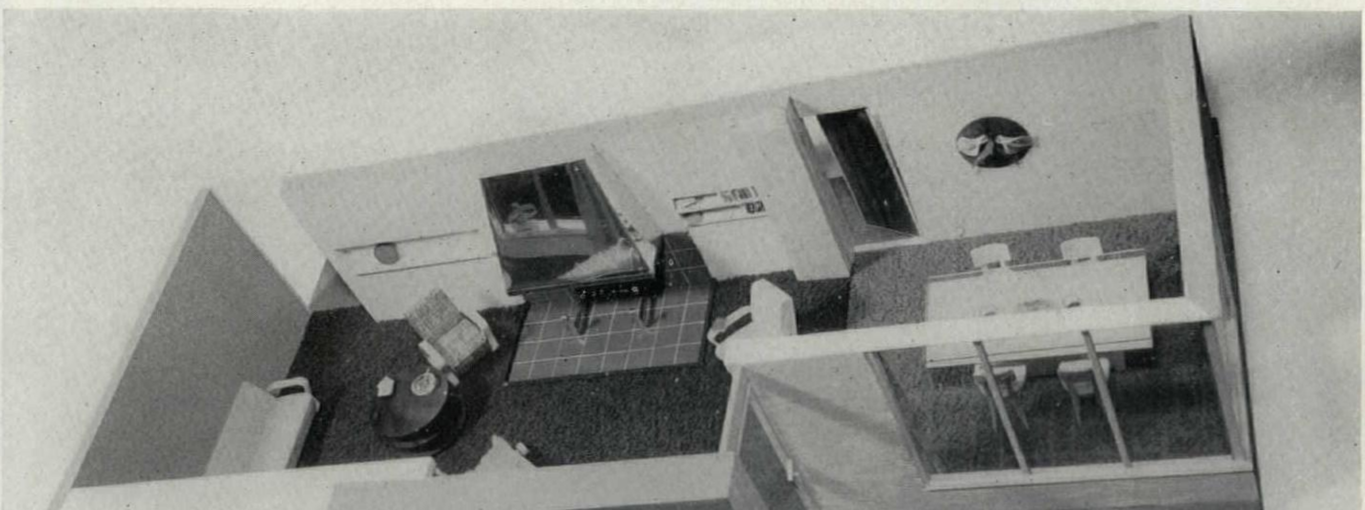
PENCIL POINTS

JVLY
1939

Interest among Architects in studying their designs in three dimensions, by means of scale models, has grown so in the last few years that many architectural schools now include training in model making as a part of their curricula. These models are regarded as a means to an end, not as an end in themselves; since the object is to turn out well-equipped designers, not model craftsmen. The models shown here and overleaf were made at M.I.T. The study at 1" scale of a proposed exhibit at the New York World's Fair is by W. E. Haible, an M.I.T. student, and the three views of a living room at ½" scale illustrate the work of S. L. MacDonald, a fifth year student at M.I.T. The furniture is of balsa wood, covered with samples of the textiles chosen for the full size execution, and the draperies are of painted paper. Note the ash tray represented by a glass button and the fireplace hood of sheet aluminum. The photographs are by Gardner Murray, Boston photographer



DETAIL OF A MODEL MADE BY S. L. MacDONALD OF M.I.T. (SEE ALSO PAGE 405)

ARCHITECTURAL MODELS

BY KENNETH REID

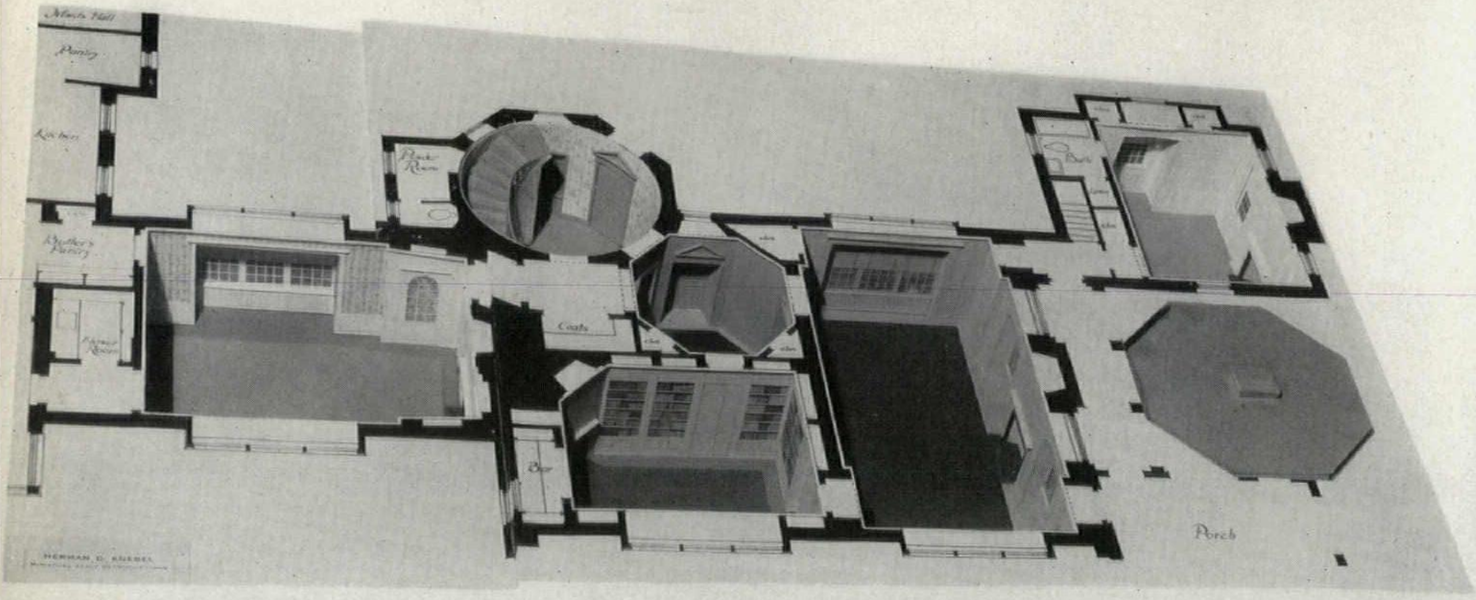
THE increasing utility of architectural scale models for both study and presentation of design is a matter about which there can be little debate. Particularly since the development of the newer and less familiar contemporary architectural forms has there come about a need for three-dimensional visualization through models. In the older day, when buildings generally conformed more or less to accepted patterns, it was easier to show a design by drawings alone—though even then models were often found useful as a supplementary mode of visual confirmation of the story told by plan, elevation, and perspective. But now, with the freer plan solutions and the resulting combinations of asymmetrically arranged masses that go to make up our modern architecture, the model has really become almost a necessity for both architect and client. Even the architectural schools are installing well-equipped model shops these days and including instruction in making models along with their courses in drawing as comprising an essential part of the equipment of the well-trained designer.

Models fall into three general classifications according to the basic materials from which they are made and the corresponding techniques; those made of clay or plastelline (which may later be cast in plaster), those made of cardboard, and those made of wood. The plastic material lends itself particularly to preliminary study of architectural masses and detail and many architects use this type of model to advantage in the drafting room or in the shop of the professional modeler. Cardboard models are also susceptible of being made with the usual drafting room equipment, perhaps the most important tool being a sharp knife. For this reason we find many offices where at least the simpler kinds of cardboard models are built by the architect or his draftsmen for both study and presentation. More elaborate cardboard models are more safely and economically built by the professional model makers who are to be found in increasing numbers in our larger cities. Models of wood have the advantage of being more durable and the nature of the material permits the expression of some forms denied to cardboard—the warped surfaces and solids curved in both plan and elevation, for example, that occur frequently in modern design. They require more elaborate equipment for building, however—lathes, power saws, sanders, planers, etc.—and for that reason are best made by professional makers, although some of the larger architectural offices have found it worth while to install the necessary machinery and employ specialists to operate them.

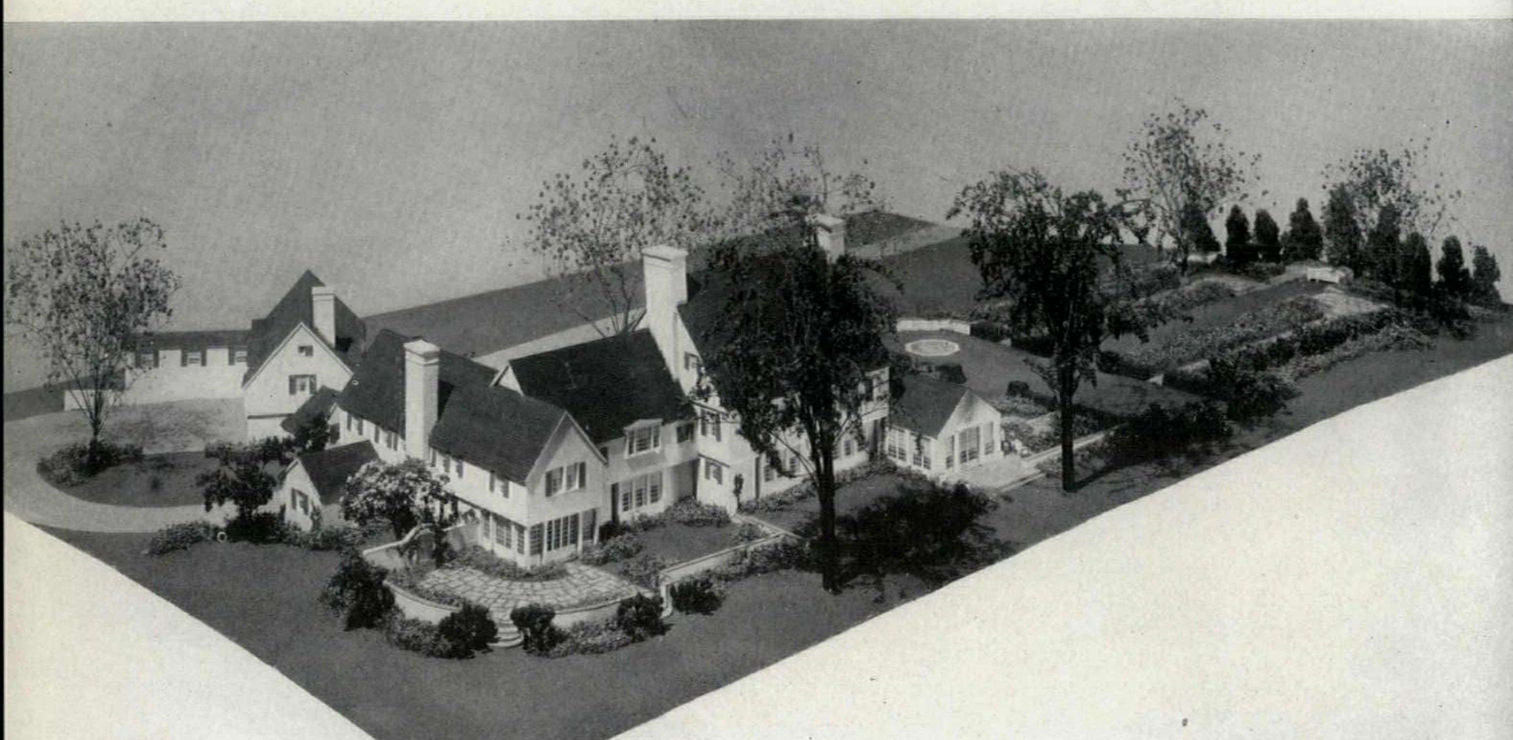
Among the professional model makers there is a natural tendency to specialize in one or the other of these three techniques, making excursions into the other fields occasionally when required. The practitioners of the art of model making are almost invariably good resourceful craftsmen and the ingenuity which they show in finding and adapting accessory materials for various details is amazing.

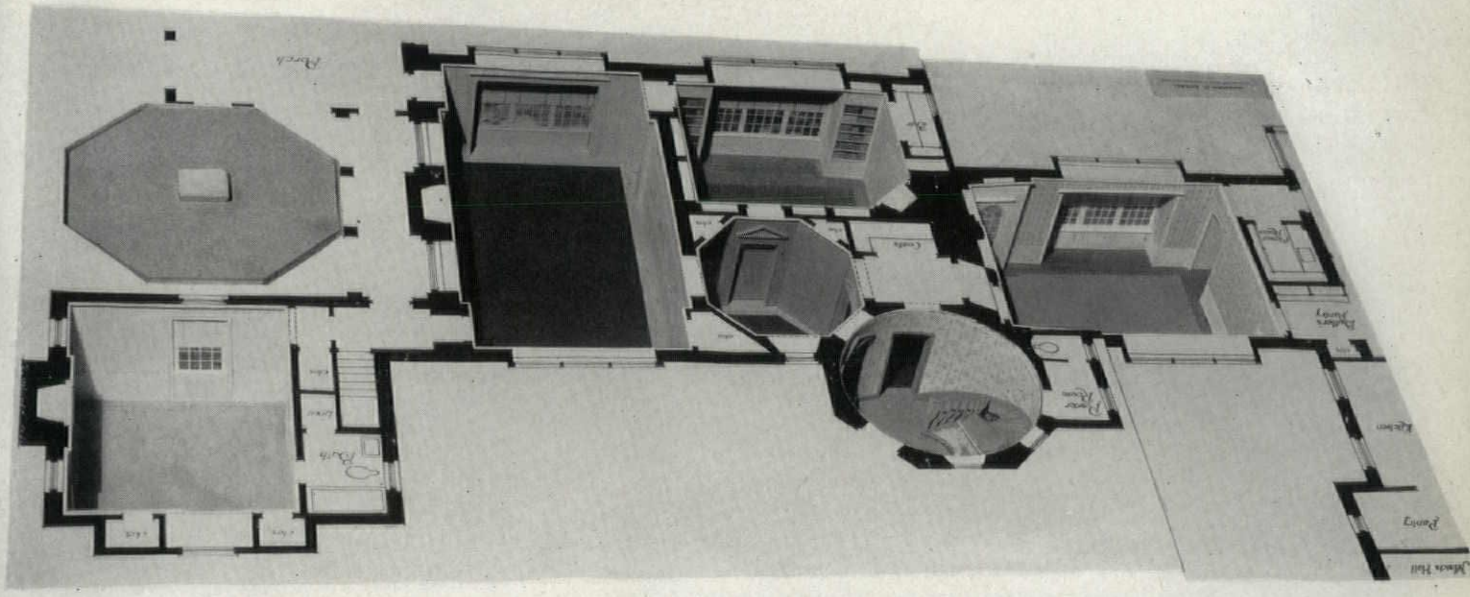
The cost of presentation models varies over a wide range according to how elaborate or simple the requirements are. A model for a small home may cost as little as fifty dollars (possibly less) while for a large complex project the cost may be many hundreds of dollars. Study models, made in the drafting room of clay or cardboard, usually are inexpensive.

In setting out to assemble material on models for publication, the editors approached a large number of architects and model makers in all parts of the country, anticipating that only a fraction of those invited would have photographs and information to contribute. To our surprise and embarrassment nearly everyone responded, with the result that we were deluged with interesting photographs, only a portion of which could possibly be included within the number of pages available. To those whose models are not included here we offer our thanks and regrets for leaving them out this month. As opportunity occurs we expect to present a number of them in later issues with notes on materials and methods used. In the meanwhile it is our hope that the illustrations and text on the following pages will be helpful to many architectural offices.

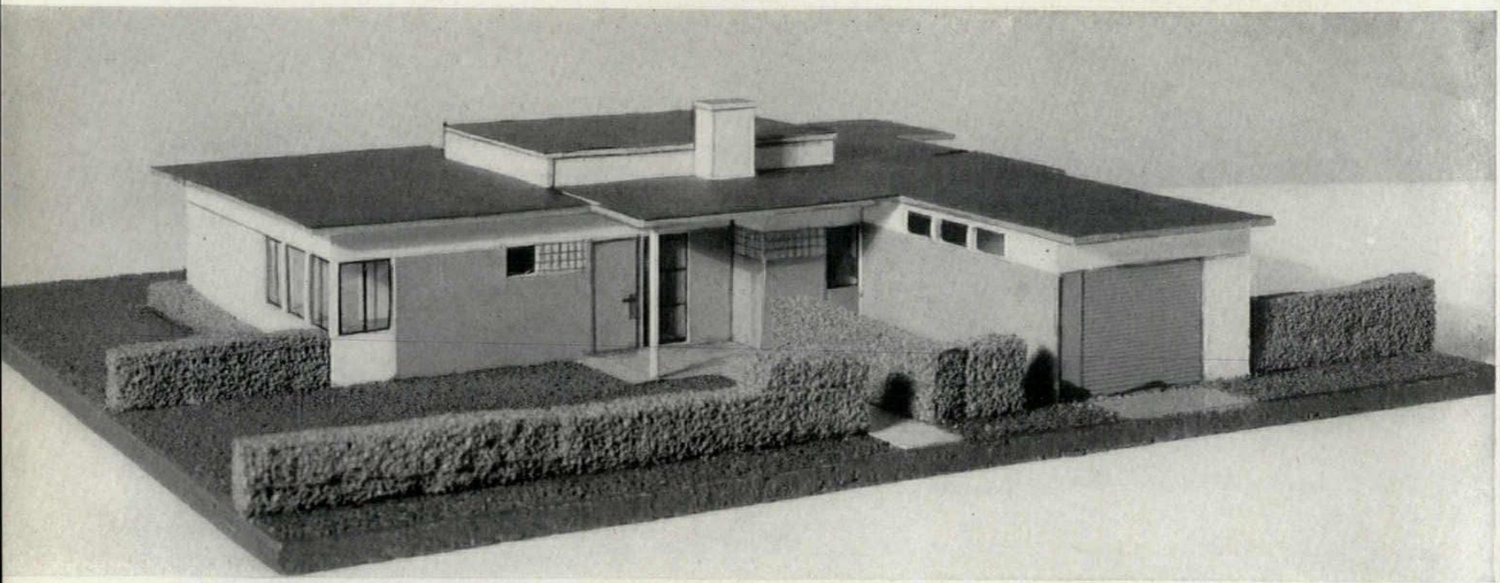


Two models were made by Herman Knebel, of New York, for the Charles D. Upson house at Middlebury, Connecticut, designed by Cameron Clark, New York Architect. One, at 1/8" scale, showed the exterior and treatment of the grounds and the other, at 1/4" scale, was made for the study of interiors of principal rooms and the interior color schemes. For the latter, a wooden box was constructed, its depth equal to the story height, and this was topped with a piece of illustration board upon which the plan of the area under study was drawn. The rooms were then cut through this board, as may be seen in the photograph, and the walls of each room, also of illustration board, were rendered in water color and glued in place. The circular stair is of wood with handrail of pierced cardboard. Sandpaper was used for the rugs. The photographs on both pages are by Louis H. Dreyer, of New York

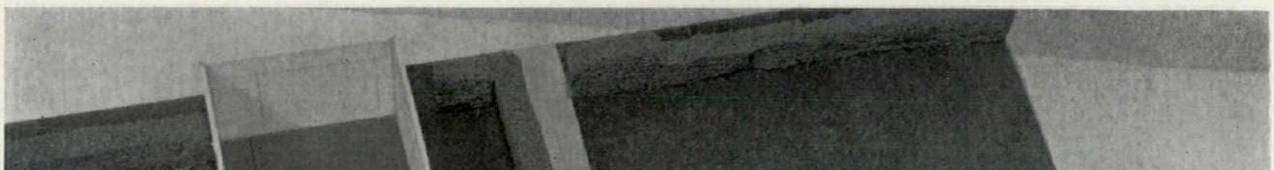




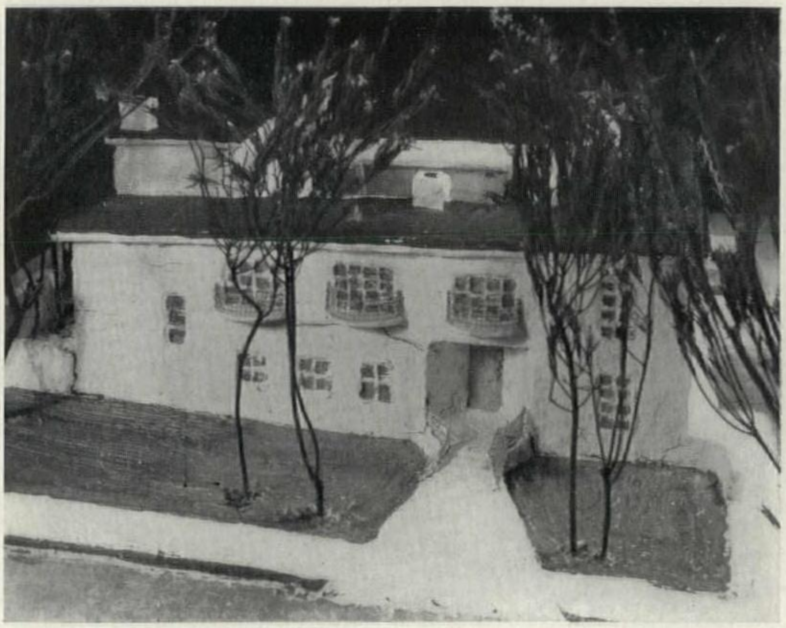
The exterior model of the Upson house was most skilfully made by Herman Knebel. The base was a wood frame shaped to represent the slightly rolling site and covered with a sheet of beaver board. Illustration board was used for the house, each surface cut separately and windows cut from celluloid with muntins ruled on the outer surface with white ink. Shutters of Bristol board were applied on the outside. The walls and chimneys were scribed with horizontal lines to simulate white painted brick. The house, incidentally, was converted from an existing English type, half-timbered house, which explains some of the roof pitches. Trees on the model were made of goldenrod and gypsophila, shrubbery and flowers of carefully selected weeds, hedges of rubber sponge, and upright evergreens of steel wool, shaped to the various typical forms and then textured with farina dusted over glue

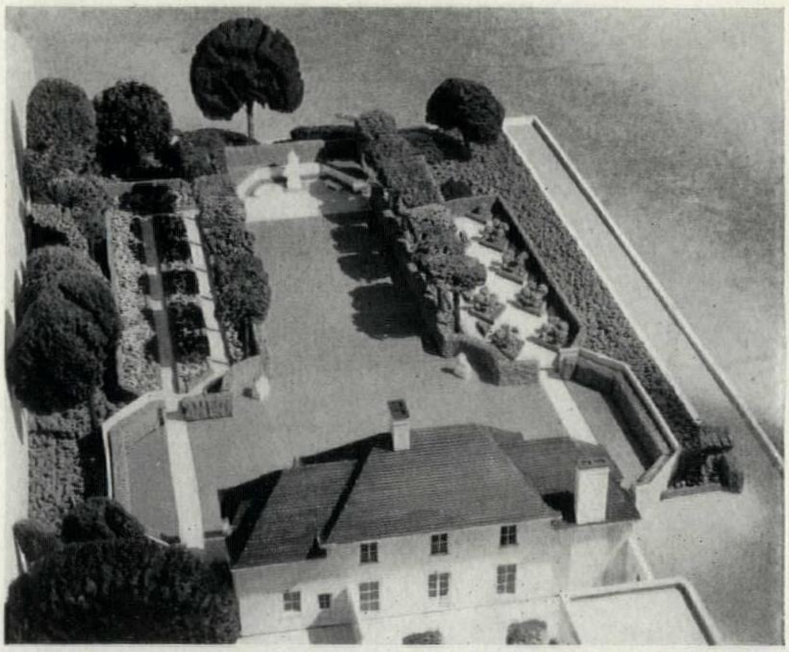


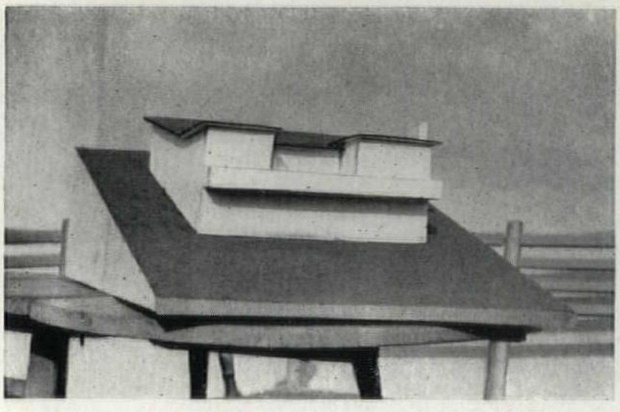
This model made by Saul Edelbaum, New York Architect, who is a partner in the firm of Evans, Moore & Woodbridge, has a removable roof to permit study of the details of the interior. It cost approximately $75. Linoleum was used for the floors, and the walls of illustration board were placed in slots in the floors and secured with rubber cement. Thin wall papers in solid colors were used for color effects and the windows were made of cellophane. The hedge was made of green rubber sponge, and the grass plot of a mixture of sand and green paint. The photographs were taken by Louis H. Dreyer, of New York

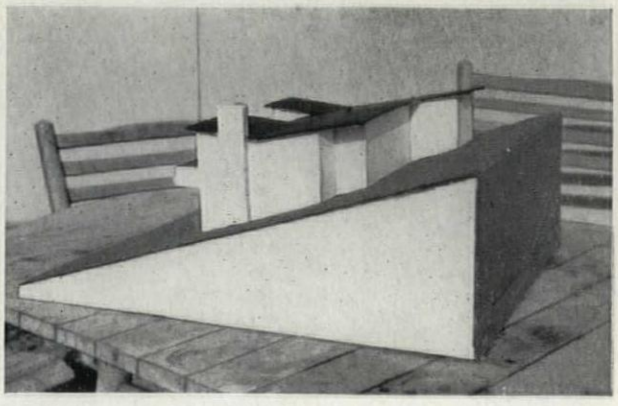


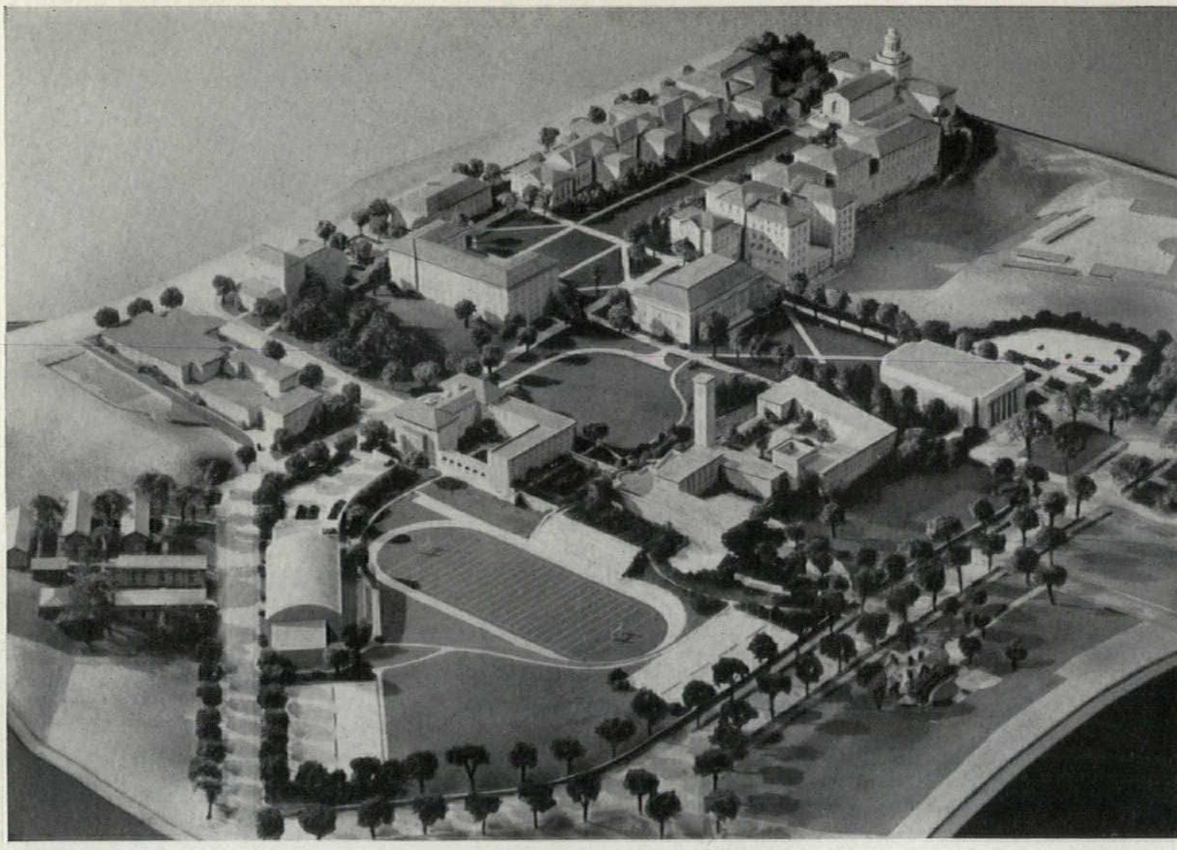
Three models from the office of William Wilson Wurster, Architect, of San Francisco, California, illustrate types useful for different purposes. At the top is a sketch at 1/8" scale, made in the office from laundry soap moulded around a rough frame assembled from odds and ends. The building was painted and the trees added, giving the Gamma Phi Betas at the University of California a quick though crude picture of their proposed new Sorority House. The more finished model represents a house and garden at Burlingame, California. It was made of cardboard, with a wood roof. Trees and planting are of natural and rubber sponge. Landscape Architect Thomas D. Church collaborated. Below are two views of the quickly constructed 1/4" scale cardboard model made to explain an unusual roof arrangement to the client. It shows the masses of a house at Richmond, California, overlooking San Francisco Bay. Since the roof was the subject in question, all openings and detail were omitted. Wurster's office now generally has its models, when needed, made by professional model makers, as being generally more efficient



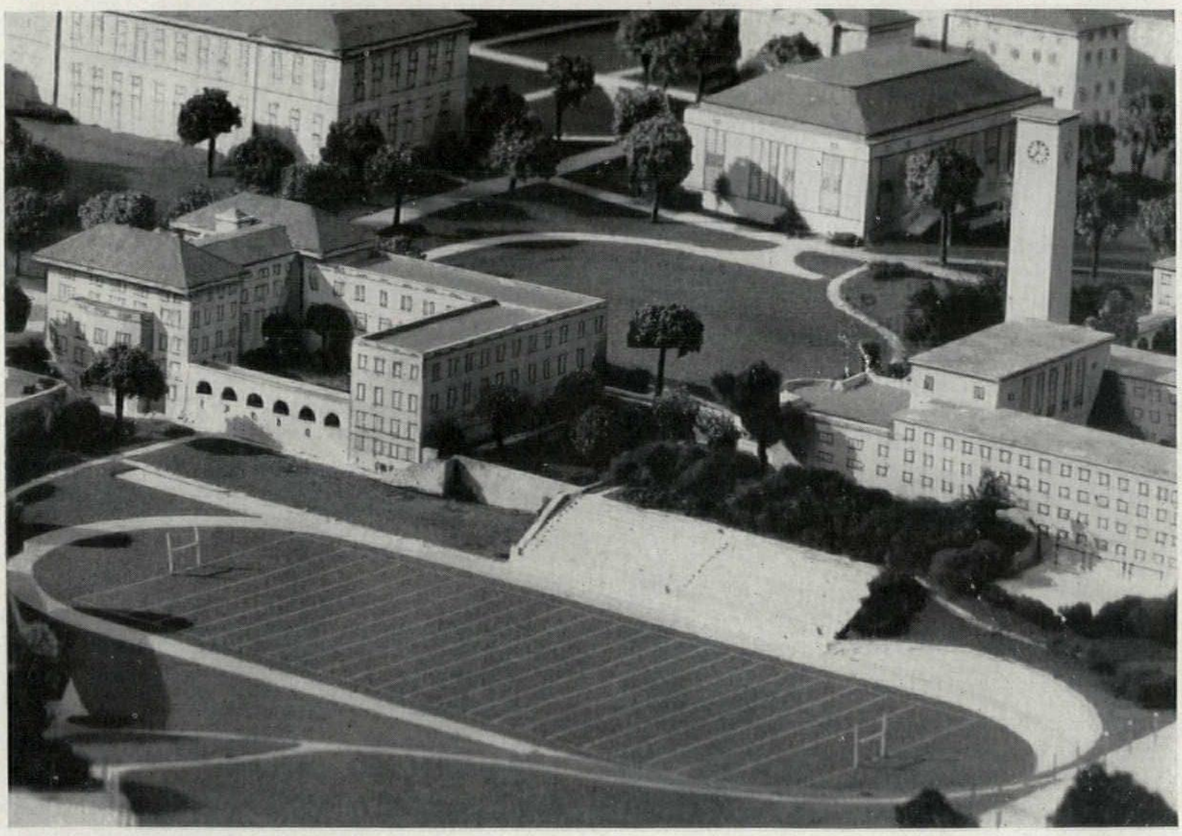








The relation of new campus buildings designed by Githens & Keally, New York Architects, to the existing structures of Carnegie Institute of Technology, is clearly defined by this model made by Edward T. Howes, New York Architect and experienced model maker. The view below shows how casually details of the new buildings being studied were indicated. The photographs were made by Lawrence H. Miller



WORLD'S FAIR MODELS

BY ROBERT I. HOYT

As the work of the Board of Design of the New York World's Fair progressed in the spring of 1936, there developed increasingly a demand for study models. This led to the establishment of a shop where they could be made quickly and cheaply. This shop was equipped with several power tools, a variety of hand tools, and a stock of assorted materials.

The four principal power tools were (1) an eight-inch bench saw, powered with a one-third horse-power motor and equipped with both eight-inch and six-inch crosscut saws and a four-inch dado which could be used for a planer and shaper: (2) a jig-saw with a twenty-four inch arm, able to cut metals, composition materials, and pine up to two-and-one-half inches thick: (3) a wood-turning lathe of 36″ bed and 8″ throw, equipped with several faceplates which made it adaptable for small metal turning, horizontal drilling and routing, and grinding and sharpening by means of a 5″ stone mounted on a work arbour: and (4) a combination belt and disk sander. Jig-saw, lathe, and sander were driven from a countershaft powered by a one-third horse-power motor that came with the saw, thus saving the cost and installation of two other motors. For a permanent shop it would be better, of course, to have each tool mounted on an individual metal stand with an individual motor.

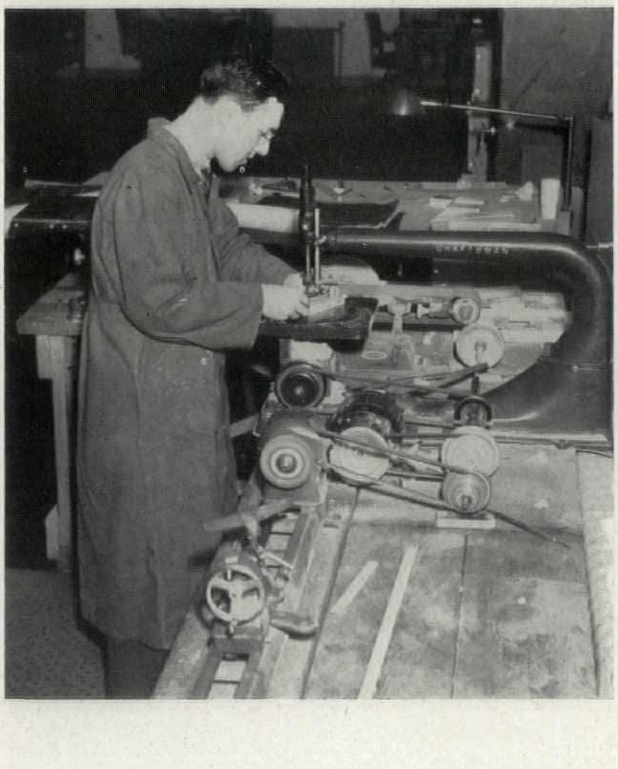
These four machines were mounted on a bench built of 2″ x 10″ planks, set upon sturdily bolted legs of 2″ x 6″. Rubber strips, cut from a heavily moulded stair tread, were tacked over the foot ends of the legs and impregnated felt was put beneath all of the tools before they were bolted down. Additional bracing was put into the bench as vibration points became evident at different machine speeds. These precautions were necessary to keep the noise to a minimum since this shop was in one corner of the drafting room.

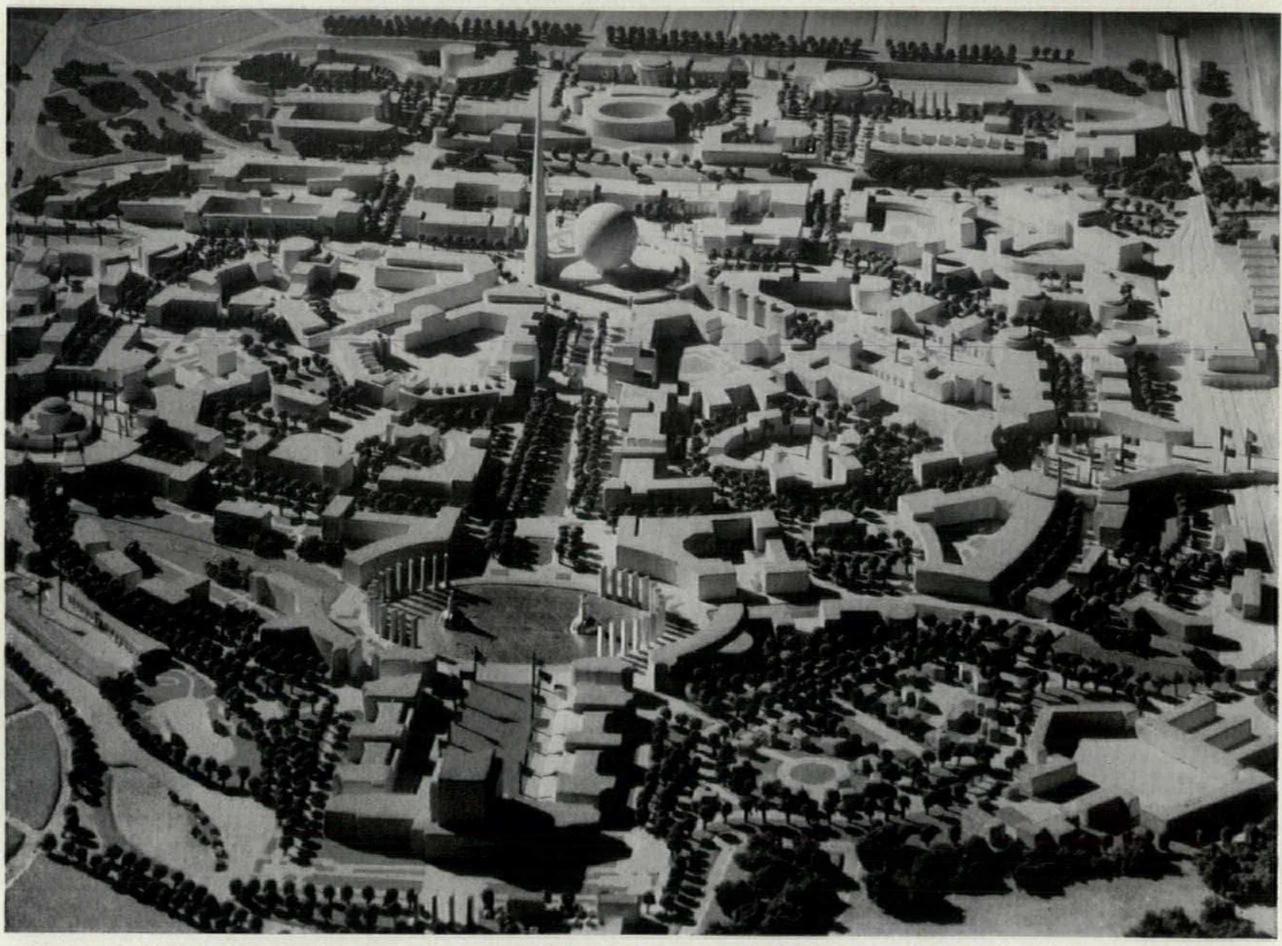
The experience of most professional model makers indicates that models composed of several different materials are likely to warp and crack due to differences in contraction and expansion. For that reason we find them specializing usually in one basic material—cardboard, plaster, wood, and clay or plastelline. Since the demand at the Board of Design, however, was for quick sketch forms, any adaptable material at hand—cardboard, metal, glass, plastics, wood, or compositions—was used as especially suitable for the effect to be produced or simply for convenience.

Among the woods used, whitewood, patternmaker's pine, and basswood were found excellent. They cut and carve easily and may be obtained in fine quality at most lumber supply houses. Balsa wood works quickly and easily and is desirable for certain purposes but it damages readily and, due to its open texture, does not take a good finish. Most supply houses carry *Lata Balsa* in several stock sizes and in the larger cities there are shops equipped to make up panels to order or furnish blocks of almost any size.

It was soon decided that each operator should carry the process of making a model of a building right through from the archi-

The World's Fair Board of Design model shop in use. The lathe-sander-jigsaw setup worked out conveniently



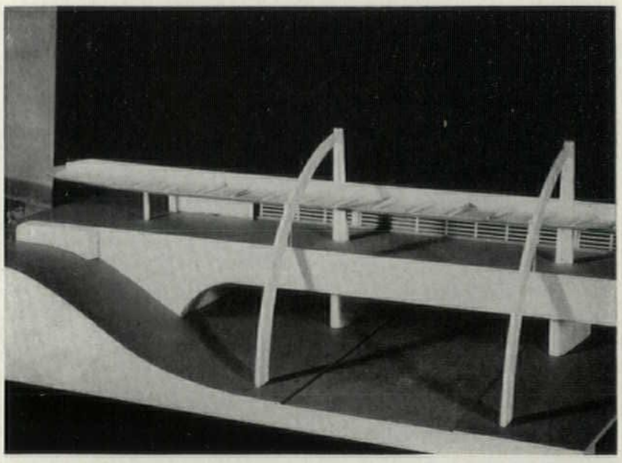


Two views of the model at 200' to the inch. Buildings and topography were cast in one piece in a glue mould made from a plasteline and plaster original. Trees were made with small map pins dipped in mucilage and dusted with ground felt. These were put in place while the plaster was still damp. This model was made from the early Board of Design layout

tect's drawings, making his own model drawing upon which was indicated the manner in which the parts were to be cut and assembled and the material for each part, then going ahead with the model itself. This procedure avoided confusion.

The wood parts were cut on the machines, according to common shop practice, and the parts assembled on the model drawing to check sizes and forms. They were then nailed, pinned, or glued together under clamps. Overhangs and fins were of wood, cardboard, or metal, according to the operator's convenience. Columns, made of dowel or turned pins, were sometimes set in drilled holes, sometimes butt-jointed and glued in place. Other columns, made of metal rod or nails, were set in the building or driven into the model base, their heights adjusted when the building was put in place. On one building the porch roof was slotted into the solid mass of the building and could be removed so that the wall behind the colonnade might be treated with a mural design.

The first model made was at 200′ to the inch, showing the fair site and its surrounding properties. It was made to present the plan scheme to the Board of Directors and five copies were later made and equipped with glass



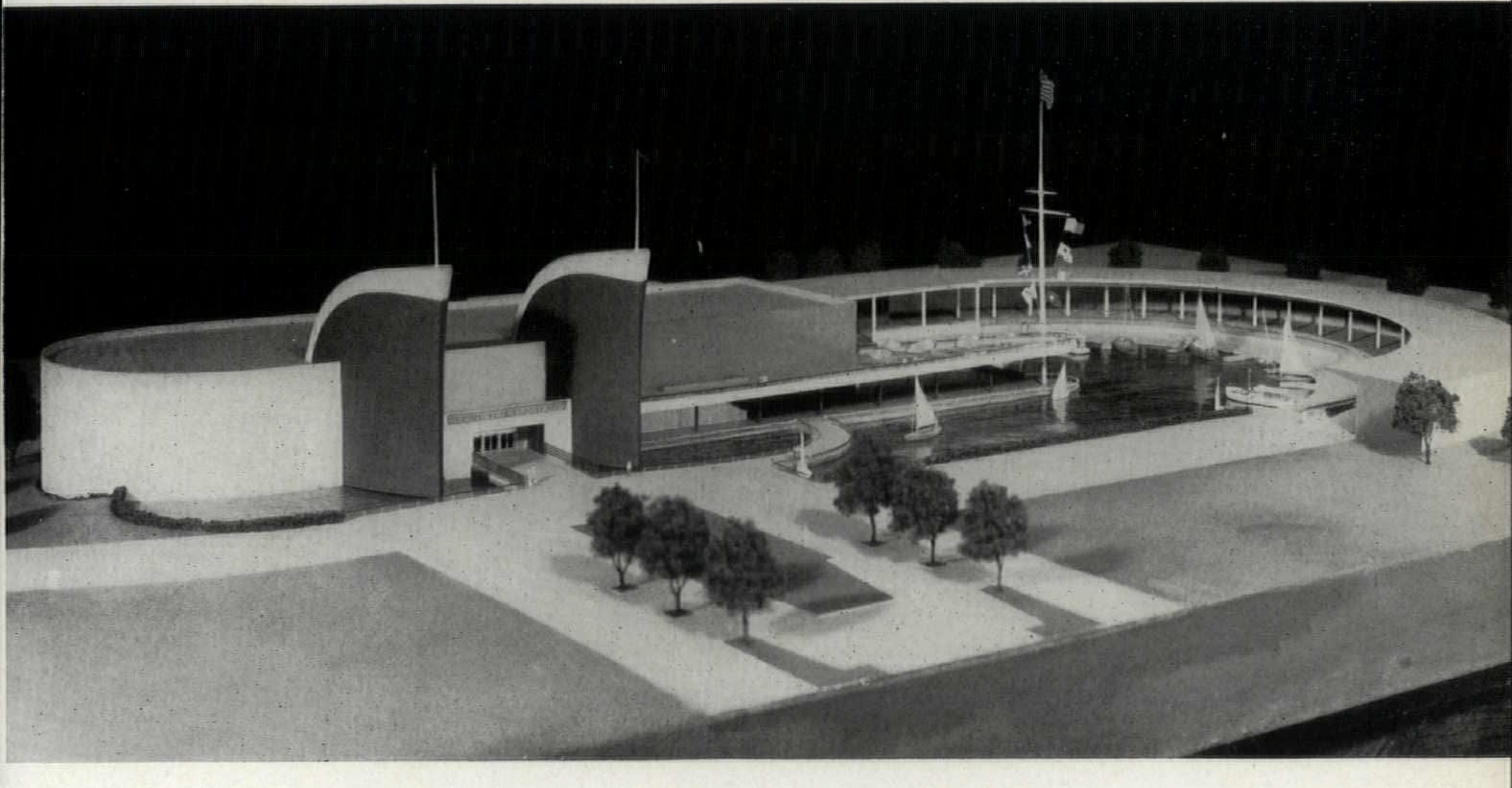
A sketch model in wood and cardboard at quarter-inch scale made to study a proposed design for one of the several bridges linking various parts of the grounds

cases to be sent around the country for exhibition and publicity purposes.

A design progress model soon became necessary and this was started at 50′ to the inch. This model was at first moved from the shop to the meeting room on meeting days but was later attached to one of the meeting room walls. It was also used to study juxtaposition of color and form.

The base of the fifty scale model had to be of a flexible material, for certain portions of the plan were to be rather completely developed while the topography of other parts had not yet been determined. It was necessary also that the model be easily movable as above

A precise, finished model of the Marine Building, at 1/16″ scale, made almost entirely of cardboard, even the base! This shows the complete building as designed. Only the main portion, however, was built at the Fair



noted. Plasteline was too heavy and easily damaged; cardboard laminations would be much too inflexible; and plaster was ruled out for all of these reasons. It was not until balsa wood was considered that a satisfactory solution was found. With a normal variation in grade of not more than twenty-five feet, a half inch thickness of the material would be of sufficient depth, at fifty scale. This was cold-water-glued in six-inch boards to the battened model bases. Thus, establishing a zero datum at sea-level or the glued side of the balsa, the top surface would be at elevation twenty-five.

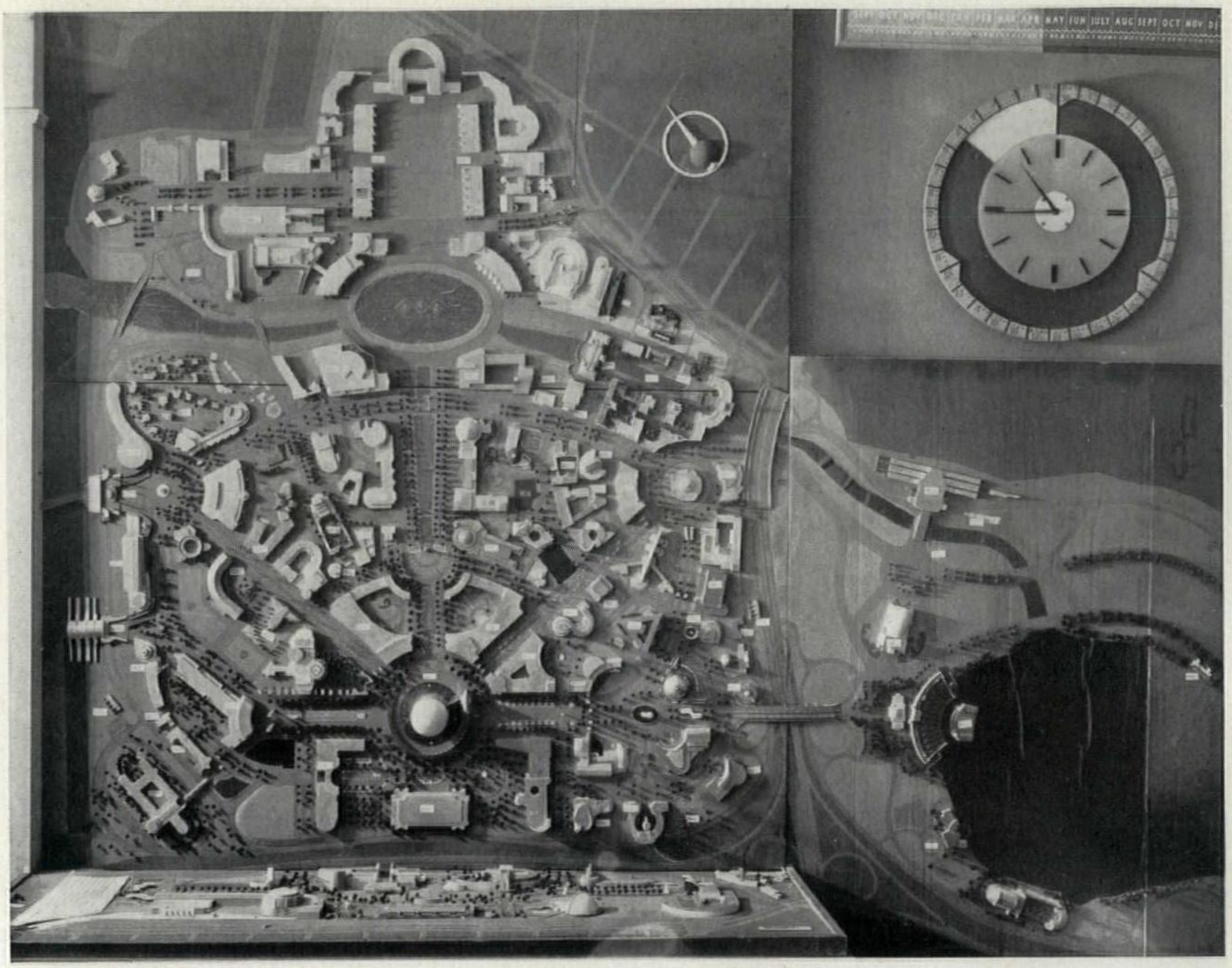
The road alignments were drawn on the balsa surface and the carving started with a vertical knife-cut along these lines. The balsa was cut out with a sidewise movement of a sharp, but slightly burred chisel. The balsa cut readily, but its tender fibers were easily damaged by a dull cutting edge. The roads were cut to the proper elevations and grades, measurements being taken with the aid of a tick-strip on the vertical knife cuts at the outline of the roads, measuring down, of course, from elevation twenty-five. The lots were

Here and on the opposite page are several views of the progress model made at 50′ to the inch. Above, it is seen in an early stage with the roads cut to grade, some of the rough balsa forms in place, and some of the more accurate whitewood or pine buildings. A few are painted, either white or in their determined colors. Opposite, the almost complete model appears in an advanced stage, applied to the wall of the meeting room with the transportation section projecting out horizontally. A closeup shows several sketch buildings in place on the base

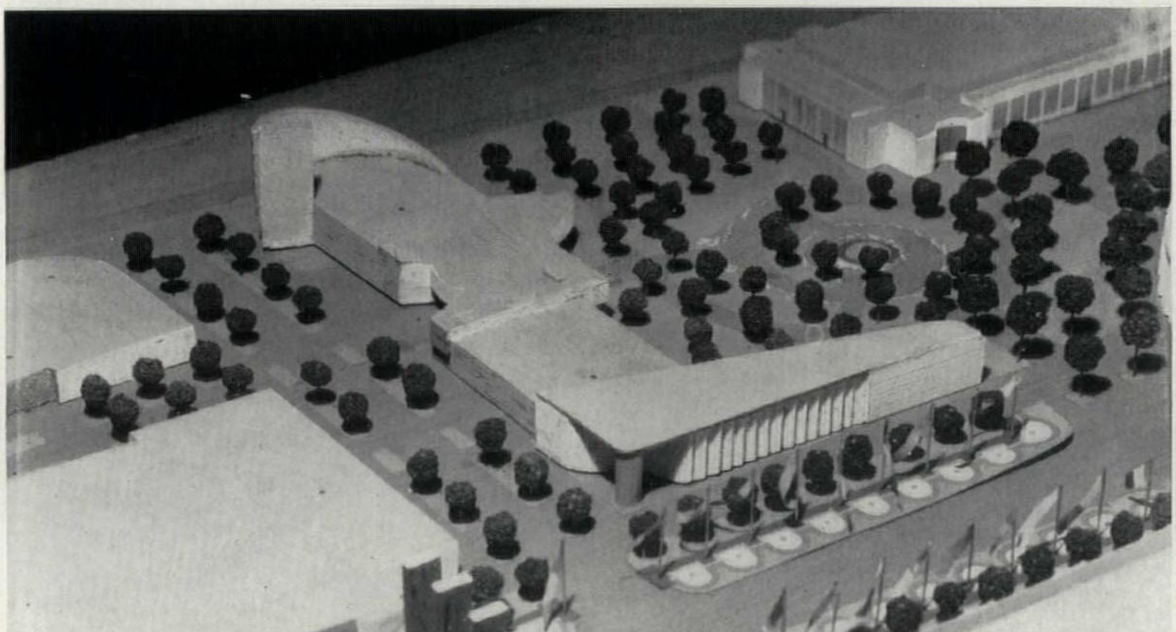
then easily graded to the roads, reference always being from topographical drawings.

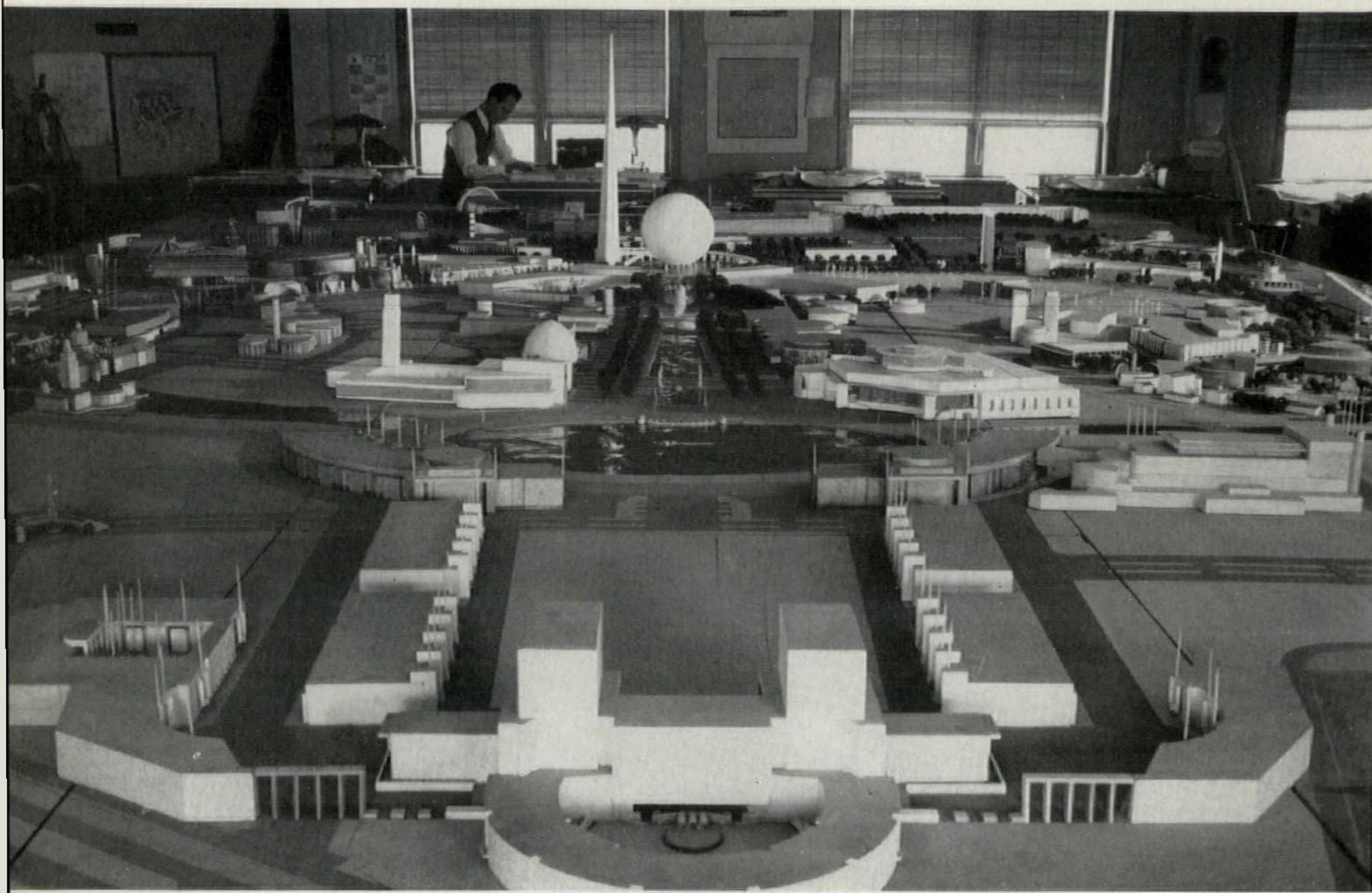
As the buildings were completed they were placed upon the balsa base and their outlines traced with a knife. The material within this outline was then cut to a horizontal plane slightly below the lowest point of outline. The building model had been built extra high with this sinkage in mind so that there might be an almost invisible joint where the warped surface of the lot met the vertical surface of the building wall.

The balsa allowed for changes due to restudy of a building outlined or relocation on its site. When such a change occurred, leaving

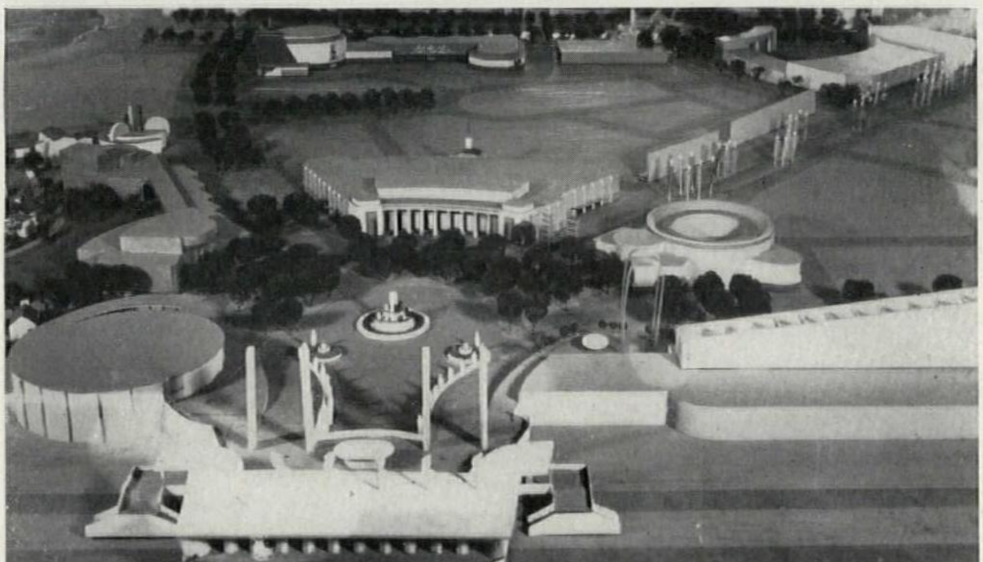


On the completed progress model all buildings are seen in their true colors except for roofs, which are painted silver. The schedule clock, when photographed, showed only five and a half months left to finish





This model made at 20' to the inch, showing the entire exhibit area, occupied the center of the Board of Design drafting room until it was completed and placed on exhibition in the hall of the Administration Building. It was used constantly and extensively in the study of color and building masses. Quick sketch models were made of each building, from the architect's first drawings, and put in place. As the designs changed and developed, more accurate and finished models were substituted. Detail below was taken at the subway entrance and the view on the opposite page is toward the Lagoon of Nations



Photos by New York World's Fair, 1939, Inc.

a recess in the base, a block of balsa was easily glued in place and cut back to grade.

The base for the twenty scale model which started as a study of the esplanade section and was later expanded to take in the entire exhibit portion of the fair, was of two inch balsa, well battened against warping. The original esplanade section had been carved to the exact topography of the site, but due to the great size of the contemplated addition it was decided to convert the existing section and make the entire model flat. This was made possible through a few minor changes in the original section. Certain false adjustments were now necessary in the treatment of the buildings, but these interfered little with the general function of the model. Here the buildings were usually sunk a full eighth of an inch into the balsa base, this height being added to the building height that the proportions and scale of the entire project be kept as accurate as possible. Trees were easily placed in the balsa base in holes quickly made with the thrust of a common awl.

Trees for these models were made of various materials. Small map pins were found of an appropriate size for the two hundred scale model. These were set in scraps of balsa and dipped *en masse* in a shallow pan of mucilage. A blended mixture of various colored ground felts was prepared and dusted over the pin heads to which it readily attached itself. After the glue had dried these were driven into the still damp plaster base with a small hammer.

Rubber bath sponge was used for the fifty scale trees. Cylinders of this material were cut from the original rectangular forms with mallet driven punches of various diameters. These pieces were then cut into short sections and trimmed to a near spherical form and mounted on common pins. Since the original green of the sponge was not the final color desired they were dipped in a thick solution of water base paint after which they were squeezed between the fingers to force the color into the crevices of the sponge.

The trees for a forty scale model were made of small wooden balls mounted upon brads. These were treated with a mixture of green paint and a coarse crack filler to create a rough texture and simulate a tree form.

The trees on the twenty scale model were entirely of metal. Heavy picture wire was first cut in two-inch lengths, one end tightly twisted, the other raveled. These loose ends were then united more in the manner in which a tree might grow and the skeleton mounted with many others in an odd piece of balsa wood. Fine steel wool was then added in several pieces to represent the foliage clusters. This might then be trimmed with shears, sprayed with mucilage and dusted with sawdust, or handled in a manner developed quite by accident in the Board shop. Here, loose ends were ignited and the burned material rushed along the slender wires, forming small globules of carbon, thus eliminating the process of gluing and dusting. The trees were then sprayed with green paint and the trunks brushed with brown.

Rubber sponge seemed to work well for trimmed hedge at almost any scale, and a more natural effect was obtained by tearing it apart rather than by using shears. Natural sponge, with its many variations of formation, worked beautifully for anything from tall vertical arborvitæ to small horizontal shrubs.

On some of the larger models, trees of natural growths were used. Goldenrod was used to compose a remarkable representation of an elm tree, and it was found in the fields all through the winter months and early spring in a fine crisp state ready for use. The modelmaker may wander into the woods or open fields, pick almost any form of grass or small plant and find some use for it on his models.

Most fortunately the color consultant to the Board of Design had some particularly able assistants who helped in the model painting. Since the twenty scale model was being used to determine actual building colors, they did almost all of the painting on this model. Water base paints were used on the buildings because of their flexibility and quick-drying qualities. A mixture of white oil base paint and aluminum powder, used as a filler and primer, was left to form a fine neutral grey tone for the roofs. This allowed the water base paint to be washed off without damage to the models, should it become too thick because of prolonged study of building colors. Murals were sometimes done in miniature on paper by the artists themselves and glued in place; others were painted directly on the buildings from the artists' sketches.

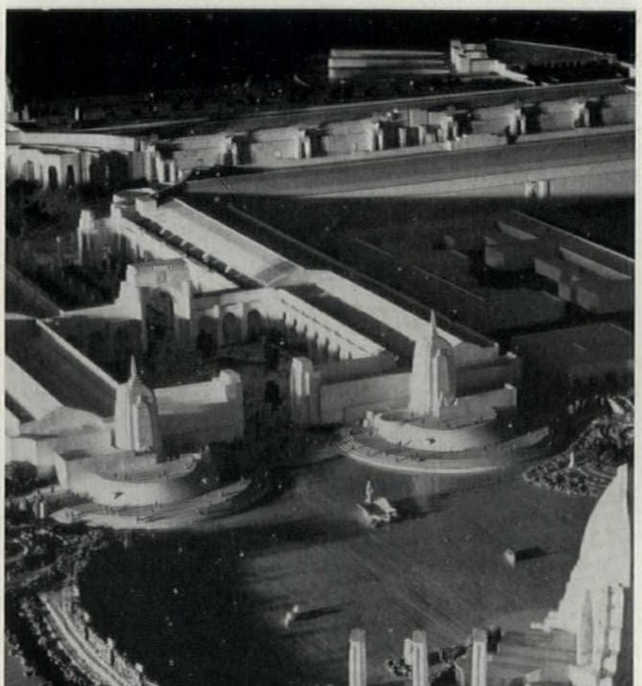
Balsa and cardboard bases were sized with shellac and the roads and grass areas painted on in oil base paints. When the fifty scale model was placed on the wall of the meeting room as a decoration, additional punch was created by painting the roofs a bright aluminum and covering the blue painted water with a silvery blue paper. Metallic papers were used upon several occasions for building surfaces, and were particularly successful, being easily scribed for jointing, etc.

Ultra-violet-reactive paints were used with great success on two of the models. The two hundred scale model was so treated and placed on exhibit in a heavily curtained alcove. Under a cycle of night and day lighting this was very effective, for the invisible rays caused the paint to put forth a glow that closely simulated the expected appearance of the Fair at night. It was used also on the buildings, trees, and water in the one-fourth inch model of the Theme Building.

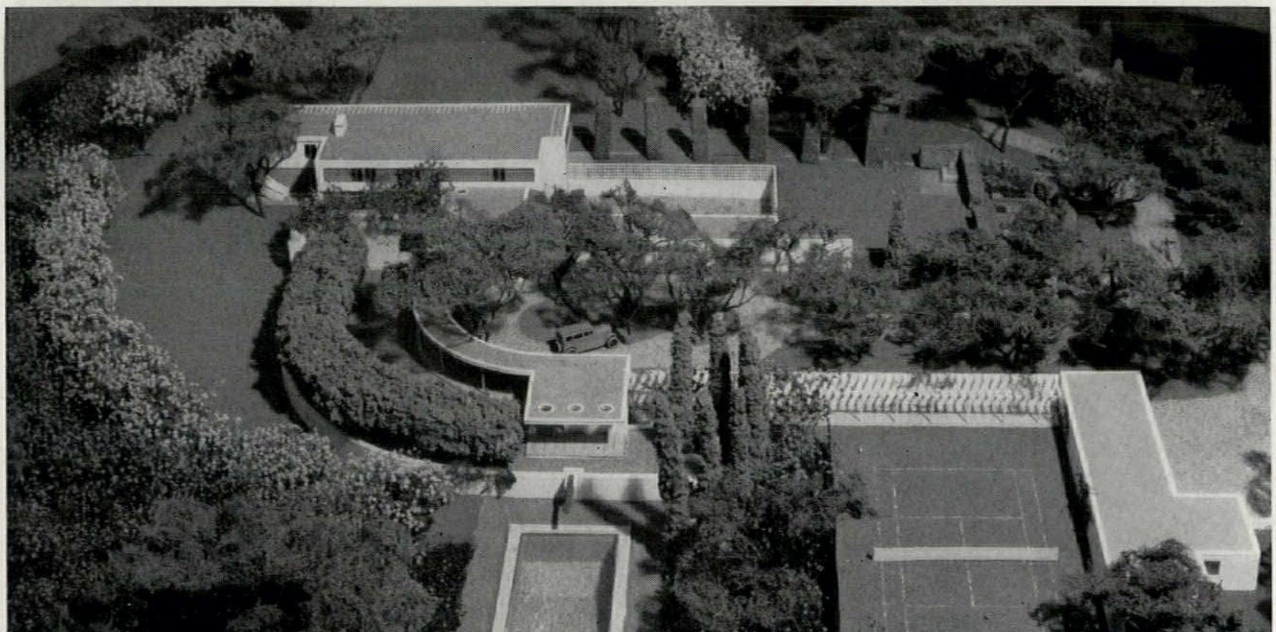
Sculpture was carved by hand from plaster, pine, balsa and soap, or built up layer upon layer of Chinese white, applied with a brush to a cardboard armature. Fountains and cascades were made of cellophane, transparent plastics, cotton, or built up of transparent cement or Chinese white.

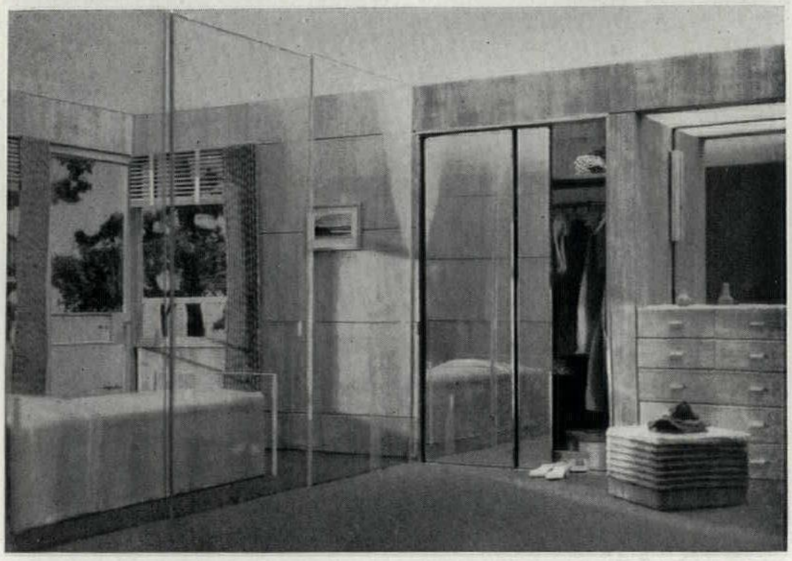
Modelmaking, it appears, is essentially the adaptation of numerous tools and materials to purposes for which they were not originally intended. Thus, the success of a modelmaker often depends upon his imaginative use and ingenious adaptation of available tools and materials to meet his own particular requirements. It is this quest for new methods, tools and materials that makes modelmaking the interesting occupation those people working at the Board of Design shop found it to be. It is their hope that their experience and modelmaking achievements may be of value to other persons wishing to build architectural models.

The Architects of the Golden Gate Exposition at San Francisco also utilized many series of models in their study and development of the festive buildings, courts, and esplanades. Representative of these are the preliminary cardboard model at $\frac{1}{16}$" of the principal buildings and courts, above, and the fairly realistic plaster model at the same scale, from which the detail below was taken. The modelmaking was in charge of Joseph H. Clark, Architect and experienced modelmaker, whose interest in the use of architectural models dates from 1913 when he was resident designer and architect for W. W. Bosworth during the construction of M.I.T. buildings. He then used cardboard and plastic clay to develop models from early sketches. The first Golden Gate models were made in the office of the late George W. Kelham, who was then Chairman of the Architectural Commission. After the cardboard model was cut, changed and revised to suit the Architectural Commission, the plaster model was started. Even then, designers in the various offices concerned outstripped modelmakers; but the effect was fairly accurate and also was used to study lighting effects. Drawings at ¼" scale were developed in plaster, then details modeled



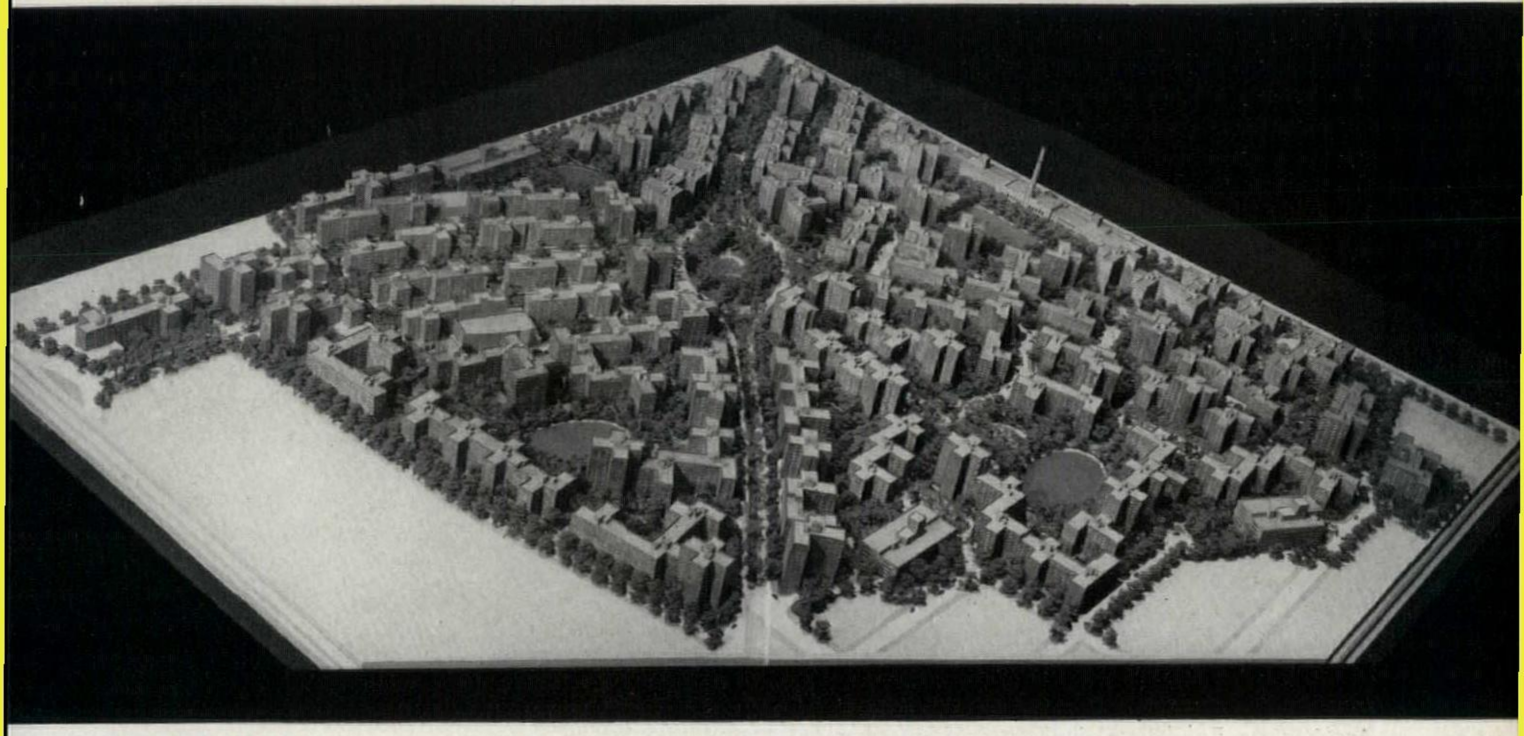
This model at 1/8" scale of a proposed residence at Mt. Kisco, New York, designed by Edward D. Stone, New York Architect, was made by Theodore Conrad, of Jersey City, whose skill as a modelmaker is well-known in the metropolitan area. Contours of the property were built up of wallboard layers over a wood frame, filled in with plaster and smoothed before the top coat of various shades of painted sawdust was applied. The model of the house—of wood, with windows of synthetic resin and roof of aluminum plates where overhang was required — was set in a socket in the base, to permit freedom in handling the landscape grades. In collaboration with Michael Rapuano, Landscape Architect, Conrad developed the landscape with shrubs of rubber, moss, and plants. Trees were fashioned of steel wool over wire



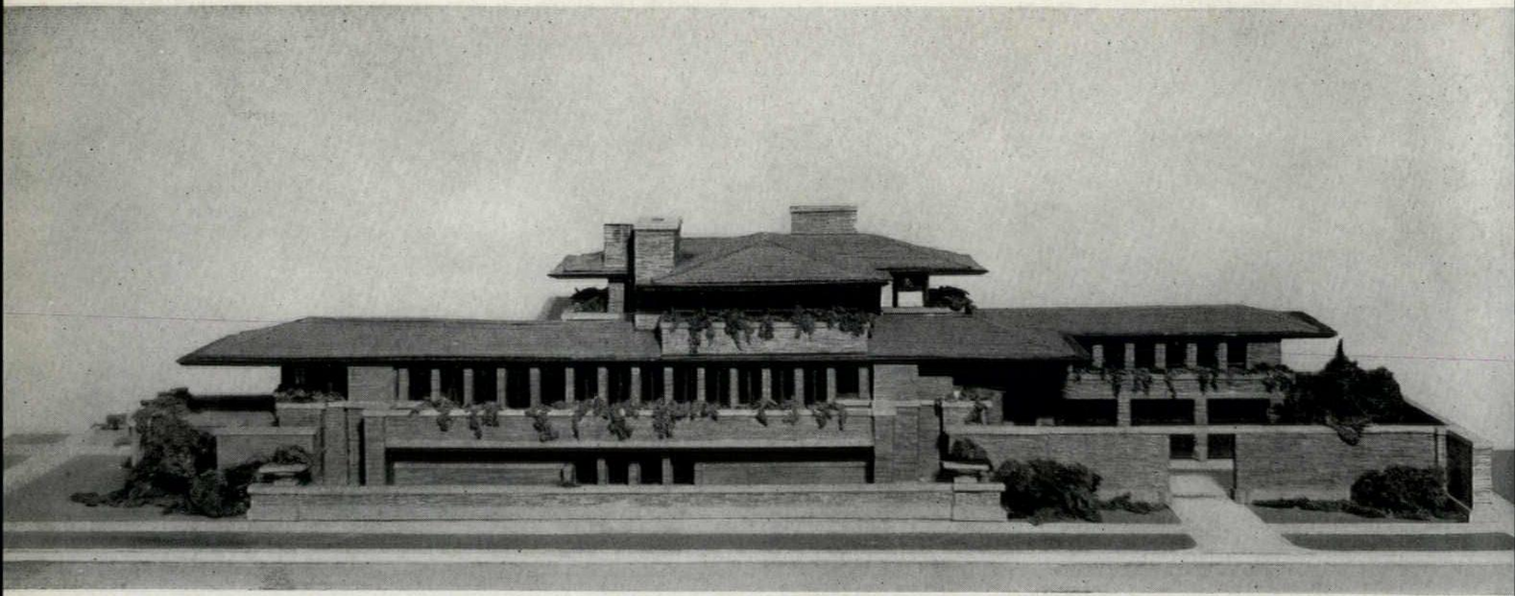


Theodore Conrad also made these models of the Pittsburgh Glass House, in the Town of Tomorrow at the New York Fair, designed by Landefeld & Hatch, Architects, of New York. Complete in every detail, as they were ordered by Collier's magazine for photographing to illustrate the house, the interiors have flexwood walls, synthetic resin windows and sliding partitions, real mirrors, tiny Venetian blinds, carved and upholstered furniture, etc. Note clothes in the bedroom closet. Floors are of linoleum scribed to represent tile. The plywood model of the house was set into a wood and masonite base. It was given three coats of paint, controlled by air gun to give a stucco finish. Photographs of Conrad's models are by Louis Checkman

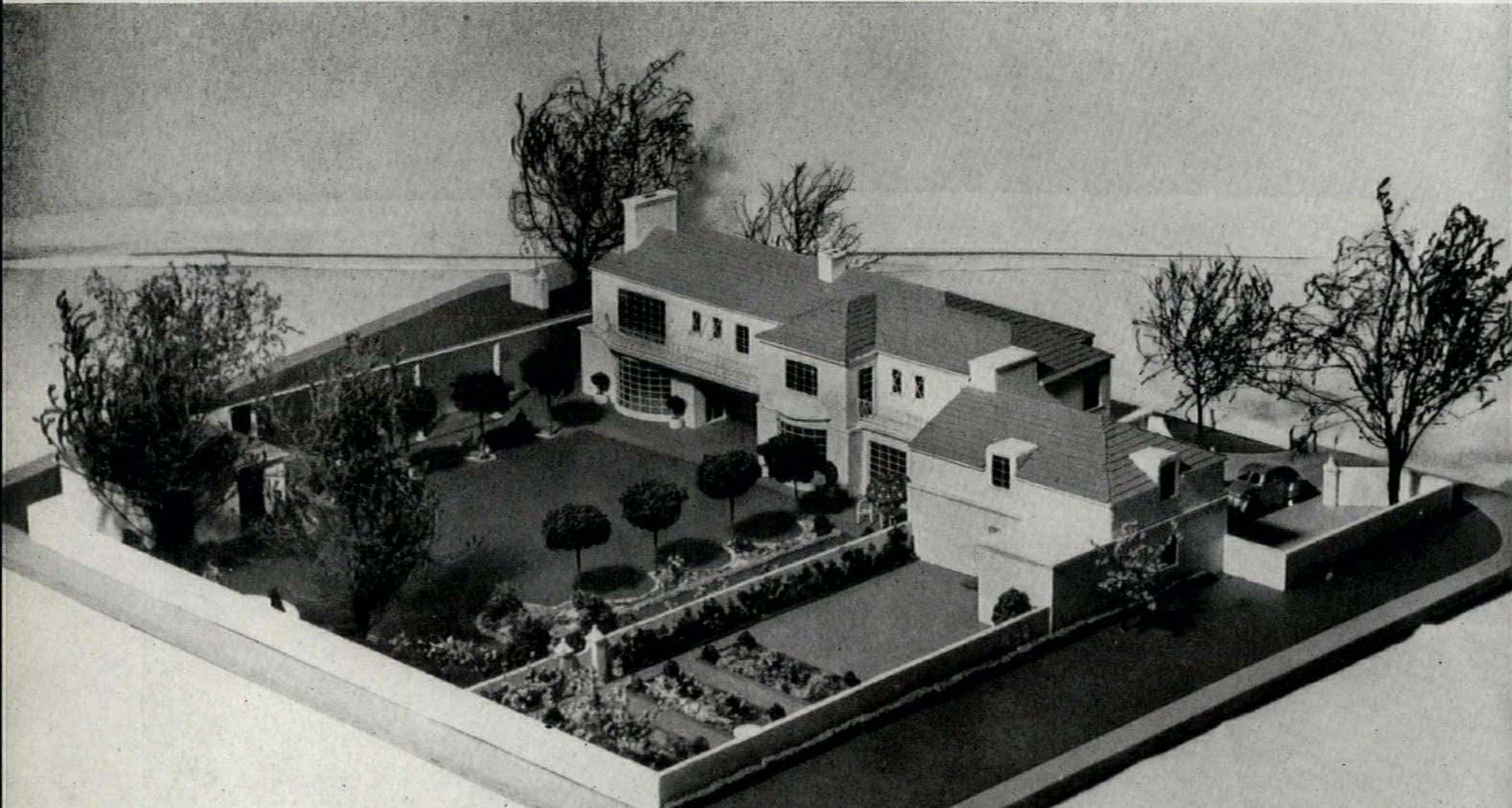
Modelmakers at work in the shop of the Metropolitan Life Insurance Company's Housing Project are shown assembling and placing the buildings and landscape features of the large model of the project, which was designed by a Board of Design headed by Richmond H. Shreve, Chief Architect. The model was made in quadrants, each of which was assembled complete before they were put together in jig-saw fashion. Pictures at the top of the page show the assembling of the buildings. The thousands of wire armature and steel wool trees, with sawdust leaves cut to scale for various species, were made by Theodore Conrad. The lower pictures show windows being cut and buildings being fixed in the base around wooden pegs of proper heights



The assembled model—started by Edward T. Howes, veteran modelmaker and teacher of many in the profession, and completed under his direction by Logan S. Chappell—is shown above. A detail below shows how accurately the cardboard buildings were fitted, glued, and finished in detail at the scale of 40 feet to the inch. Window openings were backed with cellophane and colored paper. A sheet of thin cardboard was placed over the plywood base and the plan was cut out to receive the buildings. Photos by M.L.I. Co.



George Loyd Barnum, Architect, of Chicago, made this cardboard model of the Robie House designed by Frank Lloyd Wright, at the request of the Museum of Modern Art for its "American Art and Architecture Exhibition" in Paris in 1938. The ¼" scale model has been retained as a part of the Museum's permanent collection, and this photograph by Soichi Sunami was furnished by the Museum. For the model, shown below, of a residence designed by Frederick L. Confer, Architect, of Berkeley, California, balsa wood was used by Alfred Cuadra, San Francisco modelmaker. Metalwork is of wire and the windows are isinglass. The roof can be removed to look inside



MODELS AND SCOTCH

BY ROBERT DENNIS MURRAY

In making scale models, Economy is essential. The most direct methods must be employed so that no time is wasted and the cost is not run up to prohibitive heights. Yet the model must be complete in every detail. It must be a miniature of a building and not a toy. What is more terrible than a lumpy looking mass of brightly colored plaster with ten-cent store toy automobiles strewn about the terrain? A real architectural model, when photographed with the proper background or made into a composite photograph with the actual foreground and background of the building site, must look like the real building. But it mustn't cost too much!

Now, Economy suggests a Scotchman. And it so happens that the best modelmaker I know is one William McCallum, formerly of the Glasgow School of Art and Haldane Academy, Scotland, and a pupil of Albert Degert of Bordeaux, France.

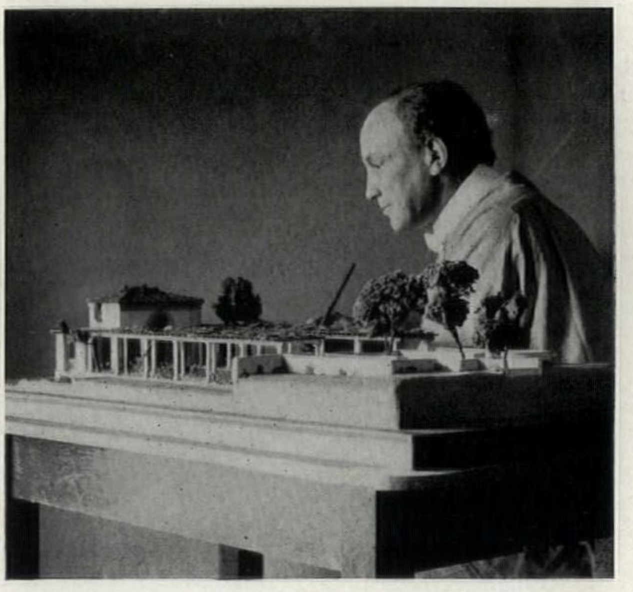
"Something not too Shakespear-r-r-ian in character-r-r," replied McCallum in his best burred Scottish accent when I asked him what kind of an article I should write on his work. "It had better be in the style of Robbie Bur-r-rns rather than Shakespeare," he added. So within my literary limitations and with that injunction as my cue, here goes.

Scale models for buildings are nothing new. Sir Henry Wotton, writing in London in 1624, said, "Let no man that intendeth to build setle his fancie upon a drought of the Works in paper, how exactly sower measured or neatly set off in perspective; and much lesse upon a bare Plant therof, as they call the Schiographia or Ground lines; without a Modell or type of the whole structure, and every parcel and Partition in Pasteboard or Wood. In a Fabrique of some forty or fifty thousands pounds charge I wish thirty pounds at least layd out before hand in an exact Modell; for a little misery in the premises may easily breed some absurdity of greater change in the conclusion." How true, after 300 years! "Some absurdity" is not uncommon when the third dimension is not appreciated.

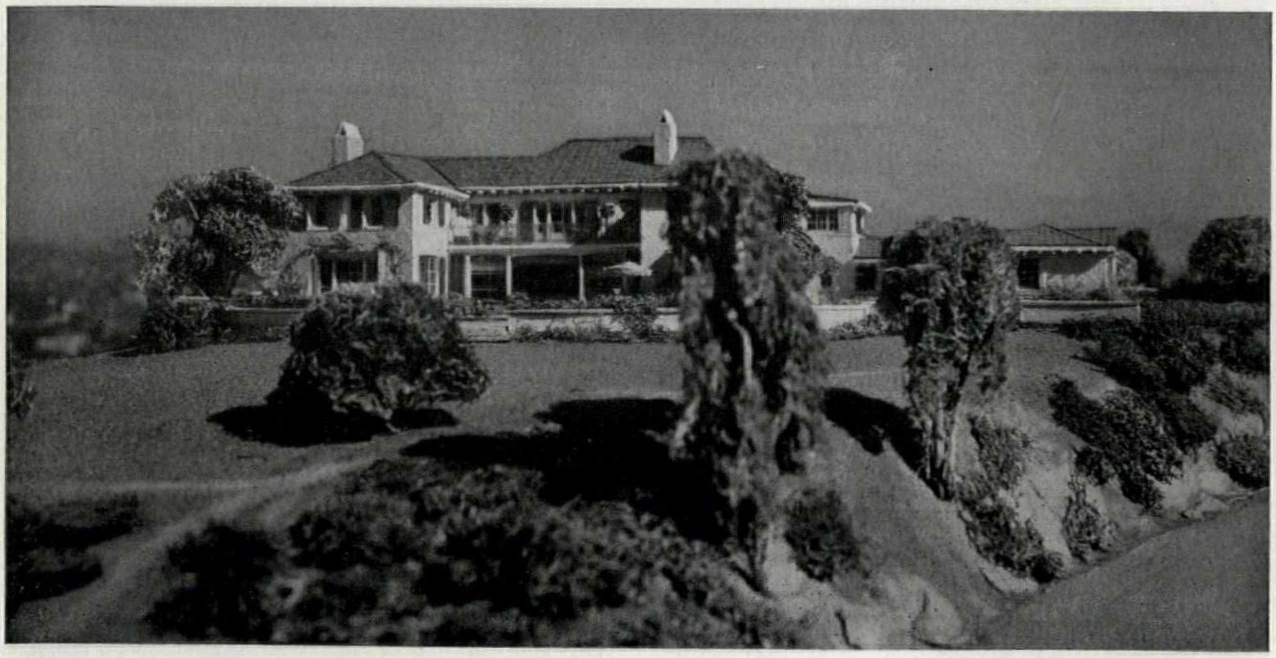
The same justification for the scale model exists today. The lay mind cannot, in most cases, read the full meaning of plans and elevations. A well made model demonstrates the entire scheme from every point of view and in as much detail as desired. Full comprehension of the scheme may lead to suggested changes but the suggestions will be made intelligently and the changes can be accomplished at this point more cheaply than later.

The sales value of models was demonstrated to me forcefully on one occasion in connection with the Lissner Medical Building in Los Angeles, otherwise known as the 1908 Wilshire Building. I first showed the client what I thought were beautiful and descriptive perspectives done in water color, all of which he did not understand. He promptly remarked that the trees were nicely done but that they didn't help him to visualise the building. I then had McCallum rapidly make a sketch model of the project. The client was so delighted with it (and so was his wife) that the rest was easy. Practically the only change made from model to building was the substitution of Latin roof tile in place of shingle tile. In selling space in the building to other doctor-tenants, the model was also of great value.

William McCallum, of Los Angeles, completes a model



This model by McCallum is of a large residence at Belair, California, designed by H. Roy Kelley, Architect, of Los Angeles. The foreground, roadway, planting, etc., were all developed in collaboration with a landscape architect to transform a bare mountain top into an attractive setting. Note fencing atop garden wall, ruled on celluloid



They could actually see from every angle what the building was to be when completed —color, texture, and all.

Though architects frequently build models in their own drafting rooms, it is my belief that it pays in this as in any other important matter to go to a specialist, a professional modelmaker. And in the case of architectural models it is essential that the work be done by one with considerable knowledge and long experience in architectural design and detail. It is in no sense a job for the ordinary mechanic or plaster shop man who cannot be expected to appreciate various mere suggestions on the designer's preliminary sketches. An exceptional craftsman might do an accurate job if he worked completely surrounded by full-size details but that would be a little ahead of the game. What is needed is one who is fully familiar with the designer's habits of mind and who can work hand in glove with him so that adjustments may be made, fenestration and projections studied as the work progresses. And that means one who has architectural training and experience himself.

Which leads me directly back to my subject, McCallum. "I remember," said I to him recently, "one of the first architectural models you made, about fifteen years ago." "No, you don't," he answered, "I made architectural models when I was a lad in kilts." He had his early practical training in the office of James Miller, A.R.A., an architect of Glasgow. Later he designed and modeled for the late Sir H. Beerbohm Tree at the Haymarket Theatre in London, for Robert Arthur of the Court Theatre in Liverpool, and for others of note. Many successful stage settings are to his credit and his experience as a miniature maker has extended over many years and taught him all the "tricks of the trade."

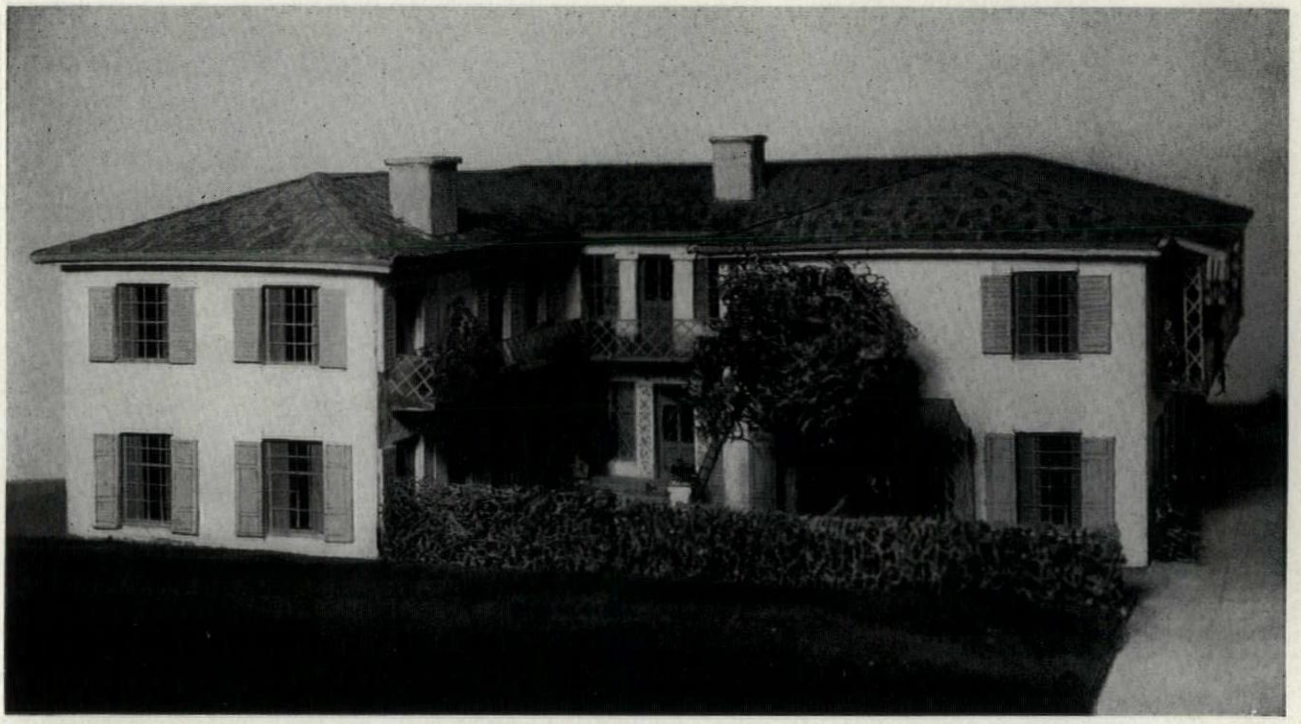
Most of his models shown here are constructed of cardboard of various thicknesses and with an eggshell finish. He recommends surgeons' lances for cutting. They should be new and sharp and of the finest steel. An advantage is that they may be adjusted to one handle. A sharp mat knife is also useful. For commercial buildings or where many openings of the same size occur, short steel chisels are a time saver—a set of them in widths of one-quarter-inch, three-eighths, half-inch, and so on will correspond at quarter-inch scale with openings of 12″, 18″, 24″, and so on. These chisels may be had fitted to one handle. Of course, tools are often used in modelmaking that are not on the market. Each individual knows best what he needs and any machinist can construct special tools for him. For example, a tool can be made for cutting out cardboard arches by substituting a two edged knife for the pencil or ink leg of the compass.

McCallum advises studying the drawings carefully before making a start so that you will understand them thoroughly, especially the details. Work from scale plans drawn on paper and not from blueprints if you want to be accurate. Each wall surface with its openings, floor levels, etc., is transferred by a soft pencil tracing from the original to the cardboard by rubbing or otherwise. Knowing the thickness of the cardboard in terms of the scale at which you are working is important. It should not be thicker than the smallest reveal—you can build up the deeper ones from the back. All arch molds, jamb columns and molds should be built up; in short, apply everything and do not try to carve anything in cardboard. All ornament, caps, bases, etc., are modeled with a small stiff brush out of a mixture of whiting, glue, and plaster of Paris. Watch the scale of the ornament carefully. Complete all reveals as to color, texture, etc., before applying the sash, which is drawn on celluloid with a ruling pen, to the back. Make a tempera mix for your color, adding a few drops of glycerine to make it run freely. Apply your drapes to the back, all in tempera color on Whatman paper. Do all the work on each piece of wall before it is erected. Complete at least two walls before erecting anything. The corners may be butted or mitered with a reinforcing strip behind for strength, as these corners must be sanded and filled. Such might be some of McCallum's suggestions to amateur modelmakers.

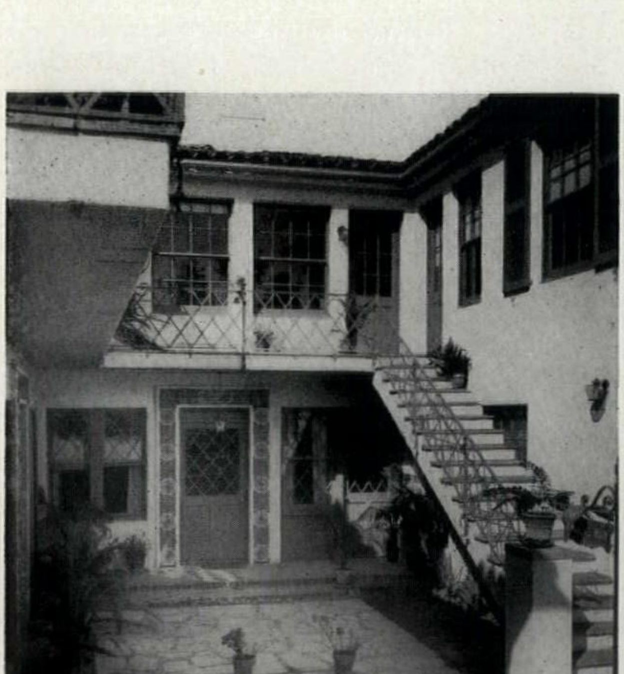
Everything on the model should be built. If you want to show automobiles, build them; never use toys, even if you happen to find them to scale (which you won't). Remember that three inches is a lot on a model, even at eight-inch scale. Wood molds may be used to make roofs, cut to suit the type of roofing to be applied. Soak white blotting paper in water, add a little glue and press into the mold. Remove when dry and apply to cardboard. Color carefully according to type. More words of wisdom.

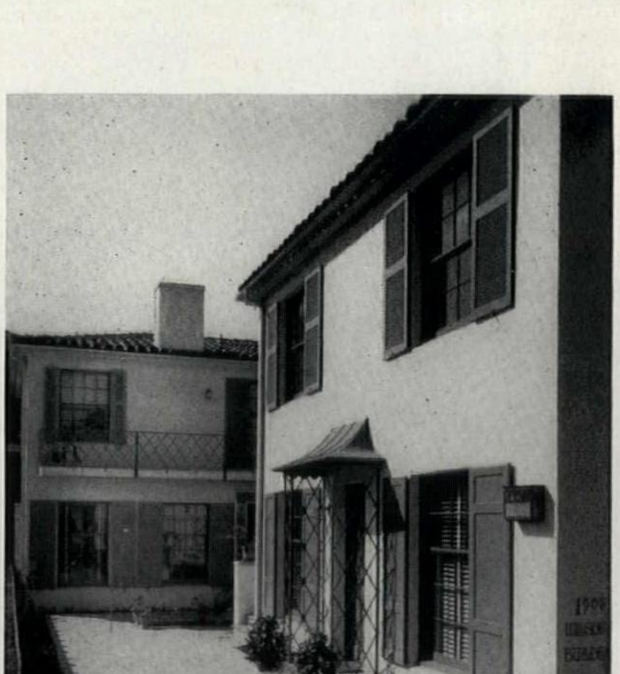
A London lad, the palette boy of the late Sir John Millais, met a friend one day. "Say, Bill," remarked the friend, "your boss is one great painter, ain't he?" "Great me eye," said the palette boy. "Why I cleans the brushes, stretches the canvas, fixes the colors, and 'ands 'im the palette. All 'e 'as to do is to shove 'em on!" It also takes skill to shove out a model.

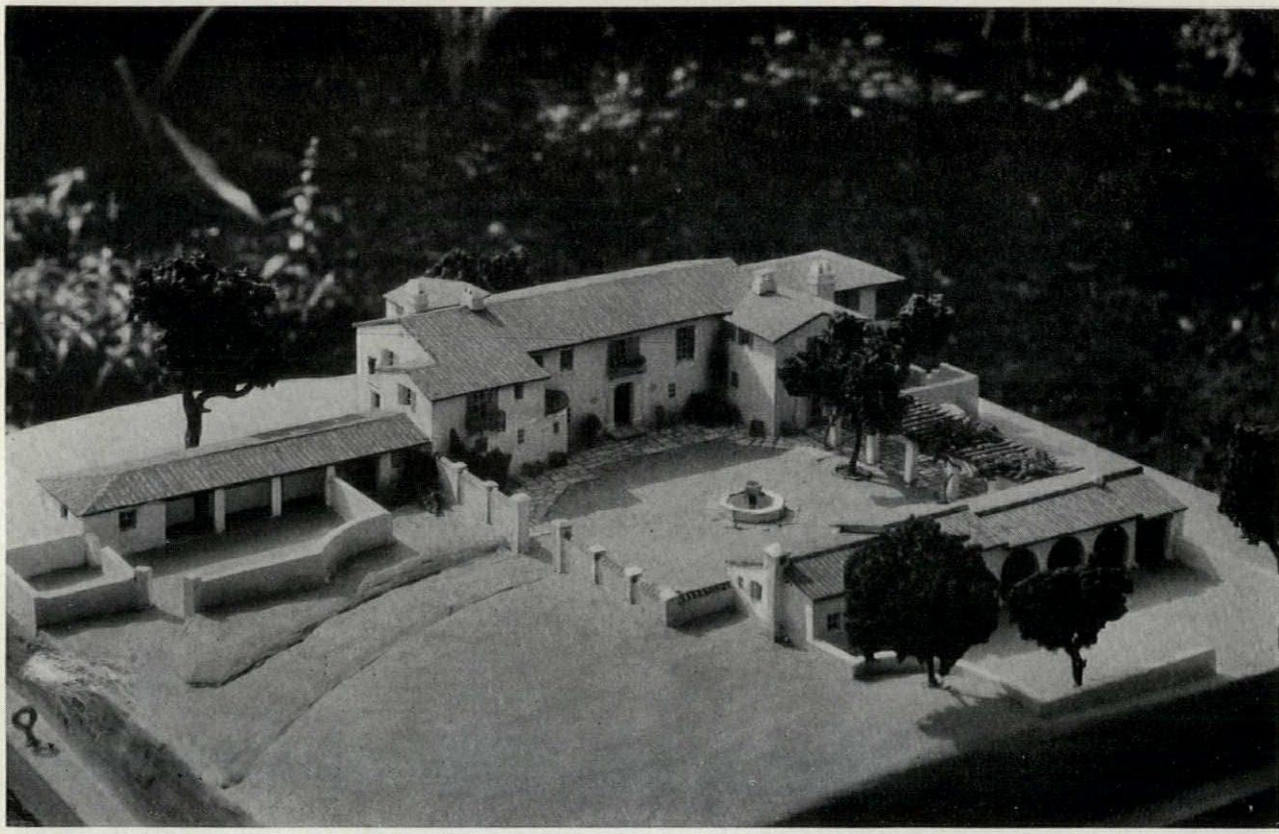
In studying the arrangement of a group of miners' cottages proposed at Inspiration, Arizona, the architects, Johnson, Kaufmann & Coate, enlisted the services of McCallum to make this model which accurately depicts the site. Four types of cottages—with variety obtained through several colors for walls, roofs and shutters—were used and each cottage was modelled as a unit. All were first assembled on a field of sand



McCallum's model, above, of the Lissner Medical Building in Los Angeles designed by Newton & Murray, Architects, proved invaluable in selling the client and then other doctors who occupied the building. Below are two views of the building that resulted, from which the accuracy of the impression given by the model may be judged. Only the roofing material was changed. Note the metalwork and treillage on the model ruled on sheets of transparent celluloid, then attached

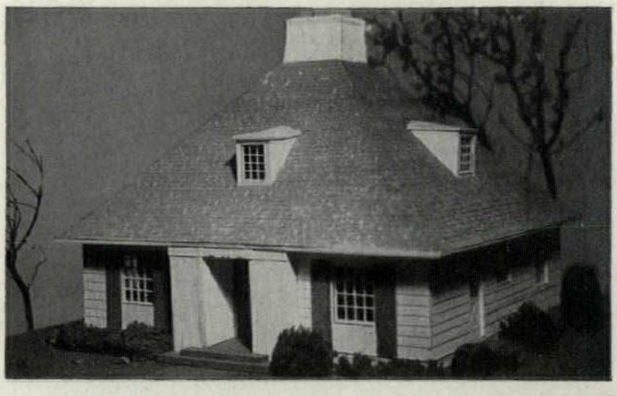


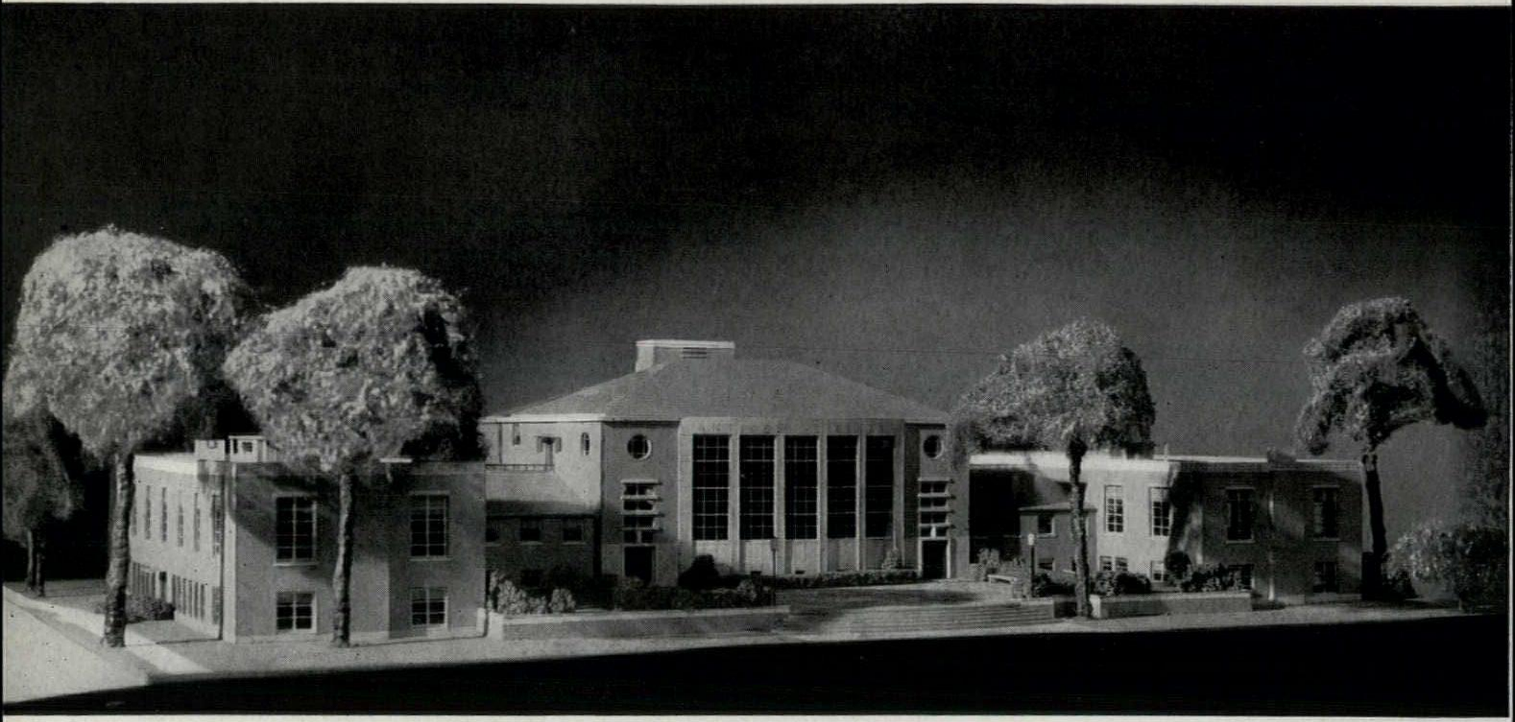




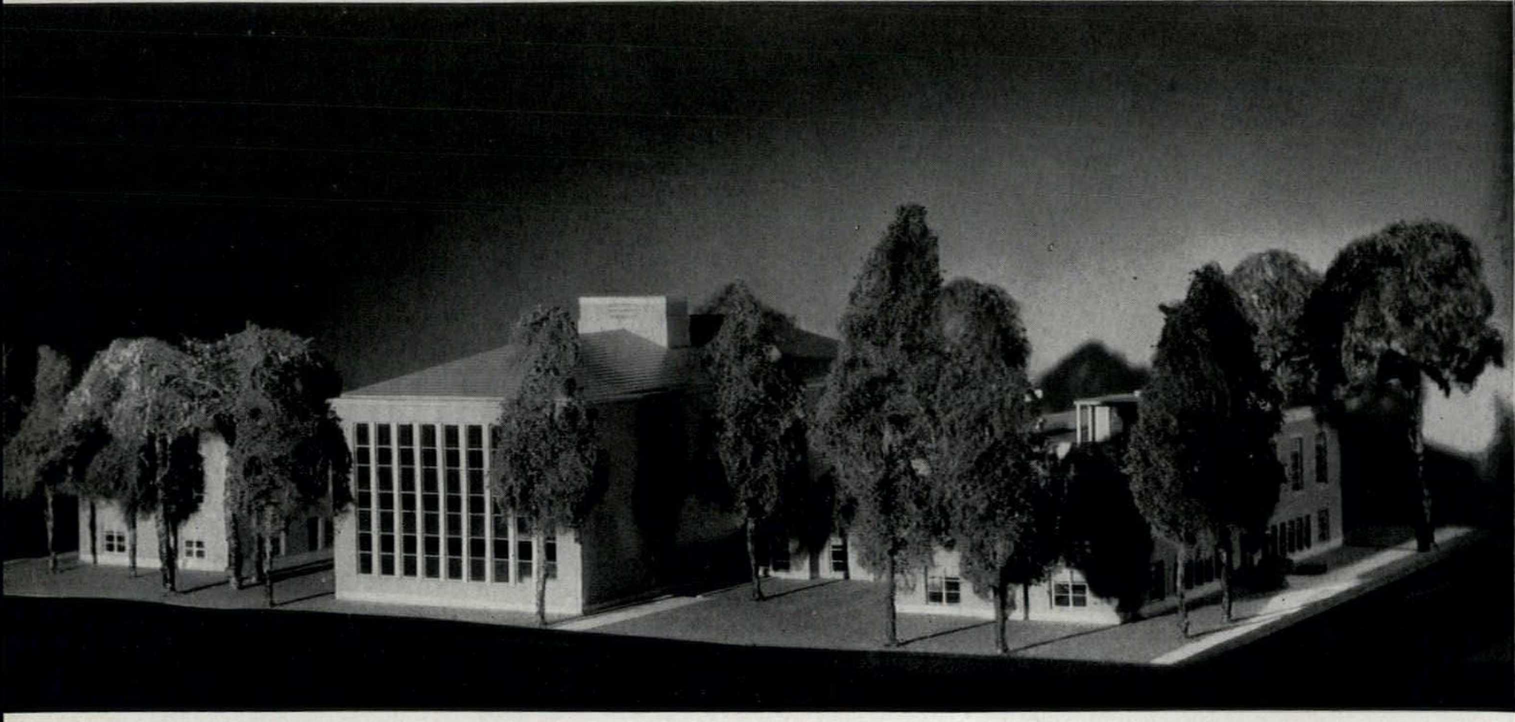
McCallum's model above is of a residence at Hope Ranch, California, designed by Johnson, Kaufmann & Coate, Architects, and the model below is of a Montecito home designed by Reginald Johnson, Architect. The upper photograph was made against a suitable background outdoors and below is a composite photograph of site and model

The Office of Glenn Stanton, Architect, of Portland, Oregon, finds models valuable for study as well as for presentation and makes its own; both sketchy block models and more detailed models made of stiffened cardboard over wood frames. Here are shown two recently completed by Frank S. Robert, one of Stanton's draftsmen. Above is a study of a Provincial cottage at 1/4" scale with colors and textures carefully simulated. Below are two views of a country residence modelled at 1/8" scale. A critical study of this model led to the changes in the design such as omitting the parapet, portico railing, and two dormers, and extending the roof over the gable walls

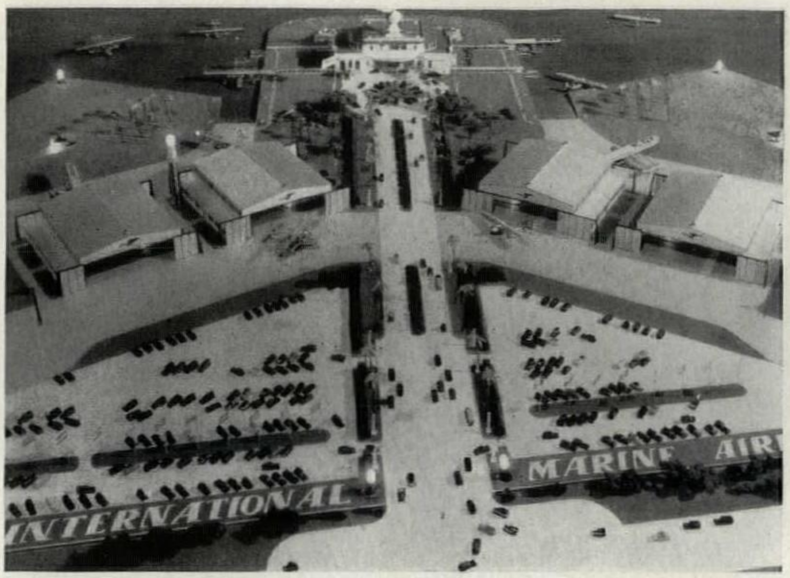


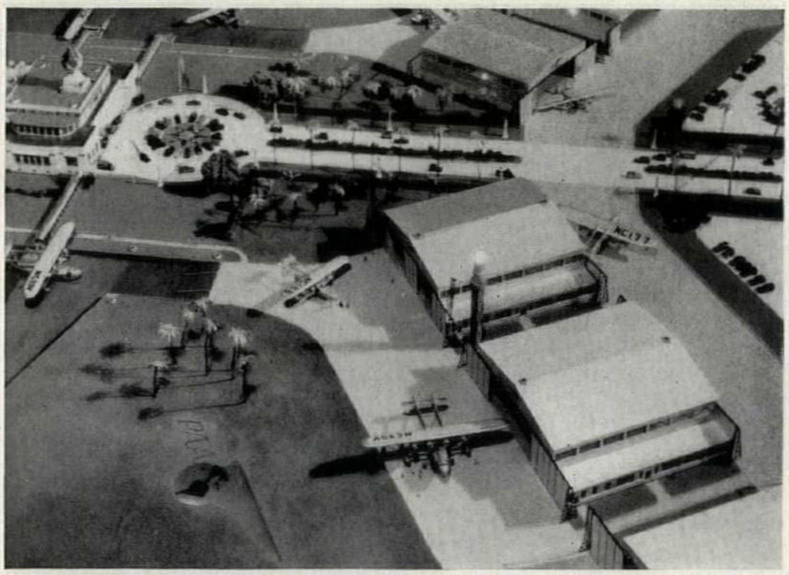


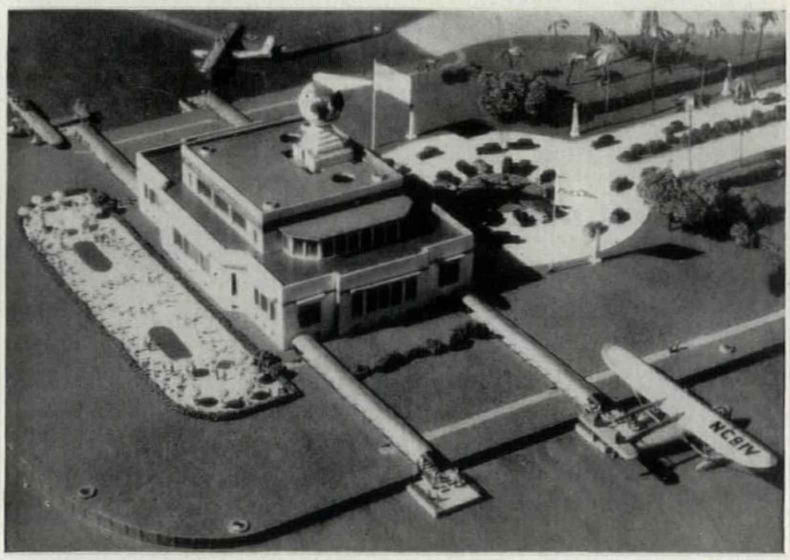
Two views of this cardboard model of the library building designed for Antioch College at Yellow Springs, Ohio, by W. Stuart Thompson, New York Architect, reveal the attention to detail and textural relations characteristic of the work of Edward T. Howes, Architect and experienced modelmaker. Note the varying tree forms and shrubs. The play of light and shadow on the building is stressed in these photographs by George Van Anda, New York Architectural Photographer



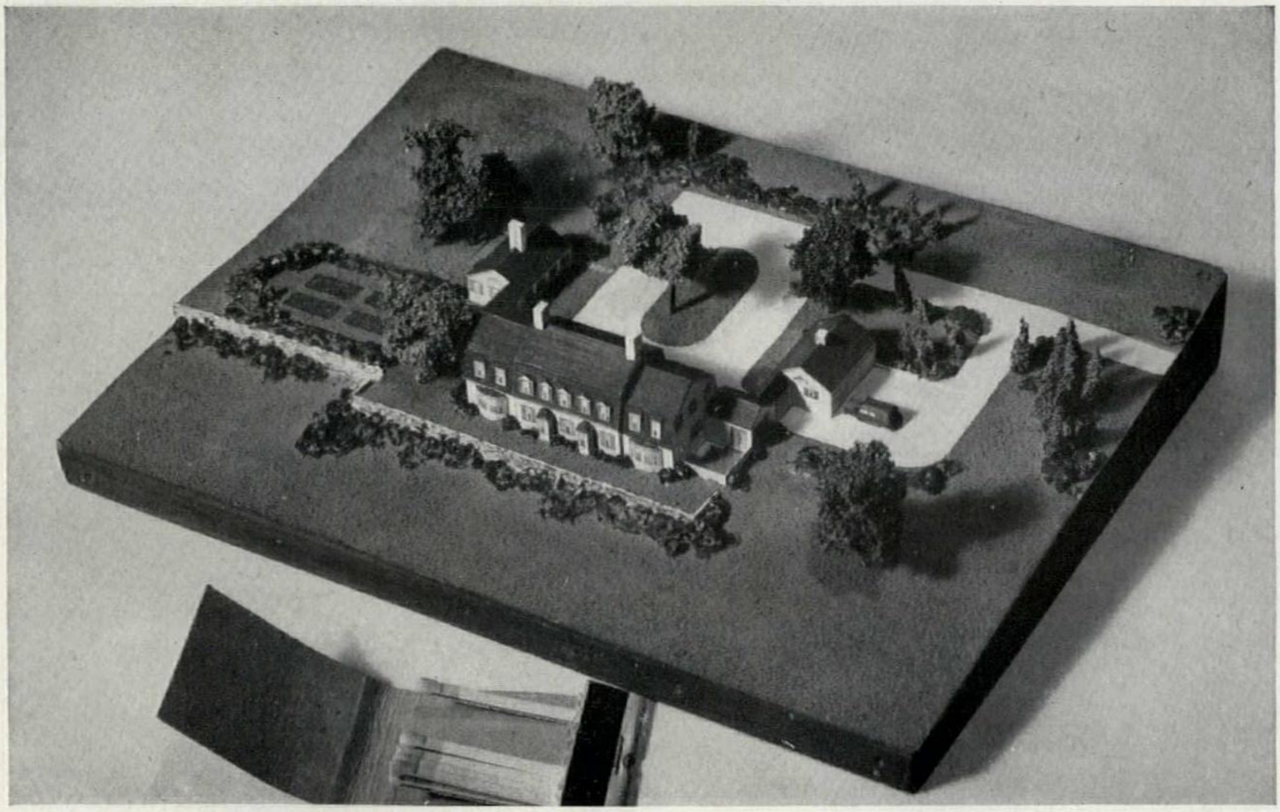
When Edward T. Howes modelled for Architects Delano & Aldrich the Dinner Key Base of the Pan American Airways, international port at Miami, Florida, he glued the wood-and-cardboard buildings to a flat, wood base. Automobiles were made to the same scale, $\frac{1}{16}$", and the planes of different types were made by his son, Dan Howes, from manufacturers' drawings. Several kinds of sponges were utilized for shrubbery and grass plots were made by gluing green powder to the base and varying the tones with green paint. The model is lighted by tiny electric bulbs. Photos furnished by Pan American Airways



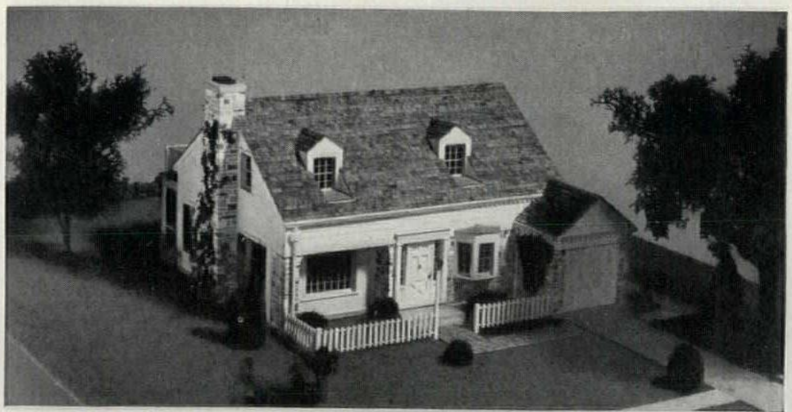


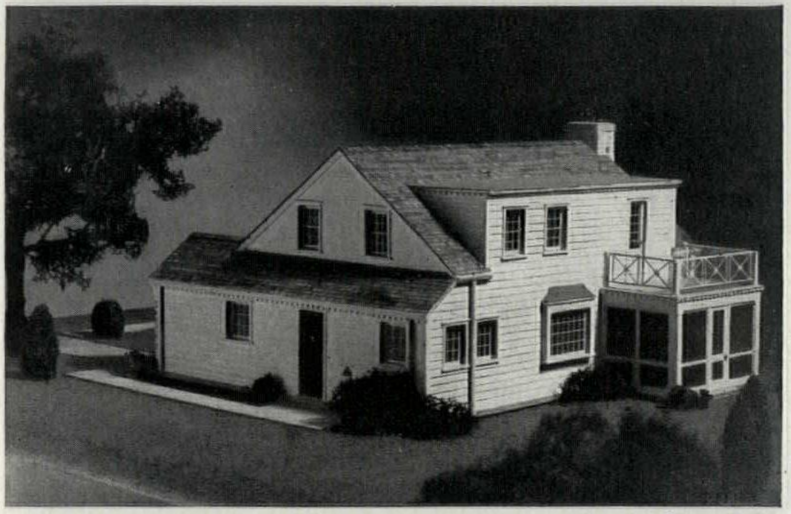


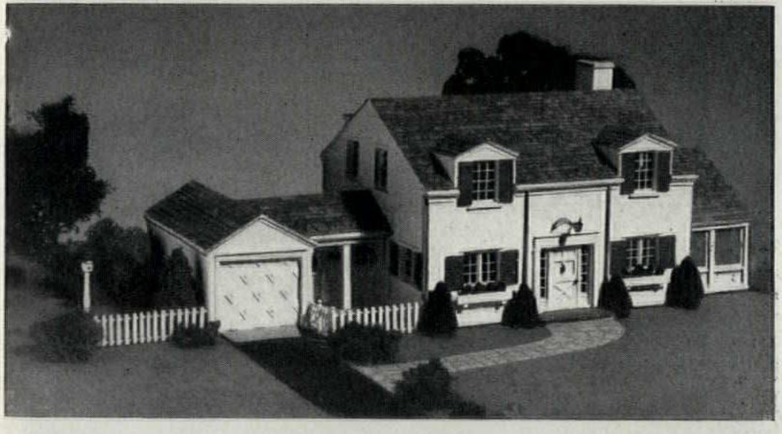
Two models attesting the skill of Herman Knebel in the most delicate work at small scale are shown here. The interior above at 1" scale was fashioned on a cardboard base, to which textured papers were applied. Panels were pressed in the walls but mantel and chair-rail are wood. Furniture was carved. The house below, designed by Cameron Clark, New York Architect, is of Bristol board, rendered at $\frac{1}{32}$" scale

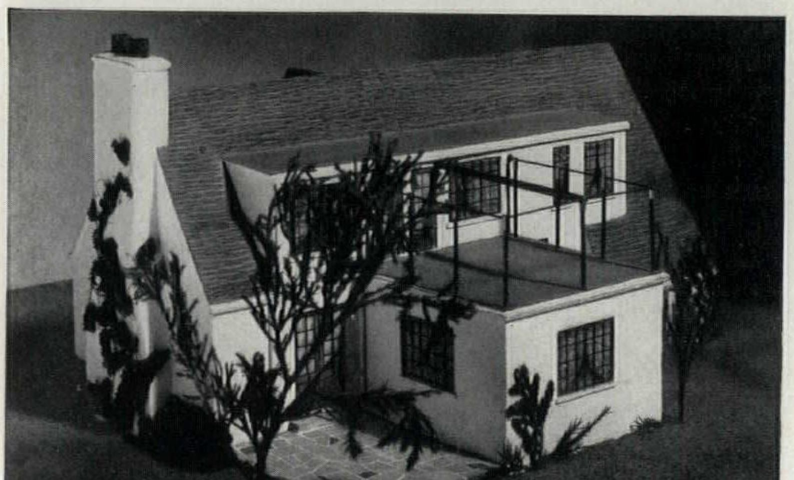


The models of three suburban homes pictured on this page were made by Phillip W. Borncamp, of Lake Forest, Illinois, for Architect James J. Gathercoal, of Wilmette, and are reported favorably received by the clients and useful in centering interest on the designer's work. The modelmaker emphasizes the wide range of tools and materials needed to make these miniature houses—and the ingenuity demanded to produce accessories and details at the proper scale. Front and rear views, at the right, show his expert handling at 3/16" scale of a stone and clapboard house now being built at Evanston. The country home below is modelled at the same scale but the house at the bottom of the page, seen from the rear, is modelled at ¼" scale









LANDSCAPE MODELS

BY JAMES C. ROSE

If a sculptor tried to produce the expressive modeling of "Bird in Flight" or the subtle relation of planes and surfaces in "Construction Sphérique" from a series of studies in plan and section, he would separate himself from the actual materials by at least one arbitrary process: interpreting a sculptural conception of specific materials from a flat drawing or paper. This is dangerous because it is only one step further until the conception is forgotten, and the paper design remains.

The same is true of landscape. By working in plan and section only, the landscapist cannot approach the real problem, which is to integrate materials with design in a three-dimensional relation. It is, however, seldom possible to work directly in landscape materials, because of scale and technological requirements. The scale model is the medium nearest to actuality—a diagram of forms in relation to the space which surrounds them and the people who use the space—but it can never hope to reproduce the subtleties of nature or the seasonal variations of the actual landscape.

Since we have two relatively constant effects from which all others might be considered variations, it would be reasonable to make two models of some projects to show space relations in summer and winter, but to attempt an exact reproduction of nature is the same laborious futility which possessed the early Dutch masters to paint with a single-hair brush every leaf on a tree or every hair on a Madonna's head.

But, with the growing interest in models, we must inevitably pass through a stage of naturalism just as we did in sketching and rendering. The designer will become intrigued with presentation rather than idea and layout, and will spend many pleasurable hours in an artistic dreamland putting a rich mosaic over the absence of an idea. Even now, many schools are following the "fad of modelism" presenting the same "charming vista which simply cries out for a bird bath" in rubber sponge and cardboard instead of brown and yellow washes or Chinese ink. Here's to keeping up with the times! After all, isn't the model just another "attempt of the younger generation to be different"?

Actually, models have gained their present status because they are the easiest method to study or present a three-dimensional idea. A landscape in plan always becomes unduly complex. For instance, a sixty-foot elm tree, a row of twenty-foot dogwoods, an eight-foot wall, a three-foot hedge, a border of perennials, paths, and ground covers look rather complicated and busy when superposed in plan, but the effect might be extremely loose and open, even sparse, on the ground because of the perforated qualities or different heights of the material. The elevation gives another flat picture—this time of "frozen music"—emphasizing the pitfalls of façadism, and neglecting the element of space. Perspectives are undoubtedly a help in the early stages and for presentation, but they can deal only with one point of view at one time. Isometrics also have unquestioned value, but are still one step farther removed from tangible space, and are less easily adapted or changed in study than the model.

In the model, we consider all problems at once and from all points of view: ground modeling, circulation, use, the forms of materials, and immaterial space. Rather than façades, pictures, and plan areas, we deal with time and space in relation to people and material—the perspective experience of people moving in free space interrupted by landscape materials to surround the individual at all times and in all locations with a variety and balance of forms, and direct his experience and circulation.

II

The contemporary landscape is concerned with the specific form for the specific condition in terms of specific materials. To facilitate study, it is advisable to develop a model palette of specific natural forms; but special man-made forms must be devised for any particular problem. The materials in which these are represented depend upon the ingenuity of the designer. A few recommendations:

1. Earth forms—to show existing contours

and proposed modeling; made of plasticene, cardboard contours, plaster Paris, sculptor's clay, and various trade plastics such as Craftstone and plastic wood.

2. Plant forms—(see April issue) the more abstract the better for study, but the subsequent use of the model will determine the material and detail of the scale symbols. In order of importance, the characteristics are: form, value, texture, color, and seasonal variations.

a. Trees: complete abstractions of form may be made from pipe cleaners, copper wire, wood, cork, paper, mesh wire, sprayed or colored cellophane. The structure of a deciduous tree can be represented adequately by picture wire with the ends splayed out to indicate branching and twigging. Texture, value, and color can be suggested for both deciduous and evergreen trees by rubber sponge.

b. Hedges and shrubs: roughly divide into four heights—over 12′, above the eye level (6′-12′), below the eye level (3′-6′), and dwarf (1′-3′). (See April issue). All kinds of sponge may be cut to proper shapes; or use yarn held together broom fashion.

c. Flowers: average one to eight feet. On small scale models, they can be indicated by a mosaic of opaque water colors, or crumbs of colored paper distributed on glued surface. The best at $\frac{1}{16}$″ scale or larger is the hooked rug method of looping colored yard through a paper templet of the flower bed. The loops of yarn are cut at the desired height, and the templet is pasted in place.

d. Ground cover: this includes grass and all substitutes less than one foot high. The representation will vary tremendously with scale—everything from green velvet and blotter to painted burlap and solid-colored yarn. Contrast of textures and values are important, but should not attract attention to themselves or the material of which they are made.

e. Vines: Best left out of models less than ¼″ scale, or indicated in water color on the climbing surfaces.

3. Rock and Architectural forms.

a. Walls and Paving: character indicated on cardboard, cellophane, or plastics having suitable surface qualities. Perforations by incision. Successful stone masonry made of Scotch tape torn in fragments representing stone or stuck on cardboard with pattern of joints exposed.

b. Outcrop: indicated on cardboard the same as exposed contours, or built up in plastic material and painted.

4. Water. White and colored mirrors may be used; rippled glass for wave effects and distorted reflections. With any kind of glass, cutting is difficult and all but the simplest shapes must be made by masking off the portions not within the desired shape. This does not permit glass to be flush with surrounding material.

Colored cellophane can be cut easily and cemented on top of other surfaces. Sealing wax also reflects when pumiced smooth, and can be made to fill crevices the same as water.

III

AFTER complete research into existing conditions and limitations of the site, make an ab-

In this diagram of organized space, all forms are conventionalized to the extreme. Trees of green blotting paper discs on match sticks contrast with vertical tree forms made of two tapered silhouettes at right angles. The rest is textured or painted cardboard and sponge. In the similar organization below, sponge cut in discs or vertical forms for trees is more realistic in effect. Wire is used to stiffen these forms, when made of sponge

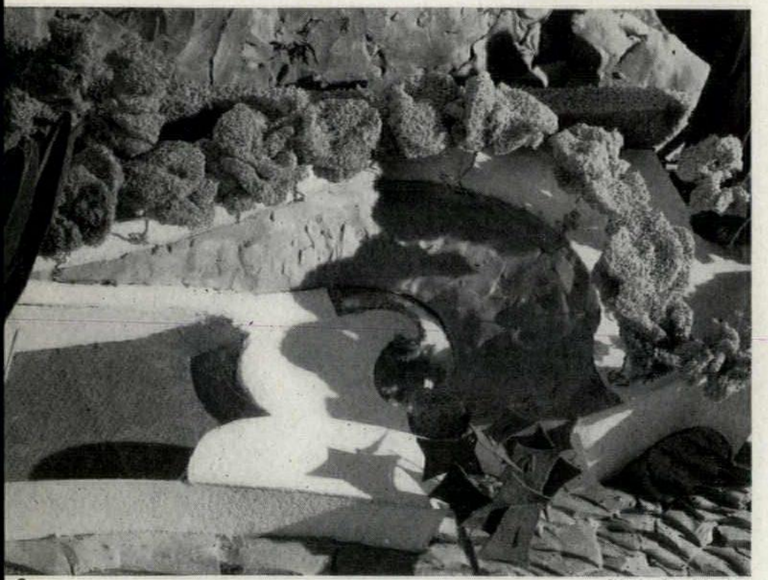
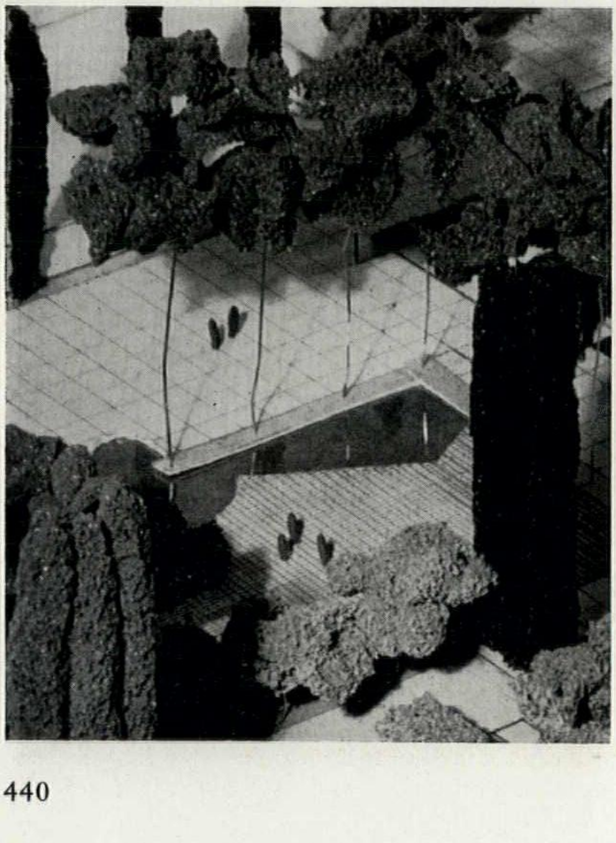


Photo by Statler

Earth modeling and outcrop forms are successfully shown with plasticine, which acquires a luminous quality when painted with tempera. As a further suggestion, note below the conventional rendering of paving, and plant materials represented by three values of sponge—to avoid confusion at small scale. The reflecting pool is not mirror but transparent cellophane over blue paper

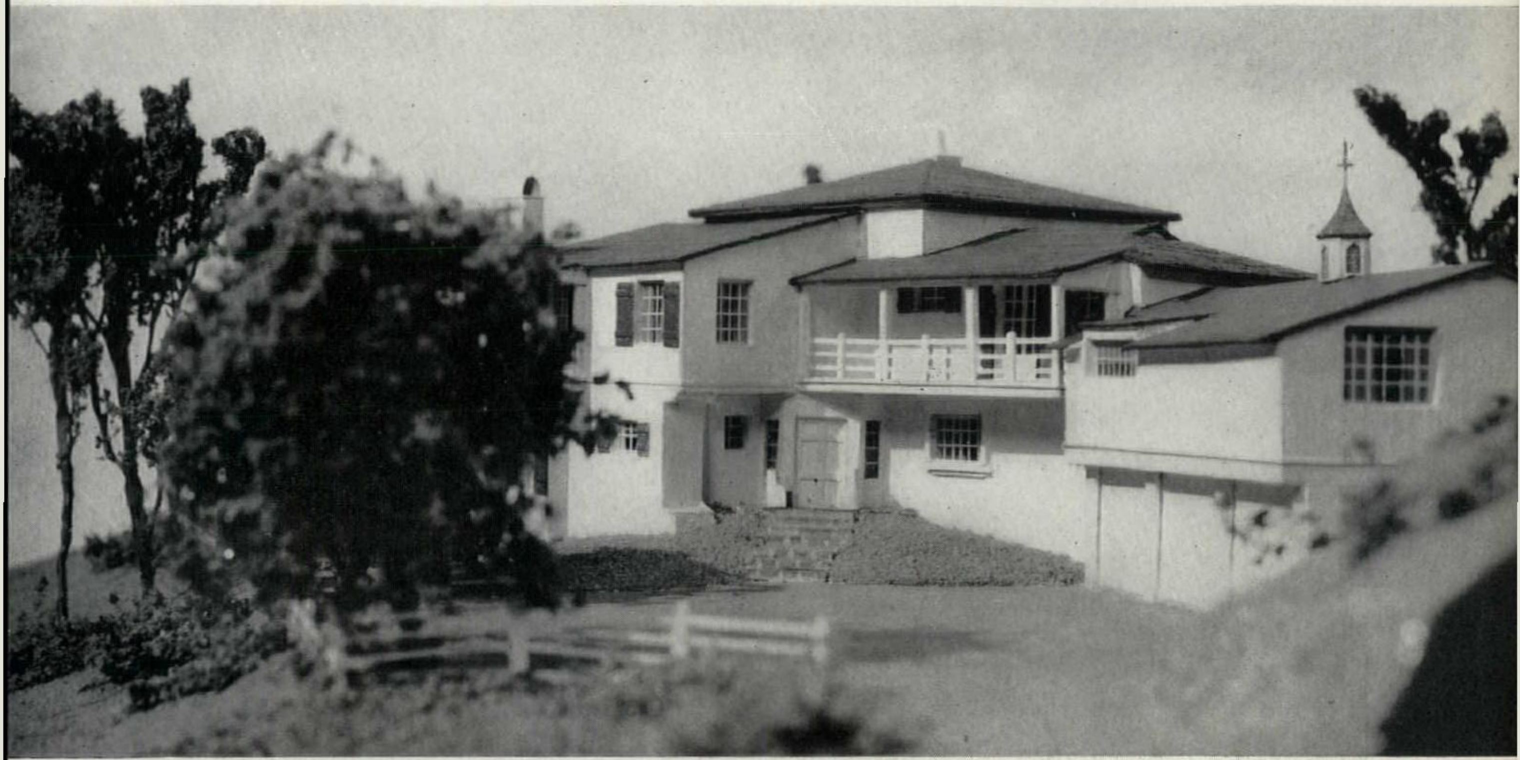


stract diagram of proposed circulation, use, and orientation. Make a replica of existing ground forms and irremovable elements such as important trees, buildings, etc. Divide the space with natural and invented forms, adjusting these with the previous diagram and plastic ground forms simultaneously. Study from all points at eye level, adjusting in terms of time and space relationships. Use perspectives freely. Study changing effects of the seasons in two or more model diagrams if necessary, and decide on specific materials which assume a desirable relationship of value, texture, color, and organic form. Record all data (elevations, construction, materials) on a rough plan to scale.

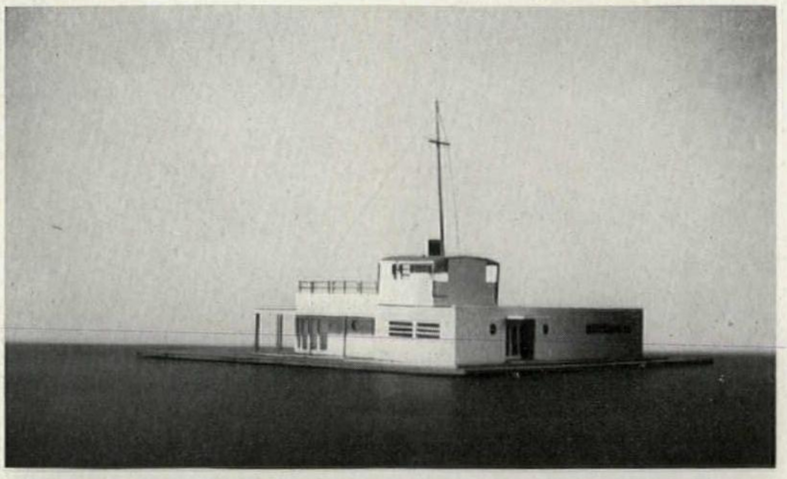
It is convenient to build the final model at a standard size and as light in weight as possible so that it can be carried or shipped conveniently in a model kit. A kit 30″ x 18″ x 8″ will carry the average model built at ¼″ to 1/32″ scale and representing ground area from approximately 120′ x 72′ to 960′ x 576′. If the engineer's scale is used, (1/5″ to 1/40″) the same thing can be accomplished with a kit 24″ x 14″ x 6″.

Discrepancies in size will be avoided if the final model is built directly on a piece of plywood wall board, or insulation board of the right dimensions. The materials for all the elements can be selected from the palette outlined above, but the refinement and literalness of the finished product depend upon how far one can go without confusion, and the use to which the model is to be put. For instance, the more abstract the better for office study. A presentation model should still be diagramatic and conventionalized with more attention to detail and accompanied by perspective sketches at eye level. For traveling or museum exhibit, solidity is the most important factor: excellent landscape models for this purpose have been made entirely of tooled wood.

Photographing presents a most difficult problem. First, a three-dimensional landscape surrounds the observer, and the perception of space cannot be "pictured." Second, the camera is designed to focus as the eye sees at human scale, but it cannot reinterpret the scale of the model. It is therefore possible to get an eye level view, as it would actually look, only if the camera is placed far enough from the model to eliminate distortion, and a small section of the negative is enlarged many times. Third, values are often different in two photographs of the same model because of lighting Trial and error is the only method for one photographing landscape models.



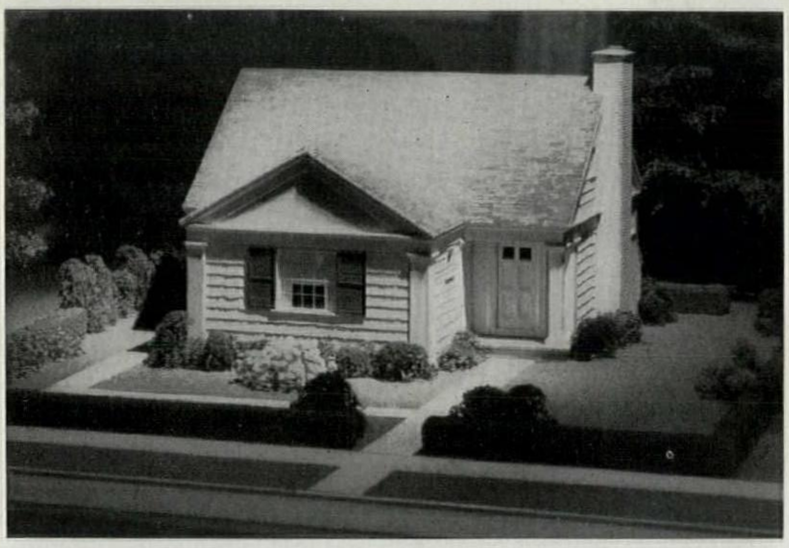
One of the pleasantest results of the Editors' efforts to assemble model material from far and near for the present issue was making the acquaintance of the many talented men in this field. Notable among these is Alfred Weidler, Hollywood modelmaker, who has followed this interesting career for 16 years. He has made more than 500 models, large and small, and is also the author of correspondence courses in modelmaking. His skill is evident from a comparison of the study model above of the residence designed by Roland E. Coate, Los Angeles Architect, for Arthur Hornblow, Jr., and Mrs. Hornblow (Myrna Loy), with a photograph of the same façade after it had been actually built. The architect and clients met in Weidler's studio to see the model, study the effects of sunlight on the porches, and consider details of the design—which was changed in several ways as a result of this conference. The same changes would have been far more costly than the model, if they had been made after construction was started or nearly done

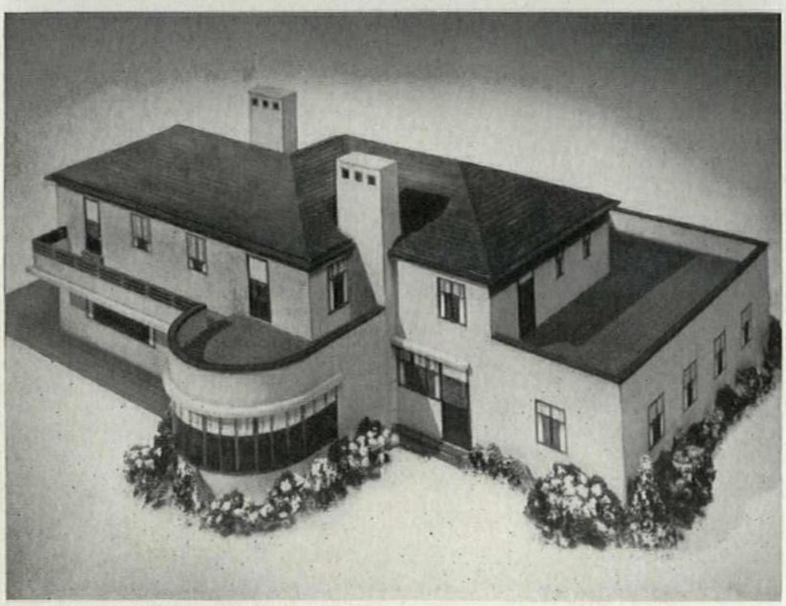


Typical of the effective models made by Theodore Fletcher in the office of Victorine & Samuel Homsey, Architects, of Wilmington, Delaware, are these at 1/8" scale showing the Cambridge, Maryland, Yacht Club, left, and a contemporary country house built in 1937. The first was particularly useful for showing a building committee the architect's suggestions. The office uses simple block models in studying mass and color and omits details even at 1/8" scale. Sprayed with a 50/50 solution of alcohol and shellac, these matboard models are painted with water color paints in lieu of rendered presentation sketches and are considered the "truly architectural way" of studying and presenting their buildings.

The model below of the George Washington High School, San Francisco, California, designed by J. R. Miller and Timothy L. Pflueger, was made in the office of the latter Architect. It was fashioned of thin cardboard over a frame of wood blocks, windows being cut out and backed with ruled paper. The columns are made of wood strips. Shrubs and trees are of sponge rubber and the contours of the site were built up in development of the carefully-studied base of the model. Photo is by G. Moulin

The distinctive residential work of Jerome Robert Cerny, Architects, of Chicago, is reflected by these models from that office. The main units of both houses were cut from balsa wood. Windows of heavy celluloid marked with white paint muntins were then inserted in recessed openings and details added, such as the iron filigree balcony of Cerny's own residence, above, indicated by white ink designs on celluloid strips. Lawns are wall board and shrubs and trees are of natural materials





The models on this page were made by Louis Fromm, who has been engaged in modelmaking in New York since 1922. Representative of his architectural scale models are the one above, at $\frac{1}{16}$" scale from a country house designed by Noel & Miller, New York Architects, and the cottage at the left, at ¼" scale, one of a group made for the Johns-Manville displays at the New York and San Francisco Fairs. It was designed by Maxwell A. Norcross, Architect, of Cleveland. The rendered model below at ⅛" scale represents a house designed for a site at Sun Valley, by Erard A. Matthiessen, New York Architect. The upper photo is by Louis H. Dreyer, the one at center by Charles P. Cushing, and the lower one by Robert M. Damora. Fromm stresses the value of ingenuity and craft facility in modelmaking, to meet the various needs of each specific job

CHEERS AND TEARS

BY TALBOT F. HAMLIN

HOUSING AT THE MUSEUM OF MODERN ART. In choosing, for the first architectural show to be held in its new building, an exhibition on housing organized by the United States Housing Authority, the Museum of Modern Art has made a daring and constructive decision. If the total amount of money to be spent, if the potential value to the community, can be architectural criteria, then public housing is by far the greatest opportunity which faces the architects of America. Eight hundred million dollars is a considerable sum of money; and though the number of families for whom it will build shelter is but a pitifully small fraction of those who are now ill-housed nevertheless the projects of the U. S. H. A. are going to be of extraordinary importance not only to those who will live in them, but also to all of the communities in which they are placed. They will at once set a standard of decent living conditions as well as of amenity and beauty which is bound to affect deeply much of the building in this country for many decades. They are going to help form the taste of millions; they are, and more and more will become, a permanent challenge to the private real estate developments.

Their architectural importance, therefore, is far greater than their mere number or size would indicate, and the great merit of the U. S. H. A. show at the Museum is the fact that it stresses primarily the architectural side of the housing problem. Working in the closest connection with the Museum, and thereby having the advantage of the Museum's growing collection of architectural models and photographs of important domestic architecture, the Housing Authority has been able to put on an exhibition which indicates superbly the close interrelation of so many contemporary architectural forms with those basic problems that are both the difficulty and the opportunity of the low-cost housing architect.

The exhibition builds carefully from essentials, starting with the simple Vitruvian concept of architecture as arrangement, as structure, and as beauty. The history of domestic architecture is treated briefly and diagrammatically, climaxed with a most interesting series of panels and models illustrating some of the revolutionary and at the same time beautiful achievements of contemporary architecture in this field. Section Two diagrams the Vitruvian idea in modern terms, demonstrating how the problems of the modern architect are basically the same as those of all of the architects of the past, although the alphabet used in the solutions is different, for the problems of the modern architect are: "1. Organization of space. 2. Organization of structure and materials. 3. The æsthetic discipline."

There follows an interesting series of illustrations of the achievements of public housing in foreign lands; and then, finally, illustrations of the American work of the present day. It is here that perhaps the most serious criticism of the exhibition may be made, for not only are the examples shown limited in number, but they seem often to tell too little in trying to tell too much. The photo-montage system of exhibit design offers marvelous opportunities for dramatic contrasts, though it also has inherently within it a possibility of leading the mind astray and presenting, not facts nor achievements, nor even logical ideals, but merely a sense of ultimate, if artistically balanced, confusion. A great number of the projects shown are not yet sufficiently far enough advanced to warrant photographs, save a few construction pictures which might confuse rather than enlighten the average observer. These, however, are not to be considered as permanent parts of the exhibit, and many will be replaced from time to time.

The presentation, in each case, of the main layout plan and a unit of family shelter at a larger scale, gives many valuable hints to the designer—such, for instance, as the delightful fan-shaped plan, with a central open court, of the Willert Park project in Buffalo, and the interesting triple-court scheme of Austin, Texas. But of the way these projects will really look to those who pass them or live in them, in relation to the entire problem—so bravely stated in the preliminary sections—of the æsthetic discipline of the whole, there is little trace. Housing *can* be beautiful architec-

The housing projects at Camden, St. Thomas, Cleveland, and Memphis offer interesting contrasts in this section of the Museum Exhibit. U.S.H.A. photos are by Sekaer

ture; it can be great architecture, for the programs which it offers are great programs; and I believe that the architects and the public seeing this exhibition, both at the Museum of Modern Art and as it travels all over the country during the ensuing year, has a right to know what kind of architecture these plans are producing. Some of it, I know personally, is beautiful; some of it is undoubtedly routine; but if the purpose of the show is educational some indication of the most beautiful results of the new program to date would have been welcome. Even if the buildings are not completed, they could have been shown by model or by drawing, in ways at least as intelligible to architect and lay person as are the present panels.

Of these panels the most dramatic is probably that of Pittsburgh, with its large photograph of devastated slopes and tragically unfit wooden shacks. The very difficulty of the site, with its precipitous hills, makes possible a composition of the greatest variety and interest, so designed as to take advantage of the air and the view and to give adequate spaces for recreation and for park. Nevertheless, the Pittsburgh plan in detail brings up a number of questions. It carries further than any of the other plans shown the problem presented by the design of row after row of almost parallel, similar buildings. The reason given for this building arrangement is usually the fact that in this way the most perfect orientation for all the units is obtained. An examination of the Pittsburgh plan, however, shows that, although each group of buildings is arranged in parallel rows, the whole series of groups of which the entire project is composed shows orientations in five or six directions. Was this parallelism, then, adopted (1) to give perfect orientation? (2) stylistically, because that is what is being done in the advanced circles? (3) accidentally, or because easy to draw? Certainly the walk down almost any street in the plan shown would be endlessly monotonous—a kind of regular repetition of little things, which is different only in degree from the monotony of a Queens real estate suburb.

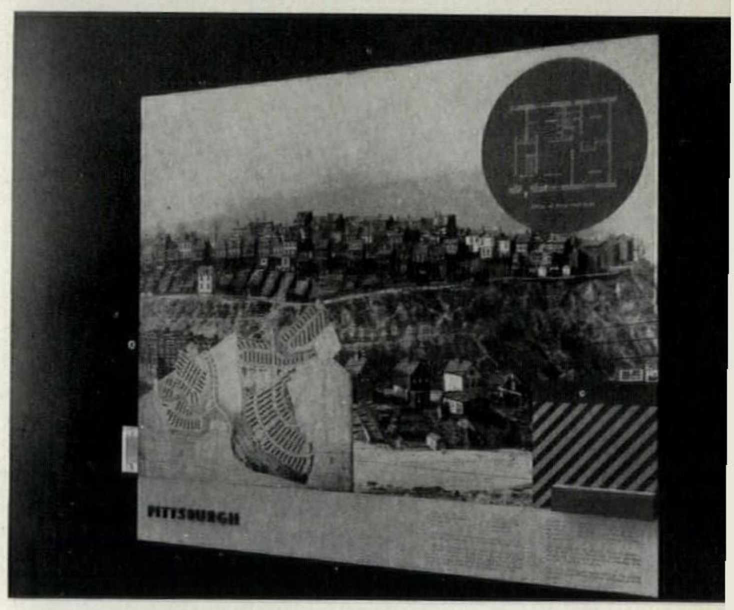
An observation of the photographs of completed work shows that the architects who work in southern climates like Porto Rico, the Virgin Islands, or even Memphis, have an easier time in producing human-looking, attractive homes than do those who work in the more blustery climates to the north; yet the photographs show, too, that a similar humanity can be given even to northern buildings, especially by the use of balconies, and both Lake View Terrace and Cedar Central in Cleveland thereby have a variety and pleasantness of effect which belies their great size and urban character. The whole combination of site, of imaginative planning, and of just those additional human touches given by balconies and porches can be seen at its best in the Camden development. Here is a housing group which is neither monotonous nor extravagant nor impractical—which vindicates architecture as an enrichment of the human environment as well as an efficient solution.

The exhibition as a whole is magnificently designed, and its installation is impeccable. The handling of the screens, the minor elements of the separation points, and the circulation pattern are all beautifully conceived and executed with a care for pleasant detail. One question only keeps rising in my mind: How much of graphic picture and plan material has been sacrificed to get large areas of text and pleasant empty spaces? It would be interesting, I believe, for the Housing Authority to have someone take a count of those who, passing through the exhibit, stop to read all the little informative essays about points of design and about the projects themselves. Perhaps this question is but one phase of a larger question, based on a kind of uncertainty as to precisely what the exhibit is supposed to do and to whom it is addressed—to architects, or to the layman, or to both.

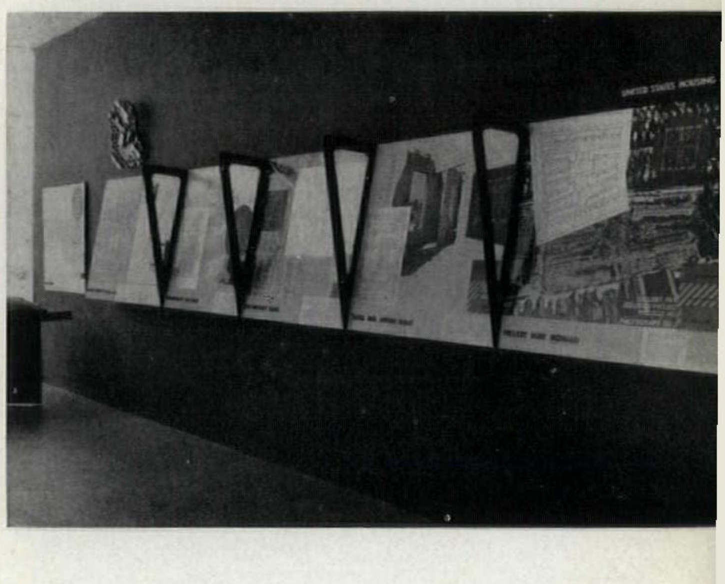
Of the beauty of the Museum itself I shall have more to say at a later date.

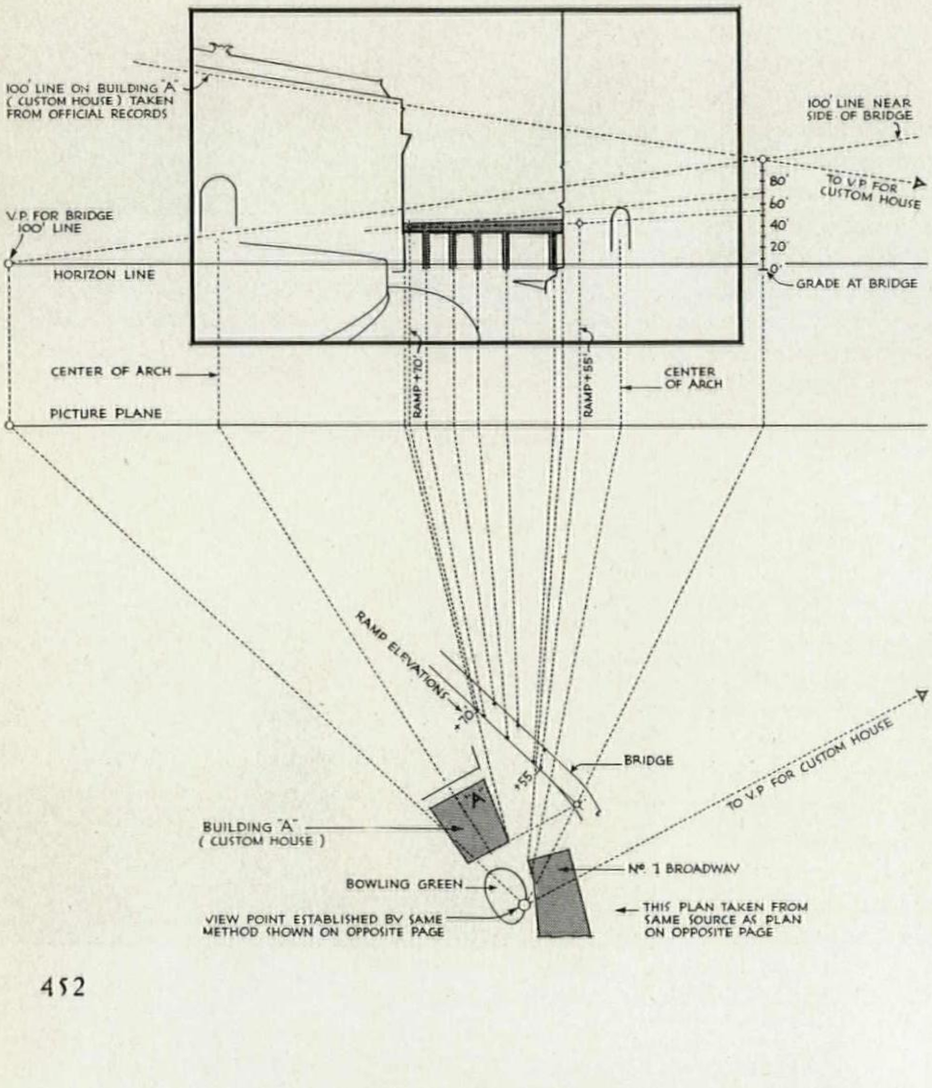
* * *

Proposed Battery-Brooklyn Bridge. The steam roller so deftly put together by the supporters of the proposed Battery-Brooklyn bridge seems to be careering full-tilt, overcoming and crushing to the earth all of the opposition which has risen so persistently against it, only to be overwhelmed by the great weight of this enormous machine, compounded, it would seem, of undue haste, little study of the problem, bad manners, extraordinary self-assurance, and an amazing disregard of expert opinion. Even the City Plan Commission jumped on the lumbering vehicle, although in its report admitting that its approval of the project was based on no sound traffic count or traffic estimate. Surely city plan commissions were made for other things than such meek following of loud shouts. It is perhaps not seemly here to comment on some of the other qualities behind this amazing drive to build a vast bridge which many consider unnecessary and few consider of pressing, immediate importance. Suffice it to say that, when one uses such terms as were used by Mr. Moses in a public hearing concerning certain distinguished men of great experience in the city planning problems of New York, and of expert knowledge, who had the temerity to object to his baby, the reasoned and efficient development of New York City is not assisted. The whole mad, impetuous clamor for haste in this matter might almost seem to argue a fear that, if the merits of the

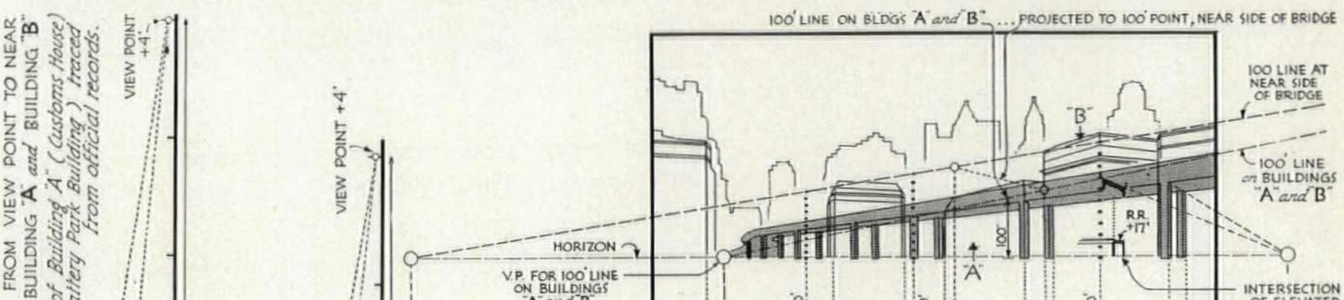


Other views in the exhibition on housing illustrate the dramatic presentation—particularly the Pittsburgh Exhibit, just above, showing one of the unfit living areas





Perspective studies by Chester B. Price, above, and Hugh Ferriss, on opposite page, of the proposed Battery-Brooklyn Bridge, referred to by Hamlin in his article this month, are shown herewith accompanied by diagrams prepared from their original perspective layouts—somewhat simplified for reproduction. They show where the bridge would be located, both horizontally and vertically. Both drawings resulted from the interest taken by the artists in the bridge controversy following a meeting of architectural and civic planning leaders at the Architectural League, in March, when further study of the bridge design and its effect on the appearance of Lower Manhattan was strongly recommended. Ferriss and Price voluntarily made the drawings for the information of those concerned, and were not employed by either side in the dispute



Check for Bridge heights in relation to Buildings "A" and "B" in rear.

problem were really examined carefully, the whole project would be seen to be the folly which many of the city's experts feel it is.

Practically, the problem of the approaches to this bridge from every point except the West Side Highway appear not only unsolved but unstudied. If the great desire is to connect the West Side Highway with the circumferential parkway in Brooklyn, well and good, but from $40,000,000 to $50,000,000 seems a great deal of money to spend for the sake of getting pleasure-car traffic to the Brooklyn beaches in ten minutes less time. The real problems are, of course, the connection of the docks and commerce of the South Brooklyn water front with Manhattan Island. An increase in the ferry service could take care of this for the time being, at a fraction of the cost of the bridge, but ferries are out of fashion, and the ferry service to South Brooklyn has been curtailed rather than increased—curtailed on the ground that there wasn't enough demand for it!

The traffic problem produced by such a bridge as this is not a matter of the mere clever handling of the bridge approaches themselves. If the flood of traffic, which the proponents of the plan claim, makes use of this bridge, where will it go? What north and south arteries exist at that point on Manhattan Island? Nowhere on the island can be found a network of streets so difficult to weave into a coherent traffic pattern as that complicated labyrinth between Broadway, Wall Street, and the East River. Manifestly, such streets as Nassau and William cannot be used for main traffic thoroughfares. There are left only South Street, West Street, and Broadway, all three coming together at a point so designed as to make the distribution of traffic almost impossible.

I do not think that opponents of the bridge need be ashamed of stressing the æsthetic damage to lower Manhattan which the bridge would cause. Civic beauty is the product of generations; partly unconscious, it is the result of years of dreaming and effort. It belongs to all the people, and it belongs to our descendants as much as it belongs to us. Now of course it is true that a great suspension bridge can be a beautiful object; the exquisite light grace of the Whitestone Bridge proves that. But bridge approaches are more difficult to handle, particularly when the roads have to proceed to great heights before passing out over the water, as they do in all New York bridges, due to navigation requirements. The drawings which Hugh Ferriss and Chester Price have made of the proposed approach to this bridge prove conclusively the irreparable æsthetic ruin it would bring upon the Battery; and these drawings, which present a view looking up Broadway from a point out in Battery Park, and a view down Broadway, showing the proposed approach as it would cut the vista in each case, should be seen and studied by everyone. With the characteristic good manners shown by the bridge proponents, these drawings were called "phony" and "faked." A careful study of the process by which they were arrived at demonstrates that, on the contrary, they are accurate and careful, true pictures of the appearance of the proposed monstrosity.

A few Sundays ago I spent some time on the Battery. A brisk southerly breeze set the bay waters to dancing; boats passed back and forth; bright sun on the trees of the park and behind them the great wall of the Customs House and the towers still further away made all seem almost ethereally beautiful. Here in the early summer weather was a free space in Manhattan, a space of fresh salt wind, of bright clear air, of sun and green, with a backdrop of the most surprising architectural phantasy man has ever built. The park was crowded not only with people coming and going from the excursion boats, but with thousands who had poured down from the hot tenements to the north. Here was the city enjoying itself, expressing itself, in a lovely area admirably fitted for that enjoyment. It is this which the great sheet of roadway, from forty to seventy feet in the air, will shadow and dim and spoil, and the possibility of this loss is really appalling. It is as though we had not yet learned what a bane and a blight are the elevated structures in Manhattan!

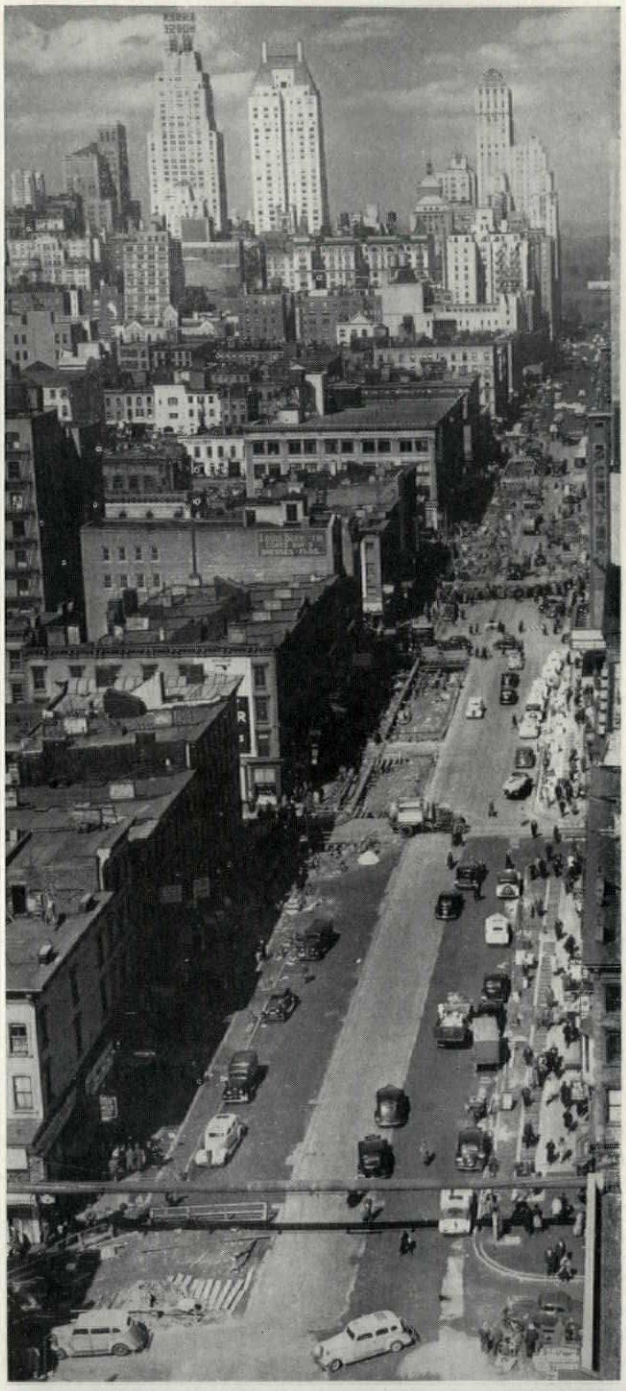
* * *

SIXTH AVENUE. Yet New York has just had a thrilling lesson in the blighting effects of elevated structures in public places, for the Sixth Avenue Elevated has at last been torn down. What was before a noisy, dark traffic passageway, along the edges of which were poured in utter confusion the most conglomerate series of undistinguished enterprises—all the commercial flotsam and jetsam of a large city—has suddenly become a wide and sun-bathed avenue which in contrast seems almost noble.

The destruction of the elevated railroad has suddenly let sun and air into the middle of Manhattan Island in a breath-taking manner; and, despite characterless Victorian architecture, despite ill-kept, blighted buildings, despite even the dirt and confusion and the wooden plank pavement that are the necessary results of the current subway building, this new north-south avenue has a quality of airiness which is unique. This results largely from the fact that for many blocks the buildings along its sides are low—from three to six stories—and the shadows they cast are short. The avenue still has the human scale of old New York. Is it too much to hope that, in the resurrection of this street something of this same quality will be preserved?

If this avenue is allowed to go the way of the important New York streets of the past, it will eventually be lined with the same sixteen- to twenty-story buildings we know so well in Madison Avenue. Such a street has a certain magnificence, to be sure, but it also has a kind of brutal arrogance that is essentially inhuman. The tall buildings dwarf the passerby; their long shadows allow sun in the street only for a brief noontime period. The existence of such a thoroughfare, under the old scheme of things, vastly increases the land values of the lots bordering the avenue, but almost because of this tends to produce a blight in the real land values on the side streets on either hand, whatever the tax assessments may be. The financial advantages of a great thoroughfare therefore accrue to but a small number of the land holders and human values tend to be completely forgotten.

In the case of Sixth Avenue, the possibility of a better and more intelligent approach to both practical and æsthetic values is still open. Practically, the object should be to distribute the accrued values of the destruction of the elevated as widely as possible on either side of the avenue. Aesthetically, the aim must be to preserve the air and light and human scale that is there today. Would it not be possible, therefore, for the whole region to be re-zoned in such a way that new buildings on the avenue were limited to six stories in height, whereas buildings on the side streets would be allowed to rise to greater and greater heights the further they were situated from the avenue? Thus the views and air of the new buildings which will be built in the Sixth Avenue region would be preserved not only on the avenue itself but also for a distance of a half crosstown block on either side, and the unearned accrual of land values would thus be spread over a much wider area. In this new zoning some arrangement could doubtless be worked out by which occasional isolated towers might be allowed. The great thing would be not to prevent the building of high buildings entirely, but to limit their land coverage to some reasonable size in proportion to the block area, and also rigidly to limit all other building heights in the region. In this way great architectural variety would be possible; and at



Wide World

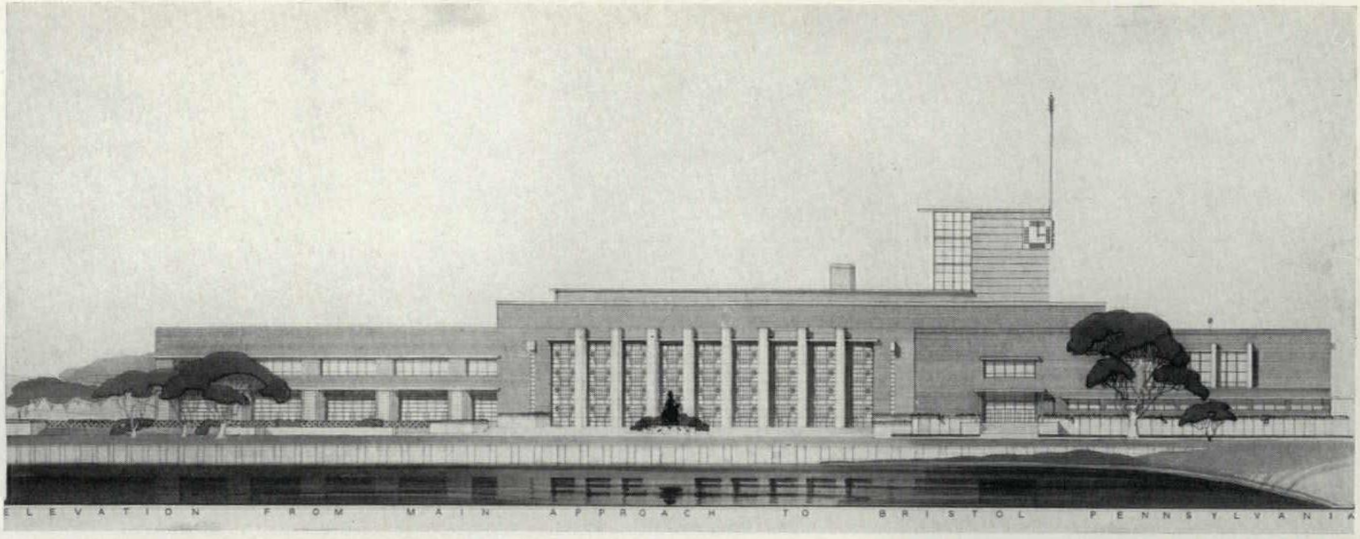
the same time the general mass of the buildings, stepping down gradually from the center of the blocks to the Sixth Avenue frontage, would enable the sun still to pour its cheering and beneficent influence unhampered into the city along the entire length of Sixth Avenue, and it would furnish a promenade distinguished by human scale and amenity, a promenade which might have something of the restrained and coherent beauty that we usually associate only with certain foreign cities.

The Sixth Avenue Association is, fortunately, awake to some of the possibilities furnished by this new—that is, to all intents and purposes new—avenue, and it is encouraging to note that they plan extensive planting of trees along its edges, in the effort to preserve its human quality. Still, even trees cannot altogether humanize 20-story façades, and the magnificent effect of the eight large trees on the Fifth Avenue front of Rockefeller Center is largely due to the fact that they are placed against comparatively low buildings or building wings. Is it too much to hope that the Sixth Avenue Association will go one step further in its commendable effort to make the new thoroughfare as fine and as advantageous as possible by taking a radical and even revolutionary stand, such as that suggested here?

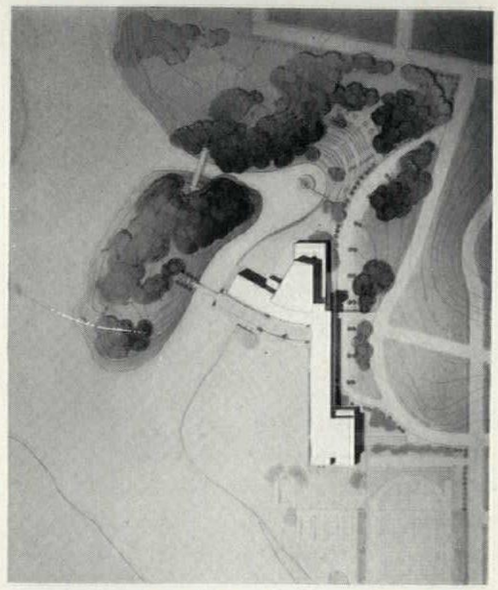
The whole problem is basically, of course, one of land usage, made vivid by the fact that present zoning regulations with regard to building heights would permit the construction of an amount of building sufficient to house all the work and residents of a city of the unbelievable size of 50,000,000 or even more. New York does not need an entire new avenue of 20-story office, loft, and apartment buildings. If built, they would either wreck the economic life of existing buildings, or else be themselves losing enterprises, destined for eventual blight. This is the reason, of course, for the spotty and incoherent building development of the entire city. Here for the first time, in the Sixth Avenue area, is an entire district in which there is almost unlimited opportunity for a logical building development in accordance both with the economic needs of the city and the æsthetic welfare of its citizens. Little by little new theories of land usage are growing. The five great towers of "Castle Village" crowning their broad parked terrace overlooking the Hudson form but one example of a growing protest against the old happy-go-lucky ways of city building. If those who promote and design the new structures that are bound to rise along the clear length of Sixth Avenue bear in mind these new ideals of land usage, then we may expect perhaps the noblest of all New York streets.

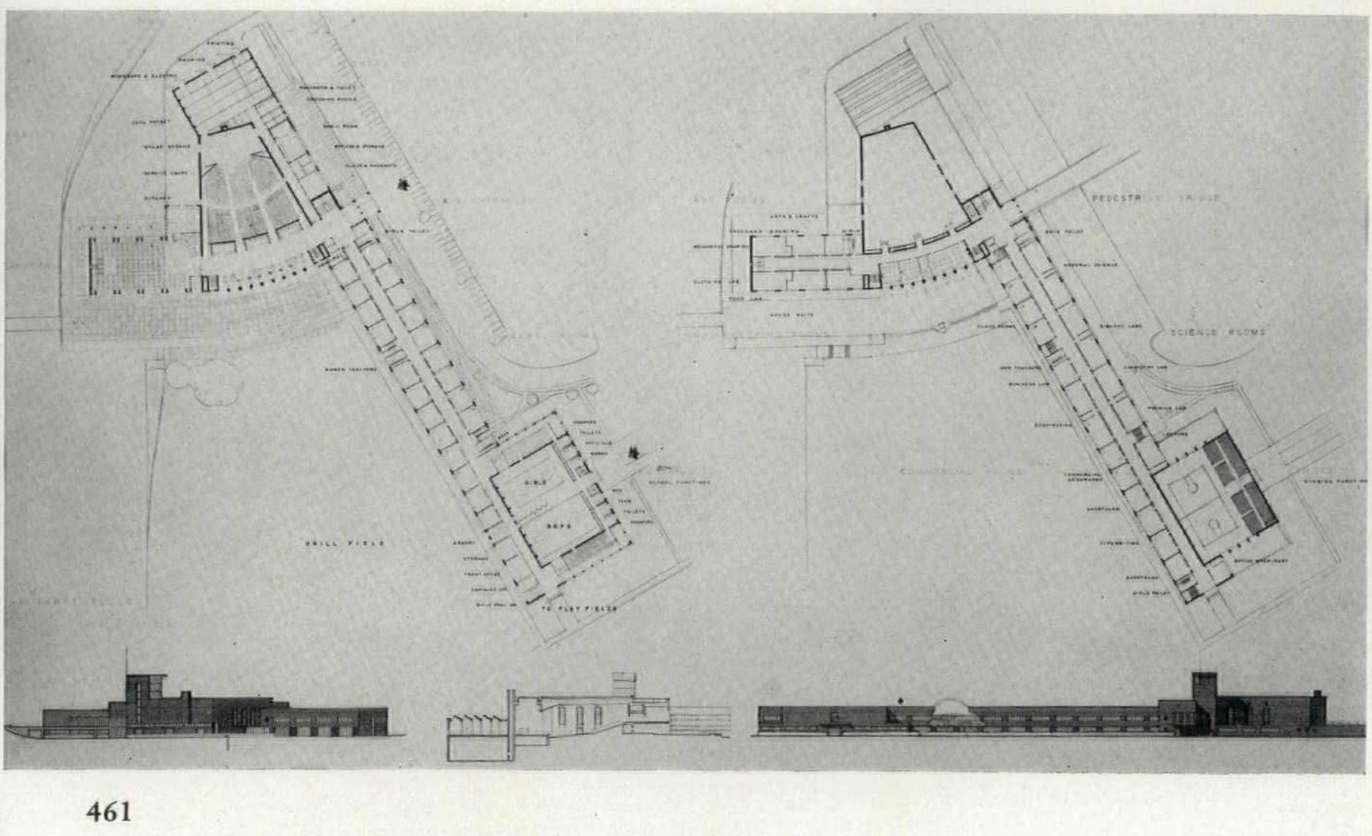
Another view of Sixth Avenue at the time that the old elevated structure was being removed illustrates effectively the change which comes with clearing this thoroughfare. Bryant Park, at the rear of the Public Library, will at last be open to the avenue and an asset to properties

Wide World



Joseph F. Balis, of Paterson, New Jersey, has been awarded the Daniel H. Burnham Fellowship in Architecture at the American Academy in Rome for this design for "A High School" to accommodate 1,500 pupils in a small Pennsylvania city. The site selected for the building is a flat area now used as a city dump and access is from a highway running across just below the plot plan shown at the right. The elevation above is seen from the highway and the plans reproduced below have approximately the same orientation. Balis was the winner among 14 final competitors selected from a field of 62 entrants. He will be 25 years old this month and received his B.S. in Architecture in 1936 at Pennsylvania State College, later working in the offices of McKim, Mead & White, of New York, and W. Pope Barney, of Philadelphia. The Fellowship provides $1,500 a year for two years and residence at the Academy. He will begin study there October 1





ARCHITECTURAL PAINT PROBLEMS

BY W. W. CASTOR

EDITOR'S NOTE: *W. W. Castor, the author of the following article, is an experienced paint chemist with a practical background in architectural paint manufacture. He is now chief chemist for a manufacturer who is not marketing paint for the building industry. He was asked to write this article because it was felt that his detachment would permit him to be impartial concerning a highly controversial subject. However, should any manufacturer or user of paint wish to voice constructive comment at variance with, or in substantiation of, any points Castor has brought out,* PENCIL POINTS *will be happy to devote additional space in an early issue of the magazine to these comments. It is asked only that either praise or criticism be brief.*

SINCE a complete picture of architectural paint problems could very easily fill several volumes, we will, perforce, deal briefly with the major aspects of formulæ, application and durability.

Before discussing specific items there are several factors of a general nature to consider. The first is paint merchandising. Many pages can be written about the sensational characteristics of various brands without disclosing one solitary useful fact about paint. Advertising intended for the average retail buyer would suffer enormously in effectiveness if it dealt with technically important features.

It is worthy of note that after all these years there is now a general trend toward formula labels. While these formulæ would be of little help to the superintendent of a paint plant, they are exerting a profound influence upon the manufacturers who exist on the technical developments of the reputable and progressive firms. The latter, fortunately, account for some 85 to 90% of total national output.

One of the dangers of formula disclosure from a paint manufacturer's standpoint, in the case of ready mixed paints, is the antagonism of some painters to anything not called "lead and oil." While lead pigments are still the most widely used of all paint pigments, a balance of lead with titanium, zinc and silica pigments, for example, makes an excellent paint of moderate cost. A few early manufacturers did a great job in selling "lead and oil" by marketing ready mixed house and barn paints consisting of high percentages of rosin along with practically anything in the way of inexpensive pigments. This led to the bad name endured by ready mixed paints for so many years. We find today many brands of good paint. They are formulated by well trained chemists and manufactured in carefully controlled and efficiently managed factories. The only way to be assured of quality in paints is to deal with reliable manufacturers. This does not limit purchases to the nationally advertised brands. Rather, it includes a large percentage of all manufacturers. A good method of identifying the reliable firms is by their research department and their financial condition; the research and technical angle being the most important. Good management of the merchandising of a good and reliable paint almost automatically leads to good financial stability. A cut-rate manufacturer—and cut rate goes hand in hand with cut quality—cannot afford good technicians plus the fact that good technicians would not jeopardize their professional standing by continuing in the employ of a fly-by-night outfit.

Attempting to buy paint on formulæ specifications is, to a fair extent, a safeguard against damaging adulteration but it also effectively precludes the possibility of turning the many new and valuable developments into enjoyed advantages. Examples of government specifications are shown in Table No. 1.

These are more or less representative formulæ. They do not include any of the various modifications which are available in some ready mixed paints—modifications which are in many instances carefully guarded or protected by patents. One example of a closely guarded advantage, which could hardly be included in a specification sheet, is a chemically-treated oil possessing some remarkable properties. This oil, so treated, is used in wall paints and as an outside first coater. It acts as an emulsion although it contains no water. When painted out on one side of a sheet of paper, it

TABLE No. 1

"PAINT FORMULAE"

Federal Specifications Executive Committee

Paste Pigments & Dry Red Lead

	Formula No.	*Pigment Type*	*Pigment Pounds*	*Linseed Oil Gallons*	*Turps Gallons*	*Drier Pints*
Priming coats on new work	1	A	100	3 -4	3 -4	1-2
	12	A-C	60-40	2 -4	1¾-2	1-2
	13	A-D	60-40	1¾-4	1¾-2	1-2
Body coats, wood, outside new and first coat repainting	4	A	100	1 -2	1½-2*	1
	8	A-B	50-50	1½-2	2 -3*	4
	15	B-E	40-60	2 -2½	2 -3*	4
Finish coats outside	5	A	100	3 -4½	⅛- ¼*	1
	19	A-B	50-50	3 -4	½- ¾*	2-3
	16	B-E	40-60	4 -4½	½- ¾*	4-5
Priming coats metal	10	C	100	3 - ⅛	5/16*	2½
	11	D	100	3	5/16*	2½
Finish coats inside flat to eggshell	6	A	100	1 -6†	1½-3	¼-½

Type of Pigment:

A—Paste White Lead (heavy) .... 100 lbs. paste—2⅔ gals.

B—Paste ZnO or leaded ZnO .... { 50 lbs. white lead paste / 50 lbs. zinc oxide paste }

C—Dry Red Lead .... 100 lbs.—1-1/3 gals.

D—Paste Red Lead .... 100 lbs.—2-1/6 gals.

E—Titanium Pigment .... 100 lbs.—4½ gals. { 60 lbs. TiO_2 (—4½ gals.) / 40 lbs. ZnO }

* Volatile Mineral Spirits may be used in place of Turpentine. See Table No. 2.

† Spar Varnish or Interior Varnish.

does not penetrate to the other side. Other specialties available include catalysts which aid in color holding, special resin modifications which produce unusual and highly desirable characteristics, such as quick drying, hardness, leveling, gloss, adhesion, and durability. These, for the most part, are rarely available in specification paints.

A brief view behind the scenes in paint formulation is of interest. We find three major divisions in the ingredients. While there are countless lesser divisions and sub-divisions the principal ones are:

1. Binders
   - Oils
   - Varnishes
   - Synthetic Resins
2. Thinners
   - Naphthas
   - Turpentine
   - etc.
3. Pigments
   - Body Pigments
   - Tinting or coloring pigments
   - Extenders or inerts

We will review them separately.

No. 1. Binders. This is the actual film forming material. It is the portion of the finish which, as its name implies, binds together the fine particles of pigment. Current paint formulations include as binders the following materials: Soy bean oil, linseed oil, china wood oil (tung oil), perilla, and several other less important oils. These oils are used as such in most exterior paints. They are sometimes modified by oleo resinous varnishes and synthetic resins to meet the required film characteristics for a specific application. Their use in wall paints is quite general. Some wall paints and most enamels have as binders such materials as treated oils, oleo resinous varnishes, and synthetic resin solutions. Commonly used synthetic resins for this purpose are the alkyd resins which consist essentially of glycerin, organic acids, and a vegetable oil.

To specify any particular oil, varnish, or resin in a paint or enamel would be of little value unless one is thoroughly familiar with paint and varnish chemistry. Binders have been developed to such a specialized degree by the paint and resin chemist and are so complex in their formulation that the final selection for a particular purpose had best be delegated to the paint manufacturer.

No. 2. Thinners. This is the volatile portion of the paint the function of which is to render the pigment and binder sufficiently liquid for the required application. These are usually chosen by the formulator according to the desired drying time of the film. For example, a paint formulated for application by brush would require a thinner or slower evaporation rate than a paint which was intended to be applied by spraying. The number of solvents or thinners used in the paint industry is large. While they consist of such material as turpentine, petroleum, naphthas, coal tar solvents, alcohols, esters, and ketones, only a small number are of interest to the architect. The most important ones are listed along with other pertinent architectural characteristics in Table 2.

TABLE 2

Material	*Boiling Range*	*Cost Per Gal.*
Kerosene	360° F. to 570° F.	$ .08 to $ .22 per gal. depending upon quantity purchased.
Mineral Spirits	300° F. to 400° F.	
V.M.P.*	250° F. to 375° F.	
Solvent Naphtha	160° F. to 240° F.	

*Varnish Maker's and Painter's Naphtha.

The boiling range determines to a large extent the rate of evaporation.

Mineral spirits are sold under various trade names such as Apco, Stod-sol, Varsol, etc., and offered generally as turpentine substitutes. Stoddard Naphthas are those meeting certain specifications of the dry cleaning industry. It is quite frequently a real economy to buy your own thinner, and always wise to check the supplier of your finishes as to the proper material. Mineral spirits, however, is the most widely used solvent in brushing materials.

No. 3. Pigments. These may be sub-divided into three general groups each of which serve a somewhat different purpose.

Body Pigments. These constitute the bulk of the pigments of the paint or enamel, and impart to the liquid such important characteristics as ease of application, hiding, and quite frequently, color.

Tinting or coloring pigments. While some of these are included in any complete list of body pigments, their primary purpose is in producing the desired decorative effect.

Extenders. These are characterized particularly as a group which impart very little in the way of color or hiding. They are used primarily for improving adhesion, reducing cost, and, in some instances, to prevent settling out of the pigment in the container. In the case of flat wall paints, where it is necessary to maintain high pigment concentration, the more extensive bodying and coloring pigments would be prohibitive from a cost standpoint. The proper pigment selection is vital to the desired final characteristics of the paint film.

The following table shows the relative hiding power of various white pigments:

TABLE No. 3

Pigments	*Hiding*
Basic Lead Sulphate	13
White Lead	15
White Lead (high tinting strength)	18
Zinc Oxide	20
Lithopone	27
Titanium Dioxide Barium Base	40
Lithopone (high strength)	43
Titanated Lithopone	44
Titanium Calcium Base	48
Zinc Sulphide	58
Titanium Dioxide	115

Note: "Hiding" equals the number of square feet of bulk surface that is completely hidden by one pound of pigment in oil.

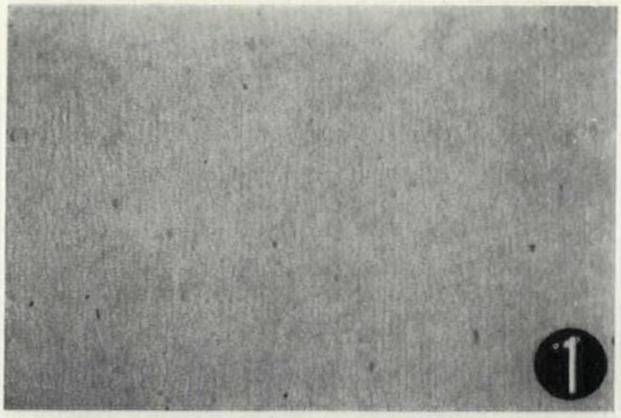
It can be seen by the above that well intended, but improper selection of one of the above pigments would produce a paint of considerably higher cost than is necessary per square foot of coverage. The necessity for blending several pigments becomes increasingly evident when it is further noted that lead pigments aid in flexibility, zinc pigments which include the lithopones serve as hardening agents, and titanium dioxide has excellent hiding characteristics. It can be seen then that the blending of lead pigments, zinc pigments, and titanium dioxide in their proper balance would produce a film of many desirable properties.

It must be borne in mind that these examples are pigments only, and that there are other very important considerations involved in the selection of a binder, its relationship to the total pigment in percent and the proper addition of driers. While the above remarks have dealt with white pigments, the same general considerations are applicable to many of the colors.

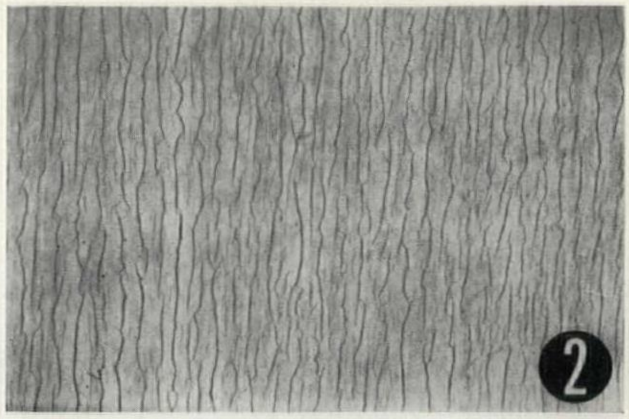
Examples of pigment combinations:

TABLE No. 4

White Lead	*Zinc Oxide*	*Asbestine*	*Titanium Dioxide*	*Titanium Barium*	*Silica*
55%	35%	10%	—	—	—
30%	30%	10%	—	30%	—
—	25%-35%	—	65%-55%	—	10%
30%-45%	15%-30%	—	—	30%-45%	—

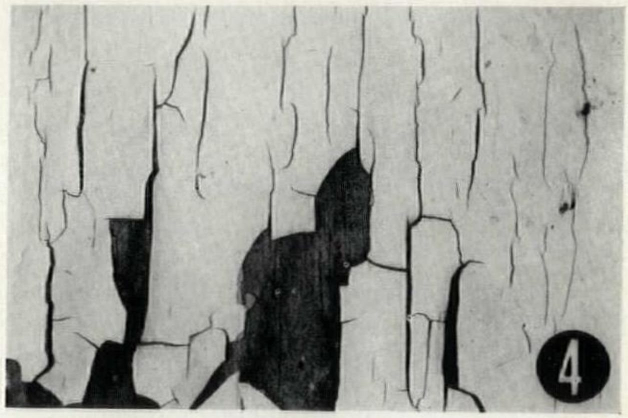


CRAZE LINES

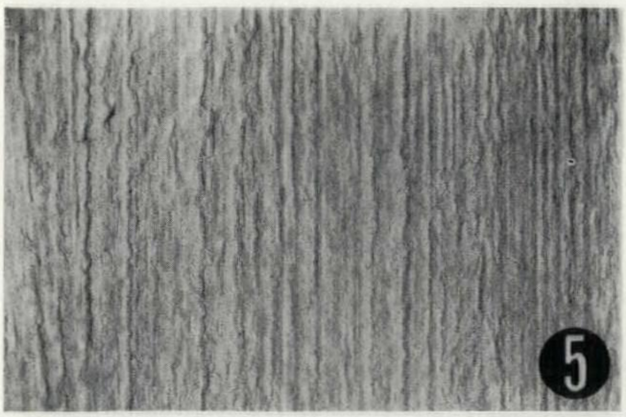


CRACKING

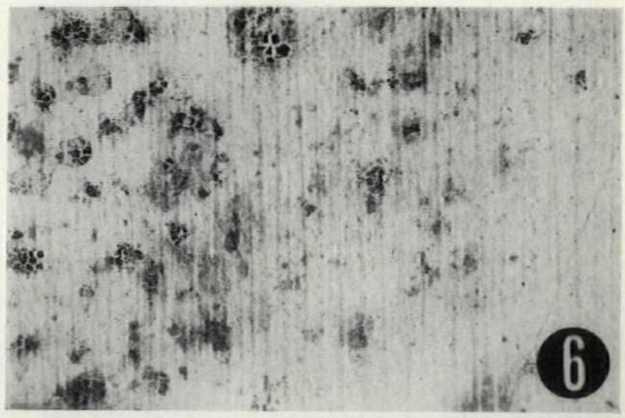
BLISTERING



PEELING



WRINKLING



BLOTCHES AND MILDEW

Wall Paints. In the selection of wall paints, primary surface conditions are as involved as in the case of exterior finishes. This complication becomes less of a problem by application of a few simple principles. In the first place, the architect in the majority of cases is concerned with applying the material on a new surface. In most instances this will be plaster. The only difference to be considered between plaster and any other porous wall surface such as unsized wall board or masonry is the chemical activity of the lime present in the new plastering. There are many satisfactory sizing compounds which are safe and efficient when applied on dry plasters. There have been recently developed one or two materials which have been used with considerable success on green plasters, and in some instances while still wet. The latter, however, are used only in the case of rush work.

For application on properly seasoned plasters, old standby sizing materials such as glue and sugar are still serviceable. Add to these the newer water soluble casein paints, and the new synthetic types (among which is the one for wet plaster noted above) and the architect does not lack efficient sizing mediums. Painting a properly sized wall then becomes a problem involving durability, color holding, cost, texture, and color.

The durability of a wall paint should be considered on the basis of the use to which the room is to be put. For example, in a school building where boiler plate would scarcely withstand the abrasion of childish enthusiasm, it would be gilding the lily to apply on the walls a paint for which a premium had been paid to insure long life. In view of the inevitable repainting about every two years, it becomes evident that hardness, ease of application, and low cost would be the primary considerations in this case. The other extreme would be an office building of selected tenantry where a life span of up to ten years could be expected from the wall finish, even with the usual biennial cleaning. A residential kitchen requires a finish highly resistant to greases and cleaning compounds, should have good color holding, and should have a sheen not less than eggshell. This last requirement is important. In formulating a cheap wall paint, it is necessary to include large amounts of inert pigments. These give substance to the liquid and materially reduce the cost. For example, titanium dioxide (trade names "Rayox," "Titanox A," etc.) has excellent hiding and tinting properties and costs about fifteen cents per pound, while whiting, desirable as an adjunct to body and build, costs about $14.00 per ton. Excessive price consciousness on the part of the buyer sometimes influences a well meaning manufacturer to dip his scoop a little deeper into the whiting and not quite so deep into the titanium. If you demand dollar-a-gallon wall paint, don't expect fifty cents worth of pigment in that gallon. It can't be done.

Casein paints are of interest in some architectural problems. Where the durability of oil base finishes is not required, and a flat finish is desirable, the low cost of casein along with the use of tap water as a thinner makes for considerable economy. The general ease of application and the resultant economy in labor is an added factor. There are some characteristics of casein paints, however, which should be considered before they are used. Only flat finishes are available. This makes for less durability especially when frequent washing is necessary. The use of strong detergents tends to re-emulsify the binder. There is still occasions where putrefaction is encountered and the manufacturer should be checked on this for his material. In the case of remodeling and renovating the use of these finishes is desirable in many instances. The fact that most old type water paints had to be completely removed before using an oil base material for repainting makes the use of casein paints more interesting in that they can be successfully recoated.

Color is, of course, a very important component of painting. The dictates of current styles leave little to influence color selection. While the pure artistry of hue, chroma, and value is suffered little more than a nodding acquaintance by most formulators, the actual reflection values are of technical interest. Listed below are some figures from the "Lighting Research Laboratory" of the General Electric Company:

REFLECTION VALUES OF VARIOUS COLORS

Color of Paint	*Ref. Value*
White (gloss)	84%
White (flat)	82%
White (eggshell)	81%
Ivory White	79%
Cream	74%
Aluminum	73%
Ivory Tan	67%
Light Green	62%
Light Gray	59%
Buff	55%
Light Blue	52%
Medium Green	49%
Tan	48%
Medium Blue	43%
French Gray	32%

Note that the very popular Buff is not a color to be used in the interest of economical lighting.

The same fundamental principles involved in putting quality into a house or wall paint apply to the rest of the coatings used by architects. Good old rail-fence honesty can't be specified but, fortunately, is generously available in the paint industry.

Paint Tests. While the previous paragraphs might have indicated the futility of satisfying yourself as to the quality of a given paint, it is by no means out of the question. The Board of Education of the City of Pittsburgh has an efficient method of evaluation. To satisfy themselves that a manufacturer is eligible to bid, they investigate his firm as a responsible business. Assured of his reliability, his product must then be proven. This is accomplished by having him paint a selected school room with a representative paint. This test job is observed for two years. At the end of that time he is notified of the results which, if satisfactory, enable him to bid on subsequent purchases. Appraisal of his bid per gallon in terms of cost per thousand square feet, is then made.

If the two year elimination idea is not practical, reliability and thorough testing as to cost would be a safe procedure. A further test would be of value in determining quality. A good system for this would be as follows:

Obtain from a manufacturer a sample of material suited to your requirements selected from the Federal specifications. Test this against your bidder's sample, observing the following:

	GOV'T SPEC.	BIDDER
Cost per 1,000 sq. ft. (see Table 4)		
Ease of brushing		
Drying Time (tack free)		
Gloss or Sheen		
Cost of Thinner		
Hardness after 48 hr. drying		
Scrubbing Test*		

** Do this only if an inside finish is being tested. Use a good scrubbing brush and a cleaning agent such as "Dutch Cleanser." Paint a 4-inch or 5-inch stripe of each paint sample on a suitable surface (as near like the one to be painted as possible). Allow about one inch between stripes. Wet brush with water and sprinkle on the cleanser. Brush against both stripes in one stroke and, counting the strokes each way, continue brushing until one stripe is worn through. Brush along the same path each stroke and keep an even pressure on the brush. The number of strokes required will vary greatly with the type of brush, the kind of cleanser, and the amount of pressure. Your results will be valuable only in comparing the samples involved. Several samples can be tested at the same time. Thirty days should be allowed for drying before this test is made. A quick drying paint will lose nothing in that time and an oil paint would not get a fair test against it in any less time.*

To test color holding, paint a sized board or wall board about 6″ x 12″ with each sample submitted—one board for each paint. Cover half of the coated side by wrapping with heavy black paper or metal foil to insure complete darkness. Leave the other half exposed to daylight—preferably sunlight—for thirty days. The wrapped area will darken in that time and a comparison of the various test boards will indicate the material remaining the whitest. A straight white lead and linseed oil gloss white paint on a wall will darken to a buff in 7 or 8 years (or less) losing nearly half of its reflecting ability. (See Table 3.)

Examine and compare samples on the basis of the listed "Defects, Causes, Corrections." With the result of the above examinations a fairly accurate evaluation can be made.

Paint Samples. In asking a manufacturer to submit a sample for a given purpose, it is especially important to list all the desired properties of the resultant film as well as full details concerning the surface to be painted, and the method of application. He is in the paint business and accumulates a generous fund of helpful information that cannot be printed on the label. Here is a questionnaire that, while not complete, includes some very pertinent questions:

1. Interior or Exterior?
2. Give full description of surface to be coated. If new, state kind of surface. If old, describe condition of old paint, paying particular attention to any evidence of porosity. The surface may need resizing, a primer, or complete removal of the old paint if badly blistered or scaled. If known, state kind of paint previously used.
3. Location. If interior, state type of building and its use. If exterior, describe district. Residential? Industrial? City? Suburban? (This will aid in evaluating corrosive atmosphere such as that emanating from a steel mill.)
4. Method of application.
5. Drying time desired. While some conditions and circumstances make quick drying essential, it is wise to specify a coating to do a certain job and leave the drying time to the manufacturer. The accelerated oxidation induced by various driers does not stop when the paint film is satisfactorily dried. Increasing the drier above the minimum shortens the life span of the paint film accordingly. While in some applications this would not be objectionable, in the case of exterior building paints where each additional year's service is money saved, the need for repainting at the end of five years instead of six means a 20% increase in the cost per paint year —all for a day or two saved in finishing the original paint job.
6. Remember that the ideal paint has not yet been made and that a good manufacturer will normally furnish the best paint he can give you at the price and is constantly striving to improve his product if for no other reason than to keep ahead or at least abreast of the industry in general.
7. Thinner. (See Table 2.) Inquire as to the turpentine substitute tolerance. It would be wise to let your painter select the thinner as he would quickly recognize incompatibility.

Select only reliable manufacturers.

State your problem thoroughly to a capable representative. By "capable" I mean a man who knows paint, not an embryo salesman. Novices in the business (speaking from early experience) are inclined to let their sales enthusiasm distort the picture of the architect's real problem. The result might be extra gallonage, or the impression that the finished job will serve as a combination boiler plate, porcelain, rubber, and, in the declining years of the building, a super-structure to which the disintegrating masonry may cling in old age.

If the job is large enough, insist upon the services of the manufacturer's technical staff. Most concerns will volunteer this service.

Have the selected manufacturers submit samples. Preferably two one-pint cans. Use one for testing before buying. Compare the other one with representative samples of the paint you purchase. Follow the testing procedure outlined above, and if a closer check is desired, have the weight per gallon checked and the percent solids determined by an unbiased chemist. Repeat this for the representative samples of your shipments. A variation of more than 1% or 2% solids should be questioned. It's the solids (oil, pigment and resin) that make the final film. The thinner is a relatively low cost material and should be kept to the minimum in the paint you buy.

Have your paint applied by a skilled painter. The majority of paint failures are the result of faulty application. The human element here can undo the work and destroy the value of the paint manufacturer and his experience. Here, also, is by far the largest part of the cost of painting. A good painter is as important as good paint. Be as thorough in investigating your painter as you are in investigating the paint manufacturer.

Brushes. If you are responsible for furnishing the brushes, remember that a 4-inch bristle brush of even fair quality costs several dollars. Beware of "Bargains" in brushes. In checking over the completed paint job, below are listed some defects, their causes, and means of correction or prevention:

Poor Flow.
Exterior Paint—Poor mixing.
Insufficient stirring of added pigments or pastes.
Painting in excessively hot weather—in the sun.
Moisture in pigments.

Lack of uniformity in sheen.
Porosity of surface due to improper sizes or priming.
Improper stirring of paint before application.

Blotches and mildew.
Wall Paints: Plaster burns due to improper sealing or painting green plaster. The destructive lime can be materially neutralized by washing the plaster with a solution made up of 2 pounds of Zinc sulphate in a gallon of water.
Failure to size the porous wall also causes these spots. Use a glue, varnish size, or casein size solution.
Exterior Paints: Bleeding over knots. Exuding sap from some woods. Coat all knots with shellac brushed out thin.

Excessively slow drying.
In the case of varnishes and floor finisher, this is usually due to a wax residue. Wipe the woodwork or floor with a rag wetted with mineral spirits.
In the case of paints, this is caused by low temperature and dampness.
Insufficient drier for the particular application is also a possible cause.

Peeling.
Painting over damp surface. This failure usually starts with blisters.
Moisture seepage from the back of the paint.
Wood failure.

Blistering.
Caused by painting in moist atmosphere, or over damp surface.
Painting over unseasoned wood, improper priming of new wood.
Moisture seepage from back of film.

Cracking.
Putting a new flexible coat over old brittle paint or in some instances over a new primer which is too hard and inflexible.
Caused by exposure of too brittle film to sun or application of a paint over a more flexible primer.
Improper pigment balance.

Craze lines.
Lesser degree of cracking, lifting caused by use of strong solvents.

Lapping (brush marks).
Caused by improper flow of paint, improper solvent balance, or pigment to oil ratios.

Darkening or yellowing.
In wall paints:
Caused by use of inferior grade of oils, lack of zinc oxide.
In exterior finishes usually caused by sulphur contaminated air on straight lead pigmented finishes.

Chalking.
While very slight chalking is necessary, excessive chalking is very undesirable. This failure is usually caused by use of excessive amounts of Titanium pigments and improper pigment-to-binder ratios. Normal chalking is important for successful repainting. Without it the finish will crack.