RNEST BORN

THE

ARCHITECTURAL RECORD

1935

This house, designed by Oliver Reagen, Architect, New York City, is completely insulated with Reynolds Metallation and Reynolds Metallated Ecod Fabric.

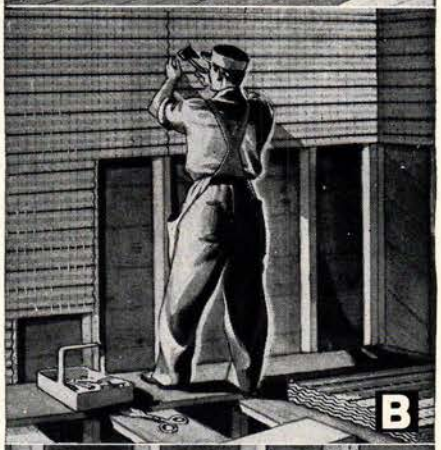
INSULATION *by Metallation**

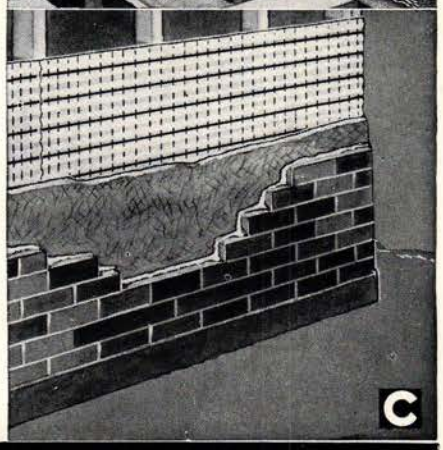
THIS BRIGHT METAL INSULATION REFLECTS HEAT JUST AS A MIRROR REFLECTS LIGHT

Easy to apply in old houses or new; costs 50% less than former methods . . . . . A

For a plaster base and for side-wall insulation— Reynolds Metallated Ecod Fabric . . . . . B

As a base for stucco or brick veneer, Reynolds Ecod requires no sheathing C





MANY architects have acclaimed Reynolds Metallation **primarily** because of its lack of bulk. They find it an important saver of space. But some of the greatest advantages of Metallation are derived from this same thinness—as thin as a calling card. Metallation reflects approximately 95% of the radiant heat which strikes its surface—and does not store heat to be given off into the house after nightfall in summer or to increase winter fuel bills. Similarly, it absorbs no moisture; (ordinary atmospheric moisture reduces the efficiency of the usual insulating materials). Lastly, Metallation is termite-proof—insects and vermin can neither attack it, nor breed in it.

Metallation represents the maximum dollar value in insulation—costing approximately 50% less, completely installed than other methods of insulation. It is a fire-safe material—in keeping with the trend toward sound construction and greater building values. It is nailed on in strips right over the rafters, roof joists or studs.

Reynolds Ecod Fabric combines Metallation with an electrically-welded, metal-reinforcing plaster base. Reynolds Ecod is likewise an economical product to use — saving in the amount of plaster used and providing insulation for side-walls and upper floor ceilings, at a cost of only six-tenths of a cent extra per square foot, over the usual plaster bases. As a base for stucco or brick veneer, Reynolds Ecod requires no sheathing. Ecod can be nailed on to the frame members, then covered with a scratch coat of plaster. The brick veneer is then applied and the space between Ecod and bricks is slushed full with mortar so that the brick veneer is an integral part of the wall and the construction absolutely water tight.

These are only two of the many Reynolds Architectural Products which architects are now specifying to give the public better values. We would welcome the opportunity to send you more detailed literature about all of them.

For complete specifications see 1935 Sweets, Catalog 11, Section 13

*Trade Mark Reg. U. S. Pat. Off.

REYNOLDS ARCHITECTURAL PRODUCTS . . .

- **Reynolds Metallation** — Efficient insulation at 50% less cost.
- **Reynolds Ecod Fabric** — The insulated, reinforced Plaster Base.
- **Reynolds Metal Wall Coverings** — Decorative, washable, moisture-proof.
- **Reynolds Liquid Metallation** — Protective, bright, the modern paint miracle.

REYNOLDS CORPORATION

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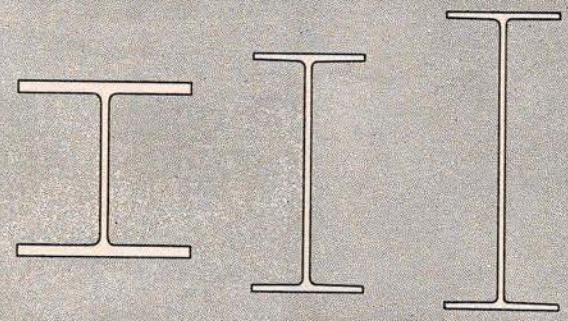
Offices in Principal Cities

THE ARCHITECTURAL RECORD

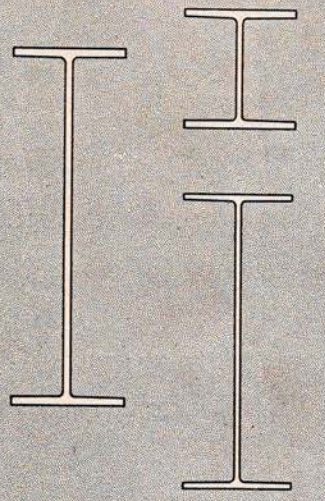
VOLUME 78 NUMBER 5 NOVEMBER, 1935

Published monthly by F. W. DODGE CORPORATION, 115-119 West 40th Street, New York. Truman S. Morgan, President; Sanford D. Stockton, Jr., Secretary; Howard J. Barringer, Treasurer. Yearly subscription: United States and Possessions, $3.00; Canada and Foreign, $5.00; Single Copy, 50c. Member Audit Bureau of Circulations and Associated Business Papers, Incorporated.

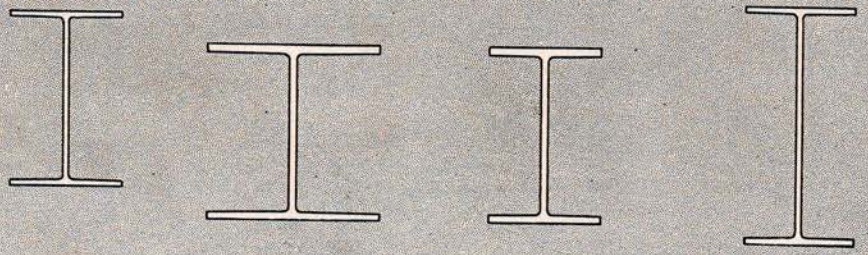
Where loads are light



BETHLEHEM LIGHT SECTIONS



bring important savings



WHEN a building is designed to meet live floor loads that are relatively light, the problem of using steel most economically is not solved by wider spacing of regular heavy sections. That would necessitate an unduly thick floor slab, adding to cost and creating extra dead load for the steel to carry.

Bethlehem Light Sections fill the need of designers for sections that, with the depth required for the span, can be spaced closely to provide economical thickness of floor slab, without using more steel than is needed to carry the load. Supplementing Bethlehem's line of heavier structural shapes, these light sections provide a far greater selection for working out economical, balanced designs.

Not only in floors do Bethlehem Light Sections find application. As purlins, as struts between columns, as well as for columns in upper stories where loads are lighter, these light sections open the way to more economical use of steel.

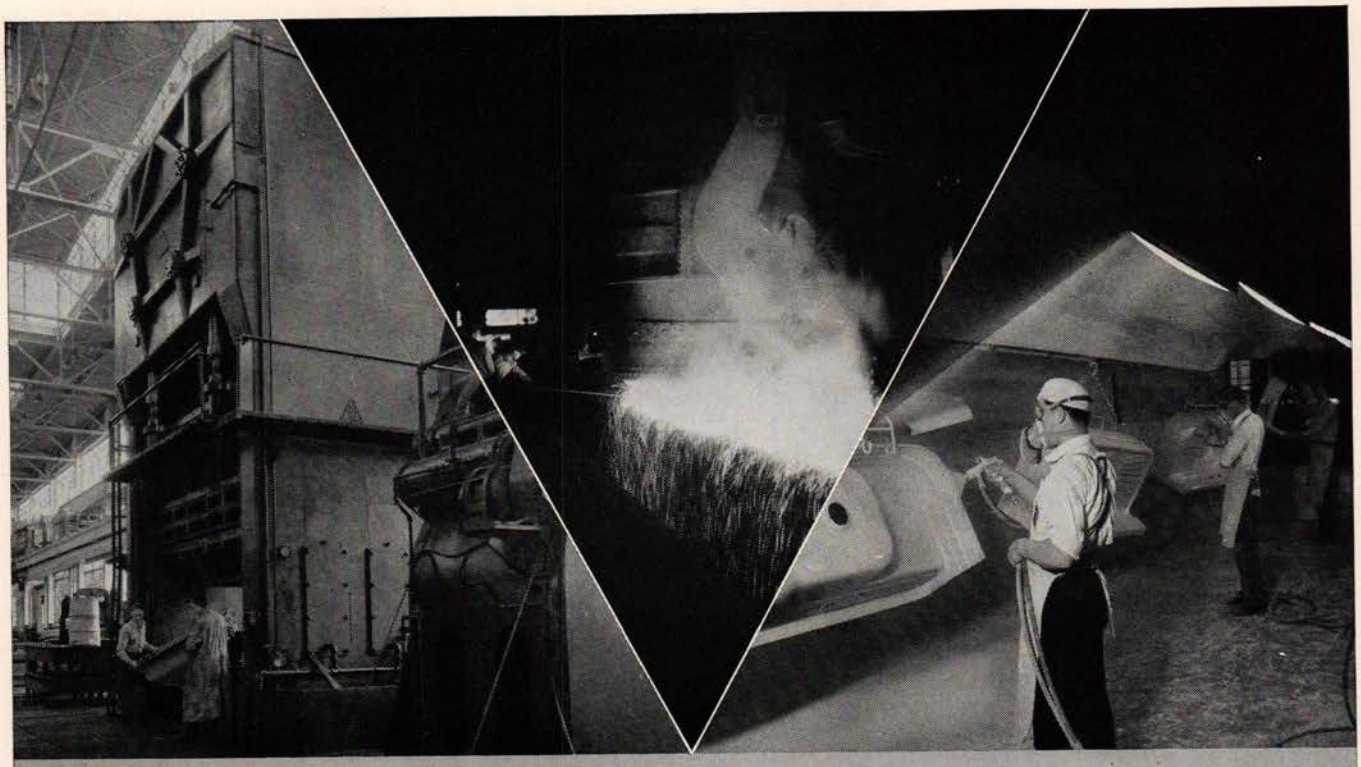
It is suggested that structural designs be reviewed thoroughly with an eye to the possibilities in Bethlehem Light Sections. The economies they offer are so substantial that it is important not to overlook any places where they might be used.

Bethlehem District Offices are located at Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Kansas City, Milwaukee, New York, Philadelphia, Pittsburgh, San Antonio, St. Louis, St. Paul, Washington, Wilkes-Barre, York. *Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Seattle, Los Angeles, Portland, Salt Lake City, Honolulu. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

GENERAL OFFICES: BETHLEHEM, PA.



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a new kind of Plumbing Ware

HERE is real news in plumbing ware. New features, hitherto impossible to obtain are now made possible through the combined research and skill of three great industries — steel, stamping and ceramics.

First, this new formed metal ware weighs about one-third as much as the former cast iron ware — yet has even greater strength. In a bathtub this represents a saving in dead weight of more than 200 pounds. In a hotel or apartment calling for hundreds of installations it affords real savings in construction costs — and this lighter weight of course makes for considerably easier handling in both transport and installation.

Second, the possibilities of design and color are much greater with pressed metal than with cast iron. New smart styling and actual combinations of colors in the individual piece lend themselves perfectly to the architect's requirements from the decorative standpoint.

Third, the porcelain enameling qualities of the famous Armco INGOT IRON give a new and more lasting lustre which was impossible to obtain on cast iron. This makes for easier cleaning — a boon to the housewife.

To the architect, the builder, the plumber and the owner, this new kind of plumbing ware offers many advantages — without adding to the cost. Armco does not manufacture the plumbing ware; but has helped to bring this new industry into being. We shall be glad to place you in touch with manufacturers who are making and building demand for this new equipment.

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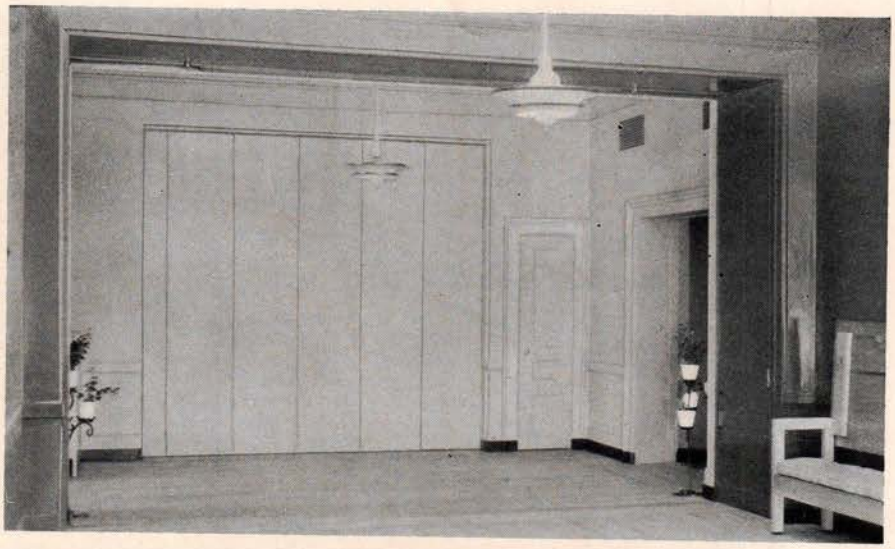
a.c.f.



FAIRHURST *folding* WALLS

The Fairhurst Patent Unitfold and Duofold folding walls are widely used in schools, churches, clubs, hotels, Y.M.C.A.'s, public buildings, apartments, and private residences wherever division of space, or multiplicity of use, is required. The installation shown above is in the Webster Apartments, New York, N.Y. In the upper illustration the nearer Unitfold is opened back out of sight, while the further one is locked in the closed position. Note the absence of visible hardware, and the complete architectural harmony with the surroundings. These Fairhurst folding walls use no hinges or bolts; can be locked in place with one key; and may be fitted at any point with shuttle or communicating doors.

AMERICAN CAR AND FOUNDRY COMPANY

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Kindly send full particulars of a.c.f. *Fairhurst Unitfold folding walls* ( ) a.c.f. *Fairhurst school wardrobes* ( )

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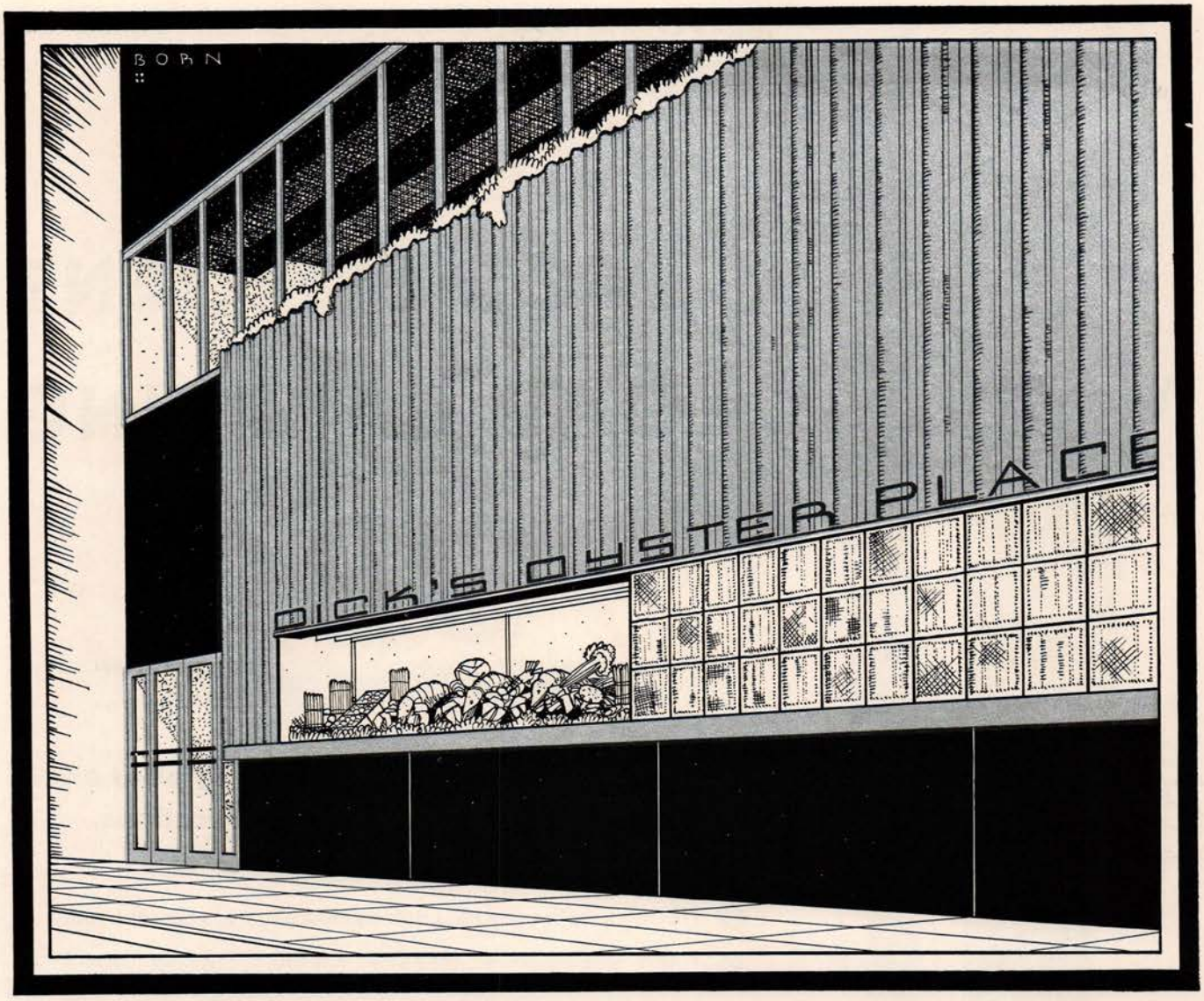
Also a.c.f. Fairhurst school wardrobes. Strong, sturdy, space-saving. Widely used by leading schools.



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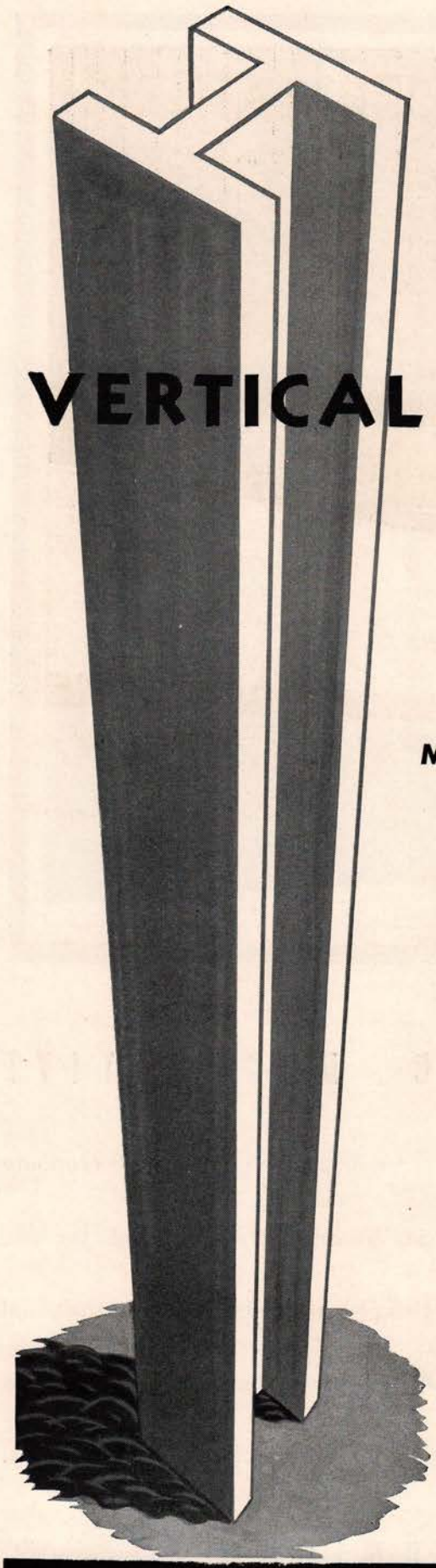
The incomparable versatility of extruded Alcoa Aluminum is a fertile source of structural economy and of decorative splendor ★ Wide, extruded shapes, butted side by side, give this facade texture, brilliance, exceptional advertising value ★ Doors and windows employ extruded shapes in the usual structural manner ★ Several thousand standard shapes are available; special shapes may be produced at very reasonable cost ★ Aluminum Company of America, 1867 Gulf Building, Pittsburgh, Pa.

ALCOA ALUMINUM



FOR EFFICIENT VERTICAL LOAD CARRYING

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SECTIONS

May be used as combination bearing piles and columns in a wide range of applications. Particularly notable are these:

1. Where exceptionally hard driving conditions are encountered.
2. Where salt water or seaboard exposure requires careful protection against weathering, or boring worms.
3. Where the scouring effects of stream-borne sand and rock must be guarded against.
4. Where heavy loads must be carried on individual piles.
5. Where piles must act as free standing columns of great height.
6. Where substantial bottoms are difficult of access.
7. Where the pile may be required to resist lateral forces, causing bending stresses.

In these and in many other situations, the steel bearing pile is serving both bridge and building engineers. More complete information regarding the various sections available and their physical characteristics will be furnished upon request.

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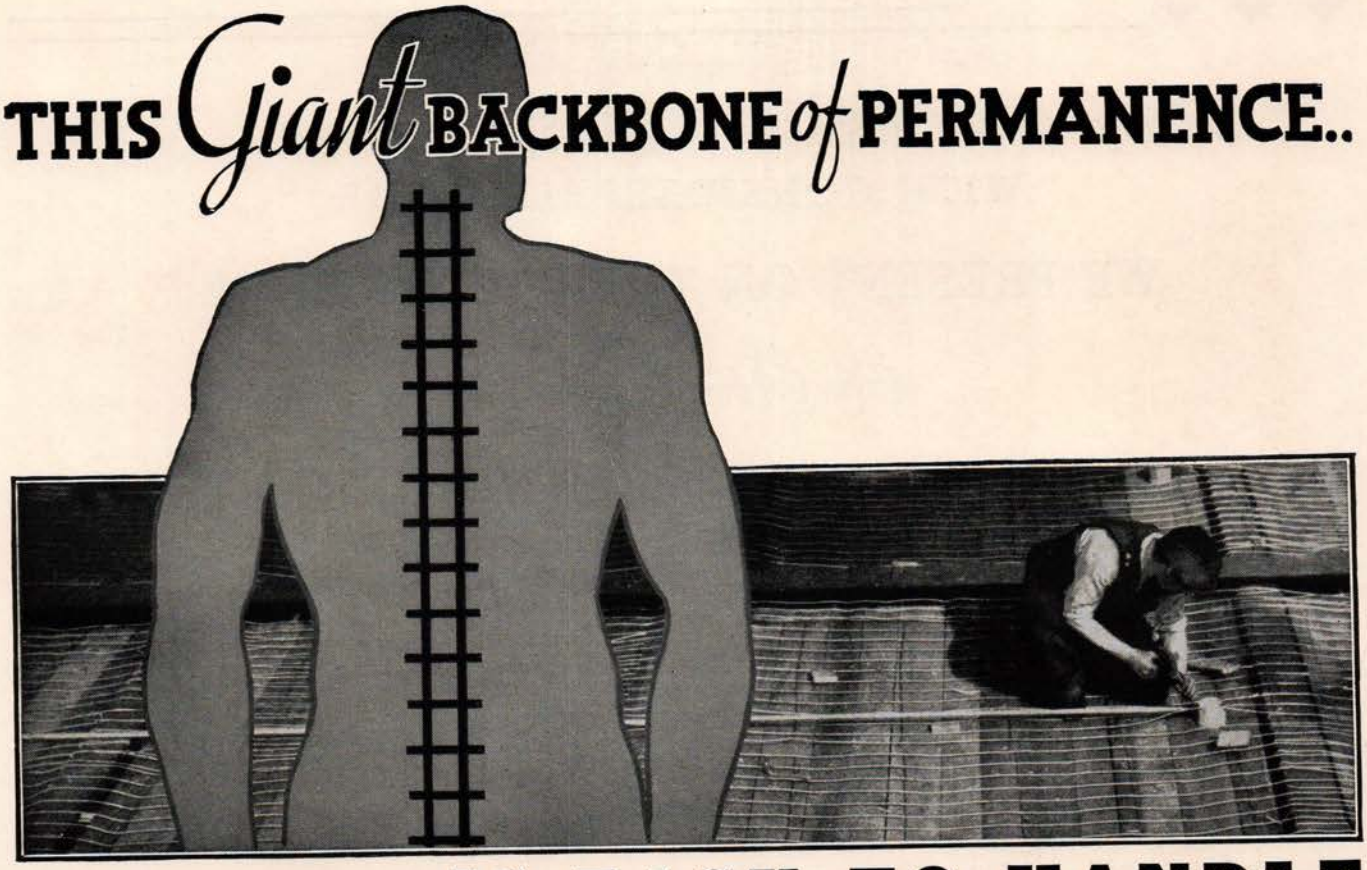

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BUILD for tomorrow—but in building for the future, do not overlook today's need for speed and economy in floor slab construction. In this connection—you will find American Steel & Wire Company Wire Fabric the ideal reinforcement material. Available in rolls—it is exceptionally easy to handle—and keeps labor costs down to a minimum. This Wire Fabric—of highest quality and perfected design—reinforces the concrete slab in every direction. It provides continuous action from one end of the structure to the other—plus high elastic limits and ultimate tensile strength due to cold drawing. It is truly called "The Giant Backbone of Permanence." Interesting literature is available covering the use of this material in the nation's leading structures. This—along with technical data—will be forwarded on request.

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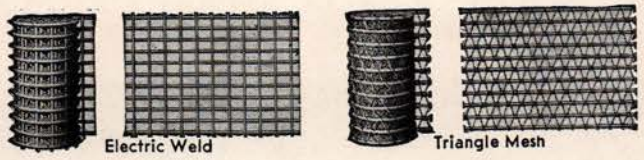

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WITH CONSIDERABLE PRIDE

WE PRESENT ON THE FACING PAGE

An Advertisement for

ATLAS WHITE PORTLAND CEMENT

Condensed from a letter to us from

GRANT & BRUNER, Ltd.

ARCHITECTS AND ENGINEERS

(Edwin L. Bruner, Architect)

LOS ANGELES

UNIVERSAL ATLAS CEMENT CO.

United States Steel Corporation Subsidiary

208 SOUTH LA SALLE STREET, CHICAGO

Full view of the Helms Bakeries project, finished in stucco marked off to resemble stone, with trim and ornamentation of cast stone. The highly successful use of Atlas White portland cement for both stucco and cast stone on this project prompted Grant & Bruner, Ltd., to send us the unsolicited letter condensed on the facing page. Credit for results achieved is largely due to the vision and skill of the architects and engineers on this $1,000,000 building project.

SCULPTURED *in* STUCCO

(Condensed from a letter from Grant & Bruner, Ltd.)

"HELMS BAKERIES, Los Angeles, accepted the counsel of their architects and engineers as to what could be accomplished with a combination of stucco and cast stone; provided that properly selected materials and expert craftsmen were employed and nominal maintenance faithfully performed.

"Atlas White portland cement was specified.

"The credit for results achieved is due to Paul H. Helms, President of Helms Bakeries, whose understanding could visualize the outcome of these recommendations; to Ed. Westberg, Los Angeles, plastering contractor; and to Watkins Company, Los Angeles, cast stone manufacturer.

"Credit is likewise due to the expert craftsmen on the job, without whose skill and painstaking effort a satisfactory finished result is impossible on any job, specifications, first-class materials and supervision notwithstanding.

"And also credit is due to Atlas White portland cement, used throughout, both in the stucco and the cast stone."

ATLAS WHITE PORTLAND CEMENT

Plain and Waterproofed

But the Front appeals to the Eye . . . it's the FLOOR that brings in the money!

The Robertson Steel Floor System, developed after years of study at famous Mellon Institute of Industrial Research, is in reality, a super-strong steel floor which contains, in itself, a complete system of protected wire raceways. These raceways permit of such complete electrification of the floor that electrical outlets can be placed every six inches over the floor area if desired, without the costly tearing up of floor surface which the installation of outlets in ordinary underfloor duct systems entails.

ONLY too frequently, a building's "front" is emphasized at the expense of its utility . . . in striving for impressiveness of appearance, utility factors, of equal importance to the building's success, are sometimes slighted. Among these important utility factors, the building's *floors* play a leading role. They alone produce the building's revenue. They determine the extent and convenience of the electrical facilities offered to tenants. And they largely determine the length of the building's profitable life.

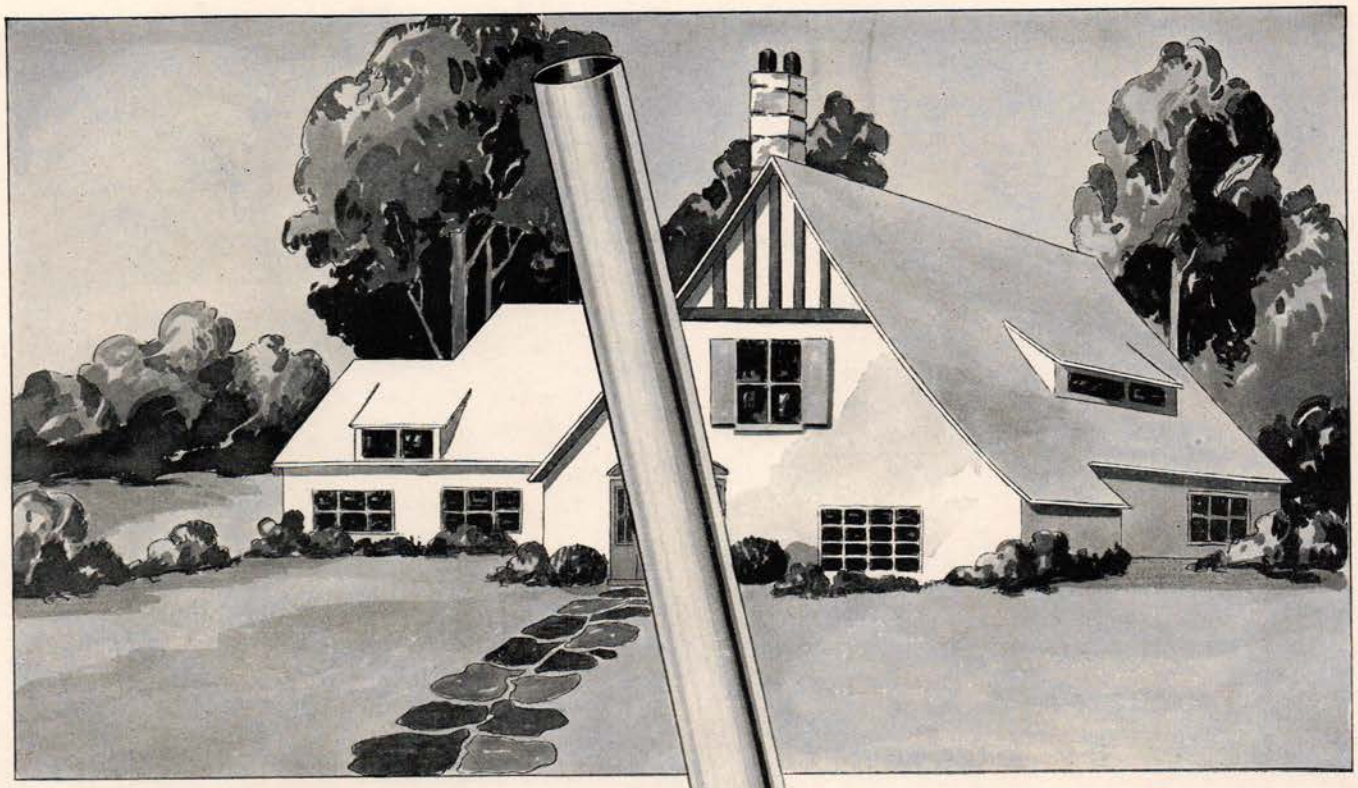
Therefore, floors obviously deserve the most careful consideration from architect, builder, and building owner. And such serious consideration inevitably leads to the newest and most modern method of floor construction . . . The Robertson Steel Floor System.

Electrically, the Robertson Floor is so completely flexible that it can meet *all* electrical requirements that the present or the future may demand of it. More than that, this flexibility is such that it is readily *available* for use without the trouble and expense usually involved in utilizing the partial flexibility of other types of floor construction. Yet this perfect electrical provision is obtained at a cost that is little, if any, higher than that of the ordinary bare floor alone. Expensive underfloor ducts are eliminated and thereby big cost savings result.

The Robertson Floor is stronger, lighter, more compact. It increases fire safety . . . lowers accident hazards. And it speeds up large building erection by 20% to 30%!

Every architect, contractor and engineer will find our brochure "New Life for Buildings" and our special technical bulletin on the Robertson Steel Floor System extremely instructive and valuable. Send for your free copies. H. H. Robertson Co., Pittsburgh, Pa.

ROBERTSON
STEEL FLOOR SYSTEM



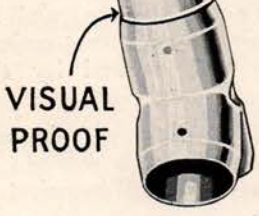
a house is AS YOUNG AS ITS ARTERIES!!

THE arteries of any building are its plumbing or heating conducting system. Upon their perfect operation depends the maintenance of comfort and convenience in living conditions that any home owner or tenant has the right to expect. The handsome and ultra modern bathroom and kitchen fixtures so much in vogue today can only reach their maximum efficiency if the service they render is in keeping with their design. Their smooth, trouble-free operation must not be impaired by rust-stained, slow running water and clogged pipes.

A BUILDING MAY BE YOUNG IN APPEARANCE, BOTH INSIDE AND OUT—BUT WOEFULLY ANCIENT IN ACTUAL CONVENIENCE. IT IS, AFTER ALL, AS YOUNG AS ITS ARTERIES.

A radiator may be the last word in design but if installed with a piping system that in a few short years will rust, leak and clog will gradually fail in its function as an efficient heating unit.

An installation of STREAMLINE Copper Pipe and Fittings will maintain these modern fixtures in perfect working capacity year in and year out. It will put new life in old buildings and add the latest improvement to new structures. This threadless, rust-proof, clog-proof and leak-proof copper system for plumbing or heating is revolutionary and will actually outlast the building itself. It costs very little more than corrodible materials which sooner or later must be replaced.



The STREAMLINE Fitting is the original solder type fitting and the only one that possesses the valuable proof ring feature constituting VISUAL evidence of a leak-proof, perfectly bonded joint, without an actual pressure test.

A catalog of STREAMLINE products is already on file in your office. You will find it in Sweet's or write for our A.I.A. File 29 B4.

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all heated by

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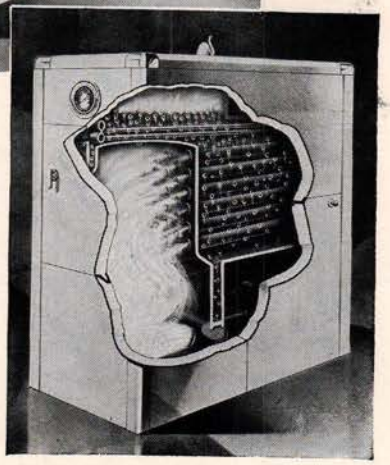
OIL-EIGHTY AUTOMATIC

STEEL OIL-BURNING BOILERS



There is deep significance in this selection by Jordan Marsh Company of one make of boiler for seven different sized homes, financed by seven different sized incomes. The modest home demanded economy first—the luxurious residence required brilliant performance and beauty, as well as adaptability for use with a well-known air-conditioning unit. All of these considerations are equally well served by the Oil-Eighty Automatic.

In addition these homes will all get year-'round INSTANT HOT WATER without the need of a storage tank—another outstanding feature of this modern oil-burning boiler.

Built throughout of corrosion-resistant copper-steel, designed as only steel construction will permit, on the scientifically correct lines for the burning of oil, these boilers are proving in all sections of the country the true value of oil as fuel, and the true importance in the home of modern automatic heat.

Built in thirteen sizes—ample to fit any residence from the small home to the large estate. (Other types for larger installations.)

WORKS WITH ANY BURNER

In thousands of installations, over two hundred and fifty different makes of oil burners are doing their best work, teaming up with the Fitzgibbons Oil-Eighty. The burner may be placed behind the panel, inside the jacket, away from damage, prying fingers, dust or dirt — and where any combustion sound is muffled.

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NEW BOOKS FOR THE ARCHITECT'S LIBRARY

A HOUSING PROGRAM FOR THE UNITED STATES. *A report prepared for the National Association of Housing Officials. Publication No.* 48, *Public Administration Service,* 850 *East* 58*th Street, Chicago, Ill.* 41 *pages.* 50 *cents*

During the fall of 1934, the National Association of Housing Officials sponsored a visit to fourteen American cities by a group including Sir Raymond Unwin, former President of the International Federation for Housing and Town Planning; Ernst Kahn, economist and former manager of housing projects at Frankfurt, Germany; Miss Alice Samuel, a representative of the British Society of Women Housing Estate Managers; Henry Wright, planner and designer of low-cost housing projects in this country; and Ernest J. Bohn, of the Cleveland City Council, president of the Association. At the conclusion of the tour, a report advocating government subsidies was drafted and a summary presented to American leaders in the housing movement. Many requests were received for the full report—largely drafted by Sir Raymond Unwin—upon which the summary was based. This is now made available under the above title. An appendix gives developments in the national housing program since the issuance of the preliminary pamphlet.

WHAT SLUM DWELLERS WANT IN HOUSING. *Published by the Henry Street Settlement, New York, N. Y.* 10 *cents*

The importance of this small pamphlet in housing literature is indicated by the fact that it sets forth standards of housing actually desired by slum dwellers living in a typical block in the lower East Side of New York City, and not the minimum recommendations usually made for such a lower-income group by housing experts and reformers. The investigation was made as part of the research work of the Henry Street Settlement, under the direction of Duane V. Ramsey and Abraham Goldfeld of the Lavanburg Foundation.

The block selected for the census—bounded by Henry, Montgomery and Clinton Streets, and East Broadway—housed 1,027 individuals of whom 246 were children under sixteen years of age. Because of the practice of doubling up, a total of 234 families was recorded in the 219 households in the entire block.

Approximately one-third of the families did not indicate discontent with present accommodations, so the investigators' conclusions are based on the opinions of the two-thirds group who did express dissatisfaction:

> "A family of four or five persons would have four or five rooms including a kitchen, a bathroom, a living room, two or three bedrooms, and in some cases a dining room, though many indicated a preference for a large kitchen which would serve also as a dining room. This family would want light, ventilation, and elevators in buildings more than three stories high. There would be central steam heating instead of individual coal or gas stoves, and both hot and cold water. The toilet would be in the bathroom instead of in the hall. The great majority would not accept a shower bath as substitute for a bath tub, and they would want their bath tub in the bathroom rather than in the kitchen as is frequently the case at present. The regard which they have for their bath tubs would seem to refute the legend that working-class families use their bath tubs as a storage place for coal. There would be adequate refrigeration. There would be built-in cupboards, clothes closets and numerous electric outlets. Over 75% of the families, a figure corresponding closely to the group now doing laundry at home, say they would use community laundry facilities. . . .
>
> "There would need to be adequate provision for recreation and cultural activities in any new large-scale housing project. The home plays an important rôle as a recreational center with radios in two-thirds of the homes, pianos in some, and pets in others. It also serves as a place to read and rest, as a place for the children to study and the family to play games together. But outside the home, there should be nurseries, kindergartens, indoor playrooms and playgrounds; gymnasium facilities and swimming pool if possible; clubrooms for children and adults; a library, art studios, music studios, and rooms for dramatics; and a theater for dramatic productions, movies, recitals, forums, meetings, etc. The district in which these people live provides all the facilities mentioned above in varying degrees of adequacy, and through participation in the activities suggested the people have come to appreciate them. . . ."

TOOLS OF TOMORROW. *By Jonathan Norton Leonard. The Viking Press,* 18 *East* 48*th Street, New York City.* 310 *pages. Illustrated.* $3

As a synopsis of new developments in industrial technology, this book is more immediately important than its title may indicate. It furnishes an excellent array of facts—notwithstanding certain serious omissions—with which to appraise the extent of industrialization in the fields of transportation and communication and building construction.

The author's discussion of metallography—the science of creating new light metals like the aluminum and magnesium alloys—is particularly valuable as an illustration of how the structural designer no longer has to depend on the natural materials alone, but is becoming increasingly able, with the aid of modern industrial technique, to make use of synthetic products which are themselves designed to meet specific use requirements.

THREE MONOGRAPHS ON COLOR: (1) COLOR CHEMISTRY; (2) COLOR AS LIGHT; (3) COLOR IN USE. *Published by the International Printing Ink Corporation,* 75 *Varick Street, New York City.* $10

These three monographs represent the collective writing of the IPI research staff, made after many months of experimentation and after consultation with chemists, physicists, and artists. Each monograph sets forth a different point of view—the chemist's, the physicist's, and the psychologist's or artist's—but together they make a correlated approach to the problem of defining a scientific color language. Numerous handsomely printed illustrations and a technical but easily readable text emphasize the necessity and value of precision in measuring specific colors, not only for the user but also for the manufacturer who must produce objects involving color.

CALENDAR OF EXHIBITIONS AND EVENTS

November 4	Lecture by Frank Lloyd Wright at Cosmopolitan Club, New York City. Auspices of Decorators Club.
November 18	Lecture by Fiske Kimball at Cosmopoiltan Club, New York. Auspices of Decorators Club.
December 2	Lecture by Karl Freund, art critic, at Cosmopolitan Club, New York City. Auspices of Decorators Club.
December 4, 5	Twelfth semi-annual meeting of The Producers' Council, Inc., in Detroit.
December 31	Closing date of contest for poster to stimulate European travel sponsored by Institute of Foreign Travel, 80 Broad Street, New York City.
1936	
January 27-31	Fourth International Heating and Ventilating Exposition, Chicago.
February 10-19	Architectural League Exhibition, Grand Central Palace, New York City.
June 6	Opening of the Texas Centennial Central Exposition in Dallas, Texas.

NEWS OF THE FIELD

Warden H. Fenton, architect, formerly of Hiss and Weekes, announces the opening of offices for the practice of architecture at 101 Park Avenue, New York City.

Paul Trapani, architect, announces the removal of his office to 521 Fifth Avenue, New York City.

Lucas Edward Bannon announces the opening of an office for the general practice of architecture at 16 Church Street, Paterson, N. J.

Ollivier J. Vinour, architect, Atlanta, Ga., is now associated with L. Phillips Clarke, architect, 6010 S. Olive Avenue, West Palm Beach, Fla. Correspondence should be addressed to Mr. Vinour at P. O. Box 2023, Palm Beach, Fla.

Robert D. Frost has opened a studio of architectural sculpture at 407 South Jackson Street, Jackson, Mich.

Sanford W. Goin, architect, announces the opening of an office for the general practice of architecture at 230 East Main Street, South, Gainesville, Fla.

Geves G. Kenny and Lawrence J. Stitt (Assoc.), 29½ East Second Street, Chillicothe, Ohio, announce that they have resumed active general practice of architecture and are specializing in dairy building construction.

Maurice J. Sullivan has been appointed critic in design, Department of Architecture, Agricultural and Mechanical College of Texas. He is a member of the American Institute of Architects, a past president of the South Texas Chapter, and has had a long practice in Houston. Samuel B. Zisman, who has been an instructor in architecture at the Massachusetts Institute of Technology during the last five years, will have direction of the elementary work in design.

PRODUCERS' COUNCIL MEETING

The twelfth semi-annual meeting of The Producers' Council, Inc., 19 West 44th Street, New York City, will be held in Detroit on December 4 and 5. The sessions, open to the public, will be devoted to a discussion of the increased cooperation between governmental agencies, financing institutions, architects, builders, and material manufacturers to promote quality in the resurgent construction industry.

THE DESIGN LABORATORY

Gilbert Rohde, designer, will direct a school of design in New York City to be known as the Design Laboratory, patterned after the famous Bauhaus of Germany and free to adults as an art service project of the Works Progress Administration. It opens November 11 at the Y.M.H.A. building, and will offer instruction in industrial design, graphic arts and fine arts.

POSTER CONTEST

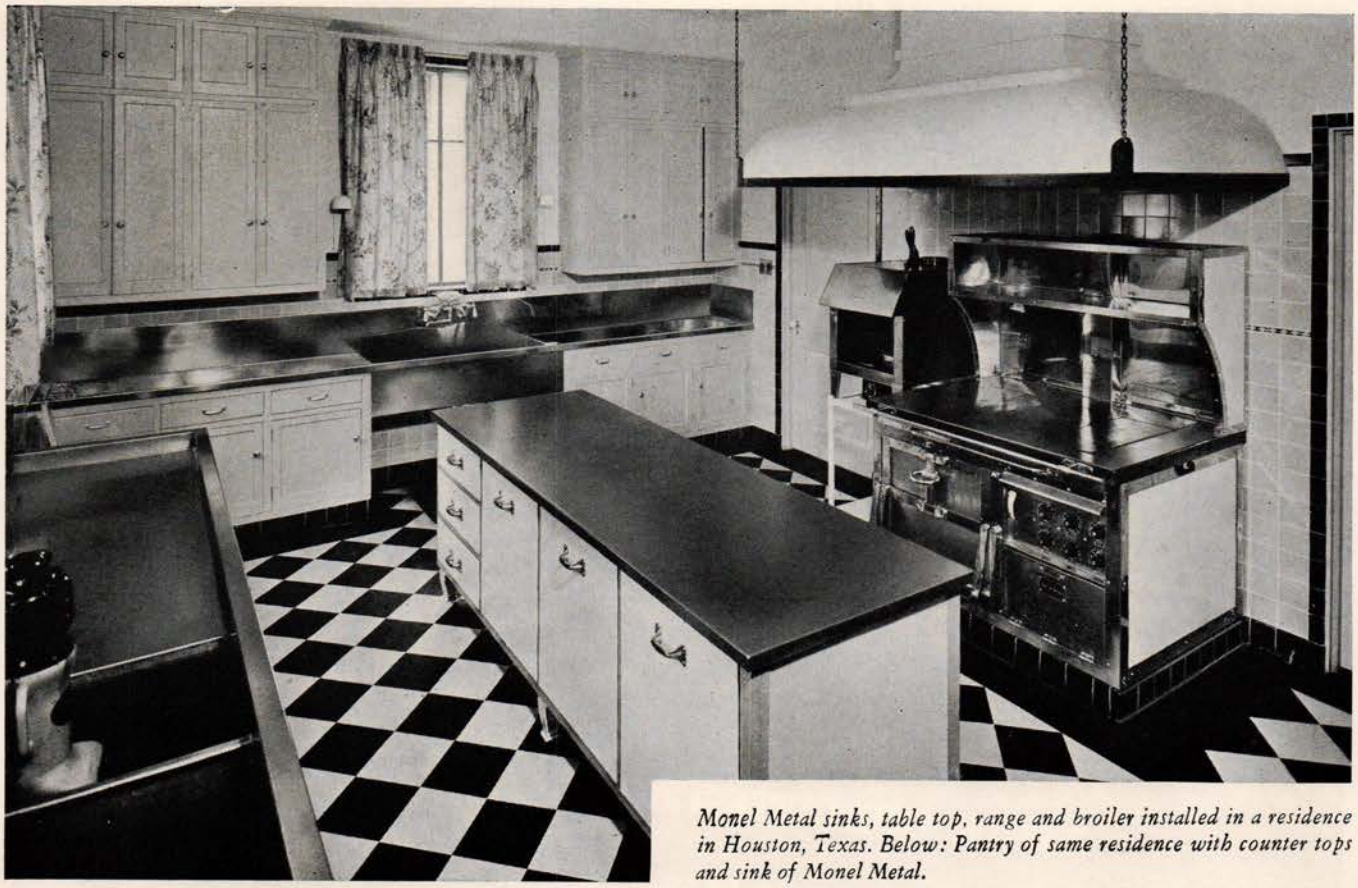
A contest for a poster to stimulate European travel, with prizes totaling $800 and a round trip passage to Europe, is announced by the Institute of Foreign Travel, 80 Broad Street, New York City. The contest will be open to artists of the United States and Canada, and three prizes, the first $500 and a round trip passage to Europe, the second $200 and the third $100, will be awarded. Entries must reach the Institute not later than December 31.

WHEELWRIGHT FELLOWSHIP AT HARVARD

The President and Fellows of Harvard University have announced a gift of $100,000 as the foundation for a fellowship in architecture, in memory of Arthur W. Wheelwright, of the Class of 1887: The yearly income (approximately $3,500) is to be awarded annually for travel and study outside the United States to some student who has completed a satisfactory course in Architecture; this student to be chosen on his complete record rather than by any one test, examination, or competition. The recipient shall not be required to account for the expenditure of the money nor to make any report concerning his travel and studies.

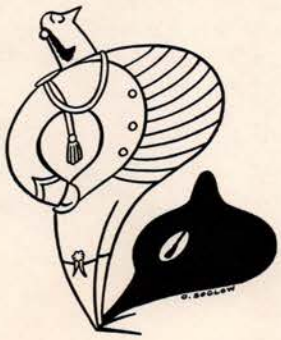
DECORATORS CLUB LECTURES

A series of lectures has been arranged by the Decorators Club, to be held at the Cosmopolitan Club, New York City. Frank Lloyd Wright will be the speaker on November 4. Dr. Fiske Kimball, director of the Pennsylvania Museum of Art, will be the speaker on November 18. Karl Freund, art critic, will be the speaker on December 2. Subscriptions for the series are $5.50 and may be secured at the Decorators Club office, 745 Fifth Avenue.



Monel Metal sinks, table top, range and broiler installed in a residence in Houston, Texas. Below: Pantry of same residence with counter tops and sink of Monel Metal.

For a Tycoon's Kitchen



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For complete information and prices, get in touch with the distributors, Whitehead Metal Products Co. of New York, Inc., 304 Hudson Street, New York, N. Y., or their branches in principal cities.

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THE NEXT TIME YOU ARE IN NEW YORK

...stop in at the Architects Building Café

THE next time you are in the Architects Building at 101 Park Avenue, stop in at the Café Forum. We want you to see the floor of Sloane-Blabon Linoleum, but you may get some other decorative ideas as well from this attractive room designed by Don Schillman.

Here is what Mr. Schillman says about this installation: "The Sloane-Blabon floor in terra cotta and black harmonizes with the black and gold room of the Café Forum, and is especially effective when used in this contemporary treatment. The design of the floor follows the shape of the bar and throws into relief the furniture and fixtures. Sloane-Blabon Linoleum is a very good economical medium for this job and it was worked into a pleasing design while still keeping the costs down; in fact, a floor-covering can either make or break a job insofar as beauty goes. The flooring withstands wear and is particularly practical where so many people put it to constant use."

• • •

The Café Forum is but one of many recent outstanding Sloane-Blabon installations. We shall be glad to send you a list of others, together with linoleum samples, and any information which may help you solve your linoleum problems. Write W. & J. Sloane Selling Agents, Inc., 577 Fifth Ave., N. Y.

SLOANE-BLABON LINOLEUM

Café Forum walls are mirrors, black glass and colorful murals. Bar is black and chromium. Floor is SLOANE-BLABON LINOLEUM in black and terra cotta Don Schillman, designer

NEXT MONTH . . . In December there will be a special issue covering in detail the restoration of Colonial Williamsburg. The work of restoring the old Virginia buildings to their original condition was done by Perry, Shaw and Hepburn, architects, with funds supplied by the Rockefeller Holding Corporation. The historical significance of this project is analyzed in an article by Fiske Kimball, the architectural development of the general restoration by William G. Perry, the town planning and landscaping aspects by Arthur A. Shurcliff, and the color decorations and interior furnishings by Mrs. Susan Higginson Nash. The Portfolio of Williamsburg Buildings is made up of a large number of photographs by F. S. Lincoln.

INSULATION . . . In the Portfolio illustrations of the house designed and owned by Robert M. Brown in Chestnut Hill, Philadelphia, which appeared in the April 1935 issue (pages 272-278) of The Record, the thermal conductance of the wall construction was given as .07 B.t.u. This value is criticized by A. S. Bull, manager of sales engineering and development, The Insulite Company, who writes:

"According to the methods of computation recommended by the American Society of Heating and Ventilating Engineers in their official guide for 1935, we calculate the thermal efficiency of the wall to be .166 B.t.u. per square foot per hour per degree Fahrenheit. This is the over-all thermal transmission coefficient and is to be contrasted with the value of .07 B.t.u.'s as shown in the sketch appearing on page 278 of The Record.

"Our calculations are based on the following total of resistance values offered by the different parts of the structure:

Exterior surface	.17
3/4" Redwood siding	.94
3/4" Sheathing	.94
Double foil faced air space	2.44
3/4" Redwood interior lining	.94
Inside surface felt	.61
Total	6.04

"The reciprocal of 6.04 is 0.166, representing over-all thermal transmission in B.t.u.'s per square foot per hour per degree Fahrenheit temperature difference."

Photograph by F. S. Lincoln

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THE

ARCHITECTURAL RECORD

THE FEDERAL HOUSING ADMINISTRATION ARCHITECT

By FREDERICK M. BABCOCK, Chief, Underwriting Section, Federal Housing Administration

One hundred and seventy-two Staff Architects and eight hundred and seventy-one Fee Architects are now employed by the Federal Housing Administration. Why? What do they do? The answers to these questions constitute one of the most significant stories to be found in the current world of architecture. The architectural fraternity is examining a new field of activity.

Title II of the National Housing Act established a system of Mutual Mortgage Insurance applicable to residential properties containing not more than four livable family units. Lenders of mortgage funds are insured against losses which may result from investments in this type of mortgage. The Federal Housing Administration does not operate on public funds but on premiums it collects. It safeguards the interests of private investors and the risks which it underwrites must be carefully selected. Furthermore, the Act requires that "Mortgages accepted for insurance..... shall be so classified into groups that the mortgages in any group shall involve substantially similar risk characteristics."

Classification of dwelling mortgages in accordance with risk characteristics has been accomplished by means of a risk rating procedure. This system is based on the idea that mortgage risk is an entity and capable of being measured. When a mortgage is submitted for consideration there is a substantial list of risk elements which require analysis. The Federal Housing Administration has found that these risk elements can be properly analyzed when they are grouped under several general categories of risk. There are five such categories as follows:

1. *THE PROPERTY*: Which refers to all those elements of risk introduced by the plot plan, the architectural design and attractiveness, the soundness of construction, and the livability and functional aspects of the plan and the general ensemble.
2. *THE NEIGHBORHOOD*: Which refers to those elements of risk introduced by the community as such.
3. *THE RELATION OF PROPERTY TO NEIGHBORHHOD*: Which refers to those elements of risk introduced by the lack of balance and correct relationship between the property and the market in which it is expected to sell or rent.
4. *THE BORROWER*: Which refers to the financial prospects, credit standing, and integrity of the mortgagor, considered in terms of his relationship to the mortgage transaction and his program of home acquisition.
5. *THE MORTGAGE PATTERNS*: Which sums up the relationship between the quality of the

·PROPERTY·

RATING OF PROPERTY:

(Assuming repairs, or alterations, or additions described in exhibits accompanying Mortgagors' Description of Real Estate or listed under "(l)" on the reverse side hereof, have been completed)

	FEATURE	REJECT	1	2	3	4	5	RATING
Fitness	GENERAL LAYOUT	0	3.0	6.0	9.0	12.0 X	15.0	12
	DESIGN OF PROPERTY	0	1.6	3.2	4.8 X	6.4	8.0	4.8
	SUITABILITY TO CLIMATE	0	1.4	2.8	4.2 X	5.6	7.0	4.2
Function	LIVABILITY	0	3.0	6.0	9.0	12.0 X	15.0	12.
	LIGHT AND AIR	0	1.6	3.2	4.8 X	6.4	8.0	4.8
	MECHANICAL EQUIPMENT	0	1.4	2.8	4.2	5.6	7.0 X	7.
	ACCESSORY BUILDINGS	0	.6	1.2	1.8	2.4 X	3.0	2.4
	SPECIAL EQUIPMENT	0	.4	.8	1.2 X	1.6	2.0	1.2
Durability	STRUCTURAL SOUNDNESS	0	4.0	8.0	12.0	16.0	20.0 X	20.
	RESISTANCE TO ELEMENTS	0	2.0	4.0	6.0 X	8.0	10.0	6.
	RESISTANCE TO USE	0	1.0	2.0	3.0 X	4.0	5.0	3.
							TOTAL RATING	77.4 %

ESTIMATE OF COST REQUIRED TO REPLACE BUILDING IMPROVEMENTS IN NEW CONDITION:

(Assuming contemplated alterations or additions described in exhibits accompanying Mortgagors' Description of Real Estate and those required under "(l)" on reverse side hereof have been incorporated)

TOTAL ..... $.....

Distribution of estimate:

Main building..... $..... | ..... cu. ft. @ ..... cents per cu. ft.
..... sq. ft. @ ..... cents per sq. ft. (Total floor area)

Garage..... $.....

Other improvements, outbuildings, landscaping, etc. $

·NEIGHBORHOOD·

RATING OF NEIGHBORHOOD:

FEATURE	REJECT	1	2	3	4	5	RATING
STABILITY OF THE NEIGHBORHOOD	0	5	10	15	20 X	25	20
PROTECTION FROM ADVERSE INFLUENCES	0	4	8	12	16 X	20	16
ADEQUACY OF TRANSPORTATION	0	3	6	9 X	12	15	9
APPEAL OF THE NEIGHBORHOOD	0	2	4	6	8 X	10	8
SUFFICIENCY OF UTILITIES AND CONVENIENCES	0	2	4	6	8 X	10	8
LEVEL OF TAXES AND SPECIAL ASSESSMENTS	0	2	4	6 X	8	10	6
PRESENCE OF CIVIC, SOCIAL, AND COMMERCIAL CENTERS	0	1	2	3	4	5 X	5
TOPOGRAPHY AND SPECIAL HAZARDS OF NEIGHBORHOOD	0	1	2	3	4 X	5	4
						TOTAL RATING	76 %

·RELATION OF PROPERTY TO NEIGHBORHOOD·

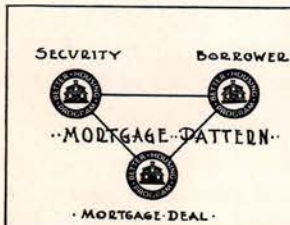
RATING OF RELATION OF PROPERTY TO NEIGHBORHOOD:

FEATURE	REJECT	1	2	3	4	5	RATING
CONFORMITY AS TO TYPE	0	3	6	9	12 X	15	12
CONFORMITY AS TO USEFULNESS AND FUNCTION	0	3	6	9 X	12	15	9
CONFORMITY AS TO PHYSICAL CONDITION	0	2	4	6	8	10 X	10
CONFORMITY AS TO ARCHITECTURE	0	2	4	6	8 X	10	8
RELATIVE ADEQUACY OF UTILITIES AND MUNICIPAL IMPROVEMENTS	0	2	4 X	6	8	10	4
RELATIVE ACCESSIBILITY TO NEIGHBORHOOD CONVENIENCES	0	2	4	6 X	8	10	6
RELATIVE FREEDOM FROM NUISANCES	0	2	4	6	8	10 X	10
CONFORMITY AS TO LOT CHARACTERISTICS	0	2	4	6	8 X	10	8
CONFORMITY AS TO PROBABLE REMAINING USEFUL LIFE	0	1	2	3	4	5 X	5
CONFORMITY AS TO PLACING OF BUILDINGS ON LOT	0	1	2	3	4	5 X	5
						TOTAL RATING	77 %

·BORROWER·

RATING OF BORROWER:

FEATURE	REJECT	1	2	3	4	5	RATING
CHARACTER	0	4.0	8.0	12.0 X	16.0	20.0	12
ATTITUDE TOWARD OBLIGATIONS	0	4.0	8.0	12.0 X	16.0	20.0	12
ABILITY TO PAY	0	4.0	8.0 X	12.0	16.0	20.0	8
PROSPECTS FOR FUTURE	0	2.4	4.8	7.2	9.6 X	12.0	9.6
BUSINESS HISTORY	0	2.0	4.0	6.0	8.0 X	10.0	8
RATIO VALUE OF PROPERTY TO ANNUAL INCOME	0	1.4	2.8 X	4.2	5.6	7.0	2.8
RATIO MONTHLY MTGE. OBLIGATION TO INCOME	0	1.2	2.4 X	3.6	4.8	6.0	2.4
ASSOCIATES	0	1.0	2.0	3.0	4.0 X	5.0	4.
						TOTAL RATING	58.8%



·MORTGAGE DEAL·

RATING OF MORTGAGE PATTERN:

FEATURE	REJECT	1	2	3	4	5	RATING
RATIO OF LOAN TO VALUE (%)	0	30	35 X	40	45	50	35
RATIO OF USEFUL BLDG. LIFE TO LIFE OF MTGE. (%)	0	4	8	12 X	16	20	12
INTEREST RATE (%)	0	3	6	9 X	12	15	9
AMORTIZATION PROVISIONS	0	2	4	6 X	8	10	6
SERVICE CHARGES BY MORTGAGEE (%)	0	1	2	3	4 X	5	4
						TOTAL RATING	66 %

RISK CATEGORIES which are investigated by the Federal Housing Administration architects to determine the rating of property on which loan applications are made. The rating is expressed on a percentage basis, as indicated by sample entries on the charts. In cases where the rating comes out less than 50%, the loan application is rejected.

security, the value of the security, the prospects of the borrower, and the specific terms and provisions in the mortgage transaction.

The first category, "The Property," is given over to the Federal Housing Administration architect as his field of exclusive jurisdiction. It is his duty, by virtue of his particular training, to establish and justify the so-called "Rating of Property."

The rating of property is expressed on a percentage basis. In cases where a property rating comes out at less than 50%, the loan application is rejected and the property is declared ineligible for Mutual Mortgage Insurance. In arriving at the final percentage rating, the architect makes ratings of the eleven features shown on the property rating grid. (This grid is illustrated on page 286.) The eleven features entering into this category are the following:

Rated from the point of view of *fitness*:

1. General layout.
2. Design of property.
3. Suitability to climate.

Rated from the point of view of *function*:

4. Livability.
5. Light and air.
6. Mechanical equipment.
7. Accessory buildings.
8. Special equipment.

Rated from the point of view of *durability*:

9. Structural soundness.
10. Resistance to elements.
11. Resistance to use.

If, in considering one of these features, the architect finds a condition which is definitely substandard, he makes a mark in the column headed "Reject" and this is sufficient to reject the loan application regardless of any other elements in the situation. If, on the other hand, none of the features justifies a reject rating, he makes ratings by placing "X" marks, one for each feature, in the columns to the right of the "Reject" column. For instance, a mark in the column headed "3" indicates that he has found a typical, average, and satisfactory condition. A like indication in the "1" column indicates a fairly poor but acceptable condition. Likewise, a mark in the "5" column indicates an unusually good condition and a lack of risk indicating pronounced superior quality.

After he has placed eleven "X" marks on the grid, he takes the figures in the squares and carries them over and enters them in the column provided for the totals on the right side of the grid. These are the relative weights ascribed to the various risk features. The sum of the weights represents the rating of the property on a percentage basis.

The instructions given the architect in the Underwriting Manual set out the considerations to take into account when making these ratings. For illustration, in rating the first feature, "General Layout," he is told that this feature relates to the plan of improvement of the site, or the manner in which the improvements, including buildings, walks, plantings, and terracing, have been laid out or arranged on the lot. He is instructed to consider the accessibility of garage buildings and other accessory structures, and whether or not the property is cut up into small unusable patches. He also studies the placing and orientation of the buildings, and the degree to which there is a generally harmonious and correct functional relationship between the parts of the property.

In rating "Design of Property" he is instructed that, if the exterior of the house is a simple, direct expression of the plan and of the materials used, its design should rate high. Low rating should be given in the case of houses that are "shirt-front" designs, in which the appearance of the building has suffered from a failure to produce attractiveness. The use of false effects of roofing, false half-timber work, or tricky handling of materials may adversely affect rating as to design.

The Underwriting Manual instructs the architect how to rate "Mechanical Equipment." The presence of the following elements tends towards higher rating: proper design for distribution of heat, ease of operation by householder, avoidance of damage to structure in installation, good workmanship in installation, and apparatus made by well-established manufacturers who can furnish replacement parts.

Under "Structural Soundness" the Manual may be paraphrased as follows: The rating should be influenced by the probability of maintenance cost being high or low. For instance, a tile roof will have a longer life and will involve a lower maintenance cost than a shingle roof. Although brick or stone walls require occasional pointing, the upkeep is likely to be less than for shingles or siding. Fireproof floor construction is likely to require less interior repair than wood-floor construction.

The Manual proceeds along similar lines to outline the bases for rating in the remainder of the features set out above.

The architectural characteristics of properties are unquestionably major factors of mortgage risk and the services of qualified architects are required to assist in determining these risks. Nearly all the capacities of the architect are used when he works in this specific field: his knowledge of functional design, his familiarity with materials, his appreciation of the artistic, his engineering skill, and his sense of selection in determining appropriateness. In rendering such services, however, the architect has had to readjust his point of view to some extent and substitute the investment or financial attitude of mind for the habit of creative thinking. In determining mortgage risk he is not expected to discover means by which to correct or improve design, but he must adapt his qualifications to the purpose of weighing the relative qualities of proposed investments in the form in which he finds them. In the architectural field this means that habits of mind must be changed. Architects have to remember to grade what they find according to quality, not to follow the temptation to change what they find.

In the foregoing we have discussed at some length the duties of the Federal Housing Administration architect in the risk-rating procedure. The architect has other duties which include the making of cost estimates which materially assist the valuators in their appraisals, the making of inspections of new houses during the progress of construction, and the enforcement of compliance with Property Standards and Subdivision Standards established by the Administration.

The Administration has established an "In-Place

Unit-Price Method" of cost estimation with which the architect estimates the replacement cost of a subject property submitted for Mutual Mortgage Insurance. On certain types of properties the cubic foot method of cost estimation is used. The Underwriting Manual describes these methods. The estimate of replacement cost is used for the purpose of guiding the valuators in establishing the values of properties and is the approximate upper limit of the possible valuation of a property. It also serves as a check in assisting the potential borrower to ascertain that he is paying a proper price.

In the case of new building operations, the architect's responsibility continues and he is required to make not less than three construction inspections during the progress of construction. The Federal Housing Administration does not aim to set up a substantial supervision by the architect. These inspections are more or less in the form of that made by the average city's building department, and for the purpose of ascertaining conditions set out in the commitment for Mutual Mortgage Insurance as described in the plans and specifications.

The Administration has established a set of minimum property standards and the architects are required to enforce compliance with them. These standards are considered as minimum requirements or the point below which properties presented for insurance are ineligible. Property standards cover minimum room sizes, light and air in relation to rooms and in relation to adjoining properties, minimum acceptable mechanical equipment qualities, and general construction.

The Administration is seeking, and through the architects hopes to establish in the minds of prospective builders and buyers, a better class of construction. The better grades of construction receive higher ratings and the Administration hopes to raise the standard of living conditions and to promote better construction through the instrumentality of the risk-rating procedure.

The employment of architects by the Federal Housing Administration has a somewhat deeper significance than might be implied by the specific duties which they perform. There is little chance that the average layman can ascertain what he is buying in the way of a house. We may assume that for the typical purchaser the buying of a dwelling property represents the most important single investment he will ever be called upon to make. It is reasonable to expect that no layman without special training can purchase a home with a sense of security unless he has consulted a competent, ethical architect or other individual with a specialized background. The buyer needs an unbiased opinion.

One of the reasons why architects are employed by the Federal Housing Administration is that the typical buyer who finances his program of home acquisition with a mortgage insured by the Federal Housing Administration can feel confident that his home has been examined by competent men. To be eligible for Mutual Mortgage Insurance a mortgage must be secured by a property having good characteristics. Therefore the purchaser of a dwelling property securing an insured mortgage can feel relatively certain that he is making a good investment.

The Federal Housing Administration architect and the architectural profession as a whole are intrusted with the charge of acquainting and embedding in the minds of potential buyers and lending institutions the idea that quality of construction and attractiveness and appropriateness of design are economically sound and materially assist in the creation of good investments. The Federal Housing Administration has recognized this in its risk-rating procedure and has had the good judgment to employ qualified architects to assist in determining the ratings ascribed to mortgages.

Probably no other Governmental Agency has seen fit to place upon the architectural profession the degree of responsibility that has been allotted to it by the Federal Housing Administration. The "Rating of Property" grid provides an opportunity for the profession to demonstrate the value of its services in the general field of mortgage finance. The Federal Housing Administration architect has been rating property for the past ten months and the Administration has come to recognize fully not only the importance but the absolute necessity of using the qualified architect in connection with its work. The ground gained by the architect during the last year will never be lost. The architect has found a new field of activity and a new set of functions. He finds that his particular type of technical skill serves in a financial field as well as in an engineering and artistic field.

The Federal Housing Administration wishes the architectural profession to be familiar with its requirements and procedures. Information may be secured from any one of the sixty-three Insuring Offices or from the Federal Housing Administration, Washington, D. C.

Photograph by F. S. Lincoln

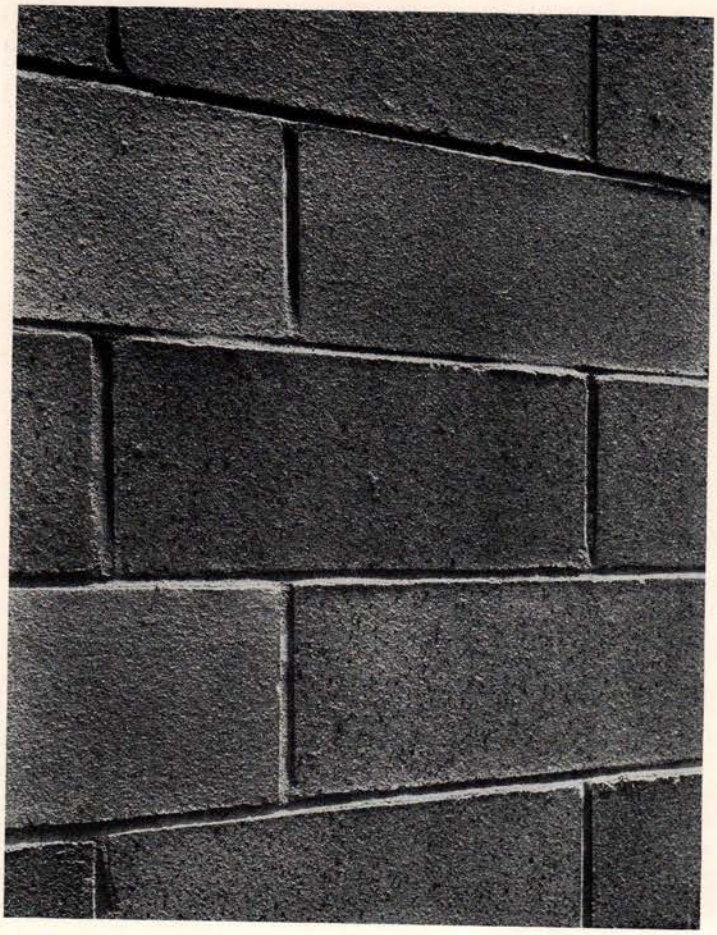
THE CARL MACKLEY HOUSES IN PHILADELPHIA

EXECUTED UNDER THE DIRECTION OF W. POPE BARNEY, ARCHITECT

The Carl Mackley Houses are owned by the Juniata Park Housing Corporation, the majority of whose officials are officers of the American Federation of Hosiery Workers. The development is known as a community for hosiery workers in Philadelphia. It was financed as a limited-dividend, self-liquidating project by means of a PWA loan of $1,039,000 and at an estimated total cost of $1,153,607. The largest portion of the equity was advanced by the Federation, the remainder by individuals. The development covers an entire block, 480 feet by 490 feet. Each of the four building units, running in a northerly and southerly direction, is 30 feet wide, 480 feet long and three stories high. There are 284 apartments comprising a total of 1,085 rooms. The price of a five-room apartment is $52.50 a month. The smaller apartments rent in proportion, two room suites costing from $27 to $30 a month.

Photographs by F. S. Lincoln

(ABOVE) GENERAL VIEW OF COURTS

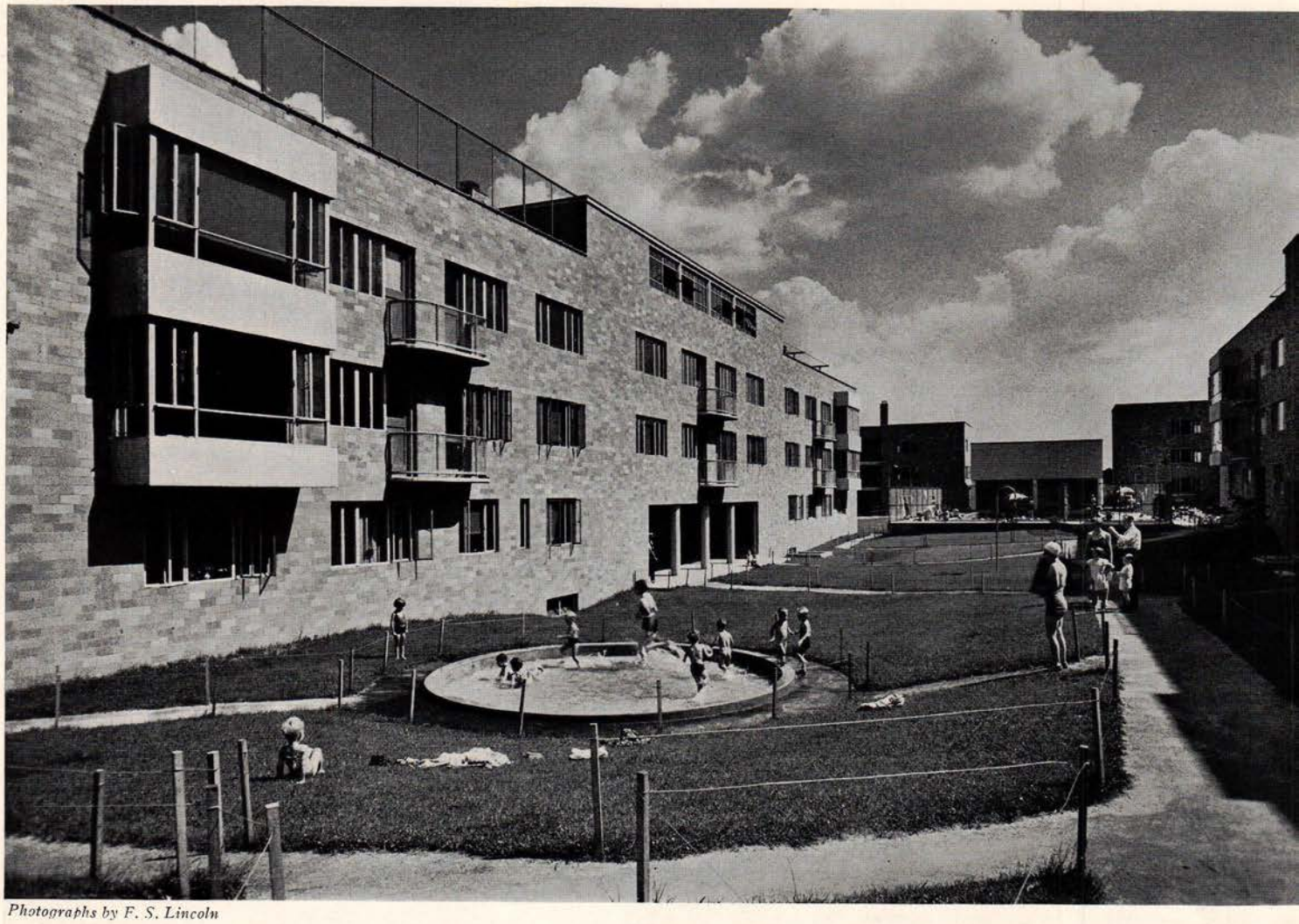


(LEFT) DETAIL OF WALL CONSTRUCTION

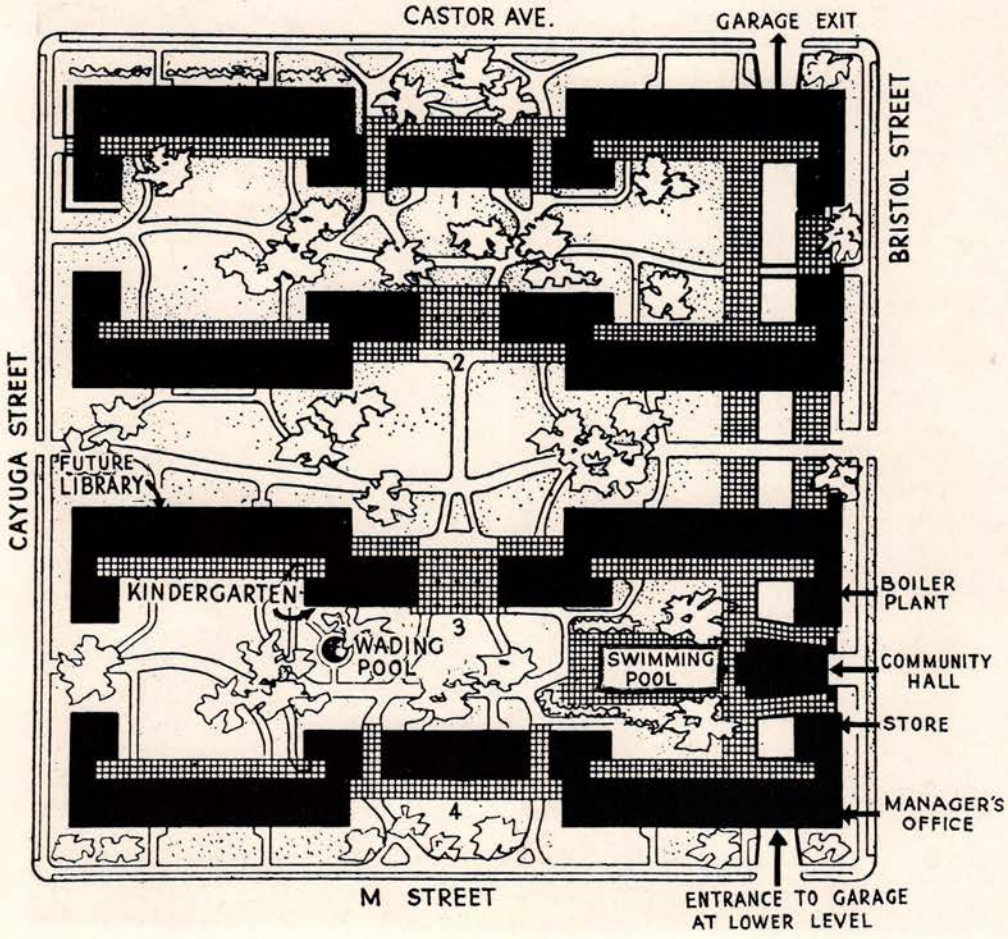
JUNIATA PARK HOUSING DEVELOPMENT IN PHILADELPHIA

EXECUTED UNDER THE DIRECTION OF W. POPE BARNEY, ARCHITECT

ENTRANCE DETAIL



Photographs by F. S. Lincoln



CHILDREN'S WADING POOL

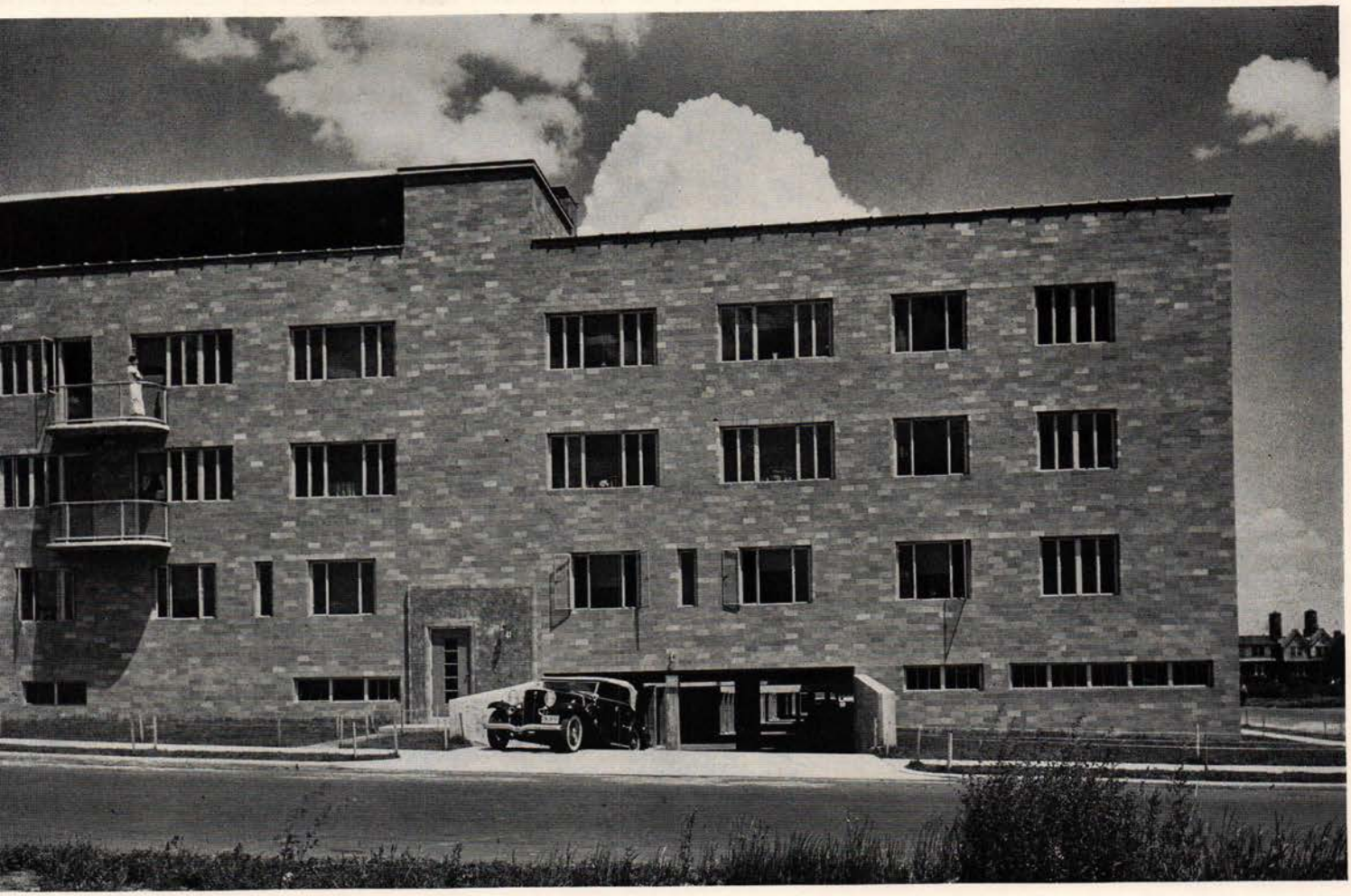
CONSTRUCTION FEATURES:

Steel casement windows. Reinforced concrete floors. Sanitary asphalt tile flooring. Electric kitchen ranges.

JUNIATA PARK HOUSING DEVELOPMENT IN PHILADELPHIA

EXECUTED UNDER THE DIRECTION OF W. POPE BARNEY, ARCHITECT

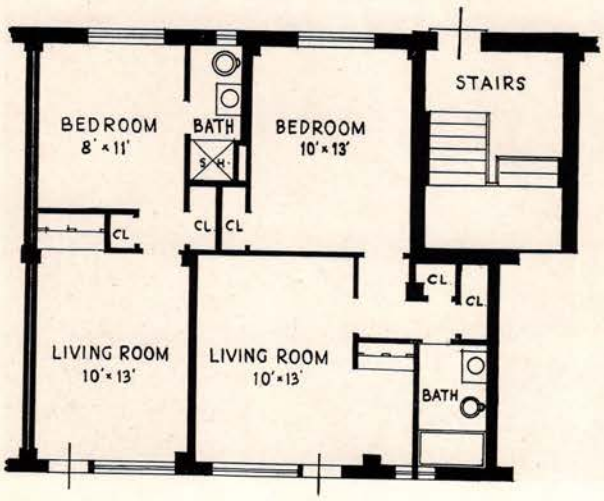
ENTRANCE TO GARAGE ON LOWER LEVEL



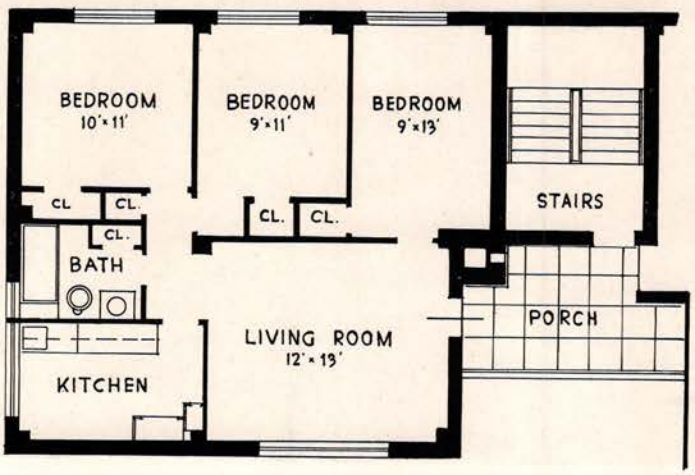
Photographs by F. S. Lincoln

SWIMMING POOL SEEN FROM COMMUNITY BUILDING

TWO AND TWO-AND-A-HALF-ROOM UNITS



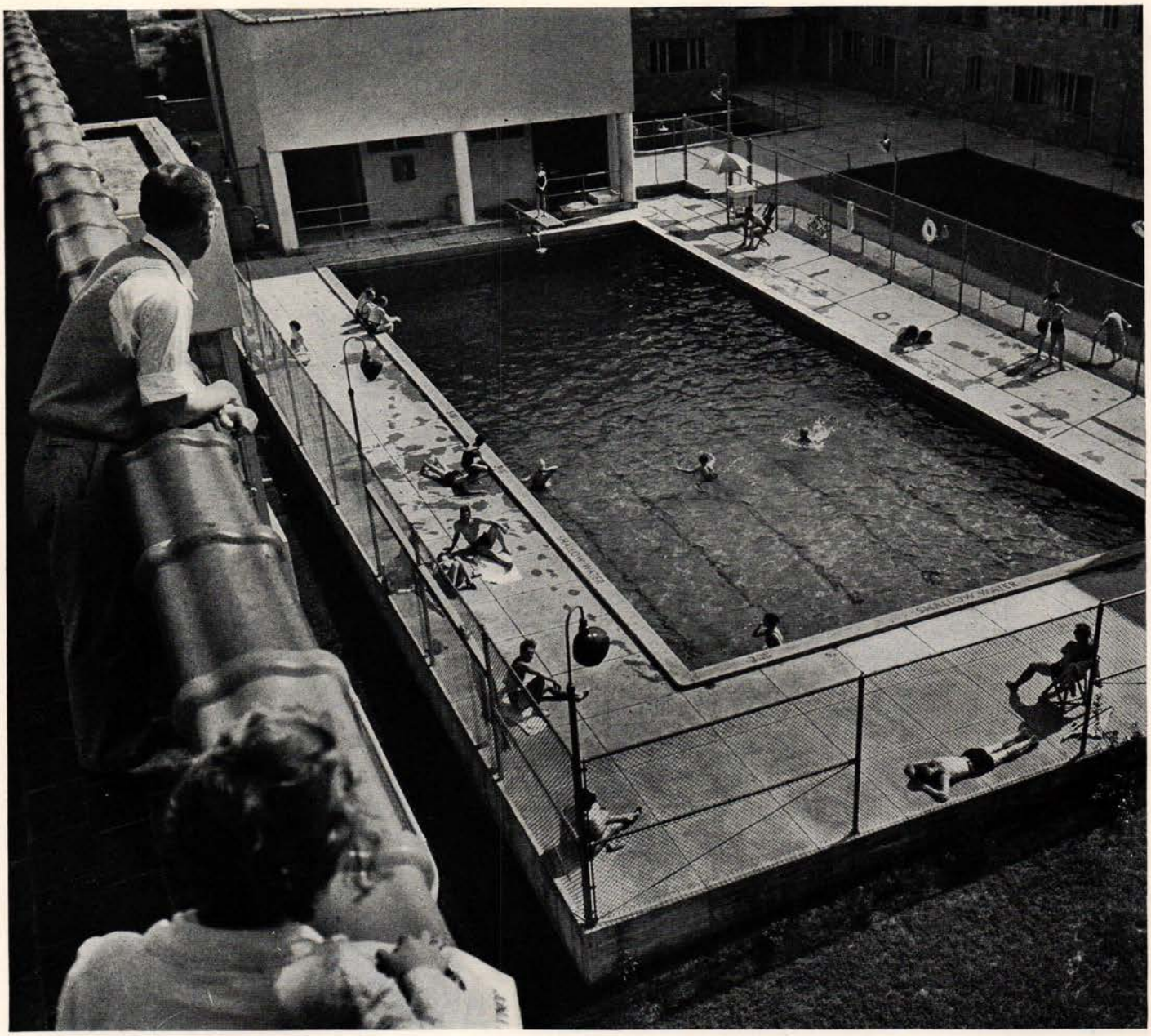
FOUR-ROOM APARTMENT



JUNIATA PARK HOUSING DEVELOPMENT IN PHILADELPHIA

EXECUTED UNDER THE DIRECTION OF W. POPE BARNEY, ARCHITECT

SWIMMING POOL

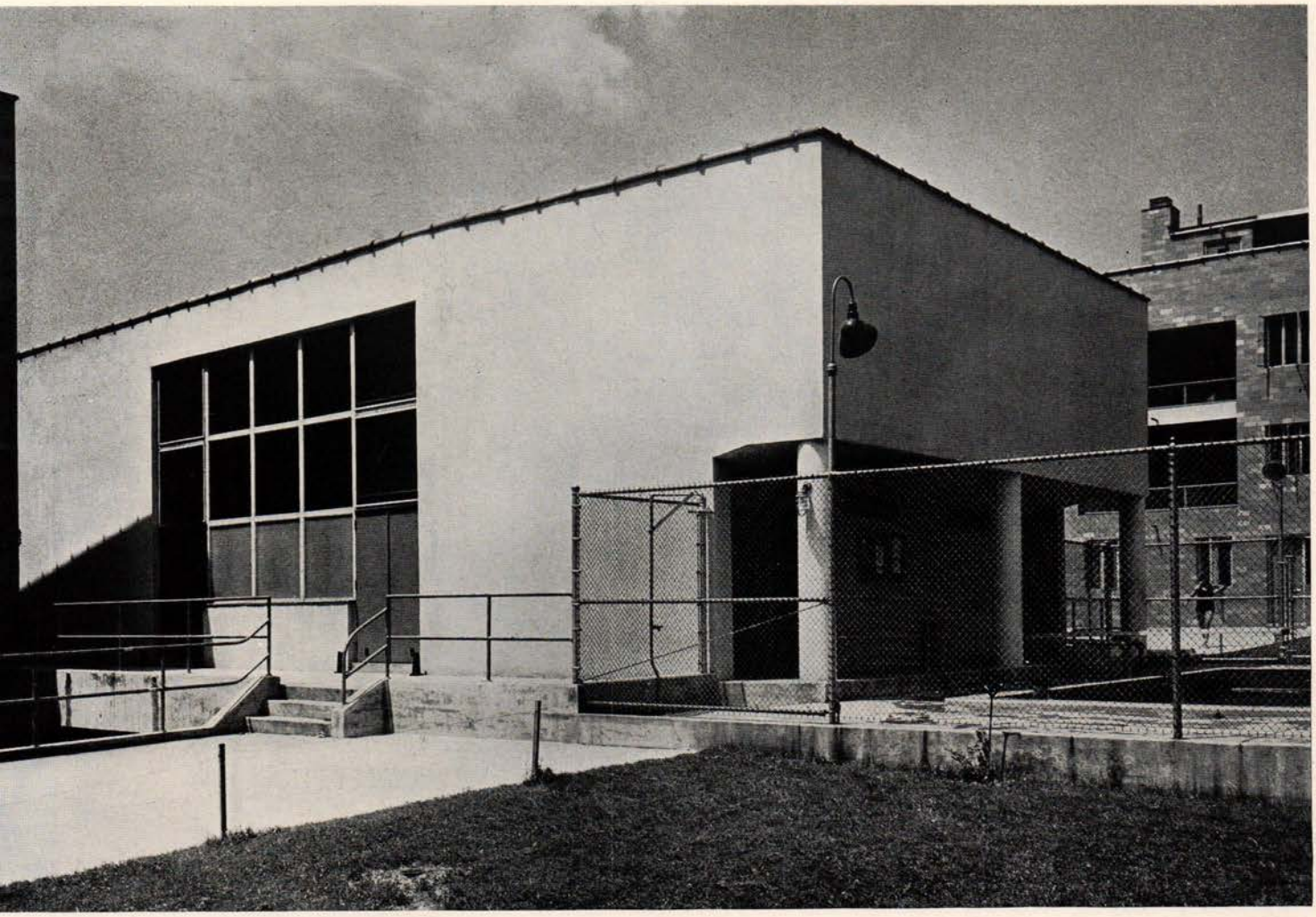


JUNIATA PARK HOUSING DEVELOPMENT IN PHILADELPHIA

EXECUTED UNDER THE DIRECTION OF W. POPE BARNEY, ARCHITECT

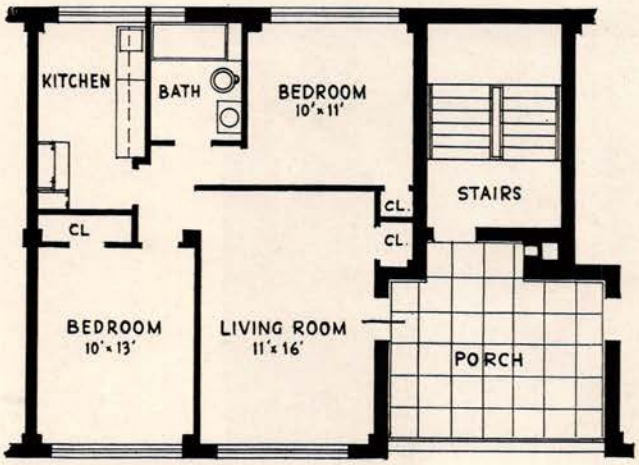
INTERIOR OF COMMUNITY HALL

Photographs by F. S. Lincoln

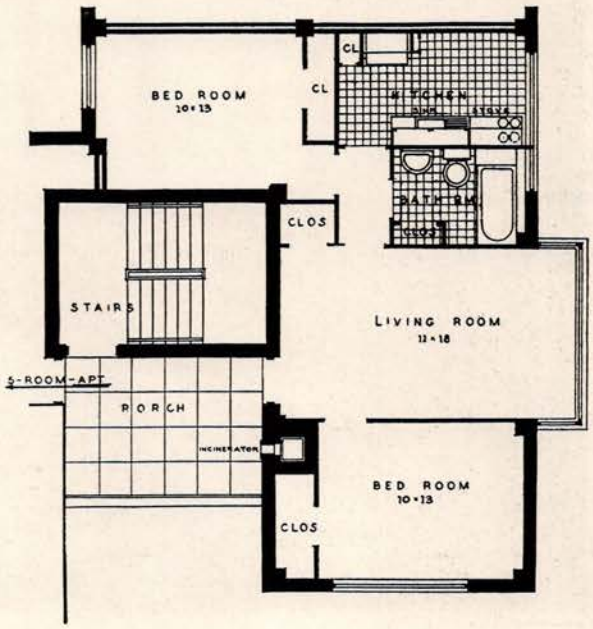


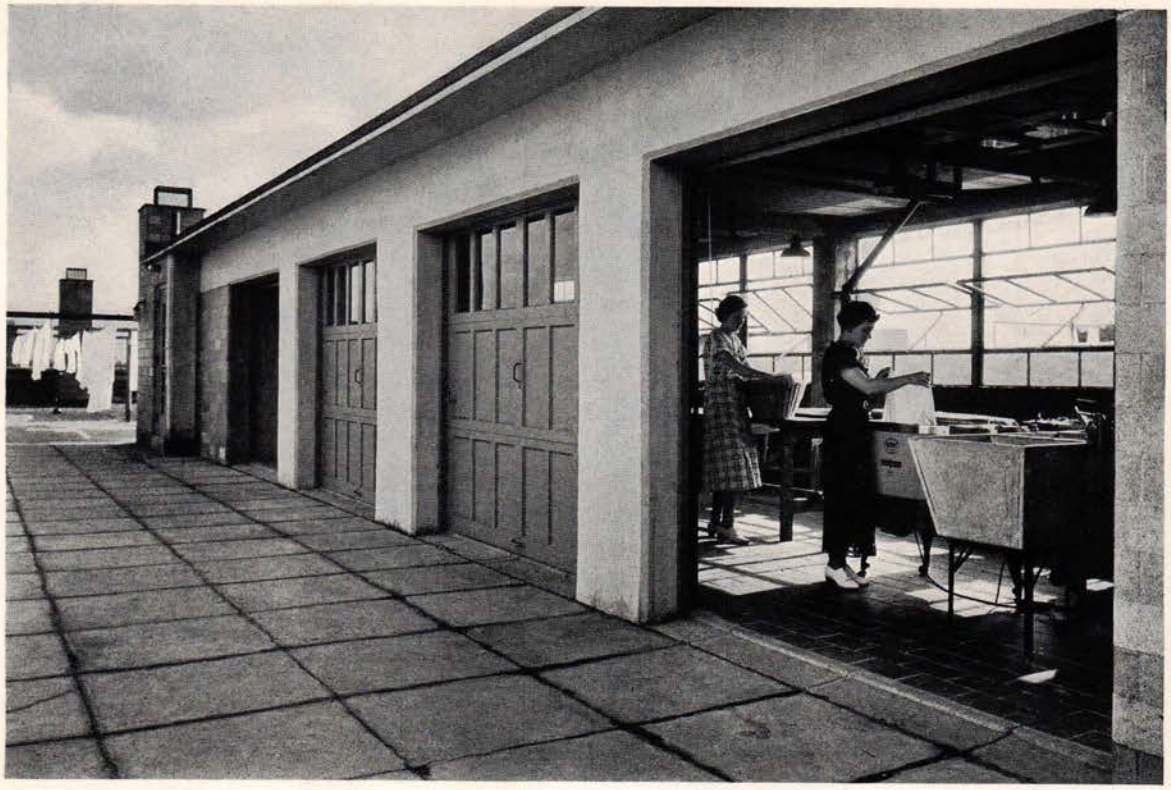
ENTRANCE TO COMMUNITY HALL

FIVE-ROOM APARTMENT



SPECIAL FOUR-ROOM APARTMENT



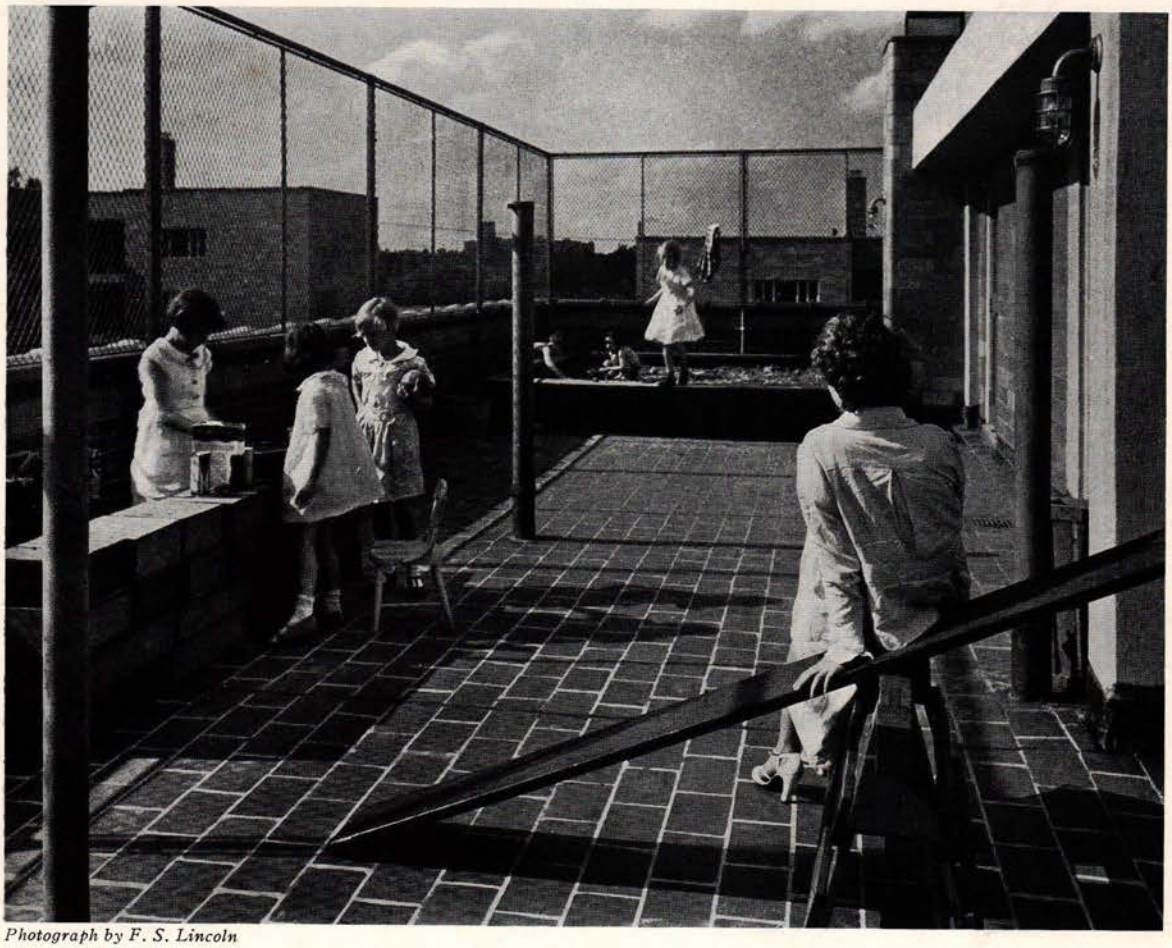


ROOF LAUNDRY

JUNIATA PARK HOUSING DEVELOPMENT IN PHILADELPHIA

EXECUTED UNDER THE DIRECTION OF W. POPE BARNEY, ARCHITECT

ROOF PLAY SPACE

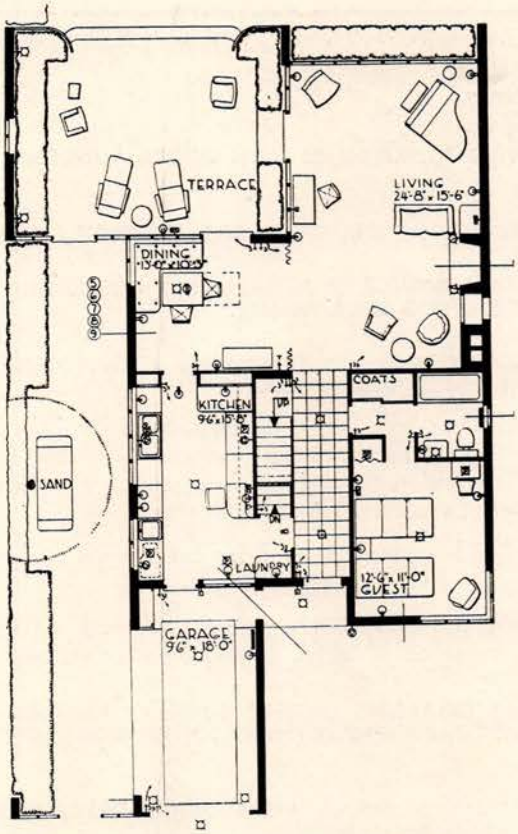


Photograph by F. S. Lincoln

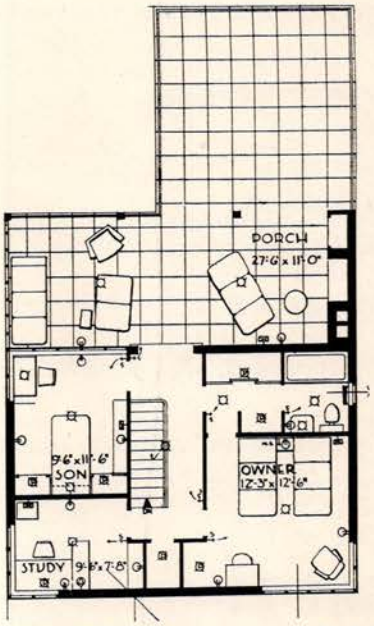
THE HOUSE PLAN

ROOM ARRANGEMENTS AND CLOSETS

This article is a supplement to previous studies: Bedrooms-Bathrooms (February 1932), Trends in Lighting (October 1934), A Check List for New Construction and Modernization of Houses (October 1934), Planning the Kitchen (October 1934).



FIRST FLOOR PLAN OF HOUSE ILLUSTRATING A NEW TREND IN PLANNING. THE LIVING-DINING AREA IS SPACIOUS AND VARIED IN USE. HERE THERE ARE FOUR DISTINCT AREAS. THE LIVING ROOM PROPER, BY PLACING OF FURNITURE, CENTERS AROUND THE FIREPLACE; THE DINING ROOM IS COMPRISED WITHIN AN ALCOVE HAVING A BUILT-IN SEAT AND TABLE. THE END OF THE LIVING ROOM SERVES AS A MUSIC ROOM. IN ADDITION THERE IS AN OUTDOOR LIVING ROOM FOR USE IN FAIR WEATHER. GENERAL ELECTRIC HOUSE COMPETITION. FIRST PRIZE DESIGN BY HAYS AND SIMPSON, ARCHITECTS.



SECOND FLOOR PLAN. AN OUT-OF-DOORS ROOF TERRACE, ACCESSIBLE FROM SECOND FLOOR BEDROOMS. A PART OF THIS TERRACE IS PERMANENTLY COVERED. IT IS INTENDED FOR NIGHT OR DAY USE. GENERAL ELECTRIC HOUSE COMPETITION. FIRST PRIZE DESIGN BY HAYS AND SIMPSON, ARCHITECTS.

THE ARRANGEMENT OF THE HOUSE PLAN SHOULD PERMIT CONVENIENCE IN CARRYING ON HOUSEHOLD ACTIVITIES AND EASE IN GETTING ABOUT IN THE HOUSE.

The house plan for today can be based on organization of living, sleeping and working areas and of equipment. "Arrangement should be in conformity with the running of a household—the logical process of movement."[*1]

The President's Conference on Home Building and Home Ownership made the observation that "The small house of the future will, in all probabilities, not resemble any houses built in the past. It will be of good architecture if it shows honesty of purpose."[*2]

IT IS DESIRABLE THAT ALL ROOMS OF A HOUSE FOR LIVING, SLEEPING AND WORKING RECEIVE UTMOST BENEFIT OF THE SUN'S RAYS DURING THE WINTER AND OF COOLING BREEZES IN THE SUMMER.

The principle of orientation is the arranging of the various parts of a house so that this end may be attained. "Sunlight is one of the most potent enemies of dirt and disease. Germs do not thrive in sunlight, and dirt is more readily detected in a bright, cheery room than in one that is dark and dreary."[*3]

"Space is saved, and wasteful, dirt-collecting corners are eliminated by the installation of standardized equipment—refrigerator cabinets, closets, fixtures especially designed for building-in." [*1]

THE PLANNING OF A HOUSE AS A SERIES OF ROOMS WAS COMMONLY USED A CENTURY OR MORE AGO IN ORDER TO CUT DOWN DRAFTS AND TO CONSERVE HEAT FROM THE FIREPLACE.

With insulation and more efficient heating systems, the entire house could be planned as one open space, except for bath and kitchen and probably for sleeping.

LIVING ROOM

GIVE MAXIMUM AMOUNT TO LIVING ROOM WHERE SPACE IS MOST USED.

Rooms such as bedrooms, bathroom, kitchen may be contracted in size and designed around equipment and required furniture.

LOCATE LIVING ROOM TOWARD SOUTH OR WEST EXPOSURE; KITCHEN TO NORTH OR EAST.

PROVIDE READILY ACCESSIBLE STORAGE SPACE FOR GOLF STICKS, TENNIS RACKETS, TOYS AND OTHER PLAY EQUIPMENT AS A SUPPLEMENT TO A GROUND FLOOR COAT CLOSET.

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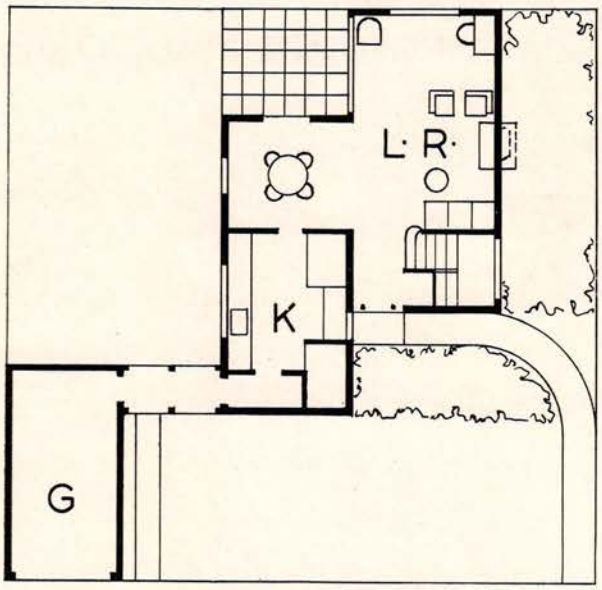
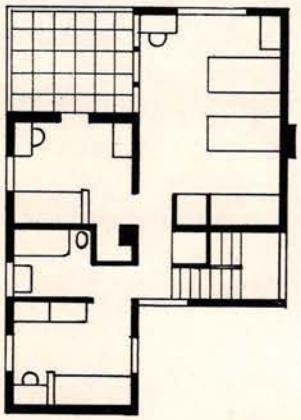
*1 The Modern House. By F. R. S. Yorke. p. 34.

*2 Housing Objectives and Programs. p. 36.

*3 M. C. Betts, Chief, Division of Plans and Services, and W. R. Humphries, Chief Engineering Aid, Bureau of Agricultural Engineering, U. S. Department of Agriculture. Bulletin 1132.



PLAN OF HOUSE SUBMITTED BY J. ANDRE FOUILHOUX, ARCHITECT, IN NEW YORK CHAPTER, A. I. A., COMPETITION FOR LOW-COST HOUSING. IT WAS INTENDED THAT THE COST OF THIS HOUSE, EXCLUSIVE OF LAND, SHOULD NOT EXCEED $3,600.
FIRST FLOOR ARRANGEMENT: THE LIVING AND DINING SPACE ARE TREATED AS A SINGLE ROOM. THE L-SHAPE PROVIDES A NATURAL SEPARATION WHICH MAY BE MORE COMPLETELY SEPARATE BY MEANS OF A MOVABLE PARTITION OR CURTAIN. A PAVED TERRACE WITHIN THE ANGLE OF THIS L-SHAPED ROOM MAY SERVE AS A DINING OR SITTING TERRACE. THERE IS COMMENDABLE UTILIZATION OF SPACE FOR THE USUAL REQUIRED PLAN ELEMENTS. THERE IS A UTILITY ROOM NEXT TO KITCHEN. A CELLAR IS OMITTED FOR THE SAKE OF ECONOMY. THE ADDITION OF A FIREPLACE IS OPTIONAL. THE GARAGE, NOT INCLUDED IN THE ORIGINAL COST ESTIMATE, IS LOCATED FOR CONVENIENCE AT ONE SIDE AND NEAR TO STREET.



SECOND FLOOR PLAN: ONE OF THE THREE BEDROOMS IS OF SPACIOUS DIMENSIONS AND FOR PARENTS. THE HALL SPACE IS EXCEEDINGLY ECONOMICAL, HAVING LEAST POSSIBLE AREA AND IS AMPLY LIGHTED BY WINDOWS. ALL BEDROOMS HAVE CROSS-VENTILATION.

LIVING ROOM (Continued)

IN SPACING OF FURNITURE AVOID INTERFERENCE WITH DOORS, WINDOWS AND CLOSETS.

CLOSET IN LIVING ROOM FOR ROLL-AWAY BED, GAMES AND AUXILIARY CHAIRS.

ARRANGE LIVING ROOM FOR CONVENIENCE IN ENTERTAINING GUESTS AND FOR YOUNGER PERSONS IN ENTERTAINING THEIR FRIENDS.

LIVING ROOM MAY BE ENLARGED BY TAKING IN THE DINING ROOM, COMBINING A PART OF THE ROOM FOR DINING AND LIVING.

A dining alcove requires less floor area than a dining room. This is because the average dining room provides for maximum seating. When the dining table is placed at one end of a living room, unusual demands for seating are cared for by usurping a part of the actual living room space.

The dining room is used only 3 hours a day, which indicates a waste of space for limited use.

Where a dining room is required, convert this room to other use during the day, such as a study room for school children, or playroom for children.*4

EQUIP DINING TABLE WITH EASY OPERATING CASTERS, SUCH AS ARE USED ON HOSPITAL EQUIPMENT, SO THAT TABLE MAY BE MOVED TO ONE SIDE WHEN NOT IN USE.

THE ARRANGEMENT AND LOCATION OF DINING AREAS CAN BE MADE FLEXIBLE BECAUSE OF CHANGING SEATING REQUIREMENTS.

If the meal for guests is served in living room, an area should be so situated as to make it possible to screen the table while it is being prepared for a meal.

USE MAY BE MADE OF FOLDING PARTITIONS IN ORDER TO OBTAIN PRIVACY WHEN REQUIRED.

THE DISTANCE BETWEEN DINING TABLE AND KITCHEN SHOULD BE AS SHORT AS POSSIBLE.

THE SPACIOUSNESS OF THE PRESENT-DAY LIVING ROOM NEED NOT BE LIMITED TO THE INCLOSING WALLS, BUT MAY BE EXTENDED TO THE GARDEN BY MEANS OF WINDOWS AND DOORS THAT OPEN ON TO SUN PORCH AND TERRACE.

In warm climates the outdoor dining porch or terrace serves as a much used auxiliary to the living-dining room.

LOCATE FIREPLACE WITH REFERENCE TO GROUPING OF FURNITURE.

• • •

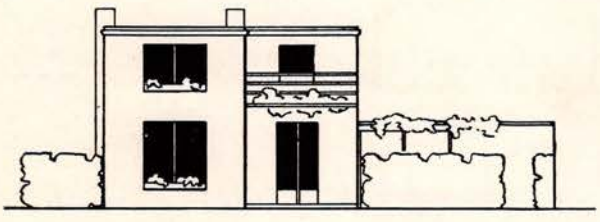
WASH ROOM ON GROUND FLOOR WITH OUTSIDE WINDOW.

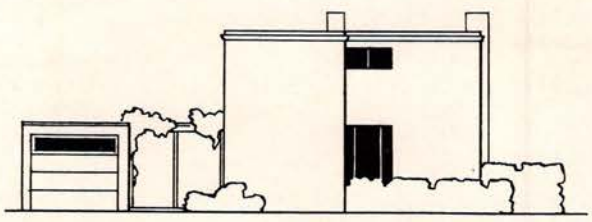
For kitchen planning see *The Architectural Record*, March, 1935.

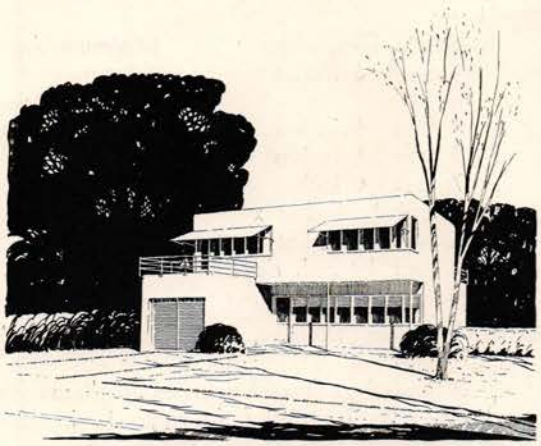
FURNITURE THAT IS TO BE MOVED FREQUENTLY SHOULD BE OF LIGHT WEIGHT AND DURABLE.

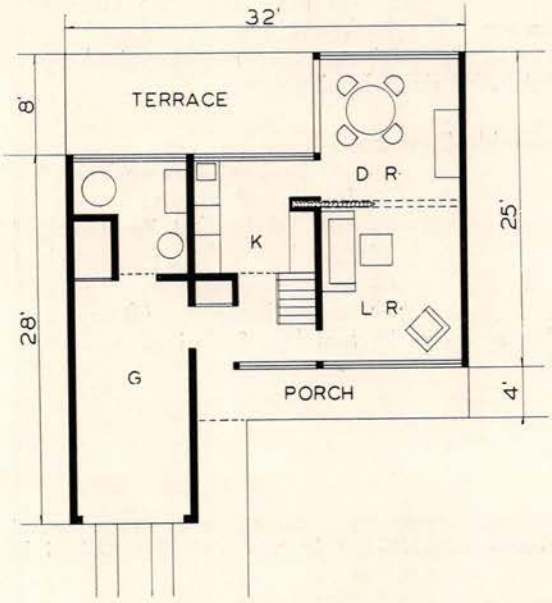
Furniture should be suited to individual purpose and, when possible, to other uses.

*4 President's Conference on Home Building and Home Ownership. Address by Mrs. Rippin p. 19.









THIS HOUSE WAS PLANNED TO ACCOMMODATE A TYPICAL FAMILY (PARENTS AND TWO CHILDREN). ITS LOCATION IS ON A NARROW LOT (NOT LESS THAN FIFTY FEET WIDE). HOUSE DESIGN BY KOCHER AND FREY.

PROVISION FOR: LIVING ROOM, DINING SPACE, KITCHEN, THREE BEDROOMS, UTILITY ROOM, STORAGE, GARAGE.

FIRST FLOOR PLAN: ENTRANCE HALL GIVES ACCESS TO LIVING ROOM; TO KITCHEN; TO STAIRWAY LEADING TO SECOND FLOOR; TO GARAGE AND INDIRECTLY TO UTILITY ROOM AND STORAGE ROOM. THERE IS A COAT CLOSET IN HALLWAY. LIVING AND DINING ROOM ARE COMBINED AS ONE FAIR-SIZED ROOM BUT WITH POSSIBILITIES FOR SEPARATING DINING FROM LIVING ROOM. THE KITCHEN PLUMBING IS AT WALL ADJOINING UTILITY ROOM AND DIRECTLY BENEATH BATHROOM ON SECOND FLOOR. THIS IS THE MOST DIRECT AND ECONOMICAL PLUMBING PLAN FOR A TWO-STORY HOUSE. THERE IS A PORCH SHELTERED FROM SUN AT ENTRANCE. WINDOWS FACE TOWARD GARDEN AND TERRACE. THERE ARE NO WINDOWS IN THE DIRECTION OF HOUSES ON ADJOINING LOTS. BOTH THE FRONT PORCH AND REAR TERRACE ARE PROTECTED BY MEANS OF PROJECTING PLAN GIVING PRIVACY ON LOT OF LIMITED WIDTH. THIS PLAN TYPE IS SUITED TO ROW DEVELOPMENT BUT PREFERABLY WITH ALTERNATE SETBACK.

BEDROOM

CONSIDER REQUIRED FURNITURE AND USES OF ROOM PRELIMINARY TO ESTABLISHING SIZE AND ARRANGEMENT OF BEDROOM.

The customary needed furniture for a bedroom includes the following: two single beds or one double bed; single bed, 3'-0" to 3'-3" wide, 6' to 6'-6" long; double bed, 4'-0" to 4'-6" wide, 6'-0" to 6'-6" long; dressing table for women with wall mirror, drawers for dressing accessories, cosmetics, perfumes, approximate size, 2'-0" deep, 3'-0" long; one chest of drawers, 1'-8" deep, 3'-0" long. Two chests required for rooms of double use. Two chairs; one full length wall mirror attached to wall; night stand, size 1'-2" by 1'-2" used as light stand. A writing desk and seat may occasionally be required as desirable bedroom equipment.

IT IS POSSIBLE TO CONSERVE SPACE BY A CLOSET ARRANGED WITH STORAGE DRAWERS AND ELIMINATING THE CHEST.

ARRANGEMENT OF FURNITURE SHOULD PROVIDE COMFORTABLE AND CONVENIENT SPACE FOR DRESSING.

GLAZED WINDOW AREA SHOULD BE AT LEAST 16 SQUARE FEET. TOPS OF WINDOWS SHOULD BE NEAR CEILING TO OBTAIN UTMOST ADVANTAGE OF VENTILATION AND LIGHT.

WINDOWS THAT OPEN THEIR ENTIRE AREA OR BOTH TOP AND BOTTOM ARE DESIRABLE.

THERE SHOULD BE SUITABLE WALL SPACE FOR ALL PIECES OF FURNITURE.

The placing of furniture should not interfere with doors, windows and closets.

CONSIDER DRESSING ROOM AS A PART OF BATHROOM, THEREBY REDUCING SPACE REQUIREMENTS FOR BEDROOM.

EACH BEDROOM SHOULD BE ACCESSIBLE WITHOUT PASSAGE THROUGH OTHER BEDROOM.

It would seem that an economical arrangement for a second floor bedroom would be to plan a clothes closet large enough for use as a dressing room. Such a bedroom would need to be only large enough for beds and a small table.

SPACE AT BOTH SIDES OF THE BED, AND PASSAGE AT THE FOOT.

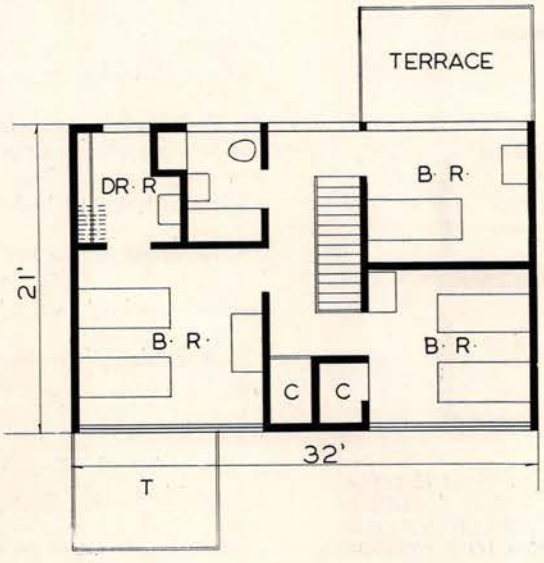
PREFERABLY TWO CLOSETS FOR EACH BEDROOM.

SPACE IN EACH BEDROOM FOR TWO BEDS, EACH 39 INCHES WIDE.

Width of space at side of bed, for convenience of person making it, 20 inches. Width of passage at foot of bed 20 inches.*[6]

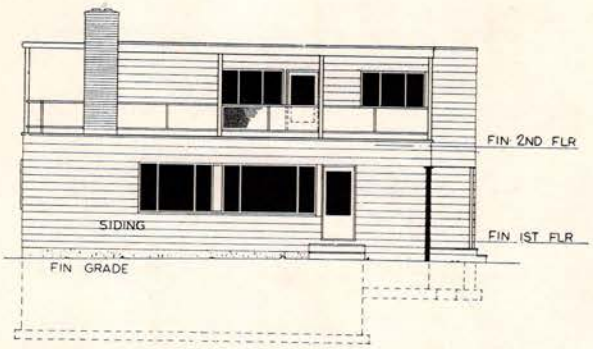
For bathroom planning see The Architectural Record, October, 1934; March, 1935.

*[6] See The Architectural Record, April, 1934, pp. 330, 331.



SECOND FLOOR PLAN: PRINCIPAL BEDROOM HAS DRESSING ROOM CLOSET WITH WASH-BASIN DRESSER.

CONSTRUCTION: WOOD FRAME, INSULATED AT WALLS AND ROOF. OUTER FACING OF HOUSE OF CALIFORNIA REDWOOD FLOORING, COVERED WITH CANVAS, AND PAINTED. ALL CORNERS ROUNDED TO A TWO-INCH RADIUS. ROOF DRAINAGE BY MEANS OF SINGLE SOIL STACK NEAR CENTER OF HOUSE; DOWNSPOUTS FOR GARAGE AND TERRACE. SECOND FLOOR AND ROOF OF STAMPED STEEL JOISTS.



EAST ELEVATION OF HOUSE BY WILLIAM LESCAZE, ARCHITECT. WALLS ARE CLAPBOARD SIDING PAINTED WHITE. SIDING IS APPLIED TO WOOD FRAME. PORCH RAIL AT SECOND FLOOR IS 1½" G I. PIPE WITH GALVANIZED WIRE 1" MESH SCREEN, PAINTED GRAY.

MINIMUM ROOM SIZES

	Minimum Dimensions	Minimum Area
Living Room	10 feet 6 inches	150 square feet
Main Bedroom	10 feet	110 square feet
Second Bedroom	8 feet 6 inches	100 square feet
Dining Room	10 feet 6 inches	120 square feet
Kitchen	7 feet 4 inches	65 square feet
Bathroom	4 feet 11 inches x 6 feet 8 inches	
Closets	1 foot 10 inch depth	

Adapted from Housing Standards, Housing Division, U. S. Public Works Administration.

The minimum sizes indicated are intended as lowest reasonable dimensions (based on experience observation). It is invariably desirable to increase room sizes for convenience of arrangement, comfort and appearance.

The following listing approximates sizes that are desirable for the average small house. In general it is preferred that living room be enlarged at expense of the sleeping rooms. The bedroom, however, should not be reduced to a size smaller than the minimum sizes recommended by the Housing Division of U. S. Public Works Administration.

Desirable Dimensions

	Desirable Dimensions
Living Room	12 feet by 18 feet
Main Bedroom	12 feet by 14 feet (for two beds)
Second Bedroom	10 feet by 12 feet (for two beds)
Dining Room	12 feet by 14 feet
Kitchen	7 feet 4 inches by 10 feet
Dining Space—Combined with Living Room	12 feet by 8 feet

MIRRORS

"IN THE MAJORITY OF HOMES, WHERE EVERY ONE DRESSES HURRIEDLY IN THE MORNING, THE MIRROR IS MOST CONVENIENT IF IT IS LONG ENOUGH TO PERMIT THE USER TO STAND.

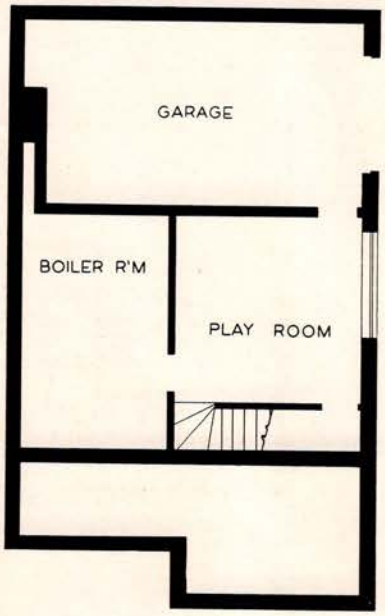
"The following is a good general rule to use in placing the bathroom or bedroom mirror. To estimate the maximum distance from the floor, use the eye level of the average two-year old; and to determine the minimum distance for the top of the mirror from the floor, use the eye level of a man 6 feet tall. "If all dressing mirrors (as distinguished from those primarily decorative) are purchased independently of pieces of furniture, minimum requirements for equipping the house would seem to be:

"1. **A mirror in the bathroom,** dimensioned so as to accommodate a 6-foot man who is shaving and a small child 34 inches tall washing his face. The minimum dimensions for such a mirror are 46 inches long, 10 inches wide, and set 25 inches from the floor.

"2. **A mirror in each bedroom,** low enough to afford a child of 2 years of age a view of the upper part of his body, and yet high enough to accommodate an adult. The minimum dimensions for a mirror for this situation are 50 inches long, 14 inches wide, and set 21 inches from the floor.

"An alternative for the bedroom is a shorter mirror which is easily raised or lowered. The minimum length of a mirror supplying a view of the upper part of the body would be 16 inches.

"3. **A full-length mirror,** located where any member of the family would be free to use it. To accommodate adults, the top of this mirror should not be less than 5 feet 11 inches from the floor. To accommodate young children the bottom should not be more than 14 inches from the floor, making the minimum length 57 inches. Or a mirror 6 inches shorter than this could be used with a platform when needed to accommodate the young child."*7



BASEMENT PLAN: A SLOPED DRIVEWAY PERMITS LOCATION OF GARAGE UNDER HOUSE; HOUSE IS ENTERED FROM GARAGE THROUGH PLAYROOM. LARGE WINDOWS GIVE LIGHT AND VENTILATION TO PLAYROOM.

*7Closets and Other Storage Arrangements for the Farm Home. By Maud M. Wilson.

MIRRORS (Continued)

"THE FULL-LENGTH MIRROR SHOULD BE AT LEAST 14 INCHES WIDE UNLESS USED IN FITTING GARMENTS; THEN 18 INCHES IS DESIRABLE.

"If the house has only one full-length mirror, its use in fitting should be considered in locating it.

"CAREFUL ATTENTION SHOULD BE PAID TO THE PLACING OF THE MIRROR WITH REFERENCE TO NEARBY OBJECTS.

"The minimum width of the floor space before the mirror should be 24 inches, while a minimum width of 32 inches should be available at elbow height. A dressing table 18 inches high placed before the full-length mirror may be 15 inches wide without interfering with the vision of an adult. The most convenient arrangement, however, is to leave the space in front of the mirror entirely free of any non-movable obstruction over 18 inches wide."*7

NURSERY

LOCATION ON SUNNY SIDE OF HOUSE.

"The floor area should allow at least 84 square feet for each child. Artificial lighting should be high and indirect. If side lights are used, they should be out of reach of the child and the light source shielded. Since most of the child's play is on the floor, hardwood floors or floors overlaid with linoleum or cork are recommended."*5

THE NURSERY SHOULD BE LOCATED NEAR A LAVATORY.

"THIS ROOM SHOULD BE CONVERTIBLE TO OTHER USES WHEN THERE IS NO LONGER NEED FOR IT AS A NURSERY."*5

Since it will not be feasible to provide a nursery in most small houses, it is desirable to consider the use of a usual room or a corner of a room as play space for children. An inclosed porch may be considered or a corner of a bedroom. The attic also has possibilities for nursery use. Whatever selection is made, the location should be well ventilated and preferably with much sunlight.

LOCATION OF PLAY PEN FOR SMALL CHILD WITHIN VIEW OF KITCHEN. This may be in yard or on a terrace.

FURNITURE SELECTED FOR CHILD SAFETY, light in weight, freedom from sharp angles and dust-collecting moldings.

WALL COLOR FOR THE NURSERY should be cheerful and with finish that is easily cleaned.

FURNITURE, HANGINGS AND WALL SURFACE CAN FOLLOW A COLOR SCHEME AND A PLAN OF ARRANGEMENT.

LOCATION OF SLEEPING ROOM FOR CHILD with regard for quiet and, in case of older child, for uninterrupted study.

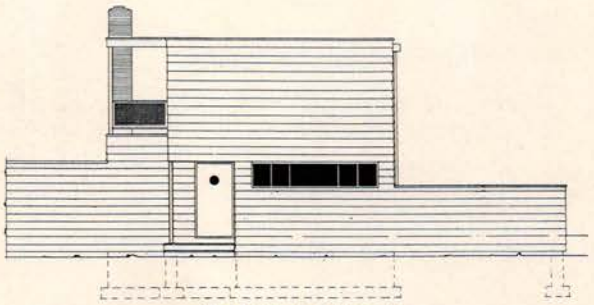
The room that serves as nursery may later be converted to sleeping room for growing child or as workshop for a boy.

WINDOWS SHOULD BE SCREENED OR OTHERWISE PROTECTED FOR SAFETY OF CHILD. HIGH WINDOWS ARE PREFERRED.

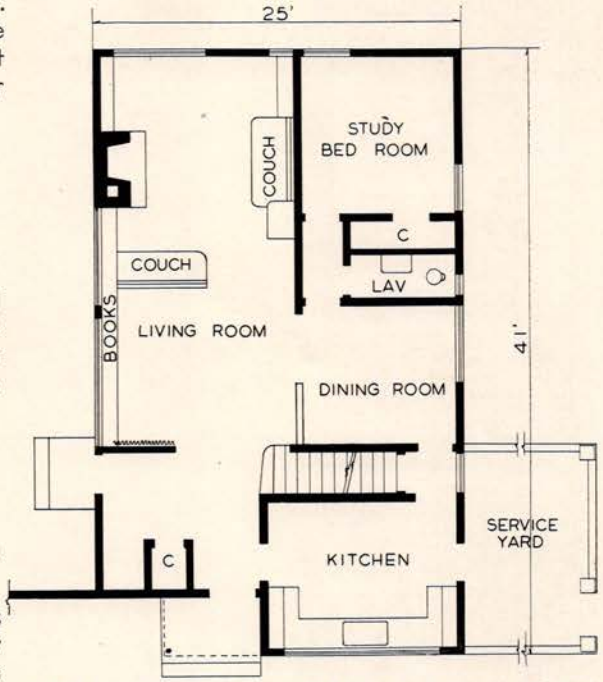
PROVIDE CLOSET WITH SPACE FOR STORAGE OF PLAYTHINGS AND CLOTHES.

*5 The Home and the Child. A publication of the White House Conference. The Century Co., p. 22.

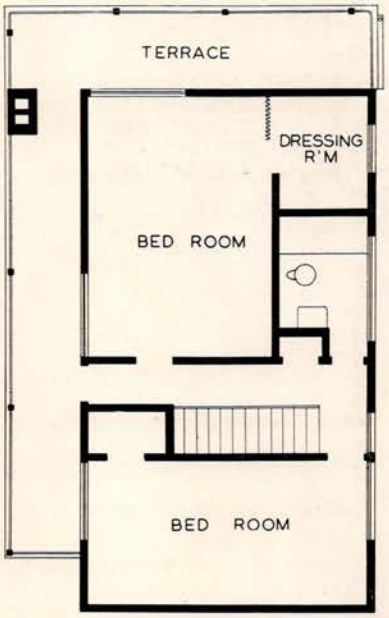
*7 Closets and Other Storage Arrangements for the Farm Home. By Maud M. Wilson.



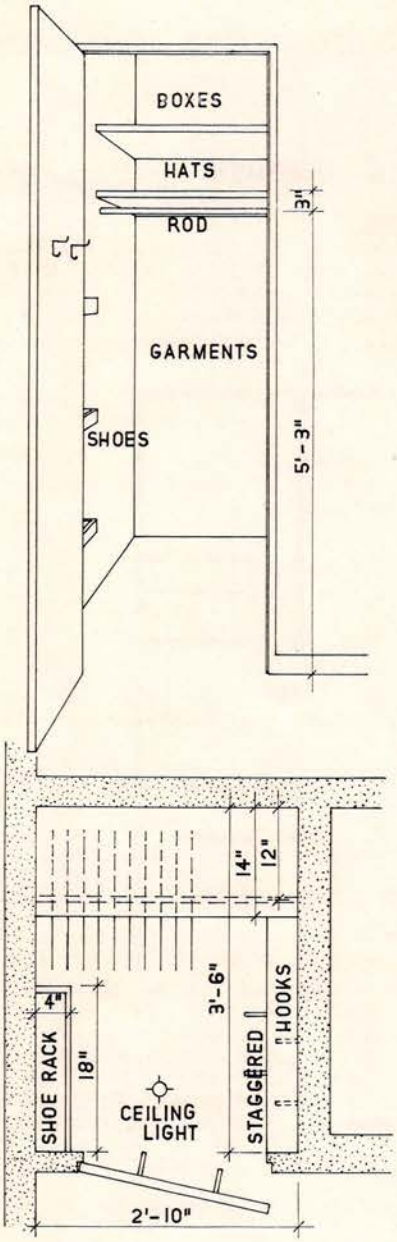
NORTH ELEVATION



FIRST FLOOR PLAN: LIVING ROOM, 13' 4" BY 25', HAS BEEN SUBDIVIDED BY LOCATION OF FURNITURE AND THE OFF-CENTER LOCATION OF FIREPLACE. EMPHASIS HAS BEEN GIVEN TO THE SITTING AREA. BOTH HALL AND DINING ROOM ARE SEPARATED BY CURTAINS. FURNITURE WAS DESIGNED AS A PART OF THE HOUSE. WILLIAM LESCAZE, ARCHITECT.



SECOND FLOOR PLAN: THE MASTER BEDROOM HAS A DRESSING ROOM THAT IS AN INTIMATE PART OF THE BEDROOM. THE HALL-PASSAGE GIVES COMMON ENTRANCE TO ROOF TERRACE FROM BEDROOMS.



BEDROOM CLOSET ARRANGEMENT FOR ADULT USE. SINGLE CLOSET OF MINIMUM PRACTICABLE WIDTH —WALK-IN TYPE. SIZE 34" x 42". GARMENT HANGER ROD 34" LONG, PLACED 63" ABOVE FLOOR. TWO SHELVES 14" x 34". FREE FLOOR AREA 18" x 24".

The following information on closets was prepared by Miss Maud Wilson, Home Economist, Agricultural Experiment Station, Oregon State Agricultural College, Corvallis, Oregon.

The publication of a bulletin incorporating this and additional closet data is announced by Dr. Louise Stanley of the Bureau of Home Economics, Department of Agriculture, Washington, D. C.

STORAGE

Every housekeeper knows the importance of having a place "to put things." It saves time, which is more important than ever now because there are so many more ways of using time than there used to be. It saves labor, which is particularly important in a household without servants, as most farm households are. And it helps to keep the house in order, which has much to do with the comfort and efficiency of the family.

Lack of closet space, however, and ill-planned closets are among the historic faults in house planning. Perhaps it is because the designer does not appreciate the housekeeping needs. Perhaps the house builder tries, in this way, to keep down costs.

AS A MATTER OF FACT, THE TOTAL COST OF A HOUSE AND ITS EQUIPMENT MAY BE LOWER IF THOROUGHGOING CONSIDERATION IS GIVEN TO STORAGE NEEDS OF THE FAMILY FROM THE OUTSET OF THE PLANS.

Alterations are expensive. Where built-ins are lacking, it is often necessary to buy pieces of furniture to supply storage space, at greater cost than for built-ins but with no greater capacity.

ROOMS SERVING MORE THAN ONE MAJOR PURPOSE ARE OFTEN MORE CONVENIENT, AND NO MORE EXPENSIVE, IF PROVIDED WITH ADJACENT STORAGE SPACES PLANNED FOR SPECIFIC USES, SUCH AS SEWING IN THE LIVING ROOM, OR USING THE LIVING ROOM AS A BEDROOM.

STANDARDS

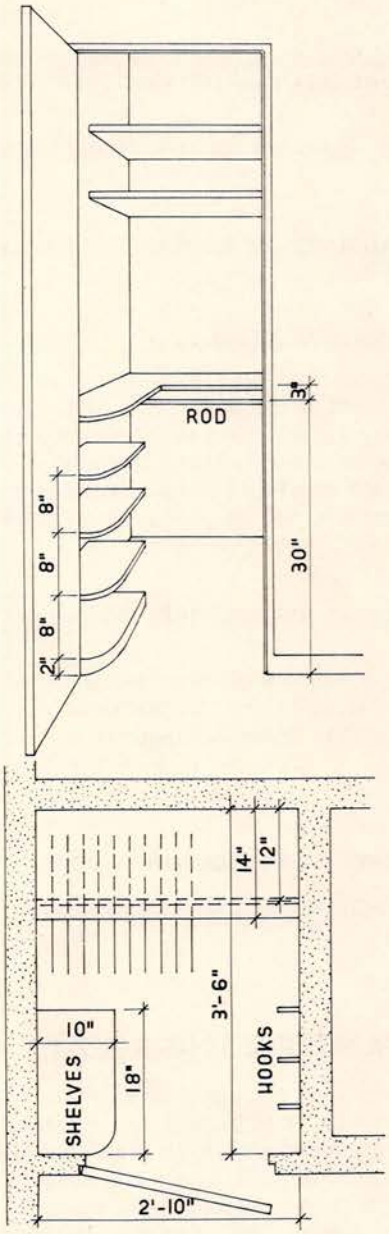
THE SIZE, SHAPE AND ARRANGEMENT OF THE CLOSET SHOULD BE SUCH AS TO MAKE READILY ACCESSIBLE ALL ARTICLES WHICH ARE IN FREQUENT USE.

The closet and its fittings should be dimensioned to accommodate the tallest person likely to use it; for efficiency in storage of clothing; and for ease of access. It should be possible to arrange the closet to accommodate persons of varying heights.

THE CLOSET SHOULD HAVE SUFFICIENT NATURAL OR ARTIFICIAL LIGHT SO THAT ITS CONTENTS MAY BE EASILY SEEN.

If possible, light from the room should enter the closet when the door is open. A light fixture should be placed within the closet unless the light of the room affords sufficient illumination.

EVERY CLOSET SHOULD BE VENTILATED; IF NOT BY A WINDOW, THEN BY OPENINGS IN THE DOOR.



BEDROOM CLOSET ARRANGEMENT FOR CHILD. HEIGHT OF ROD 30"; USABLE ROD LENGTH 24"; 6 HOOKS, HEIGHT 30"; SHELVES AT SIDE 10" x 18"; SHELVES ABOVE ROD 10" x 28" and 14" x 28"; HEIGHT 33" ABOVE FLOOR.

STANDARDS (Continued)

DEEP CORNERS SHOULD BE AVOIDED IN THE SHALLOW (REACH-IN) TYPE OF CLOSET.

Sliding doors may be used to save space in the room or to make the contents of the closet more accessible.

TWO OR MORE NARROW DOORS FOR A WIDE CLOSET ARE MORE CONVENIENT THAN ONE WIDER DOOR.

DOORS TO WALK-IN CLOSETS SHOULD FIT TIGHTLY AT THE BOTTOM TO KEEP OUT DUST. THE FLOOR OF A WARDROBE CLOSET SHOULD BE AT LEAST 2 INCHES ABOVE THAT OF THE ROOM TO PREVENT LINT FROM COLLECTING.

HOOKS SHOULD NOT BE PLACED WITHIN 5 INCHES OF THE EDGE OF A DOOR.

A HOOK FOR GARMENTS ON HANGERS SHOULD NOT BE PUT ON A DOOR THAT IS LESS THAN 30 INCHES WIDE.

TO SERVE THE NEEDS OF SMALL CHILDREN, HALF-GROWN BOYS OR GIRLS, AND ADULTS, IT SHOULD BE POSSIBLE TO ADJUST THE HEIGHT OF HOOKS, RODS, AND SHELVES, OR TO INSTALL SPECIAL FITTINGS FOR THE CHILD'S USE.

Hooks for use of small children should not be above eye level.

With children, the weight and size of a drawer is more of a factor than distance from the floor. A child can use a step, if the drawer is small enough and light enough to be pulled out easily.

CLOSETS ARRANGED SO AS TO PERMIT ALTERATION TO MEET INDIVIDUAL REQUIREMENTS.

CHOICE AND PLACING OF FITTINGS

IN OFFERING DIMENSIONS OF CLOSETS THE FOLLOWING PRACTICES SHOULD BE FOLLOWED IN STORING GARMENTS:

On hangers: All dresses, except those of infants. Skirts. Blouses. Men's dress shirts, if laundered at home. Men's coats and vests. Trousers, on hangers separate from coats and vests. Coats, overcoats and jackets. All coats stored away or seldom used.

On hooks: Articles which have been worn since being cleaned or laundered, as nightgowns, pajamas, slips, aprons. Bathrobes. Coats, jackets and leggings worn by small children at play.

On shelves: Hats, caps, gloves, mittens.

In drawers, trays or shelves: Men's work shirts. Dress shirts done at commercial laundry. Sweaters, aprons, slips, underwear, hose, nightwear. Toys and keepsakes of children.

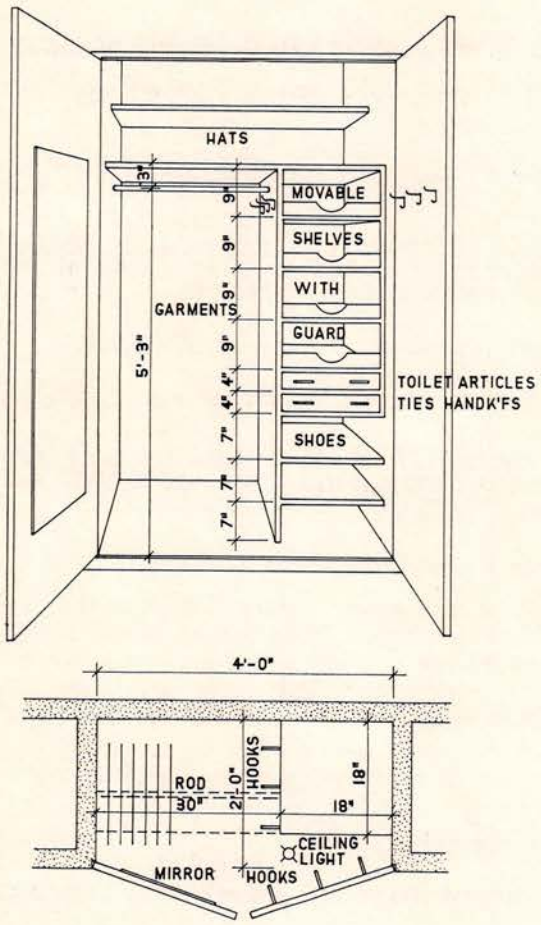
On racks or shelves: Shoes.

On hooks, racks, or in drawer: Ties.

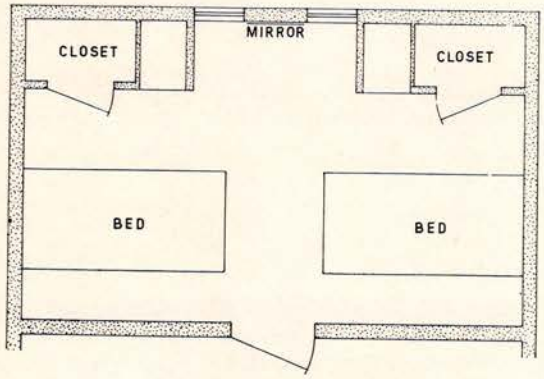
The most economical arrangement for shoes is a cabinet of horizontal shelves, since this may be converted to other purposes, particularly when the closet is rearranged to meet children's needs. Tilted shelves or racks require less floor space than horizontal ones, but lack the advantage of convertibility.

Drawers or trays are more convenient than shelves for the storage of folded clothing. Shelves are given in a number of plans, however, because they are cheaper to build, and because with drawers and trays room must be allowed to pull them out.

It is assumed, except in the dressing closet and wardrobe plans, that only shoes, hats and reserve clothing in boxes are stored on shelves, and that drawers for folded articles are provided in a dresser nearby. Where drawers are used, a movable cabinet is preferable to a built-in one, except in a space under a sloping roof or stairs. Several small drawers are preferable to fewer and larger ones.



BEDROOM CLOSET OF WARDROBE TYPE. FOR ONE PERSON. ECONOMICAL USE OF SPACE FOR STORAGE PURPOSE. SHELF ABOVE ROD, 18" WIDE, 48" LONG, SET 66" ABOVE FLOOR. BASE OF CLOSET 2" ABOVE FLOOR. TIER OF SHELVES, TRAYS AND DRAWERS 18" WIDE, 18" LONG. MIRROR ON DOOR PLACED WITH RESPECT TO ARRANGEMENT OF ROOM AND DIRECTION OF LIGHT FROM WINDOWS.



CLOSETS (Continued)

THE CLOSET ROD SHOULD BE PLACED HIGH ENOUGH TO ALLOW 6 INCHES BELOW GARMENTS HANGING FROM IT, AND TO PERMIT CLEANING THE FLOOR WITHOUT DISTURBING THE GARMENTS.

The rod should not be set higher than this, unless the space underneath can be utilized.

THE PREFERRED POSITION FOR THE ROD IS PARALLEL TO THE DOORWAY, FOR CONVENIENCE IN SEEING AND PLACING GARMENTS.

ALL GARMENTS IN FREQUENT USE SHOULD BE READILY ACCESSIBLE.

To accomplish this, rods of the extension type are suggested where space in the closet does not permit easy withdrawal of a garment. The collapsible type of rod is preferred where it is necessary to place shelves behind the rod. Where only a small number of garments need to be stored on hangers, as in the closet for chore coats, a long hook is used instead of a rod. For seldom-used garments stored in long garment bags, it is well to provide a long high hook.

PLACE HOOKS AS NEAR THE DOOR OF THE CLOSET AS POSSIBLE. THEY SHOULD NOT BE PLACED BACK OF THE ROD.

A space-saving method of placing hooks is to arrange them in two rows, placing the upper ones on an extension (as a two-by-four on brackets) which sets them out into the room 4 inches farther than the lower ones.

HOOKS SHOULD NOT BE PLACED WITHIN 5 INCHES OF THE EDGE OF A DOOR.

HOOKS FOR USE OF SMALL CHILDREN SHOULD NOT BE ABOVE EYE LEVEL.

COMBINATION CLOTHES CLOSETS AND DRESSING ROOMS

In many situations it is preferable to dress in some place other than the sleeping room. For instance, the bedroom may be unheated, or perhaps it does not warm up in the morning in time to be comfortable for dressing. Or the living room may serve as the bedroom. In such cases a convenient arrangement is a combination clothes closet and dressing room, equipped with adequate and well-placed window and electric light, and heat register, radiator, or portable heater. It should have a draft-tight door if it opens into an unheated room. Space for use of person while dressing: 42 inches diameter.

FITTINGS OF DRESSING ROOM:

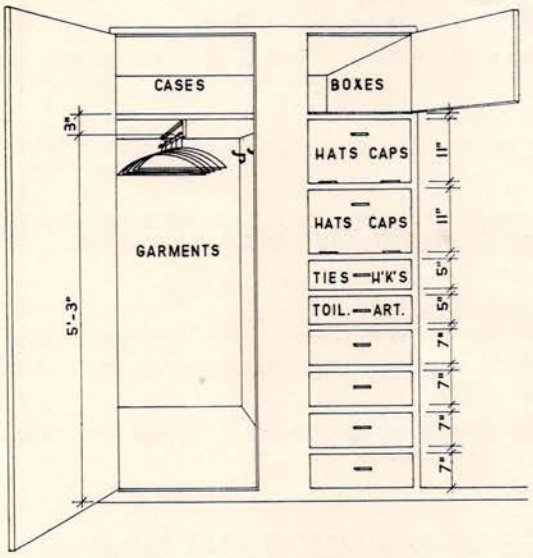
Chair or stool; shallow drawer conveniently located for toilet articles; cabinet top for layout toilet articles—12 by 12 inches minimum.

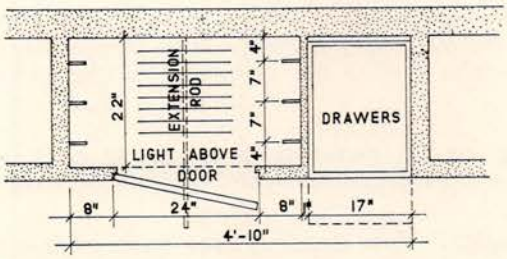
BED CLOSETS

ONE OF THE WAYS OF KEEPING DOWN THE SIZE OF THE HOUSE IS TO PLAN AREAS WHICH SERVE AS BEDROOMS AT NIGHT BUT ARE AVAILABLE FOR OTHER USES DURING THE DAY.

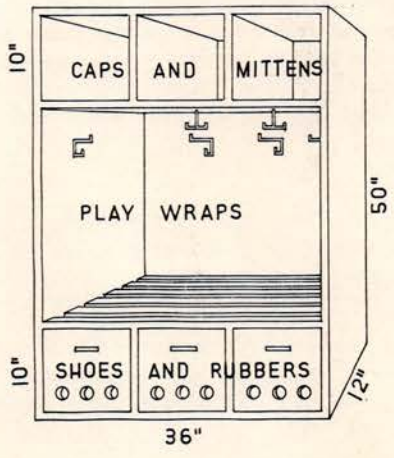
This may be done by providing a closet for the bed, with or without space for clothing storage and room for dressing. Such a closet may open from the living room, sun parlor, dining room, sewing room, child's play room, study, or living porch. A bed closet built in connection with the sleeping porch serves to keep the bed clothing warm and dry.

For use in this way in the farmhouse the roll-away type of bed is probably the best as there may be periods when the bed can be taken to the storeroom and the closet used for other purposes. Furthermore, the closet for this type of bed may open from a hall, and the bed be pulled to any one of several rooms as desired.





COMBINATION DRESSER AND CLOSET. SIZE: 22 INCHES BY 58 INCHES. THERE IS CLOTHING STORAGE FOR ONE PERSON; USE IS MADE OF EXTENSION ROD. DRESSER TIER HAS 4 DRAWERS 7" x 15" x 24"; 2 DRAWERS 5" x 15" x 24"; 2 COMPARTMENTS WITH FRONTS HINGED AT BOTTOM.



COAT CABINET FOR CHILDREN. INTENDED FOR INSTALLATION ON PORCH, IN HALL OR IN A COAT CLOSET. ACCOMMODATION FOR THREE CHILDREN OF PRE-SCHOOL AGE. 6 HOOKS; 3 COMPARTMENTS FOR CAPS AND MITTENS (11" WIDE, 12" LONG, 10" DEEP); 3 VENTILATED DRAWERS EACH 11" WIDE, 12" LONG AND 10" DEEP, FOR OVERSHOES AND RUBBERS. SLATTED SHELF OVER DRAWERS.

BED CLOSETS (Continued)

A CLOSET OPENING FROM A LIVING ROOM SHOULD BE OF SUCH DIMENSIONS THAT IT CAN BE USED FOR ANY ONE OF SEVERAL PURPOSES, SUCH AS STORING A BED, SEWING EQUIPMENT AND SUPPLIES, A CHILD'S PLAYTHINGS, GAME BOARDS, AND SMALL MUSICAL INSTRUMENTS.

Space that is large enough for a stored bed, clothing, and dressing facilities, is ample for any other purpose for which a living room closet is useful.

Dimensions for areas for clothing storage and dressing are based on measurements included in the general discussion of closets and dressing rooms. The area allowed for the bed is 2 feet in depth, and 5 feet in width.

BEDROOM CLOSETS

OF THE VARIOUS POSSIBLE SHAPES, THE SHALLOW CLOSET IS THE MOST ECONOMICAL OF SPACE, AND CAN BE CONVENIENTLY ARRANGED, PROVIDED THE OPENING IS NEARLY AS LONG AS THE CLOSET ITSELF.

A SEPARATE CLOSET FOR EACH PERSON IS DESIRABLE.

Where the closet must be shared by two persons it is more convenient if fitted with two rods for hangers.

BATHROOM CLOSETS AND CABINETS

THE AMOUNT AND LOCATION OF STORAGE SPACE FOR A BATHROOM SHOULD BE PLANNED WITH REFERENCE TO THE NEARBY CLOSET FACILITIES AS WELL AS TO THE FUNCTIONS THAT THE ROOM IS LIKELY TO SERVE.

The house with bedrooms and bathroom all on one floor may have a central closet for bedding which can also care for all equipment and supplies used in the bathroom except small, frequently used articles. The homemaker often prefers to keep all infants' wear in a downstairs bedroom. Men sometimes prefer bedrooms for shaving or the family may use commercial services for shaving, care of the hair, or shoe cleaning. **Special toilet facilities** may be provided for the use of guests, for persons who are ill, or for men engaged in dirty work. **A chute** may convey soiled clothing to the laundry. **Heated bedrooms or dressing rooms** may make unnecessary the use of the bathroom for dressing. **Articles used in cleaning the bathroom** may be stored with other cleaning supplies and equipment in a nearby closet. All these possible uses of the bathroom by various members of the household make a difference in the kind and quantity of material to be stored.

Bathroom storage requirements may include space for:

Linen: Clean bath towels, hand towels, wash cloths, bath mats—entire supply, small number only (main supply kept elsewhere), those kept especially for infants' use, those kept especially for use of guests; clean rags; towels and wash cloths in use; bath mat in use; pad used in bathing or changing baby.

Infant's wear, kept where the baby is cared for: Diapers, entire supply or small amount; other baby clothes.

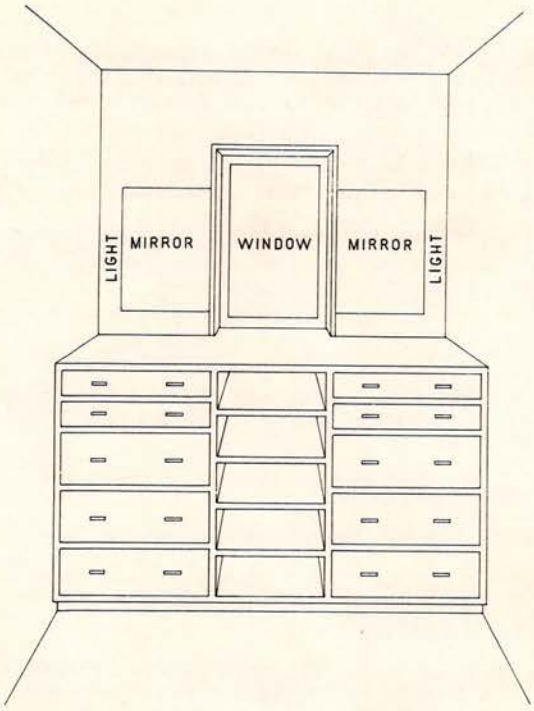
Other clothes: Handkerchiefs; stored in connection with bath-dressing room —nightgowns, pajamas, house slippers (daytime storage); day wear (storage during night).

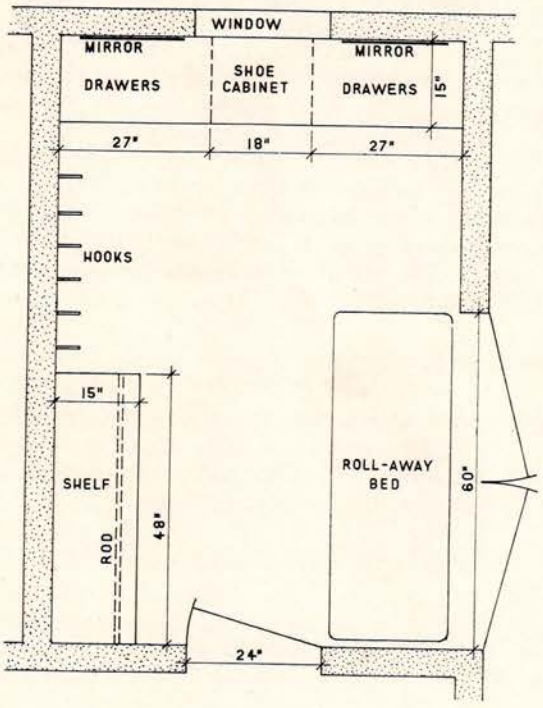
Toilet supplies and equipment: Glasses, paste, and brushes used in care of teeth; soap in use; combs, hair brushes; facial tissue; bath and nail brushes; bath salts, powder; shaving equipment; powder, face cream, etc.; curling iron, dryer; reserve supplies, such as soap, toilet paper, facial tissue.

Cleaning supplies and equipment: Water-closet and bath tub cleaners; closet brush; floor cloth.

Shoe polishing equipment and supplies.

Other equipment: Hot water bottle, syringe, attachments for syringe; bath spray; foot tub, baby tub; bed pan, child's chamber; child's toilet seat, nasal syringe.





BED CLOSET: SIZE, 6 FEET BY 9 FEET. PROVIDES FOR STORAGE OF DOUBLE ROLL-AWAY BED TO BE USED AS **EXTRA BED.** THE BED IS ROLLED INTO ADJOINING ROOM. THERE IS CLOTHING STORAGE AND DRESSING ROOM FOR TWO PERSONS. THERE IS A DOORWAY INTO HALL AS WELL AS INTO ROOM WHERE BED IS USED. SUITABLE FOR LOCATION WHERE BED IS USED ON SLEEPING PORCH.

HANGER ROD IS 48" LONG, SET 63" FROM FLOOR. THERE ARE SHELVES ABOVE ROD; 12 HOOKS. CABINET IS 15" DEEP, 72" LONG, 4' HIGH, CONSISTING OF TWO SETS OF DRAWERS, EACH 27" LONG, WITH SHOE SHELVES BETWEEN THEM. THERE IS A MIRROR ABOVE EACH SET OF DRAWERS.

BATHROOM CLOSETS AND CABINETS (Continued)

Medicines, disinfectants: Poisonous materials; first-aid kit; bandages; liniment, oils, etc.

Soiled linen: Diapers; other infant's wear; other clothing; towels.

IT IS DESIRABLE TO KEEP PRESCRIPTION MEDICINES AND POISONOUS SUBSTANCES IN A PLACE SEPARATE FROM TOILET SUPPLIES, OINTMENTS, AND THE LIKE.

PROVIDE SHALLOW CABINET RECESSED IN WALL
Mirror may be on door but this is not preferred; overhead illumination; shelves in this cabinet should be removable and adjustable as to distance apart; shelf for drinking glasses.

BATHROOM MIRROR IS MOST CONVENIENT IF PLACED DIRECTLY ON THE WALL RATHER THAN ON THE DOOR OF A CABINET.

OUT-OF-SEASON STORAGE OF GARMENTS AND BEDDING

Some homemakers prefer to **store out-of-season garments away from those in current use,** and this simplifies the planning of closets. Those opening from bedrooms can be somewhat smaller than if they provided for the entire wardrobe.

USUALLY ONE CLOSET IS SUFFICIENT FOR THE OUT-OF-SEASON STORAGE OF GARMENTS FOR THE ENTIRE FAMILY AND FOR GARMENTS AND BEDDING THAT ARE SELDOM USED.

While a central location is desirable, it is not necessary since accessibility is a minor matter. This closet may be dimensioned so as to provide for dresses and coats in moth-proof bags and other garments in moth-proof boxes or wrappings. Or the whole closet may be moth-proofed. (See U. S. Dept. Agr., Farmers' Bull. 1353, Clothes Moths and Their Control.)

ACTIVITY AREAS

Minimum width of opening of closet.....24 inches
Minimum free space in closet of walk-in type.....24 by 24 inches

One of the ways of keeping down the size of the house is to plan areas which serve as bedrooms at night but are available for other uses during the day. This may be done by providing a closet for the bed, with or without space for clothing storage and room for dressing. Such a closet may open from the living room, sun parlor, dining room, sewing room, child's playroom, study, or living porch. A bed closet built in connection with the sleeping porch serves to keep the bed clothing warm and dry.

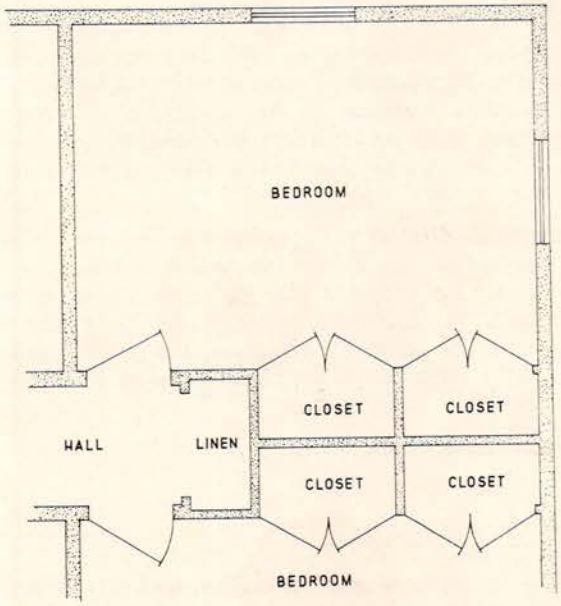
FIREWOOD CLOSET

A good arrangement is a closet convenient to the fireplace. If the design of the house permits a good-sized closet for this purpose, its convenience is enhanced if it is made large enough for the winter's supply of fireplace wood.

If wood is kept in the basement, a convenient arrangement is a wood lift located under a window seat with a hinged top that can be easily raised whenever another log is needed on the fire. Or the lift may be located under bookshelves or a storage cabinet.

SHOE RACKS AND SHOE-CLEANING CABINET

Shoe racks are of four types, two for the wall, one for space below garments that are hanging on hooks, and one a set of shelves for use where floor space is available. The shoe-cleaning cabinet should contain a foot rest, shelves for polishes and brushes, and a hook for a polishing cloth. Shelves should be made adjustable as to height and readily removable.



CLOSETS ARRANGED IN PAIRS IN ADJOINING BEDROOMS. LINEN CLOSET CONVENIENT FROM HALL.

ROD

To determine length of rod, for garments or hangers, allow space per garment as follows:

Men's and boys' clothing

	Inches
Suits	2
Trousers	3
Overcoats	4
Shirts	1½

Women's clothing

	Inches
House and street dresses	1½
Skirt	2
Jacket	3
Evening dress	2
Coat without fur collar	5
Coat with fur collar	6

Girls' clothing

	Inches
Wash dress	1½
Coat without fur collar	2
Coat with fur collar	3

Minimum distances from center of rod to wall:

	Inches
For adult use	12
For children 6 to 12 years of age	10
For children 3 to 5 years of age	8

DISTANCE BETWEEN FLOOR AND TOP OF ROD OR WARDROBE HOOK (ASSUMING USE OF HANGER WHICH PLACES TOP OF GARMENT 4 INCHES FROM TOP OF ROD):

	Inches
Garments of adults, general use	63
Short coats, skirts, shirts	45
Evening gowns	72
Garments stored in moth-proof bags	72
Garments of children 6 to 12 years of age	45
Garments of children 3 to 5 years of age	30
Distance between top of rod and bottom of shelf above it	2½

VIEW OF COAT CLOSET ACCESSIBLE FROM ENTRANCE HALL. LAVATORY FACILITIES ARE PROVIDED. WALLS AND DOORS HAVE SANITARY WASHABLE FINISHES OF GLAZED TILE AND ENAMEL.

HOOKS

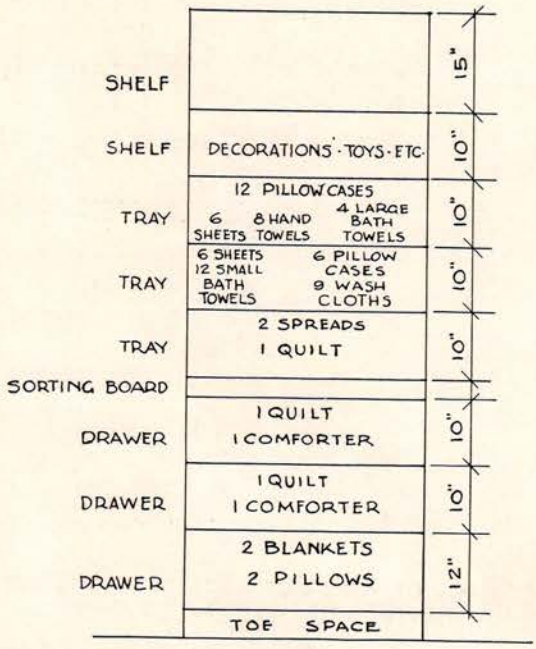
	Inches		Inches
Bedroom closet, hook to hook	7	Hook to corner	3½
Bedroom closet, hook to hook	7	Hook to corner	3½
Play coats, small children	9	" " "	4½
Chore coats, men	12	" " "	6
Distance between top of hook and bottom of shelf above it			4
Depth of space occupied by garments on hooks			4

SHELVES

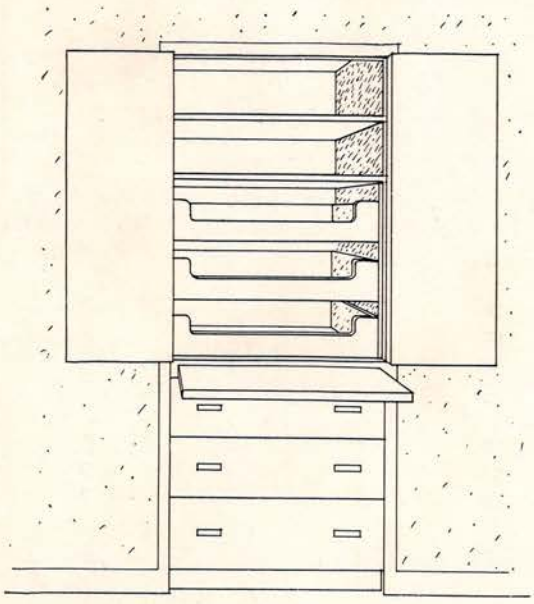
Article	Width of shelf front to back in inches	Length of space side to side in inches	Vertical height between shelves in inches
For a man:			
Hat	14	12	8
Hat box	15	13	9
Cap	12	11	4
Shoes	13	9	7
For a woman:			
Hat	12	12	8
Hat box	14	14	9
Shoes	10	7½	7
For a child:			
Shoes	6-10	5½-7	6

SHOES MAY BE STORED ON LOW SHELVES, OR SHOE RACKS.

The length of the shelf or rack should be 14 inches, 18 inches, or 21 inches, to allow for 2 or 3 pairs of women's or men's shoes.



LINEN CLOSET ARRANGEMENT WITH CAPACITY, DIMENSIONS AND METHOD OF STORING. DESIGNED BY MAUD M. WILSON, HOME ECONOMIST, FOR BUREAU OF HOME ECONOMICS, U. S. DEPARTMENT OF AGRICULTURE.



CLOSET FOR BEDDING AND LINEN—FOR STORAGE OF BED LINEN, BED COVERS, AND TOWELS. NOTE SORTING BOARD AT TABLE HEIGHT.

TELEPHONE BOOTH OR CLOSET

The telephone arrangements of a house should be such that any one can conduct a telephone conversation in an ordinary tone of voice without disturbing or being disturbed by other members of the household. In larger houses this can often be accomplished by installing the telephone, or an extension, in a hall or study. In the smaller house it is often necessary to plan a closet or booth to insure privacy.

Since telephone conversations carried on at home are apt to be long, it is well to install the instrument at sitting height, and to provide a shelf as an elbow rest and a place to write. An ordinary 16-inch backless stool is a satisfactory seating arrangement. A rectangular shelf should be at least 16 inches in depth and 28 inches in width. If triangular, the shelf should measure at least 28 inches on a short side. A shelf placed below this provides convenient space for telephone directories.

A booth 30 inches square is satisfactory for home use.

DIMENSIONS

Telephones: Wall type, small: Cabinet, 7 inches wide x 9 inches high x 3½ inches deep; receiver, add 3½ inches to width; transmitter, add 3½ inches to depth. Desk type: Base, 5½ inches diameter; width over-all, 6½ inches; depth over-all, 6 inches; height over-all, 12 inches. Bell box: 7 inches wide by 9 inches high by 4 inches deep.

Directories: Maximum size, 9½ inches x 11¾ inches.

User: Depth of space under table required for feet, 16 inches; width of space required for freedom of arm movement, 14 inches at either side of center of mouthpiece; distance from mouth of user to mouthpiece of instrument, 3 inches.

Booth and installation: Booth itself, 30 x 30 inches. Size of writing shelf, triangular type, minimum length of leg of triangle, 28 inches; rectangular, minimum width, 16 inches; minimum length, 28 inches. Width of lower shelf, 2 inches less than upper shelf. Distance from floor to top of writing shelf, 28 inches. Maximum distance from top of upper shelf to bottom of lower shelf, 3½ inches.

Installation of wall type of telephone. Use bracket or frame long enough to bring back of cabinet 6½ inches into room. This will bring the plane of the mouthpiece to 3 inches from edge of writing shelf. Install so that height of center of mouthpiece is 38½ inches from floor.

TRUNKS AND FURNITURE CLOSET

In planning a house with neither basement nor attic, it is desirable to include a closet for trunks and unused furniture. This room is likely at various times to provide space for a baby carriage, high chair, or crib; unused bedsteads, springs, mattresses, cots; trunks, chests, and traveling bags; extra chairs; furniture awaiting repair; holiday decorations; cast-off clothing; books, sheet music, or magazines.

Trunks are valuable for storing unused clothing and bedding. They should be placed where they may be opened without moving them or articles stored nearby. If not needed for this purpose, trunks may be piled one upon the other.

Wide shelves should be provided for traveling bags, boxes, and small articles. Mattresses may be rolled and covered.

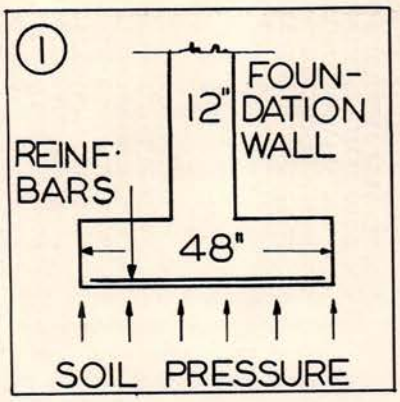
In general, it is best to store articles on the same floor on which they are likely to be used. First floor or basement space is desirable for camping equipment and porch furniture; extra beds should be stored on the floor with bedrooms.

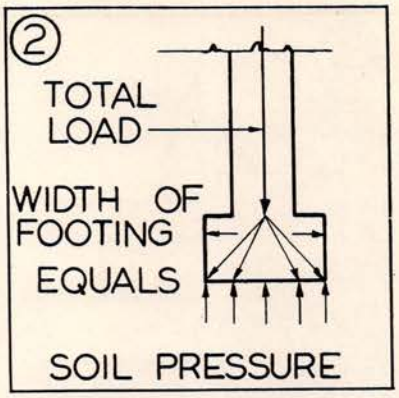
A room 6 x 8 feet is generally large enough for these purposes. This size will permit the storage of luggage, child's furniture, and extra beds, but it does not allow for much unused furniture. If no beds are stored, a closet 4 x 6 feet is adequate.

Information on Closets taken from Closet Arrangements for the Farm House. By Maud M. Wilson.

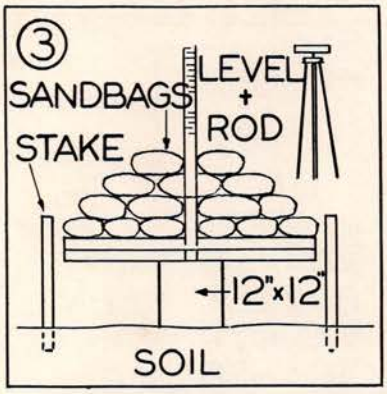
SMALL HOUSE FOOTING DESIGN

By SHELDON D. WERNER



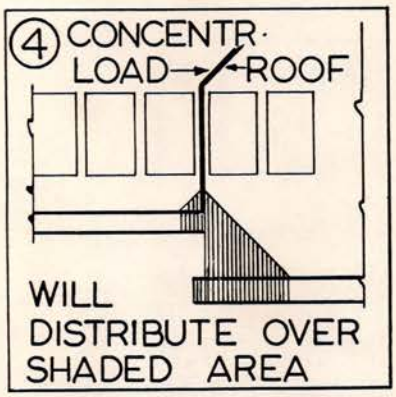


The importance of proper footing design for small houses is attested by the general prevalence of settlement cracks in such structures. It is common practice to specify that framing be carried around chimneys, because the chimney footing is obviously more heavily loaded than the adjoining walls, but it is apparently not generally realized that the several walls of a house differ in loading to a greater extent than exists between the chimney and walls. The function of any footing is to distribute the load over an area sufficient to reduce the settlement to a certain tolerance, depending on the character of the soil. In the case of a building with isolated and continuous unreinforced concrete footings, it becomes a great importance to proportion them so that an equal soil pressure is obtained at every point. If this is not done, the footing will crack near the line where the load changes, the more heavily loaded portion settling at a faster rate than the lightly loaded portion (Figure 6).



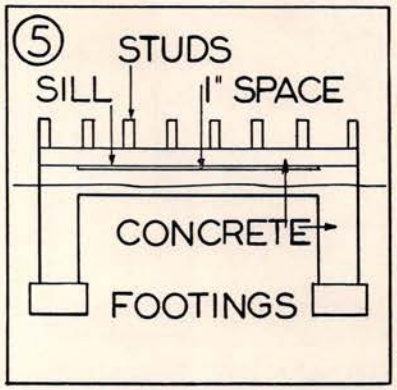
Shear and bending do not generally enter into the design of small house footings, because of the light loads involved and the absence of concentrations. It is safe to assume that where the footing width is less than four times the thickness of the wall it supports, reinforcing will not be required. Where this ratio is exceeded, the footing must be considered as a series of 12" wide beams supported by the wall in the center, and carrying the soil pressure as a uniform load (Figure 1).

If the value of steel required per lineal foot of wall is found to be less than .05 square inches, it may be disregarded entirely, and the steel omitted. All other stresses may be disregarded and the problem of proportion analyzed.

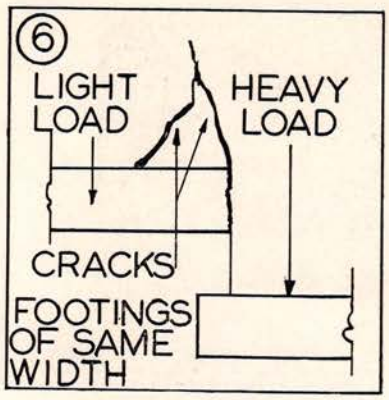


It is first necessary to determine the load per lineal foot separately for each section of the wall where it varies, and per unit for chimneys, lally columns, post footings, or other points of concentration. It must be remembered that settlement is the product of load and time, so that maximum stresses and live loads are not considered unless they are of long duration.

The weight of the footing itself must necessarily be inserted after the other loads have been determined, since its size must be assumed until the analysis is complete. This can usually be done without any appreciable error after the loads are tabulated, and if the assumed weight is found to be within 100 lb. of that required, no revision is necessary. The most lightly loaded walls will determine the soil pressure to be used, and should have no footing at all unless required by the building code, in which case it should be the minimum size. The soil pressure per square foot will then be the total load per lineal foot, divided by the width of the wall in feet, or the minimum footing width (Figure 2, 7 and 8). The width of all other footings is then readily determined by dividing the load per foot by the soil pressure. This will result in an even square foot load over the entire foundation, and comparatively even settlement. Where the soil is not of the same character under all the footings, or where rock is encountered, in part, the difference in bearing values should be determined by test, and footings over the softer soil be increased in direct proportion.

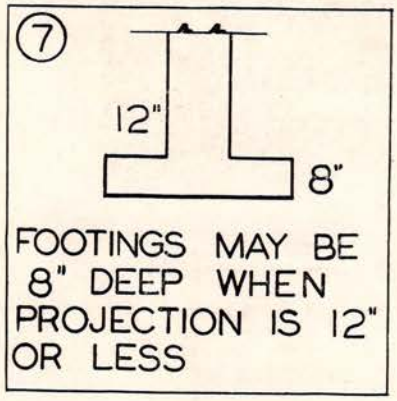


The method of testing, and the value of the results will vary greatly, and where any extreme condition is encountered, should be left to the judgment of a competent engineer. An economical test may be performed by constructing a substantial platform of wood, 4' x 4', and placing a built-up, but carefully leveled 12" cube of wood in its exact center (Figure 3). This block is placed on the undisturbed earth in the excavation, the platform held in a horizontal plane by stakes which do not



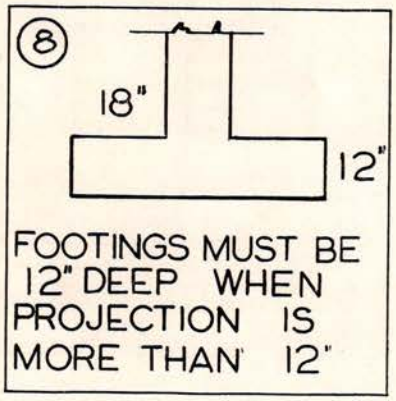
interfere with its vertical movement, and a level reading taken. The platform is then loaded with cement or sand bags of known weight, and at a uniform rate of speed, until a settlement of 1/4 or 1/2 inch is noted. The weight and the time in placing the weight are noted, and compared with similar tests at other points. If this is carried out with precision, a good indication of the value of the soil in resisting settlement will be obtained, and the results used to advantage, as stated above.

The weight of chimneys is found by computing the whole cubical contents and deducting openings for flues, fireplaces and ash pits. Posts and lally columns will generally produce a sufficient concentration to require a footing, and each should be investigated and provided for by dividing the total load by the soil pressure and using a square footing. For chimneys or rectangular piers, the footing shape should approximate that of the masonry it supports.

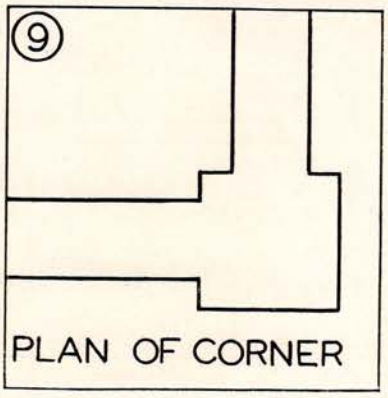


It will often be found that roof valleys will concentrate a considerable load at the corner of a wall, and, if there are door or window openings closely adjoining the corner, will leave, in effect, a slender column of wood or masonry, bringing this concentration plus that of the lintels, to the foundation wall (Figure 4). Should the foundation wall continue past the corner, in line with either of the outside walls, the concentration will spread downward from the point of application at a 90° angle, and thus distribute the load over a length approximately equal to the depth of the wall. In this case, the footing should be widened over that length by an amount equal to the concentrated load, divided by the soil pressure plus the length of the distribution. Where the foundation wall turns the corner but is not connected with interior foundation walls, the distribution will be small and the entire additional footing required should be placed at the corner, forming a square in which the concentration is centered (Figure 9). This should also be done where the walls are continuous but of greatly varying depth. The same principle will apply to floor girders, or any member producing a concentration greater than one-half the uniform load per foot of the supporting wall. Where the concentration is less than one-half it may be disregarded.

It will sometimes be found that in very small houses, with a partial cellar, the most lightly loaded wall will carry only 250 pounds per lineal foot, and the more heavily loaded cellar walls as high as 2,500. Assuming the 250-pound wall to be 8" thick and without a footing, the soil pressure will be 375 pounds per square foot, and the 2,500-pound wall will require a 7' 6" wide footing to produce an equal 375-pound soil pressure throughout. To eliminate this condition it is necessary to increase the soil pressure under the 250-pound wall by using piers, spaced for example 10 feet apart, and building the intermediate spandrel walls so that they do not support the house sill, but just hold it in position (Figure 5). This will increase the total load to 2,500 pounds at each pier footing, and by making these 1' 5" square, result in a 1,250-pound soil pressure, thus requiring a 2' footing for the 2,500-pound wall. In this case, the house sill will carry the load from pier to pier, and should be made a minimum of 6" x 6" instead of the usual 4" x 4" or 4" x 6". The spandrel wall should then be laid with a 1" space between the sill and masonry.



Concrete block foundation walls which carry a load in excess of 400 pounds per lineal foot will require a footing because of the greatly reduced bearing area of this block, although it may be only the width of the wall where calculation shows no footing is required. In larger houses, where the footing loads may run in excess of 4,000 pounds per lineal foot, the soil pressure should not exceed 4,000 pounds per lineal foot, unless tests or previous experience show soil at that particular site to be safe for a higher pressure. Retaining walls, or any wall, not supported at the top, require a footing designed to resist an overturning moment.

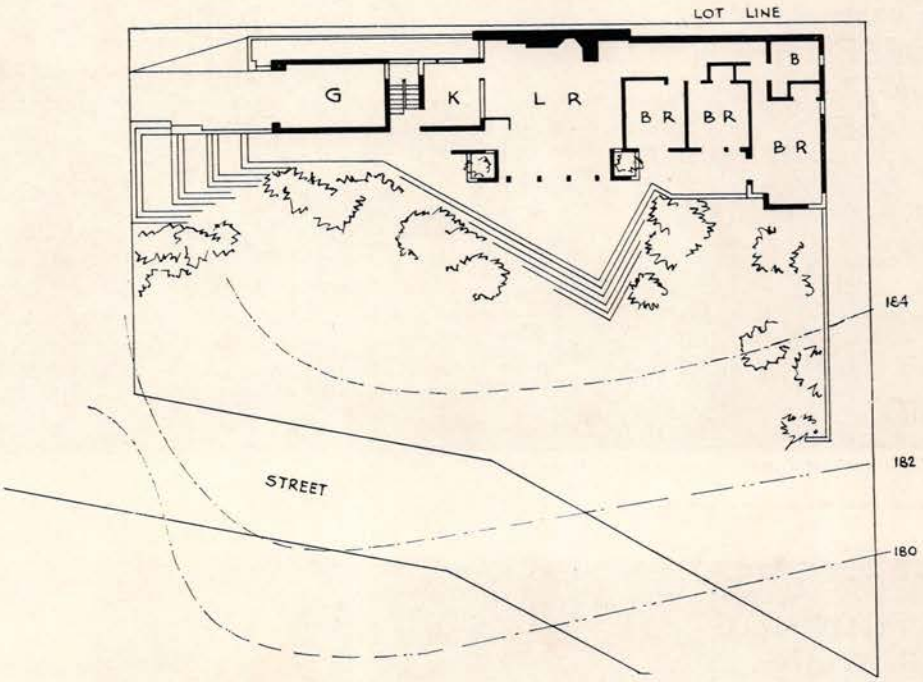


The dead load should be selected first and the floor live loads added or proportioned over the area covered. Thus, if a span of 18 feet supports a living and dining room, an average of 6 pounds per square foot should be added to the dead load for this area, the weight per lineal foot being nine times that amount of each supporting wall.

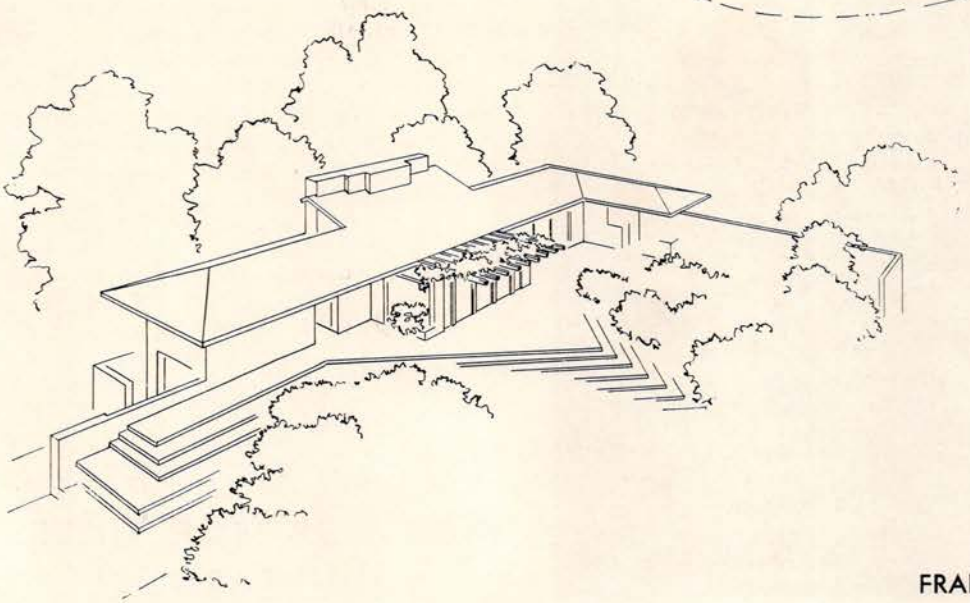
Ordinary shrinkage cracks are likely to appear in any building shortly after completion, but these usually occur only once, and seldom affect the foundation walls. Settlement, however, is a continuous process, and will produce cracks which cannot be permanently repaired. These are especially serious in foundation and masonry walls, since they leave an opening for frost and termites, two very destructive agencies.

Photographic Laboratory, University of Minnesota

PORTFOLIO OF HOUSES

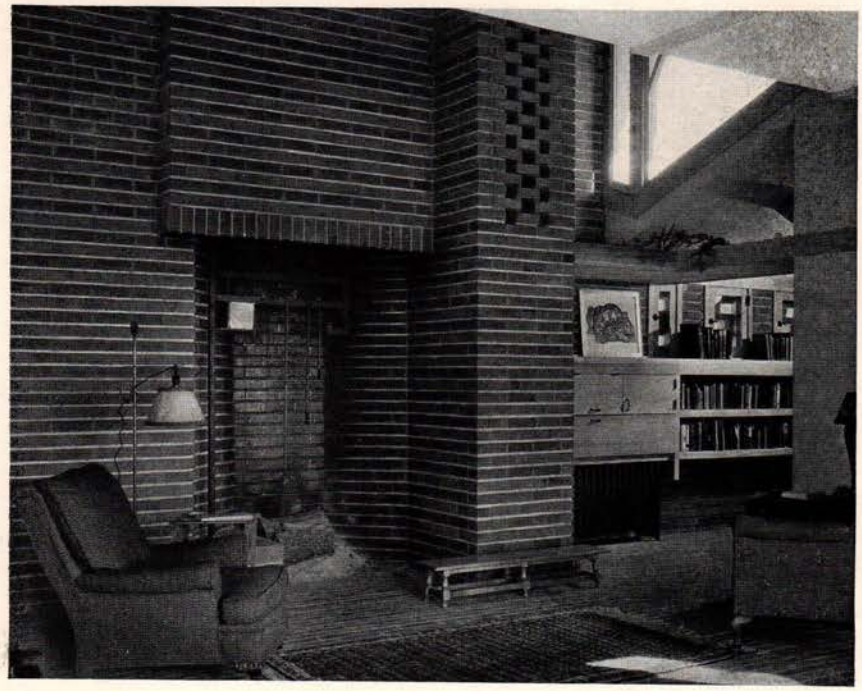


HOUSE OF PROF. MALCOLM WILLEY IN MINNEAPOLIS



FRANK LLOYD WRIGHT, ARCHITECT

Photographic Laboratory, University of Minnesota



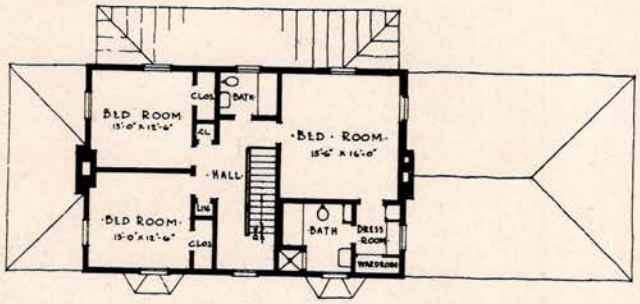
(ABOVE) LIVING ROOM WAS PLANNED FOR OUTDOOR VIEW. (LEFT) FIREPLACE DETAIL

HOUSE OF PROF. WILLEY
MINNEAPOLIS

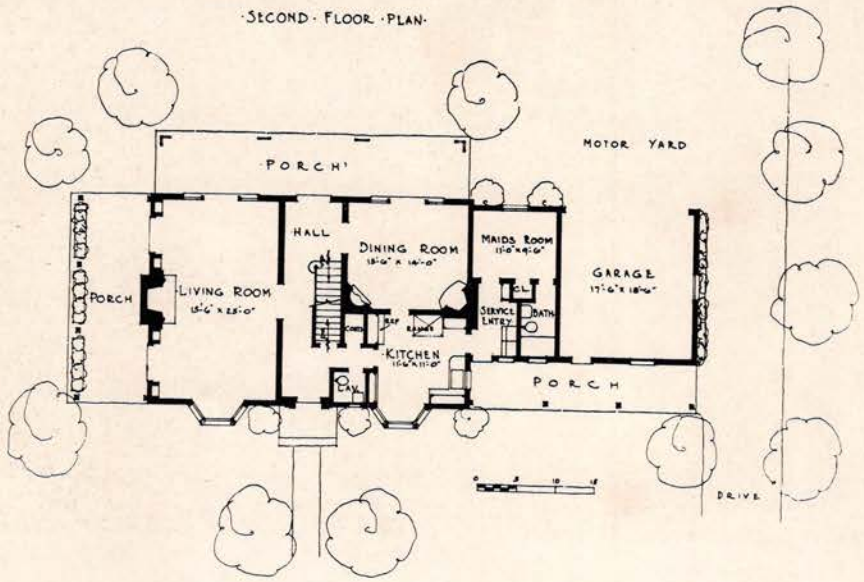
(ABOVE) KITCHEN IS ADJACENT TO LIVING ROOM. (RIGHT) DETAIL OF DINING SPACE.

FRANK LLOYD WRIGHT
ARCHITECT

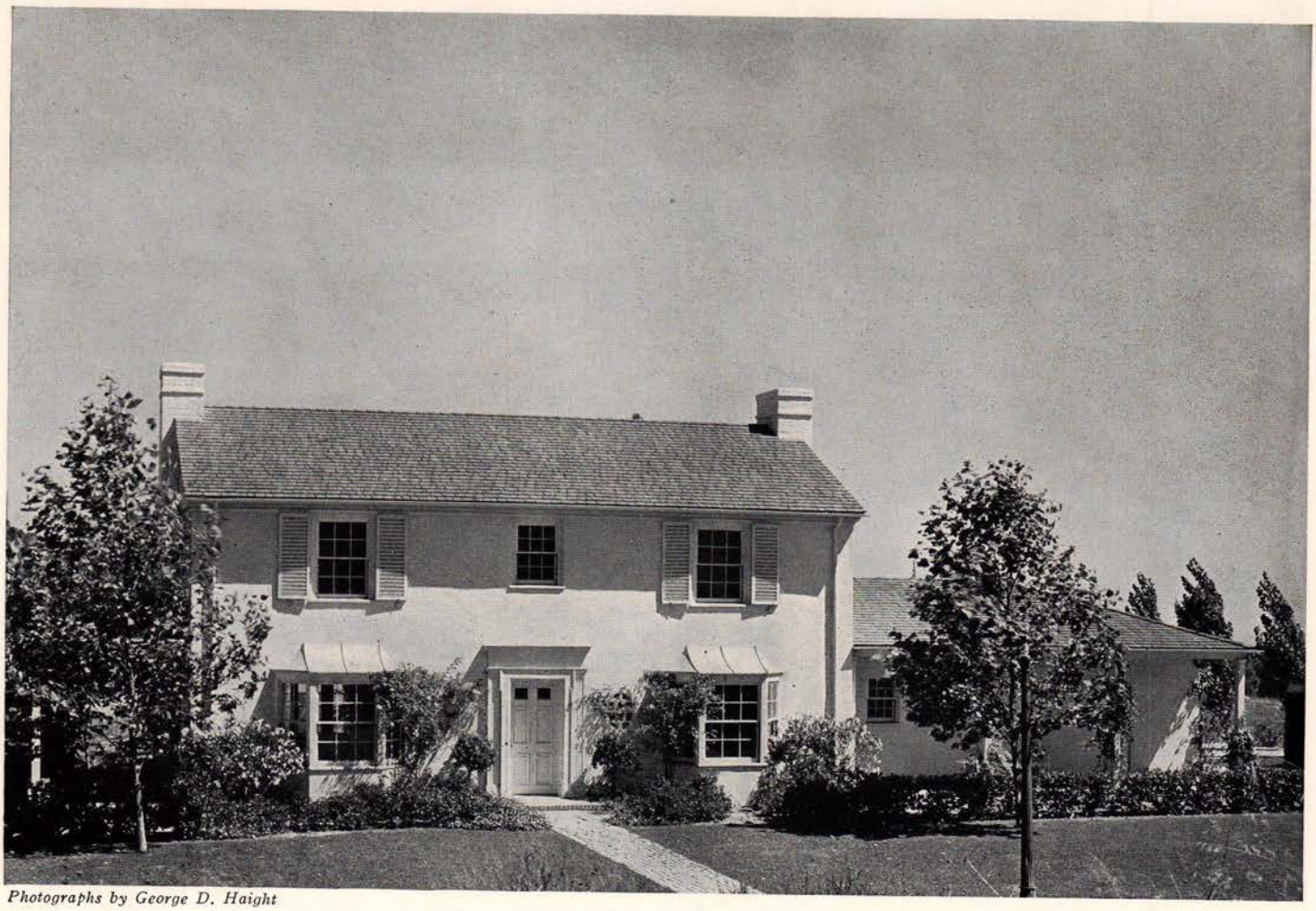
HOUSE OF MAJOR HARRY L. TOPLITT AT WEST LOS ANGELES, CALIF.



· SECOND · FLOOR · PLAN ·



The arrangement of rooms in this house takes advantage of views to the southeast and north. The simple plan and design make for economy of construction. Structural system: wood frame and stucco exterior; shingle roof. Windows: Libbey-Owens-Ford standard glass, double-hung wood sash, bronze screens. Color scheme: walls and trim painted white. All interior trim: Vitrolite enamel. Interior walls papered. Floors: oak throughout except for tile in bathrooms. Polished brass Luminaire lighting fixtures and Russwin hardware in living room, dining room and halls; pewter in bathrooms, chromium in kitchen and baths. Heating system: Payne gas-fired hot-air furnace.



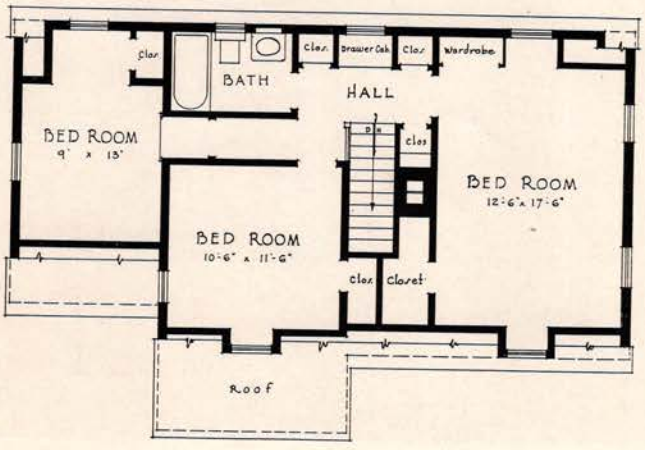
Photographs by George D. Haight

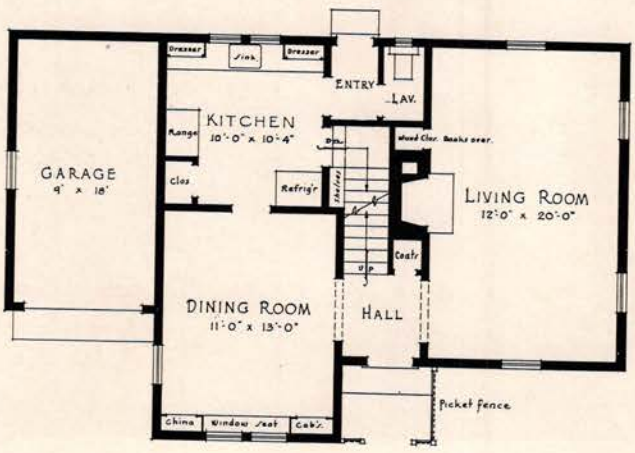
H. ROY KELLEY
ARCHITECT

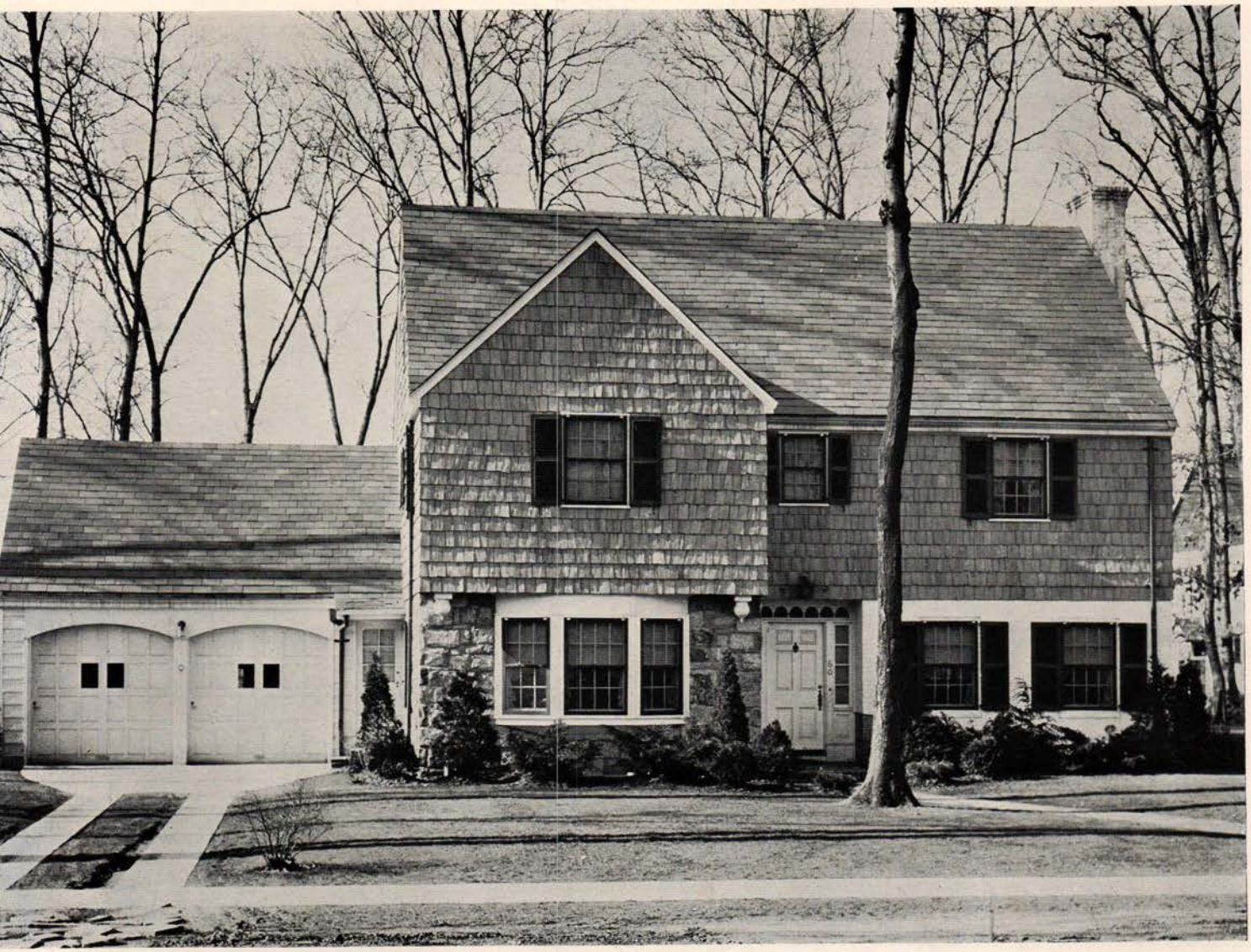
FRED BARLOW
LANDSCAPE ARCHITECT

Photographs by Gustav Anderson

TWO LONG ISLAND HOUSES BY M. R. JOHNKE, ARCHITECT

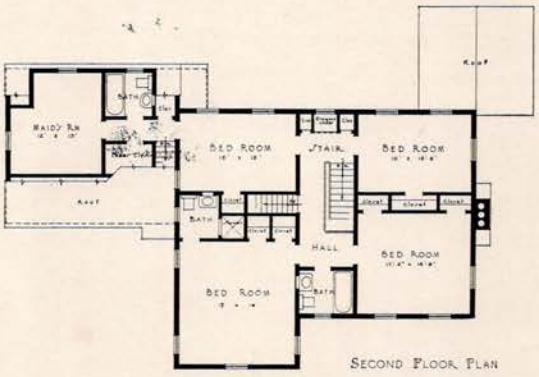






(ABOVE) HOUSE IN ROCKVILLE CENTRE

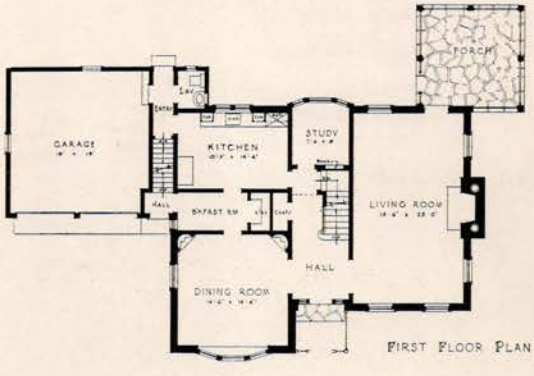
Compactly planned, this house serves the requirements of a family of three adults and two children. Structural system: poured concrete foundations; wood frame with hand-rived shingle facing, stone and brick veneer; Vermont gray slate roof; Celotex insulation. Random width plank floors in main rooms, slate flagging on porch and terraces. Color scheme: whitewashed brick, white trim, gray stained shingles, green shutters. Heating: two-pipe vapor vacuum hot-water system; American Radiator recessed radiators. Cost, including oil burner, gas range, landscaping: $14,000.



SECOND FLOOR PLAN

(LEFT) HOUSE OF MARTHA ELLISON AT HEMPSTEAD, LONG ISLAND, N. Y.

Structural system: poured concrete foundations; wood frame with shingle facing; shingle roof; Celotex insulation board used as a base for interior plaster finish. Red oak floors. Color scheme: walls painted white, shutters and roof green (Sherwin-Williams). Windows: Pennvernon standard glass, double-hung wood sash, copper screens. Heating: two-pipe steam system. Cost, including oil burner, gas range, landscaping: $4,500.



FIRST FLOOR PLAN

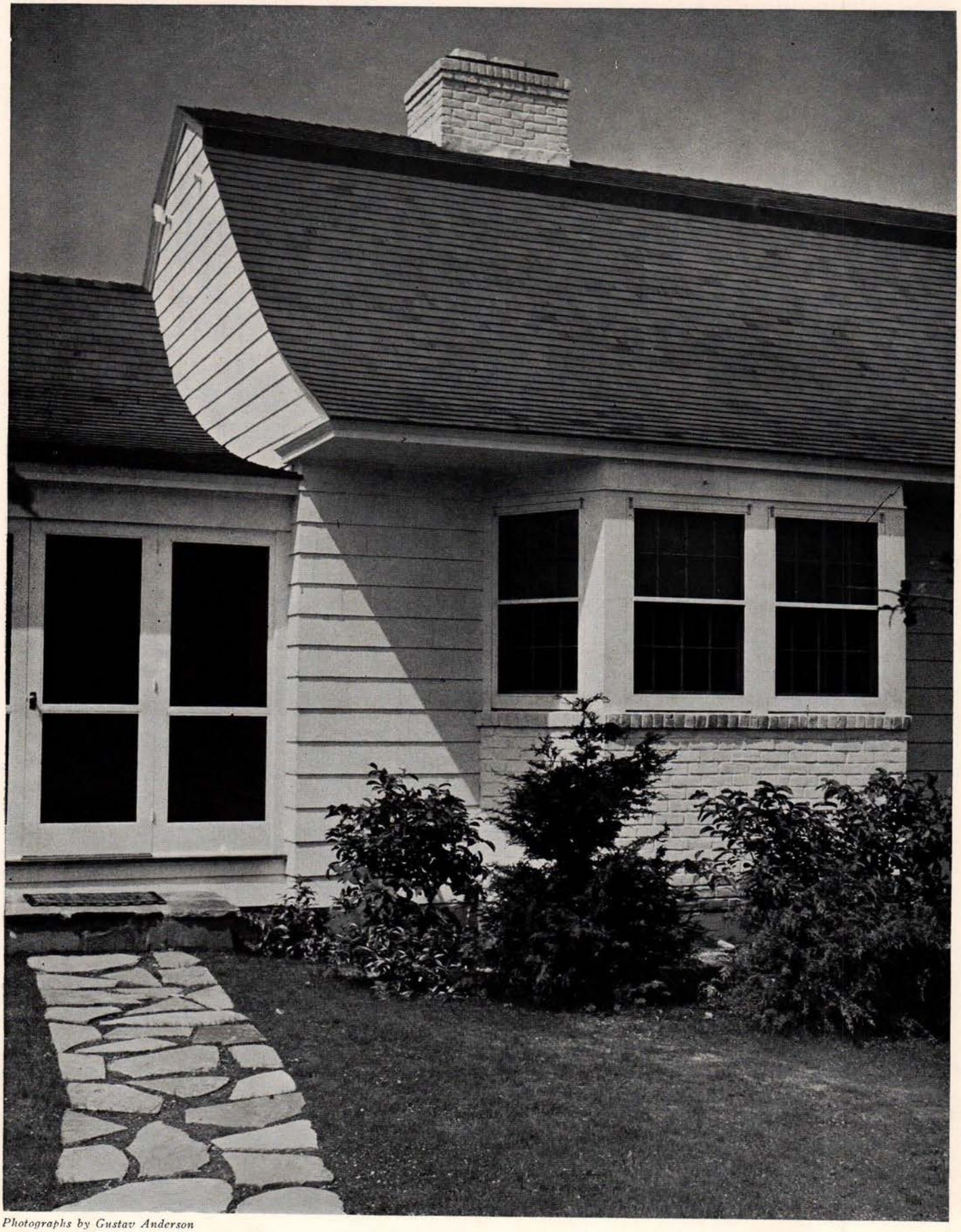
Photograph by Gustav Anderson

(LEFT) HOUSE OF MRS. HOOD AT HEMPSTEAD, LONG ISLAND, NEW YORK
M. R. JOHNKE, ARCHITECT

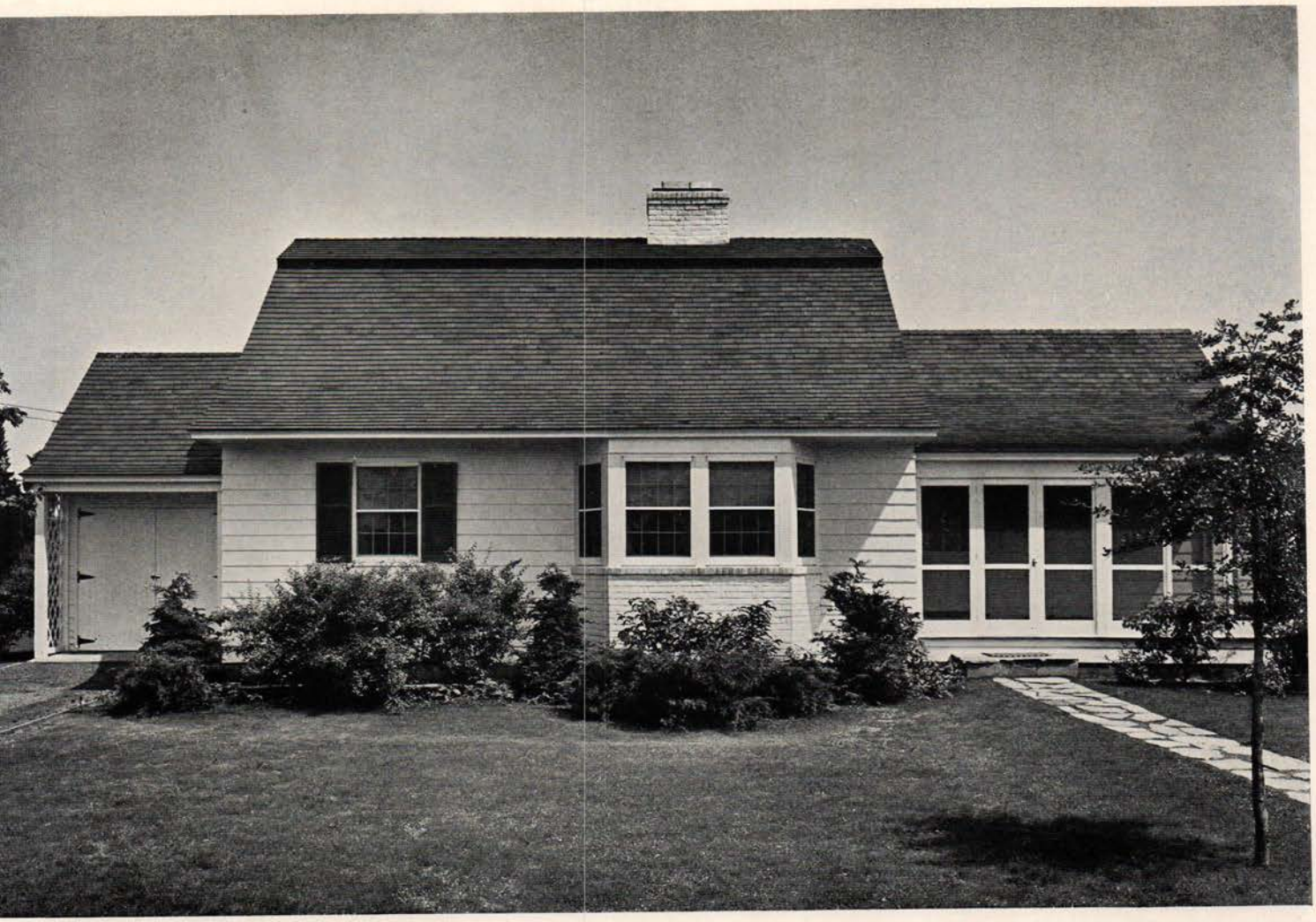
(BELOW) "THE WILLSHIRE" — AT ORCHARD HILL, WESTCHESTER, NEW YORK
RANDOLPH EVANS, ARCHITECT

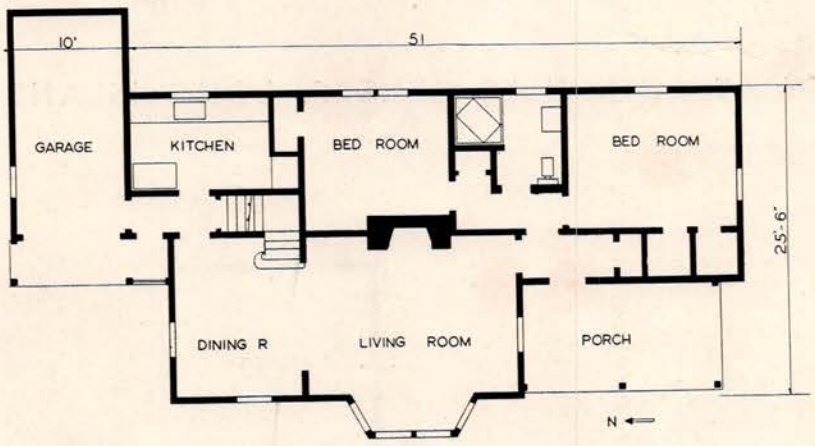
"THE BARNSTABLE" — AT HARBOUR GREEN, MASSAPEQUA, LONG ISLAND

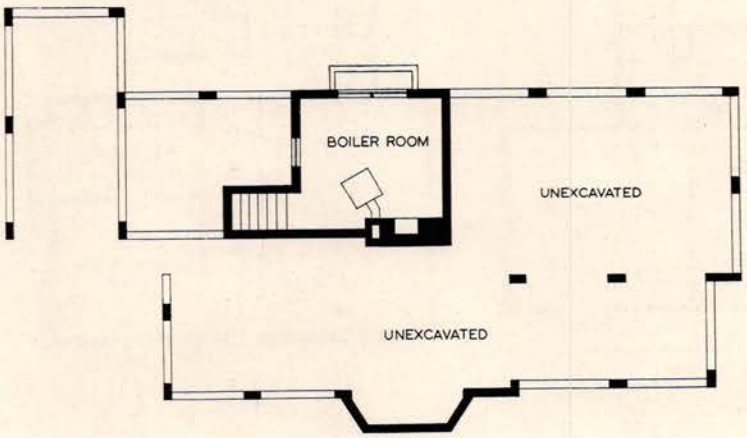
RANDOLPH EVANS, ARCHITECT



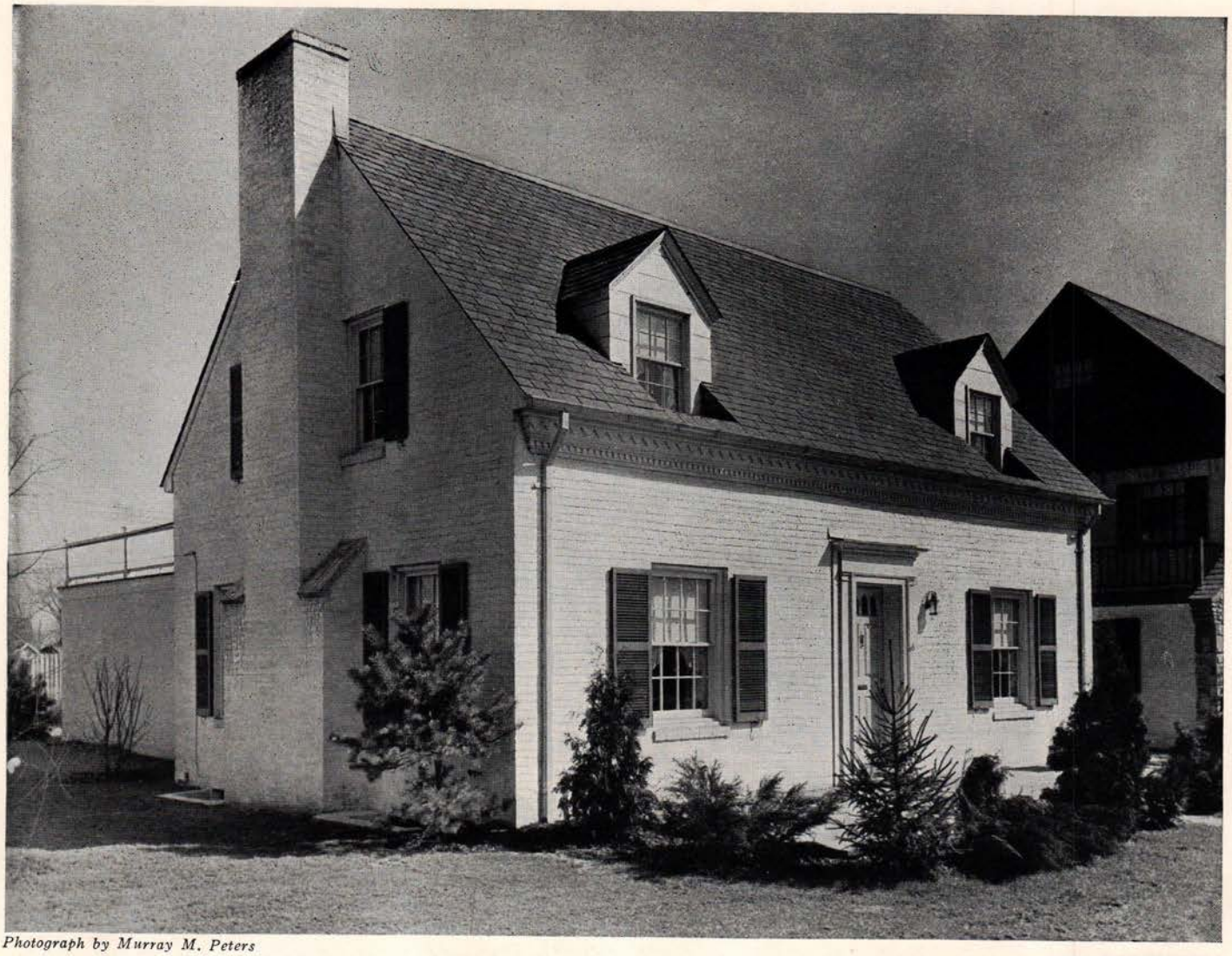
Photographs by Gustav Anderson







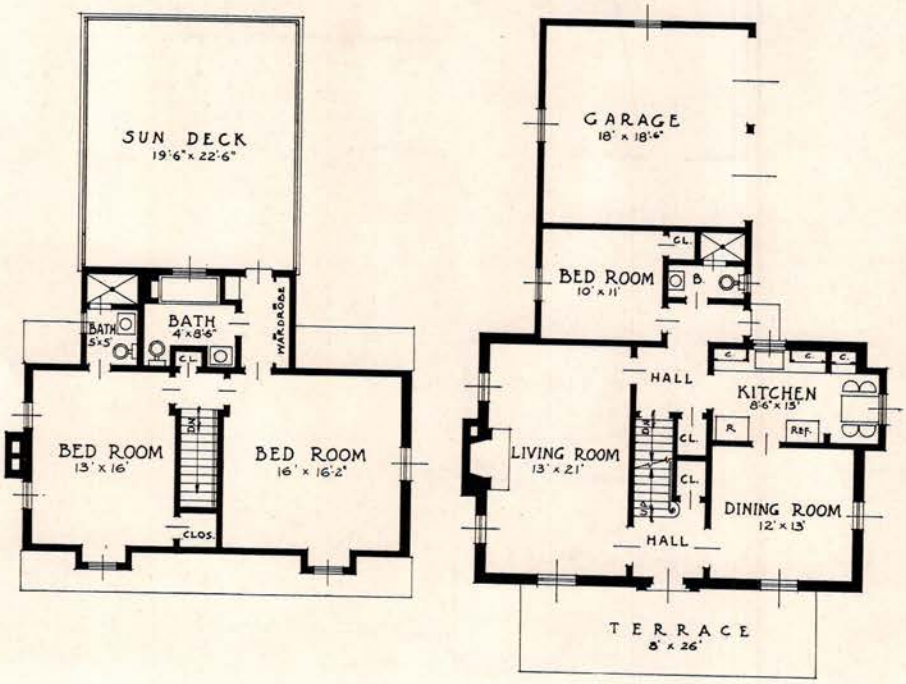
Rooms are all grouped on one floor with space available for additional rooms on second floor. Cellar is unexcavated except for a boiler room. Structural system: poured concrete foundations; wood frame walls and shingle facing; Johns-Manville insulation lath applied to ceilings. Windows: standard glass, double-hung wood sash, bronze screens. Color scheme: white walls, green blinds, green shingled roof. Floors: oak throughout. Pewter lighting fixtures of Colonial design. Schlage brass hardware. Steam heating system. Built-in features: kitchen cabinets, equipped with electric washing machine, recess for trays in kitchen, shoe racks in bedroom closets. Cost: $5,500 for house, $1,700 for furnishings, $140 for landscaping.



Photograph by Murray M. Peters

HOUSE OF MRS. A. E. KEARNEY AT ROCKVILLE CENTRE, LONG ISLAND
WALTER D. SPELMAN, ARCHITECT

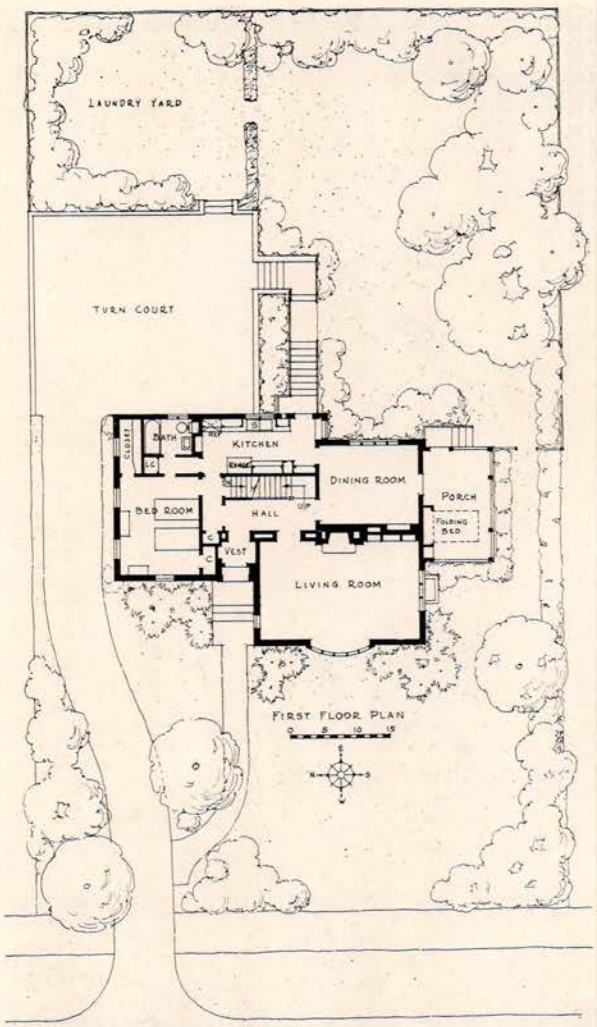
Structural system: poured concrete foundations; wood frame with brick veneer painted white; Reynolds Metallation; slate roof; copper gutters and leaders. Rear unit: stucco walls; flat roof built up with 5-ply Ruberoid surface. Floors: red oak in main rooms; Armstrong linoleum in kitchen and rear hall; ceramic mosaic tile in bathrooms. Windows: Libbey-Owens-Ford standard clear glass, double-hung wood sash, copper screens. Green painted shutters. Schlage brass hardware. Plumbing: Kohler fixtures with chromium fittings and brass pipe. Steam heating system: oil burner, Kohler boiler. Building cost: 30¢ a cubic foot.

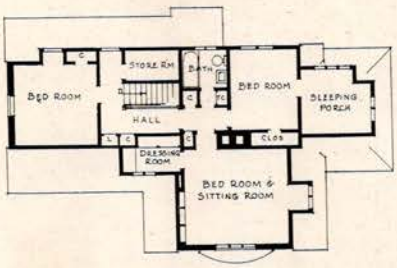


HOUSE AT INTERLACHEN PARK
NEAR MINNEAPOLIS

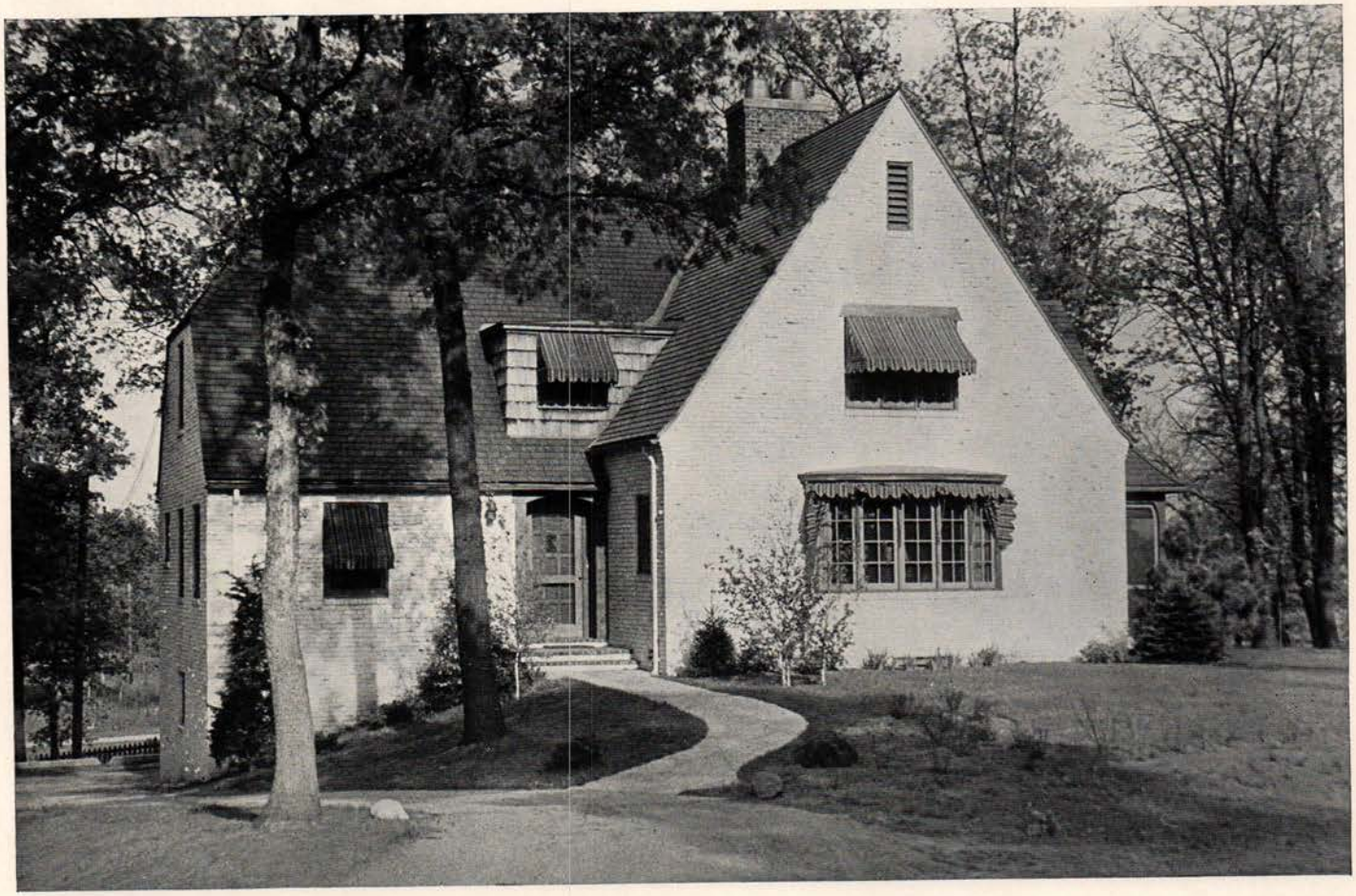
ROLLIN C. CHAPIN, ARCHITECT

NICHOLS, CORNELL AND NASON
LANDSCAPE ARCHITECTS



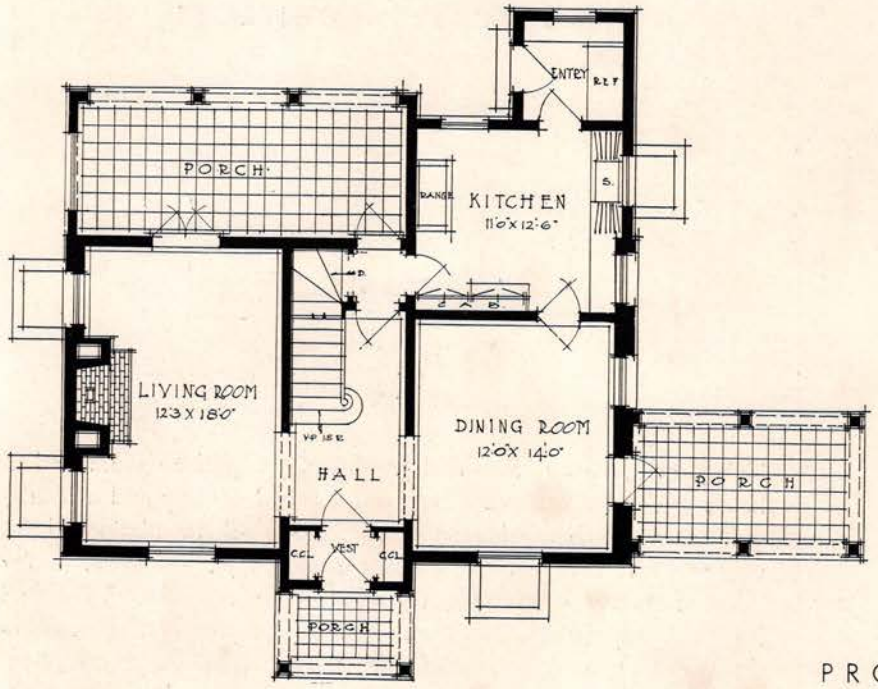


Living room, dining room and porch are grouped on south end of house where a view is obtained over wooded country and a nearby golf course. Structural system: concrete block foundations; brick veneer walls; shingle roof; Celotex blanket-type insulation. Color scheme: stained white walls, stained medium brown roof, dull red brick chimney, light brown sash and trim. Sargent hardware. Windows: Pennvernon glass, wood sash, bronze screens. Air conditioning system: Lewis air conditioner for humidification; hot-water heating. Cost, including driveway, walks, retaining walls, sewage disposal system, water supply system: $14,300.



TWO COTTAGES AT FORSGATE COUNTRY CLUB, JAMESBURG, N. J.

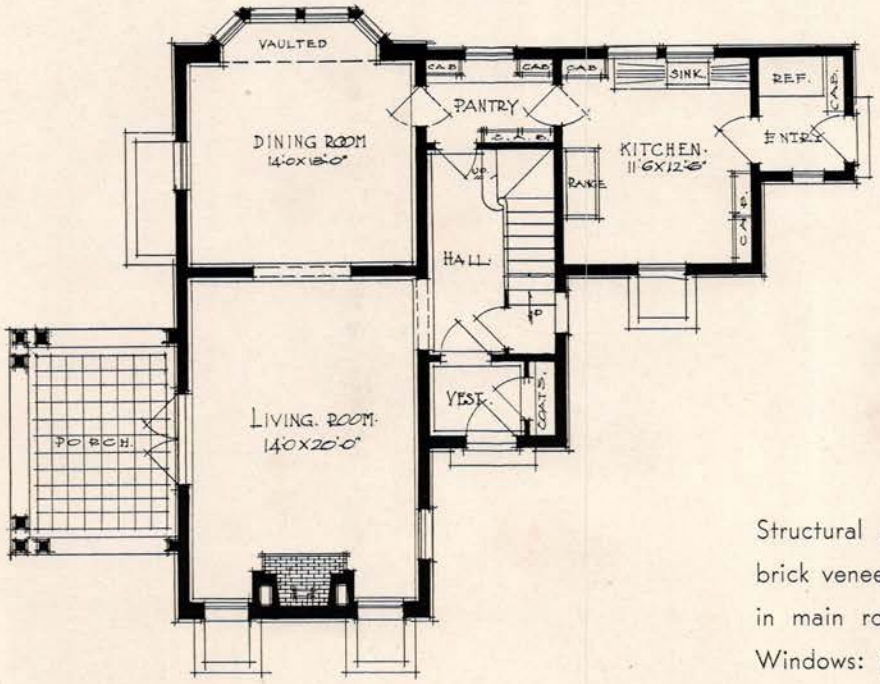
CLIFFORD CHARLES WENDEHACK, ARCHITECT



PROFESSIONAL'S COTTAGE

Photographs by Gustav Anderson

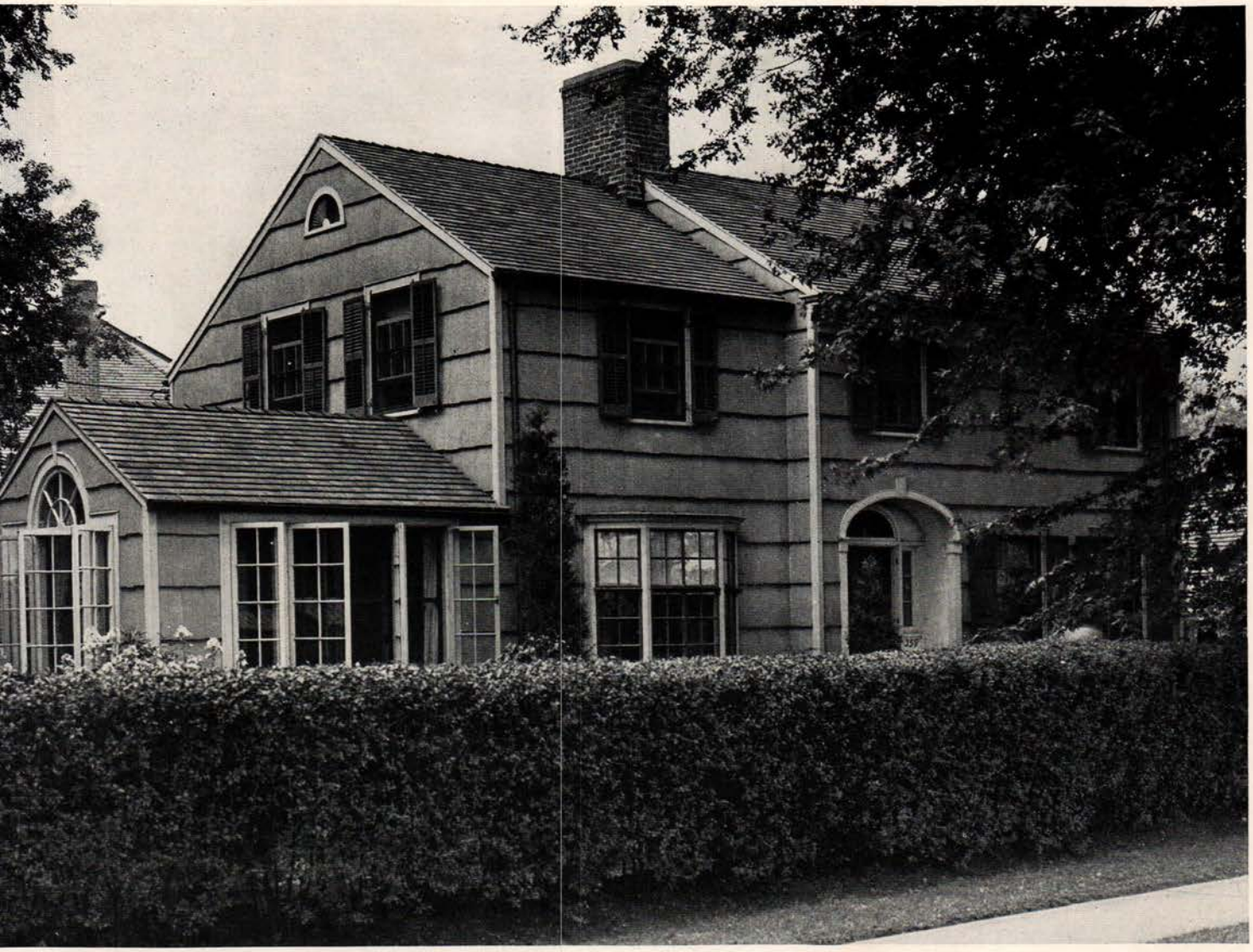
SUPERINTENDENT'S COTTAGE



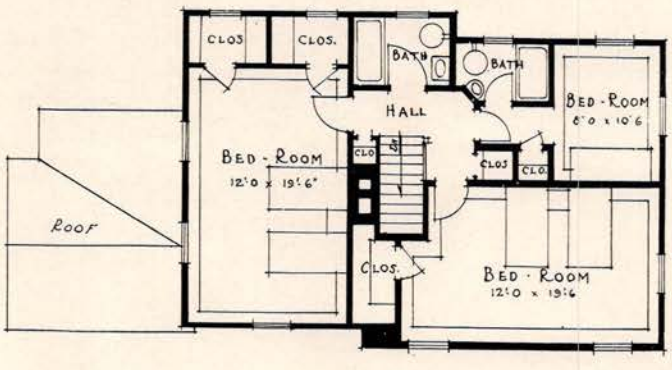
Structural system: concrete foundations; frame walls; brick veneer and shingle facing; slate roof. Oak floors in main rooms, bluestone passage. Corbin hardware. Windows: plate glass, double-hung wood sash, bronze screens. Steam heating system. Cost: approximately $8,000.

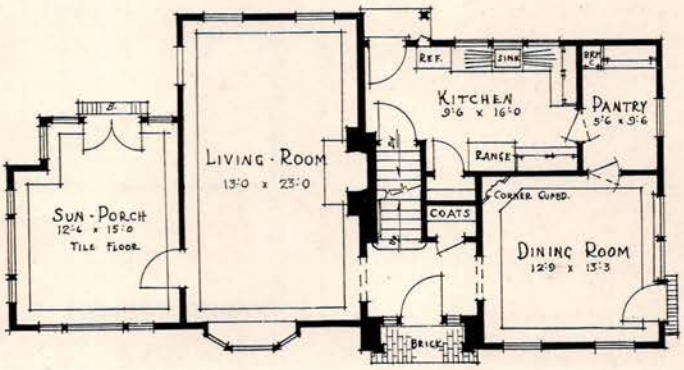
HOUSE OF HOWARD TOWNSEND, JR., AT DOUGLASTON, LONG ISLAND
GEORGE ROGER THOMPSON, ARCHITECT

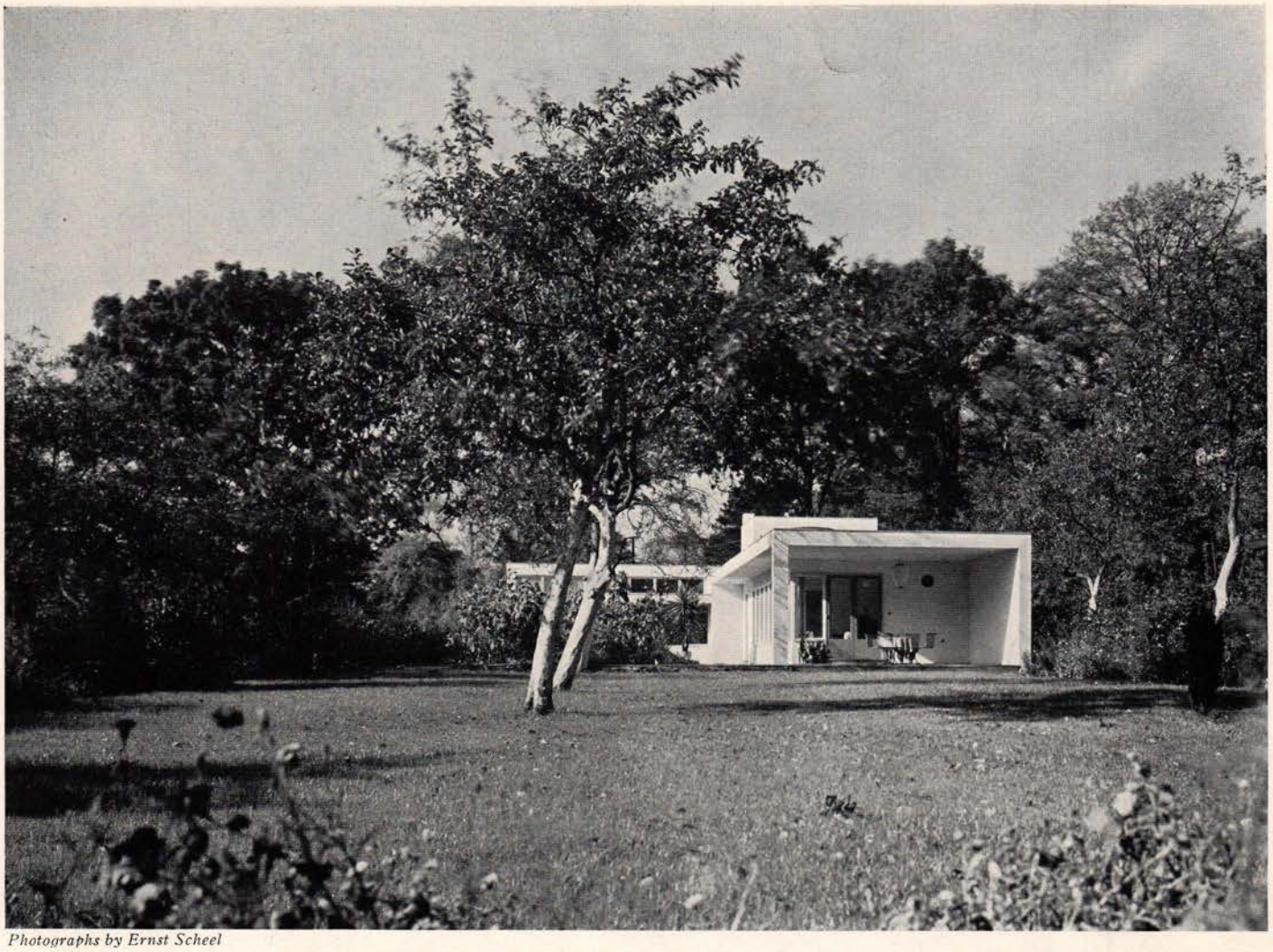
Photographs by George H. Van Anda



Structural system: concrete foundations; wood frame with shingle facing; shingle roof. Oak floors in principal rooms, tile in sun room. Interior wall finishes: painted plaster and wall paper. Corbin brass and chromium hardware. Steam heating system. Windows: standard glass, steel casement and wood casement, double-hung sash. Cost: $13,500.

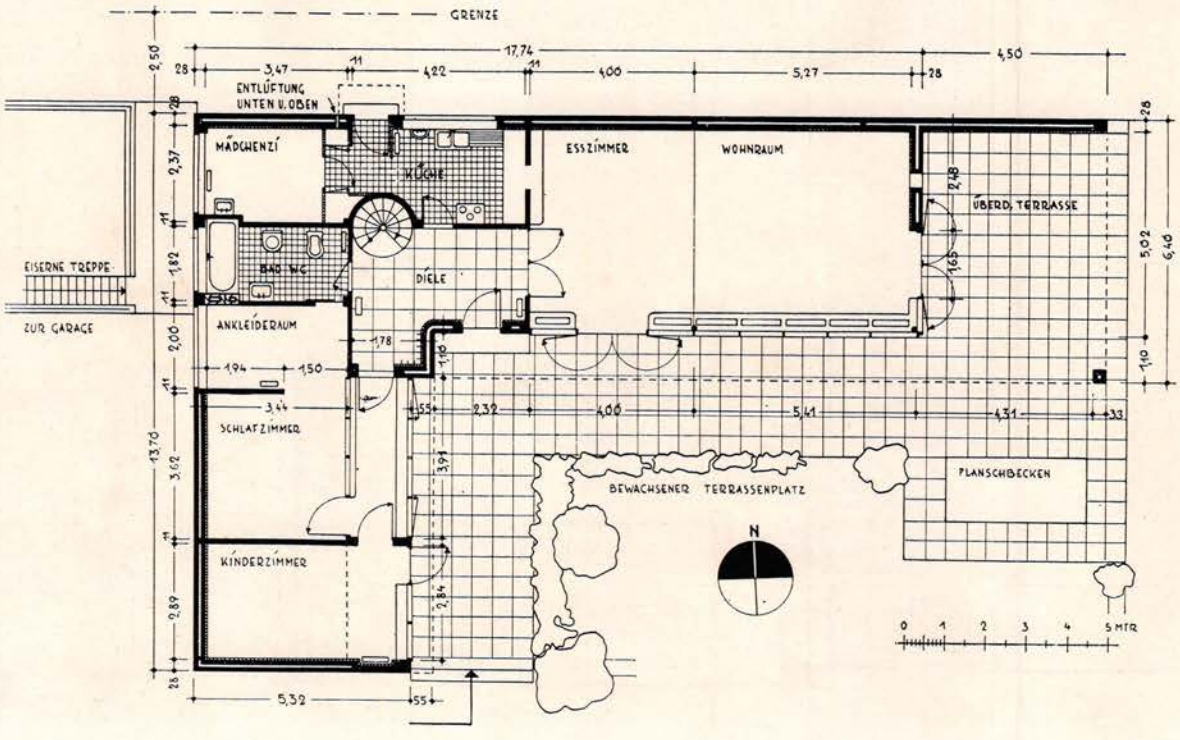




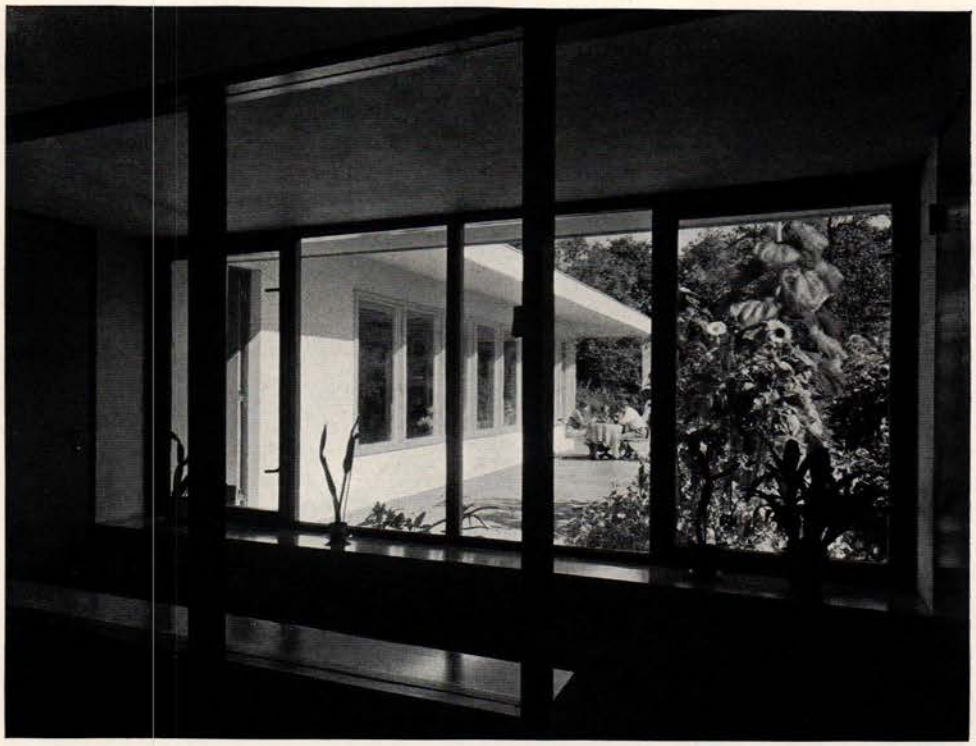


Photographs by Ernst Scheel

AN ARCHITECT'S COUNTRY HOUSE AT POPPENBUTTEL, HAMBURG, GERMANY

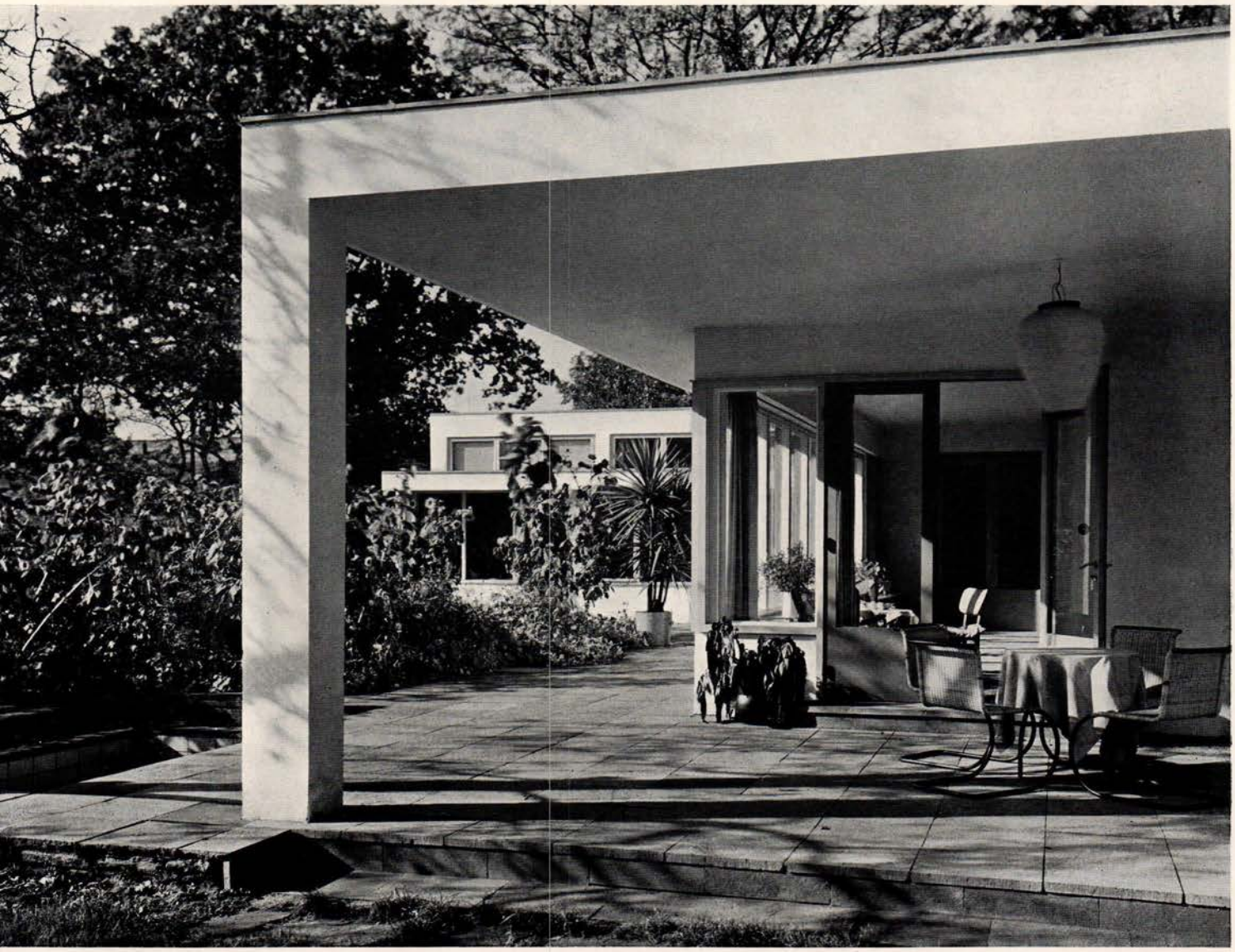


ALBERT HAUSCHILDT
ARCHITECT



VIEW FROM BEDROOM CORRIDOR

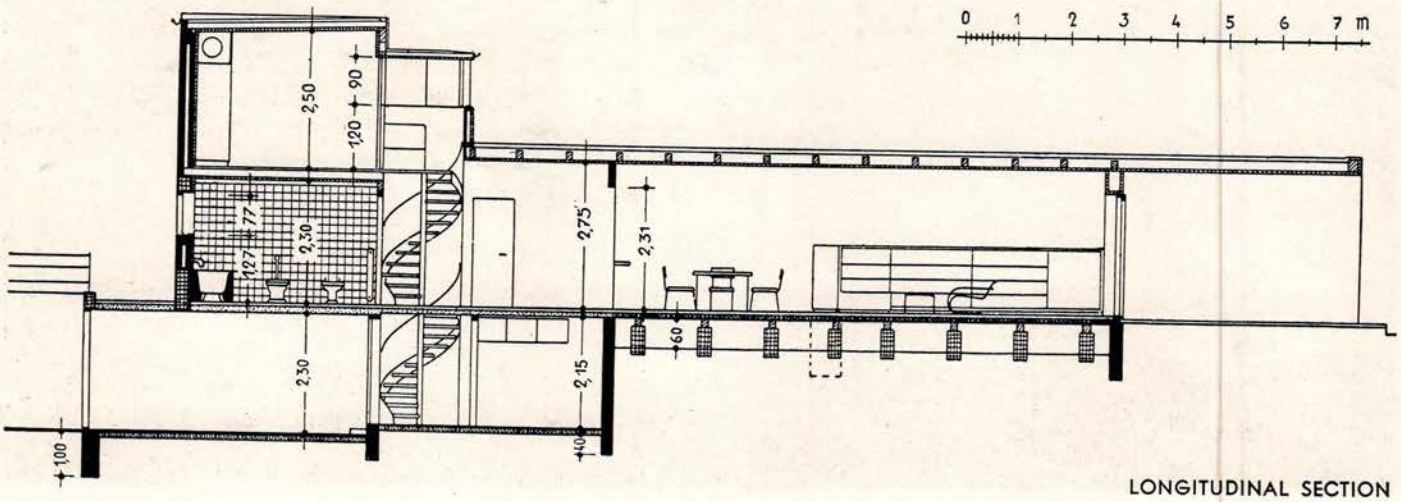
PORCH TERRACE OPENING OFF LIVING ROOM



Photographs by Ernst Scheel

LIVING ROOM

COUNTRY HOUSE OF ALBERT HAUSCHILDT, ARCHITECT AT POPPENBUTTEL, NEAR HAMBURG, GERMANY

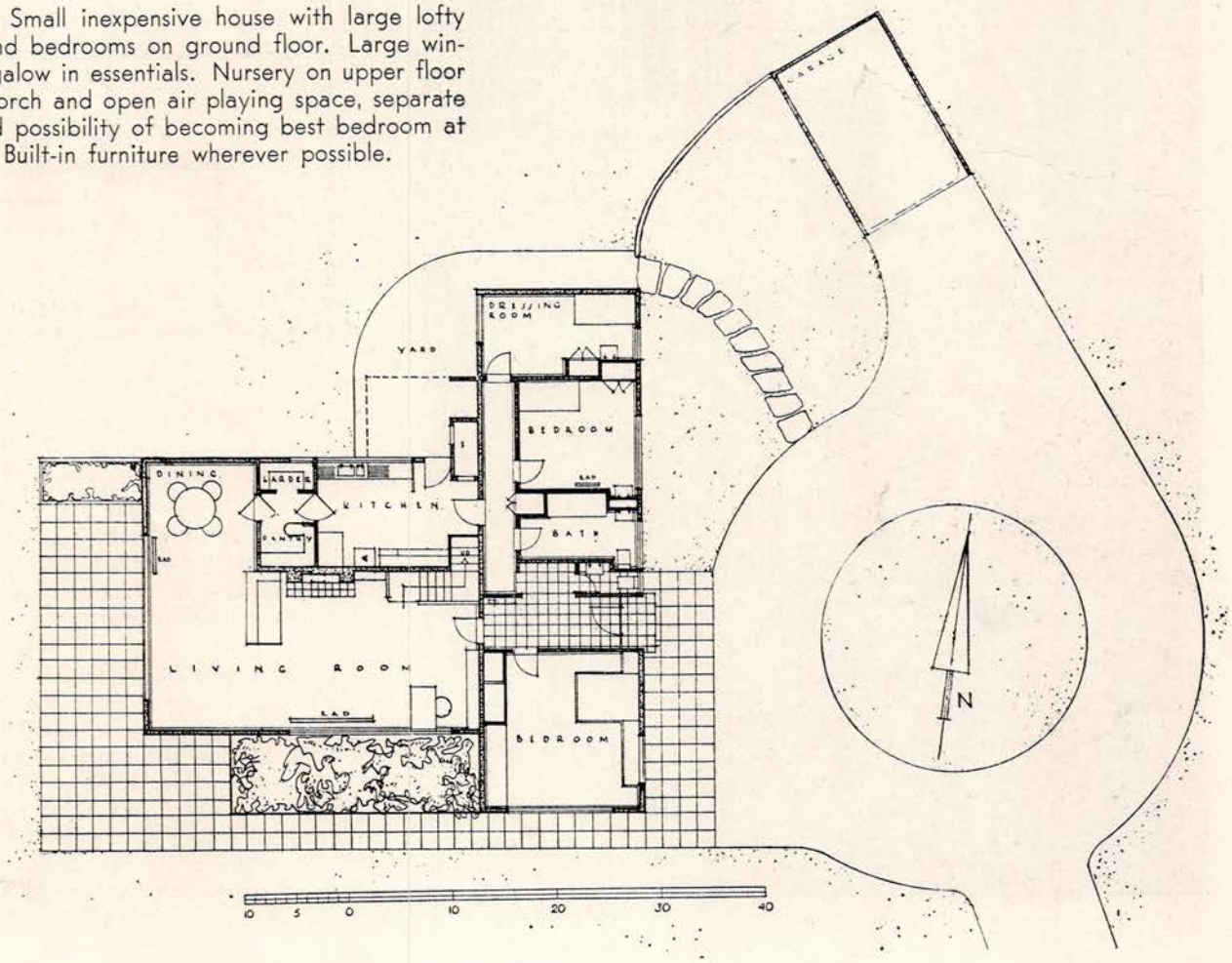


LONGITUDINAL SECTION

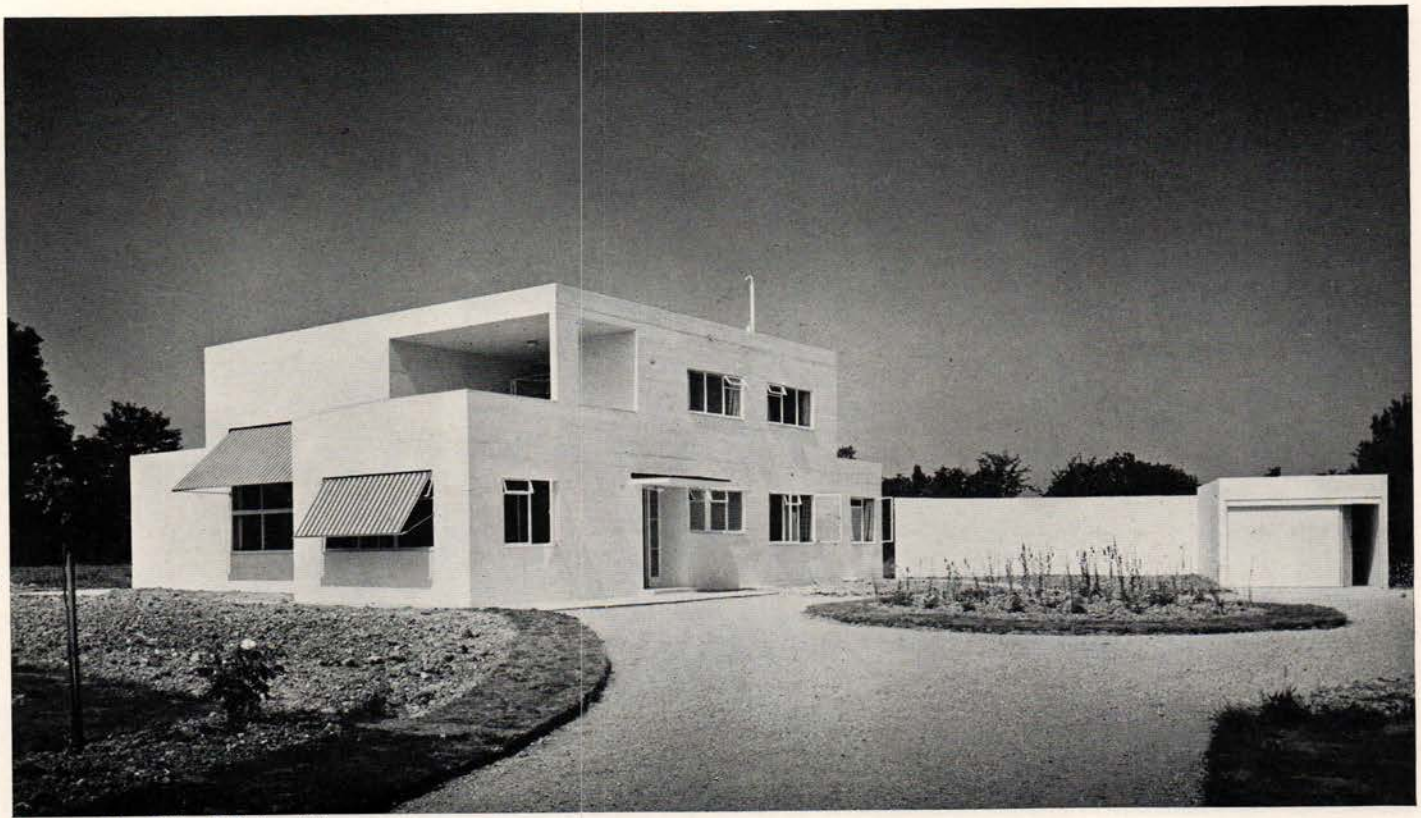
A CONCRETE HOUSE AT NAST HYDE, HATFIELD, ENGLAND

DESIGNED BY F. R. S. YORKE

Requirements: Small inexpensive house with large lofty living room and bedrooms on ground floor. Large windows. A bungalow in essentials. Nursery on upper floor to have sun porch and open air playing space, separate bathroom, and possibility of becoming best bedroom at a later date. Built-in furniture wherever possible.



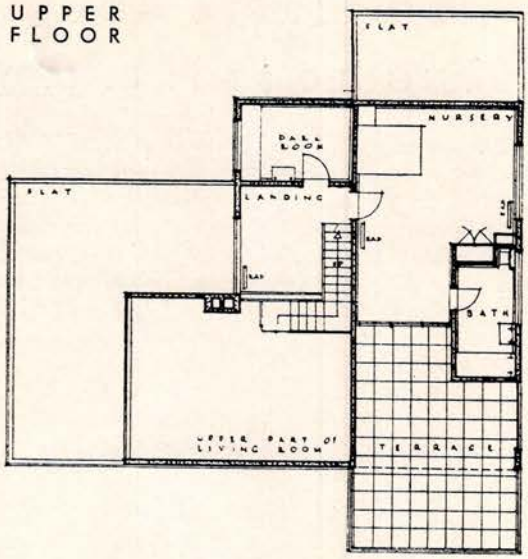
GROUND FLOOR



Photograph by Dell and Wainwright

BUILT-IN FURNITURE

UPPER FLOOR

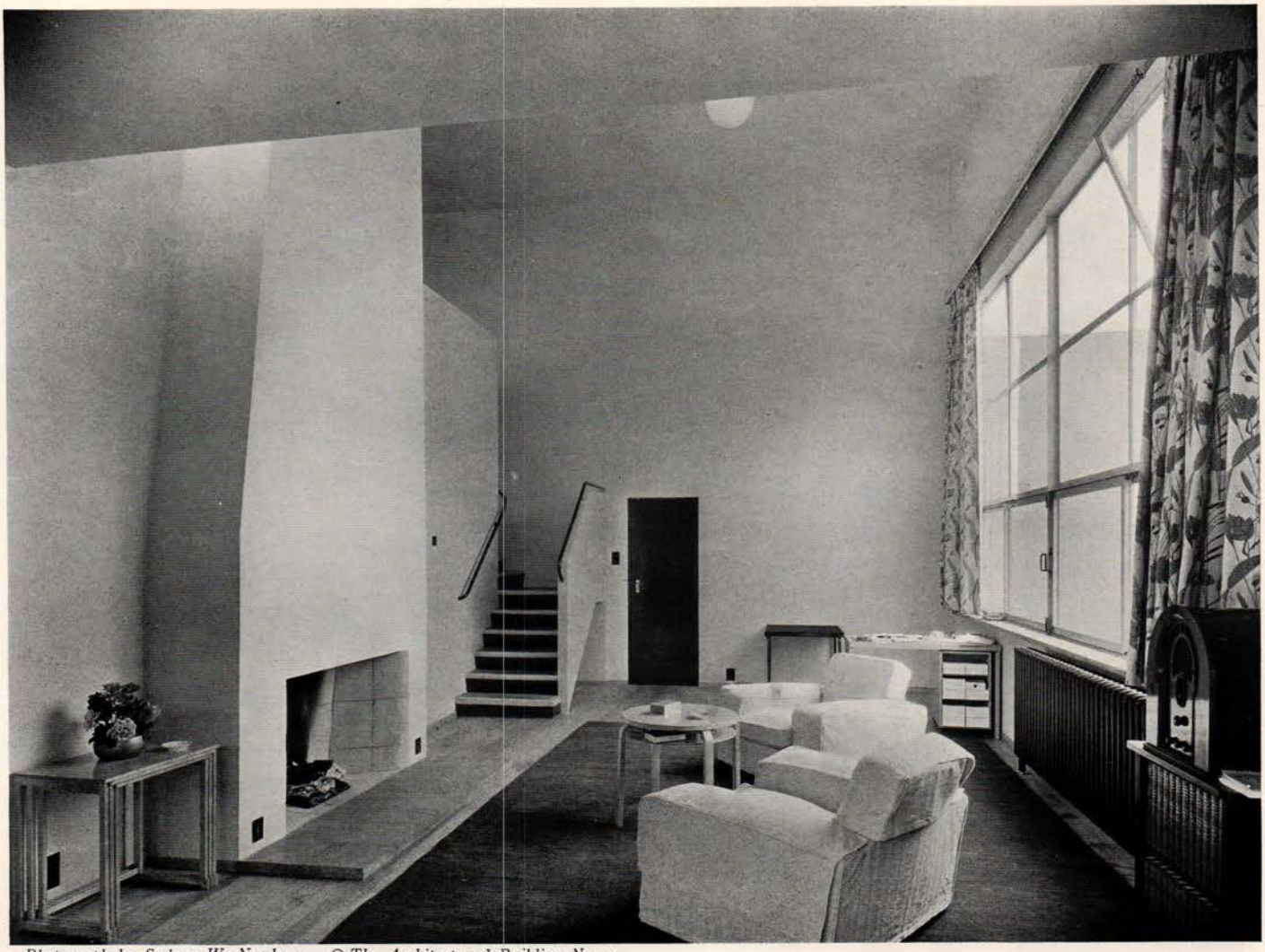


Upper floor: Only other room, in addition to nursery, is a dark room, added after building work began. This room is supported by blank cantilever wall on north.

Living room: Made as large as possible by including dining recess and first floor landing. Dining recess end is ceiled at 9 feet but main part of the room extends through the upper story to a height of 17 feet. Staircase and landing are inside the room. The living space is extended to the garden when sliding glazed doors are opened between the living room and the paved terrace.

A CONCRETE HOUSE AT HATFIELD, HERTFORDSHIRE, ENGLAND

Photographs by Dell and Wainwright

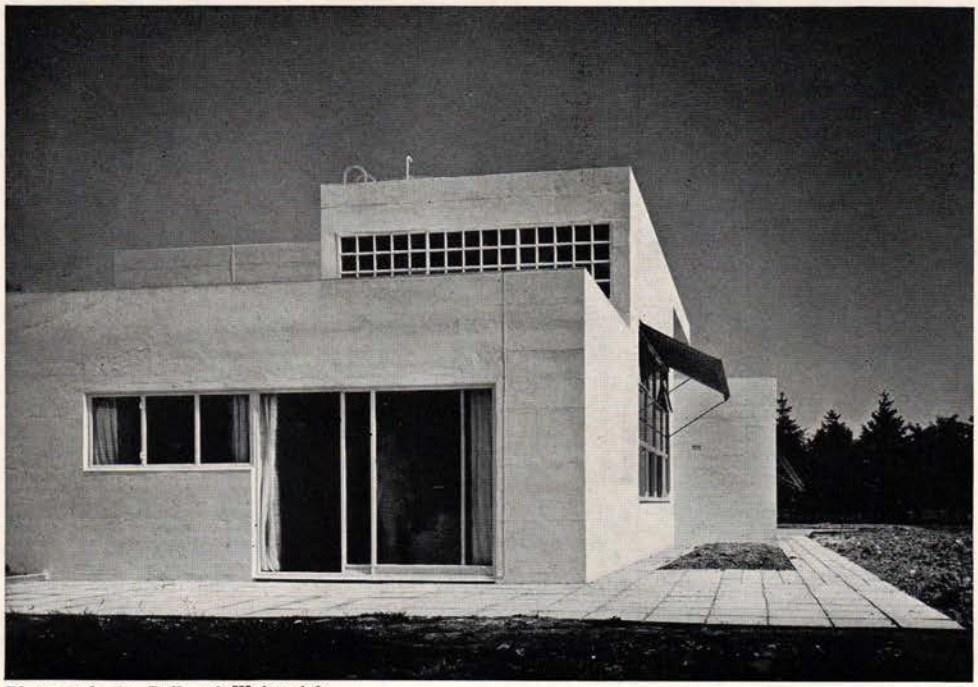


Photograph by Sydney W. Newbery — © The Architect and Building News

LIVING ROOM

DESIGNED BY F. R. S. YORKE

Sydney W. Newbery — © The Architect and Building News

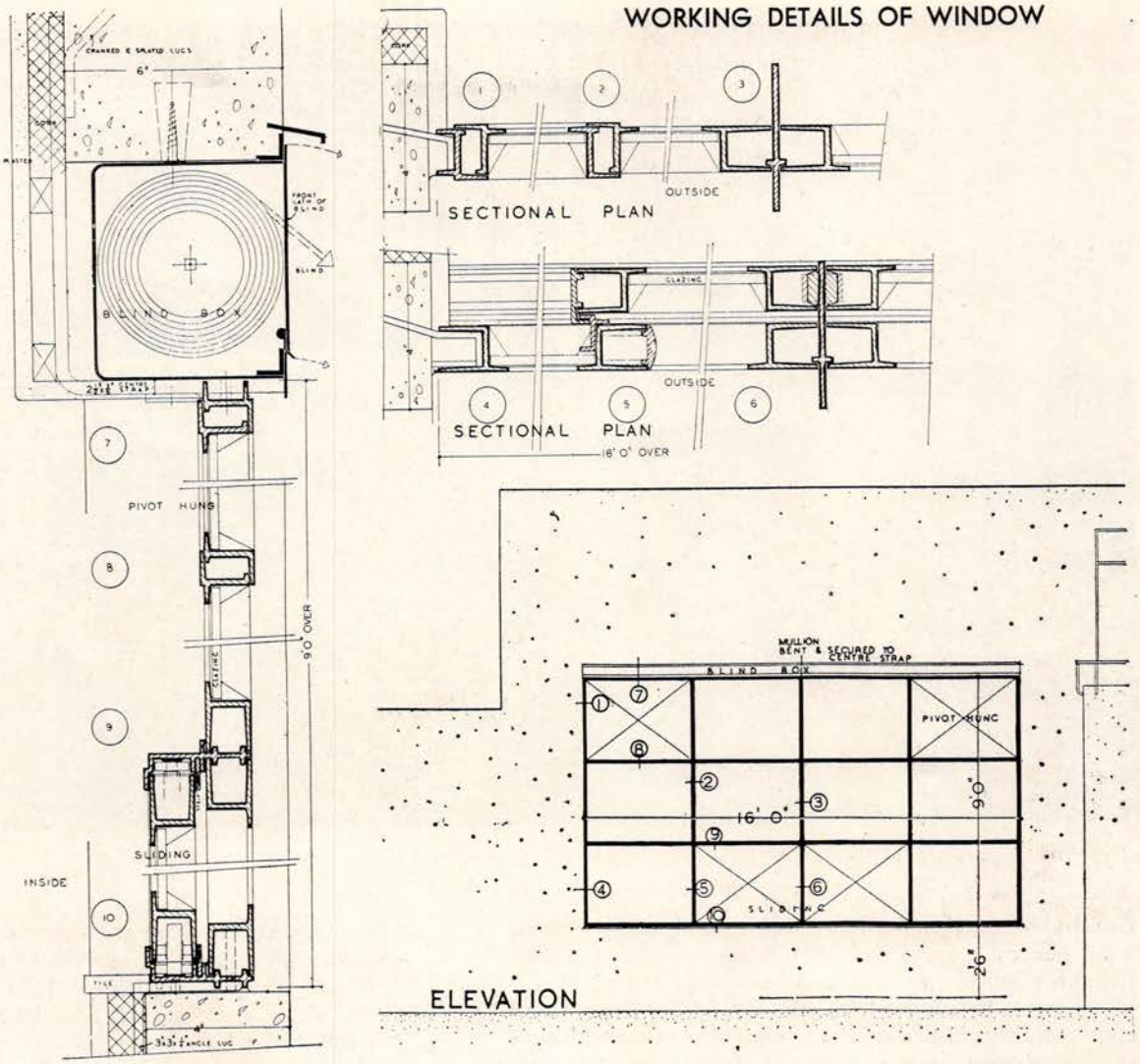


Photographs by Dell and Wainwright

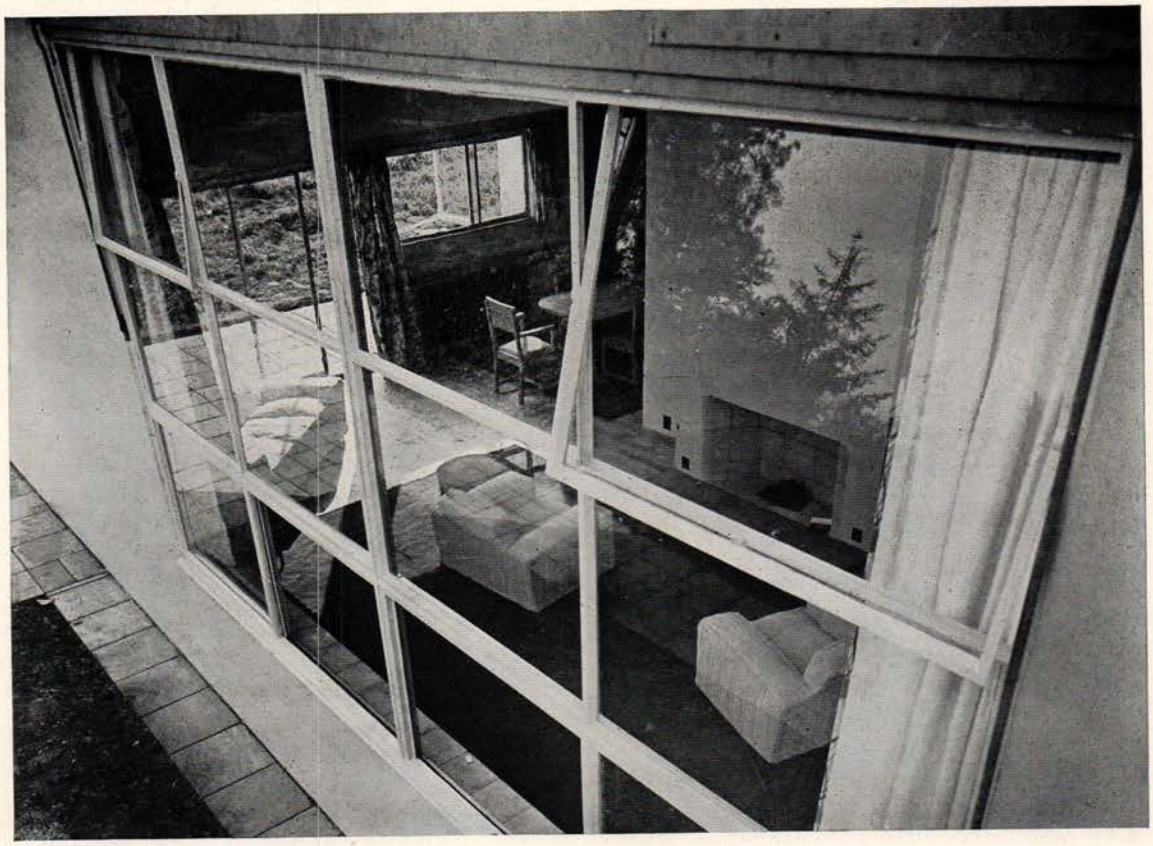
CONCRETE HOUSE AT HATFIELD, HERTFORDSHIRE, ENGLAND

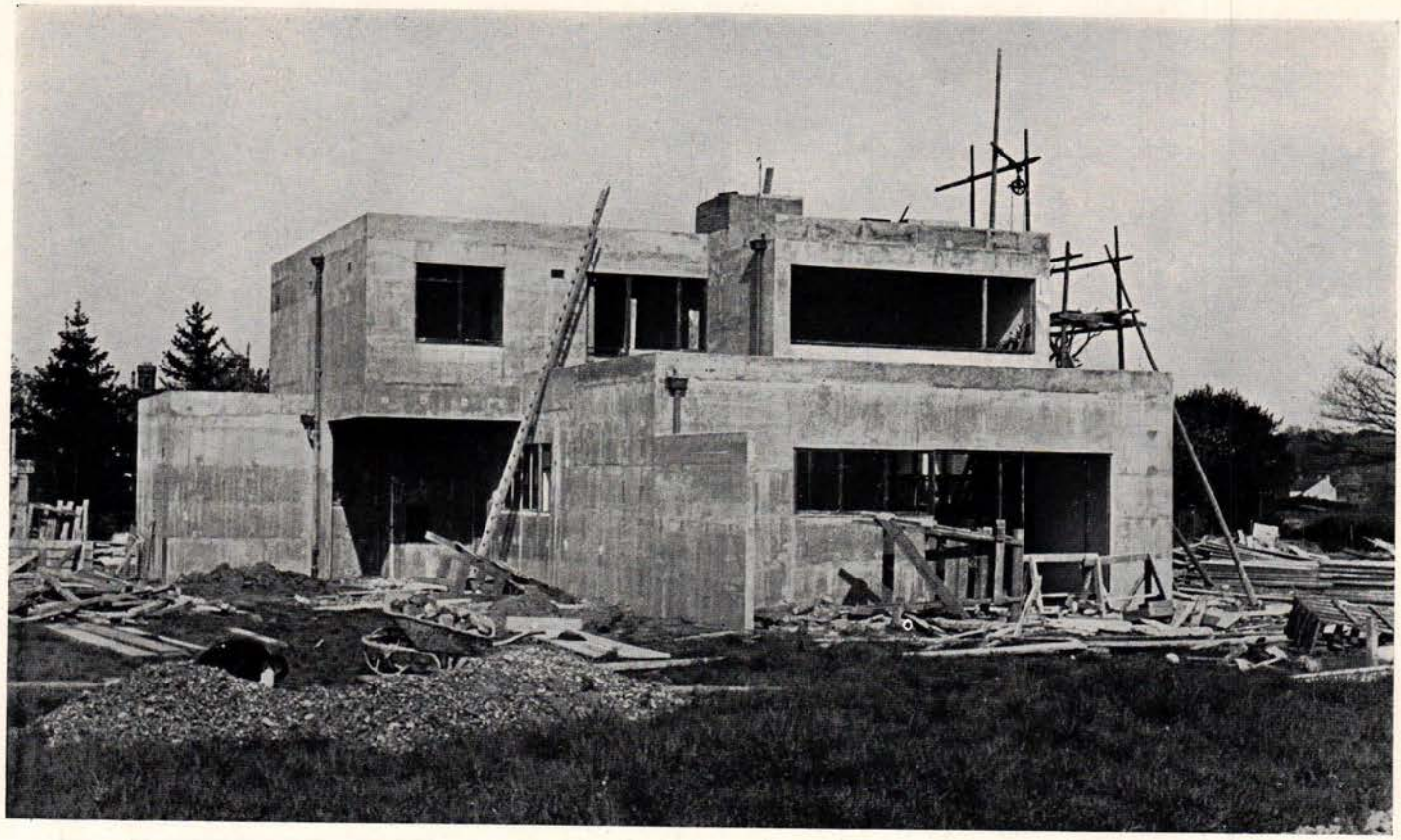
DESIGNED BY F. R. S. YORKE

WORKING DETAILS OF WINDOW



WINDOW HAS CENTER-HUNG LIGHTS AT THE TOP AND TWO SLIDING LIGHTS AT THE BOTTOM. THE LATTER MOVE ON A SPECIAL SECTION (SEE DETAIL) AND ARE SEALED WITH BRASS WEATHERSTRIPS.





Construction: Reinforced concrete bearing walls 4 inches thick generally; increased to 6 inches in special cases. Reinforcement in walls consists of 3/8-inch rods at 12-inch centers horizontally and vertically. Solid reinforced concrete floor and roof slabs, generally 5 inches thick, reinforced to suit spans. Concrete composed of 4 parts coarse aggregate (3/4 to 3/8 inch), 2 parts fine aggregate (3/8 inch and smaller), 1 part cement. This method of construction (see Figures 1 and 2) appeared most economical and was the only one that would give a straightforward solution. The plan—sizes of openings and the like—is such that had brick been used for walls, lintels of concrete over openings would have been either exposed or faced with brick; neither of these treatments appeared satisfactory. In the case of frame construction with reinforced concrete frame, and some other light material for interior walls, it is difficult to obtain a clean weatherproof external surface without the application of plaster over the whole exterior. Special frame and panel systems that have been evolved are economical for small buildings only when types can be standardized and mass-produced. For a single house it appeared best to use a single structural material—reinforced concrete.

Waterproofing: Sika waterproofing compound, added to mixing water for concrete in ground slab and in walls to a height of 18 inches above ground.

Insulation: Forms were lined with 1/2-inch Celotex with projecting galvanized bonding wires (see Figures 3 and 4) so that the fiber board is fixed to the concrete as permanent insulation. This received one skim coat of plaster. Similar treatment for roof slab which, in addition, has 1 1/2-inch compressed cork slabs above concrete.

Formwork: Wood board and battens, site fabricated, lined for external face with 3/16-inch Masonite Presdwood and for internal face as described under "Insulation." Exact spacing of internal and external formwork for 4-inch and 6-inch walls was maintained by laying at intervals on completed section of wall 4-inch or 6-inch precast cubes of concrete. These cubes had circular holes through centers to take bolts, so that formwork for both faces could be drawn tightly together, leaving exactly 4-inch or 6-inch space for concrete (see Figures 5 and 6).

Floor Finishes: On ground floor, either jointless composition in two coats direct on concrete, or maple boards secured to battens held to concrete by patent galvanized floor clips (see Figure 7); pitch poured between battens to 1/4 inch and remainder of space filled with dry sand. On upper floor, cork carpet laid with mastic to cement screed over structural concrete. On stairs, rubber treads and nosings; concrete face of risers painted.

Heating: Radiators with central hot-water boiler, supplemented by coal-burning fire in living room and plugs for electric heaters in all rooms.

Windows: Standard steel sections to special pane sizes. Window between nursery and roof terrace is sliding-folding, so that children may run from room to open air without obstruction.

External Finish: Concrete rubbed down, where irregularities occurred, by means of electric flextol revolving carborundum disc. Whole of exterior concrete painted pale pink. Windows and trim painted with white enamel. Plumbing pipes for bathrooms and bedroom lavatories, and rainwater pipe from terrace, are concealed in a duct behind the ground floor bath. The rainwater pipe runs to this duct through a horizontal casing in the space between the head of the entrance door and the ceiling.

Cost, calculating one pound sterling at $5: $8,500, which is a little more expensive than brick house of similar quality but traditional design. To build same design in brick would, however, be difficult and probably more expensive than in concrete.

A CONCRETE HOUSE AT HATFIELD, ENGLAND

DESIGNED BY F. R. S. YORKE

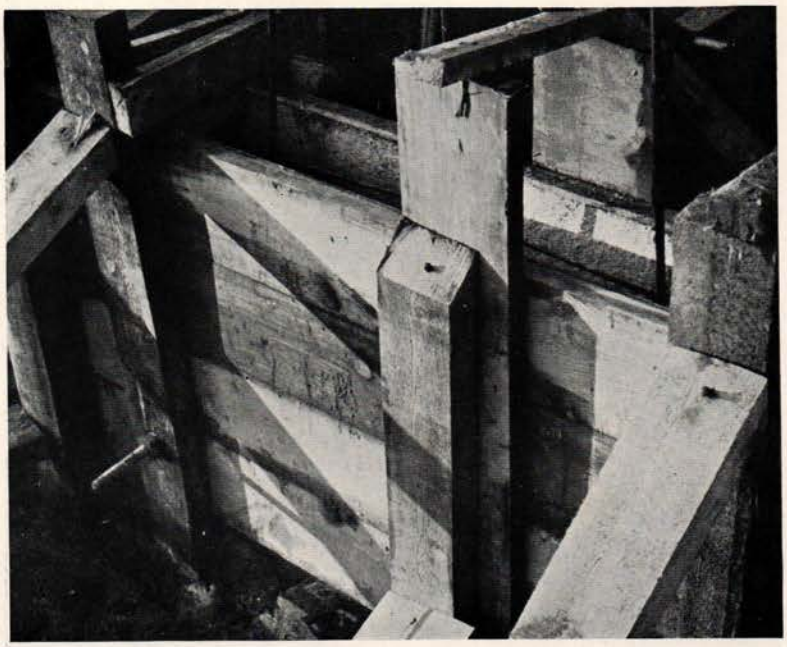
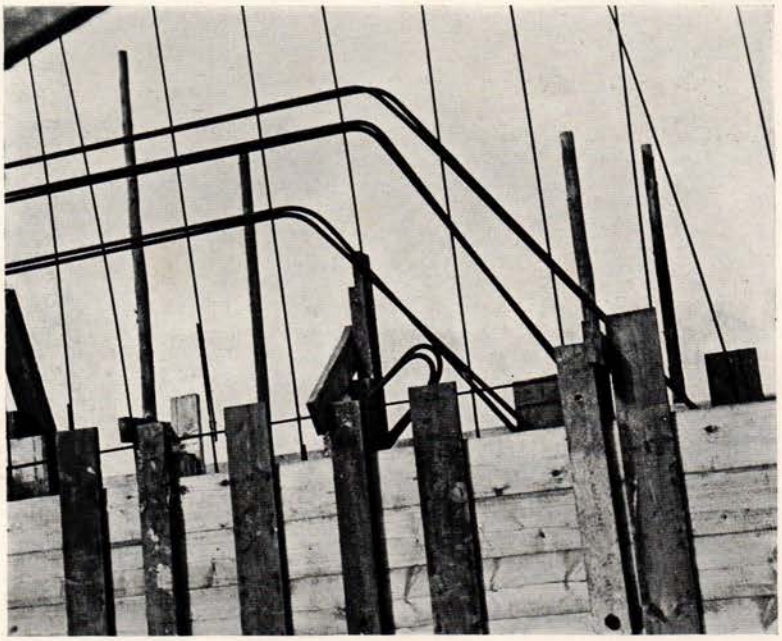


FIGURE 1 — FORMWORK FOR CONCRETE WALLS.

FIGURE 2 — REINFORCING RODS IN WALL.



FIGURES 3 AND 4 (BELOW) — BONDING WIRES ARE APPLIED TO CELOTEX (THEN PLACED IN THE FORMS) SO THAT CONCRETE WILL HOLD THE INSULATION PERMANENTLY IN PLACE.

FIGURE 5 — DETAIL OF WALL REINFORCING SHOWING HOW EXTERNAL FORMWORK AND FIBER-BOARD LINING ARE POSITIONED.

FIGURE 6 — 4-INCH AND 6-INCH PRECAST CONCRETE CUBES WITH CIRCULAR HOLES THROUGH CENTERS TO TAKE BOLTS ARE USED TO MAKE ALIGNMENTS IN WALL FORMWORK.

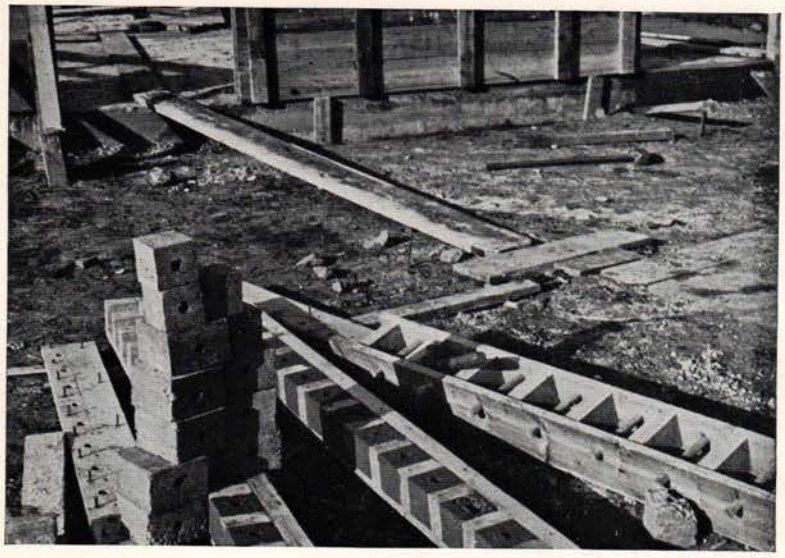
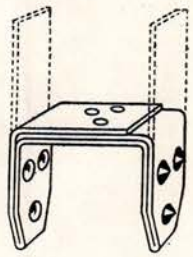


FIGURE 7 — PATENTED FLOOR CLIPS HOLD WOOD FLOORING TO CONCRETE.



A CONCRETE HOUSE AT HATFIELD, ENGLAND

DESIGNED BY F. R. S. YORKE

THE ROLE OF MATERIALS IN MODERN HOUSING

This article, prepared especially for The Record, is a condensed version of an address which Mr. Burchard gave before the 38th annual meeting of the American Society for Testing Materials, recently held in Detroit. The original paper, bearing the same title, will be published in full by the A. S. T. M. as a special publication.

Mr. Burchard's appraisal of various building materials is based largely on experiments made by Bemis Industries, Inc., of which he is vice-president. For many years this company, located in Boston, has been active in housing research, both in the laboratory and in the field, with a view to producing individual houses more cheaply. Numerous experimental houses have been built to test new structural systems. Findings based on these investigations were described by Mr. Burchard in an article which appeared in the January 1934 issue (pages 3-8) of The Record.

The present article ventures into prophecy—a field which is always controversial. The Record publishes the paper, therefore, not as an expression of editorial belief, but as the personal opinion of an active investigator in housing research. The standards which Mr. Burchard sets up for the development of materials, new and old, are believed worthy of consideration by designers and manufacturers alike at a time when building design and construction are characterized by rapid change.

By JOHN ELY BURCHARD

At long last it seems safe to predict that we are on the verge of a revolution in American housing design. We know by now the general form these new houses will take. There will be much greater freedom of plan, fewer limiting fixed partitions. Walls will be designed to let in much more light. The old lighting fixtures will be replaced by cove lighting, the anachronism of the candle or oil-lamp fixture supporting the mazda bulb will disappear. The new house must provide for conditioned air. Finish will be simpler, flatter, easier to keep clean. The flat roof is inevitable; it is more efficient, and properly treated can be beautiful. The whole house will be lighter and cleaner and freer and in much closer contact with the out-of-doors.

Simultaneously with the rapid evolution that is even now going on, and that will accelerate until it appears like revolution, there will be a corresponding evolution in the materials used. This will at first take the form not of discovery of many new materials but of discovery of saner uses of old ones—the elimination of some that have been used long and ably by tradition and the substitution of others that have been sadly neglected.

The brunt of this evolution will fall on low-cost housing. If this should not be so there will be no important change. The wealthy client may in the future as in the past command the materials and styles of all time as they please his fancy, whether they be archaeological or drastically contemporary. Delft tiles over a hundred years old for his bath, Tudor paneling for his library, chromium mirrors and mantels for his lounge, will rise with equal facility from his wallet. However great the wish to ape such examples, the house of the average owner or renter will as in the past be governed primarily by conditions of economy. That is, of course, the most cogent reason why our housing must change. Quite aside from any questions of prefabrication, group housing, government subsidy, the principles of modern design lend themselves to fundamental economies.

At this point, therefore, it is essential that the proponents of modernism be realistic. The methods of design do carry implications of economy but the methods must be applied with common sense. Early modern houses were created principally for a well-to-do intelligentsia and gave rise therefore to the impression that opulent exotic woods and gleaming unusual metals were the essence of modernism, were indeed necessary to make otherwise simple design bearable. This, of course, is nonsense; if it were true there would be no great rise of modernism.

Now realism about cost seems hard to attain. It has always plagued the "prefabricators," for example. Some of these people were and some still are sales promoters—interested in promotion of more of their own products, hence inhibited at the outset by limitations in their research that would not have been tolerated in their own laboratories. It is reasonable of course to try to fit certain materials into modern housing but unreasonable to try to fit modern housing around the materials. Others with no preconceptions about materials had *a priori* notions of design, notions that resulted in houses costing many times what they should. But these romantics always fell back, and still do fall back, on the hypothetical economies to be achieved by mass production. Now the great god Mass Production is by no means omnipotent. It is often responsible for tremendous savings, but sometimes it is not and in any event it is unlikely that the savings are

of the order imagined by the public. At the extreme of this school of thought are those purveyors of balderdash who announce that though their first house may cost a million dollars, their millionth will cost one thousand. It is possible, but unlikely. Finally, between these two schools of thought is that of the middle ground—that of the man who achieves a house which costs more than conventional houses but which he finds better and which he therefore proceeds to market as a better article for slightly more money. Inasmuch as our crying need is not a better house for more money but an equally good or even slightly inferior house for a lot less money, persons who fall into this trap leave the van of the battle and start conducting a rear-guard action.

But the *Sturm und Drang* period must end. It is certainly possible to look at housing with a critical eye. It is certainly possible to be honest with one's self, to ask and answer fairly a few simple questions. When I contemplate using an old material in a new way I must inquire, "Will my way use less material; will the cost of using it as I propose be less than the cost as now used; if I require more material, will my use make economies in fabrication and erection that will more than offset the increased material cost?" Again, when I plan on using a new material I must ask, "Is the material cheap enough; will it ever be cheap enough; if not, does its use as I plan offer sufficient offsetting economies?" These are easy questions. Unfortunately, it has not been easy for any one in the misty field of housing to be hard-boiled about reality.

Yet this is the simplest fundamental that must lie at the base of all change. Of course we could use better housing with greater social advantages, better health conditions, more livability for more people. But purely from the point of view of materials we perhaps do not at the outset need better materials. We need cheaper houses, if possible with no sacrifice of physical standards but certainly cheaper.

STRUCTURAL REQUIREMENTS

This criterion applies with equal force to prefabricator and speculative builder, to architect and social worker, to houses detached or grouped, paid for by individuals or by society. Regardless of social trends in modern housing, it is certain that modern housing must on the whole be of lower cost and that the use of materials must be governed accordingly.

Remembering always that this economic property is of first importance, we may profitably inquire what other properties materials must have in order to fit into the modern scheme. With no attempt to evaluate these properties in order of importance, they are:

1. *Relative permanency of dimension.* Materials must not change so much with normal changes in temperature and humidity as to cause major defects in the structure or even annoying failure of parts such as windows to operate properly. For factory-built housing this property becomes still more important. The changes after fabrication and before erection must never be so great as to defeat ease of erection or an accurate result therefrom.

2. *Lightness.* Materials must be light enough to permit economical shipment and reasonable deadloads. This is a property to be measured not in terms of specific gravity but in terms of the weights of the required sections. Material weighing 500 pounds per cubic foot, but usable in thicknesses of ⅛-inch, would accordingly be regarded as lighter than material weighing 30 pounds per cubic foot but requiring a minimum thickness of 8 inches.

3. *Adequate strength.* Most materials now used in house building are if anything too strong. Where this excess strength does not cost anything it is of course no handicap. Materials must be carefully regarded whose strength in most respects is adequate but which have one type of weakness such as shearing or tensile strengths materially less than their compressive strengths.

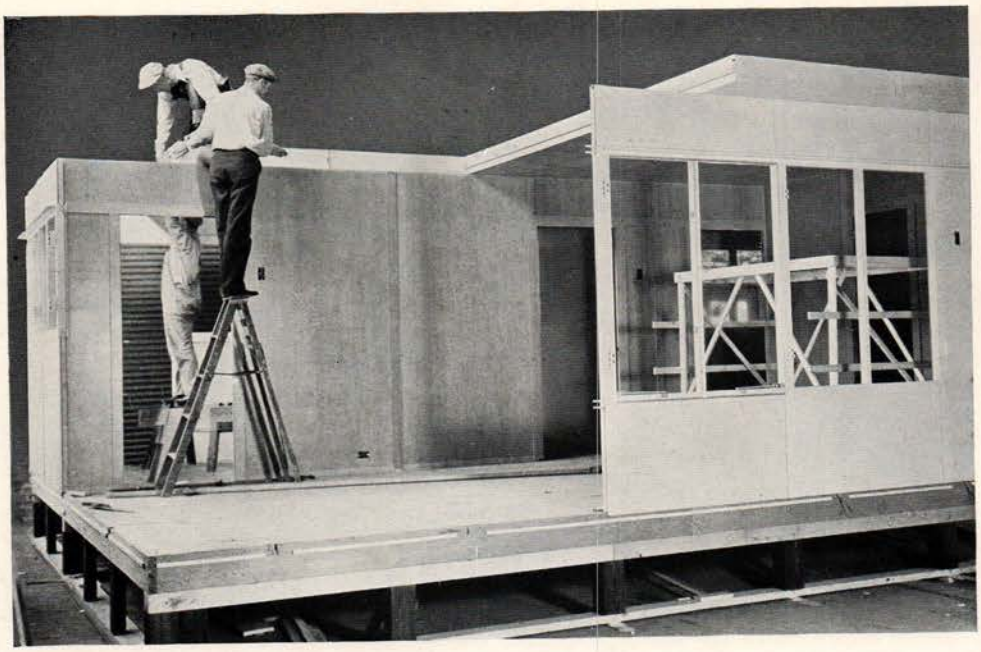
4. *Durability.* For materials to be used outdoors, durability against weather erosion and against gases normal to the atmosphere and against water; for the interior, durability against water, alcohol, household cleansers, rapid heat and humidity changes, children's fingers; for concealed materials, durability against water, gases common to the atmosphere, and vermin.

5. *Reasonable resistance to breakage from impact shock* which will occur primarily in the course of shipment or erection. To the extent to which non-shock-resistant materials may economically be adequately packed and handled during erection, they may qualify as satisfying this requirement. Shock is less likely to occur after the building is occupied.

6. *Good resistance to passage of heat.* The requirement applies chiefly to the composite exterior wall and not to each of its collateral materials. But care must also be taken in the use of good conductors not to provide through-sections of such material, however thin. In other words, the wall must have a high total resistance to afford economical heating and must have no spots of excessively low resistance which will cause condensation, an increasing risk as humidified air begins to be used.

7. *Good resistance to passage of sound.* This is a requirement primarily of the composite interior partition or floor. It becomes more important as increasing mechanization makes our domestic environment more continuously noisy. It will be specially required in party walls of group housing, in partitions surrounding kitchens and cellars and baths, and in all floors. The conventional floors are not satisfactory in this respect. Prevention of sound transmission in the house will be largely a matter of rigid construction. There will be few rooms so large as to require sound-absorptive material in addition to that afforded by normal furnishings. In fact, to the man of today an excess of sound-absorbing materials in a small room creates a peculiar and unpleasant condition. None the less, sound absorption, rarely present in materials not specifically designed for the purpose, must be scored as a credit for any material that possesses it.

8. *Fire resistance.* Our houses are not so fireproof as they ought to be. But in the early quest for cheaper housing, it must be remembered that lowered insurance rates for fireproof construction do not offset interest on the increased costs at present. There is relatively little risk to life in the burning of a small detached house. In group housing proper planning can minimize the risk of fire spreading. For the immediate future non-combustibility must be reckoned as a credit



NEW WOOD CONSTRUCTION

Prefabricated wood panels being assembled in a model house built by Forest Products Laboratory, U. S. Department of Agriculture.

rather than combustibility as a debit. It will be a long time before the normal furnishings of our houses will not supply adequate fuel for a hot fire. Meanwhile also few materials now used, except concrete and the ceramics, can be said to be fireproof in the presence of a hot fire. Metals, for example, although they will not burn, soften to the danger point and are little better in this respect than timber.

9. *Weather resistance.* In contrast to durability against weather this means the property of materials used on exteriors to keep the winds and the snows and the rains out of the house. In a sense it is coupled with durability in that the material must not only perform this function at the outset but must continue to do so thereafter. Hence a material that was not destroyed itself but lost its protective property could not be said to be durable.

10. *Beauty.* The property need apply only to those materials that are seen. In modern design, however, there will be a tendency to use fewer and fewer materials that do not show. Fortunately, it is a property possessed by every material. No honest composition, either of nature or of man's synthesis, fails of beauty when it is well synthesized and well used. Man has learned to produce good examples of the various genera of materials. He has not always learned to use them well and materials are all too often amenable to bad usage. As long as used in the simple and straightforward way in its own milieu and not in that of another, any material will be beautiful. This is perhaps the greatest lesson modern design is teaching us.

Other important properties of materials will be found, upon analysis, to fall within these categories or that of economy. For example, workability is almost entirely related to economy; so, too, is ability to be formed with precision. All materials can be worked but the working of some is harder and hence more costly than that of others.

Since most of the groups of materials to be discussed possess most of the properties listed, it will be sufficient to comment on the properties they do not possess in adequate degree.

VEGETABLE GROUP

Wood is, of course, the outstanding representative of this class. Until very recently it has been the tendency to think that wood was doomed to relative extinction in housing after a long and distinguished life as the principal building material of man. This premature conclusion was based primarily on the inconsistency of dimensions. As is well known, wood expands and contracts to a considerable degree with changing moisture content; this movement is serious only across the grain and may be nearly twice as great tangentially as radially to the annular rings. Results of the phenomenon are familiar to every one who has ever tried to close a swollen door.

Efforts to eliminate the difficulty have been of two kinds: the one, which has tried to seal the wood against entrance of moisture, cannot be said to have afforded a generally satisfactory result; the other, which consists of proper curing followed by coatings of aluminum leaf, is satisfactory to preserve the original size of wood of substantial dimension for several weeks, a sufficient period to get it into the structure and covered up. This preparation will prevent subsequent serious structural defects but will not be permanently satisfactory for wood which has to be exposed constantly as in the case of windows and doors. For such uses wood may be temper-cured, a process involving overdrying the wood and bringing it slowly back to moisture equilibrium. By this process doors and windows have been made that could be guaranteed not to stick under any conditions encountered in the temperate zone. Both of these processes are, however, costly and tend to eliminate most of the cost advantage still held by lumber.

In the case of windows and doors, the extreme treatment required by wood indicates that it is no "ideal" material for window frames, doors and sash. But in reasonable cost ranges the substitutes are at present rather too good conductors of heat and will produce condensation. Improvements in molded plastics may provide the low-cost window and door frames we need; until they do, wood will probably remain the most suit-

NEW STEEL CONSTRUCTION

"Steelox House" developed by the Insulated Steel Construction Co. of Middletown, Ohio. Walls and roof are made of interlocking channel-shaped steel sections.

able though by no means a thoroughly desirable material. For inside doors, metal frame and trim with composition doors are even now preferable to wood.

The prefabricator who wants the sizes and positions of holes and the like to remain where he puts them in his members finds the changing dimension of wood a constant annoyance and the necessary conditioning equipment for large-scale work would demand controlled-humidity dryers, air-conditioned fabricating and storing rooms, and even some protection on the site, all at large scale, with inevitable resultant expense. Thus wood as we now know its properties does not in its natural form appeal to the prefabricator.

Recent developments in plywoods have, however, opened new vistas. The use of thermo-setting glues instead of the old casein types seems to have made possible plywoods that are stronger, less likely to warp and twist, and obtainable in larger sizes. The manufacturers, moreover, promise that the higher price now charged for these plywoods is not fundamentally necessary in the future. Again, work at the Forest Products Laboratory has demonstrated that it is possible to glue plywood to wood framing so that the glue bond is stronger than the wood itself. Based on this discovery, floor and wall panels have been made of studding or joists with plywood covers nailed and glued to them. The faces and the framing cooperate under the principle of stressed covering, long known to designers of aircraft, to permit units requiring less lumber than that of conventional frames. Prefabrication of the wood panel is thus brought perceptibly nearer.

Assuming adequate life of the glue, these panels suggest a number of further interesting lines of investigation. Certain types of high-grade plastic paints are debarred from field use because of drying difficulties. In the shop where drying equipment is available they might be employed to advantage, both of cost and of other properties. Certain expensive hand-finishing jobs, such as sanding floors, might be transferred to full machine operation in the factory if flooring could be glued to the panels and if the satisfactory joining of two adjacent panels would be worked out. Painted plywood, or plywood covered with simple textiles like canvas, might afford attractive and durable wall and ceiling finishes.

Another defect of wood that has often led to bad workmanship is the difficulty of making satisfactory connections other than those in bearing because low shearing strengths make it difficult to transmit tension. In this connection work abroad, and to a lesser extent here, with toothed and ring metal connectors may be of significance. These connectors, developed primarily to improve fabrication of wooden trusses, might in smaller sizes have real significance in house building although as they are now used they are somewhat too crude for the prefabricator.

Thin veneers backed on cloth have of course been used successfully for a number of years but they would seem to be of special promise for factory finishing as their flexible shape would permit carrying them on rollers and the new gluing methods might make the bonds absolutely certain. Meanwhile there may be expected still further improvements in the technique of processing wood fiber into boards, a technique which has already taken us from relatively weak insulating boards to hard pressed and oil-tempered products of remarkable strength, durability, and beauty, though perhaps not for flooring as is so often suggested. Wood flour is also being experimented with as a basis for a new thermoplastic and the product is of interest though cost information is at present uncertain. With notable exceptions in the case of sugar cane and licorice fibers, many efforts to employ other vegetable fibers for products ranging from fiberboards to synthetics of high dielectric capacity have not been successful, judged purely from an economic point of view. Their properties are often remarkable but they cannot at the time of writing be regarded seriously.

The beauty of wood goes without saying, and the remarkable vitality indicated by recent wood technology suggests that it will have a very large rôle in modern housing, even though the wood-framed house should disappear altogether.

Efforts at fireproofing, however, still show no real promise of success without materially altering other desirable characteristics of the wood.

THE METALS

Although the metals as a group have a generally high strength per unit of cross section as compared with wood, and actually average higher also per unit of weight, most of them have such low moduli of elasticity as not to render them suitable for framing members. This practically limits the structural metals to iron alloys and to aluminum. Though steel costs intrinsically a little more than the wood it would replace in framing, it might be possible for it to gain precedence over wood for structure. The use of steel for lintels and the like does, for example, eliminate structural defects due to cross-grain shrinkage. Where metal frames are to be used, however, the problem of condensation is acute. Insulation must be carefully applied over all through-metal, resulting inevitably in an additional cost factor. The problem of spots of condensation has been insufficiently recognized by experimenters who seem to overlook the fact that air-tight interior wall finishes are a practical impossibility.

None the less, steel frames might be able to stand the cost differential of increased base cost and increased insulating cost if their advantages were thoroughly exploited. These advantages lie in the fact that metals can be fabricated with repetitive features such as holes for the semi-automatic attachment of finish and that these holes will stay where they are punched or drilled. Although many steel frames have had these holes, most of them have been employed only with conventional methods of attaching finish. Used with prefabricated finish and semi-automatic or self-keying means, steel frames might well justify their increased cost. The experiment would seem to be worth making at a reasonable scale. Even then it is hard to be sure that inexpensive protective treatments against corrosion will maintain their value through the years on steel that is covered up and subject to neither inspection nor maintenance. The problem of corrosion of metals is of course a generally serious one. It applies with particular force to efforts to use metal as face sheets or battens on the exterior. For either use it is probable that maintenance will by no means be eliminated but the problem may be less acute for battens than for sheets and varies materially in its magnitude with the metal used.

A few of the metals, notably copper and aluminum, undergo normal atmospheric corrosion with end products that are protective against further corrosion and that are also attractive. Metallurgy has of course developed protective alloys for nearly all the other metals, including steel, but the rare nature of some of the elements used in the alloys seems to bar them definitely from the low-cost field, at least until these elements cease to be rare. Similar in effect are processes that bond protective materials to the steel by means of intermediate terne-plate, but these processes are at present too costly to allow their products to be widely used in low-cost housing—the greater the pity.

As inside finishing elements, however, lacquer and other treatments including such things as porcelain enameling (dangerous out-of-doors because of the liability of chipping) promise that many of the metals may be suitable. The results with extruded aluminum and electrolytically deposited copper are, for example, really splendid. Design of modern Pullman cars shows there need be no loss of interior aesthetics by the use of metals in this way, and where the metals need little polishing and are easily cleaned they may prove very efficient. There is reason therefore to expect increased use of metals in our house interiors.

In subsidiary fields metals remain the best materials for flashings; electro-sheet copper affords an interesting way to produce built-up roofing; aluminum foil seems to give remarkable results as an insulator although some of us may wonder what will happen if time removes the bright finish. Pleasant as steel and other metal sash are from the point of view of operation, they have the problem of condensation to face and in an air-conditioned house the problem may be still more acute. On the other hand, metal door bucks throughout the interior, coupled with composition doors and simple metal trim, should be used more and more.

CONCRETES

In fields other than that of prefabrication there may be an increased use of poured concretes. Concrete has the virtue, from the architectural point of view, of being a thoroughly plastic material. Unfortunately, it can seldom be used without insulation and most persons do not like it as floor surface or as interior wall finish. If it is to be used effectively in low-cost housing, the other materials must not be affected by moisture because the time of drying out is serious.

Instead of plaster and wet concrete surfaces we already have factory-made plaster and concrete in the form of gypsum boards and asbestos-cement sheets. Although the latter are more expensive than the former, they have more promise; they do not have to be covered with paper, they are stronger, more fireproof, not destroyed by water, and susceptible of a wider variety of finishes. Recently asbestos-cement manufacturers are really beginning to be aware of the beauties innate in their material and we may see the time when they cease to try to make their products look like cedar shingles or ceramic tiles and strive for franker use of their material. In this connection the work of Earley with mosaic concrete panels suggests remarkable possibilities for decorative veneers. Modern housing may expect to see greatly increased use of cementitious materials in this form.

In the form of precast blocks and the like, however, there seems to be less promise. Precasting concrete has always appealed to inventors by the legion. But due to slow setting, concrete is not particularly amenable to factory manufacture in complicated shapes that have to be poured, and tongues and the like are frangible and fit none too well. Lightweight blocks of cinder concrete or Haydite still are among the most economical foundation materials, but they can not be regarded as the type of material we shall always want for this purpose. They suffer from some of the same defects as other masonry materials. Aerated cements have in general proved unsatisfactory. Wood concretes have not been successful. Precast floor slabs have their present economies, but they need much finishing and cannot be deemed an important factor for modern housing. The great rôle of concrete would seem to be in the form of the thin, tough, beautiful panel of considerable size.

CERAMICS

With one exception, ceramics and stone products seem to be waging a losing battle. The building of masonry walls is altogether too laborious a process to survive in an unlaborious age. Beautiful as brick and stone walls may be, they must be archaeological in the low-cost modern house. Ceramics are of course durable and require relatively little upkeep, but as used in masonry they involve too many joints, too many places where wind and water can get into the building. They are too good heat conductors, and require too much interior finishing even according to modern standards. And under today's conditions, which have perforce eliminated the arch, the dome, and the vault, as a means of spanning walls, they are limited to mural work, thus producing a house that has little homogeneity. Similar conclusions must be reached with respect to the really handsome synthetic stones of today. Minor uses may be found for other ceramic products, such as expanded clay bricks, and the new Microporite which seems to have remarkable properties but of which we as yet know too little to venture on prophecy.

The one exception in the ceramic field is glass. Glass is perhaps the most romantic material of our age. We have realized in modern housing that we have shut too much light from our lives, and glass is the medium by which we must restore the equilibrium. But we cannot lose the heat that glass so readily transmits or suffer the burning rays of the noonday sun. Glass technology is ready, though not yet at prices we can afford to pay. It has provided us with double glass, two panes separated by a dehumidified air space and bound together at the edges by synthetic resin, so that glass is in measure ready for air conditioning. Of course the air in the space must be truly dry and the inside surfaces of the glass clean and the bonding medium air-tight. We want to shut out the breezes and yet have the beneficial antirachitic effects of ultraviolet light. Glass is prepared for this, too. Although the problem of decreased ultraviolet transmission efficiency due to solarization is not completely solved, the technology improves. We want summer light without attendant heat and the glass industry gives us *Aklo,* a glass that will absorb a large part of the heat rays of the invisible spectrum while transmitting the visible rays and that, though getting hot in the process, is tough enough to withstand the rapid cooling of a sudden shower. Glass has shattered readily, but laminated glass improves yearly and now we have tempered or case-hardened glass with an extremely tough outside area of compression that makes shattering risks almost negligible.

Moreover, glass products that have been known for long have perhaps not been suitably exploited in houses of the past. Where airs are reasonably clean the functional patterns of ribbed industrial glasses might serve the house designer well, give light with privacy, and add pattern and texture to our house interiors. Glass bricks, used abroad for fifteen years and here for six, are still very costly, but have tremendous possibilities and perhaps if used in quantities comparable with bricks might come within the desired cost range.

Glass eliminates infiltration; it is a good fire-stop; it is non-porous; does not suffer surface cracking; absorbs no odors; is impervious to air, water, grease, most acids, and all vermin; does not lose its hardness or brilliance on exposure to moisture; its polished surfaces do not disintegrate, they retain their luster, they are ideally easy to clean.

SYNTHETICS

New synthetics come to us daily. Most of those that are established have already been mentioned in one or another connection. Many are too new to judge. The one on which all of us in this field have long pinned our faith, synthetic resin of thermo-plastic or thermo-setting type, still remains too expensive for us to use except in minor ways. The properties of the material are almost ideal and its use on a large scale in our modern house merely awaits the not impossible day when the manufacturers succeed in bringing its cost within range of the pocketbook.

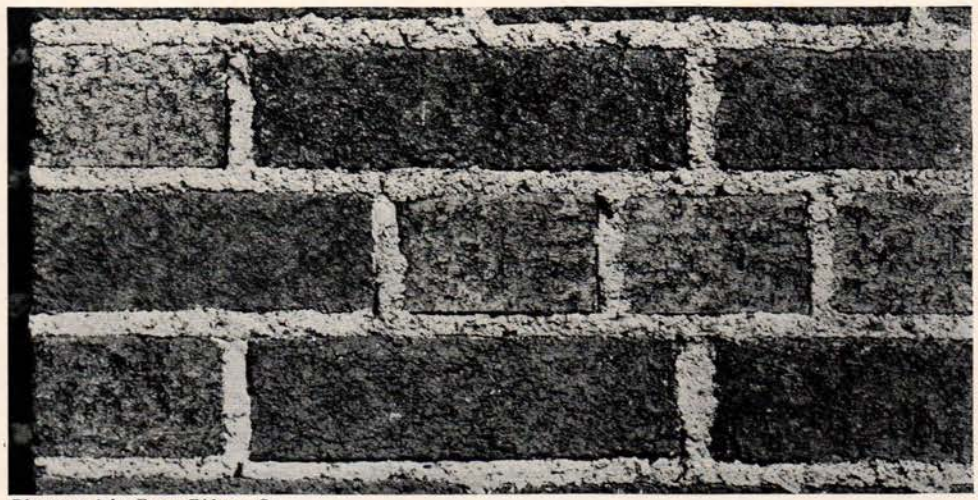
NEW CONCRETE CONSTRUCTION

Precast mosaic concrete panels, developed by Earley Process Corp., of Washington, D. C., being put into place on building site.

Reni Photographers

TECHNICAL NEWS AND RESEARCH

By DR. E. W. SCRIPTURE, JR.
Director, Master Builders Research Laboratories



Photograph by Ernst-Eidman Co.

SHRINKAGE OF MORTAR

PRINCIPAL CAUSE OF LEAKY BRICKWORK

The subject of brick construction, whether with relation to leakage or to its other properties (such as strength, durability and so forth), is highly controversial. Most differences of opinion are more differences of approach to the subject than of actual disagreement on the fundamentals. Recently a movement toward coordination of various views has been apparent.

To secure best results in brick construction, it is necessary to consider the characteristics of the brick and the mortar, as well as the purpose to which the wall will be put or the conditions which it must meet in service. The composition of the mortar should certainly be adapted to the properties of the brick or else the characteristics of the brick should be controlled. On the other hand, with a brick and mortar which are mutually compatible, control of the water is of utmost importance.

It would not be possible to give a thorough discussion of all factors involved in brick construction within the limits of a single article. It seemed desirable, however, to point out particularly one factor which has been somewhat neglected—namely, shrinkage.

DIFFICULTIES IN BRICK CONSTRUCTION

Practically all authorities agree that the principal cause of leaky brickwork is mortar shrinkage, with ensuing shrinkage cracks. Prof. Carlson calls attention (Journal of Industrial & Engineering Chemistry, June, 1935) to volume change as the limiting factor in the usefulness of concrete. A similar point may be made with respect to brick mortars. Recent tests conducted by Palmer and Parsons at the Bureau of Standards show that all mortars shrink whether job-mixed or made with patented masonry cements. In their "Permeability Tests of 8 Inch Brick Wallettes" (ASTM, Vol. 34, 1934) they found that 73% of all leaks in 240 test wallettes appeared at the junctures of the vertical and horizontal mortar joints. Every mortar that is in common usage in the United States, a total of 51 tested, including patented mortars, lime and cement of all well-known brands, shrank.

This inherent weakness of brick masonry construction, mortar shrinkage, is largely responsible for its tendency to permit water penetration. Although leakage or water transmission through brick walls is an old problem, it has been aggravated in recent years by the constant demand for more speed in construction, thinner and more exposed walls, and changed conditions of workmanship. By far the greatest cause of leakage in brick walls is faulty joints, that is, where water enters between the brick and the mortar or through cracks in the mortar.

Numerous researches on this subject have disclosed several causes for the defects in brick construction which can be attributed to the mortar:

1. Excessive shrinkage.
2. Low plasticity.
3. Poor bonding qualities.
4. Solubility of the mortar.
5. Low strength.

Within the past decade considerable progress has been made in producing mortars with improved bonding qualities, increased strength and lower water absorption. Less successful have been attempts to eliminate solubility resulting in efflorescence, to increase plasticity and to reduce shrinkage. Of all these desirable mortar properties reduced shrinkage has received the least attention, probably owing in part to the fact that its seriousness has not been realized and in part to the belief that it was an attendant evil about which little could be done.

Laying brick in mortar involves to a very high degree all the difficulties inherent in the use of two dissimilar materials in juxtaposition. Such questions as control of the absorption rate of the brick or conversely of the water-retaining capacity of the mortar and adaptation of the mortar mix to the type of brick and kind of service contemplated are all factors in this problem. As these involve complex relations and are rather controversial in many of their aspects it is not proposed to enter in detail into all these phases but only to point out the importance of volume change, especially shrinkage.

WATER CONTENT OF MORTAR

With volume change and shrinkage is bound up control of the water content of the mortar. The function of the water, in excess of that required to hydrate the cement, is to provide a medium in which the solid particles can move, making the mortar plastic. If the amount of water required to produce a plastic mortar were just that necessary to hydrate the cement, the early shrinkage problem would be overcome, but this does not seem possible.

Even allowing for the absorption of the brick does not obviate the difficulty. If just sufficient water were used (1) to hydrate the cement or lime and (2) to satisfy the absorption of the brick, as soon as the mortar is placed in contact with the brick, enough water would be abstracted to make it unworkable.

Furthermore, the rapid abstraction of water from the mortar by the brick itself constitutes a source of early shrinkage. It has been maintained that this and other early movement of the mortar is compensated by a movement of the brick. While this may be true to a limited extent of the horizontal joints, it is certainly not true of the vertical joints. As the wall is built the bricks press down on each other, tending to close up shrinkage cracks between brick and mortar in the horizontal joints, but there is no force tending to produce a lateral movement to close up the vertical joints. It is generally recognized that leakage is most prevalent through the vertical joints and this is probably the reason.

There are at least three ways of overcoming the effects of absorption of water by the bricks: (1) use of sufficient excess water to allow for that absorbed; (2) use of a mortar which resists abstraction of water, i.e., a mortar of high water-retaining capacity; and (3) use of a mortar which remains plastic over a wide range of water content; or, of course, a combination of two or more of these. None of these, however, solves the shrinkage problem.

A consideration of shrinkage involves a study of the relations of the type of mortar and its water requirement on the one hand and its workability on the other hand. Assuming that the mortar and the brick are suitably selected in any given case, control of shrinkage implies control of water maintaining adequate plasticity.

ANALYSIS OF SHRINKAGE

The principal forces affecting volume change of mortars are four:

1. Loss or gain of water by evaporation or absorption.
2. Hydration of cement.
3. Temperature changes.
4. External stresses.

While it is clearly recognized that other influences are at work they are of less importance. Consequently this discussion is confined to the more significant effects of these four factors.

(a) WHAT HAPPENS DURING HARDENING

To appreciate the rôle of volume change in determining the characteristics of a brick wall it is necessary to have a clear picture of the changes taking place during and subsequent to hardening.

When the mortar is first mixed ready for use it is composed of a fine cementitious material, usually cement or lime, sand, and water to bring it to a workable consistency. Placed between the brick two actions proceed simultaneously: the mortar loses water either by evaporation or by absorption into the brick, and the cement sets and acquires strength. The loss of water by either of these methods causes the solid particles of the mortar to be drawn together, reducing the volume, consequently the mortar shrinks in any direction in which it is free to move. As long as the mortar is in a plastic state these shrinkage movements can take place easily and may be comparatively large. Shrinkage at this stage is most serious in the case of brick mortar, because the bond with the brick has little or no strength, hence is easily broken by shrinkage of the mortar. This break is ordinarily not visible in the beginning, but does not seal and the crack is increased by subsequent volume changes. Prevention of this early rupture of the bond has been sought by control of the absorption of the brick or by increase of the water-retaining capacity of the mortar through changes in the mortar composition. While these have met with some success they can hardly be said to have solved the problem entirely.

As the mortar acquires more strength and rigidity the same shrinkage forces are exerted but no longer produce such large actual volume changes. Instead, with some smaller shrinkage, the loss of water also produces voids and sets up strains by opposing to the tendency to shrink the resistance to deformation which the mortar has acquired.

While this is a very general picture of the happenings during hardening, other influences of considerable importance are at work. Not only is the mortar itself gaining strength, but a bond is being built up between the brick and the mortar, and this is very susceptible to adverse conditions. The shrinkage movements of themselves tend to pull the mortar away from the brick, weakening or even destroying the bond. If water is taken out of the mortar very rapidly, as is the case with a very porous brick and a mortar of low water-retaining capacity, the bond may be completely broken. On the other hand, with a wet mortar from which the water is not rapidly drawn, a separation of the solid particles toward the bottom, of the water to the top, may take place producing a pocket of water on the underside of the brick and a complete lack of bond at that point.

Two forces tending to counteract shrinkage are operative during the hardening period. The first of these is an actual movement of the bricks. While the mortar is still plastic the bricks will move in a downward direction under the force of gravity, taking up a part of the early shrinkage in the horizontal joints. This is not, however, the case with the vertical joints.

Some of the water used in making the mortar is not lost by evaporation or absorption but combines with the cement or lime. As this hydration reaction increases the size of the cement particles they tend to fill some of the voids and compensate for a part of the decrease in volume. Both of these influences combined are not, however, great enough to take up all or even a large part of the shrinkage.

In general, during hardening, the mortar tends to contract and develop voids through loss of water. This action proceeds rapidly and causes a large shrinkage during the early hardening period while the mortar

CRACKS IN UNSTRESSED CONDITION

FIGURE 1:

Photomicrographs show how cracks due to mortar shrinkage open wider and new cracks appear with application of loads.

CRACKS WHEN LOAD IS APPLIED

is still either plastic or relatively weak. As it acquires strength the speed and size of this shrinking action are progressively diminished, ceasing almost completely when the mortar is cured and dried out. In spite of some modifying influences such shrinkage takes place in *all mortars,* more in some than in others.

What effect shrinkage during hardening will have depends on the balancing of three factors—the magnitude of the shrinkage, the strength of the mortar itself, and the strength of the bond between mortar and brick. The mortar may shrink away from the brick, impairing the bond and leaving cracks through which water can penetrate; the mortar may itself develop cracks; or, no actual cracks may appear, but a state of tensile strain may be set up within the mortar or between mortar and brick. What happens in any particular case varies with the conditions, but ordinarily it may be expected that all of these phenomena are observable to some extent. Cracks between mortar and brick are especially apt to develop in the vertical joints, cracks in the mortar at the junction of vertical and horizontal joints, and a condition of strain anywhere that cracks have not relieved the shrinkage force.

The photomicrographs of Figure 1 show the cracks which develop in practically all mortars from shrinkage (a) in an unstressed condition and (b) after the application of a compression load. In Figure 2 are illustrated the cracks which develop between brick and mortar from shrinkage and lack of bond: (a) a complete failure of bond, (b) a partial failure and (c) a good bond secured with a good mortar.

(b) WHAT HAPPENS AFTER HARDENING

After the mortar has cured and dried out with attendant development of cracks and strains, volume changes may still exist, though smaller than those of the hardening period. If the wall is wet, by rain or otherwise, the pores fill up and the mortar tends to expand slightly. On drying out again it contracts a nearly equal amount. This alternate expansion and contraction occurs every time the wall is wetted and dried. These changes are so small that in themselves they would probably have little or no effect, but with the state of strain set up during hardening, their constant repetition operates to open up new cracks as well as enlarge those already present.

Again, temperature variations will cause small volume changes. A rise in temperature expands the mortar, a fall contracts it. Like the changes produced by wetting and drying, these effects are so small that they are probably only harmful because the mortar is already partially cracked and in a state of strain. If the two effects of moisture and temperature were superimposed they might be injurious even to a perfect mortar in that they might exceed the elastic limit. Fortunately such a cumulative effect is most unusual in nature; when it is hot, the mortar dries out so that the expansion from rise in temperature is compensated by the contraction on drying. Similarly, when it is cold, the mortar tends to take up moisture, compensating for the contraction on cooling by the expansion of wetting.

A third force which may play a part after hardening is that of external stress. If a mechanical strain is exerted on the wall as by loading, by wind pressure or by a blow, the structure will tend to be deformed. If the strength is sufficient at all points this deformation will be resisted, but with a mortar in a condition of strain and containing imperfections in the form of microscopic shrinkage cracks the added mechanical load will open up wider the already existing cracks (see Figure 1) and produce new cracks at the points of maximum strain.

While other qualities of the mortar have some influence in determining its durability under various weathering conditions, the part played by volume change is very important. The small alternate contractions and expansions produced by wetting and drying or by temperature or the distortions of mechanical stress tend as previously stated to open up cracks which have been formed by shrinkage during early hardening or to produce new cracks in areas which have been put in a condition of strain by the same force. Water entering these openings—frozen and thawed—gradually breaks down the structure.

OTHER FACTORS AFFECTING SHRINKAGE

With a mortar of the type commonly used for laying up brick, composed of cement, lime and sand, there are four major points which determine the amount of shrinkage which may be expected:

1. Nature of cementitious materials.
2. Grading of the aggregate.
3. Richness or leanness of the mix.
4. Proportion of water in the mix.

Quite a wide variation in volume change is found among the different cementing materials. During early

FIGURE 2: Photomicrographs by Prof. W. C. Voss (M. I. T.) showing various bond conditions between brick and mortar.

COMPLETE FAILURE OF BOND | PARTIAL FAILURE OF BOND | GOOD BOND WITH GOOD MORTAR

hardening lime shrinks more than portland cement; subsequent to hardening the reverse is true. Volume changes are less with lime than cement (*cf.* Palmer and Parsons). There are, moreover, fairly wide variations among different cements and limes. Lime which has been soaked over a considerable period of time probably undergoes smaller volume changes than lime which is made up and used immediately. All of the cementitious materials, however, shrink to a considerable extent. To avoid troubles from this cause it is necessary to select those materials which have the smallest possible shrinkage and to combine them in proportions which will avoid large volume changes, but will at the same time confer the other properties required in a usable mortar, including strength and workability.

Shrinkage is significantly influenced by the size grading of the sand used. The finer the sand the greater will be the shrinkage. Also a sand which is graded over a range of sizes to give good packing will cause less shrinkage than one which contains only a narrow range of sizes or has an excessive proportion of one size.

Consequently a sand should be selected with a fairly even distribution over the different sizes and of as coarse a nature as possible. Here again the other characteristics, especially workability, required in a practical mortar restrict the choice. If the sand is too coarse, harsh unworkable mixes are produced and for laying up the comparatively narrow joints used in brickwork the maximum size cannot be large. Another limitation is that, unfortunately, well-graded sands are not always available in the vicinity of the job.

The relation between richness of the mix and volume change is very simple: the richer the mix, the larger are the volume changes. It is therefore desirable to use as lean a mix as possible. Lean mortars are, however, less plastic and less strong than those containing more cement or lime, placing a very definite limit to the extent to which any decrease in richness can be carried. It is a common observation, however, that more difficulty has been experienced of late years as the result of using too rich a mix than through too lean a mix.

WATER VERSUS SHRINKAGE

Probably the most important factor in shrinkage is the proportion of water used in the mortar. In fact, it is the underlying influence in determining volume changes. Those cementitious materials which take more water shrink more; fine, poorly-graded sand requires more water; rich mixes use more water. This is the reason these materials show high shrinkage. It is fairly safe to state in a general way that the shrinkage is proportional to the amount of water used per cubic yard of mortar. The importance of using as dry a mortar as possible is at once evident.

WORKABILITY VERSUS SHRINKAGE

To secure a satisfactory brick job it is necessary to reduce the shrinkage of the mortar, but it is also necessary that the mortar shall be workable. As before stated, one important cause of leakage in brick walls is a failure to secure well-filled joints, especially the vertical joints. When the tendency of the mortar to shrink away from the brick is exerted on incompletely filled joints, it is not surprising that cracks are opened up between the brick and the mortar through which water can pass readily. It should be pointed out, however, that, even when joints are properly filled with mortar, they are still subject to shrinkage and consequent bond failure, and that "perfect workmanship" in this regard is not full assurance of perfect results.

Compacting the mortar after the brick has been laid, as by tooling, will help to take up some of the initial shrinkage and produce a stronger, more watertight wall. If the mortar is not workable when this operation is performed no beneficial effect can be derived. It will be evident that, with average workmanship, a highly workable mortar is necessary to aid the mason in securing well-filled, compacted joints and good adhesion between brick and mortar. Stated another way, with a given calibre of workmanship, the more workable the mortar the better the job.

Unfortunately many of the factors which improve the workability of a mortar are just the influences which promote large volume changes. Richness of mix, fineness of sand, increased water, all make the mortar more plastic, but all increase shrinkage. Basically the problem is resolved into a balancing of the water ratio against workability and shrinkage. The first must be kept high, the second reduced to a minimum. Any means, therefore, which will permit the water to be decreased without impairing workability will have a beneficial effect.

ATTEMPTS TO IMPROVE MORTARS

Many devices and materials have been proposed and used for the improvement of brick mortar. A number of soluble chemicals, of which the chlorides are typical, have been used to accelerate the hardening of the cement. This they accomplish, but they have little or no effect on workability or shrinkage. They are open to the objection that they contribute nothing to the ultimate strength of the mortar or to any other property, but do introduce soluble salts which may lead to efflorescence. Stearates in various forms are widely used and perform a useful function in reducing the absorption of the mortar. This, of course, decreases danger of leakage through the mortar, helps to prevent efflorescence and improves the durability. They may also contribute somewhat to workability, but this effect is not large.

PLASTICIZERS AND POZZOLANAS

Various finely divided solids have been added to brick mortars, presumably to impart plasticity. Any fine material, including lime, will accomplish this purpose and lime is generally considered the most effective of all. Within limits a certain proportion of lime or some other fine material having a similar effect is desirable in a brick mortar to give it a plastic quality known as "fatness." Lime also increases the water-retaining capacity of the mortar and diminishes volume changes after hardening. The proportions of lime and cement to be used in a mortar should be governed by the nature of the brick, higher proportions of lime being required for the more porous bricks, and by the service conditions to be expected.

The finely divided solids used in a mortar require the addition of more water and in this respect some are worse than others. In so far as additional water is needed they have an adverse effect on shrinkage. One other purpose may be served by suitable finely divided solids and that is the absorption of free lime and possibly other solubles in the mortar. By combining with the soluble portions of the mortar, these materials reduce the tendency toward efflorescence and contribute to the durability of the mortar. To accomplish this the fines must be pozzolanic in nature. Many of the substances used, such as lime, whiting, marble dust, are not but many others, generally of a silicious nature, are. Even among the pozzolanic materials there is wide variation in degree of activity. To derive any real benefit such a material should have a high degree of reactivity and this is found more in synthetic pozzolanas than in the natural products. Finely divided solids have a definite place in brick mortar in so far as they contribute "fatness" and reduce solubles; they are disadvantageous insofar as they require additional water.

WATER-RETAINING CAPACITY

The "water-retaining capacity" of the mortar should be suitable to the brick which is being used. With an absorbent brick a high "water-retaining capacity" is necessary to prevent water being drawn out too rapidly, increasing shrinkage and impairing the bond. With a relatively non-porous brick the "water-retaining capacity" need not be so great. This is best controlled by selecting the right character and combination of cementitious materials, and is aided by the addition of gelatinous materials high in water-retaining value.

ROLE OF WATER IN MORTAR

Water in a brick mortar serves two purposes: it combines with the cement and lime, giving them strength; it furnishes a medium in which the solid particles can move, making the mortar plastic. Roughly, the water needed to give a workable mortar is more than twice as much as that taken up by the cement. The water which is not consumed by this hydration reaction will, sooner or later, leave the mortar either by evaporation or by absorption in the brick. In so doing it causes contraction and produces shrinkage cracks as long as the mortar lacks sufficient rigidity to withstand the contracting force. Thereafter the water leaving the mortar is simply replaced by air forming a system of more or less inter-connecting capillary voids (see Figure 2).

The shrinkage cracks are sources of mechanical weakness and points of attack for the destructive agencies to which all structures are exposed. The capillaries permit the penetration of water into the mortar, sometimes causing leakage, always detracting from durability and often allowing soluble salts to be brought to the surface as efflorescence.

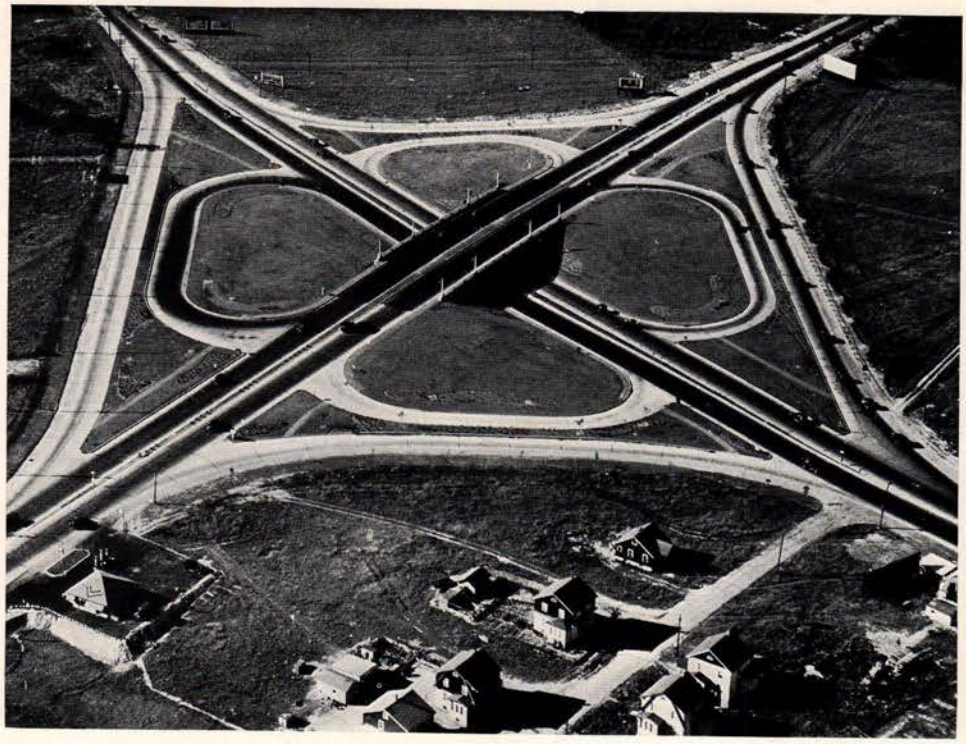
WORKABILITY WITH REDUCED WATER

It has been found that some gelatinous materials will have a beneficial effect on workability. They will reduce the quantity of water required with any given mortar to give the desired flow. By reducing the water without impairing workability or, what is the same thing, by increasing workability at the same water ratio, the volume changes of the mortar are reduced. Just how this decrease in shrinkage is secured will vary with the specific condition. If greater workability is required to promote good workmanship, the mortar mix and its water content will be kept the same and the plasticity increased by addition of the gelatinous material. If the workability is satisfactory, shrinkage may be diminished by using less water, or by making the mix leaner, or by altering the proportions of cement and lime.

CONCLUSIONS

Briefly stated, to control the volume changes of a brick mortar and to secure good workmanship, it is necessary to provide a workable mortar with as little water as possible. This end may be reached by careful design of the mix with respect to the kind and proportions of cementitious material, grading of the sand and richness of the mix. The composition of the mortar, which must be adapted to the brick, should be so controlled that it will produce all the desired properties as far as possible. While much may be accomplished by proper selection of materials and suitable proportioning, volume changes due to the water needed still remain and further improvement is to be sought in reduction of the quantity of water required to make the mortar workable.

If brick could be laid in mortar with just sufficient water for the hydration of the cement, practically all mortar troubles would disappear. The avoidance of defects obviously lies in approaching as closely as possible to this ideal, by so selecting and combining the mortar materials that the smallest amount of water is used consistent with workability. By such means all desirable properties of the mortar can be fully developed and volume change—shrinkage—reduced to a minimum.



1.

Die Kunstkammer

2.

NEW TOWNS FOR HIGH-SPEED ROADS

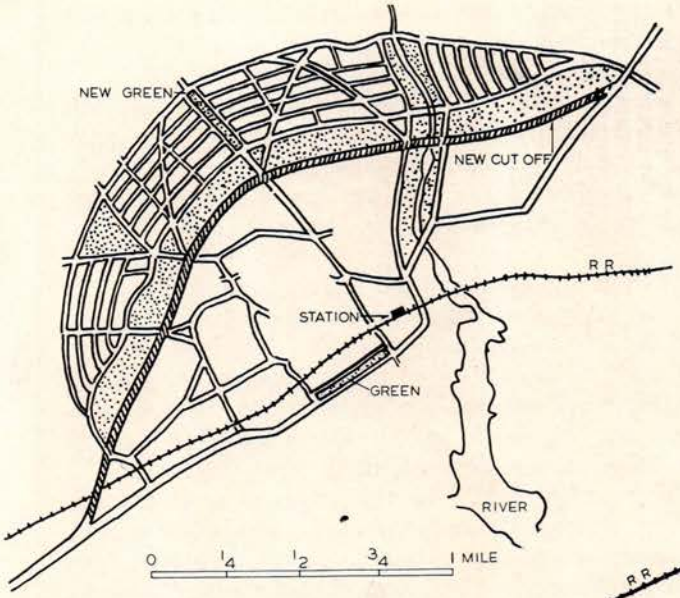
The American parkway, as it has been built around New York and other cities, is in conception a relic of the horse and buggy days when the rate of progress over the road gave time for the enjoyment of scenery. This was indeed the object of the drive and a source of inspiration for the drivers who were much more closely pent in the city than we are today. Motoring may still be carriage exercise for some, but I think the number who drive for the sake of being outdoors and enjoying the scenery is constantly diminishing and that most persons motor to get somewhere for business or pleasure.

Safe and ordinary speeds for cheap cars today are from 40 to 60 miles an hour, yet the speed must be kept under 30 or 35 because the parkways are designed for luxury in landscape rather than for comfort in use. It is ridiculous to be driving a car which is comfortable at 60 miles per hour at half that speed because the roadway was designed for luxurious planting, extravagant lawns and curves to delight the leisurely driver of the past.

The ideal for which we should strive is a means whereby we can drive from a garage not more than ¼ mile to a super highway on which we can continue uninterruptedly until within 5 miles or so of our destination in another city or in a country camp or farm. A satisfactory adjustment between utility and luxury in parkways would produce a parkway with no grade crossings, with straight runs wherever possible, with the curves long and well banked, with no sharp peaks in profile to hide what is in front from a driver sitting low, and with no more luxury in landscape treatment than enough to hide the dullness of factories or slums.

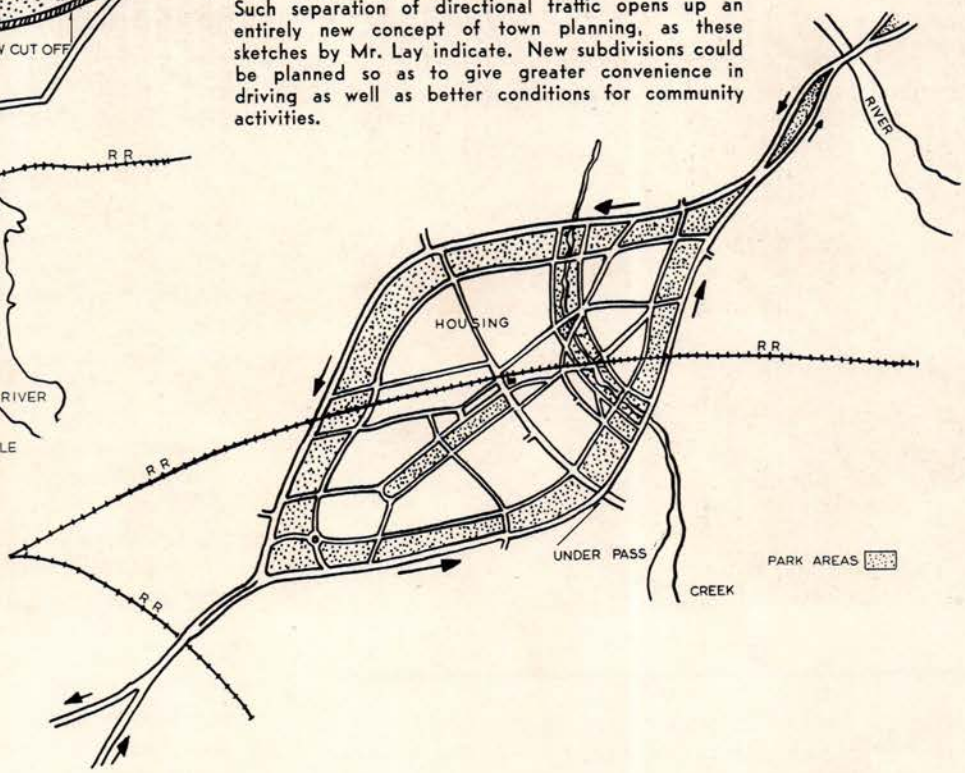
It is desirable wherever possible that the two directions of the roadway be separated by a strip of grass or planting 20 or more feet wide to prevent head-on collisions between cars too far to the left and to avoid some of the tiring whiz of cars passing in the other direction. Sharp changes in profile (a steep rise and a drop beyond) need not then be avoided since head-on collisions are impossible. There is no doubt that the grass strip lessens the danger of left-hand turns and makes entrance to the highway for a left-hand turn much safer. In the case of six- or eight-lane roads where the traffic is likely to be all one way on certain days or hours a further division into three or four roads of two lanes each might be desirable. On days of heavy traffic in one direction four or six lanes could be all one way, leaving two for the few cars going in the opposite direction. On a road of two lanes in each direction the speed on the outside should be 40 to 45, on the inner lane 45 or higher which permits a car at the lower speed to take the outside lane to let a higher speed car go by. The minimum of 40 should be obligatory.

It is my opinion that a separation of 20 to 50 feet is sufficient for most drivers and that any additional space is simply a strip park and not very useful as a park. The design of these big high-speed roads is still a matter of study and of disagreement because they are a new conception to meet the need of high-speed cars.



Left: (1) Clover-leaf intersection near Woodbridge, N. J., built by New Jersey State Highway Commission. (2) High-speed automobile road between Frankfurt and Darmstadt in Germany.

To prevent head-on collisions of automobiles the two directions of the high-speed road should be separated wherever possible by a strip of grass or planting. Each roadway then becomes a one-way street and could be a mile or more apart if so desired. Such separation of directional traffic opens up an entirely new concept of town planning, as these sketches by Mr. Lay indicate. New subdivisions could be planned so as to give greater convenience in driving as well as better conditions for community activities.



By CHARLES DOWNING LAY, Landscape Architect

When the road is separated by grass or planting into two roads for traffic in opposite directions each road then becomes a one-way street with no relation to the other. It is entirely possible in fact to have these one-way roads a mile or more apart without serious inconvenience. The separation, whether it is much or little, is determined by the cost of construction, the cost of bridges and the cost of land. Division by a separation of a quarter of a mile, or more or less, might require less taking of land than a separation of a hundred or more feet. The two roads might meet as one for important bridges or intersections.

An advantage in a separation of roadways is sometimes to be found in the reduced cost of cut-and-fill, especially when the intervening green strip can be used to take up the slope between roadways at different levels.

These big roads 300 feet or so wide can usually only be run through unimproved or open country, but the one-way road might conceivably be run on old highways without excessive damage. The inconvenience caused some of the owners of property on the one-way street should not be great if cross connections are frequent. The one-way street has become so common that it does not often incur objection.

The land for highways will cost less the more removed from towns, but the citizens of each town are likely to urge that it be brought, for their convenience, near the community center. If the super highway is 5 miles from town and the ordinary speed is 40 miles an hour, 7½ minutes will be required to reach the center. But if it is brought nearer so that some traffic lights must be passed, the lesser distance plus 3 lights would equal the longer run in time: thus, 3 lights or 4½ minutes plus 1½ miles at 30 equal 7½ minutes. This is a fundamental consideration.

There are further advantages in a separation of roadways in that going off and going on may be done from either side. This may greatly reduce the cost of construction or make easier the choice of a location. A left turn presents little danger on a one-way street.

The cost of policing the separated one-way roads will be greater, but there is no reason to suppose that the cost of upkeep will be any more.

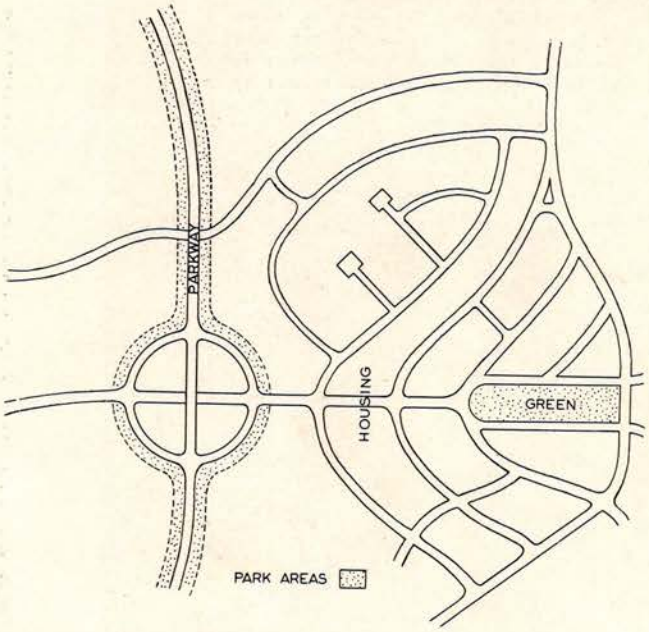
No distinction can be made between parkways, trunk highways and super highways, except in the lower speeds, fancy planting and prohibition of trucks on the parkways, and the fact that access from adjoining property can be prohibited on a parkway but not on a highway.

There is nothing so gratifying to long-distance motorists as a byway or by-pass for every city and village, for the difficulty of going through towns congested with local traffic, pedestrians and parked cars is the great cause of low average speeds on long runs.

The separation of grades in super highway or other streets has brought about the clover leaf, a scheme for entrance and exit for cars in both directions without making a left-hand turn through traffic.

Going on and off at the center has never been tried but might work to advantage in some places, particularly where the separation is wide.

A town plan by Charles Downing Lay, landscape architect, showing how a new community could be developed near a clover-leaf intersection in such fashion that entrance to or exit from the highway in either direction becomes easy.



For the comfort of tourists, as distinguished from automobile commuters and pleasure drivers, there should be frequent opportunities to turn off from the road to a comfortable parking place for rest, for repairs, or for change of drivers, or for lunch. If these parking spaces are not more than 3 miles apart and agreeable in themselves, or if they give a pleasant view or easy access to a town or a restaurant, every reasonable demand for luxury will have been satisfied, without elaborate landscaping between stopping places or, as Commissioner MacDonald of Connecticut prefers to call them, "halts."

If the park along a parkway is to have any value except for scenery, it should be possible for motorists to stop on a hard gravel road at any place within reason along the way. The wider the parkway is made, the more important it becomes to provide for its full use. It is my belief that all our highways are lacking in comfortable stopping places and that this lack lessens the pleasure of driving. By "comfortable" I mean a place off the highway where one is expected to stop in order to enjoy a view or the shade or a running brook.

So far as I know, the problem of controlling the use of the land adjoining a super highway has never been well-studied. There are endless miles through the country built on new locations and offering admirable sites near towns and villages for new subdivisions or new dwellings. A four-lane super highway or trunk highway is dangerous for pedestrians to cross and becomes with heavy traffic an almost impassable barrier. It is too noisy most of the time for comfortable living, and except where public opinion demands rigid zoning it is likely to become a jumble of hot-dog stands, barbecues, gas stations and novelty shops. Any such development should be at a distance, as if the trunk highway were built as a by-pass or cut-off. Five hundred feet to the nearest dwelling might be enough to give the new community some protection from noise and desirable isolation, without giving up any of the advantages of being near the trunk highway.

The 500-foot strip between the highway and the new community would probably be used for a park and for industry. The location should be near a "clover-leaf" or other form of separated grade so that entrance and exit from the highway in either direction becomes easy.

A stoplight system is too inconvenient and too expensive. If traffic on the trunk is stopped for one minute in five it is a clear reduction of 20% in the capacity of the road. The cost of bridges and grading makes it evident that for access to the new villages the clover-leaf should be in a place where every natural condition favors its location.

The sensible plan, however, seems to be to put the village between the one-way roads, which obviates all expensive clover-leaf schemes. If the separated one-way trunks run east and west, then the villagers would drive north to get on the highway if they were going west, and south if they were going east. They might of course still like an underpass at each one-way highway to give easy access to the country beyond.

The trunk highway should reflect the tendency toward decentralization but its effects in this way have hardly been felt in most communities. Except for an accidental creation, beginning with a hot-dog stand, a gas station, a restaurant, a novelty shop and cottages for the attendants, the new community is most likely to start as a new subdivision or possibly around a large auto camp or cabin camp.

There are not many towns having planning boards with energy and push sufficient to secure modifications in the super highway plan which would make a new development easy. The development is likely therefore to be started by some landowner anxious to sell building lots; it is likely to be too near the super highway and it will probably depend upon a stop light for access or crossing.

The super highway on a new location does offer exceptional opportunities for subdivisions of a good class on low-priced land. If they are skillfully planned in relation to the highway and the nearby town they are likely to become the most desirable residential districts.

On a well-designed super highway one should be able to go the full 40 or 60 miles an hour from the time of starting, and reach Boston from New York (250 miles) between early lunch and late dinner.

If trucks are to be permitted on these roads there should be a minimum of three lanes each way and their speed should be restricted to a minimum and maximum so that the need for passing will be infrequent. Holland is building good roads of this type, and Germany has built from Koln to Bonn, 21 kilometers, a perfect high-speed motor road.

The lack of such through trunk lines not only restricts the automobile to about half its capacity, but also actually cuts down its use more, because high-speed trunk roads would, by means of branches, serve all the cities within 20 miles of the main route and give rapid communication between all towns in a large region. If the automobile cannot be comfortably used for long distances at high speed, it is because our highway engineers have not kept up with the progress in automobiles.

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HOME BUILDING RISES TO HIGHER LEVELS

By L. SETH SCHNITMAN, Chief Statistician
F. W. DODGE CORPORATION

The residential building improvement which started early in 1935 has all the evidences of a genuine emergence from the prolonged depression. For the nine-month period ended September 1935, the total was about 80 per cent ahead of the total for the corresponding period of 1934. Based on partial figures, the October residential volume will doubtless reach a level higher than thus far recorded for any month in 1935 and, in so performing, will exceed the level for every other month at least since October 1931, and possibly since June of that year.

In this march toward recovery all types of residential structures have shared; the most significant gain has occurred in one-family houses for owner occupancy. Singularly, virtually all the recent improvement in the field of home-building has occurred on the side of new construction, as apart from alterations and additions.

Foreclosures have begun to decline. Foreclosed properties in the hands of lending institutions are being sold. Real estate, generally, is showing underlying firmness and a stronger price level.

Mortgage money, until recently practically unavailable, is becoming more plentiful. These are some of the forces which underlie the current betterment in residential building and which may be expected to provide the basis for its continuation.

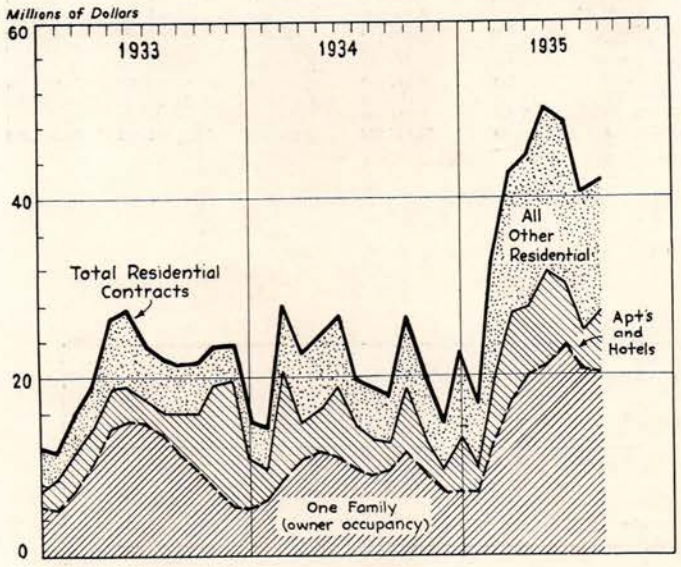


CHART 1. Contracts for residential building in the 37 eastern states, plotted by months; September ,1935, latest month shown. All figures include both new and alteration projects. In the classification entitled "all other residential" are included two-family houses, one-family houses for sale, whether erected singly or by development companies, and dormitories.

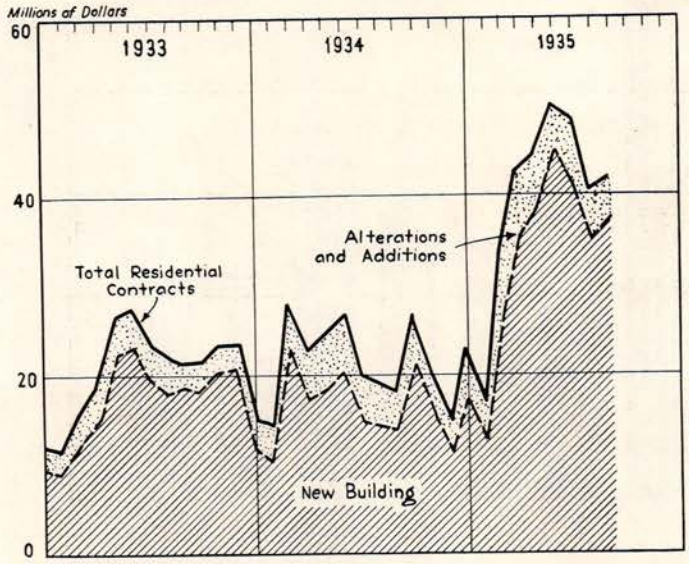


CHART 2. Contracts for residential building in the 37 eastern states, plotted by months; September 1935, latest month shown.

By February of 1933 residential building had sunk to a level lower than for any other month in at least a generation. Though some improvement occurred as the year progressed, the annual total for 1933 was not only lower than the 1932 volume by more than 10 per cent, but was also only a mere fraction of the total for 1928, the peak year. It remained for 1934 to establish the fact that the 1933 volume was apparently the irreducible minimum; it was in 1934 that the residential building total, in the face of all the counter forces at play, failed to show any change from the low level of the preceding year. This calm seemed to signalize the broad gains which have been witnessed in 1935.

For 1934 the total dollar volume of one-family house construction was more than 10 per cent lower than in 1933. For the first nine months of 1935 this class of building was running almost 85 per cent ahead of the corresponding period of 1934. The monthly progress beginning with 1933 is given in the chart to the left. For apartments and hotels the 1934 volume was virtually the same as the 1933 total. For all other classes of residential building, chiefly speculative small houses for sale, the 1934 construction total was somewhat better than for 1933. For both the apartment-and-hotel and all-other-residential classifications, the 1935 totals will exceed their respective volumes for 1934.

The 1934 total of residential building alterations and additions, as apart from new building, exceeded the alteration total reported in 1933 by about 35 per cent. For 1935 this rate of improvement was not maintained; for the initial nine months as a whole a gain of only about 15 per cent was shown in alterations as compared with the same period of 1934. This condition is shown in the accompanying chart by months beginning with January 1933. It is thus seen that practically all of the recent improvement in the residential field has been in new building as distinguished from alterations.

CONSTRUCTION PROGRESS BY MAJOR GEOGRAPHIC TERRITORIES

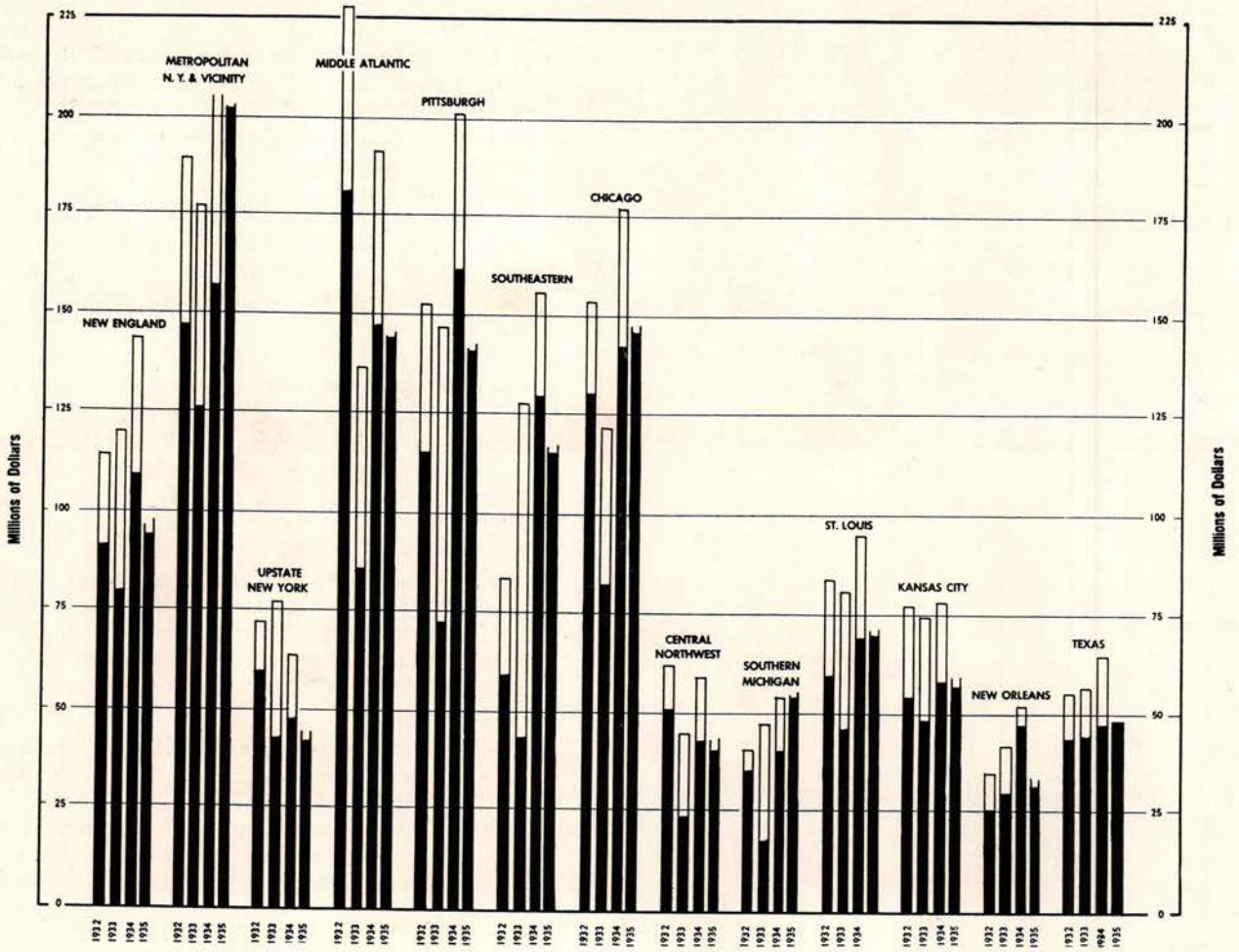
With the October record included, the volume of construction undertaken in the 37 eastern states thus far in 1935 has finally exceeded the cumulative volume for the corresponding period of 1934. As will be seen from the accompanying table the nine-month total was still slightly below the corresponding 1934 volume. For the full year, 1935, the total volume of construction should exceed the 1934 level of $1,543,000,000 by about 5 per cent. Private residential building, virtually alone, accounts for this improved situation, with every geographical area participating, except the relatively unimportant New Orleans district.

For the Metropolitan New York, the Chicago, Southern Michigan, St. Louis and Texas districts the nine-month totals for all construction have exceeded the corresponding volumes for 1932, 1933 and 1934. (See chart).

CONTRACTS AWARDED FOR CONSTRUCTION

(Figures denote dollars)

Territories	Residential Building		Non-Residential Building		Public Works		Public Utilities		Total Construction	
	1st 9 Mos. 1935	*1st 9 Mos. 1934*	*1st 9 Mos. 1935*	*1st 9 Mos. 1934*	*1st 9 Mos. 1935*	*1st 9 Mos. 1934*	*1st 9 Mos. 1935*	*1st 9 Mos. 1934*	*1st 9 Mos. 1935*	*1st 9 Mos. 1934*
New England	25,926,600	24,071,900	37,144,100	38,387,100	27,761,200	39,146,700	3,473,000	7,428,000	94,304,900	109,033,700
Metro. N. Y.	76,428,000	43,887,800	68,587,700	63,821,600	43,257,400	34,852,400	13,843,200	14,631,700	202,116,300	157,193,500
Upstate N. Y.	6,500,400	3,549,400	19,483,100	26,815,800	14,037,500	13,221,200	2,494,500	3,909,500	42,515,500	47,495,900
Middle Atlantic	53,589,400	29,528,500	59,974,100	61,250,700	25,730,800	40,548,100	5,408,400	16,085,800	144,702,700	147,413,100
Pittsburgh	34,319,700	16,635,900	54,923,000	46,379,200	40,437,100	84,960,400	11,864,300	14,378,100	141,544,100	162,353,600
Southeastern	38,863,700	16,976,800	38,138,400	35,736,400	31,254,000	70,163,400	7,152,400	6,191,700	115,408,500	129,068,300
Chicago	28,157,600	13,066,100	48,820,400	59,625,200	61,646,000	63,189,000	8,191,900	6,845,300	146,815,900	142,725,600
Central N. W.	7,493,700	3,090,900	9,529,300	11,857,700	22,671,800	24,412,400	2,144,400	3,726,800	41,839,200	43,087,800
So. Michigan	15,216,400	9,254,800	20,482,400	15,661,300	15,955,900	13,594,000	3,168,500	3,137,700	54,823,200	41,647,800
St. Louis	18,681,300	8,142,100	22,744,800	19,355,300	24,570,400	33,896,200	4,038,000	7,728,400	70,034,500	69,122,000
Kansas City	12,758,100	6,708,300	19,545,800	18,550,600	20,889,600	29,333,200	4,598,700	4,329,100	57,792,200	58,921,200
New Orleans	4,288,800	4,385,600	5,441,500	22,532,800	20,778,200	18,848,100	711,700	1,932,500	31,220,200	47,699,000
Texas	16,683,800	8,782,000	18,907,300	11,865,600	8,402,500	25,279,300	4,586,900	1,818,800	48,580,500	47,745,700
37 E. STATES.....	**338,907,500**	**188,080,100**	**423,721,900**	**431,839,300**	**357,392,400**	**491,444,400**	**71,675,900**	**92,143,400**	**1,191,697,700**	**1,203,507,200**



CONTRACTS AWARDED BY TERRITORIES

Heights of bars indicate annual totals for designated years; shaded portions show totals through September of each of the years.

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Architects are invited to use the coupon on this page as a convenient means of obtaining manufacturers' publications describing in detail the products and materials mentioned

L 51
INVISIBLE GLASS

Invisible glass for show window use is introduced by the Invisible Glass Co. of America. The new glass is constructed with camera-like precision, being an arrangement of curved and straight surfaces of a specially treated glass, and mirrors that transfer to hidden light-absorbing areas all light that could cause reflections. Deflector ends create the illusion of greatly enlarged display space. Merchandise is seen in the same light at any hour of the day or night without relation to the weather. Another feature is the protection of displayed merchandise from the damaging light of the sun, or from destructively intense artificial illumination. Only a fraction of ordinary illumination is said to be required.

L 52
FORMED METAL PLUMBING FIXTURES

Technical advances have played a part in the development of the new formed metal fixtures manufactured by the Plumbing Ware division of the Briggs Manufacturing Company. While lighter and

stronger than cast iron, the new fixtures are said to be more durable and permanent. They are enameled with an acid-resisting porcelain in several colors.

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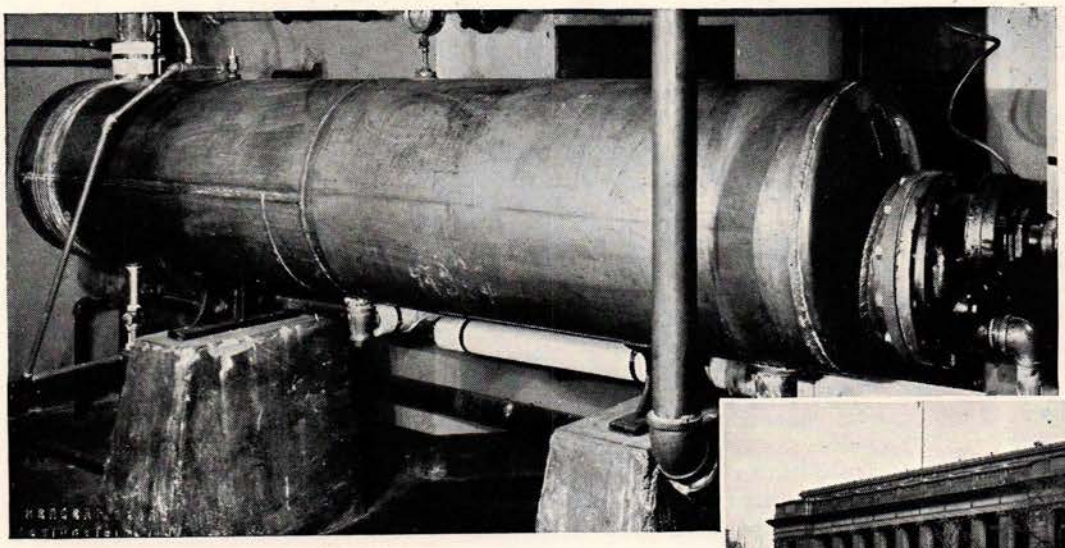

This all-welded Whitlock Everdur Type K storage heater, made by Whitlock Coil Pipe Co., Hartford, and installed in the Supreme Court Building at Springfield, Illinois (below) measures 24″ x 120″ and has an hourly heating capacity of 1250 gallons. Yelton-Weaver Supply Co. furnished the heater to J. F. Willey, *Plumbing Contractor*, both of Springfield, Ill.

IN the Supreme Court Building at Springfield, Illinois, the newly installed storage heater will provide a plentiful supply of rust-free hot water *indefinitely.* It will cost less to own than the one of rustable metal it replaced. For the shell of the new heater is made of welded Everdur Metal. It *cannot* rust.

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L 53
A BOOKLET ON THERMAL INSULATION

The Insulite Company, Minneapolis, Minnesota, has just published a new general insulation book entitled "Building for the Future with Insulite." Beginning with a simple definition of thermal insulation as applied to buildings, the book treats on the various uses of insulation for decoration, sound control and resistance to the passage of heat.

L 54
UNIT HEATERS IN ADDED SIZES

The Fedders Manufacturing Co., Buffalo, N. Y., announces the addition of seven sizes to its line of Series 3 Unit Heaters making 20 standard models in the complete line. The addition of these seven unit heaters provides sizes and capacities up to 1,300 EDR. Data on the complete line is given in Data Book No. 537, copy of which will be furnished on request.

L 55
NEW GLASS BLOCK

Development of an improved glass block for building purposes, a block which has stood up under pressures of 72,500 pounds to a single block and which reduces heat flow, deadens sound, transmits and diffuses light, deflects sun glare and resists fire is announced by the Owens-Illinois Glass Company. Variations of light transmission, according to the announcement, are obtained through a variety of face cuttings on the block, adding to the decorative quality of the block without permitting a lens effect which would develop glare or a spotty concentration of light. Depending upon the face cutting, the blocks transmit as low as 11.7 per cent and up to 86.5 per cent of light falling upon them.

L 56
EDGE-RAY ANNOUNCED

Walter Kantack designed the new indirect luminaire, Edge-Ray, described in a folder by Curtis Lighting, Inc. Edge-Ray takes its name from the reflector ring encircling the outer edge of the bowl and which directs the light so that it illuminates the bowl producing an exterior surface effect of luminous, concentric rings. Combining efficient, indirect lighting with exceptional beauty of the fixture itself, Edge-Ray is recommended for clubs and hotels, restaurants, offices, etc. Copy of the Curtis folder will be supplied on request.

L 57
MICARTA BOOKLET

A new 40-page illustrated booklet on the application of Decorative Micarta for interior and exterior finishes is announced by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The book contains reproductions of 32 design-colors and patterns and is divided into five general sections covering the use of Decorative Micarta (1) restaurants, grills, taverns; (2) stores, hotels, hospitals, theatres, public buildings; (3) transportation industry including ships, airplanes, trains; (4) homes including kitchens, bathrooms, mantels, bookshelves; and (5) exterior finishing of commercial establishments.

National Scale Free Pipe

WHEN you specify or buy pipe for plumbing or heating, make sure that the cost estimates give consideration to time and labor saved by using the right pipe. The pipe to choose is one that will handle easily, thread smoothly, and give long, satisfactory service to the owner. This last factor is especially important. Architects and plumbing and heating contractors build reputations for themselves by specifying durable, trouble-free pipe. It is because NATIONAL Scale Free Pipe resists corrosion and therefore lasts longer that it is preferred for America's outstanding structures, both by those who specify and those who use pipe. Having clean, smooth surfaces, free from scale, NATIONAL Pipe reduces corrosion, particularly pitting, to a minimum. The NATIONAL Scale Free Process (applied to butt-weld pipe, sizes ½ to 3-inch), and Spellerizing—two definite, specific mill operations, developed by this Company—give to the pipe a homogeneous structure, and surfaces free from scale, inside and outside. These advantages, together with the ease and economy of installation for which NATIONAL Pipe is noted, make it a greater dollar value for plumbing and heating lines. Specify this better, cleaner pipe and learn about it for yourself. Descriptive literature will be sent on request, to those interested.

CHROMATE TREATMENT—*All National Galvanized Pipe is given a special chromate treatment to resist discoloration and the formation of white rust. This patented process preserves that smooth, glistening surface or metallic lustre which is characteristic of good galvanizing.*

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Pacific Coast Distributors—COLUMBIA STEEL COMPANY, San Francisco, Calif.

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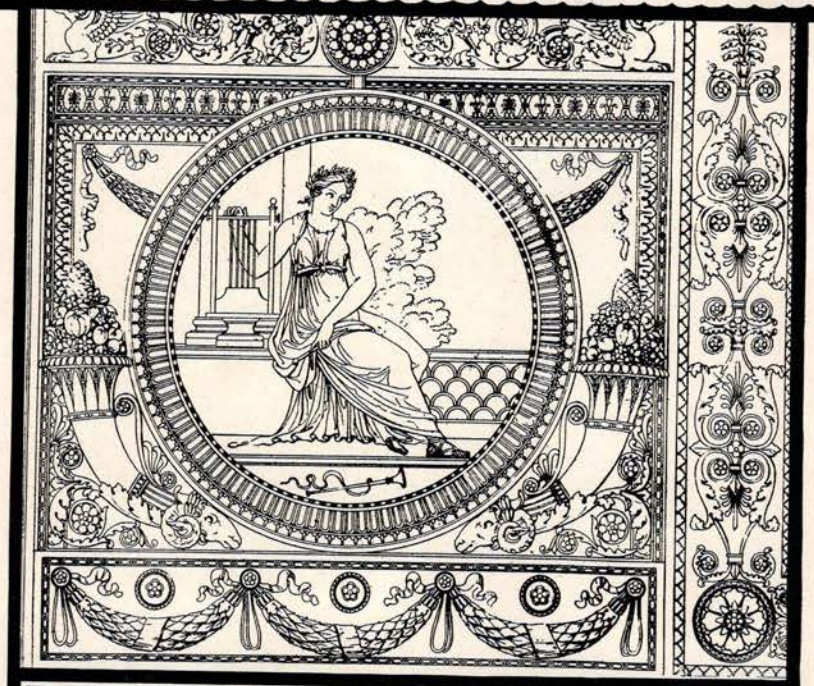
United States Steel Corporation Subsidiary

HIGGINS' INK ATELIER

CONDUCTED BY ARTHUR L. GUPTILL, A.I.A

still more about HISTORIC DOCUMENTS

OF THE historic documents of real worth to the student of architecture are those published by the famous associated French architects Charles Percier and Pierre Fontaine. The example here reproduced is from their "Recueil de Decorations Interieures." This volume affords information and inspiration not only to designers of the "Empire" style (they were architects to Napoleon) but to



INSPIRATION FROM PERCIER AND FONTAINE

all lovers of pains takingly studied and accurately delineated ornamental detail. Draftsmen have long turned to these Percier and Fontaine plates for suggestions.

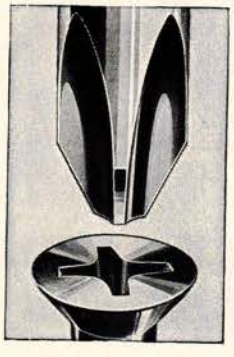
For work of such a nature only the best of materials will do. **HIGGINS' BLACK DRAWING INKS** have proven their worth again and again. Some prefer the Waterproof, though the "General" (soluble) has its champions.

CHAS. M. HIGGINS & CO., Inc. 271 NINTH STREET BROOKLYN, N.Y.

L 58
NEW BEVELED CORK TILE

Beveled cork tile has been added to the line of resilient tiles made by the Armstrong Cork Company. The new tile can be installed over rough suspended subfloors without the necessity for sanding. Surface irregularities in the subfloor are offset by the beveling of the tile. Since sanding is eliminated, the smooth, attractive surface given to the tile at the factory need not be removed. Beveled cork tile floor is expected to meet with the favor of architects and owners of homes and buildings because of its pleasing appearance from a decorative standpoint.

L 58
SCREWS AND BOLTS OF NEW DESIGN



The American Screw Company, of Providence, R. I., is introducing a line of screws and bolts with a newly designed recessed head. A tapered recess which exactly fits a tapered driver takes the place of the slot in the ordinary screw. Faster driving, better holding power, better appearance, reduced spoilage, fewer accidents and other advantages are claimed

L 510
"PLUG-IN" STRIP

"Plug-in" strip is a method of adding to present wiring by simply laying a strip on top of the baseboard or along the side of any other trim, with a convenience outlet—a place to receive an attachment plug—every six inches around the room. Factory assembled and encased in a steel channel 1 3/16" wide, it can be placed in any home or building without extra or special wiring. It comes in 5, 4, 3, 2 and 1-foot lengths and is of such appearance that it is hardly noticeable. The manufacturer, National Electric Products Corporation, claims that "Plug-In" strip may take the place of all other wiring in office, residence and apartment buildings.

L 511
GALVANNEALED SHEETS

A booklet by The Superior Sheet Steel Company explains the heat treating process that fuses the zinc coating with the base metal, forming a sheet that is rust-resisting, adapted to fine finishes and is impervious to injury or cracking when shaped and formed. The booklet illustrates a broad range of products fabricated with Superior Galvannealed sheets. These products evidence the versatility and long-wearing properties of the steel sheets from which they were made.

THE INTER-SOUTHERN BUILDING, Louisville, Ky. It has been safeguarded against the elements since 1921 with a Genasco Standard Trinidad Built-up Roof. Architects: D. X. Murphy & Bro., Louisville, Ky. Roofing Contractors: National Roofing & Supply Co., Louisville, Ky.

This skyscraper needed the most enduring roofing

A Genasco Standard Trinidad Built-up Roof was selected for its unrivaled waterproofing quality and lasting protection.

Genasco Roofing is the only roofing waterproofed with Trinidad Lake Asphalt . . . Nature's own enduring waterproofer and weather resister, which gives added protection from the destructive action of the sun's actinic or ultra violet rays.

This is one reason leading architects specify Genasco Standard Trinidad Built-up Roofs for commercial, industrial, institutional and public buildings throughout America. Many of these buildings are shown in our brochure, "For Your Roof". Your copy is waiting for you . . . just fill out the coupon below, requesting it, and mail it to us.

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AR11

The BARBER ASPHALT Company
1600 Arch Street, Philadelphia

Please send me a copy of your illustrated book "For Your Roof" which carries illustrations of many prominent buildings in all parts of the country protected with Genasco Standard Trinidad Built-up Roofing.

Name _____

Address _____

THE AMERICAN ROLLING MILL COMPANY

At the Industrial Exhibit of the Purchasing Agents Association of Pittsburgh, October 10 and 11, The American Rolling Mill Company won an award for having displayed the most informative exhibit at the convention. Sixty-nine exhibitors competed. The Armco display included sample sheets of galvanized Armco ingot iron, Armco enameling iron, hot rolled steel, cold rolled steel, stainless steel, electrical sheet steel and spiral welded pipe.

TRADE ANNOUNCEMENTS

FOURCO GLASS COMPANY

Announcement has been made of the formation of the Fourco Glass Company, to be exclusive sales agents for four big independent flat glass companies: Adamston Flat Glass Company, Clarksburg, W. Va.; Blackford Window Glass Company, Vincennes, Ind.; Rolland Glass Company, Clarksburg, W. Va., and Scohy Sheet Glass Company, Sistersville, W. Va. In addition to these plants the new company owns the following plants: Allegheny Glass Company, Mt. Jewett, Penna.; Jeanette Glass Company, Point Marion, Penna.; Homewood Glass Company, Mannington, W. Va.; Quertinmont Glass Company, Fairchance, Penna.; Flat Glass Specialty Company, Clarksburg, W. Va. The officers of the new company are: Eugene Rolland, President; Frank Bastin, Vice-President; W. M. B. Sine, Secretary, and John B. Scohy, Treasurer.

INLAND STEEL COMPANY

At the special stockholders' meeting of Inland Steel Company the plan of reorganization to effectuate the union of the business of Inland Steel Company with that of Joseph T. Ryerson & Son, Inc., was approved. Edward L. Ryerson, Jr., Joseph T. Ryerson and Everett D. Graff were added to the Board of Directors of Inland Steel Company. J. H. Morris was also elected a director.

HOFFMAN SPECIALTY COMPANY

W. A. Russell Company, manufacturers of Warco Air Valves, have granted exclusive license to the Hoffman Specialty Company for all rights on the Russell adjustable port venting valves. Under a cross-licensing agreement, the Hoffman Specialty Company has given an exclusive license to the W. A. Russell Company for manufacturing rights under certain of the Hoffman Patents.

Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of March 3, 1933, of The Architectural Record, published Monthly at New York, N. Y., for October 1, 1935.

State of New York, County of New York, ss.: Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. A. Oakley, who, having been duly sworn according to law, deposes and says that he is the Business Manager of THE ARCHITECTURAL RECORD, published by F. W. Dodge Corporation and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, F. W. Dodge Corporation, 119 West 40th St., New York, N. Y.; Editor, Michael A. Mikkelsen, 119 West 40th St., New York, N. Y.; Managing Editor, A. Lawrence Kocher, 119 West 40th St., New York, N. Y.; Business Manager, J. A. Oakley, 119 West 40th St., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member must be given.) F. W. Dodge Corporation, 119 West 40th St., New York, N. Y., whose stockholders, owning 1% or more of the total amount of its stock, are Paul Abbott, Executor under the will of Henry H. Abbott, 40 Wall St., New York, N. Y.; Dana T. Ackerly, 15 Broad St., New York, N. Y.; May Gibson Baker, care of L. C. Collins, 83-10 35th Avenue, Jackson Heights, L. I., N. Y.; James McV. Breed, 15 Broad St., New York, N. Y.; Janes Curtiss Breed, 850 Park Avenue, New York, N. Y.; William C. Breed, 15 Broad St., New York, N. Y.; Mary F. Broadwell, 423 West 120th St., New York, N. Y.; Sumner Ford, 15 Broad Street, New York, N. Y.; Sumner Ford and Underwriters Trust Company, Trustees, 37 Broadway, New York, N. Y.; Laura Morgan Jackson, R. F. D. 1, Ridgefield, Conn.; Frances M. McIntosh, 736 Riverside Drive, New York, N. Y.; Michael A. Mikkelsen, 119 West 40th St., New York, N. Y.; Helen D. Morgan, 563 Park Avenue, New York, N. Y.; Laura O. Morgan, 1111 Park Avenue, New York, N. Y.; Truman S. Morgan, 1111 Park Avenue, New York, N. Y.; Minnie C. Ort, Port Murray, R. D., New Jersey; George H. Partridge, 6 Brooklands, Bronxville, New York; William J. Quinn, 15 Broad St., New York, N. Y.; Sanford D. Stockton, Jr., 15 Broad St., New York, N. Y.; Marcus Wayne, 2489 Overbrook Rd., Cleveland Heights, Ohio; Chauncey L. Williams, 119 West 40th St., New York, N. Y.; George A. Wilson as Trustee under agreement dated June 1, 1932, 15 Broad St., New York, N. Y.; Helen Morgan Young, 30 East 68th St., New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders, as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

Sworn to and subscribed before me this 30th day of September, 1935.

J. A. OAKLEY, Business Manager.

(SEAL)

EDWIN H. FREED, Notary Public, Queens County.

County Clerk No. 1941. N. Y. County Clerk No. 443. Commission Expires, March 30, 1937.

This is the BLACKBOARD I can specify safely without reservation

School architects have for years specified STERLING BLACKBOARD WITHOUT RESERVATION. They have learned by experience that the words "OR EQUAL" do not give STERLING QUALITY.

STERLING'S velvety smooth writing surface never fills up, chips, peels, or wears away. Its cement-asbestos base is practically indestructible. And because it does not reflect light or fade out writing it minimizes pupil eyestrain. If you want to be sure of *sterling* performance, specify STERLING on your next blackboard job.

Send for A. I. A. File 35-b-12 which gives Blackboard details, specifications and drawings. Address Dept. S1150.

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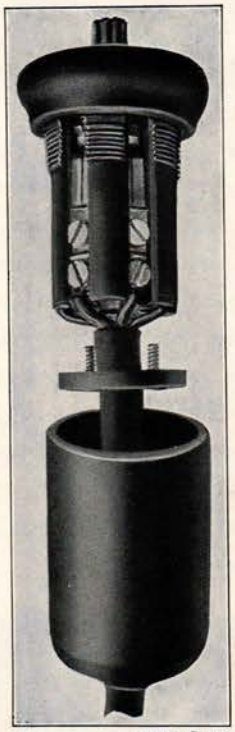
MANUFACTURERS - - - CHICAGO HEIGHTS, ILL.

NEW IMPROVED NURSE'S CALL BUTTON



1. New, unbreakable, bakelite body and cap. Comfortable to touch, no cold metal. Easily sterilized. Cannot be disassembled by the patient. Prevents short circuits and electrical shocks to the patient.

2. Improved wide reset ring, easier to release, prevents accidental resetting.

3. New locking device positively prevents resetting by blow, jar or dropping on floor.

4. Mechanism and contacts of HOLTZER-CABOT design assure long life and ability to withstand hard usage.

5. Entire button can be sterilized repeatedly with live steam without injury.

6. Rugged construction will withstand abuse and prevent cords from pulling out.

7. Any adjustments or replacement of parts can be made by an electrician with a screw driver.

Write Dept. 31 *for further information.*

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Bringing *new* Beauty to the RCA VICTOR Sound System

This is an announcement of a handsome new walnut Cabinet, housing all controls, including facilities for radio, records, and microphone. Width 42", Height 73¾", Depth 18½".

HERE is the latest addition to the RCA Victor Commercial Sound Systems, bringing into one beautifully finished and compact cabinet all the necessary controls. Cabinet houses two complete world-wide radios, a 2-speed phonograph, a microphone, and a simple switching system by which any room or combination of rooms can be supplied with whatever service may be desired. Standard specifications include provision for control of 80 loudspeakers, and additional switching equipment can be added if desired.

Though primarily designed for use in schools, this Control Cabinet is also suitable for similar purposes in other institutions. It now becomes a vital part of the RCA Victor Commercial Sound Systems, which are suitably flexible to suit the needs of any public or semi-public buildings and areas, such as schools, playgrounds, sports arenas, hospitals, courtrooms, hotels, etc. Wiring for sound is simple, and the cost is well within reach of conservative budgets. Write for information.

RCA VICTOR
COMMERCIAL SOUND SYSTEMS
RCA MANUFACTURING CO., Inc., CAMDEN, N. J.
A RADIO CORPORATION OF AMERICA SUBSIDIARY

Commercial Sound Section, Dept. AR.,
RCA Manufacturing Co., Inc., Camden, N. J.

Gentlemen: Please send me complete information on the RCA Victor Commercial Sound System.

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For the New Home
and the home made new

Score another point of improvement in bathroom equipment—the new Crane ECONOMY Shower Head. The world is asking for the new, the useful, the economical in home equipment. The ECONOMY Shower Head answers that requirement with a new kind of shower, a spray using less water, and a spray at less cost.

THE CRANE *Economy* SHOWER HEAD

MORE SHOWER • LESS WATER

LOW-COST

The new ECONOMY Shower Head saves water because it directs water *only* at the bather—none is wasted as in a circular spray which is effective only at its center. Actually, only one-third the amount of water used by a 4-inch spray head is required by the ECONOMY. Large diameter outlet resists clogging. Removable brass spreader breaks up the stream by a swirling action which precipitates good *wet* drops in place of mist-like spray. Spray guide conforms spread of shower to an elliptical shape which fits a tub, concentrates on the bather. Ball joint easily adjusted, will not corrode, has spring-loaded packing. Openings in spray guide aerate the spray, give soothing effect to body. Furnished for ⅜″ or ½″ pipe, with ball joint only. Of solid brass, heavily chromium plated. Cost is surprisingly low. Write for Circular No. 162.

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CRANE PLUMBING AND HEATING MATERIALS

EAGLE INSULATION CHEATS FLAMES

Spectacular roof blaze on East Yonkers Apartment kept from spreading by thick layer of fireproof Eagle Insulation

LOSS MINIMIZED!

• When crossed wires under the roof of the Parkway Towers, 219 Bronx River Road, East Yonkers, N. Y., started a spectacular fire last June, more than 75 families fled from their apartments. The whole building seemed doomed to ruin.

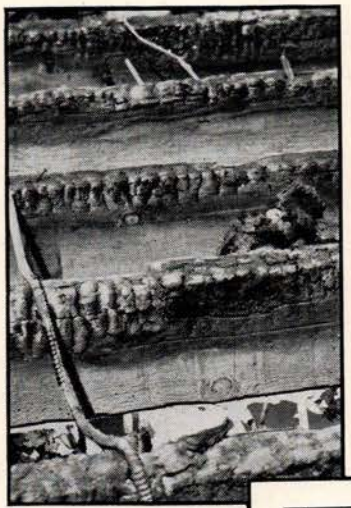
• But the blaze was quickly brought under control. A thick 4-inch blanket of Eagle Insulation, between ceiling beams in all top-floor ceilings, kept the roaring flames from spreading to the apartments below.

• The roof was almost completely destroyed, but the top floor ceilings were not even scorched . . . a dramatic demonstration of the fireproof protection that Eagle Insulation gives to apartment buildings and homes.

• No wonder more and more families are today insisting on insulation—the thick, efficient kind of insulation that Eagle mineral wool provides. This "loose fill" material is easily installed in any type of building by a special pneumatic process . . . keeps homes up to 15% cooler in summer . . . saves up to 40% of fuel bills in winter . . . and is approved by the U. S. Board of Underwriters as being absolutely fireproof.

The Parkway Towers, beautiful East Yonkers apartment building. Eagle Insulation, installed early last spring for the year-round comfort of tenants, actually prevented costly damage a few months later when a roof blaze threatened to sweep the building. Fireproof Eagle mineral wool installed under the roof stopped the fire from spreading to the apartments below.

Actual photograph taken the morning after the Parkway Towers fire. Note complete destruction of the roof. Because the ceiling beams were lined with Eagle Insulation, the fire could not spread to the floors below.



Note how flames were stopped at the point where Eagle Insulation began. (This fireproof mineral wool was scraped back before photograph was taken.)

Easy to install Eagle Insulation . . .

between ceiling beams and wall studdings. This most efficient of all loose fill insulating wools is quickly installed in all types of buildings at moderate cost by a special pneumatic process. Also available in new convenient bat form. Licensed Eagle Insulation contractors in all large cities.

See Sweet's Catalog for specifications . . . or mail coupon for complete information.

EAGLE INSULATION

for homes and apartments

Made by The Eagle-Picher Lead Company—pioneers in the manufacture of efficient insulating materials.

The Eagle-Picher Lead Company, Dept. **AR11**, Cincinnati, Ohio. Please send me free samples of Eagle Insulating Mineral Wool . . . also complete specifications.

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ask 978 manufacturers in the new SWEET'S CATALOG FILE for 1936

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But no matter what you may need, or when you may need it, our catalogs in Sweet's will be at your service the instant you want them, every day throughout the coming year.

There isn't room here for our names, but we can give you an idea of how many of us there are.

NUMBER OF MANUFACTURERS WHOSE PRODUCTS WILL BE CATALOGED IN SWEET'S FOR 1936

Special Services	5
Foundations	4
Masonry Materials	68
Waterproofing	24
Structural Steel and Iron	7
Miscellaneous Steel and Iron	34
Metals and Metalwork	24
Roofing	59
Skylights and Ventilators	24
Doors, Metal and Wood	31
Windows, Metal and Wood	17
Lumber and Special Wood Work	21
Insulating and Acoustical Materials	35
Lath, Plaster and Wallboard	23
Flooring and Wall Materials	57
Paint	29
Glass and Store Fronts	18
Hardware	42
Door and Window Equipment	44
Partitions	20
Furniture	29
Service Equipment	46
Special Equipment	57
Plumbing Supplies and Equipment	50
Plumbing and Bath Fixtures	41
Heating and Air Conditioning	101
Electrical Supplies and Equipment	16
Lighting	15
Communication	21
Elevators	16

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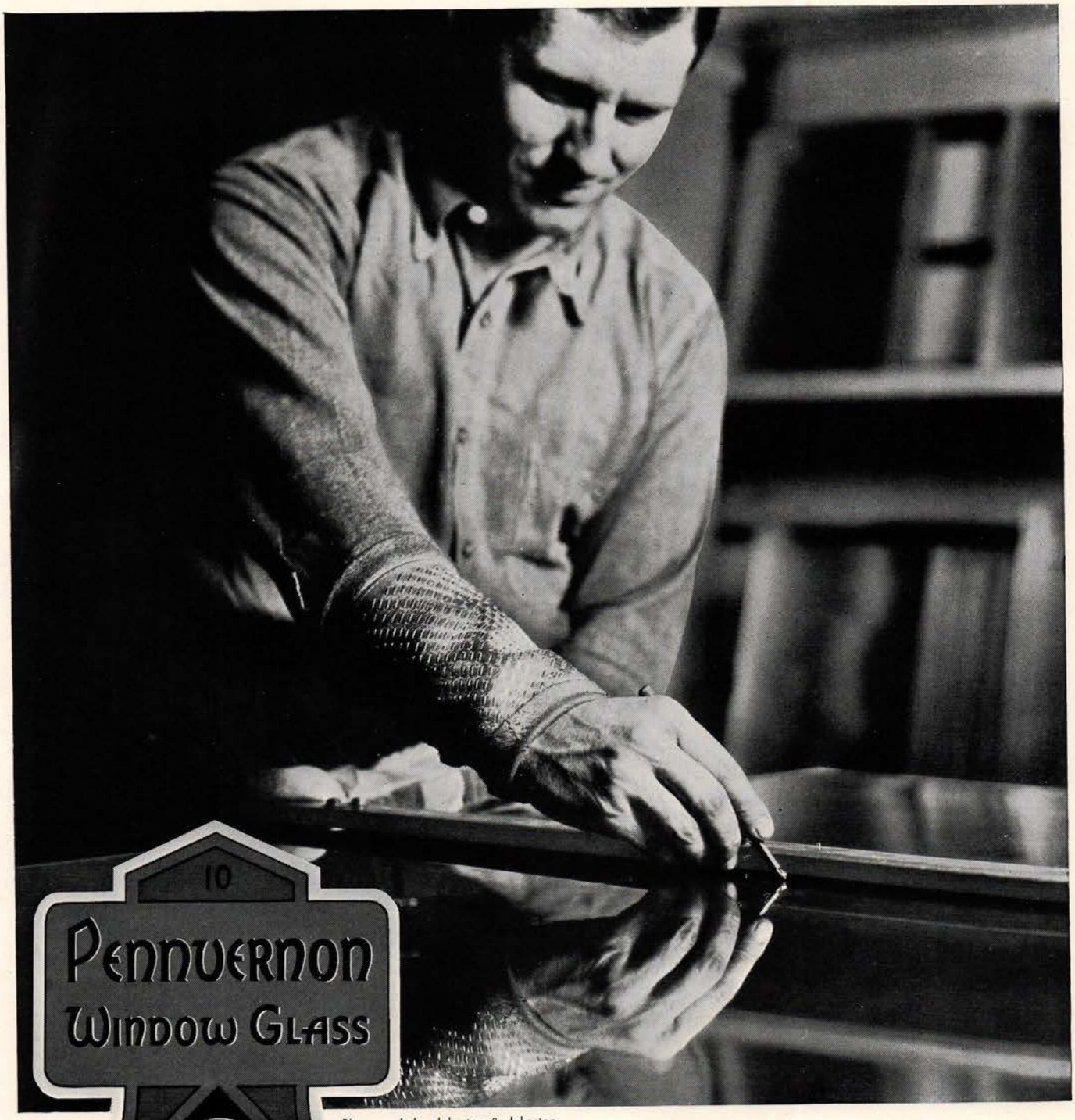
Specify "Pennvernon"...not just "window glass"



Photograph by Johnston & Johnston

A SWEEP OF THE ARM... a gentle tap . . . and a sheet of Pennvernon Window Glass is cut. The surfaces of this glass are unusually dense of structure, and therefore more resistant to wear and abrasion. But Pennvernon Glass cuts truly and easily with the ordinary tool. Notice the accurate reflection of this Pennvernon Craftsman's hand in the glass.

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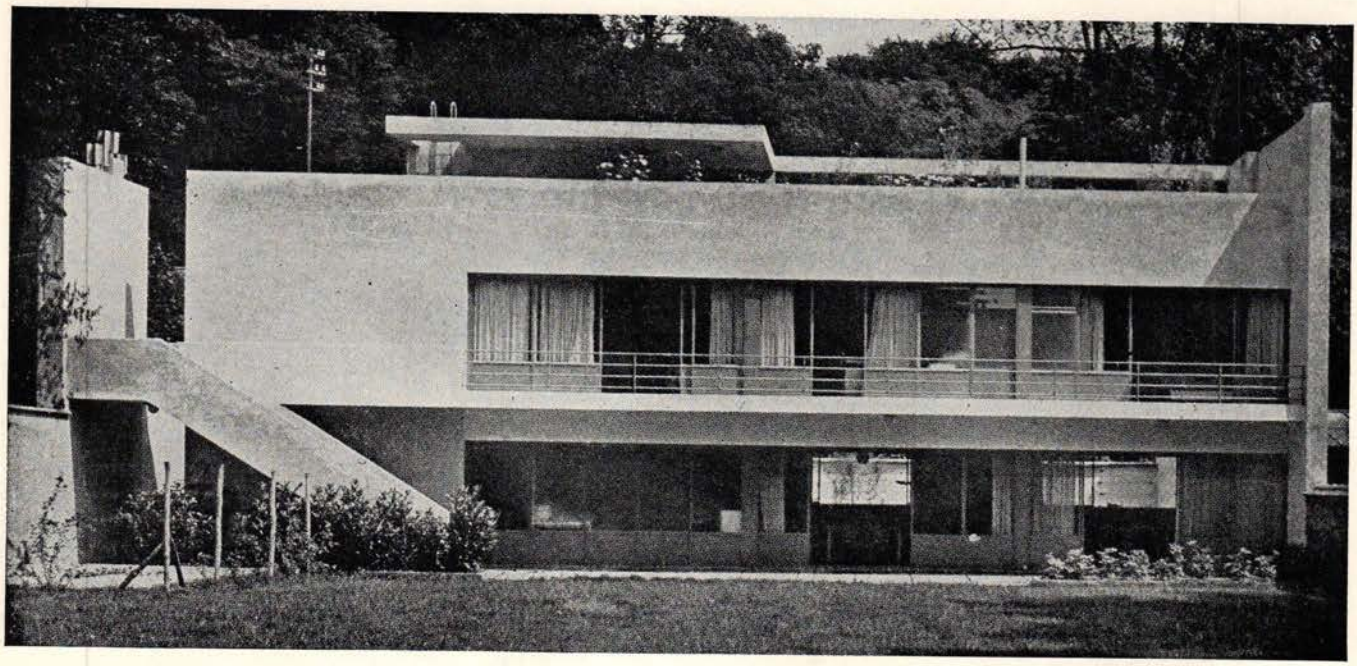
By F. R. S. YORKE, A.R.I.B.A.

THIS important and timely book will be invaluable to every architect, designer and student of PROGRESS in residential building. It reflects the latest advances in the design and construction of Modern Dwellings not only in the United States and England but in France, Germany, Holland, Belgium and other countries abroad. It is filled with practical information on plan, design, methods of construction, materials and equipment. It outlines the requirements to be met in the new type of home and discusses all its component parts—plan, wall, window and roof. One chapter deals with Experimental and Prefabricated Houses and over 100 pages are devoted to typical houses erected from 1924 to date. The book contains 200 pages 7½ x 10 with about 500 photographs, plans and constructional details. It is sold in the United States by The Architectural Record at $6.00 a copy postpaid. Use the coupon below.



THE ARCHITECTURAL RECORD
119 West 40th St., New York City

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Moisture destroys insulation effectiveness. BALSAM-WOOL is completely and permanently protected from moisture . . . *sealed* in a water-proof covering.

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Insulation must have no weak spots—no loophole for wind, heat or cold to get through. BALSAM-WOOL is positive in application—*fastened in place.*

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Materials that settle or that change their form, cannot be permanently effective. BALSAM-WOOL lasts as long as the building in which it is applied.

Does It Offer the RIGHT Thickness?

For every home and every climate, there is a *right* thickness of insulation. BALSAM-WOOL comes in thicknesses to fit every insulation need, everywhere.

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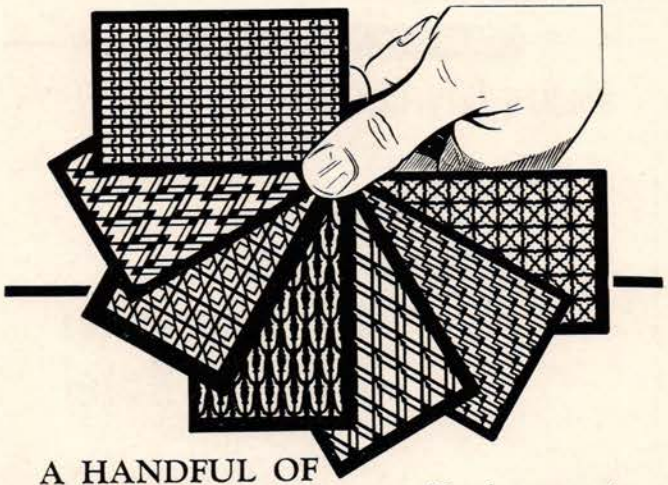
WOOD CONVERSION COMPANY
ST. PAUL · · MINNESOTA
Made by the Makers of NU-WOOD



A HANDFUL OF HENDRICK GRILLES

There's space to display only seven . . . we could show seventy-seven . . . but these will bring you some impression of the attractiveness and variety of Hendrick Grilles. Any standard design you might need and many special, some exclusive, designs are available. They can be produced in all commercially-rolled metals, including Aluminum, steel, stainless, bronze, monel, and brass. If you do not have the illustrated book, "Grilles," write for one.

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

Note for the Specification Writer's Desk Pad

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BUILDERS' HARDWARE SPECIALTIES

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Clients vary, not only one man from the next, but the same man from time to time. To insure their permanent satisfaction it is wise to adopt a policy of specifying Rixson Hardware whenever the opportunity occurs. This is far safer than stopping to decide when you should indicate Rixson, or when you can take a chance on something else. It is easier, too.

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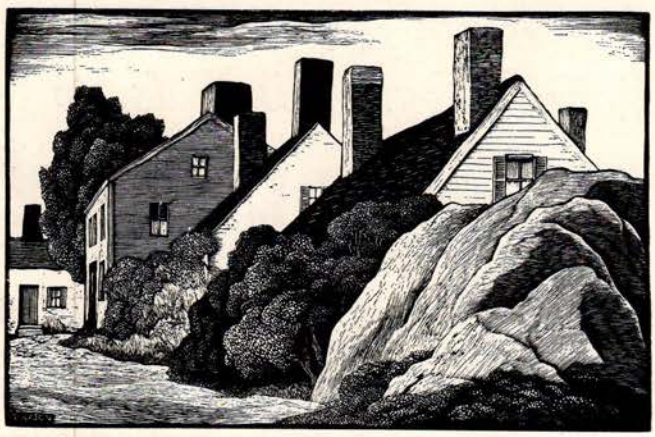
RIXSON

Builders' Hardware Specialties

New, Authentic REPRODUCTIONS OF *Old New England Colors*



Etching of old New England houses by T. W. Nason. Loaned by Goodspeed's Book Shop, Boston.

NOW for the first time, architects designing Colonial Houses can match the original colors used on famous early houses of New England. These colors have been authentically reproduced in a special new series of Cabot's Collopakes. They are based on painstaking historical research, plus careful reproduction in our laboratories. Among the shades available are Wayside Inn *Pink*, Old Lyme *Yellow*, Salem *Gray*, Haddam Barn *Red*, Harwichport *Blue* for blinds. For color samples, sign and mail coupon below.

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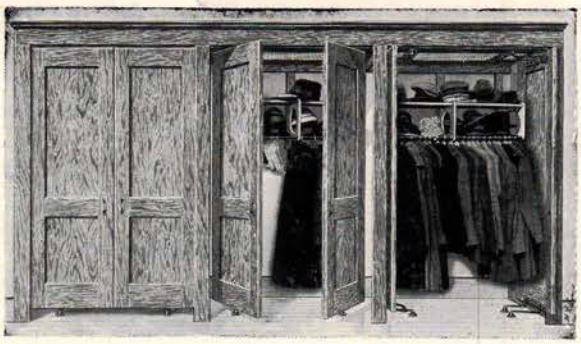

EVANS "Vanishing Door" WARDROBE

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Class J

equipped with either "Floor" type (as illustrated) or "Jamb" type hinges. This is Class D wardrobe if made with flush doors.

CLASSROOM WARDROBES

High in Quality—Low in Cost

This type occupies a recess flush with the wall. Plaster back and ends. No partitions, but with mullions between pairs of doors. Wire mesh ceiling. Blackboards if required.

The "Vanishing Door" hinges on which the doors are hung are made with double pivoted arms and swing the doors back into the wardrobe entirely out of the way. Simple—trouble-proof—and last as long as the building.

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We make many other types of school wardrobes, fully illustrated and described in Catalogue "N." Send for your copy.

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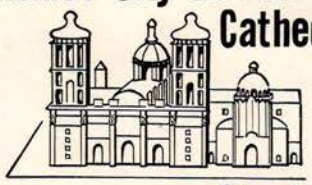
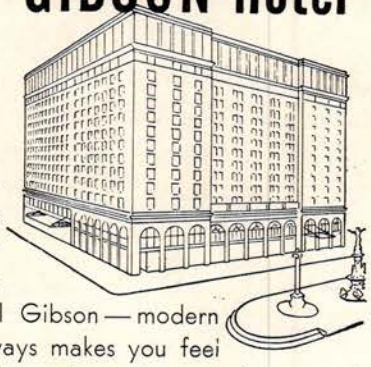
Mexico City has its Cathedral



Cincinnati has the GIBSON Hotel



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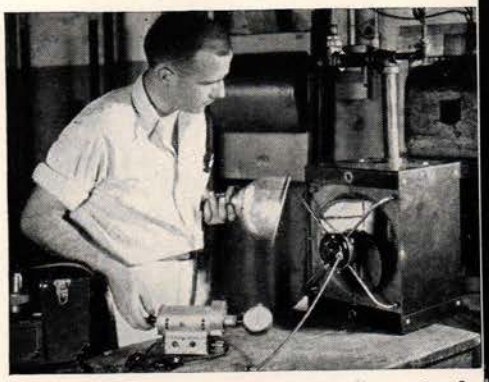

These new Venturafin Unit Heaters are the result of 50 years' experience. They are tested in accordance with the standards of the American Society of Heating and Ventilating Engineers and are given numerous other tests. This shows a Stroboscope test to detect undue vibration or performance deficiencies.

Top: Sensitive watt meters in the American Blower research laboratories record the power input of the new Venturafin Units. Bottom: This extensive sound equipment which records and rates Venturafin Units for sound, eliminates guesswork and makes it possible for you to select the proper Unit to conform with the existing sound conditions of any job.

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The 1st unit heaters with definite sound ratings

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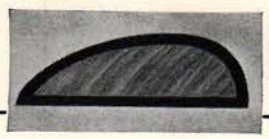

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*City*_____ *State*_____

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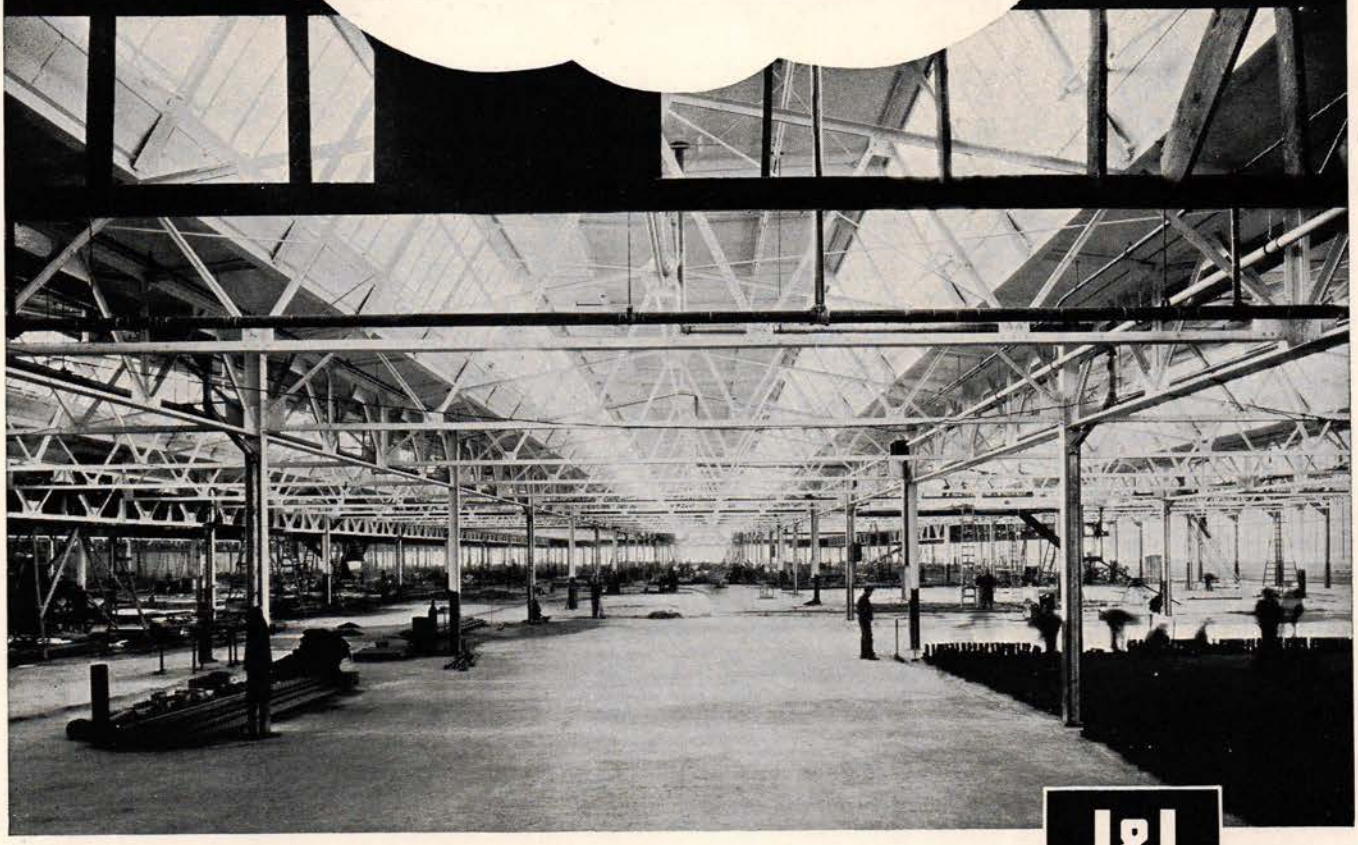

J&L STEEL

The Chevrolet Assembly Plant at Baltimore, Maryland, photographs of which are shown here, is one of the largest automobile assembly plants in the country. It occupies 626,630 sq. ft. and 5,230 tons of steel were required for its construction. All fabricated structural steel for this plant was furnished by Jones & Laughlin.

Albert Kahn, Inc., Detroit, Mich. were the architects and J. A. Utley, Detroit, Mich., the steel erection contractor.

Look to J & L for fabricated structural work of all kinds, including mill, factory and office buildings, pier sheds, airplane hangars, racks, scale frames, bridges, viaducts, trestles, barges and grade crossing elimination work.

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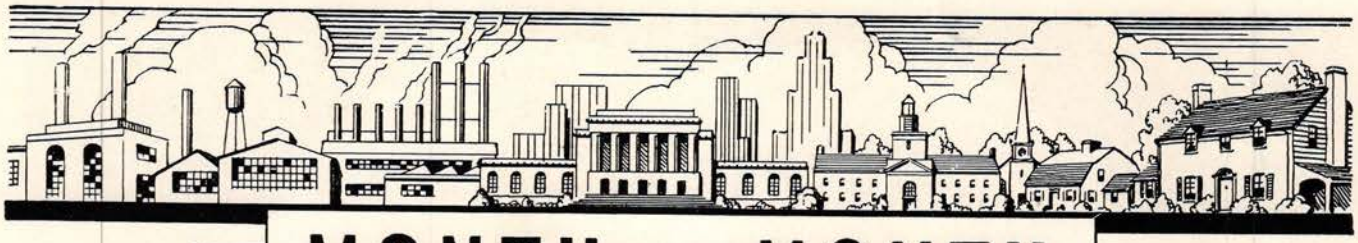

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With Dodge Reports

ARCHITECTS TELL WHY THEY GIVE EARLY NEWS TO DODGE REPORTERS

Many important benefits are derived by architects through the release of early news to Dodge Reporters. They range from the elimination of irritating rumors to actual savings in time and money. They include the dispensing of accurate information which in turn efficiently governs the timing of contacts with the trade, the obtaining of information on new products and ideas, and the location of bidders in distant places. These are only a few of the many valuable services rendered to architects by Dodge.

Architects themselves point out more reasons for giving early news to Dodge Reporters. One says "we consider it good business to do so." It is good business because, as says another, "Dodge is rendering a valuable service to the entire building interests of the country." A friendly understanding of architects' interests, combined with the intelligent distribution of news to the right people at the right time, has induced many favorable comments like those which follow.

"In giving this information at the right time, we are not only serving ourselves, but furthering the interests of our clients as well."

• • • •

Special Inquiry Service

Architects are invited to write or telephone to our Special Inquiry Service for information which they may need, whether it be in regard to building materials, new installations, manufacturers' or distributors' names, or conditions in other localities. We answer thousands of diversified questions every year.

"Saves time and trouble for the engineer, architect and owner."

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"in return for such information as we have been able to give, you have given us much that has been of value to us."

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"saves our office force many calls and much correspondence."

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"we were relieved of much of the annoyance of personal calls and loss of time through untimely visits of salesmen and contractors' representatives."

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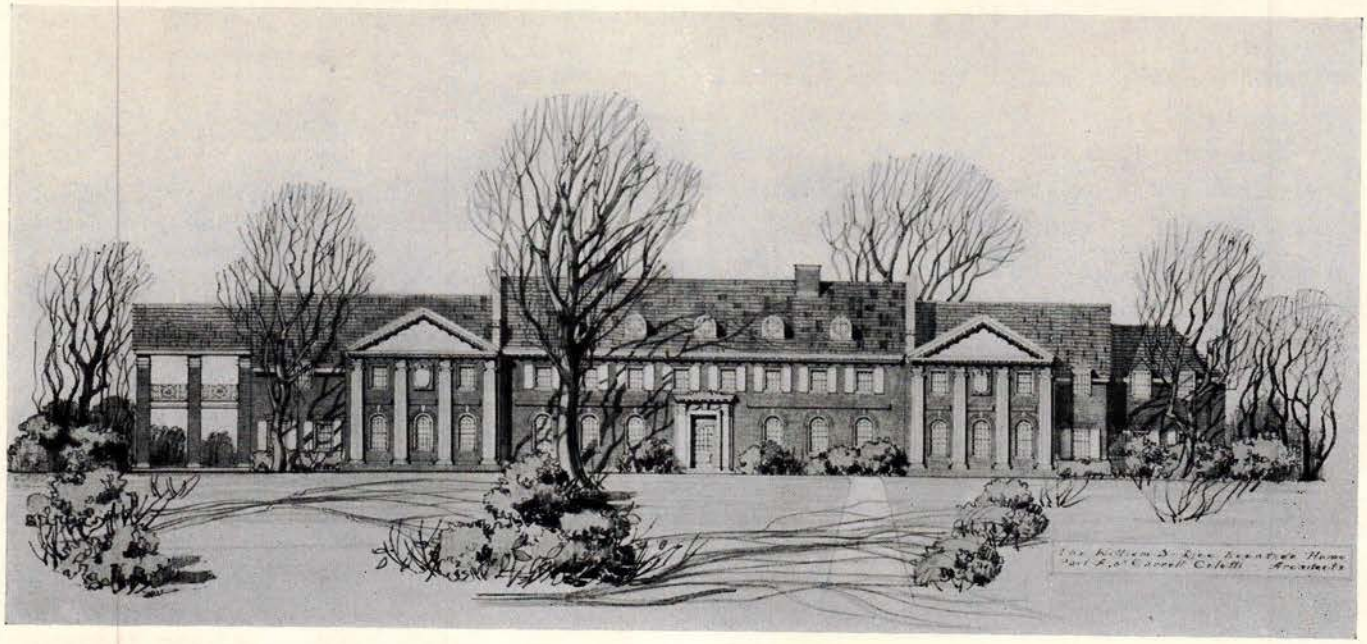
Welcome the Dodge Reporter when he calls. Give him early news on contemplated projects with confidence that he, and this organization, will control and use it to your ultimate advantage.



The William B. Rice Eventide Home, Quincy, Massachusetts
Now Under Construction

Paul A. & Carroll Coletti
Architects

Residence for Edward S. Whitney
Manchester-by-the-Sea, Massachusetts

Paul A. Coletti
Architect

BOSTON FIRM COMMENDS HELPFUL FACILITIES OF LOCAL DODGE PLAN ROOM

Architects everywhere testify to the many advantages they have gained by filing blueprints of their many projects in Dodge Reports Plan Rooms. Such testimony is given in a letter we have just received from one of the active younger architectural firms, Paul A. & Carroll Coletti, Boston, who write:

"We have found your Plan Room facilities very helpful on many occasions. When we have placed plans on file there during the time the estimates were being received we were relieved of much confusion and congestion in our own office. A wider range of comparative prices on the work and materials specified was obtained.

"When the advantages of placing a set of plans in your Plan Room is explained to our clients we find that they readily agree to the cost of an extra set of blue prints for that purpose.

"We have also found that considerable time can be saved in answering requests for names of bidders, due date of bids, etc., by listing this information in your Dodge Report service."

Paul A. Coletti, who now lectures in architecture at the Massachusetts Extension University, started practice in 1931. The residences at Quincy, Mass., and Manchester-by-the-Sea pictured on this page are attractive examples of his work. Carroll Coletti, winner of the Rotch Traveling Scholarship, 1932-1934, joined his brother about two years ago. Under construction at this time is the William B. Rice Eventide Home at Quincy, Mass.

ARCHITECTS EVERYWHERE GIVE NEWS TO DODGE REPORTERS

We congratulate the following architects upon their new commissions—a few from many currently reported:

James Gamble Rogers and Henry C. Pelton, New York City, hospital, Tupelo, Miss.

W. E. Glover, Topeka, Kansas, auditorium and gymnasium, Lillis, Kansas.

E. M. Ross, El Campo, Texas, school addition, Columbus, Texas.

W. A. McElroy, Henderson, Texas, church, Henderson, Texas.

Frank J. Everts, Lancaster, Pa., administration building (alterations), Millersville, Pa.

Lawrie & Green, Harrisburg, Pa., new shop building and alterations to model school, Mansfield, Pa.

George Zagel & Bros., Milwaukee, Wis., village hall and fire station, Belgium, Wis.

H. K. Gedney, Hastings, Nebr., school addition, Riverton, Nebr.

E. L. Goldsmith Co., Scottsbluff, Nebr., library and community building, Hemmingsford, Nebr.

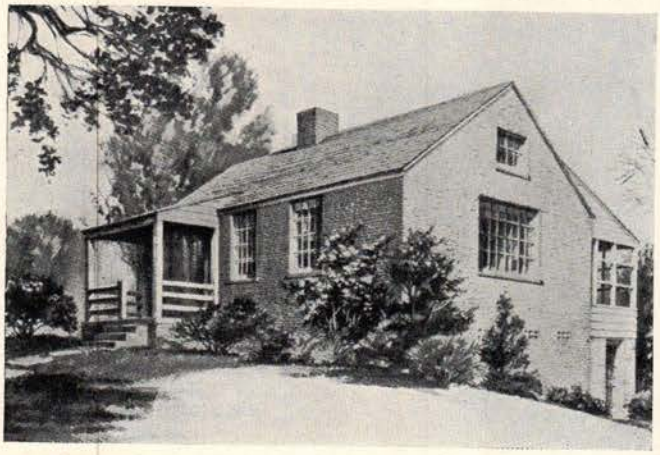
W. C. Weeks, Sheboygan, Wis., community building (alteration from opera house), Hortonville, Wis.

Residence for Dr. T. Vincent Corsini
Quincy, Massachusetts

Paul A. Coletti
Architect

F. W. DODGE CORPORATION, 119 W. 40th ST., NEW YORK

PROVEN ECONOMY



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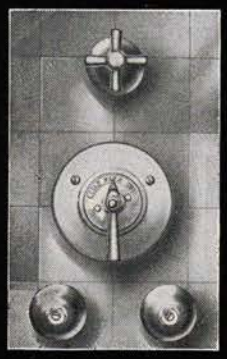

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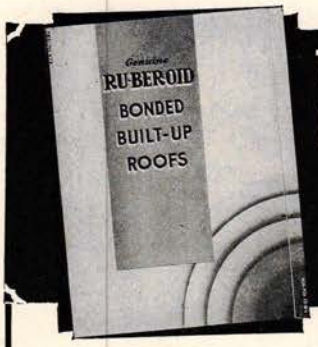

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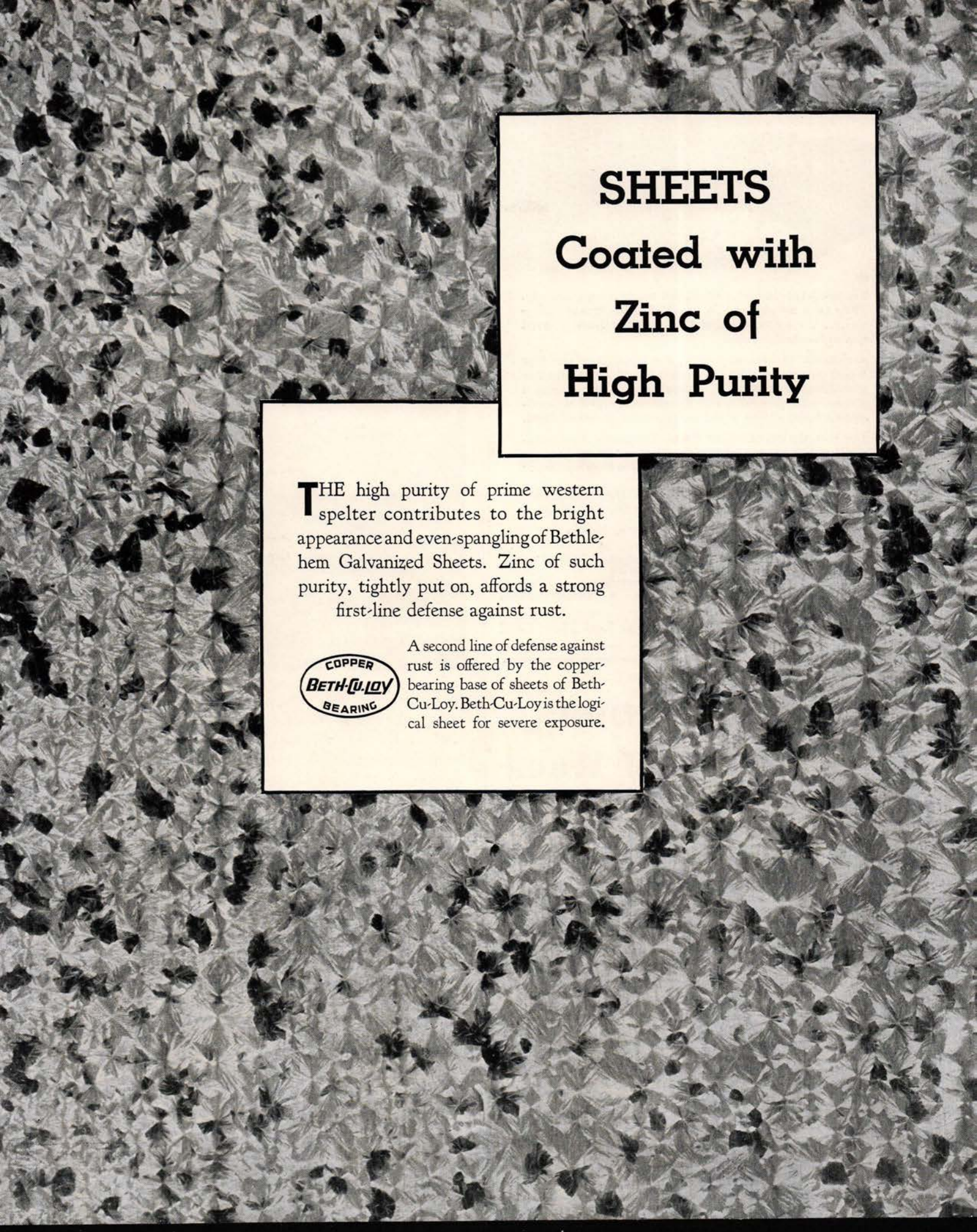

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EVERY HARD MAPLE FLOOR YOU INSTALL CAN HAVE A DIFFERENT PATTERN

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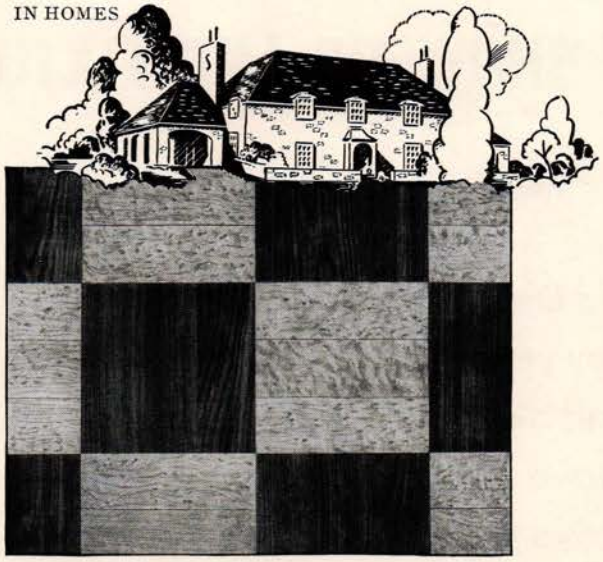
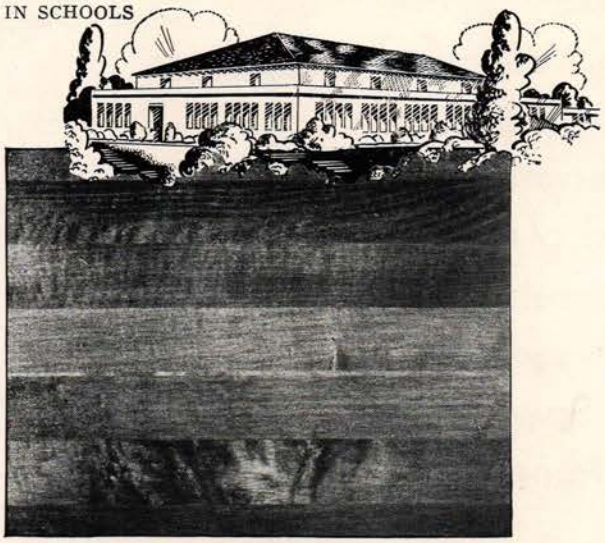


IN SCHOOLS



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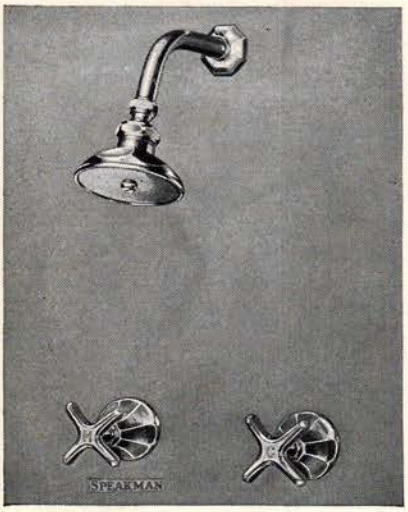

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SMOOTH SURFACED

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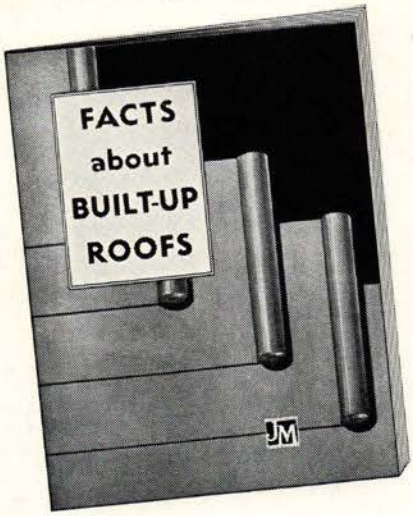

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