THE
ARCHITECTURAL RECORD

A PRESENT-DAY OUTLOOK ON APPLIED ART

By CHARLES R. RICHARDS, Director, Museum of Science and Industry, New York

Architectural design in several countries in Europe has affected, or at least run parallel with, the design of commodities in the period since the World War to a greater extent than in the United States. Yet it is true today, as it has always been, that architectural design here as elsewhere must continue to exercise a guiding influence on applied design if we are to live in a harmonious physical world.

In late years the province of function in determining form has been greatly emphasized in architecture and in the design of household furnishings; and in the matter of surface treatment as well, both have gone far on the same road. If one walks north on Fifth Avenue from 59th Street it is easy to place chronologically the more important private houses erected between 1890 and 1926 by noting the lessening use of carved and molded ornament and increasing reliance on the beauty of plain stone surface for decorative effect.

Approach to the newer and more complex problem of the tall office building has followed a more varied and erratic course. Here legal requirements have, of course, played a large part, but the basic importance of function as the primary consideration in design has of necessity been increasingly recognized. In this field, however, treatment of the outside shell has varied from the banality of sheer bareness and stupid use of inappropriate ornament to splendid examples presenting fine dispositions of mass and outline with simple and subdued surface treatment. On the whole it is surely true that the tendency has been towards the suppression of meaningless ornament and reliance on the structural material for surface effects.

The contrast between such high peaks of architectural design as the Woolworth Building of more than 20 years ago and the Barclay-Vesey Building of the New York Telephone Company represents a change of attitude parallel with progress in the best of household design. In both cases economic considerations and aesthetic convictions have moved steadily forward in emphasizing the same general principles.

A LIVING ROOM
BY GILBERT ROHDE

Hedrich-Blessing

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(1) Chair made in 1929 by Süe et Mare, leaders in modern design at the time of the Paris International Exposition of Modern Decorative and Industrial Art.

(2) The products of Eugene Schoen, in the author's judgment, combine the modern attitude toward applied design with the elegance stressed in this article.

In industrial design, however, meaning by that for the moment the design of useful commodities, practice has varied even more than in architecture. Here the two sets of ideas that divide the architects, viz., dependence upon tradition as the sole source of inspiration and the conviction that design should be thoroughly adapted to modern requirements and modern taste, have been and still are in strong conflict. In each camp one or the other of these ideas is held with such tenacity and intolerance of the other that real progress is severely handicapped.

On the one hand, paucity of imagination and limited vision on the part of manufacturers and designers together with the economic limitations of the professional decorator that operate in most cases to limit him to a mere purveyor of merchandise, serve to prevent the development of traditional forms into satisfying examples well fitted for the conditions of modern living.

On the other hand, among the protagonists of progress there has been in too many cases the failure to recognize the real significance of modernism as an emphasis and not a style. Pursued as a style, modernism becomes too often stark, eccentric, devoid of charm, alien to all tradition, and unassimilable with other expressions of design. Such a conception carries with it the illusion that a modern room must be composed entirely of objects distinctly and thoroughly modern in their quality of design, an illusion that M. Clouzot of the Musée Galliera in Paris has recently combatted. It is true that a room composed in a radical spirit hardly permits the company of old styles, but true modernism, or modernism with practical value, is by no means confined to radical conceptions.

If we conceive the real basis of the modern movement as an emphasis rather than a style, we are freed from dogmatism and intolerance. We no longer feel the need of condemning the old because it is old, but can bend our efforts solely to produce things thoroughly adapted for the requirements of modern life. If we look at our problem in this fashion

Hedrich-Blessing

A LIVING ROOM
BY EUGENE SCHOEN

we see at once that there is much in traditional motives, as for instance in the simpler English and American furniture of the late eighteenth century, that is well fitted to serve as a basis for modern creations, both from the standpoint of utility and charm and from the ease with which they can be adapted to the requirements of quantity production.

There is at the same time plenty of opportunity for creations making use of new materials and new forms, but here the problem is more psychological than practical. Bathroom and kitchen equipment is built to meet functional requirements and represents a striking example of successful design in this respect, as truly modern as the motor car. Living rooms, dining rooms, and bedrooms bring forth other problems. Here we need something more than mere functional adjustments to bodily needs. We need to satisfy the human spirit with grace and charm and variety. We need also the familiar, and often the things dear to us by association.

It was remarked some years ago by the late M. Koechlin that the French designers, with all their notable achievements, had failed to produce a salon that rivalled those of the old styles. That statement pretty nearly holds true today, and applies equally to our own living rooms.

Modernism as conceived by its extreme exponents insisting upon purely functional considerations as the end and all of design, is likely to reduce our lares and penates to purely geometrical elements. It is true that simple, geometric forms are the easiest to produce, either with the hand tools of the craftsman or with the machines of today. They are the forms most readily made by the knife, the axe, the hand plane, the planing machine, and the turning lathe, but they are hardly the forms sufficing all the needs for companionship of the human spirit. They are simply the basis of usable forms that through all time man has labored to modify and enliven by added touches of interest and subtlety. Are these things to be barred from our lives because some misguided designers con-

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(1) Copper bowl by the Chase Brass & Copper Co.

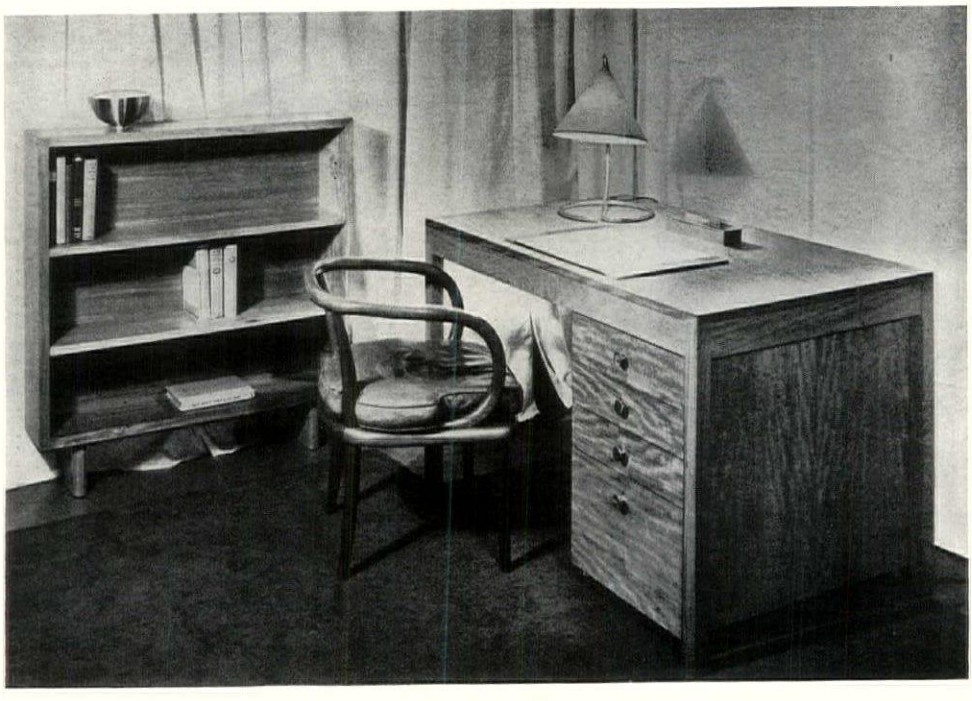
(2) A high-fire vase by Leon Volkmar.

ceive their absence to be the only true expression of modernism? It is necessary only to ask this question to know the answer.

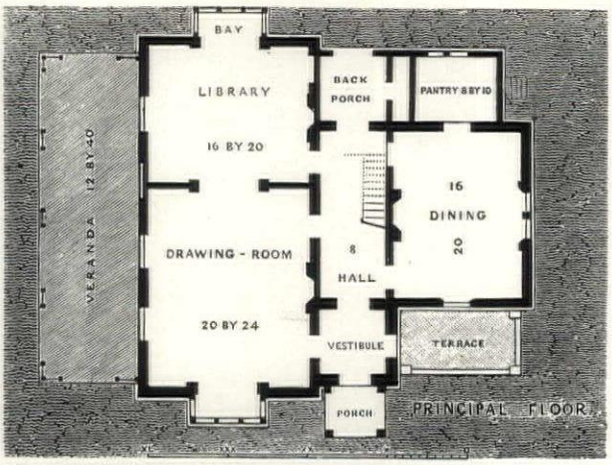
The radical attitude toward applied design is a natural and salutary reaction against the slavish dependence upon purely traditional forms that has marked all our creations well up to the last few years. This reaction has accomplished much, but it still has and will have its battles to fight until the slowly changing quality of public taste now evident has reached a much more general appreciation of the dignity and simplicity of straightforward design in household goods in contrast to mere decorative prettiness.

We have now reached a place, however, where it is desirable to consider both the achievements and weaknesses of the movement and to examine the situation with a view to greater unity and perhaps more intelligent effort in the future. Such an advance will inevitably come in time, as all the tendencies and evidences of modern life are continually rationalizing our point of view. To speed up this rapprochement we need to relinquish our extreme attitudes and bring the two opposing camps nearer together so that our best design talent will be brought nearer to a common working ground. One of the things most needed to permit this reconciliation would seem to be a recognition on the part of the leaders in the modern camp of the psychological element as one deserving as much attention and one in a sense as truly functional as the obvious physical considerations so often held to be all-sufficient.

One cannot leave a discussion of modern design in the applied arts without care to distinguish between the design of useful objects of three dimensions and the treatment of wall and floor surfaces, furniture coverings, and hangings. What has been said in this article relates to the former class and has sought to emphasize the importance of functional considerations and reliance upon the structural material for decorative effects rather than upon applied painted or carved ornament. On the other hand is the important field of textiles in which imagination has free scope to run the gamut of color and line, and to balance the austere trend of modern furniture with fantasy and movement.

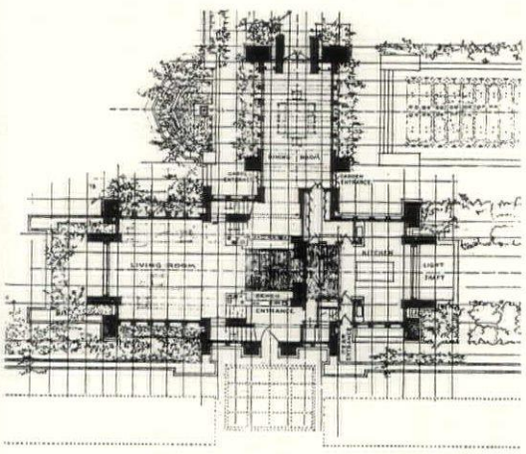


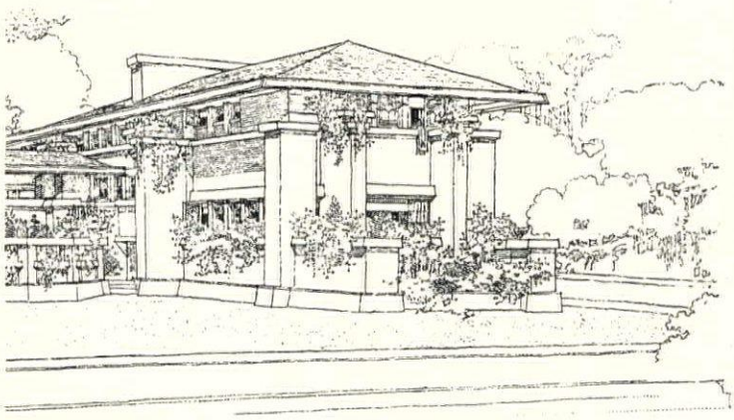
Low-priced furniture from the Chicago Workshops, Inc. The chair is reminiscent of the bentwood chairs first manufactured by Thonet Bros. in Vienna in 1853. These early chairs may be said to be the first modern chairs, as they departed entirely from traditional forms and technique, and were produced in a factory by mass production.



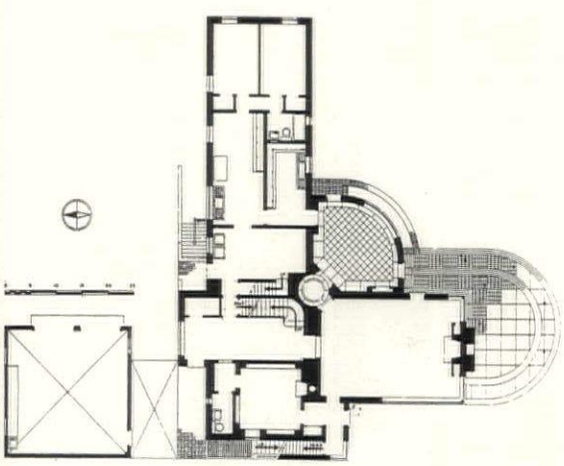
From COTTAGE RESIDENCES by A. J. Downing

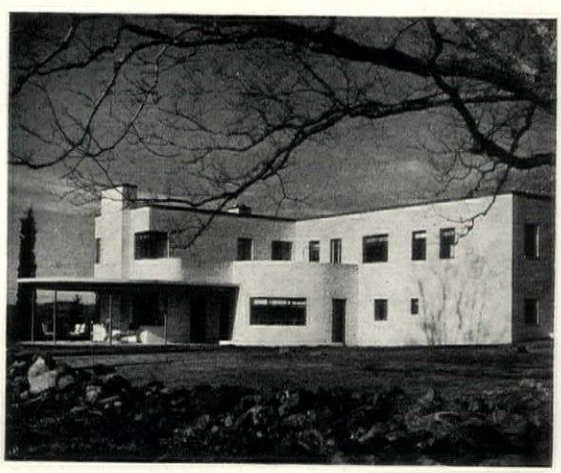
1835 "A VILLA IN THE ITALIAN STYLE, BRACKETTED"





1900-10 HOUSE AT OAK PARK, ILLINOIS, BY FRANK LLOYD WRIGHT





1935 HOUSE AT AVON, CONNECTICUT, BY TALCOTT AND TALCOTT

Metropolitan Museum of Art

MID-VICTORIAN INTERIOR

INTERIOR ABOUT 1900

INTERIOR ABOUT 1920

CONTEMPORARY INTERIOR

INDUSTRIAL DESIGN AND THE ARCHITECT

By HARVEY WILEY CORBETT, Architect

In these days of specialization we are apt to think of industrial design as something very different from other forms of design, and therefore requiring a different approach, a different training, or a different technique. I think this is wrong: it indicates a misconception of the underlying principles of all design.

My readers may suppose that, speaking as an architect, I am endeavoring here to define abstractly the problems of a separate and distinct group, the industrial designers. This is not the case. I am an industrial designer myself. The objects of industry on which I expend my design efforts are office buildings instead of egg-beaters, but I fail to see wherein my background of training and experience does not equip me more effectively to design egg-beaters than the background of the egg-beater specialist qualifies him to design office buildings. Design is something generic and all-inclusive, not something special and limited to a fixed field.

Perhaps at this point a definition or two may be clarifying. Words are all too loosely used these days. "Art," as one of these words, can mean anything or nothing at all, according to one's point of view.

"Design" is another such word, possibly not with so wide a variety of interpretations but still surprisingly indefinite. In its application to this discussion we define "design" as being an effort to improve appearance, and in saying that I do not necessarily mean making an object more beautiful.

"Beauty" is another painfully indefinite word; all too often one man's notion of beauty is another man's horror. For centuries man has been trying to define beauty and to fix its limitations. He has not yet succeeded, and I doubt if he ever will. The most vital element in all art is the ever-changing standard of beauty.

We might, however, attempt to define the present purpose of design—whether it be a cathedral or a teacup. If the object is intended to last a long time, then the designer must be so guided and make sure that it will have an attractive appearance not only today but throughout the years. If, on the other hand, the object is only of fleeting duration, then it must be designed with reference to prevailing ideas of appearance, which the designer knows may not be lasting but will have immediate public appeal.

Fortunately at present a new and rational point of view has come into general acceptance. Practical use and function dominate the designer's work, and the bad logic of the past thirty or forty years—the thinking that "design" is something "added to," "stuck on," or "painted over" the practical functional form has been largely abandoned.

The great volume of industrial mass-produced articles coming on the American scene in recent years has developed peculiar and striking problems in design. The machine-made commodity has been not only cheaper, but functionally better than the hand-made commodity. It has not been necessarily attractive in appearance. Its appeal has been economic and practical rather than aesthetic, and little thought has been given to appearance until two or more manufacturers begin producing the same article, each practical and efficient, each about the same in cost. The manufacturer discovers that the purchaser is obliged to exercise a choice, not a choice based on practicability or on price, but on something else, and that something else is called "appearance."

Competitive merchandising forces manufacturers to give serious attention to design. This is the underlying reason why, in the field of industrial production, design has taken an ever increasingly important position.

Design follows many directions. It may aim simply to secure a shocking or arresting effect, or to create something inherently and lastingly beautiful; between these two extremes, we have a long scale of variations.

Fortunately there are several equally practical ways of accomplishing a given functional result. The trained designer must know these ways. He must understand his problem intimately; he must know his materials, his processes of manufacture; the economies effected through understanding of these processes. With this background of knowledge he can then make his choice. If he seeks a bizarre appearance, something strange, exotic, unusual, he makes one choice. If he seeks to secure an effect of stability, permanence and enduring value, he makes another choice. This procedure applies with equal force to architectural design as well as to design of the smallest and most inconsequential products.

Architects in the past few years have not been overburdened with work. Many of them have wondered if there is not some new field in which they can make use of their background of training and experience, and their talents in design. Just recently a leader in the merchandising field—a man who understands and appreciates the value of design in every product of industry—informed me that he prefers, whenever possible, to get designers who have had architectural training. He feels that they have the most rational approach to the design problem.

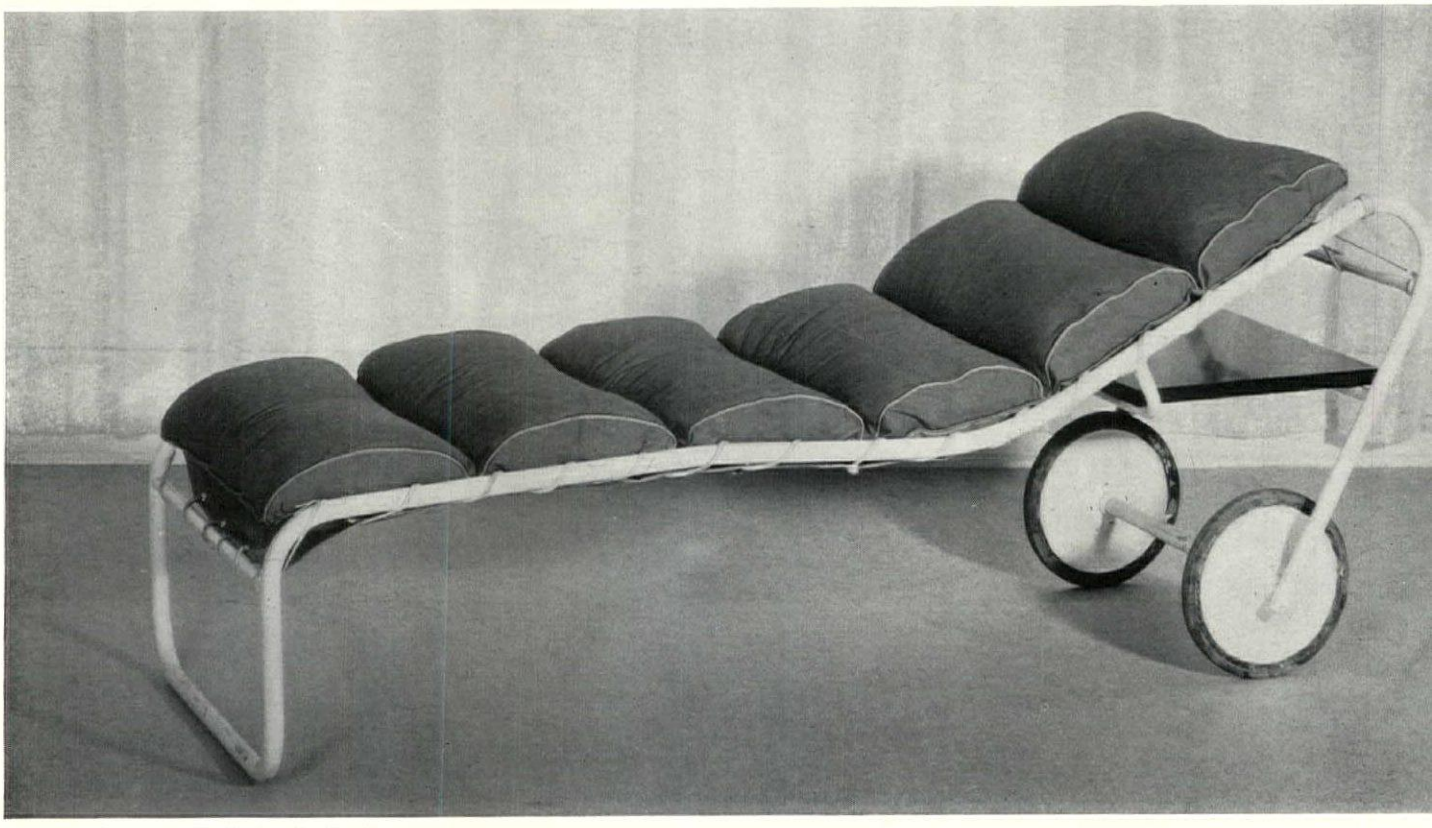
OFFICE FURNITURE. **Maximum convenience and minimum means.** **Heinrich Lauterbach, architect.**

Klettephoto

Photograph by G. Thirier

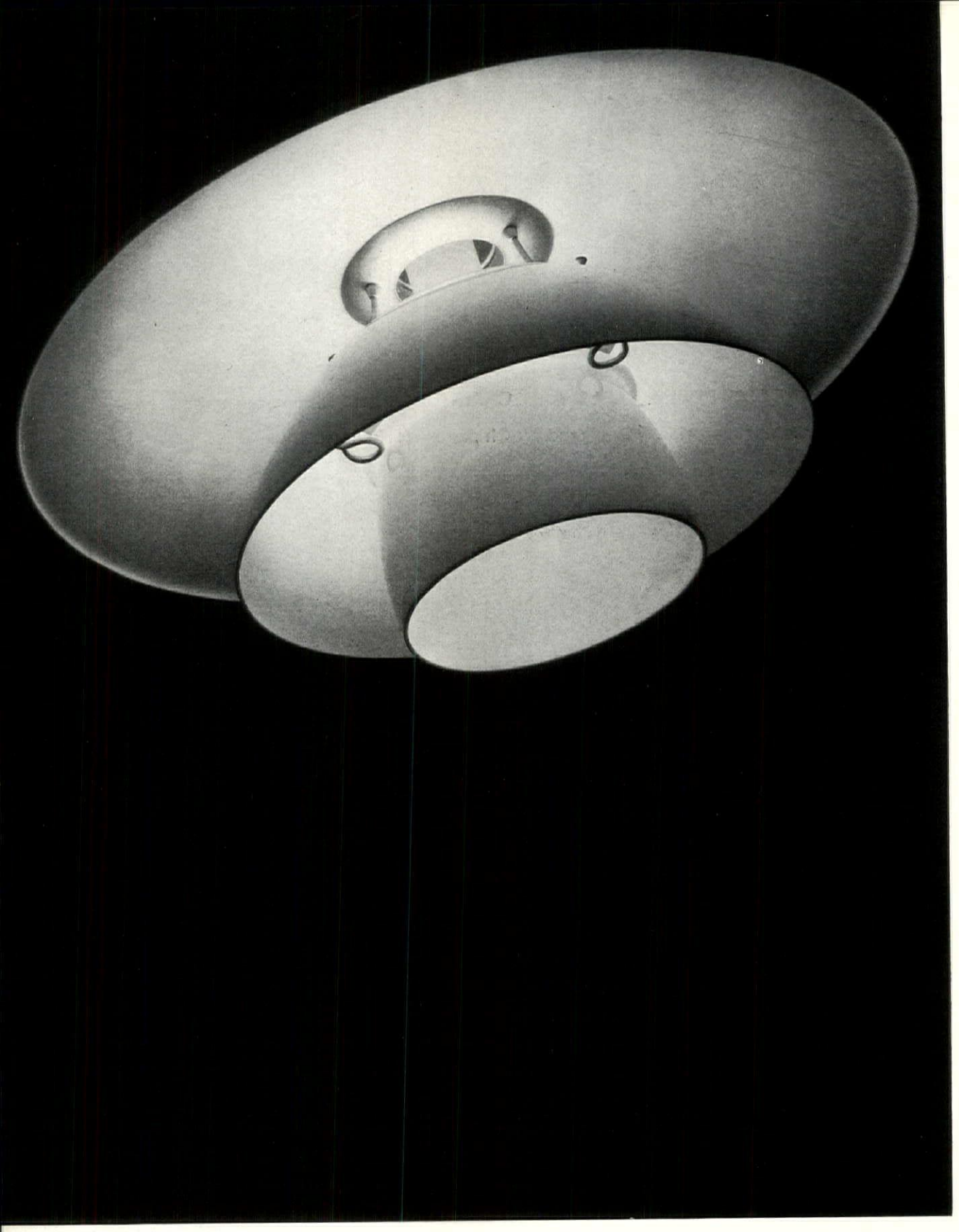
CHAIR with welded frame. Arm-rests of fabric. Cushioned seat and back. Designed by Le Corbusier, P. Jeanneret and Charlotte Perriand, architects.

RECLINING COUCH that may be readily moved from place to place. Magazine shelf.



Photograph by Izersen Studio for Metallon Corp.

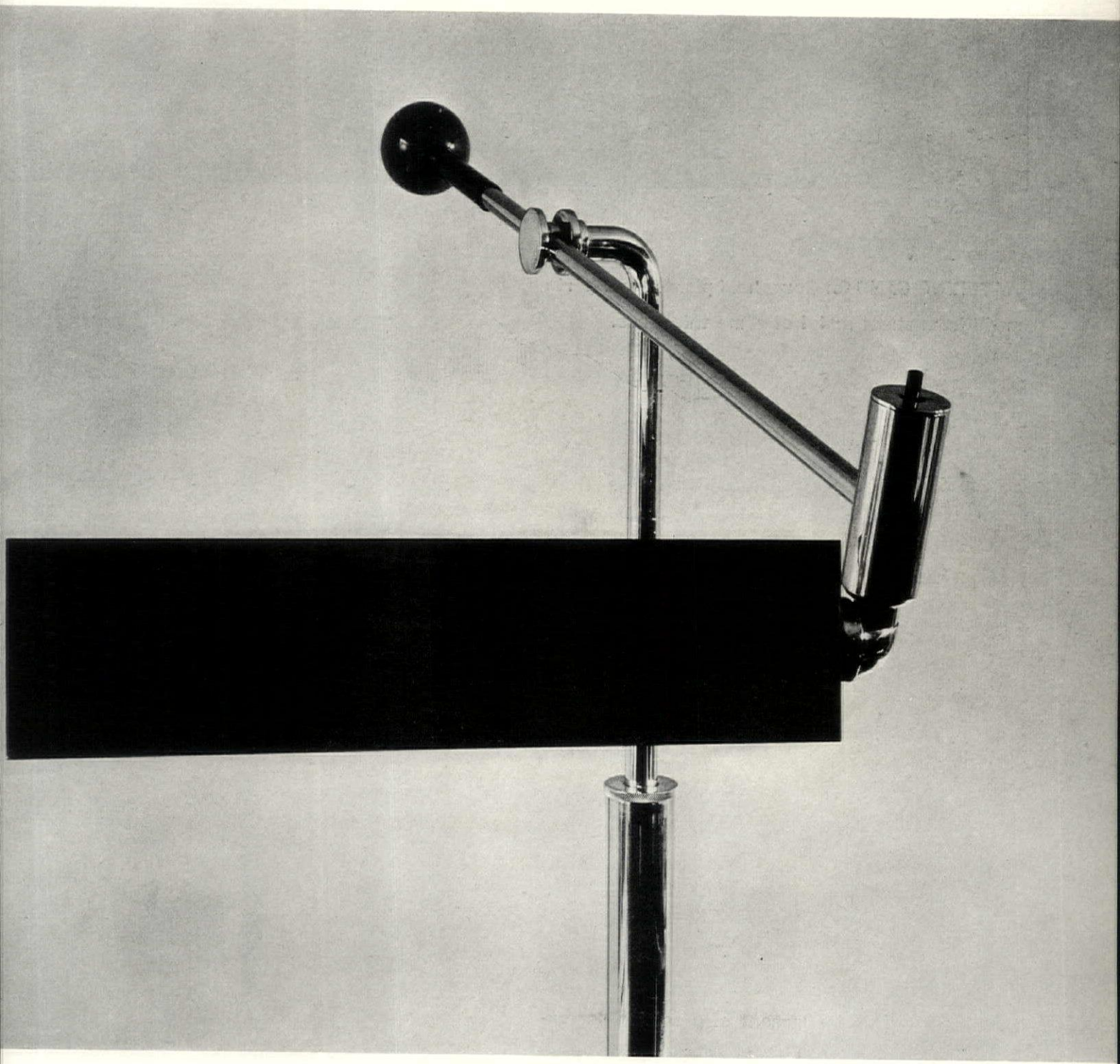
LOW-COST DINING TABLE AND CHAIRS of wood with seats upholstered in horsehair material. Designed by Chicago Workshops, Inc.

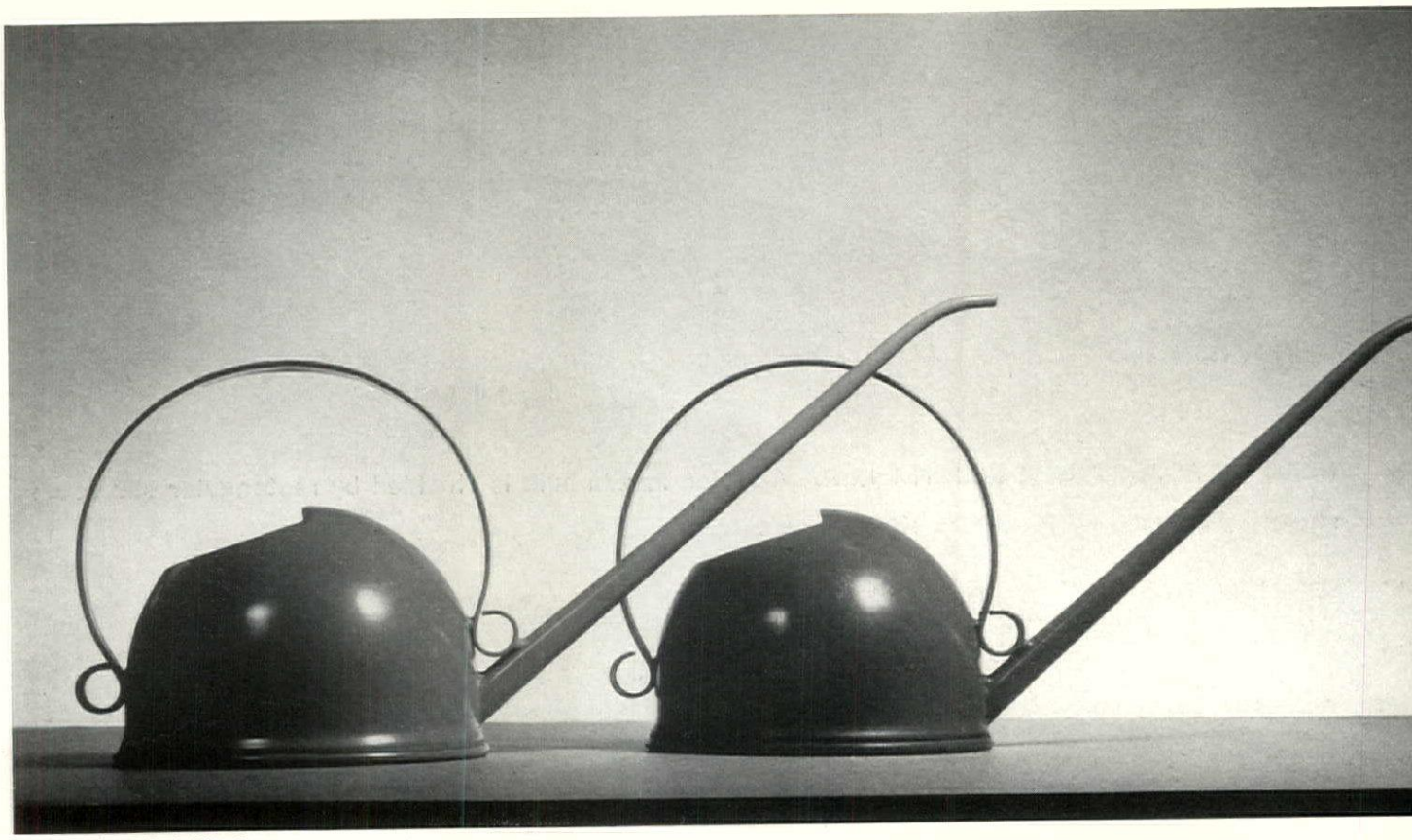


Photograph by F. S. Lincoln

P-H LIGHTING REFLECTOR. The glass reflectors are designed to conceal lighting bulb and to provide efficient glareless distribution of light.

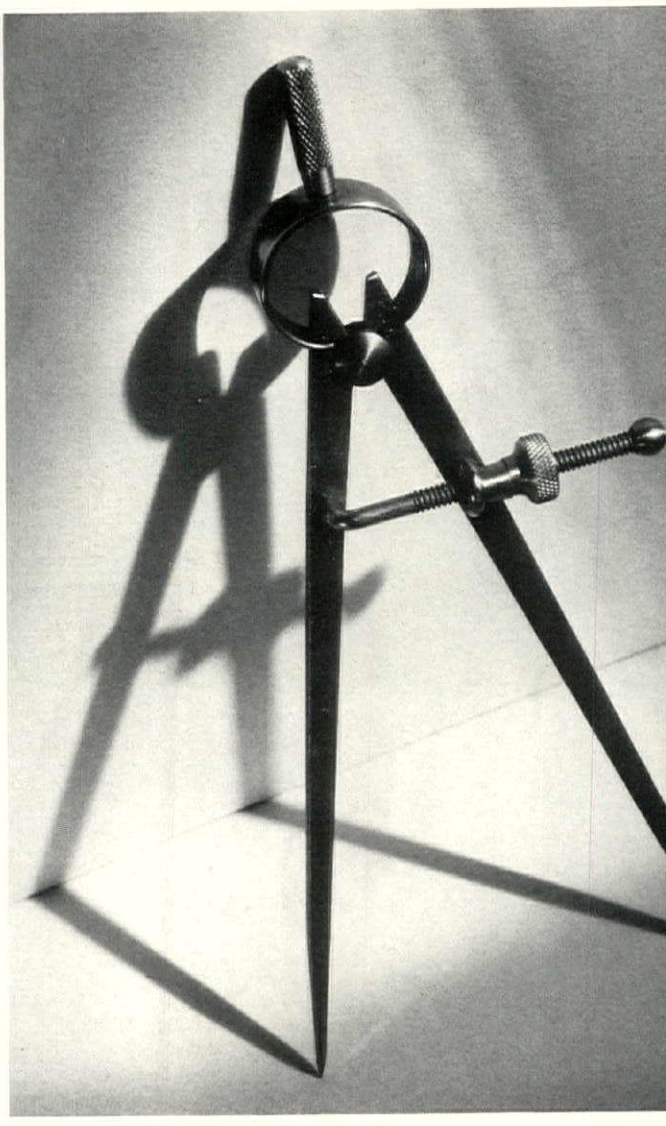
HEAD OF ADJUSTABLE FLOOR LAMP. Tubular mazda bulb is shielded by rectangular chromium sheet. Designed by Frederick Kiesler, architect.





Photographs by F. S. Lincoln

WATERING CANS for household plants. All parts made from sheet metal of same thickness.

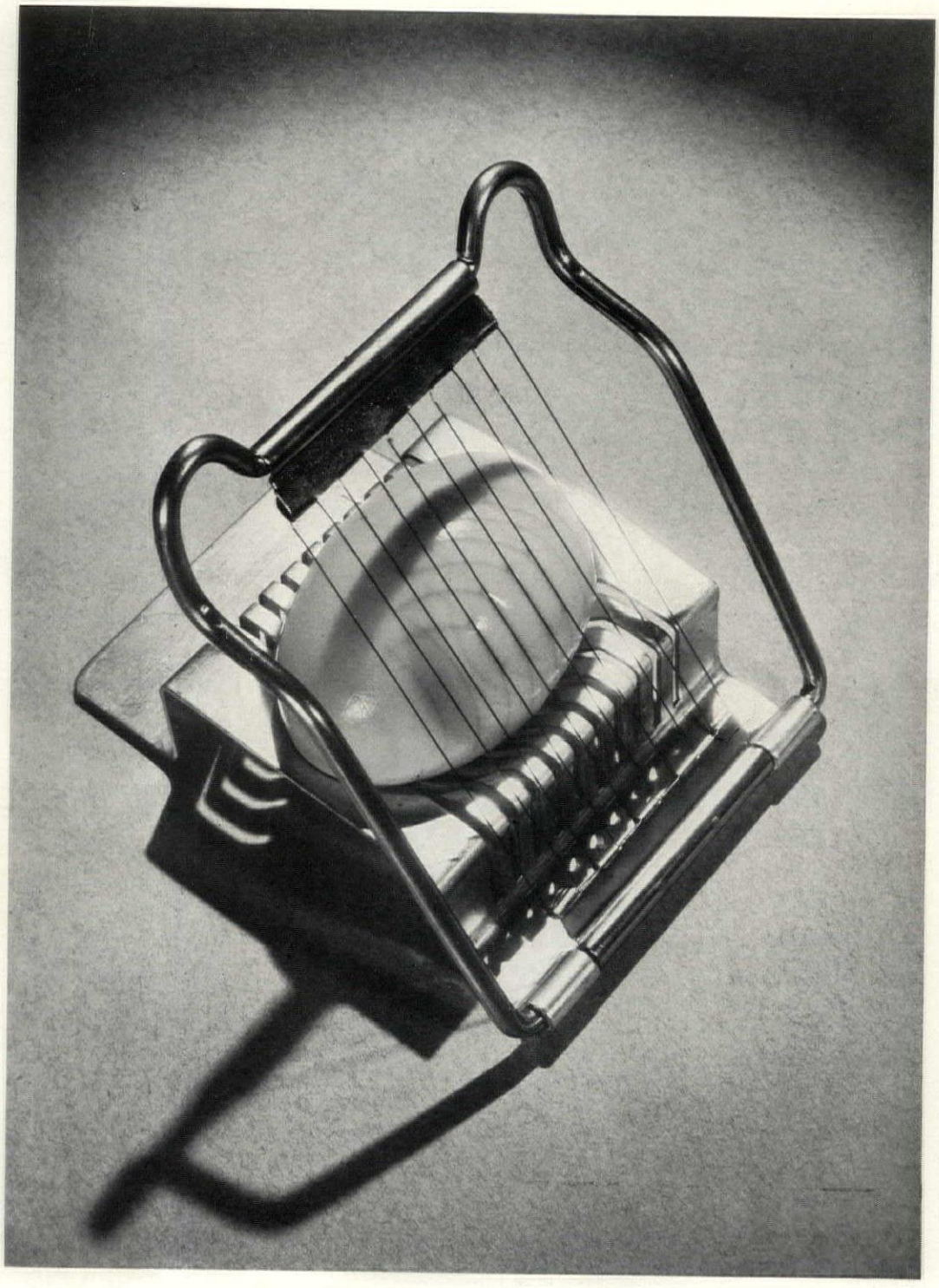


DIVIDERS. This instrument of precision demonstrates a mathematical basis of good proportion.

ARTICLES OF DAILY USE

Selected from 5 - and - 10 - cent store.

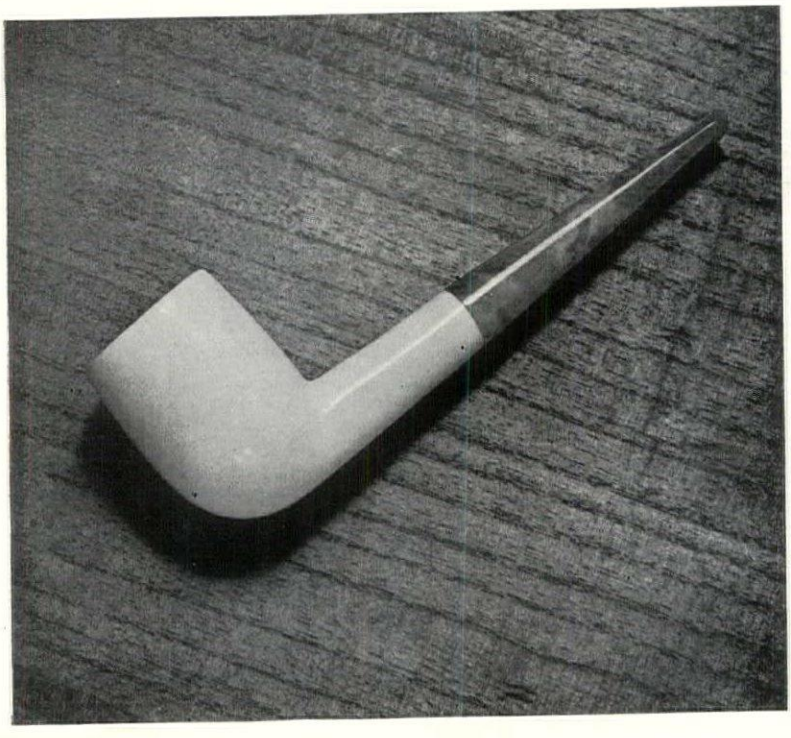
EGG SLICER. A factory-made product without any formal intention. The shape was conditioned by purpose and by natural process of manufacture.



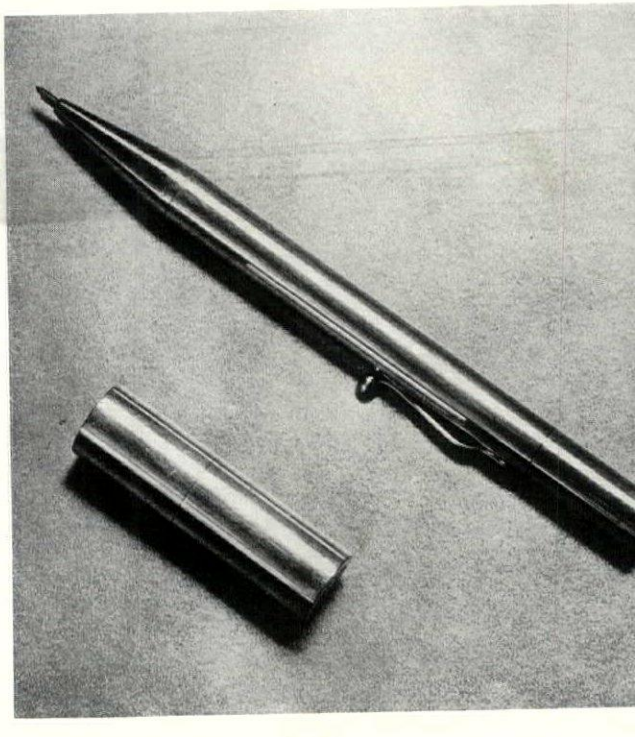
Photographs by Ruth Bernhard for Museum of Modern Art

GRADUATED MEASURES of non-oxydizing metal.

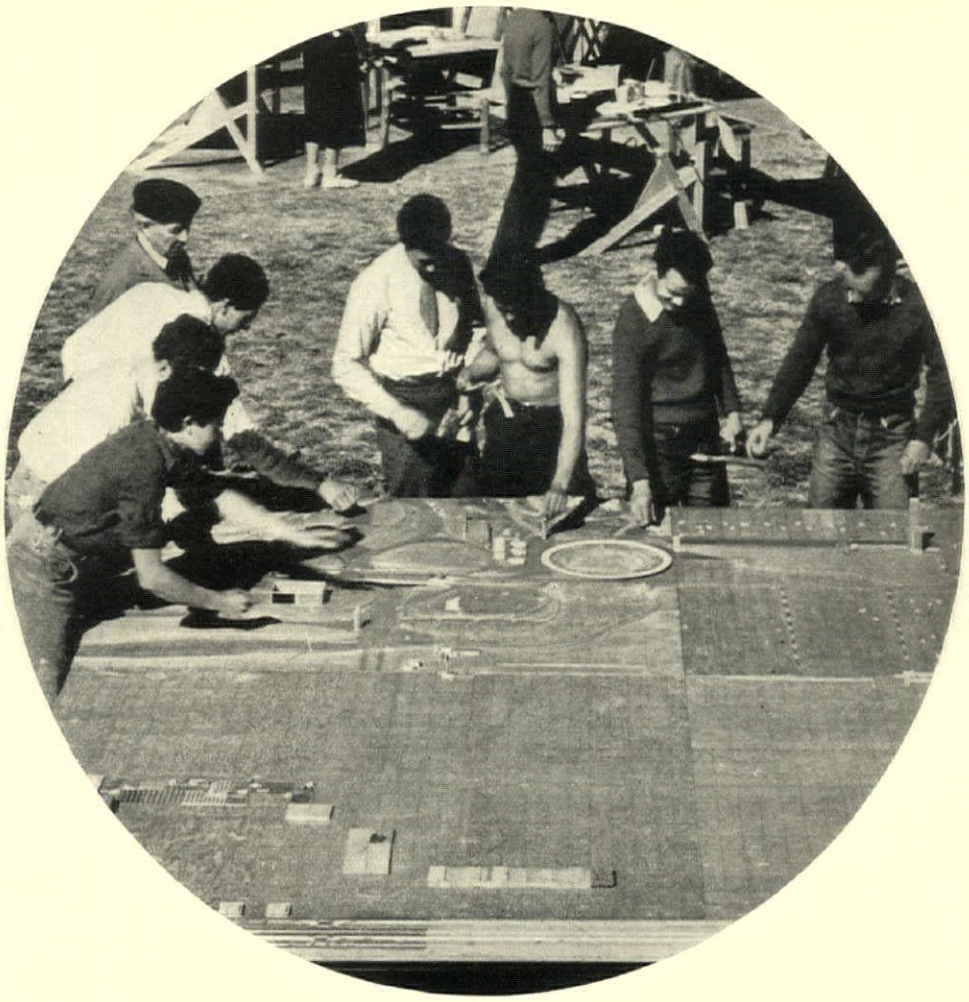
MEERSCHAUM PIPE by Dunhill. Only slight variations are possible in the proportions of a pipe.



PENCIL AND CIGARETTE LIGHTER of sterling silver.

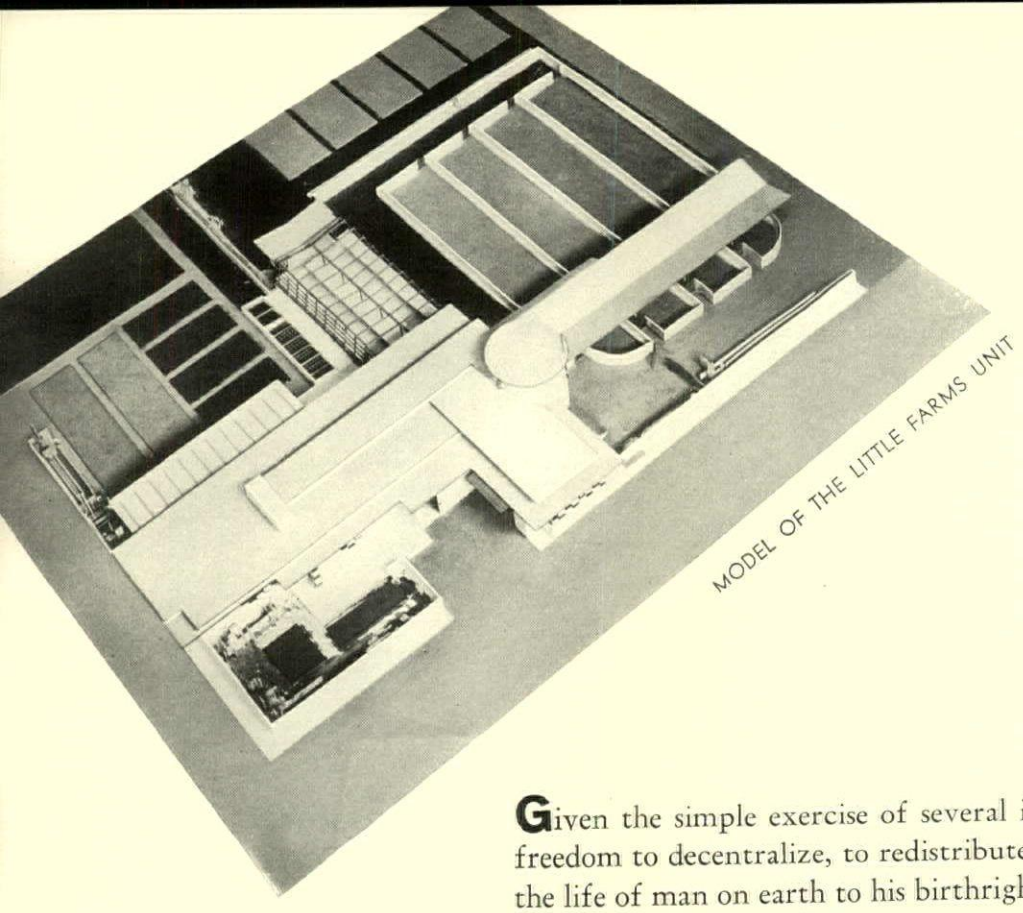


FRANK LLOYD WRIGHT
ARCHITECT



BROADACRE CITY: A NEW COMMUNITY PLAN

● In this article Frank Lloyd Wright describes his conception of Broadacres as the ideal community—"a general decentralization and architectural reintegration of all units into one fabric." A model illustrating the coordinated grouping of small farms, small factories, small homes, small schools, and small laboratories has been prepared by Mr. Wright and his student-apprentices of the Taliesin Fellowship (Taliesin, Wisconsin) in a winter session at Chandler, Arizona. It will be shown publicly for the first time April 15 to May 15 at the Industrial Arts Exposition in Rockefeller Center, New York City, under the auspices of the National Alliance of Art and Industry.



MODEL OF THE LITTLE FARMS UNIT

Given the simple exercise of several inherently just rights of man, the freedom to decentralize, to redistribute and to correlate the properties of the life of man on earth to his birthright—the ground itself—and Broadacre City becomes reality.

As I see Architecture, the best architect is he who will devise forms nearest organic as features of human growth by way of changes natural to that growth. Civilization is itself inevitably a form but not, if democracy is sanity, is it necessarily the fixation called "academic." All regimentation is a form of death which may sometimes serve life but more often imposes upon it. In Broadacres all is symmetrical but it is seldom obviously and never academically so.

Whatever forms issue are capable of normal growth without destruction of such pattern as they may have. Nor is there much obvious repetition in the new city. Where regiment and row serve the general harmony of arrangement both are present, but generally both are absent except where planting and cultivation are naturally a process or walls afford a desired seclusion. Rhythm is the substitute for such repetitions everywhere. Wherever repetition (standardization) enters, it has been modified by inner rhythms either by art or by nature as it must, to be of any lasting human value.

The three major inventions already at work building Broadacres, whether the powers that over-built the old cities otherwise like it or not are:

(1) The motor car: general mobilization of the human being.

(2) Radio, telephone and telegraph: electrical intercommunication becoming complete.

(3) Standardized machine-shop production: machine invention plus scientific discovery.

The price of the major three to America has been the exploitation we see everywhere around us in waste and in ugly scaffolding that may now be thrown away. The price has not been so great if by way of popular government we are able to exercise the use of three inherent rights of any man:

(1) His social right to a direct medium of exchange in place of gold as a commodity: some form of social credit.

(2) His social right to his place on the ground as he has had it in the sun and air: land to be held only by use and improvements.

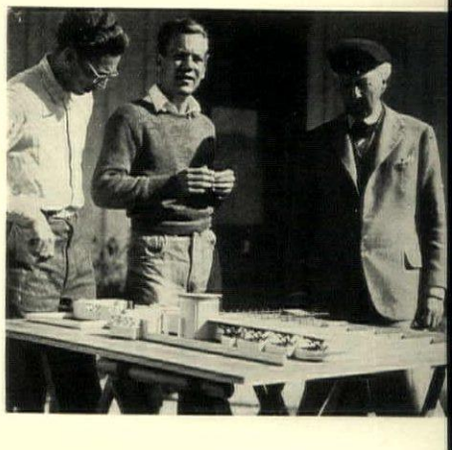
(3) His social right to the ideas by which and for which he lives: public ownership of invention and scientific discoveries that concern the life of the people.

The only assumption made by Broadacres as ideal is that these three rights will be the citizen's so soon as the folly of endeavoring to cheat him of their democratic values becomes apparent to those who hold (feudal survivors or survivals), as it is becoming apparent to the thinking people who are held blindly abject or subject against their will.

The landlord is no happier than the tenant. The speculator can no longer win much at a game about played out. The present success-ideal placing, as it does, premiums upon the wolf, the fox and the rat in human affairs and above all, upon the parasite, is growing more evident every day as a falsity just as injurious to the "successful" as to the victims of such success.

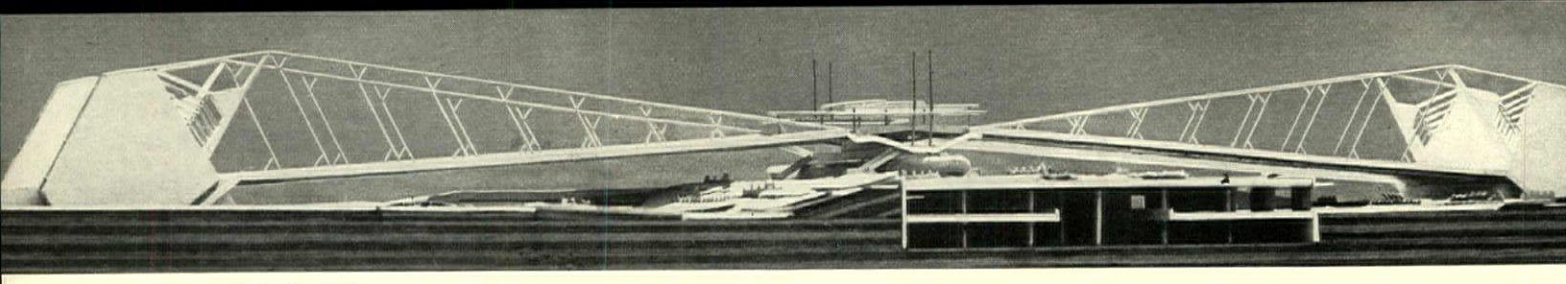
Well—sociologically, Broadacres is release from all that fatal "success" which is after all, only excess. So I have called it a new freedom for living in America. It has thrown the scaffolding aside. It sets up a new ideal of success.

FRANK LLOYD WRIGHT AND TWO OF HIS STUDENT-APPRENTICES



In Broadacres, by elimination of cities and towns the present curse of petty and minor officialdom, government, has been reduced to one minor government for each county. The waste motion, the back and forth haul, that today makes so much idle business is gone. Distribution becomes automatic and direct; taking place mostly in the region of origin. Methods of distribution of everything are simple and direct. From the maker to the consumer by the most direct route.

Coal (one third the tonnage of the haul of our railways) is eliminated by burning it at the mines and transferring that power, making it easier to take over the great railroad rights of way; to take off the cumbersome



Photographs by Dan Keller

BRIDGE PASS OVER THE GREAT ARTERIAL RIGHT OF WAY WHICH CONSISTS OF MANY LANES OF SPEED TRAFFIC ABOVE, MONORAIL SPEED TRAINS IN THE MIDDLE, AND TRUCK TRAFFIC ON LOWER SIDE LANES. WITHIN THE HIGHWAY STRUCTURE ARE STORAGE FACILITIES FOR RAW MATERIALS.

rolling stock and put the right of way into general service as the great arterial on which truck traffic is concentrated on lower side lanes, many lanes of speed traffic above and monorail speed trains at the center, continuously running. Because traffic may take off or take on at any given point, these arterials are traffic not dated but fluescent. And the great arterial as well as all the highways become great architecture, automatically affording within their structure all necessary storage facilities of raw materials, the elimination of all unsightly piles of raw material.

In the hands of the state, but by way of the county, is all redistribution of land—a minimum of one acre going to the childless family and more to the larger family as effected by the state. The agent of the state in all matters of land allotment or improvement, or in matters affecting the harmony of the whole, is the architect. All building is subject to his sense of the whole as organic architecture. Here architecture is landscape and landscape takes on the character of architecture by way of the simple process of cultivation.

All public utilities are concentrated in the hands of the state and county government as are matters of administration, patrol, fire, post, banking, license and record, making politics a vital matter to every one in the new city instead of the old case where hopeless indifference makes "politics" a grafter's profession.

In the buildings for Broadacres no distinction exists between much and little, more and less. Quality is in all, for all, alike. The thought entering into the first or last estate is of the best. What differs is only individuality and extent. There is nothing poor or mean in Broadacres.

Nor does Broadacres issue any dictum or see any finality in the matter either of pattern or style.

Organic character is style. Such style has myriad forms inherently good. Growth is possible to Broadacres as a fundamental form: not as mere accident of change but as integral pattern unfolding from within.

Here now may be seen the elemental units of our social structure: The correlated farm, the factory—its smoke and gases eliminated by burning coal at places of origin, the decentralized school, the various conditions of residence, the home offices, safe traffic, simplified govern-

ment. All common interests take place in a simple coordination wherein all are employed: *little* farms, *little* homes for industry, *little* factories, *little* schools, a *little* university going to the people mostly by way of their interest in the ground, *little* laboratories on their own ground for professional men. And the farm itself, notwithstanding its animals, becomes the most attractive unit of the city. The husbandry of animals at last is in decent association with them and with all else as well. True farm relief.

To build Broadacres as conceived would automatically end unemployment and all its evils forever. There would never be labor enough nor could under-consumption ever ensue. Whatever a man did would be done—obviously and directly—mostly by himself in his own interest under the most valuable inspiration and direction: under training, certainly, if necessary. Economic independence would be near, a subsistence certain; life varied and interesting.

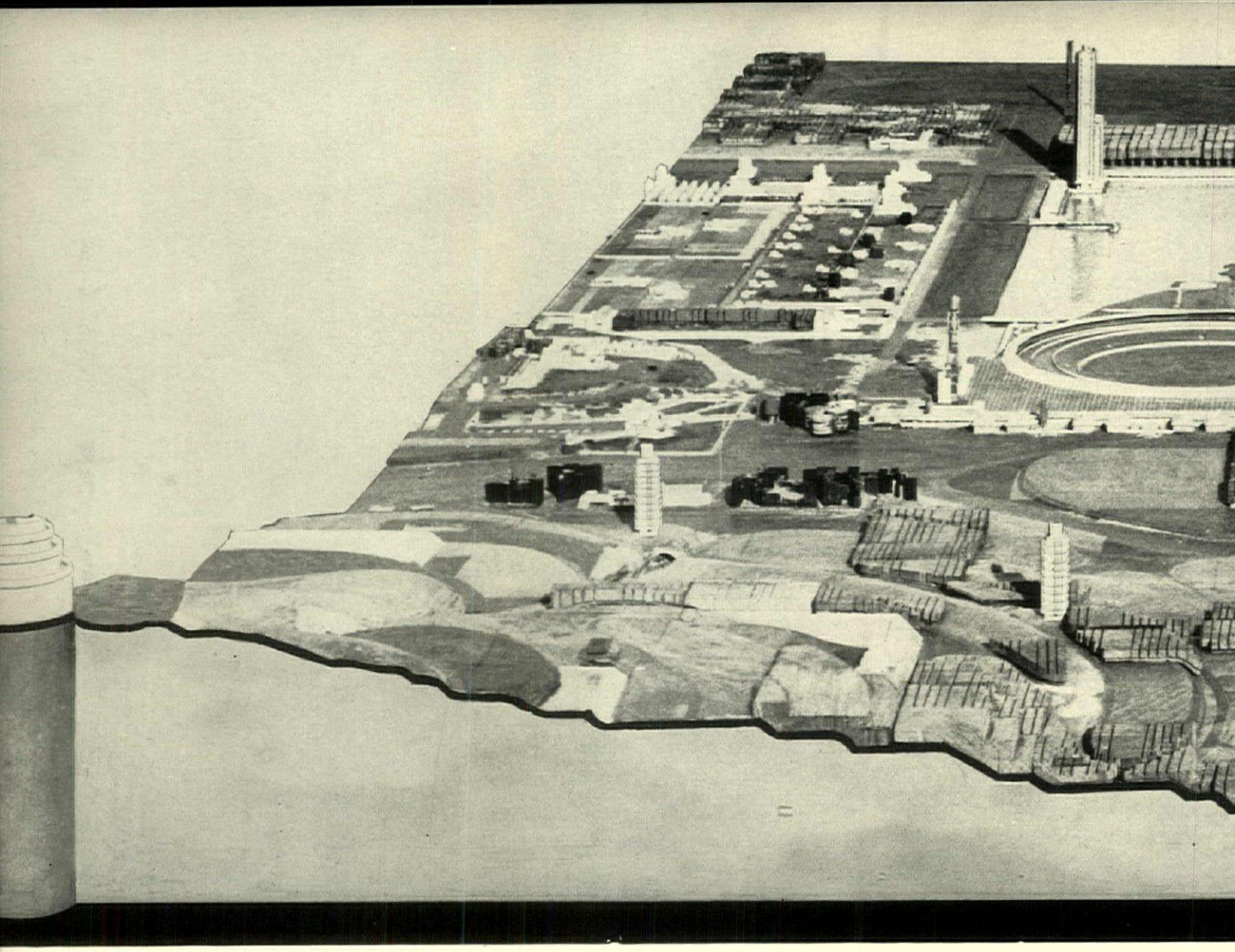
Every kind of builder would be likely to have a jealous eye to the harmony of the whole within broad limits fixed by the county architect, an architect chosen by the county itself. Each county would thus naturally develop an individuality of its own. Architecture—in the broad sense—would thrive.

In an organic architecture the ground itself predetermines all features; the climate modifies them; available means limit them; function shapes them.

Form and function are one in Broadacres. But Broadacres is no finality. The model shows four square miles of a typical countryside developed on the acre as unit according to conditions in the temperate zone and accommodating some 1,400 families. It would swing north or swing south in type as conditions, climate and topography of the region changed.

In the model the emphasis has been placed upon diversity in unity, recognizing the necessity of cultivation as a need for formality in most of the planting. By a simple government subsidy certain specific acres or groups of acre units are, in every generation, planted to useful trees,

COLLATERAL DETAIL MODELS: A TWO-CAR HOUSE, TWO MINIMUM HOUSES AND A MEDIUM HOUSE.



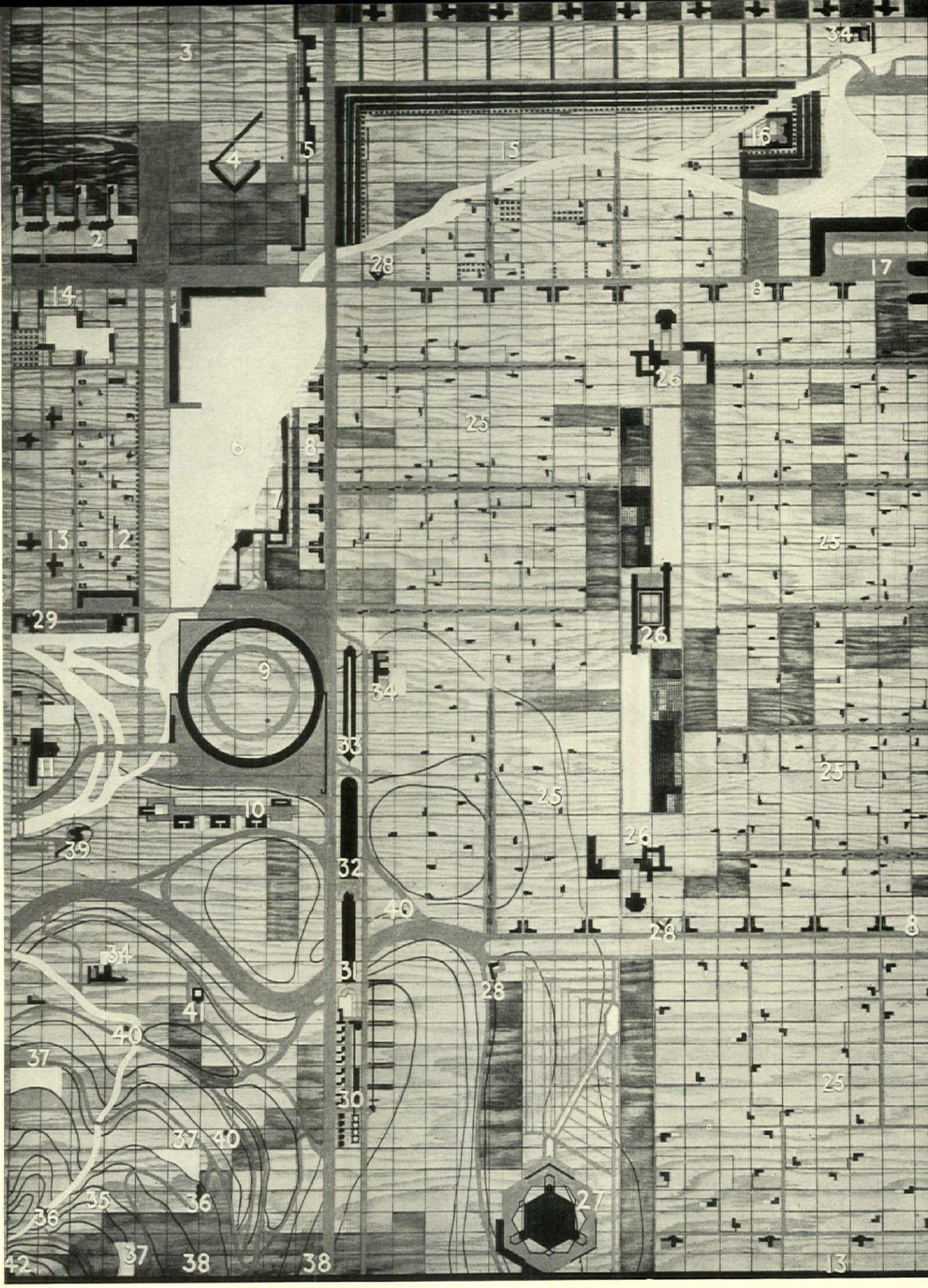
Photographs by Dan Keller

THE MODEL SHOWS FOUR SQUARE MILES OF A TYPICAL COUNTRYSIDE DEVELOPED ON THE ACRE AS UNIT ACCORDING TO CONDITIONS IN THE TEMPERATE ZONE AND ACCOMMODATING SOME 1,400 FAMILIES. IT WOULD SWING NORTH OR SWING SOUTH IN TYPE AS CONDITIONS, CLIMATE AND TOPOGRAPHY OF THE REGION CHANGED

meantime beautiful, giving privacy and various rural divisions. There are no rows of trees alongside the roads to shut out the view. Rows where they occur are perpendicular to the road or the trees are planted in groups. Useful trees like white pine, walnut, birch, beech, fir, would come to maturity as well as fruit and nut trees and they would come as a profitable crop meantime giving character, privacy and comfort to the whole city. The general park is a flowered meadow beside the stream and is bordered with ranks of trees, tiers gradually rising in height above the flowers at the ground level. A music-garden is sequestered from noise at one end. Much is made of general sports and festivals by way of the stadium, zoo, aquarium, arboretum and the arts.

The traffic problem has been given special attention, as the more mobilization is made a comfort and a facility the sooner will Broadacres arrive. Every Broadacre citizen has his own car. Multiple-lane highways make travel safe and enjoyable. There are no grade crossings nor left turns on grade. The road system and construction is such that no signals nor any lamp-posts need be seen. No ditches are alongside the roads. No curbs either. An inlaid purfling over which the car cannot come without damage to itself takes its place to protect the pedestrian.

In the affair of air transport Broadacres rejects the present airplane and



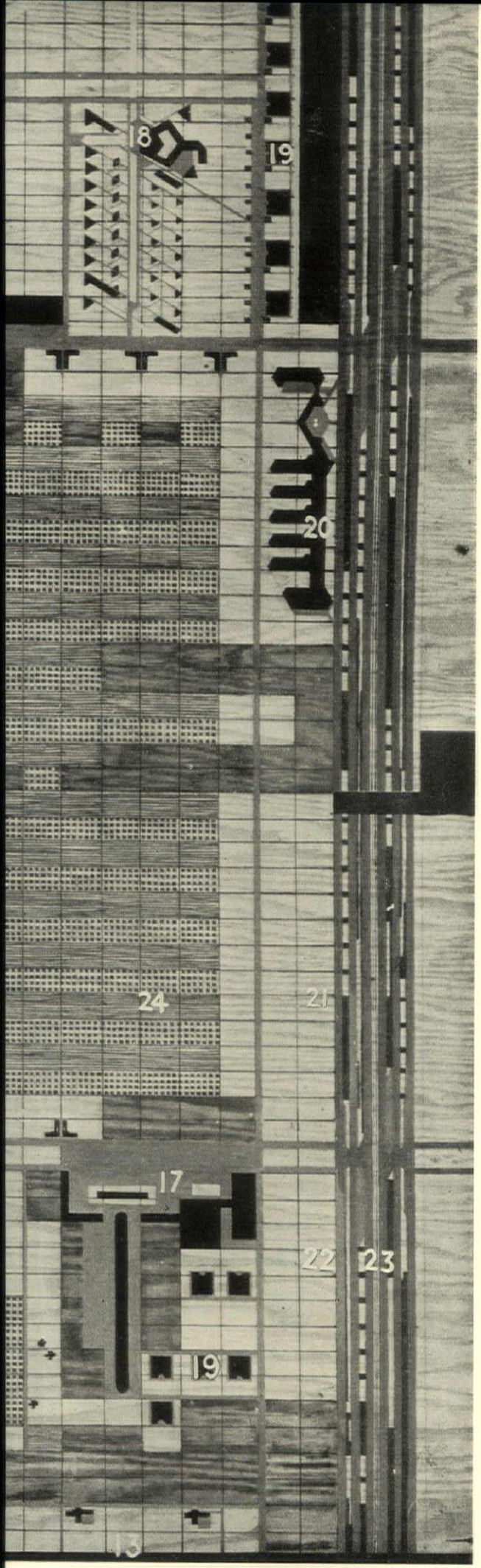
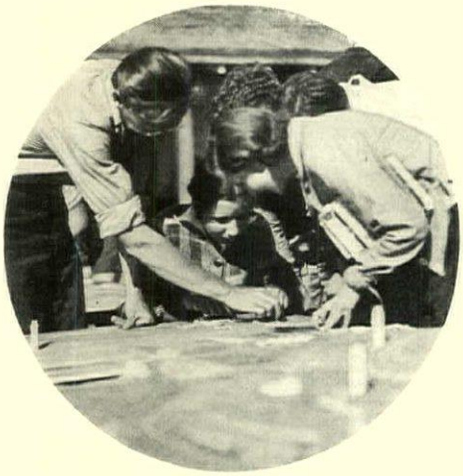


CHART TO PLAN OF BROADACRES

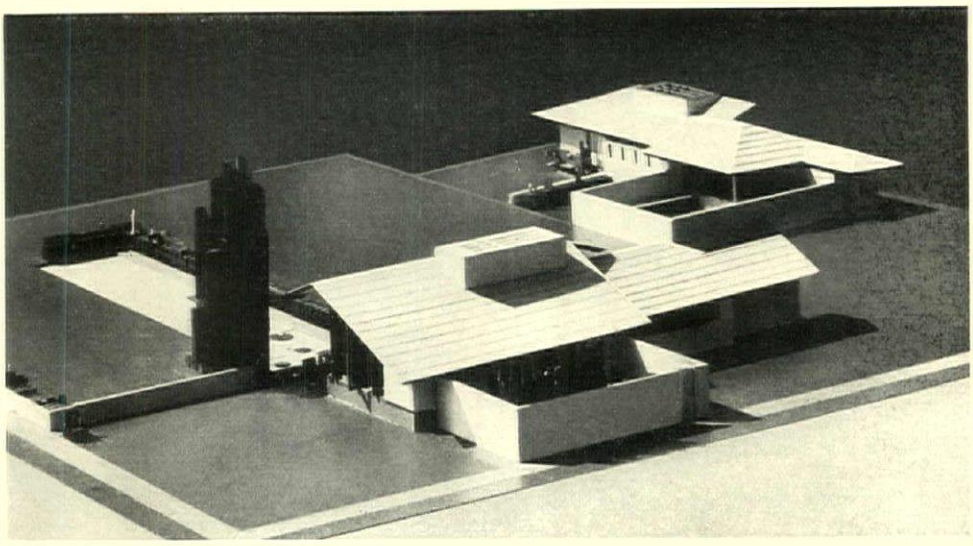
(1) County Seat—Administration. (2) Aerotor—Post Port and Administration. (3) Polo. (4) Baseball. (5) Clubs. (6) Lake and Stream. (7) Crafts and County Architects. (8) Professionals. (9) Stadium. (10) Hotel. (11) Sanitarium. (12) Small Industry. (13) Small Farm Units. (14) Small Apartments. (15) Interior Park. (16) Music Garden. (17) Merchandising. (18) Automobile Inn. (19) Little Factories with Dwellings Above. (20) Factory Assembly. (21) Aerotor Service. (22) Aerotor Factory. (23) Main Arterial (the Present Railway). (24) Vineyards and Orchards. (25) Homes. (26) Schools. (27) Temple—Columbarium and Cemetery. (28) Neighborhood Guests Houses. (29) Baths and Dressing Rooms. (30) Scientific and Agricultural Research. (31) Arboretum. (32) Zoo. (33) Aquarium. (34) Luxurious Dwelling (House on the Mesa). (35) Taliesin (Equivalent). (36) Luxurious Homes. (37) Water Supply. (38) Forest Cabins. (39) Country Club. (40) Apartment Houses. (41) Small School for Small Children. (42) Automobile Objective.

NOTE

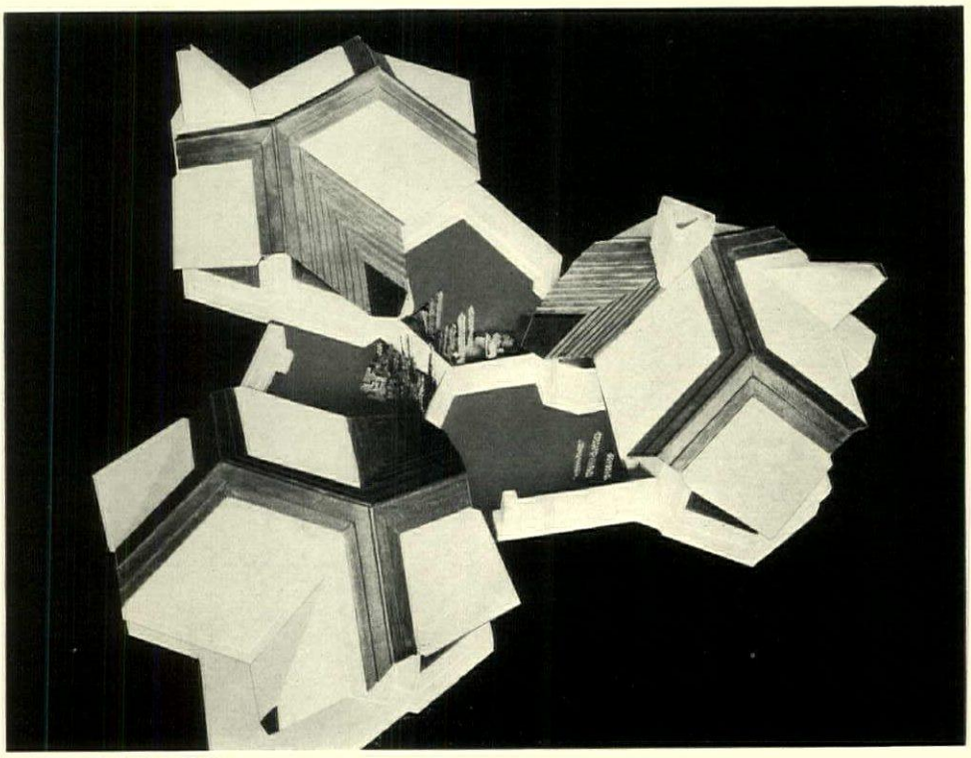
Plot—two miles square. Unit of division—one acre: 1,648 by 264 feet. Transportation and garage system—semi-dark bands. Left turns, crossings and overpasses (see detail photographs). Reforestation: dark acreage.



AN APPRENTICE GROUP AT WORK



COLLATERAL MODEL OF TWO MINIMUM HOUSES



A GROUP OF BLACK AND CANVAS CABINS IN THE AUTOMOBILE INN

Photographs by Dan Keller

substitutes the self-contained mechanical unit that is sure to come: an aerotor capable of rising straight up and by reversible rotors able to travel in any given direction under radio control at a maximum speed of, say, 200 miles an hour, and able to descend safely into the hexacomb from which it arose or anywhere else. By a doorstep if desired.

The only fixed transport trains kept on the arterial are the long-distance monorail cars traveling at a speed (already established in Germany) of 220 miles per hour. All other traffic is by motor car on the twelve lane levels or the triple truck lanes on the lower levels which have on both sides the advantage of delivery direct to warehousing or from warehouses to consumer. Local trucks may get to warehouse-storage on lower levels under the main arterial itself. A local truck road parallels the swifter lanes.

Houses in the new city are varied: make much of fireproof synthetic materials, factory-fabricated units adapted to free assembly and varied arrangement, but do not neglect the older nature-materials wherever they are desired and available. Householders' utilities are nearly all planned in prefabricated utility stacks or units, simplifying construction and reducing building costs to a certainty. There is the professional's house with its laboratory, the minimum house with its workshop, the medium house ditto, the larger house and the house of machine-age-luxury. We might speak of them as a one-car house, a two-car house, a three-car house and a five-car house. Glass is extensively used as are roofless rooms. The roof is used often as a trellis or a garden. But where glass is extensively used it is usually for domestic purposes in the shadow of protecting overhangs.

Copper for roofs is indicated generally on the model as a permanent cover capable of being worked in many appropriate ways and giving a general harmonious color effect to the whole.

Electricity, oil and gas are the only popular fuels. Each land allotment has a pit near the public lighting fixture where access to the three and to water and sewer may be had without tearing up the pavements.

The school problem is solved by segregating a group of low buildings

in the interior spaces of the city where the children can go without crossing traffic. The school building group includes galleries for loan collections from the museum, a concert and lecture hall, small gardens for the children in small groups and well-lighted cubicles for individual outdoor study: there is a small zoo, large pools and green playgrounds.

This group is at the very center of the model and contains at its center the higher school adapted to the segregation of the students into small groups.

This tract of four miles square, by way of such liberal general allotment determined by acreage and type of ground, including apartment buildings and hotel facilities, provides for about 1,400 families at, say, an average of five or more persons to the family.

To reiterate: the basis of the whole is general decentralization as an applied principle and architectural reintegration of all units into one fabric; free use of the ground held only by use and improvements; public utilities and government itself owned by the people of Broadacre City; privacy on one's own ground for all and a fair means of subsistence for all by way of their own work on their own ground or in their own laboratory or in common offices serving the life of the whole.

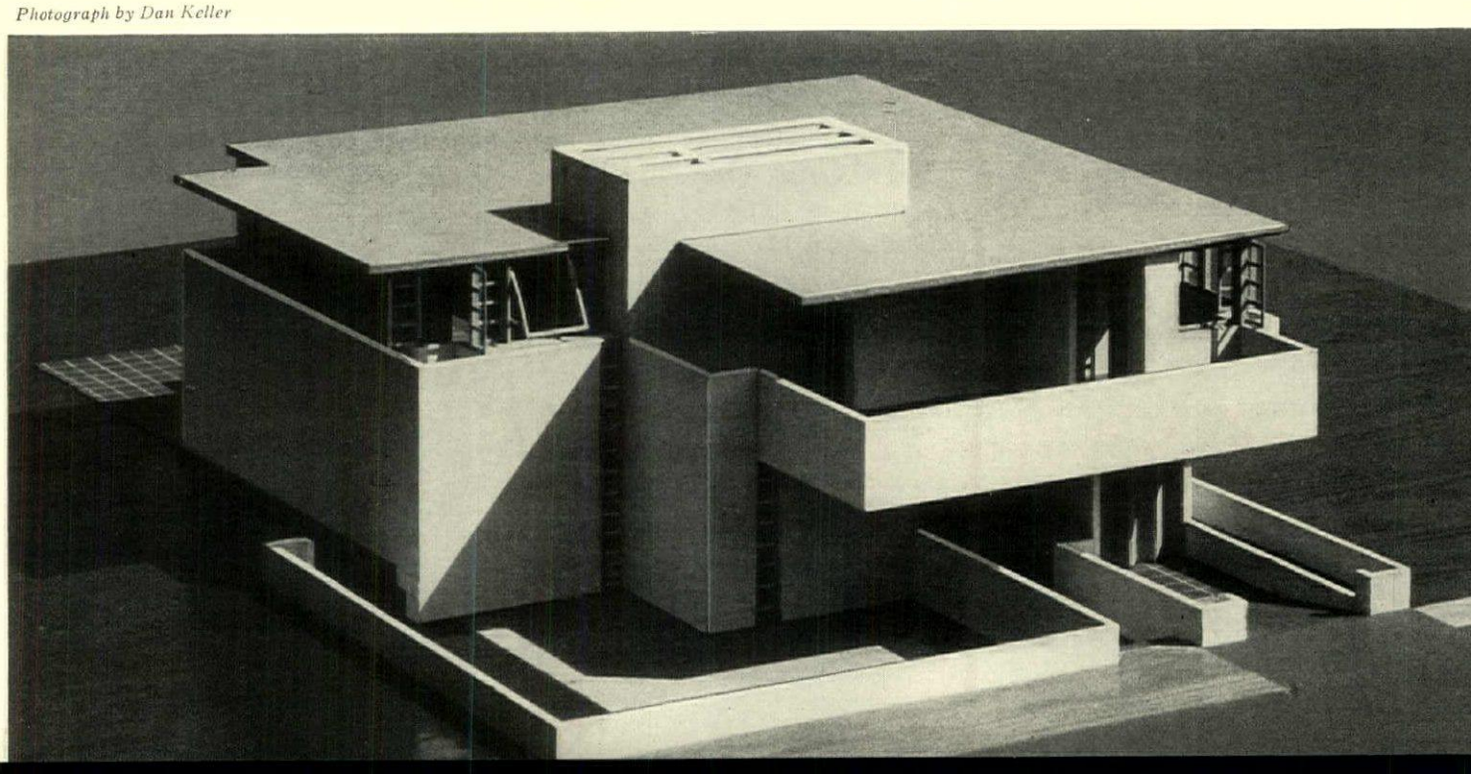
There are too many details involved in the model of Broadacres to permit complete explanation. Study of the model itself is necessary study. Most details are explained by way of collateral models of the various types of construction shown: highway construction, left turns, crossovers, underpasses and various houses and public buildings.

Any one studying the model should bear in mind the thesis upon which the design has been built by the Taliesin Fellowship, built carefully not as a finality in any sense but as an interpretation of the changes inevitable to our growth as a people and a nation.

Individuality established on such terms must thrive. Unwholesome life would get no encouragement and the ghastly heritage left by overcrowding in overdone ultra-capitalistic centers would be likely to disappear in three or four generations. The old success ideals having no chance at all, new ones more natural to the best in man would be given a fresh opportunity to develop naturally.

MODEL OF THE 2-CAR HOUSE

Photograph by Dan Keller

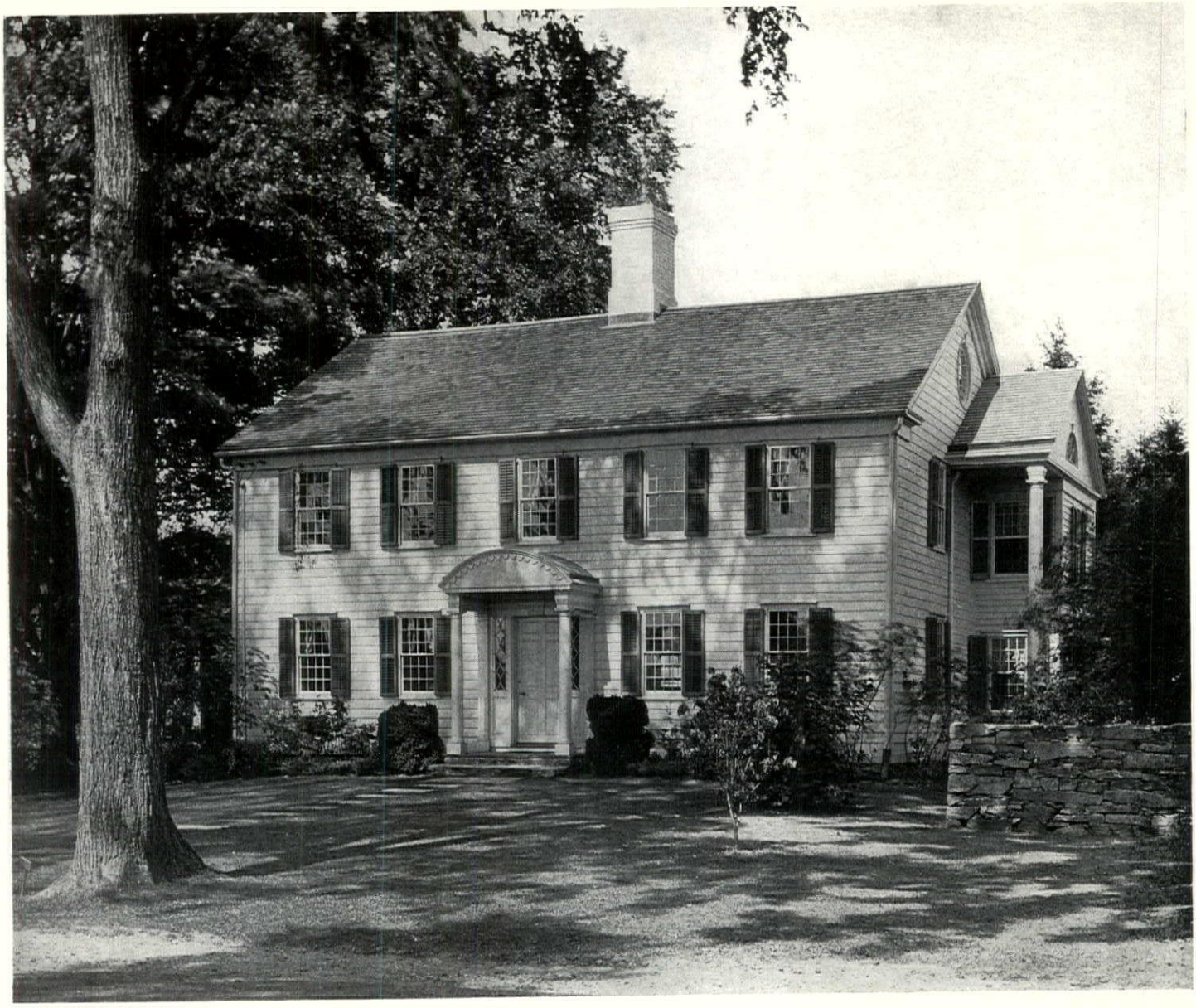


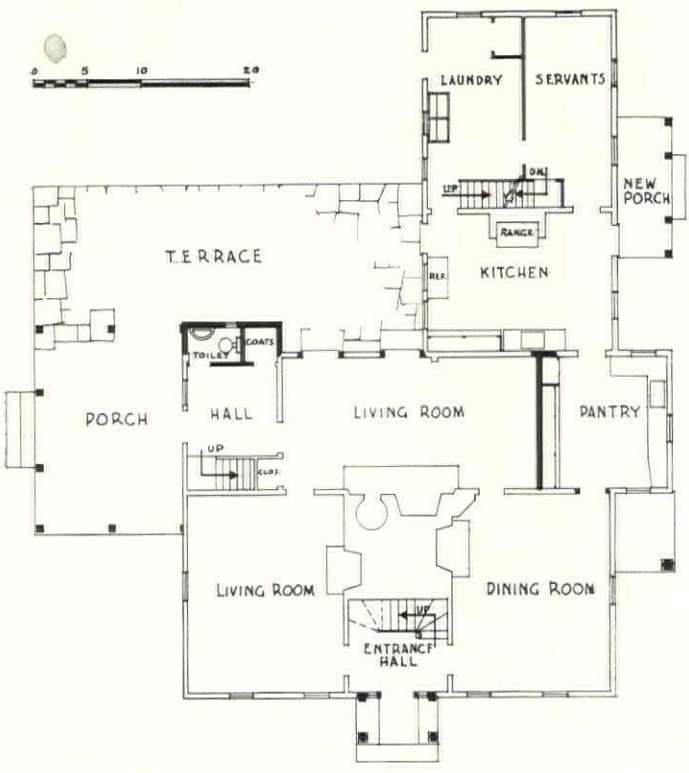
PORTFOLIO

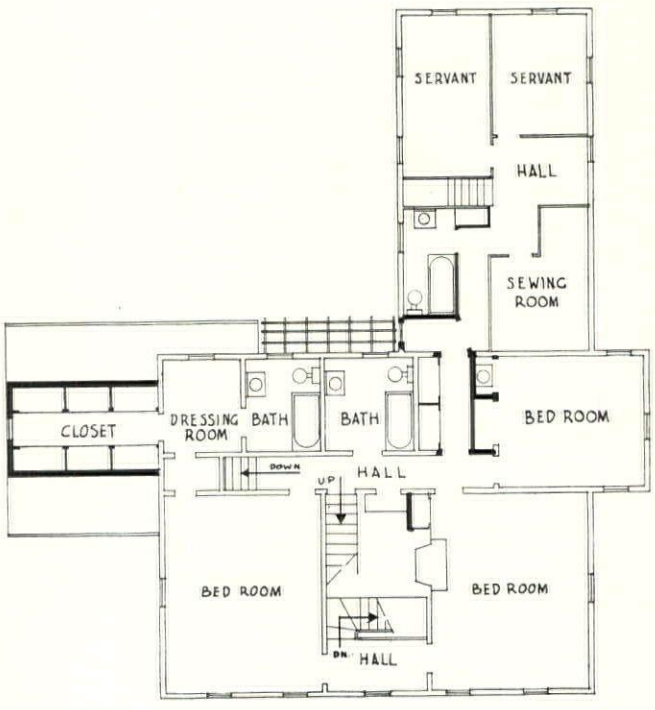
OF CURRENT ARCHITECTURE

REMODELED HOUSE

OF CHARLES DUPEE AT SOUTHPORT, CONNECTICUT — CAMERON CLARK, ARCHITECT




0 5 10 20
LAUNDRY
SERVANTS
NEW PORCH
UP
DN
RANGE
TERRACE
REF.
KITCHEN
TOILET
COATS
PORCH
HALL
LIVING ROOM
PANTRY
UP
CLOS.
LIVING ROOM
DINING ROOM
UP
ENTRANCE HALL


SERVANT
SERVANT
HALL
SEWING ROOM
CLOSET
DRESSING ROOM
BATH
BATH
BED ROOM
DOWN
UP
HALL
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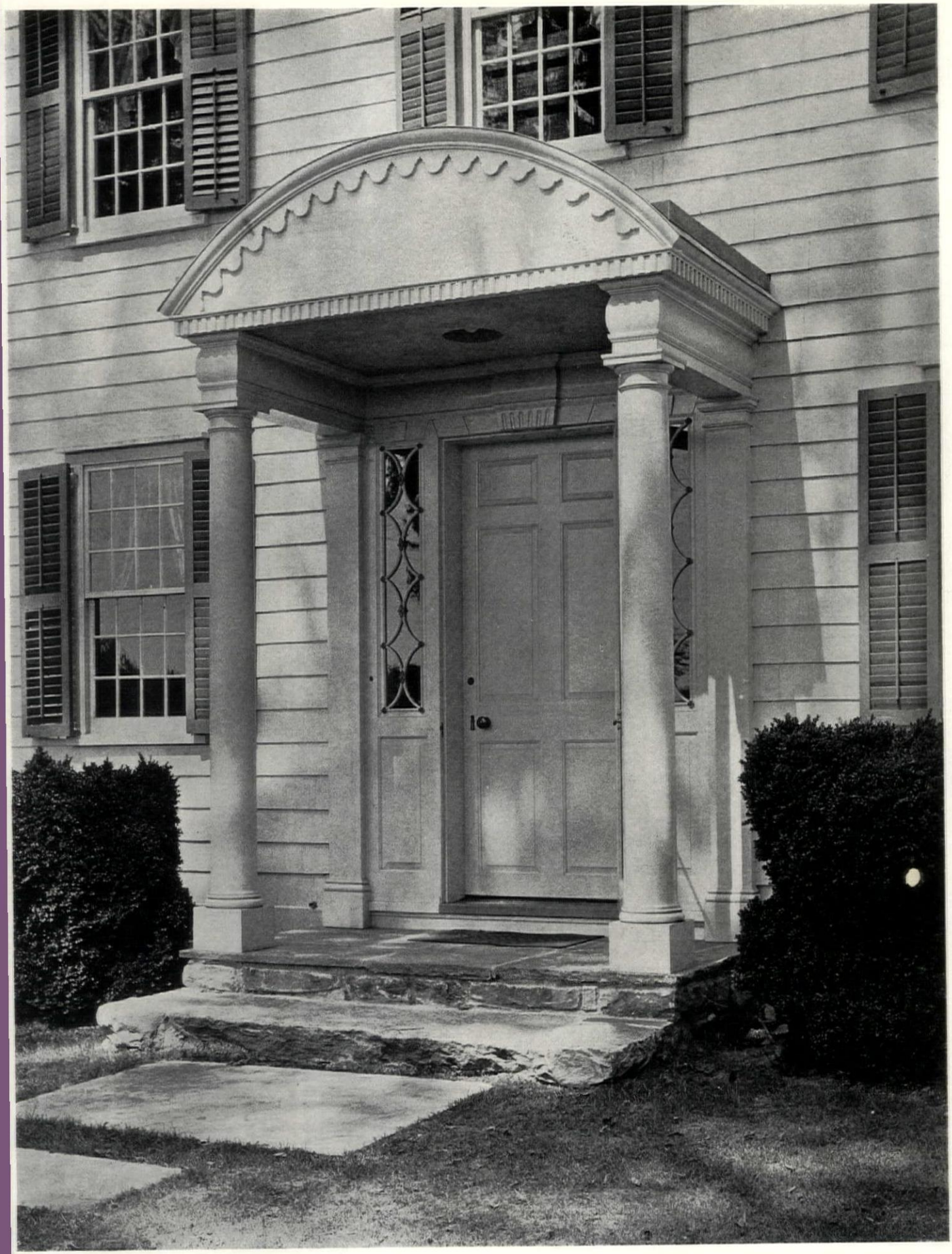
HALL



HOUSE OF CHARLES DUPEE AT SOUTHPORT, CONNECTICUT — CAMERON CLARK, ARCHITECT

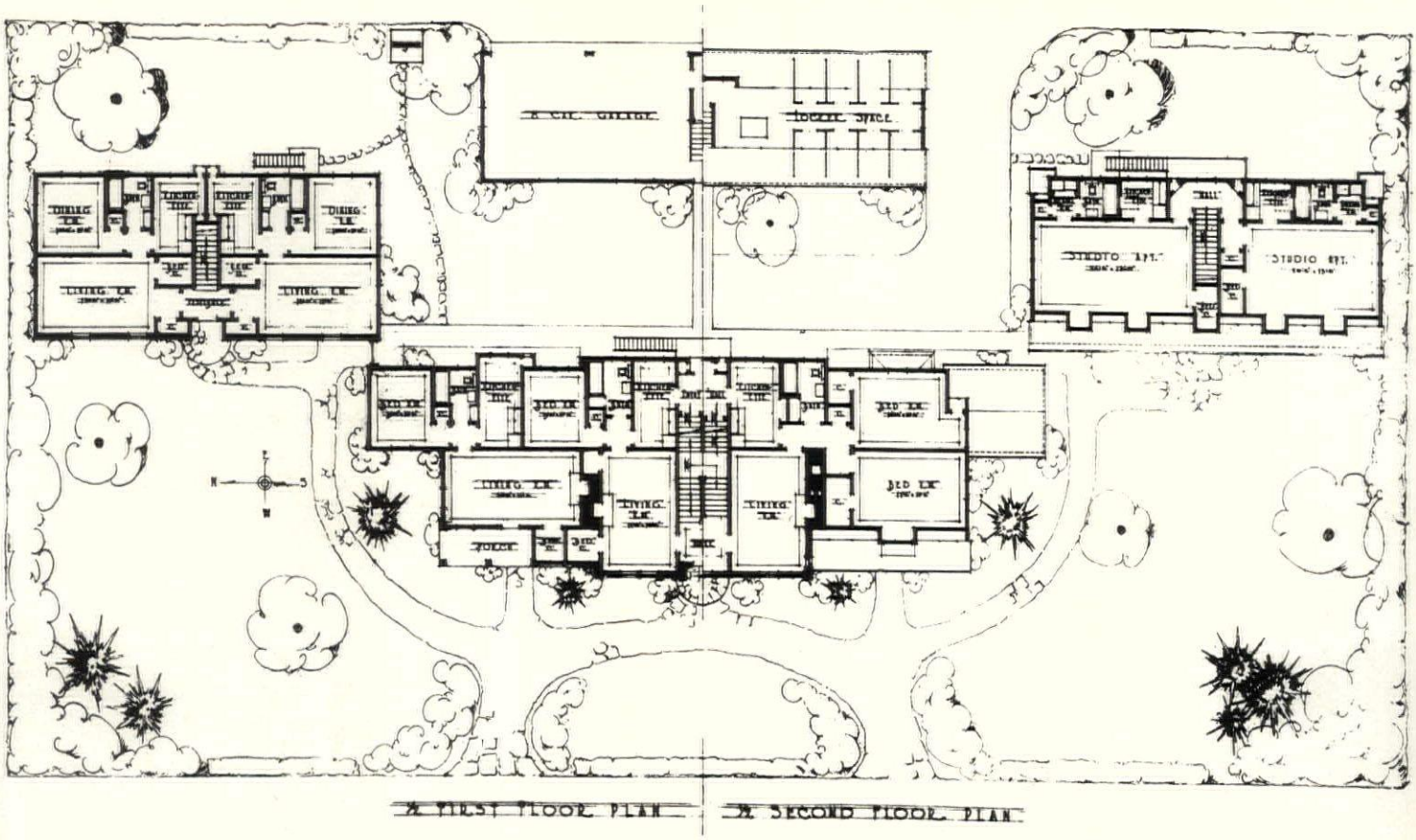
HOUSE AFTER ALTERATIONS

HOUSE BEFORE ALTERATIONS

HOUSE OF CHARLES DUPEE AT SOUTHPORT, CONNECTICUT — CAMERON CLARK, ARCHITECT

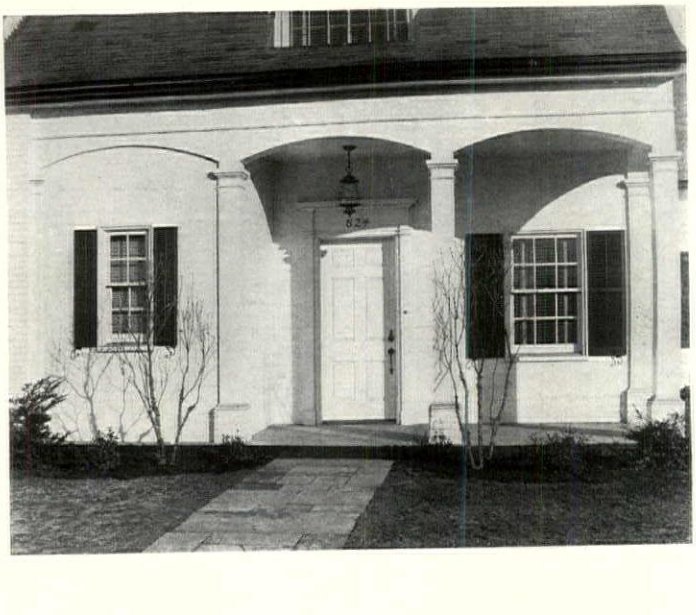
THE ELLIOTT APARTMENTS FOR FRANK E. BALL AT MUNCIE, INDIANA

The group includes four buildings containing, in all, fourteen apartments. The center building has six apartments, four of which are entered from the main entrance, and the remaining two have private side porticos. Two smaller buildings are set back and contain four apartments each, all opening into a center entrance and stairhall. In the rear is an 8-car garage with spacious locker space overhead for storage use. Cost of apartments: $62,000, inclusive of all equipment, but exclusive of cost of lot. The construction above ground is frame, completely fire-stopped and insulated with rock wool. The first floor is reinforced concrete. The buildings are heated by vapor in concealed radiation, supplied by a stoker-fired boiler in basement; center portion of the main building only is excavated. Exterior materials are local stone in varying shades of blue, gray, cream to brown, laid with wide white joints; common brick; shingle siding and tongue and groove siding. The roof is slate in weathering greens, grays, sea greens and blacks. The shutters are painted bottle green. All wood and brickwork are painted flat white.



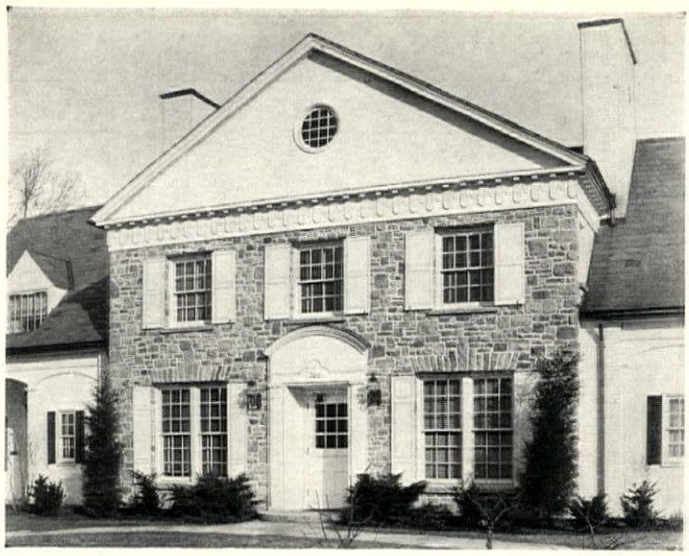
DEVOL ERNST, LANDSCAPE ARCHITECT

HERBERT F. SMENNER, ARCHITECT



ELLIOTT APARTMENTS

MUNCIE, INDIANA



HERBERT F. SMENNER

ARCHITECT

HOUSE OF ROBERT M. BROWN AT CHESTNUT HILL, PHILADELPHIA

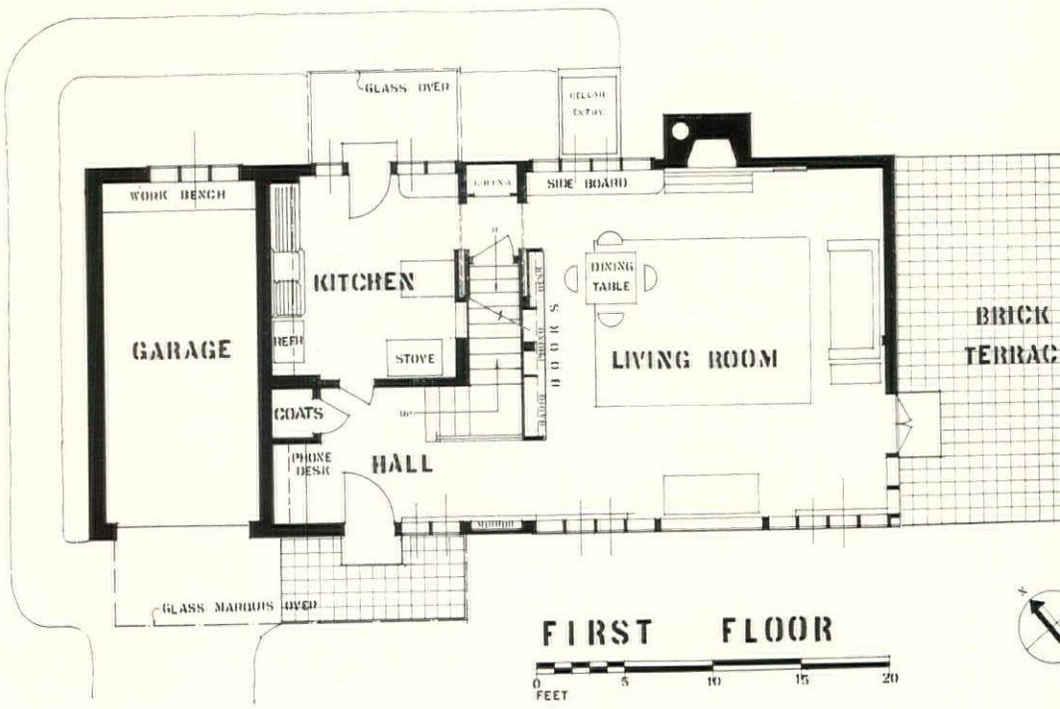
In building this house materials were studied for beauty, permanence and easy fabrication. Wood was chosen as the most flexible and pleasing, as well as the most economical. Many details associated with boat construction were used, giving a compact solidity in construction with a minimum loss of useful space. Wherever possible, structure and finish were combined in the same material. Twelve-inch redwood boards screwed horizontally to light framing combine pleasing appearance with considerable structural value, as well as being extremely durable as finish and moderate in cost. The window construction is an adaptation of the idea of prefabricated wall panels, and combines the wall structure with both interior and exterior finish. The steel casements were placed after erection, but could easily have been installed before. All millwork was fabricated at the site by the owner (the designer) and one assistant on two simple machines, permitting careful selection of material. Many special woods were used.

Photographs by F. S. Lincoln

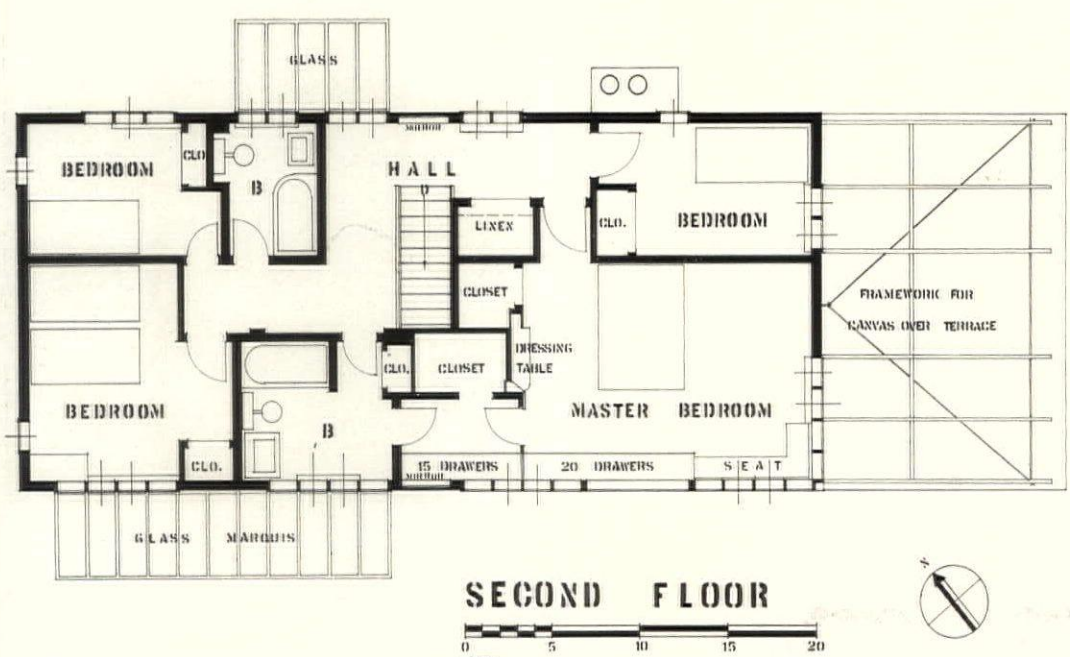
Photographs by F. S. Lincoln

ROBERT M. BR
DESIGNER—BUIL

The living room, its relation to the rest of the house and the outside, is the main feature of the design. A separate dining space was considered unnecessary and undesirable. The hallway and stairs were placed with a view to gaining privacy in the living room and access upstairs from the kitchen. A combined recreation room, bar, and workshop, occupying most of the basement, provides secondary living space.



HOUSE AT CHESTNUT HILL, PHILADELPHIA



The owner's bedroom, dressing room and bath are of comfortable size and provide ample facilities, while the other bedrooms and bath are held to rigidly minimum dimensions. The positioning of bathrooms and kitchen centralizes all plumbing, reducing the cost and minimizing the damage from possible pipe failure. Copper water tubing is used throughout.

Photographs by F. S. Lincoln

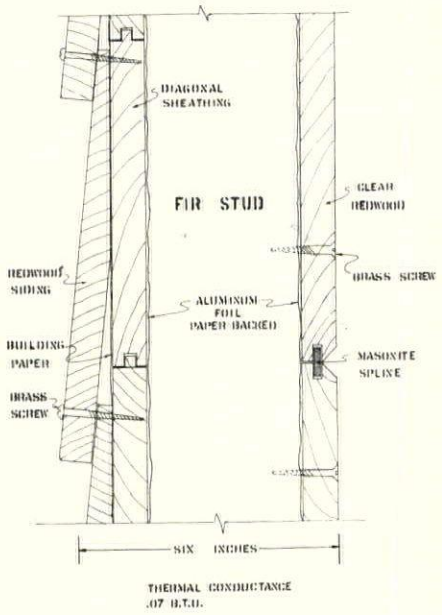
OWNER'S BEDROOM

HOUSE AT CHESTNUT HILL, PHILADELPHIA

VIEW INTO LIVING ROOM

ROBERT M. BROWN, OWNER, DESIGNER AND BUILDER

TYPICAL WALL SECTION



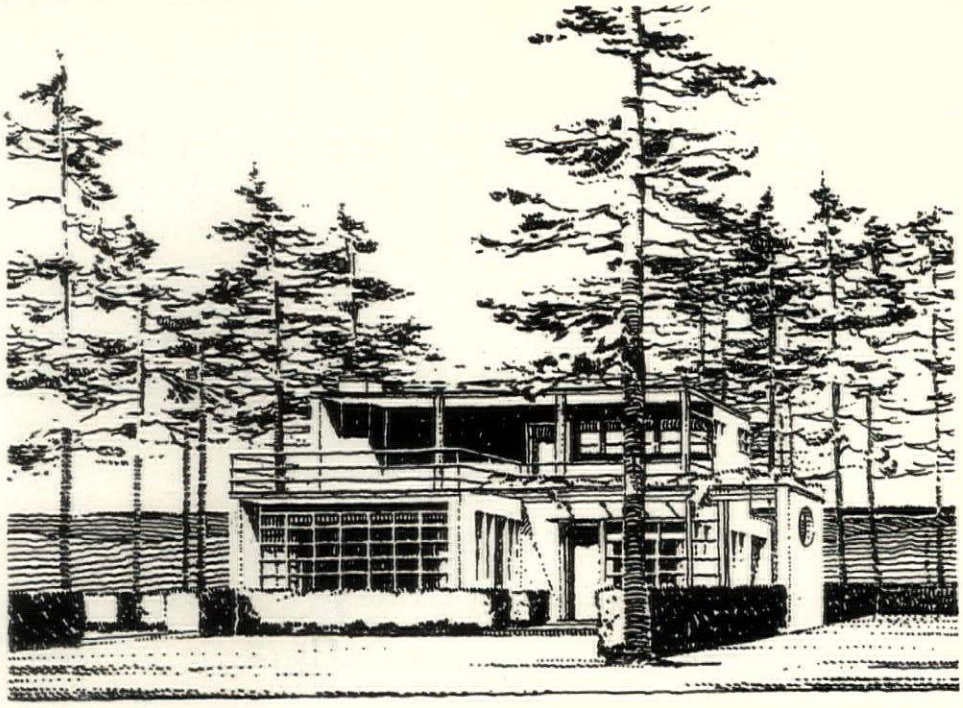
HOUSE DESIGNED, BUILT AND OWNED BY ROBERT M. BROWN
CHESTNUT HILL . . . . . PHILADELPHIA

The structural design of stairs and surrounding framing was worked out in conjunction with the placement of recessed mirrors, roof drainage line, cupboards, bookcase, and radio speaker. The framework of horizontal bookshelves and cabinets below was used as the structural foundation for finish in the stairs, reducing the wall thickness to less than 2 inches. The slag roof is pitched very slightly (1/8" in 1') to a central drain, and structural provisions have been made for later development of an exterior stairway and tiled roof terrace. There is no parapet and all roof flashing is eliminated by using a galvanized steel angle iron to make the joint between roof and sidewall.

Floors: Diagonal subfloor laid over entire areas of first and second floors (there are no bearing partitions) in casein glue and nailed; half-inch sound deadening board; then finish floor (wide plank—white oak downstairs, pine painted upstairs) is screwed through insulating board to subfloor.

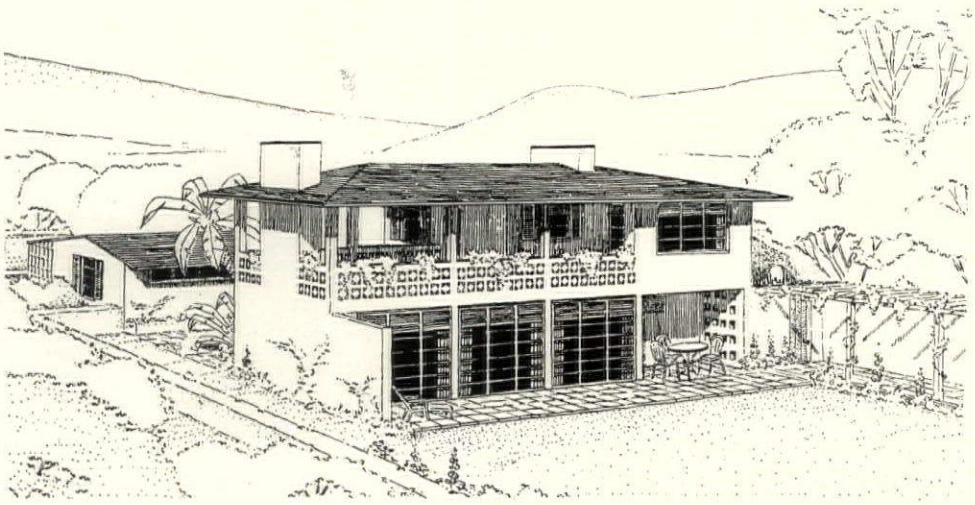
Interior walls: Kitchen: 3/4" plywood. Master bath: carrara glass. Second bath: tempered Presdwood, spar varnished and enameled. Bedrooms: 12" redwood, painted. Living room and halls: 12" redwood—brass screws and natural wax finish. All ceilings: painted Homasote.

Aluminum foil on paper backing (Reynolds) is used throughout to provide maximum insulation at low cost. The fuel cost is extremely low. Heating is by hot water, low temperature system, using concealed indirect radiation, burning low-cost coal without blowers or pumps. Two standard 10" steel pipes 18' long, with lower ends flanged and anchored in masonry eliminate all fire hazard and leakage 6' above grade. Aluminum hoods, projecting 8 inches over windows, stop vertical summer sun and pass horizontal winter sun. Hoods over front and back doors: oak and steel frame, with half-inch rough plate glass over. Flat, truck cover canvas is stretched and roped on redwood and aluminum tube frame over terrace in spring, removed in autumn. Cost: About $8,000.



GRAND PRIZE IN CLASSES A AND B

HAYS AND SIMPSON ARCHITECTS



GRAND PRIZE IN CLASSES C AND D

PAUL SCHWEIKHER, THEODORE W. LAMB ARCHITECTS

GENERAL ELECTRIC COMPETITION AWARDS

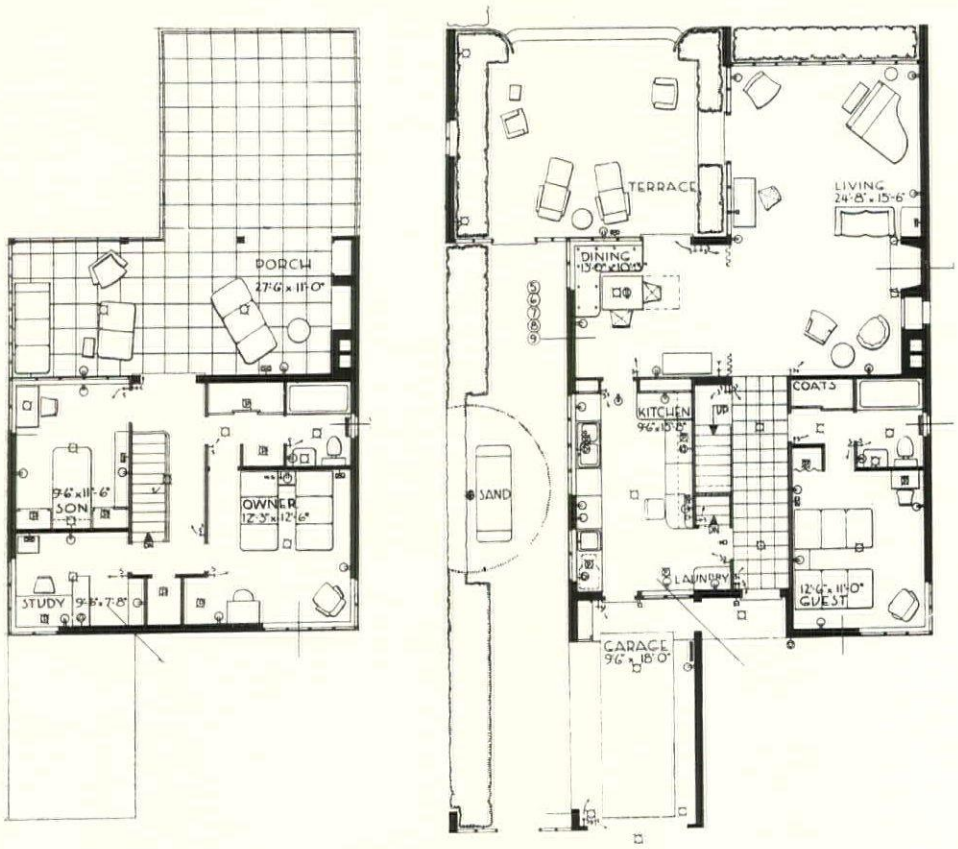
Architectural firms in Cleveland and Chicago shared the two grand prizes and architects in New York carried off the two first awards in the home electric architectural competition sponsored by the General Electric Company in cooperation with the Federal Housing Administration. The contest opened January 1, continued 10 weeks, and more than 2,000 sets of plans were submitted from every state in the union.

A total of $21,000 was awarded in 52 prizes. The two grand prizes, each for $2,500, were awarded to Hays and Simpson of Cleveland and to Paul Schweikher and Theodore Warren Lamb of Chicago. The two first prizes, each for $1,500, were awarded to Stephen J. Alling, a young architect who finished his studies at the Massachusetts Institute of Technology a year and one half ago, and to J. Andre Fouilhoux and Don E. Hatch, jointly, both of New York. Mr. Fouilhoux was a partner with Raymond Hood, until the time of the latter's death, and it was during this association that this firm designed many of the country's famous buildings, such as the Chicago Tribune tower, the Daily News building, Radio City, and the McGraw-Hill building in New York.

Four second prizes, each for $1,250, were awarded to Ralph H. Burkhead, Richard C. Hoyt and Angelo Messina, jointly, of New York; John Ekin Dinwiddle of San Francisco; Arthur Martini and Jonas Pendleburg, jointly, of Flushing, L. I.; and to Richard J. Neutra of Los Angeles.

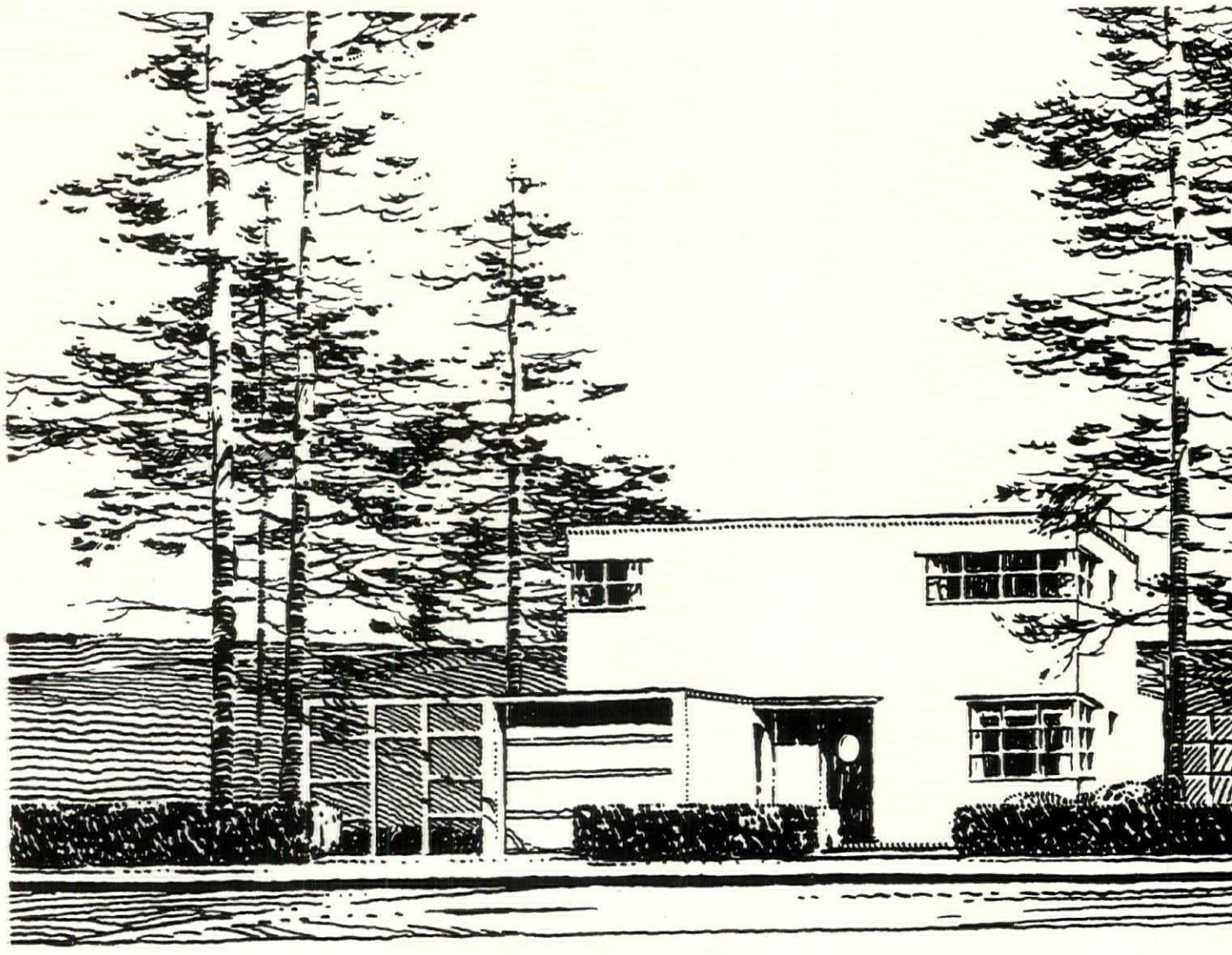
Four third prizes, each for $1,000 were awarded to Verner Walter Johnson and Phil Birnbaum, jointly, of New York; Herman A. L. Behlen, Ardsley, Pa.; John Hironimus, of New York, and John Donald Tuttle, of New York.

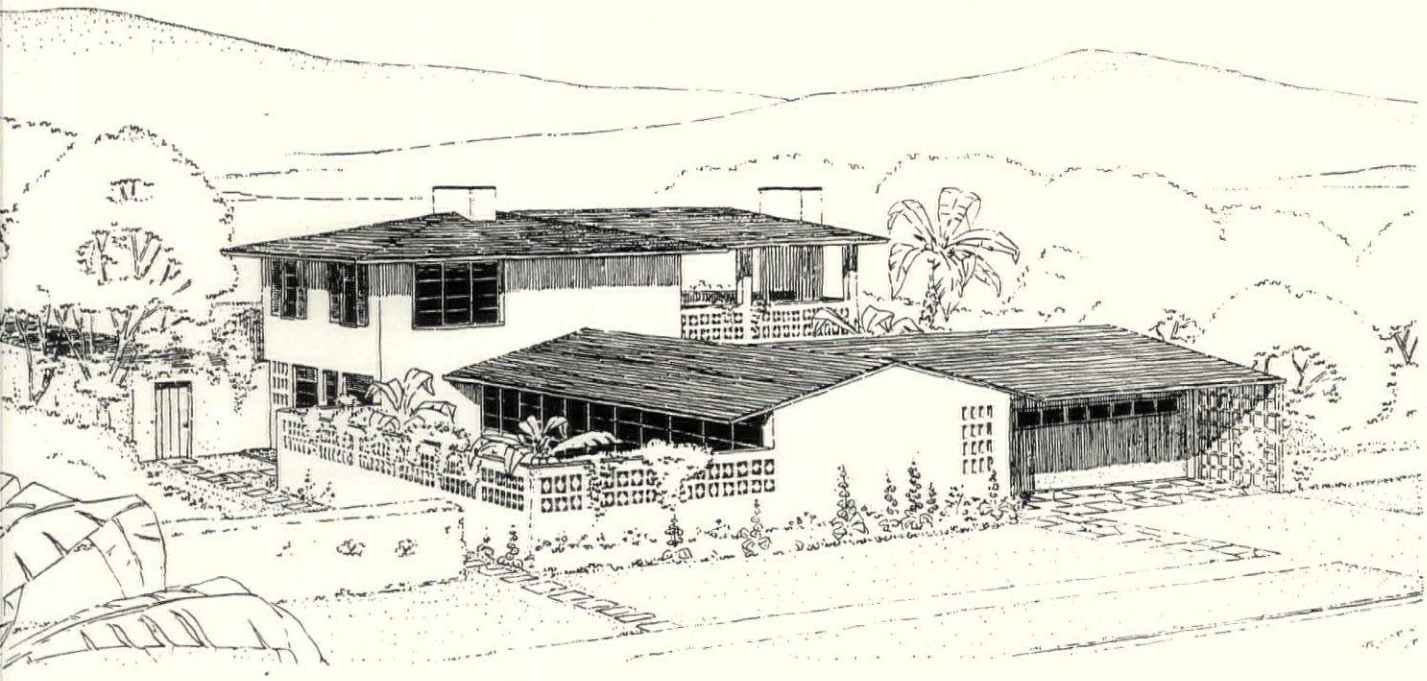
(*Continued on page 292*)

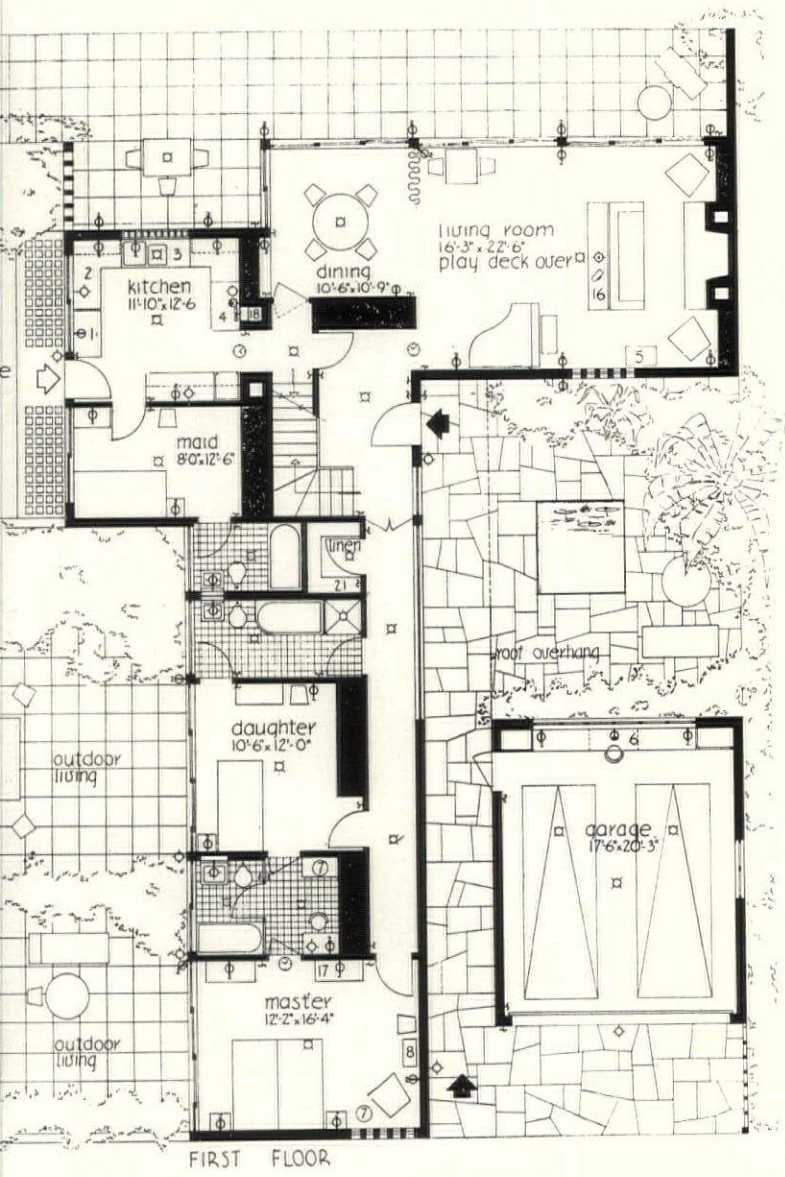


GRAND PRIZE
CLASSES A AND B

HAYS AND SIMPSON
ARCHITECTS—CLEVELAND





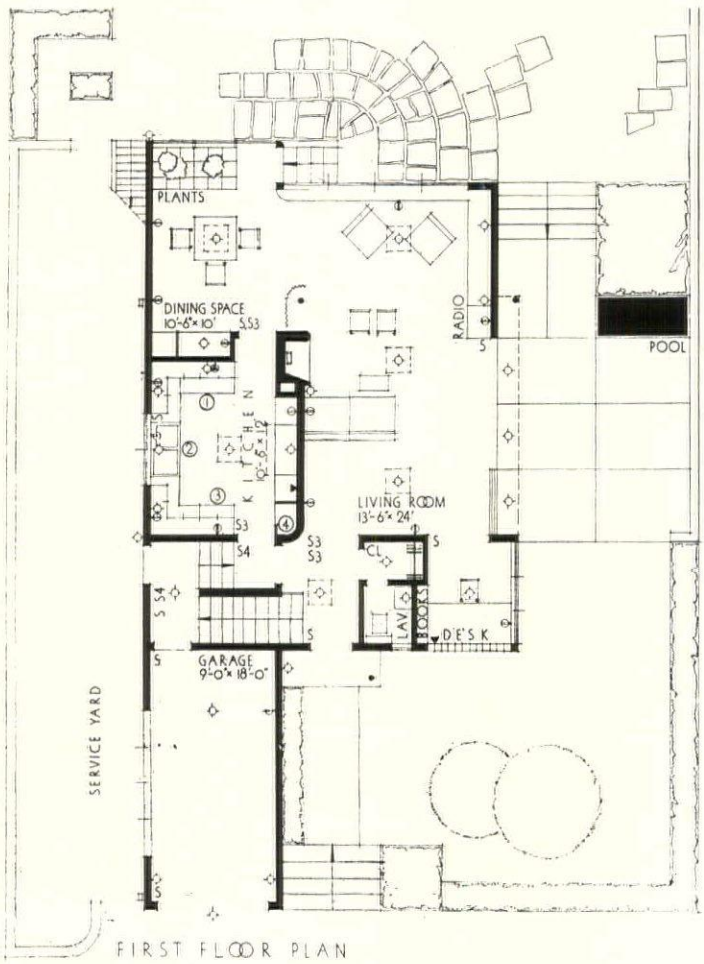


GRAND PRIZE
CLASSES C AND D

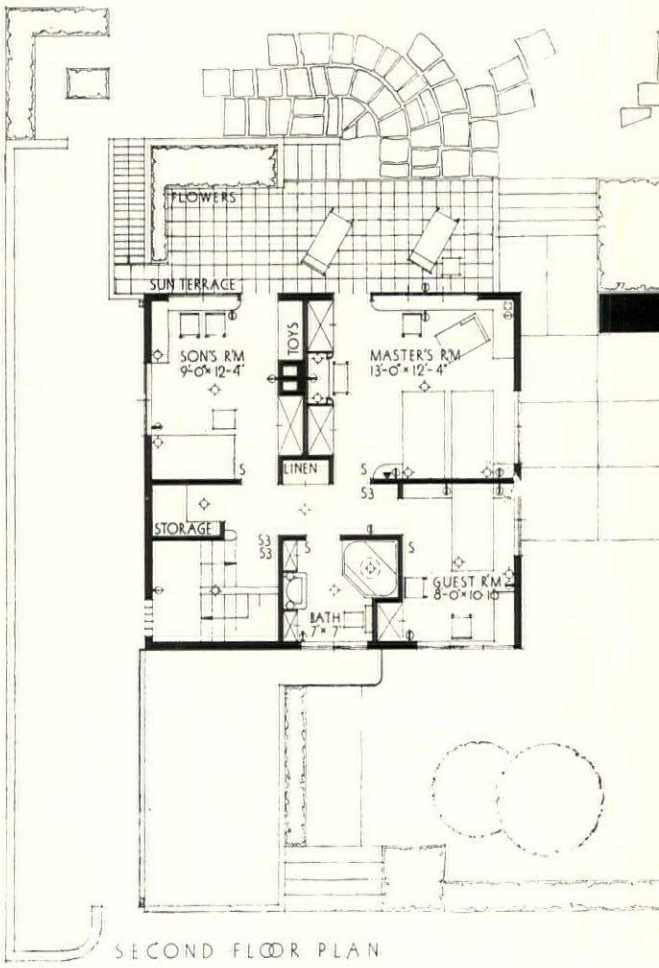
PAUL SCHWEIKHER
THEODORE W. LAMB
ARCHITECTS — CHICAGO

FIRST PRIZE — CLASS A

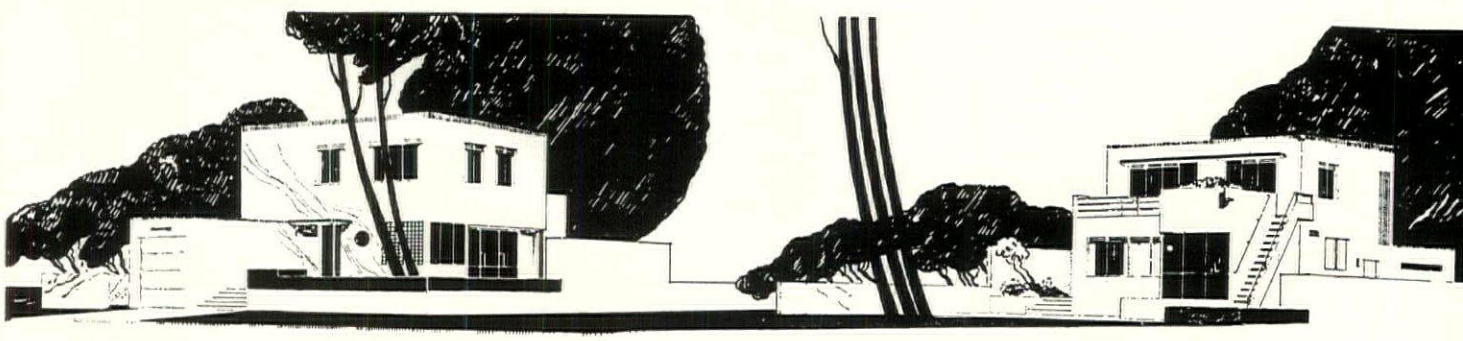
STEPHEN J. ALLING, ARCHITECT

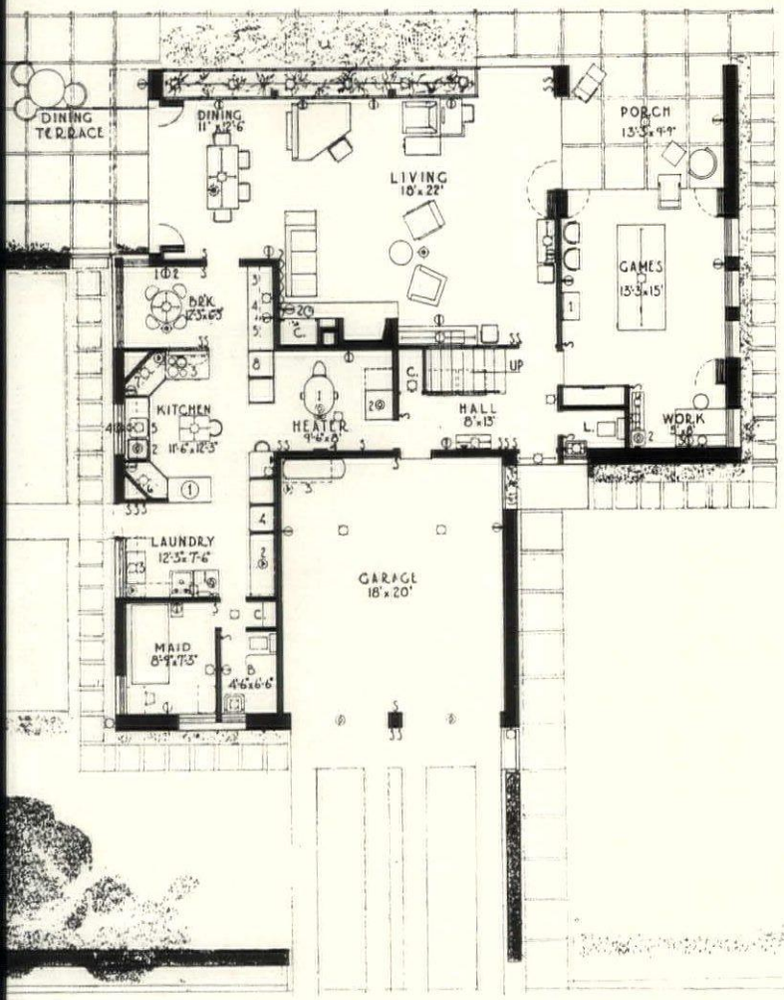


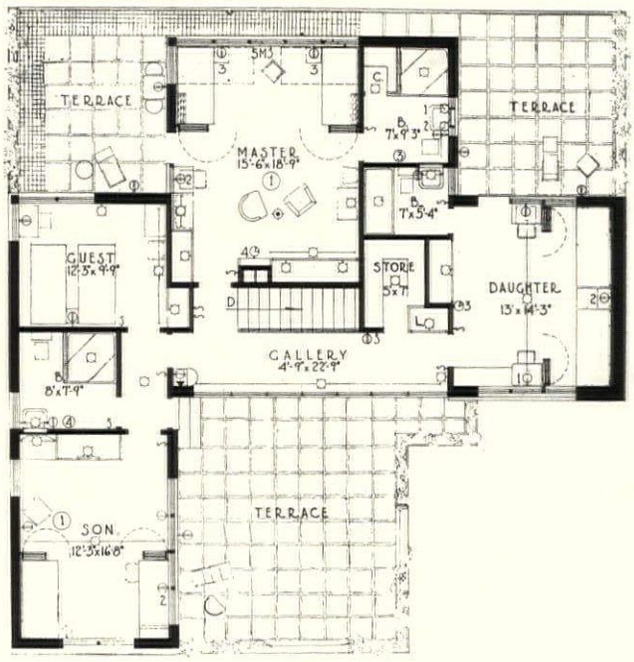
FIRST FLOOR PLAN



SECOND FLOOR PLAN



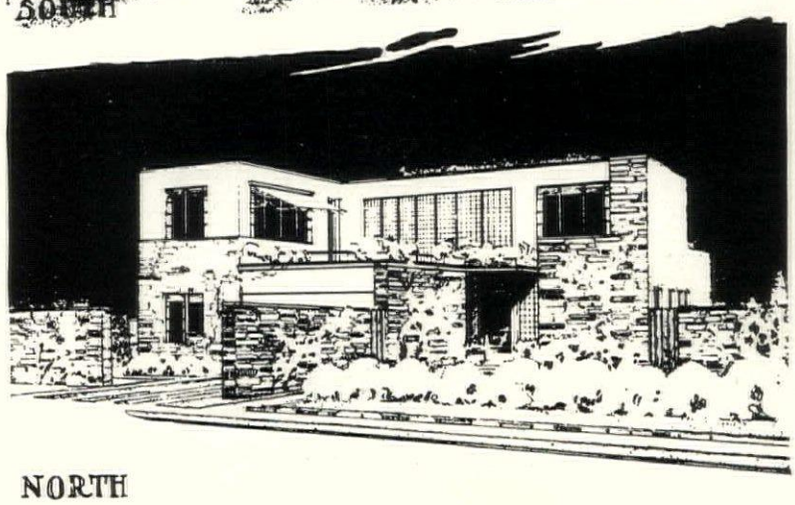




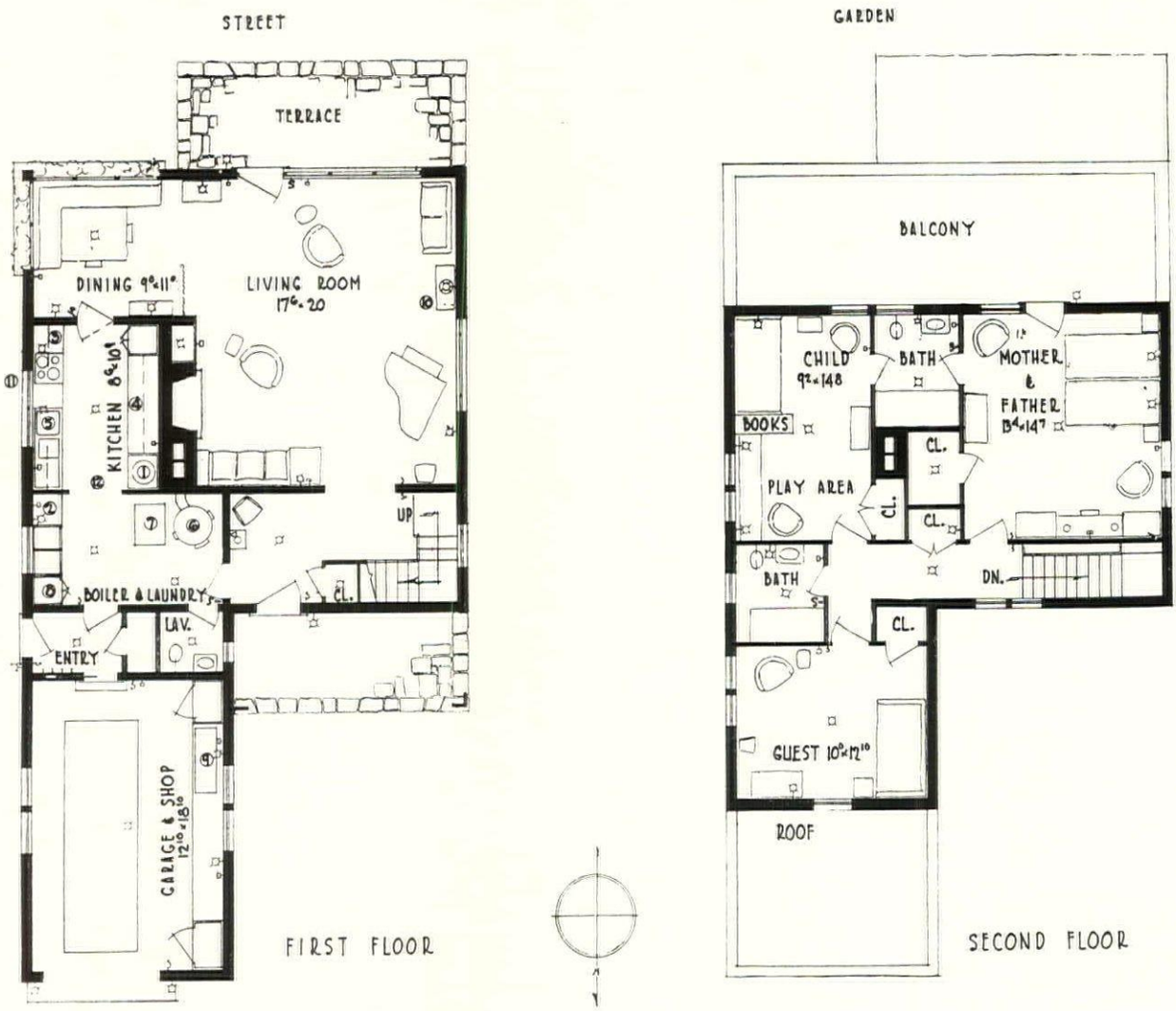
FIRST PRIZE — CLASS C

J. ANDRE FOUILHOUX AND DON E. HATCH, ARCHITECTS

SOUTH

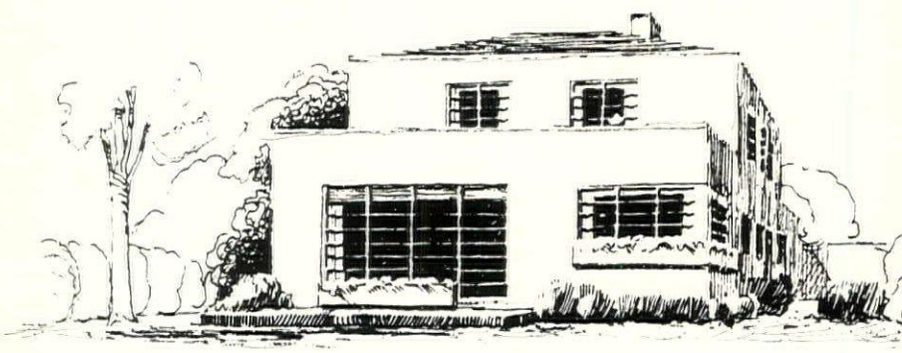


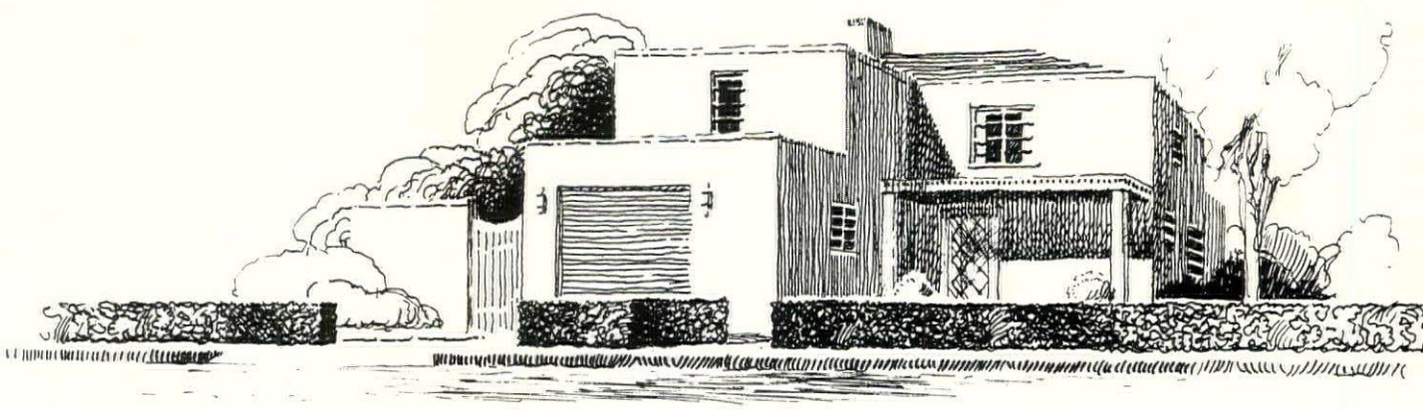
NORTH

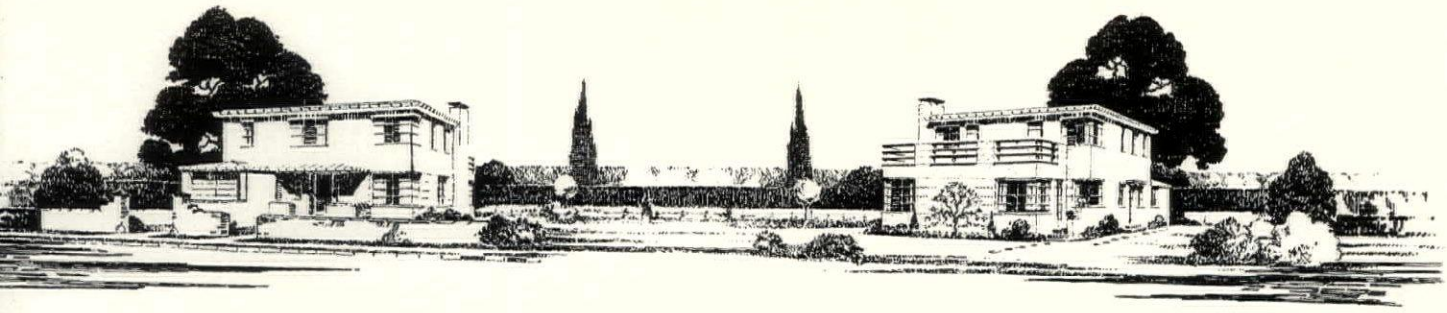


SECOND PRIZE IN CLASS A

RALPH H. BURKHEAD
RICHARD C. HOYT AND
ANGELO MESSINA, ARCHITECTS

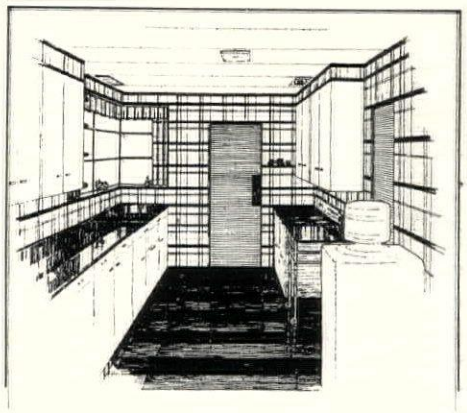




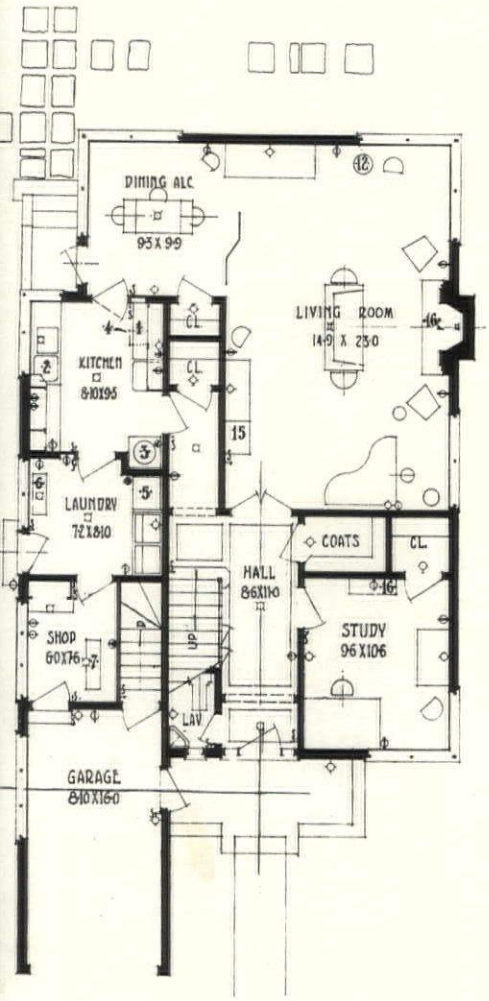


SECOND PRIZE — CLASS B

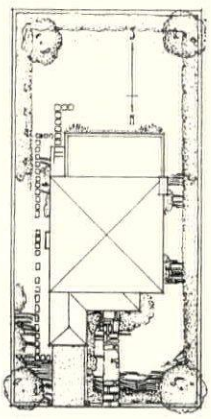
JOHN EKIN DINWIDDIE, ARCHITECT



PERSPECTIVE OF KITCHEN

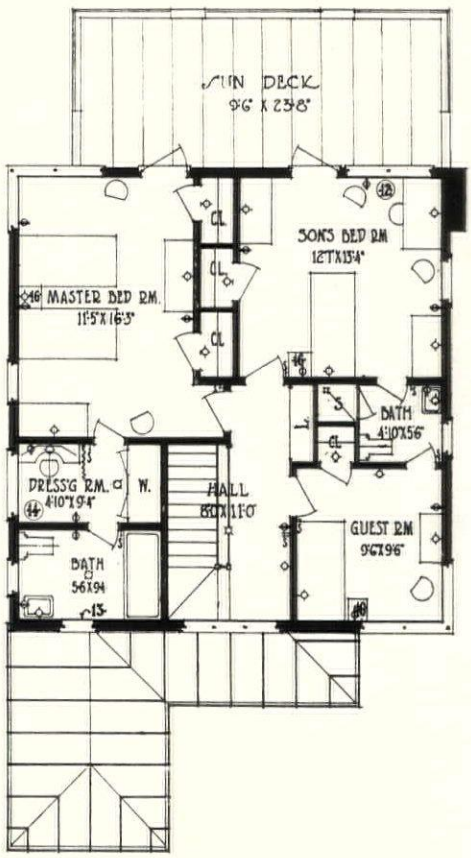


FIRST FLOOR PLAN



PLOT PLAN

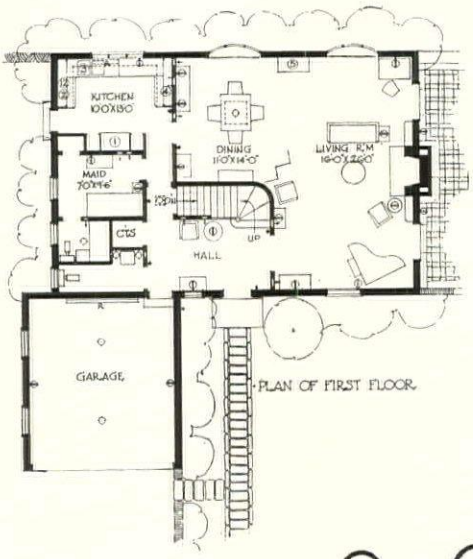
BASEMENT PLAN



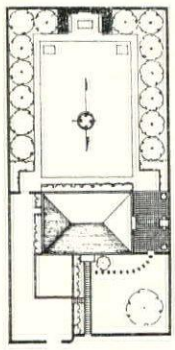
SECOND FLOOR PLAN

· KITCHEN

·LEGEND·
① PLAN DESK.
② REFRIGERATOR.
③ DISH WASHER.
④ ELECTRIC RANGE.
⑤ RADIO.
⑥ OIL FURNACE.
⑦ AIR CONDITIONING SYSTEM.
⑧ WORK SHOP.
⑨ WASHER.
⑩ DRYER.
⑪ IRONER.
⑫ FAN.

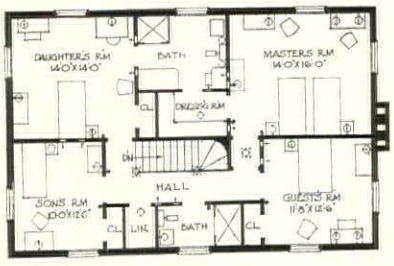


PLAN OF FIRST FLOOR.

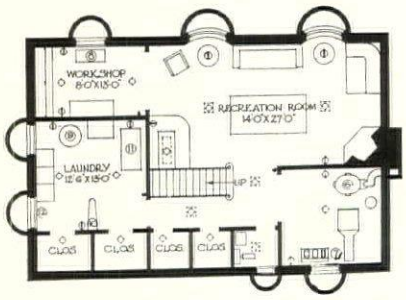


PLOT PLAN

SCALE FOR PLANS



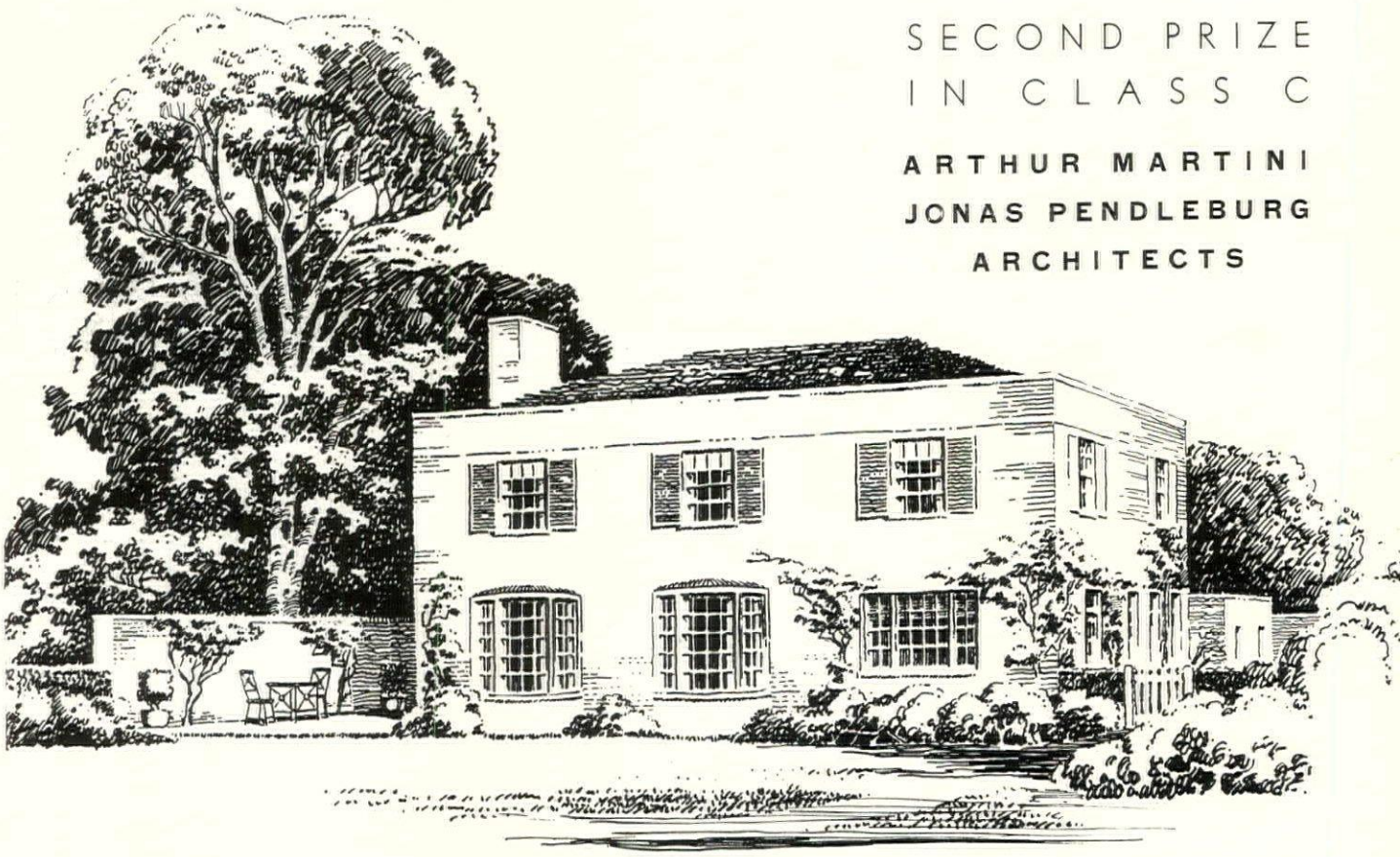
PLAN OF SECOND FLOOR.



PLAN OF BASEMENT

SECOND PRIZE IN CLASS C

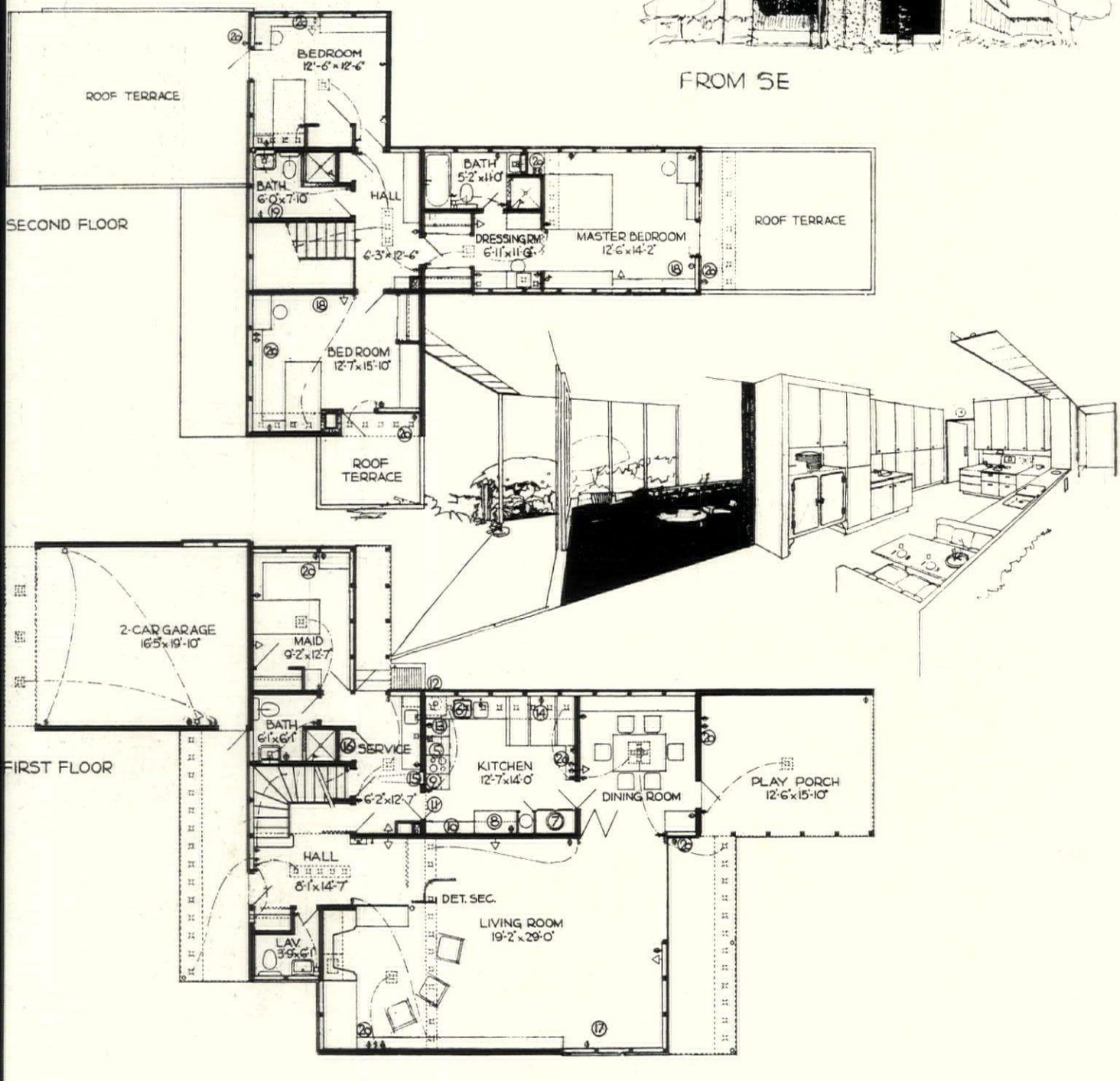
ARTHUR MARTINI
JONAS PENDLEBURG
ARCHITECTS

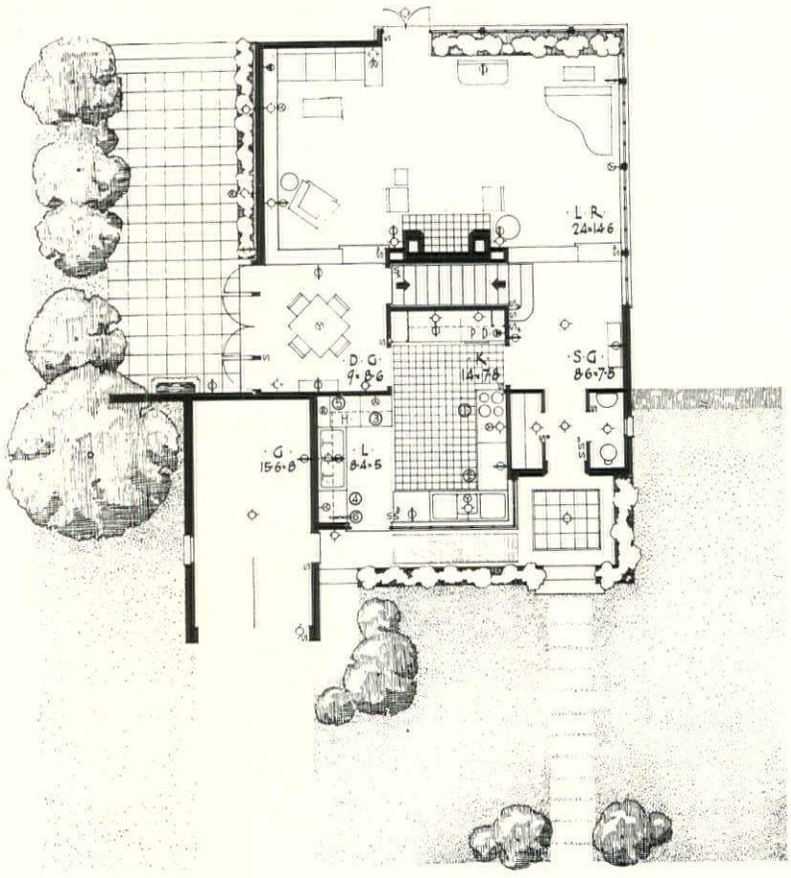


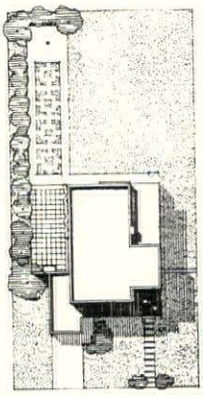
SECOND PRIZE — CLASS D

RICHARD J. NEUTRA, ARCHITECT

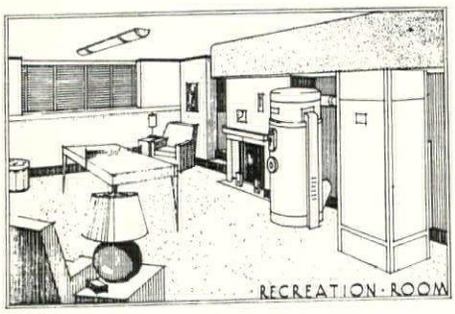
FROM SE

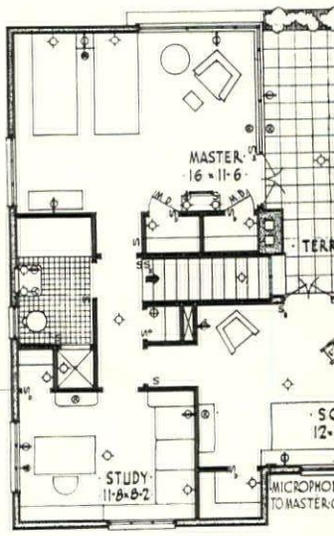






L·R·LIVING·ROOM·
D·G·DINING GALLERY
S·G·STAIR GALLERY
K· KITCHEN
L· LAUNDRY
G· GARAGE
R·R· RECREATION R.M·
ST·CL· STORAGE CLOSET
P·D· PLAN DESK
H· HAMPER·
T· WASH TUB
DUPLEX RECEPTACLE
RADIO OUTET



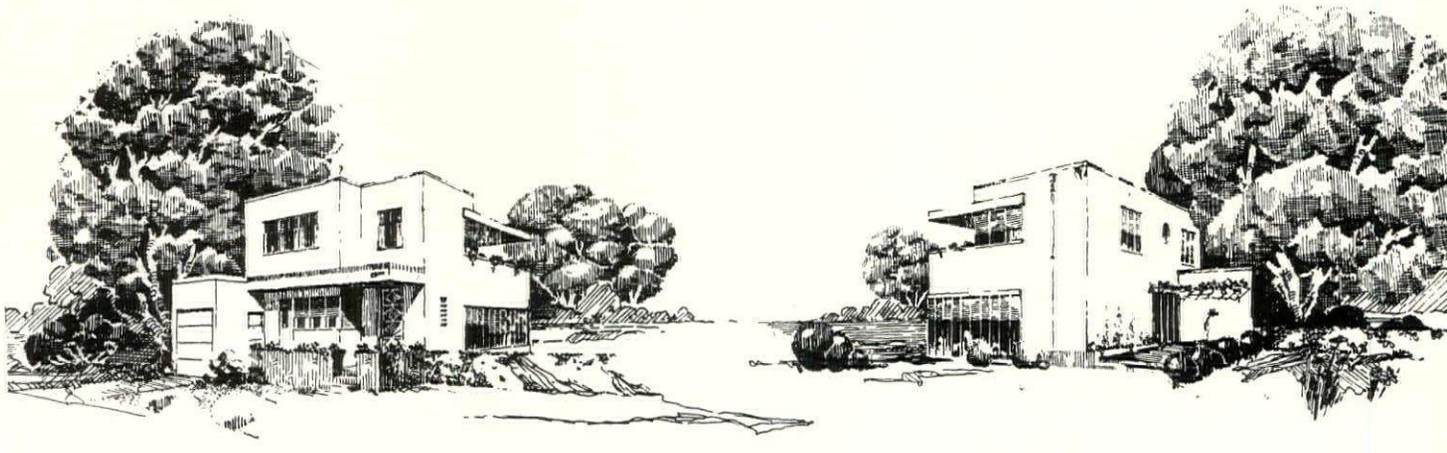


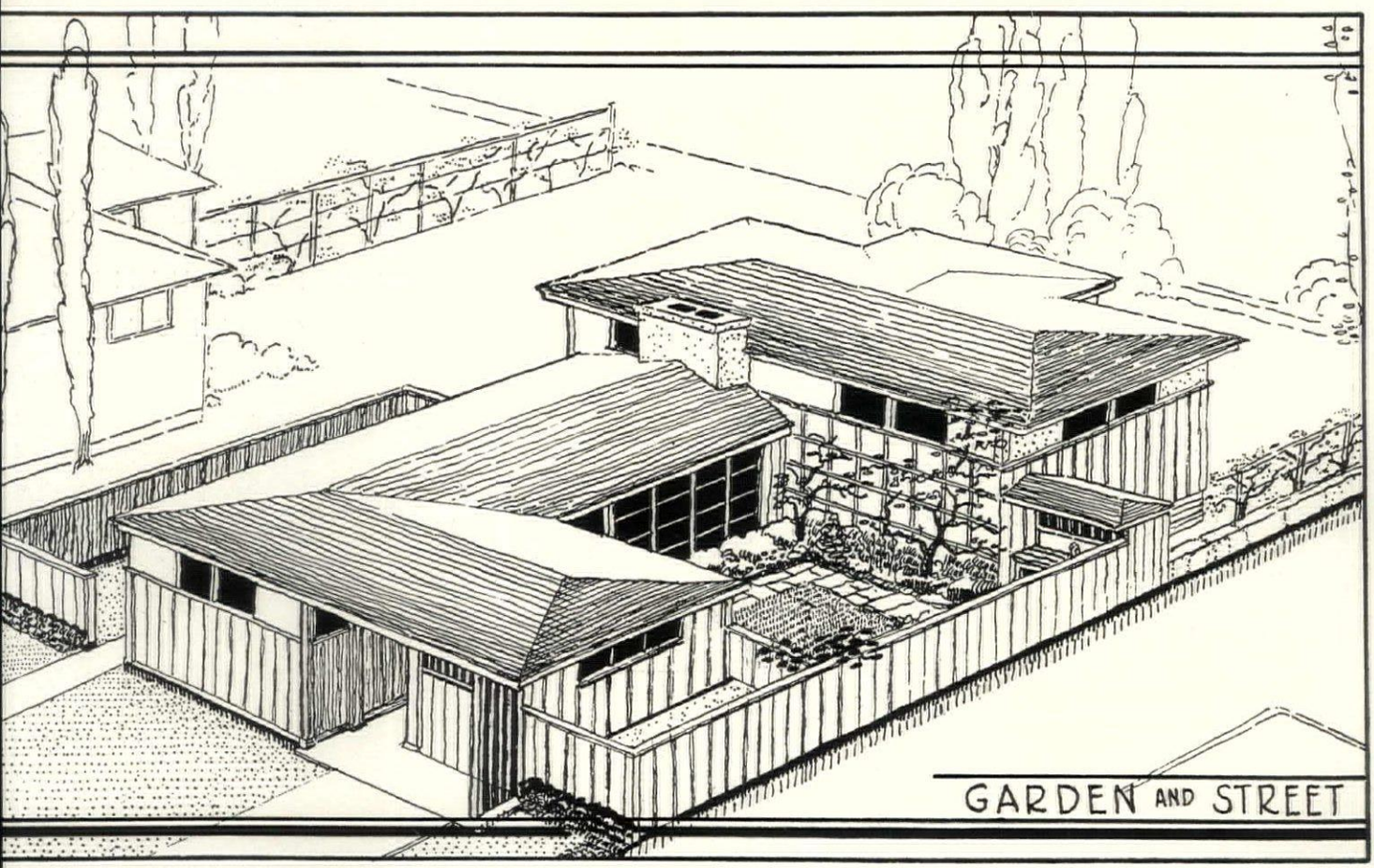
APPLIANCES

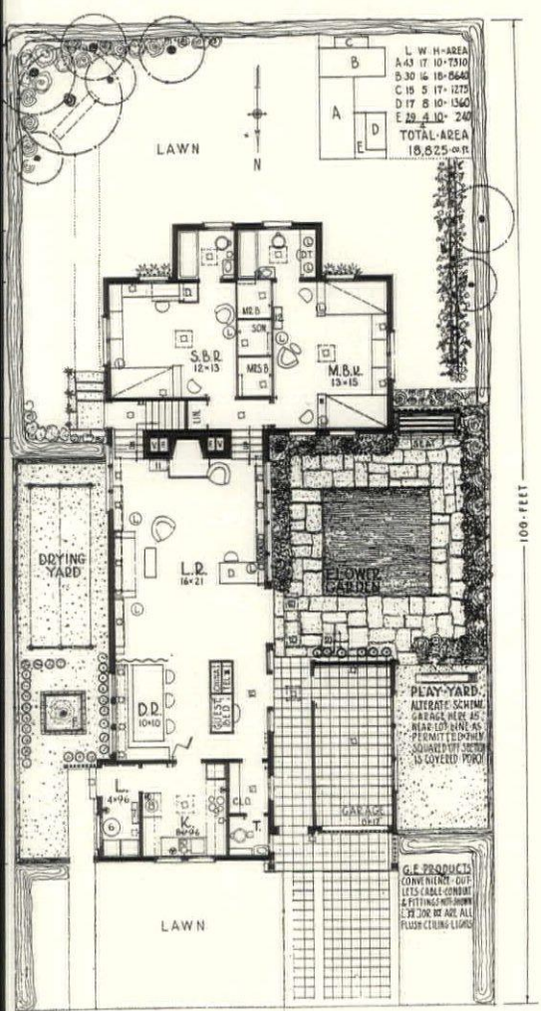
① RANGE		·KITCH BASE CABINETS
② DISHWASHER & SINK		·KITCH WALL CABINETS
③ REFRIGERATOR·		·PERSONAL RADIO·
④ WASHING MACHINE		·CONSOLE RADIO·
⑤ FLAT PLATE IRONER PORT·		·VACUUM CLEANER
⑥ VENTILATING·FAN		·CLOCKS·ALL ROOMS
⑦ OIL FURNACE·		·SUN LAMPS
⑧ AIR CONDITIONER		·INFRO·RED LAMPS
⑨ LATHE COMBINATION		·HOT POINT·KITCH·ACCESS·

THIRD PRIZE IN CLASS A

VERNER W. JOHNSON
PHIL BIRNBAUM
ARCHITECTS

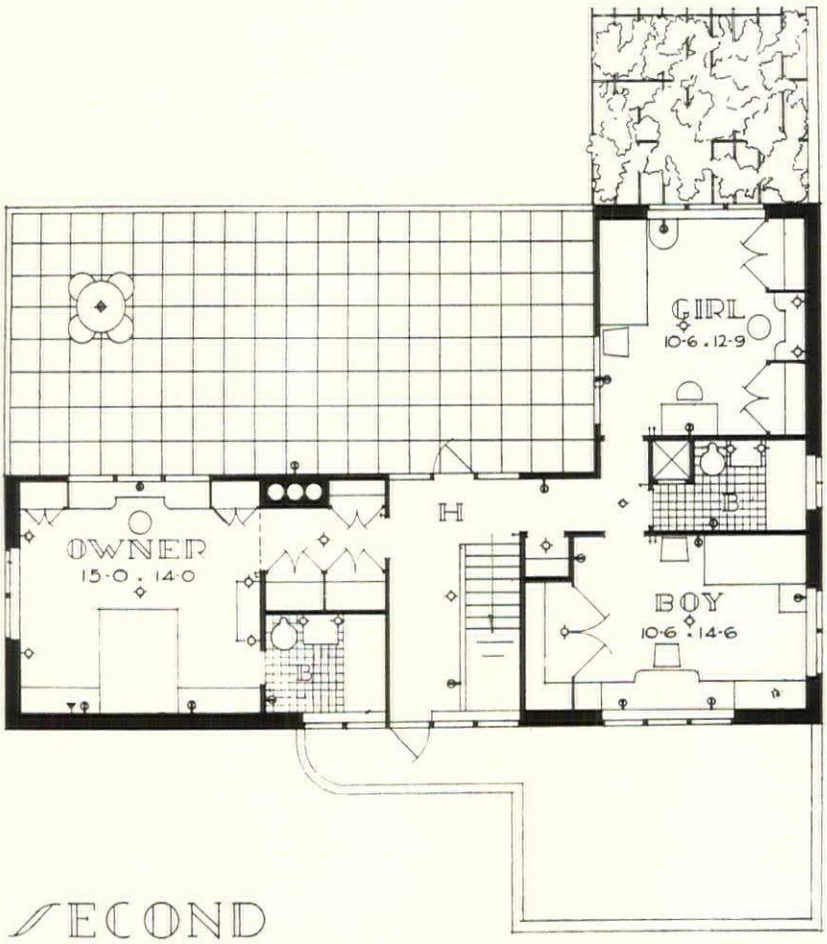




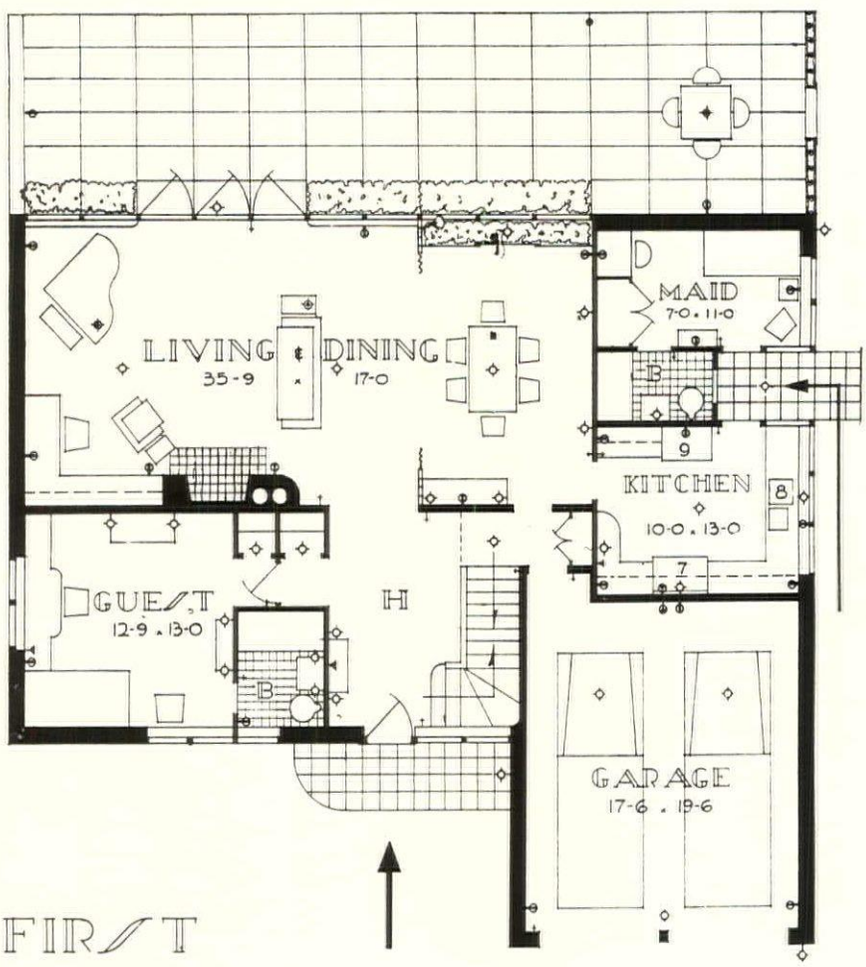


THIRD PRIZE — CLASS B

HERMAN A. L. BEHLEN, ARCHITECT



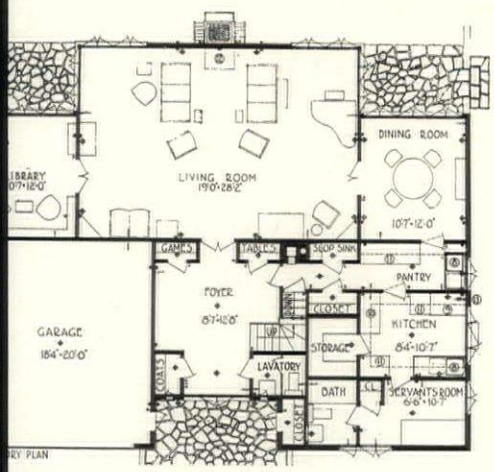
SECOND

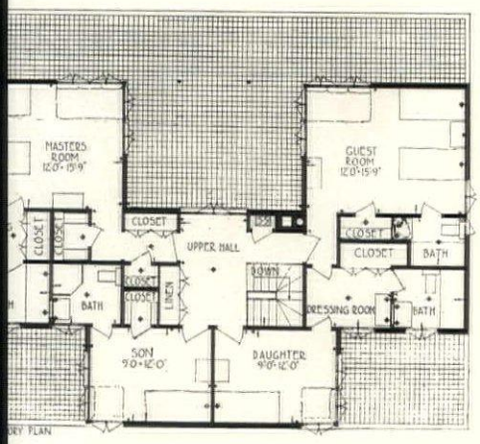


FIRST

THIRD PRIZE IN CLASS C

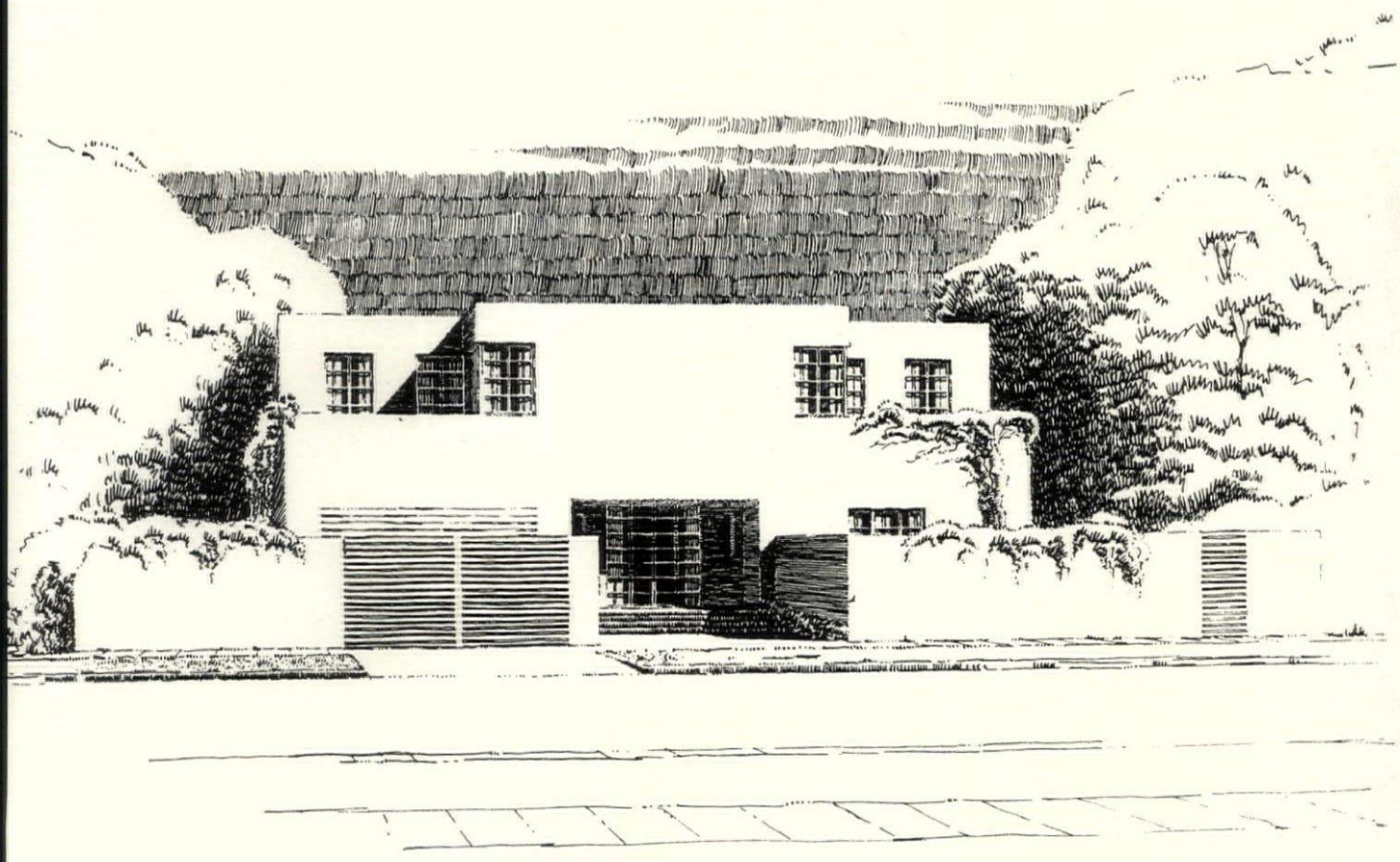
JOHN HIRONIMUS
ARCHITECT





THIRD PRIZE — CLASS D

JOHN DONALD TUTTLE, ARCHITECT



GENERAL ELECTRIC COMPETITION AWARDS

(Continued from page 279)

Forty who received honorable mention and checks for $100 each were Geoffry N. Lawford of New York; Jonas Pendlebury of Scarsdale, N. Y.; Kenneth Kassler of Princeton, N. J.; H. Lee Smith, of Toledo; Frederick M. Moss of Washington, D. C.; Paul Schweikher of Chicago; Roy E. Nelson of E. Cleveland; Phillip D. McFarland of Seattle, Wash.; Constantin A. Pertzoff of Boston; Walter H. Bruber of New York; R. Raymond Carter of Stillwater, Okla.; Phillip Sanfilippo of Brooklyn; Albert W. Ford of Long Beach, Calif.; Louis A. Thomas of Los Angeles; Arthur R. Hutchason of Los Angeles; Burton A. Bugbee of New Rochelle, N. Y.; J. R. Sproule of Seattle, Wash.; J. V. Wilson of Pittsburgh, Pa.; Stanley C. Reese of Chattanooga; J. D. Tuttle of New York; H. T. Lindeberg of New York; Melville Nauheim of New York; Charles F. Pope of Park Ridge, Ill.; Herman Frenzel of St. Paul; Byron E. Laidlaw of New York; W. E. Campbell and F. T. Hogg of Boston; A. R. Hutchason of Los Angeles; W. D. Lambdin of Baltimore; Howard A. Topp of Los Angeles; John D. Grisdale of Philadelphia; Harvey Stevenson of New York; George Palm, Jr., of Cleveland; W. K. Oltar Jevsky and N. T. Montgomery of New York; Jason S. Trespel of New York; Cecil Claire Briggs of New York, and Walter L. Moody of Los Angeles.

The Jury of Awards consisted of eleven members; seven architects representing the different sections of the United States; one expert in child training; one domestic science expert; one general contractor; and one realtor. Ralph T. Walker, of Voorhees, Gmelin and Walker, New York, was chairman; Kenneth K. Stowell, A.I.A., and former editor of Architectural Forum, was professional adviser; John F. Quinlan, of General Electric, was manager of the competition. Architects on the jury of awards were Franklin O. Adams, of Tampa, Fla.; Ernest A. Grunsfeld, Jr., of Chicago; Charles T. Ingham, of Pittsburgh; H. Roy Kelley, of Los Angeles; Charles W. Killam, of Cambridge, Mass.; and Eliel Saarinen, of Bloomfield Hills, Mich.

Other jury members were Katharine Fisher, Director of Good Housekeeping Institute; Harold D. Hynds, engineer of New York City; Dr. Grace Langdon, child training expert and Director of Educational Advisory Service, New York; Hugh Potter, realtor of Houston, Texas, and president of the National Association of Real Estate Boards; and Henry F. Richardson, engineer, of New York City.

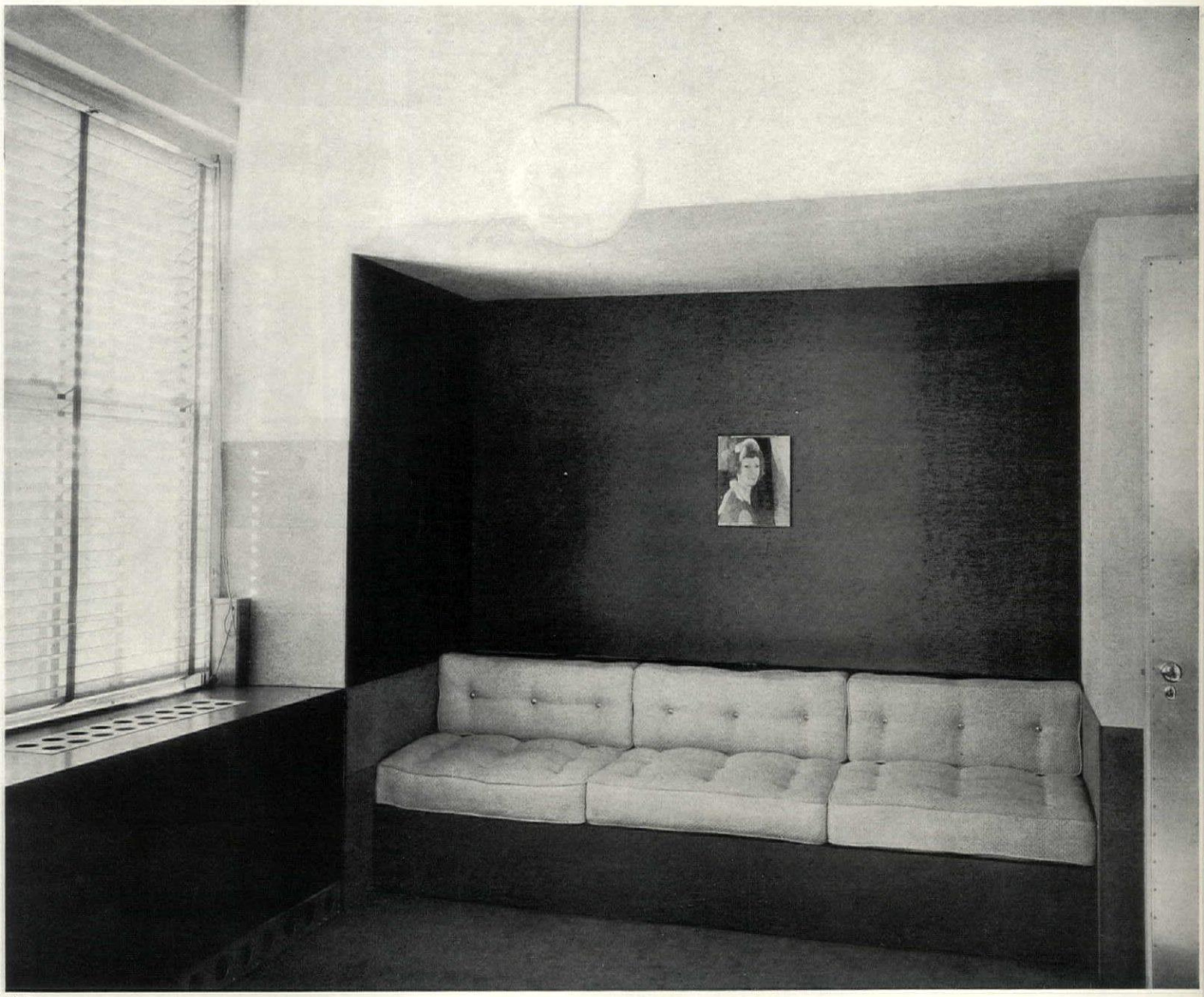
Fully 75 per cent of the plans depicted the flat roof, modern type of house, somewhat as displayed at the Century of Progress in Chicago. Many designs placed the garage at the front of the house with the kitchen adjoining, and the living room across the rear, facing the yard and garden. All plans gave particular attention to the layout of the yard with its shrubbery and flowers.

Greater utilization of the cellar or basement, now commonly used for the furnace and perhaps the laundry, was also brought out in the many designs. This space is used for a recreation or play room for children. This is made possible by the use of automatic heat, such as supplied by the oil or gas furnace. The drawings showed that time-saving, step-saving, and labor-saving had been the rule in the studies of the architects.

PAINT—A PARTNER IN ILLUMINATION

By RALPH BENNETT and T. J. MALONEY

OFFICE OF NATHAN HORWITT, HEAD OF DESIGN ENGINEERS, INC., NEW YORK CITY



Rotan

SIX FACTORS IN GOOD SEEING

(1) *General illumination* sufficient to overcome sharp contrasts with light sources and to afford eye comfort. The degree of illumination should give consideration to room functions.

(2) *Supplementary light sources* for special tasks where general illumination is inadequate—as for reading or other close visual tasks. Sufficient intensity of light, with suitable diffusion, to afford abundant illumination without glare.

(3) *Complete absence of glare* from direct sunlight, exposed or inadequately diffused artificial light, or reflection of light from polished surfaces and mirrors, and from bright light against dark backgrounds.

(4) *Utilization of reflecting surfaces*—walls, ceilings or reflectors—that do not absorb appreciable amounts of light, and are sufficiently matte or textured to scatter or diffuse light.

(5) *Daylight quality*—white light. Reflecting surfaces for artificial illumination favoring white or blue-white to minimize the fatiguing yellow of tungsten lamps. Opal glass diffusers or blued filter lenses are sometimes recommended.

(6) *Intensity of light* varying according to the object to be seen. Dark surfaces, reflecting less light, require more light to be seen. Light useful in seeing is that reflected from an object and not that falling upon it.

TANGIBLE RESULTS OF PROPER ILLUMINATION

(1) Elimination of eye strain.
(2) Elimination of fatigue and nervous tension.
(3) Reduction of accident rate.
(4) Improved morale.
(5) Increased efficiency of personnel.

Rotan

FACTORS IN GOOD SEEING

From the standpoint of adequate and suitable illumination, and the relationship between primary and secondary light sources—that is, between daylight or artificial light and reflecting surfaces of the right finish and a suitable color—paint becomes a salient factor. The decorative and psychological aspects of illumination calling for a specialized use of color are augmented by an increasing demand for radically improved seeing conditions—which is a threefold problem involving:

(1) The utilization and control of daylight from windows.

(2) The utilization and control of artificial lighting.

(3) The utilization of secondary sources—walls and ceilings with high reflection coefficients, to refine and distribute light.

MEASUREMENTS OF LIGHT

In utilizing and controlling light, we are aided in determinations of light intensity and quality by several contributions of science.

The *foot-candle or sight meter,* an instrument which enables us to measure, on a given plane, the quantity of direct light or light reflected by painted surfaces.

The *photo-electric recording spectro-photometer,* developed by Professor Hardy of M. I. T. This instrument measures the physical properties of a material which when illuminated gives rise to a sensation of color. It also measures the relative amounts of all wave lengths of light reflected from variously colored surfaces.

Finally, the *photometer and reflectometer,* which measures the reflection values of surfaces under different light sources and painted with different colors.

Left: Office of Nathan Horwitt, head of Design Engineers, Inc., New York City. Ceiling and upper walls are painted white for light reflection.

Right: Apartment of P. Immo Gulden, New York City, designed by William Muschenheim, architect. Color scheme: gray ceiling; white walls; blue radiator inclosure; dark blue curtains; black, blue and gray carpet.

F. S. Lincoln

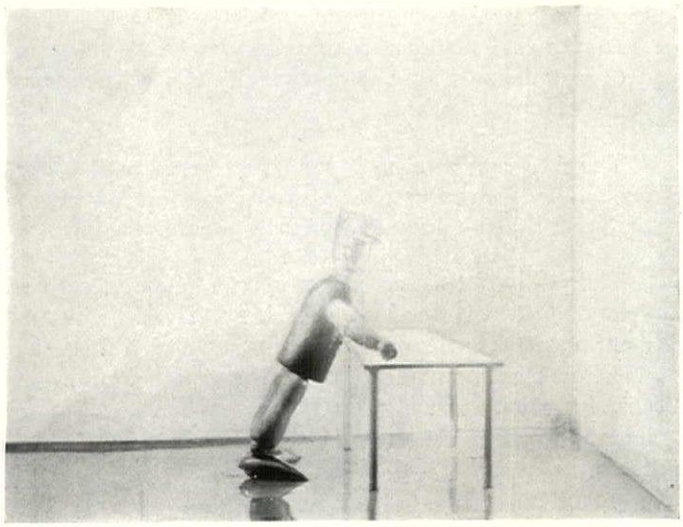


Figure 1

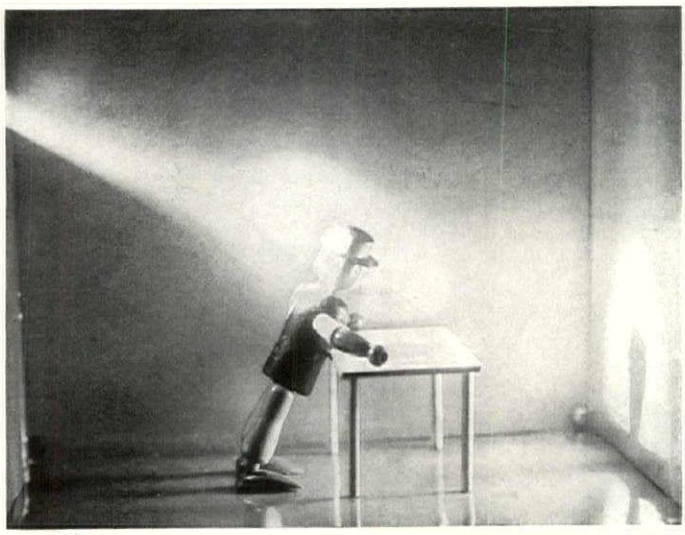


Figure 2

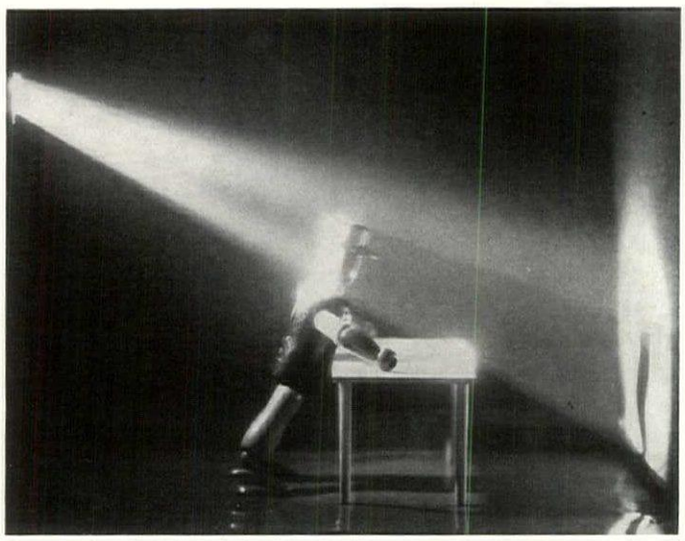


Figure 3

Figures 1, 2 and 3 illustrate the relationship between light sources and reflecting surfaces. Where good seeing is the objective, complete diffusion of light over the working plane is essential. In attempting to give depth or character to a design too much diffusing light may have a flattening effect. (Fig. 1) White paint on walls and ceiling affords a high degree of reflection and diffusion of light. (Fig. 2) Metallic paint, because of its lower reflection value, diffuses less light, resulting in sharper contrasts and shadows. (Fig. 3) The identical room painted black results in a searchlight effect and glare from the light source against the dark background.

PAINT A PARTNER IN ILLUMINATION

The relationship between light sources and reflecting surfaces is very close. One aspect of it can be shown graphically by three miniature rooms constructed and photographed in the laboratories of the Sherwin-Williams Co. In each case the light source was identical, and the conditions were the same save for the color of paint applied.

Fig. 1: The interior was painted white. The resulting high degree of reflection and diffusion or scattering of light eliminates all glare spots and shadows, and the luminous flux or brightness is high for all parts of the room.

Fig. 2: Metallic paint was applied. Owing to greater specular reflection, there is a drop in luminous flux. Glare spots appear. The source of light becomes more apparent, and a shadow is cast from the robot.

Fig. 3: The same room painted black. The light absorbing and low reflecting powers of black reduce the luminous flux to a minimum for the light source used. A searchlight effect results, and glare from the contrast of light and dark, together with the shadows cast from the robot combine to afford a virtually impossible seeing condition.

CONTROLLING ELEMENTS

Given a suitable light source, it is apparent:

(1) The quantity of good, usable light is directly proportional to the reflection values of surrounding surfaces.

(2) The quality of illumination is dependent upon the nature of the reflecting surfaces and the color.

REFLECTION VALUES OF PAINT

Considering the above two factors in order: The reflection values of paint colors become a prime consideration in developing color schemes in any room where good visibility is important. A balance between high and low reflecting paints must be established where color is to play a decorative rôle, and preference should be given to paints with high coefficients of reflection for upper walls and ceilings.

The reflection values for different colors in paint, based upon a comparison with magnesium oxide (not a paint pigment) as the standard of reflection at 98 per cent, are:

The following table* shows paint colors and the amount of light they reflect:

White	84%
Cream	70.4
Light Pink	69.4
Ivory	64.3
Yellow	60.5
Flesh	56.
Buff	55.4
Light Green	54.1
Light Gray	53.6
Light Blue	45.5
Sage Green	41.
Aluminum Gray	41.9
Brown	23.6
Dark Red	14.4
Dark Green	9.8
Dark Blue	9.3
Black	10.

*Readings made by the Munsell Color Co., Inc., for the New Jersey Zinc Co.

MEASUREMENT OF QUALITY

By means of a foot-candle or sight meter we can obtain a direct reading of actual light values in any part of a room, as effected by the color of paint on wall and ceiling surfaces. The unit of measurement is the foot-candle—defined as the amount of light resulting from a candle flame one foot in any direction from the light source. An average of one foot-candle of light on a surface one foot square constitutes one lumen, and is referred to as the luminous flux.

Figures 4, 5, and 6 are identical miniature rooms designed to illustrate the increase in luminous flux in terms of foot-candles where the light source remains constant and room surfaces alone differ. Figure 4 represents an unpainted room, and only one foot-candle is recorded by the sight meter. Figure 5 is a poorly painted room, and dirt has reduced the reflection value of the paint; a reading of but 4 foot-candles results. Figure 6 is painted with a white paint having a high coefficient of reflection; the foot-candle meter jumps to 22½. In the industrial field practical determinations in the reduction of lighting costs and improvement in the intensity or quantity of light have been made by similar tests and with overwhelming evidence in favor of paints with high reflection values.

A range up to 22½ foot-candles of light from an artificial source is normally ample for most seeing conditions.

General illumination should range from 4 to 12 foot-candles, according to conditions or effect desired. The lower levels are favored for corridors, lounge rooms, auditoriums, hospital lobbies, hotel dining rooms, etc.; higher levels for kitchens, reading and writing rooms. Close work in offices, prolonged and more difficult reading and other special visual tasks require 18 to 30 foot-candles. Inasmuch as the eyes see by reflected light and not by light falling upon an object, darker objects require higher light intensities to give clear definition. With higher intensities of artificial lighting it becomes increasingly important to shield the light source and thoroughly diffuse the light.

Inasmuch as the eyes see an object by light reflected from it and not by the light falling upon it, the foot-candle meter should be made to read higher where dark objects are to be seen. Clear definition requires increased illumination.

QUALITY OF LIGHT

The second important consideration—quality of light—involves:

(1) Types of reflection from surfaces—specular, spread, and diffuse.

(2) Color, in obtaining artistically or psychologically desirable effects or suitable illumination.

TYPES OF REFLECTION

Specular reflection results from light rays striking a high gloss paint, or from polished metal surfaces, glass top desks, and mirrors. This type of reflection causes annoying glare if in the field of vision, and should be avoided from the standpoint of good seeing. Gloss paint applied to a finely textured surface tends toward spread or diffuse reflection, and is therefore less glaring.

If the light source is of the concealed type and provided with a diffusing glass or, where exposed,

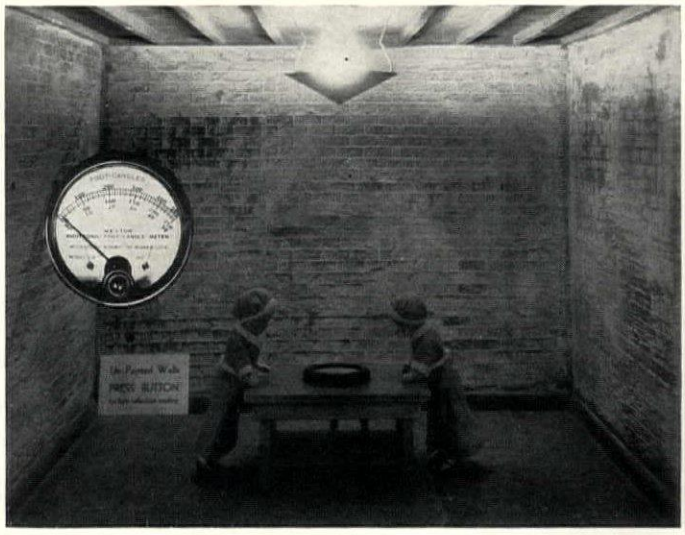


Figure 4

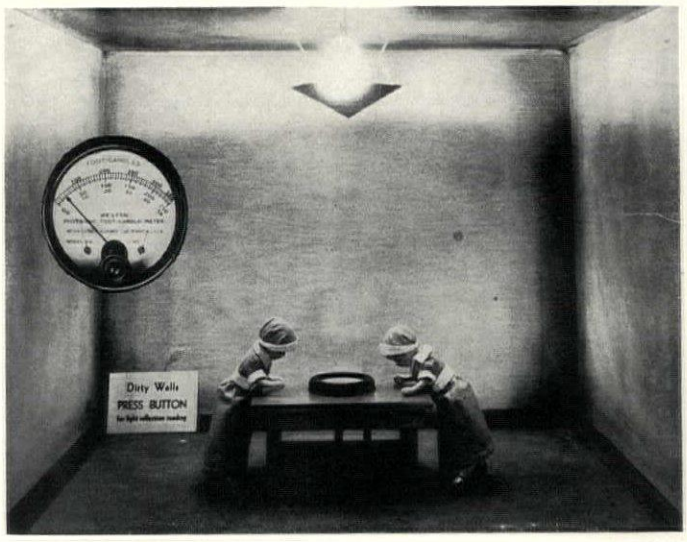


Figure 5

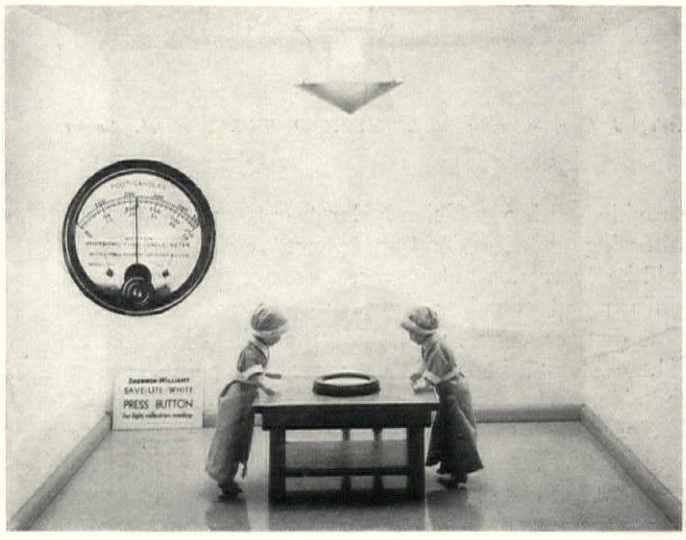
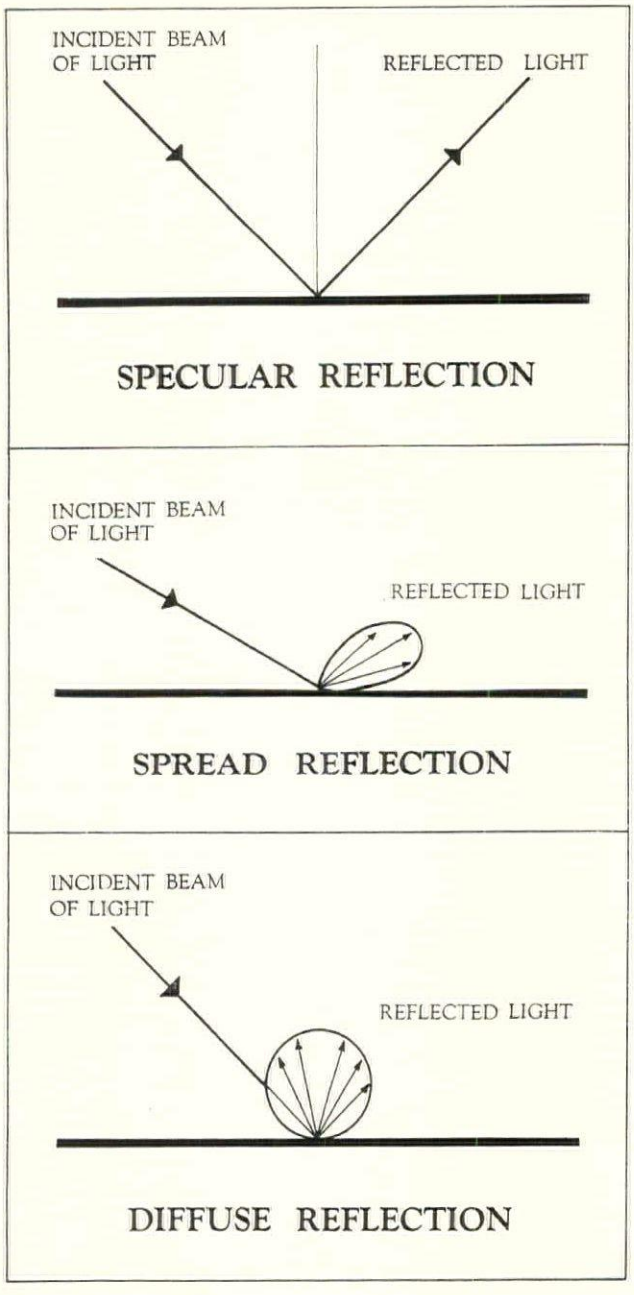


Figure 6

Figures 4, 5 and 6 show the relative reflection values of white painted surfaces and other finishes. Three miniature rooms, identical except for the wall and ceiling surfaces, were given a Sight-Meter test by the Sherwin-Williams Company laboratory. Figure 4 is an unpainted brick wall. The Sight-Meter registered only one foot-candle. In Figure 5 the room is painted, but dirty and dingy. The Sight-Meter showed but 4 foot-candles. In Figure 6 the room was painted white. The foot-candle meter jumped to 22½, though the light source remained the same.



Adapted from diagrams in LIGHT AND WORK, by M. Luckiesh

provided with a sufficiently large opal or other type of diffusing globe, serious annoyance from gloss finishes will be overcome. However, there are types of slightly diffusing gloss paints and semi-gloss paints that combine dirt resistance, washability and diffusing qualities. These should be used wherever flat paints are not suitable.

Spread reflection is the type usually resulting from spun metallic surfaces and metallic paints. The ray of incident light striking the many polished edges or particles is reflected in one general direction but not in an exact line as in the case of specular reflection. This type of reflection is not especially annoying except where the light source is of high intensity and the reflection is cast in the field of vision. This may be controlled by suitable placement of artificial light sources, but the problem becomes more complicated with respect to daylight.

Diffuse reflection is by far the most desirable type from the standpoint of good seeing. Matte or flat and textured surfaces break up light rays, scattering them in different cross directions instead of in parallel or radiating lines. The resulting diffusion avoids harsh glare spots and shadows, and gives a more even distribution of light.

Complete diffusion would require a perfect reflecting surface of a diffusing type. For offices, stores, schools, and practically every type of industrial work, the degree of diffusion afforded by white or light colored ceilings and upper walls is a distinct asset in increasing the efficiency of individuals and in reducing eye fatigue. Objects or areas upon which the eye will be focused over a period of time should always be painted colors sufficiently off white to be restful, however.

Too complete a diffusion of light, especially where indirect luminaries are used against a low relief design on a ceiling sometimes results in a flattening effect undesirable from an architectural standpoint. Where the desire is to give accent or form to architectural details, it may be advantageous to adopt cornice or other types of lights obscured from the field of vision and of sufficient intensity to give depth. The lighter painted area can be planned to direct the greatest volume of light to the decorative objects or areas. Different shades of color may also be used effectively in giving accent or depth to relief designs.

RELATION TO INDIRECT ILLUMINATION

Frequently, as in offices and department stores and the like, the principal objective is to obtain abundant diffused light over the floor areas and to hold peoples' attention there.

Figures 7 and 8 illustrate by contrast how this may be effectively accomplished by substituting indirect luminaries placed above the eye level behind counters and on center cabinets. Stippled, convex glass cover plates placed over the light sources eliminate ceiling striations. The ceiling illustrated is painted white, the columns buff, and the floor a gray marble. Indirect illumination is dependent entirely upon the reflection values of white or light tints of paints on the upper walls and ceiling.

The distinct advantages in a department store resulting from the adoption of indirect illumination, supplemented by white paint, are:

(1) Customers' attention is taken from the ceiling lights and directed to the well-lighted counters displaying merchandise.

(2) The brighter interior has the psychological effect of creating a cheerful state of mind conducive of increased buying.

(3) Better illumination is obtained without added lighting load.

(4) A more inviting atmosphere results from the improved appearance.

In schoolrooms, the abundant diffusion of light has been proven to increase the alertness of pupils, and definitely to increase the number eligible for promotion, making it a particularly important consideration and a real economy.

FUNCTIONS OF COLOR

"In the visible spectrum, one of the most striking phenomena is that of selective absorption, together with its concomitant phenomena of selective reflection and

Photographs courtesy Nela Park Engineering Dept., General Electric Co.

7

8

Figures 7 and 8 illustrate a practical demonstration of the relationship of paint and light. Indirect and semi-indirect illumination are especially dependent upon the light reflection values of white paint. Figure 7 shows the Gimbel Department Store before adopting indirect illumination supplemented by white painted ceilings. Figure 8 shows the same floor area using indirect luminaries placed above eye level behind counters.

selective transmission. To these are due all color effects in opaque and translucent bodies."*

Our present knowledge of colors, combinations and effects, opens up vast possibilities for their use to good advantage and with consideration to daylight and artificial illumination.

Any treatment of illumination or decoration must give consideration to the emotional qualities and decorative aspects of colors as well as reflection values. This can be accomplished without serious sacrifice of any one desirable quality. Generally speaking, lower levels of illumination and colors of a more subdued, neutral or restful sort should be used in lounge rooms, lobbies, theaters and other places designed for relaxation. Brighter illumination and more stimulating colors should naturally be favored where the objective is to inspire activity or an active state of mind.

This selection of suitable colors is of extreme importance. In hospitals, convalescence may be speeded by the emotional state created by one color scheme, or retarded by another. Ceilings are of especial importance. In the operating room where eyes are strained, white is considered objectionable; straw color or soft greens are usually recommended.

In offices, in stores, schools, hotel lobbies, and certain types of dining rooms where the aim is to create animation, brighter colors and illumination are of definite value.

CONSIDERATIONS

Inasmuch as the emotional responses usually associated with given colors may be radically altered in particular applications, consideration must be given to:

(1) The color scheme or treatment.
(2) The design employed.
(3) The light source.

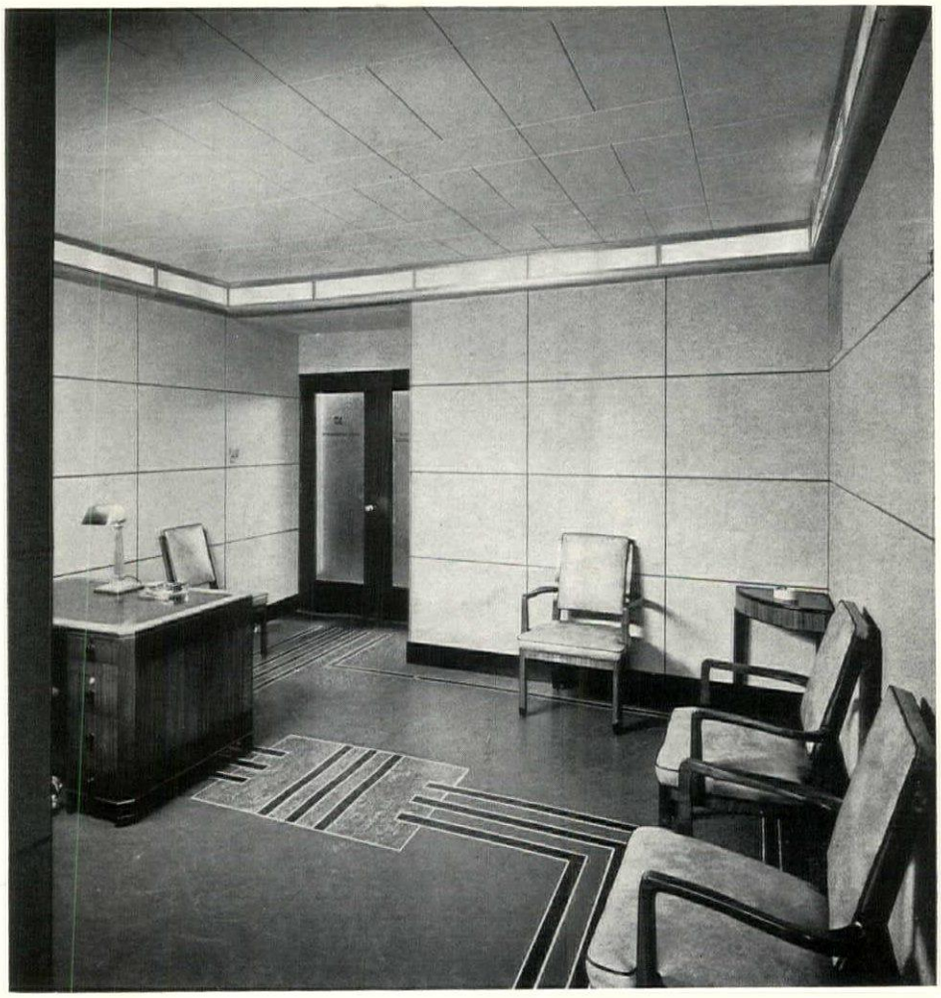
Black, usually classified as depressing and heavy, may assume life and snap with but slight relief from bright colors or designs that lend motion. Brilliant or subdued illumination will also alter the atmosphere considerably, irrespective of other factors.

LIGHT AND COLOR

In specifying colors consideration must always be given to the type of artificial light to be used and to the effect of both day and artificial light on the shade of color. Certain shades of blue and green become almost indistinguishable under the tungsten illumination. Reds, oranges, yellows, and browns tend to become richer. Blue becomes darker under artificial lighting, and appreciably brighter and a really pure color under daylight. Fabric colors are especially susceptible to the color values of different light sources, and may effect the entire color scheme. Colors for a room should therefore be picked with respect to day or night occupancy, or the effect of either type of light on the colors for day and night.

If a colored surface is flooded with intense light as from spotlights or indirect luminaries, a paling or flattening effect will be produced. This condition can be avoided by directing the light against white or tinted surfaces, or by diffusing the light at the source by means of opal or other types of diffusing glass.

*"Modern Lighting"—Radiation & Color by Caldwell.



Reception room of the Johns-Manville Corporation, New York City, designed by Shreve, Lamb and Harmon, architects. Acoustic tile ceiling finished in baked enamel for light reflection.

COLOR AND LIGHT

The use of reflectors or shades that favor a white or blue-white reflecting surface will facilitate simulating daylight quality.

When indirect or semi-indirect illumination is to be used and the light intensity must be sufficient for good seeing conditions, white or light tints should predominate the color scheme—especially on upper walls and ceilings. Daylight received from limited window sources is also dependent upon paint surfaces of high reflection values.

Perhaps it is because of long association with the fireplace, and the warm red-yellow of candle flames that the natural yellow of tungsten lamps is so accepted and the natural yellow is often increased by the use of yellow, brown, or red shades or painted reflecting areas. From the standpoint of seeing, especially for reading, or performing other close visual tasks the light resulting from lamps so treated is both harmful and fatiguing to the eyes.

In this respect we may expect to find increased attention being paid to the quality of light from artificial sources, and reflected from paint surfaces—for paint surfaces reflect their own color predominantly. Artificial daylighting on a large scale is not entirely practical from the standpoint of initial and operating cost. The only really satisfactory daylight quality obtained by artificial methods at the present time is by using lenses over tungsten lamps which whiten the light by selective transmission. These should be of the power of Corning and Macbeth lenses to produce a light quality closely simulating daylight.

BALANCE IN COLORS

Balance between areas giving light reflection and those lending color is important. The proportion of each must be governed to suit the mood of the occupant and with respect to activities in a particular room.

"STREAMLINED" COLORS

A particularly successful treatment of color in relation to light is the color scheme recently developed in the color studios of The Sherwin-Williams Co. and being carried out in the new streamlined trains of the New York, New Haven & Hartford Railroad. Indirect illumination is used. The ceiling proper of the car and the sloping cornices are painted white or just off white to reflect as much of the light as possible, downward and over the chairs. A very soft pastel shade of the color selected for the car is then carried from the cornice to the window heads. This very light shade overcomes the absorption of the light by upper areas and avoids the flat effect common to dark colors receiving strong illumination.

Windows are brought together by a color band of a deeper, restful, and lower reflecting shade of the theme color. Frames and mullions are painted the same color. Below the sills, the pure color selected is applied, which gives strength and definiteness. The chairs and floors are done in harmonizing shades. The use of pastel shades on upper portions gives brightness and cheerfulness, and the color innovation marks a happy departure from the drab and depressing interiors so frequently associated with railway cars.