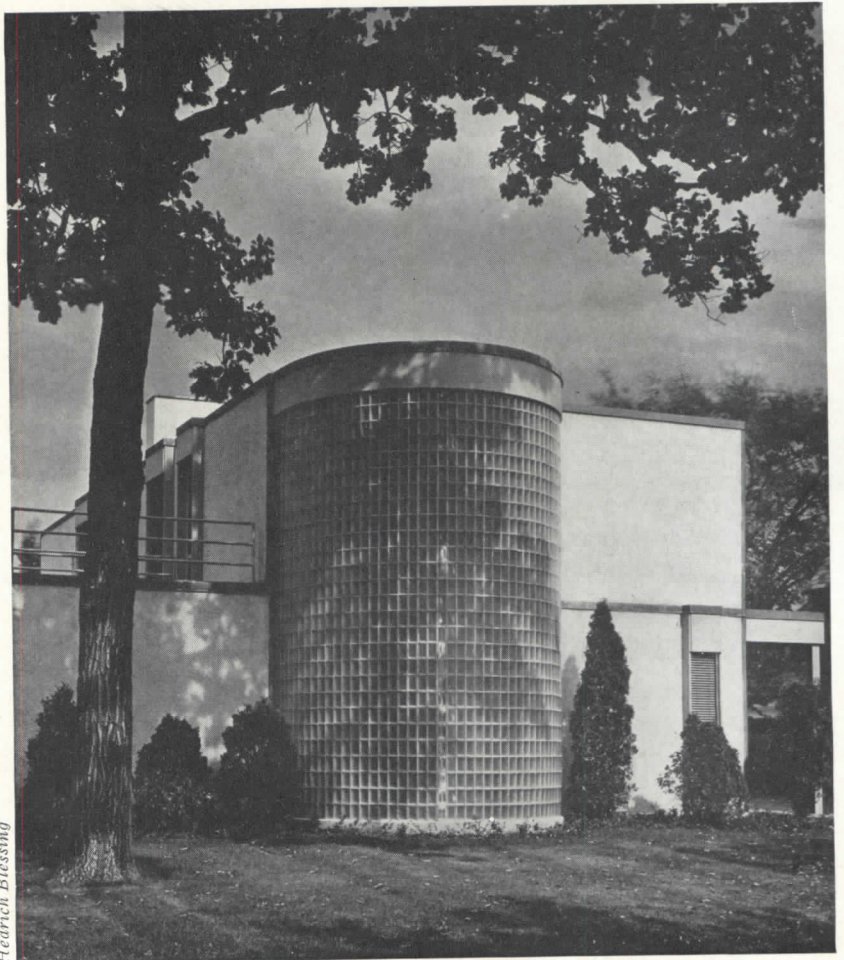


BUILDING NEWS

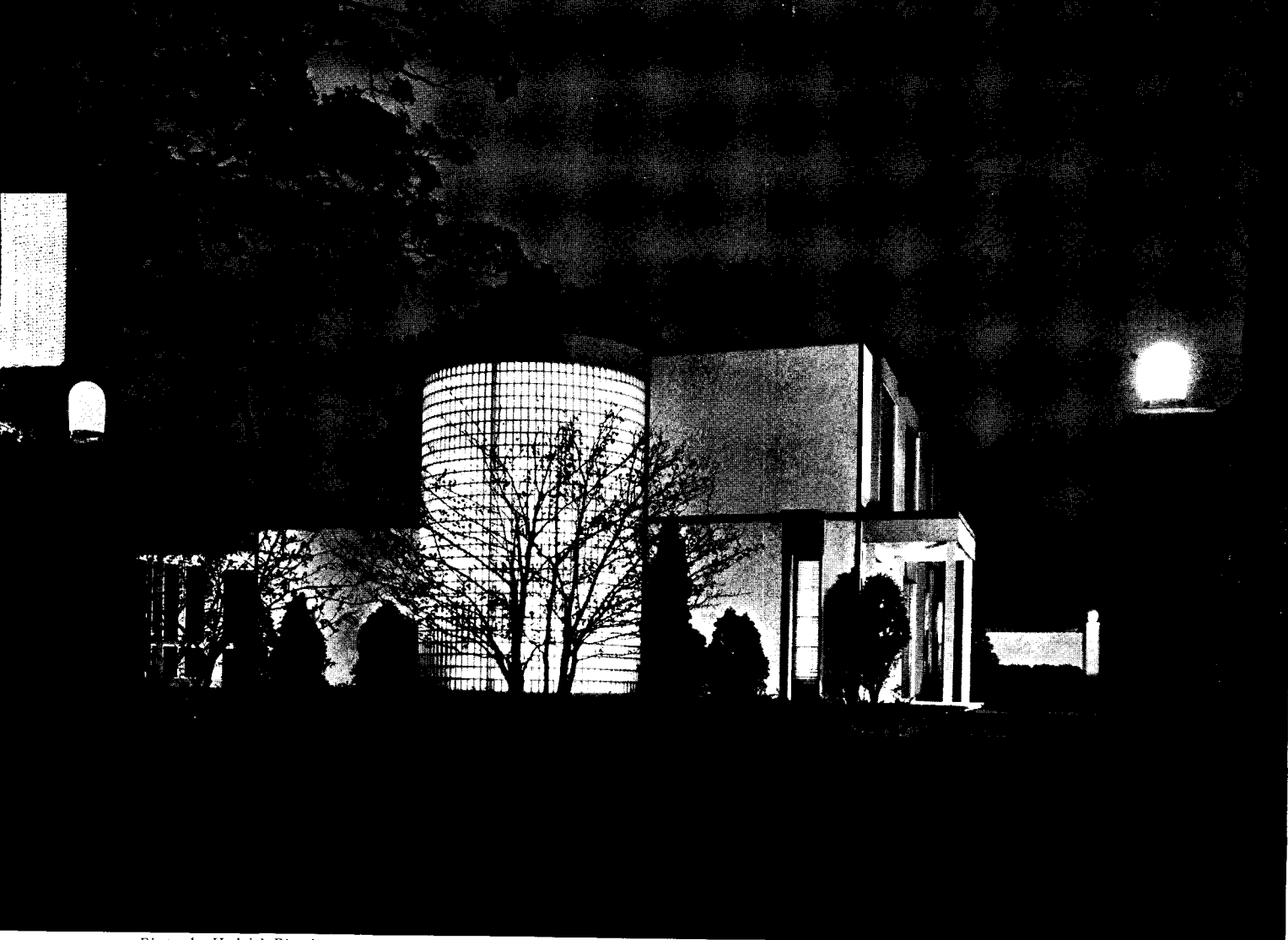


Hedrich Blessing

Chicago, Ill.: "The children won't be ashamed of it..."

ARCHITECTURAL

Record



Photos by Hedrich-Blessing

South front at dusk

ARCHITECT STAGES 1-MAN DESIGN JOB IN CHICAGO HOUSE

GEORGE FRED KECK

Architect



Architect-designed

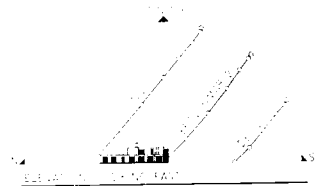
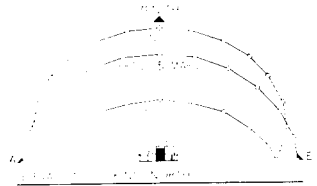
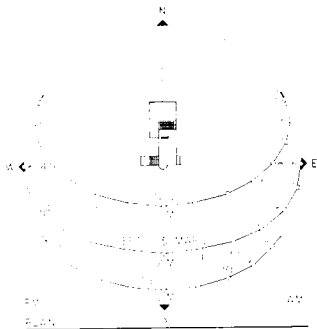
SELDOM does the building designer have an opportunity such as that which came to George Fred Keck, Chicago architect, with the commission for the Herbert Bruning house in Wilmette, Illinois. For here was not only an interesting problem—with adequate time and money for its solution—but also complete control of it in the architect's hands from start to finish, plot plan to curtain fabrics.

Basic owner requirements to be met were these: accommodations for a family of five, two guests, two servants, two cars. Convenient and efficient integration of the above accommodations was stressed, as was the necessity for planning the various units according to function—leisure, recreation, sleeping, service. A further requirement was that the finished structure be of such a character "that the children would not be ashamed of it

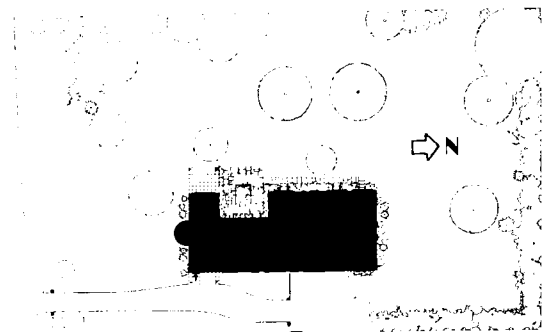
when they reached the age of reason"—i.e., that it be simple, permanent and economically maintained. These, together with a level 160' x 270' suburban lot, formed the reference frame within which architect Keck had to work.

Orientation and placement of house were determined by careful consideration of two factors—maximum use of sunlight and minimum installation of utilities. For the former the architect made a series of unusually detailed studies (see facing page) which resulted in the main living areas being placed along the southwest corner. To give these rooms the maximum outlook over their own grounds, the structure was then pushed to the extreme eastern boundary line; and to reduce utility costs, it was placed as near the street front as practicable. All major windows were kept off this facade (above) so that privacy is not impaired. Thus simply was the plot plan determined; and the simple landscape work clearly implements its intention.

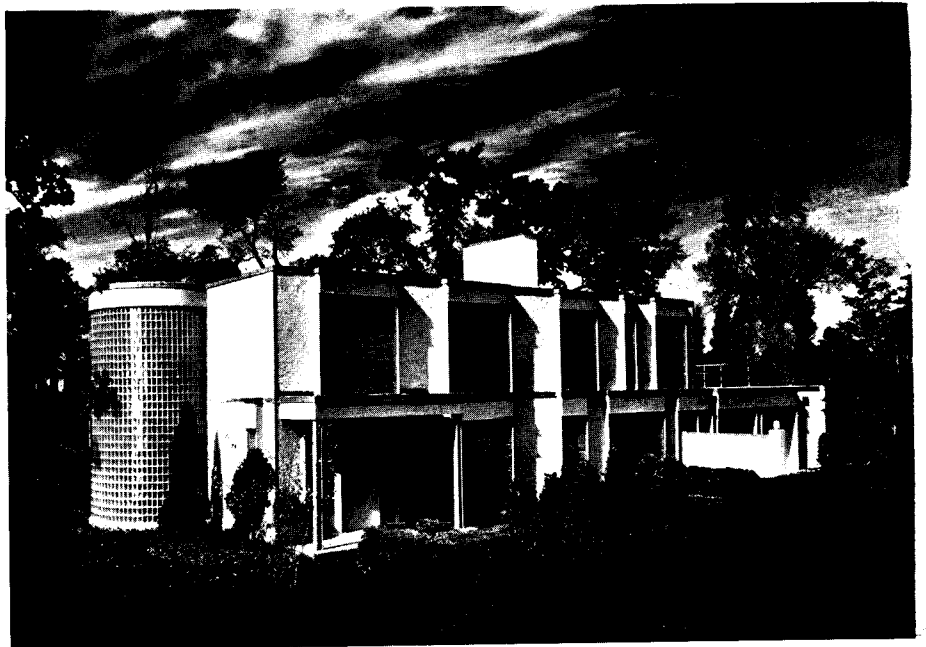
A 13-ft. unit or "module" is basic to the plan, stair hall and entrance porch excepted, which sprang from the structural system finally adopted (and detailed on page 37). This plan is made up of several clearly defined three-



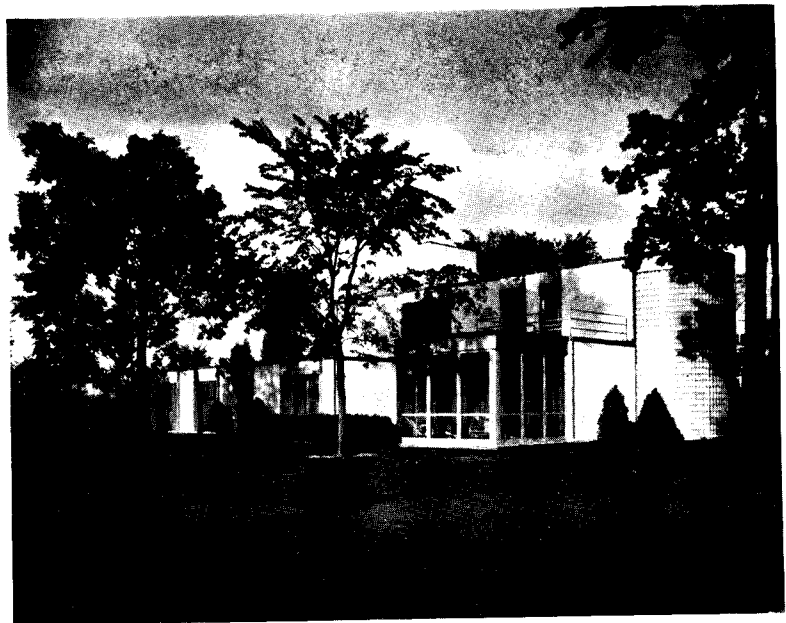
The final studies show the care with which Mr. Keck set about trapping sunlight for his clients.



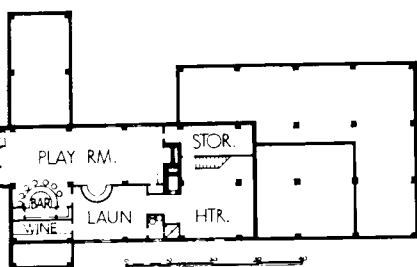
Plot Plan



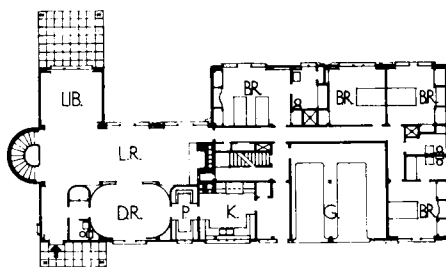
East (or entrance) front



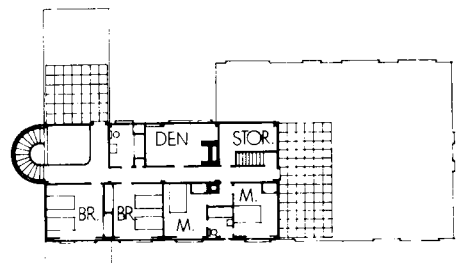
West (or garden) front



Basement



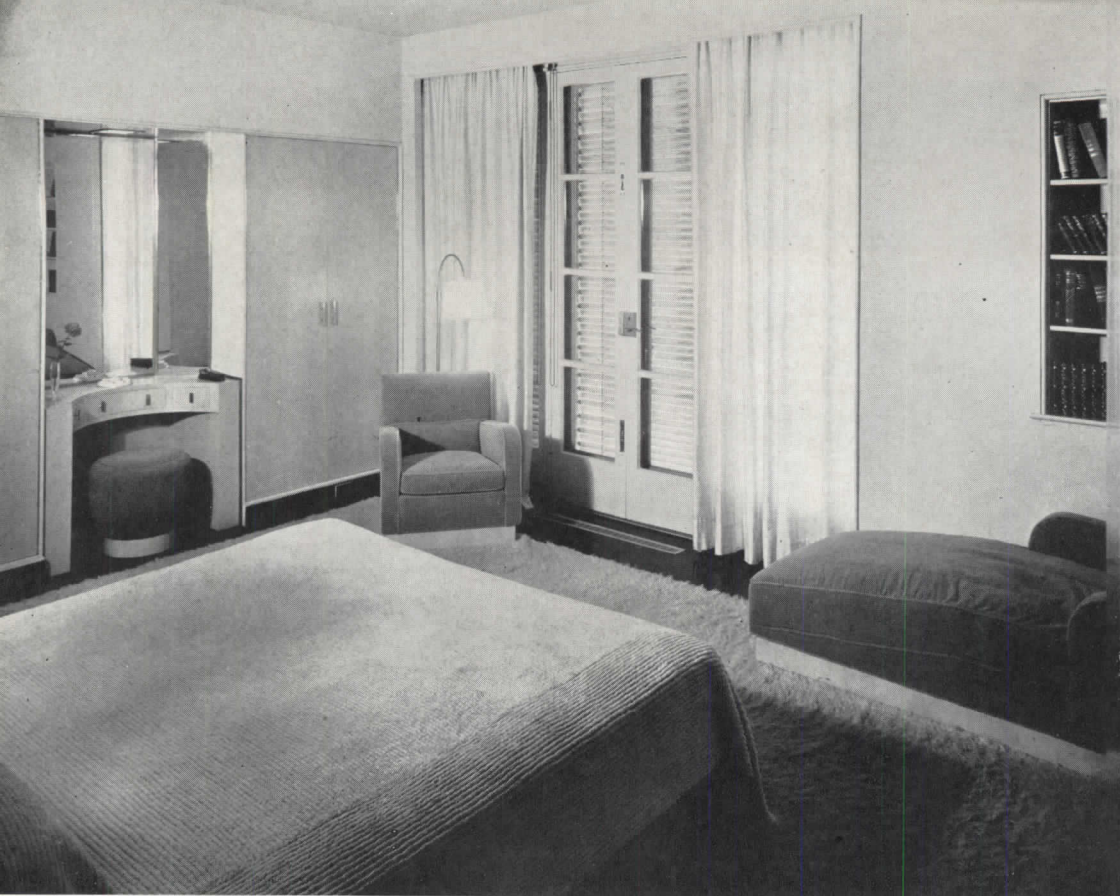
First Floor



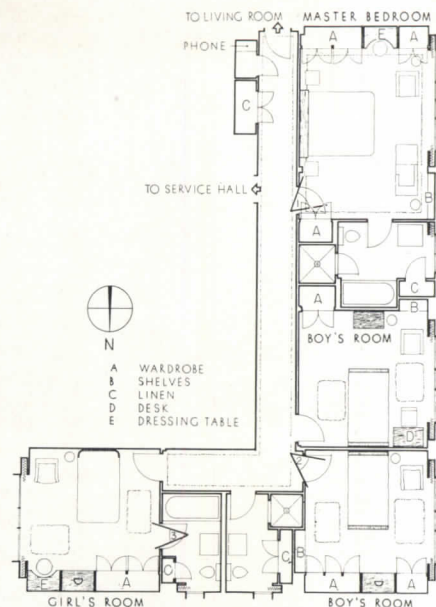
Second Floor

dimensional units. *Leisure*—living room, study and dining room with *Recreation*—playroom and bar—directly below it. *Owner sleeping*—master's, two boy's and daughter's bedrooms with bath. *Guest sleeping*—two bedrooms, bath and den. *Service*—laundry and air-conditioning equipment in basement; kitchen, pantry and garages on

first floor; two maid rooms and storage on second floor. Every major room in the house has easy access to an outdoor area of one sort or another—roof deck, screened porch, paved terrace or open lawn. These major units are interconnected horizontally by means of minimal corridors; vertical circulation is by stairways fore and aft.

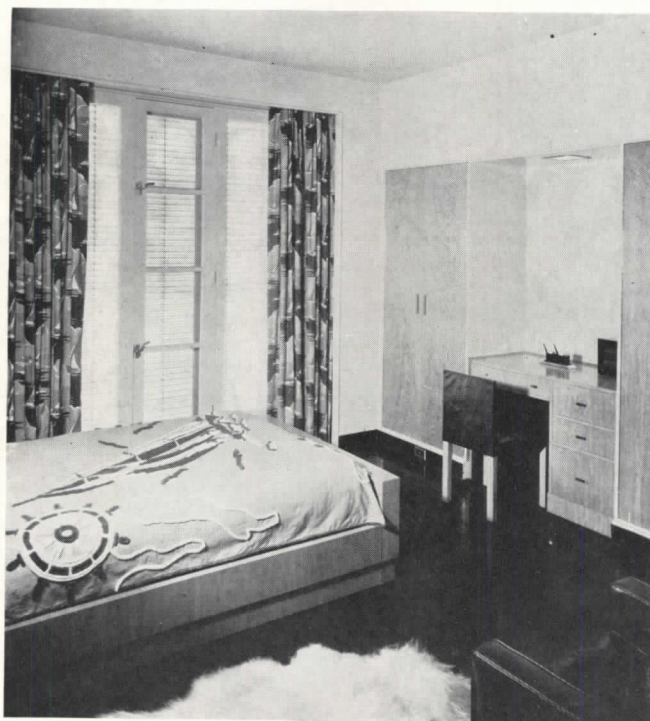


View No. 1: Master bedroom from corridor. Floor: black rubber. Rug: natural curled nap by V'Sooky. Walls: cold yellow. Ceiling: ivory. Curtains: natural color raw silk. Furniture: natural-finish white holly with chartreuse wool.



OWNERS' SLEEPING AREA: Entire family accommodated in this unit. Floors: rubber tile. Walls: smooth finish plaster. Ceilings: Sanacoustic tile. All baths have structural glass walls.

Photos by Hedrich-Blessing



View No. 2: Boy's bedroom from hall. Floor: brown rubber. Rug: white fur. Walls: ivory. Ceiling: same as above. Curtains: figured wool. Furniture: French burry oak, blue leather upholstery.

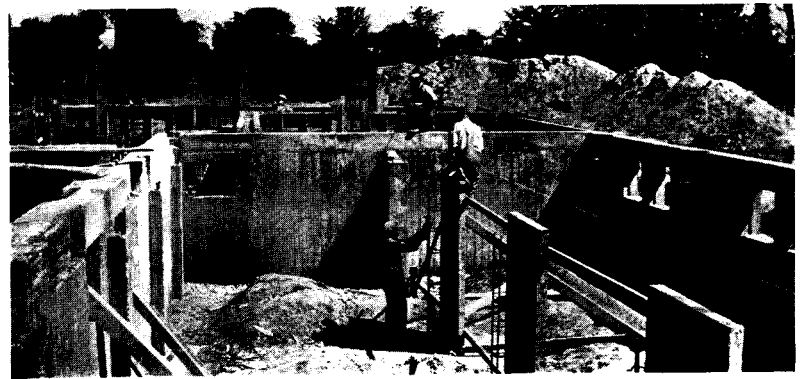
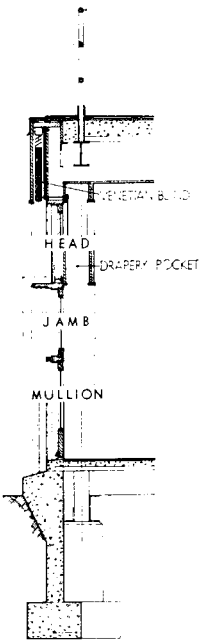


View No. 3: Girl's bedroom from bath. Floor: brown rubber. Rugs: white fur. Walls: pale pink. Ceiling: ivory. Curtains: light blue satin. Furniture: natural Carpathian elm burl, blue wool upholstery.

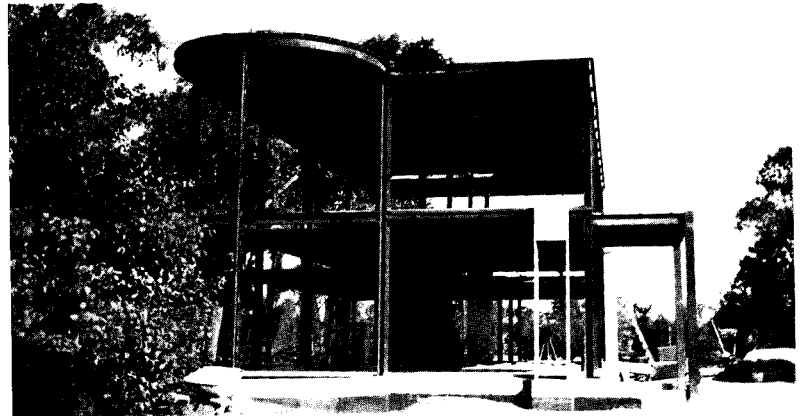
he designed. All rooms have ceiling diffusing units; built-in lighting is largely confined to dressing tables and wardrobes; indirect lighting is used only once—in the top of the partition between dining and living rooms.

The entire house has zoned air conditioning with summer cooling. Total cost, including all furnishings, equipment and architect's fees, was \$75,000; the structure proper cost \$54,000 or between 62 and 63c per cu. ft.

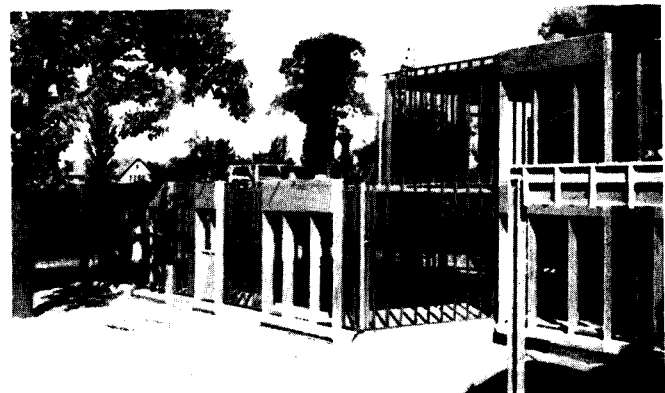
RESIDENCE



FOUNDATIONS: All concrete in place, ready for first-floor slab.

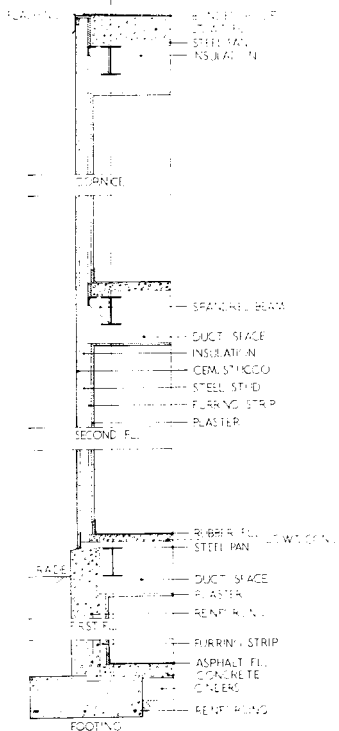


STEEL SKELETON: With floor and roof slabs in place, the structure is ready for partitions and curtain walls.

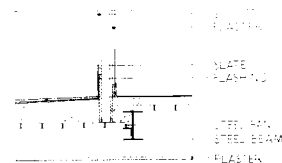


CURTAIN WALLS: Window units and studs in place.

Year-round air conditioning necessitated a careful study of the large glass areas. Summer sun load on equipment was greatly reduced by use of outside chain-type aluminum blinds to protect glass from direct sun. On the other hand, four members reduce heat loss in winter—drawn blinds, storm sash, regular sash and drawn curtains. Housing these blinds, together with storm sash, regular sash and curtains, results in the basic unit detailed above. Only the center panels—whose screens are replaced by storm sash in winter—are hinged; they open in.



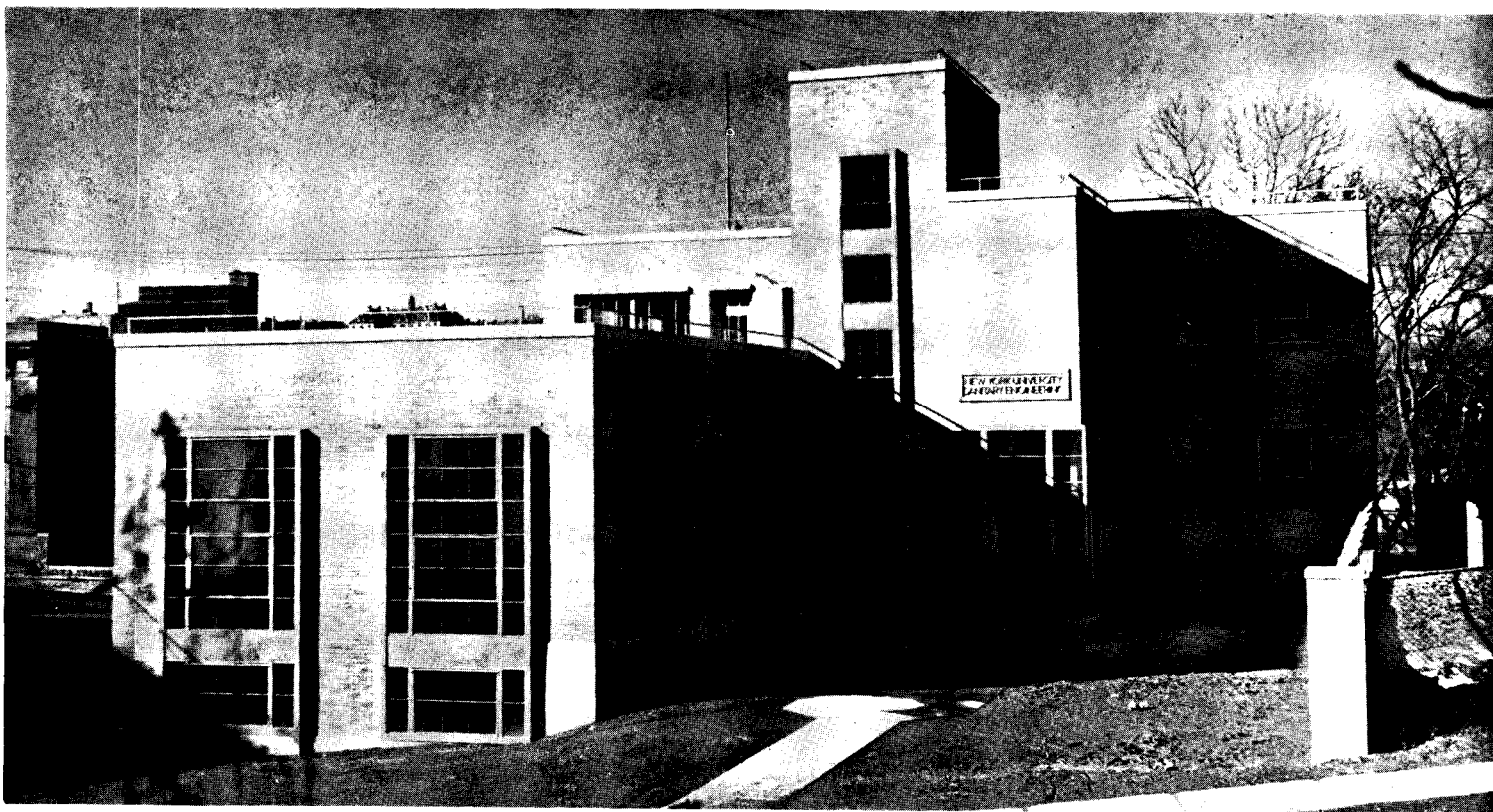
Vertical section, typical wall



Setback condition

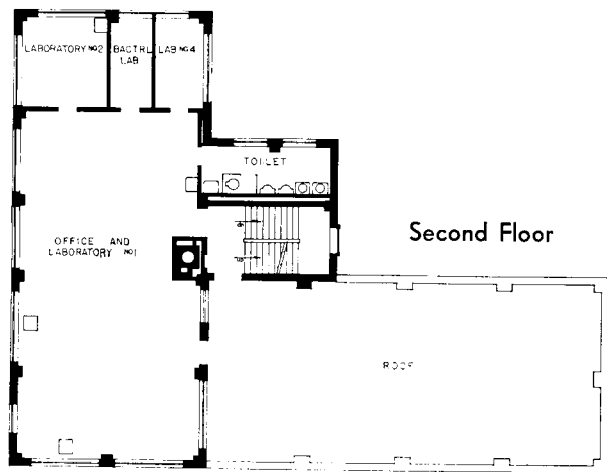
Frame: long life, low maintenance and flexibility dictated steel, while a standard 13-ft. column spacing kept members light and spans economical; all steel work is welded. *Floors* are of lightweight concrete on light steel pans with rubber finish. *Ceilings* are suspended, both to accommodate duct work and for insulation purposes; in all leisure and recreation areas they are acoustic tile; elsewhere, plaster. *Roof* construction is similar but with deeper slabs, asphalt and gravel topping, and mineral wool fill. *Parapets* are omitted, thus simplifying flashing and eliminating snow pockets. *Drainage* is to interior downspouts, enabling roof to carry a thin sheet of water in hot weather and further reduce load on cooling equipment. *Curtain walls*, carrying only their own weight, are designed for heavy wind pressure. Outside membrane of reinforced cement stucco, back stuccoed, is carried on steel studs; inside membrane is plaster on metal lath; interstices are filled with mineral wool. *Expansion joints* are provided at all interior and exterior corners, horizontally and vertically. *All flashing* is leadcoated copper, crimped for expansion. *Interior partitions* are non-loadbearing, plaster on metal lath and studs; they may be easily dismantled or altered.

SANITATION RESEARCH LABORATORY IS FIRST OF ITS KIND

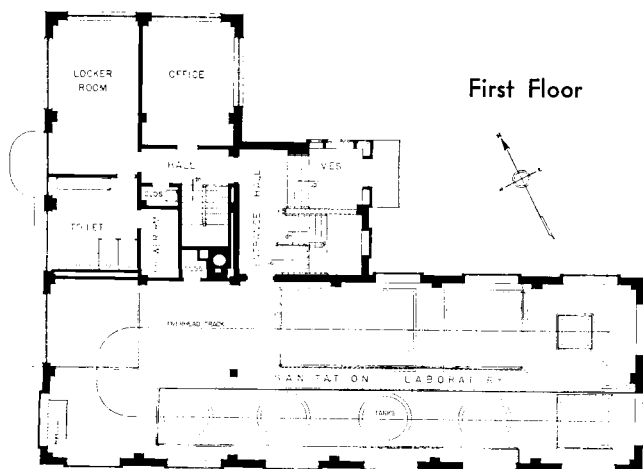


Photos by Andrews

Main Elevation



Second Floor



First Floor

THE PROBLEM of disposing of metropolitan sewage has given rise to the development of several new building types—plants for treatment and disposal of sewage. (Recently New York dedicated its tremendous new sewage treatment plant on Ward's Island—one of the largest in the country.) The latest type of building evolved as a result of this problem is a laboratory for the study of sewage and sanitation problems. Unique in many respects, this institution represents the cooperation of New York City's Department of Sanitation and New York University, who pooled their resources in the cause of a common interest: the comprehensive furthering of sanitary engineering research. On a plot of land deeded to the city by the University for the specific purpose, the laboratory building was erected as a WPA project. Not only will the laboratory serve as a training place for students and selected municipal employees, but it will also provide for investigations on sewage treatment, new methods of sewage disposal, the effect of industrial and other wastes on sewage treatment, and furnish data for the proper design of new sewage-treatment plants which may be erected by the city.

Since the prime purpose of this edifice is to provide a place for research, most of the building is devoted to laboratories. The sanitation laboratory occupies the first floor and part of the basement in one wing of the L-shaped building. Located here are the large sewage tanks built of reinforced concrete on their own foundations, to allow for their removal. Sewage, taken from a nearby sewer, is sent through piping which is so arranged

For Works Progress Administration:

ALBERT B. BAUER
Supervising Architect

For City of New York, Department of
Sanitation:

F. B. MACDUFFEE
Chief Engineer
Incinerator and Garages

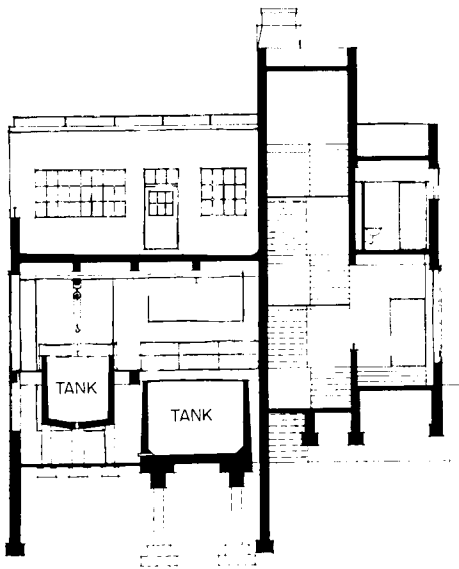
WALTER D. BINGER
Deputy Commissioner

For New York University:

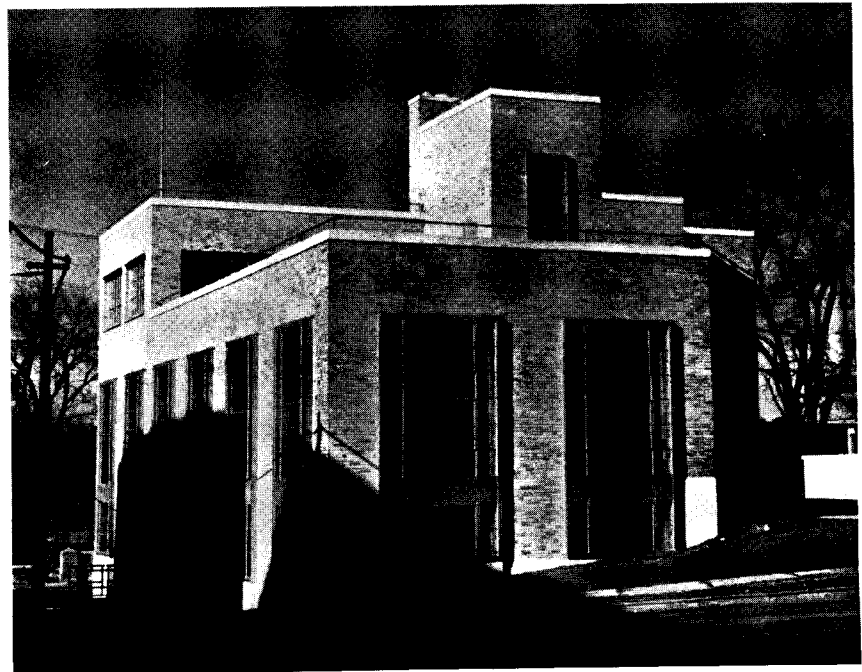
LEWIS V. CARPENTER
Professor of Sanitary Engineering



The secondary entrance leads to section offices and crew quarters.



Section



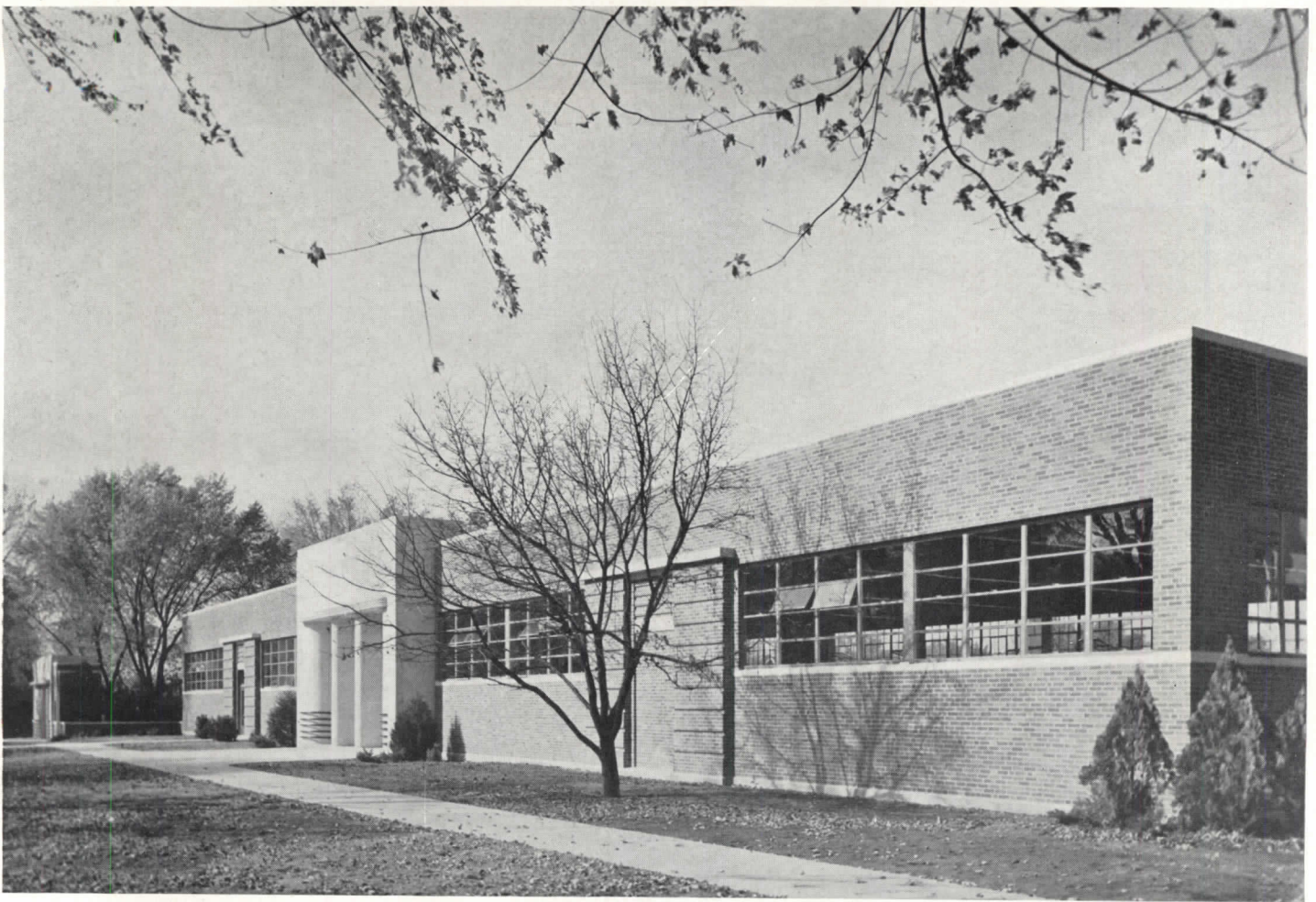
Windows take up one-half of the building's wall space.

that two tests, involving four different tanks, can be operated at the same time. The chemical and bacteriological laboratories, on the second floor, have daylight exposure on all four sides. On the ground floor (not shown) are located offices of the City Sanitation Department Section Station, and quarters for a neighborhood crew of street cleaners.

An interesting detail in the design of this building is

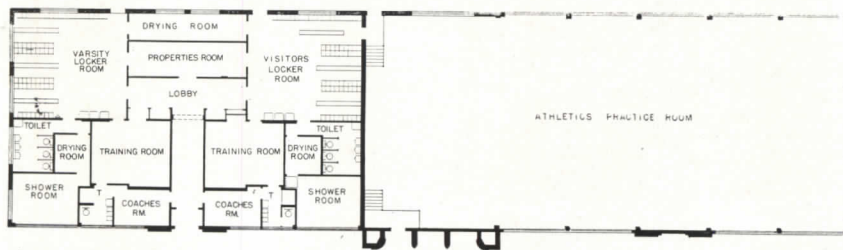
that used on the long windows. The frame, of aluminum-painted steel, is set out from the wall, instead of the more usual flush or recessed setting. The building otherwise depends on its mass and simple form for effect. The frame of the building is steel; exterior walls are of buff-faced brick, backed up with hollow tile. Reinforced concrete is used for the floors and floorings, and 5-ply felt with standard slag covers the concrete roof slab.

YPSILANTI, MICHIGAN: STATE NORMAL GETS NEW FIELDHOUSE

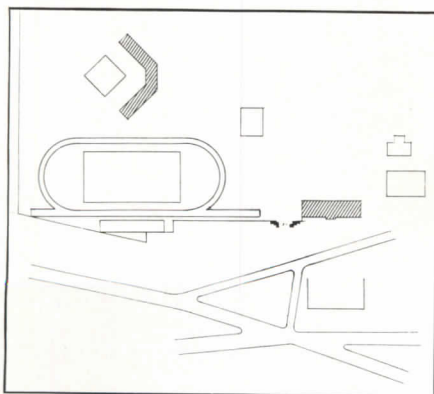


Photos by Elmer L. Astleford

General View, Fieldhouse



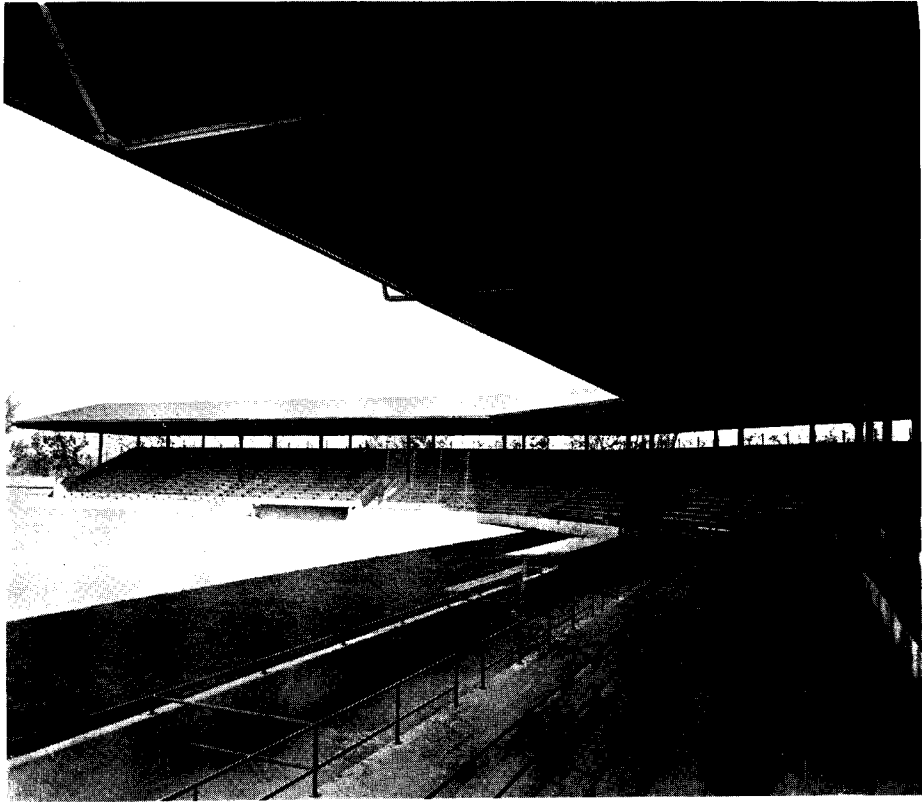
Floor Plan, Fieldhouse



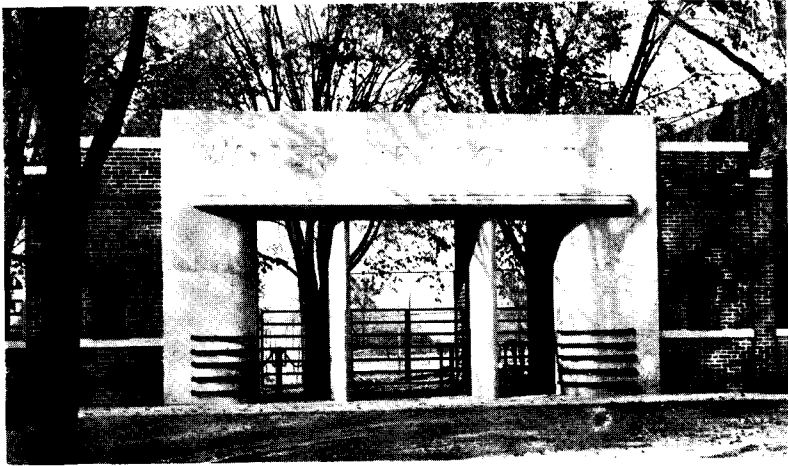
Plot Plan, showing Fieldhouse and Stadium

LATEST addition to the athletic plant of Michigan's State Normal College at Ypsilanti are these new buildings, gift of Mr. Walter O. Briggs to the College. The new fieldhouse not only provides accommodations for home and visiting athletes but also a practice room which can be used as a gymnasium. Although the disposition of elements in the plan is unsymmetrical, the architects have employed a symmetrical facade, repeating the triple openings of the gatehouse in what is actually a secondary entrance to the building. Gatehouse and stadium are also part of the program.

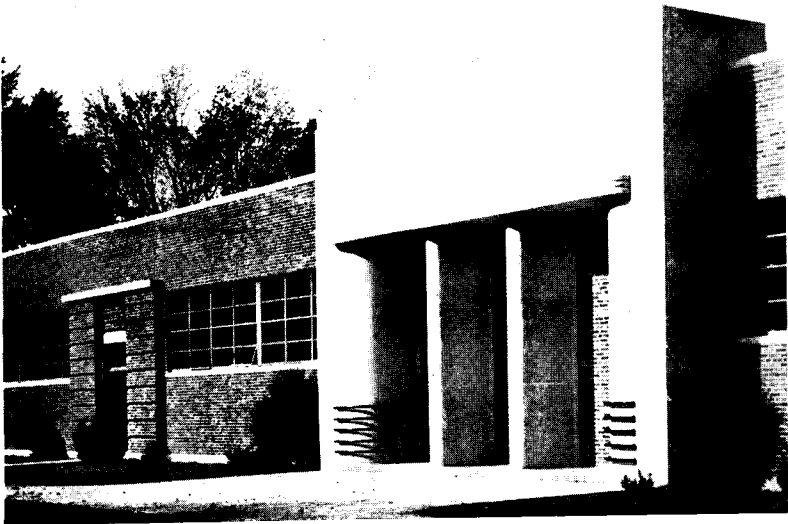
GIFFELS AND VALLET
Architects



A part of the expansion is the new baseball diamond and the steel and concrete stadium with its cantilevered steel roof.



The gatehouse, connected by a brick wall to the fieldhouse, serves as box office and entrance to the field.



Detail of the practice room entrance, a repetition of the gatehouse with two out of three of its openings blocked.

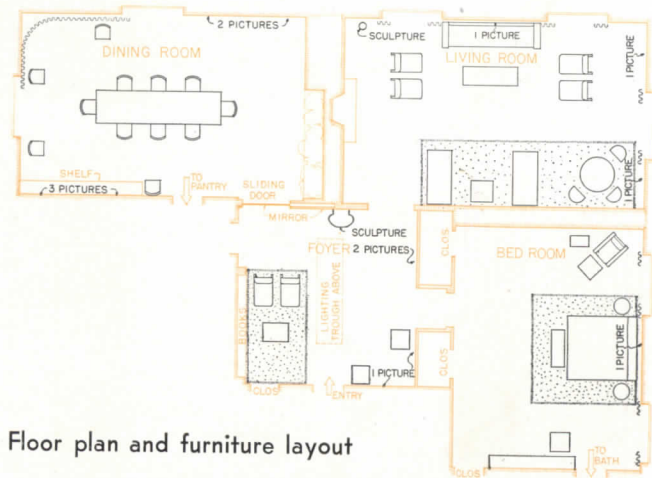
APARTMENT REDESIGNED TO HOUSE ART COLLECTION



Photos by Anderle-Marks Studios

DINING ROOM: end wall features recessed flower panel with linen and silver storage beneath behind sliding ebony doors. Table is ebony and brass, chairs ebony frame with tufted white leather.

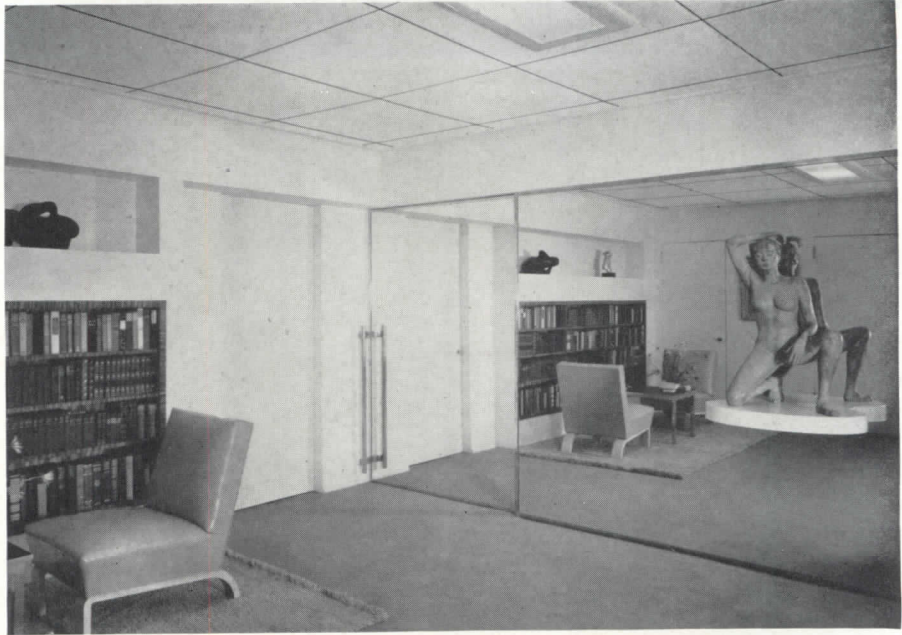
THE NEW YORK apartment for Mr. and Mrs. Norman K. Winston was redesigned expressly as an advantageous setting for the client's collection of modern art. Stripping a conventional Park Avenue apartment of its burden of paneling, trim and molding, Mr. Goodman has relied largely upon color and lighting to provide a suitable background for the canvases. Few structural changes were necessary: an elaborate mantel in the dining room was removed and its counterpart in the living room reduced to a simple opening; the foyer ceiling was lowered, the bookcases and mirrored door and wall installed. Lemon-yellow walls, white ceilings and gray carpets are used throughout, secondary colors being picked up in curtain and upholstery fabrics. Illumination throughout the apartment is designed for one purpose—adequate, glareless illumination, especially of those wall areas designed for pictures (see plan, right). Particularly interesting is the lighting fixture in the dining room (called by the architect-designer a "wrinkle eliminator") of painted metal. This fixture illuminates the room indirectly from the trough, while three spotlights spaced along the trough length are focused to throw a brilliant light on the table top only, leaving the diners in indirect light. While the furniture—especially designed by the



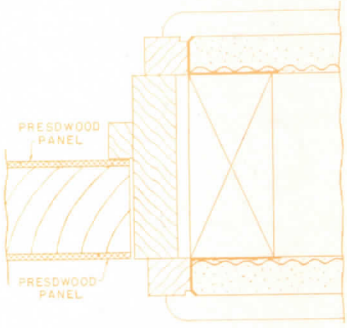
Floor plan and furniture layout

architect for the Winston apartment—was deliberately kept simple in both line and color, a wide variety of leathers, metals, woods and plastics lends it richness. The layout was largely determined by the clients' habits—especially their need of a relatively large seating capacity; all principal groupings are arranged on deep-piled hand-woven rugs in off-white.

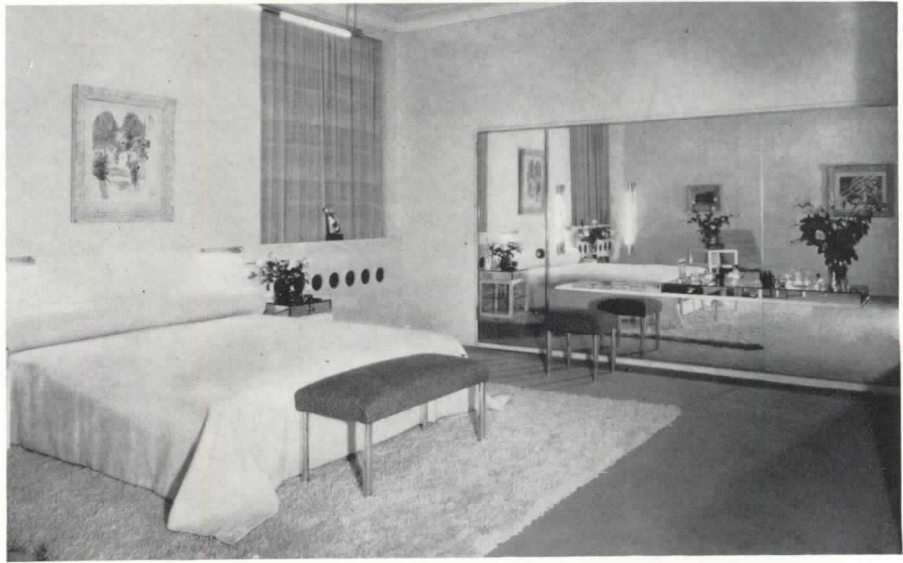
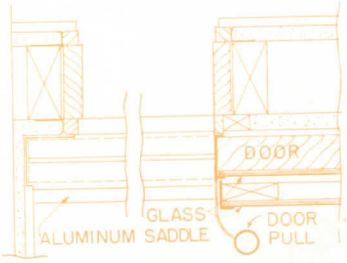
PERCIVAL GOODMAN, INC.,
Architect



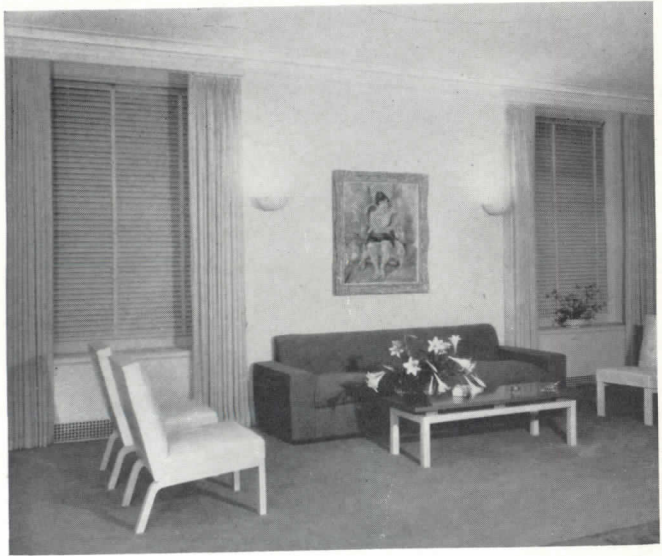
FOYER: dropped muslin ceiling to improve proportion. Walls and rug are white, book shelves in zebra wood, chairs in yellow leather with maple frame. The table (see layout) is of tortoise-shell catalin and brass.



Characteristic of the finesse of the job is the typical detail (above) by which all trim was eliminated and existing panel doors sheathed in presdwood. Below is a detail of sliding mirrored door between foyer and dining room.

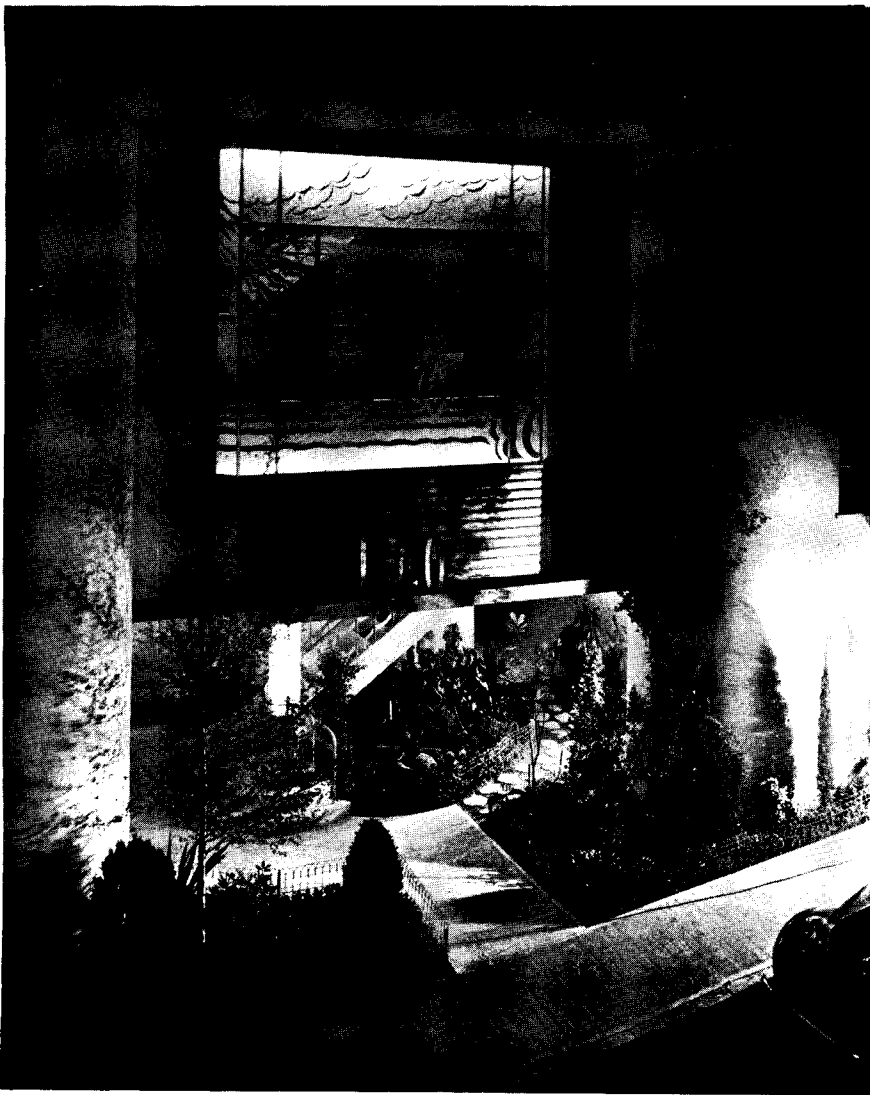


BEDROOM: all woodwork is off-white, color accents coming from the yellow walls and curtains. Night and dressing tables are of mirror and white lacquered wood. Stools are brilliant emerald-green with glass legs. The rug is white, high piled.

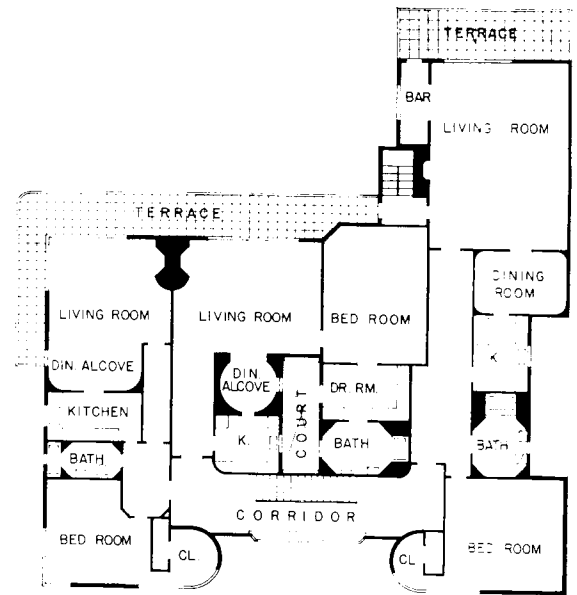


LIVING ROOM: (left): lighting fixtures throw direct light on the ceiling, indirect on their adjacent walls. Chairs are of white leather with light maple frame. In front of the couch, upholstered in a medium-gray rough-textured fabric, is a light maple table, with a brass and red lacquer top.

SAN FRANCISCO: NEW APARTMENT EXPLOITS A VIEW



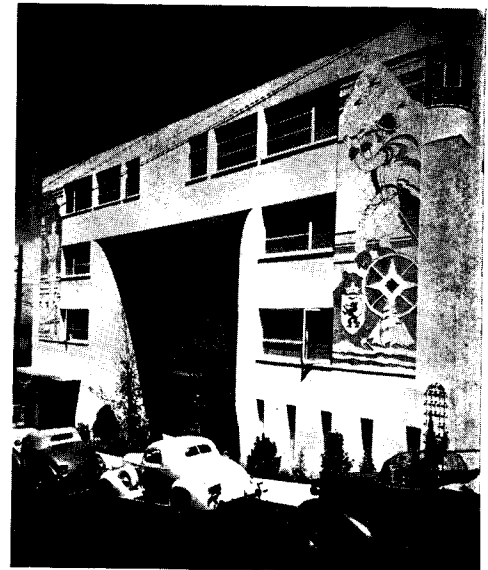
Main Entrance



Typical Floor

ON TELEGRAPH HILL in San Francisco's Bohemian quarter stands this new four-story apartment house all of whose individually planned units overlook the hills of the city and the Bay. Making use of a lot whose grade would have stumped architects of flatter climes, the designers faced the task of meeting a city ordinance governing height of wood-frame structures and state and city requirements for lateral stress—i.e., 'quake resistance. The former was met by making basement, garage and sub-basement of reinforced concrete, the latter by special design of the structural frame. The entire structure has a stucco finish.

Each unit not only has a view, but adequate terrace area from which it can be enjoyed. The somewhat unusual plan of the individual units springs from the fact that each was planned for its tenant. And though this naturally added to the initial cost, the owners feel that a 100% rental long before completion justifies the added cost. Entrance is through a garden (above) which, together with staff quarters and garage entrance, occupies the street side of the first floor.



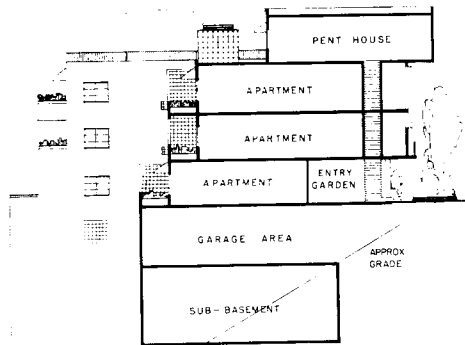
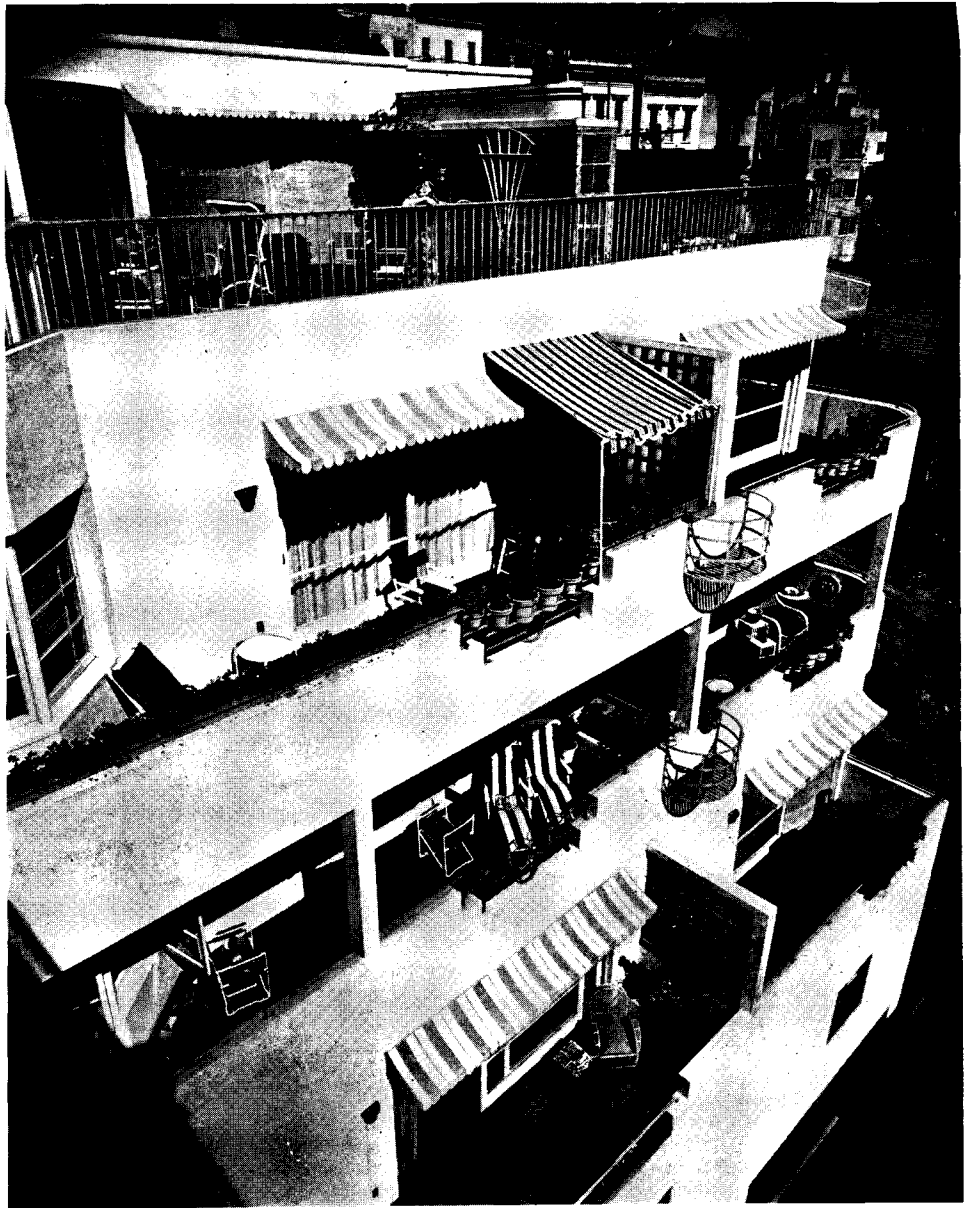
This front elevation view shows the 40-ft. sgraffito carvings, in two colors, which flank the entrance; garage entrance is at lower left.

J. S. and J. R. MALLOCH,

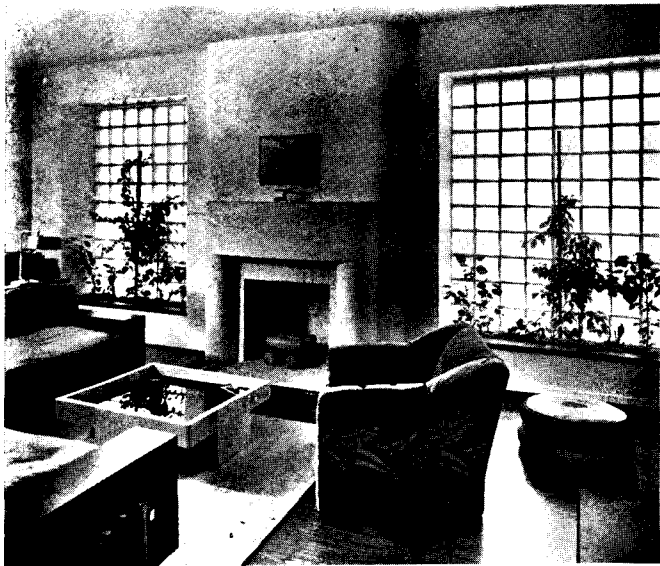
Builders

W. H. ELLISON,

Consulting Engineer



Application of the setback principle to the rear elevation provides private terraces for each apartment. The section (above) demonstrates the designer's canny use of the steep lot. The 14-car garage and sub-basement are of reinforced concrete construction; upper floors are wood-framed.

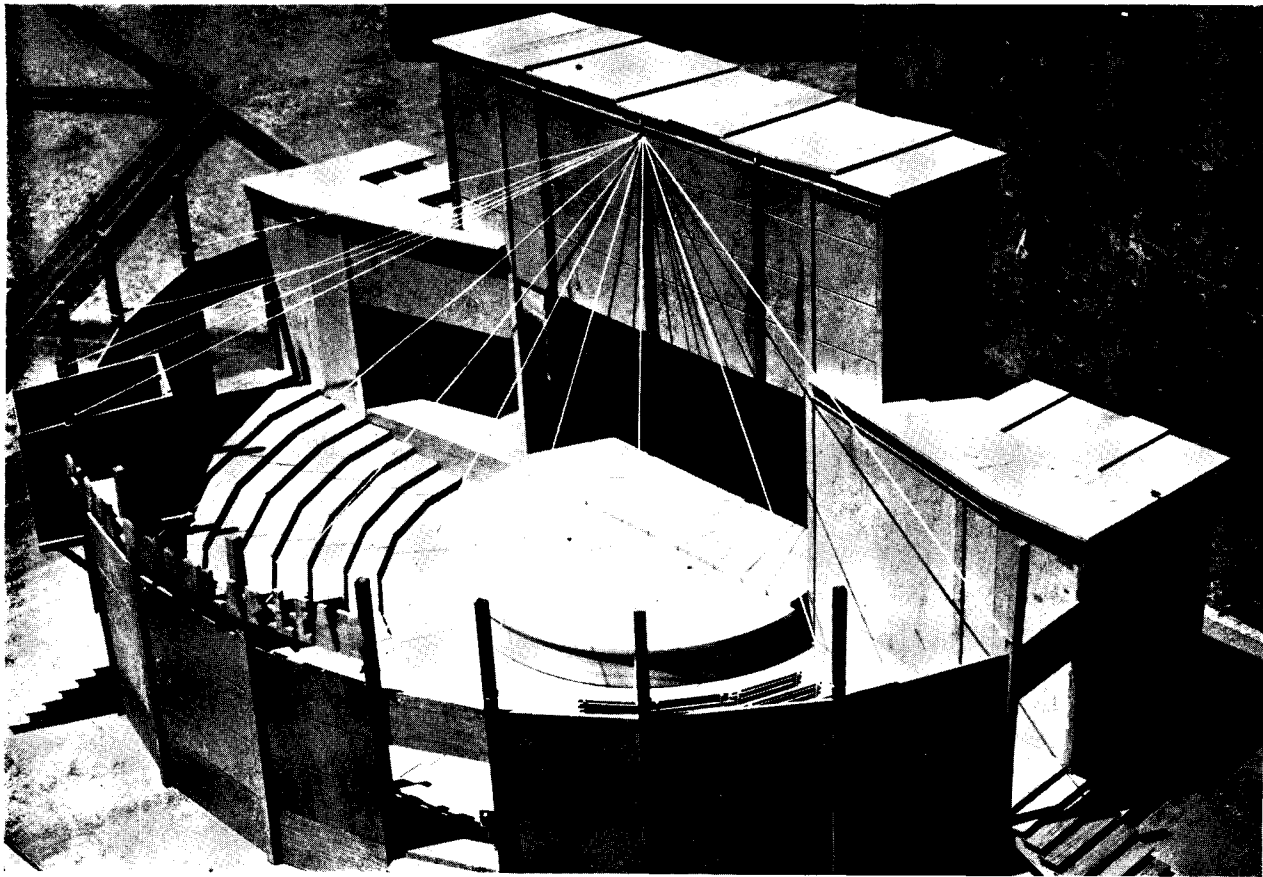


Interiors show elimination of moldings, baseboards and nonessentials. Indirect lighting is used throughout, and different color schemes contribute to the individuality of



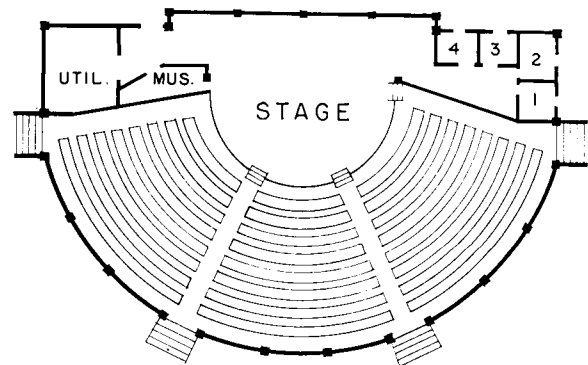
apartments. Above, left, is a typical living room, and right, a typical dining room.

PROPOSED BUILDINGS

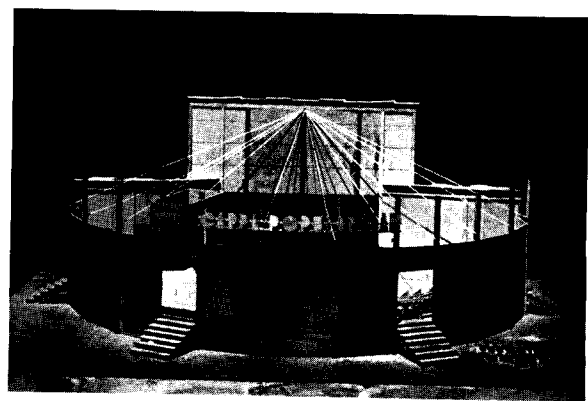


Architect Proposes Portable, Prefabricated Structures for Mexican Popular Theater

DEEP-ROOTED among the Mexican people is a movement which shows signs of becoming a truly National Theater. Known as the "Carpa Popular", this movement consists of wandering groups of actors and musicians throughout Mexico, who perform not only at the almost continuous fiestas, but also in streets, gardens, parks, in any obtainable shelter. To encourage so valuable a movement, the League of Revolutionary Writers and Artists has tentatively approved this design for a portable, prefabricated theater. Expressly designed for mass production by the young Mexican architect, Carlos Le Duc, the theater can be easily dismantled and set up again, since it is made in units, of wood, with a roof of weatherproof canvas. No foundations are required since all vertical elements are bolted to the outside base of the semicircular bleachers. Although the total weight of one of these theaters is but 20 tons, the design provides semicircular tiers of seats for 700 persons. Its cost also is moderate: estimated price of one of the pocket-sized theaters is \$2,250. Because this is a theater of, by and for the people, the audience participates as actively in the performance as the players. Hence the protrusion of the apron, and its development as the actual stage, with the first row of seats close by. There is no acoustical problem, says Mr. Le Duc, because no spectator is ever more than 20 feet from the stage. The problem of entrance and exit is also easily solved: the two front doors are for entrance, the two side ones for exit. There are no ticket booths; a roaming hawker sells them on the street, circus-wise.



Because a "Carpa" audience tolerates no obstruction between actor and audience, the orchestra instead of occupying its usual pit is moved to one side (above) where it may be heard but not seen.



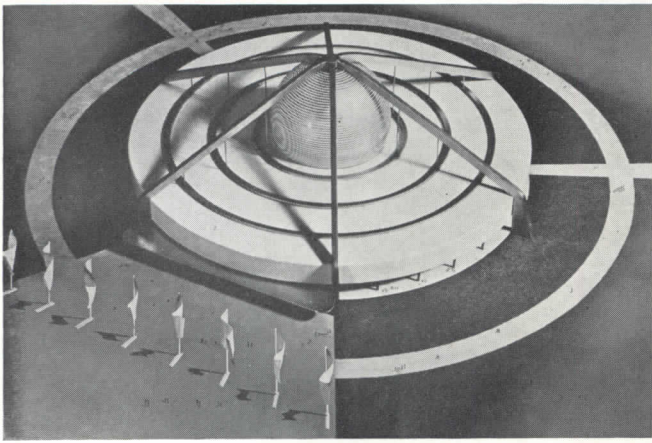
Ample exits provide for continuous circulation.

PROPOSED BUILDINGS

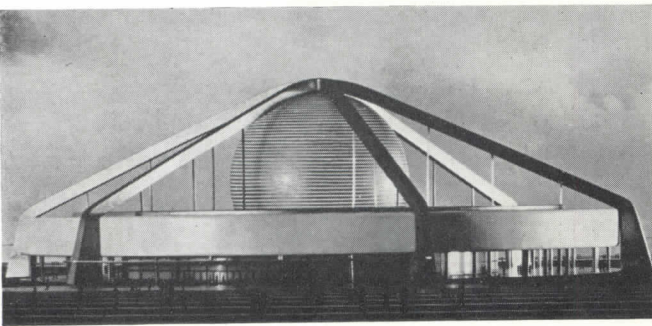
An Exhibit Architect Designs an Exhibit Building

THIS PROPOSED building for a U. S. Government Exhibit at the World's Fair, designed by Alfred Clauss, TVA's Exhibit Architect, obtains its exterior appearance from an ingenious use of six intersecting girders, and its flexible plan from the consequent elimination of all internal columns. The large central dome, besides offering "an easily recognizable government characteristic", is used to house the main theme exhibit. For greater flexibility of plan, columns are eliminated on the exhibit floor by suspending the ceiling from the girders. These girders are covered in polished corrugated sheet copper which reflects the sunlight by day and houses colored tubular lighting for night effects. The exterior of the solid dome is treated with horizontal louvers covered with aluminum that conceal light troughs to illuminate the reflecting surfaces between them. The plain wall surfaces of the building are white; the columns are covered with polished sheet copper; and the entrance roof with aluminum. The covered terraces on the ground floor are designed as a shelter for visitors and connect with the surrounding gardens.

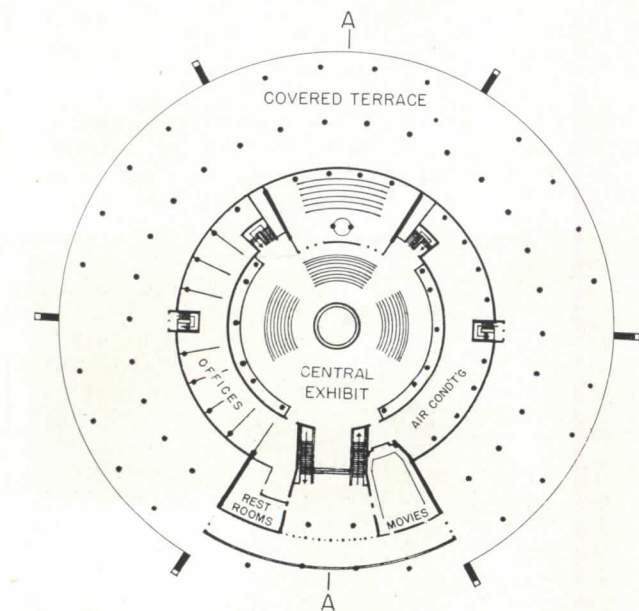
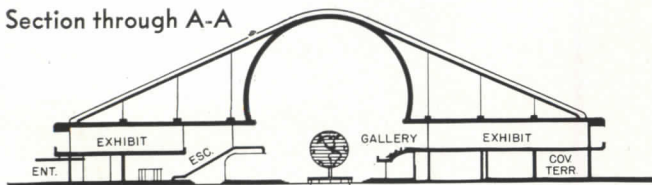
On the ground floor of the central dome Mr. Clauss proposes a "Main Theme" for the general government exhibit. Focal display of this exhibit is a large globe showing the relationship of the U. S. to the world. This globe splits horizontally and three movie screens appear at intervals for a twenty-minute showing of a movie dramatizing the Main Theme, "Government Progress Toward the World of Tomorrow." An orchestra pit is provided under the globe and a seating capacity for 600 spectators around three sides of it and in the gallery. Around the circular exhibit room are dioramas and displays setting forth the historical story of the U. S. Government. Stairs and escalators carry visitors up to a circular gallery which provides access to twelve exhibit themes showing the varied government activities.



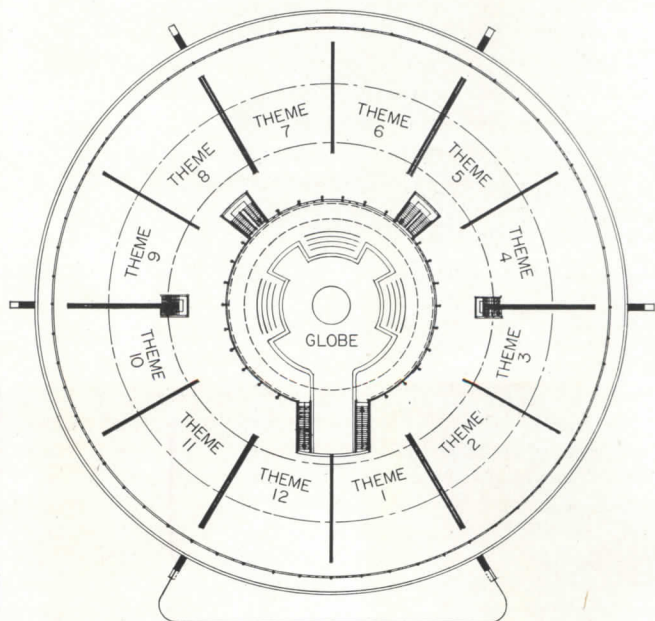
The circular form used on the proposed U. S. Government Exhibit building was determined only partially by the shape of the lot assigned to it; need for centralization and good circulation also dictated a circle.



Section through A-A

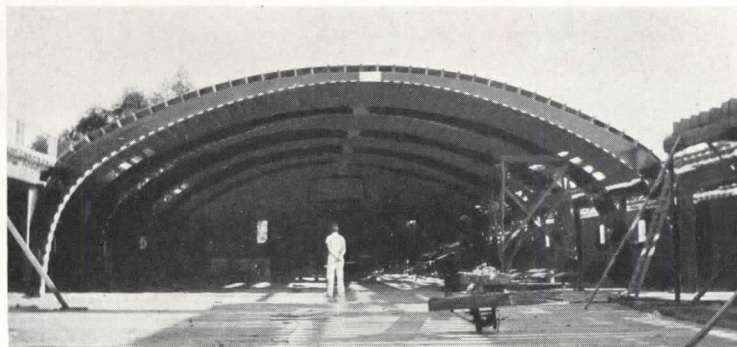
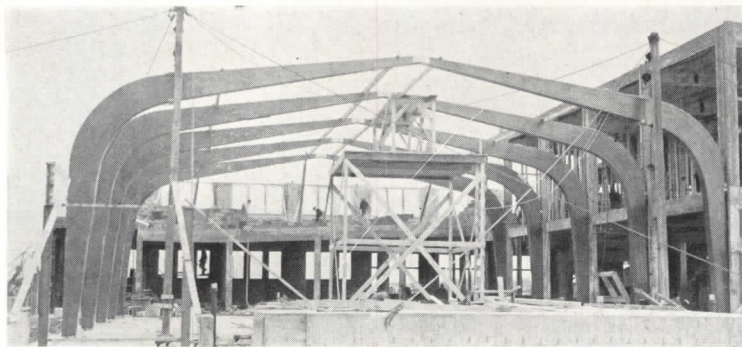


Ground Floor



Second Floor

NEW STRUCTURAL SYSTEMS FEATURE TRUSSLESS CONSTRUCTION



Two variations of Unit Structures' arch frames are shown above: left, gymnasium of Henry Mitchell Junior High

School, Racine, Wis., with equipment for erection of arches; right, Riverside Dance Hall, Green Bay, Wis.

Laminated Wood Arch Frames Eliminate Waste Space

A SERIES of two-piece, three-hinged arch frames of laminated wood designed for symmetrical loading conditions has been developed by Unit Structures, Inc., of Peshtigo, Wis. Like other systems of this type, Arch-Frames are rigid, but since no horizontal trusses are required, they are especially applicable to buildings such as auditoriums, gymnasiums, exhibition halls, etc., where free space and clear field of vision are necessary. (For other trussless systems, see AR 9/37, p. 34, and 12/37, p. 31.) Elimination of waste overhead space by means

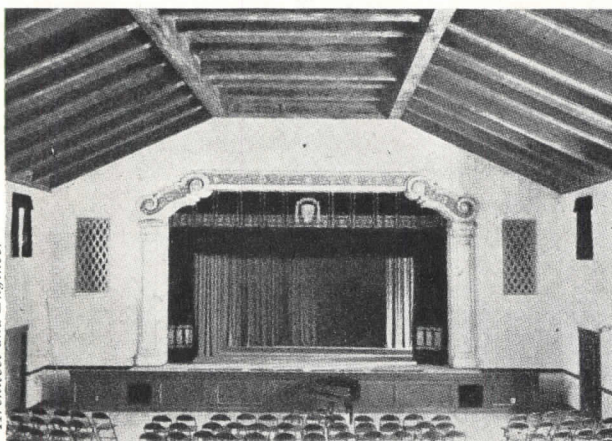
of these flat arches materially reduces the cubical contents of the building. These arches and their columns are one frame, so that there is no need for additional construction as in other types of roof design.

The company manufactures sections of "Arch Frames" (and "Segment Arches" as well) in any specified shape to fit the need of a particular building. The sections are fabricated of laminae of selected wood, united under high uniform unit pressure, glued with water-resistant casein glue, and forcibly curved

into a solid timber of the desired shape. The surfaces are then planed, sanded and given any desired finish, so that the frames are ready for use on delivery.

Because this type of construction replaces with one solid timber the usual large number of scattered members, it is claimed to afford better fire protection. The claim is based on the fact that wood weakens through a gradual reduction in its cross-sectional area only when in direct contact with a continuous open flame, whereas steel weakens under heat and loses its strength at 700° F.

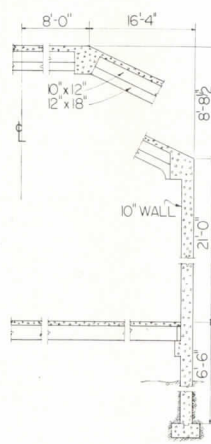
Segmental Arch Solves Low-pitched Roof Problem



Interior of Auditorium

A SEGMENTAL arch which requires no interior tie rods and is designed so that its thrusts are concentrated at the extreme end walls, provides uninterrupted vision from all points of the auditorium of St. Matthew's School, San Mateo, Calif. Developed by L. H. Nishkian, C. E., this roof design consists of three straight segments, 48'-8" in total over-all breadth, of which the central one is horizontally placed. The sloping side segments rise 7'-8½" in a horizontal run of 16'-4". The full vertical loads

of the roof fall on the side walls which are only 10" thick, and have no supporting pilasters or counteracting buttresses. This is possible because the outward thrusts normally developed by such flat side slopes are resisted by the inclined segments which act as horizontal beams and transmit these thrusts to the end walls, 86' apart. Embedded in the concrete of these end walls, and extending from side wall to side wall, is an amount of steel equal to that in all the tie rods which would ordinarily have been used.



Section

Nailable Concrete Planks Cantilever Over Supports

LATEST ADDITION to the widening field of concrete structural units is the pre-cured concrete plank manufactured by the Concrete Plank Co., Jersey City, N. J. Factory-molded to a smooth, level surface on both sides, non-warpable "Cantilite" is fabricated of steel and cellular Portland cement concrete. (Trade name derives from the fact that the planks cantilever over the supports and produce a continuous action.) The welded, galvanized-steel wire mesh which reinforces the plank both top and bottom acts as a steel beam, so that "Cantilite" can be laid regardless of spacing. Tongue and groove on all edges make locked joints and are grouted with Portland cement after laying, binding the plank into a monolithic unit. This product can be nailed to wood, or clipped to steel, is cuttable and has no exposed metal. Planks are made in 16" standard width, stock lengths, and two thicknesses: 2" plank, weighing 12 lb. per sq. ft., in lengths of 6', 7'-6" or 9'; 2¾" plank, weighing 17 lb. per sq. ft. in lengths of 9' or 10'. Breaking point for former was 330 lb. per sq. ft. tested as a simple beam on 6-ft. span; for the latter, 240 lb. per sq. ft. on 8-ft. span.

NEW MATERIALS AID THE BUILDING DESIGNER

Sprayable Lacquer Lends Rubber Metallic Finish

A BRONZE lacquer for rubber, developed by Maas & Waldstein Co., Newark, N. J., gives a metallic finish which harmonizes with whatever metals are used in conjunction with the rubber. This special rubber lacquer makes it possible to cover semi-stiff rubber with a strongly adherent, durable finish resembling brass, copper, bronze, aluminum, steel or other metals. It consists of a special bronzing liquid to which metal powder of any kind is added just prior to use. The mixture is applied by spraying, and air-dries rapidly.

Thin Film Protects Glossy Finishes

FOR PROTECTION during fabrication, shipment or installation of highly finished surfaces, "Protex", a new product of Haydn F. White & Co., 1740 E. 12 St., Cleveland, Ohio, provides a temporary coating. It can be applied by spraying, brushing or dipping, and can be removed quickly by peeling. "Protex" forms a thin but tough elastic film which can be either covered with paper or dusted to eliminate tackiness.

Architect-Designed



Completely architect-designed for the first time, Curtis Company's new woodwork is now in large-scale production from designs of Dwight James Baum, New York architect. Doors, mantels—even complete stairs—are available in adaptations of a variety of styles; above is typical result of Baum-Curtis collaboration.

Sealing Factor Upped in Doors and Windows

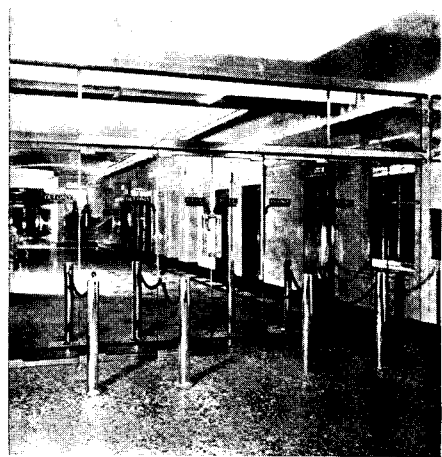
DOORS and windows—almost inevitably the weakest points in any project involving atmospheric control—have seen some improvement recently. Produced by the Farley and Loetscher Manufacturing Co., Dubuque, Iowa, are two types of flush doors whose continuous core construction materially reduces transmission of heat or cold and sound. The inner core construction of "Airo-Kore" is a series of small ventilated air cells built up in grid or "egg crate" form to eliminate warping and twisting caused by torsional strains and stresses. Kiln-dried white pine strips interlocked on edge make up the grid. This type of construction permits the circulation of air inside the door as well as outside and provides a definite sound-proofing quality. "Farlo-Kore" doors are made of kiln-dried white pine core blocks, cemented together with staggered joints so that a practically solid wood slab results. This slab is edged with hardwood strips before any veneer is applied.

[Novel feature of these doors is that they are finished, not with a natural wood veneer but a full-color photographic reproduction of various woods. This veneer—cemented in place with synthetic resin under intense heat and pressure—may be varnished like wood.]

Heat loss through windows and the load on air-conditioning systems can be materially reduced by means of Truscon's new Tempryte Insulating window. Modern prototype of the storm sash, Tempryte is an inside casement of internally reinforced steel frame, fitted with a special weathering seal which is attached to the inside of Truscon operator-type casements. Between casement and Tempryte window there is a 1" dead-air space. Installation of the Tempryte window is said to eliminate condensation on windows under ordinary conditions. Controlled ventilation is made possible by glass ventilating panels or sill vents, which are included at additional cost. The windows are removable and can be stored in a vertical position without damage to the weathering seal.

On Eligibility

The objective here is to provide building designers with information on new systems, new materials, new equipment while they are news—on products still in the laboratory or just emerging from it. Advertised and widely used products are presented elsewhere in the RECORD.—Ed.



Unbreakable

Made entirely of clear sheets of "Herculite", these doors at 40 Wall Street, New York, have neither frame nor view-obstructing support. This new product of Pittsburgh Glass Co. will support five times as much weight as ordinary plate glass, and disintegrates into blunt-edged fragments when tested to its limit.

Engineers Use Sponge Rubber for Expansion Joint

SPONGE RUBBER as an expansion joint filler recently made its first appearance on the new express highway in St. Louis, Mo. This material, prepared in the B. F. Goodrich Laboratories, was chosen for appearance as well as durability. The sponge rubber was furnished in a color to match that of the finished concrete, so that all joints are smooth and unobtrusive. Engineers of the Missouri State Highway Department based their specifications for the various thicknesses of the rubber on the cubic content of the individual sections of concrete. These thicknesses ($\frac{3}{4}$ "-1") are designed to allow for 50% compression as the concrete sections expand in hot weather. Before the wing retaining wall was poured, the sponge rubber expansion joints were wired to the bridge pier. After the next section was poured, the joint was permanently in place.

Caulking Compound Provides Elastic Seal

RECENTLY introduced by Tamms Silica Co., of 288 N. La Salle St., Chicago, Ill., is a new double-duty caulking compound. Made of rubber, linseed oil and asbestos, it sets rapidly and can be painted like wood within 24 hours. Because of its rubber content the compound expands and contracts, while the linseed oil produces a fine protecting film which is moisture-repellent. It provides an elastic seal and, claims the manufacturer, does not crack.

NEW PRINCIPLES INFLUENCE DESIGN OF AIR CONDITIONERS

Experiments Yield

Data on Radiant Heat

PRESENT KNOWLEDGE of air conditioning sprang almost full-grown from the characteristic American emphasis on mechanical means; it is only recently that the more fundamental physiological element has been explored. To increase the necessary knowledge on this important phase of air conditioning, Drs. C. A. Mills and Cordelia Ogle of the University of Cincinnati have just completed experiments on the control of body-heat loss through radiant means. Their findings indicate that profound changes in both structure and design of air-conditioning equipment may be necessary to meet human needs and to provide healthful working and living conditions. In determining the feasibility of using radiant heat for control of body-heat loss, four experimental rooms were set up within larger laboratory rooms and equipped to cover the desired conditions. Exhaust fans and inlets supplied adequate ventilation, and recirculating units in the various rooms conditioned the air.

The effect of these different environments on human subjects was varied. In Room 1 subjects showed distinct discomfort, with free perspiration and a smothering sensation, while in Room 2, with identical air conditions, the absorption of heat radiation by the cold plates created an atmosphere without stuffiness or smothering, in which adequate body cooling took place. In Room 3, with no heaters operating and the air at 32° F., body chilling was severe. But soon after the heaters were turned on, the subjects experienced great comfort although the air was still below 40° F. However, after the heaters had been operating for several days and weeks, subjects in this room were uncomfortably warm in a half-hour's time, no matter how lightly clothed. Room 4 provided a cool but comfortable environment for subjects wearing usual winter indoor clothing.

Test biologic effect on mice

Not satisfied with experiments on humans only, the investigators proceeded to test the biologic effects on mice of these various controlled atmospheres. In each room were placed 10 male and 20 female white mice. Fastest growth and earliest sexual development occurred in the group in Room 2. Moist heat in Room 1 accounted for growth retardance. In Room 3 there was also growth retardance, although temperatures were moderate and relative humidity low. From this is illustrated the contention that the level of metabolic

	Room 1 Moist Heat	Room 2 Moist Heat Radiant Cooling	Room 3 Cold Air Radiant Heating	Room 4 Air Cooled
Size	6' x 6' x 6'-6"	6' x 6' x 6'-6"	8' x 8' x 7'	8' x 8' x 7'
Construction	Inside walls and ceiling of rigid insulation board.	Same as Room 1, but lined with aluminum foil.	Double walled steel; 1" rock wool insulation; lined with aluminum foil.	Same as Room 3.
Equipment	Recirculating unit.	6 cold plates, 20" x 42", on opposite side walls, connected to a condensing unit outside. Plates kept at temperature of 32°-40°F.	Air cooling unit connected to outside compressor. Arrangements for input of radiant heat from ordinary coil reflector units.	Ordinary room conditioning unit. No exposed radiant heat or cooling surfaces.
Temperature	89°-92°F.	89°-92°F.	32°-76°F.	66°-70°F.
Relative Humidity	60-70%	60-70%	60-70%	60-70%

Schedule: construction and equipment for Mills-Ogle Experiments

or internal combustion, and all other vital functions attached thereto, is determined by the ease or difficulty of body-heat loss. For instance, in Room 1, body-heat loss was difficult as both the air and all materials assumed a uniform temperature; but in Room 2, where the cold plates took up the heat lost by radiation, air and foil were at the same temperature as Room 1, and all other materials were at lower temperature levels.

[That the laws of radiation apply to man as well as to the theoretical "black body" used in their deduction has just been ascertained by experiment. Dr. James D. Hardy of Russell Sage Institute of Pathology and New York University, and his colleague, Dr. Eugene DuBois, subjected their naked selves to a temperature range of 72° F. to 96° F. in a respiration calorimeter (sealed room to which measured amounts of air can be supplied), and found that their bodies lost by radiation and convection the same amount of heat as an inanimate "black body" of equal radiating area. In this case the "black body" was a blackened cylinder which could be filled with water kept at any desired temperature. Drs. Hardy and DuBois also found that automatic regulation of body-heat loss is effective only down to 84° F. As the room temperature drops from 88° F. to 72° F., the blood flow decreases and remains stationary, says Dr. Hardy.]

Radiant means regulate body-heat loss

The preliminary findings of these experiments indicate certain points of considerable importance. Human comfort and animal growth and development, the scientists conclude, can be regulated

with apparent safety by control of body-heat loss through radiant heat channels alone. They have found that the differences in radiant heat emission and absorption determine the practical feasibility of such radiant control. Particularly interesting to the building designer is the apparent obviation of the need for wall insulation since, from the experiments, wall surface temperature is no longer important. Foil wall surfaces are efficient passive reflectors of radiant heat, although their temperatures are always maintained at air temperature levels. Advantages which this system of conditioning seems to offer include: elimination of marked contrasts between indoor and outdoor temperatures; reduction in heating and cooling load, and in insulation needs.

Scientists Find Alumina is Moisture-Adsorbent

REMOVAL of moisture content from the air by the application of "adsorbent dehumidification" has now passed the experimental stage, says R. B. Derr of The Aluminum Corporation of America's research laboratories. The process is based on moisture adsorption by activated alumina, an oxide of aluminum which occurs naturally as corundum and is prepared artificially as a white tasteless amorphous powder. Alumina is capable of adsorbing substantially 100% of the moisture from a gas passed through it, and can take up from 12 to 14% of its weight in water.

In the light of the present concern over water shortage, this development will be of particular benefit in the industrial use of air conditioning, for the adsorbed water is removed from the alumina by heating, and, when cooled, can be used over again.

NEW EQUIPMENT ANNOUNCED ; TWO RUMORS DOWNED

Air-Conditioning "Package" Designed for Residential Use

FOR YEAR-ROUND residential air conditioning Westinghouse has just announced a compact packaged oil- or gas-fired unit in a number of capacities suitable for small as well as large homes. The new unit employs a central system of matched units comprising a direct-fired forced warm-air furnace, with filters, blower and humidifier for winter conditioning, and a condensing unit and cooling coil for summer conditioning. The latter may, however, be added after the winter system has been installed. Gas-fired furnaces are available in capacities of from 60,000 to 100,000 Btu with matched equipment for summer conditioning. Oil-fired furnaces come in capacities of from 50,000 to 100,000 Btu. Concentrating on the market for new homes from \$5,000 up, Westinghouse plans to sell these units as installed packages for the average house at the cost of a medium-priced automobile.

Air Curtain Shields Workers from Wintry Drafts

OF INTEREST to designers of industrial buildings is a draft-prevention device recently installed in the Olds Motor Works at Lansing, Mich. In this particular building—as in most assembly plants—the problem of maintaining an even and comfortable temperature near doorways was acute, because of the necessity for continuous opening and closing of doors. At the Olds Works the problem was solved by using an "air curtain", which is actually a new use for the unit heater. A warm air current, created by a fan installed over the opening, is forced down through a duct system, just the width of the opening. Baffles direct the air to the de-

sired angle—straight down in this case—so that it acts as a door seal. The warm air shuts off most of the cold outside air, and mixes with any that filters through the "curtain." Installation and operating costs are approximately the same as for any unit heater, according to J. J. Carter, Manager of Manufacture at Olds. For installing fan, heating coils, motor and hood, the cost was \$600; for operating, the cost is 22c per hour, including both steam for the heating coils and electricity for the fan.

Cold Is Byproduct of Heat in New Equipment

FUEL will be made to do double duty in the new "Stator Duplex" unit for supplying home refrigeration and hot water simultaneously. Comstock & Westcott Laboratories, Cambridge, Mass., developers of the Technicolor motion picture process, perfected the unit. Stator Corp., Plainfield, Conn., will make it. Utilizing either electricity or gas, the device produces refrigeration as a byproduct of hot water heating. Sponsors are considering addition of air conditioning as a further byproduct.

Synthetic Resins to Purify Water

INDICATED for the near future is a new industry—that of water purification by means of synthetic resins. The process by which this will be accomplished was discovered by Drs. Adams and Holmes of the National Physical Laboratory, Teddington, England. Basing their experiments on the known facts that peat sometimes extracts salts and other constituents from water, and that synthetic resins of the bakelite type are darkened by strong alkalis, the scientists found that by passing water through powdered resins the salts of various metals, dissolved gases and micro-organisms are removed. Water said to be as pure as the best distilled water is obtained by passage through two powdered resins: the first converts a neutral into an acid water; the second neutralizes the acid water by removing sulphates, chlorides and other salts.

Water Consumption Corrected and Defended

SPURRED ON by the increased sales of air-conditioning equipment during 1936, Department of Commerce recently conducted a survey of water and sewer systems in 91 cities in the U. S. (For report on survey, see AR, 10/37, p. 39.) On the basis of this survey it was concluded that many cities

have a water supply barely equal to the demand. Alarming large, the figures presented a somewhat erroneous picture of conditions, according to J. J. Donovan, manager of GE's Air Conditioning Division, for they were based on the assumption that all existing air-conditioning equipment operates on a 12-month, 24-hour-a-day schedule. The average actual operation is 750 hours a year, with 500 hours as the minimum, 1,200 the maximum. One horsepower of air-conditioning equipment requires 100 gallons of water at 75° F. per hour, and on this basis, existing installations use between 13 and 15 billion gallons annually, or less than one percent of the total water consumption of all cities of 100,000 or more.

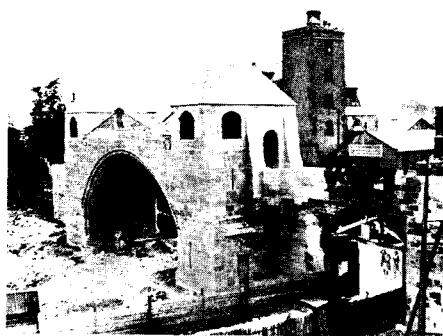
Survey Acquits Rock Wool of Moisture Charge

TO COMBAT a current rumor that rock wool was the cause of widespread structural and pigment failure (because of its alleged tendency to absorb moisture) Johns-Manville recently conducted a comprehensive investigation of that product in 90 houses where rock wool has been in use for from one to ten years. From the data collected, the Johns-Manville survey concludes: (1) that rock wool in the walls or attic of a house does not invite condensation and will not take up moisture from the air; and (2) that where rock wool had become wet (through improper installation, which caused absorption of moisture from wet plaster, or through roof or outside wall leaks) it had dried out without subsequent effect on its insulating efficiency, and without damage to wood framework.

No damage found

Of the 90 homes studied, all in the Great Lakes and Atlantic Seaboard area, where average winter conditions are particularly severe, 29 had air conditioning which, because it increases the humidity, is an acid test for insulation performance. Samples of wool were taken at the sill line and next to the studs in all the houses surveyed, subjected to an immediate physical inspection and then sent in airtight containers to the laboratory for moisture and other analysis. Every sample was found to be in perfect condition. Stud and plate surfaces were scraped for moisture, mold or fungus growth. The voluminous Johns-Manville report, documented by statements from representatives of architects and engineering firms who acted as impartial observers in the survey, concludes that mineral wool does not promote dry rot or fungus growth.

New Gates



When old "Newgate" at Chester, England, (right), grew too small for modern traffic, city fathers cautiously pierced the wall and built this new gate (left) in pseudo-Gothic style.

NEW INFORMATION FOR THE BUILDING FIELD



1938 Sweet's Catalog File Features Five Units

OF F. W. DODGE CORPORATION'S several information services for the building field, Sweet's Catalog Service is second only to Dodge Reports in number of clients served. Last month Sweet's started nation-wide distribution via Western Union of its new five-unit, 50-pound file of building product catalogs for 1938. World's largest collection of pre-filed catalogs, Sweet's this year reached 5,423 pages of indexed, classified, and pre-filed information for the building designer. About 800,000 pounds of paper, some 20 carloads, were required for printing this year's files. Over 1,100 manufacturers filed catalogs or catalog information therein. Reflecting a constantly increasing demand, the number of sets to be distributed to users this year will climb from 13,000 to 14,500.

Originally a one-volume file

Growth of Sweet's from the original 758 page volume of 32 years ago to its present size is no accident. Founded in 1906 by ARCHITECTURAL RECORD, Sweet's was the logical outgrowth of the chaos in the field of industrial cataloging. Said Thomas Nolan, at that time assistant professor of architecture at the University of Pennsylvania, in his *Introduction* to that first volume: "Let the matter be looked at entirely from the point of view of the architect. For a period of a dozen years, every possible method of collection, sorting, classifying, filing and indexing was tried . . . and abandoned because they did not work well in the specification room." Conditions, wrote Mr. Nolan, were intolerable; the architect needed more information than ever, but in an accessible form. He could not at first-hand read all the pamphlets—"the day is too short"; nor could he afford to ignore their contents. "His dilemma (was) that he must either forego this necessary knowledge and re-

main behind his age or give up his time to learning . . . and have no time left for anything else." What was needed, said Mr. Nolan, was a reference information service—"a really scientific standard guide to building materials and construction"; and Sweet's, he confidently predicted, would fill that need.

Significantly, that early editorial stressed three points: (1) that such a reference service must be designed from the standpoint of the user; (2) that consequently all information must conform to scientific standards of content and format; (3) that such a service *would never be perfect* but subject to continuous improvement, periodic liquidation. Time itself has proved the correctness of that statement. Year by year Sweet's has expanded with American industry; and year by year it has undergone "retooling" until today it is the largest, most complete and most scientific catalog service in the world.

Basic standards researched and applied

More statistics give little clue to the *design problem* posed by such a service. Behind the physical production of Sweet's, there is, in addition to artists, draftsmen, technical copy writers, engravers, printers, etc., a two-part design staff: a research department, which carries on constant research into the basic standards of catalog content and format; and Sweet's consulting staff of architects and engineers, which—working with the manufacturer—applies these general standards to individual catalog design. The importance of this design service to both manufacturer and building designer increases almost hourly. For the need of integrated information increases in exact proportion to the increasing specialization going on inside industry in general, building in particular.

Control of this service, of course, is not vested wholly in Sweet's; it lies partly with Sweet's, partly with Sweet's clients. But to the full extent of its ability Sweet's carries on its educational campaign among the latter: interpreting the building designer's information requirements, explaining the necessity of improved catalog design on the basis of those requirements, and pointing out the economies effected for all concerned by the pre-filed method of catalog distribution.

New Publications Individually Distributed

General

Bibliography of Italian Baroque Art. By Francis J. Geck, University of Colorado, Boulder, Colo. Price, \$1.25.

Glass in Modern Construction. Text and introduction by Harold D. Eberlein and Cortlandt Van Dyke Hubbard. Charles Scribner's Sons, 597 Fifth Ave., New York, N. Y. Price, \$3.75.

The Architectural Heritage of the Piscataqua. By John Mead Howells, with introduction by William Lawrence Bottomley. Illustrated with photographs and detail drawings. The Architectural Book Publishing Co., 112 W. 46 St., New York, N. Y. Price, \$10.

The Science of Seeing. By Matthew Luckiesh and Frank K. Mass. D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y. Price, \$6.

Electrical Equipment

Brown Automatic Boiler Regulation. The Brown Instrument Company, Philadelphia, Pa.

Emerson Electric Fans for 1938. The Emerson Electric Manufacturing Co., St. Louis, Mo.

Floodlighting Projectors, Catalog 211. The Pyle National Co., 1334-1358 N. Kastner Ave., Chicago, Ill.

Indirect Lighting. The Edwin F. Guth Co., 2615 Washington Blvd., St. Louis, Mo.

M-L Time Switches. Diebold Safe and Lock Co., M-L Time Switch Division, Canton, Ohio.

Material Proofing

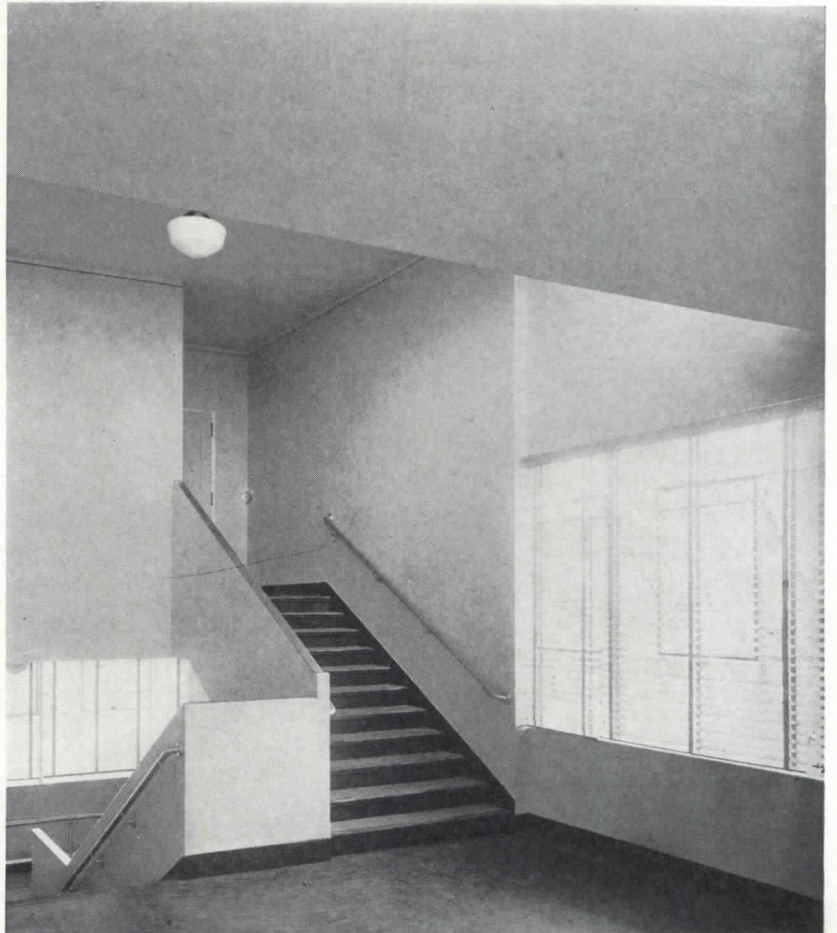
Amercoat on Guard against Corrosion. American Concrete and Steel Pipe Co., P.O. Box 1428, Arcade Station, Los Angeles, Calif.

A Manual of Porcelain Enameling. Edited by J. E. Hansen. Enamelist Publishing Co., 4150 E. 56 St., Cleveland, Ohio. Price, \$5.

CALENDAR OF EVENTS

- **February 7-11**—Joint convention, American Concrete Contractors Association, National Concrete Masonry Association, National Cinder Concrete Products Association, Hotel Sherman, and Cast Stone Institute, Medinah Athletic Club, Chicago, Ill.
- **February 9**—Closing date, entries to competition for Distinctive Merit in Packaging, Irwin D. Wolf Awards Administration, 232 Madison Ave., New York, N. Y.
- **February 26 - March 3**—Convention, National Education Association, Atlantic City, N. J.
- **March 1**—Closing date, proposal of candidates for 1938 Edwin Langley Scholarships of AIA.
- **March 15**—Closing date, Higgins Ink Mechanical Drawing Competition, Scholastic Awards, Chamber of Commerce Building, Pittsburgh, Pa.
- **March 15**—Closing date, entries to competition for design of table and floor lamps, Illuminating Engineering Society, 51 Madison Ave., New York, N. Y.

DESIGN TRENDS

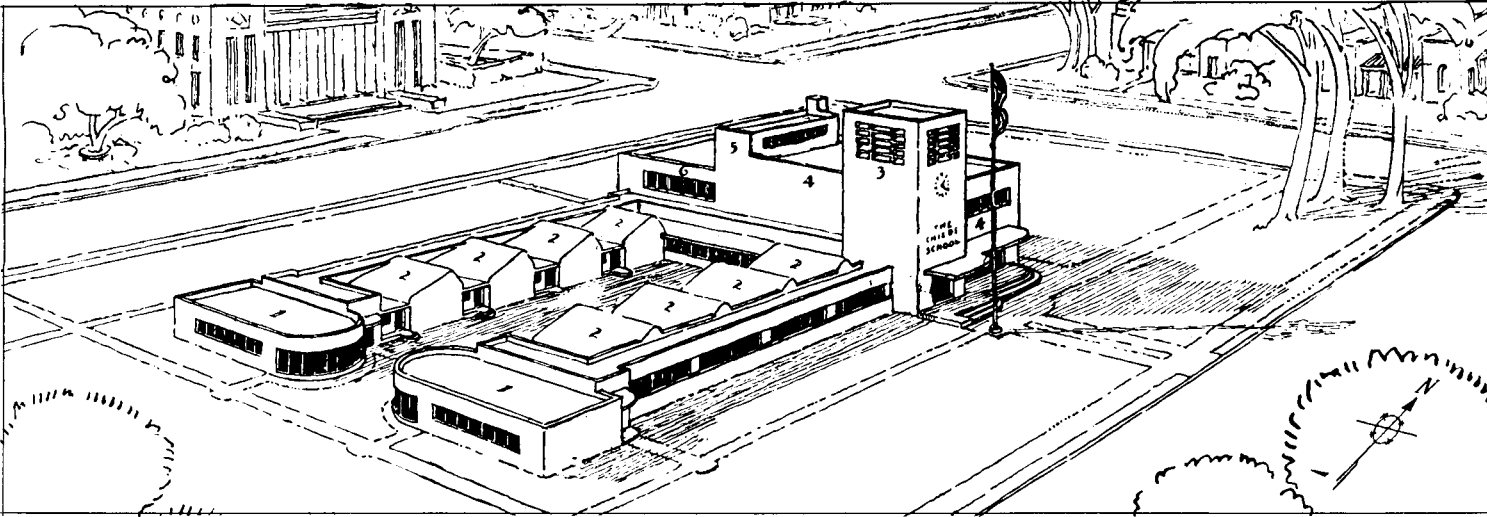


Luchians Studio

Schools designed to obtain maximum advantage of daylighting and suitability for special classroom instruction (pp. 54-57).

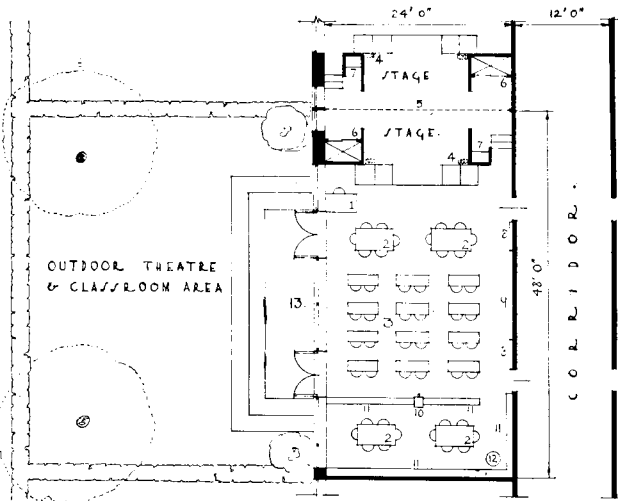
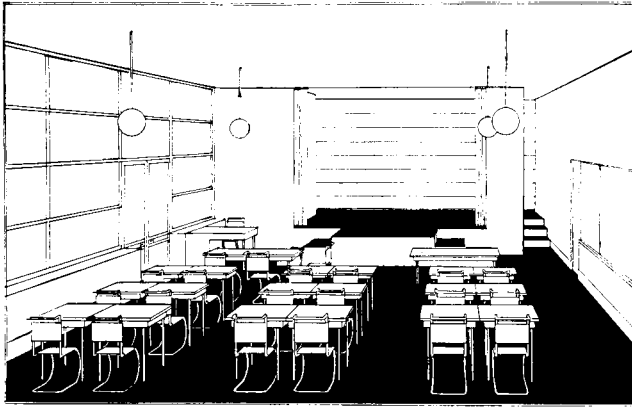
ARCHITECTURAL

Record



- | | |
|---------------------|------------------|
| 1 Kindergartens | 4 Auditorium |
| 2 Activity Rooms | 5 Stage Loft |
| 3 Ventilation Tower | 6 Playroom (gym) |

Activity School Unit with differentiation of school building compartments for a program of teaching that is based on "learning by doing." Designed by Arthur L. Martsolf, Architect.

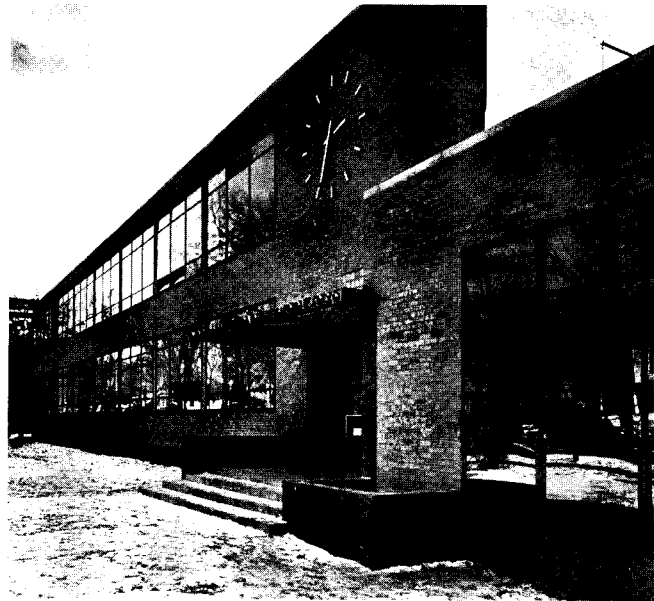


- | | | |
|----------------------|--------------|------------------------------|
| 1 Teacher's desk | 6 Wardrobe | 10 Motion-picture projection |
| 2 Work tables | 7 Sink | 11 Bookcases |
| 3 Student tables | 8 Bulletin | 12 Suspended globe |
| 4 Stage curtain | 9 Blackboard | 13 Outdoor stage |
| 5 Soundproof curtain | | |

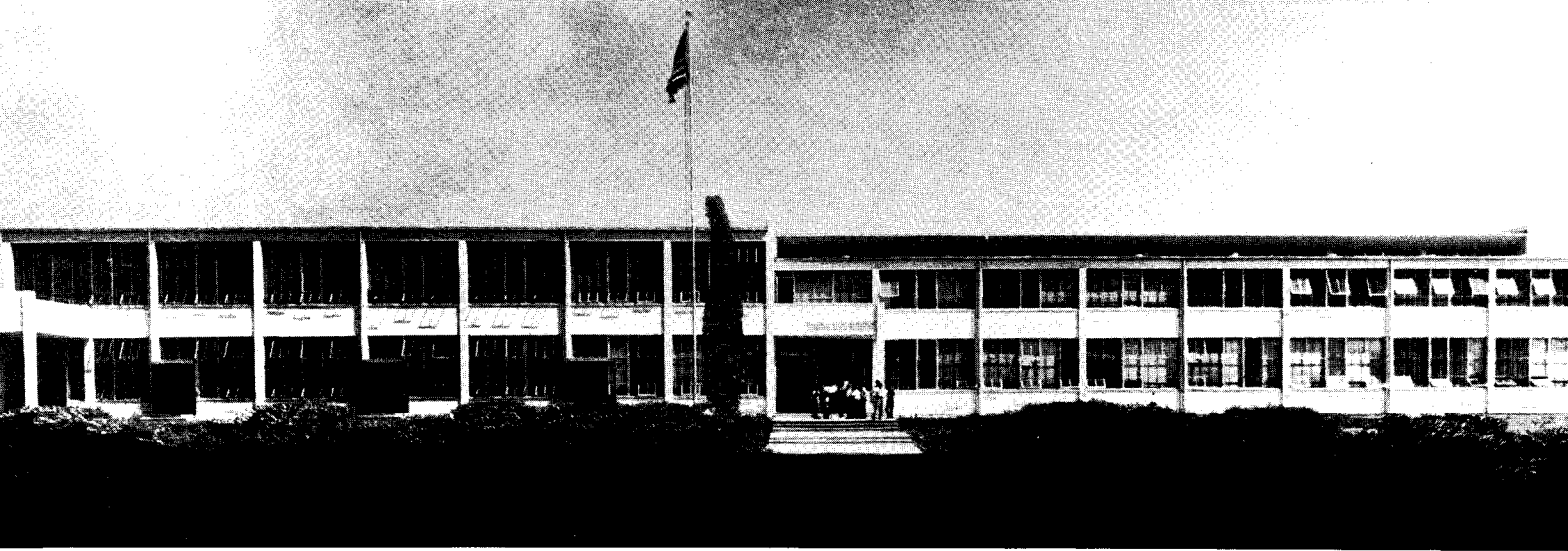
Classroom for teaching English, with provision for types of activities naturally associated with English instruction. W. K. Harrison and J. Andre Fouilhoux, Architects.

School Planning

IN SCHOOL building design, shape and distribution of rooms, size and location of windows, furniture and mechanical systems are determined by the requirements of teaching. The school buildings, briefly reviewed in this issue, and nursery schools, scheduled for the RECORD next month, indicate a tendency toward simplification and rationalization of planning.



Northville Grade School, Northville, Michigan. Lyndon and Smith, Architects. Kindergarten (right) is at ground floor level.



Ralph Waldo Emerson Junior High School. Richard J. Neutra, Architect.
One of the new schools near Los Angeles with earthquake-safe construction.

Luckhaus

or Changing Curriculum Needs

CHANGES in school planning and design can be perceived by even a casual review of school buildings built in the past two years. Progress is recorded in a closer adjustment of school planning to specific space requirements for education. For example, there is an increasing popularization of classrooms for special use; the daylighting of classrooms is receiving more thoughtful attention in current work as evidenced by enlarged window areas; protection against hazards of disaster and accident is increasing; sanitation is improving; there is greater ease of exit, and better provision for desirable student circulation under supervision.

It is because methods of education are undergoing continuous change that the old conception of the schoolhouse and its related grouping is becoming obsolete. Departure from the old and conventional type of teaching areas is most clearly apparent in the layout of nursery schools, play areas, recreation rooms, laboratories, shops and home economics rooms. Professor N. L. Engelhardt of Teachers College, Columbia University, has pointed out that "the laboratory type of educational space must supplant the textbook type of classroom." As illustration he cites the case of a "social science group that desired a large laboratory in which there was much of modern, economic, social and governmental material constantly on display. Large project areas in which group projects representing commercial, industrial, and other developments could be presented, work spaces for small groups, library alcoves, and files for materials and storage. . . . Adjoining the laboratory was an audio-visual studio where the problems of the social sciences

might be definitely portrayed in intimate relationship to all aspects of world living. Rooms adjoining the laboratory included group rooms for discussion and planning, reading rooms, and special teacher guidance and conference spaces, as well as teacher-student curriculum rooms in which the curriculum materials of the current program were constantly in the process of being developed by the students themselves with the aid of a curriculum teaching expert."

Richard J. Neutra of Los Angeles has applied to school planning many of the provisions listed in the foregoing comment by Dr. Engelhardt. For the West Coast he has classrooms with seating designed for maximum advantage of daylighting as well as suitability to special classroom instruction. A room for recitation and oral English, illustrated in this article, has a diagonally arranged stage and seating. It is probable that school building shapes will be further changed the better to serve the requirements of sidelighting. A classroom with outdoor and indoor areas is being tried experimentally by Richard J. Neutra and others.

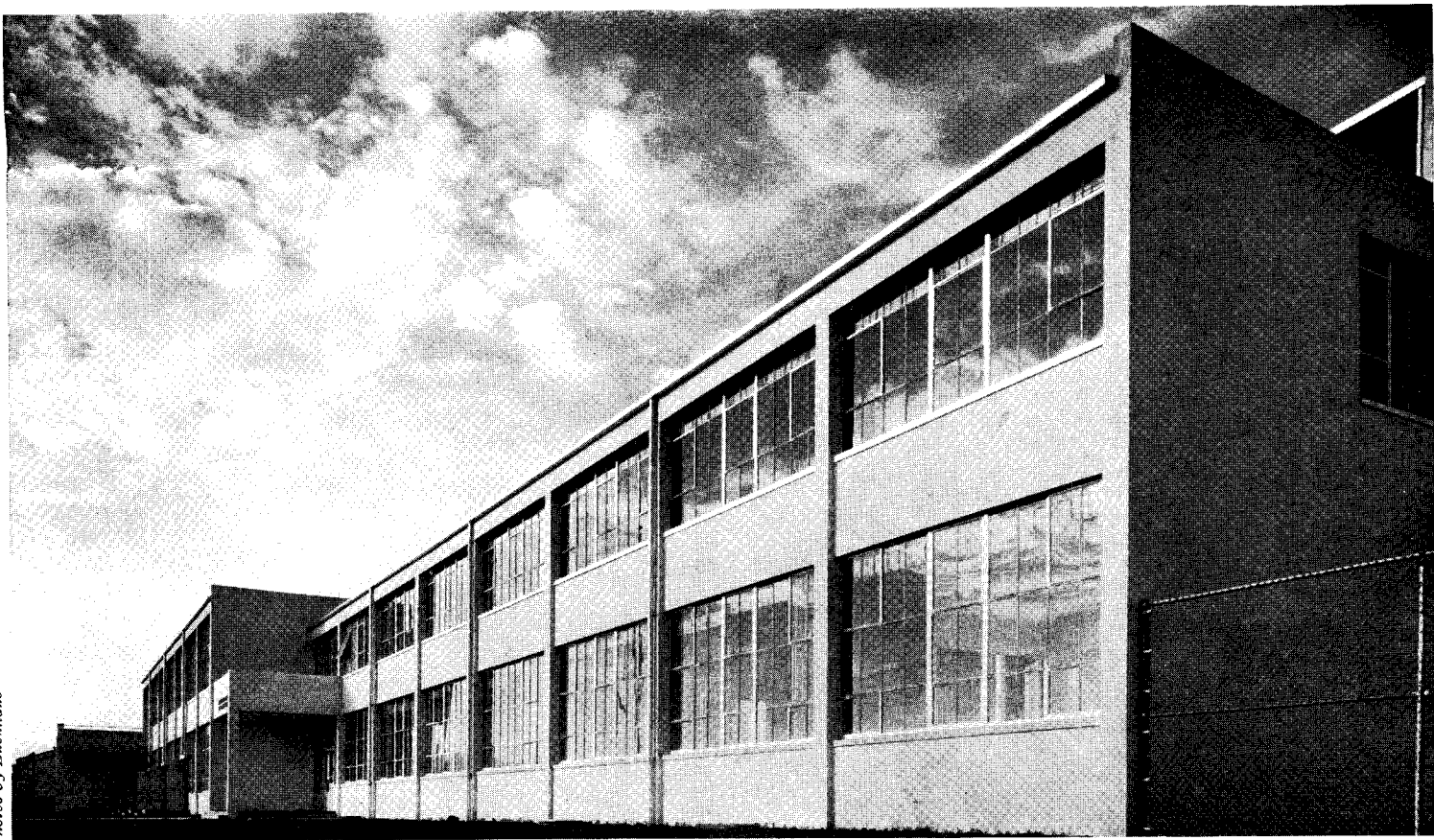
Books on Improved School Planning

The Educational Talking Picture. By Frederick L. Devereux and others. The University of Chicago Press, 1933.

The American School and University. American School Publishing Corp., New York. 1928-1937 editions.

New School Planning and Equipment. The Architectural Record, Vol. 79, June 1936.

School Activities and Equipment. By Rose B. Knox, Houghton, Mifflin Co., Boston, 1927.



Ralph Waldo Emerson Junior High School, West Los Angeles, California. Richard J. Neutra, Architect. As seen from the South.

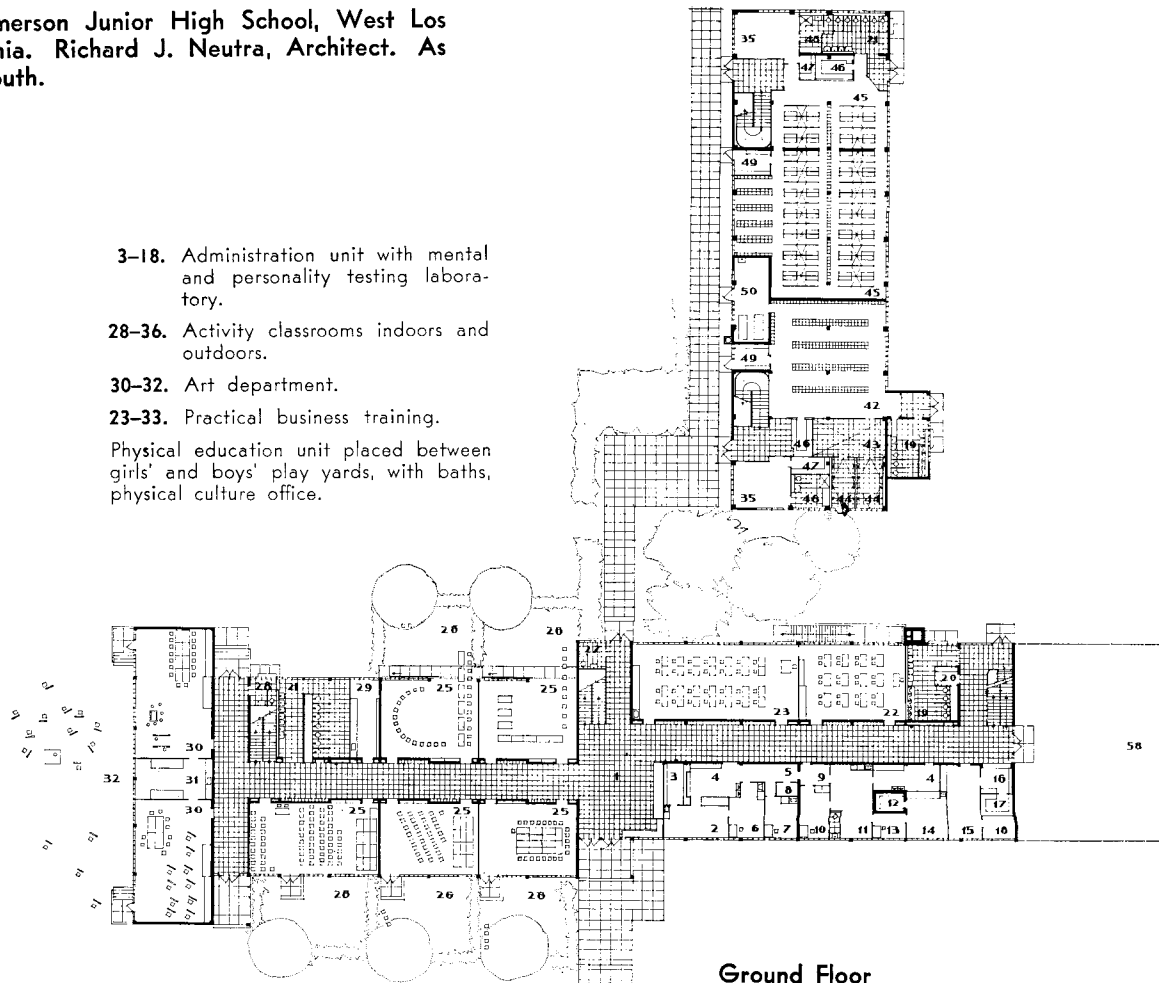
3-18. Administration unit with mental and personality testing laboratory.

28-36. Activity classrooms indoors and outdoors.

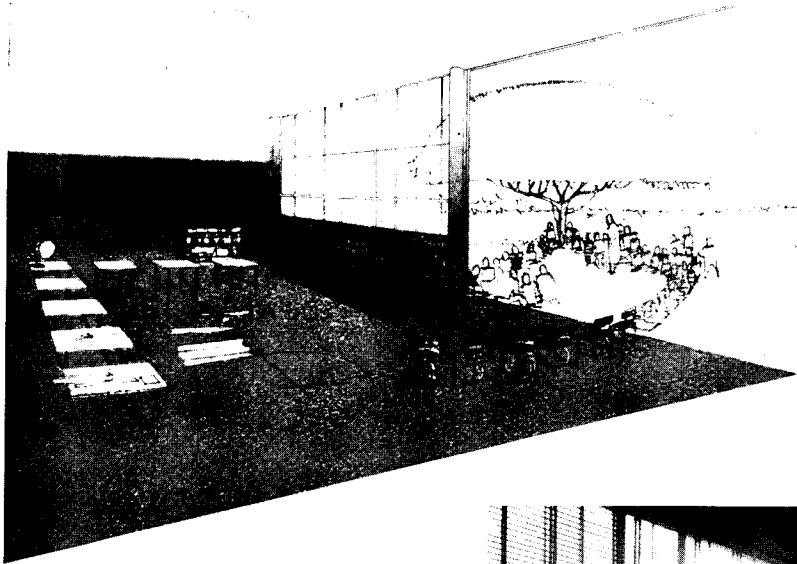
30-32. Art department.

23-33. Practical business training.

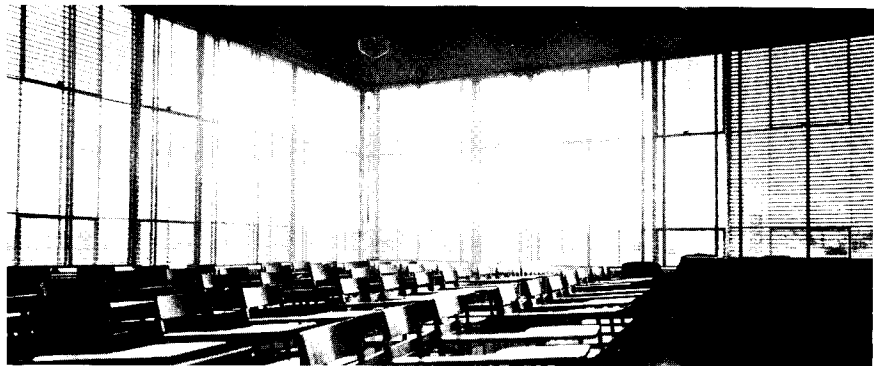
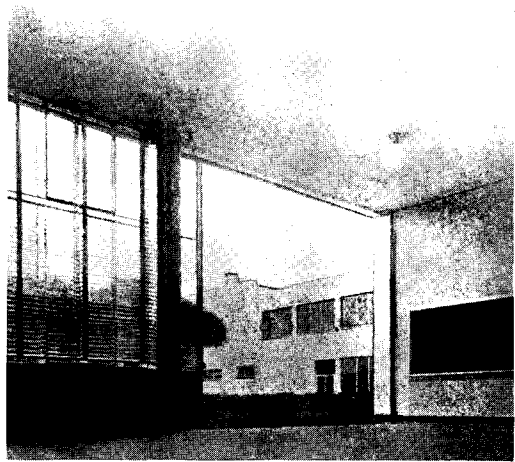
Physical education unit placed between girls' and boys' play yards, with baths, physical culture office.



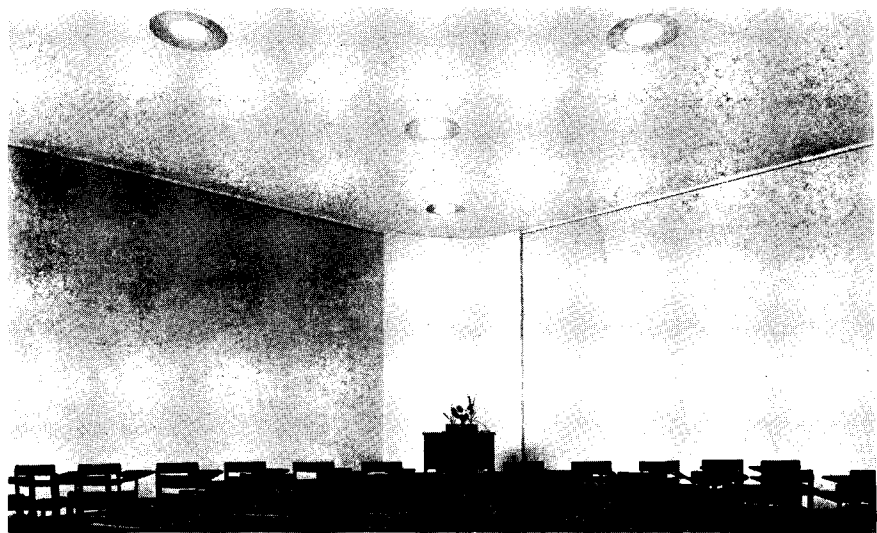
Ground Floor



2



3



4



5

1. Social Science Room with sliding metal doors into outside patio. A detail view of this side-sliding door is shown in 2. 3. Room for Musical Instruction. 4. Classroom for Recitation and Oral English with diagonally arranged stage and seating. 5. Room for Physical Exercises.

Planning a Physician's Office Suite

By **NORMAN N. RICE**, *Architect*

TODAY the office of the physician is new in its working arrangement and modern in its equipment. Such, at least, is the desired result sought by the designer who adopts the principle of first setting up requirements, followed by the workable solution. It is the purpose of this study to set down a few planning principles as an aid to architects who may be called upon to create such better surroundings.

Scope of Physicians' Offices

The office of a practicing physician varies with the character and extent of his practice. It may range in size from one or two rooms in his home that must serve the many functions of general medical practice, to a specialist's elaborate suite of rooms in a medical office building, each room with its special use and equipment. There are three essential divisions in the medical office plan: (1) waiting room, (2) consultation room, (3) examination and treatment rooms. In the smallest offices, one room may serve for consultation, examination and treatments, and the doctor's waiting room may also be the living room in his home. In large offices, there will be a waiting room and a consultation room, and a number of examination and treatment rooms according to the doctor's specialty and personal methods of treatment; in addition, there may be a laboratory, animal room for housing test and experimental specimens, darkroom, dressing room, toilet, etc.

Circulation

The circulation sequence in these main divisions is this: The patient passes directly from the waiting room to the consultation room; here the doctor refers to the case history card—or, if it is a new patient, takes the case history—and discusses present symptoms. From here the patient is conducted to the examination room for further diagnosis or simple treatments. More complicated treatments requiring special equipment or relatively long periods of treatment are given in the treatment rooms. After treatment, the patient departs, preferably by a route which avoids the waiting room, or other treatment rooms. Such a second means of access to the private part of the offices also allows the doctor to enter and leave unobserved; where offices are set up in conjunction with living quarters, private access for the doctor from these quarters should be arranged.

Waiting Room

This room should have direct access to the street, or to the public corridor if it is in an office building, and should be oriented for good daylight and good view where possible. Size will vary according to the seating

"This central room was at once business office, consultation room, operating theater, living room, poker den, and warehouse for guns and fishing tackle. Against a brown plaster wall was a cabinet of zoological specimens and medical curiosities . . ."

Sinclair Lewis in "Arrowsmith"

required for the normal number of patients expected during office hours. Table space should be provided for books and magazines. Doctor's medical library may be in this room or, preferably, in consultation room. In most instances, the secretary is in this room; her desk should be placed where she can supervise the entrance and the door to consultation room, with filing cabinets for case histories and correspondence close at hand. The room should not have hospital character, but should be attractive and comfortable; in some offices, it may even be impressive, or "swanky", depending on the doctor and his patients.

Consultation Room

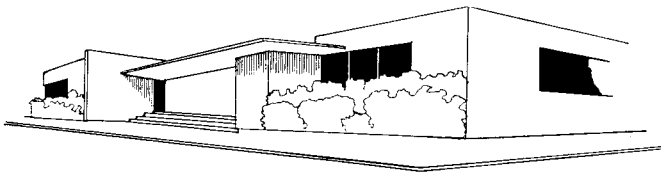
This room should have direct access to the waiting room and to the examination and treatment rooms. Size may vary from space sufficient for the doctor's desk and a few chairs, to a room that is spacious and impressive. Since waiting rooms are usually quiet, conversations in the consultation room may be overhead. Soundproofing can be obtained by relatively simple means: a double set of doors and (or) double partition between the two rooms, sound-absorbing finishes on walls and (or) ceilings, heavy carpeting and upholstered furniture, either singly or in combination.

Reception Room or Business Office

In some layouts, the secretary has a separate room. Its location and use depend on office practice; whether it is a reception and supervisory station only; or whether, in addition, patients must pass through it when departing and making financial arrangements. To serve these functions best, it should be located between the waiting and consultation rooms, communicate with the treatment and examination rooms, and contain the main entrance to the offices. Its size should be ample for the resultant cross circulation and for the secretary's desk, filing cabinets and a chair or two.

Examination and Treatment Rooms

These make up the outpatient or hospital portion of the office. Their number, size and equipment depend upon each doctor's type of practice and his personal methods of treatment. The available space and building budget are determining factors of equal importance. Many offices have only one examination and treatment room, but additional rooms are more efficient since they allow the treatment of two or more patients concurrently, especially where the treatments and the therapy machines do not require the doctor's constant presence. Each room should be entirely walled in for privacy and elimination of unpleasant noises. The doctor's personal



Elevation

Scheme for a proposed medical office building at Hermosa Beach, Los Angeles, by Harwell Hamilton Harris.

methods of treatment and his equipment and machines must be studied in detail; equipment and machines must be placed for efficiency of use and economy of space; these factors will determine the number, sizes and shapes of rooms. Daylight and natural ventilation are desirable but not necessary with artificial lighting and ventilation.

Dressing Rooms, Rest Rooms and Toilets

Private dressing space should be provided for patients. A rest room, with cot or couch, is also necessary for patients who need rest after or between treatments. Sometimes this becomes a bedroom for overnight patients. Two toilets are desirable in a large office, one adjoining waiting room, the other close to treatment rooms.

Laboratory

Most doctors have modest laboratory requirements for tests and research work. Stock kitchen cabinets make good laboratory furniture; counter tops should be covered with inert plastic like Micarta; sink can be black iron let into counter top. If all chemicals are mixed with water before disposal, there will be little or no corrosion of pipes.

Dark Room

Light baffle at doorway is desirable but not necessary. Worktable may consist of a long sink covered with open battens. Hangers for drying film, and storage for plates, trays, chemicals, etc., should be provided.

Closets

Space is required for linens, dressings, sundries, files.

Apparatus in a Typical Doctor's Office Shown at Right

EXAMINATION

- 1. Examination table
- 2. Scale
- 3. Instrument closet
- 4. Waste hamper
- 5. Sink
- 6. Stool
- 7. Instrument sterilizer
- 8. Costumer

X-RAY

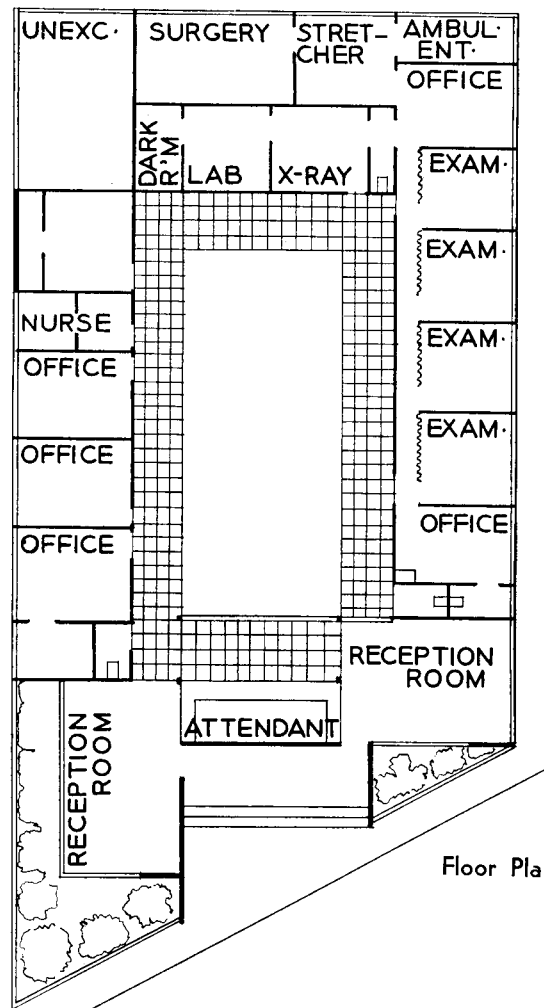
- 9. Developing tank
- 10. X-ray machine
- 11. Lamp
- 12. Diathermy machine

LABORATORY

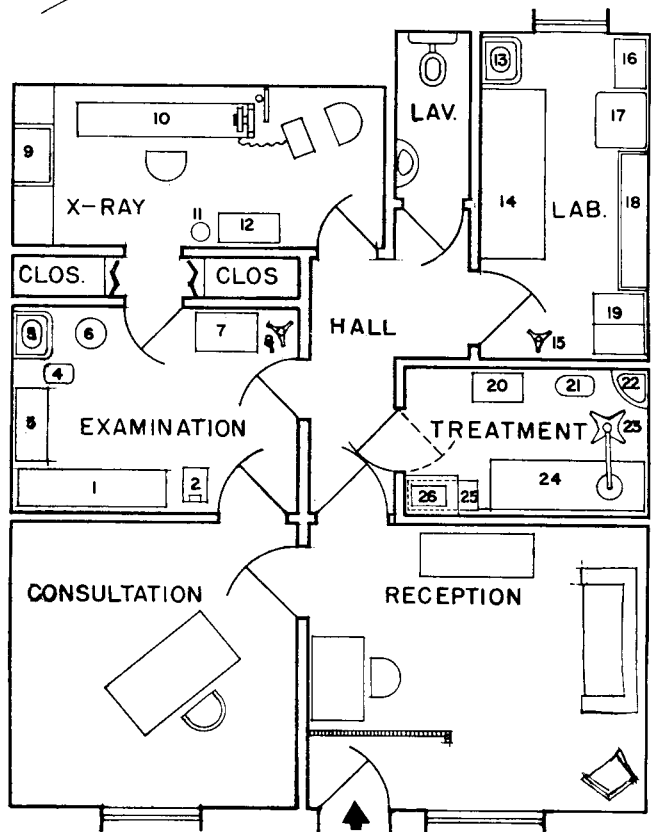
- 13. Sink
- 14. Compounding table
- 15. Costumer
- 16. Table for microscope and slides
- 17. Refrigerator
- 18. Drug cabinet
- 19. Filing cabinets

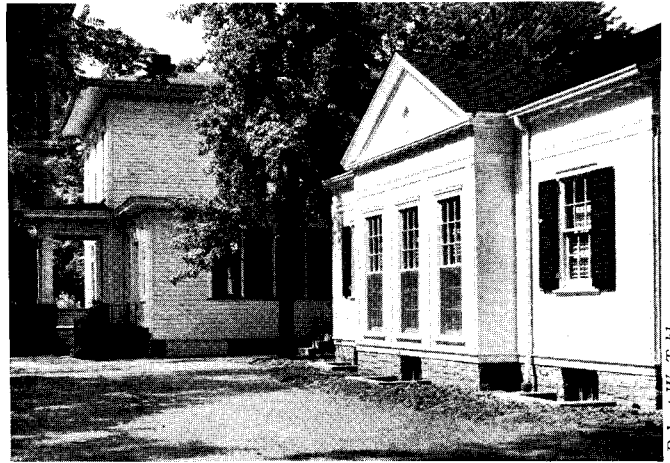
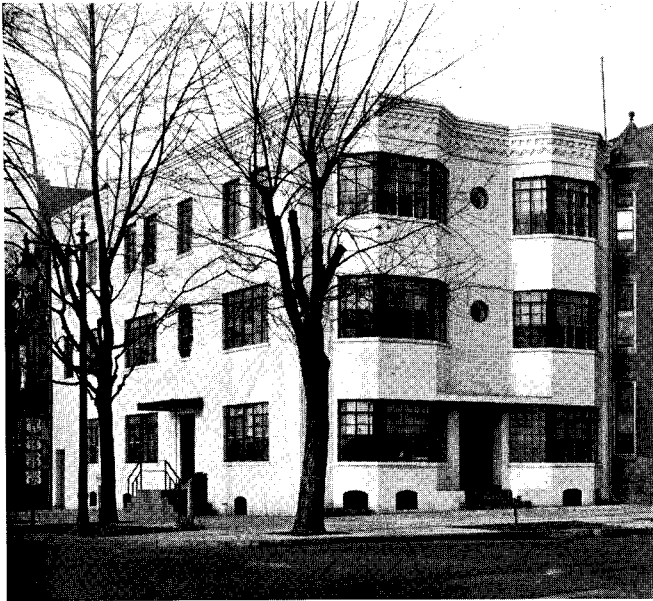
TREATMENT

- 20. Electrocardiograph machine
- 21. Basal metabolism machine
- 22. Sink
- 23. Quartz lamp
- 24. Cot
- 25. Diathermy machine
- 26. Short-wave machine

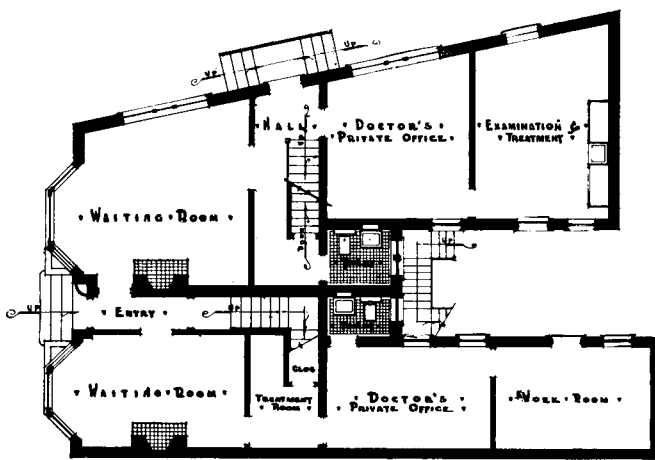


Floor Plan

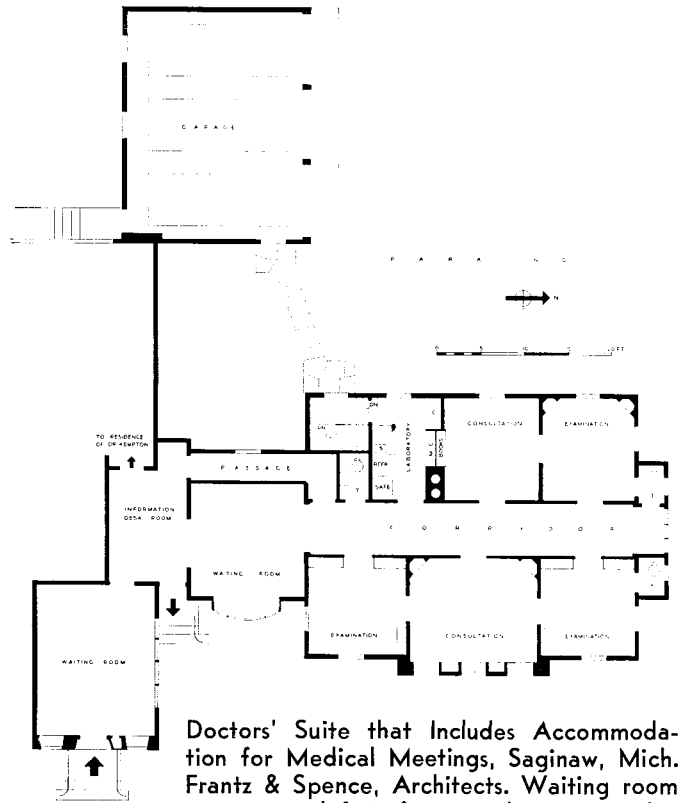




Robert W. Tobbs



Two Houses Remodeled as Doctor's Home and Office, Harrisburg, Pa. Edmund George Good, Jr., Architect. Two 80-year-old houses were made over to achieve the combined residential-office quarters. At main entrance, glass brick permitted entrance of light and at the same time insured privacy.



Doctors' Suite that Includes Accommodation for Medical Meetings, Saginaw, Mich. Frantz & Spence, Architects. Waiting room at extreme left is for two physicians and a possible third. Consultation and examination rooms are in series. There is a laboratory, used in common.

The doctor will have definite ideas concerning the equipment to be purchased; he may already own most of it. The architect can suggest certain furniture and equipment items to be built in; some simple items can be designed by the architect.

Finishes

In waiting and consultation rooms, finishes are limited only by cost and the character of the selected design. In the "hospital" portion, finishes are similar to those in a hospital, but need not be so rigidly sanitary. For floors, linoleum, rubber or asphalt tile, ceramic tile, and wood or cement may be used. Linoleum is the best all-around material. For walls: painted plaster, washable fabrics, linoleum, tile and structural glass are available.

Flush doors are desirable but not necessary: 2'-6" or 2'-8" width is sufficient since beds are not wheeled out of rooms. Trim should be eliminated as far as possible.

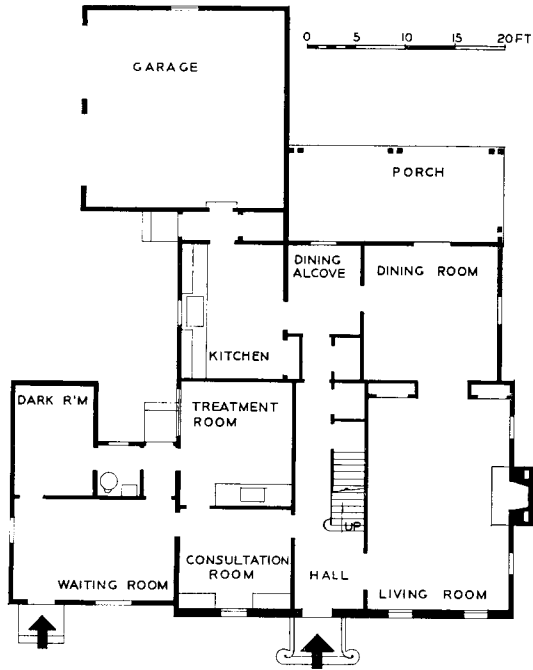
Plumbing

Usual residential fixtures will function satisfactorily in most instances; special fittings and foot controls can be added to most types. Special hospital-type fixtures are much more expensive.

Electric Work

An ample number of convenience outlets should be provided for equipment and machines. Check most convenient heights for location of outlets for various machines. Check wattage and amperage of each appliance; convenience outlets must have sufficient amperage ca-

Robert W. Tibbbs



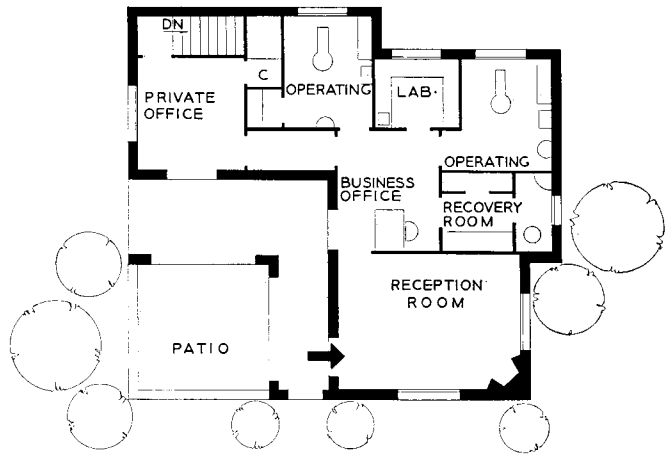
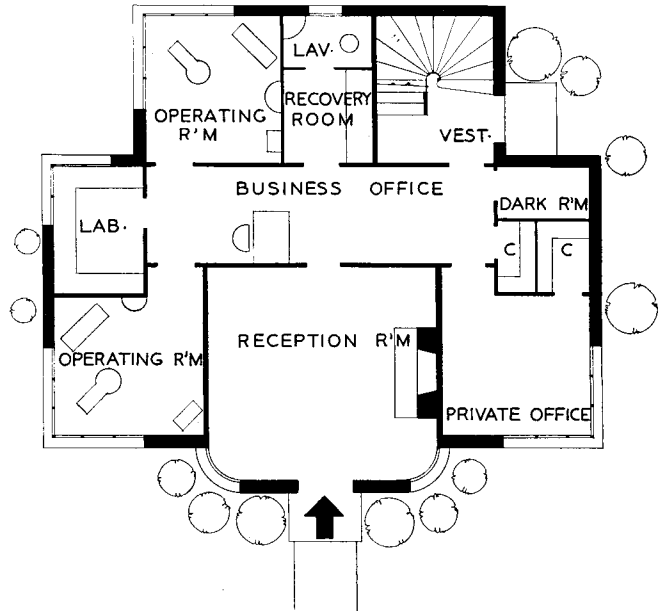
Residence and Attached Office for a Physician, Plainfield, N. J. Leo Matzner, Architect. This typical combination of office and residence for a physician has separate entrances to offices and living quarters. There is convenient accessibility from office to residential part. Garage at rear is attached to house and is reached from residential part.

capacity; arrange capacities of circuits and fuses on the assumption that all, or nearly all, equipment is used at the same time, so as to obviate blowing of fuses. X-ray machines require special conduit and cable on a separate circuit. In cities where doctors' offices pay higher electric rates, it may be worthwhile to install meter and circuits separate from the residence part of the building.

Lighting should conform with the design of the waiting and consultation rooms. In the treatment rooms, special hospital-type fixtures and spotlights may be required, although many stock commercial and residential fixtures can be found which will prove satisfactory.

Ventilation

Small rooms and heat-producing machines require good natural ventilation or forced circulation of air. For

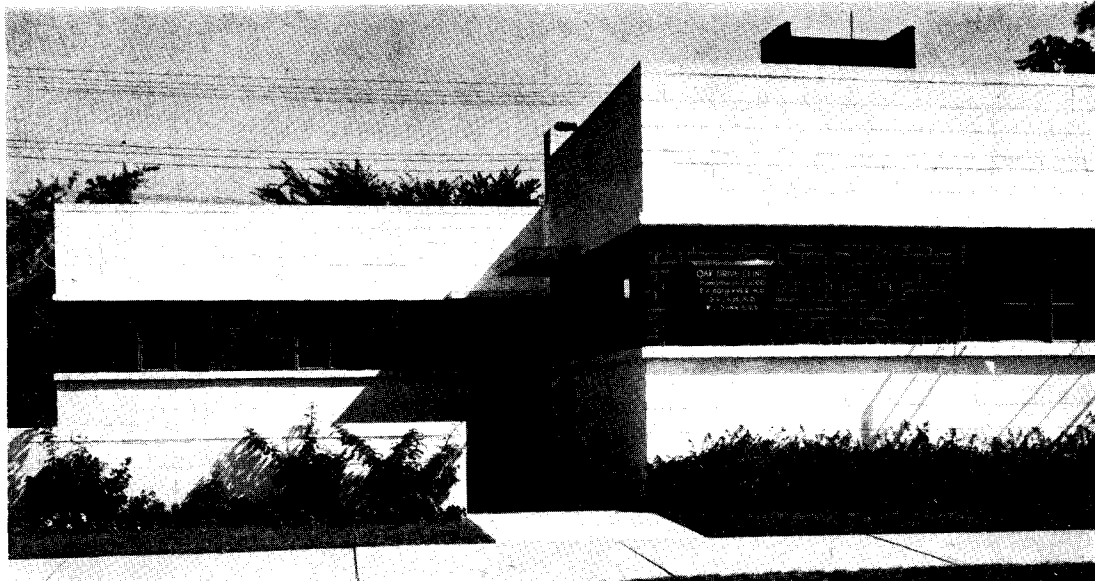


Plans for Residential Dental Practice. These plans are for a residence of moderate size (upper) and for a bungalow type (lower) used exclusively as an office. In the larger example the living quarters are on the second floor. These plans were developed from proposals by the S. S. White Dental Manufacturing Co.

a simple ventilating system: fur down corridor ceiling to form a duct, set grilles connecting it to each treatment room, and provide fan of sufficient capacity at end of corridor to exhaust to outer air; doors to each room must have grilles or louvers for air inlets. An air-conditioning system is desirable for summer cooling.

Intercommunication System

This system is used in calling the doctor to the phone, for calling him from the residential part of the building, for calling the secretary or nurse, for patients under treatment in calling the nurse or doctor, etc. A system of flush-type multi-tone buzzers and push buttons can be installed, with pendant push buttons on cords for patients' use; an annunciator for locating calls should be placed where it can always be seen by the doctor.



Photos by Robert W. Tebbs

A COMBINED MEDICAL AND DENTAL CLINIC DETROIT, MICHIGAN

DITCHY-FARLEY-PERRY
Architects

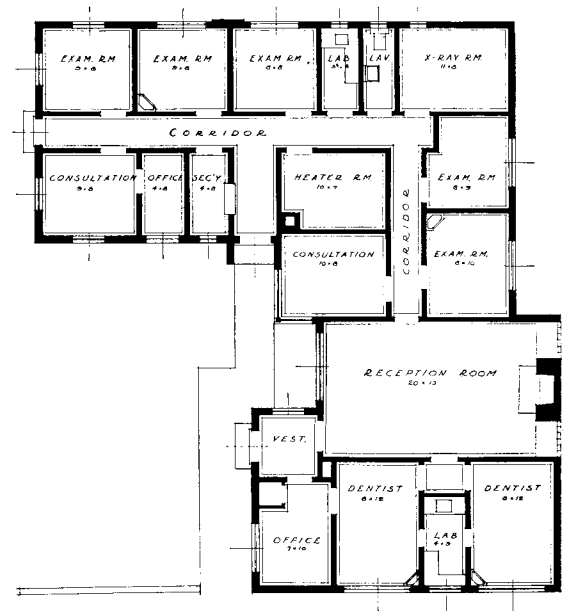
THIS CLINIC contains offices for a dentist, a pediatrician and a physician-surgeon. Facilities are provided for minor operations where no hospitalization is required.

Exterior walls are of solid masonry consisting of alternating bands of cement block and brick; the walls are furred and plastered on the inside. The interior partitions are frame with plaster over wallboard.

The roof is wood construction with asphalt surface over 1" of Celotex; additional insulation consists of Silvercote fabric between roof and ceiling joists.

The walls and ceilings of all rooms are enameled. The reception room has light cream side walls, peach ceiling and white trim; the floor is covered with a blue carpet; the fireplace face is covered with primavera flexwood, the opening is trimmed with an aluminum angle; the chimney breast is flanked on either side with glass block panels. All doors are flush panel with plain narrow double bull-nose wood casings. Windows are Fenestra casement sash with marble stools. The floors are wood with linoleum finish.

The heating system is forced hot water with concealed convectors.



Floor Plan



Reception Room

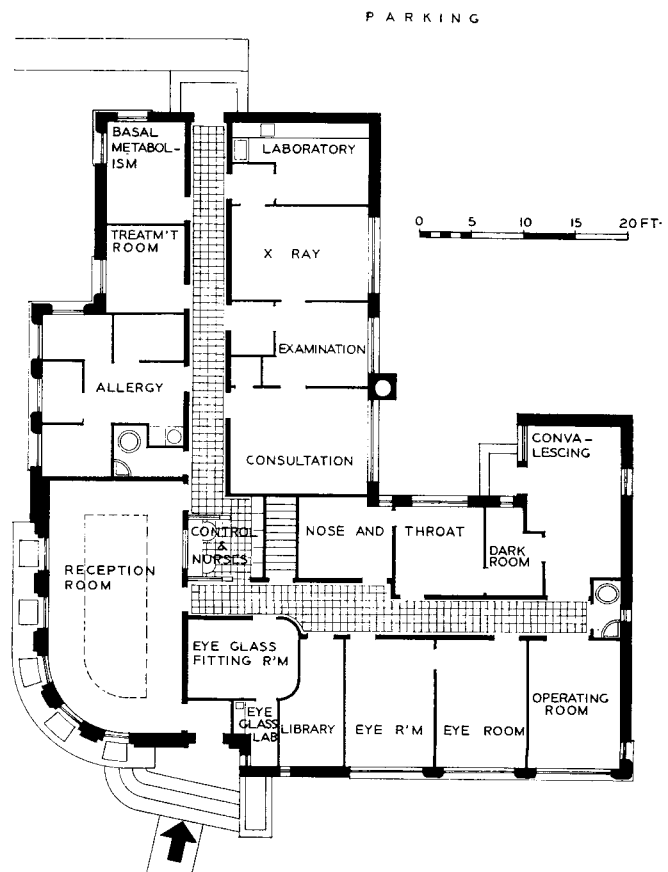


Photo by Zimmerman

OFFICES FOR TWO PHYSICIANS, WITH MINOR HOSPITAL FACILITIES PASSAIC, NEW JERSEY

CHARLES SHILOWITZ
Architect

THE PROBLEM was to design two units with a common physician's reception room and central control room. It was also necessary for either doctor to consult readily with the other. The reception room was placed at center of the two wings, and the control room seating two nurses was placed in a central location with a view of each corridor. Hence, one nurse can control both wings whenever the other nurse is on call. A side door was provided for doctors' private entrance. The convalescing room is an adjunct of the operating room and has been placed in the rear to avoid street noise. Patients may be discharged directly from this room to car in rear parking space. The eyeglass fitting room has an adjoining workshop for repairing and preparing glasses. Eye-rooms are painted a dull nonreflecting dark green. Consultation and glass fitting rooms are finished in mahogany panels, with recessed viewbox for x-ray film examination. Ventilating fans are provided for x-ray laboratory and operating rooms. The allergy room is so arranged that patients may occupy all cubicles without seeing one another, and yet doors and curtains are eliminated. The cellar is arranged for heating plant, storage room, showers and lockers. Construction is of brick veneer with plaster-finished interior walls.

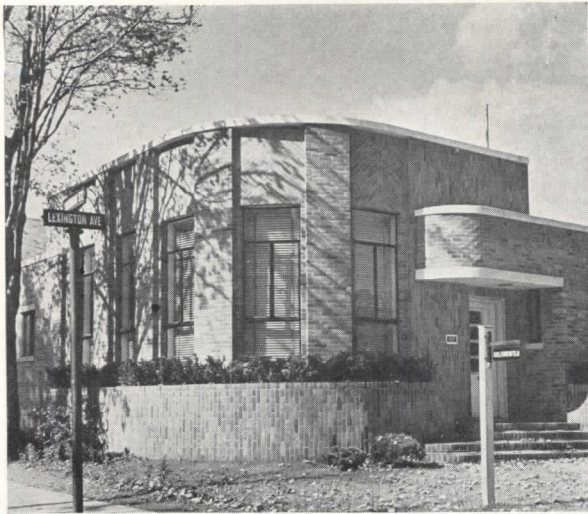


OFFICES FOR TWO PHYSICIANS WITH MINOR HOSPITAL FACILITIES

PASSAIC, NEW JERSEY

CHARLES SHILOWITZ

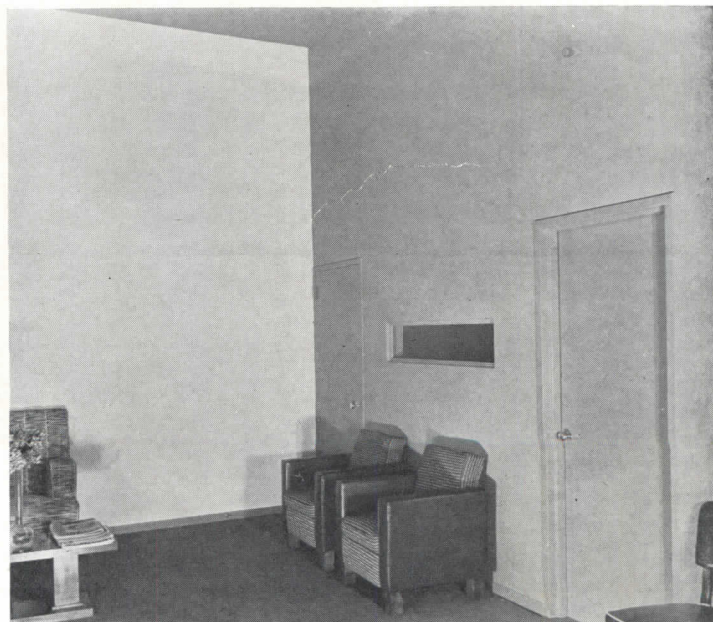
Architect



TWO INFLUENCES have been responsible for the recent activity in providing buildings for medical practitioners. These are: (1) excessive rental cost of office-building space; (2) necessity for flexibility of space to accommodate physicians with general and physicians with specialized practice. It has been assumed that the public prefers to patronize the neighborhood doctor instead of one in the heart of the city, where medical office buildings are usually located. The widest trend is toward offices of residential character, usually in or near a housing community. For reasons of economy it is customary for two or more doctors to occupy such a building. Where the doctor undertakes to combine his own residence with his office, entirely different requirements must be met by the architect.

1, 2. Exterior finish: brickwork in earth colors with struck joints; coping in concrete; limestone window trim; brick front steps; cement walk; steel case-ment sash. 3, 4. Reception Room: walls are white, with one wall and ceiling terra cotta red; light fixture plaque below ceiling is white; Venetian blinds are a natural wood color and finish; doors are of flush type, same color as wall. 5. Corridors: painted medium gray to height of 5'-0", with light gray above; floors are of black linoleum. 6. Private Office. 7. Operating Room: ample light at corners of plan; wall and floor in gray tile.

3





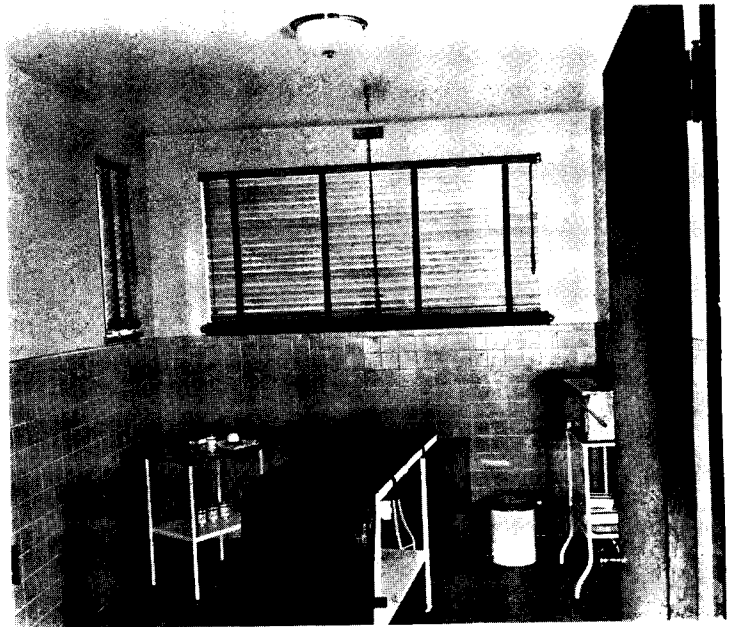
Photos by Zimmerman



5



7



Health Centers for Preventive Medicine, Recreation and Education

By FRANK K. SAFFORD, JR., M.D.

SCORES OF health centers for American cities and towns were established last year. The plan for such a center with facilities for organized recreation, sunbathing, physical rehabilitation, as well as medical care, was developed by Dr. Frank K. Safford, Jr. His proposals follow several years of research into the requirements of the desirable health center.

THE HEALTH CENTER here presented is new only in the sense of being a combination and coordination of features that are already existing successfully in American cities today. Most significant is the combination of recreational and educational activities with a medical clinic. The purposes of the combination are: first, to bring the center, by means of the recreation, into daily contact with a large percentage of the city population; and second, to make the center, through its recreation, self-supporting. The intention is that families and people of all ages in the city will use this center on a membership basis and that an effective program not only of disease prevention, but also of crime prevention will be made possible. Competing with barrooms and poolrooms of the city, the center offers for sociologists a new type of community meetinghouse for social rehabilitation work and for a solution of the leisure problem.

In the plan of operation the first requisite of the center is that it be affiliated with a hospital as the hospital's department of preventive medicine. The second requisite is that it be administered by a coordinated body made up of physicians, hospital organization and city health department. Accordingly, the whole idea of the center must first be approved by the three administrative divisions—in short, by the medical profession—if it is to achieve its purpose. This purpose is to bring about a far-reaching program of preventive medicine in the American city, a plan that is directed and carried out chiefly by the physicians of the city.

The need for preventive medicine in the American city is substantiated not alone by medical and criminal records; it is frankly admitted by responsible authorities. The American Foundation Study of Medical Care brought out much disagreement as to medical policies in general, but practically universal agreement as to the need for preventive medicine. One doctor summed up the situation with the remark, "We as medical men have not met the demand of the public for preventive medicine." Doubtless the present campaign against syphilis is giving this demand new impetus.

Historically, the idea of establishing health centers for preventive medicine has been steadily evolving with the growing complexity of city life. In London a health center combining recreation with clinical service has already been built. In American cities all the features of

such a center exist separately. The plan of their combination is described in the following pages.

Three designs for such a center were drawn and developed as models during the past four years: the first, for a large slum-clearance housing project; the second, for an American city of 100,000 population; and the third, for a city of 35,000 population. In all three, though they differ in architectural treatment and arrangement, the same general plan was carried out: namely, the combination of a clinic for preventive medicine with facilities for all-year-round recreational and cultural educational developments. Typical plans and a model of the health center are shown with this article. They are offered as suggestions for accommodation and arrangement. It is self-evident that the center, maintaining its general plan, can be adjusted and scaled to any size of community. A description of the general plot plan, the buildings, and an explanation of their purpose follows.

Description of the Center

Designed to fit approximately an area of one large city block, preferably in a centrally accessible location, the center comprises five units.

1. *The Administrative and Medical Building.* In this building are the administrative offices and the medical unit. (The administrative offices and service division of the health department could be established here.) In the medical unit is a diagnostic clinic (including examining room, laboratory, x-ray, dental clinic, etc.) and a department of physical medicine. This department has the hydrotherapy of a spa like Saratoga Springs and physical therapy of the pattern found, for example, in the New York medical centers. These facilities include medical baths, massage rooms, rest rooms, roof terrace solariums, special exercise rooms for posture work, warm pool for treatment of paralysis, and rooms with equipment for electrotherapy, light therapy and fever therapy. This treatment equipment is only that which is not found, or inadequately found, in physicians' offices. Details of how this whole unit functions will be described later.

The penthouse and roof of this building are equipped as a nursery kindergarten where children can be left under supervision while their parents use the various facilities of the Center.

2. *A Gymnasium Building and Glass-covered Pool.* Here are men's and women's locker and shower rooms leading to the swimming pool and the gymnasium; basketball, handball and squash courts with observation galleries; large and small exercise rooms; an indoor track; and roof games.

Boys' and girls' clubrooms are included in a separate part of this building. They comprise meeting rooms, game rooms, lockers and showers.

The covered pool is connected with the gymnasium. By means of glass sides, which are easily removable, it can be open and airy in the summer, closed and warm in the winter. Adjoining the pool are a sand beach, a beach cafe, and a beach game area for a putting green, ping-pong, shuttlecock and other games.

3. *A Playhouse.* This is used for "movies", as a concert hall, or a little theater. Certain afternoons can be reserved for children's puppet shows. The basement serves as a roller-skating rink or a bowling alley.

In this building is the section for adult education with lecture rooms, a library, a picture gallery, a cooking school and a school of arts and crafts. Classes for religious training are also suggested.

4. *A Restaurant, Coffee House and Beer Garden.* The restaurant with its eating terrace overlooks the outdoor activities. The coffee house has a sidewalk cafe. Inside is a large quiet section where people can read newspapers or periodicals. Adjoining this section are game rooms for cards, chess and billiards. The beer garden has tables under trees where one can have coffee, food or beer. On certain afternoons and evenings, there can be outdoor music and dancing.

5. *Outdoor Features.* These include the pool, beach game area, a running track which is open to bathers, and four tennis courts, which in winter are transformed into an *artificial ice-skating rink*. A rink has over 100 skating days possible for the New York area. It can be illuminated at night. Hockey events, as well as ice-skating carnivals with music, can be planned and carried out here.

Overlooking these outdoor activities and connecting all the features of the centers is a boardwalk promenade. On this walk, bleachers can be set up for swimming, track, tennis and hockey events. At other times, the walk is open to the public.

Wherever possible in the center buildings, space for shops has been reserved in the belief that concession rentals will increase economic security.

The Plan of Preventive Medicine

The plan of preventive medicine is carried on in these five units. The recreation is designed to attract people to join the center as members, paying a yearly membership fee. Their membership privilege would include free use of athletic facilities, the service of the diagnostic clinic, and reduced rates in the eating places, theater, medical baths and educational facilities. In the diagnostic clinic, members of the center would receive physical examination, including routine x-rays, urine and blood tests, periodic consultations, instruction in preventive medicine, including advice about exercise, recreation and diet. The medical work would be carried on by a visit-

ing staff of physicians who would devote so many hours weekly in the center clinic just as they do in other hospital clinics, with the difference that in the center (supported by recreation and membership) they would be paid for their services. In this way it is estimated 12,000 to 15,000 people could use a center of the size indicated on a membership basis and many more thousands on a single ticket basis. The possibility of truly effective disease prevention for these 12,000 to 15,000 citizens would be a progressive step toward a complete solution of the community health problem. Successfully operated, this center would offer an example for other centers to follow.

Cost, Expense and Income

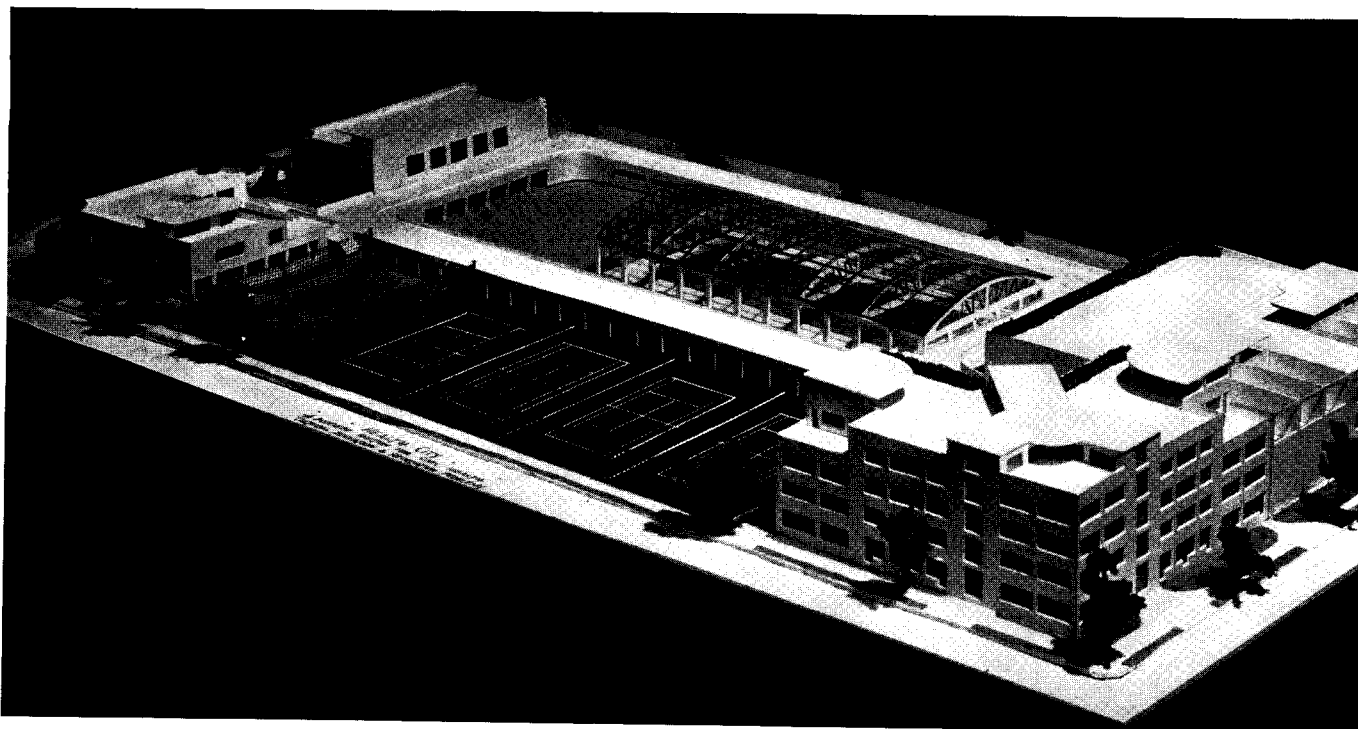
To throw further light on the operative procedure and to demonstrate the possibility of self-support, a few estimates of costs, expenses and income have been made. They are only approximate and are offered as suggestions for determining actual values. They pertain, in the case of land and construction, to the health center designed for a Midwestern city of 100,000 population; in the case of expense and income, to the center for a slum-clearance housing project in New York.

Land Costs: 300 x 600 superficial feet (divided into the four building units described above) at a cost of 35c per cu. ft. (suggested as an average for this type of work), \$770,000; development of outdoor features and additional equipment, \$150,000; total for land and construction, \$920,000.

Operating Expense: Approximately \$600,000 yearly. This estimate, as well as estimates on expected income, are based on a study of existing projects, some of which are: R. H. Macy & Company hospital clinic; physical therapy departments of New York medical centers; Saratoga Springs, N. Y.; Y. M. C. A.'s; Jones Beach, L. I.; St. George Hotel Pool, Brooklyn.

Expected Income: It was assumed that the project should not only maintain itself but also pay interest on its initial investment, and prices were arranged accordingly. The annual income based upon the minimum average capacity of the center and upon the experience of the above-named existing projects exceeded the expense of operation by over \$100,000. In general, the income was derived in the following ways:

1. The sale of single tickets for the use of facilities such as the swimming pool, games, medical baths, etc. The concentration of facilities in a center, together with the fact that the center is run on a *nonprofit* basis, makes it possible to reduce the price of single admission tickets below the usual charges, thereby ensuring widespread use.
2. Concession rentals from shops—beauty parlor, barber shop, sporting goods, etc.
3. Income from restaurants and movie house. (These also could be concessions.)
4. Most important for the plan of preventive medicine is the sale of 12,000 to 15,000 yearly memberships varying in price according to age of the member and use of the center. (In the center for a slum-clearance housing project the membership price averaged \$25.) This, as well as other prices



Model of a typical Health Center to occupy an entire city block. The "center" is intended primarily to serve a city neighborhood in preventing illness and in improving physical health. Services include health inspection, sun-bathing, exercise, recreation, education. Tennis courts are used in winter for skating and ice hockey. The swimming pool has a completely glazed roof. Arrangement by Dr. Frank K. Safford, Jr. Design by A. Gordon Herr.

in the center, will depend on the intention of the administrative organization. In a nonprofit, self-supporting and efficiently directed institution, the prices can be kept low.

Survey of Other Projects

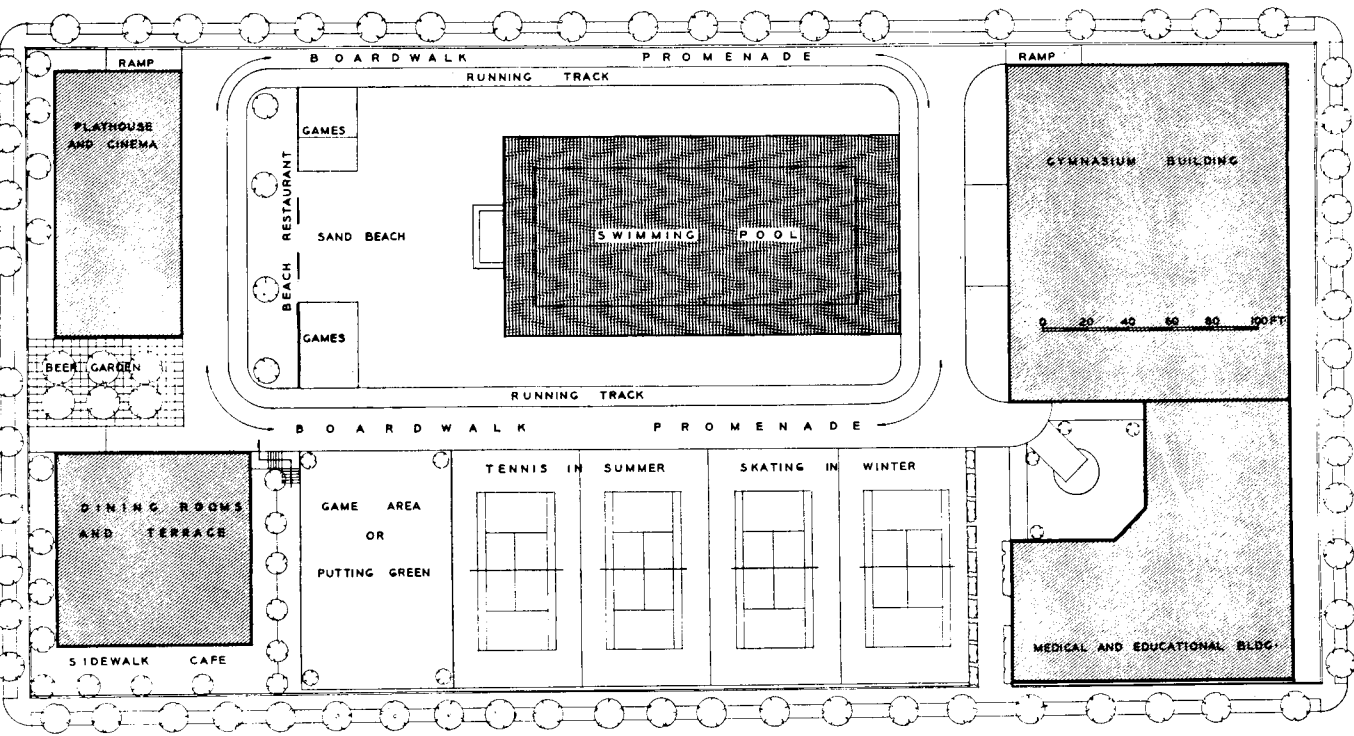
The functioning of the medical unit in this Center is the most significant as well as most difficult to conceive. To discover its possibilities, a survey has been made of what happens in some of the existing projects upon which it is patterned. The medical clinics of some of the large commercial organizations like the New York Telephone Company, the Metropolitan Life Insurance Company, R. H. Macy & Company, carry on effective programs of preventive medicine. A brief description of the Macy hospital clinic illustrates the pattern.

1. *The R. H. Macy Clinic:* This clinic is efficiently organized and laid out. It consists of examining rooms, laboratory, x-ray department, rest rooms, offices for clerical work and a certain amount of physical therapy equipment for the treatment of compensation cases. An average of approximately 14,000 Macy employees are given a physical examination here. About 60% of them are x-rayed. Blood tests are taken only when indicated. Medical advice and health literature are distributed. Approximately 170,000 visits are made to the clinic yearly, making an average of 13 visits per employee. About 14 doctors, working half time in four-

hour shifts, with the help of 15 nurses, numerous secretaries, technicians, stenographers, etc., carry on the work of the clinic. From the preventive medical viewpoint, definite results are achieved; otherwise a commercial organization like R. H. Macy & Company would hardly maintain such a clinic. Some of the results are: Approximately 90% of the tuberculosis among Macy employees is detected in the Macy clinic rather than by outside physicians. Occasional walking pneumonias are discovered, many cases of flu, much necessary dental work, glandular disturbances, underweight and overweight correction necessities, etc.

Large commercial organizations have found that it pays to establish these clinics. A city government would doubtless also find it a saving to prevent disease and crime on a large scale by larger clinics. Whereas, however, the commercial organizations have an established continuous contact with their employees, a city would have to create such contact by offering recreation and soliciting members. That this is not only feasible, but is already in practice in American cities is illustrated by the example of what happens in one of the large New York Y. M. C. A.'s.

2. *The West Side Y. M. C. A.:* In this "Y" there is an average of 5,000 to 6,000 adult members, (at present 5,400) and 700 to 1,000 boy members. The yearly membership fee is arranged on a sliding scale according to age. Boys pay \$10. Adults pay \$6 for a basic membership plus \$6 to \$12, according to age, for morning membership in the physical department (this includes use of gymnasiums and pool); \$16 to \$31, according to age, for full-time membership in the physical department. About 250 businessmen pay \$55 and have a separate locker room. On this basis, the physical department is made self-supporting. Membership privilege in the "Y" includes a compulsory physical examination with a limited amount of medical advice and instruction. No



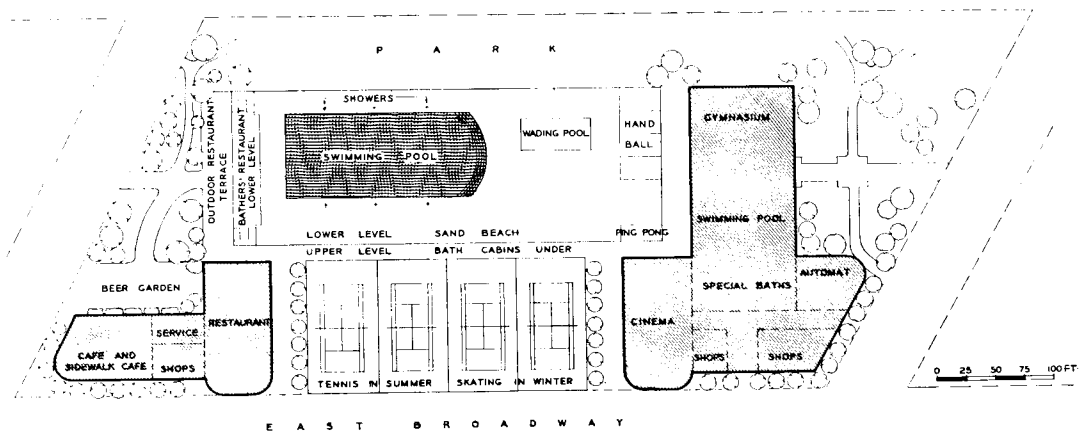
treatment is given; no x-rays, urine or blood tests are made. The examinations are performed by a visiting staff of physicians who voluntarily give their services one hour weekly. The physicians are allowed membership privileges. Though superficial, this medical service is not without benefit from the viewpoint of preventive medicine. But the point is, if a Y. M. C. A. like this, limited to indoor activities, to sex, and partial to creed, can solicit 7,000 members, it isn't difficult to see how a Health Center of the type described could enroll 12,000 to 15,000 members of both sexes and all ages.

3. *District Health Centers of the New York Health Department:* A Y. M. C. A. offers an excellent pattern for a City Health Department to follow in establishing closer contact with people for preventive work and health education on a larger scale. In New York, a progressive health department has come to the point of establishing district health centers, but without recreation. The plan is to divide New York into districts of popula-

tion of 200,000 to 250,000 and then to subdivide these districts into health areas of 25,000 population. So far the Federal Public Works Administration has made available funds for the building of several district health centers. They are relatively small three-story buildings including the following services: nursing, maternity and child hygiene, school hygiene, tuberculosis, venereal disease and health education. The other health department services of sanitation, food and drugs, laboratories, vital statistics and the control of communicable diseases are kept in the central office for city-wide administration. These district health centers are a great step forward in localizing the city's health program. Nevertheless, lacking a means of continuous close contact with the district population, the scope of preventive medicine remains limited.

4. *The Pioneer Health Center, Peckham, London:* In European countries, the idea of combining recreation with health clinics has developed perhaps further than

(Above) Plan of the Typical Health Center with facilities indicated. A typical city block area is intended. (Right) Plan for an alternate plot in the neighborhood of large apartments. Proposal by Dr. Frank K. Safford, Jr. Design by George C. Keiser.



in this country. One of the most notable examples is the Pioneer Health Center at Peckham, London, designed by Sir E. Owen Williams. "This center has been built to house the activities for maintaining health as described in a book, 'The Case for Action', by Dr. Imnes H. Pearse and Dr. S. W. Scott Williamson. Briefly, the book postulates that a community should take care of health before it is broken down rather than deal with it in hospitals afterwards." The center includes a great many facilities for physical and mental recreation for the whole family, and complete medical quarters for periodical examinations. The following are some of the conclusions Drs. Pearse and Williamson have come to as the result of several years' experience in periodically examining people of the artisan populace in Peckham:

Given the opportunity, the artisan is prepared to spend the money, which formerly was expended in barrooms, poolrooms and movies, in taking the responsibility of his own and his family's health. Health demands responsibility and cannot be obtained through the assistance of charity. People must support their own health organization.

Examinations have revealed that 90% of individuals over 25 years of age are suffering from frank disease which usually is amenable to adjustment, but which untreated in the course of years leads to devitalization. (Type of conditions commonly found: varicose veins, dental caries, hemorrhoids, flat feet, hammer toe, incapacitating bunions, scoliosis, nasal obstructions, ear discharge, glossitis, hernia, chronic appendicitis, gallstones, gastric ulcer, goiter, chronic mastitis, cervicitis, syphilis, gonorrhoea.)

These annual examinations afford the medical profession free access to disease in the earliest stages and give the maximum value to medical skill and service.

The Advantages of a Health Center with Recreation

A survey of the four existing projects just described not only makes the plan of a membership health center with recreation less visionary but also points to its definite advantages. To the citizen consumer as well as to the city health department the advantages hardly need further mention. To the hospitals the advantages are: first, with the affiliated department of physical medicine, the hospitals' general equipment for dealing with the complex problem of the chronically ill is increased; second, with the department of preventive medicine the hospital becomes an institution no longer limited to the treatment of the sick. The onus, the vague ominous portent overshadowing hospitals today, because of the presence of the acutely ill, will be lost. Doctors can carry out research on normal people, compile statistics from well-organized member charts, start longitudinal member records, all of which may well contribute to the science of disease prevention. To the physicians of the city, the advantages of such a center are the following:

All physicians who are qualified for hospital connection can work in the center clinic.

The principle of free choice is maintained in that members of the center can choose any one of the staff physicians for examination and consultation.



Photos © The Architects Journal

The physician-patient relationship would not be lost except in the matter of fee exchange.

Physicians would be paid regulation fees for their work by the center, corresponding to the fees that prevail for this type of work in the community.

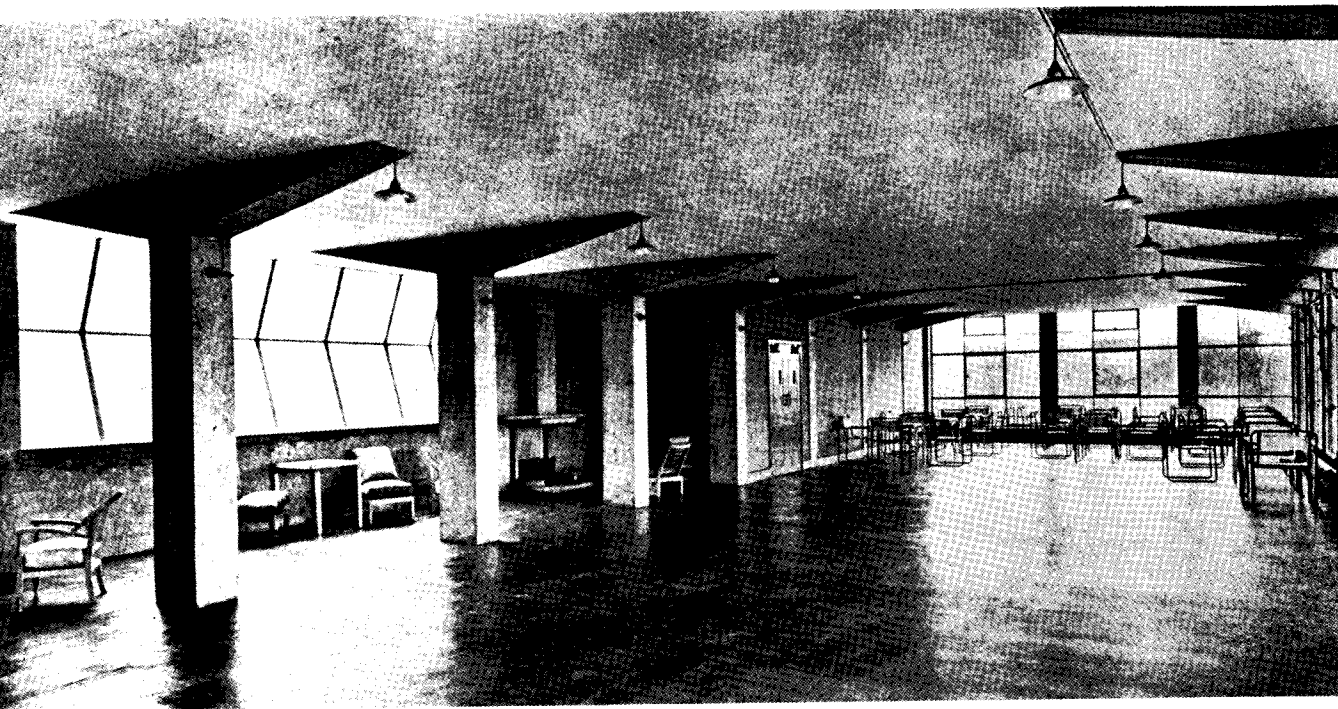
The treatment in the department of physical medicine is supervised by physicians who refer their cases. These treatment facilities will help doctors to keep under their care patients who today are patronizing quacks and nostrums. Only such treatment is given in the center as physicians are not equipped to give in their offices. All other necessary treatment is referred to the outside offices of physicians.

The center brings the physician into a central place in the public health program, a step which in the long run will benefit the physician in the scope of his prestige and the public as to health.

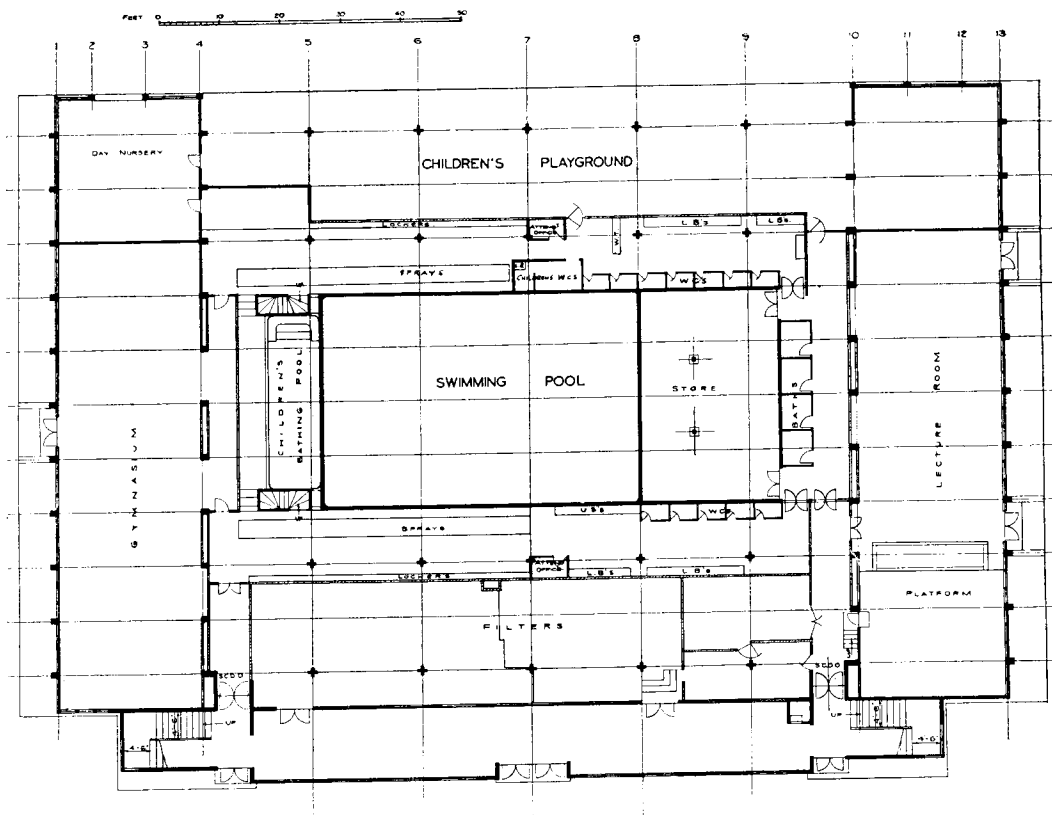
Possibilities of Realization

A hundred years ago people were fighting for the realization of schools, libraries and hospitals. Today, the increasing public demand for preventive medicine suggests several possible ways in which the Center here presented might be realized:

A progressive city government might be persuaded to adopt such a project and borrow federal PWA funds to carry it through. The project presents possibilities of self-liquidation, just as do projects of city water works, city garbage-disposal plants, etc. This center would fit well into any large-scale housing project.



Peckham Health Center near London, England, was built to house activities for maintaining health. Illustrations on this and opposite pages, show exterior, interior of upper floor and ground floor plan. Sir. E. Owen Williams, Architect.



Industrialists who today are building golf courses, country clubs and extensive recreational units for their workers might be persuaded to give their funds for this type of health center.

Certain endowed foundations might discover in this type of center a program of public health worth their encouragement and support.

Some philanthropists instead of leaving money for a memorial such as a stadium might find this type of center

a more worthy cause.

The citizen consumers in some community might be organized to contribute in advance their yearly membership fees in order to start one of the buildings of the center. The other units could be added later.

Most important is the support of the medical profession under whose direction the center will operate. Without such support it is difficult to conceive any worthwhile realization.

Effect of Air Conditioning on Building Design

By A. WARREN CANNEY, *Air-Conditioning Consultant*

THE THESIS for this and the next article, to be published in the March RECORD, is based on the premise that an enclosure and an air-conditioning system are not only interdependent essentials to the provisions of indoor comfort, but that they are interrelated with respect to both air movement and to the creation of the thermal prerequisites to comfort.

First of all, a healthy body constantly generates too much heat. The body, within wide limits, functions as its own thermostat to control blood temperature, and the body must constantly dissipate the excess heat as waste. This waste is not only removed by the air, but depends considerably on a temperature of surrounding materials below that of the body.

Now, from the fact of *excess* heat generation: it is of the utmost importance to realize that *it is the primary function of any method of environmental control to permit the body to keep itself cool.*

It is a good idea to keep in mind the thought that the thermostatic self-regulation of body heat is *primarily* a process of self-cooling, and a heat-conserving mechanism of limited ability.

The process is very much like a building heating system having capacity for an extremely cold day, but generating an excess which spills out of the building at all times.

To recapitulate, the body functions *inside* as its own boiler to produce heat in excess, and functions *outside* as its own cooling system.

Even in winter, then, what we *want* to do is to restrict heat loss from the body so as to continue to let the body do a comfortable cooling job all of its own. This has nothing to do with heating buildings, nor, in a technically correct sense, with heating people, for, if an individual is in fact heated, he is made ill with a fever.

This gives us the entire key to the problem of comfort. Broadly expressed, it means planning to avoid extremes in the thermal environment of the occupants of a space, so as to let the body lose its heat at a comfortable rate.

The skin, with two million pores, provides the prin-

THIS ARTICLE discusses the more important relations between architectural planning and air conditioning. One of the many considerations which prompted this study is based on the well-known premise that room shapes have an important relation to lighting and acoustics. It seems only natural, then, to inquire whether rooms may have configurations or size limitations which influence air-conditioning results. Does air conditioning have any definite limits in meeting spatial conditions? What spatial conditions? What limits?

Insulation and its relations to air conditioning will be discussed by Mr. Canney in the March issue.

cipal medium for our body equipment in self-cooling. It cools in three ways:

1. By the outward travel of heat, just like any radiator.
2. By convecting heat to air currents in contact with the skin and clothing.
3. By adding humidity to the air from the evaporation of moisture, the skin acting as a low temperature stove to boil off this moisture.

The significant thing here is the fact that *a comfortable person loses nearly half his body heat by radiation.* The total heat to be dissipated being about constant when we are comfortable, what is not removed by radiation must be lost by one or both of the other two ways of heat loss. This radiation loss depends on the surface temperature of the walls, floor and ceiling of a room to which an occupant radiates heat.

In an inside room, these surface temperatures are controlled by the air temperature maintained by the air conditioning. In an outside room with windows or poor insulation, the inside surface temperature of outside wall and glass may be influenced by an auxiliary heating system.

There are several aspects of the important relations between the design of buildings and the results which are attainable from mechanical systems, such as heating and air conditioning, for keeping occupants comfortable.

These relations may be classified into three broad divisions for the purpose of discussion:

1. The relations between spatial characteristics and the method of air distribution.
2. The relations between the insulating value of exterior construction and the heating and (or) air-conditioning system.
3. The coordinate planning of buildings and systems so that the over-all economics of both are balanced for minimum annual investment.

The requirements for human comfort tie Items 1 and 2 together in two different ways: by the control of the "effective temperature" of the air by the system (meaning the net effect of air temperature, relative humidity

and air velocity), and by the control (or the limiting) of the temperature of the inside boundary surfaces of the room, which governs body radiation.

The reason for this is that *the temperature of the air ties all of these factors together*. But if insulation is poor, the ability of air conditioning to control surface temperature, and hence body-heat loss by radiation, is limited.

The *effective* temperature produced by an air-conditioning system in a room can be perfect, but if, for example, the side of the room is completely of single glass, and if it is cold outside, an occupant would be uncomfortably chilly because of excessive loss of body heat by radiation.

For instance, in an inside room, as the ideal, there are no external sources of heat or cold to influence wall temperature. It is influenced only by air temperature, according to its distribution and control by the air-conditioning system.

In this first article, we shall discuss air distribution in relation to spatial conditions.

The requirements of air distribution are essentially threefold:

1. To provide diffusing space, so that the air will move at a uniform velocity in the occupied zone.
2. To provide diffusing space and so to direct the air discharged that the air will have had opportunity virtually to attain the desired room air temperature before reaching the occupied zone.
3. The air distribution is to be such as to maintain inside boundary room surfaces at substantially room air temperature, considered either alone or in conjunction with an auxiliary heating system, such as radiators or panel radiant heating.

Hence, exclusive of infiltration, the problem of indoor comfort is largely a matter of presetting the temperature of inside surfaces to which occupants radiate, in conjunction with the control of effective temperature. The former will be discussed in the next article. Provision of the right effective temperature is largely contingent on air distribution. What we want is a uniform environment, and this begins with air distribution.

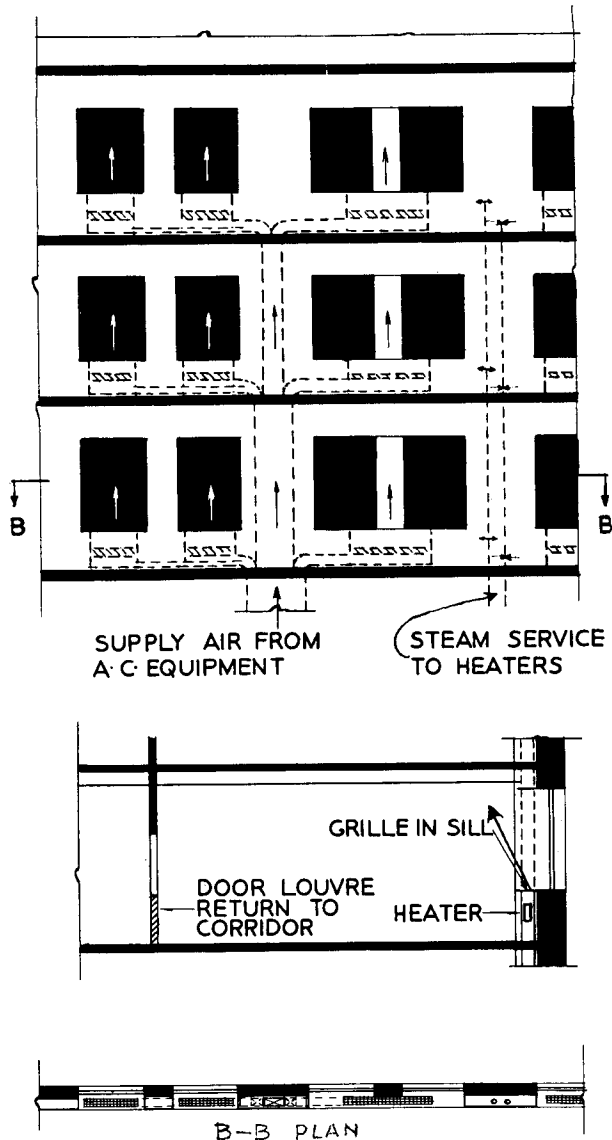
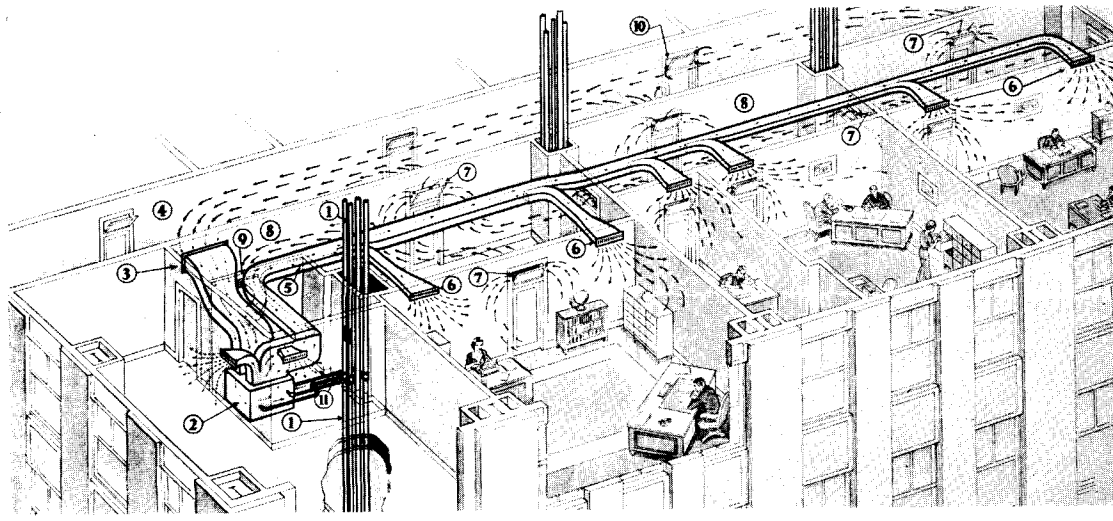


Figure 1. Supply ducts in outside wall with special advantages for both heating in winter and cooling in summer. There are heaters at outlets. Windows on the left are individually connected. Those on right of riser have an alternate method whereby two windows are supplied by one duct outlet.



- 1 Chilled water supply and return pipes
- 2 Unit air conditioner
- 3 Corridor air intake grille
- 4 Public corridor
- 5 Supply duct
- 6 Outlets
- 7 Pressure relief transoms
- 8 Private corridor
- 9 Recirculated air grille
- 10 Building exhaust positive waste for positive outdoor infiltration
- 11 Condensate drain and humidification supply pipes

Figure 2. Duct-Type Air Conditioner for selective cooling system. Clyde R. Place, Consulting Engineer

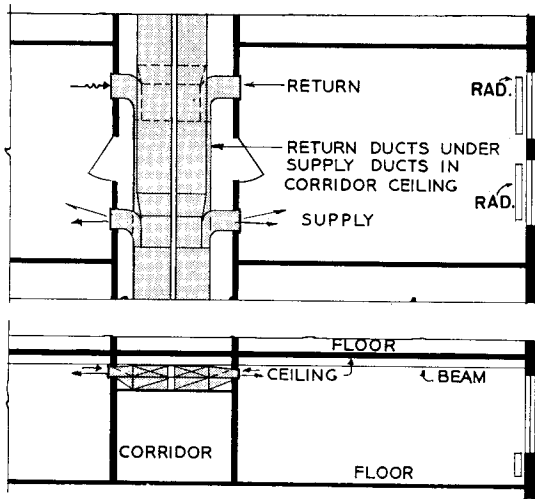


Figure 3. Supply and return ducts in corridor ceiling supplemented by direct radiation.

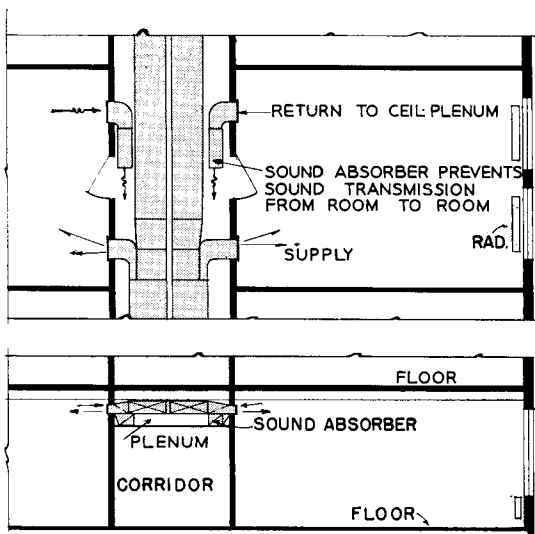


Figure 4. Supply duct in corridor hung ceiling which also serves as plenum for return. Note that this supply is supplemented by direct radiation.

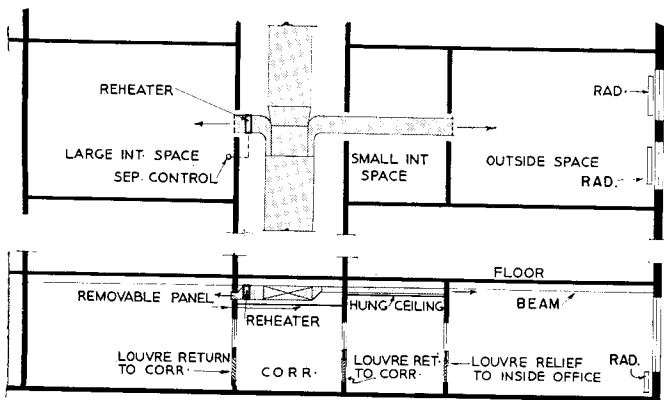


Figure 5. Supply duct in corridor. The corridor under suction acts as return plenum to central return grille. This method is supplemented by direct radiation. Large interior space: separate reheating control. Small interior space: on relief from outside space.

When air is supplied to control the inside surface temperature of an exterior wall or window, I shall use the expression: "covering" the wall or window by the air supply.

Some Primary Factors of Interrelation

There are really no fundamental rules determining basic design which will lead to one general form of air-conditioning system or another. Each installation is largely individual, because there are just too many factors involved; and the governing issue is always to find the predominating set of factors compared to objectives, and the next set of factors of secondary importance, as in any rational planning.

Here are a few suggested architectural considerations, presented from the standpoint of air conditioning:

1. Exterior walls should have as little mass as possible to reduce the cost of heating or cooling them caused by intermittent operation.
2. Whether alone or coupled with the heating and cooling arrangement, all inside surfaces of exterior walls should be sustained at very near air temperature, approaching an inside room as the ideal:
 - (a) Exterior walls may be insulated, utilizing glass brick or double glass for windows.
 - (b) Exterior walls may be "covered" by the air supplied to the rooms; and windows, if single, may be:
 - (1) Heated by the air supply in a shallow room, the outlet located so as to "cover" the glass.
 - (2) Heated and cooled by air discharged upward from the sill.
 - (3) Equipped with radiator or convector at window.
 - (c) Exterior walls may employ the British principle of panel heating, with single windows handled as in (b). (The reverse, panel cooling, is impracticable, because of condensation, unless the expense of dehumidifying the air is added).
 - (d) In multi-story structures, ducts spread in the outside walls may be made to effect an ideal combination of air conditioning with the partial equivalent effect of panel heating in winter and the partial effect of panel cooling in summer, with windows handled according to thermal value provided; i.e., with single glass, as in (b). (See Figure 1.)
3. The wall construction should be of minimum porosity, and seals should be everywhere effected to reduce infiltration and exfiltration.
4. Exterior surfaces should reflect sunlight.

The Arrangement of Systems

Actual examples of systems will serve better than any generalities which might be found universally applicable. Knowing the proposed general form, purpose, occupancy and tentative subdivisions of the structure, there arises the vital question of the floor-to-floor distance for steel, to secure desired headroom. This is very important, since provision for horizontal duct space may add as

much as 10% to the building cube. Ceiling height also has a direct relation to satisfactory air distribution. Regret has sometimes been expressed that these matters have not received advance study. Sizes of horizontal ducts and their location are also determining factors, and this is dependent, in multi-story structures, on the vertical frequency of apparatus to which electric power, water, drains, steam or hot water and chilled water are connected. A chilled water system with unit conditioners requires less shaft area, but, dependent on the type of unit, may need more floor area.

In general, where there are windows, the tendency in taller buildings has been to keep all equipment in the center portion of the building, with radiators at windows. But in a certain department store, where floor space is everywhere at a premium, apparatus location is at the outside wall at every mezzanine floor-level. The size of the store and similar factors will, in turn, establish the wisdom of such a plan.

In multi-story structures, the fan apparatus is located to feed up and down with total duct shaft area at a minimum, where buildings are owner-occupied. But where buildings are leased and highly subdivided, provision for unknown future occupancy conditions, with spaces subject to rearrangement, has indicated a trend to the chilled water type of system designed for reserve capacity, in the same manner as a wiring system permits various connected wattages per square foot for individual tenants. Unit conditioners of various types are then connected to the chilled water system, as required. Figure 2 illustrates such a system as actually installed. This particular system was worked out in collaboration with Ernest Williams, of the office of Clyde R. Place, Consulting Engineer.

On several operations, where the buildings in each case were more than four and less than six stories high, and where the space from windows to corridors was shallow (under 24 feet), ducts were run from interior vertical duct mains propelled by a fan apparatus in the basement. Duct risers were zoned, and horizontal branch ducts were run to a specially designed cabinet at each window sill. Each cabinet contained a steam reheat and automatic damper under control of a thermostat, and the air was discharged toward the ceiling from a grille at the sill.

This general method deserves further study for new multi-story structures with windows, locating apparatus at about every eighth floor and running ducts up and down in the outside wall to save cubage while getting the desired headroom. This method, which is to say, any kind of window unit, should be used only where exterior spaces are shallow, with usual headroom. A setup with shallow space is conceivably similar to school building practice, with units at windows performing all air-conditioning functions, slots for outside air and another for its relief being coordinated with the fenestration.

There are many arrangements using the corridor hung ceiling:

1. As a space for both supply and return air ducts (Figure 3).
2. As a space for supply ducts and as a return air chamber, or "plenum" (Figure 4).

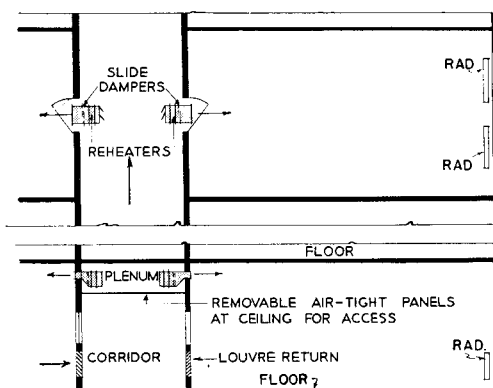


Figure 6. Corridor ceiling plenum for supply; corridor under suction for return. Radiators and reheaters are alternate to each other.

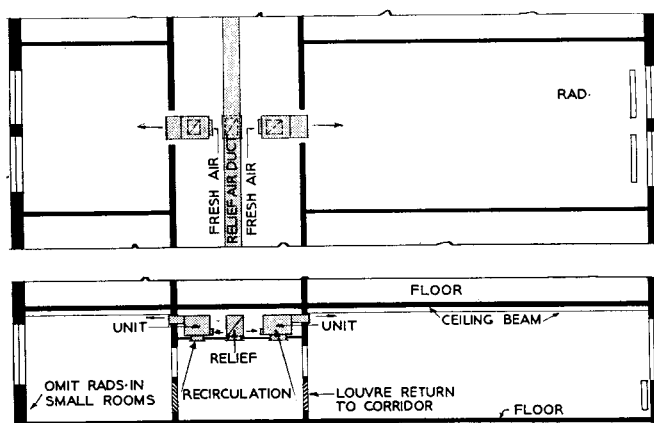


Figure 7. Recirculating units with fans and cooling coils. Hung ceiling space serves as fresh air plenum. Central relief exhaust duct in ceiling space. Removable airtight panels required for access to units. For small rooms at the left, radiators are omitted and heating coils added to the units.

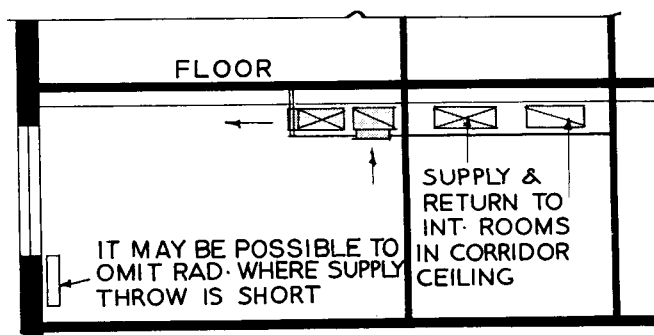


Figure 8. Where large duct area is required and space is not available, ducts are sometimes forced out of corridor and into the room.

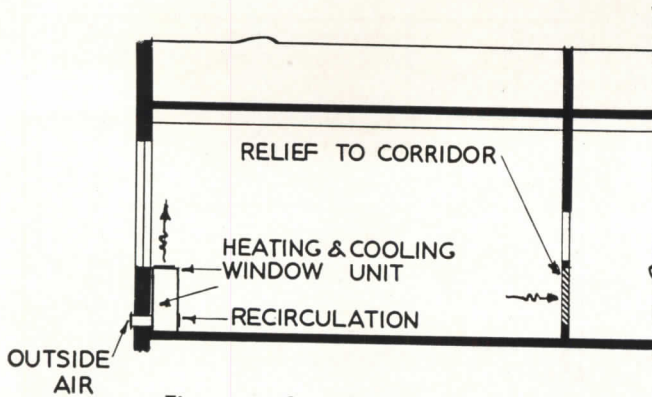


Figure 9. Outside air relieved to corridor.

3. As a space for supply ducts, using the corridor as a return air plenum (Figure 5).
4. As a plenum space for supply air, with the corridor as a return air plenum (Figure 6).
5. As a space for recirculating fan units (Figure 7).
6. As a duct space where two sets of ducts are required (Figure 8).

For instance, in one recent installation both methods No. 5 and No. 6 are used, in different corridors, of course. Method No. 5 is used where continuous 24-hr. service is a primary requirement. The hung ceiling for method No. 6 is constructed of removable panels; since the removal of a panel short-circuits the air-distributing system, it could not be used for the requirements of method No. 5.

There are several reasons why the general scheme of using the corridor is interesting:

1. Its adoption is more universal.
2. If the space is shallow, radiators (or convectors, as you prefer) may be omitted.
3. It is logical to direct air toward exterior wall space.
4. Unless the wall is thermally better than average, it is desirable to get the air discharge first to "cover" the wall.
5. Unless the wall is thermally better, and if the radiator is eliminated, it is advisable, with single glass, to "cover" the exterior surface with the air supply.
6. Reduced headroom in the corridor is apparently less objectionable than in exterior space.

In Figure 11, a window unit is indicated. Outside air may be relieved to the corridor or to the toilet exhaust system, as in a hotel.

Relation of Air Conditioning to Spatial Conditions

Here is one reason an air-conditioning consultant should be called in early when planning. The higher the heat loss or heat gain in a given area, the greater must be the air volume circulated, and therefore, for any specific method of air distribution, the greater should be the cube of the room to avoid localized drafty regions. For present universal practice in air distribution, there must be provided a zone which, insofar as the desired air-conditioning results are concerned, is theoretically wasted. The use of ceiling plaques reduces this "waste" cube. But for a wall outlet the air supply must, on the one hand, be driven at a velocity high enough to get

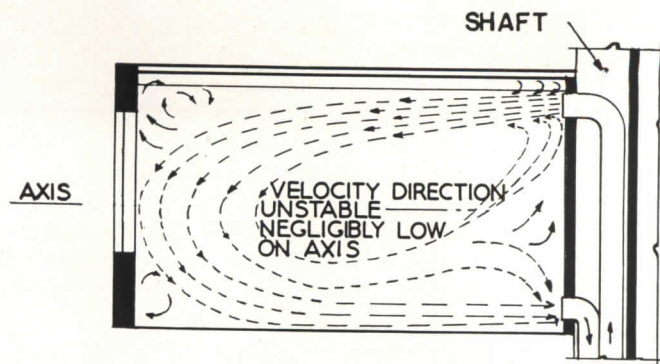


Figure 10. Uniform movement of air in occupied zone.

horizontal coverage, while on the other hand, there must be vertical space so that as the air travels from the outlet there is space for the velocity to dissipate to the desired level. The general arrangement commonly used is indicated by Figure 10.

The idea, of course, is to secure a uniform movement of air in the occupied zone. Dissatisfaction often ensues because, when cooling, cold air drops in puffs before diffusion to a sufficient reduction of velocity; otherwise, excessive velocity creates objectionable down-draft, especially on occupants close to the wall opposite the outlet.

With a grille producing a jet action of air along the ceiling, the general action of the air is similar to that of water in a rectangular can stirred with uniform motion by an object held near the periphery, the motion being comparable to that indicated by Figure 10. The velocity-field in the occupied zone is inescapably *non*-uniform with this method, resulting in "dead" and turbulent regions, the latter being the potential cause of drafts.

If sufficient space is not available for dissipation of velocity of the air stream, no matter how carefully the type of grille or outlet is selected—which may be a slot the entire width of the room—the probability of drafts is increased. With this method of supply and with horizontal discharge, wall outlets should not be placed close to the ceiling, as indicated in Figure 11. A beam requires lowering the grille still more.

The most objectionable conditions are occasioned by low headroom such as under, or on, mezzanines of fractional story height, particularly where, because of limits imposed by physical conditions for duct space or by economy, the air is discharged horizontally along the length of the mezzanine. The lower the headroom, the more important it is to introduce air in such a manner that both the required distance of blow and the outlet velocity are reduced.

Generally, mezzanines of partial floor-to-floor height require careful consideration. The latitude in planning new work should obviate most of the objectionable draft conditions encountered by the addition of air conditioning to existing structures, because there is flexibility in new planning for running ducts and spotting outlets.

The discharge of the supply air from a low elevation toward the ceiling, as indicated by Figure 9 or by the lower outlet in Figure 11, reduces the room cube necessary for diffusion.

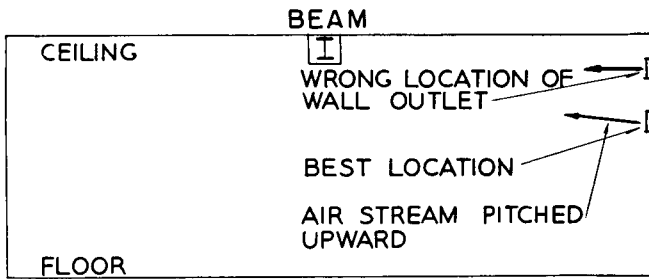


Figure 11. Section of room with beam condition.

The performance of supply grilles is a complex matter. Cool air drops toward the floor after it is discharged from the outlet. If the air delivered performs the heating function, it must be delivered warmer than room temperature. In this case, the air will rise, and whereas special attention must be given to warm air heating, the dropping of cool air presents a more critical problem, and is therefore the usual basis for locating grilles. The new technique is to locate the outlets for cooling at the 7-ft. level or thereabouts, in rooms of ordinary ceiling height, and to arch the air stream by pitching it slightly upward on discharge from the grille. The horizontal distance from the grille to a velocity level of 50 fpm is termed the "length of blow." The distance the air stream is arched upward is then to be deducted from the drop which would result at the end of the air stream were the air to leave the wall grille horizontally. The relations to headroom and ceiling height can then be predicted by this result, the net drop.

An index of grille selection for good performance is given in the following table, which discloses why so much trouble has developed from applying grilles which were all sized at the same velocity. The table is for a grille size of 26" x 6", a size selected at random, and of the type with adjustable vertical bars which spread the air for the short blow, and are gradually shifted to deliver the air straight ahead at the longer distance.

PERFORMANCE OF 26" x 6" GRILLE

Length of Blow	Air Volume CFM	Vertical drop at end of blow for air supplied at 15° below room temperature
13'	325	2'-0"
14'	375	2'-3"
16'	425	2'-9"
18'-6"	480	3'-4"
21'	550	3'-10"
25'	580	5'-0"
32'	670	7'-6"
39'	700	9'-6"
44'	800	11'-0"

Thus, the minimum ceiling height for applying a grille of this size, discharging 800 cfm, would be 11' + 6'-6" = 17'-6". The clear length of blow is 44'.

Figure 12 shows very poor distribution, and Figure 13 shows better distribution with a wall outlet.

In cooling, the temperature of the air stream is important from the point of view of drafts. A slight movement of cold air is objectionable, whereas air at room temperature, or warm air, traveling at the same velocity, would not even be felt. In cooling, therefore, it would

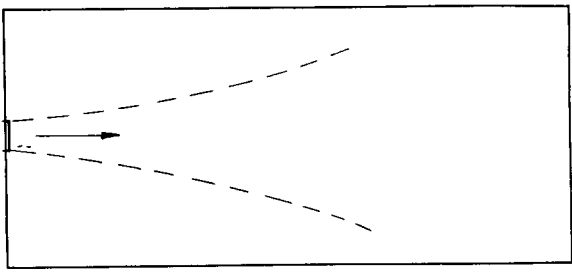


Figure 12. A grille producing a jet action of air along the ceiling, resulting in dead and turbulent regions.

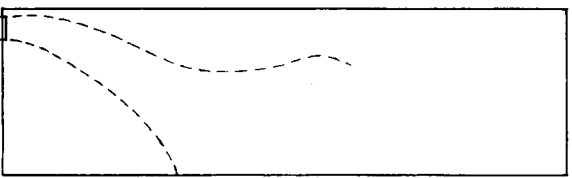


Figure 13. With a wall outlet there is good distribution.

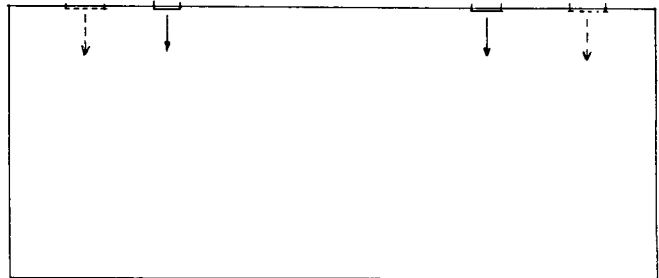


Fig. 14. The location of grilles at the ends of a room, as shown by the dotted lines, is a common error. The solid locations are preferred.

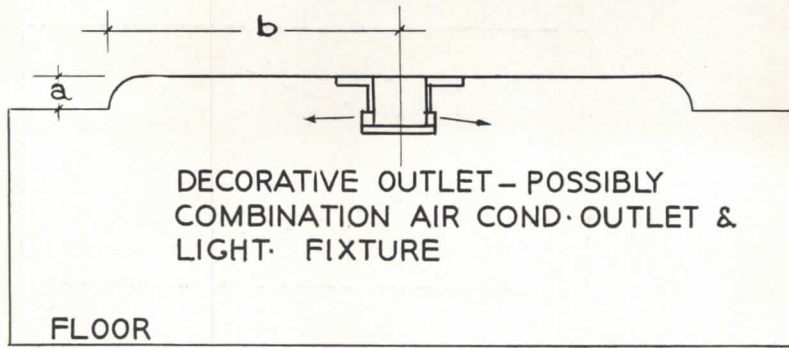


Figure 15. Section of circular or oblong room with comparatively shallow cove. If it is required to supply a coved room from the center where a/b is about one in fifteen, the outlet should be dropped below the ceiling as indicated.

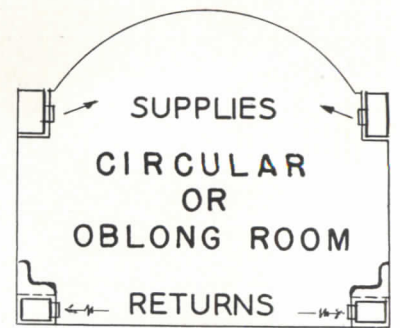


Figure 16. When the air change is low, this type of spatial condition can be handled as shown.

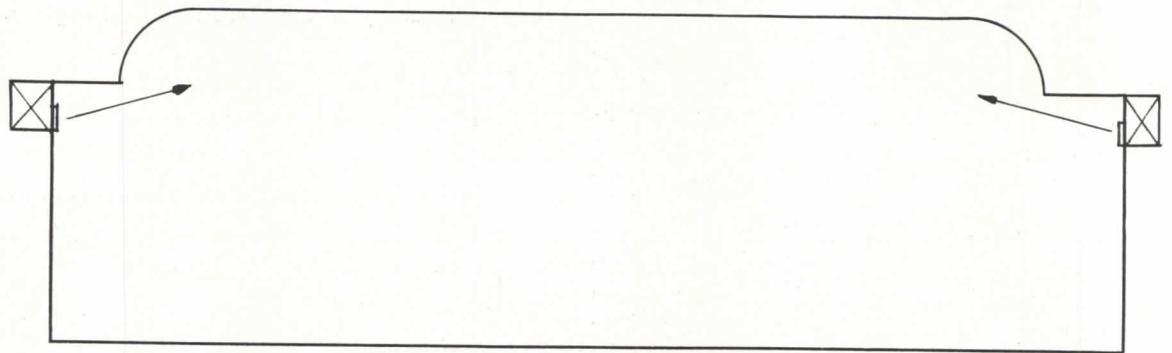


Figure 17. Architectural treatment and distributing zone may be coupled in spaces of medium size or larger.

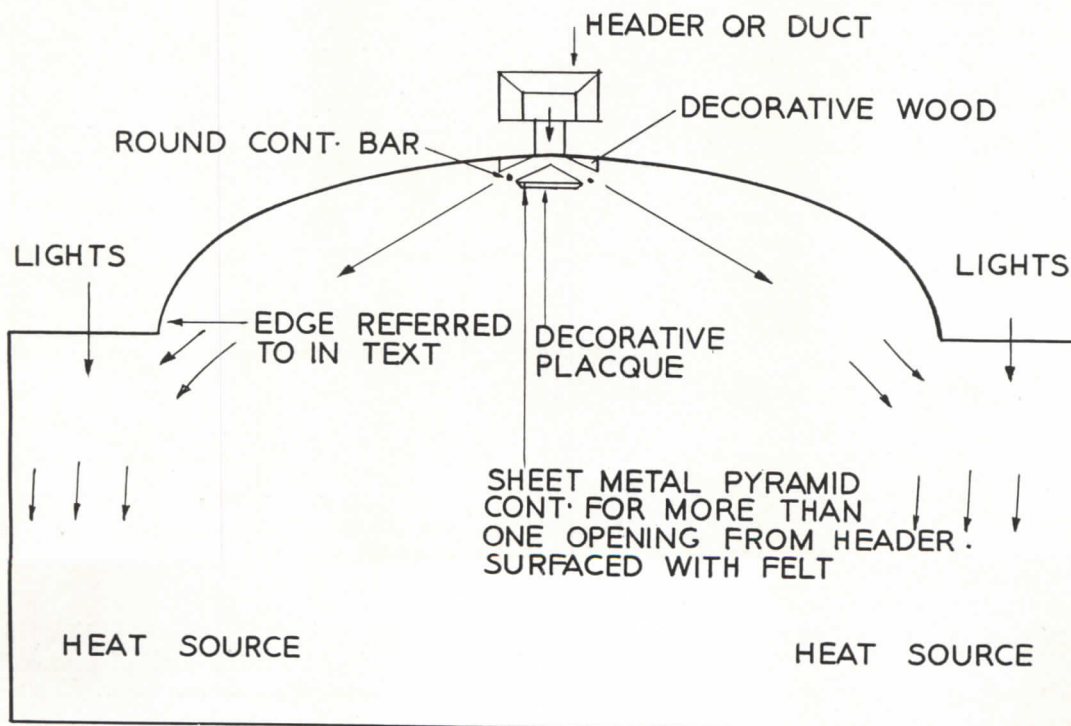


Figure 18. Application to a high ceiling. The edge at the lower level of vault should be taken advantage of to secure slow, uniform downward diffusion at the periphery of the room. The location of the return grilles relative to the mode of supply is of very considerable importance under many conditions.

be well to know when the air being supplied will reach room temperature. Tests show that the quantity of air which is delivered, the velocity at which it is traveling, and the amount it is fanned out when it leaves the grille all affect the distance that it travels before reaching room temperature. Tests on a jet type of grille delivering the same volume of cool air, having small slots spaced two or three inches apart, instead of a bar type of grille having the same effective area, do not show any appreciable change in the rate of coming up to room temperature.

The cool air rises in temperature rapidly as it leaves the grille, but must move slowly as its temperature approaches that of the room. It does not completely reach room temperature until the end of the throw, there being a slight difference even then. Therefore, it is very important to keep the *main stream* well out of the occupied zone throughout the whole throw.

Greenlough, research engineer specializing in air distribution, states: "The fact that cold air can be supplied at the top of the room and will fall into the lower part is an advantage from one angle, yet it is likely to cause trouble from another. Since the supply air is heavier than the room air it tends to drop, and if the supply is not properly placed, the main stream will enter the occupied zone and create very objectionable drafts. There are two ways of locating the outlet to avoid this. The grille can be placed (in the wall) high enough above the floor so that the air will have lost most of its velocity and reached the opposite wall before it falls to the occupied zone; or the grille may be placed just above the six-foot level and the air deflected up toward the ceiling. The latter method is the more effective, because by arching the air toward the ceiling, the supply air can be coming up to room temperature (as the air travels) on the way up to the ceiling and also on the way down. Or in effect, there is twice as much height above the occupied zone as actually exists. This method is particularly effective where the ceilings are not quite high enough to supply the air in the conventional way or when it is desirable to put the ducts down near the six-foot level, as under a balcony or on top of shelves, or clothes racks."

From the foregoing, it can be seen that room volume and ceiling height are of extreme importance in relation to heating or cooling load requirements, and that allowable space for distribution must be carefully considered. Unsuccessful air conditioning in existing premises is fre-

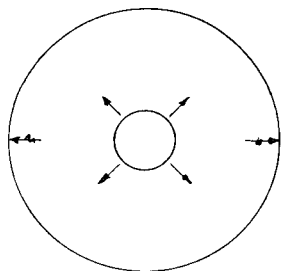


Figure 19. Plan of a circular room, an ideal shape to be served by one ceiling plaque.

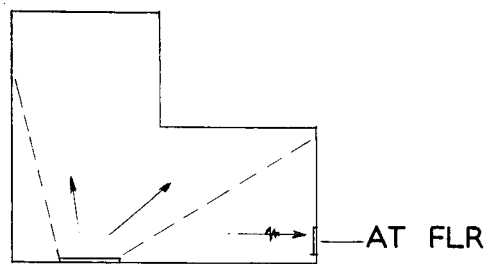


Figure 20. Distribution in odd-shaped rooms depends upon area to be covered with allowable outlet velocity, kind, location and amount of outside walls, windows and direct radiation, height of ceiling or other physical limitations of the building.

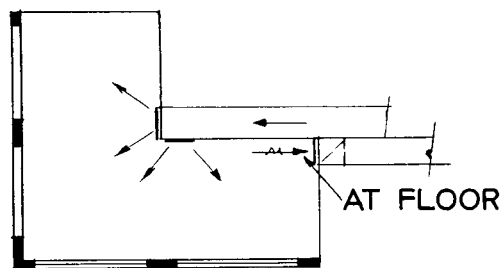


Figure 21. Plan of outside room having the same shape as shown in Figure 20.

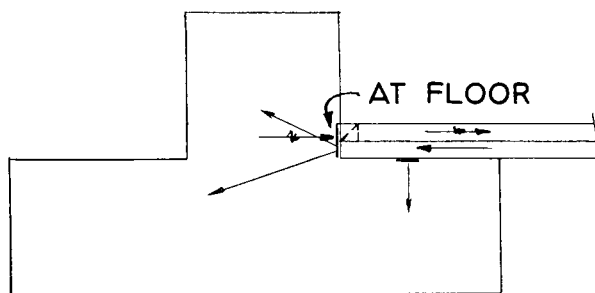


Figure 22. Odd-shaped room with supply at central source.

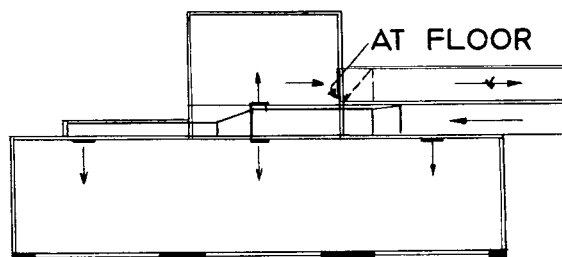


Figure 23. Plan of outside room having the same shape as shown in Figure 22.

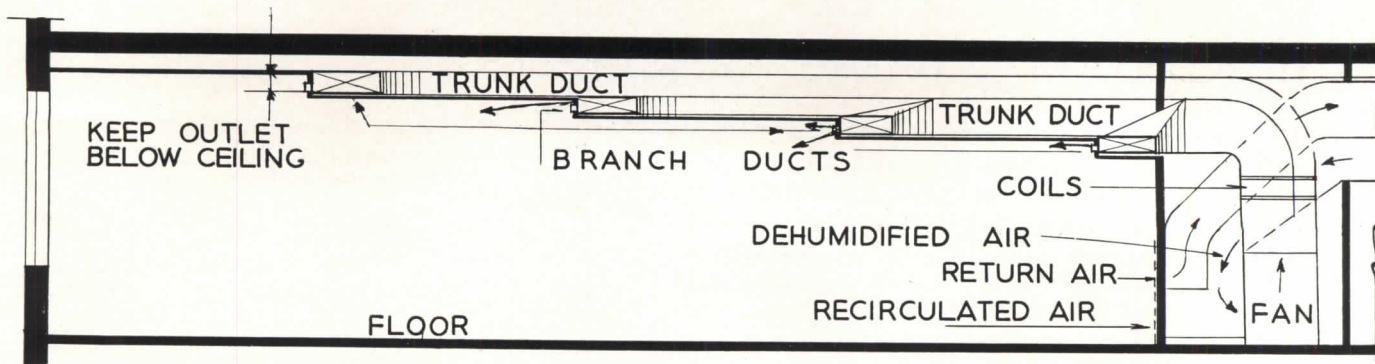


Figure 24 shows a staged supply for a large area. Note the separate trunk duct for the outlet nearest the window.

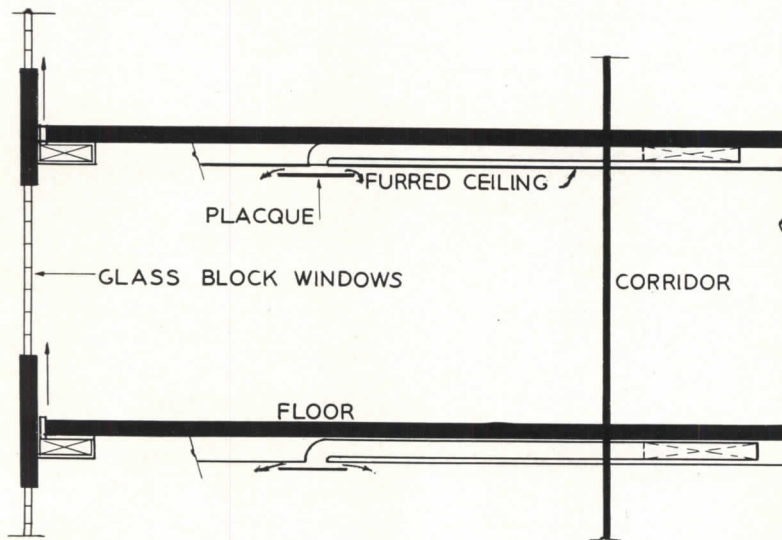


Figure 25. Air is discharged upward along the outside wall to control its inside surface temperature by air controlled separately from the main air-conditioning system.

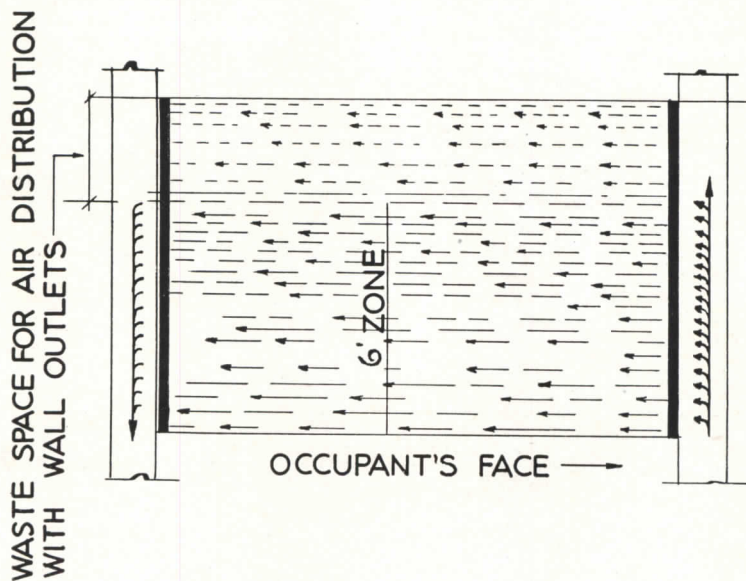


Figure 26. Movement of air across the room. The air-distributing space ordinarily required may be saved for conditions where high heat loads demand a rapid air change.

quently traceable to the limitations imposed by spatial conditions.

On the other hand, close attention and experienced analysis can effect improvements of air distribution for almost any setup. If close cooperation between architect and engineer exists in the early stages of planning, sufficient study usually yields a solution acceptable to both parties. Nevertheless, spatial handicaps are frequent.

Consider the main auditorium of a theater, visualizing a section. Here the air-conditioning engineer has

ample space to work with above the occupied zones; yet drafts are a common experience. There is no real excuse for it. But an extreme illustration like this exposes a real need for cautious planning.

Theater mezzanines are inherently troublesome by their very nature, with high heat loads and low ceilings. In a recently designed auditorium, the air supply to the top mezzanine was correctly discharged toward the rear of the house. The grilles were "painted in."

Except for mezzanines, auditoriums and the like pro-

vide ideal opportunities for superior work, because the direction people face when seated is known. The upshot of all this is that *air conditioning, to be right, begins with air distribution;* and the crux of the matter lies in a minimum building cube for horizontal ducts and for diffusion-space.

The ideal space for air conditioning implies a windowless compartment or its equivalent. By equivalent is meant space with inside wall surfaces having the same temperature as the air of the occupied zone. There can be glass, but it requires more than double glass to do this, unless, as previously stated, the glass is "covered" by the air supply, or is separately heated.

Figure 25 shows such an arrangement to provide body-radiation control by a vertical discharge of the air stream, one of the many possible arrangements. A separate duct serves a multiple of floor grilles in each room, the air supply from these grilles being thermostatically regulated so as to control the inside surface temperature of the wall, the temperature of the inside surface of the glass brick windows being governed accordingly.

For a theoretical basis for comparing existing practice in air distribution, it would be well to consider moving the air across the room as indicated in Figure 26. This is impracticable, of course, under most conditions. Opposite walls are perforated, with a "pressure" air plenum behind each, connected to a supply and return air duct, respectively. Air volume is set to provide the desired velocity for air motion. Considerably more air is handled, and the temperature differential would be very low, so low that people could comfortably sit adjacent to either wall. The net effect is the same as being out-

side in a slight breeze. *The high air volume coupled with a displacement-effect would solve the problems of smoke and odor.*

Whereas the scheme is impracticable in large buildings because of excessive costs of lost floor space, it is practicable for residences and small buildings.

The presentation of this mode of air distribution is made to show what we should be doing, if the sensation of a pleasant outside breeze is the measure of quality. But comparison with outside conditions productive of a comfortable sensation can hardly be made with customary modes of air distribution, except perhaps in large spaces, similar to auditoriums in size.

It can be observed by reference to Figure 26 that the air-distributing space at the ceiling required by contemporary practice may be saved for those conditions in which there are high heat loads demanding a rapid air change.

This is no conjecture: in fact, there is a case at hand in which the writer was called in after the basic design was developed. Air-motion tests were conducted proving that the story height was inadequate. But this was incidental, since the tests were made to determine the best arrangement to meet spatial conditions called for by completed plans.

If we could get tight construction, there is considerable merit, as the next best arrangement, to the scheme just considered of horizontal air-flow, to the perforated ceiling. This is commercially available in combination with an acoustical material. The same thing may be closely effected with a number of "anemostats" to produce a low velocity blanket of air (see Figure 27).



Figure 27. Installation producing a low-velocity blanket of air through use of a number of anemostats.

Building Volume and Cost Trends

By **CLYDE SHUTE**, Manager, Statistical & Research Division, F. W. Dodge Corporation

Method for Use of Charts

AN APPROXIMATION to accuracy of construction cost data on materials and labor combined can only be obtained by determination of cost trends.

The base data for the charts displayed on these two pages have been secured from E. H. Boeckh & Associates, Incorporated.

The United States average for each type of construction for 1926-1929 is used as the base period, or 100, because prices of both labor and materials showed greatest stability during these years.

Six general construction types will be presented, at the rate of two per month, because the quantities of the different building materials and the amounts of the different classes of labor vary in each type of building. The

six types* to be shown will appear in the following order: (1) Brick, (2) Steel, (3) Frame, (4) Brick and Wood, (5) Brick and Concrete, and (6) Brick and Steel.

Sixteen representative but widely scattered cities will be shown monthly for each type displayed because material prices and labor rates are different in the various localities and do not change at the same time in all cities, nor to the same degree.

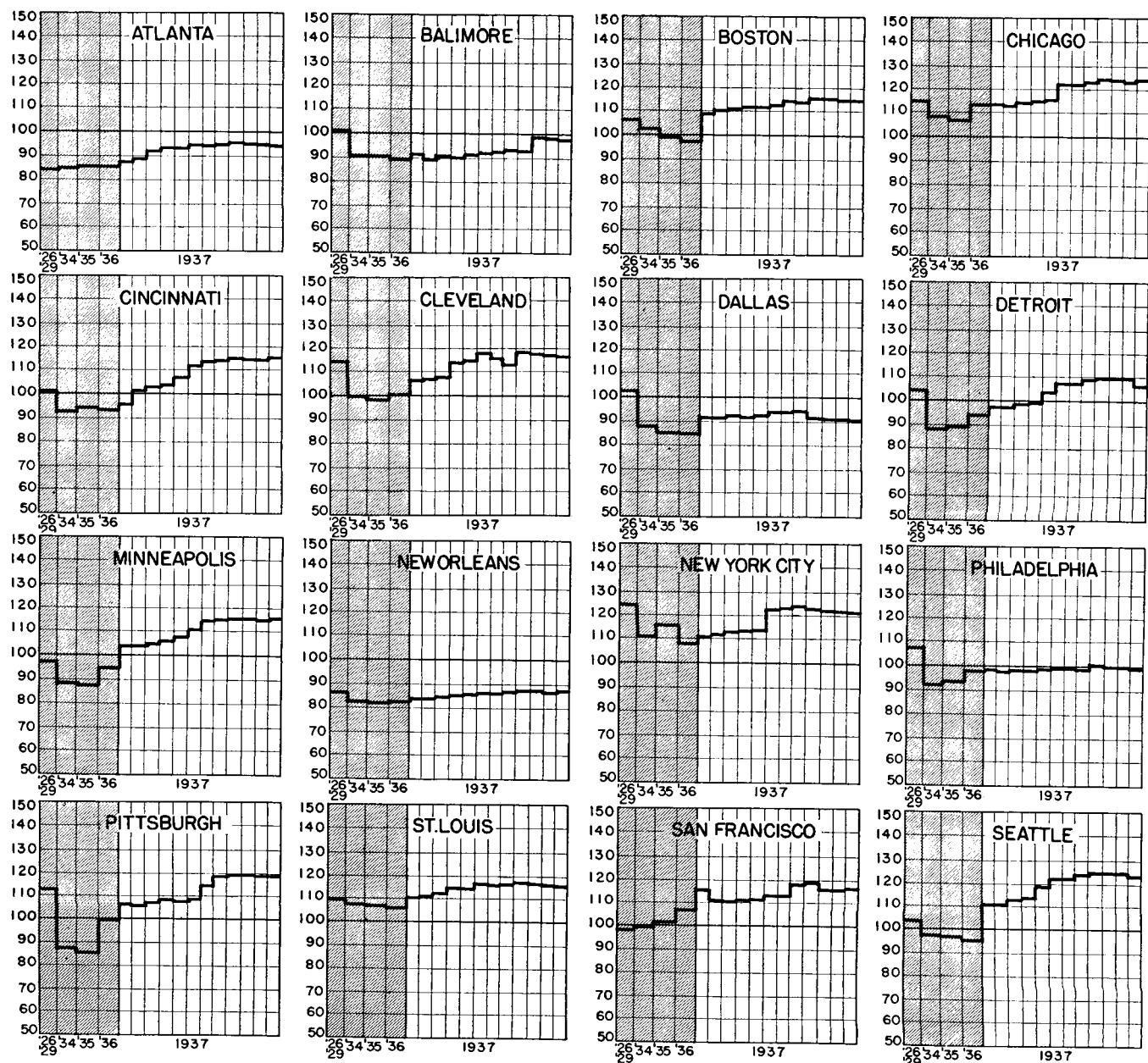
The index numbers indicate the relationship of the current or reproduction cost of a building at any given time, in any given place, to the 1926-1929 United States average cost for an identical building.

The plotting of the data provides readers with a quick and efficient method of construction cost comparisons.

*The first four types were presented in December, 1937, pp. 75-77 and January, 1938, pp. 65-67.

CONSTRUCTION COST INDEX

Brick and Concrete Buildings



TOTAL BUILDING — 37 EASTERN STATES*

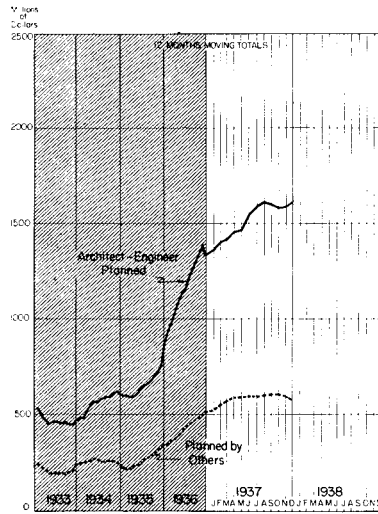
Planned by Architects or Engineers and by Others

CLASSIFICATION	ARCHITECT-ENGINEER PLANNED		PLANNED BY OTHERS		TOTAL Thous. Dollars (000 Omitted)
	Thous. Dollars	%	Thous. Dollars	%	
Commercial Buildings	171,358	62.1	106,172	37.9	280,530
Industrial Buildings	167,801	57.3	124,917	42.7	292,718
Educational Buildings	178,885	92.7	14,188	7.3	193,073
Hospitals & Institutions	61,102	88.6	8,283	11.4	72,385
Public Buildings	83,452	86.4	13,144	13.6	96,596
Religious & Memorial	28,908	82.0	6,329	18.0	35,237
Social & Recreational	37,582	75.4	18,811	24.6	76,393
Total Non-Residential	755,088	72.1	291,874	27.9	1,046,962
Apartments & Hotels	185,618	88.6	23,919	11.4	209,537
1 & 2 Family Houses	296,522	45.5	353,754	54.5	652,276
Total Residential	482,140	55.9	379,673	44.1	861,813
TOTAL BUILDING	1,237,228	64.8	671,547	35.2	1,908,775

*First eleven months 1937

TOTAL BUILDING*

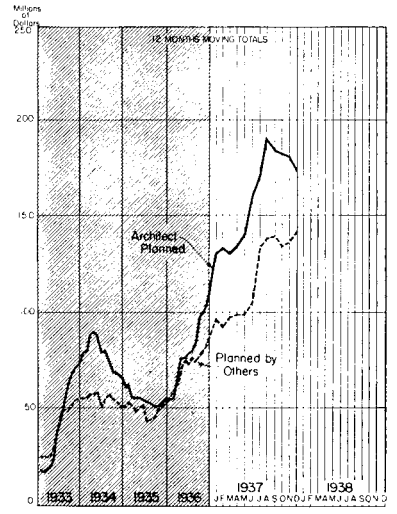
Architect-Engineer Planned vs. Others



*37 Eastern States

INDUSTRIAL BUILDING*

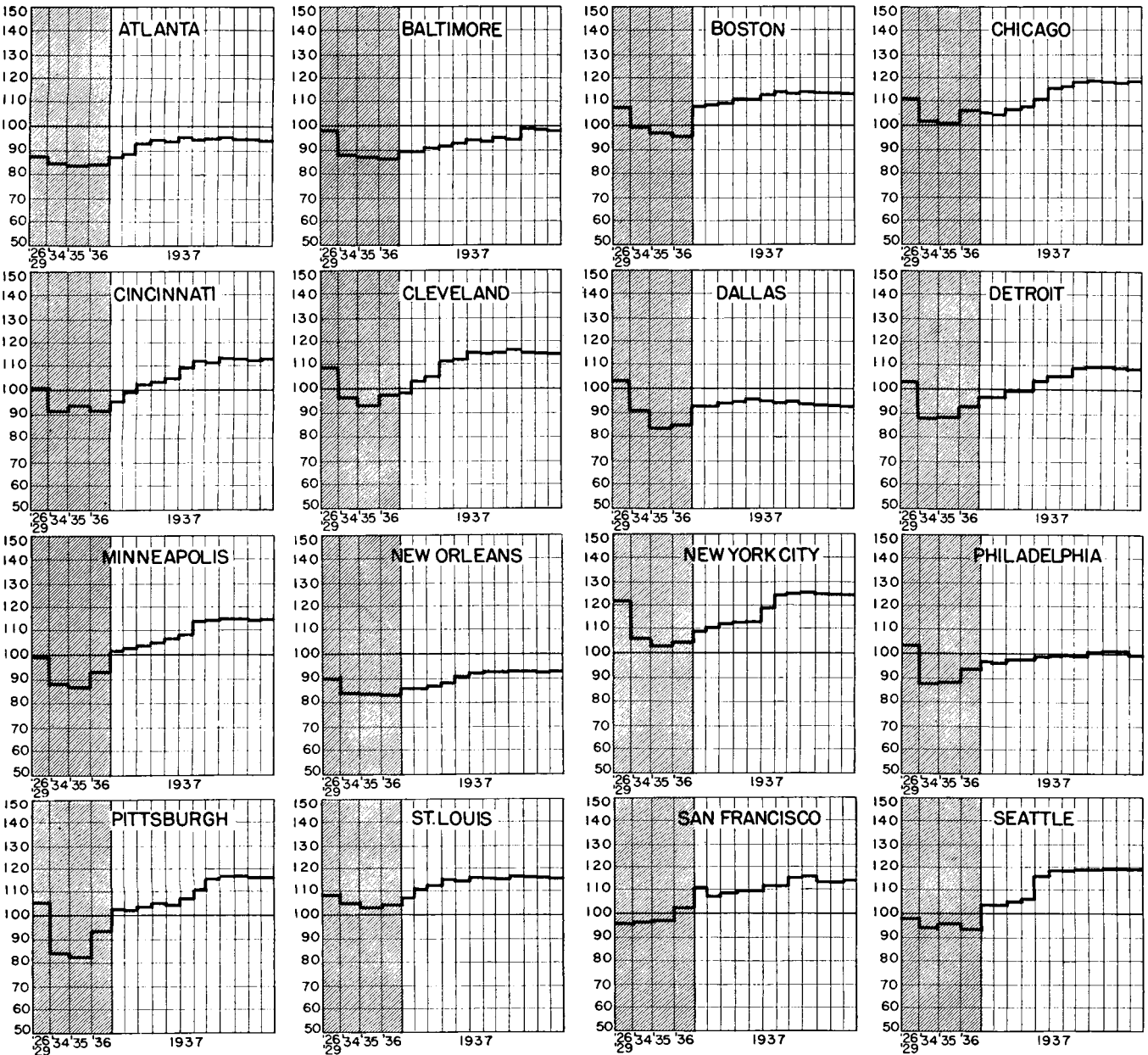
Architect Planned vs. Others



*37 Eastern States

CONSTRUCTION COST INDEX

Brick and Steel Buildings



Reviews of New Books

THE MODERN FLAT. By F. R. S. Yorke and Frederick Gibberd. Published by The Architectural Press, London. Handled in U. S. by Architectural Record. Price, \$8.50

This book is intended to show the developments that have taken place in the design of apartments in all countries in recent years and to demonstrate one solution to the vexing problem of housing—the provision of homes in multi-story buildings. The authors attempt to show: first, the type of building that fulfills modern requirements, and that has actually been built, though not in ideal surroundings; second, the type of urban development in which such buildings could, on a larger scale, become units.

In the past the standard of living was whittled down to the lowest level that people would endure. It is only recently that standards have improved to something approaching comfort in modern apartments designed on scientific lines.

A study is made by the authors to determine the way in which the average family is housed in this decade: size of family, its members and what they do in the apartment in leisure time; the ownership of objects required for urban living; the requirements of health in the way of light, activity and so on. From these facts, spaces and their relationship are considered and composed as plan.

Group projects are rather fully covered as the setting for apartment location and relationships. There are illustrated examples of apartment housing to give some idea of the change that is possible when public authorities take over and clear large areas in existing towns or develop new areas.

The book contains 200 pages, size 11¼" x 8¾", bound in cloth.

ARCHITECTONISCHE DETAILS. By I. Ramen en Deuren. Published by Prof. Ir. J. G. Wattjes. N. V. Uitgevers-Maatschappij, Kosmos, Amsterdam, Holland. 1937.

Illustrations and working drawings of Dutch houses and other buildings, including details of windows, doors and wall sections.

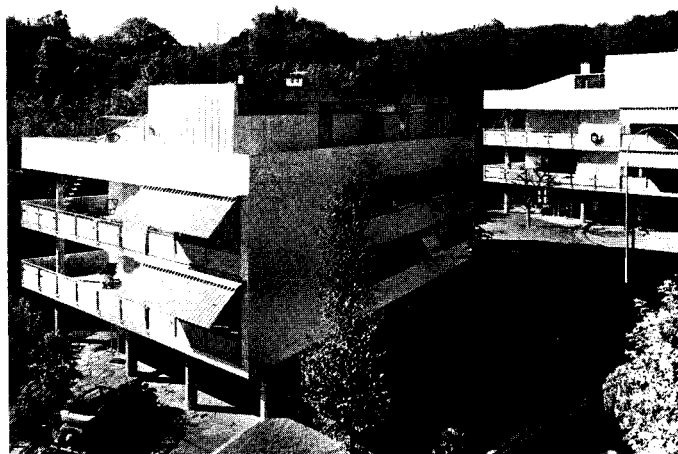


Photo by Finsler from "The Modern Flat"

SPANISH-COLONIAL ARCHITECTURE IN THE UNITED STATES. By Rexford Newcomb. J. J. Augustin, Publisher, New York City. Price, \$12.

This volume forms the culmination of studies in Hispanic-American architecture extending over a quarter of a century. Beginning in 1911, Rexford Newcomb has written upon various aspects of the art expression of Old Spain in the United States. This volume contains illustrations and text on architecture of Spanish-Colonial California but also historic examples from each of those states where the Spanish-Colonial developed a worthy architectural expression.

THE ARCHITECTURAL, STRUCTURAL AND MONUMENTAL STONES OF MINNESOTA. By George A. Thiel and Carl E. Dutton. University of Minnesota Press, Minneapolis. Price, \$2.50.

Listing of building stones in the state of Minnesota and discussion of their qualities.

APARTMENT HOUSE RENTAL, INVESTMENT AND MANAGEMENT. By James R. McGonagle. Prentice-Hall, Inc., New York. 1937. Price, \$5.

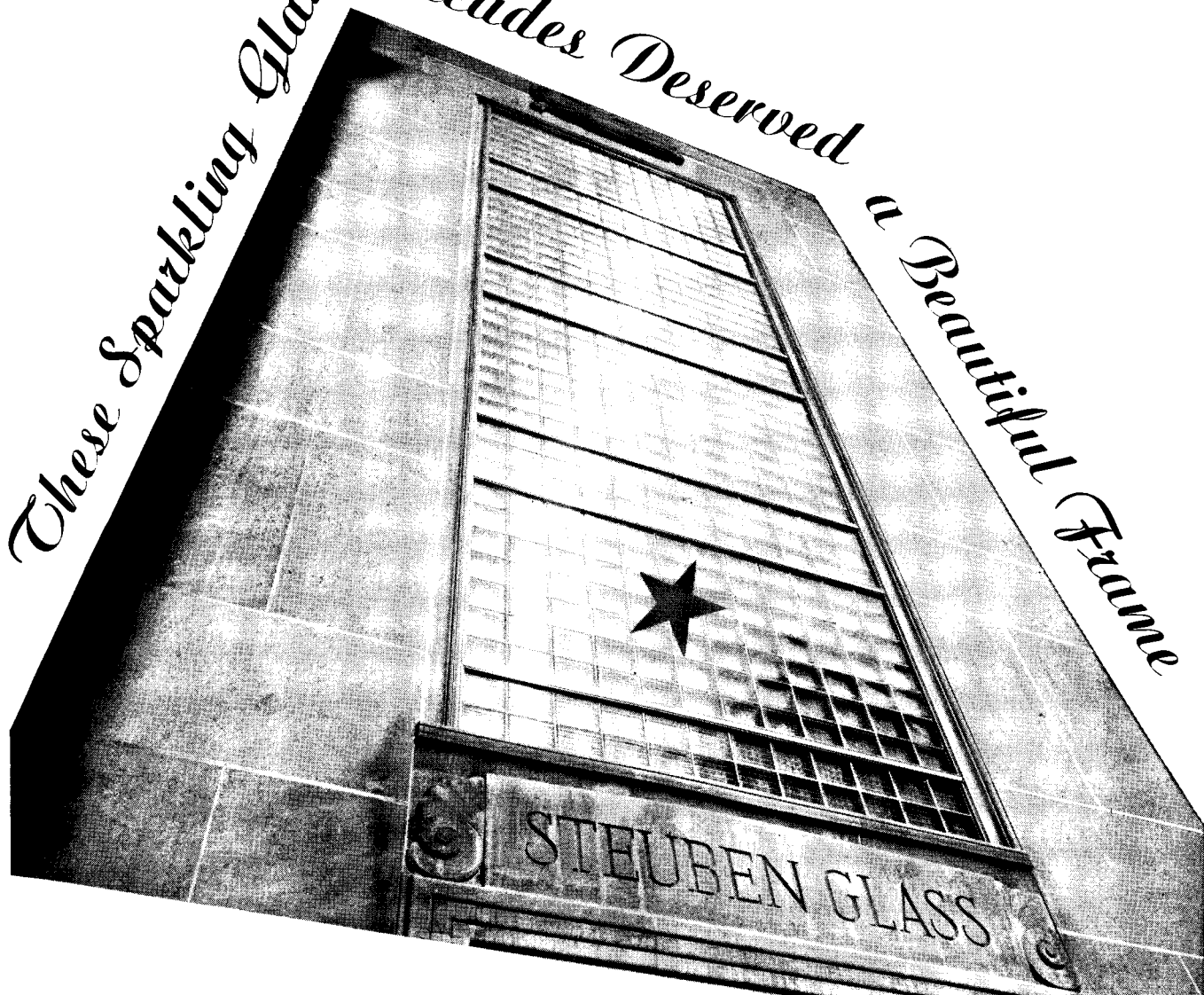
This book was written for real estate men, banks, investment houses, architects and builders. It shows (1) how to manage an apartment house in order to bring the greatest return with the least labor; (2) how to rent an apartment building at a low cost; (3) when and how to invest money in apartment buildings.

PERIOD INFLUENCES IN INTERIOR DECORATION. By Walter Rendell Storey. Harper & Brothers, New York City. 1937. Price, \$3.

Discussion of period styles.

RETAIL STORES— a reference study in the BUILDING TYPES section — starts on page 101.

These Sparkling Glass★ Facades Deserved a Beautiful Frame



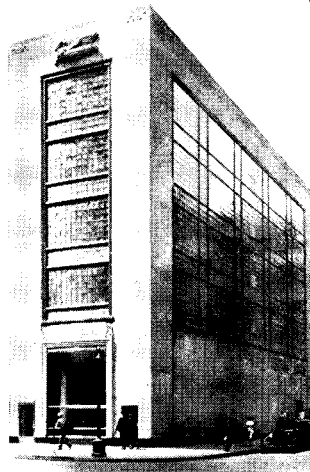
CLASSIC simplicity is the keynote of this charming House of Glass, recently completed on New York's Fifth Avenue for the Corning Glass Works and Steuben Glass, Inc. Obviously dominant features are the vast areas of glass block construction on both facades.

Here we see employed the most modern of present-day building materials, and happily framed within a decorative metal that is equally modern in aesthetic qualities.

Because it offered a rich pastel shade bordering on white, the architects selected Solid Nickel Silver for the outside framing of all glass areas. Altogether, 7,776 pounds of this lustrous Nickel bronze were used for both exterior and interior decorative trim.

The soft sheen of Solid Nickel Silver makes it one of the handsomest metals for ornamentation — its warm, glowing high-lights blending beautifully with glass, stone, tile, marble, wood, etc.

Moreover, Solid Nickel Silver is extremely durable, possesses adequate structural strength, meets all fabricating requirements and is readily available through the usual sources of supply.

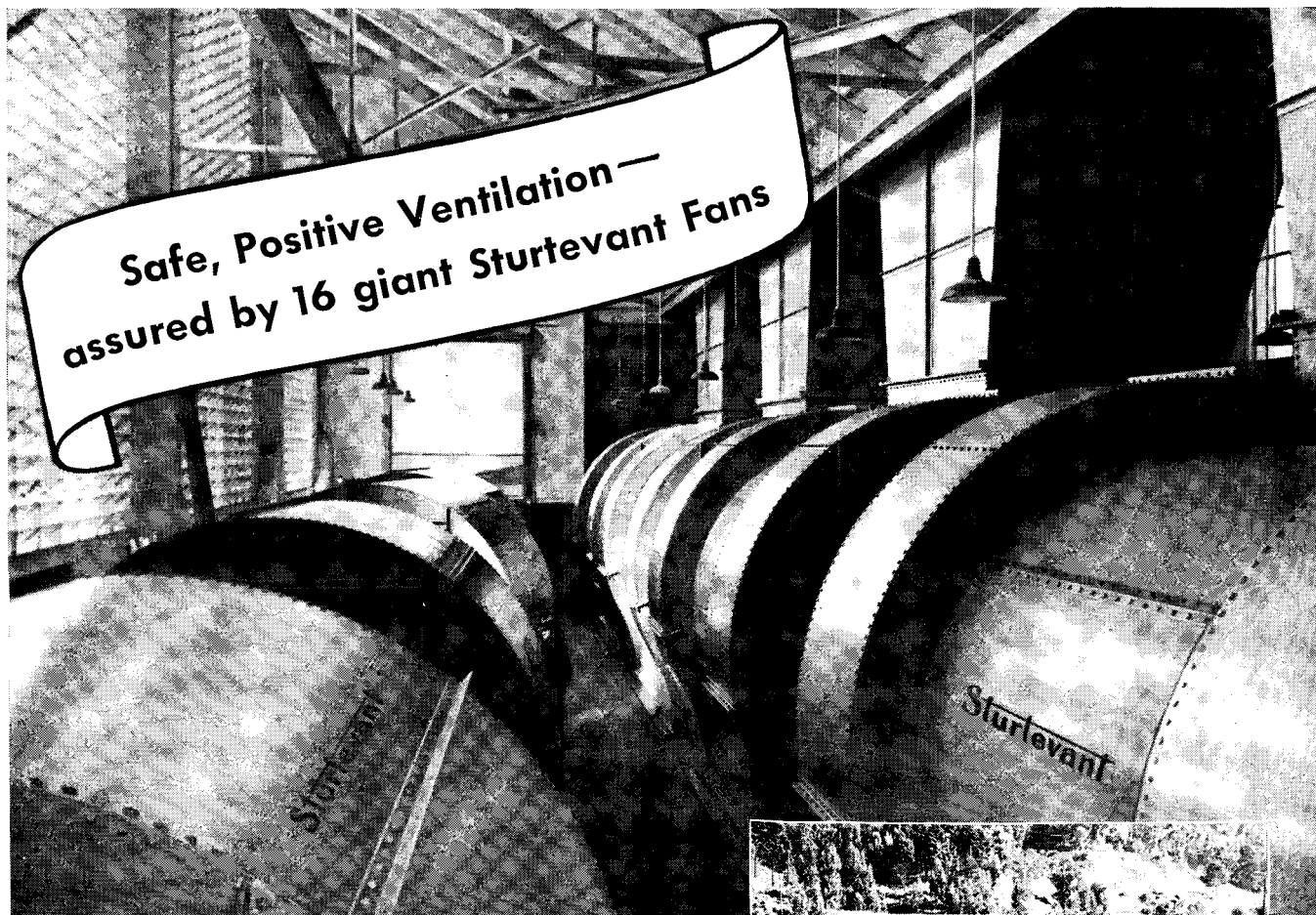


Solid **NICKEL** *Silver*

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

4200 TONS OF AIR PER HOUR

... for California's new Vehicular Tunnel



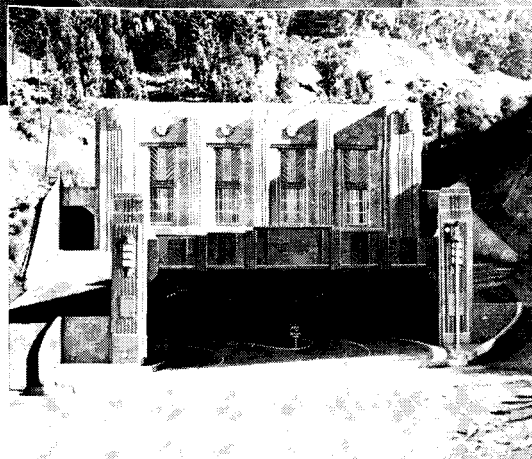
LONGEST subterranean vehicular tunnel in the world is the recently opened Broadway Low Level Tunnel—ventilated by Sturtevant. Drilled through the base of the Berkeley Hills, it provides a great underground highway between Alameda and Contra Costa Counties, California.

16 Giant Sturtevant Ventilating Fans flood the tunnel with fresh, outdoor air, exhaust foul air and motor gases, keep Carbon Monoxide content less than 2 parts to 10,000, at all times. Total Fan Capacity: 2,000,000 c.f.m.

For every ventilating problem, from a mammoth tunnel to a small kitchen, there is a Sturtevant Fan exactly suited to the job. But regardless of size or capacity...it is the product of Sturtevant's 75 years of air research and constant product development.

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Fans, Blowers, Air Washers, Air Conditioning, Heating, Vacuum Cleaning, Drying, Mechanical Draft Equipment

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2 NEW
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DURA-FLO

The new Auer Dura-Flo Wall Register has structural principles assuring great strength and rigidity. It also has generous open area, approximately 80%. It is a straight bar register, the fixed blades may be either single-directional or multi-directional. Bars are attached to frame by a lock-mortise joint. Welded frame has L-braces at each corner for extra strength.

FIN-FLO

The new Auer Fin-Flo Register, because of its thin blades, has an extra high percentage of free air opening. Designed particularly for modern forced air systems of heating or cooling. Fixed blades are set for any desired directional flow. Frame is welded, with reinforced corners. Fin blades are locked with right-angle bends through perforations in frame. A register combining beauty and strength.

The restrained and pleasing design of both these models commends them especially to the approval of architects. They are in good taste in almost any surroundings.

Dura-Flo and Fin-Flo Registers come in all standard sizes and finishes. Complete catalog of all Registers, Intakes and Grilles on request. See Auer Catalog also in Sweet's.

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AUER DISTINCTIVE **REGISTERS**
& GRILLES  For Air Conditioning *and Gravity*



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Engineer: Clyde R. Place, Esq., New York.
Contractors: Messrs. Baker, Smith & Co., New York.

ANEMOSTAT HIGH VELOCITY AIR DIFFUSER

THE Anemostat is an accepted scientific achievement. It has solved major problems of the Air Conditioning Industry by reducing the speed of air flow to such an extent that it is no longer perceptible as a draft. The Anemostat mixes room air with conditioned air within the device, thus the predetermined room temperature is established considerably above the breathing level. The Anemostat permits greater temperature differentials, smaller ducts, smaller plants, lower installation and operating costs. The Anemostat can be applied to existing systems as well as to new installations.

Travelers and employees of the American Airlines Inc. can discuss travel plans in perfect comfort in the air conditioned passenger office of this great organization without experiencing the harmful and unpleasant sensation of draft.

The center of the ceiling is vaulted. The Anemostat is set in the center of the vaulted section. Light members are concealed behind a vertical ring which finishes the ceiling design. These light members throw the light into the vaulted section of the ceiling and onto the Anemostat, resulting in a splendid and unusual indirect lighting effect.

INSTALLATION DATA

Length of Room..... 22'	Volume of air distributed through Anemostat..... 1200 c.f.m.
Width of Room..... 20'	Neck diameter of Anemostat..... 14"
Height of Ceiling..... 21'	Diameter of largest cone..... 35"
Velocity in Anemostat neck..... 1150 f.p.m.	
Temperature Differential..... 15 deg.	

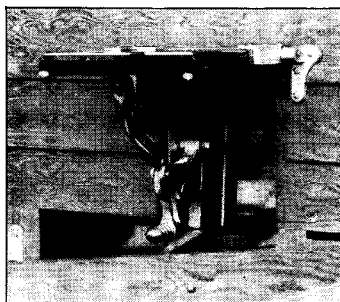
ANEMOSTAT CORPORATION OF AMERICA
10 EAST 39th STREET, NEW YORK

ANEMOSTAT

"No Air Conditioning System is better than its Air Distribution"

AN-7

With Track Doors, it is the "flap" that makes, or breaks, them



This is the York Track Door Flap in "Open" position. Note the simple but positive mechanism which operates the flap... keeps gasket on flap tightly compressed when door is closed.

Exclusive with York, this Cold Storage Door "track flap" brings you these advantages: 1. Positive in action, both in opening and closing. 2. Foolproof, no adjustment necessary, nothing to get out of order. 3. Long life, because of simplicity of design, minimum number of moving parts which are made of malleable iron. 4. Improved appearance... nothing but the hinges are visible on outside of door. 5. Track flap is fully opened with approximately 15 degree opening of main door. 6. Can be made inoperative without affecting the operation of the main door.

For Refrigeration Accessories use York's Nation-wide Service

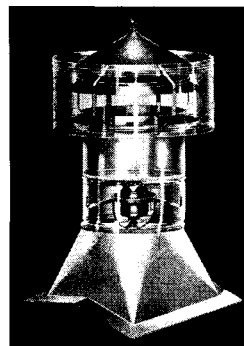
Through Headquarters Branches, in every important center of demand, York provides Doors, Fronts, Hardware, Valves, and Fittings, everything for refrigerating plant operation and repairs. Also engineers to help you with your problems. Ask for a copy of the York Accessory Equipment and Supplies Catalog. Write Dept. AR-1A

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YORK Headquarters for Mechanical Cooling since 1885
REFRIGERATION  AIR CONDITIONING

BURT

Headquarters for
ROOF VENTILATORS



Every roof ventilation problem is different. No set rule presents the best solution. With a background of 35 years experience, Burt Engineers are able to give valuable assistance as to the best way to meet any situation. This service is freely at the disposal of architects and engineers. Burt makes a type and size of roof ventilator for every purpose. The Standard Fan, illustrated above, is the latest addition to the extensive Burt line, very efficient and not expensive. Write for descriptive literature and data sheets.

THE BURT MFG. CO.
177 MAIN STREET AKRON, OHIO



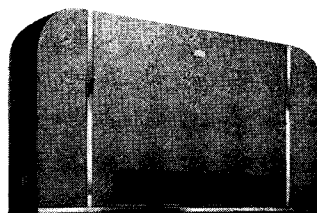
Hand in hand
FOR BETTER HEALTH

IT'S fun to go to school! Especially when that school is equipped with Nesbitt Heating and Ventilating Units—the modern units that syncretize room and airstream temperature and make every day a June day. Nesbitt Units go hand in hand with the better health programs being conducted by modern school authorities. They furnish fresh air at room temperature and circulate it without creating dangerous drafts. There is no overheating—no cold spots—no quick changes in temperature to encourage colds and other respiratory diseases. Nesbitt Heating and Ventilating Units are extensively used all over the United States and Canada. More of these popular, scientifically designed units are going into both new schools and old every day than ever before in the history of our organization. Get all the data now. Phone the nearest American Blower Branch Office.

AMERICAN BLOWER CORP.

Division of American Radiator and Standard Sanitary Corp.

5000 Russell Street, Detroit, Mich. Canadian Sirocco Co., Ltd., Windsor, Ont.

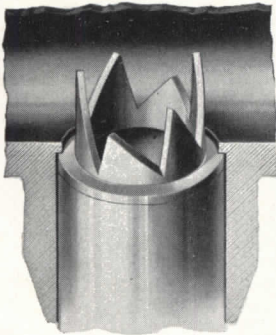


The Training School Building of Washington State Normal School, Cheney, Washington, is equipped with Nesbitt Heating and Ventilating Units throughout. George M. Rasque, Architect—A. G. Rushlight & Company, Contractors.

...AND DON'T FORGET THE
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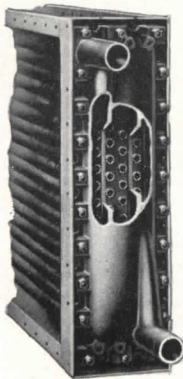
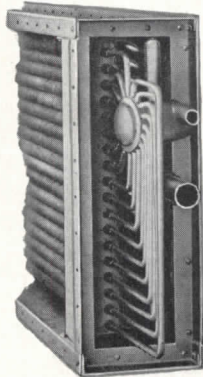


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Units

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REMOVABLE HEADERS**
For Water Cooling

The headers being removable permit easy cleaning of tube interiors. They are particularly valuable when sediment or scale-forming chemicals are present in the cooling water.

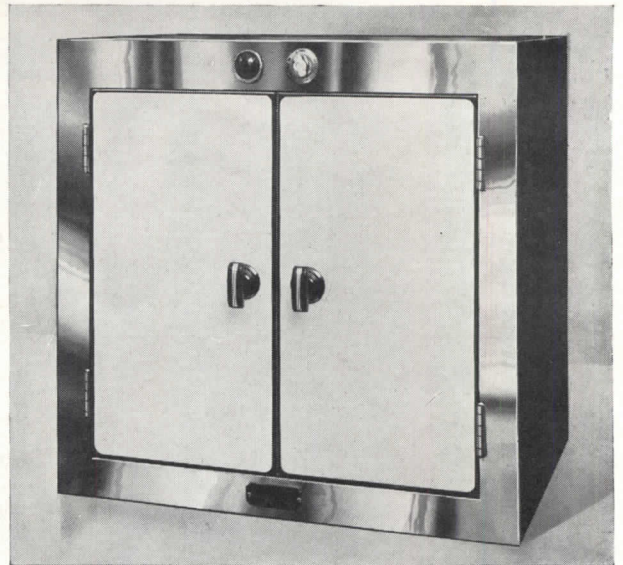
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PROMETHEUS

PLATE WARMER

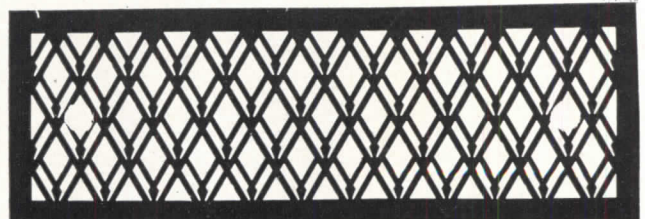
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for Church Interiors

In many recent churches and other similar edifices Hendrick's M-No. 2 pattern is used for the grille work.

Though by no means its only use, M-No. 2, with medieval lines and Gothic atmosphere, fits very appropriately into any sanctuary setting.

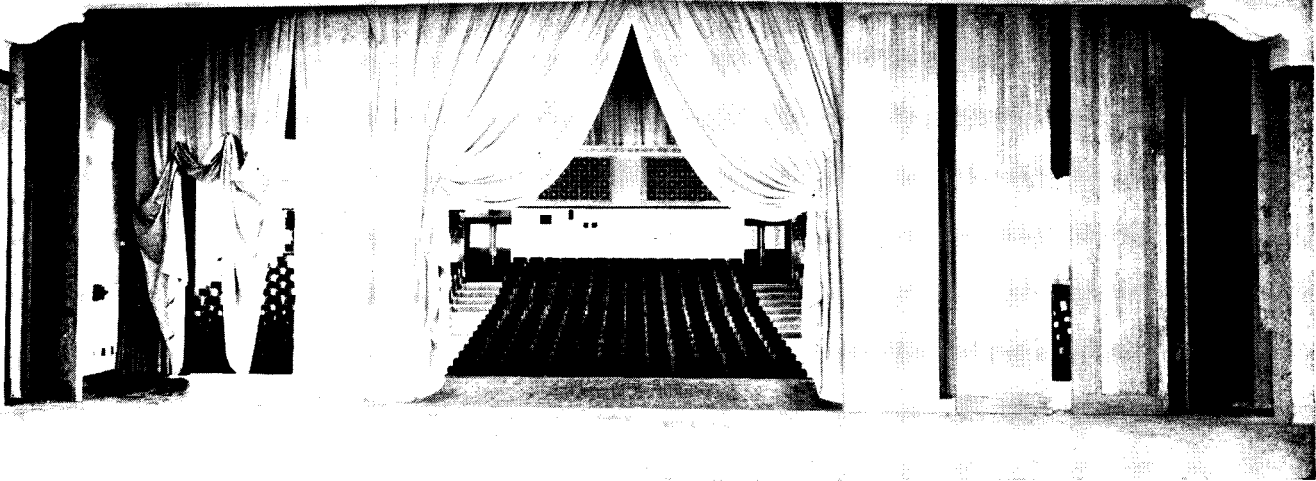
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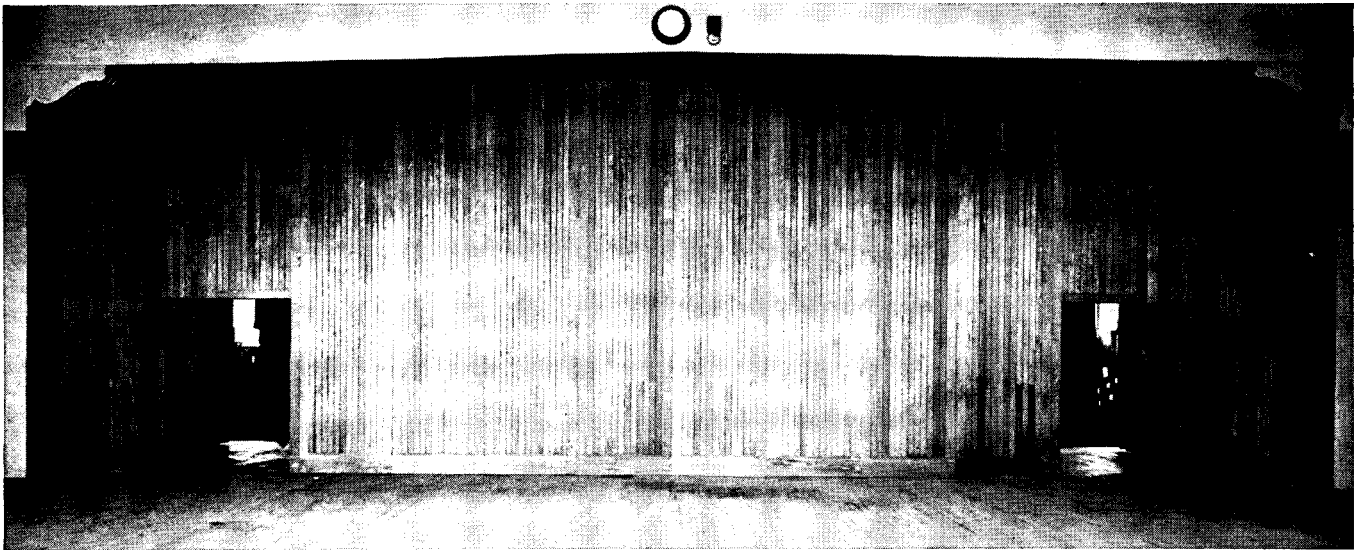
Hendrick Manufacturing Co.
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Offices and Representatives in principal cities. See phone book. Mrs. of Mitco Open Steel Flooring, Mitco Shur-Site Treads and Mitco Armorgrids, Hendrick Perforated Metals and Screens.

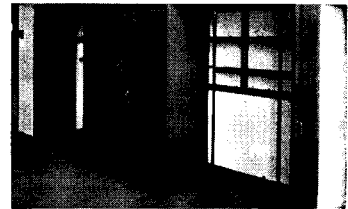
O.C.F.



FAIRHURST *folding* WALLS...



Any building in which flexibility of space is desirable will find the problem most satisfactorily solved by use of the Unitfold folding wall, manufactured by the American Car and Foundry Company under the well and favorably known Fairhurst patents. The illustrations above show the Fairhurst folding wall separating a gymnasium and an auditorium. The gym side of the wall is built of narrow beaded boards to provide a satisfactory wall for hand-ball courts. The small wicket doors close flush, with invisible Soss hinges and flush cup handles. Fairhurst folding walls provide ample allowance for building settlement, floor or ceiling sag. Fine woodwork has been an American Car and Foundry Company specialty for years.



Also O.C.F. Fairhurst school wardrobes. Strong, sturdy, space-saving. Widely used by leading schools.

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ALSO MAKERS OF FINE ARCHITECTURAL WOODWORK

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as a Lubian at midnight



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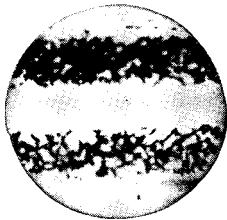
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J. S. STAEDTLER, Inc.
53-55 Worth St., New York

Photomicrograph of Lumograph line (upper), and other drawing pencil (lower); Proving Lumograph's superior opacity.



MARS LUMOGRAPH

4

BUILDING TYPE studies on H O U S E S in 1938

MARCH \$7,500 and under
APRIL \$ 7,500—\$15,000
SEPTEMBER \$15,000—\$25,000
OCTOBER \$25,000 and up

DURING 1938 the RECORD will publish in its *Building Types** section four separate reference studies on houses. Beginning in March with a survey of houses costing \$7,500 or less, each study will provide a wide range of information on residential planning, construction and equipment. Though each will be complete in itself, the four at the year's end will represent a comprehensive, practical and valuable reference file on this significant phase of architectural activity.

The March study is being developed as a composite report on architectural and building progress in the \$7,500-and-under price range. Small house designers throughout the country have been queried regarding planning and construction practices, equipment requirements, specification standards, etc. On the basis of their replies, the *Building Types* section in March will reflect in illustration, text, diagrams and tabular material, those practices now current in every department of small house design. Supplementing this will be a record of technical advances suggesting progress toward improved standards for tomorrow's small one-family dwelling.

Studies to appear in April, September and October will deal with larger houses. But each will be just as much concerned with practical and progressive methods for planning, constructing and equipping one-family dwellings the more efficiently to meet the varied living requirements of architects' clients.

Thus, in 1938, readers of ARCHITECTURAL RECORD will receive—in addition to reports from month to month on new houses in the News section, and trends in house design analyzed from time to time in the Design Trends section,—a usable, working-file of reference information on the subject which today is in the headlines.

*Building Types is the trademarked name for a 32-40 page reference study on selected types of buildings appearing in Architectural Record every month.

ARCHITECTURAL RECORD
Published by F. W. Dodge Corporation
119 WEST 40th STREET, NEW YORK, N. Y.

WORLD'S LONGEST AND FASTEST STREAMLINER

*started with
a pencil*



FACTS OF INTEREST

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Powered by a three-car locomotive, housing six Diesel engines which deliver a total of 5400 horsepower.

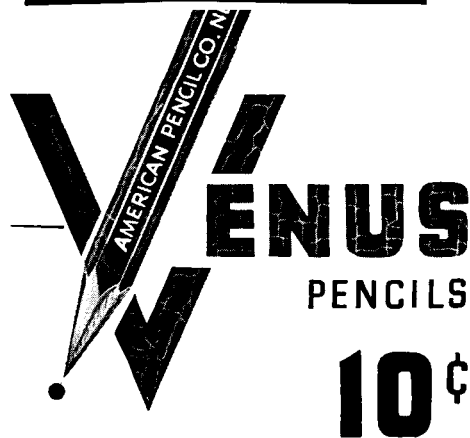
Regular schedule—39 $\frac{3}{4}$ hours between Los Angeles and Chicago.

Seventeen cars — almost a quarter of a mile in length! . . . Speeds in excess of 110 miles per hour! . . . Luxurious interior appointments with inter-communicating telephone systems and lighting to suit individual requirements . . . These are but a few of the breathtaking facts that mark the newest development in American railroading — the streamlined "City of Los Angeles."

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finished specification drawings, pencils played the important part.

Wherever tomorrow's engineering and architectural achievements are taking form and shape, one pencil you regularly see in drafting rooms is Venus Drawing. Its 17 precise degrees of black were especially developed and are rigorously maintained with unvarying accuracy to meet the exacting requirements of professional men. The super-smooth, super-strong colloidal* lead of which Venus Drawing Pencils are made, accounts for their popularity throughout the world!



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Hoboken, New Jersey

CANADA — Venus Pencil Company, Ltd., Toronto
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*Pat. No. 1,738,888



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Home Owners' Catalogs contains the comprehensive stories about products of leading firms listed on this page. It emphasizes the advantages of quality products and helps to crystallize client thinking. The distribution of *Home Owners' Catalogs* to prospective home builders is the newest of the services which Dodge makes available to the architectural profession.

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See our catalog in Sweet's 14/36



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"Vanishing
Door"
WARDROBE

Style X

equipped with either "Floor" type (as illustrated) or "Jamb" type hinges. This in Style P wardrobe if made with flush doors.

CLASSROOM WARDROBES
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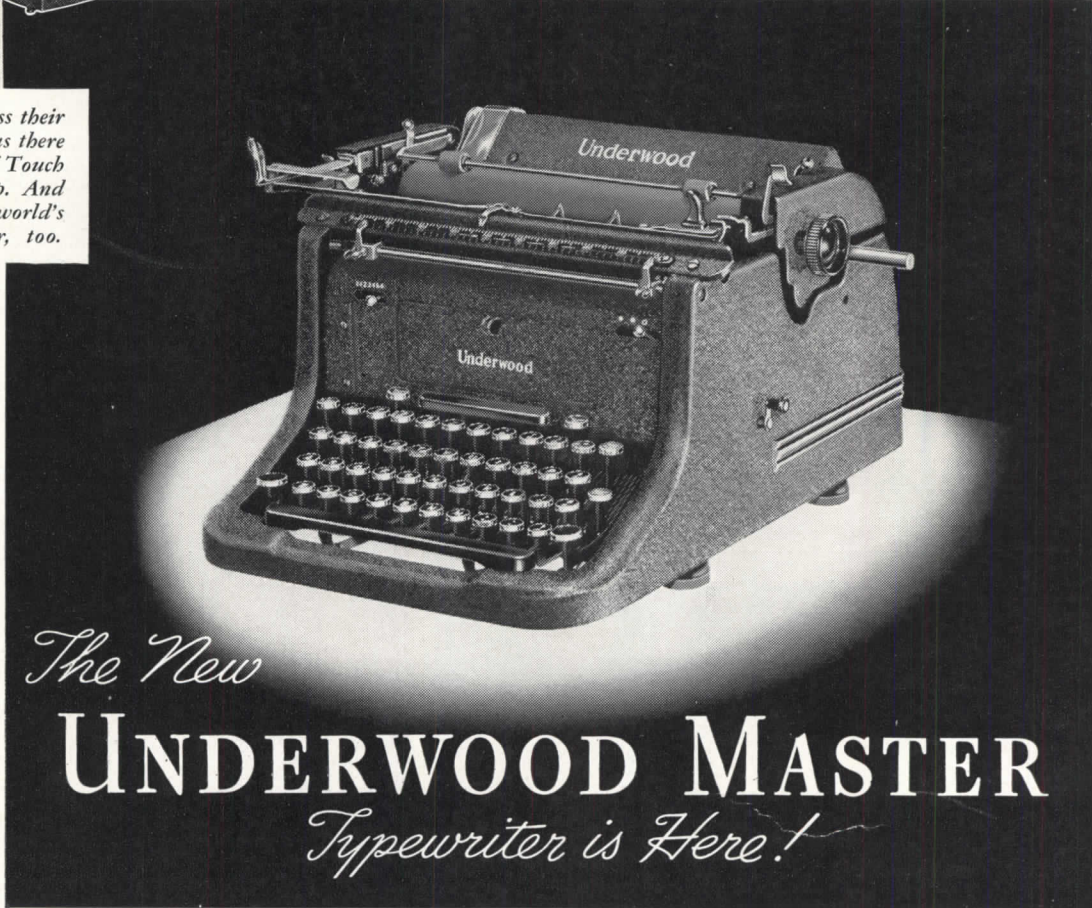
AW FABER Inc.

NEWARK, N. J.



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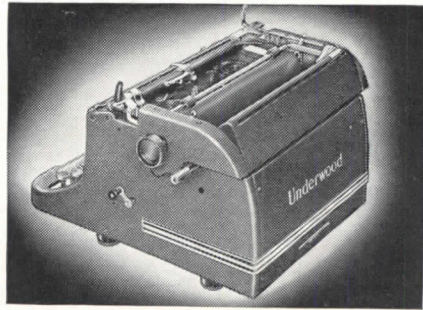
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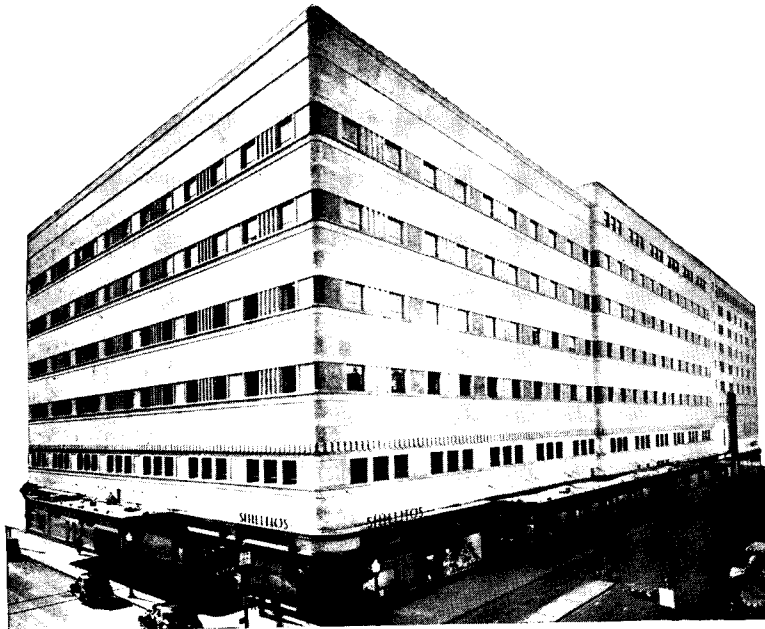
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Alberene Soapstone Spandrels, providing a pleasing color harmony with the limestone facing, were used in the rejuvenation of the Shillito Department Store in Cincinnati, by Potter, Tyler and Martin, architects. Thin spandrels, and slabs, of natural stone added a new exterior without overloading the old walls.

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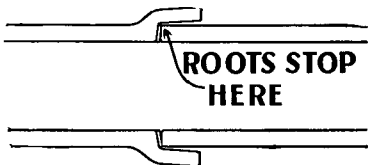
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Stop-Root Rings are made for all sizes of public or private sewers. Write for free and complete data for your files.

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Recreation Room, McKeesport, Pa. Alexander Sharove, Architect

Knotty Pine and a natural combination

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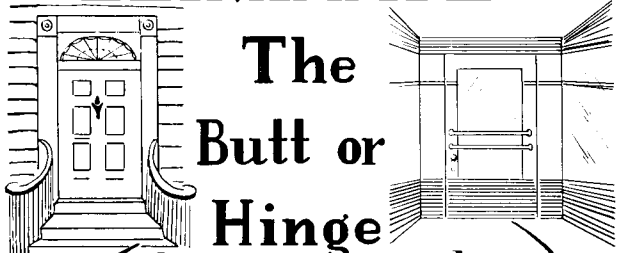


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Dept. R-2, 11 West 42nd Street, New York

In Canada: { The Atlas Asbestos Co., Ltd., Montreal
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ELIMINATE



The Butt or Hinge

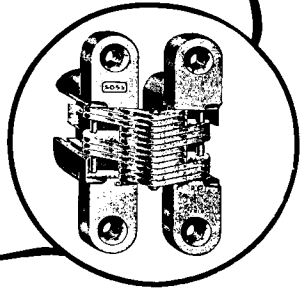
from your mind in the creation of harmonious design

SOSS

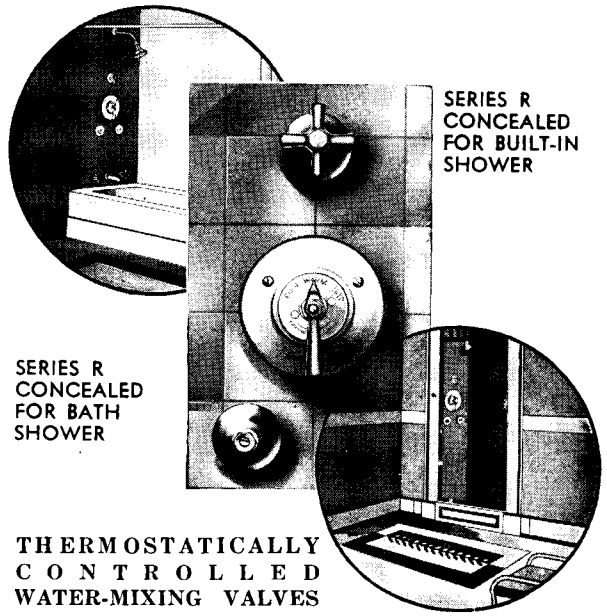
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RETAIL STORES

(A Reference Study)

ARCHITECTURAL

Record

Activities in Retail Store Design

By R. STANLEY SWEELEY

A RETAIL STORE may be defined as an establishment for "purveying goods to ultimate consumers for consumption or utilization, together with services incidental to the sale of goods."* Included under this definition are department stores selling a diverse assortment of goods; large or small shops selling only one type of commodity; urban or suburban groups of shops independently operated but having some common facility such as a parking area or delivery service.

In every type of store the following must be provided:

1. Adequate areas and equipment for the display of merchandise to passersby as well as to those who enter the store.
2. Sales areas: these may be developed as comparatively independent departments for various types of merchandise sold; or a more open planning in which maximum visibility of all goods may be desired, and segregation of any department is then carefully avoided.
3. Means of customer circulation: aisles, stairs, elevators, escalators.
4. Areas and equipment for administration: employee activities, receipt, storage and dispatch of merchandise.

These must be functionally integrated within a plant that will maintain economically a comfortable environment for customers and employees with all necessary services and protection for occupants and goods.

The United States Department of Commerce Census on Retail Distribution, published in June 1937, presents a detailed and comparative summary

of the retail business of the country for the years 1935, 1933 and 1929. Findings most relevant for designers are these:

1. Total number of stores increased 8.4% from 1933 to 1935.
2. Independently operated stores increased more than 9%; the number of chain stores decreased 8.2% and showed a 2.6% relative decrease in total sales volume, still accounting, however, for almost 23% of the total.

The report further states that there were in operation in 1935, 1,653,961 retail stores of all types, and in the period since 1929 an average count of almost 1,600,000; more than 110,000 or roughly 7% of these have a sales volume of \$50,000 or more annually, and do more than 53% of the total business in dollar volume. The greater part of architect-designed stores were probably in this latter classification. During the first 11 months of 1937, 11,064 store construction contracts were awarded in the 37 Eastern States. Assuming 1937 to have been a normal year, eight or ten years may then be taken as the life expectancy of the physical plant of the average store. This is a relatively high factor of obsolescence; perhaps no other building type is affected as quickly or as positively as the retail store in its competition for public attention. New enterprise constantly forces a more rapid utilization by all stores of improved techniques for attracting attention in the display and sale of merchandise.

Thus, lighting for display and advertising purposes offers new opportunities and demands new standards

in store design. In this connection, the increased use of glass is an important factor. Less reliance is being placed on the older and now almost archaic "hung-on" sign. New lighting equipment and methods offering increased opportunities for the use of color, more precise control of levels of illumination, new patterns and combinations are being perfected. By a more complete exploitation of these developments, merchandise can be brought more *forcefully* to the customer's attention and can be more conveniently inspected as well.

Surveys indicate that stores represent a likely field for air conditioning. It is reasonable to suppose that competition will hasten the adoption of year-round air conditioning by increasing numbers of retail stores. Certainly the designer should, wherever possible, make some provision for its future installation.

Store modernization usually requires greater ingenuity and more precise scheduling of construction activities than other types of building, because it is essential that there be the least possible interference with business operations. Sales areas must be kept open; customer comfort must not be sacrificed unduly; entrances must be kept free from scaffolding or other barriers. In smaller stores these conditions can be satisfied more readily than in larger ones where structural changes or additions make the work more complex and difficult. A current example of a major modernization has been included in this study to indicate the methods and results of a complete alteration of an existing structure and its integration with a large addition, without seriously hampering the normal selling of merchandise.

As in other building types studies, it is impossible to include all aspects of retail store design in the space available. Specialty stores have been presented here in detail because they represent a considerable portion of total work; they are fourth in volume as well as in numbers; further they represent a large and important section of most department stores.**

*Retail Distribution, Vol. 1, p. 1-01, June 1937. United States Department of Commerce.

**For further reference to the subject of retail stores, see *AR, Building Types*, 2/37, 7/35; see also *Retail Shops* by Bryan Westwood and Norman Westwood, Architectural Press, 1937.

RETAIL STORE CONSTRUCTION

Districts	11 Months, 1937		11 Months, 1936	
	Projects	Valuation	Projects	Valuation
New England	996	\$ 9,428,500	958	\$ 6,262,200
Metropolitan New York	1,279	19,659,100	1,260	16,124,100
Upstate New York	408	6,469,300	329	3,111,100
Middle Atlantic	1,211	13,537,600	1,488	10,414,000
Pittsburgh	1,667	19,939,500	1,517	12,412,300
Southeastern	1,150	12,327,300	1,113	9,821,500
Chicago	1,179	15,697,300	1,205	13,673,800
Central Northwest	371	3,559,300	358	2,287,100
Southern Michigan	595	8,282,100	622	5,162,500
St. Louis	584	5,600,200	607	3,881,400
Kansas City	713	4,306,500	629	3,226,700
New Orleans	261	1,897,200	223	1,660,500
Texas	650	5,671,900	570	3,812,300
Total for 37 Eastern States	11,064	\$126,375,800	10,879	\$91,849,500

Details for Specialty Shops

By EDWIN CORDES, Architect

Specialist in Store Planning. Design Consultant to Lerner Stores, Inc.

SPECIALTY shops, because of their rapid increase and their tendency toward obsolescence every eight or ten years, offer to the architect a consistency of demand sadly lacking in other types of buildings.

Included in the general classification of specialty shops are apparel, millinery and shoe shops forming the women's group, and the haberdashery, clothing, hat and shoe stores forming the men's group. Economically and numerically, the more important of these at present is the women's group—more especially, the shops which cater to the woman in industry and in business. The very fashionable and exclusive shops dealing in individually styled merchandise must of necessity have individually styled settings and the details and standards discussed here cannot be applied to this group.

In 1937, the Division of Women in Industry of the New York State Labor Department estimated the average minimum clothing budget of the working woman at \$196 annually. This tremendous volume, augmented as it is by the patronage of non-business women—housewives, school girls, etc.—to whom this type of store is just as appealing, constitutes a large percentage of the 12 billion dollars spent annually on women's wear, an industry which is rapidly assuming the proportions of one of the largest in the country.

Compactness is a great asset in this type of store. Its convenient layout permits the purchase of numerous articles—hosiery, underwear, dress, hat, suit or coat—in the limited period of one lunch hour. In this respect alone the specialty store has a tremendous advantage over the department store, where the purchase of these different items necessitates shopping over huge floor areas and numerous trips on crowded escalators and elevators.

The specialty business is a highly competitive one and sources of supply are open to all; the merchant must make his store outstanding in every respect to attract trade. The setting and general presentation of merchandise must be as smart and up-to-the-minute as the merchandise itself; the



An example of street level and second-floor show windows

value of modernization has proven itself time and again in increased business.

Show Windows

Since the show window is generally the specialty shop's only advertising medium, show windows should be large enough to accommodate as much merchandise as can be displayed to advantage; merchandise assortments of every line carried by the store are usually put on view in the windows.

Second-floor windows are generally considered useless for the display of merchandise; but they are sometimes used for color and decoration in place

of meaningless architectural ornament. Such windows are particularly dependent on adequate lighting of high intensity.

Whether finished decorative show window backs of wood, mirrors, etc. of more or less permanent nature are preferable to plain plaster or sheetrock for application of temporary displays is a controversial subject. The answer depends upon location, trade and the personal preferences of the owner. Reflectors in deep windows should be switched to permit lighting of the part farthest from street first, gradually working toward the front as natural light fades. The

show window in Figure 2, first floor, indicates such a wiring arrangement, the numerals indicating the independently controlled circuits. Outlets for night lights and for spotlights should be provided.

Interior Displays

Since the primary purpose of displays is to sell more merchandise, they should, wherever possible, be planned to accommodate an ensemble of merchandise rather than just a single article. The location of eye level displays usually solves itself. Corners, existing breaks in walls where the fixture line must necessarily break, and returns at stairways and elevators lend themselves readily to display purposes. While the selling value of displays above the eye level is open to question, as in the case of exterior second-floor windows, the introduction of properly illuminated recesses in areas above the wall cases lends interesting notes of color and decoration to the interior.

Sales Space and Merchandise Layout

Figures 1 and 2 show typical arrangements of women's apparel stores ranging from a small store,—a one-floor layout on a narrow lot—to a more pretentious one. Here, as far as possible, all merchandise is displayed for selection by the customer. The smaller, faster-selling articles are kept well up toward the front of the store where the customer must pass on the way to and from the dress and coat departments located either at the back of the store or on the upper floors.

Shoe Shop

The store illustrated in Figure 3 is typical of the so-called family shoe store in the medium-price range.

Today's standards in shoe store planning eliminate towering racks of stock boxes and rolling ladders. A small stockroom in the rear of the store with shelving to the ceiling provides required stock space. Hosiery is a very important and profitable sideline in all shoe stores and many carry in addition a limited line of handbags. Placing the entrance door off center permits the grouping of cases and displays for the accommodation of these accessories, with the wrapper's and cashier's desk in a minimum of floor and wall space.

Figure 3

Figure 1

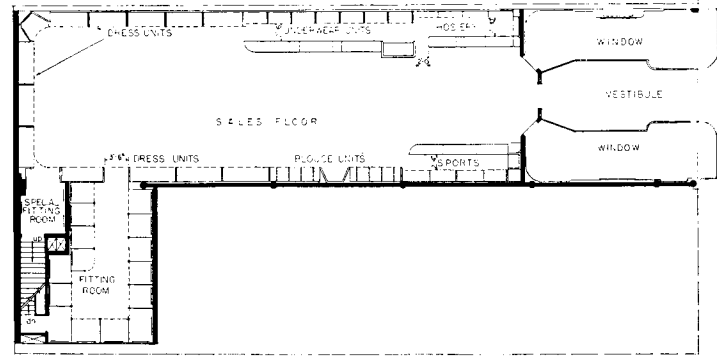
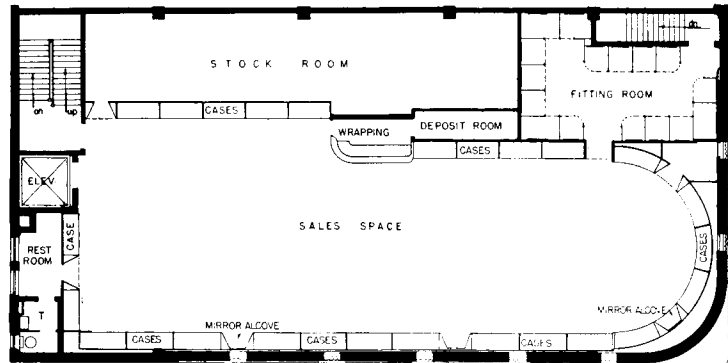
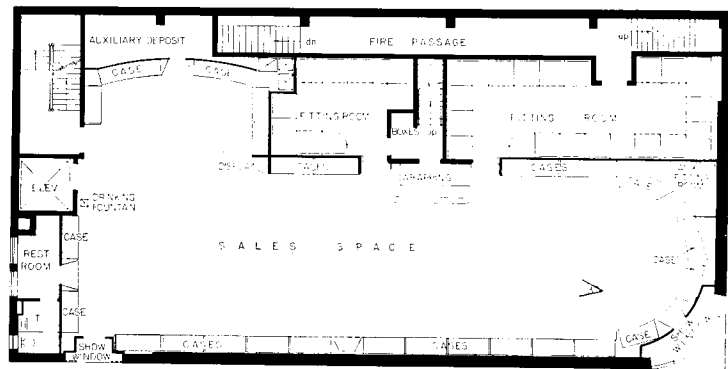


Figure 2

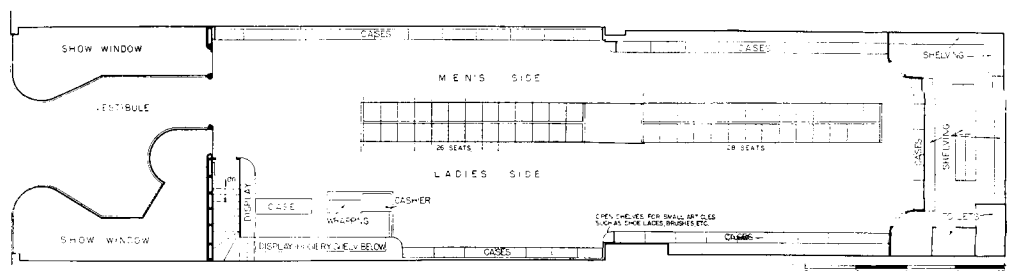
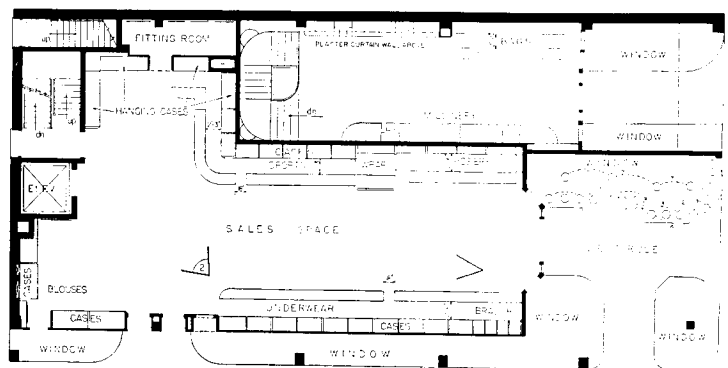


Third Floor

Second Floor



First Floor

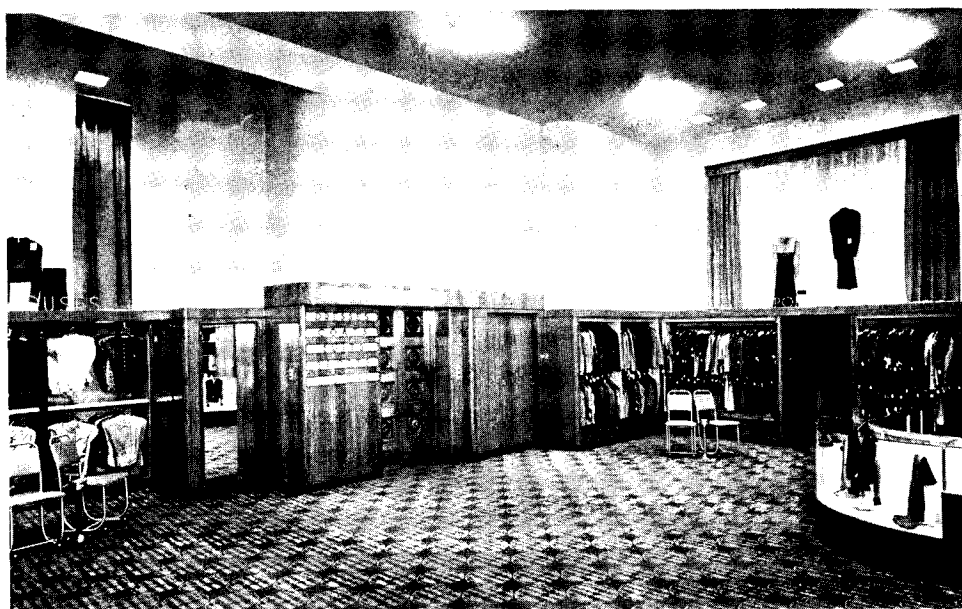


INTERIORS AND UNITS



VIEW 1 (First Floor)

Showing underwear and sport wear units



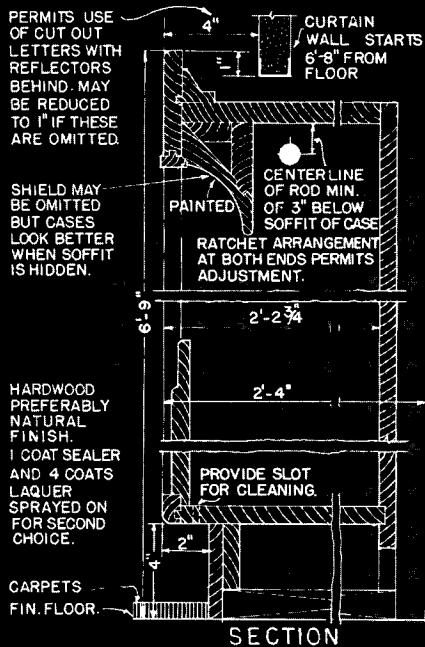
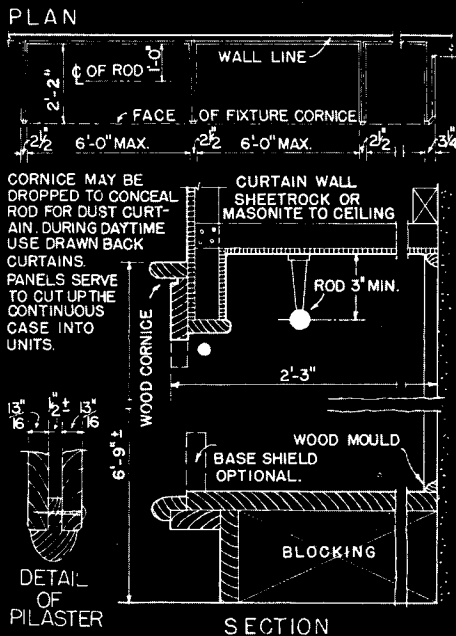
View 2 (First Floor)

Showing blouse units and hanging cases



VIEW 3 (Second Floor)

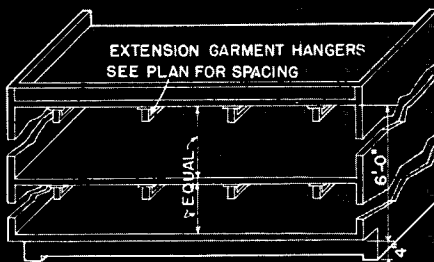
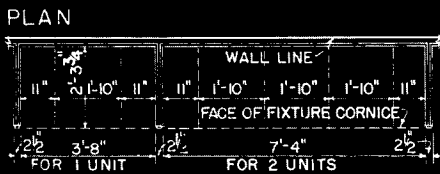
Showing hanging cases and wrapping unit



AN ECONOMICAL FORM OF HANGING CASE WHERE COSTS MUST BE HELD TO A MINIMUM. IN THIS DETAIL CASES ARE NOT BUILT AS UNITS IN THE SHOP BUT CAN BE ASSEMBLED ON THE JOB BY A CARPENTER USING THE EXISTING PLASTER WALL AS A BACKGROUND FOR THE CASE. THE ONLY FINISHED PIECES REQUIRED ARE THE CORNICE AND BASE MOULDINGS. MAY BE CONTINUOUS OR BROKEN WITH INTERMEDIATE DIVIDERS OF SINGLE THICKNESS OF PLYWOOD FACED WITH MOULDING.

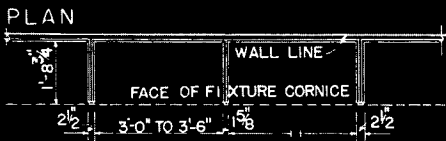
THIS IS THE MORE WIDELY USED TYPE OF HANGING CASE. THESE ARE BUILT UP IN THE SHOP IN UNITS AVERAGING 6' IN LENGTH. TONGUED PILASTERS FASTENED FROM THE SIDE HIDE THE JOINTS BETWEEN THE UNITS.

Hanging Case

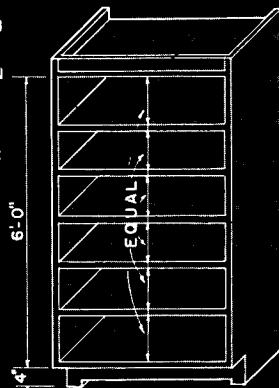


ISOMETRIC OF BLOUSE UNIT

Blouse Unit



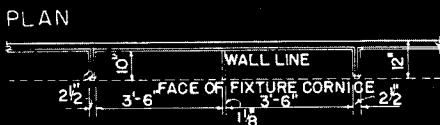
THESE UNITS ARE JOINED WITH A TONGUED PILASTER SIMILAR TO THAT SHOWN IN THE HANGING CASE AND THE FINISHED CORNICE APPLIED ACROSS THE TOP



ISOMETRIC OF SPORTS UNIT

Sports Wear Unit

IN SOME CASES THE TOP SHELF MAY BE OMITTED AND THE SPACE DEVOTED TO A DISPLAY WITH SLIDING PLATE GLASS DOORS.



THIS TYPE OF HOSIERY UNIT IS AN OPEN SHELF TYPE FOR SELLING FROM BOXES. THE OTHER TYPE IN WHICH THE STOCK IS KEPT IN GLASS FRONT DRAWERS HAS THE GREAT ADVANTAGE OF QUICKER SELLING FOR THE FOLLOWING REASONS.

HANDLING... BOXES MUST BE REMOVED FROM THE SHELF UNCOVERED LAID ON COUNTER, RECOVERED AND RETURNED TO PLACE. SELECTION FROM A DRAWER IS SIMPLE PULL AND PUSH.

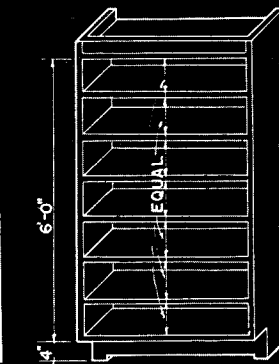
COLOR SELECTION... QUICKER WHEN TONE CAN BE SEEN THROUGH GLASS FRONT THAN BY LABELS.

STOCK NEATNESS... AUTOMATIC WITH DRAWERS, WHILE BOXES BECOME HOPELESSLY JUMBLED ESPECIALLY DURING A RUSH PERIOD.

THE DRAWERS WHICH COST FROM 5 TO 6 DOLLARS EACH RUN THE COST OF THIS UNIT SO HIGH THAT SOME MERCHANTS FEEL IT IS NOT JUSTIFIED BY THE INCREASED EFFICIENCY.

ISOMETRIC OF HOSIERY UNIT

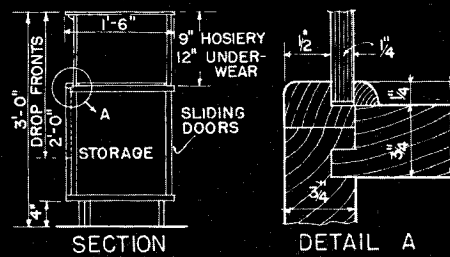
SCALES	
PLANS:	$\frac{3}{16} = 1'-0"$
ISOMETRICS:	$\frac{1}{4} = 1'-0"$
DETAILS:	$\frac{1}{2} = 1'-0"$



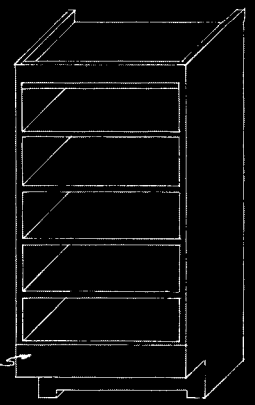
Hosiery Unit

FOR SPECIALTY SHOPS

Floor Cases



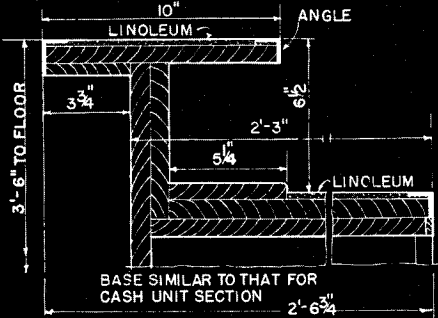
SMALL ITEMS, HOSIERY, UNDERWEAR & SPORTS ARE SOLD OVER FLOOR CASES USUALLY GLASS TOPPED & ILLUMINATED FOR DISPLAY WITH STORAGE SPACE BELOW.



ISOMETRIC

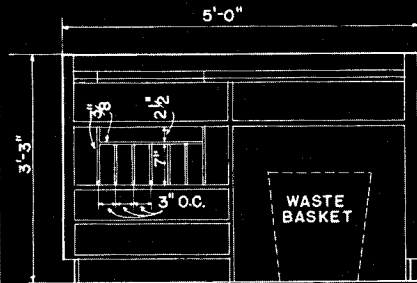
Underwear Unit

THE PERISHABLE QUALITY OF THIS MERCHANDISE MAKES PROTECTION IMPERATIVE. RECEDING GLASS DOORS IN WOOD OR DRAWN METAL FRAMES ARE THE MOST PRACTICAL.



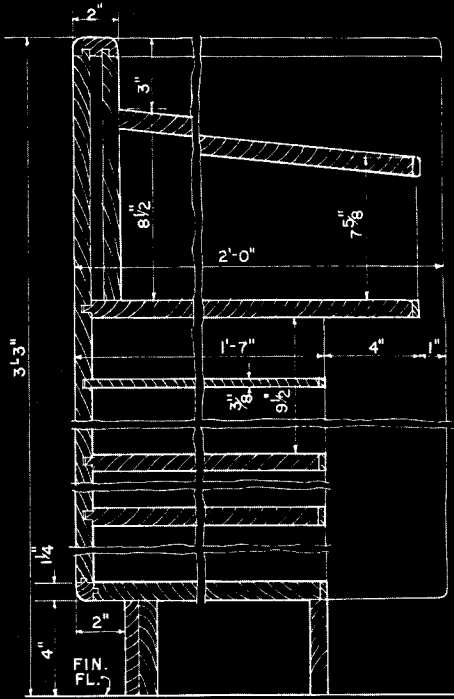
SECTION

FOR LARGE ARTICLES, COATS, DRESSES, ETC.



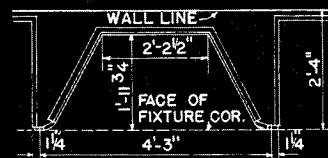
CASH WRAP UNIT

FOR SMALL ARTICLES USUALLY CENTERED IN THE HOSIERY & UNDERWEAR SECTIONS



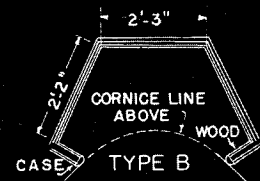
CASH UNIT SECTION

Wrapping and Cash Units



TYPE A

STANDARD TREATMENT FOR UNITS BETWEEN CASES ON LONG WALLS.



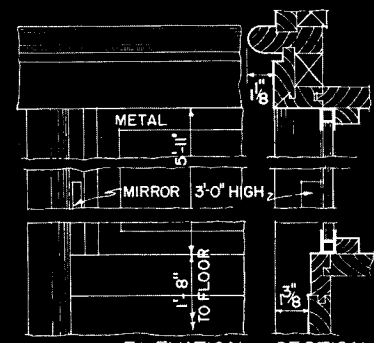
TYPE B

WHERE WALL SPACE IS AT A PREMIUM TRIPPLICATE MIRRORS CAN BE ARRANGED AROUND FREE STANDING COLUMNS IN GROUPS OF 2 OR 4.

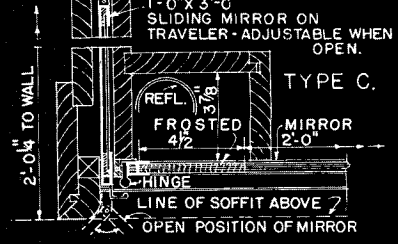
FOR USE IN OTHERWISE DEAD CORNERS.

TYPE C. A MORE UNUSUAL TREATMENT OF AN ILLUMINATED TRIPLE MIRROR. THE BACK MIRROR WHICH IS BROUGHT OUT ALMOST TO THE FACE OF THE CASES HAS ON EITHER SIDE A FROSTED PANEL BEHIND WHICH ARE SET LUMINE REFLECTORS. THE SIDE MIRRORS IN METAL FRAMES ARE MOUNTED ON TRAVELERS WHICH ALLOW THEM TO BE CONCEALED WHEN NOT IN USE. WHEN PULLED OUT FROM WALL THEY MAY BE ADJUSTED AT ANY ANGLE.

PLAN		MIRROR PLANS	
3/16	= 1'-0"	1/2	= 1'-0"
1/2	= 1'-0"	1/4	= 1'-0"



ELEVATION SECTION

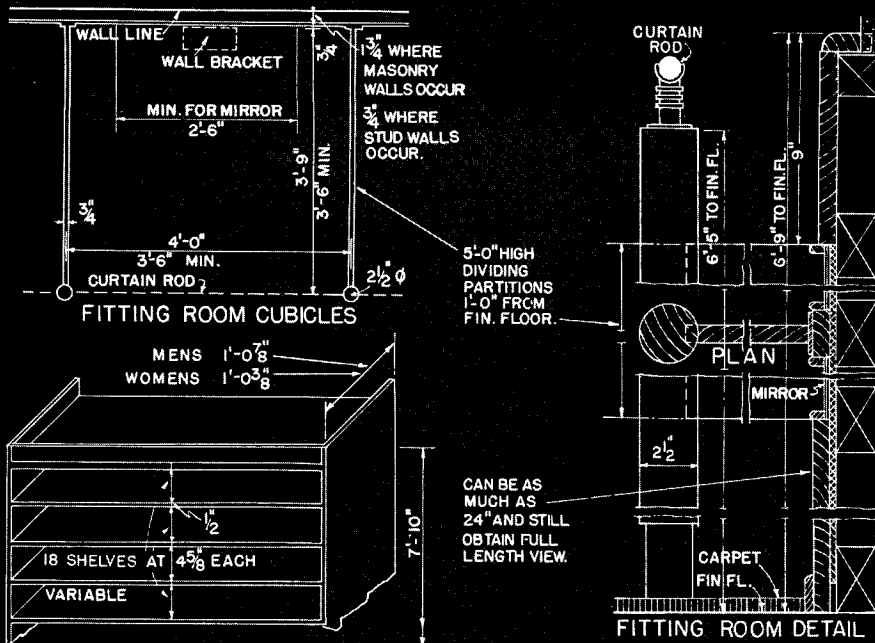


TYPE C.

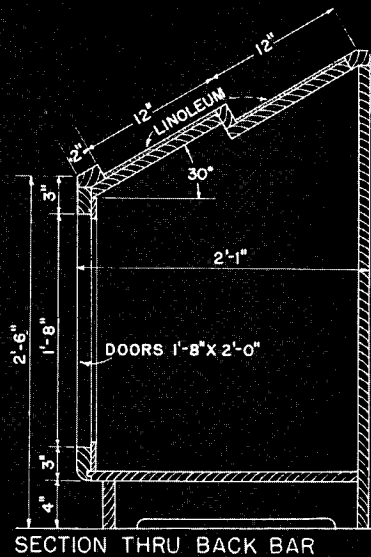
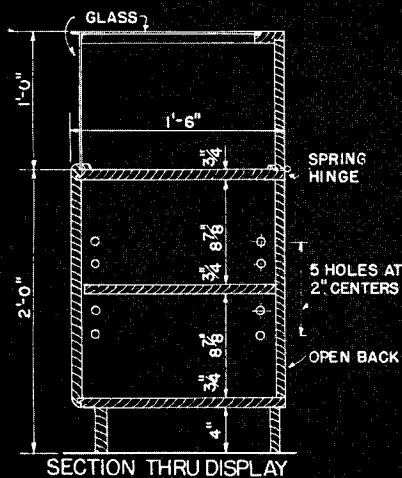
Mirrors

DETAILS OF UNITS FOR SPECIALTY SHOPS

Fitting Rooms



Shoe Cases



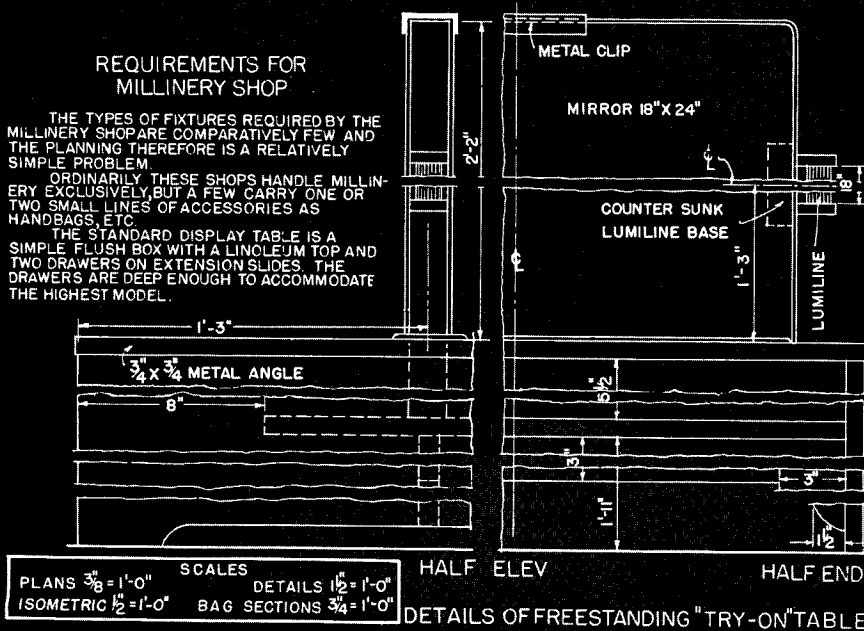
Bag Counter and Back Bar

REQUIREMENTS FOR MILLINERY SHOP

THE TYPES OF FIXTURES REQUIRED BY THE MILLINERY SHOP ARE COMPARATIVELY FEW AND THE PLANNING THEREFORE IS A RELATIVELY SIMPLE PROBLEM.

ORDINARILY THESE SHOPS HANDLE MILLINERY EXCLUSIVELY, BUT A FEW CARRY ONE OR TWO SMALL LINES OF ACCESSORIES AS HANDBAGS, ETC.

THE STANDARD DISPLAY TABLE IS A SIMPLE FLUSH BOX WITH A LINOLEUM TOP AND TWO DRAWERS ON EXTENSION SLIDES. THE DRAWERS ARE DEEP ENOUGH TO ACCOMMODATE THE HIGHEST MODEL.



Millinery "Try-on" Tables

Drugstore Planning

By R. A. FASH

Architect for the United Cigar Stores Co. and Whelan Drug Co.



CORNER locations are vastly preferable for drugstores. It is safe to say that there is a difference of at least one-third in the volume of business done in a corner as against an inside location. There is probably no other business in which corner-location is as important a factor.

Chain 5-and-10 cent stores or 25 cents-to-\$1 stores, chain lingerie stores, etc., thrive best in groups, because they establish centers which attract volume. This does not apply to drugstores where close proximity with competing stores would create damaging competition.

Traffic factors are:

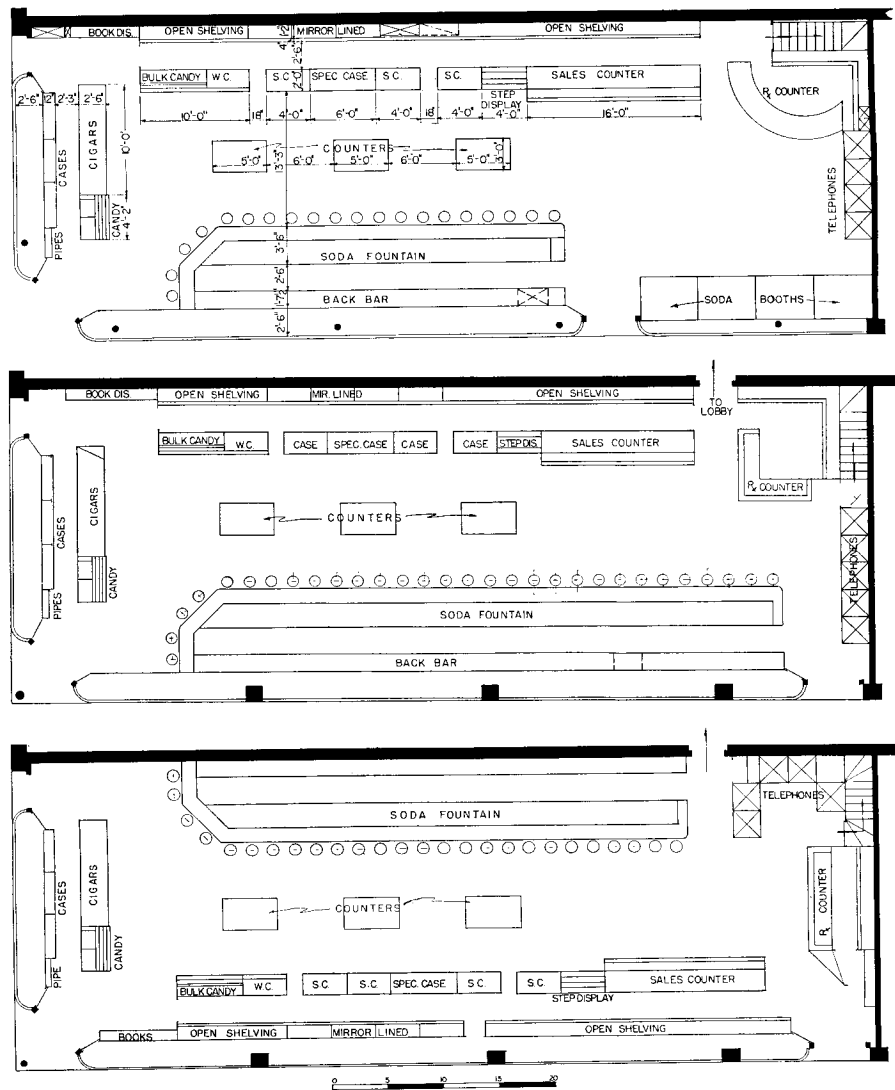
- (a) Volume.
- (b) Sex proportion: a cigar trade naturally depends on a majority of men in the traffic, a drug business on a fairly equal division.
- (c) Quality: upon quality of the traffic depends the per capita purchase; this is followed by the corollary, that the larger the per capita purchase, the smaller the handling cost.

Lines of business catering to men usually thrive best in office building areas. As a rule, stores at transportation stations are desirable. Location of the entrance in such instances must be considered; an inside store directly opposite the station entrance is frequently better than a corner store with a distance of a few yards intervening.

Space Allocations

The usual minimum size of a drugstore should be 20' x 80'; the usual maximum 35' x 100'. The usual minimum size of a cigar store should be 15' x 25'; the usual maximum 25' x 60'.

In the average drugstore, the cigars occupy a space 6' x 50'; cosmetics,



Typical Layouts for a Drugstore, 30' x 80'

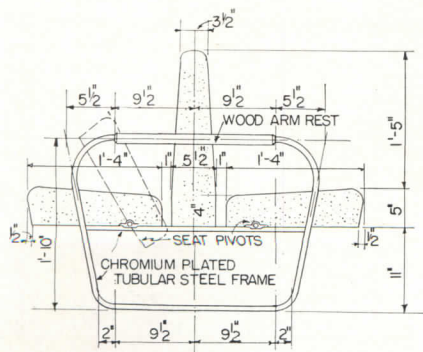


Worsinger

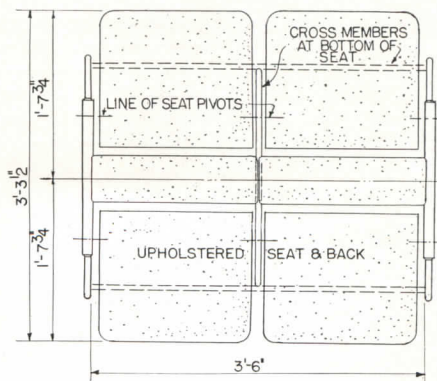
View of Front and Back Bars



Booth Arrangement at Left



Detail of Booth Seats, Side Elevation and Plan



drugs and sundries 7' x 80'; prescription department 8' x 12'; book section 7' x 20'; telephones 10' x 2'-6". Of course, the sizes given depend upon the size of the store, and the allocations of space to the various departments depend upon the amount of business estimated for a particular location. For instance, in some locations the cigar business may not be as good as in another. Perhaps the prescription department can be entirely eliminated in other sections.

Basement

- A basement is usually available for:
- Storage: separate areas for merchandise of each department, and for display materials.
 - Service pantry: food storage and preparation; cooking, to be connected to soda fountain by dumbwaiters and signal system; facilities for dishwashing; china, glass, silverware storage.
 - Toilets, provided with dressing rooms.
 - Lockers for employees.
 - Mechanical equipment, including refrigeration for soda fountain.
 - Slop sinks and storage of cleaning equipment.

Integration

The Cigar Department is usually best located across the front of the store; that is, close to the entrances. The buyer of cigars and tobacco is thus enabled to make purchases without inconvenience. The payment of soda checks can then be made at the cigar counter too.

The Soda Fountain is located close to the main entrance. The Cosmetic Department is generally placed opposite the soda fountain and at the front of the store. Next to it come the Drug, Sundry and Household Items Department. The Prescription Department is extended across the rear of the store taking in a space about ten feet in length. The Book Department is placed in the rear. Three or more telephone booths are allotted to a store.

Furniture and Equipment

A standard cigar case is eight or ten feet in length with a glass top and front, hermetically sealed and equipped with proper humidors. The cigar wall cases should be metal-lined and hermetically sealed. The cosmetic floor cases should have mirror backs, sliding doors, glass shelves on movable brackets and illuminated with case reflectors. The wall cosmetic cases should be mirror-

lined with movable glass shelves, sliding doors, and illuminated with case reflectors. The drug section should have drug sundry case. Top of case may be of linoleum, with section for wrapping at least 2'-6" long and at least two feet of space for a cash register, with proper storage under. The wall drug cases should be equipped with open shelving. The prescription department should be equipped with pill drawers, narcotic case and other equipment necessary to compound drugs, together with a sink with hot and cold running water.

The soda fountain front bar usually is for storage of ice cream and is equipped with a salad unit and sink section with proper drainboards. These, in most cases, are made of stainless steel. The counter usually is faced with tile, marble, metal or plastic materials, with metal strip or molding. The top of the counter may be linoleum with edging of metal or plastic material. A three-rung chromium-plated footrest is now commonly used in place of the linoleum-covered step. This is much cleaner and requires less attention. It is also more convenient for the customer.

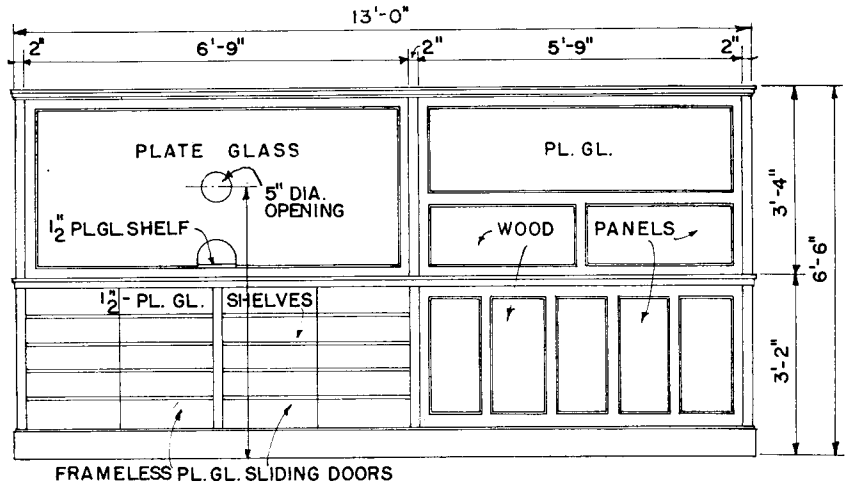
Stools are revolving, 12"-diameter seats, with or without a back rest, and are spaced 2' o.c. Required clearance from center of seat to edge of counter is 18".

The back bar accommodates a steam table, hot grill, drink mixers, fudge warmers, toasters (gas or electric), burners and warmers for coffee making and a cash register. The steam table is usually constructed of stainless metal. The back bar counter itself may be built of plastic material of a suitable color, as may the cupboards also.

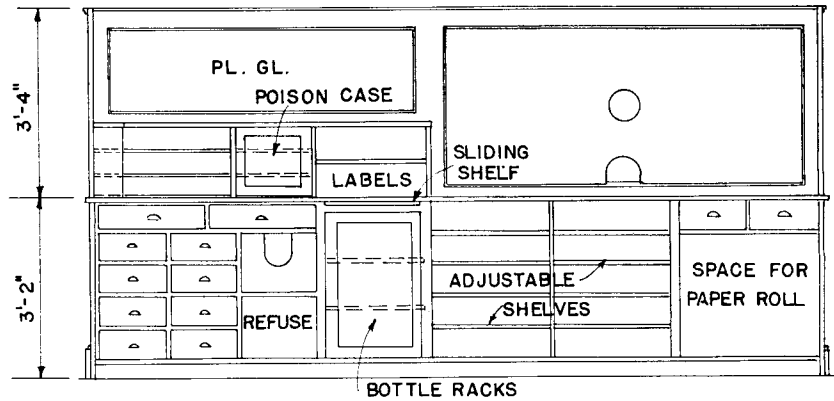
The usual fountain requires two 1/2-h.p. refrigerator compressors, one carbonator, one 5,500-watt electric outlet for toaster or a 3/4" gas outlet for a gas toaster, a 3/4" gas outlet for the grill, necessary plumbing to sinks, hot and cold water supply, drains for creamer units, salad unit, steam table and necessary chilled drinking water.

Mechanical Equipment

The mechanical equipment required is mostly in the soda fountain, which needs electrical refrigeration, electric carbonators, electric exhaust fan for service pantry and back bar; electric fans are necessary if the store is not air conditioned; gas water-heater, gas stove, electric outlets for cash registers and check throwing machines may also be needed.

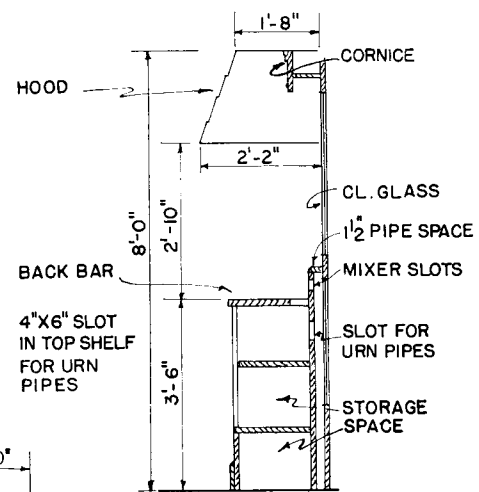
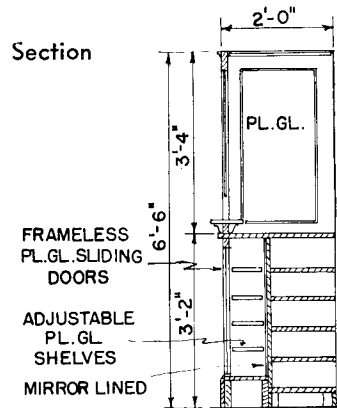


Front Elevation

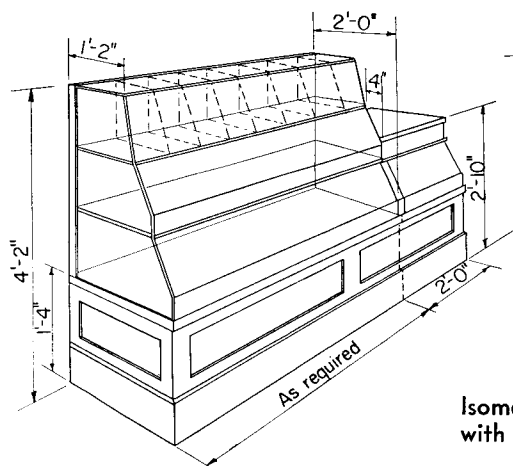


Rear Elevation

Detail of Prescription Counter



Section of Back Bar



Isometric of Typical Candy Case with Wrapping Counter at end

Display Lighting in Retail Stores

By O. P. CLEAVER, Westinghouse Electric & Manufacturing Co.

LIGHT can be made to perform three major functions in displays, whether they be inside or outside the store.

1. Light can make displays easily and quickly visible.
2. It can compel attention to a display.
3. It can make a display novel and exceptional.

Psychologists have found that approximately 87% of all impressions are visual; and obviously a display must be seen if it is to sell merchandise. Since a pedestrian takes less than seven seconds to pass the average show window the display must appeal strongly and quickly to his buying instincts.

Tests have revealed that well-lighted display windows have actually changed pedestrian traffic from one side of the street to the other; and likewise, interior displays which command attention through the use of higher levels of illumination have caused store traffic to increase in their vicinity, thus increasing sales.

Display lighting must be considered in its application to showcases, show windows, shelves and sales areas. The level of illumination and the use of color are all-important factors.

Required Level of Illumination

The level of illumination to be recommended depends upon the locality, the backgrounds and merchandise displayed, and the habits of the passersby. All of these factors have been given proper weight based on average conditions, and the levels of illumination given in Table I represent the best practice in cities of the sizes indicated. The recommendations, however, are for night illumination and for windows with relatively light backgrounds, and without color screens on the reflectors. If color screens are employed the wattage should be multiplied by four for blue screens, doubled for red, and at least 50% added for green. No increase is necessary for amber or yellow-colored screens.

The levels of illumination recom-

Table I—Recommended Standards of Illumination for Display Windows and Display Cases*

	Show Window Ft.-e	To Reduce Daylight Window Re- flections Ft.-e	Show Cases Ft.-e	Special Light Colored	Displays Medium Colored	Inside	Store Dark Colored
LARGE CITIES							
Brightly Lighted Districts.....	200	200-1000	50-100	30-50	50-100	100 or more	
Secondary Business Locations...	100	200-1000	50-100	30-50	50-100	100 or more	
Neighborhood Stores	50	200-1000	50-100	30-50	50-100	100 or more	
MEDIUM CITIES							
Brightly Lighted Districts.....	100	200-1000	50-100	30-50	50-100	100 or more	
Neighborhood Stores	50	200-1000	50-100	30-50	50-100	100 or more	
SMALL CITIES AND TOWNS							
	50	200-1000	50-100	30-50	50-100	100 or more	

*These values represent order of magnitude rather than exact levels.

Table II—Spacing of Reflectors and Sizes of Lamps for Display Windows and Display Case Illumination

	Show Windows		Display Cases				Display Shelves	
	Reflector Spacing	Mazda Lamp Watts	Mazda Lamps Spacing	Watts	Lumiline Spacing	Lamps Watts	Mazda Lamps Spacing	Watts
LARGE CITIES								
Brightly Lighted Districts.....	15"	500*	12-18"	40-60	18"	60**	12"	100
Secondary Business Locations..	12"	200*	12-18"	40-60	18"	60	12"	60
Neighborhood Stores	15"	150*	12-18"	25-40	18"	30	12"	40**
MEDIUM CITIES								
Brightly Lighted Districts.....	12"	200*	12-18"	40-60	18"	60	12"	60
Neighborhood Stores	15"	150*	12-18"	25-40	18"	30	12"	40***
SMALL CITIES AND TOWNS								
	15"	150*	12-18"	25-40	18"	30	12"	40***

*This is the spacing and wattage recommended for night-time illumination. To reduce daylight reflections 500-watt lamps spaced 15" apart should be used.

**12"-40-watt Lumiline Lamps mounted end to end will produce the same level of illumination as 18"-60-watt lamps, and may be substituted in the above tables.

***18"-60-watt or 12"-40-watt Lumiline Lamps may be substituted for 40-watt Type A Mazda lamps.

mended in the table for show windows apply only to the general illumination from standard window lighting equipment spaced as indicated in Table II. Where special spot-lighting of merchandise is used, these values for the general illumination on backgrounds, etc. may be less, while the level on the merchandise is maintained as recommended or increased, thereby improving the attention-getting value of the window. Where colored lighting is used for general illumination in conjunction with the floodlighting of the articles displayed, the foot-candles of general illumination may be less than recommended in the table, since the greater attraction value of the colored light will

make up for the loss of effectiveness caused by lower brightness.

Show Window Lighting Equipment

A number of methods of installing reflectors with accessories such as opal or prismatic glass cover plates and several types of louvers to aid in glare elimination are shown in Figure 1. The reflecting surfaces of these are usually either polished metal, mirrored or prismatic glass, each designed to distribute the light properly in the usual types of show windows.

In addition to individual reflectors, continuous troughs extending the length of the window, with reflecting surfaces similar to those described are also available for use where little

space for concealment is possible, where the viewing angles are such that glare may easily result. These troughs may have opal or prismatic glass cover plates to direct the light and to aid in the elimination of glare.

Narrow troughs in portable form are convenient for lighting in small display cases. These cases segregate the small articles and make possible the use of very high levels of illumination in an economical manner (Figure 2).

Since the show window is a veritable stage, footlights and narrow strips of so-called border lights may be installed to destroy objectionable shadows cast by overhead units; and to build up the general illumination level on the display or background. Border lights should always be so placed in the windows that the bare lamps are never in direct view of the observer. Frequently this is difficult in island and corner windows, but the difficulty is often solved by using these borders as part of the background, illuminating it as well as the display.

Showcase and Wall Case Lighting Equipment

The usual small wall and showcase lighting equipment consists of either mirrored glass reflectors using standard Mazda lamps, properly spaced, or continuous troughs designed for either tubular or lumiline Mazda lamps. These troughs are inconspicuous and may be placed to the front and at the top of the case.

Individual reflectors are usually installed on 12 to 24-in. centers and equipped with 25-watt tubular lamps. Where a relatively higher order of illumination is provided in the store itself, or where dark goods are displayed, 40 to 50-watt tubular lamps should be used. Trough-type reflectors are usually installed with 25-watt lamps on 12, 18 or 24-in. centers. Where a higher order of illumination is desired, the 12" 40-watt and 18" 30 and 60-watt lumiline lamps have made possible continuous lines of light. Their diameter of only 1" and the variety of colors in which they are obtainable make unusual and attractive effects possible within an extremely small space. Standard reflectors are also available for these lamps.

For larger display cases, principally wall cases, regular show window reflectors may be used; or they may have lamps in continuous troughs in the ceiling of the case; such troughs may be covered either with opal glass

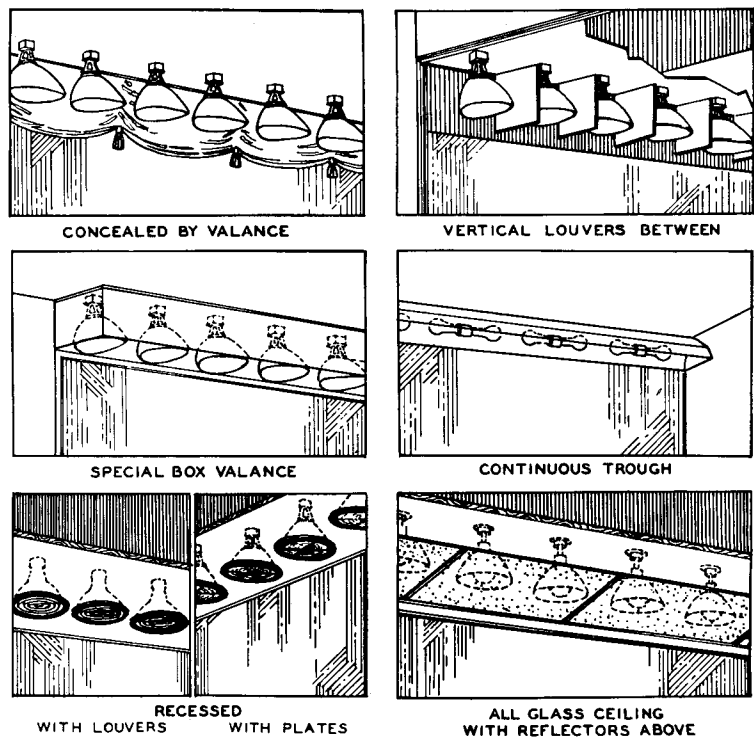


Figure 1

Show Window Lighting



Figure 2

Example of Segregated Window Display

or prismatic plates for directing the light asymmetrically. Then, too, a special louver can be used to conceal the lamps from view in such a trough, or louvers can be used on the usual type of window reflector recessed in the ceiling at proper intervals.

Luminous backgrounds of opal glass may be employed for illuminating displays, especially of transparent glassware such as bottles containing liquids, or for silhouetting merchandise to produce unusual effects.

Show Window Lighting Design

In the design of show window

lighting, every effort should be made to conceal bright-surfaced light sources from direct view, and sufficient light must be available for the seeing task involved. With the use of dark backgrounds, the next larger size of lamp specified in Table I should be installed to compensate for the greater absorption of light by the dark colors. To select the proper type of reflector to produce the level of illumination found necessary, the mounting height above the floor, the depth of the window from front to back, and the height of the background display must be known. With

this information, Table III can be used to find the correct type and selection can be made from any manufacturer's catalog.

Lighting equipment for special effects should be adaptable and, whenever possible, portable. Therefore, duplex convenience outlets should be located at the front of the window at each side, top and bottom, over the window opening, and at the rear on each side of the permanent background. Further flexibility is obtained if these outlets are not all on the same circuit, and not on the circuit with the window reflectors.

Wall Case Lighting Design

The illumination in the wall case should also be approximately four times the value of the general store illumination. These cases may be illuminated with small individual reflectors similar to the type used in show windows, employing 60-watt lamps on 24-in. centers for the usual installation; tubular or lumiline lamps will also be found satisfactory. The use of diffusing glass panels in the tops of the cases is also suitable. These should be 12" deep running the entire lengths of the cases, and having 60-watt A-21 bulb lamps located on 18 to 24-in. centers placed horizontally about 5" above the glass. For maximum utilization of light, the lamps should be covered by a metal housing either polished or finished in white on the inside.

Display Shelves

The level of illumination on the vertical should not vary more than five to one from the topmost shelf to the one at the floor if the illumination is to be effective. Usually these requirements are met by: (1) A continuous trough of lamps along the top and extending out from the edge of the shelf; (2) Small individual reflectors on short arms spaced properly at the top; (2) Prismatic lighting fixtures suspended from or fastened to the ceiling, directing the light on the shelves at an angle.

If a continuous trough is used, lamps of 40 to 100 watts should be installed per running foot, depending upon the height of the shelving and the nature of the display. (See Table II.) The reflecting surface and location of the troughs away from the edge of the top shelf should be such that the rays will be directed to the bottom shelf without too great a reduction in foot-candles as compared to the illumination level at the top.

TABLE III—Design Data for Show Window Reflectors

Mounting Height or Height from Floor to Ceiling in Feet	Distance from Front to Back of Window in Feet	Height of Background or Display							
		1 to 2 Feet	2 to 4 Feet	4 to 6 Feet	6 to 8 Feet	8 to 10 Feet	10 to 12 Feet	12 to 14 Feet	14 to 16 Feet
4 to 6	1 to 3	F	A	B					
	3	A	A	B					
	4	A	B	B					
	5	A	B	B					
6 to 8	2	F	C	C	B	B			
	3 to 5	C	C	B	B				
	5 to 7	C	C	B	B				
8 to 10	7 to 9	C	B	B	B				
	2 to 4	G	E	E	E	D			
	4 to 6	E	E	E	D	D			
10 to 12	6 to 8	E	E	D	D	D			
	8 to 10	E	D	D	D	D			
	10 to 12	E	D	D	D	D			
	3 to 5	G	E	E	E	D	D		
12 to 14	5 to 6	E	E	E	D	D	D		
	6 to 8	E	E	E	D	D	D		
	8 to 10	E	E	E	D	D	D		
	10 to 12	E	E	E	D	D	D		
	12 to 14	E	E	D	D	D	D		
14 to 16	14 to 16	E	D	D	D	D	D		
	4 to 6	H	H	J	J	J	J	I	
	6 to 8	J	J	J	J	J	I	I	I
	8 to 10	J	J	J	J	I	I	I	I
	10 to 12	J	J	J	J	I	I	I	I

INDEX TO LAMP SIZE AND GENERAL CLASSIFICATION OF REFLECTORS

- A—Reflector for 100-watt A-23 lamp in average small store show windows.
- B—Reflector for 150-watt A-25 lamp in average size deep show windows.
- C—Reflector for 150-watt A-25 lamp in average size shallow show windows.
- D—Reflector for 200-watt PS-30 lamp in average size deep show windows.
- E—Reflector for 200-watt PS-30 lamp in average size narrow show windows.
- F—Concentrating type Reflector for 100-watt A-23 or 150-watt A-25 lamp in very shallow average show windows.
- G—Concentrating type Reflector for 200-watt PS-30 lamp in very shallow large show windows.
- H—Concentrating type Reflector for 300-watt PS-35 or 500-watt PS-40 lamp in very large shallow show windows.
- I—Reflector for 300-watt PS-35 or 500-watt PS-40 lamp in large deep show windows for High Intensity "Super-Lighting."
- J—Reflector for 300-watt PS-35 or 500-watt PS-40 lamp for large size narrow show windows for High Intensity "Super-Lighting."



Example of Trough Lighting of Silhouette Signs. Hecht Co., Baltimore, Md. Alfons Bach, Designer

Novel changeable-letter luminous signs and silhouette signs can be combined with these troughs. Spill light from the reflecting equipment is used to illuminate the sign.

Individual reflectors should be of the concentrating type and so spaced that 40 to 100 watts per running foot are obtained. Each reflector should be mounted about one foot from the vertical surface of the shelf to insure proper distribution of light from top to bottom.

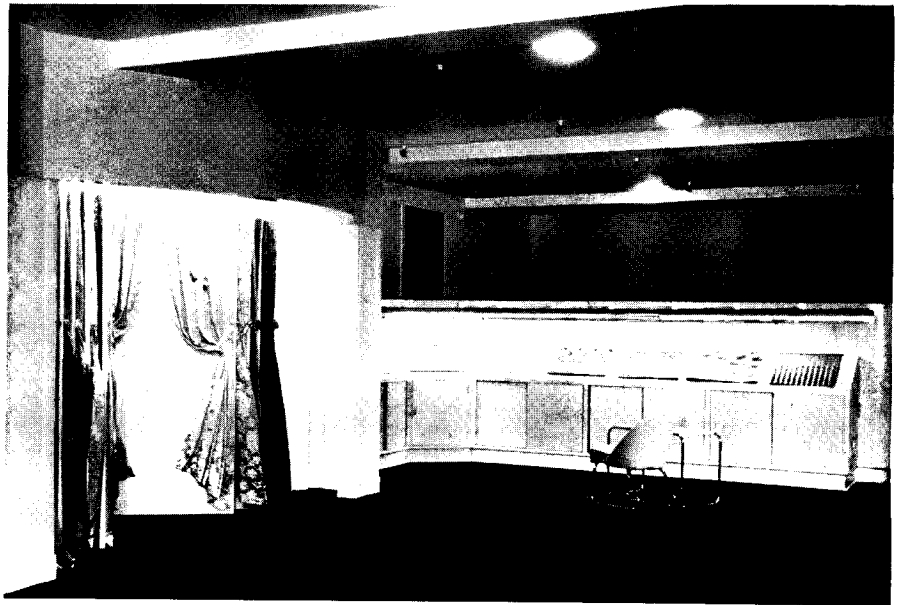
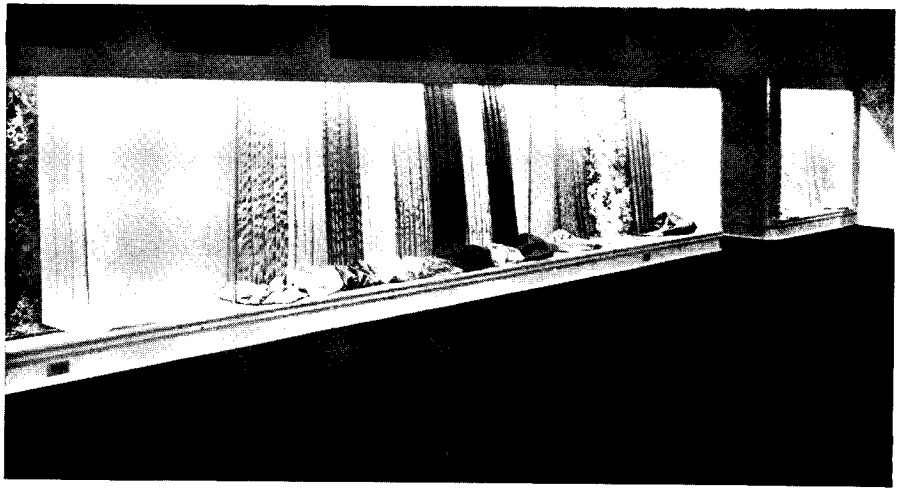
Where displays consist of only two or three shelves, a continuous trough, concealing lumiline lamps and mounted in the outer top edge of the shelving, may be used. In such cases the width of the shelving increases downward, the top shelf being narrowest and the bottom widest; thus, a uniform flood of light is directed over the shelves from a single light source.

Color Lighting

The color of any object depends upon the color of the light which it reflects. The apparent color is, therefore, dependent upon both the reflecting character of the surface and the color of the light by which it is illuminated. The following color lighting outline furnishes a guide in the selection of colors for walls, floors, ceilings and fixtures and for color lighting of any display.

EFFECT OF COLORED LIGHT ON COLORED OBJECTS

Color of Light	Actual Color of Objects	Apparent Color of Objects
Red	Black	Purple-Black
Red	White	Red
Red	Red	Redder
Red	Orange	Redder Orange
Red	Yellow	Orange
Red	Dark Green	Red-Black
Red	Light Green	Reddish-Gray
Red	Light Blue	Violet
Red	Violet	Purple
Amber	Black	Brown-Black
Amber	White	Amber
Amber	Orange	Yellow-Orange
Amber	Red	Dark Orange
Amber	Yellow	Light Amber
Amber	Green	Brown-Green
Amber	Dark Blue	Gray
Amber	Light Blue	Light Gray
Amber	Violet	Maroon
Green	Black	Greenish-Brown
Green	White	Green
Green	Green	More Brilliant
Green	Red	Brown
Green	Orange	Yellow
Green	Indigo	Dull Green
Green	Violet	Bluish Green-Brown
Blue	Black	Blue-Black
Blue	White	Blue
Blue	Blue	More Vivid
Blue	Red	Violet
Blue	Orange	Brown
Blue	Yellow	Green
Blue	Green	Bluish Green
Blue	Indigo	Dark Blue Indigo
Blue	Violet	Dark Blue Violet



Examples of Merchandise Display Lighting. Cohn-Hall-Marx Co., New York. Alfons Bach, Designer

Photos by F. M. Demarest

Air Conditioning the Retail Store

By HAROLD L. ALT, Engineer

Air-Conditioning Consultant; Member of American Society of Heating and Ventilating Engineers; author of numerous books on air conditioning.

AS IN OTHER building types the air-conditioning plant of the retail store presents in every specific instance an individual problem. Whether it is desired simply to have summer cooling, winter humidifying or year-round conditioning is a matter for the individual proprietor or owner to decide. It may be well to start by determining what the term "retail store" includes, so far as this discussion is concerned: for our purposes it will be considered here as any store in which goods are sold at retail over the counter and where no unusual production of heat or moisture occurs in the normal course of such sale. Thus, it would include all shops handling dry goods, wet goods in bottled form, clothing, millinery, food products and the like, but would exclude all restaurants, cafes, drug-stores doing a hot-lunch counter business, beauty parlors, tailor shops and other businesses where heat and moisture are developed in the store. So far as air conditioning is concerned, a small department store will rank with a large retail store.

Trends

In general, it may be said that retail stores—especially those of smaller size—have not adopted air conditioning in any form as fast as department stores and restaurants; this has been due to a number of reasons, among which is the fact that the retail store is most frequently a rented property, in which the lease may be for a short period, resulting in the owner having no desire to install a system suited for one particular type of business when the next tenant may want an entirely different arrangement or—possibly—no conditioning at all. On the other hand, the tenant may not have the necessary capital, or—if he does have it—may hesitate to make the investment when he has no assurance of being in possession of the premises long enough to benefit sufficiently from the installation. Besides, the tenant of the small store frequently does not have the foresight, vision or

initiative of the manager of the larger store. Nevertheless, considerable air conditioning has been done in retail stores of the chain store variety, possibly because of better financial backing and a broader viewpoint; every air-conditioning job installed is likely to produce others among the competitors of the store which has braved the cost and put in this type of system. So it is probable that retail stores will install air conditioning more and more as they are forced into it by competition.

Advantages

Winter conditioning consists of supplying heated air with a proper moisture content so that a relative humidity of 40 to 50% is maintained in the enclosure conditioned: there is a reduction in the dust in the store, less drying out of the materials handled and more healthful conditions for customers and employees. Summer air conditioning consists of supplying the store with cooled and dehumidified air so that reasonably comfortable conditions are maintained: customers are easier to please, some coming in simply to get out of the heat. It eliminates oppressiveness by keeping relative humidity down to 40 to 50%. The temperature in the shop should be kept about 15° F. below the outside temperature on the hottest days, tapering off as the outside temperature approaches 70° F., until at that point the shop and the outside are practically at the same temperature. This will prevent the damage and spoilage to stock which may be caused by unusually high relative humidities or damp air. But the big thing is *customer comfort* from which the employees incidentally also benefit. Year-round air conditioning has, throughout the year, the advantages enumerated in the foregoing.

So far retail store owners and managers have shown considerable interest in summer cooling, but very little in winter humidifying. This, undoubtedly, is because most retail

shops are already provided with some form of heating; and the matter of humidification is one that the average customer does not notice. With cooling the reaction is much more pronounced; everyone is aware of the irritability produced by excessive temperature and the much more uncomfortable feeling produced by high humidities.

Disadvantages

It is often the practice of air-conditioning enthusiasts to present the advantages of air conditioning and to omit mentioning some of its disadvantages. The chief disadvantages in any air-conditioning installation consist of the following:

1. Initial cost of the work.
2. Operating expense.
3. Humidifying in winter must be reduced as the temperature drops.
4. Cooling in the summer cannot be lower than 15° F. under the outside temperature.
5. Space occupied by the equipment.
6. Equipment is not easily moved to other locations and probably is not suited to such locations if it is moved.
7. A certain amount of servicing and operating attention is required.

Balancing these factors, air conditioning is becoming less a luxury and more a necessity each year.

Size of System Required

In describing what a summer cooling system might mean in a retail store, stores of varying widths and depths have been calculated and the results tabulated on a comparative basis. The examples used are listed in Table I; it will be noted that they include small and large stores as well as stores of shallow and full depth. The amount of air to be circulated in an air-conditioning system is a function of the *sensible heat* to be removed from the room: from this it follows that heat entering the room

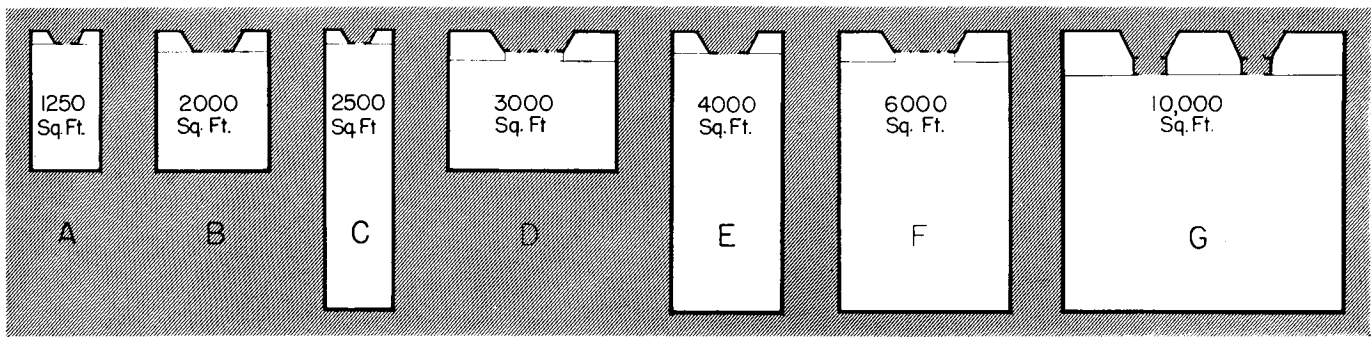


Figure 1

TABLE I—Types of Retail Stores Considered in This Discussion

Type Designation	Front Width Ft.	Depth Ft.	No. of Occupants Assumed
A	25	50	10
B	40	50	20
C	25	100	20
D	60	50	30
E	40	100	30
F	60	100	40
G	100	100	50

TABLE II—Air and Refrigeration Requirements

	Type of Retail Store						
	A	B	C	D	E	F	G
Air Required:							
No Sun							
Size in Feet	25 x 50	40 x 50	25 x 100	60 x 50	40 x 100	60 x 100	100 x 100
Area in Sq. Ft.	1,250	2,000	2,500	3,000	4,000	6,000	10,000
Btu. (Sensible)	50,500	78,700	95,500	116,300	145,350	213,000	345,000
Total Cfm.	3,350	5,250	6,400	7,800	9,550	14,200	23,000
Cfm. per Sq. Ft.	2.7	2.6	2.5	2.6	2.4	2.4	2.3
Cfm. per Cu. Ft.	0.27	0.26	0.25	0.26	0.24	0.24	0.23
With Sun Effect on Front and Roof							
Btu. (Sensible)	50,500	78,700	95,500	116,300	145,350	213,000	345,000
Sun Btu.	22,500	36,000	35,000	54,000	56,000	84,000	140,000
Total Sens. Btu.	73,000	114,700	130,500	170,300	201,350	297,000	485,000
Total Cfm.	4,900	7,650	8,700	11,355	13,400	19,800	32,500
Cfm. per Sq. Ft.	3.9	3.8	3.48	3.8	3.4	3.2	3.2
Cfm. per Cu. Ft.	0.39	0.38	0.35	0.38	0.34	0.32	0.32
Refrigeration Required:							
No Sun							
Total Tons	8.75	13.98	16.90	20.87	25.25	35.38	60.25
Tons per Sq. Ft.	0.0070	0.0069	0.0067	0.0069	0.0063	0.0059	0.0060
Tons per Cu. Ft.	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006	0.0006
With Sun Effect on Front and Roof							
Total Tons	12.84	20.14	23.46	30.17	35.10	47.15	84.55
Tons per Sq. Ft.	0.0103	0.0100	0.0093	0.0100	0.0088	0.0078	0.0085
Tons per Cu. Ft.	0.0010	0.0010	0.0009	0.0010	0.0009	0.0008	0.0009

or store from the outside is dependent on the areas included within six sides (four walls, floor and ceiling), the construction used for these areas and the coefficient of heat transmission for the construction, if all other things remain equal. The quantity of air circulated also must absorb all other

sensible heat production in the room, such as electric lighting and body heat from the occupants. Figure 1 gives the floor plans of the various types of shop arrangement considered; an average ceiling height of 10 ft. was assumed in all cases. The electric lighting was taken to be about 3 watts per

sq. ft. and the number of occupants—employees and customers—was assumed as shown in Table I.

The walls were considered as 12-in. brick, which has about the same coefficient of heat transmission as frame wall construction; store fronts were assumed to be entirely of glass; floors were considered as 3-in. concrete with single or double wood floor, and the ceiling was taken as lath and plaster with an air space between the ceiling and the construction, above which might be a roof or a floor. It is found that the changes in building construction are not likely to make any great difference in the amount of air required except in extreme instances; but the amount of sun effect, particularly on the roof of a one-story shop, exerts a considerable added heat load with a corresponding increase in the amount of air and size of system required. The results of such air-conditioning calculations are shown in the first portion of Table II; it will be seen that there is really a very small variation in the quantity of air required either on a square foot basis or a cubic foot basis, running from 2.7 cfm. per sq. ft. in the small shops down to 2.3 cfm. per sq. ft. in the larger shops.

Sun Effect on Front and Roof

If the shop is situated so that sun effect will be experienced on the front and roof—which means a one-story shop facing east, south or west, and not shaded by adjacent buildings—the increase in the amount of air will be found in the second portion of Table II to be raised to 3.9 cfm. per sq. ft. of floor area in the small shops and to 3.2 cfm. per sq. ft. in the larger shops. The latter portion of Table II carries the results of the refrigeration calculation, of which more will be said later. It will be noted from the figures that sun effect on the roof and front of a retail store will raise the size of the system almost 50%. This only emphasizes the desirability

of ceiling insulation when such conditions occur.

It now is possible to plot the total cubic footage of air required per minute in thousands of cubic feet against the floor area of the shop in thousands of square feet, for shops with and without sun effect, which has been done in Figure 3; this permits the reading of the amount of air required for cooling shops up to 10,000 sq. ft. in area. Department stores of still larger areas should not vary much from these figures, since the greater amount of counter and display case lighting, combined with a larger number of persons in the store, would, to a considerable extent, offset the slight reduction in the ratio of outside wall to the floor area enclosed.

Types of Air-Conditioning Systems

There are two general types of air-conditioning systems in use: the older one—the central plant duct system—in which the conditioned air is carried in ducts from the central conditioning plant to the various points where it enters the room through grilles; and the later development of unit air conditioners through which the air is circulated. There are advantages and disadvantages for each type of system: the elimination of duct work and the space required, when units are used; and the elimination of several pieces of mechanism, with the substitution of one central unit, when the duct system is used. The floor space occupied by the units frequently proves a serious difficulty, although units may be placed in the cellar and short ducts carried up through the floor if desired.

In the duct system and with a shallow shop the scheme shown in Figure 4 may be used with economy, since it involves the minimum amount of duct work. But it is not suited for shops in which the distance from the supply grille to the front door is not more than 30 to 40 feet; beyond this, excessive velocities are likely to be required at the supply grille to throw the air to the front of the shop. In Figure 2 is shown a method in which a duct is carried along the ceiling, either in the form of a false beam or as a continuation of the cabinet or shelving work; there is a continuous slot or line of perforations throughout its length for the admission of air along the entire side of the shop. In a wider shop, it might be necessary to have such a duct on each side, as shown in Figure 5, in order to keep down the size of duct and to secure good distribution. In a very wide

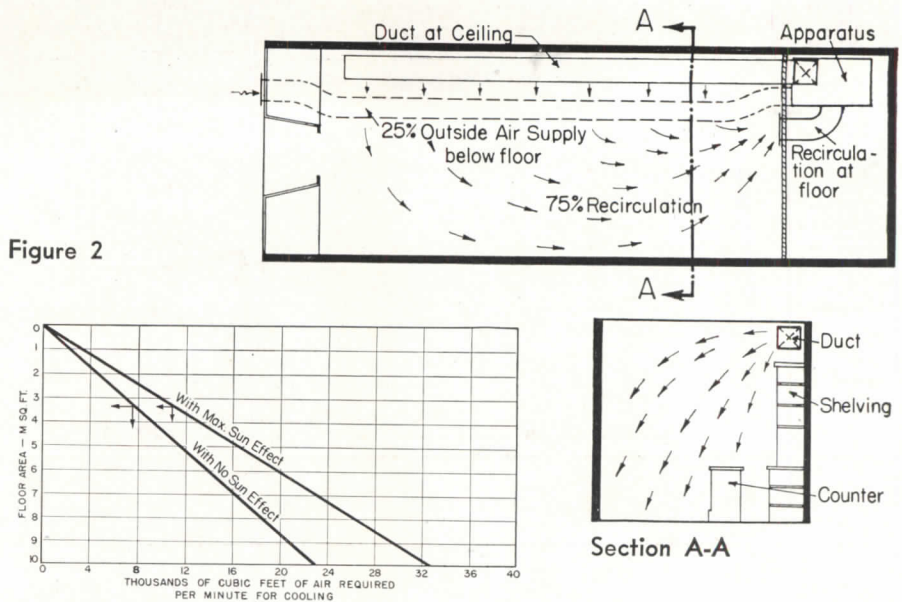


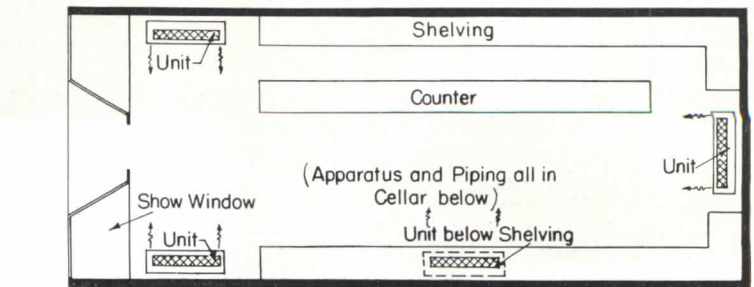
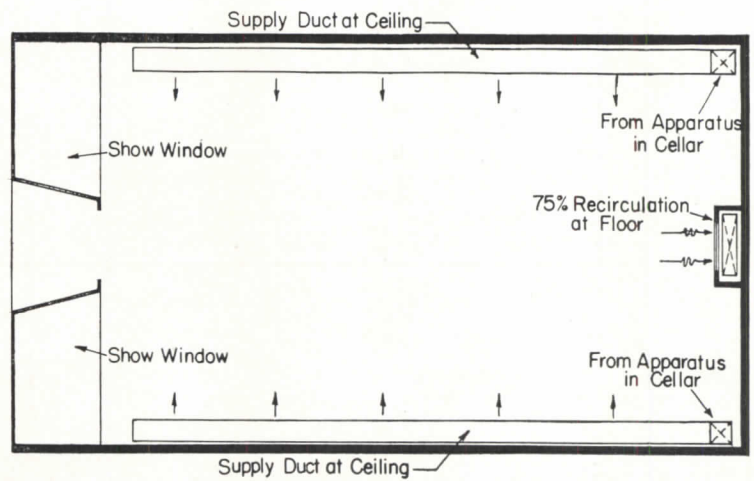
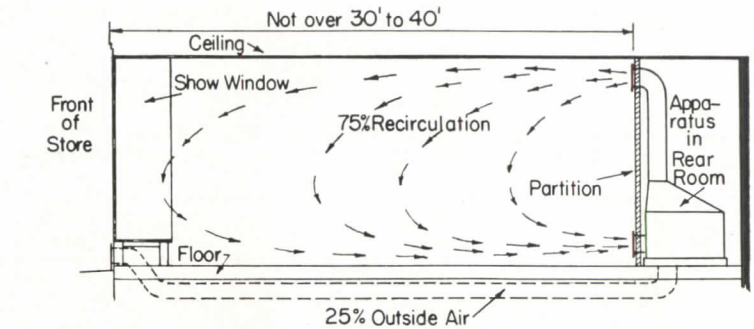
Figure 2

Figure 3

Figure 4

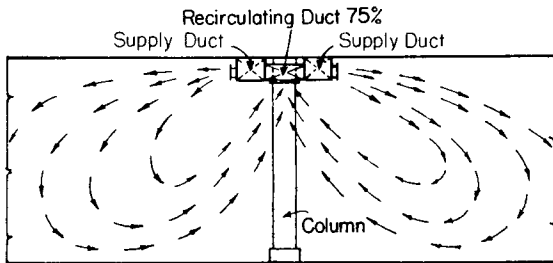
Figure 5

Figure 6





Air-Conditioning Ducts in a Department Store. Linoleum Shop, Sibley Lindsay and Carr Co., Rochester, N. Y. Alfons Bach, Designer.



Duct arrangement for stores of large floor area

Figure 7

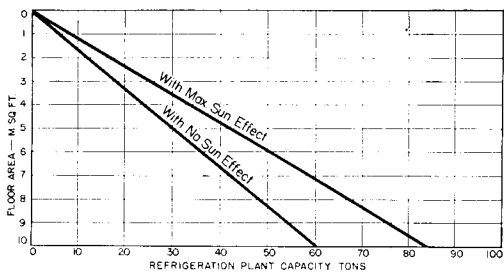


Chart of required refrigeration capacities

Figure 8

shop, similar ducts often are run down the ceiling with a supply duct on each side of a return circulation duct in the middle, as shown in Figure 7. By duplicating this arrangement at intervals of 50 to 60 feet, any width of shop or department store may be handled. The location of the conditioning equipment may be anywhere that space conditions permit, such as in a room at the rear of the shop or in the cellar.

If units are used there are two types to consider: one is the self-contained unit which has the refrigeration plant contained within it; the other is the unit which simply has the

cooling surface and a fan or fans, with refrigerant or cold water supplied to the cooling surface from a central refrigeration plant located at some other point. The self-contained unit usually is not obtainable in sizes over $\frac{3}{4}$ -ton capacity, so that a considerable number of such units are required even for a very small shop; in fact, this type of unit is seldom used because of this difficulty. The units containing only the cooling surface and fan may be secured in sizes up to 5-ton capacity—even larger in some makes—and form a practical solution of cooling in the shop where floor space is available, or where they

are placed in the cellar and piped up with ducts to the outlet locations desired. A typical arrangement of this type of installation is shown in Figure 6.

Refrigeration Plant

The refrigeration plant offers a number of solutions, but for the average retail store the common compression plant using Freon is most commonly employed. This refers to conditions where mechanical refrigeration must be used. Some retail stores have used well water alone when the water temperature has been sufficiently low and when the supply has been adequate to do the work; in other cases, well water at a higher temperature has been used to cool the air down through part of the range with mechanical refrigeration for the final reduction and dehumidifying work. City water has been similarly employed in conjunction with refrigeration, the water being first used for precooling the air and then for cooling water in the compressor and condenser. When all of these are impracticable a complete mechanical refrigeration plant must be installed. Cooling towers under 100 tons of refrigeration capacity seldom prove economically practicable; although they are out of the picture for the ordinary retail store, they are, however, frequently employed in the larger systems of big department stores.

The refrigeration capacities for the various types of store have been computed in Table II, to which about 10% has been added for the losses occurring in the cooling plant itself and in the distribution of air or water to the outlets or units. Plotting the refrigeration in a curve similar to that employed in Figure 2 for the air quantity then gives the results shown in Figure 8. It will be noted, however, that the refrigeration with 25% outside air used will approximate a maximum of about $2\frac{2}{3}$ tons for each 1,000 cu. ft. of air per minute system capacity.

Outside Air Supply

It is recognized generally that a certain amount of outside air must be injected into an enclosure which is air conditioned to prevent a sensation of stuffiness and the building up of odors. This is particularly important in stores handling rubber goods, oil cloth or linoleum, paints, oils or putty, artists' supplies, shoes or other leather goods, etc. It is customary to make this admixture of outside air about 25% of the total.

When this is done—and it should always be done—only 75% of the air in the shop is returned to the apparatus for reconditioning; the other 25% leaks out through the doors, windows and other openings. Hot outside air does not enter the store, and all infiltration or leakage is prevented by maintaining a slight positive air pressure in the store.

This air, if secured from grilles located under the show windows and near the sidewalk, should be filtered before entering the apparatus and, if the return circulation air is filtered similarly and the dust removed, the air in the store will be much cleaner, the dust settlement will be reduced, materials will be less easily soiled. In small installations these filters may be of the dry mat variety, the sections of which must be cleaned or renewed when accumulated dirt begins to interfere with the flow of air. This introduces a servicing item in the system and one which is not likely to receive attention by the store proprietor, unless he is specially coached in the matter and made to realize that with a dirty filter he will receive a reduced amount of cooling; that, if allowed to continue, it will reach a point where he may receive no cooling at all.

Costs

A discussion of costs will, and must, be very general. The cost of any system will be affected by:

- (a) Its general size and design.
- (b) The use of union or nonunion labor.
- (c) The locality in which the work is done.
- (d) Whether it is for a new or an existing structure.
- (e) Whether all the items of cost are included in the air conditioning, or whether some are concealed in work by other contractors.

For instance, the cost of the sheet metalwork required in Figure 4 would be almost negligible, while in the arrangement shown in Figure 2 it would be more; and in the arrangement given in Figure 5 it would be still more. Unit installations approximate the average cost for duct installations very closely so that the unit arrangement suggested in Figure 6, if of the same size and capacity, might run higher than the duct scheme in Figure 4, about the same as the method used in Figure 2, and probably would be cheaper than the double ducts used in Figure 5. After systems reach 40 to 50 tons in capacity, the

cost per ton and per thousand cfm. of capacity is likely to approach a straight line until considerably larger systems are reached; then the longer duct runs, heavier metal, stiffening, better insulation, and usually a more strict specification cause an increase in the cost, especially when cooling towers are included.

Union labor in most parts of the country will run considerably higher than nonunion labor and the local rate of wages will have some reflection in the cost of the work. An installation in a new building is likely to be easier and cheaper than one in an existing building and, if a store is occupied, additional costs are necessary to conform to existing furniture and fixture arrangements, and for labor at a time when business will not be obstructed. In addition, there is the matter of how many and what items are included in the air-conditioning contract; does this contractor supply the grilles?; does he do the cutting?; does he have to perform the patching?; does he run electric services for the motors?; does he have to carry water and waste lines to the equipment?; does he do any furring in and plastering of concealed ducts? Often all of these are furnished or done by the trades involved and not by the air-conditioning contractors, and so may be omitted from the complete air-conditioning cost in one case and not in another.

No attempt will be made here to approximate the costs of using well water exclusively for cooling, or for combinations of well water or city water and mechanical refrigeration; these are so variable that nothing of practical value can be offered. Where a complete mechanical plant is to go in, however, the costs assume a more settled form, although they will be only approximate as pointed out. In Figure 9, the approximate capacities of cooling systems in cfm. are given across the top of the chart, and the corresponding refrigeration capacity is shown along the scale at the bottom of the chart. The lower curve represents the cost in dollars per ton of capacity as read on the scale at the right, while the distance between the lower curve and the upper curve represents the added cost of the system outside the refrigeration plant, which makes the upper curve represent the total cost of the installation including complete mechanical refrigeration. A study of these curves indicates an almost equal division between the cost of the refrigeration plant and the cost of the other items in the system; also

that down to about 30 to 40-ton capacity the total cost should approximate \$300 per ton of capacity, while below this the smallness of the systems will raise the cost per ton slightly—sometimes materially. Beyond 100-ton capacity the curve may begin to rise again as larger plants with long duct runs and cooling towers begin to come into the picture.

Plants undoubtedly are installed at costs lower than indicated by the curves, such costs frequently being arrived at by not including all the items of cost incidental to the installation; or by the contractor failing to supply a complete or adequate installation. He may omit the insulation on the supply duct; he may fail to put soundproofing and an adequate foundation under the apparatus; he may use such high velocities in the ducts as to result in undersized ducts and the danger of air noise; he may install a constant speed motor; he may put in too small a fan and step up the speed to get the necessary amount of air; and he may install a system which could not meet the test conditions of 80° F. in a room with 40 to 50% relative humidity when it is 95° F. outside with 50% relative humidity.

Because any cooling is a relief in hot weather, some satisfaction will be experienced if the conditions are relieved in any way, even though they may not be relieved to the maximum extent which experience has proven possible.

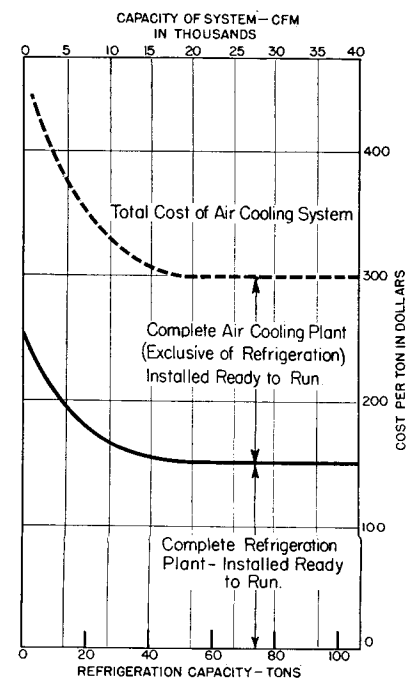
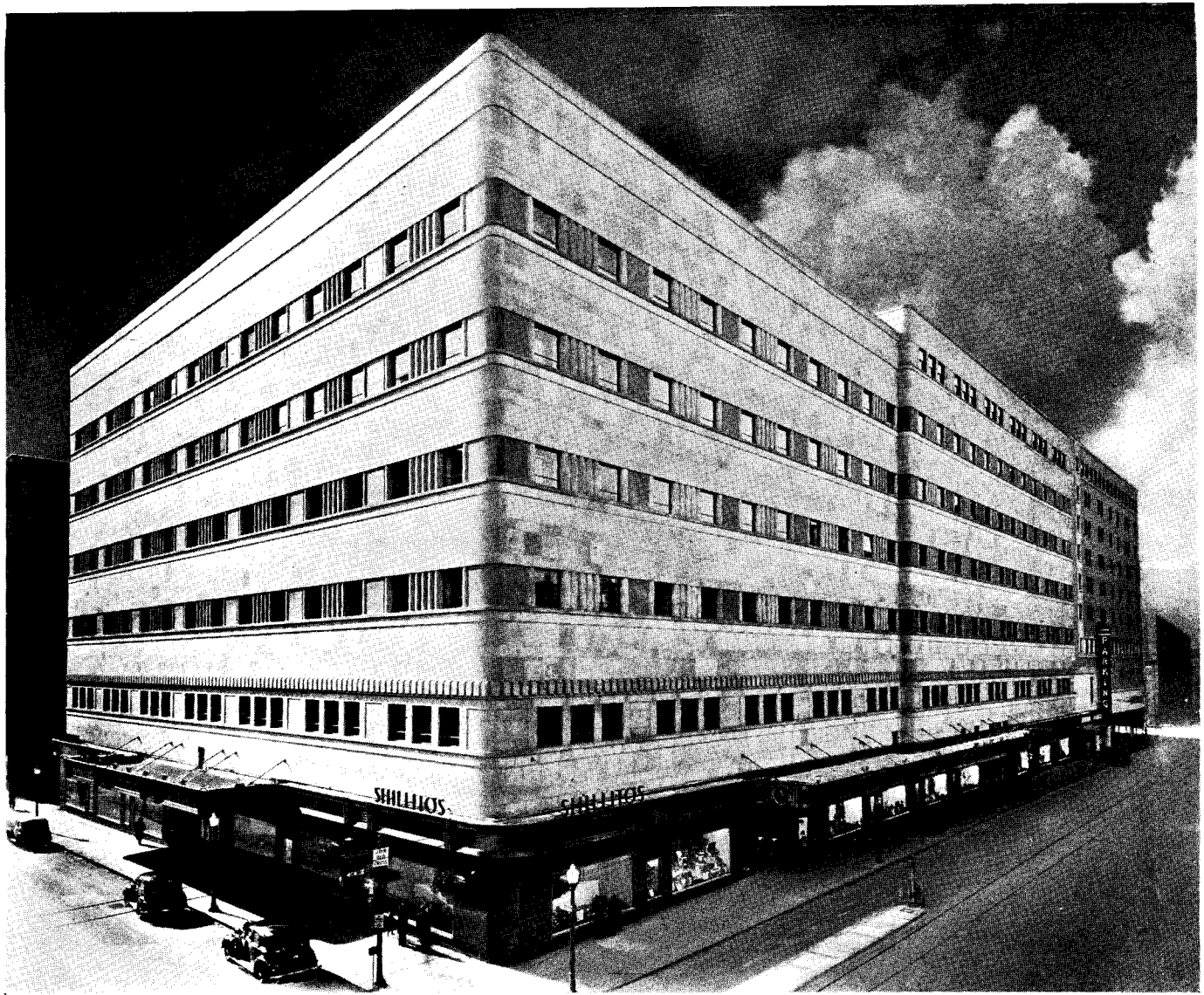
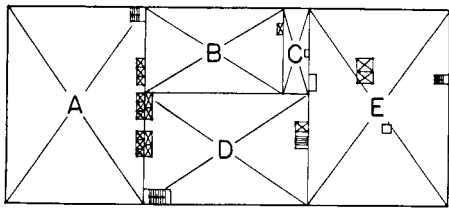


Figure 9



A DEPARTMENT STORE MODERNIZATION
THE JOHN SHILLITO COMPANY, CINCINNATI, OHIO

POTTER, TYLER & MARTIN
Architects



ORIGINAL:
A, B, C

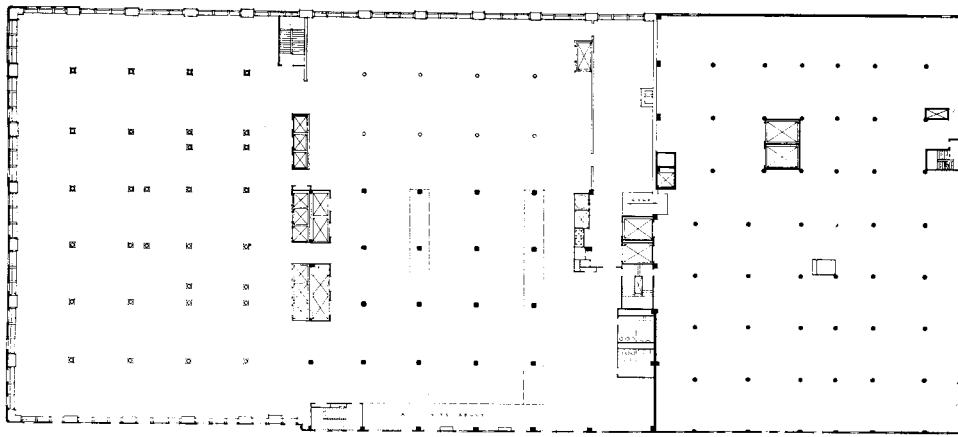
NEW:
D, E

STRUCTURALLY interesting was the refacing of the old building. The old masonry walls were found to be still in excellent condition, but the lower stories were inadequate to carry the additional load of this new facing. A structural steel frame was designed extending from the foundation piers to the third-floor line. Heavy steel girders at the third floor carry the weight of the new limestone facing which extends to the roof, and additional beams at the lower floor levels carry the new masonry between the third floor and the new show windows. The columns of the structural steel framework are supported by concrete bolsters which distribute the load of the new wall to the old piers and buttresses.

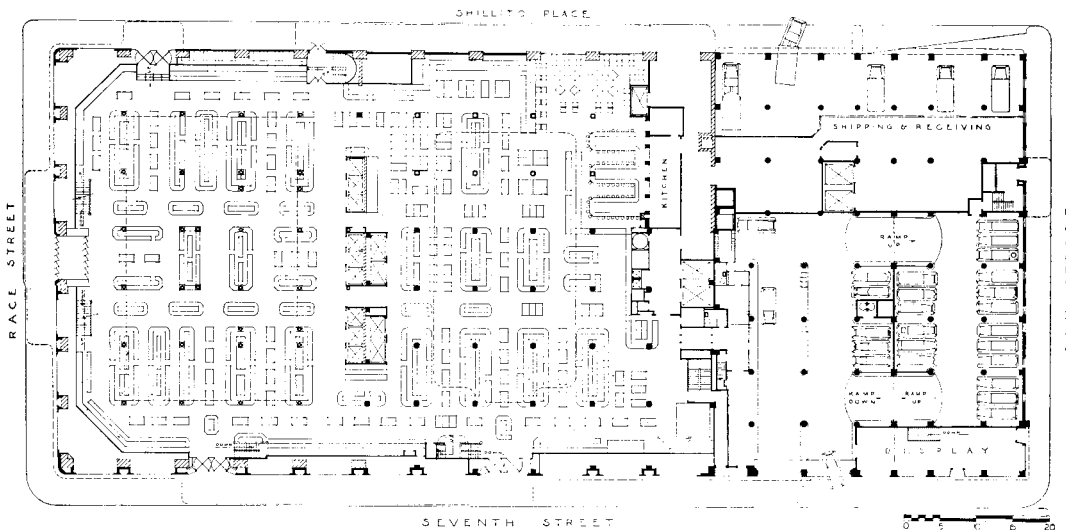


Original Building, 1875. J. W. McLaughlin, Architect

A DEPARTMENT STORE MODERNIZATION



Typical Floor



First Floor

CHAS. T. KENNEDY, Structural Engineer

EDWIN E. ASHLEY, Mechanical Engineer

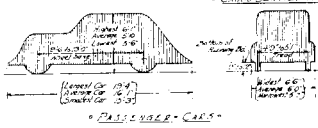
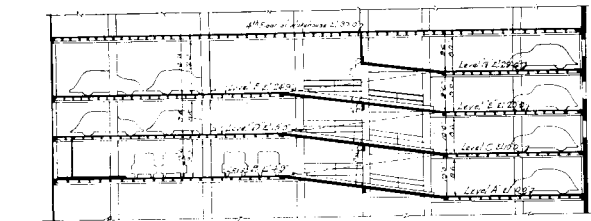
IN ORDER that the addition should become an integral part of the older store, all columns in the interior of the new addition had to line up in both directions with the existing columns, so that aisles would be continuous throughout the entire selling space. This required certain columns of the new building to be located entirely inside the heavy brick supporting walls of the older structure. To have removed these walls before beginning would have necessitated a difficult and expensive shoring job, for the entire support of all of the present seven floors and roof would have had to be removed along two sides of the existing buildings. To avoid this, vertical slots of the exact width of the new columns were cut through the existing walls one story at a time. As soon as a slot had been cut, forms were erected on two sides and the reinforced concrete columns were poured in direct contact with the sides of the slot. This process was carried up one story at a time; provision was made at each floor line for the support of a reinforced concrete beam to be installed later.

This method of construction resulted in a minimum of interference with store operations; only a small portion of the existing wall at each new column location had to be barricaded off from the selling area. When this process had been completed to the roof, the old roof construction was shored up from the top floor just inside the exterior wall, which was then removed in the top story only. A reinforced concrete beam was then poured

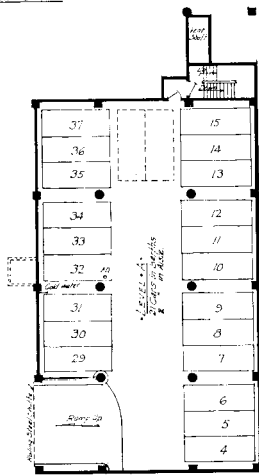
between the columns at the top floor line, and the weight of the top floor construction was transferred to this new beam by means of steel ledge angles. This process was repeated story by story until the entire old wall between the old and new sections of the store had been removed to the foundations.

The roofs are provided with a system of spray pipes. The roof drains can be set at any desired elevation above the roof surface so that water can be spread to the depth of several inches over the entire new roof area. It is expected that the insulation provided by this sheet of water will effect an appreciable improvement in hot weather in the top stories of the building, with a reduction in the load on the air-conditioning equipment.

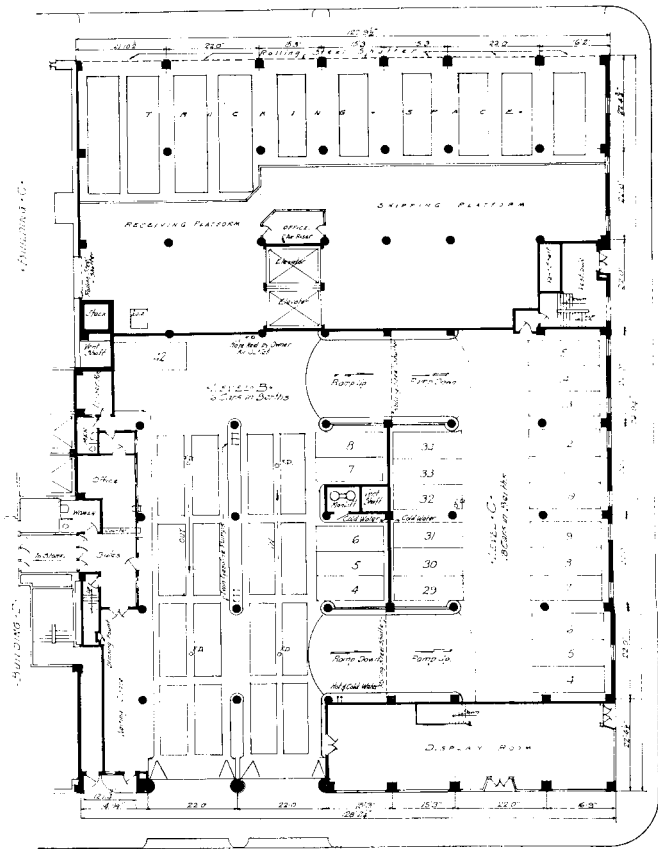
The air-conditioning system has been installed throughout all of the selling areas. In this system, heating, ventilating and air conditioning have been combined in units located in each story. These have a direct connection to the outside so that fresh air is constantly being supplied. This air is washed and filtered, and is then supplied at a constant temperature and humidity by a system of ducts leading to all parts of the floor. To provide the necessary volume of water to be used in the refrigeration apparatus, two new wells have been driven approximately 180 ft. below the sub-basement floor. This gives a total of five wells now in operation, each producing approximately 150 gallons of water per minute.



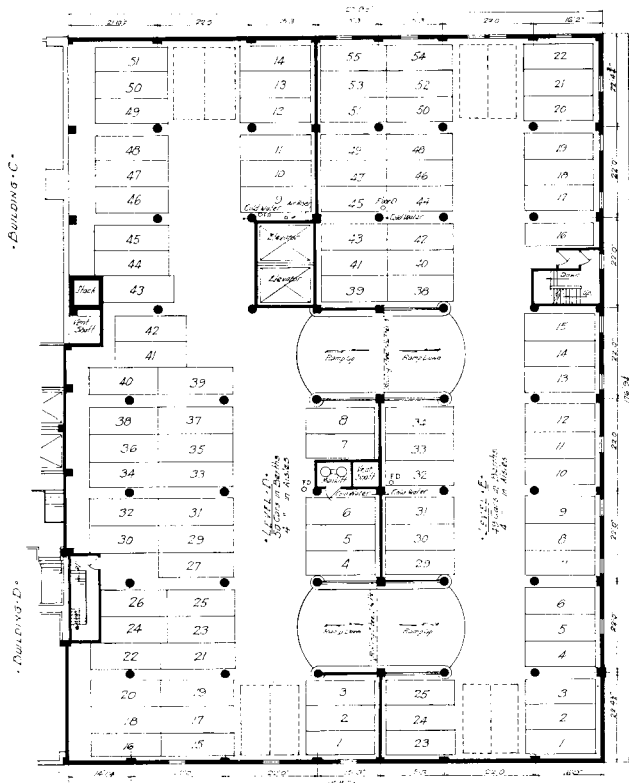
PLANS AND SECTION OF GARAGE PORTION



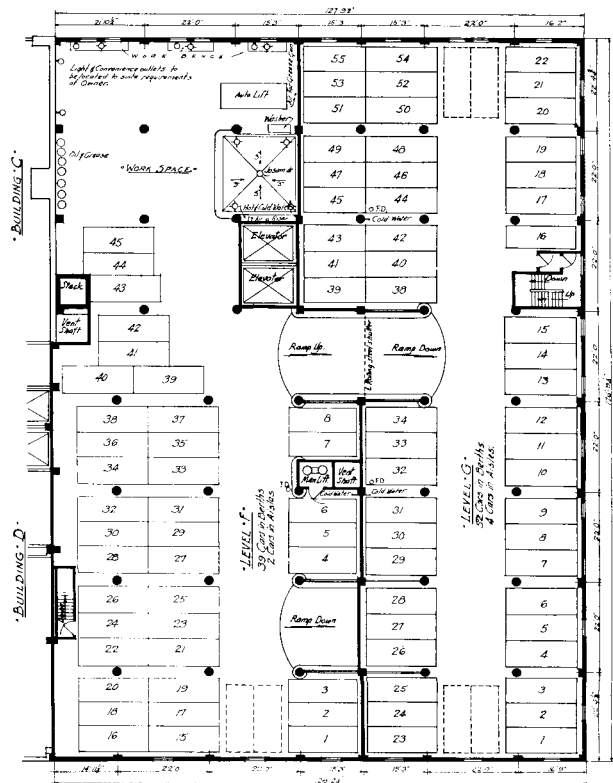
Level A



Levels B and C



Levels D and E



Levels F and G

A parking garage for the convenience of customers was incorporated into the design of the warehouse. The floors of the garage are staggered; each complete floor area has been built at two separate levels, the levels on one side of the dividing wall halfway between those on

the other side. This permits the connection of these staggered floors by means of short ramps of moderate grade. Seven levels, representing three-and-a-half floors, are provided for parking purposes. There is direct access between garage and selling areas on the first floor.

A DEPARTMENT STORE MODERNIZATION



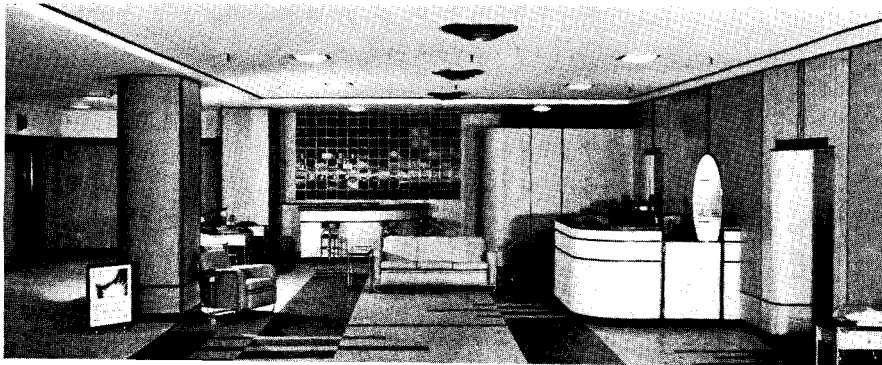
T. H. Hite

Main Floor and Mezzanine



T. H. Hite

Men's Wear Department



Foyer of Beauty Salon

SCHEDULE OF EQUIPMENT AND MATERIALS

FOUNDATION	Reinforced concrete
STRUCTURE	Reinforced concrete, integral joist and slab
EXTERIOR	
Walls	Indiana limestone, Ingalls Stone Co.; Alberene panels; brick backup; brick and stone in garage and warehouse sections, David Hummel Building Co.; granite base, Sauk Rapids Granite Co.
Roof	Flintcote on garage; on new store section, 5-ply built-up asphaltic—Philip Carey Co.
Sash	Fenestra "Fenmark" projected in garage and warehouse, Fenestra custom sections, fixed-type in store section; Pomeroy in office section
Doors	Van Kannel revolving doors; Richmond fire-proof doors in garage
Metalwork	Natural and nickel bronze combination, General Bronze Corp.
INTERIOR	
Floors	Concrete with Master Builders—Metalicron in garage, warehouse and utility areas; Magnesite terrazzo on basement and first floor; upper floor carpeted, Parkay by Cinti Floor Co.

Walls

Plaster painted with Casein; garage, mechanical and warehouse areas concrete ceilings; Sanitized or unglazed double or triple brick

INSULATION

Rock wool over ceilings of office areas; Philip Carey Co., roof bonding of entire building

WATERPROOFING

Membrane on sidewalk slabs, spray coats on walls below grade; Ironite on slabs at shipping and receiving platform, Western Waterproofing Co.

HEATING

Steam

AIR CONDITIONING

Year-round including workroom areas in warehouse; well water condensers, York Ice Machine Co., unit heaters and direct radiation in garage and warehouse

HARDWARE LIGHTING

Solid bronze, J. B. Schroder Co.

First floor new section, Curtis Lighting, Inc.; indirect X-ray lowered reflectors in show windows

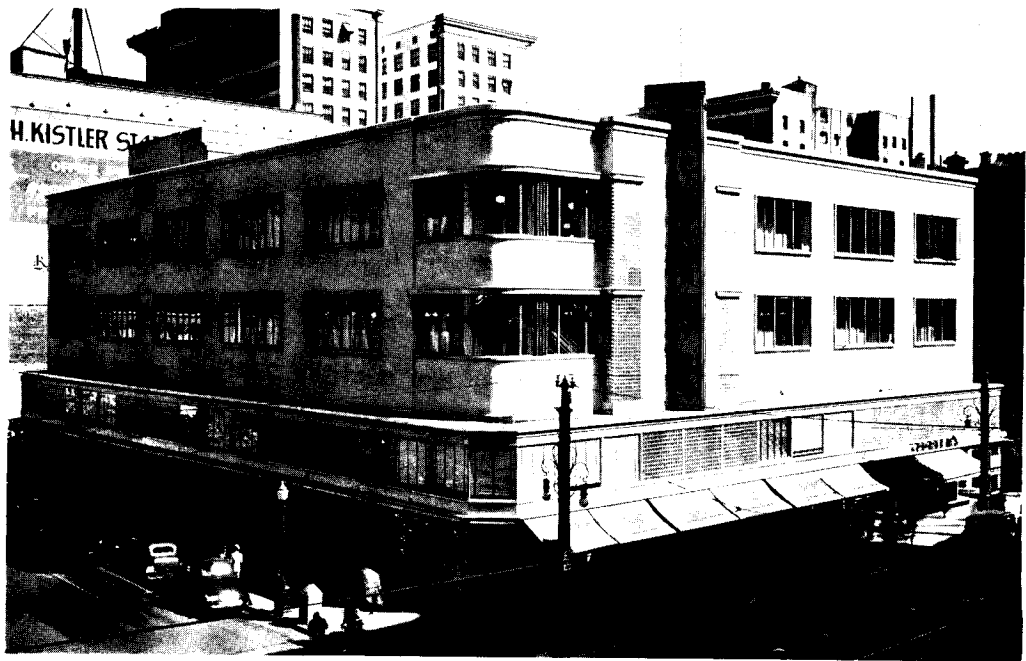
PLUMBING FURNISHINGS

John Douglas fixtures

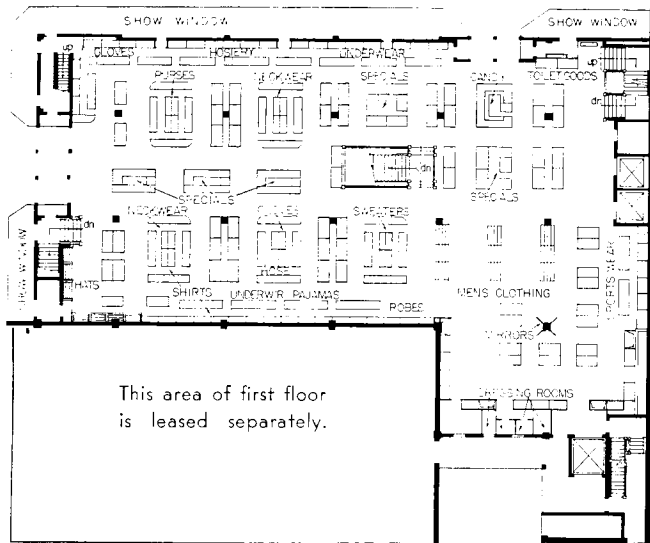
Grand Rapids Store Equipment Co. or manufactured by owner

A CHAIN DEPARTMENT STORE

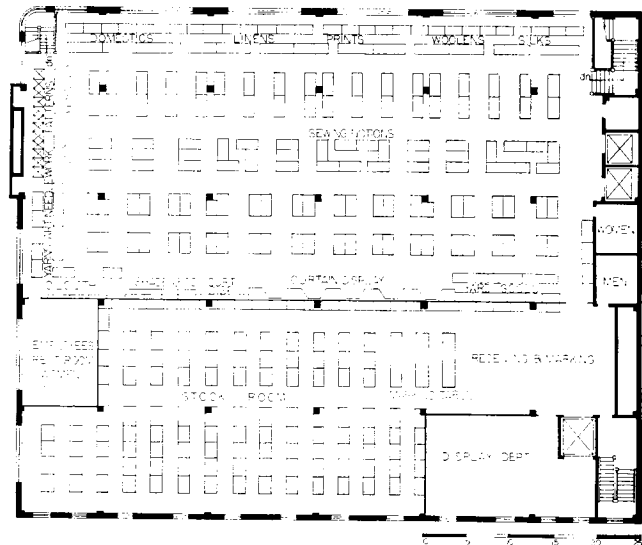
J. C. PENNEY STORE
DENVER, COLORADO



FRANK WALTER FREWEN and EARL CHESTER MORRIS
Architects



First Floor



Third Floor

SCHEDULE OF EQUIPMENT AND MATERIALS

FOUNDATION	Reinforced concrete
STRUCTURE	Structural steel; reinforced concrete slabs, "pan" type construction
EXTERIOR	
Walls	Indiana limestone veneer; glass block; Belgian black marble base, brick backup
Roof	Elaterite roofing
Sash	"Brown" paneled windows
Metalwork	Extruded aluminum cornices and trim, Aluminum Co. of America
INTERIOR	
Floors	Mostly asphalt tile, "Moultile"; second floor carpeted
Walls	Smooth plaster
Doors	Solid slab birch; exterior doors of oak

INSULATION	Cork on roof, "Silver Coat" on duct work
WATERPROOFING	Two coats of hot asphalt
HEATING	Split system of radiation and hot air; Kewanee boilers; Warren Webster valves and traps; Johnson Service Co. temperature control
AIR CONDITIONING	Complete year-round, American Blower Co. fans; Freon gas air condenser units, Westinghouse
HARDWARE	Chromium plated, Hendrie & Bollhoff Supply Co.
PAINTING	3 coats of semi-gloss on interior walls and ceilings
PLUMBING	Crane Co. fixtures
GLASS	Plate glass, except wire plate in alley windows
ELEVATORS	Operator-controlled, Otis Co.
Total cost approximately \$350,000, @ 29c per cu. ft.	



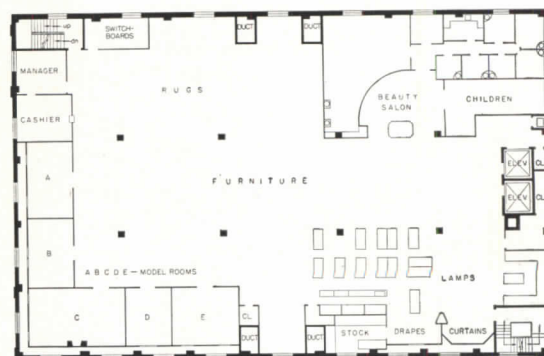
Murray L. Peters

A BRANCH DEPARTMENT STORE

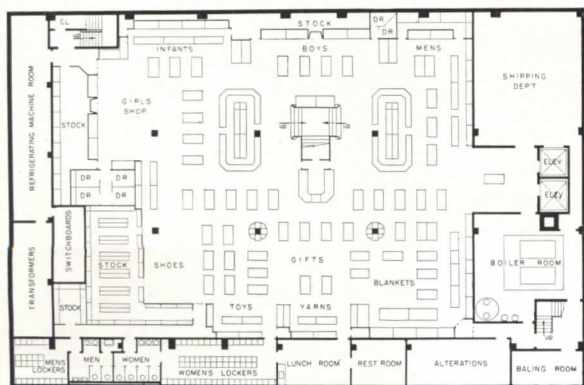
SLEE & BRYSON
Architects

FREDERICK LOESER & CO.
GARDEN CITY, NEW YORK

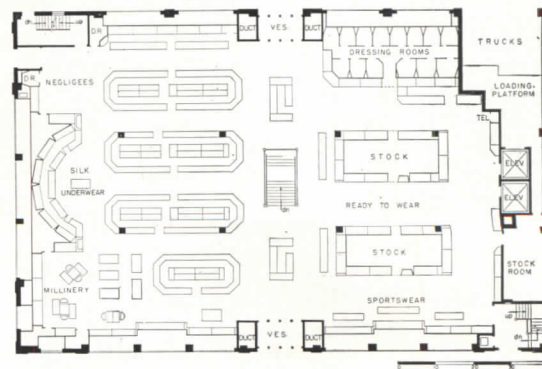
A PIONEER in department store planning, this structure houses under one roof a group of specialized shops. This type of organization combines selective selling with the advantages of volume buying and the services possible in a large-scale enterprise.



Second Floor



Basement



First Floor



Accessory Department



Shoe Department

Photos by Frank Kandt

SCHEDULE OF EQUIPMENT AND MATERIALS

FOUNDATIONS	Concrete and reinforced concrete, Eureka Fireproofing Co.
STRUCTURE	Steel, Bethlehem Steel Co.
EXTERIOR	
Walls	Common brick backed up by hollow tile; artificial stone trim
Roof	Slate; built-up asphaltic slag surface on flat roof
Sash	Casement, Lupton Steel; copper screens
INTERIOR	
Floors	Reinforced concrete slabs Finishes: wood on second floor, carpeted; terrazzo on first floor and basement
INSULATION	Johns-Manville "bats" under roof
WATERPROOFING	Integral waterproofing in foundations; asphaltic waterproofing on brickwork

HEATING	Steam, Wolf & Munier
AIR CONDITIONING	Year-round, York Ice Machinery Corp.
LIGHTING	Indirect
HARDWARE	Sargent & Co.
PAINTING	
Exterior	Cabot's Virginia white over common brick; sash and trim painted blue
Interior	Lead and oil enamel finish on woodwork; "Luminal" on walls
PLUMBING	Standard Sanitary Mfg. Co. fixtures
GLASS	Standard, plate and hammered
ELEVATORS	A. B. See Elevator Co.
FIXTURES	Blonde mahogany, Grand Rapids Store Equipment Co.

Costs: Building, \$308,000; Furniture, \$73,000



Hedrick-Blessing

AN APPAREL STORE

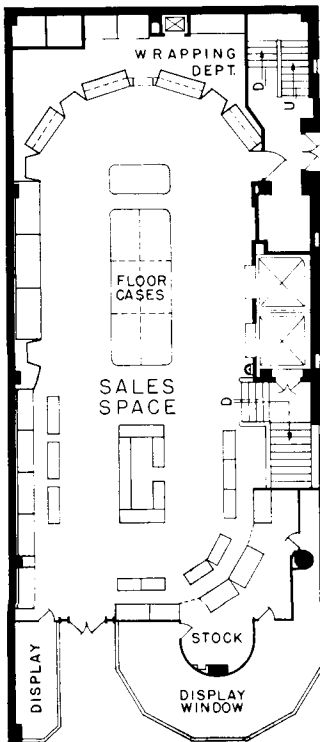
BENSON & RIXON STORE
CHICAGO, ILLINOIS

ALFRED S. ALSCHULER, INC.
Architect

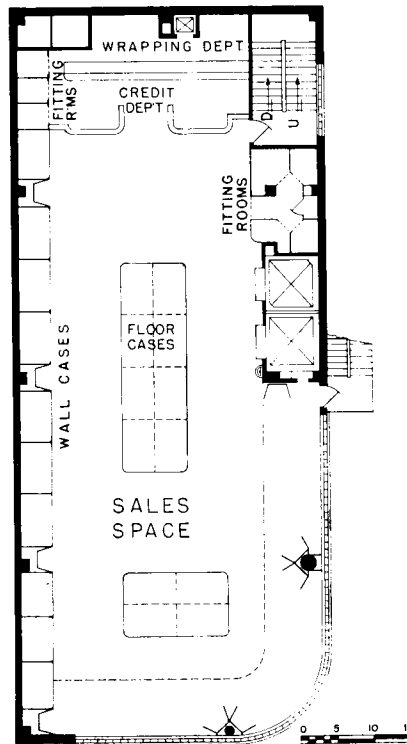
THIS STORE is located on a main street crowded with theater marquees and "hung-on" advertising. The architect has attempted to achieve distinctiveness in the structure itself, without sacrificing selling space on the main floor. The lettering below the second-floor level has been developed as an integral part of the design; at night it is conspicuous below the bands of diffused light emanating from the glass block. (See section cover.)

Display windows are limited to the first floor and the corner on the second floor. Elsewhere a hinged iron framework, carrying half-blocks, satisfies code requirements. There are no columns inside the store, 42-ft. girders spanning the width of the structure. To avoid columns in the show window, the entire corner is cantilevered from a column set eight feet back from the street line.

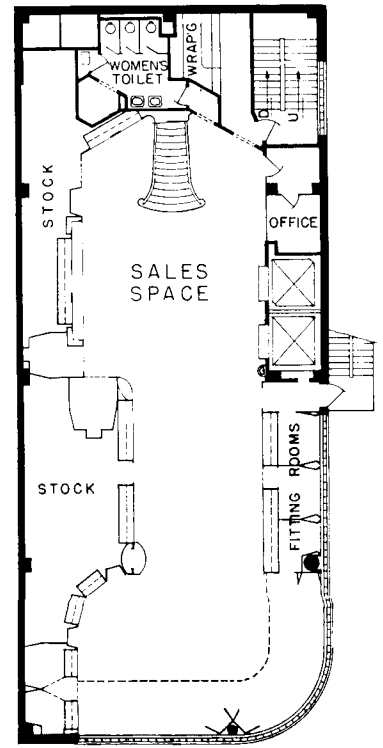
Second and third floors are for men's wear. The women's department is on the fourth and fifth floors, which are connected by a special staircase used for modeling gowns. The sixth floor is reserved for offices.



First Floor



Third Floor



Fourth Floor



DeLacy Photographic Studio

Men's Wear Department



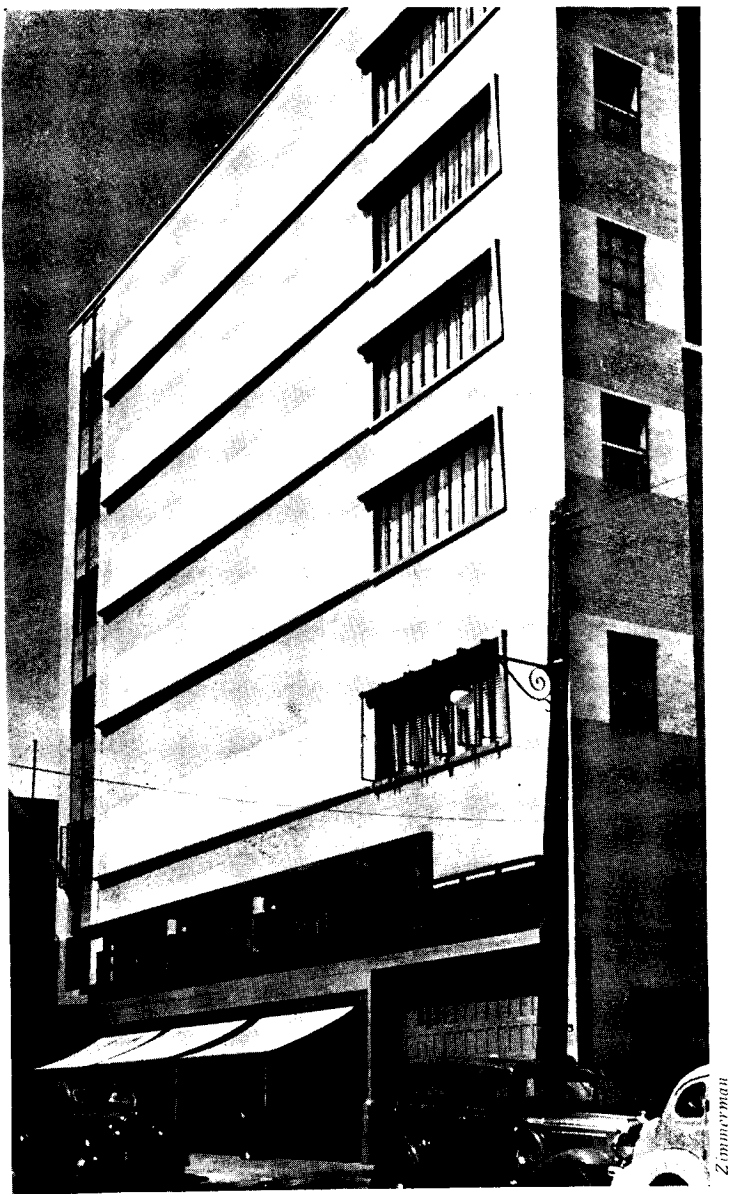
Women's Wear Department

SCHEDULE OF EQUIPMENT AND MATERIALS

FOUNDATIONS	Reinforced concrete spread footings
STRUCTURE	Structural steel frame, reinforced concrete floors
EXTERIOR	
Walls	Poured concrete and solid brick; Insulux glass block, Owens-Illinois Glass Co.; beige terra cotta blocks, American Terra Cotta Co.
Roof	"Certainteed" built-up asphaltic, gravel surface
Sash	Pivoted steel sash
INTERIOR	
Floors	Asphalt tile; terrazzo
Fixtures	Cases in light pin-grain finish, Grand Rapids Store Equipment Co.

INSULATION	Rigid insulation board on roof, Celotex Corp.
WATERPROOFING	Integral in basement walls; Ironite on existing party wall
AIR CONDITIONING	Complete year-round, Carrier Corp. and Trane Co.; hot air heating
PLUMBING	Standard Sanitary Mfg. Co. fixtures.
LIGHTING	Indirect and recessed fixtures, Curtis Lighting, Inc.
ELEVATORS	Automatic geared traction, 300 fpm.; Houghton Elevator Co.; Tyler Co. cabs and hatch doors

Cost: 58c per cu. ft. (including fixtures)



A FURNITURE STORE

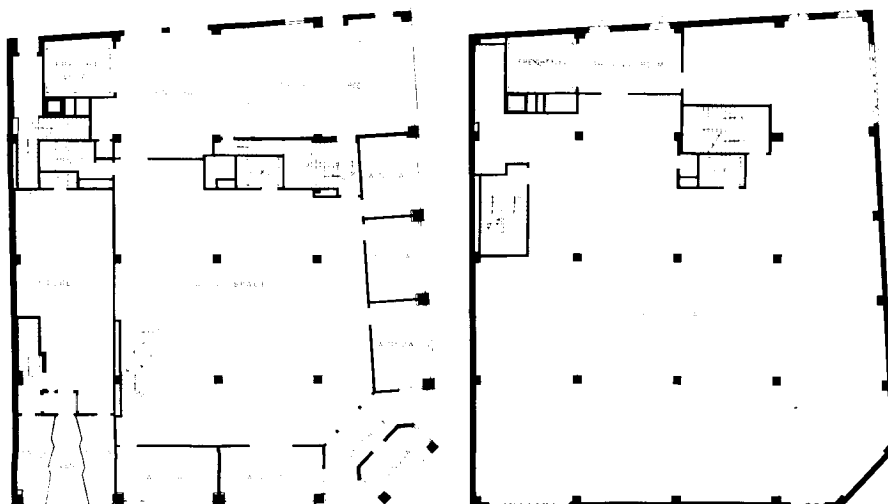
SPEAR'S FURNITURE STORE
JAMAICA, NEW YORK

DE YOUNG & MOSCOWITZ
Architects

To OBTAIN uniform lighting and to prevent damage by sunlight to fabrics and other furniture materials, window space in the upper stories has been reduced to a minimum. The corner wall has been splayed to accommodate a large vertical sign of maximum visibility. The letters of this sign are of stainless steel silhouetted by reflected light. Horizontal signs are green porcelain enamel with green neon illumination.

SCHEDULE OF EQUIPMENT AND MATERIALS

FOUNDATION	Reinforced concrete
STRUCTURE	Structural steel; reinforced concrete slabs
EXTERIOR	
Walls	4" salmon-colored brick facing, 8" backup tile; 4" Macotta, Maul Macotta Co., 8" brick backing
Roof	Built-up asphaltic with gravel surface, 20-year bond, Barrett Co.; 16 oz. copper on marquee roof
Sash	Steel casement, Detroit Steel Products Co.; bronze show windows, Penn Brass & Bronze Co.
Doors	Kinnear Co. manually operated roller shutter doors at loading platform
INTERIOR	
Floors	Wood finish on second floor, terrazzo elsewhere
WATER-PROOFING	Integral in all concrete and mortar; asphaltic on interior of exposed walls; membrane at spandrels, Somers & Co.
HEATING	Steam, Fitzgibbons boiler; Ray oil burner
LIGHTING	Holophane concealed flush-type on first floor; indirect fixtures elsewhere
PLUMBING	Standard Sanitary Mfg. Co. fixtures
HARDWARE	Corbin
ELEVATORS	Otis Co.; Peele manually operated doors on freight elevator shaft



First Floor

Typical Floor

A portion of the third and fourth stories is devoted to a full-size model house extending through the floors.

Cost: Approximately \$230,000.



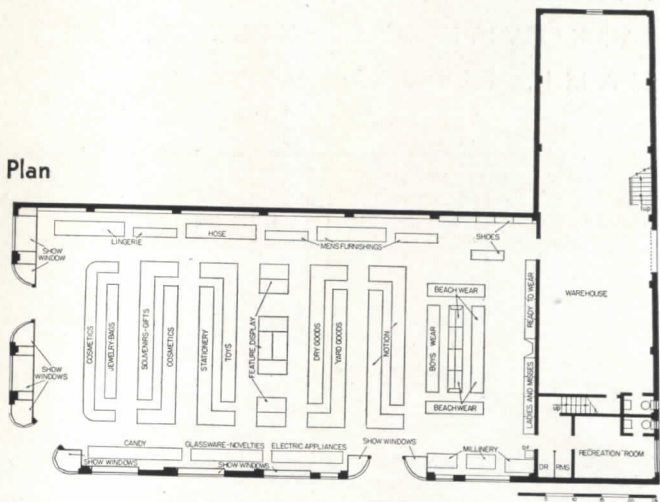
A SMALL DEPARTMENT STORE

WILLIAM H. MERRIAM
Architect

HOLLEY'S STORE
CORAL GABLES, FLORIDA

LARGE SHOW WINDOWS have been placed along the bus terminal to attract the travelers who leave from and arrive at this point. The concrete slab is cantilevered six feet to afford shade and protection for both windows and patrons. The building has been designed to accommodate a future second floor with steel girders spanning the 50-ft. width without intermediate support. These girders project only six inches below the present ceiling. A warehouse is provided, serving four other stores as well as Holley's.

Plan



SCHEDULE OF EQUIPMENT AND MATERIALS

FOUNDATIONS	Reinforced concrete
STRUCTURE	Reinforced concrete and structural steel; mezzanine, wood joists
EXTERIOR	
Walls	Concrete blocks and stucco
Roof	Built-up asphaltic, gravel surface, The Barrett Co.
Sash	Steel casement; commercial-projected in warehouse, Truscon Steel Co.; Alumilite-finish store fronts, The Kawneer Co.
INTERIOR	
Floors	Verde Antique terrazzo on first floor; wood finish on mezzanine
Walls	Wood furring; perforated rock lath; gypsum plaster, unpainted

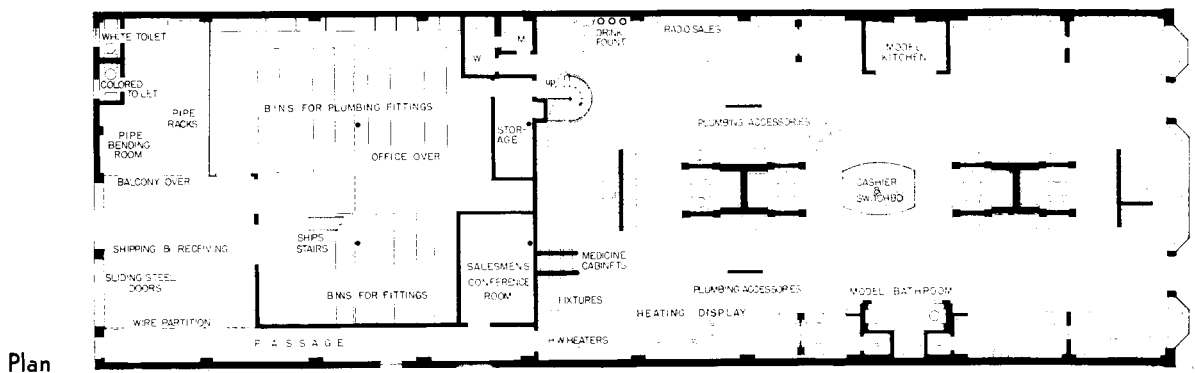
WATERPROOFING	Integral waterproofing in stucco and floor slabs, Sec Manufacturing Co.; "Somay" decorative waterproofing paint on exterior
VENTILATION	Air-circulated by Ventura Fans, American Blower Corp.
LIGHTING	Direct, Curtis Lighting Co.; rigid conduit, National Electric Products Co.
HARDWARE	Russwin
PLUMBING	Crane Co. fixtures
PAINTING	Varnish and stain, Benjamin Moore & Co.
GLASS	"Muralex" for transoms, plate in store windows, Libbey-Owens-Ford Glass Co.
FIXTURES	The Store Craft Mfg. Co.

Cost: \$19,728 @ 16c per cu. ft.; fixtures \$9,000 in addition



A PLUMBING DISPLAY STORE
 MARKOWITZ & RESNICK STORE
 MIAMI, FLORIDA

L. MURRAY DIXON
 Architect



Plan

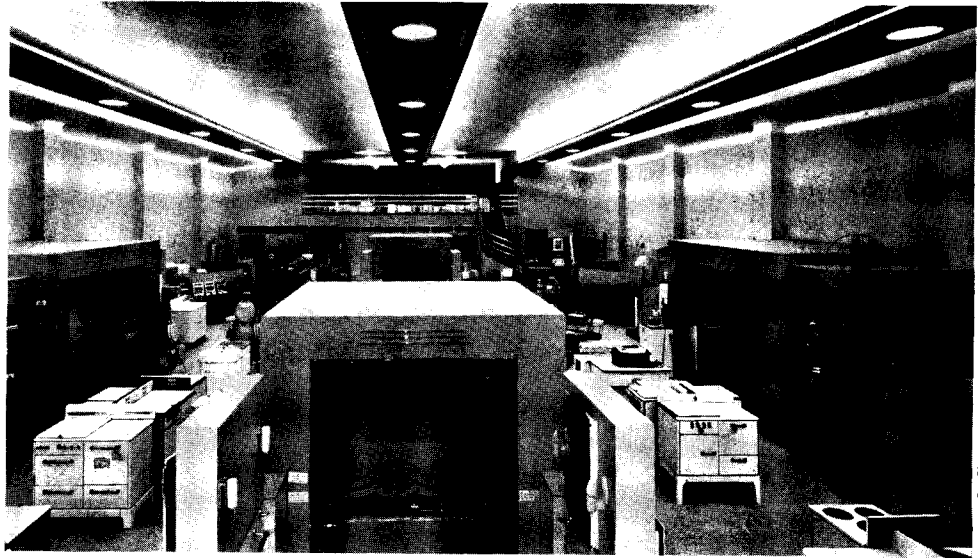
SCHEDULE OF EQUIPMENT AND MATERIALS

FOUNDATION	Wood piling
STRUCTURE	Concrete blocks, Maulojus Rock Co.
EXTERIOR	
Walls	Stucco on sides; marble on front, Georgia Marble Co.
Roof	Gravel surface, 15-yr. bonded, Johns-Manville
Store Front	Extruded red bronze, Standard Store Front Construction Co.
Sash	Steel, commercial-projected
INTERIOR	
Floors	Concrete slabs on grade Finish: terrazzo

Display Booths	Masonite and Armstrong linoleum with white metal strips; typical baths in Vitrolite
INSULATION	Rigid insulation board
WATER-PROOFING	Crystex in slabs, concrete columns, beams, and masonry mortar
HARDWARE	Schlage
WIRING	National Electric Products Co. in steel tubing by Steel & Tubes, Inc.
PAINTING	Du Pont
SCREENS	Copper
GLASS	Plate, Libbey-Owens-Ford Glass Co.

Costs: \$35,000 @ 22.2c per cu. ft.; fixtures, \$7,000.

Interior Toward Mezzanine

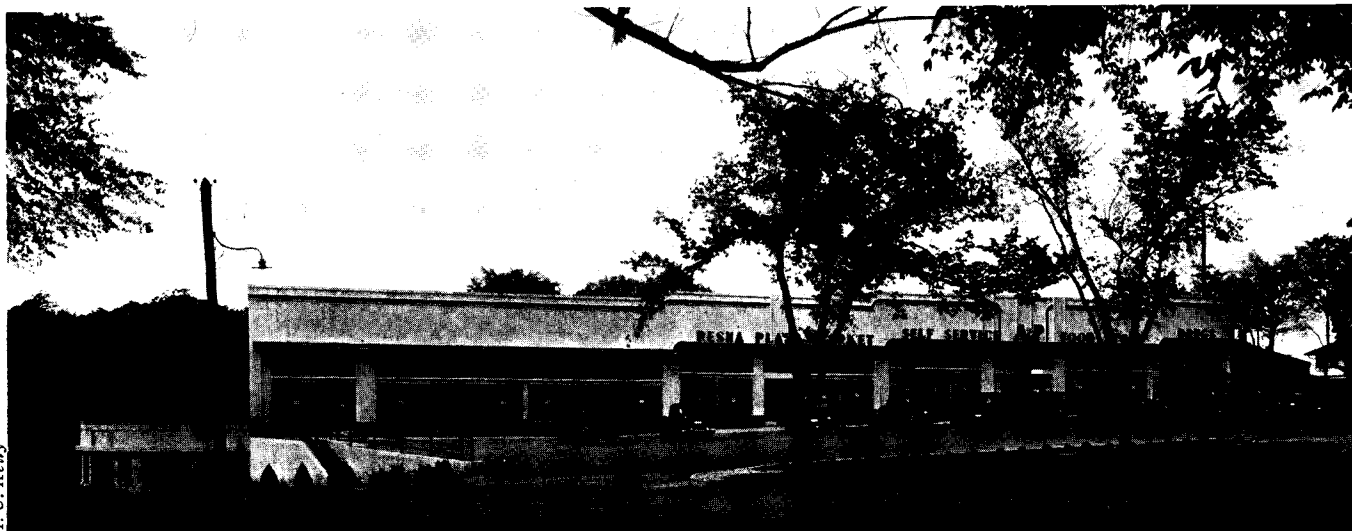


Verne O. Williams

Mezzanine Stair Detail



A. C. Keily



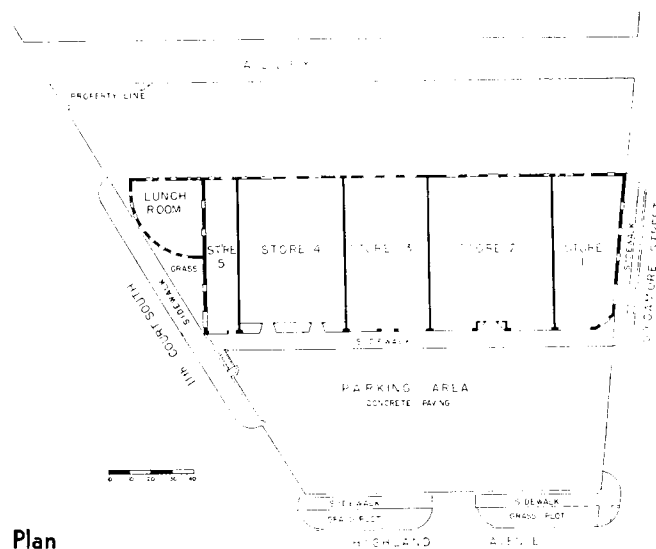
A SHOPPING CENTER

JAMES L. GATLING
Architect

PLAZA STORES
BIRMINGHAM, ALABAMA

DESIGNED AS A UNIT, this shopping center includes five stores and a lunchroom at one end. The architect has taken advantage of the natural slope of the site, placing the lunchroom on a lower level, with the dining room under store 5. A large barbecue fireplace is located in the lunchroom adjoining the kitchen.

Particular attention has been given to providing parking facilities for patrons, a competitive advantage of some value to the stores served. Parking space has been provided in front and rear of the group. The unity of the project has been maintained by cooperation among the tenants in restricting discordant sign display.



SCHEDULE OF EQUIPMENT AND MATERIALS

FOUNDATION	Concrete
STRUCTURE	Masonry-bearing outer walls; structural steel interior columns; lightweight steel trusses
EXTERIOR	
Walls	Solid brick, Stephenson Brick Co.; terra cotta facing, Atlantic Terra Cotta Co.
Roof	Built-up asphaltic, gravel surface
Sash	Steel casement and commercial-projected, Campbell Metal Window Corp.
INTERIOR	
Floors	Reinforced concrete; wood finish in grocery store; tile in drugstore and lunchroom; asphalt tile in bakery, cleaners (store 5) and dining room (under store 5), Thomas Moulding Co.

Walls	Plastered; Insulite tile board in ceilings
INSULATION	Rigid insulation board in roof of lunchroom
WATER-PROOFING	Integral waterproofing in floor slabs; asphaltic on walls below grade
HEATING	Unit gas heater in drugstore
PLUMBING	Crane Co. fixtures
LIGHTING	Indirect fixtures in lunchroom, semi-indirect elsewhere; exterior—trough floodlighting above canopy for sign silhouette
HARDWARE	Russwin; Rixon door closers
GLASS	Libbey-Owens-Ford plate glass; Owens-Illinois glass block transoms

Total Cost: \$125,000.