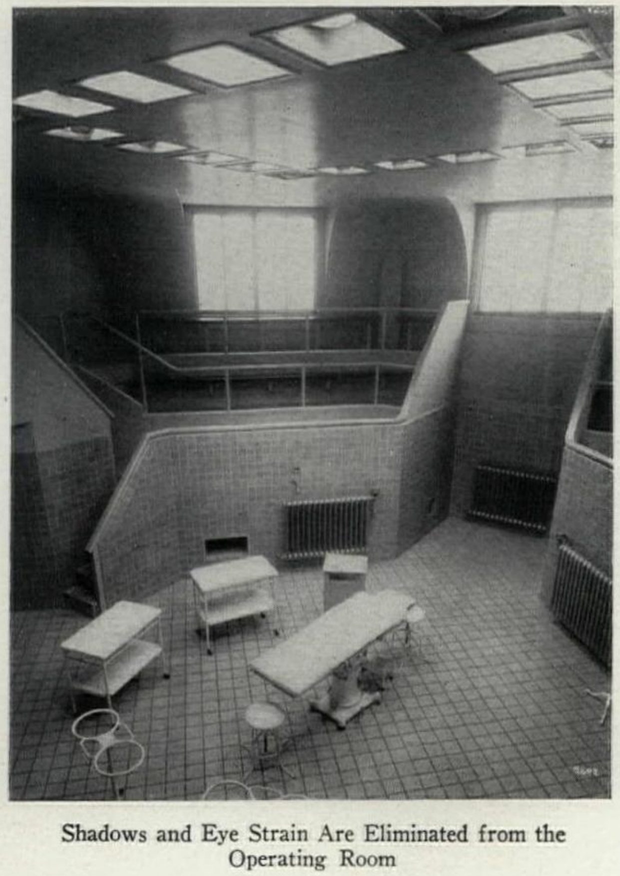


Fig. 1. Spectral Analysis of Daylight and Lamps

not offer much room for argument. In marked contrast, both intensity and color quality are largely relative and therefore controversial.

First, it is hard to put a definite foot-candle valuation on the requirement that there be a "comparatively high tensity" of light on an operating table. Not much help is obtained from a study of daylight values. It is generally known that outdoor daylight illumination, excluding direct sunlight, varies from around 100 foot-candles on a dark day to about 2000 foot-candles. Interior daylight illumination follows the outdoor variations, although the intensities are, of course, only a fraction of the outdoor values. In factories and offices, from 10 to 20 foot-candles over an entire room may be regarded as good practice for both artificial and natural illumination. In a hospital operating room having a large skylight, where translucent screens or other means are provided to exclude direct sunlight, the daylight illumination on the operating table will usually range from 50 foot-candles to about 1000. Perhaps half this much light will be obtained if the operating room has side windows instead of a skylight. Except for the general experience that the lower levels of daylight illumination fall below the desirable minimum for operating, these figures are not particularly helpful. However, they do explain, at least in part, why the intensities of artificial illumination recommended by various authorities range from around 1000 foot-candles to about 1200 foot-candles.

In regard to *color quality of light*, we must realize that comparison plays a large part in color vision. When the gas-filled lamp was developed in 1913, its light was described as "practically white," because its predecessors,—the early tungsten lamp and the carbon lamp,—gave off a light which was distinctly ruddy in comparison. Yet a gas-filled lamp with a clear glass bulb, when compared with a blue bulb "daylight" lamp, gives off a light which is not white at all, but quite reddish. And, in turn, the light from a "daylight" lamp does not appear white when compared with the light from a "north sky" color matching unit. So our standard of "white light" cannot very well be based on artificial illumination. The obvious way out of this dilemma seems to be to define an approximately white light as meaning the color quality of daylight. This is what many surgeons have done, and it is logical that they should ask for a duplication of daylight, because for centuries the human eye has evolved, and its sense of color values has been built up almost entirely under daylight. So we turn confidently to a spectral analysis of daylight, and find the situation presented graphically in Fig. 1. Curve A shows that light from a blue sky has a marked excess of energy in the short wave lengths and therefore cannot claim to be the true "white" light. This conclusion may seem a little radical in view of the fact that north sky light has long been regarded as the standard for color matching, but it should be remembered that the principal reason for this was the *constancy* of north sky light rather than its spectral quality. Curve B, showing the energy distribution of noon sunlight, comes quite close to the perfectly flat line which represents theoretically white light. As the sun drops, the curves show that sunlight has an increasingly marked deficiency in the blue region, accompanied by an excess in the red region. While not



Shadows and Eye Strain Are Eliminated from the Operating Room

of practical value, it is interesting to consider that once in a great while,—when the sun shines through a film of clouds with just the right amount of the blue sky showing,—we actually have white daylight. The rest of the time daylight is not truly white. And it is far from constant in color quality,—a most annoying situation to anyone who seeks to make a duplication of daylight indoors. Energy distribution curves for the gas-filled lamp and the "daylight" lamp have been included in Fig. 1. Here they may be compared directly with the various daylight curves.

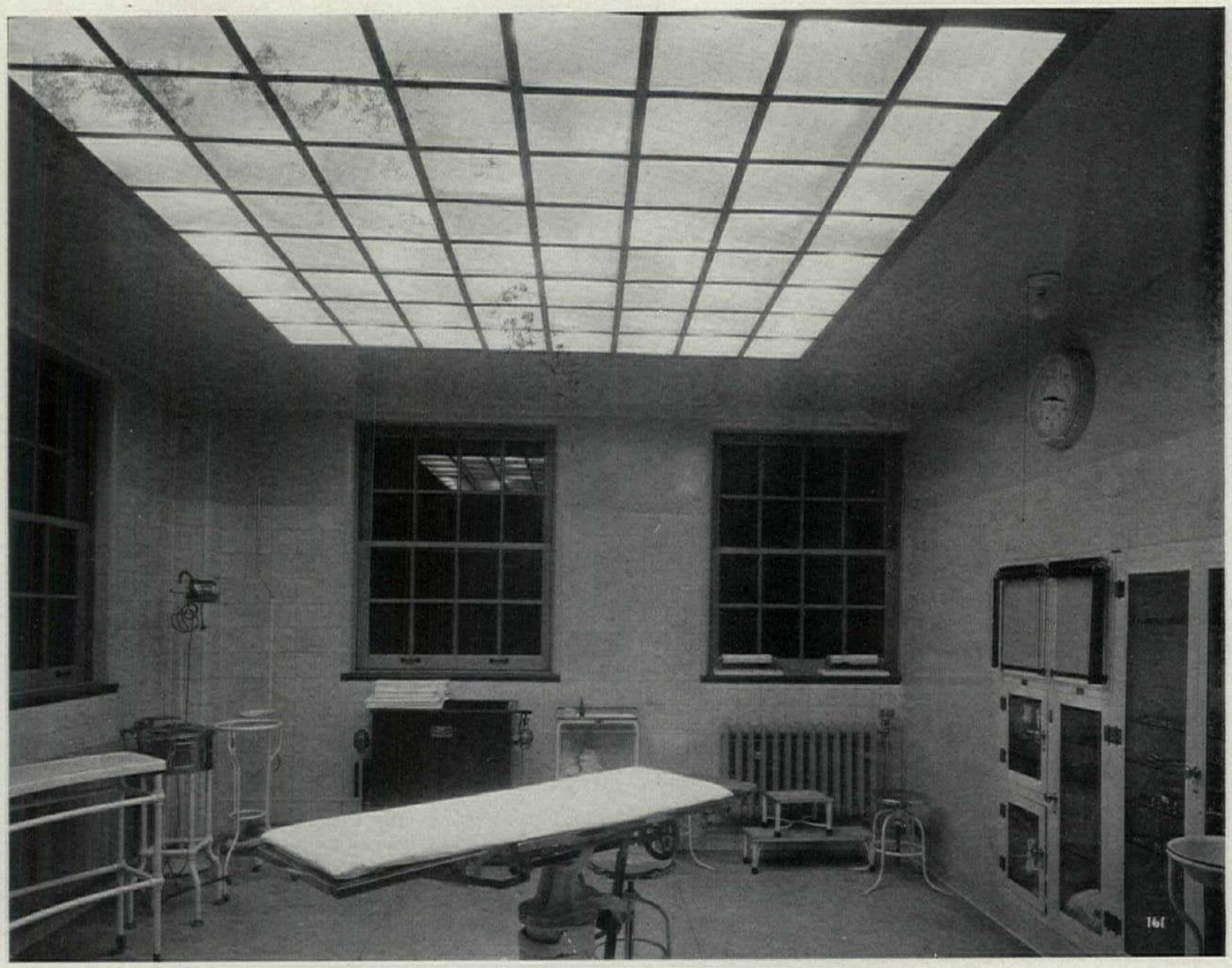
Thus far we have given separate consideration to intensity and color quality. As a matter of fact, they are almost too closely related for this treatment. For example, it has been found that without any change in the color quality of the light, color discrimination improves as the intensity is raised. Also, from the practical standpoint, it is noteworthy that color correction of the light from incandescent lamps is accomplished by means of absorption. Starting with a clear bulb lamp, we find that the light covers the entire range of the visible spectrum, but there is an excess of energy in the red region. The blue glass bulb of a "daylight" lamp makes a step toward balancing the energy distribution by absorbing part of the excess in the red region. This absorption amounts to about one third of the light emitted from the lamp filament. Where still further "color correction" of the light is made by means of enclosing globes of plates of dense blue glass, the absorption is still higher. To obtain the color quality of light designated as "noon sunlight," about two thirds of the light is absorbed, while for "north sky" quality about five sixths is absorbed. Therefore, whenever the color quality of the light is changed by a blue glass bulb or accessory, the wattage must be increased or there will be a marked reduction in intensity.

Operating Rooms for Contagious Diseases Requires High Intensity Light

Floodlights of a Focusing Type Leave the Table Free from Shadows

A considerable amount of space has been devoted to these matters because there are such conflicting opinions on them. One prominent company manufacturing lighting equipment for operating rooms is apparently convinced that by providing on the operating table several hundred foot-candles, of the color quality emitted by clear bulb lamps, the requirements of color discrimination are met. Another prominent manufacturer has long maintained that a color quality approximating theoretically white light is of such primary importance that it easily justifies the use of several times as much wattage. Perhaps the "daylight" lamp is a compromise between these two extremes. It seems that the subject offers a splendid opportunity for practical research, through the installation of a test system capable of providing a wide range in intensity, color quality, and distribution of light. Apparently no comprehensive investigation of this nature has ever been conducted.

Operating Room Lighting Systems. There have been many operating rooms in which the major source of illumination was an adjustable spotlight employing a single large lamp. From the illumination standpoint, the extreme contrast between the bright spot of light and the surrounding dimly



Color Correcting Glass is Used in this Major Operating Room

lighted area causes a condition of eye strain which usually manifests itself as eye fatigue and general fatigue of the surgeon. Also of importance is the fact that lamps burn out when least expected, and if the spotlight lamp fails during an operation, it leaves the surgeon without a high-intensity source of illumination. Further, adjustable mechanism sometimes fails to operate smoothly, and even under the best of care, particles of dust on the unit may be disturbed in the process of adjustment after the patient is on the table. These difficulties are overcome by the installation of a number of light sources properly placed at or in the ceiling above the operating table. The extremely bright spot is eliminated, shadows are materially softened, asepsis is assured, and the failure of a lamp during an operation is not serious.

Among the overhead lighting systems the direct type is best suited for this application. Indirect lighting, in which all the light is thrown upward against the ceiling, might also be considered. It is characterized by softness of shadows and absence of specular reflection from instruments and from fluids in a wound. While the diffusion is sufficient, so that light penetrates even a deep incision fairly well, indirect illumination has the disadvantage that there is no more light on the operating area than elsewhere in the room, and that unless the wattage is very large, the intensity is comparatively low.

It seems more logical to employ a system which directs most of the light to the operating area, at the same time providing sufficient illumination throughout the room to avoid extreme brightness contrast. Such a system provides excellent penetration for a deep incision, and by making the light sources of large area, the diffusion is markedly improved. The lamps can be circuited to permit wide flexibility in control, making it possible for the surgeon to have the predominant light come from whatever direction is best for the particular operation at hand. The ultimate operating room lighting system will probably be of the direct type, providing an intensity of around 500 foot-candles, of a color quality somewhere between noon sunlight and late afternoon sunlight. As previously pointed out, full research work along this line is yet to be done. For diagnosis and for minor operations, there is sometimes use for a portable stand lamp. With a good overhead lighting system, however, there is no occasion for the regular use of any portable lighting equipment.

Emergency Lamps. Every operating room should

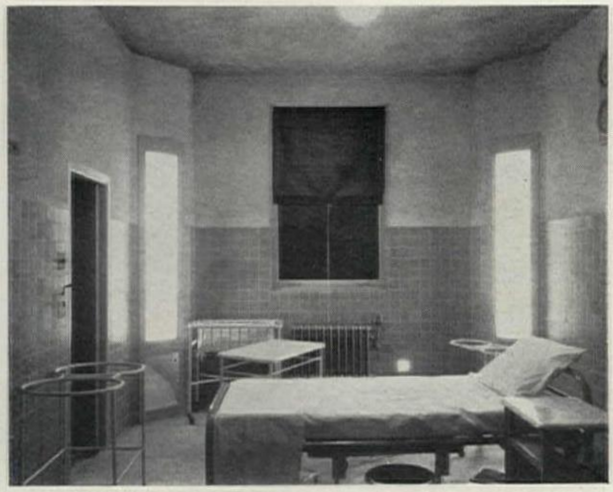
Prismatic Glass Properly Arranged Provides Efficient Illumination for Operating

be equipped with an emergency hand lamp, supplied by storage batteries, for use whenever the power supply fails. Recently an operation in a Cleveland hospital, well lighted except for an emergency provision, had to be finished by candle light because the power cable supplying the hospital burned out. It is advantageous to have a luminescent front on the emergency lamp cabinet to indicate in the dark its exact position.

Lying-in Rooms. A lying-in room in a maternity hospital differs from an operating room in that the light should come largely in a horizontal direction, or within 45 degrees above the horizontal. For this distribution artificial "window" and "cornice" lights are often recommended. One accompanying illustration (page 922) shows a typical installation. Where this type of lighting cannot be employed, fairly good results may be obtained by the use of a large portable spotlight.

Private Rooms. In very few hospitals are the private rooms well lighted. This is somewhat surprising, because the problem is not difficult, and suitable lighting fixtures have been on the market for years. For general illumination an indirect or dense semi-indirect unit is recommended, as any other type becomes uncomfortably bright to the patient who must lie looking up toward it. The general practice of finishing the ceiling and upper walls in a light tone permits the use of indirect lighting without undue sacrifice in efficiency. In a small private room, a 100-watt or 150-watt lamp provides sufficient general illumination, while in the larger rooms a 150-watt or 200-watt lamp is recommended. For reading and writing in bed, the general illumination should be supplemented by some form of local lighting near the head of the bed. This lighting also proves useful for examinations and ministrations by doctors and nurses. Since floor lamps and table lamps are almost invariably in the way, properly shaded wall brackets, one on each side of the bed, are recommended for this service. In selecting the type of wall bracket, care must be taken to avoid glare. If the brackets are of the type in which the lamp bulbs hang downward, the shades should be small at the bottom so as to shield the bright bulbs from the eyes of the patient. If the lamp bulbs point upward, either cone-shaped shades or half-shades may be used. For brackets of both these types, 60-watt inside-frosted lamps are recommended. Recently there have been developed several good semi-indirect wall brackets. These are so well suited for use in hospital rooms that they will undoubtedly

Minor Operating Room with Prismatic Glass Projectors



Artificial Windows Used in a Delivery Room

be widely adopted for this service. Since wall brackets of this type contribute to the general illumination as well as providing local illumination, they should be equipped with 100-watt lamps. For night lighting of a private room, there are on the market several forms of overhead lighting equipment supplied from two circuits,—one bright and one dim. This arrangement is not entirely satisfactory, because even a dim overhead light is likely to arouse a fitful sleeper. It is much better to use a small lighting unit recessed in the wall about a foot above the floor. The sketch on page 924 represents a suggested design. Such a unit provides sufficient illumination for attendance to the patient by the nurse on night duty, without making it objectionably light in the room. For the use of electrical equipment, such as electro-cardiographs, heating devices, and portable examination lamps, a convenience outlet or two should be installed in the wall near the bed.

The foregoing comments on the lighting of private rooms have dealt with what might be called the practical side of the problem. We must not overlook the other side,—the æsthetic. There is no question but that a homelike atmosphere is conducive to general pleasantness and quick recovery, and lighting which adds to the attractiveness of the room as well as meeting the utilitarian requirements exerts a psychological influence which is beneficial to the patient.

General Wards. The lighting requirements of a general ward are substantially the same as those of a private room. The desirability of obtaining minimum brightness in the general lighting equipment,—especially in children's wards,—suggests the use of indirect lighting. Having total wattage equivalent to from 1½ to 2 watts per square foot of floor area is a good general rule to follow. Care should be taken that the wall brackets for local lighting at each bed do not cause glare in the eyes of those whose beds are along the opposite walls; the use of good shades or semi-indirect brackets is especially important on that account. Night lights and convenience outlets are needed here as in a private room. For wash basins, nurses' desks, medicine cabinets, and other details at which light may be required at night, it is desirable to employ lighting equipment having opaque or dense shades which confine light.

Corridors. For the lighting of corridors, good

X-ray and Therapy Rooms Require Good Illumination

Side Light Brackets Instead of Portable Lamps for Reading

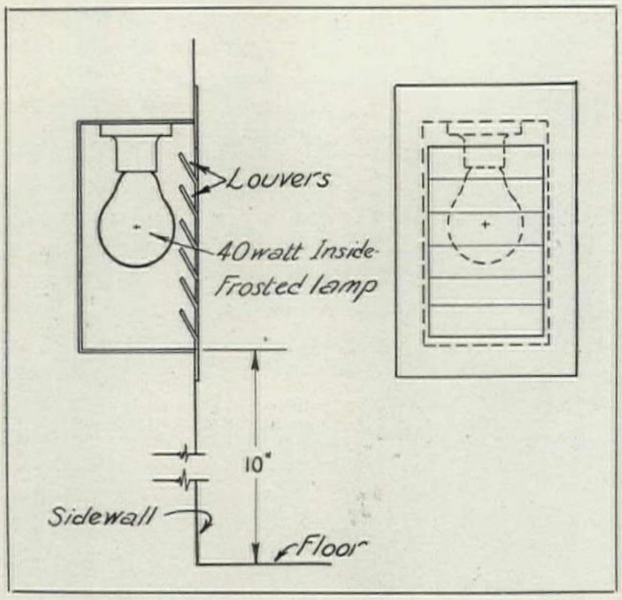
Diffused Light is Supplied in the Ward by Indirect Fixtures

results are obtained with equipment consisting of white glass or prismatic glass globes, completely enclosing the lamp. Equipment of this type has the advantage of high efficiency, and while it is too bright for comfort where it is in the field of view for any appreciable length of time, as in a ward or room, it does not become particularly uncomfortable during the short time it takes to wheel a patient through a corridor. Enclosing globes, mounted at the ceiling, spaced 15 to 20 feet apart along a corridor, and equipped with 150-watt or 200-watt lamps, are recommended for this service. For night illumination a few brackets or recessed wall units are sufficient. In most modern hospitals the nurses' call systems employ signal lights, but a discussion of this matter hardly belongs in an article on lighting.

Laboratories. The work in hospital laboratories is of a varied nature, and provision should always be made for a fairly high level of evenly distributed general illumination. Satisfactory results are obtained with enclosing glass globes, spaced not farther apart than one and one-half times their height above the work tables, and equipped with a total lamp wattage amounting to about 2 watts per square foot of floor area. There are some classes of work in the laboratory which require special lighting in addition to the general illumination of the room. One common example of this is found in microscopic laboratories. Here there is need for local lighting equipment consisting of a small box mounting a 25-watt or 40-watt lamp. On one side of the box is a frosted glass plate; the light passes through this plate and strikes the mirror on the base of the microscope, which is set at the proper angle to reflect the light up and through the slide under examination. A frosted blue glass plate may be used if it is desired to have light approximating daylight in color quality, for the inspection of colored slides and also for comparing slides under both artificial and daylight color qualities of light. Some of the later types of microscopes have small light boxes permanently installed on the bases of the instruments; in other cases the light

Indirect Lighting in Private Room

A Well Lighted Children's Ward



Night Lighting Unit for Rooms and Wards

boxes are part of the regular laboratory equipment.

Offices. Lighting equipment of the indirect or semi-indirect types is recommended for offices. With a good system of general illumination, there is no need of individual desk lamps, with the attendant glare, specular reflections, and bothersome shadows. A total of about 3 watts per square foot of floor area should be installed in the overhead lighting system.

Reception Room. The hospital reception room is no longer a bleak and uninviting place. While not a "sales room" in the usual sense of the word, the reception room is relied upon to create a favorable impression of the hospital in the minds of entering patients and visitors. In nearly every case the room is comfortably furnished, and much thought is obviously put on the decorations, the interior finish, and the design of its doorways, windows, and other architectural features. Recognition is given to the importance of the lighting in that it is not unusual for the lighting equipment to be specially designed to harmonize with the motif of the room. In this connection there are two points which it seems to me ought to be mentioned. One is that even though the lines and proportions of a fixture are excellent, if the lamp bulbs in it are unshaded it loses a large part of its attractiveness when lighted. The trend toward use of shaded light has resulted in the addition of shades to many formerly unshaded ceiling and wall fixtures, and the selection of the shades has not always been given proper care. The very fact that a fixture is of sufficient importance to be specially designed is a convincing argument that the original design ought to include a shade which will be in perfect harmony with the fixture. The second point is that frequently the wattage employed in a reception room is too low. There is no need of a high level of illumination in a hospital reception room, but neither should it appear dimly lighted. Gloom is closely associated with gloominess, and that is "bad medicine" for the incoming patient.

There is no particular problem in connection with the lighting of the hospital rooms not already covered,—kitchens, dining rooms, laundries, sterilizing rooms, toilets, utility rooms, and similar places. In every case it is simply a matter of supplying reasonably uniform illumination, with an occasional local light at important working places.

Lighting Cost. The cost of a lighting system is an item which always comes in for close scrutiny when specifications are being drawn up. Lighting is like most other things,—however much or little you spend, you just about get value received. Taking a broad view of the matter, everyone agrees that any expenditure which is at all within reason is justified wherever human life is at stake. For an operating room, it certainly does not seem exorbitant to spend about as much for a good lighting system as for sterilizing equipment. And the cost of burning the lights,—including lamp renewals and current,—might be about equal to the cost of the gauze and bandages! Speaking from the standpoint of one whose contact with hospitals is not as impersonal as could be desired,—during the past three years my own "investment" in surgeons and hospitals just misses four figures,—good operating room lighting is worth far more than it costs. Yet hospital building funds have a habit of being more or less inadequate to make the dreams of the medical boards come true, and lighting costs must stand the scrutiny along with everything else. The result has been that in several modern hospitals the operating rooms have been equipped with excellent artificial lighting systems, with only enough window space for ventilation and for light to clean the rooms. In this way the total lighting cost is little if any more than it would be for good natural lighting and indifferent artificial lighting. In some cases the elimination of windows in an operating room offers the further advantage that the student observation space is about doubled. In private rooms and wards the additional cost of good lighting over mediocre lighting is not large in comparison with the charges made by hospitals.

There is one last suggestion to those who have taken the trouble to read through this rather lengthy article. The suggestion also applies, by the way, to those who started the article and then skipped to the last paragraph to see whether it had a happy ending. It is this: install wiring which is adequate not only for the present needs but also for probable future needs. In factories, offices, and stores,—as in hospitals,—the wattages installed today are double or triple or even quadruple those installed just a few years ago. If the outlets are properly installed as regards both spacing and sizes of wire, then a change in reflector type or lamp size may be made with ease. But if there is an insufficient number of outlets or if the wiring is inadequate, then every change in lighting becomes a "major operation," with attendant cost.

ELECTRICAL EQUIPMENT FOR HOSPITALS

BY

WALTER V. BATSON

ELECTRICAL ENGINEER

ELECTRICITY continues to be one of the greatest aids to modern life, not only from the standpoint of utility, but also in our leisure moments, and at no time can electricity be of greater service than during illness. Electricity properly used produces cold and heat, the cheer of a brightly lighted room, or only the dim light which may enable us to perform our duties when the usual brilliance is objectionable. Electricity properly used relieves us of much physical labor in performing our daily tasks; it allows us to communicate with our friends at distant points, so heartening during illness, and in our convalescence it brings us entertainment by the leading artists and musical organizations. Electricity through the marvelous, invisible X-ray assists the physician and surgeon to observe conditions within the body, so that they may apply the remedy.

Sources of Electricity. The proper equipment of a hospital to utilize to advantage all the possibilities of the various applications of electricity is of the utmost importance. The first consideration in a logical development of the subject should be given to the source and form in which electricity is to be supplied. At the present time there are few places where it is not possible to purchase satisfactory service from a reliable public utility corporation. If the hospital is sufficiently large and if the grounds provide space for a separate building, it may be desirable to install an isolated plant for this purpose. The employment of a separate building to house an isolated plant is an important point, as it is practically impossible to operate such a plant without some noise and vibration, both of which are especially objectionable in an institution of this kind. Besides the question of isolation to prevent disturbance, there is the question of the cost of supplying the service. It is not feasible without considerable expense to store electrical energy, so it becomes necessary to operate the generating apparatus continuously, which involves constant attention. The necessary labor for this purpose involves frequently such a large expense that the cost of generating electrical energy may prove to be much greater than the cost of purchasing it. No fixed rule can be given to determine whether or not an isolated plant should be installed, and it therefore becomes advisable that a competent engineer be employed to make the necessary calculations and recommendations to decide this matter.

Electrical power is usually furnished by one of two forms of current,—direct and alternating current, commonly spoken of as "D.C." and "A.C." Nearly all forms of electric lighting units and heating units may be operated by either form of current, but motors, X-ray apparatus and some other forms of equipment are definitely designed to be operated by one or the other of the two kinds of current. It is, therefore, necessary to make a decision as to the kind of current which is to be used. If an isolated plant is to be installed, apparatus to produce either form of current may be readily obtained. Each form has its advantages and its disadvantages. The principal advantage of the direct current is that motors may be designed to be operated by it at very slow speeds, thus allowing the direct connection of the motors to the driven apparatus. Slow-moving machinery is always less noisy than that which is running at a high rate of speed, and it is always desirable to be free from the use of belts in connecting motors and the driven machines. Direct-current apparatus is also quieter than alternating-current apparatus on account of the absence of a humming noise which frequently accompanies the operation of the latter type of machinery.

While alternating-current motors are simpler in construction and therefore cost less for maintenance, the chief reasons for the use of alternating current are the advantages it possesses for the public utility company in its generating and distributing. If the electricity is to be purchased, moreover, it will be found that in most cases only alternating current is available, and this may be used with entire success. Before the selection of apparatus for a hospital, the characteristics of the current to be supplied should be definitely ascertained and specified when securing information or ordering apparatus. Alternating current will be distributed by a public utility company at a voltage much higher than can be used directly at the lamps or other apparatus, and it is necessary that suitable devices for transforming the voltage of this current should be provided.

Distribution System. After the decision has been made as to the source and character of electrical power, the next consideration is the distribution system. If an isolated plant is to be installed, then a main distributing switchboard will be installed in the generator room from which feeders must be carried to the different parts of the hospital. It is advisable to provide separate feeders for light and power. It will also be necessary to run separate feeders for X-ray equipment. One or more feeders for lights should be carried to each building, and it is also advisable to make such interconnections that the failure of a feeder will not deprive any building of its supply. If the power is purchased, a main distributing switchboard should be located at some central point from which feeders should be run to the different parts of the hospital, as previously described. The feeder cables should be drawn into conduits which may be installed in a pipe tunnel between the main switchboard and the centers of distribution in each building or in conduits which are installed entirely outside of the pipe tunnels. The author prefers, where possible, to provide the separate duct lines, as pipe tunnels are usually much congested with the steam, water and plumbing pipes, and the high temperatures which are usually found in pipe tunnels may cause deterioration of the insulation of the feeder cables. The separate duct system will be more expensive, but unless it is necessary to reduce the cost to the lowest limit, the expense is justified.

A subsidiary switchboard must be located in each building, from which mains will run to centers of distribution in different parts of the building, at which centers there should be groups of fuses in cabinets to protect the smaller groups of lamps and motors. If possible, it is advisable to place the fuse cabinets for tap circuits near enough together so that no group of lamps will be more than 75 or 100 feet from a cabinet.

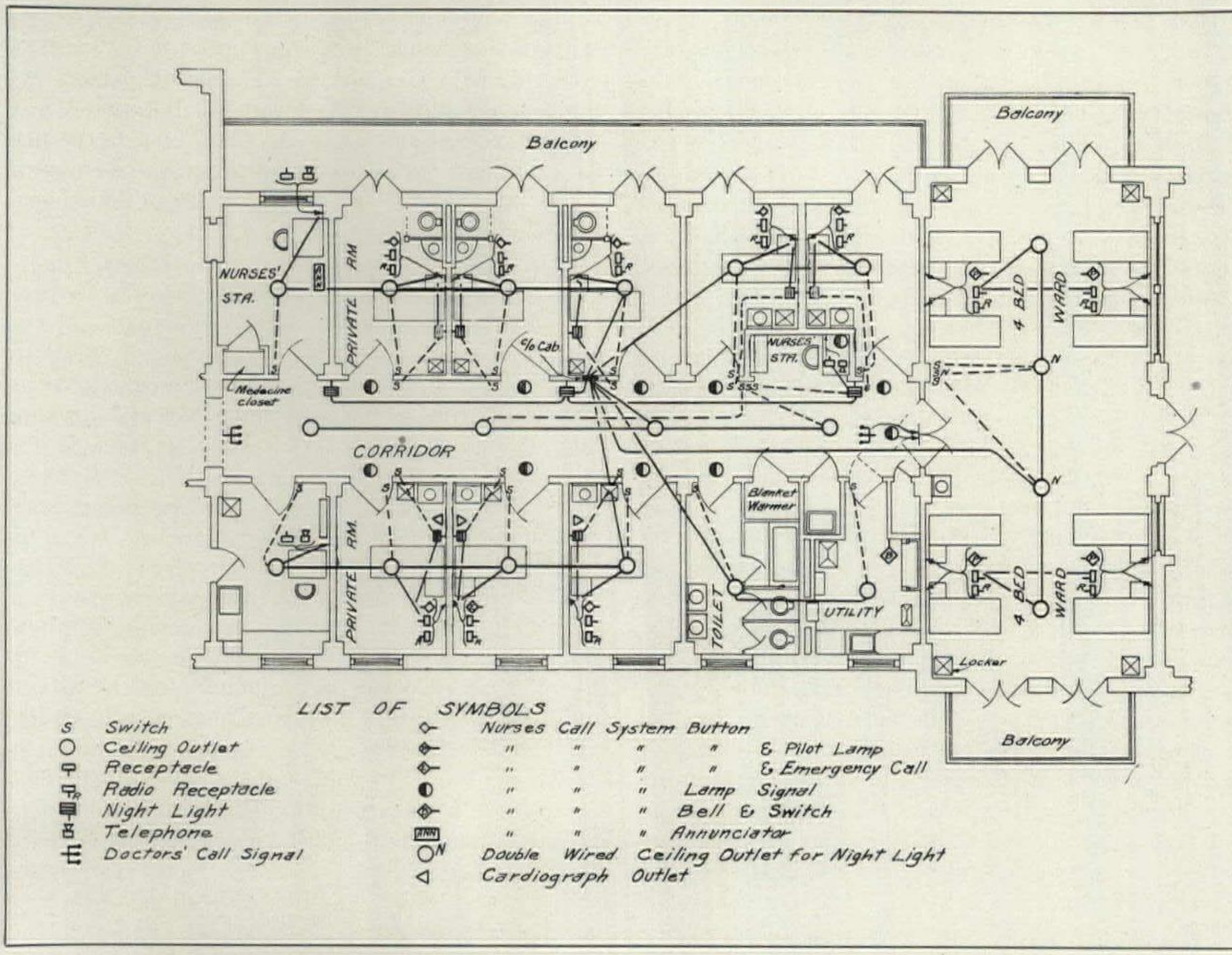
Power Equipment. In practically all hospitals there will be a number of motors for driving fans, elevators, kitchen equipment, etc. Special care should be taken that the noise and vibration of motors shall not be transmitted through the structure to distant parts of the building. Motor foundations should be sufficiently massive to absorb the vibration, and these foundations should be separated from the building structure by material such as sheet cork, compressed fiber blocks, etc., which will prevent the transmission of the vibration from the foundation to the building. All anchor bolts which must be attached to the building structure for holding motors and moving machinery in place, must be separated by suitable deadening materials in the form of fiber bushings and washers so that no part of the machine will be in direct contact with these bolts or supports. Motor starting apparatus, especially for alternating current, is often a source of annoyance, and it should be mounted away from the steel frame of the building or isolated from it by fibrous material.

Each direct-current motor larger than ¼ h.p. should have a safety knife switch and an enclosed type motor starter. The writer recommends the automatic type of starter with push-button station, even if the starter is located beside the motor, in order that the rapidity with which the motor is brought up to speed may be adjusted to the proper rate and not left to the devices of a careless operator. The starter should provide overload and no-voltage protection. The writer does not think it advisable as a general practice to have motors started from a distance when the operator cannot see the motor, but thinks it advisable to have the engineer see the motor every time it is started; otherwise, there may be a tendency to neglect the machines. When necessary to install motors in places to which access is difficult, then a push-button starter for starting the motor may be placed at a convenient point. A motor which is started from a distance should have a safety type switch and a push-button station located at the motor so that a mechanic at work on the machinery may protect himself from injury by disconnecting the motor so that it cannot be started until the work is completed. The push-button station enables the mechanic to test the operation of the motor and observe its action without leaving it. Alternating-current motors up to 5 h.p. capacity should have a starter of the hand-operated type with thermal cut-outs or thermal relays to protect the motor against overloads; motors larger than 5 h.p. should, in general, be provided with a safety type knife line switch and a starting compensator with overload and no-voltage protection. Alternating-current elevator motors should be protected by a reverse energy relay and circuit breaker which will disconnect the motor from the supply should the phase rotation of the supply be changed.

Signals and Communication. A hospital should be equipped with telephone connection between the superintendent, the service rooms, nurses' duty stations, doctors' and internes' rooms, and to the local exchange of the telephone company. It is becoming common to provide for telephone connection from patients' private rooms to the commercial system by the use of portable instruments plugged into outlets in the rooms.

Nurses' Call System. Means should be provided by which a patient may call the nurse. The system usually consists of buttons at all beds, a signal lamp or annunciator at the nurses' duty station, a signal lamp and bell in diet kitchen or utility rooms, and signal lamps in corridors over doors of wards and private rooms, to which may be added a supervisory annunciator at the head nurse's or superintendent's office and a device which will record the elapsed time between the making of the call by the patient and the time when it is responded to by the nurses. There are several systems available, some of which use the 110-volt lighting current to operate the lamps and other apparatus, while other systems use batteries, or use transformers to cut down the lighting voltage, so that the voltage used will be from 6 to 24 volts.

In a hospital with several floors on each of which there are wards containing several beds and a number of private rooms, there would be a nurses' duty station on each floor and one or more rooms such as a diet kitchen, utility room, etc.; the equipment would consist of a button outlet by each bed in wards and private rooms, at each outlet a receptacle and plug with cord and button, the cord being long enough to allow buttons to lie on the bed or table within reach of the patient. At outlets by beds in wards having two or more beds there would also be a pilot lamp behind a colored jewel set in the plate with the button receptacle. At each bed outlet there is also a button or other device by which the nurse answering the call can cancel the signal. In the corridor over or beside each room door there would be a signal lamp. In diet kitchen and in each utility room there would be an outlet with a signal lamp, a single-stroke bell, and a switch which will silence



the bell when this is desirable. At the nurses' duty station there would be at least a signal lamp and frequently an annunciator to indicate the point from which a call is made.

When a patient pushes a button, if he is in a private room, the signal lamps in corridor, in diet kitchen and utility rooms and at the nurses' duty station are lighted simultaneously, and each bell makes a single stroke. The nurse seeing the flash of a signal lamp or hearing the sound of the bell looks down the corridor and sees by the signal lamp by the door, from which room the call came. On arriving at the bed she cancels the call by pushing a button in the outlet plate or releasing the button. The only difference in the operation of the system in case the call was made by a patient in a ward with several beds, is that the signal lamp at the button outlet is also lighted to direct the nurse to the particular bed from which the call was made. The nurse on arrival cancels the call as already described. It is sometimes desirable to equip a few of the button outlets with an emergency call. This consists of a button in the outlet plate to be operated by the nurse, should she find assistance necessary. The operation of this button lights a red lamp in the corridor over the room door, rings bells at the duty station and in the utility rooms, operates a floor indicator, and rings in the superintendent's office.

Call Systems. In order that doctors, the superintendent, head nurses or other officials visiting the wards may be reached when necessary, there should be a calling system which will notify each person to call the telephone switchboard operator who can give the required information. Such a system may consist of a telephone transmitter by means of which loud speaker telephone receivers located in the various parts of the hospital will simultaneously repeat the call made by the operator. This type of call is sometimes considered undesirable because of the sound. Other systems which operate silently consist of lamp signal annunciators placed at duty stations and at various positions in corridors where the person to be called might pass. A bank of buttons at the calling point operates the annunciators, on each of which a number, a name or some symbol is shown. Each person who may be called is assigned some special call, and on seeing his signal is expected to go to the nearest telephone and call the operator to find out what is wanted. In another system groups of lamps are placed at various points as are the annunciators just mentioned. A device at the transmitting point causes lamps to flash a code signal. Each person to be called is assigned to a signal and is expected to communicate directly with the operator by telephone, as already explained. It has been found that the flashing signal will attract the attention more quickly than the indicator or annunciator will do.

The wiring for nurses' and doctors' calls should be done as carefully as the wiring for lights and motors. If current at a potential in excess of 24 volts is used to operate the system, no wires smaller than No. 14 may be used, but if potentials of less than 24 volts are used, No. 16 or No. 18 wires may be used if runs are of moderate length. It is desirable to use no wire smaller than No. 16. All wires should be rubber-covered and be pulled into iron conduits built into the structure. No joints should be allowed in wires, but all wires should be connected through suitable connecter strips placed in accessible cabinets. A cabinet should have a directory indicating the location of the other end of every wire entering, and the system to which it belongs.

Diagnosis and Treatment Equipment. Electricity is applied to the diagnosis and treatment of cases in various ways, such as, through X-ray cabinets containing a large number of incandescent lamps, the patient being seated in the cabinet; cauteries; and the electric cardiograph. Heating pads may also be required. Probably all hospitals except the smallest will have rooms fitted for examination by X-ray. It is advisable to provide alternating current for this purpose. The wires supplying X-ray machines should be not smaller than No. 1 or equivalent for each machine, and if the runs are long, larger wire must be used. Modern X-ray apparatus requires wiring for controllers placed at a distance from the transformers and tubes, and as different makes of X-ray apparatus differ in their needs, the manufacturers should be consulted before attempting to lay out the detailed wiring for this apparatus.

A large hospital will have several sets of equipment requiring considerable wiring. The connections between the transformers and the X-ray tubes carry current at extremely high potentials, in some cases over 200,000 volts. The work will always be done by the manufacturer of the apparatus. As it is frequently necessary to make X-ray examination at the patient's bed, 30-ampere receptacles should be installed in the corridor on each floor at two or more places so that the distance from any receptacle to any room will not exceed 50 feet. Current should be supplied to these outlets at 220 volts. Use wire not smaller than No. 6 to feed the receptacle in any vertical line. These circuits should be connected to the alternating-current supply. Although not a part of the electrical equipment, the architect should not overlook provision for shielding the operator and all others except the patient from the X-rays by heavy lead linings on partitions and floors surrounding X-ray rooms.

The electrical equipment for a hospital should include plate or viewing boxes in the X-ray department and in all operating rooms. These viewing boxes consist of cabinets containing incandescent lamps with reflecting surfaces which will so direct the light from the lamps that diffusing glass fronts of the boxes will be brightly and uniformly illuminated. Suitable provision is made to hold the X-ray films in front of the illuminated glass so that the details may be readily seen. The wiring contacts should provide receptacles to which the boxes may be connected. For the light cabinets, circuits of wires not smaller than No. 8, and 30-ampere receptacles should be provided.

The electric cardiograph is an instrument by means of which the extremely small electric currents generated by the movements of the heart may be made apparent to the physician. The indicating apparatus, which is a very sensitive galvanometer, is located at a convenient point and cables are run from this point to operating and examining rooms. The manufacturer of this apparatus will furnish receptacles to be installed at the examining points, connection blocks for connecting branches from the main cables to it, and the special cables which contain the wires for conveying the small current from the patient to the indicating instrument, and also wires for telephonic communication between the doctor at the patient's side and the operator of the indicating instrument. The cables must be pulled into conduits like other wires, but they should never run paralled to alternating current circuits which are nearer than 3 feet, and they should not cross such circuits at less than 8 inches away from them. They should be kept as far as possible away from wires carrying large currents, and they should never be run in elevator wells.

Ground Wires. It is considered necessary by some to provide in each operating room a binding post connection to a wire which is permanently grounded, from which a wire may be run to the frame of the operating table. Convenience outlets should be liberally provided in wards, private rooms, examination rooms, etc., each outlet being equipped with a duplex receptacle. A diet kitchen should have one or more outlets equipped with a receptacle switch and pilot lamp, each outlet being supplied by a separate circuit. These outlets may be found very convenient for the use of stoves, water heaters, etc.

Radio. The radio which brings pleasure to so many is an important part of hospital equipment. It is customary to provide for two receiving sets and amplifiers, and to run two sets of wires to outlets at each bed, to the rooms of the internes and nurses, and to the recreation room of the servants. At each outlet there should be installed a plate with two receptacles for plugs for a head receiver or loud speaker. The two sets of wires may be run in one conduit, but it is recommended that one pair be enclosed in a lead sheath. A twisted-pair telephone wire is suitable for a number of stations which are connected in parallel. Loud speakers can be used only in the recreation rooms of the staff and servants, and head receivers for patients, in order to avoid possible annoyance to some.

THE HOSPITAL HEATING AND REFRIGERATING PLANTS

BY

ALFRED KELLOGG

CONSULTING ENGINEER

BEFORE the architect can decide upon the type and design of the several engineering utilities entering into the hospital he is to plan, he must consider the size and purposes of the project, its location and proximity to labor markets, and whether the operating personnel is to be drawn from an urban or a rural community. Consideration of these and possibly other factors should enter into the calculations of not only the building arrangement, but also of the heating and ventilating, refrigerating, plumbing, laundry, electrical and equipment installations, and along with these (and of prime importance) the probable operating personnel.

Quite naturally, the small hospital of 50 beds or less will require different treatment from one to house 200 or 300 patients. In the care of the plant after it is turned over to the owner, the small hospital will probably employ but one engineer, who must be a jack of all trades and reasonably expert at each. He may be expected to operate the laundry machinery and the refrigerating plant, if any there be; to attend to the upkeep of the piping and radiators, sterilizers, electric light wiring, the nurses' call system, etc. The larger hospitals will of necessity employ a greater number of and possibly better trained aids, in which case the qualifications of those employed in the mechanical operation of the plant are likely to be subject to statute or local ordinance, and not at all unlikely also, to the demands of the labor unions! It therefore behooves the designer to make a careful survey of the field before committing himself to any type of mechanical design. In no class of building is there greater need of the specialist than in the designing of the hospital and its equipment. Bear in mind that after the building is completed it will be turned over to a corps of men and women expert in their several professions, who know what is required of the plant provided for their use and who will also know whether or not it functions properly. In this brief article the endeavor will be to assist the architect in the selection of engineering materials and in the general design of the plant, subdivided into: 1. Plant Materials; 2. Heating and Ventilation; 3. Refrigeration; 4. Fire Protection.

Materials

Pipe. The quality of the materials will be governed in some measure by the funds available. It is considered good engineering, and wise economy also, to install in steam and return lines the best noncorrosive pipe for the purpose. A small saving may be effected if the steam supply lines are not of such high grade, but all return and drip piping should be of the best, as should all concealed piping. The extra-strong pipe in the usual heating system is not specified for the increased strength that may be secured, but that it may withstand corrosion for a longer time, owing to the greater wall thickness.

Valves everywhere in the plant should be of the highest grade. In the boiler room and in the main piping elsewhere, the principal valves,—3-inch and larger,—should be of the rising stem type, because at a glance the engineer can see whether they are open or closed. Globe pattern valves should be installed where there is the necessity of controlling the volume of steam or water, and gate valves elsewhere. Fabrication of pipe lines by the welding process is fast becoming the custom. This may be done usually at a lower cost than by the older method of connecting pipes through flanges, unions and fittings, in sizes of 2 inches or 2½ inches and larger. The elimination of joints in pipe lines makes for lower cost of upkeep, greater rigidity, less weight, and freedom from leakage. New connections to existing pipe lines can be made in less than half the time and at much less than half the cost where a system of welded piping is installed. It is poor economy to install smoke connections of light weight. If low-pressure boilers are installed for heating purposes only, as would probably be the case in a small hospital, the boilers will usually lie idle for three or four months each year, and corrosion of smoke connections will be rapid; therefore, it is recommended that the connections from boilers to chimney be of not less than No. 12 steel, and in the larger plants somewhat thicker.

Radiators are generally of cast iron of open pattern. The more recent fin types of concealed radiators are efficient but may not lend themselves readily to ease in cleaning, and in hospitals, above all other considerations, cleanliness should be paramount in importance. For many years cast iron radiation, known as "hospital type" has been generally employed, and this pattern is today believed by many engineers to be unsurpassed for hospital purposes owing to the ease of cleaning. A newer pattern, the "tube type" radiator, is offered as a substitute, and some makes appear to be suitable for hospital use. In the better class hospitals, legless radiators are almost invariably specified, but the installation cost is greater. Leg pattern radiators make it more difficut to clean under and at the backs.

Insulation of all hot surfaces is essential on the score of economy, for one thing, and to avoid the overheating of rooms through which steam pipes pass. Hospital superintendents invariably complain of the overheating of the wards. To partially remedy this situation it is well to insulate the mains and risers in all bedrooms. Concealed risers should always be insulated. First class work calls for 85 per cent magnesia insulation, in standard thickness up to 50-pound steam pressure, and 1½-inch thick-

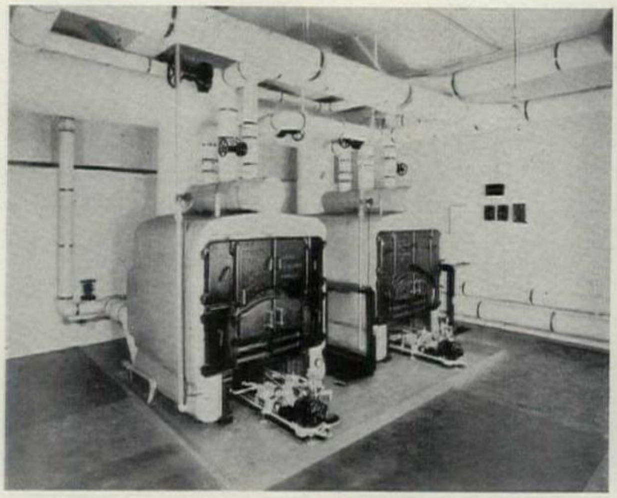


Fig. 1. Boiler Installation with Oil Burners

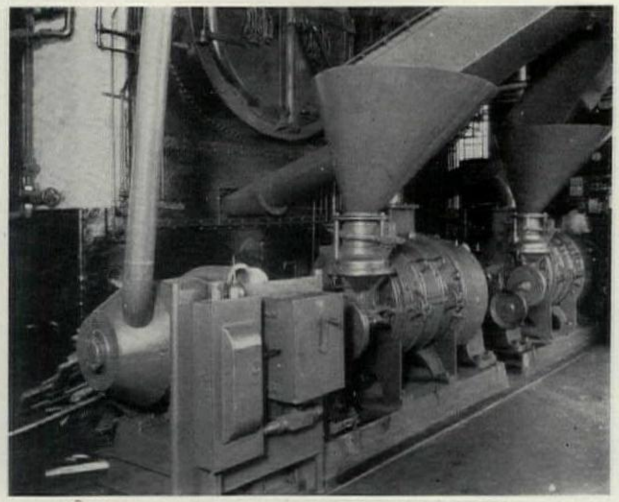


Fig. 2. Soft Coal Pulverizer and Feeder

ness for greater pressures. The strictly low-pressure heating pipes may be insulated with the better class asbestos air cell covering at a small saving in cost, but it should be of not less than the 4-ply thickness with 5-ounce canvas jacket,—*not* 3-ounce which is "standard." The latter covering would ordinarily be used in small hospitals or where first cost must be considered. Heating returns are frequently left uncovered through the reasonably warm basements, especially with a vacuum system of heating.

Flues and ducts may be built of masonry or sheet metal,—usually the latter. They should be rigid, with all exposed edges wired and openings into rooms left open. Hoods are regularly placed over kitchen ranges, kettles and steamers, also over dish washers and sterilizers, and frequently in laundries over washers, drying tumblers and ironers. Such hoods are usually built of sheet metal of substantial design, and the heat and steam are withdrawn by exhaust fans. Registers and grilles collect dirt and are rarely removed for cleaning. If control of the flow of air is necessary, one may install dampers of the friction pattern located in accessible places, wherever this is practicable. The ventilators and exhaust flues from the chemical laboratory fume hood or cabinet, should preferably be made of some non-corrosive sheet metal or clay tile, and the exhaust fan of non-corrosive metal. Ventilators should be built of copper.

Heating and Ventilation

The type of heating and ventilation to be installed will depend upon the class of hospital under consideration. It is not so many years ago that it was considered necessary to provide *every* hospital with a complete system of fans and ducts for supplying fresh air to each room, and for the removal of air therefrom. Just now, however, the pendulum has swung pretty well to the other extreme, and it is a question if it has not swung too far. Today, only hospitals for contagious diseases, hospitals for the insane and feeble minded, and special rooms in every class of hospital, are provided with indirect systems of heating and ventilation; direct is used elsewhere.

In any hospital there are certain rooms that from the natures of their purposes should be supplied with exhaust fans or, at any rate, with ducts and flues for ventilation. These in general, are the laundry, all kitchens and serving rooms, sink or utility rooms, the X-ray suite, dark (X-ray photographic) and transformer rooms, clinic, autopsy, sterilizer, plaster, anæsthetizing and operating rooms; all laboratories, delivery rooms, and the nursery or creche; all general and private toilets and bathrooms located away from outside building walls, and preferably wherever located. The removal of the air from these rooms may be in many cases by gravity, provided however, that the vent flues lead direct to the roof or at most with but a short offset. Certain rooms, on the other hand, will not be considered properly ventilated unless the air is removed by fans. These are the operating and X-ray rooms or suites, chemical laboratory, the autopsy room, maternity suite, main kitchen, and laundry. In some instances, however, hospital authorities require all rooms to be ventilated by mechanical means, but this is quite unusual at the present time.

Private rooms and two-bed wards are seldom provided with fresh air other than through windows, and no ventilating flues are installed for these rooms, but in wards with four or more beds it is usually found necessary, for the sake of harmony among the patients, to provide means for control of each unit of the heating, air supply and ventilation. As to temperatures, these also vary, but in general, a temperature of 70° is considered proper, *except* in operating rooms, labor and delivery rooms, and the nearby nursery; also in the dressing rooms connected with the X-ray department, hydrotherapy and patients' shower rooms. These should be capable of being heated to 80 or 85°,—both summer and winter,—at the lowest outside temperature for the locality. In such rooms, and in the administration offices, the control of the temperatures should be automatic where the appropriation for building will per-

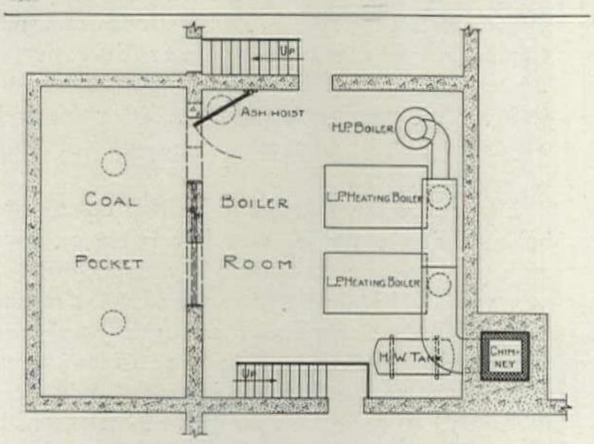


Fig. 3. Boiler Room Plan for Small Hospital

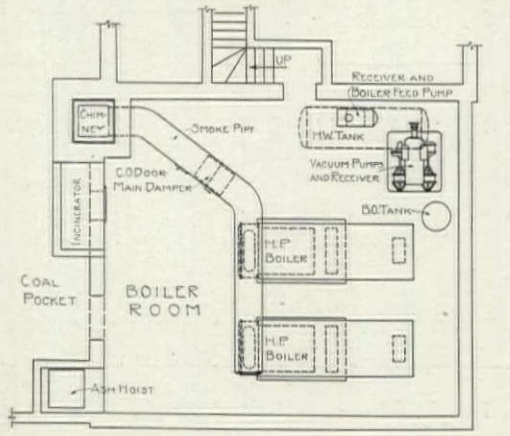


Fig. 4. Boiler Room Plan for Large Hospital

mit. In all patients' rooms hand control of radiator valves is considered the most practical.

Air conditioning of the premature wards in children's hospitals is frequently required. The chief value of air conditioning is the resulting stabilization of the body temperature, and this is accomplished by maintaining uniform temperature and humidity adjusted to the physiological needs of the infants. The conditions best conducive to the requirements are dry bulb temperatures varying from 75 to 88° and 65 per cent relative humidity. From 30 to 50 air changes per hour are needed, and automatic control of temperature and humidity is imperative.

Boiler Room Installation. If the hospital is not larger than of 50- or 60-bed capacity, the boilers will probably be of the low-pressure cast iron type for heating the building and the domestic hot water supply. For supplying steam for the sterilizers and kitchen, a high-pressure steel boiler will usually be employed, or this equipment may be provided for by the use of city gas or electricity. The high-pressure boiler installation will be found to be the most economical to operate, and it may also be used in the summer to heat the domestic water supply and the operating and maternity suites, thus obviating the installation of a coal or gas heater for the purpose. In a larger hospital or one operating a laundry, it will be better to install high-pressure boilers only, and these in duplicate. Such boilers will provide steam at from 80 to 100 pounds pressure for the laundry, and through suitable pressure-reducing valves at 60 pounds for the sterilizers and water stills, and at 30 pounds for the kitchen and again at 5 pounds or less for heating. The domestic hot water will be heated from either the 5-pound or the 30-pound line as most convenient. Exhaust steam from engines or pumps may be available and for economic reasons will be used.

The system of heating the building will usually be either by hot water, low-pressure steam, one- or two-pipe with gravity return *direct* to the boilers (termed a "closed system"), or low-pressure steam with gravity return pumps which in turn deliver the water back into the boilers. In place of pumps the condensation may in the smaller buildings be returned by boiler return traps direct to the boilers, while in hospitals of considerable size a vacuum return system will probably prove the best from an economical and operating point of view.

Hot water heating of small and medium-sized hospitals is seldom employed. Where installed, it will usually be a "forced" hot water system. The so-called "closed" system of low-pressure steam heating will probably not be installed in other than the very smallest cottage hospital. The types of heating, variously known as "vapor" or "modulation" systems, where properly installed, give generally satisfactory service. If ample fall to the boiler room for the condensation is possible and if the runs of piping are not too long, there will be no necessity of installing a vacuum pump, as what is termed a "condensation pump" will serve quite as well.

Architects and contractors alike should have it fully impressed upon them that the successful operation of any vapor, modulation or vacuum heating system, depends *wholly* upon the uniformity of the pressure of the steam supply to the radiators. With properly sized pipe connections and radiators fitted with fractional valves that may be partly closed at will, room temperatures may be very accurately controlled. This depends upon just two things,—sensitiveness of the damper regulator or pressure-reducing valve and the occasional adjustment of the radiator supply valves. Quite recently a system of high (and variable) vacuum heating has been made available to the designer, whereby room temperatures may be quite accurately maintained to meet variations in outside temperatures. This is accomplished by varying the vacuum carried on the return lines and the pressure in the supply lines. Properly installed and competently operated, this system should effect marked savings in fuel, and secure a high degree of temperature control. In the very low-pressure heating installations it is well to carry 10 to 15 pounds pressure on the boilers *all* the time and through a proper valve reduce the pressure for heat-

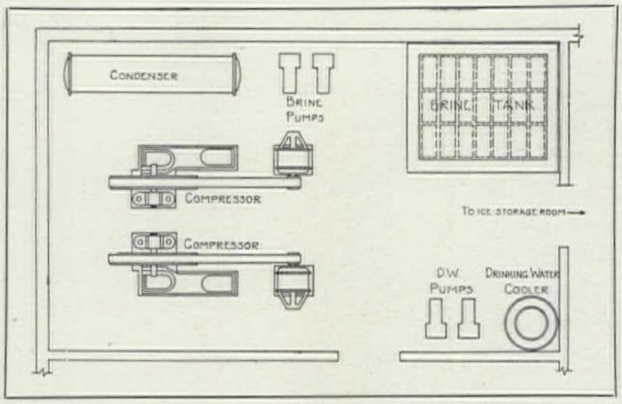


Fig. 5. Plan of a Central Refrigerating Plant

ing to a few ounces. Thus a wide variation in boiler pressure due to intermittent firing will not affect the heating pressure upon which successful temperature control depends.

A vacuum system of heating will probably be considered in larger installations, where condensation must be lifted from lower levels, or where extra long lines of return piping must be drained back to the boilers. The accuracy of temperature control of the radiators depends upon a uniform and unvarying steam pressure.

High-pressure steam, varying from 30 pounds in the kitchen to 80 pounds in the laundry, is needed in all but the smallest hospitals. In the laundry this pressure is required during the daytime only, and it is quite the custom to carry but from 50 to 60 pounds pressure on the boilers at other times for the sterilizers. Steam and return piping connections are made to the laundry, kitchen and sterilizers of sizes to meet the needs of the equipment furnished. It is a trade custom that the heating contractor shall furnish and install all the traps, valves, etc., needed to connect the laundry and kitchen equipment. The sterilizers and distilled water equipment, however, should be supplied by their makers with *all* the traps, valves and immediate piping, all nickel plated and brought to a convenient point for connections by the steam heating contractor.

The boiler room, in the small hospital, will probably be located in the basement. For obvious reasons this room should be built as nearly fireproof as it is possible to build it. If located in the hospital it should be as convenient to the service entrance to the building as possible. It should also have an entrance from outside the building, and *all* entrances should have self-closing firedoors. The boiler room in any case would be better housed in a separate building, and in the larger hospitals this becomes more important. By placing the boiler, refrigerating and laundry plants in a separate building, the fire risk is reduced, and the dirt and attendant noise greatly lessened,—and these are important considerations. If possible, the coal storage space should be placed outside the building or boiler house and be of such design that coal trucks may drive over it and discharge the coal therein with little or no handling. Quiet about a hospital is indispensable, and patients should not be disturbed oftener than necessary. Fig. 3 is a plan of a small boiler installation suitable for the smaller hospital of 50 or fewer beds. Fig. 4 is a suitable plan for hospitals of from 50 to 100 beds.

The low-pressure cast iron heating boilers or steel boilers suitable for high or low pressure, together with the boiler piping, hot water tank, heaters, and pumps, should be installed in the simplest manner to accomplish the desired results. In the small hospital it is good judgment, on the score of economy and convenience of operation, to incur extra expense (if necessary) to secure simplicity in installation, keeping in mind the probable lack of skill of the attendants the hospital is likely to employ, and the multiplicity of duties that fall to the lot of the engineer.

Steel boilers will usually be brick-set, and it is poor economy to permit use of an indifferent quality of brickwork for the small first cost savings that may be effected. Poor settings mean leakage of cold air into the combustion space, a lowering of the temperature of the gases, low boiler efficiency, and waste of fuel. Coal, oil or possibly natural or artificial gas may be the proper fuel to burn, depending upon the cost of each in the particular locality. Gas and oil fuels cause less dirt about the building; fires may be started more quickly, and there are lower standby losses than when burning solid fuels. Where soft coal is burned, a larger combustion space in the boilers is required, which means greater height in the boiler room due to setting the boilers higher. Horizontal return tubular boilers should be set with the distance from grates or stoker to shell of about 3 feet, 6 inches in the 48-inch and 54-inch sizes, increasing 4 inches for each increase of 6 inches in boiler diameter. Fig. 1 is a good illustration of a low-pressure cast iron boiler installation burning oil fuel. Fig. 2 shows a unit soft coal pulverizer and feeder for the larger installations. Such an installation is suitable only for a hospital with a detached boiler house. Scales for weighing coal should be provided, and many patterns are obtainable.

An incinerator will probably be built in the boiler room except in the smaller hospitals. These are usually brick-set and fired with coal, gas or oil, although there is usually enough combustible refuse available to burn the garbage. In the smaller hospitals the refuse is either burned in small gas- or coal-fired incinerators, locally placed, or is taken in suitable containers and burned under the boilers. In such plants the kitchen wastes are collected daily and carted away to be disposed of.

Refrigeration

Refrigeration in hospitals is fully as essential as heating, and in all but the very smallest hospitals it will be obtained by artificial means. Natural ice may be used in the very small hospitals in country districts, where a good quality of ice is abundant,

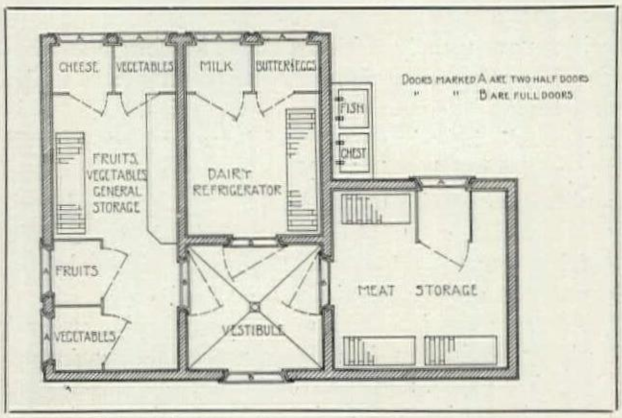


Fig. 6. Built-in Storage Refrigerator plant

but even in such locations, artificial ice is coming more and more to be used. Refrigeration is of course needed for the preservation of food stuffs at temperatures of from 32 to 36° for meats, fish, etc., and of from 34 to 38° for dairy products and vegetables. Fruits are best kept at a slightly higher temperature, or at about 40°. These temperatures apply to commodities for current use. Where they are to be stored over long periods, slightly lower temperatures would be required.

Where garbage is kept temporarily awaiting removal by teams, the temporary storage room should be refrigerated to about 32°. Refrigeration is also extensively employed in the laboratories where sharp freezing for microscopic work, at from 5 to 10°, is required; also in hardening ice cream at from zero to 5° after its manufacture; in the cooling of water for drinking purposes at from 40 to 45°, and for maintaining a temperature of 64 or 65° in the developing and fixing solutions in dark rooms where X-ray negatives are developed. The mortuary cabinets require refrigeration to about 32°. Air conditioning also requires the extensive use of refrigeration for operating rooms and premature wards of children's hospitals, but the details of their installation are too extensive to be described in a short paper. Ice is used in hospitals principally in making ice packs. For this purpose it is usually crushed in the ice-making room and kept in compartments of the diet kitchen refrigerators on the several floors, or in special storage containers in the nurses' work rooms.

Artificial refrigeration is produced in one of two ways; (a) by a centrally-located machine employing either ammonia or carbon dioxide as the refrigerant in connection with a brine cooling tank located in close proximity to the machine room, and a system of pumps and piping for distributing the brine to the refrigerators; or (b) my means of small self-contained automatic units. These machines are relatively small in refrigerating capacity, and usually employ as a refrigerant ethyl chloride, methyl chloride, sulphur dioxide, or other refrigerants. They are usually suitable for small refrigerators only, but where two or three small diet kitchen boxes come over one another on several floors, one machine may be installed to advantage for their operation. These machines may be successfully employed in making ice cream and for ice cream serving (not hardening) boxes and for cooling drinking water where a central refrigerating plant is not to be installed. They undoubtedly fill a very decided need in the small institution and in detached locations not easily accessible for brine circulation. Carbon dioxide machines are coming more and more to be used in hospitals, especially if the machine is to be located in the hospital proper, or in a place where escaping ammonia fumes would prove dangerous. If the refrigerating plant can be placed separate with free access to out of doors, the ammonia type machine is entirely satisfactory. In the south, unless condensing water of below 85° temperature is available, carbon dioxide machines cannot be successfully employed. Automatic temperature control is highly essential in all refrigerating plants, more especially for laboratory service. Fig. 5 is a plan of a central refrigerating machine room, with brine tank. This design will be suitable generally for refrigerating plants of from 5 to 20 tons capacity.

Refrigerators for hospital use are of either the portable or the built-in types or a combination of both. The small hospital will probably install portable boxes only, and these may be had in a variety of sizes to meet the demand for storage of food stuffs sufficient for one or two days' use. The "built-in" refrigerator with full-sized doors may be of any required size. In the larger institutions there may be several such boxes opening onto an insulated corridor or vestibule. The vestibule is not refrigerated, but the temperature remains sufficiently low to prevent raising the temperature of the boxes when the doors opening onto the vestibule are opened. The vestibule is also frequently supplied with sink and cutting table and used for meat cutting. Such refrigerators are mainly used for storage and frequently have a capacity for a week's supply.

The main vegetable storage room is usually located in the basement. In the smaller hospitals such rooms are not as a rule supplied with refrigeration. In the larger hospitals, however, such rooms are usually kept at below 60°. Service boxes, usually of the portable type, are installed in the main and diet kitchens, the pantry, bakery, dairy and the laboratories. Frequently, however, the storage refrigerators, if located conveniently to the main kitchen, may be divided in such a way as to povide one or more "reach-in" compartments accessible from the outside. Where this is done, a day's supply of food is usually placed on the shelves of these compartments from inside of the main boxes. This arrangement obviates the installation of a number of portable service boxes, and it also obviates carrying food from the storage refrigerators to separately located service boxes through a hot kitchen.

The walls of refrigerators are insulated according to the service required. The built-in boxes usually have floors 6 inches thick of natural cork laid in hot pitch on a concrete floor or base. The walls and ceilings are usually 4 inches thick, but in some locations or where temperatures below 25° are to be maintained, they may be 6 inches thick. Fig. 6 is a plan of a built-in storage refrigerator large enough for a 200-bed hospital. Note the two-door (upper and lower) service boxes for dairy products, cheese, fruits, meats, etc., and the ice-cooled fish chest. This refrigerator was built in the main kitchen of a prominent eastern hospital of 300-bed size.

Portable refrigerators are insulated with natural cork or equivalent insulating material, waterproof sheathing paper, and wood or metal. The thickness of the insulation should be at least 2 inches in the smallest boxes and 3 or 4 inches in the larger sizes. The inside lining may be tile, white glass, baked enameled iron, one-piece porcelain or monel metal. The outside surfaces may be wood or baked enameled iron with refrigerator type doors and heavy bronze hardware. Refrigerator shelving may be made of galvanized steel sheets, heavy galvanized wire netting, monel metal, or glass. Fish chests use crushed ice in which the fish are packed. The box and cover linings are usually of galvanized steel or monel metal.

The cooling of refrigerators for hospital use is often done by the circulation of calcium chloride brine from the refrigerated brine tank located near the compressor through steel pipes to the various locations. A direct expansion system is not suitable for hospital use. The brine is circulated by means of pumps, and the pipe circuits are continuous from the brine tank to the refrigerators and back again to the tank. The brine circulation pipes should be cork insulated, of "brine thickness" or heavier if the pipes pass through especially hot rooms or have to carry brine at unusually low temperatures. The cooling pipes within the refrigerators are called "bunker coils." These may be supported from the ceiling if the height is at least 10 feet, 6 inches; otherwise from the side walls. The overhead arrangement is considered the best, as it does not take up desirable space for shelving and food storage along the walls. In either case, pans must be placed under the coils to catch the water while the coils are being defrosted. These pans have to be drained to the general drain from the refrigerator. Portable boxes should always be set on a concrete or tile base about 3 inches above the finished floor, with a sanitary cove. The required amount of ice for the hospital will be made in the brine tank near the compressor. Ice cans are made in sizes to hold from 25 up to 300 pounds. The 50-pound size is convenient for hospitals. Near where the ice is made, a motor-driven crusher should be installed, and ice in that form stored nearby; from there it is carried to the work rooms.

Fire Prevention

Prevention of fire in hospitals is essentially a matter of building design, construction and equipment. The maximum degree of safety is attained by the use of fire-resisting materials and the installation of an automatic sprinkler system. Actual data show that a hospital burns every day somewhere in the United States; that three institutions or asylums for the unfortunate are burned or badly damaged by fire every week. In addition to complete destruction, out of every 16 institutions in the country, one suffers a serious fire every year, and there are upward of 10,000 such institutions in the country, making from 600 to 700 hospitals that suffer in some measure from fire each year. Aside from monetary losses running into the millions, consider if one will, the sick, feeble and helpless patients, and give careful consideration to the type of building construction and equipment for which the architect assumes a considerable measure of responsibility. Statutes and building laws establish building requirements in many cases, especially in the larger communities, but nevertheless the same care should be exercised even wherever greater freedom of design is permitted. Thoughtful hospital authorities will reject wood construction in other than one-story buildings. In multistoried buildings fireproof construction becomes an absolute necessity. Boiler rooms should be isolated by fire walls, ceilings and doors from other parts of the building, and similar construction should extend to rooms in which chemicals, paints, oils, and X-ray films are to be stored. Such rooms should be amply ventilated and shut off from other rooms by fire doors.

The automatic sprinkler is probably the best safety device for putting out fires, and its use is constantly urged by fire authorities. It is also required by statute in many cities. Standpipes and fire hose are of questionable value in some cases, inasmuch as the heavy equipment cannot be readily handled by nurses. Fire extinguishers placed at stragetic points are valuable in putting out fires before they attain dangerous proportions, and to hold fires in check until the arrival of the regular fire-fighting force. If for any reason second class construction be employed, then a sprinkler system assumes greater importance in affording adequate protection from fire.

QUIET FOR HOSPITALS

BY

CLIFFORD M. SWAN

DESPITE all that has been said and written concerning the subject of hospital quieting during the past few years, there still seems to be a large lack of appreciation of the importance of this subject. This may be due in part to the reluctance or inability of trustees and building committees to increase expense, but since the most elementary and inexpensive precautions are so often overlooked, it would appear that the explanation is to be sought elsewhere. Certainly, if doctors and superintendents insist on having anything they consider vital to a hospital's needs, they are likely to get it; since the element of sound prevention is so frequently neglected, it seems probable that the hospital staff becomes so accustomed to its surroundings as not to realize and stress the problem. To the average layman, however, even when strong and healthy, the sounds, sights and odors of a hospital are disquieting if not actually terrifying. How much more is this the case when he is a patient,—weak, sick and worried! If a doctor would appreciate only a small fraction of the suffering caused to a fevered or apprehensive mind by the sounds which carry through a hospital, he would be very prompt in demanding action to eliminate the noise problem. What is more essential to recovery of health than relaxation of nerves and repose of mind? Quiet surroundings and freedom from irritating or exciting noises are of primary importance. To produce such conditions should be a matter of prime consideration for all hospital architects, consultants and superintendents.

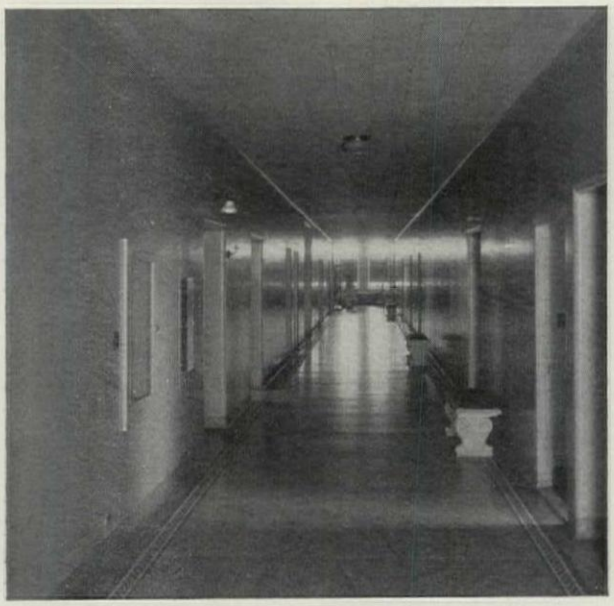
Disturbing sounds originate in a number of sources. They may come from outside the building, as from passing street traffic, factory whistles or shouts of children. Again, and with more annoyance, they may come from within, as in the rattle of dishes, banging of doors, groans of patients, cries of infants, or conversation in corridors. To be sure, quiet zones are established in many cities in streets surrounding hospitals, but such regulations are largely ineffective, and noises may and do come also from areas beyond the zones. Sometimes the hospital is not careful about traffic within its own grounds. A friend once told the writer of lying awake night after night in a hospital listening to automobiles and ambulances driving up to the door several stories below his window, imagining in his fever-stricken brain that they were carrying away the bodies of patients who had died during the day! Did that aid in his recovery? Even today that man has an abiding horror of hospitals.

As far as possible, the hospital should be designed and administered so as to keep seriously ill persons at the greatest distance from external sounds. Equally important is it to keep the windows closed, using double panes of quarter-inch plate glass if necessary, and supplying fresh air by forced ventilation. Sounds generated within the building should be less difficult to control, provided the wish to do so exists. It is, of course, axiomatic that all preventable noises should be eliminated at their sources. There must necessarily remain, however, a large and varied assortment, of sounds which are inherent in the operation of such an institution. These must be prevented from reaching the patients.

There are four factors to be considered in such a process, and they should be studied carefully while the building is still in the design stages, and adequate provision for them should be made in the specifications. These four items are: prevention of magnification due to the reverberation in the room where the sound is produced; the stopping of transmission of such sound through the floors, walls and structural fabric of the building; elimination of its travel through open corridors; and, finally, the counteracting of its possible amplification by the reverberation in those rooms or wards which it ultimately reaches. The second of these is a problem in wave conduction and transmission through the materials in the structure of the building. The other three come under cases of sound reflection, and consequently must be studied with relation to the materials and finish of exposed surfaces which the sound strikes.

Let us first consider the transmitted sound. This may be carried along structural members such as columns and girders, or along conduits, steam, water and soil pipes, or through ventilating ducts; or it may pass upward or downward through ceilings or floors, or laterally through wall partitions. If the source is the hum of a motor or fan, the pounding of a pump or compressor, the click of circuit-breakers of elevators, or similar noises, the first thing is to insulate these machines as fully as possible from the supporting structure. This is usually accomplished by bolting the machine to a heavy concrete bed set on an isolating layer of cork sheets. There are also patented systems which have been used with good effect. The insulation of these foundations is of the utmost importance. Perhaps there is nothing so annoying in the small hours of the morning, when all else is still, as to hear the distant monotonous and relentless throb of a pump or similar machine.

The next step is to prevent the sound waves, traveling through the air and impinging on the walls, floor or ceiling, from transmitting their energy through these surfaces or along pipes which may pass through the rooms. This means the construction of soundproof floors and walls, which may be done more or less successfully by various meth-



Sound Absorbing Ceiling Quiets the Corridor

ods, too complicated to describe here. It is well to seek expert advice with relation to the best method to meet local conditions. Pipes should be insulated by wrapping them in soundproof covering wherever there is danger of communication through them. A great deal of sound will pass through a narrow opening, so it is essential that cracks around doors shall be sealed by rabbeted and felted jambs or by weather strips. Doors should be flush and solid, and be kept closed.

Having taken every precaution to prevent the conduction and transmission of sound through the structural elements of the building, the next thing is to take care of reflected sound. In any enclosed space bounded by hard reflecting surfaces, such as concrete, hard plaster, terrazzo, glazed tile and the like, a sound once created will be reflected back and forth several hundred times before its energy is so far absorbed as to make it inaudible. This process takes an appreciable interval of time. If other sounds are generated during that time, they add their energy to the first and to one another, producing an accumulation of energy which causes an increase in the loudness of the sound. Not only this, but if any of this sound penetrates into another room which is itself reverberant, the process is there repeated. This means that the reverberation must be diminished not only in rooms where noise originates, but also in all other rooms where quiet is desired, even if no noise is produced directly in them. Furthermore, the same process of reflecting causes sound to travel readily along corridors and through elevator and dumbwaiter shafts to all parts of the building. Such channels of communication act much like large speaking tubes.

The remedy in all of these cases is to be found in the reduction of the reflecting power of a portion of the surfaces, except perhaps in shafts, where it is better to prevent the egress of sound by means of soundproof doors. Whatever is used to absorb the sound, and thus reduce the amount of reflection, it must be applied as a surface layer exposed to the sound waves, and must be of sufficient thickness to be effective. Such materials run from one half inch to one inch or even more in thickness. Furthermore, the treatment must look well, and it must have a sufficiently high reflection for light so that undue wattage need not be expended in illuminating the room. Some materials have a natural finish which answers the purpose; others require a covering or coating. If this is necessary, even if only a coat of paint is used, there is danger of lessening the efficiency, as the sound waves may not easily penetrate the covering.

All of the surfaces in a reverberant room or corridor do not require absorptive treatment. The noisy condition can be reduced to a practical degree of comfort usually by a marked reduction in the reflection from the ceiling alone, sometimes accompanied, in extreme cases, by a partial treatment of the upper walls. On walls and furred ceilings the absorbing layer should be applied over a brown coat of plaster to insure a level surface. This also will prevent air suction through the treatment and lessen the rapidity of soiling. On ceilings which are not furred, the plaster may be placed directly against the concrete slab between beams. There are many materials on the market which have a high degree of absorption for sound, and which are practical as an interior finish. They vary considerably in efficiency, however, as well as in appearance, sanitary quality and economy of maintenance, so that some are not suitable for hospital use. They fall into three general groups,—fiber boards, felts, and masonry materials such as tile and plaster. In every case the absorption is due to a maze of small intercommunicating pores, nearly uniform in size, permeating the whole structure of the material. If these pores become sealed at the surface, the absorption is very much diminished, especially for sound waves of high pitch, which are present in large number in the voice as well as in most sharp noises. It is essential, therefore, for effective use, that the sound shall have free and unimpeded access to the voids in the material. Here is a difficulty. If the surface must present open pores, it will of necessity collect dirt and germs. How serious the bacterial problem may be is a moot question; it is certain, however, that accumulation of dirt is a real problem, affecting both appearance and light reflection. A material should therefore be selected which can be readily cleaned or redecorated without loss of absorbing power. At the present time, there is no material which ideally meets these conditions, although some are much better than others. Among the fiber boards we find such substances as flax, sugar cane, or mineral-coated excelsior, compressed into rigid sheets or tile, and sometimes perforated to increase the absorption. They usually cannot be washed; cleaning or redecoration must take the

Sound Absorbing Materials Make Kitchens Less Noisy

form of spraying or stippling with a thin paint, except in the case of the perforated material, which may be painted as desired. Felts are made of jute, wool, cattle hair, goats' hair, wood fiber, etc. They were the first materials in the development of the art to be used for the purpose of sound absorption and acoustical correction. They are usually covered by some fabric in order to present an acceptable appearance. If this membrane is unbroken and painted, the pores of the felt are sealed, with the result already described. This limits the desirability of the material as a quieting medium to some extent. If holes are punched in the membrane of sufficient size and number to restore the absorption, the problem of redecoration again becomes difficult, the maintenance cost comparatively high, and the holes give the surface a rather restless appearance. The cleaning problem is much simplified, both for fiber boards and felts, if they are covered with a thin perforated metal sheet. This can be easily painted without refilling the holes, and can be washed or scrubbed without difficulty; but the appearance of the dotted surface is a consideration, as with the perforated cloth.

Tiles and plasters are structural, permanent and fireproof, and give a normal appearance to the surface treated. Their absorption is not quite as great as that of some of the other substances mentioned, but they can be applied over large areas and thus give equal results. The plasters are comparatively low in cost and can be stippled or sprayed with thin paint when soiled. Acoustic tiles, although higher in initial cost, are inexpensive to maintain, can readily be scrubbed with soap and water, and do not need painting. In reaching a decision as to which of all these treatments should be used in any particular case, consideration should be given to the percentage of sound absorption, especially over the upper half of the scale of pitch, to the appearance and light-reflecting qualities, to the possibility of maintaining these, and to the combined cost of such upkeep plus the original cost of installation. Floors should also be given some attention. Marble, concrete or terrazzo simply add to the extent of reverberant surfaces. Linoleum, cork or rubber tile, or composition floorings of similar resilient type, are much more conducive to quiet.

Practically every department in a hospital requires some absorptive treatment. Noises are generated in offices, diet and other kitchens, dishwashing rooms, serving pantries, nurseries, labor and delivery rooms and elsewhere,—noises which should be muffled at the outset by one of the treatments described.

Use of the precautions and corrective measures thus briefly outlined will require some little time and thought in the planning of a new hospital and the letting of contracts, but the labor thus expended will be well worth the trouble in the results which can be attained. If hospital authorities can but realize what a saving in time, health and nervous energy, as well as in actual discomfort and suffering, a little preliminary attention to such details will bring about, our hospitals will not be the maddening sound boxes which many patients think them, and will become more effective places of healing.

LAUNDRY EQUIPMENT FOR HOSPITALS

BY

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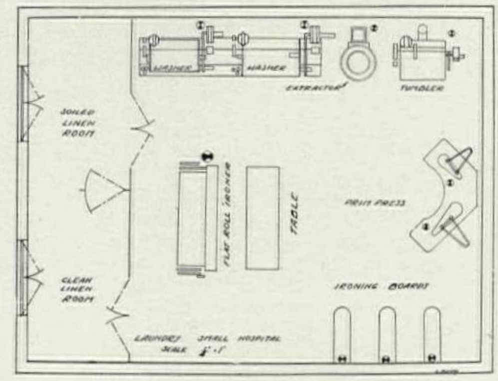
A LAUNDRY as part of a hospital of 50 beds or more is essential for three major reasons. First, the hospital can usually do its laundry more economically than a commercial laundry can afford to do it. Second, there is a material saving of linen in the personal supervision of the way in which the linens are laundered. Third, promptness of service makes it unnecessary to maintain a large reserve supply of linen.

There are two principal considerations of equal importance with reference to the location of the laundry. One is accessibility to prompt hospital service for delivery of soiled linens to the department and the return of clean linens. Chutes of the type that can be cleaned properly are recommended for the soiled linens. In hospitals where one chute cannot service the entire hospital, more may be provided or else auxiliary service in special soiled linen trucks should be maintained. The same trucks should never be used for both soiled linens and clean linens. The second consideration has to do with the supervision of the mechanical equipment by the chief engineer. The laundryman has all he can do to operate the equipment, and it should not be up to him to do the necessary repair work. The latter should be part of the duty of the engineer. Unless the equipment receives constant mechanical supervision and inspection by the chief engineer or his assistant, the equipment may not give the service the hospital's needs demand. Such things as oiling and greasing can be done by the laundryman, but they should be checked by the engineer.

A well planned hospital laundry department should have a minimum of four rooms,—one soiled linen room, one wash room, one clean linen room, and one supply store room. In a hospital that has a school of nursing, it is most desirable, even in one of the smaller hospitals, to have a special clean linen room for personal linens. Care should be given in arranging the units of the department so as to avoid as much cross traffic as possible. Thought should be given to planning so that the operating costs can be kept to the minimum. Many features of economy can be included. In the average small or medium-sized hospital it is possible to utilize each employe's services for more than one particular work. The washman need spend only his mornings in the laundry, while in the afternoon his time can be spent working in some other department. We know that it usually takes four girls to operate the mangle. When the mangle is not running, a sufficient number of hand ironing boards and prim presses should be available to keep these girls busy. At least one third of the shelf space in the clean linen room should be of the locker type so that a reasonable supply of clean reserve linen could be kept ready for an emergency. Attention should be given the size of the supply store room so as to permit the management to take advantage of quantity prices. However, linens in storage should not be kept in the laundry supply store room.

The equipment needed in the laundry is determined by the demands of the hospital. The minimum equipment for first class work,—two washers, one extractor, one mangle, one prim press, three hand ironing boards and one tumbler,—can be made to give efficient service, using the different sizes available, in a small hospital of 50 beds or even in a medium-sized hospital of from 150 to 200 beds. This amount of equipment can be relied upon to turn out from one thousand to four thousand pieces of hospital linens in an average eight-hour day.

A Well Equipped Hospital Laundry



Plan for Laundry of Small Hospital

MODERN HOSPITAL SANITARY INSTALLATIONS

BY

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TIME was when a hospital was simply a room or rooms or even a whole building for the gathering of the sick or injured so that continuous care in nursing, and proper diet, dressings and medicines could be regularly administered, but without plumbing equipment other than toilet facilities and a few sinks for a supply of water to be boiled for sterilization.

Hospital operation requires comparatively large quantities of water, for cleanliness is the basis of efficient service, and in order to economize the labor of nursing and housekeeping staffs and save precious time of the medical and surgical personnel, it is very necessary that fixtures to supply water and to remove waste must be well distributed and that the fixtures themselves be adapted to the service, so as to be as far as possible self-cleansing.

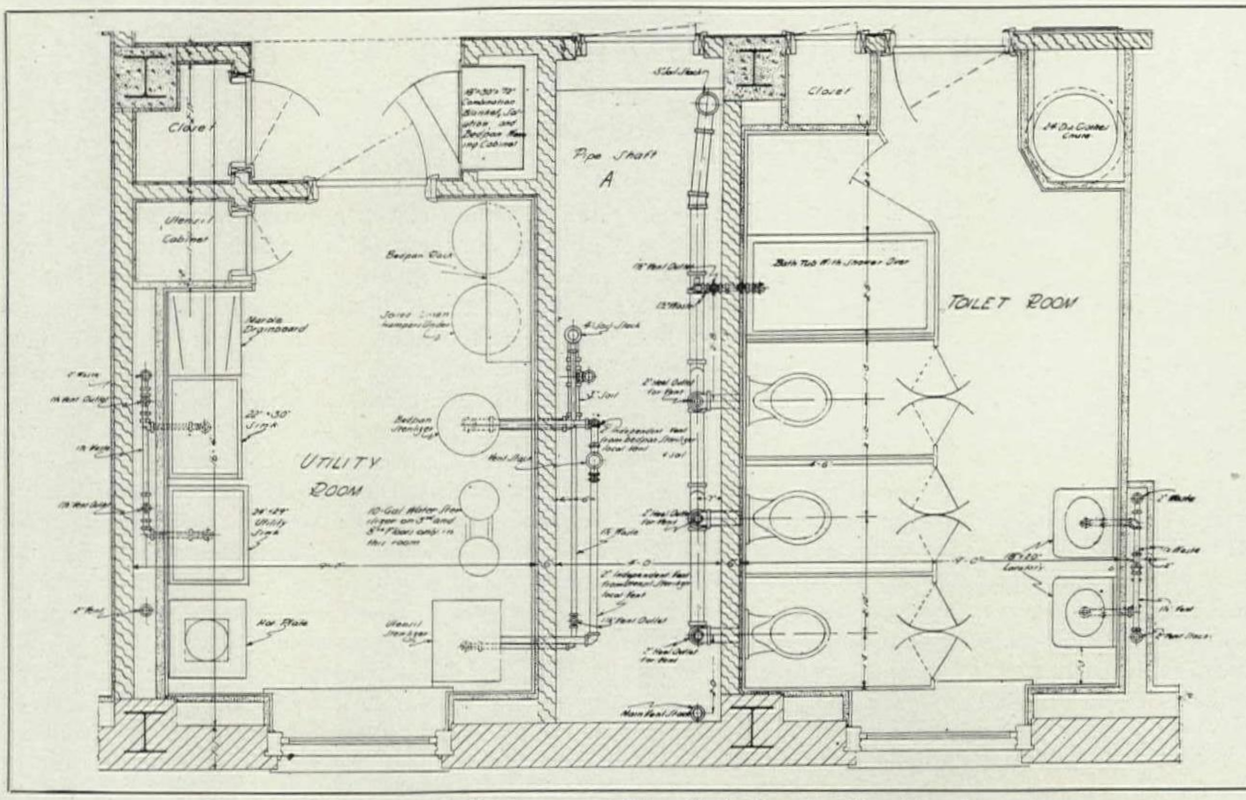
Necessity and Danger. Plumbing has advanced till it may be said that the modern hospital is built around its plumbing. After it is once installed, less attention is paid to the plumbing than to any other part of the plant or structure. The hospital authorities, usually physicians, generally know little of the practical end of sanitation in plumbing, and are likely to explain unexpected relapses and cases of infection as due to any source other than to thoughtless tinkering with the plumbing system. Scores of such cases, previously unexplained, have been definitely traced to defective plumbing,—usually carelessly or ignorantly mutilated plumbing. It can be seen that the hospital's greatest asset,—a comprehensive plumbing system,—can also be its undoing. Post-operative infection is probably in nine cases out of ten traceable to washing the wound with infected water supposed to be sterile, or to the use of contaminated dressings. There is usually no thought given to the sterilizer and the possibility of infection from that source, as it is a mechanical appliance and is not supposed to go wrong. It may have been so connected with sewer pipe and water supply that pollution or infection is not only possible but probable each time certain conditions occur co-incidentally, and in the usual plumbing installation such conditions occur with more frequency than one would expect. Check valves and other mechanical appliances in water and waste lines are no bar to the passage of the minute organisms, and that the natural laws of gravity and siphonage are operative in every plumbing system.

The Source of Trouble. It is customary to provide water supply pipe sizes only sufficiently ample to care for a part of the fixtures drawing at one time; therefore, with a large number of connections on a single riser of many stories, the opening of several faucets on the lower floors creates a pressure reduction above, even extending to a point of pressure (or lack of it) where gravity from the higher levels will overcome it and cause siphonage of the contents of the attached fixtures or appliances if the supply valves be intentionally opened or if the valves are in a leaky condition, or possibly if through carelessness they have not been shut off tightly. This same condition occurs whether the water supply comes from the street pressure or from an overhead tank. If the siphoned fixture happens to be a bed pan sterilizer in a typhoid fever ward, the siphonage of the contents back into the general water supply line of the hospital may occur.

The Remedy. There is no known *positive* remedy or preventive of this condition except the use of a definite "air break" between the water supply and the fixture served. An air break is the delivery of the water supply freely through the air from an opened valve above the fixture, such as the faucet over a kitchen sink. A direct connected pipe is subject to siphonage whenever it is possible, even under unusual conditions, such as obstruction of the waste, for the water level in the appliance to rise as high as the supply connection. Vacuum valves in the water supply line will provide protection as long as they remain in operative condition, but they may get out of order, someone may place something so as to obstruct them, or other conditions may interfere with their action, and while their use might be considered permissible in apartment houses, hotels and other structures where the risk of infection is not great, they should not be used in hospital work.

At the present time most of the plumbing appliances used in hospital equipment are of the closed pattern, with both water supply and waste to sewer having direct pipe connections, each being closed off with a valve. These valves, water-tight when in proper repair, are never gas-tight except when water is in the fixture, and not fully so then, as the standing water at any temperature under 140° will become contaminated through absorbing sewer air. This is a slow, normal contamination and is distinct from the definite infection just described. It is only in the last two or three years that this condition and the necessity for special sewer and water connection in hospital work have been recognized.

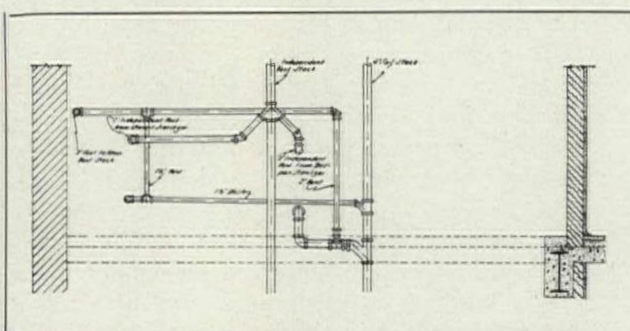
Cross Connections Fatal. One writer claims that nine out of ten present-day hospitals have one or several serious examples of cross connections between water supply and sewage, which directly cause many otherwise unexplainable fatal terminations in medical cases through use of drinking water contaminated in the building and in surgical cases through wound-washing with infected water and dressings. Conservative thought would not



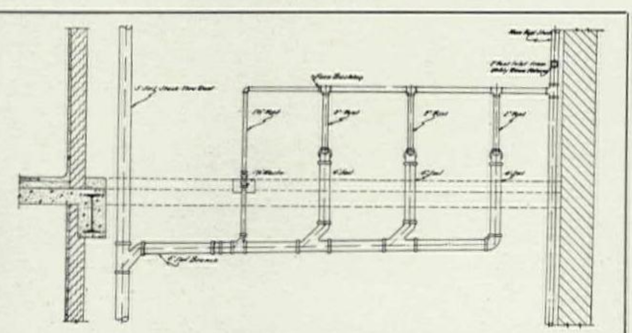
Plan of Utility Room, Toilet Room and Pipe Shaft Showing Plumbing Connections

place the proportion so high, but certain it is that many, many hospitals should have an expert sanitary engineer of unquestioned ability go over their equipment and give it a thorough dye test. While lack of knowledge may in the past have been some excuse for permitting the creation of a condition out of which direct or indirect contamination and infection could arise, there is, in the light of present-day research and information, no excuse for permitting the erection of a new hospital and installing its equipment with sterilizers and other sewer- and water-connected fixtures in such a manner as to make a cross connection even remotely possible. It is reported that one very large hospital project, only recently completed, developed under a dye test eight different types of improper connections with many instances of each, and that the correction of these, before throwing the doors open, cost in the neighborhood of $60,000. This should have been taken care of in the design.

Importance of Pipe Sizes. Design and sizing of the water supply system are second in importance only to the type and design of the fixtures to be used, and much care should be taken in the layout. The exact sizes can be determined only when the size of the structure and the type of service to be provided for are definitely known, but all supply pipes leading to nursing service rooms, generally known as sink rooms, to all sterilizer rooms and to diet kitchens should be full size to care for all openings operating simultaneously without undue pressure drop. To some this might seem to require absurdly large riser lines, but in hospital design it is better to err on the safety side. In tall buildings it is good practice to make the drop line from the tank somewhat smaller and group larger supplies to each floor or to two floors on a pressure-reducing valve; in fact the use of pressure reductions is to be recommended, as it is *volume* that is desirable and not *pressure*. Low pressure and large pipes make for



Section Through Pipe Shaft Showing Utility Room Connections



Section Through Pipe Shaft Showing Toilet Connections reduction in velocity with consequent elimination of noise from the system, and if the velocity can be kept below 9 or 10 feet per second and if all ends of long runs are protected by elastic disc shock absorbers, the water supply system will be effectively silenced and protected against strains.

Proper Pipe Sizes. In sizing supply lines it is customary to assume the discharge area of all compression valves or faucets as 60 per cent of the cross-sectional area of the tailpiece of the couplings, which is usually a ⅜-inch or ½-inch iron pipe size. The inside area of pipe is not the same as the area of a circle of the same denomination but differs slightly for mechanical reasons, the effective area of a ⅜-inch pipe being .191 square inch instead of .110, and of a ½-inch pipe, .304 square inch instead of .196; the actual diameters being .493 and .622 inch respectively. The reason for assuming 60 per cent of the pipe supply area of a compression valve or faucet is that the disc never lifts more than half the diameter above the seat, and there is a considerable friction component to be added; and it follows then that the effective flow area to be figured for a ⅜-inch compression connection is .12 and .18 for a ½-inch. For a gate valve connection full area must be used. Knowing the total number of outlets, it is a simple matter to add them up and to size the pipes accordingly, as on risers and short runs at low velocities the frictional drop can be practically disregarded. One error frequently made in sizing supply pipes is in using the *nominal* instead of the *actual* diameters and areas, and another is using the old "rule of thumb" that doubling the diameter increases its capacity four times. Doubling the diameter does increase the area four times, but it only doubles the inside circumference, called the "wetted perimeter," and it is the relation between this and the area which determines much of the frictional resistance to flow. Therefore, instead of pipe capacities being to each other as the squares of their diameters, their relation is as the square root of the fifth power, or instead of 1 to 4, it will be about 1 to 5.7, at least in the sizes of pipes we have to deal with in plumbing a building. Adherence to use of these proportions will give ample flow, without undue drop in pressure, and the pipe sizes generally will be much less than as if full areas are taken.

The main supply pipe from which the various risers are taken, whether run around the building in the basement, or around the top story ceiling, or in the clear space under the roof, should be larger than proportional requirements so that it can act as a drum or header, allowing free pressure distribution in each direction. The tank, pump, or street pressure connection to it, however, can be smaller and of just sufficient size to furnish the required supply at times of peak load. The lateral branch to each riser should *grade back* to the drum, each branch should be valved and tagged, and it is also good practice to make these branches one size larger than the riser lines. If supply is from a city main, arrangement should be made for storage of a small supply to tide over possible shut-offs to the neighborhood, or a nearby fire, which might drain the supply by suction. A gate valve and an efficient check valve should be provided on the entering main and three gate valves and a check valve provided on the meter by-pass.

Unless the source of the supply is of unquestioned character, a battery of filters should be installed. The most satisfactory type for hospital use is the gravity sand and quartz filter with a reversible washing arrangement. These filters can be so installed that they can be cut in when needed, and in battery so that any one may be cut out of service for washing or repair without affecting the others.

The hot water supply of a hospital is usually maintained at a higher temperature than for other classes of buildings and as precipitation is more active in such a case, brass pipe will probably be used, preferably U. S. Government Class A pipe with Navy Standard fittings. In high-temperature hot water service there is much strain on joints, owing to extreme expansion and contraction, and ordinary brass fittings are likely to deform and strip threads. Navy Standard fittings are designed to prevent this and have been found entirely satisfactory in high grade work. In passing, it is interesting to know that cast iron is not subject to the same limitations as wrought iron or steel in water supply work, and there are many instances where, to save expense, uncoated cast iron fittings have been used with brass pipe and are apparently satisfactory.

Cold Water Supply. Need for the best non-corrosive pipe for cold water supply is not generally so pronounced, although deemed necessary in certain sections; but it is well to consider the desirability of its use for all riser lines and concealed piping, at least. Genuine galvanized wrought iron pipe may well be used for exposed main piping and headers, as it can readily he repaired or replaced when the need arises, and in the larger pipes the difference in cost would seem to justify such construction. Any pipe added to the water sterilizer outlet must be glass, glass lined, or block tin.

Soil and Waste. Too much care cannot be given to the soil, waste and sewer installation. Every fixture trap should be self-cleansing, all changes in direction should be made with what are termed "long-turn fittings," and the sizes should be as small as possible consistent with fixture waste requirements so as to be self-scouring. In the absence of any local plumbing code, the work should be done in accordance with the accepted requirements of the so-called "Hoover Code." A full vented plumbing system is desirable in any building, but in a hospital structure it is a necessity, and even added relief vents may well be used. The sewer and house drain generally will, of course, be of extra heavy cast iron soil pipe with lead calked joints, but there is some leeway in the selection of the kind of pipe for the stacks and branches. The use of standard weight galvanized steel or wrought iron pipe has been quite general, since it possesses advantages of fewer joints, better finish and less space occupied by pipes in walls, chases and bulkheads; but the almost universal use of concrete as a floor slab and skin wall material has brought into question its effective life in the building, due to possible corrosion from contact with that material. Acids are also used in hospital work in the laboratory and to a limited extent in the nursing service rooms and elsewhere, and as steel pipe is very susceptible to injury by certain acids, interior pipe corrosion may ensue. Extra heavy cast iron soil pipe is also subject to corrosion, but in a more limited way owing to its granular structure. In some cities it is a requirement that all sewage from a hospital unit or group must pass through a disinfecting chamber, and it is a question as to whether it should not be done whether required or not. Such a chamber can be easily provided in the shape of a concrete flush tank of suitable capacity, arranged to receive and retain the sewage the while an automatic feeder applies the proper solution at intervals, and then periodically flushing it out into the sewers by means of an automatic sewage siphon.

Fixtures. In addition to the usual toilet and bath fixtures of a hospital, which are usually of the standard types used elsewhere, there are many special fixtures for the surgeons' or nurses' special requirements and several used in special treatments. Equipment for both main and diet kitchens, and laundry equipment too, are what might be specified in hotel work, except that the laundry will be equipped with disinfector, and there should be additional and positive dish sterilizers in the kitchen and pantry instead of relying on the hot water in a mechanical dish washer. The usual laundry sterilizer equipment is of the rectangular type.

Sterilizers. Not only are steam pressure sterilizers used for dressings, but additional "autoclaves," as they are called, are used for utensils and instruments. They may be operated by gas or electricity, but steam is preferable in all cases where a high-pressure boiler system is in service in the building at all hours of the day and night. If this dependable supply of pressure steam from the boiler is not available, the use of electricity is usual. Autoclaves for dressings are either part of the main battery in the sterilizing room between the operating rooms, or, in larger hospitals, in the nurses' work rooms. Instrument and utensil sterilizers may be of either the open boiling type or of the pressure type. The most advanced pressure steam sterilizers are of the concealed wall type. The number, size, type and location of sterilizers are important to the architect in planning for their connections.

Water sterilizers in the sterilizing room will vary in size according to the demands and size of the hospital. A pair of 15-gallon water sterilizers with a 1-gallon still is satisfactory for hospitals of up to 15 or 20 beds. Thirty-five or 50-gallon sterilizers with a 4-quart still are suitable for hospitals of from 50 to 100 beds. Utility rooms should have a small portable electric instrument sterilizer for treatment work. They should also be provided with apparatus for emptying and cleansing bed pans. The open hopper sink for bed pans is being discarded in favor of the bed pan washer and sterilizer. With all sterilizing apparatus great care must be taken to avoid cross connections which may cause polution of the water supply or contamination that will cause post-operative infections. Water supply lines must be so arranged that water from them cannot siphon back into the water supply in case the pressure is taken off while the supply valve is open or leaky. The water supply to sterilizers should be by gravity from a special tank with an elevated ball cock arranged to have the supply to it discharge above the water line so that siphonage is impossible.

Sinks and Lavatories. In addition to sterilizing apparatus, each nursing service room should be provided with a slop sink with full 3-inch trap way, a service sink, and a pack sink. The service sink is for handling icebags, hot water bags, utensils and similar work, and the pack sink is for preparation of hot and cold wet packs for patients. A 22-inch x 36-inch sink 10 or 12 inches deep will answer for either of them, and quite frequently a double fixture is used. It is also wise to provide a special nurses' wash-up lavatory with the water supply control through a mixing box operated by elbows, knees or by foot pedals. Such a fixture enables the nurse to thoroughly cleanse and sterilize her hands without soiling them again by touching the faucets to shut the water off, and in making ready to handle and dress open wounds even the remote possibility of infection from the valve handles must be avoided.

Other special fixtures are the babies' bath in the nursery service room, a plaster sink with a special plaster-intercepting trap in the cast room, and "straddle stands" in venereal treatment rooms. The water supply to these latter fixtures must always be taken from a special gravity tank for obvious reasons, and surgeons' wash-up lavatories should also be provided in the rooms. Post-mortem and morgue tables are sometimes provided with a sewer connection, but it is considered better practice to discharge them over a trapped and vented floor drain. Floor drains may also be installed in nursing service rooms and where floors are expected to be washed down with a hose, and all floor drains should be of the flushing-rim, flush-valve-operated type. A sewer-connected floor drain or other sewer-connected fixture should never be put in an operating room on account of the possibility, however remote, of back pressure's blowing the seal during an operation.

Some hospitals maintain hydrotherapeutic sections for the giving of percussion treatments, Scotch douches, and kidney and liver spray baths. Such equipment, consisting of control table, shower, needle and sitz baths, and the continuous-flow baths so much used in mental cases, may be had in many forms.

BUSINESS RELATIONS WITH HOSPITAL BUILDING COMMITTEES

BY

C. STANLEY TAYLOR

THE development of a hospital project brings the architect into contact with a hydra-headed client,—many heads, each thinking independently and each demanding consideration of its own problems on the part of the architect. There is no single responsible client in institutional building problems, and the architect who engages in this form of work soon finds that he must develop in his dealings with this composite type of client a technique somewhat different from what he customarily employs in ordinary domestic work or in the development of an investment or business structure which is dominated by a single individual whose authority is complete. This body with many heads must not be confused with the hydra-headed monster of mythology, for it is composed of a group of very normal human beings. The complexity of the architect's business relations may be somewhat increased, and he may find it more difficult to establish a division of responsibility.

We cannot speak of a typical hospital building committee with any more precision than we can speak of a typical man, but nevertheless, it is possible to broadly define the composition of the usual or normal hospital building committee. Its membership varies in size from three to five hand-picked members (the ideal committee) to a conglomerate body of from 50 to 100 individuals who have been organized rather heedlessly under the misconception that the greater the number the more funds for the project and the more ideas from which to derive a perfect hospital structure. Usually the membership includes one or more laymen selected for their business acumen and knowledge of finance; a small group of public spirited citizens, who are included because of their willingness to devote time to any public welfare enterprise, or who may be important for local social or political reasons; one or more members of the medical staff; and usually the hospital superintendent or some representative from the executive staff. In addition, the hospital committee may have a hospital consultant as its technical adviser. Out of this group there usually evolves a small active sub-committee that does most of the work, and this sub-committee almost inevitably will include a member of the medical staff, a member of the executive staff, and a business representative of the board of governors or directors. This latter individual may be put on the active committee to control finances,—which is highly desirable.

Unless a hospital project has its genesis in an unexpected endowment, the first problem of the building committee is to establish a budget covering the necessary construction and development expenses. The budget must be predicated on a knowledge of what the hospital requirements of the community may be, and this involves a determination of the type of hospital building, its size, layout, and the nature of its accommodations and equipment. Frequently the architect is not engaged in time to render much needed advice during this preliminary stage, with the result that an inadequate budget is often established, or else the committee ultimately raises funds for a building which is not well adapted to the actual requirements. This situation usually necessitates re-planning and re-budgeting the project in a manner which may be quite contrary to the contributors' expectations. The next step involves raising funds for the hospital, and this is of utmost importance to the architect, since once the funds are raised it is exceedingly difficult to get additional money to meet unexpected contingencies or an over-run on building costs. Secondly, if the financial campaign is unsuccessful, the entire budget and the preliminary plans must be revamped to accord with the money available.

When financial matters are settled, the building committee turns more definitely to the solution of many technical problems involved in the actual design of the desired structure, and at this stage the services of the architect and the hospital consultant are fully appreciated and are drawn upon heavily. The committee has an important problem within its own body to correlate and adjust the frequently conflicting ideas of its several members,—a problem of no mean importance, in which the experienced architect must display extraordinary tact, a sound knowledge of hospital design and construction, and a measure of firmness which is founded upon confidence in his own competence. Subsequently, out of this mass of problems there emerges a definite building plan and construction program, and the committee faces its final problems of contracting for the work and supervising construction. At this stage the intelligent building committee desires relief from the responsibility of construction supervision, but, unfortunately, the work then being in tangible form, the committee usually undertakes personal supervision to a degree which amounts to actual interference with the architect's proper work.

Upon the architect and his colleague, the hospital consultant, there devolves the critically important problem of correlating the interests of the building committee. By keeping the various points of view constantly in mind and conforming in all of his contacts to the points of view of the individual members with whom he is dealing for the moment, the architect can make substantial progress and avoid the difficulties which usually arise when the professional adviser "takes sides" with one or another element in a composite body of this sort. This thought applies to the procurement of architectural commissions during contacts or solicitations with the various members of the newly formed building committee, as well as to dealings after the commission has been secured.

Before important decisions are reached, it is essential that the building committee function as a unit and become a homogeneous body working harmoniously toward a definite objective. No contracts can be signed and no permanent decisions reached if five or six minds are working in as many different directions. Theoretically, perhaps, the architect is not the chairman of the building committee and, therefore, does not necessarily face the problem of welding the committee into a smoothly working unit, but his technical training and his knowledge of the problem to be encountered logically equip him to assist in this work. One effective method of accomplishing this result is to frankly make the building committee itself appreciate its normal divisions of interest and to openly deal with certain members on costs; with other members on plan and equipment from the medical point of view; and with the rest of the committee on the practical problems which relate to operation and maintenance. The architect, by thus dividing the committee, must himself assume the responsibility for adjusting conflicting requirements, but he is equipped to do this work better than anyone else, unless it be the hospital consultant.

To digress for a moment, it may be worth while to consider the architect's relation with a hospital consultant employed directly by the committee. There are a number of architectural offices which have handled hospital projects in sufficient number to have become thoroughly qualified to serve a hospital building committee without the aid of a specialist as consultant. Such an organization has at least one individual on the staff who is conversant with all types of hospital food service systems, with the latest advances in medical and surgical equipment, and with the detailed problems of hospital operation and management. Such individuals are rare, and usually sooner or later they branch out as hospital consultants on their own account, for it must be recognized that hospital planning is a complex science that has reached the state of development where it requires intensive study and intimate knowledge of the almost daily developments in hospital practice. Lacking such an individual in the architect's organization, the best interests of both the client and the architect are served by recommending the employment of a qualified individual to serve in a consulting capacity. The consultant should be chosen only with the architect's approval and coöperation. It is the function of a hospital consultant to know the merits and demerits of every alternative arrangement and of every item of equipment down to the last detail of hardware. The architect working with a competent consultant saves himself a great deal of expense and time in developing an efficient plan and proper specifications, and he in no wise impairs his professional standing by recommending the employment of a specialist.

Returning again to the building committee, there are several matters to which the architect should pay particular attention if difficulties are to be avoided and a pleasant relationship maintained. The first principle of good management in building projects is to arrive at a settlement of every conceivable problem before the client is committed to an actual construction contract. The architect, therefore, should prepare his preliminary drawings with exceptional care and carry them to considerable detail in their final stages before asking approval preparatory to starting working drawings and specifications. Similarly, the preliminary drawings should be accompanied by outline specifications in which every item of material is brought up for discussion with the building commitee and a written record retained of its approvals and disapprovals of the architect's recommendations. The preliminary studies and specifications should finally be accompanied by estimates prepared by competent builders, estimates which are likewise submitted to the committee for study in order that every precaution may be taken to prevent an over-run in construction costs. A fourth detail of almost equal importance is to insist that the building committee submit the preliminary plans to a competent insurance broker or direct to an insurance rating bureau for the purpose of obtaining recommendations which may reduce insurance rates.

After the working drawings and final specifications are completed, it is advisable to submit these also to the building committee, and to make a careful check of the final documents with the approved preliminary drawings and specifications in order to demonstrate that the architect has not deviated from his instructions or exceeded his authority in a manner which might subsequently result in increased cost which the committee has not had an opportunity to approve. These precautions will simplify the always troublesome problem of opening bids and completing construction contracts. So long as the building committee is completely informed of every step of the work being done by the architect and is required to express approval of his actions wherever they relate to materials or costs, there can be no loss of confidence in the architect's capacity or integrity. If the committee is left ignorant of many such details, and if the cost subsequently exceeds its expectations, it inevitably blames the architect for extravagance or incompetence, regardless of the care he has exercised to protect the committee's interests.

In the final stages of actual construction work, the architect should exercise equal care to obtain the written approval of the building committee for every change in the plans or specifications which affects the contract price by either an increase or a decrease in cost. This is necessary for the protection of the architect and the contractor, as well as to protect the committee from committing itself to an expenditure for which there are no funds. It is equally important to impress upon the committee that it has no right or authority to deal directly with the contractor or to make criticisms or changes except through the architect. A clean-cut division of responsibilities between the committee, the architect, the consultant and builder, will simplify the work of all.

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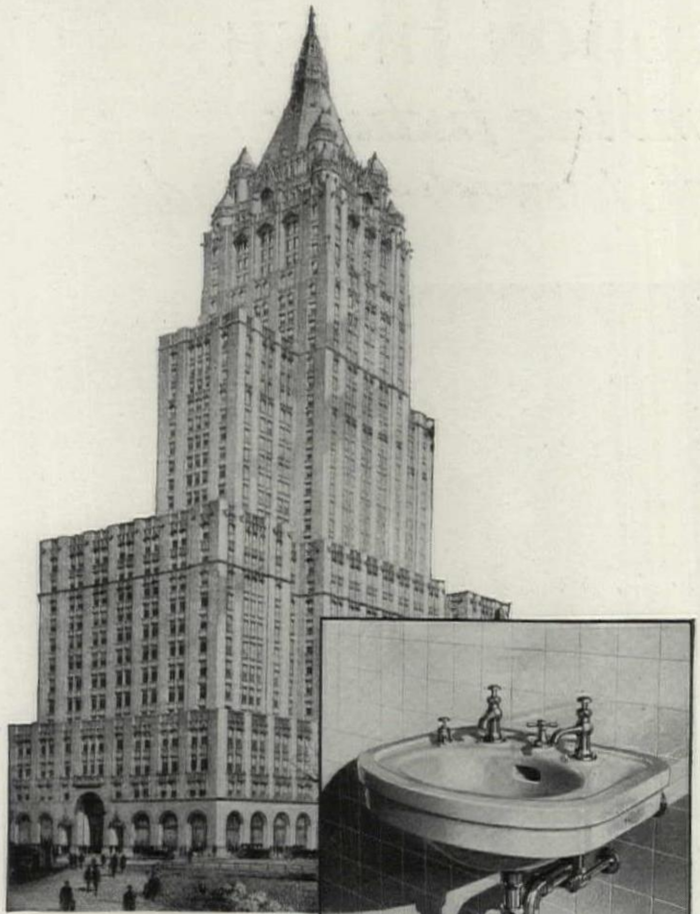

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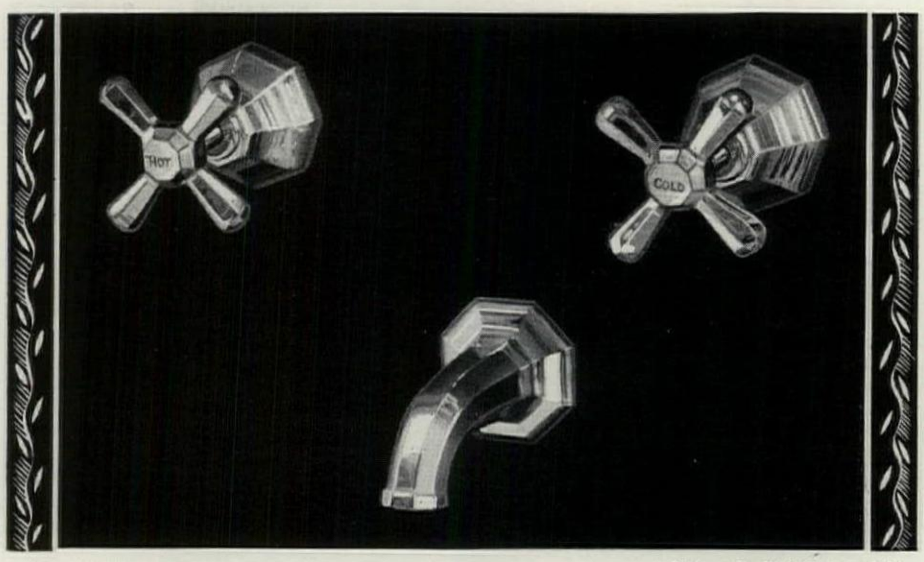

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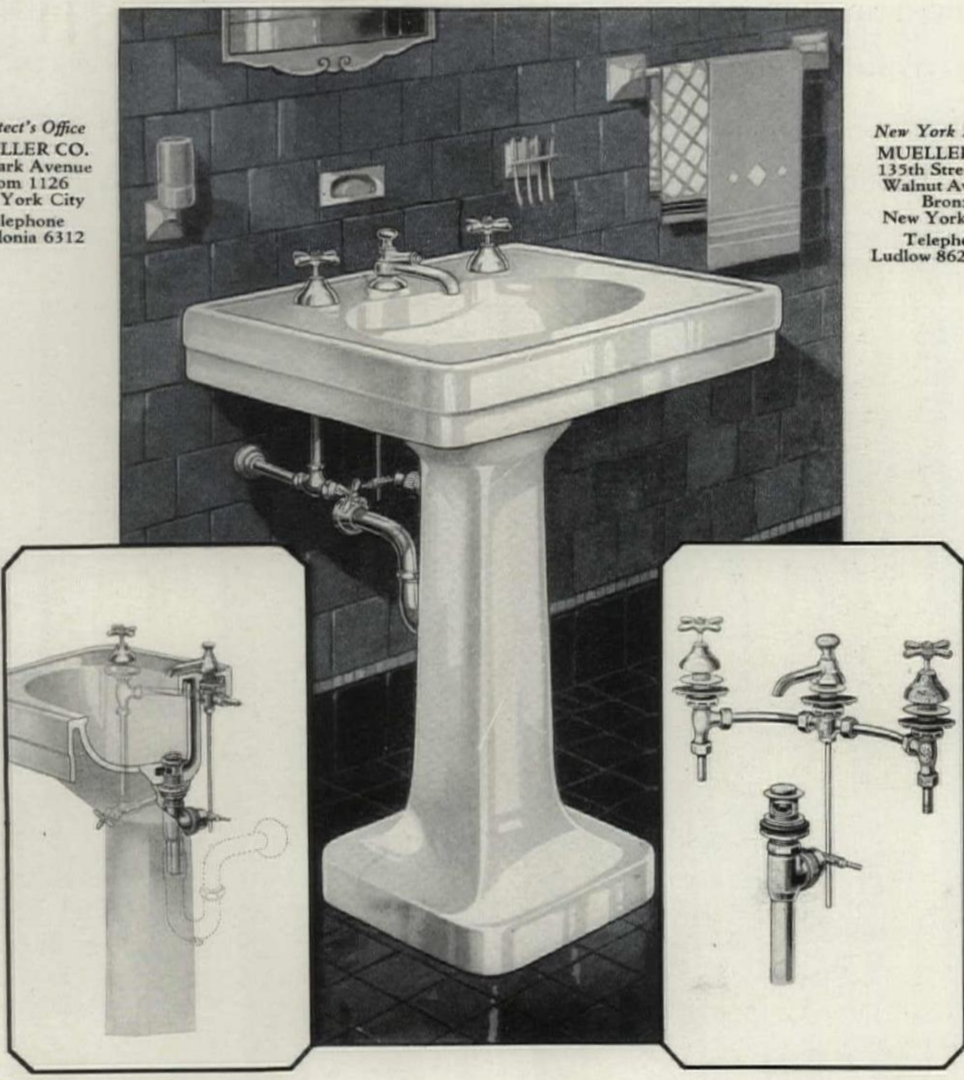

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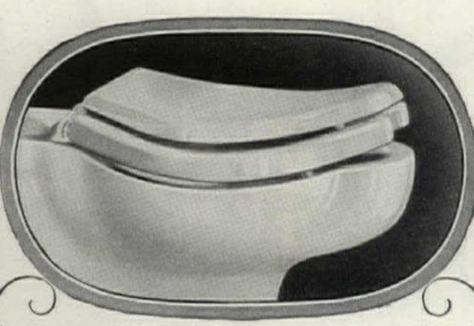

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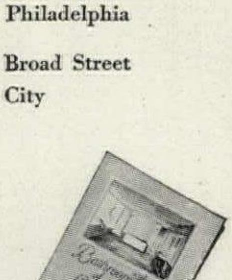

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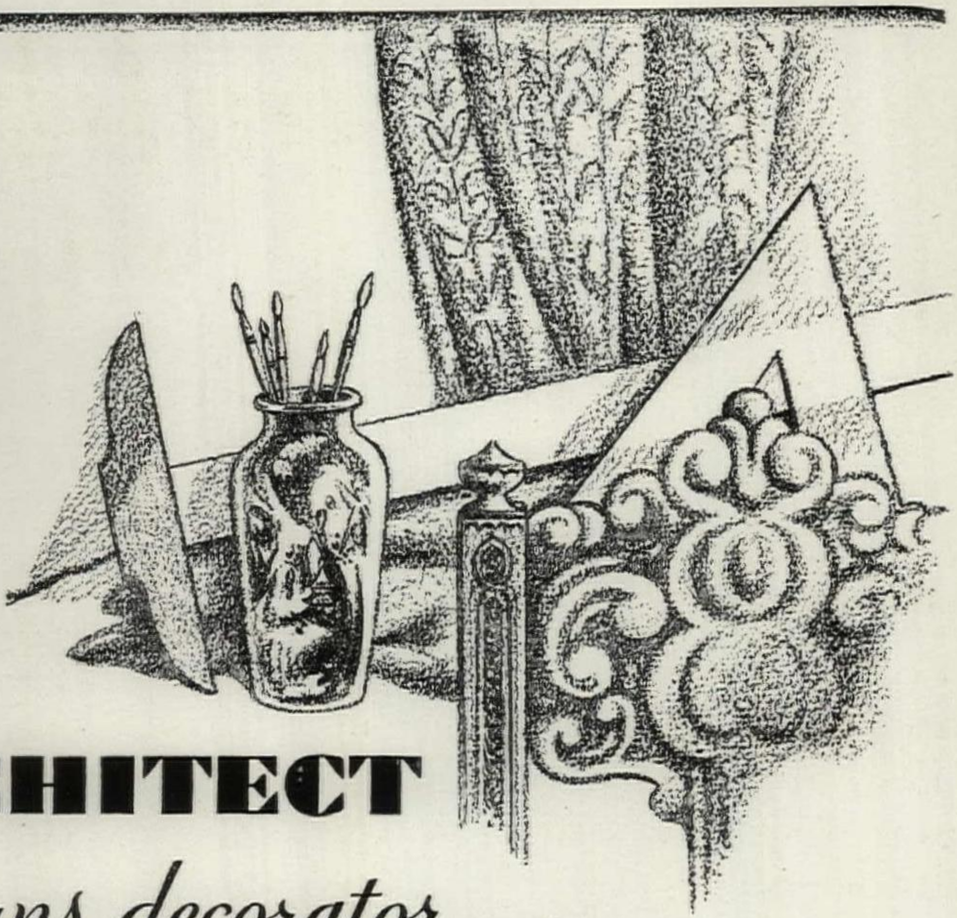

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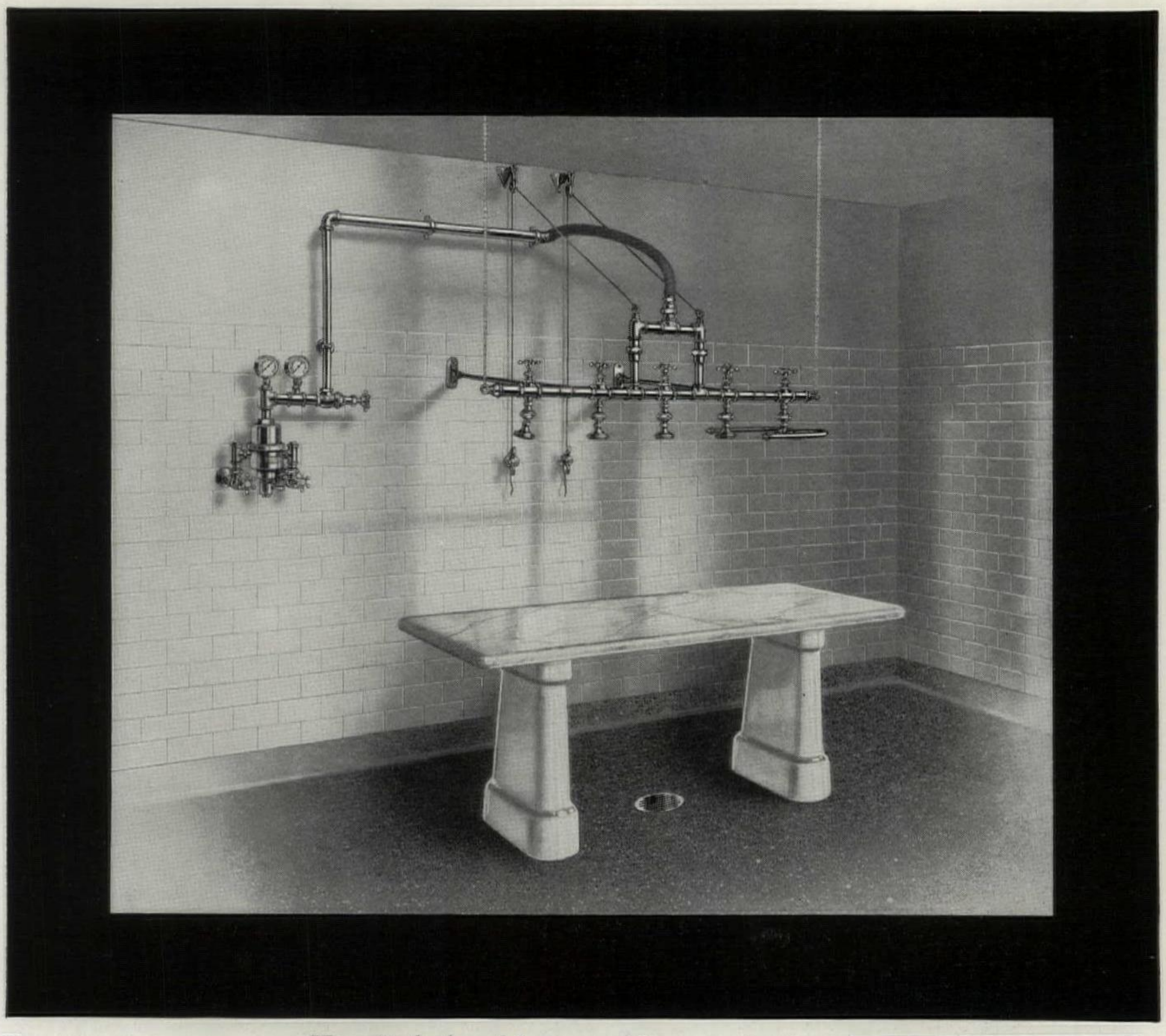

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The *Importance of Properly* Hanging Lateral and Vertical Lines *of* Soil Pipe!

By Joseph J. Crotty

A MOST important essential in soil pipe construction is the proper placing of hangers on vertical stacks and lateral runs of soil pipe to guard against displacement or sagging. Some practical ideas that meet this situation in modern plumbing design are presented herewith.

A, B and C on the drawing show types of concrete inserts used for attaching pipe hangers. These inserts are placed in the false work and become firmly imbedded when the concrete is poured. The accompanying drawing shows a vertical soil stack, 4″ in size, connected at basement to a horizontal run of 8″ soil pipe. Different types of pipe hangers are shown in detail, and their use illustrated in both reinforced concrete construction, and buildings wherein steel work is used.

Cast iron pipe rests for vertical stacks are not recommended, particularly where they are arranged so as to span the opening through which the soil stack occurs.

Friction hangers made of wrought strap iron properly bolted represent by far the best anchorage for vertical soil stacks. A spacing of 8′ between hangers on lateral runs is considered the best practice from 2″ to 8″ soil pipe. Upon larger sizes of soil pipe, the spacing should be closer. A certain flexibility may be observed in connection with this rule on smaller sizes of pipe than 4″, although in certain types of construction, the question of vibration must always be considered, and for that reason departure from the 8′ spacing between hangers, is not recommended.

Figure 1 shows a ring and bolt hanger.

Figure 2 shows an adaptation of the cradle hanger to use on a vertical stack run on the face of a steel beam. As shown in the illustration the bolts for the cradle hanger have hooks which enable them to fit securely over the flange of beam, and by tightening the nuts on the bolts the stack is rigidly anchored.

Figure 3 is a closed hanger which must be used before the pipe is caulked together as the ring must be slipped over the pipe.

Figure 4 shows a very practical method of hanging vertical stacks. It can be made in all lengths and is dependable for use in spanning openings through which the soil pipe stack is brought up.

Figures 5 and 6 are variations of the same method.

Figures 7 and 9 hangers may be used in connection with a long threaded bolt which permits the proper adjustment to hang a horizontal run of soil pipe and maintain the pitch as laid out by the plumber.

Figure 8 is what is known as a cradle hanger. There are many different ways in which this hanger can be used to advantage. The bolts are sometimes dropped through large plate washers which bear directly on the concrete. Proper adjustment to the pipe is secured by reason of the threads and nuts upon which the cradle hanger rests.

Figures 10 and 11 show types of beam clamps that may be used in conjunction with hangers for horizontal runs of soil pipe.

The use of light strap iron, wire or link chains, which have a tendency to stretch, is not advocated as sound practice.

Since it is universally acknowledged by architects and engineers that cast iron soil pipe for drainage makes for a permanence far superior to pipe of all other materials, this article is particularly addressed to the *Plumbing Contractor*. The proper hanging of soil pipe calls for the use of hangers as permanent as the pipe itself.

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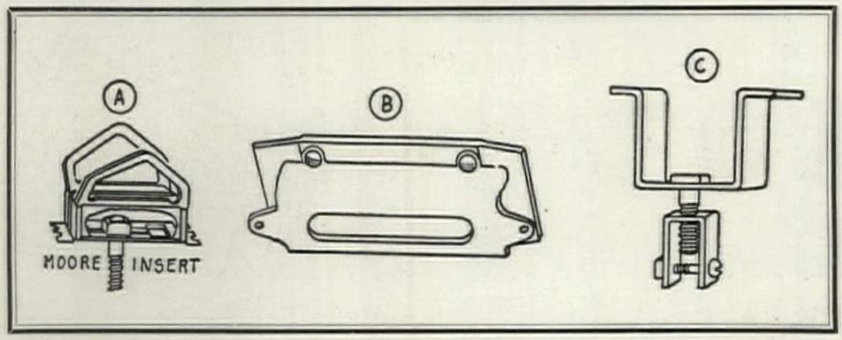
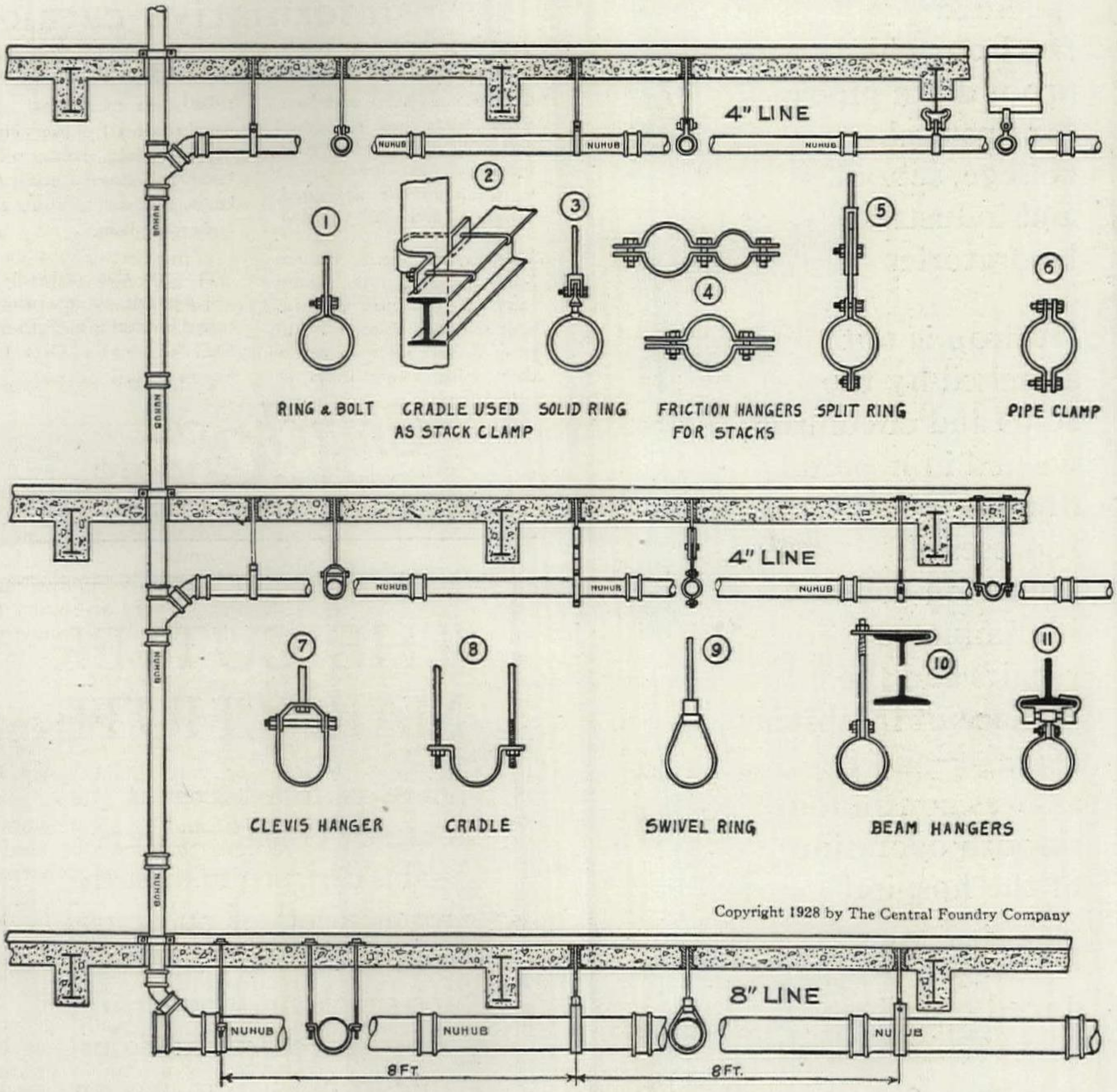
"A", "B" and "C" show types of concrete inserts used for attaching pipe hangers. These inserts are fastened to the false work and become firmly imbedded when the concrete is poured.



Proper Hanging of Soil Pipe calls for ***Hangers as permanent as the Pipe itself!***



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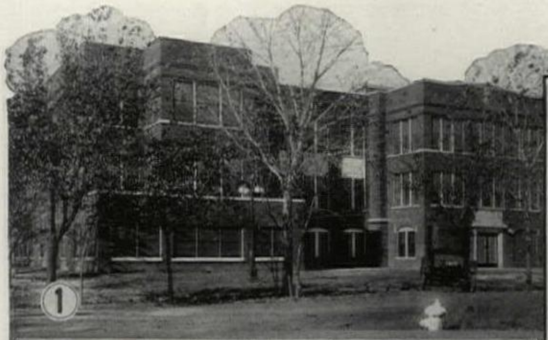

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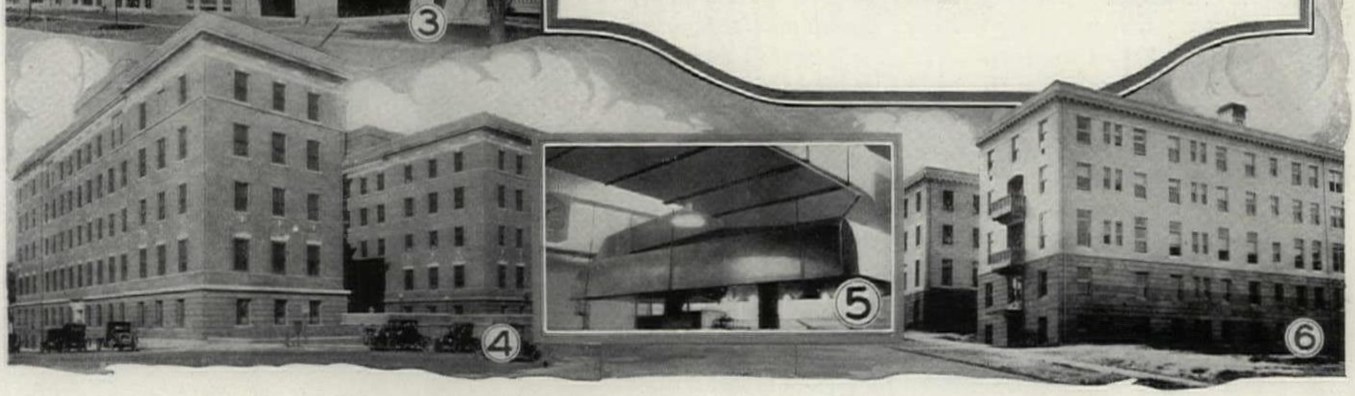

1. Methodist Hospital, St. Joseph, Mo.
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2. St. John's Hospital, St. Louis, Mo.
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3. Hatcher Hospital, Winfield, Kansas
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4. Muncipal Hospital, Shawnee, Okla.
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The Architect: S. H. Lester, Shawnee, Okla.

5. Kitchen of The Jewish Hospital, Cincinnati, Ohio.
Ventilating hood and ducts of ARMCO Ingot Iron
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The Engineer: Carl J. Keifer, Cincinnati, O.

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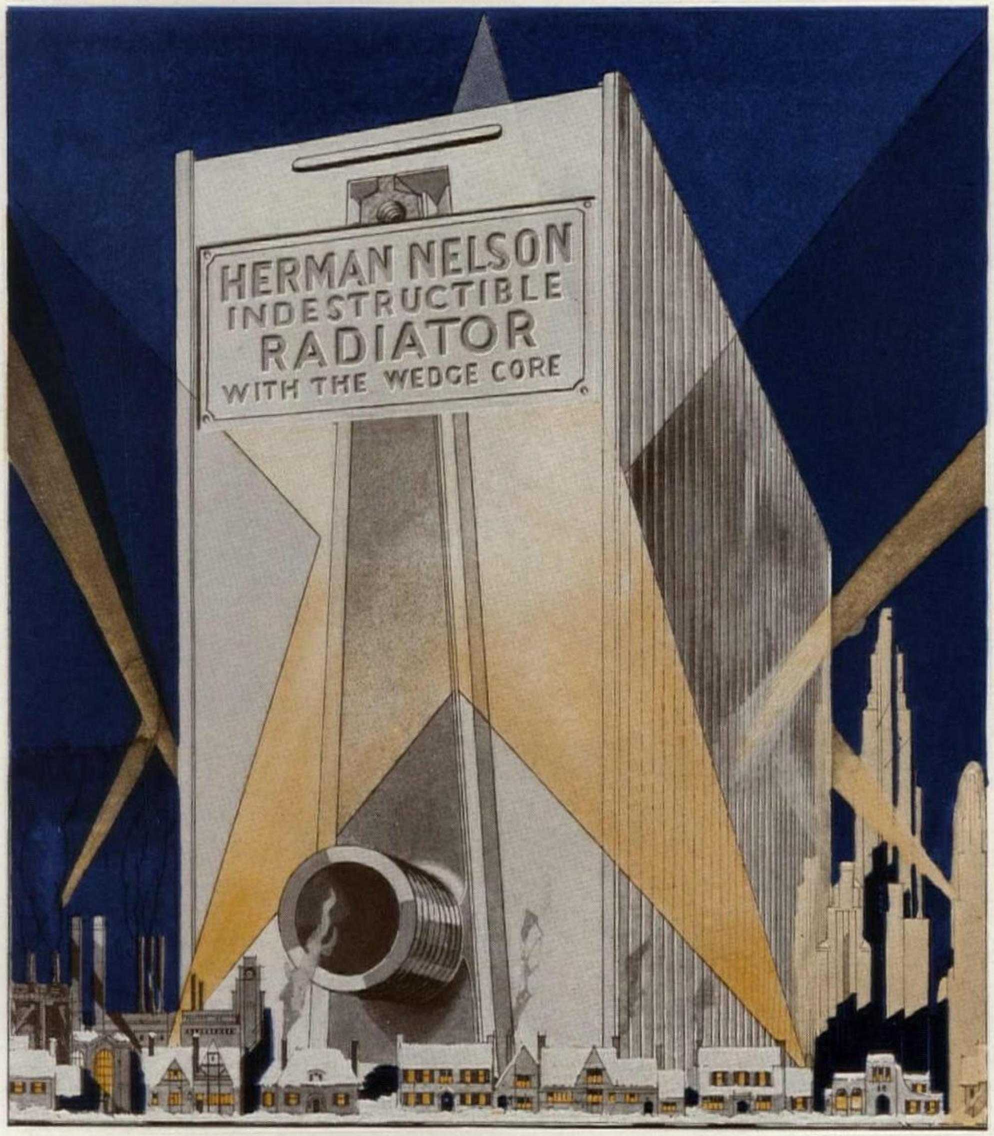
Our Contribution
to the art of Heating & Ventilation



FIVE YEARS AGO when the Herman Nelson light weight, compact, indestructible radiator was placed on the market, it was immediately accepted as the greatest advance in the art of Heating and Ventilation in a generation. It has made possible heating and ventilation dependability and performance hitherto unattainable.

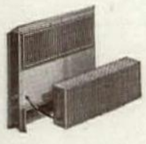
The Herman Nelson Wedge Core Radiator is an exclusive feature of all Herman Nelson Heating and Ventilating Products and accounts for their unequaled performance.

HEATING · VENTILATING · COOLING · DRYING · CONDENSING

UNIVENT

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

HERMAN NELSON *Invisible* RADIATOR



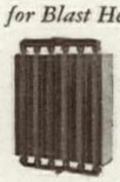
... supersedes all previous radiators, radiator cabinets or enclosures. Occupies no room space and makes possible any desired decorative scheme or furniture arrangement. Indestructible in service.

THE HERMAN NELSON hiJet UNIT HEATER

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

Herman Nelson Radiator Sections

for Blast Heating and Cooling



Indestructible, operating at any steam pressure from 1 to 150 lbs., non-corrosive and leak-proof.

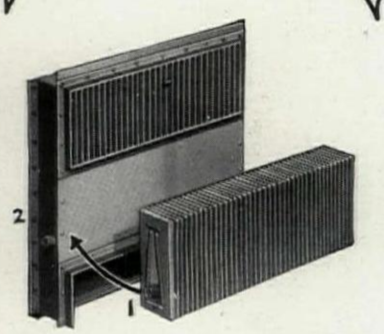
May be arranged in banks to solve any special problem of heating or cooling.

THE HERMAN NELSON CORPORATION · *Moline, Illinois*

Builders of Successful Heating and Ventilating Equipment for over 20 Years

Sales and Service

BELFAST, ME.	UTICA	SCRANTON	SAGINAW	CINCINNATI	DES MOINES	ST. LOUIS	DALLAS	SALT LAKE CITY	SAN FRANCISCO
BOSTON	BUFFALO	PITTSBURGH	DETROIT	TOLEDO	MILWAUKEE	BIRMINGHAM	EMPORIA	SPOKANE	VANCOUVER
NEW HAVEN	PHILADELPHIA	CHARLOTTE, N. C.	CLEVELAND	INDIANAPOLIS	GREEN BAY	ATLANTA	KANSAS CITY	PORTLAND	TORONTO
NEW YORK CITY	WASHINGTON, D. C.	GRAND RAPIDS	COLUMBUS	CHICAGO	MINNEAPOLIS	MEMPHIS	DENVER	SEATTLE	WINNIPEG, MAN.



Radiator (1) comes installed in a steel case (2) more substantial than the wall itself. The complete unit is ready to install in any standard wall or partition.

RADIATORS—*yes, but out of sight—out of the way*

NO LONGER need space wasting radiators intrude upon beauty in the home, office, or monumental building. An Architect's ideal has been made a reality by the Herman Nelson Invisible Radiator.

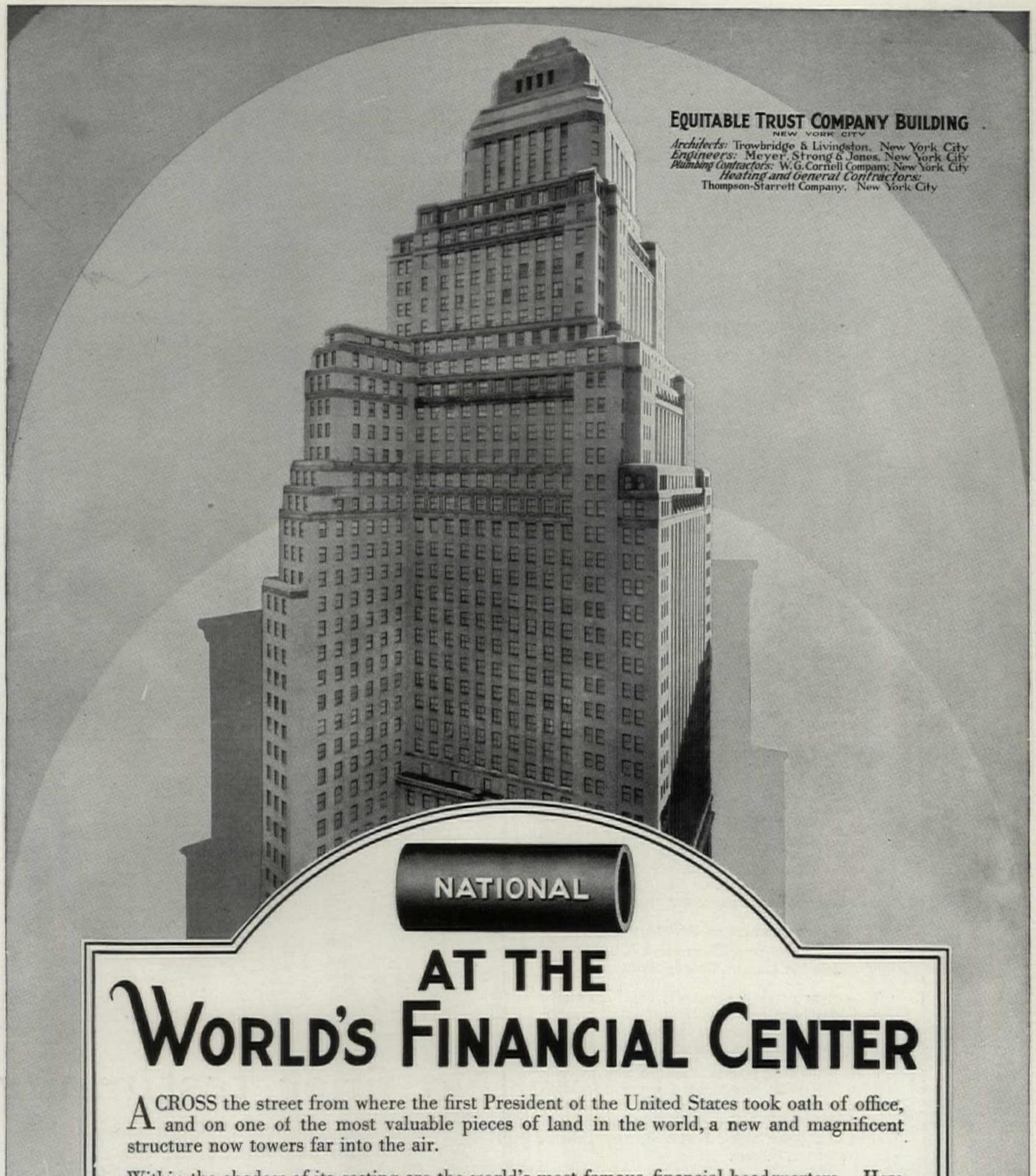
Once walled in, this compact modern heating unit offers all the advantages of finest radiator heat, yet permits of unlimited scope in the arrangement of furniture or decorative scheme.

Indestructible, rust-proof and leak-proof, it never requires service. Even freezing does not harm it.

From the standpoint of comfort, sanitation or investment, the Herman Nelson Invisible Radiator represents a new heating standard. Let us send you our book and complete data. The Herman Nelson Corporation, Moline, Illinois.

HERMAN NELSON *Invisible* **RADIATOR**

For Steam, Hot Water, Vapor or Vacuum Heating



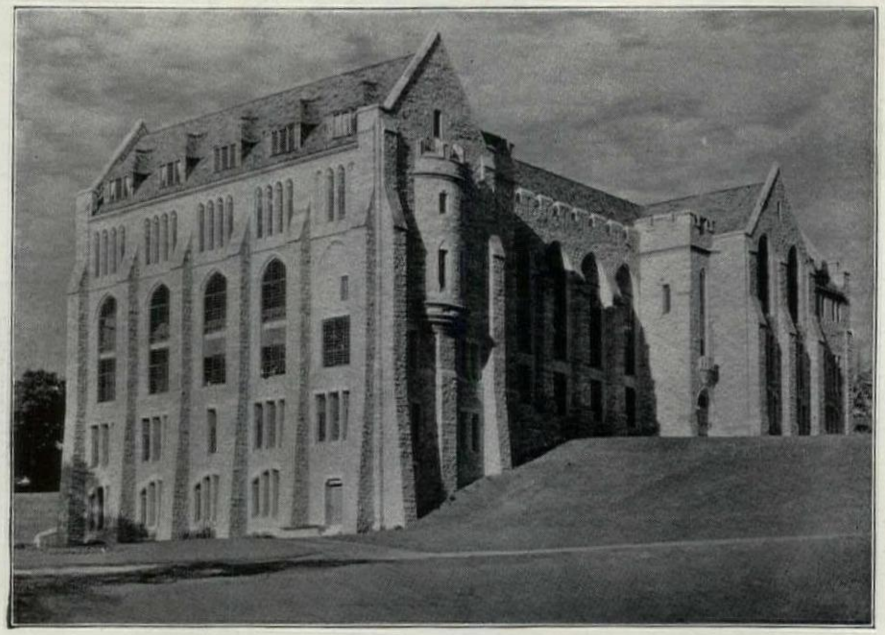
AT THE WORLD'S FINANCIAL CENTER

ACROSS the street from where the first President of the United States took oath of office, and on one of the most valuable pieces of land in the world, a new and magnificent structure now towers far into the air.

Within the shadow of its casting are the world's most famous financial headquarters. Here will stand another landmark created by master minds of the architectural and engineering professions—emphasizing modern beauty and efficient design.

Responsibility for such structures rests heavily. Every selection of materials will challenge the wisdom of their sponsors as time determines their service quality, adequacy and durability. Many miles, many tons, of "NATIONAL" Pipe have now become an integral part of this building. The reputation for general dependability, consistently appearing throughout tubular history from the earliest days of pipe making, gives every promise that this piping bears the same ratio to successful performance as the building itself.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
District Sales Offices in The Larger Cities



Floor Satisfaction Assured

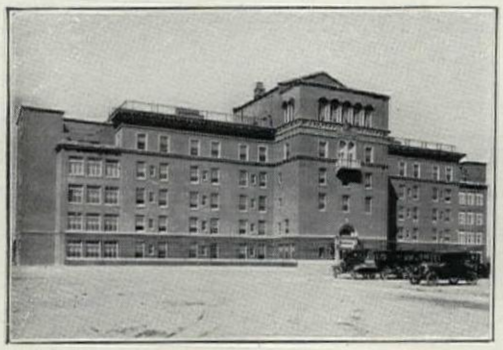
with MASTER MASTIC T-M-B FLOORING

The record made by T-M-B in hundreds of schools, hospitals and offices over a period of years definitely establishes its satisfactory service.

A soft, velvety, rubber-like, seamless surface—cleanliness—great durability—ease of repair—pleasing color—these are the outstanding characteristics of T-M-B.

Both first cost and maintenance cost are considerably lower than other types of approved materials.

T-M-B is manufactured and installed by one of the oldest and strongest companies in the flooring field.



Above—Administration Building, St. Olaf College, Northfield, Minn. Coolidge & Hodgdon, Architects. 20,000 sq. ft. of T-M-B used.

Left—Presbyterian Hospital, Denver, Colorado. 8,000 sq. ft. of T-M-B—W. E. and A. A. Fisher, Architects.

THOS. MOULDING FLOOR CO.

(Flooring Division—Thos. Moulding Brick Co.)

165 W. Wacker Drive—Chicago—General Offices and Display Rooms

Grand Central Terminal Building, New York

Chamber of Commerce Building, Pittsburg

Selected List of Manufacturers' Publications

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

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

ACOUSTICS

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

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

AIR FILTERS

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

BASEMENT WINDOWS

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

BATHROOM FITTINGS

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

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

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

Cabinets and Fixtures. Booklet, 31 pp., 5¾ x 4¾ ins. Illustrated. Catalog and price list of fixtures and cabinets.

BRICK

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

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

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

The Heart of the Home. Booklet, 23 pp., 8½ x 11 ins. Illustrated. Price 25 cents. Deals with construction of fireplaces and chimneys.

Skintled Brickwork. Brochure, 15 pp., 8½ x 11 ins. Illustrated. Tells how to secure interesting effects with common brick.

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

CEMENT

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

Kosmos Portland Cement Company, Louisville, Ky.
Kosmortar for Enduring Masonry. Folder, 6 pp., 3½ x 6½ ins. Data on strength and working qualities of Kosmortar.

Kosmortar, the Mortar for Cold Weather. Folder, 4 pp., 3⅜ x 6½ ins. Tells why Kosmortar should be used in cold weather.

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

Missouri Portland Cement Company, St. Louis, Kansas City, Memphis.
Twenty-four Hour Cement. Booklet, 15 pp., 8½ x 11 ins. Illustrated. Data on a cement which makes a quick-drying concrete.

Precautions for Concrete Paving Construction in Cold Weather. Folder, 4 pp. 6 x 9 ins.

Design and Control of Concrete Mixtures. Booklet, 32 pp. 8½ x 11 ins. Illustrated.

Concrete Paving Construction in Hot Weather. Booklet. 11 pp. 6 x 9 ins. Illustrated.

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

Portland Cement Association, Chicago.
Concrete Masonry Construction. Booklet, 47 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.

CEMENT—Continued

Town and Country Houses of Concrete Masonry. Booklet, 19 pp., 8½ x 11 ins. Illustrated.

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

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

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

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

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

CONCRETE BUILDING MATERIALS

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

CONCRETE COLORINGS

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

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

CONSTRUCTION, FIREPROOF

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

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

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

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

CONSTRUCTION, STONE AND TERRA COTTA

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

DAMPPROOFING

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

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

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

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

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

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

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

DOORS AND TRIM, METAL

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

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 149*

DOORS AND TRIM, METAL—Continued

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

Truscon Steel Company, Youngstown, Ohio.
Copper Alloy Steel Doors. Catalog 110. Booklet, 48 pp. 8½ x 11 ins. Illustrated.

DOORS, SOUNDPROOF

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

DUMBWAITERS

Sedgwick Machine Works, 151 West 15th St., New York.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¼ ins. 60 pp. Illustrated.
Catalog and pamphlets, 8½ x 11 ins. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT

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

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

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

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

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

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

Variable-Voltage Central Systems as applied to Electric Elevators. Booklet, 13 pp., 8½ x 11 ins. Illustrated. Deals with and important detail of elevator mechanism.

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

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

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

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

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

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

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

ELEVATORS

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

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

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

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

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

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

ESCALATORS

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

FIREPROOFING

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

FIREPROOFING—Continued

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

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

FLOOR HARDENERS (CHEMICAL)

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

Concrete Floor Treatments—Specification Manual. Booklet, 23 pp., 8½ x 11 ins. Illustrated. Valuable work on an important subject.

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

FLOORS—STRUCTURAL

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

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

FLOORING

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog. 8½ x 11 ins. 40 pp. Color plates. A technical treatise on linoleum; including table of gauges and weights and specifications for installing linoleum floors.

Armstrong's Linoleum Pattern Book, 1927. Catalog. 3½ x 6 ins. 272 pp. Color Plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.

Quality Sample Book. 3½ x 5¾ ins. Showing all gauges and thicknesses in the Armstrong line of linoleums.

Linoleum Layer's Handbook. 5 x 7 ins. 32 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.

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

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

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

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

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

Bonded Floors Company, Inc., 1421 Chestnut St., Philadelphia, Pa.
A series of booklets, with full color inserts showing standard colors and designs. Each booklet describes a resilient floor material as follows:

Battleship Linoleum. Explains the advantages and uses of this durable, economical material.

Marble-ized (Cork Composition) Tile. Complete information on cork-composition marble-ized tile and many artistic effects obtainable with it.

Treadlite (Cork Composition) Tile. Shows a variety of colors and patterns of this adaptable cork composition flooring.

Natural Cork Tile. Description and color plates of this super-quiet, resilient floor.

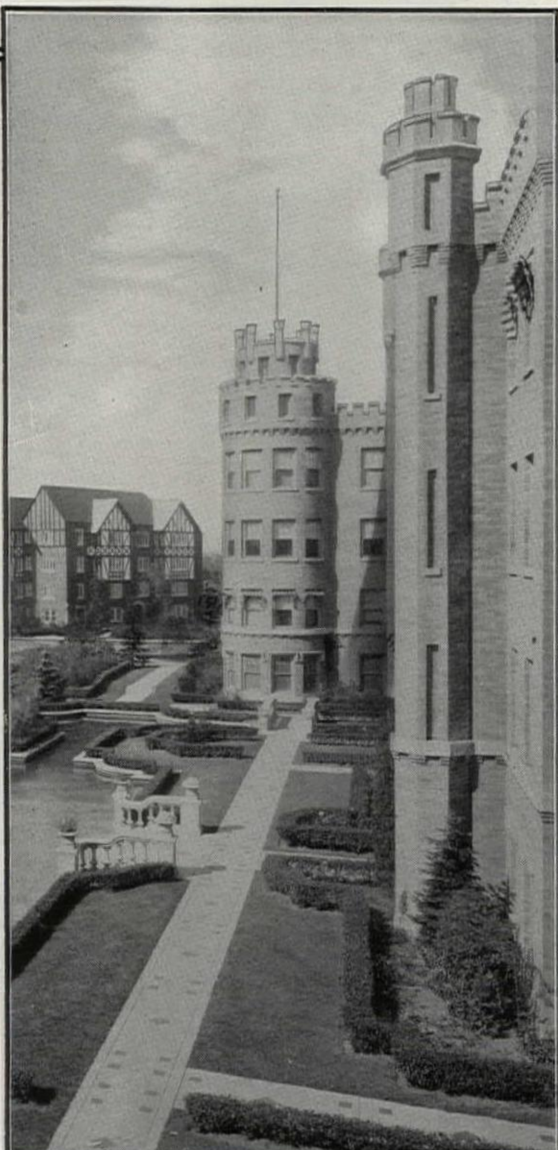
Resilient Floors in Schools. Resilient Floors in Stores. Resilient Floors in Hospitals. Resilient Floors in Offices. Resilient Floors in Apartments and Hotels. Booklets, 8 pp., 8½ x 11 ins. Illustrated.

Specifications for Resilient Floors. Leather bound booklet, 48 pp., 8½ x 11 ins. Illustrated. Practical working specifications for installing battleship linoleum, cork composition tile and cork tile.

Carter Bloxonend Flooring Co., Keith & Perry Bldg., Kansas City, Mo.
Bloxonend Flooring. Booklet. 3¼ x 6¼ ins. 20 pp. Illustrated. Describes uses and adaptability of Bloxonend Flooring to concrete, wood or steel construction, and advantages over loose wood blocks.

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

Co-operating with Co-operative apartments

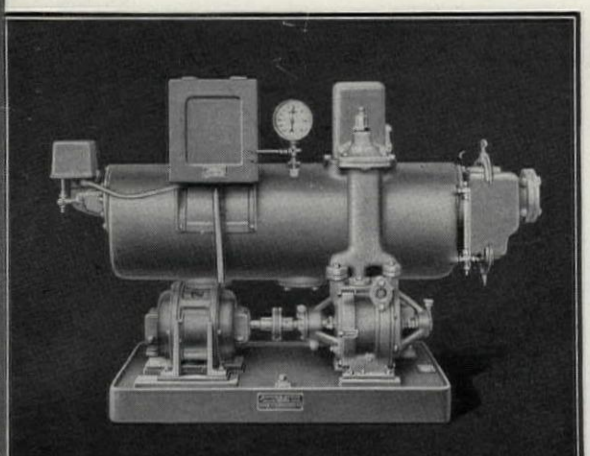


NEAR the northern city limits of Chicago, surrounding three sides of a fifteen acre park that once divided the lands of the United States from those of the Chippewa, Ottawa, and Pottawatomie tribes, is the Indian Boundary Park Co-operative Apartment Development.

When completed, this project will comprise seven large apartment buildings, containing 327 co-operative homes in one of Chicago's exclusive residential neighborhoods.

A Jennings Vacuum Heating Pump is installed on the heating systems. By helping the radiation respond quickly to varying heating demands, this pump contributes to the comfort of the owner occupants. By enabling the heating systems to serve with substantial savings in boiler fuel, it also is co-operating with the owners in keeping operation within the estimated budget.

Park Gables, one of seven buildings comprising the Indian Boundary Park Co-operative Apartment Development, Chicago, Ill. Gubbins, McDonnell & Blietz, realtors. Mr. James F. Denson, Architect.



Motor-driven Jennings Vacuum Heating Pump is installed on the return line of the vacuum steam heating system in Park Gables.

Jennings Pumps

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

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 150*

FLOORING—Continued

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

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

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

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

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

FURNITURE

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

Kittinger Co., 1893 Elmwood Ave., Buffalo, N. Y.
Kittinger Club & Hotel Furniture. Booklet. 20 pp. 6¼ x 9¼ ins. Illustrated. Deals with fine line of furniture for hotels, clubs, institutions, schools, etc.
Kittinger Club and Hotel Furniture. Booklet. 20 pp. 6 x 9 ins. Illustrated. Data on furniture for hotels and clubs.
A Catalog of Kittinger Furniture. Booklet, 78 pp., 14 x 11 ins. Illustrated. General Catalog.

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

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

GARAGES

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

GLASS CONSTRUCTION

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

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

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

GREENHOUSES

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

HARDWARE

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

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

McKinney Mfg. Co., Pittsburgh.
Forged Iron by McKinney. Booklet. 6 x 9 ins. Illustrated. Deals with an excellent line of builders' hardware.
Forged Lanterns by McKinney. Brochure, 6 x 9 ins. Illustrated. Describes a fine assortment of lanterns for various uses.

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

Russell & Erwin Mfg. Co., New Britain, Conn.
Hardware for the Home. Booklet, 24 pp., 3½ x 6 ins. Deals with residence hardware.

HARDWARE—Continued

Door Closer Booklet. Brochure, 16 pp., 3½ x 6 ins. Data on a valuable detail. Garage Hardware Booklet, 12 pp., 3½ x 6 ins. Hardware intended for garage use.
Famous Homes of New England. Series of folders on old homes and hardware in style of each.

HEATING EQUIPMENT

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

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

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

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

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

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

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

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

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

McQuay Radiator Corporation, 35 East Wacker Drive, Chicago, Ill.
McQuay Visible Type Cabinet Heater. Booklet. 3 pp. 8½ x 11 ins. Illustrated. Cabinets and radiators adaptable to decorative schemes.
McQuay Concealed Radiators. Brochure. 3 pp. 8½ x 11 ins. Illustrated.
McQuay Unit Heater. Booklet. 8 pp. 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.

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

Modine Mfg. Company, Racine, Wis.
Thermodine Unit Heater. Brochure. 24 pp. 8½ x 11 ins. Illustrated. Apparatus for industrial heating and drying.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 152*

HEATING EQUIPMENT—Continued

Thermodine Cabinet Heater. Booklet. 12 pp. 8½ x 11 ins. Illustrated. Cabinet heaters for buildings of different kinds.

Nash Engineering Company, South Norwalk, Conn.
No. 37. Devoted to Jennings Hytor Return Line Vacuum Heating Pumps, electrically driven, and supplied in standard sizes up to 300,000 square feet equivalent direct radiation.

No. 16. Dealing with Jennings Hytor Air Line Heating Pumps.

No. 17. Describing Jennings Hytor Condensation Pumps, sizes up to 70,000 square feet equivalent direct radiation.

No. 25. Illustrating Jennings Return Line Vacuum Heating Pumps. Size M, for equivalent direct radiation up to 5,000 square feet.

National Radiator Corporation, Johnstown, Pa.
Aero Radiators; Beauty and Worth. Catalog 34. Booklet. 6 x 9 ins., 20 pp., describing and illustrating radiators and accessories.

Six Great Companies Unite to Form a Great Corporation. Booklet, 27 pp., 8½ x 10½ ins. Illustrated. Valuable data on heating.

Heating Homes the Modern Way. Booklet, 8½ x 11¾ ins. Illustrated. Data on the Petro Burner.

Residence Oil Burning Equipment. Brochure, 6 pp., 8½ x 11 ins. Illustrated. Data regarding Petro Burner in a bulletin approved by Investigating Committee of Architects and Engineers.

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

Petroleum Heat & Power Co., 511 Fifth Avenue, New York.
Petro Mechanical Oil Burner & Air Register. Booklet, 23 pp., 8½ x 11 ins. Illustrated. Data on industrial installations of Petro Burners.

Present Accepted Practice in Domestic Oil Burners. Folder, 4 pp., 8½ x 11 ins. Illustrated. A reprint from Heating and Ventilating Magazine.

Sarco Company, Inc., 183 Madison Ave., New York City, N. Y.
Steam Heating Specialties. Booklet, 6 pp., 6 x 9 ins. Illustrated. Data on Sarco Packless Supply Valves and Radiator Traps for vacuum and vapor heating systems.

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

B. F. Sturtevant Company, Hyde Park, Boston, Mass.
Tempervane Heating Units, Catalog 363. Booklet, 44 pp., 8½ x 11 ins. Illustrated. Data on "Heating Every Corner with Maximum Economy."

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

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

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

HOSPITAL EQUIPMENT

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

Holophane Company, 342 Madison Avenue, New York.
Lighting Specific for Hospitals. Booklet, 29 pp. 8½ x 11 ins. Illustrated.

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

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

Wilmot Castle Company, Rochester, N. Y.
Sterilizer Equipment for Hospitals. Book, 76 pp., 8½ x 11 ins. Illustrated. Gives important and complete data on sterilization of utensils and water, information on dressings, etc.

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

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

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

HOTEL EQUIPMENT

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

INCINERATORS

Home Incinerator Co., Milwaukee, Wis.
The Decent Way. Burn it with Gas. Brochure, 30 pp., 5¼ x 7¾ ins. inside. Illustrated. Incinerator sanitation equipment for residence use.

INCINERATORS—Continued

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

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

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

Kerner Incinerator Company, 715 E. Water St., Milwaukee, Wis.
Incinerators (Chimney-fed). Catalog No. 15 (Architect and Builders' Edition). Size 8½ x 11 ins. 16 pp. Illustrated. Describes principles and design of Kernerator Chimney-fed Incinerators for residences, apartments, hospitals, schools, apartment hotels, clubs and other buildings. Shows all standard models and gives general information and working data.

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

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

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

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

INSULATING LUMBER

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

INSULATION

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

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

Filing Folder for Pipe Covering Data. Made in accordance with A. I. A. rules.

"The Cork Lined House Makes a Comfortable Home." 5 x 7 ins. 32 pp. Illustrated.

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

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

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

JOISTS

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

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

KITCHEN EQUIPMENT

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

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

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

LABORATORY EQUIPMENT

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

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

LANTERNS

Todhunter, Arthur, 119 E. 57th St., New York.
Hand Wrought Lanterns. Booklet. 5¼ x 6¼ ins. 20 pp. Illustrated in Black and White. With price list. Lanterns appropriate for exterior and interior use, designed from old models and meeting the requirements of modern lighting.

Home of Mr. Earle W. Vinnedge, Wyoming, Ohio, insulated with 1½ inches Armstrong's Corkboard on the walls and 2 inches on the roof.

Gas Bill 42% Less in this Cork-lined House

IT is not at all unusual for a home owner to find, after he has lined his new home with Armstrong's Corkboard, that the added comfort and the fuel saving are even greater than he had been led to expect. The following letter from Mr. Earle W. Vinnedge, of Wyoming, Ohio, is a typical illustration:

"The deciding factor in my choice of your corkboard was the anticipated saving of fuel during the winter months. At the time of our discussion as to its merits, you advised that I could reasonably expect saving of about 35% in fuel costs, providing the proper type of heater was installed. This saving has been actually much greater than estimated and I find that my first winter's results represent a saving of about 42% over the average fuel used for an uninsulated house the size of mine. These results have been obtained from the Commercial Department of the Union Gas & Electric Company of Cincinnati.

"My home has been made more comfortable to live in both summer and winter and all of your statements, which were considered somewhat extravagant, have more than proved themselves."

If you haven't a copy of Armstrong's catalog and specification book in your files, send for one at once. It contains much valuable data on the use and performance of Armstrong's Corkboard in residence construction. Address Armstrong Cork & Insulation Company, 132 Twenty-fourth Street, Pittsburgh, Pa.; McGill Building, Montreal; 11 Brant Street, Toronto 2.

Armstrong's Corkboard Insulation

for the Roofs of All Kinds of Buildings

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 154*

LATH, METAL AND REINFORCING

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

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

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

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

LAUNDRY CHUTES

The Pfaudler Company, 217 Cutler Building, Rochester, N. Y.
Pfaudler Glass-Lined Steel Laundry Chutes. Booklet, 5⅝ x 7⅜ ins. 16 pp. Illustrated. A beautifully printed brochure describing in detail with architects' specifications THE PFAUDLER GLASS LINED STEEL LAUNDRY CHUTES. Contains views of installations and list of representative examples.

LAUNDRY MACHINERY

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

LIBRARY EQUIPMENT

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

LIGHTING EQUIPMENT

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

Holophane Company, Inc., 342 Madison Ave., New York.
The Lighting of Schools; A Guide to Good Practice. Booklet, 24 pp. 8½ x 11 ins. Illustrated.
Lighting Specifications for Hospitals. Brochure, 30 pp. 8½ x 11 ins. Illustrated.
Industrial Lighting. Bulletin 448A. Booklet, 24 pp. 8½ x 11 ins. Illustrated.
Holophane Catalog. Booklet, 48 pp. 8½ x 11 ins. Combination catalog and engineering data book.
The Lighting of Schools. A Guide to Good Practice. Booklet. 24 pp. 8½ x 11 ins. Illustrated.

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

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

LUMBER

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

MAIL CHUTES

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

MANTELS

Arthur Todhunter, 119 E. 57th St., New York, N. Y.
Georgian Mantels. New Booklet. 24 pp., 5¼ x 6¾ ins. A fully illustrated brochure on eighteenth century mantels. Folders give prices of mantels and illustrations and prices of fireplace equipment.

MARBLE

The Georgia Marble Company, Tate, Ga., New York Office, 1328 Broadway.
Why Georgia Marble is Better. Booklet. 3⅜ x 6 ins. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc.
Convincing Proof. 3⅜ x 6 ins. 8 pp. Classified list of buildings and memorials in which Georgia Marble has been used, with names of Architects and Sculptors.

MARBLE—Continued

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

METALS

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

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodwork. Standardized Book. 9 x 11½ ins. 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.
Better Built Homes. Vols. XV-XVIII incl. Booklet. 9 x 12 ins. 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.
Curtis Details. Booklet, 19½ x 23½ ins. 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.

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

Roddis Lumber and Veneer Co., Marshfield, Wis.
Roddis Doors. Brochure, 24 pp., 5¼ x 8½ ins. Illustrated price list of doors for various types of buildings.
Roddis Doors, Catalog G. Booklet, 183 pp., 8½ x 11 ins. Completely covers the subject of doors for interior use.
Roddis Doors for Hospitals. Brochure, 15 pp., 8½ x 11 ins. Illustrated work on hospital doors.
Roddis Doors for Hotels. Brochure, 15 pp., 8½ x 11 ins. Illustrated work on doors for hotel and apartment buildings

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

MORTAR AND CEMENT COLORS

Color Card. 6½ x 3¼ ins. Illustrates in color the ten shades in which Clinton Mortar Colors are manufactured.
Something new in Stucco. Folder, 3½ x 6 ins. An interesting folder on the use of coloring matter for stucco-coated walls.

ORNAMENTAL PLASTER

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

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

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

National Lead Company, 111 Broadway, New York, N. Y.
Handy Book on Painting. Book, 5½ x 3¼ ins. 100 pp. Gives directions and formulae for painting various surfaces of wood, plaster, metals, etc., both interior and exterior.
Red Lead in Paste Form. Booklet, 6¼ x 3½ ins. 16 pp. Illustrated. Directions and formulae for painting metals.
Came Lead. Booklet, 8¼ x 6 ins. 12 pp. Illustrated. Describes various styles of lead cames.

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

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

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

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

Valentine & Co., 456 Fourth Ave., New York.
How to Use Valspar. Illustrated booklet, 32 pp., 3¾ x 8 ins. Deals with domestic uses for Valspar.
How to Keep Your House Young. Illustrated brochure, 23 pp., 7 x 8½ ins. A useful work on the upkeep of residences.
Architectural Four-Hour Varnishes and Enamels. Booklet, 8 pp., 4½ x 6 ins. Data on a useful line of materials.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 156*

Continued from page 156

PAPER

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

PARCEL DELIVERY DEVICES

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

PARTITIONS

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

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

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

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

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

PIPE

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

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

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

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

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

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

PLASTER

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

PLUMBING EQUIPMENT

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

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

PLUMBING EQUIPMENT—Continued

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

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

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

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

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

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

Trenton Potteries Company, Trenton, N. J.
The Blue Book of Plumbing. Bound volume. 181 pp. 8½ x 10½ ins. Illustrated.

PUMPS

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

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

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

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

REFRIGERATION

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

REINFORCED CONCRETE—See also Construction, Concrete

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

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

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

ROOFING

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

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

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

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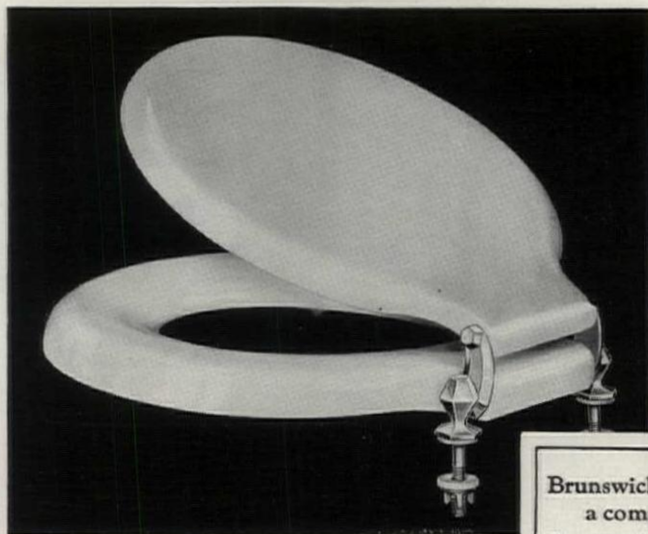

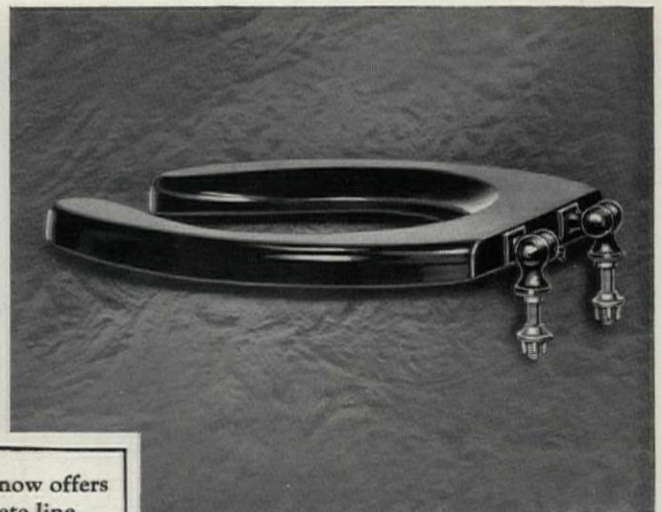

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Seat Department, 623 South Wabash Avenue, Chicago

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 158*

ROOFING—Continued

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

Structural Gypsum Corporation, Linden, N. J.
Relative Effectiveness of Various Types of Roofing Construction in Preventing Condensation of the Under Surface. Folder, 4 pp., 8¾ x 11 ins. Important data on the subject.
Gypsteel Pre-cast Fireproof Roofs. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Information regarding a valuable type of roofing.

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

SEWAGE DISPOSAL

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

SCREENS

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

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

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

SHADE CLOTH AND ROLLERS

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

SHELVING-STEEL

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Steel Shelving. Catalog E. Illustrated brochure, 40 pp., 8⅜ x 11 ins. Deals with steel cabinets, shelving, racks, doors, partitions, etc.

SOUND DEADENER

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

STEEL PRODUCTS FOR BUILDING

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

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

Steel Frame House Company, Pittsburgh. (Subsidiary of McClintic-Marshall Corp.)
Steel Framing for Dwellings. Booklet, 16 pp. 8½ x 11 ins. Illustrated.
Steel Framing for Gasoline Service Stations. Brochure, 8 pp. 8½ x 11 ins. Illustrated.
Steel Frame Standard Gasoline Service Stations. Booklet, 8 pp. 8½ x 11 ins. Illustrated. Three standard designs of stations.

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

STONE, BUILDING

Indiana Limestone Company, Bedford, Ind.
Volume 3, Series A-3. Standard Specifications for Cut Indiana Limestone work, 8½ x 11 ins. 56 pp. Containing specifications and supplementary data relating to the best methods of specifying and using this stone for all building purposes.
Vol. 1. Series B. Indiana Limestone Library. 6 x 9 ins. 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.

STONE, BUILDING—Continued

Vol. 4. Series B. Booklet. New Edition. 8½ x 11 ins. 64 pp. Illustrated. Indiana Limestone as used in Banks.
Volume 5. Series B. Indiana Limestone Library. Portfolio. 11½ x 8¾ ins. Illustrated. Describes and illustrates the use of stone for small houses with floor plans of each.
Volume 6, Series B—Indiana Limestone School and College Buildings. 8½ x 11 ins., 80 pages, illustrated.
Volume 12, Series B—Distinctive Homes of Indiana Limestone. 8½ x 11 ins., 48 pages, illustrated.
Old Gothic Random Ashlar. 8½ x 11 ins., 16 pages. Illustrated.

STORE FRONTS

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

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

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

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

TERRA COTTA

National Terra Cotta Society, 19 West 44th St., New York, N. Y.
Standard Specifications for the Manufacture, Furnishing and Setting of Terra Cotta. Brochure. 8½ x 11 ins. 12 pp. Complete Specification, Glossary of Terms Relating to Terra Cotta and Short Form Specification for incorporating in Architects' Specification.
Color in Architecture. Revised. Edition. Permanently bound volume, 9⅜ x 12¼ ins., containing a treatise upon the basic principles of color in architectural design, illustrating early European and modern American examples. Excellent illustrations in color.
Present Day Schools. 8½ x 11 ins. 32 pp. Illustrating 42 examples of school architecture with article upon school building design by James O. Betelle, A. I. A.
Better Banks. 8½ x 11 ins. 32 pp. Illustrating many banking buildings in terra cotta with an article on its use in bank design by Alfred C. Bossom, Architect.

TILE, HOLLOW

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

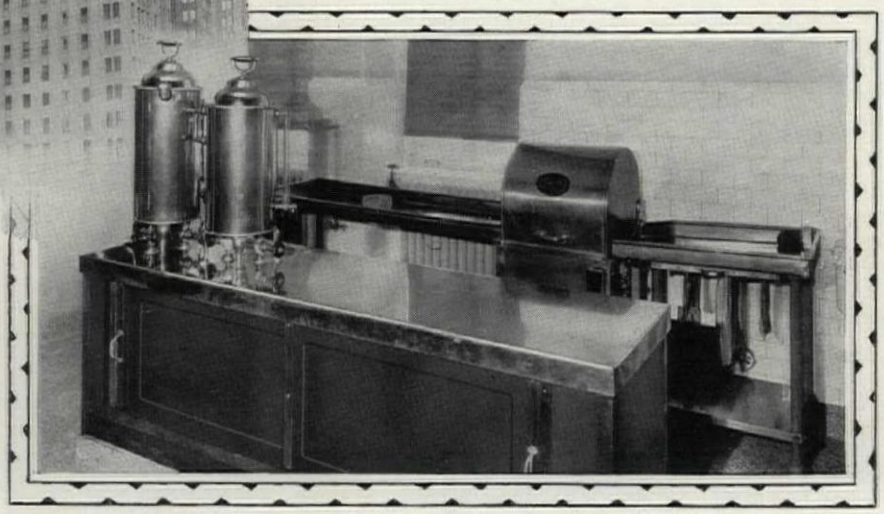
TILES

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

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

Medical Center

NEW YORK



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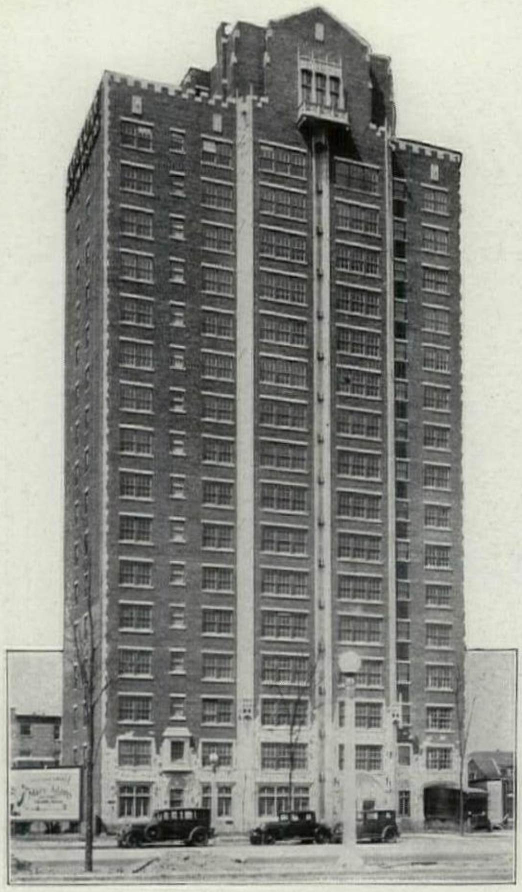

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 160*

VALVES

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

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

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

VENETIAN BLINDS

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

VENTILATION

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

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

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

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

WATERPROOFING

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

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

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

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

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

WEATHER STRIPS

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

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Dallas, Tex.	New York, N. Y.	Pittsburgh, Pa.	Seattle, Wash.

Export Distributors:
For Australasia—Automatic Telephones, Ltd., Sydney
For Canada—Independent Sales & Engineering Co., Ltd., Vancouver
Elsewhere—Automatic Electric Company, Ltd., Chicago

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

WINDOWS

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

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Pivoted Sash. Catalog 12-A. Booklet, 48 pp., 8⅜ x 11 ins. Illustrates and describes windows suitable for manufacturing buildings.

WINDOWS, CASEMENT

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

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

Hope & Sons, Henry, 103 Park Ave., New York, N. Y.
Catalog. 12¾ x 18½ ins. 30 pp. Illustrated. Full size details of outward and inward opening casements.

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

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Casement of Copper Steel. Catalog C-217. Booklet, 20 pp. 8⅜ x 11 ins. Illustrated brochure on casements, particularly for residences.
Lupton Heavy Casements. Detail Sheet No. 101, 4 pp., 8½ x 11 ins. Details and specifications only.

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

WINDOW SHADES AND ROLLERS

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

WINDOWS, STEEL AND BRONZE

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

David Lupton's Sons Company, Philadelphia, Pa.
A Rain-shed and Ventilator of Glass and Steel. Pamphlet, 4 pp., 8⅜ x 11 ins. Deals with Pond Continuous Sash. Sawtooth Roofs, etc.
How Windows Can Make Better Homes. Booklet. 3⅞ x 7 ins. 12 pp. An attractive and helpful illustrated publication on use of steel casements for domestic buildings.

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

WOOD—See also Millwork

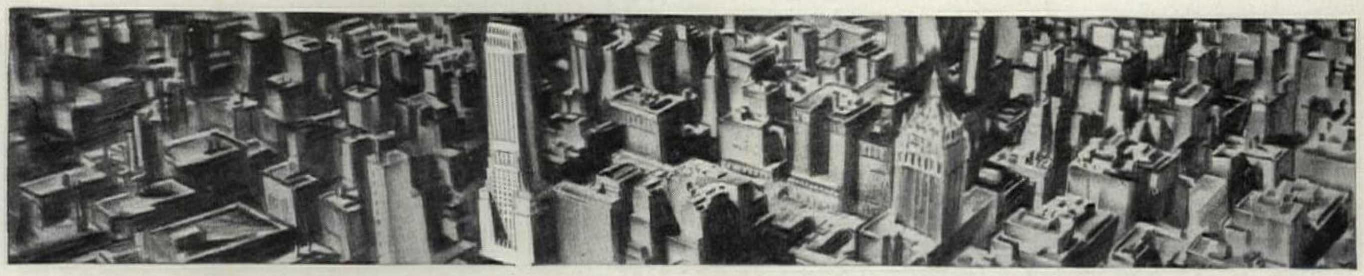
American Walnut Mfrs. Association, 618 So. Michigan Blvd., Chicago, Ill.
American Walnut. Booklet. 7 x 9 ins. 45 pp. Illustrated. A very useful and interesting little book on the use of Walnut in Fine Furniture with illustrations of pieces by the most notable furniture makers from the time of the Renaissance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

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

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

Dominating the sky-line of New York's Grand Central Zone, the new 56-story $12,000,000 Chanin Building brings another Barrett Roof to a neighborhood in which *these* roofs are conspicuously numerous. This picture shows many of the best known structures in this famous area—roofed and protected by *Barrett:*

GRAYBAR BUILDING · PERSHING SQUARE BUILDING · NEW YORK CENTRAL BUILDING · FRENCH BUILDING · HOTEL COMMODORE · HOTEL ROOSEVELT · HOTEL BELMONT · HOTEL BILTMORE · YALE CLUB · CANADIAN PACIFIC BUILDING · NATIONAL CITY BANK



Another towering tribute to Barrett Specification Roofs

NOSING 670 feet upward into the thinner atmospheres, the great shaft-like Chanin Building, topped with a Barrett Specification Roof, takes its rank as New York's third loftiest skyscraper—and the Chanin brothers' most outstanding achievement.

Standards in architecture have changed. But *one* standard, a roofing practice of leading architects for many years, continues to *carry on.*

Just as the other two members of the "big three"—the 792 foot Woolworth Building (1913) and the Metropolitan Life Building (1890), with its 700-foot tower—are protected by Barrett Roofs, so too will this *newest* comer depend on Barrett Coal-Tar Pitch and Felt and gravel—*a Barrett Specification 20-Year Bonded Roof.* A roof that guarantees the owner against repair and upkeep expense for a full 20 years.*

The owners and architects chose a Barrett Specification Roof, which was approved by the investment bankers, S. W. Straus & Co. For they *knew* the records of this roof—they knew that Barrett Specification Roofs, though bonded only for 20 years, are still serving hundreds of old-timers, buildings erected way back in the *70's* and *80's*—still "licking" the weather and defeating expense.

This knowledge, together with the high reputation of Barrett Approved Roofers, cooperating on every job with Barrett inspectors, checking every step of the work, is responsible for this newest Barrett application in a neighborhood of *many* Barrett Roofs.

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

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IN CANADA:

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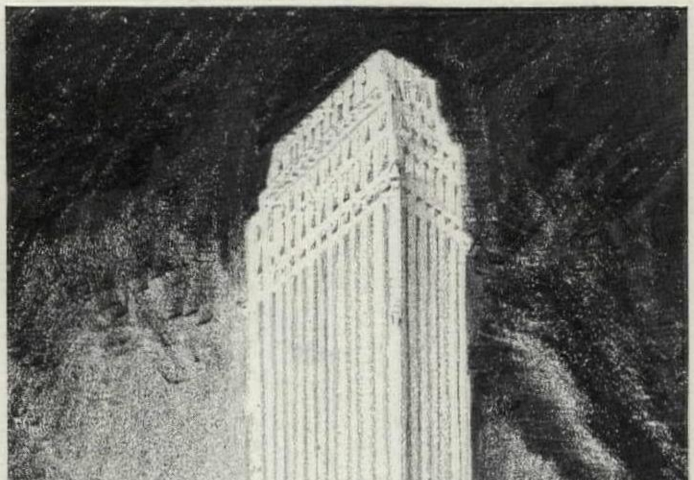
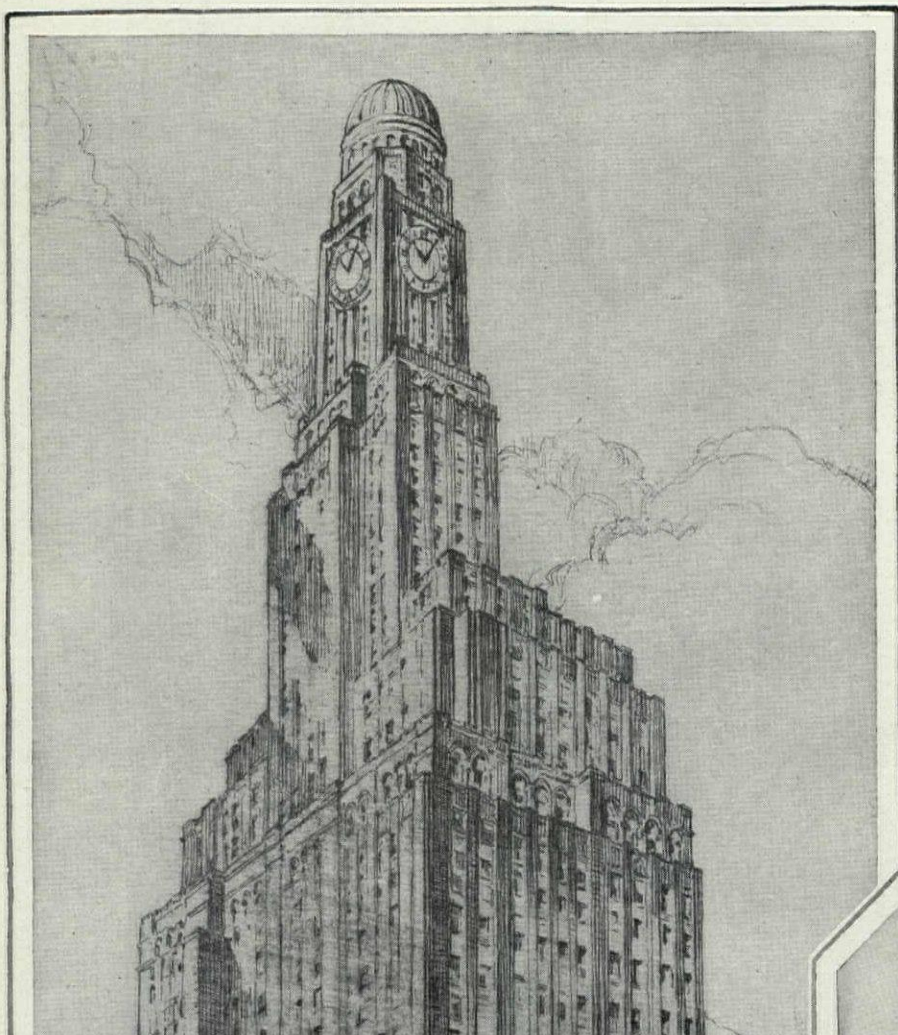


The Chanin Building (42nd St. at Lexington Ave.), New York City, is protected by a Barrett Specification Roof. Architects: Sloan & Robertson; Engineers, Builders and Owners: Chanin Construction Co., Inc.; Roofers: Sobel & Kraus, Inc. All of New York City.

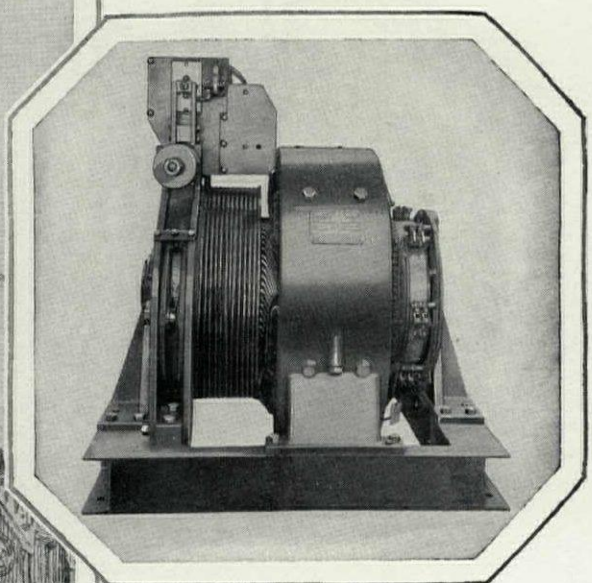


4

Williamsburg Savings Bank Building, Brooklyn, N.Y. Elevator equipment supplied by Gurney Elevator Company

Architects—Halsey, McCormack & Helmer

Consulting Engineer—Frank Sutton



G-E gearless elevator motor

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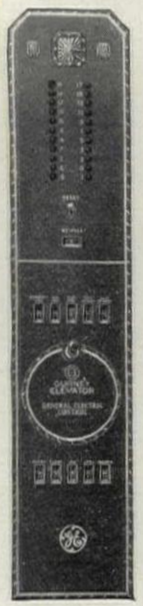

Automatic Leveling

The car switch and car push buttons shown here are essential parts of the G-E automatic elevator control system with the G-E Leveler—a distinct contribution to elevator operation.

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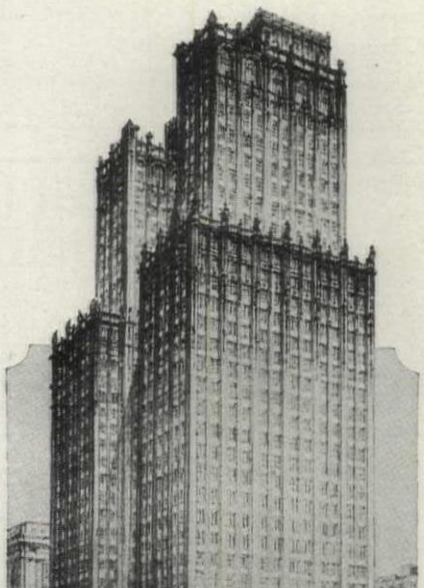

Grant Building, Henry Hornbostel, Architect Thompson Starrett Co., Contractors

IN Pittsburgh's Golden Triangle, so called because of this city's concentrated business district at the point where the Allegheny and Monongahela rivers form the Ohio, business expansion has necessitated the erection of a number of buildings which are outstanding examples of modern construction and equipment. With heights ranging up to forty stories, these buildings must have elevator service as modern as the structures themselves.

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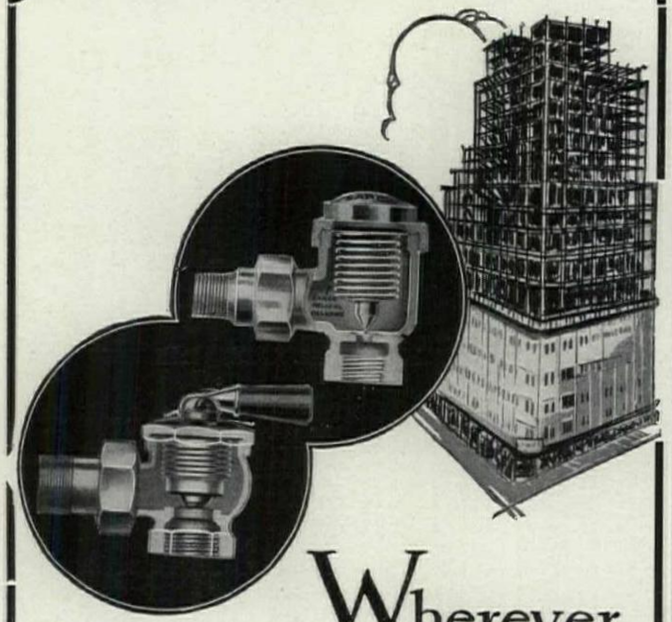

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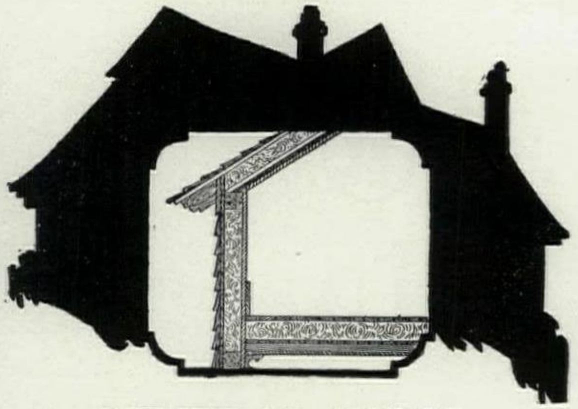

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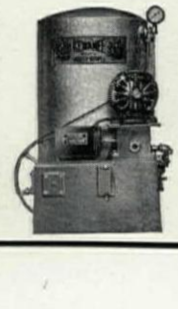
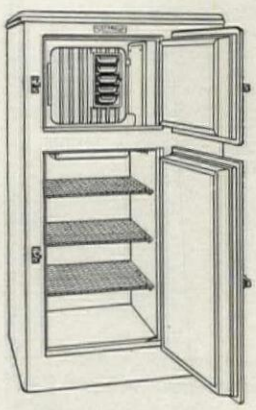


ELECTROLUX VINDICATES *the* ARCHITECT'S JUDGMENT

Fred Anderson Apartments on Judson Avenue, Evanston, Illinois. Equipped with Electrolux Refrigerators.

Read why this architect chose the Gas Refrigerator as ideal for apartment house installation



Chef Model Electrolux... 7 cubic feet food space. This convenient size is installed in the new apartment dwelling pictured above.

ELECTROLUX vindicates the architect's judgment in selecting it. The gas refrigerator makes apartments easier to rent. The economy of gas is well known, and the total absence of moving parts in Electrolux insures absolute silence, long life and freedom from servicing.

That's why the architect of this handsome new apartment dwelling in Evanston, Illinois, chose Electrolux.

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This amazing refrigerator freezes by the heat from a tiny gas flame. It has no moving, wearing parts . . . no motor, compressor, pump, fan, belt . . . nothing to need oiling or replacement. Engineers see no reason why Electrolux should ever wear out . . . why it should not last as long as the building. The freezing unit is hermetically sealed at the factory and never needs renewal or replacement.

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The Electrolux cabinet is worthy of the unit it contains. It is an expression of the finest workmanship with materials of the highest quality. We are confident that Electrolux cabinet construction will pass your most minute technical scrutiny.

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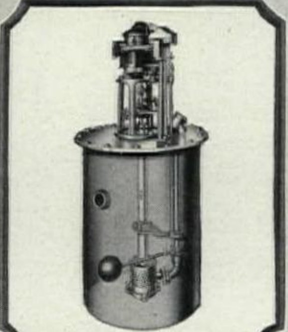

Fig. NGR-2001. "Weil" Type NRG Condensation Pump and Receiver. Occupies small space. Concrete pit unnecessary.

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INCINOR solves the garbage problem. INCINOR banishes the dirty, disease-ridden garbage can. INCINOR gets rid of the dangerous, fire-hazard accumulation of waste papers, rubbish and trash.

Burns all garbage, rubbish, trash—quickly, completely, cheaply—*with gas*. Reduces bushels at a time to a handful of clean, sterilized ash.

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HOME INCINERATOR CO.
Security Building
Milwaukee, Wisconsin

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BURN IT WITH GAS — THE DECENT WAY

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Security Building, Milwaukee, Wisconsin
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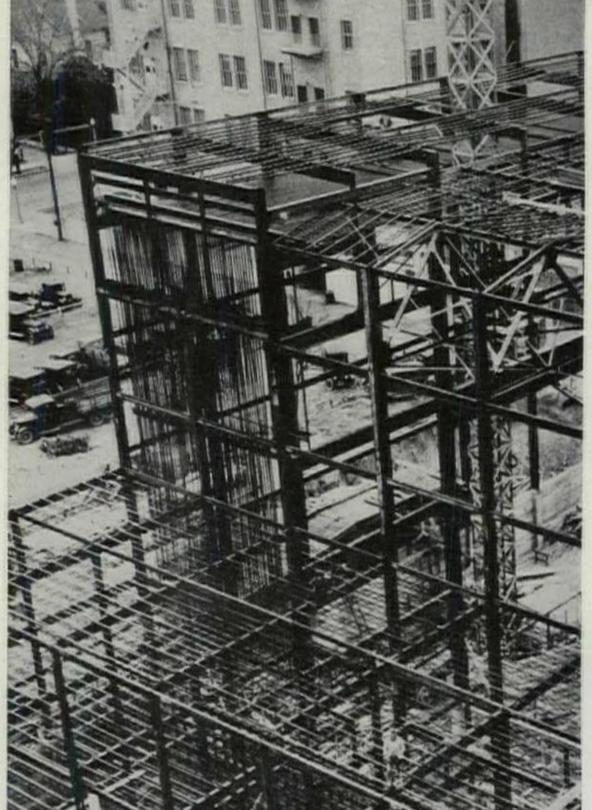

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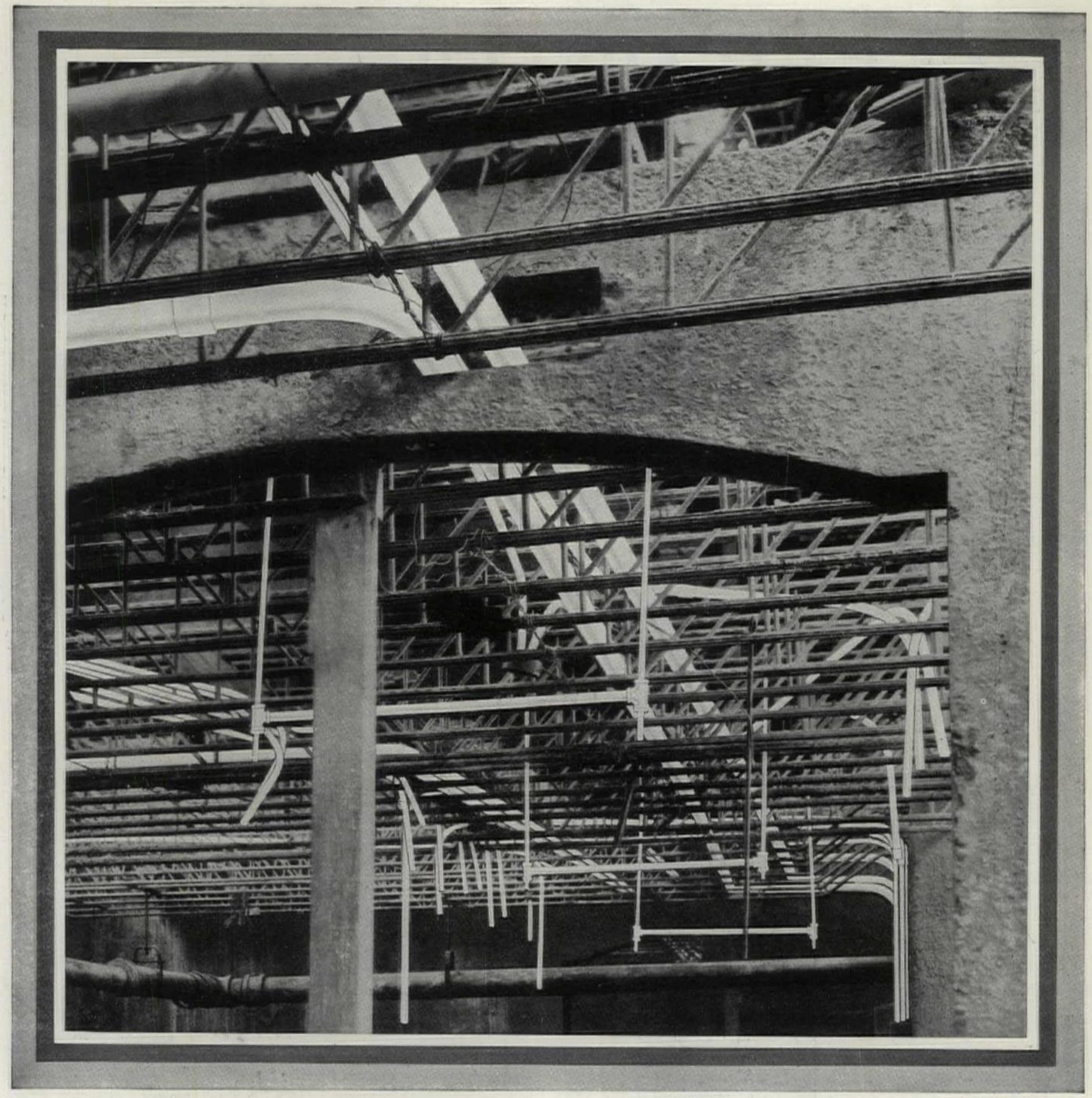

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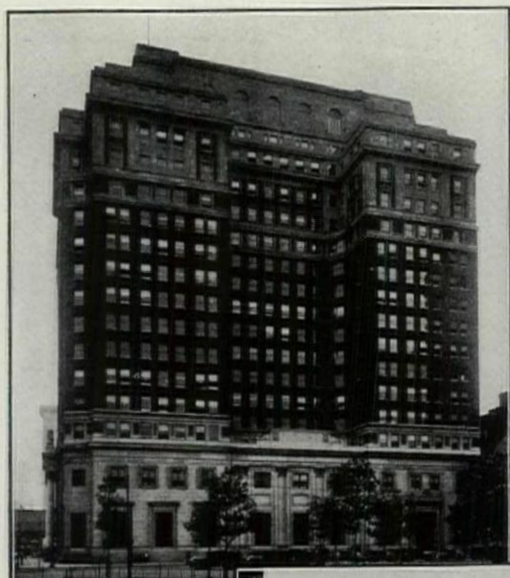

Above: Insurance Company of North America Building

Right: Mitten Building and Fox Locust Theatre

Below: Liberty Title and Trust Company Building

Above: Hahnemann Hospital Annex

Right: Packard Building

With the introduction recently of the new 33- and 36-inch Wide-Flange Structural Shapes, Bethlehem broadened the utility of this line of famous Sections.

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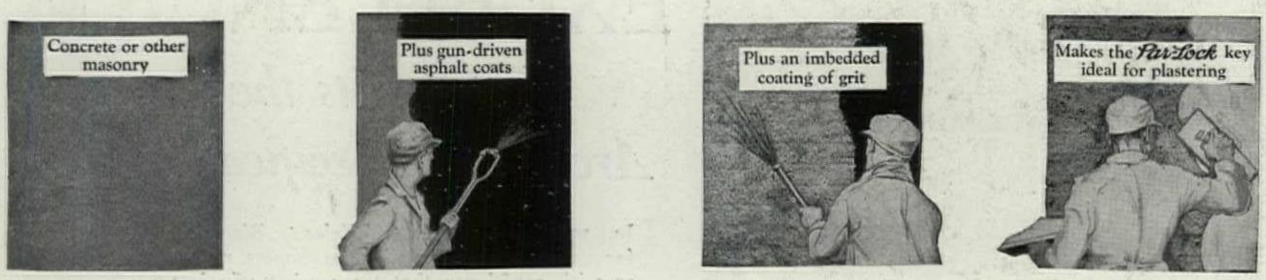

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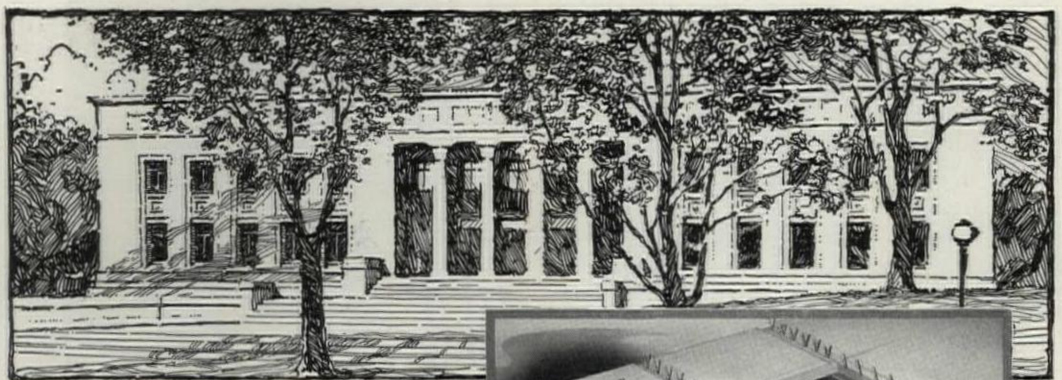
BUFFALO, 958 Ellicott Square Bldg.
CHICAGO, 111 West Monroe Street
CLEVELAND, 218 Hunkin-Conkey Bldg.
COLUMBUS, 751 South Cassingham Rd.
DETROIT, 2457 First National Bldg.
KANSAS CITY, MO. 2035 East 19th Street

Par-Lock Appliers

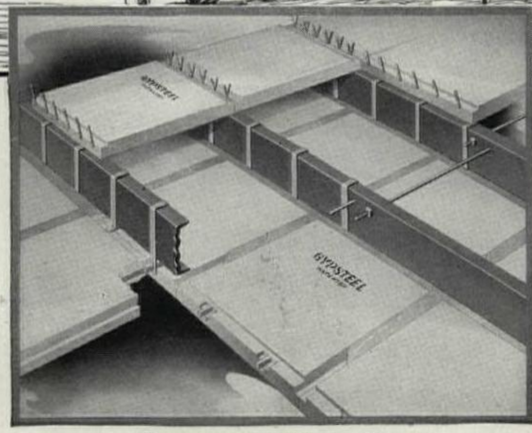
MINNEAPOLIS, 434 Builders Exchange
NEW YORK CITY, 50 Church Street
PHILADELPHIA, 1700 Walnut Street
PITTSBURGH, 614 Bessemer Building
SCRANTON, PENNA. Cedar Avenue
ST. LOUIS 1011 Telephone Building
TORONTO, 2258a Bloor Street, West
TRENTON, 339 Broad St. Bank Bldg.
YOUNGSTOWN, 503 City Bank Building
WILKES-BARRE, PA. 904 Second Nat'l Bank Building

P-27

THE VORTEX MANUFACTURING COMPANY · *1984 West 77th Street, Cleveland, Ohio*



Buffalo Museum of Science, Buffalo, N.Y.
Esenwein & Johnson, Architects
Felton Construction Co., General Contractors
Gypsteel Pre-cast floors and ceilings throughout



Shows how ceiling slabs are suspended from beams by sturdy hangers

They Saved $12,000 *Over Cost of* Concrete Floors

When The Bids Came In
Gypsteel floors saved $12,000.

When Erection Started
floors grew with magic speed. No form work needed. Factory made slabs reached the job dry, ready to erect.

When The Blizzard Came
all other work stopped, but the laying of Gypsteel floors went on regardless.

When Ceiling Slabs Were Hung
they were ready for plaster. No forms to drop. No wait for drying out. No plaster *scratch* cost required.

When They Finished The Floors And Ceilings
the work was two and a half months ahead of schedule. A dry job. *A fast job.* A winter job.

A Flat Ceiling Job
A thoroughly fire-proof construction. $12,000 in money and two and a half months in time saved, because the architects knew about Gypsteel.

NOTE THIS

Sweets has four pages on Gypsteel.

For smooth architectural ceilings. use Gypsteel Pre-cast Floors.

If showing of beams no objection, use Gypsteel Poured-in-place Floors.

For light weight fire-proof roofs, Gypsteel 30 in. or long span Precast Slabs.

For sound-and fire-proof partitions, Gypsteel Hollow Partition Tile.

Motor truck deliveries to New York District from Linden, N. J. factory; to Buffalo District from Akron, N. Y. factory.

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GYPSTEEL

Library in the Office of The Architectural Forum, New York

You are invited to use the offices of

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as headquarters when you visit New York

Here will be found such practical conveniences as telephone and stenographic service, an adequate architectural library, and in fact many of the dozen and one things which may contribute to the pleasure and profit of a sojourn in New York.

THE ARCHITECTURAL FORUM, 383 Madison Avenue


Quiet Offices
THE usual noises in many offices are being reduced by the use of INSULITE—the all-wood-fiber insulating board.
For acoustical correction in large and small offices—in churches, theatres, lodge halls, and other places where sound control is so important—its use is proving eminently successful.
The illustration shows a private office of the Pennsylvania Petroleum Co., North Kansas City, Mo. The result here is that noises are not reflected from walls and ceiling. Moreover, the effect is very pleasing to the eye.
This installation was made by Smith Wood-Products, Inc., North Kansas City. The INSULITE was applied directly over plastered walls and ceiling through the use of brads and waterproof cement.
Specifications or recommendations on the use of INSULITE for any acoustical problem will be gladly given.
INSULITE
the Wood-Fiber Insulating Board
THE INSULITE COMPANY
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MINNEAPOLIS
MINN.

Rigid Skeleton Cuts Wind Sway

The construction of the Sharp Building, Lincoln, Nebraska, is very interesting. (Frame, reinforced concrete. Height, 16 stories. First floor area, 14,200 square feet.)

The *reinforced concrete frame* is so rigid, it withstands wind stresses that usually would crack brickwork and terra-cotta. From the 2nd to the 11th floors, steel reinforcing was increased in beams, spandrels and joists to allow for wind stresses. And a rich concrete was used. No extra provision was necessary for wind stresses above the 11th floor.

By using the maximum percentage of steel and spirals, the column sizes were held down. (Largest interior column, first floor, 32 inches square.)

Since the builders knew that reinforced concrete assures: strength, economy, speed, permanence, beauty —nothing but reinforced concrete was considered for this office building, the tallest concrete frame construction in Nebraska.

Architects:
Joseph G. McArthur
Omaha, Nebraska.

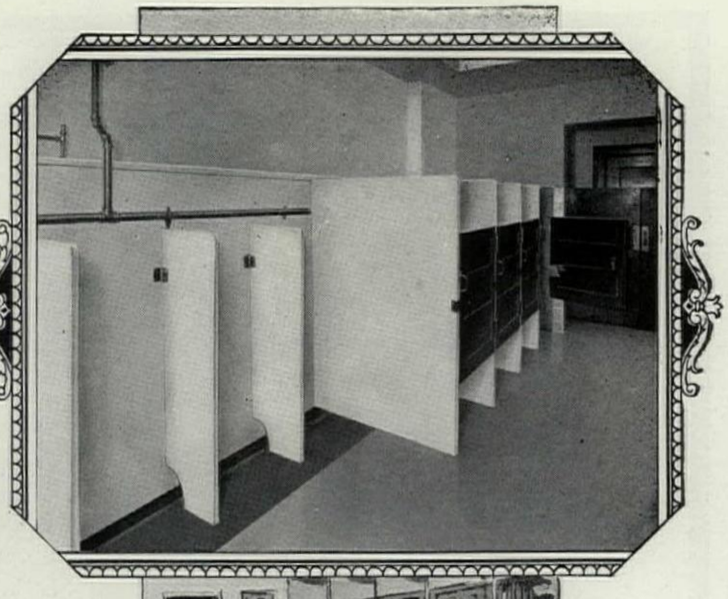
Contractors:
Selden-Breck Construction Co.
St. Louis and Omaha.

REINFORCED CONCRETE

Concrete Reinforcing Steel Institute
Tribune Tower
Chicago

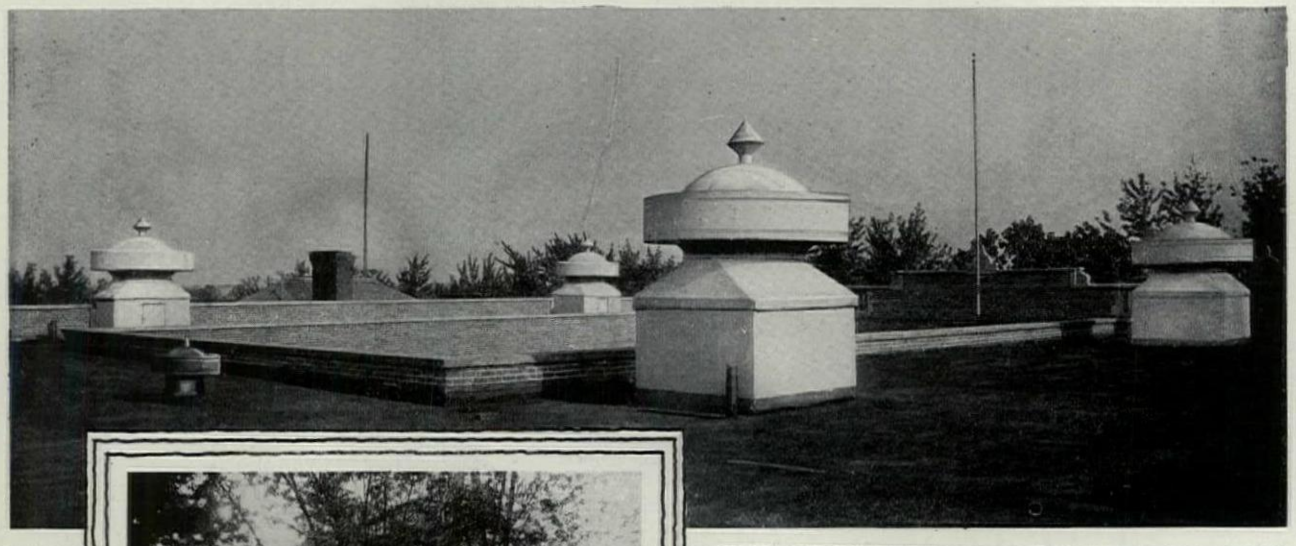
Rail Steel Bar Association
Builders Building
Chicago

PERMANENTLY SANITARY



With Alberene Stone—and only with Alberene Stone—it is possible to make assemblies of sanitary work with tongue-and-groove, bolted-and-cemented joints which will never open up. This, coupled with the non-absorbent quality of the stone, makes Alberene Stone Toilets and Urinals permanently sanitary, with no lodgment for filth or germs. *Write Alberene Stone Company, 153 West 23rd Street, New York for description details and specifications.*

ALBERENE STONE



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

PURE AIR FOR SCHOOLS

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

GLOBE VENTILATOR CO.

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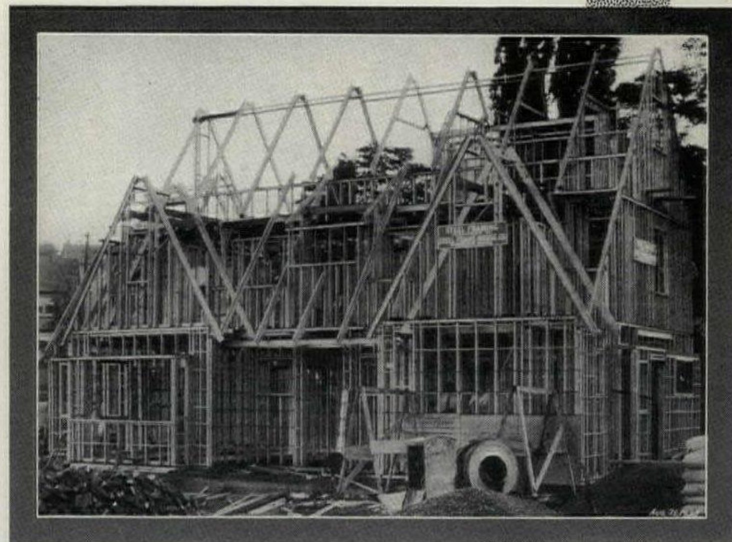
- it's here -



A practical and economical system for framing houses with steel

HERE at last, is the simple, practical system of steel house framing for which every progressive architect and building contractor in the country has been looking for many years—a system that makes the modern house truly firesafe, stormsafe and at a cost comparable to ordinary wood construction.

The complete steel frame is fabricated at the mill and delivered to the job site ready to erect with the use of ordinary tools. The wrench takes the place of the hammer and saw with this construction. Any competent building craftsman can assemble and erect a "STEEL FRAME HOUSE"—no specialized skill is required.

STEEL FRAME HOUSE COMPANY

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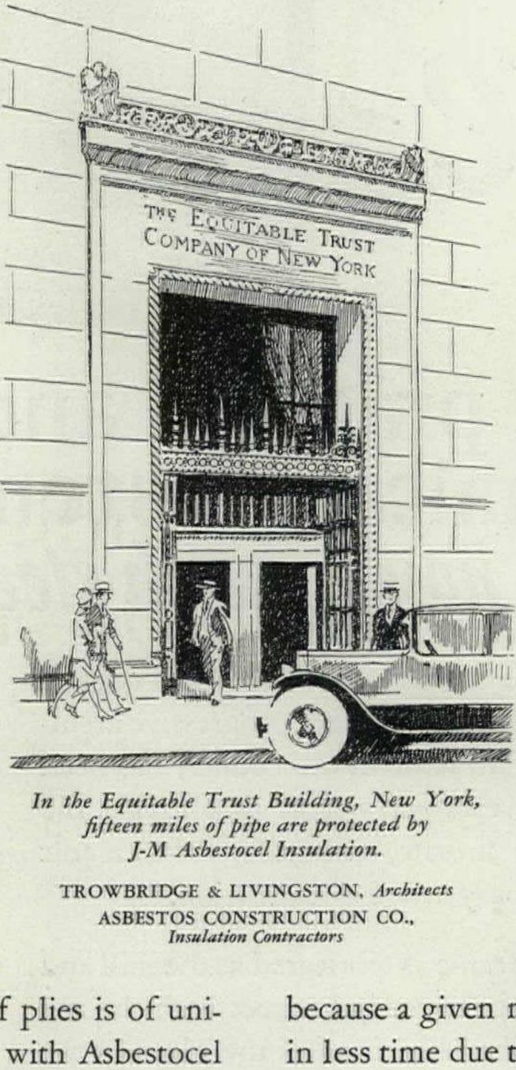
INVESTIGATE

this modern method of house construction. Send for our booklet "Steel Framing for Dwellings"

STEEL FRAMING

THE MODERN METHOD OF HOUSE CONSTRUCTION

WHEN PIPE INSULATION IS BOUGHT BY THE MILE



In the Equitable Trust Building, New York, fifteen miles of pipe are protected by J-M Asbestocel Insulation.

TROWBRIDGE & LIVINGSTON, *Architects*
ASBESTOS CONSTRUCTION CO., *Insulation Contractors*

ASBESTOCEL, the nationally standardized covering for heating pipes, meets your specifications exactly regardless of the size or location of the building. Manufactured to definite standards and distributed throughout the country, it is always obtainable and always satisfactory.

This is important in buildings of great size where steam travels long distances to radiators. It is also important when appearance has to be considered. Asbestocel is uniformly circular. All Asbestocel of the same number of plies is of uniform diameter. Pipes covered with Asbestocel have a neat, clean-cut appearance, which avoids the irregularities of ordinary air cell. In fact, a pipe covered with Asbestocel may be left in view when ordinary air cell would result in an unsightly effect undesirable even in a cellar.

The efficiency of Asbestocel is higher than that of other insulations of this type. This is due to the cross corrugations, to the precision used in manufacture, and to the uniform quality of the materials used. Actual tests have conclusively proved that this improved construction provides an insulating material which is fully 15% more efficient than air cell. Such a percentage means important savings in the operation of large buildings.

Contractors like to work with Improved Asbestocel because a given number of feet can be applied in less time due to its uniform lengths and perfectly circular construction. We are always glad to confer or correspond with architects about pipe insulation for large buildings, or for small houses. *Address Architects' Service, Johns-Manville Corporation, 292 Madison Avenue, New York City.*

MASTER *of* ASBESTOS
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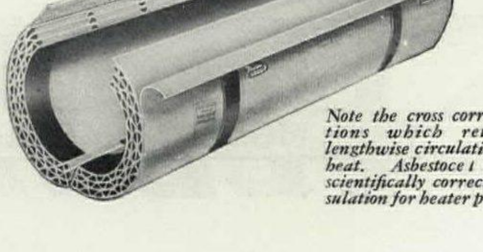
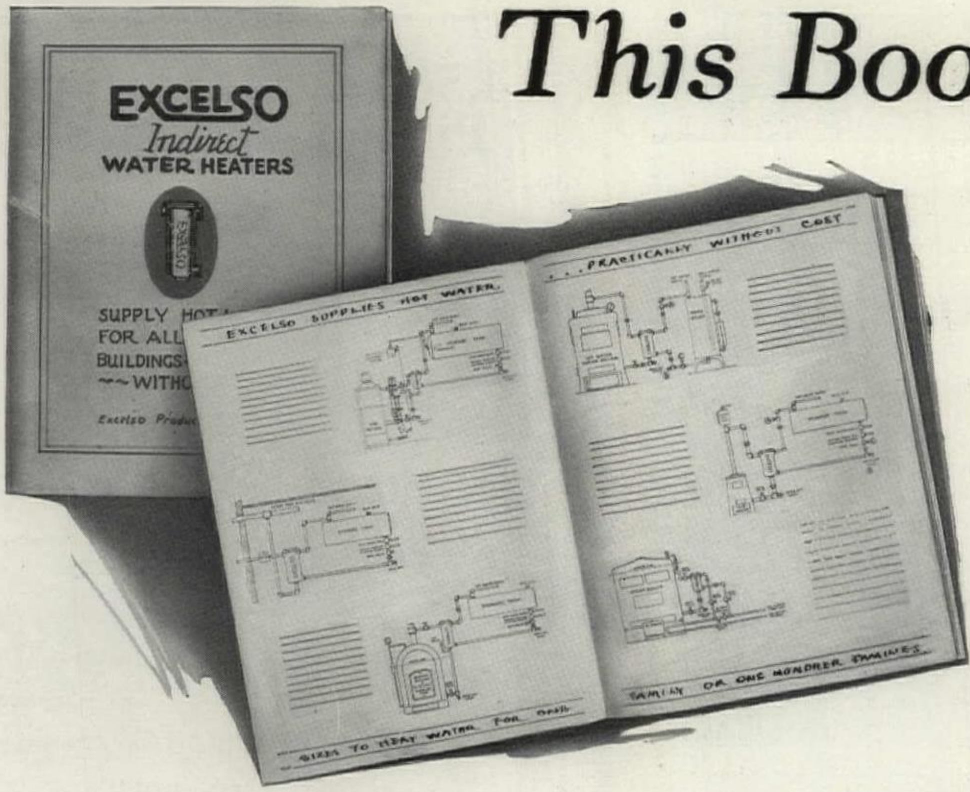
IMPROVED ASBESTOCEL PIPE INSULATION



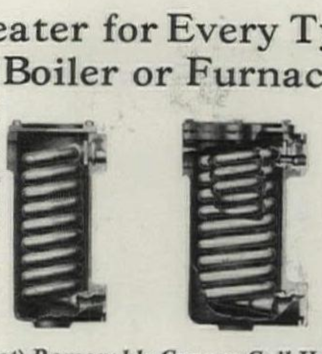
Note the cross corrugations which retard lengthwise circulation of heat. Asbestocel is a scientifically correct insulation for heater pipes.

This Book –

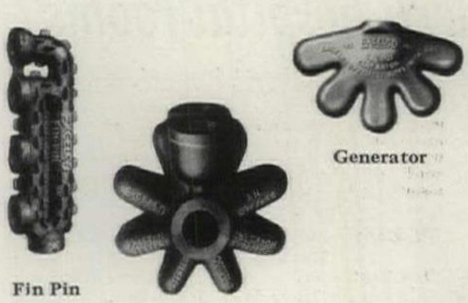


...Shows 14 Tested Indirect Hot Water Heater Installations

A Heater for Every Type of Boiler or Furnace



(Indirect) Removable Copper Coil Heaters for Steam or Vapor



Fin Pin

Phaeton

Generator

(Direct) Brass or Iron Heaters for Hot Water Boilers or Furnaces

also gives helpful tables of water heater, tank and fixture capacities; and other information for those specifying the plumbing and heating details in residences, apartments, hotels, offices, etc.

If your file—A. I. A. 29-d—does not already contain this useful book, just write "Send me free copy of the new Excelso catalog" —and get in quick, concise form the story of the modern way to heat the domestic supply of water *without* the care and cost of separate fire and fuel.

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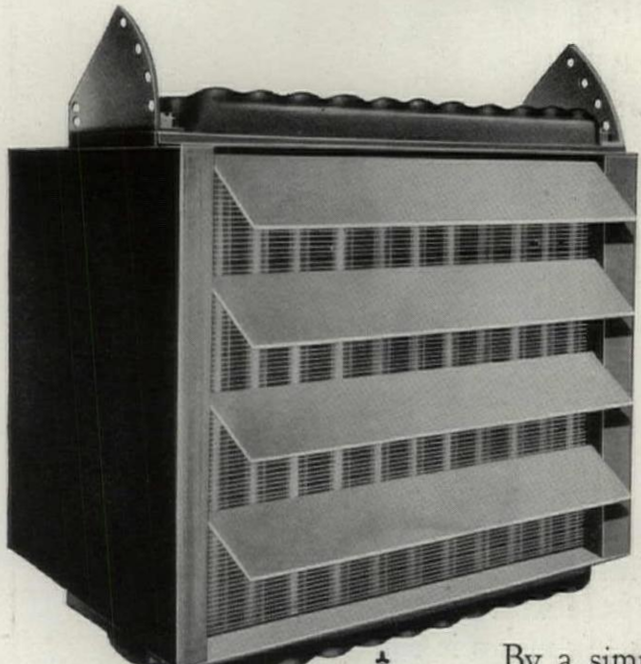
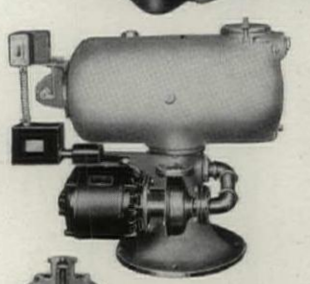
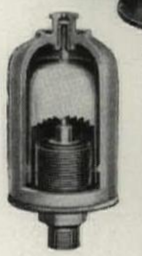


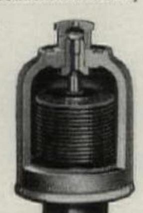
Complete Trane Unit Heating System Saves 40% to 50% on First Cost — and Provides Features Worth the Highest Price in the Market . . . .



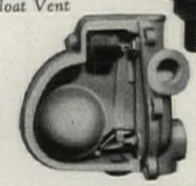
Condensation Pump



Float Vent



Quick Vent



Float Drip Trap

Heat Cabinet

By a simple change in design, Trane engineers have increased the capacity of high-grade Trane Unit Heaters 20% to 40%, retaining all the former advantages which put them in the front rank of sales in less than a year. Trane Unit Heaters now cost 40% to 50% less than equivalent cast iron radiation—about the same amount of money as the lowest priced heaters in the field.

The new Trane unit is built for severe service. Copper steam tubes flared and rolled into a cast iron header, in typical boiler fashion. Positively can't leak from expansion and contraction. Standard units guaranteed for 150 lbs. working pressure.

For best results, equip Trane Unit Heaters with Trane accessories and get a complete system from one manufacturer. Investigate Trane Float Drip Traps which enable heaters to deliver their full capacity—the Trane Quick Vent and Float Vent—Trane Condensation Pumps, providing at least 25% saving on power cost in the new, compact model. Ask us about Trane Heat Cabinets for office heating. Mail the coupon.

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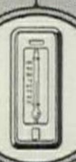

A Hospital In Washington D. C. Issued This Statement:

"The Johnson System Of Temperature Regulation installed at this hospital six years ago has met with our entire satisfaction and we do not hesitate to recommend it most highly.

"It is very desirable that the temperature of the rooms be kept as nearly constant as possible and it is also often necessary to maintain several rooms at different temperatures. The ease with which the Johnson System accomplishes this makes it one of the most valuable adjuncts to our heating plant.

"Another feature of the System is that it helps to lighten the duties of the nurses, who are relieved of watching room thermometers and the labor of turning on and off the radiator valves.

"The saving which the temperature regulation system effects in our coal bill by shutting off radiator valves when the rooms are at the right temperature and preventing them from overheating gives us a very profitable return."

JOHNSON HEAT CONTROL IN HOSPITALS

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AUTOMATIC TEMPERATURE REGULATION SINCE 1885
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The Dunham Differential Vacuum Heating System

is now being installed in the new Milwaukee County General Hospital Wauwatosa, Wis.

U. S. Patent No. 1644114 Additional Patents in the United States, Canada and Foreign Countries now pending.

Architects:
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Milwaukee
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Heating Contractor:
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IN the magnificent new Milwaukee County General Hospital at Wauwatosa, Wisconsin, a Dunham Differential Vacuum Heating System is being installed in the buildings which will be completed early in 1929. There will be 69,925 sq. ft. of equivalent direct radiation.

The Differential System will provide an abundance of mild comforting warmth throughout all of the rooms of this great hospital, never overheating yet always sufficient for even the coldest days of the most severe winter weather. This will be accomplished without the drying out of the air — a factor of vital importance in hospital heating — and made possible in the Differential System because there is no overexpansion of the air within the rooms due to overheating. As only sufficient heat is supplied by the radiators to compensate for heat losses from the building, the temperature of the steam being controlled to achieve this end, marked fuel economies result.

We invite inquiries from Architects and Engineers regarding the application of the Differential System to hospital projects, and will gladly supply heating cost records and other data upon request.

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Strong Memorial Hospital, Rochester, N. Y. Gordon & Kaelber, Architects

Beth Israel Hospital, New York, N. Y
Louis Allen Abramson, Architect

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Why build an expensive hospital, with provision for complete sanitation in every respect except the method of cleaning?

The Spencer System

does not raise dust and stir up germ-laden air—it sucks all dirt, dust and air out of the room—to a container in the basement—and then the exhaust air goes up the chimney flue.

Any surface—bedding—walls—floors of any kind are quickly cleaned by a stroke of the light weight vacuum tools. No noise—no lost time—no chance for the spread of dirt, dust, or germ-laden material.

Data for Architects

Many leading architects endorse the Spencer System for hospitals. Its use in more than 10,000 buildings has resulted in a fund of valuable data. A letter concerning your projects will bring information of value to you.

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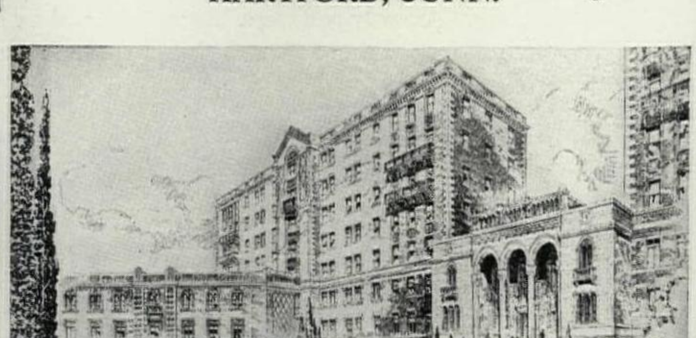
Central Cleaning Systems
HARTFORD, CONN. 3031

Passavant Hospital, Chicago, Ill. Holabird & Root, Architects

Bellevue Hospital, New York, N.Y. McKim, Mead & White, Archts.



Beth Israel Hospital, Boston, Mass. Densmore, LeClear & Robbins Archts.

Fine hotels *must* have the finest of heating equipment

St. Francis Hotel, San Francisco,—comfortably, economically heated with Johnson Oil Burners—also uses Johnson oil burning equipment in its kitchen. Where comfort and efficiency is paramount you find Johnson installations.

NO OTHER factor is so important to comfort as proper heating. Great hotels, specializing in "comfort," *must* select heating equipment wisely.

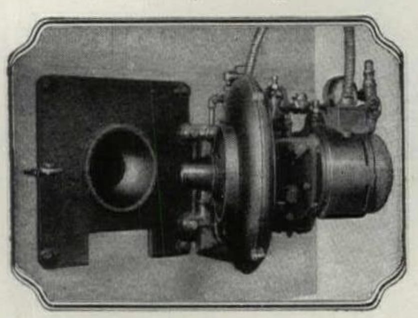
San Francisco's famed hotel, The St. Francis, solved its heating problem with the selection of Johnson Oil Burners.

And this preference for Johnson oil burning equipment extends from coast to coast. In small homes, large buildings, factories and industrial plants Johnson Oil Burners are giving trouble-free, dependable, economical service. There is a size and type for every heating and power requirement.

You can recommend and use Johnson Oil Burners with the assurance that they will give enduring satisfaction day in and day out, year after year.

For behind every Johnson Burner lies the experience of more than 23 years in the exclusive manufacture of oil burning equipment. Scientific and precision methods of manufacture have won for Johnson Burners the world's highest award.*

The accumulated data of these 23 years is available to you. Our Engineering Department will welcome the opportunity of assisting you in the solution of your heating or power problems.



**Awarded Gold Medal, Sesqui-Centennial Exposition, Philadelphia, 1926, for "Excellence of workmanship and completeness of design."*

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Johnson Rotary Burners, with either manual, semi-automatic or full automatic control, are made in three styles and six sizes—giving a range of from 250 to 27,800 square feet of steam radiation or the equivalent. We also manufacture natural draft, whirlwind, low pressure air and steam atomizing oil burners; also electric and steam driven oil pumping and preheating equipment.

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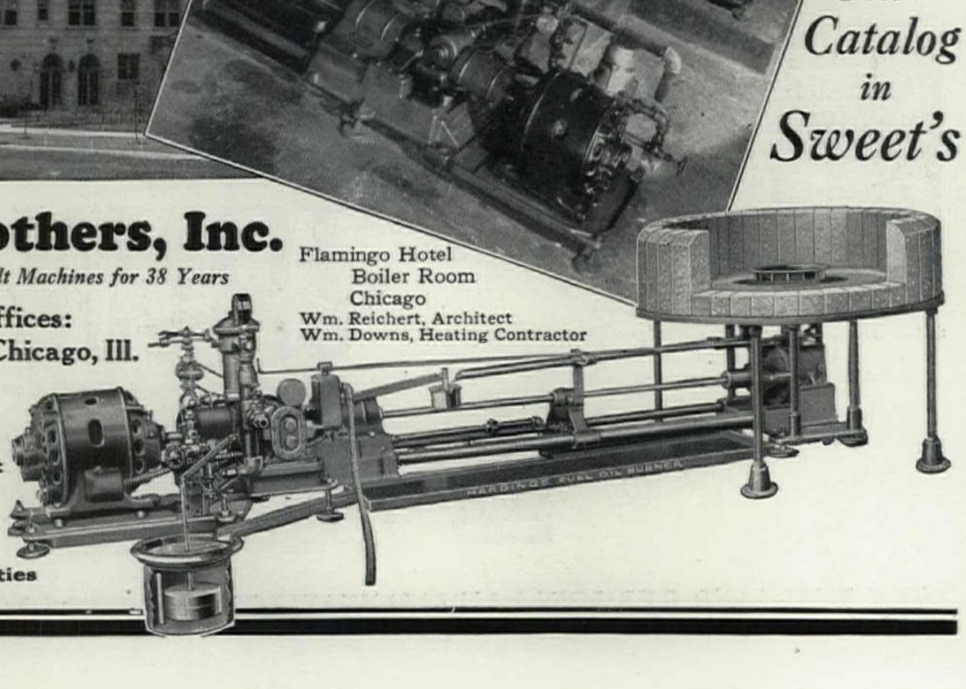
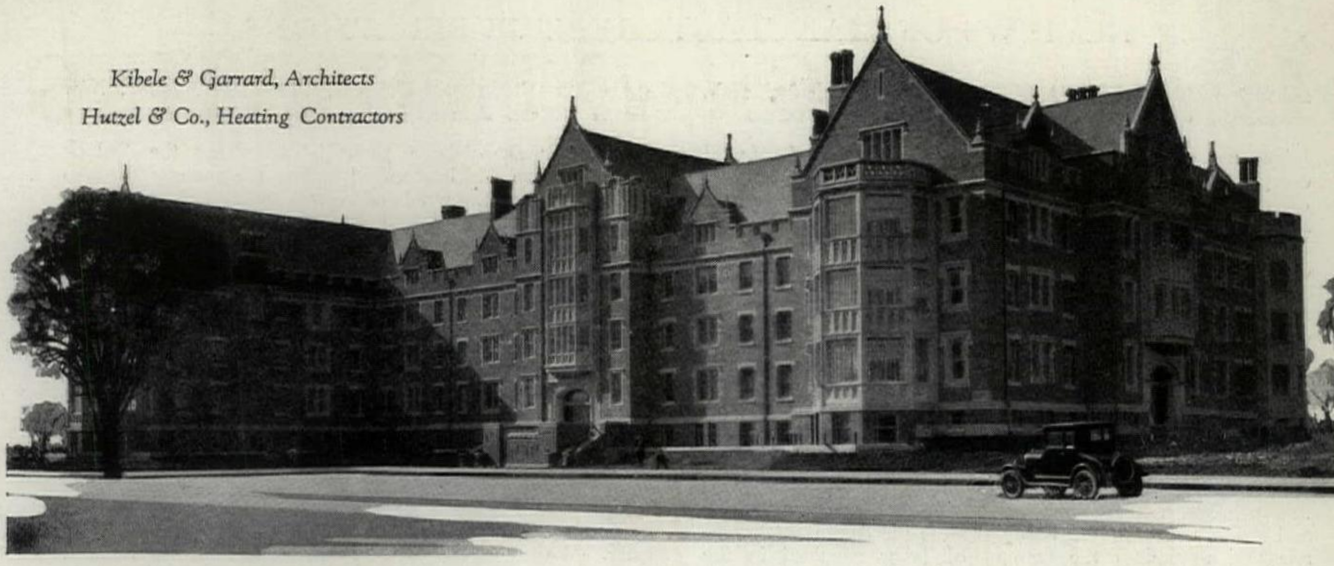


Kibele & Garrard, Architects
Hutzel & Co., Heating Contractors



Selected for the Ball Brothers Memorial Hospital, Muncie, Ind., because of their beauty and ability to provide

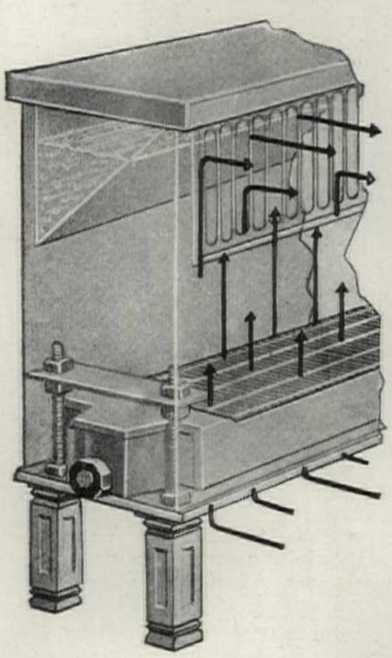
Complete Circulation of Heated Air

Typical of the modern buildings in which McQuay Cabinet Radiators are being used, is the beautiful Memorial Hospital built by the Ball Brothers at Muncie, Indiana.

In this installation—to conserve space—the legs were eliminated and the radiators hung from the walls.

McQUAY *Cabinet* RADIATOR

A Complete Radiator—not just a cover



The phantom drawing shows the complete McQuay. Note that the heated air is impelled into the room (in a horizontal direction) with sufficient initial velocity to create positive circulation, *distributing heat evenly* and warming every spot in the room. The humidifying pan gives the air the moisture it must have for healthful, effective heating.

Due to the greater heating effectiveness of moist air, and the complete circulation provided by McQuay Radiators, comfortable heat is obtained with lower radiator temperatures—reducing heating costs considerably.

The attractive cabinet of heavy furniture steel (which completely hides the heating unit and the humidifying pan) can be painted or enamelled any desired color. The copper heating unit is immune from rust and corrosion, will not clog, and is practically indestructible.

Ask our nearest office for complete data on McQuay Cabinet and Concealed Radiators and Unit Heaters.

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New York: 2148 Graybar Bldg.
Boston: 164 Federal St. Newark, N. J.: J. F. McLaughlin Co., 738 Broad St. Cleveland: 291 E. 149th St.

REVIEWS OF MANUFACTURERS' PUBLICATIONS

DAVIS EXTRUDED SASH COMPANY, Lincoln, Neb. "Bronze Store Front Construction."

The use of well designed shop fronts, now to be found everywhere, has come about as the result of the decision of architects and merchants that something better was needed than the commonplace if not actually ugly store fronts which were the rule a few years ago and which even now are to be found in many places. But the efforts of architects and merchants might easily have come to naught had they not been supplemented by the coöperation of manufacturers of the materials of which shop fronts are built. This folder deals with the bronze for shop fronts supplied by the Davis Extruded Sash Company. "Long has there been the need for a heavy solid bronze sash which would permit the setting of glass without the necessity of embedding it in putty or other glazing compounds, so unsightly and objectionable in the better class of work. The Davis patented center fulcrum sash solves this problem without the sacrifice of a single advantage, and at the same time it greatly reduces the danger of breakage and minimizes the amount of labor required in the setting of plate glass. Screw pressure is indirect, but positive. Furnished with or without ventilation, it can be obtained without screws in face." The folder is replete with valuable data, one detail being that which deals with the setting of large sheets of glass. Architect, builder, merchant and building owner instantly appreciate the everlasting beauty of solid bronze. And all the advantages of this superior metal are wrought into Davis Solid Architectural Bronze Construction,—solid strength, perfect combination of all members, assured glass safety through its patented fulcrum principle, and concealed ventilation and drainage.

DIAMOND MANUFACTURING CO., Wyoming, Pa. "Architectural Grilles of Perforated Metal."

Architects and decorators have long objected to the use of radiators for steam or hot water heating upon the score of their marring the appearance of interiors in which they are placed. The efforts of manufacturers of radiators to render their output architecturally acceptable have been at best only partially satisfactory, and the present tendency among architects is to conceal the radiators, but to conceal them in such a way that their benefits as sources of heat are not impaired. This is done in many instances by setting the radiators in recesses or niches within thick walls and covering the niches with grilles of open work, or, where the walls are not sufficiently thick, by covering the radiators,—the tops and three or four sides,—with metal grilles. The success of this treatment depends of course on the grilles themselves being architecturally attractive and upon their being sufficiently open to permit the radiation of heat. This brochure is a study of just this problem. It illustrates and describes an assortment of grilles made of perforated metal,—an assortment sufficiently varied to make possible the selection of a grille for any use, while the percentages of their open areas have been so carefully worked out that the usefulness of the radiators as heating units can be easily calculated. "Diamond Grilles present a new range of perforated metal products in designs of artistic merit that make a definite contribution to the field of architecture and the building trades. The styles shown in this catalog emphasize the true beauty and decorative value now available in interior grille design fully meeting present-day architectural demands. Nation-wide acceptance of the plan of recessing radiators as the best general practice makes the matter of interior grilles of first importance. Carefully worked out detailing is now an essential in planning every heating or ventilating unit. The many fine installations shown in this catalog illustrate the point that the metal grille work in a building may be planned to contribute an element of real decorative value toward the interior scheme as a whole. Diamond designs are being specified generally by architects for office buildings, hotels, apartments, public buildings, churches and residences in all parts of the country. They are made up to specification only, to fit any size or shape of opening. They combine economy with artistic merit and extreme durability. Fully equal in appearance to cast grilles, they have greater strength with less weight and lower cost."

MISSISSIPPI WIRE GLASS CO., 220 Fifth Avenue, New York. "Black Tom Explosion, July 30, 1916."

Many Americans have probably forgotten the "Black Tom" explosion which occurred during the summer of 1916 and which rocked the whole of New York and the surrounding district. The explosion damaged a great number of buildings and totally wrecked others, while the extent of personal injuries was great beyond belief. The cost of repairing damages was likewise great, and the damage to polished plate and window glass alone is said to have amounted to $1,000,000. This brochure is issued in the interest of wire glass, which withstood the concussion with little or no damage. The booklet presents illustrations which show buildings damaged and their wire glass cracked but still intact, protecting the contents of the buildings from exposure to fire or driving rain and dampness which might have ruined valuable machinery. The brochure says: "Work continued as usual. No harm was done to machinery or employes. It was not even necessary to replace the cracked glass, except for appearance, and that could be done at leisure. While on the other hand, in a building perhaps more elaborate in appearance and costing more for artistic design and finish, equipped with the cheapest form of window construction, when exposed to the shock, the glass was blown out and in some instances even the wood frames destroyed. Imagine the condition of tools and machinery in such a building after the explosion, and how much worse it would have been had the explosion occurred at 2 P. M. instead of A. M.! How many workmen would be in the hospitals with bandages over their eyes? How many men would come back to work at all to a trade which required their eyesight?" The explosion proved the value of wire glass.

UNITED STATES GYPSUM CO., 300 West Adams Street, Chicago. "The Gypsumist."

An unusually interesting number of *The Gypsumist* is the special number, recently issued, devoted to original documentation on the Pyramid of the Sun, the Pyramid of the Moon and the Citadel at San Juan Teotihuacan. Photographs were made Mr. Gordon C. Abbott, and half-tones from others are presented in connection with historical notes and descriptions by H. A. Simons. These illustrations are especially interesting and timely, due to the great interest that is being taken in Mexican motifs by architects in this country, particularly in the California and Florida districts. Excavation is being carried on by Dr. Manuel Gamio, director of archæology for the Mexican government. Teotihuacan is 28 miles northeast of Mexico City, and was one of the principal cities of the Toltecs, a people who developed a distinctive civilization between the period of Mayan ascendency and the rise of the Aztecs. The ruins here consist of two great pyramids, the Pyramid of the Sun and the Pyramid of the Moon, and a roadway known as the "Pathway of the Dead," bordered by small pyramids. The Pyramid of the Sun is the largest Indian mound thus far found in America, being 180 feet in height and rising in four sloping terraces to the summit, which was formerly crowned by a temple, no traces of which remain. The richly ornamented terraces on three sides have fallen into decay and the sculptures have been carried away, but fortunately, in ancient times, the Pyramid was enlarged by an addition of masonry to the fourth side, so that the sculptured stonework was buried and thus preserved in its original state. This ornament is in the form of a repeated motif consisting of the protruding head of the "plumed serpent" with the feathered body in low relief. The tail is in the form of a rattle and near it are other huge projecting heads with large circles on the frontals, said to represent the Obsidian butterfly, a divinity of great importance among the Toltecs. Although this motif is repeated over the whole expanse of the Pyramid, it is carved with such freedom and freshness that there is no slackening of expression. The whole is rhythmically arranged and gives an effect of very rich ornamentation. The illustrations have a decided value to designers, and this number of *The Gypsumist*, like all the issues of this little publication, is filled with data of importance to the specification writers of architects and engineers and should be received and filed in every office.

REVIEWS AND ANNOUNCEMENTS

BRASCO MANUFACTURING COMPANY, 5025 Wabash Avenue, Chicago. "Brasco Art Bronze Series."

"Many building owners and merchants find the cost of heavy bronze beyond the reach of their store front appropriations, so it remained for the Brasco Manufacturing Company to blaze the trail of an entirely new departure. After many months devoted to careful research and experiment, with pardonable pride, they announce the perfection of a decidedly novel and distinctive construction, two full size illustrations of which are presented, in this folder. Simple and pleasing in its rich tone effects, it at once breaks the bonds of plainness and places the shop window in which it is installed far beyond the pale of the commonplace. Nothing has been found so rich and appealing as bronze, and large sums have been spent in an effort to create something finer and more attractive in shop fronts." This folder says that all the qualities which are desirable in bronze are offered, by the company's service, at a price only slightly above the cost of ordinary copper construction. It also says that samples of its material will be sent for inspection to architects and contractors without obligation.

U. S. SANITARY SPECIALTIES CORP'N, 435 S. Western Ave., Chicago. "Soaperior Liquid Soap Dispensing."

Lavatories and wash basins are of course supplied with water, either hot or cold, by apparatus which brings water from a source of supply by gravity or pressure. The same lavatories may now be supplied with liquid soap by much the same system upon a smaller scale. The "Soaperior System," dealt with in this booklet, consists of an elevated soap tank of any desirable size, which can be installed at any distance above the soap supply line, from which soap is fed through a line of piping to especially designed hexagon, fool-proof valves. The valves are conveniently located, one over each wash basin. An unlimited number of valves can be fed from one soap tank for use in groups of wash basins, or the tank may be used with one valve for a single basin. The more modern and economical method in new building construction is to place a single large soap tank on the top floor or pent house of a building. The soap is piped from the tank to every wash room, thus bringing to each user a fresh, clean supply of liquid soap every time the valve is pushed. There is no leakage, evaporation, or waste where the "Soaperior System" is installed, for a pre-determined supply of 16 drops of soap is discharged into the hand at every push of the button.

RHINELANDER REFRIGERATOR CO., Rhinelander, Wis. "Rhinelander Handbook of Refrigeration."

A generation ago the use of ice was regarded as very much of a luxury. Ice was Nature's product, "cut" each winter from frozen lakes or ponds and packed away in sawdust in "ice houses" for use when the heat of summer made its chill necessary. Then came the era of manufactured or "artificial" ice to supplant Nature's product, and along with it came the development almost to the point of perfection of the household refrigerator to take the place of the long-used "ice chest." It is hardly to be imagined that the use of the extremely well developed refrigerators which use ice will ever give way to use of refrigerators chilled in any other way. Useful as it undoubtedly is, mechanical refrigeration requires the use of considerable apparatus, which while wholly practical in hotels, apartment houses and other large structures is likely to be rather beyond reach of those who live in individual dwellings. This interesting volume contains a carefully written survey of the use of ice and its different uses, analyzing the refrigerator and the materials,—wood, metal, cork, etc.,—of which it is built. The greater part of the volume is given up to an excellent presentation of the superb assortment of refrigerators supplied by the Rhinelander Refrigerator Company. Every detail which could interest an architect or engineer is illustrated and described, the illustrations including blue prints. The volume is of particular value to architects whose practice involves residences or apartments.

RICHARDS-WILES MFG. CO., Aurora, Ill. "Distinctive Garage Door Hardware." A brochure on its selection.

The coming of the automobile brought with it the garage wherein the car is stored, and the garage itself has gone through many stages of development until it has become a highly complex institution. There are, of course, many types of garages, from the most primitive, which houses the family Ford, to the vast city garages, which accommodate daily hundreds if not thousands of cars of all kinds, these garages being equipped with ramps, elevators, and every detail which could promote their smooth functioning. This brochure does not deal with elevators or ramps, but with the hardware of garage doors, a subject which is itself sufficiently complex to fill 160 pages, each 8½ by 10 inches in size. The variety of such hardware is great enough to astonish anyone not familiar with the subject, from the tiniest detail to the automobile turntables, which of course are useful in many places, since they render unnecessary the backward motion of a car, often hazardous.

Grant M. Simon announces his removal to 1500 Walnut Street, Philadelphia.

Home Smith & Company announce the opening of new offices at Lambton Mills, Ont.

Warren, Knight & Davis are occupying new offices in the Protective Life Building, Birmingham, Ala.

A. Abramson, designer and builder, has opened offices at 9316 Oakland Avenue, Detroit. He desires the catalogs and other publications of manufacturers.

Kenneth F. Jones announces the opening of an office for the practice of town planning and landscape architecture at 910 Kahl Building, Davenport, Ia.

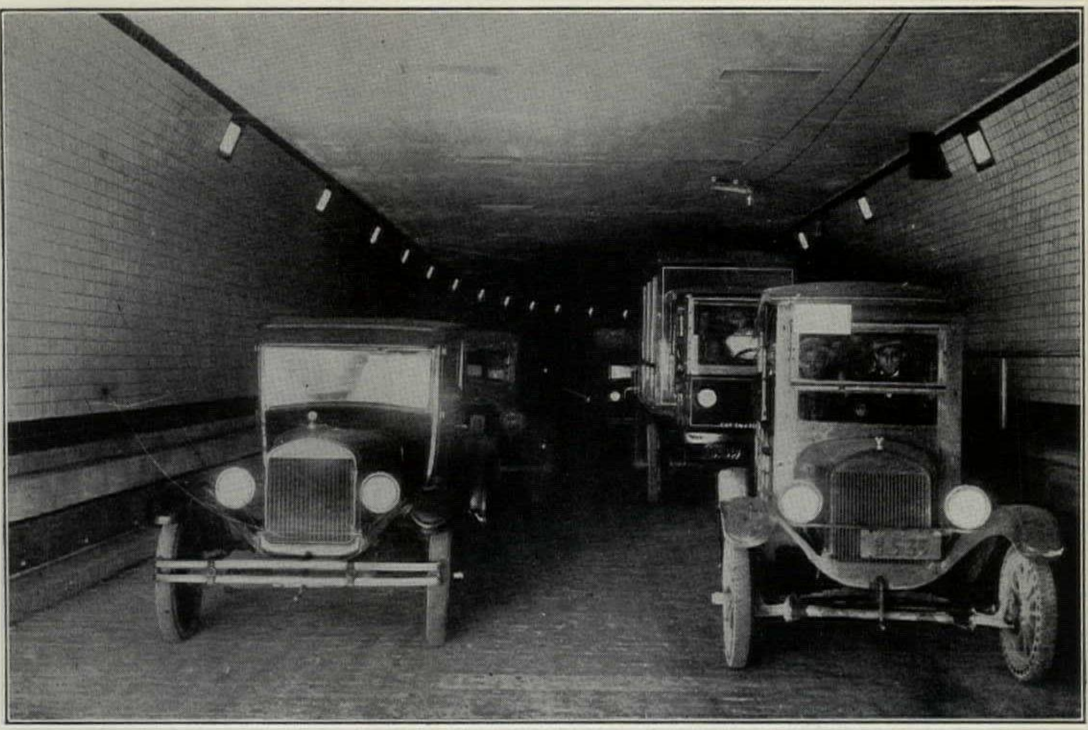
Robert W. Dickerson and Emery W. Rhoads announce the formation of a partnership under the name of Dickerson & Rhoads, with offices at 1001 Huron Road, Cleveland.

Fred G. Rounds announces the opening of offices in the Advocate Building, Chehalis, Wash. He desires the samples and publications being distributed by manufacturers.

Samuel E. Hillger, architect, and Wallace P. Beardsley, architect and engineer, announce the formation of a partnership with offices in the Seward Block, Auburn, N. Y.

Swartz & Ryland, of Fresno, announce the opening of a branch office at 301 Pearl Street, Monterey, Cal. They desire the catalogs and other publications of manufacturers.

In an advertisement which appeared in the July issue of THE ARCHITECTURAL FORUM, Mr. Paul M. Hesser, Jr., was referred to as "Chief of the Bureau of Design, Bureau of City Architect, Philadelphia." This was in error, inasmuch as Mr. Hesser was formerly the Chief of the Bureau of Design, but has been practicing architecture independently from his office in Philadelphia, for the past three years.



Through this miracle of engineering—the Holland Tunnel, connecting New York City with New Jersey—15 million motor cars pass annually. Materials used in its construction and preservation have been put to the most searching tests. They must hold up in service.

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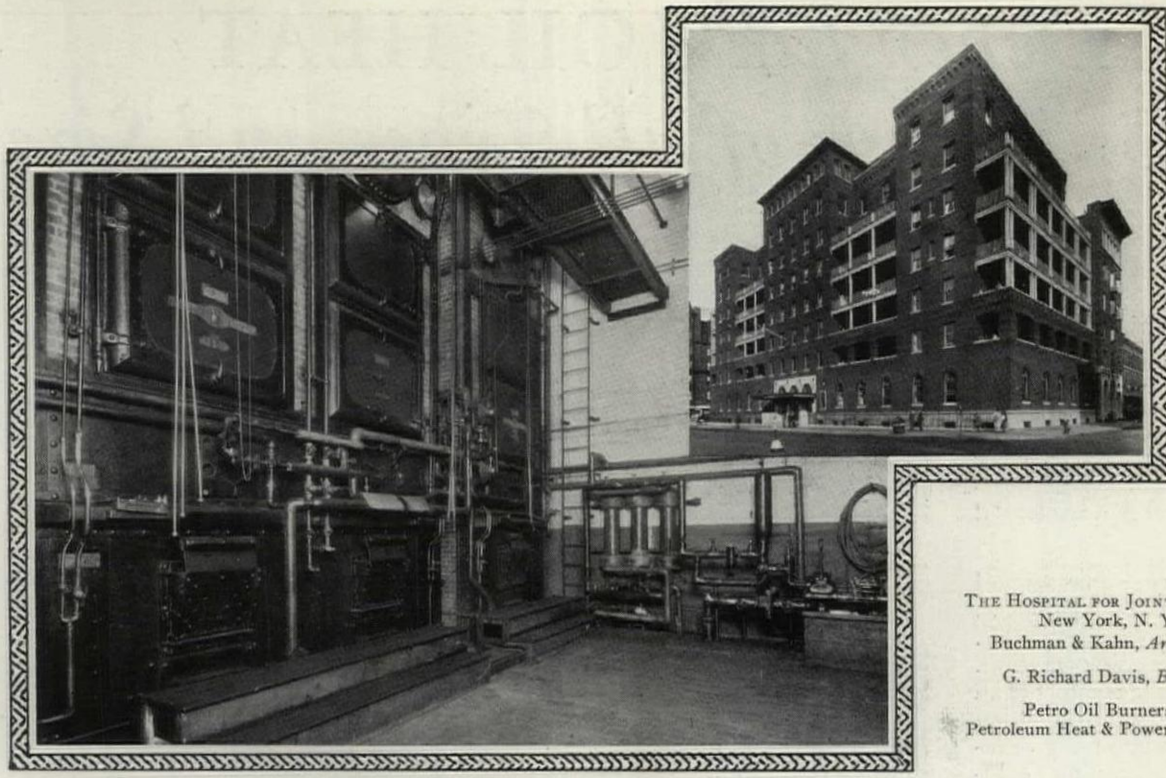

The Hospital for Joint Diseases
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Buchman & Kahn, *Architects*

G. Richard Davis, *Builder*

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Carnegie Laboratory	Boston
Children's Hospital	Boston
Harvard Dental School	Boston
House of the Good Samaritan	Boston
Huntington Memorial	Boston
Infants Hospital	Boston
Lying-In Hospital	Boston
Medical School Dormitory	Boston
Free Hospital for Women	Brookline
Holy Ghost Hospital	Cambridge
Homeopathic Hospital	Providence
Alta Vista Hospital	New York City
Massachusetts General Hospital	Boston
Massachusetts Homeopathic Hospital	Boston
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for highly corrosive waters—Anaconda 85 Red-Brass Pipe*

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When normal water conditions prevail—when waters are not of high permanent hardness—Anaconda 67* Brass Pipe is recommended for distribution lines. This pipe contains not less than 67% copper and is semi-annealed, seamless and guaranteed to be structurally sound and physically perfect.

For conveying filtered waters and surface waters, particularly when drawn from sources of peaty origin, which may be high in carbonic acid content and low in alkalinity, Anaconda 85* Red-Brass Pipe is offered as the best corrosion-resisting pipe commercially obtainable. It contains not less than 85% copper, is semi-annealed, seamless and guaranteed.

For underground service lines with threaded fittings, and for other pipe lines subjected to corrosion from the outside as well as the inside, Anaconda 85* pipe is recommended regardless of the water conditions.

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