INDUSTRIAL DESIGN

June 1956 *two dollars a copy*

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Shaping America's Products: Small-scale industry

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This month's cover, spelling out the theme of our lead article on pages 51 to 67, was composed of Plexiglas letters formed at Rohm & Haas by "Airforming," described on pages 54 and 55.

VOLUME 3, NUMBER 3

INDUSTRIAL DESIGN

A bi-monthly review of form and technique in designing for industry. Published for active industrial designers and the design executives throughout industry who are concerned with product design, development and marketing.

CONTENTS FOR JUNE, 1956

Frontispiece: *Not a surrealistic landscape, but an apartment house viewed from below is Hugh Johnston's picture, its air conditioners filed against the sky. A head-on view of the subject appears in Design Review, pp.* 120-121.

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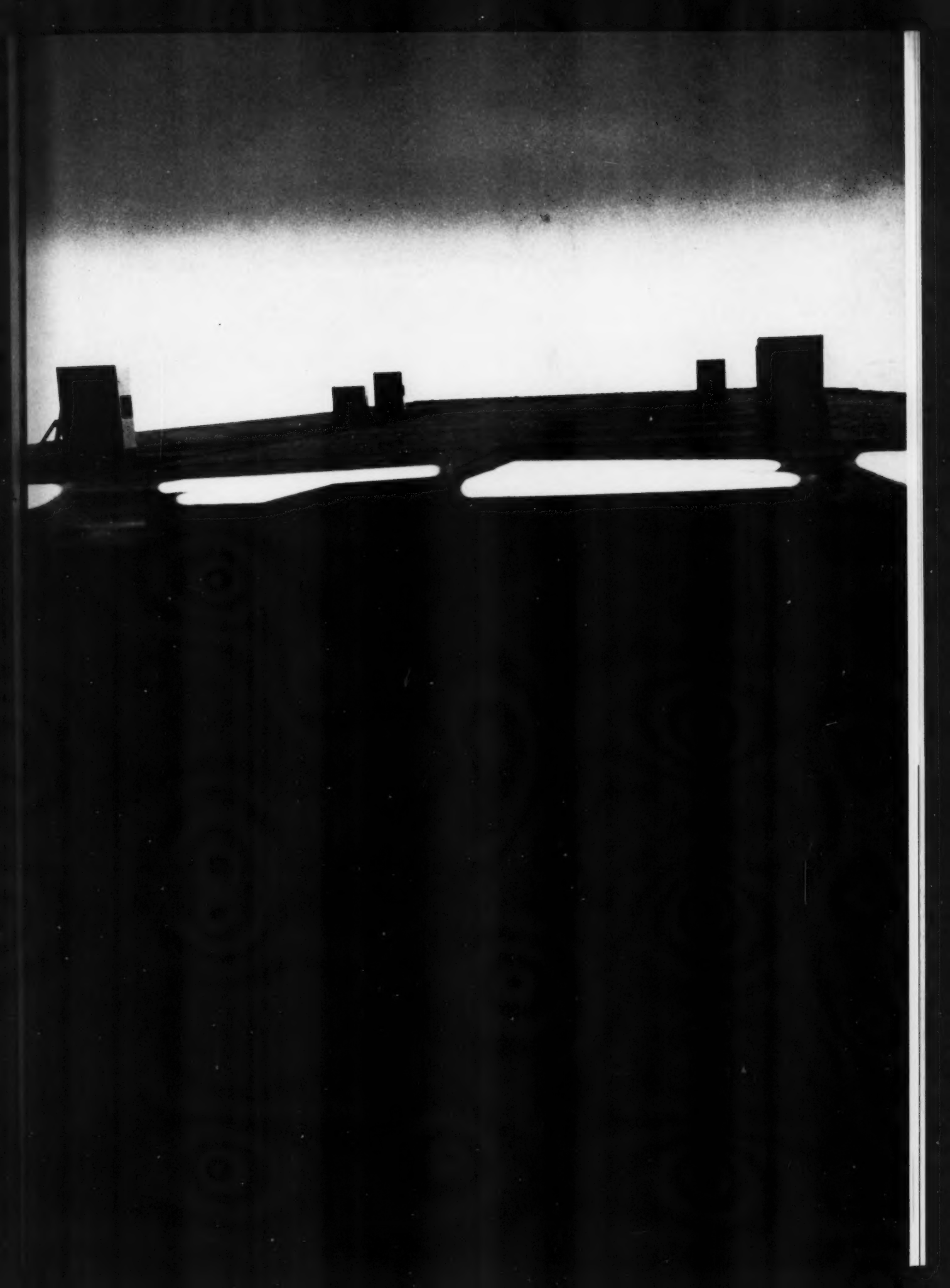
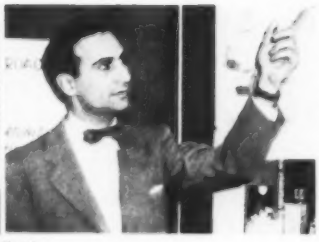


in this issue...

Bowlen

Monahon

Witzgall



Forni

Stern

Loewy, Wagner

Robert Monahon, New England born and bred, started out by studying theatre at the Yale School of Fine Arts. In 1953 he graduated from the Cambridge School of Design in Boston and worked with Walter Dorwin Teague on architectural and product projects. Now a staff designer at Rohm & Haas, he explores modular methods for sign design, and is the consultant member of a design team advising customers on molding powder and sheet applications.

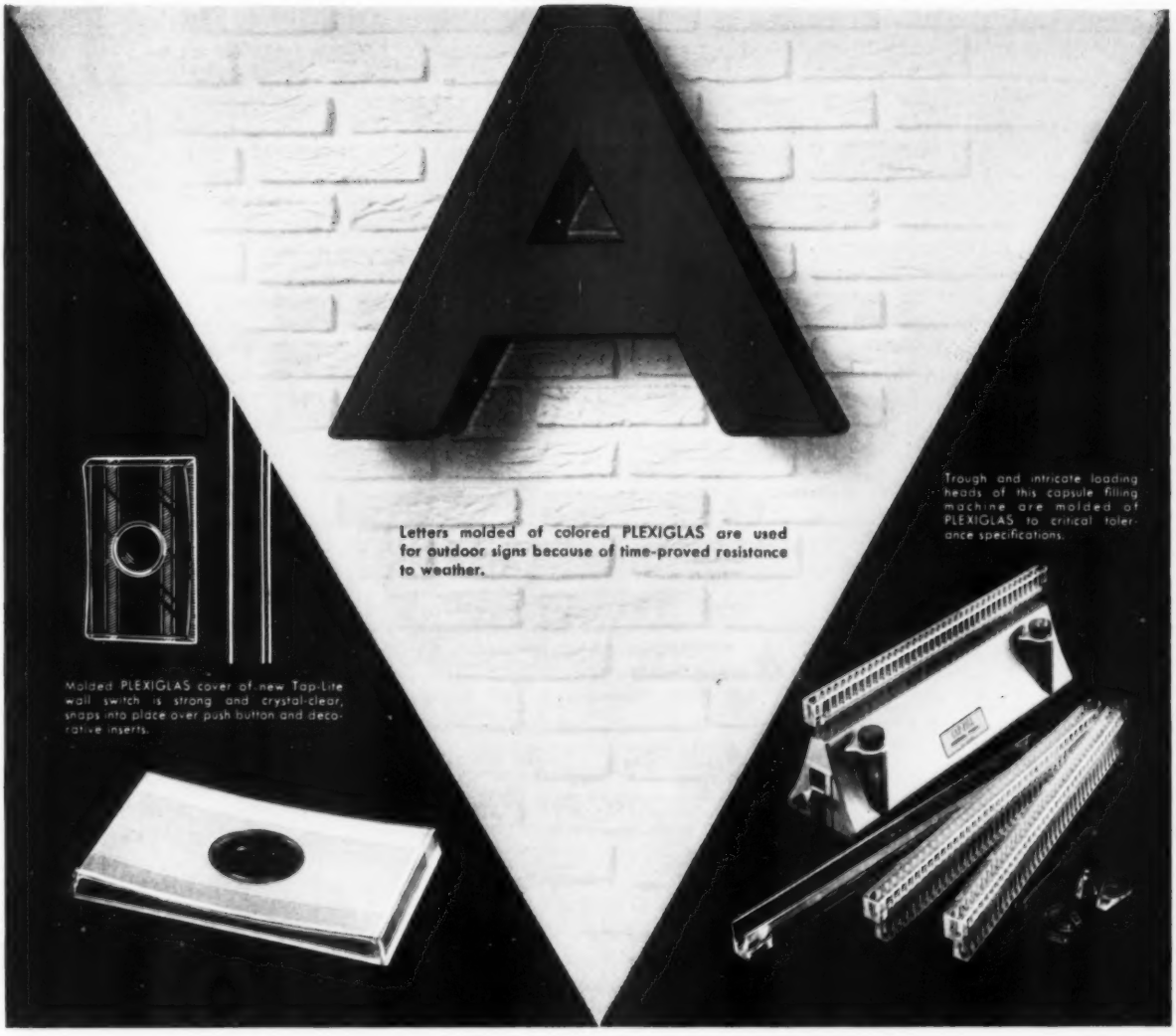
Nord Bowlen joined Lunt Silversmiths in 1933, immediately after completing his training at the Rhode Island School of Design. He has been head of the design department since 1948 and is responsible for the creation of numerous successful patterns, one of which, the revolutionary nylon-handled sterling flatware, is shown on pp. 64-67.

Herbert J. Witzgall, Industrial Design Engineer in GE's Plastic Department, started at GE with the Apprentice Course in 1929. He continued up the line through the plastics toolmaking department, becoming consecutively Plastic Mold Designer, Industrial Designer of Plastic Products and, in 1952, Mechanical Engineer for Atomic Products. In his present job since 1955, Mr. Witzgall is responsible for the design of large-volume products like the polystyrene drawer on pp. 56-57.

Anthony F. Forni, a native of the Bay State, graduated from Rensselaer Polytechnic Institute with a B.S. in Chemical Engineering in 1942. Initiating his career as a line foreman with General Chemical Company, he was next engaged as a production engineer at Firestone Steel Products. He joined GE as a market analyst in the Chemical Division in 1946, and the following year became Supervisor of Advertising and Sales Planning of the Chemical Division. Since 1954 Forni has managed the Product and Sales Planning area of the Plastics Department. His function is to dream up and sell products made of GE plastics to purveyors of wholesale goods like Sears, Roebuck. For the whole story on his most recent brainchild, see pp. 56-57 and the new polystyrene drawer.

Walter B. Stern, specialist in package design, reports again on the AMA packaging exhibition (pp. 97-99). He has been packaging engineer for Montgomery Ward and Sears Roebuck; Packaging Director for Barnes & Reinecke and Kraft Foods; and, for four years, Technical Director of the Packaging and Graphics Division at Raymond Loewy Associates. He is a member of the A.S.I.D. and Packaging and Materials Handling Engineers, and has written a handbook on package engineering.

Franz Wagner heads **Raymond Loewy's** Chicago office, whose latest design is shown in our narrative on the Do/More Chair (pp. 70-73). Now Executive Vice-President, Wagner has guided the Chicago office since 1943. Prior to this he had his own design office and was chief designer and assistant manager for Libbey-Owens-Ford. He is a graduate of the University of California and the California Institute of Fine Art and a member of A.S.I.D.



designed with PLEXIGLAS *in mind*

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BOOKS

"Every part tells the same story": Manufacturer's Trust Bank.

FROM THE GROUND UP, *by Lewis Mumford. 243 pages. Harvest Books*, $1.25.
This selection of Mumford's writings in the *New Yorker*, criticisms from under "The Sky Line," 1947-56, is both sobering (although there is wit and levity in his ripening style) and illuminating. While he calls the shot on any number of New York's mistakes in architecture and planning, this paper-backed book also demonstrates how consistently he has done so, not piecemeal, but from a long range view, *his* ground being fundamental human and cultural values, as the chapter titles suggest: "Buildings as Symbols," "The Plight of the Prosperous," "Museum or Kaleidoscope," "Closed Minds and Open Spaces," "Restored Circulation, Renewed Life."

From his standpoint, the New York Life Insurance Company housing project at Fresh Meadows in Queens is "great" because it was planned "not merely with a view to creating a safe, long-term investment, but also to promote the joy and the equability of its inhabitants." The designers' imagination was allowed to play over more than isolated buildings, but to consider the interrelationship of people, trees, greens, parks, streets and stores. He finds it not only handsome but, in one- to three-story buildings, "built to human scale." He applauds the fact that he saw only one keep-off-the-grass sign and suggests the addition of a small nursing home and maternity center, taking admirable issue with the "large-scale warehousing of disease"—conspicuous among the many diseases of our urban situation.

Disease is a good word because Mumford's criteria derive from his feeling for what is favorable to organic growth as well as what is organic in design — his ideas coming not, in other words, from a platform up, or from a special stylistic preference. This balance of sense and sensibility enables him to appreciate without carping the creative fruitfulness of Wright: ("He challenges us by risking failure with a new design instead of courting safety — or courting perfection — by refining an old form. . . . It is much easier for the young architects of our time to accept the consistent tightening and elimination of Mies Van der Rohe's work than to enjoy Wright's excess of confident vitality.") At the same time, in his analysis of this man he calls "The Fujiyama of Architecture," he takes full account of the subjective qualities of his buildings, being "corporeal extensions of his personality," of his imaginative grasp of materials, his idiosyncracies, his arrogance. Summing up: "He awakens, by his still confident example, a sense of the fullest *human* possibilities."

Humanist *au fond*, Mumford is one of the few voices pointing out the inhumanity of our office buildings, "filing cases along Park Avenue"; the lure of supermechanization, i. e. the shutting out of light in the new Whitney Museum; significant oversights by Mr. Moses and other planners, who forget small squares for sunlight while planning huge, monotonous civic centers; the "creeping paralysis of congestion" increased by new skyscrapers in midtown Manhattan; the rape of Long Island, and the suffocation of the suburbs.

Architecture and city planning are his subject, design *re* human values is his theme, applicable not only to vast problems of land development but to small objects: how the fussy and ornamented clock in the executive offices of the Lever House is inappropriate to the clean concept of the building; how, on the other hand, "the great merit of the Manufacturer's Trust's new quarters is that, being all of one piece, every part tells the same story and to perfection . . . thus, the clock on the second floor, ignoring the foolish modern convention that requires blank dials and small stubby hands that don't indicate more than a vague approximation of the time of day, actually tells the hour with pointed precision."

Although incidental, specific industrial design criticisms enter into Mumford's surveillance for the part they play in the total environment. What should be sobering and illuminating for both designers and critics of design is just this breadth in his perspective: working from the larger implications down to the small details, rather than being governed by a commitment to detail which is unable or unwilling to rise to the large considerations. In that respect, for those concerned with the design of our surroundings, the lesson in *From the Ground Up* is its author's underlying sense of proportion.—*s. b.*

WROUGHT IRON. *Its manufacture, characteristics and applications, by James Aston, Consulting Metallurgist, A. M. Byers Co. and Edward B. Story, Chief Metallurgist, A. M. Byers Co. 101 pages, illustrated. A. M. Byers Co., Pittsburgh, Pa.* $1.00.
No one should toy with wrought iron without consulting this handbook, now in its tenth printing, by the company that owns the largest wrought iron mill in the world in Ambridge, Pennsylvania. Written with primer-like plainness, it admirably condenses the fundamental facts about a material which is not only fashionable these days in home furnishings, but has proved its lasting qualities. Since primitive times when it was made by piling ore around the fire, wrought iron has consisted of a combination of iron and siliceous slag.

How the advantage of the slag "impurity" was finally understood and appreciated in the 20th century is outlined in this book, with the interesting story of progress in production. Direct methods of extracting iron from ore were used in the Egyptian furnace, with a slave and bellows. Indirect methods were explored in the 18th century, extracting wrought iron from pig iron using reverberatory furnaces. This process of hand puddling became mechanical in 1905, which in turn led to modern large-scale manufacturing methods; in its essential steps, the present Byers process conforms to that of the traditional hand puddling process, with the achievement of remarkable quality control. Blisters have been eliminated, bendability improved, and, old as it is, wrought iron in combination with alloys still offers a vast field for research. Messrs. Aston and Story's summation of the characteristics and properties of wrought iron are supplemented by practical hints and diagrams on techniques of bending and welding.—*s. b.*

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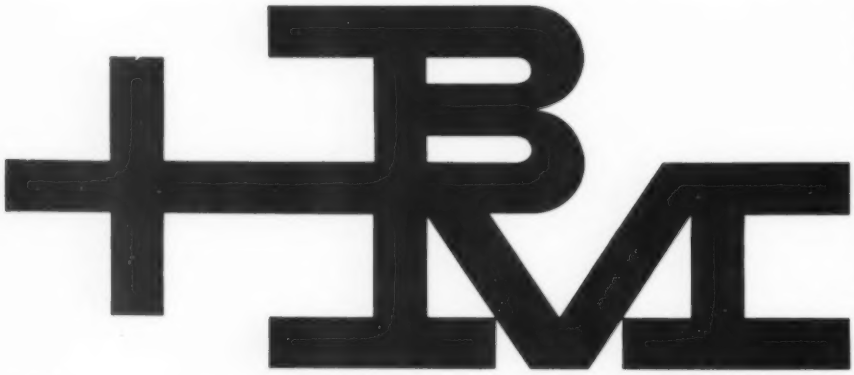

B & M will have new insignia

Herbert Matter submits designs for McGinnis regime at Boston & Maine

Continuing the awareness of design which marked his period of presidency of the New Haven Railroad, Patrick B. McGinnis, president of the Boston & Maine Railroad since January 1956 (see ID, February, 1956), is considering several versions of a new B & M logotype by designer Herbert Matter. Expanded Egyptian lettering will replace the figure of the Minute Man, traditional emblem of New England's northern line. While one bold, powerful design (above) is still under consideration, the entwined letters (below) are being tried out on freight cars and on company publications. Company colors are blue and white; the blue, vivid and difficult to duplicate, will be used alternately within the letters or as a background. Design plans so far are on a much more modest scale than on the New Haven; Herbert Matter and Marcel Breuer are being consulted.

New York firms lend history

Display of New York's industrial growth includes products old and new

An exhibition at the New York Historical Society's Museum called "New York, The Empire State" is a graphic record of change, shown through rare prints and paintings, maps, photographs, models and, also, a variety of products which have been or are being manufactured in the state. Cameras, typewriters, washing machines, hearing aids, spectacles, microscopes, men's collars, shoes, gloves, juke boxes manifest enormous design development, shown side by side.

A 1920 copper tub wringer washer used by the family of Calvin Coolidge until 1936 could be compared to Easy Washing Machine's (Syracuse) 1956 combination washer and dryer. A 1932 Wurlitzer (North Tonawanda) juke box looked like an old phonograph box, cabinet size, and played only ten records. Hearing aids showed considerable scientific progress, all from the Sonotone Company at Elmford: an ear trumpet from the 19th century; their first wearable self-contained hearing aid made in 1946 and the latest model made with transistors.

Packaging was also included in the display: a 1900 box of jello with the slogan, "Delicate, delightful, dainty"; a jar of Borden's instant coffee——the first version made in 1916 had cream and sugar already added. There was a sampling of paper products: plates by the Diamond Match Co., in Plattsburg; napkins by Sitrue in Clayville; machine-coated papers and folding cartons.

The exhibition, scheduled until May 1, has been extended into early June.

Left, Easy washer, vintage 1920, *was used by Calvin Coolidge's family; right,* 1956 *model. Below left, the first Remington Rand typewriter, made in* 1873 *in Ilion.*

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Now—dress up your products—before or during forming—with new vinyl clad metal. Combines appealing vinyl colors and textures with rugged strength of structural metal, eliminates final surface coating. Ideal for business machine housings . . . instrument panels . . . automobile dashboards . . . suitcases . . . commercial water-coolers . . . many other products. Vinyl coating gives sheet metals:

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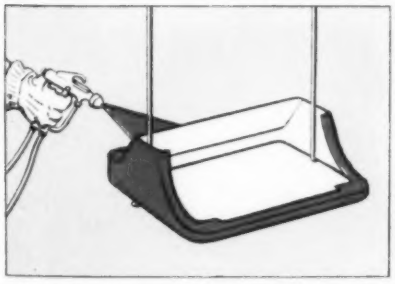
Can vinyl clad metal help you eliminate an expensive alloy . . . or by-pass a costly buffing or hand-polishing operation?



1. Custom processors can spray-coat your preformed metal parts with solution or dispersion vinyls; the spray coating can yield unique decorative effects. Vinyl plastic coating is **already pigmented**... no other finish is necessary... beauty is permanent.

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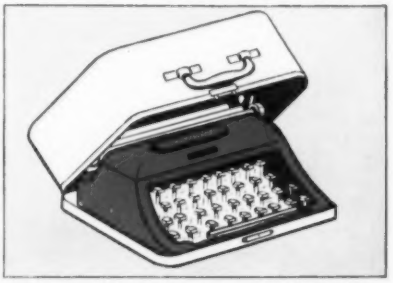

3. Vinyl clad metal gives your product new sales appeal that bare structural metals or conventional finishes cannot offer... beauty, permanent colors, rust and corrosion resistance.

Monsanto does not make vinyl clad metals . . . only the chemical raw materials that go into the vinyl plastics. However, Monsanto would be pleased to put you in contact with custom-processors who can furnish samples, specific information, prices. Send brief description of your needs to: Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Dept. ID-2, St. Louis, Missouri.

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"Your Future is in Design" is a topic for the American Ceramic Society. Left, Philip R. Distillator, Charles D. Speier, Dr. A. L. Johnson, Harrison Keller, Moderator Karl Schwartzwalder A. M. Turner, J. Russell Price, William Carey, Robert E. Anderson, Sr.

Design discussed at the Statler

American Ceramic Society holds lively meetings among the "four E's"

At the opening of the annual meeting of the Design Division of the American Ceramic Society, April 23-25 in New York, program chairman F. J. Von Tury pointed out its aim, to bring together the "four E's." Design, he said, had given executives, editors, educators and engineers common ground on the same program for the first time. Executives in the ceramics industry discussed design's current role; editors commented on current trends — and representatives from each field had something to say about design education:

Philip Distillator, President, Jackson Vitrified China Co.: "Today we have designers in every retail organization, working with consumers to learn what kind of products they want."

J. Russell Price, Design Director, Doulton & Co.: "The designer must be a participator; his problem is one of relatedness to people, to the market *and* manufacturer."

A. M. Turner, Vice President, Owens-Illinois.: "We are convinced that supplementing the demand for high quality handmade ware, there is a broad market for automatically produced glassware. Only good design will move it out of the store and onto the table."

R. E. Anderson, President, Robertson Manufacturing Co.: "For a long time we were satisfied with standard tiles in standard uses. We found, however, that when new decorative features were added, tile often found itself being displayed in practical areas which before had been denied it. In this case, function followed form."

Harrison Keller, President, Salem China Co.: "Unusual design is the thing that allows a factory to get a good price for its product. In our plant the designer is as important as the plant manager or sales manager, and has equal say."

Theodore A. Randall, Assistant Professor of Design, College of Ceramics, Alfred University: "We feel that education is our chief challenge, rather than design training in a professional sense; that real professional competence should be essayed in a fifth year or graduate program, to be further developed with the help of industry in an industrial place."

Arthur J. Pulos, Head of Industrial Design, Syracuse University: "Good design is a function of total quality, not quantity. It is not how many but how well that counts; it is not how economically a product is made that makes it good, but how much the saving incurred was passed on to the consumer as an increase in quality for monies paid."

Joseph Carreiro, Director of Industrial Design Department, Philadelphia Museum School of Art: " . . . The young designer's ideas must be hatched in an environment conducive to survival; they must receive protective nurturing for considerable time before any major surgery disposes of them. It is the responsibility of the designer himself to see that his position has the potential for future growth, for without it he rapidly loses his creative ability which is his greatest contribution."

Norman Boothby, Dean, Parson's School of Design: "The patrons of our coming new education system will be the large, money-earning corporations . . . who will incorporate interneship programs within their own industries, to transform the student grounded in history and theory into a producer. Thus schools will not need to prepare students to handle beginning jobs, but will concentrate on developing the necessary attitudes and point of view."

I.C.A. holds packaging conference

Program includes three case histories and a panel discussion

On April 11 the Institute of Contemporary Art held its 30th annual conference, "Design for Packaging and Point-of-Sale," at the Sheraton Plaza in Boston. Robert Sinclair, Gillette designer, and Samuel L. Ayres, Jr., consultant, told about their happy collaboration with Mr. A. M. Blumenfeld of Rohm & Haas in developing a counter display. E. A. Strand, Dennison Manufacturing Co. and David Millard, designer, showed recent changes in the Dennison packaging line. In a panel discussion, Harry D. Shain of Stop & Shop, Inc. gave a detailed analysis of the requirements for super market packages; Lony Ruhmann, Assistant Director, Design Laboratory, Container Corporation, discussed Container's techniques of evaluating the merchandising power of packages; and Morton Hollis and Lee Winslow Court, Visual Merchandising Consultant, also suggested some "Constant Factors in the Packaging, Display and Sales of Consumer Goods."

Conferences to come

The **Sixth Annual Conference at Aspen on International Design,** June 23-July 1, has been organized into three sessions, each lasting two days, under the general title, "Ideas on the Future of Man and Design." Misha Black, Arthur Hald, J. G. Lippincott, Jacques Vienot, Hisaakira Kano will speak on "Management and Design." F. H. K. Henrion, J. Müller-Brockman; Alberto Roselli, Paul Rudolph, Garrett Eckbo, Sori Yanagi will speak on "The Profession of Design." Mortimer Adler, Jupp Ernst, Max Frisch, Gregor Paulsson will speak on "Education and Design." Each speaker will show slides, exhibits or films for a visual frame of reference, and between each session one day is free for rest and leisurely discussion. The program committee is composed of Will Burtin, Chairman, and James Fitch in New York; Saul Bass, Los Angeles; William Friedman, Bloomington, Ind.; and Dan Defenbacher, San Francisco. Inquiries should be addressed to I. D. C., 220 South Michigan Ave., Chicago.

The **American Society of Industrial Designers, New York Chapter,** will sponsor a meeting in the Museum of Modern Art at 8:30 p.m. on June 21, "Industrial Design in Europe Today." Speakers will be Misha Black from Britain, Jacques Vienot, France, and Jupp Ernst, West Germany. Admission: $3.00.

The second annual series of **Summer Conferences of the American Management Association** will take place on the campus of Colgate University during July and August. More than sixty meetings are planned including a one-week course for chief executives; a four-week course in the basic tools of management; a three-week course in marketing, and special subjects scheduled by the day.

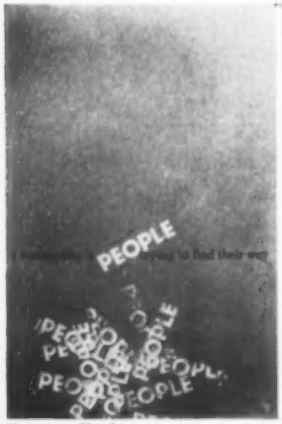
Posters commissioned for FSA shown in New York

Posters designed in different media for the Family Service Association, a counseling agency, were displayed in April and May at the Museum of Modern Art, New York, which cooperated with the FSA in organizing the project. Photography, pen and crayon drawing, watercolor, typography and graffito (drawing incised on plaster) were used in various ways to convey the FSA message by the nine artists commissioned by the Museum. A 30"x46" size was specified, and space had to be incorporated for the phrase that relates the posters to particular localities—". . . for family counseling call . . ." Suggested slogans were given to the artists, but in every instance they made up their own. The exhibition was significant for more than the variety of ways found to express an identical idea. While posters have long been used in connection with physical health problems, these posters represent one of the first attempts to use the poster idiom for arousing interest in emotional health.

Constantino Nivola

Noel Martin

Bernarda Bryson

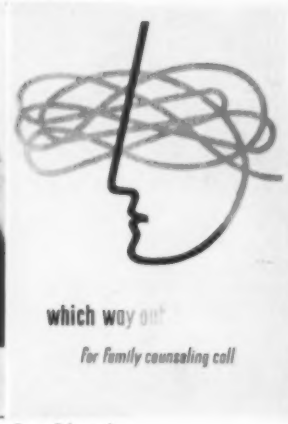


George Tscherny

Ben-Zion

Henry Ries

Wayne Miller



Leo Lionni

Robert Andrew Parker

I.D.I. honors Belle Kogan

New York Chapter holds first annual testimonial dinner at the Vanderbilt

Belle Kogan, completing 25 years of activity as an industrial designer, was guest of honor on April 23 at a testimonial dinner arranged by her colleagues and members of the Industrial Designers' Institute. The committee, headed by Robert I. Goldberg, presented Miss Kogan with a citation to mark the occasion. Toastmaster Alfred Auerbach introduced two guest speakers, Abe Stark, President of the New York City Council, and Jose Louis Sert, Dean of the Graduate School of Design at Harvard.

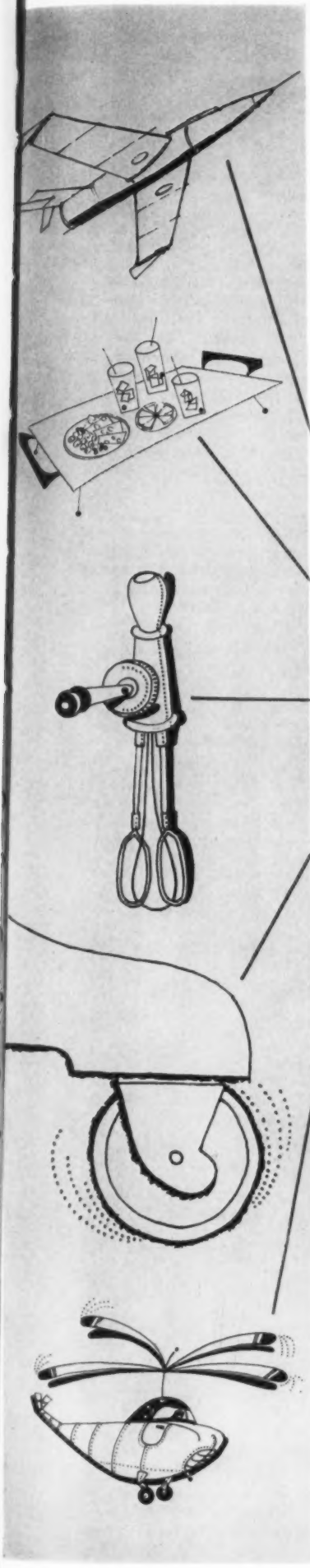
Mr. Stark outlined an idea for a 22-acre Television City on the West Side of Manhattan through the industrial application of Title I of the National Housing Law, providing for public acquisition of land for slum clearance and subsequent resale to a private developer. "In order to halt the exodus of major shows relocating on the Pacific Coast, we must provide the television industry with enough studio space for normal expansion, color television, educational TV, vast spectaculars and commercial displays. The broadcasting industry, which spends $300,000,000 a year in the city of New York and provides employment opportunities for tens of thousands of people, should be aided through the cooperative efforts of government and private enterprise." Mr. Stark said that a tentative location had already been selected and was being further studied.

Dean Sert called for a greater spirit of cooperation among designers in their various fields. "Today there is an unhealthy search for sensationalism. Each designer wants to outdo his neighbor, his aim being, not to do something just as good that will belong, but something that will assert itself so strongly, it often destroys the effect of his neighbor. The Japanese are an example of the opposite approach. They do not produce the great artists who, as individuals, affected the world, but they have produced the most harmonious physical environment of any civilization."

I.D.I. forms California chapter

Organizational gathering at Art Center School elects James W. Kelso chairman

At a meeting held at the Art Center School in Los Angeles in April, the Industrial Designers' Institute organized a California charter chapter and elected as temporary chairman James W. Kelso, Director of Design at the Packard-Bell Co. Frank Giannoto of New York, former national vice president of the I.D.I., journeyed to California to help bring designers in the Los Angeles area together and establish the chapter.



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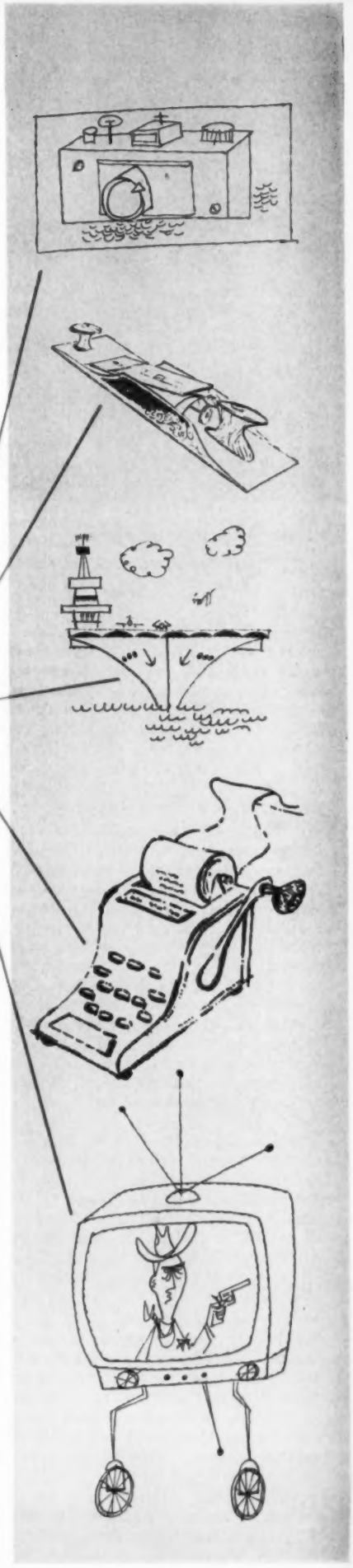


Plastic auto interior shown

Monsanto sponsors experimental project for Pratt students

Designed and built by Pratt Institute industrial design students, a three-quarter scale automobile interior incorporating many experimental plastics applications is being displayed this month at the Seventh National Plastics Exposition in New York. Sponsored by Monsanto's Plastics Division, Springfield, Mass., the project was under the direction of Victor G. Canzani of Pratt's Industrial Design Laboratory.

Perhaps the most provocative of the Pratt proposals is the seating. The bottom and back of the seat are a one-piece bucket molding of reinforced polyester, which eliminates complicated assembly. Urethane foam coated with sprayed-on vinyl provides upholstery which could be durable, decorative and substantially less expensive than conventional upholstery. The door liner is another one-piece unit which slides quickly into place and fastens easily. Of high-impact styrene, it could be made in a variety of colors and finishes with either sprayed-on or laminated vinyl. Molded-in armrests are cushioned with urethane foam.

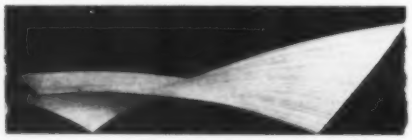
As a head liner to cover the inside of the car roof, styrene molded in one piece and designed to snap into place was used. When the car owner wants to change the color scheme, the head liner can be unsnapped and readily replaced. Urethane foam appears again between the liner and the roof for acoustical and thermal insulation, as well as for a protective cushion in the event of an accident.

Polyester, vinyl or styrene padded with urethane foam is suggested for the instrument panel, a one-piece affair which would replace the multi-section panels in today's cars. Other features are a one-piece styrene rear deck shelf and a vinyl floor covering, which can be sprayed on or laminated to the steel underbody.

Major student contributors to the project were Alexander M. Cranstoun, Robert W. Hain, Richard Hassa, Dean Richardson, Bartholomew G. Russo and David B. Smith.

Finland sends crafts to U. S.

Work by Wirkkala and Bryk is shown at Smithsonian Institution



Plywood sculpture by Tapio Wirkkala.

Ceramic wall plaque by Rut Bryk.

Through the cooperation of the Finnish-American Society in Helsinki and the Finnish Embassy in Washington, 130 examples of the work of Tapio Wirkkala and his wife, Rut Bryk, were displayed in the Smithsonian's Natural History Building until May 17, when the exhibit began a tour of the United States. Wirkkala, a designer of international renown (he won a Gran Prix at Milan's Triennale, both in 1951 and 1954), is Finland's most eminent representative in applied art. Originally a sculptor and graphic artist, he has been concentrating on glass, silver and plywood sculpture during the last ten years, as well as exhibition architecture — including the eight-case installation for this travelling show. Of his abstract sculpture, Edgar Kaufmann writes in the catalogue introduction: "Wirkkala seems to stay rooted in the elements of his craft, to evolve his flights of fancy from the very materials and processes he has in hand." His handground crystals, a silver dish, knives and forks have the grace of curling leaves; his laminated wood carvings are a unique expression of a modern material.

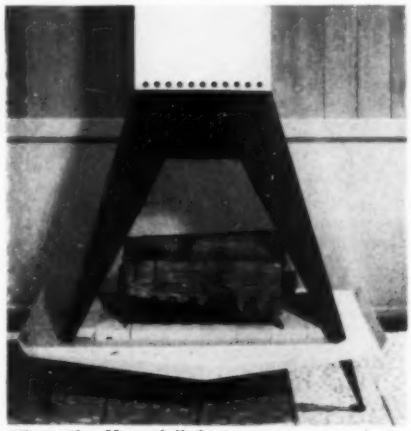
Rut Bryk, who was also trained at the Industrial Art Institute in Helsinki, uses glazes with pigments to make ceramics that go beyond decorative art and are a means of personal expression. Her deep and glowing colors were called "the most beautiful glazes in the world" by the judges at the Milan Triennale where she too received a Gran Prix in 1951 and a Diploma of Honor in 1954. Since 1942, she has been working in the ceramic department of the Arabia porcelain factory, making trays and wall plaques.

California design travels east

Pasadena Art Museum organizes an exhibit of California products

With the assistance of a grant from the Los Angeles County Board of Supervisors, Clifford Nelson organized and installed in the Pasadena Art Museum a selection of 314 products, designed and manufactured in California. Shown there from January 22 to March 4, the exhibit was planned also as a travelling show, going to the Fine Arts Gallery of San Diego, the Colorado Springs Fine Arts Center and the Walker Art Center, Minneapolis, with models of such large items as dock-loading trucks, street sweepers, and gasoline pumps. Furniture was copiously represented, with 59 examples; printed fabrics, handwoven fabrics, porcelain and ceramics are also among the largest industries on the West Coast. Appliances, barbecues, wallpapers, lamps are not slighted, however, in California production; a detailed catalogue supplies prices and the names of designers. Some of the independent design offices contributed items: for example, Henry Keck Associates, a built-in barbecue for Burr-Southern Corp., a dish washer for Given Manufacturing Co., and the redesign of the Wayne 605 industrial sweeper; James W. Kelso, a television receiver for Packard-Bell Co. and two polyethylene products for Plas-Tex, an icebucket and waste basket.

Tape recorder microphone designed by Emory Lee, Elgin National Watch Co. for American Microphone Co., Pasadena.



"Scandia Hearth," heavy-gauge steel finished in porcelain enamel. Designer: Thorlief H. Petterson, Pasadena; manufacturer, Scandinavian Art Metal, Inc.

DESIGNING WITH ALUMINUM

NO. 19

This is one of a series of information sheets which discuss the properties of aluminum and its alloys with relation to design. Extra or missing copies of the series will be supplied on request. Address: Advertising Department, Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.

PRE-ANODIZING TREATMENTS FOR ALUMINUM

One of the many surface treatments being used for aluminum products is the controlled formation of a relatively thin but durable oxide film. Films of this type are called anodic films and their qualities may be varied according to the particular end use of the product being manufactured. Because they are stable in many natural and man-made environments, they offer excellent resistance to corrosion. Through a variety of processes, it is possible to make anodic coatings that offer attractive decorative finishes, that resist abrasion or that act as electrical insulation. Certain anodic finishes are being dyed to create some of the most brilliant colors available in metal products.

Anodic coatings are fairly simple to apply. The process consists of passing an electric current between the metal and an acid solution in which the metal is immersed. However, surface contaminants that are unavoidable during fabrication will affect the coating adversely if they are not removed before anodizing. Oil and metal contaminants picked up by the aluminum surface will cause darkening or streaking of the anodic film and may even inhibit its formation. Therefore simple pre-anodizing treatments are of great importance in obtaining a uniform, continuous anodic film. The choice of the optimum treatment depends upon the ultimate purpose of the anodic coating.

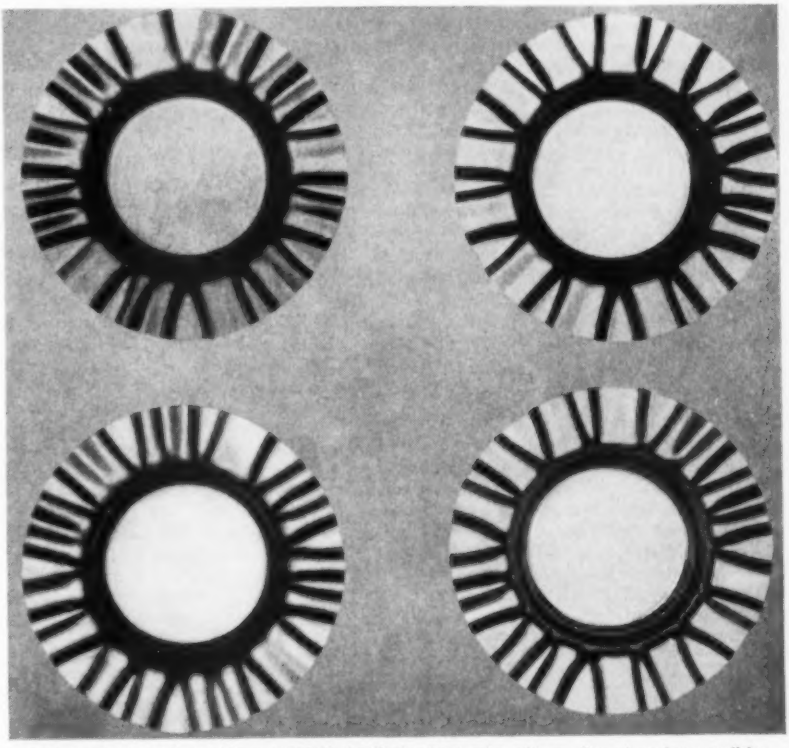
If heavy soil or grease are present, their removal by vapor degreasing or an inhibited alkaline cleaner should be the first step in any pre-anodizing treatment. Both of these cleaning methods are relatively inexpensive, require little handling and may be used to clean inaccessible surfaces thoroughly.

Vapor degreasing may be done by either a batch method or as part of a continuous processing line. The metal to be cleaned is passed vertically through a vaporized solvent such as trichlorethylene or perchlorethylene. In less than a minute the vapor, which condenses on the cool metal and runs off, effectively removes normal soil. When the oily or greasy contamination is extremely heavy, the metal may be wiped with a solvent before entering the vapor degreaser.

Inhibited alkaline cleaners, 4 to 8 oz. per gallon of water, are generally operated at 160F to 180F. The metal to be cleaned may be sprayed or immersed in the solution for two to five minutes, after which it is rinsed in water. When cleaning parts that have small crevices, a quick dip in dilute nitric acid may be necessary as an additional rinse to remove residues from the cleaning solution. These parts are then water rinsed again before proceeding to the next finishing treatment.

For General Use

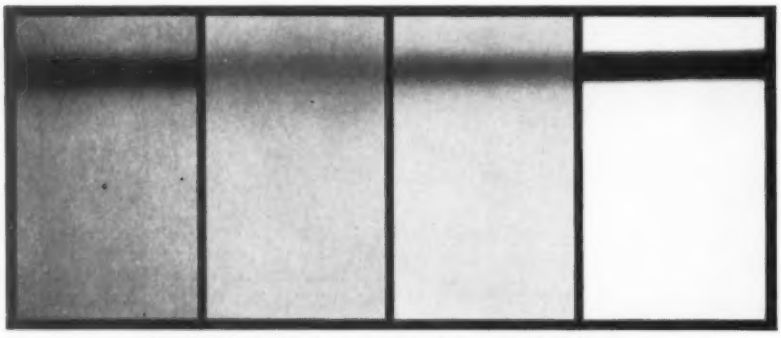
A caustic etch is one of the more common treatments used for preparing aluminum surfaces for anodizing. A typical bath would contain five per cent caustic soda. Numerous proprietary compounds of this type are available. The metal to be etched is immersed in this bath, which is usually maintained at 160F, for a period of two to five minutes. A lustrous, satiny finish can be obtained by caustic etching certain alloys, and the depth of the etch can be controlled by varying temperature, time or concentration of caustic. Variations in either the etching conditions or in the etchants may also be used for creating different shades, or degrees of total reflectivity. Sodium fluoride is frequently added to caustic etch solutions to obtain a desired effect. This addition imparts a finer, more uniform etch to the aluminum surface.



TOP: Anodized and dyed ashtrays. BOTTOM: Anodized natural color ashtrays. Normal good pre-anodizing treatment was used on ashtrays at left; normal good pre-anodizing treatment, plus Kaiser Aluminum bright dip, used on ashtrays at right.

Still finer etching can be obtained by using an acid fluoride bath which produces a white surface that has high total reflectivity. A solution of this type,

CONTINUED ON NEXT PAGE ➡



Alloy 5357 sheet anodized after various pretreatments. Note differences in specular reflectivity shown by black bar mirrored on surfaces.

which is used in finishing diffuse light reflectors, is made of a mixture of sulfuric and hydrofluoric acids.

For Minimum Loss of Metal

To clean aluminum with a minimum loss of metal prior to anodizing, a chromic-sulfuric acid mixture is used. This mixture effectively removes oil stain, oxide and heavy metal inclusions. However, it attacks the aluminum only slowly. Consequently, the anodized surface may not appear as uniform as a surface prepared with a caustic or acid etch treatment. A typical mixture of this type would contain 3.5% by weight chromic acid (anhydride) and 17.5% by weight of concentrated sulfuric acid (specific gravity 1.84). The bath is operated at 180F, and the aluminum is immersed in it for about five minutes. As in the case of caustic or acid etching, the operation can be controlled by changing any of the variables in the process.

For Decorative Purposes

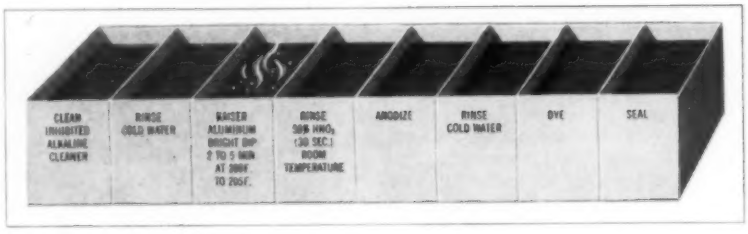
One of the chief purposes of anodizing aluminum is to provide a clear, highly reflective coating for decorative applications. The appearance of giftware, electrical appliances, automobiles, and many other products is being enhanced with brightly anodized aluminum trim of a functional or purely decorative nature. In many products, dyes are being used to add color to this metallic sparkle.

To create this attractive anodized finish the brightening process which precedes anodizing must have a uniform action across the entire surface of the metal. Several types of brightening processes are available. An electrochemical process, requiring the passage of an electric current between the metal and a special acid or alkaline bath in which it is immersed, is used on such highly polished items as light beam reflectors. Concentrated acid baths requiring no electricity during immersion may be used for cleaning and brightening a great many aluminum alloys. Unfortunately, these processes are somewhat expensive and the fumes given off during operation can create a hazard to workmen.

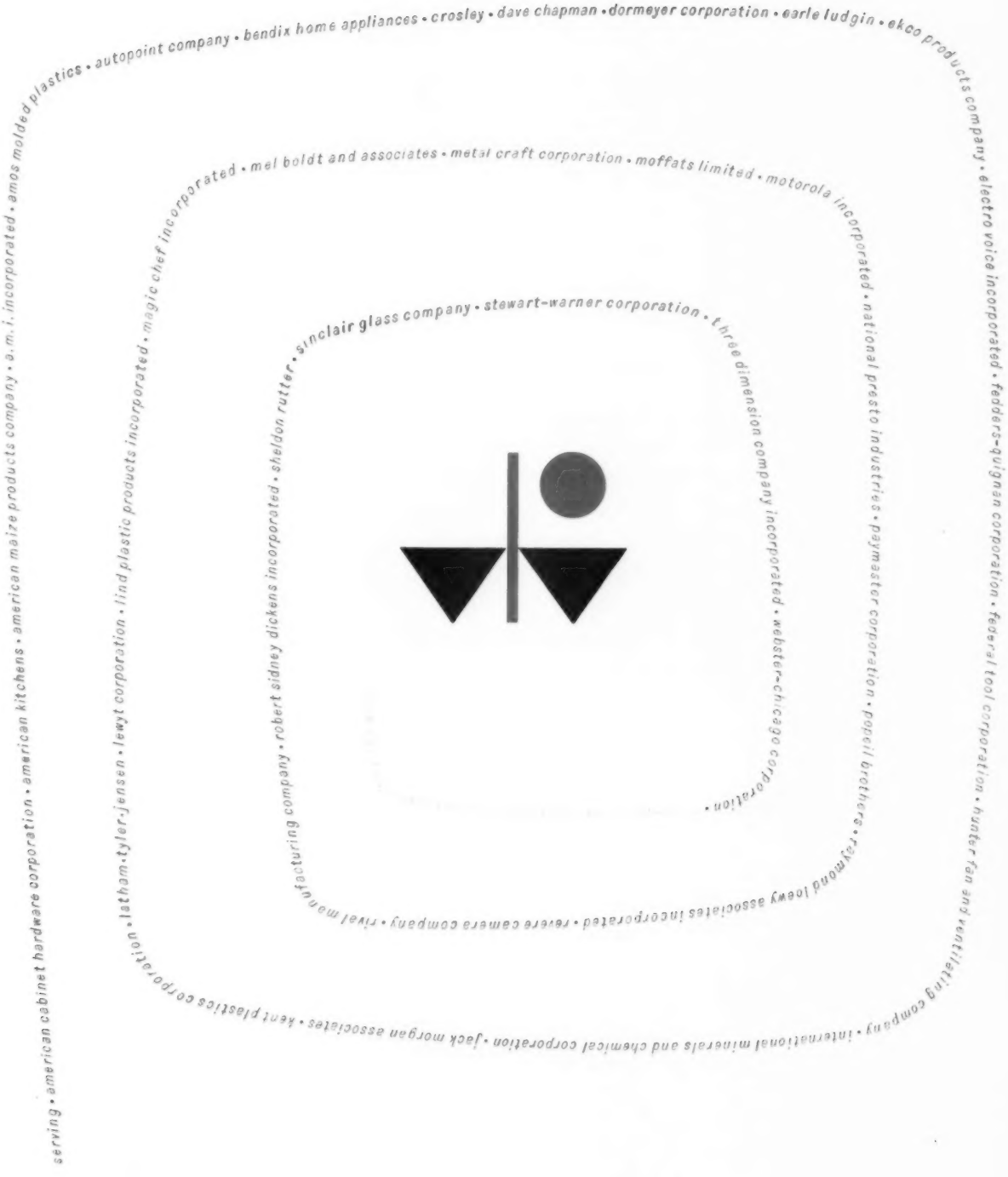
Dilute acid solutions are generally easier to handle and are quite effective on most alloys. Furthermore, dilute acid baths are considerably less expensive to prepare and maintain. Kaiser Aluminum Bright Dip, introduced a few years ago, is a dilute acid brightener which is being used by many anodizers of aluminum end products that depend on a pleasing appearance to increase their sales appeal.

Normal dipping time for Kaiser Aluminum Bright Dip is two to five minutes, and the bath is maintained at 200F to 205F. A flow sheet for using this Bright Dip in finishing an aluminum item which was to be color-anodized would include these steps:

1. Clean
   Inhibited alkaline cleaner
2. Rinse in cold water
3. Kaiser Aluminum Bright Dip
   2 to 5 minutes at 200F to 205F
4. 50% HNO_3 rinse (30 sec.)
   room temperature
5. Rinse in cold water
6. Anodize
7. Rinse in cold water
8. Dye
9. Seal



For other applications, such as in the architectural field, specialized anodizing techniques may be required. Techniques of this sort are the subject of continuous study by Kaiser Aluminum's Department of Metallurgical Research. Further information concerning pre-anodizing treatments may be obtained by contacting the Kaiser Aluminum sales office listed in your telephone directory, or one of our many distributors. Kaiser Aluminum and Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., 919 North Michigan Avenue, Chicago 11, Illinois; *Executive Office*, 7671 Kaiser Bldg., Oakland 12, California.



Three of INDUSTRIAL DESIGN*'s five award-winning entries in* Industrial Marketing*'s 18th Annual Editorial Competition.*

Awards

INDUSTRIAL DESIGN became the first publication to win five merit awards in one year in *Industrial Marketing*'s **18th Annual Editorial Competition for Business Publications,** the results of which were announced recently. Over 600 entries were made for this year's contest, which was divided into three categories: the Industrial Group; the Merchandising, Trade and Export Group; the Class, Institutional and Professional Group. ID was one of 11 publications to win mention in the last category, receiving the following awards: two certificates for the best single issue (October and December, 1955); one certificate for the best single article ("Harley Earl and His Product: the Styling Section," October, 1955); one certificate for the best graphic presentation ("Sheet Forming Techniques," August, 1955); and one certificate for the best original research ("Why Polyethylene?", February, 1955).

The Trane Company, La Crosse, Wis., was selected as a Special Certificate Award winner in the **22nd Annual Competition for Significant Plants,** sponsored by *Factory Management and Maintenance,* a McGraw-Hill magazine. A new 55,000-square-foot coil plant, completed in June, 1955, was Trane's winning entry. Similar awards were made to Schubert, Sorenson & Associates, architects, and Peter Nelson & Sons, Inc., general contractors for the plant. Both are La Crosse firms.

Sponsored by the Aluminum Company of America and the National Association of Architectural Metal Manufacturers, the nation's first **Competition for New Design and Construction Ideas for Aluminum Curtain Wall Buildings** awarded a total of $25,000 to 18 prize winners at NAAMM's annual convention held at Belleair, Fla., in April. The $10,000 first prize was awarded to Alfred Clauss, partner in the Philadelphia architectural firm of Bellante and Clauss. His winning design offered a new technique for fastening metal panels to a building's framework, plus a novel way of featuring color to provide a mosaic effect. Miss Jean Francksen, an artist, collaborated with Mr. Clauss in achieving the color effects.

Second prize of $5,000 went to George W. Qualls and William E. Cox, Philadelphia architects, and the third prize of $2,500 was given to Robert P. Darlington, Champaign, Ill. Fifteen honorable mention winners received $500 each.

Judges of the competition were three nationally known architects: Max Abramowitz and Louis Skidmore of New York City, and Sigurd Edor Naess of Chicago. Pittsburgh architect Paul Schell served as professional advisor to the 295 entrants.

Students receive packaging prizes

Three schools take part in New England Paper Box Competition

At the annual meeting of the New England Paper Box Manufacturers' Association on April 5 in Boston, six students from three schools received awards for folding boxes in NEPBMA's new competition. The plan conceived by Thomas Casey Greene, Executive Secretary, provided that each of three regional groups in the organization, located in Boston, Providence and New Haven, appropriate $250 for the contest in a local design school—$150 to be given to the students for first and second prizes and $100 to the schools. The NEPBMA committee selected three products which are normally marketed in folding boxes, assigned one to each school: Ekco's Flint Kitchen-ette knives to Yale School of Fine Arts Department of Design; the G.E. heating pad to Massachusetts School of Art; and Hasko's Walt Disney Lap Trays to the Rhode Island School of Design. There was no stated cost limitation for the boxes, only that it be "appropriate for the product in respect to cost, manufacture, packing, shipping, marketing, display and consumer use." In each area, a box manufacturer visited the class and discussed manufacturing considerations, and took the students on a tour of a box plant.

Twelve Yale students (from a class predominantly interested in book design), taught by Paul Rand, sent in entries. Their objective was to make the Flint knives, a rather expensive product, look as glamourous as possible. Yale winners were Homer Mitchell and John D. Hough. Massachusetts School of Art contestants concentrated on product identification and providing a repository for the heating pad when not in use. Robert James and Arthur Eilertson won first and second place respectively. The problem given to the Rhode Island School of Design, where Thomas Sherman and James Graham won the prizes, required a poster-like treatment of the box and easel construction for display.

Convair builds seaplane towing tank

The spray pattern (above), set up by the hull of a model seaplane, shows action in Convair's new 300-foot towing tank which, when completed, will be twice this size. Its purpose is to test hull performance, braking underwater, ballistics and supersonic aircraft shapes, among other data.

Student winners are: John Douglas Hough, first, and Homer William Mitchell, second, Yale; James Graham, second, and Thomas Sherman, first, Rhode Island School of Design; Arthur Eilertson, second, and Robert F. James, Massachusetts School of Art.

for young men who want to catch up to their bosses . . .

Alcoa's Up-to-Dater on Forgings

Four factual pages of news on the world's largest aluminum die forging, latest alloys, titanium, brass forging costs, hand forgings and other information for young men who want to catch up to their bosses.

Here's the world's largest

Forging history is being made as you read this. At Alcoa's Cleveland plant the world's largest closed die aluminum forging is being made. The part is a structural member for a jet bomber aircraft wing. It is 13 feet long, 3 feet wide, 12 inches thick. And it weighs 3,715 pounds. The die blocks weigh 60,000 pounds each. It is being forged on the giant 50,000-ton press operated by Alcoa for the United States Air Force.

Another example of what these giant presses save in machine time, man-hours and money is a jet bomber bulkhead. Alcoa was first asked to make it as an aluminum hand forging. We did, and it weighed 1,625 pounds. Redesigned, it was next made as a blocker-type forging on Alcoa's 15,000-ton press. It weighed 830 pounds. Now, here's the kicker. Redesigned again, the part was placed on the 50,000-ton press and squeezed out as a precision forging. This time it weighed 290 pounds! And imagine what happened to costs!

What does this illustrate? Simply that larger, more intricate forgings are a practical reality the way Alcoa makes them on the large hydraulic presses. Die life is lengthened. Draft angles drop from the customary 7° to 0°, in some cases. Machine time is cut dramatically. Thinner webs and ribs are possible. The actual forging, because it is squeezed instead of pounded,has smoother surfaces, less chance of surface defects, slivers and laps. And while you may never design a part that requires the facilities of our 15,000-, 35,000- or 50,000-ton presses, it's obvious that experience learned in solving problems like these can effect savings on your parts, regardless of the size and quantity. Let us prove it.

Need just a few? Need them in a hurry? Try hand forgings

Hand forgings come awfully close to what the blacksmith can beat out with an anvil and hammer. Except in Alcoa's shops,they grow to 2,500 pounds

Alcoa's Up-to-Dater on Forgings (continued)

and 300 inches long and 40 inches wide. Alert designers specify hand forgings when part requirements are few, or when designs are not final. In so doing, they avoid die costs and lost time.

This is old stuff to some, but we wonder if all designers realize that hand forgings can be had in far more intricate forms than the usual bars, slabs, biscuits, etc. And, further, they can be had in all the forging alloys.

The closer a hand forging approaches the shape of the finished part, the more metal and machining time is saved at your plant. Also, better mechanical properties come when the stock is forged to lighter sections. This extra quality is reflected in the strength of the finished part. But the dollars add up as a forging gets closer to the finished part. When does it pay? It depends on such things as machining costs, scrap wasted, work-load in your plant, properties necessary, etc. How to find out? Give your Alcoa sales engineer a sketch or drawing of the finished piece and an idea of the number needed. He will suggest the hand forging that might best serve your needs. Or, if you prefer, he will submit several propositions involving hand forgings ranging from the simplest shape to others coming closer and closer to your finished part.

We have just printed an informative, technical booklet, *Alcoa Hand Forgings*. Make sure you ask your Alcoa sales engineer for a copy. Or drop us a line.

Big news on small stuff

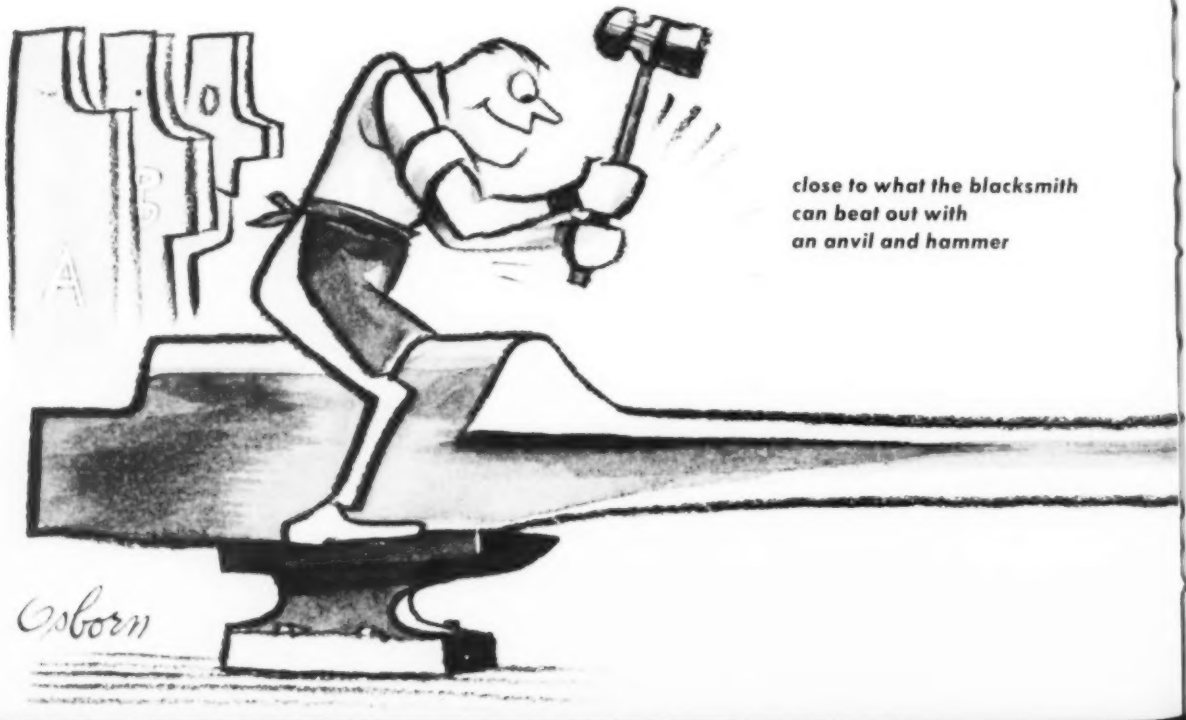
We often get so wrapped up in 50,000-ton presses and 2,500-pound hand forgings that we fail to mention a substantial part of your business and ours, i.e., small forgings. We operate a large percentage of our vast number of hammers and mechanical presses continuously on small forgings. These jobs are in our shops instead of somebody else's for one of several simple reasons: They cost less, and/or they're made better, and/or we deliver 'em faster, and/or we give more engineering service. It's the plain, unanodized truth that we can do the same for you. Let us quote.

The latest on titanium forgings

Titanium being the fourth most abundant structural metal in the earth's crust gives us more than a passing interest in the stuff. We don't make the basic metal sponge, or alloy it in ingots. But we are doing considerable development work in its fabrication that could easily accrue to your benefit. Titanium forgings are a case in point.

Being the country's largest light metal forging facility, we have equipment to do some remarkable things with titanium. Heavy-press capacity lets us forge it at optimum temperatures. This reduces the oxide film that forms at high temperatures and also results in better properties. Our pioneering work in no-draft forgings of aluminum plus superior die design work has helped us eliminate many problems of titanium forgings. These and other techniques, which we are keeping under wraps, permit us to offer titanium forgings at some mighty competitive prices.

Capacity now in operation can handle titanium forgings in sizes up to 30x60 inches. Deliveries run about the same as aluminum. Typical properties go something like this: 150,000 tensile, 140,000 yield, 15 per cent elongation.



close to what the blacksmith can beat out with an anvil and hammer

do some remarkable things with titanium

We see a lot in titanium beyond aircraft and ordnance. High-temperature processing equipment for corrosive materials is already a proven market for titanium forgings. Likewise severe marine applications. Now is the time to do some hard commercial planning with titanium. We'd like to help.

Buying brass forgings? Why?

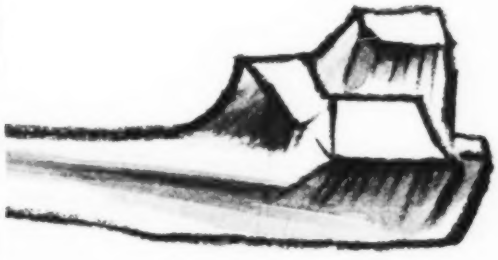
"Why"—since aluminum costs one-sixth as much as brass?

"Why"—since aluminum has become so easy to forge?

We don't expect these simple facts to undermine the foundations of the brass forging industry. But they are particularly pertinent in these competitive days. We don't mean to imply that every part now forged in brass would be less costly in aluminum. But the plain truth is that if more users of brass forgings would ask themselves "Why," there'd be a whopping lot of money saved.

A tour through Alcoa's forge plants will show aluminum forgings such as valve and pipe fittings, luggage hardware and many other parts that used to be brass. They are now aluminum for one main reason only. Cost. Yet it is equally true that these users have gained more than money. Their products are lighter—about half as heavy for equal strength. They are rustproof. They can be colored any shade of the spectrum right in the metal surface. They conduct heat and electricity like—well, like brass.

If you have an inkling that your brass part might cost less in aluminum, let us inkle with you. The difference could be considerable, and the consultation is painless and free.

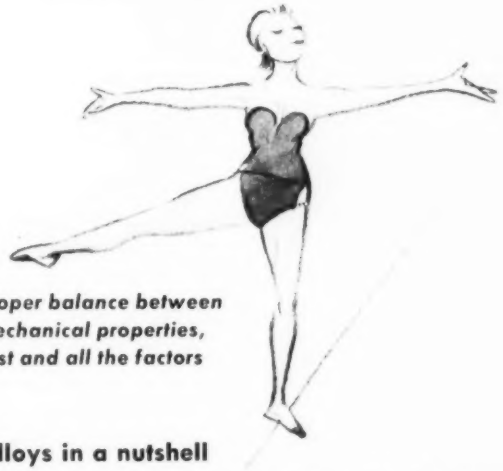


About quality control

This is something that everyone talks about, and few have to a degree that makes it really worth while. Usually the palaver goes something like this: "Every step is closely guarded by standards of rigid quality control, using utmost skill and the latest methods of inspection."

Next time you hear something like that, get the specifics and check them against Alcoa's tally: Ultrasonic inspection, fluorescent penetrant inspection, destructive testing, sectional testing for grain flow, Brinell tests, plus hundreds of visual checks and inspections throughout the process.

There's a difference.



proper balance between mechanical properties, cost and all the factors

Alloys in a nutshell

Maybe the toughest nut in designing for aluminum forgings is picking the right alloy. On the next page is a skeleton table along with brief comments about each alloy. Note alloys X-7079 and X-2219, just announced a few months ago. Alloy X-7079 is a new high-strength deal like 7075. But it provides a higher level of short transverse elongation plus being less apt to distort on machining. Alloy X-2219 offers a lot of new features for problems in 500-600°F range. There's lots more to the alloy story and we think your Alcoa salesman is the right man to help you get the proper balance between mechanical properties, costs, and all the factors that go into the picking of the alloy that's exactly right for your job.

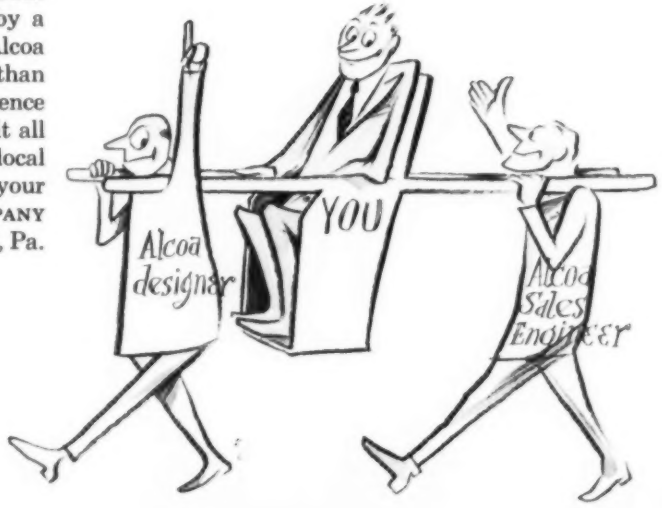
MECHANICAL PROPERTIES OF ALCOA® ALUMINUM FORGINGS

	MINIMUM SPECIFICATION VALUE (1)			TYPICAL VALUES (1)			
ALLOY	TENSILE STRENGTH	YIELD STRENGTH	ELONGATION % in 2"	TENSILE STRENGTH	YIELD STRENGTH	ELONGATION % in 2"	BRIEF ADVANTAGES OF ALLOY
2014-T6	65,000	55,000	10	70,000	60,000	13	readily forgeable, high strength.
X-2219	55,000	35,000	6	62,000	43,000	16	high strength in 500-600°F temperature range.
6151-T6	44,000	37,000	14	48,000	43,000	17	good mechanical properties, readily forgeable.
7075-T6	75,000	65,000	10	82,000	72,000	11	highest strength.
X-7079	74,000	64,000	10	78,000	68,000	14	high strength, improved ductility in transverse, less quench sensitive.
4032-T6	52,000	42,000	5	55,000	46,000	9	high strength at elevated temperature. Selection between these three alloys depends on individual requirements.
2218-T72	38,000	29,000	8	46,000	36,000	10	
2018-T61	55,000	40,000	10	62,000	48,000	12	
6061-T6	38,000	35,000	10	45,000	40,000	17	superior welding and brazing qualities, readily forgeable, corrosion resistant.
2025-T6	55,000	33,000	16	58,000	37,000	19	special-purpose propellers, etc.

(1) For forged sections to 4" thick for all alloys except 7075-T6 which is 3" and X-7079 which is 6".

Straight talk

In these days of designing for sales as well as performance, many a designer has found a competitive edge in Alcoa Forgings. This often comes about through solid technical thinking contributed by a local Alcoa sales engineer and a designer in Alcoa forge shops. It is this help, perhaps more than machines and equipment, that makes the difference in dealing with Alcoa. And the practicality of it all is that it's free. Your first step is to call the local Alcoa sales office listed under "Aluminum" in your classified phone book. Or write, ALUMINUM COMPANY OF AMERICA, 1994-F Alcoa Bldg., Pittsburgh 19, Pa.



Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM FORGINGS

Litho in U.S.A.

How to engineer a platypus

A happy combination of purposeful practicality is the furry platypus with its webbed feet, beaver's tail, and duck's bill.

A lot of our customers, to their continuing delight and profit (we hope), have discovered that glass is sort of platypus-like in that it, too, can be made to combine many useful characteristics.

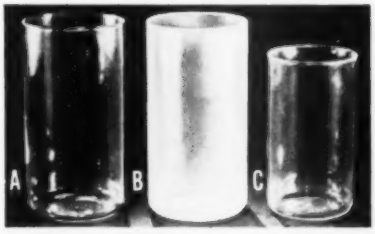
Take, for example, PYREX brand pipe. Here you see a man using a piece of it to drive a one-inch nail in a pine block. This is essentially an extra-curricular activity for glass pipe, which is more at home conveying metal-eating acids around chemical plants, but it's a way of showing just how tough glass can be when it's *made* that way.

All of which may serve to illustrate for you how we can arrange the optical, chemical, thermal, mechanical, and electrical properties of glass in different combinations to match a considerable variety of end-use requirements. In fact, we've worked up some 50,000 different formulas for glass in our years of helping customers solve specific design and processing problems.

If platypus-like glass is a novel idea to you, if you've never given glass a second thought as a highly adaptable design and construction material, we suggest your reading a pocket-size volume entitled "Glass and You." It tells in a few words and many pictures how glass contributes to profit and pleasure and we'd be delighted to send you a copy. Or, if you're more concerned with putting glass to work for you than in learning what it's doing for others, there's a slightly more technical bulletin called, "Glass—its increasing importance in product design." We'll be glad to send you either—or both.

Most remarkable glass

In 1952 Philadelphia's Franklin Institute presented the John Price Wetherill Medal to Corning's Dr. Martin E. Nordberg and Harrison P. Hood for inventing the most fabulous of glasses—VYCOR brand 96 per cent silica glasses.



Evolution of a VYCOR jar: A—formed by conventional glass blowing; B—"thirsty glass"; C—finished product.

These two scientists discovered a composition that appeared to be a combination of two distinct types of glasses. One type could be dissolved out, leaving a skeleton of 96 per cent or more of silica filled with so many millions of holes that a one-inch cube contained some 60,000 square feet of hole surface.

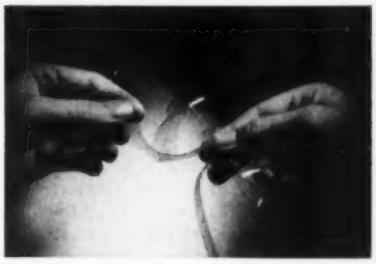
This new child of research was dubbed "thirsty glass" because, just sitting around, it absorbed moisture right out of the air. But our researchers were on the trail of something even more exciting. They heated their "thirsty glass" and it shrank to two-thirds its original size. The millions of little holes vanished and left a vacuum-tight glass that looked like any other—except that you could take this new glass white-hot from a blazing furnace and plunge it into ice water without the slightest injury. It was a glass as ideal as fused quartz, but different since it could be melted, mass produced, and worked in its original state like ordinary glass.

If you'd like to know more, just check the coupon above.

Ribbon glass by the yard

Here's a glass that's a thousandth of an inch thin and in small widths it's flexible as—well, a ribbon. You can twist it, roll it, wrap it around your arm without cracking it. It comes in any length you want—inches, yards, miles.

Actually ribbon glass isn't a single glass. We can make it of several different compositions according to what you need it for. Originally we developed it to take the place of mica in electronic capacitors of which there are several in your radio and TV sets and in any other piece of electronic equipment you can name. As mica is formed in layers, it is subject to cleavage in the plane parallel to lamination; ribbon glass being homogenous is easily workable. This is just one advantage of this glass in capacitors.



Medical scientists have found a quite different use for ribbon glass—as microscope slide covers. These are the wafer-like pieces of glass that are used to cover blood smears and the like for examination under the microscope. In this case ribbon glass can be made clearer, flatter and more free of bubbles and striae than previously made glasses.

Seems as if this unique stuff should be good for a *lot* of things, but *what* (other than electrical and laboratorial) probably lies in the laps of imaginative designers. Would you like us to send you a little strip to play with? *Customer* ideas and problems really bring out the best in glass. So, even if what's on your mind seems unrelated to any item this page discusses, glass may still be its fulfillment. We'd like to hear from you.

CORNING GLASS WORKS

CORNING, N. Y.

Corning means research in Glass

TV goes to work in a bank

The National Bank of Hyde Park in Chicago is using a closed-circuit television system to speed up customer service, signature inspection and record keeping. Each teller cage is equipped with a standard Zenith TV receiver, while a camera in the bookkeeping department scans the appropriate data and puts it instantly on view. Russ Havill designed the system.

Company News

Westinghouse has announced a new expansion program "to reach the billion-dollar annual sales mark within the next few years": a new Appliance Design Center, directed by F. W. Perl (below, left), and a new Research and Advanced Development Department under E. K. Clark (right).

The company has leased a two-story office building in Mansfield, Ohio to house the Research and Design Center, including laboratories and model-making facilities. At the same time Westinghouse announced that Peter Muller-Munk Associates of Pittsburgh will be retained on a much broader basis, to concentrate on all Westinghouse major appliances and emphasize a family design resemblance.

General Motors dedicated its new 330-acre, 25-building Technical Center on May 16, with a message on TV from President Eisenhower. On display were: a machine which assembles 75 parts of a cylinder head; a mechanical heart; the T101 gun carrier; and the XP500, an experimental car with a free piston engine that runs on almost any fuel. Its pistons operate without a crankshaft, blowing hot gases through a pipe to a turbine which powers the rear wheels. 130 GM plants in the U. S. and Canada held open house the same day.

Frigidaire is expanding its air conditioning lines to include oil and gas-fired residential heating equipment.

General Electric is organizing an Industrial Electronics Laboratory to concentrate on the development of new products, techniques and systems for a field which it expects to double in business within the next five years. The plan is for a 50-man staff under Donald E. Garr.

Stromberg-Carlson, a division of General Dynamics, has ceased the manufacture of television receivers and is expanding production on radio-phonographs and hi-fi equipment.

Convair, another division of GD, has designed a medium-range jet transport, the "Skylark 600," as a commercial transport, with deliveries to start in 1960. The four-engine jet will reach 609 m.p.h., operate from 5,000 foot runways and carry 80 passengers. Convair is also building a $40 million plant north of San Diego to house research, development, manufacturing and testing of the Atlas intercontinental ballistic missile.

Du Pont opened three new display rooms designed by William Pahlmann in the Empire State Building in New York to show five fibers—rayon, acetate, nylon, "Orlon" acrylic, and "Dacron"—as used in fabrics, upholstery, carpets in a home furnishings room, a showroom for women's wear and one for men's wear.

People

Emanuel M. Benson, dean of the Philadelphia Museum School of Art, has been named principal speaker at the Industrial Designer's Institute sixth annual awards luncheon on June 21, in Chicago.

Raymond Loewy Associates, Inc. has been retained by the Scott-Atwater Manufacturing Co., Inc., Minneapolis outboard motor manufacturers, as design consultants.

Robert A. Kolli, head of the Industrial Design Department at Pratt Institute, has been promoted to Professor of Industrial Design.

Robert D. Mason (below left) has joined Packard-Bell Company as assistant director of design. He is shown below with design director, **James W. Kelso** (right).

J. M. Little & Associates will occupy in July a new steel-frame building which they are constructing in Maumee, Ohio.

James R. Radcliffe has been transferred from product designer at National Gypsum Company to its general commodity division, where he will conduct market surveys.

Palma-Knapp Associates, industrial designers, are constructing a new two-story building in River Forest, Illnois, which they will occupy October 15. They have also announced the appointment of **R. L. Deschamps**, **C. A. Lebner** and **D. A. Maust** (shown below, in that order) as company

associates. **Jon W. Hauser Associates**, in St. Charles, Illinois, announce the addition of **Don DeFano**, Director of Design, **Eugene Russell**, senior designer, and **Don DeVarco**.

Peter Quay Yang Associates, New York, have been retained by Roland Radio Corp. and Steelman Phonograph Corp.

Harold Van Doren has moved to larger quarters, 1717 Sansom St., Philadelphia.

Channing Wallace Gilson has opened a new design office in San Francisco under the direction of **Donald W. Brundage**.

Paul Shiloff, formerly director of Parke Studio, school of industrial design, has established "Perspective," a modeling service and evening school of design, in Detroit.

Rudy Schroeder has been appointed supervisor of Product Design at Clarostat Manufacturing Co. Inc., Dover, New Hampshire.

Wilbur Henry Adams (left) has been retained by American Meters as consultant.

John Abbate, Abbate Associates, Inc., New York, has been retained to design a transitional line of case and upholstered pieces for Romweber of Batesville, Indiana.

Charles Kasak, formerly director of package and graphic design at Raymond Loewy Associates, Inc., Chicago, has opened his own office in Villa Park, Illinois.

A. B. Girardy has resigned from his position as manager of television-radio design at Westinghouse.

Peter Muller-Munk Associates announce that **Ernst Budke, III** and **Robert J. Renaud** have become associates in the firm. Mr. Renaud and **Paul Karlen** have recently returned from a four-month visit to Israel, Turkey and India under the auspices of the International Cooperation Administration program of technical assistance for handicrafts and small industries.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(TRADEMARK)
and other Hercules plastics
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Hi-fax for better housewares – from mixing bowls to baby bottles; spoons to canisters; pitchers to glasses . . . Hi-fax, a versatile new ethylene polymer to be made by the Hercules process, will mean better products for tomorrow's market. For more information on Hi-fax, and other new Hercules plastics developments, turn the page.
HERCULES POWDER COMPANY
INCORPORATED

hi-fax for better housewares

Hi-fax, the new ethylene polymer to be made by the Hercules process. brings a new range of exciting properties to housewares. A completely new plastic, Hi-fax offers a combination of unique properties never before available.

Here's what Hi-fax brings to housewares:

Hi-fax can be sterilized! Products made with Hi-fax can be immersed in boiling water without distortion.

Hi-fax is four times as rigid! Provides four to five times the rigidity of regular polyethylene.

Hi-fax is twice as strong! Has double the strength of conventional polyethylene.

Hi-fax has improved resistance to solvents and greases! Has a fluid permeability of only ⅓ that of regular polyethylene.

All this plus: a richly colorful, lustrous finish. Easy to mold or fabricate by conventional methods.

That's why: People who have seen Hi-fax agree it's the plastic of tomorrow for tomorrow's superior products. Whether you make or design toys, housewares, industrial moldings, sheet and film, pipe, bottles, or electrical insulation, you'll want to learn more about how Hi-fax can improve existing products or help launch new ones.

Cellulose Products Department

HERCULES POWDER COMPANY
INCORPORATED

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CP56-3

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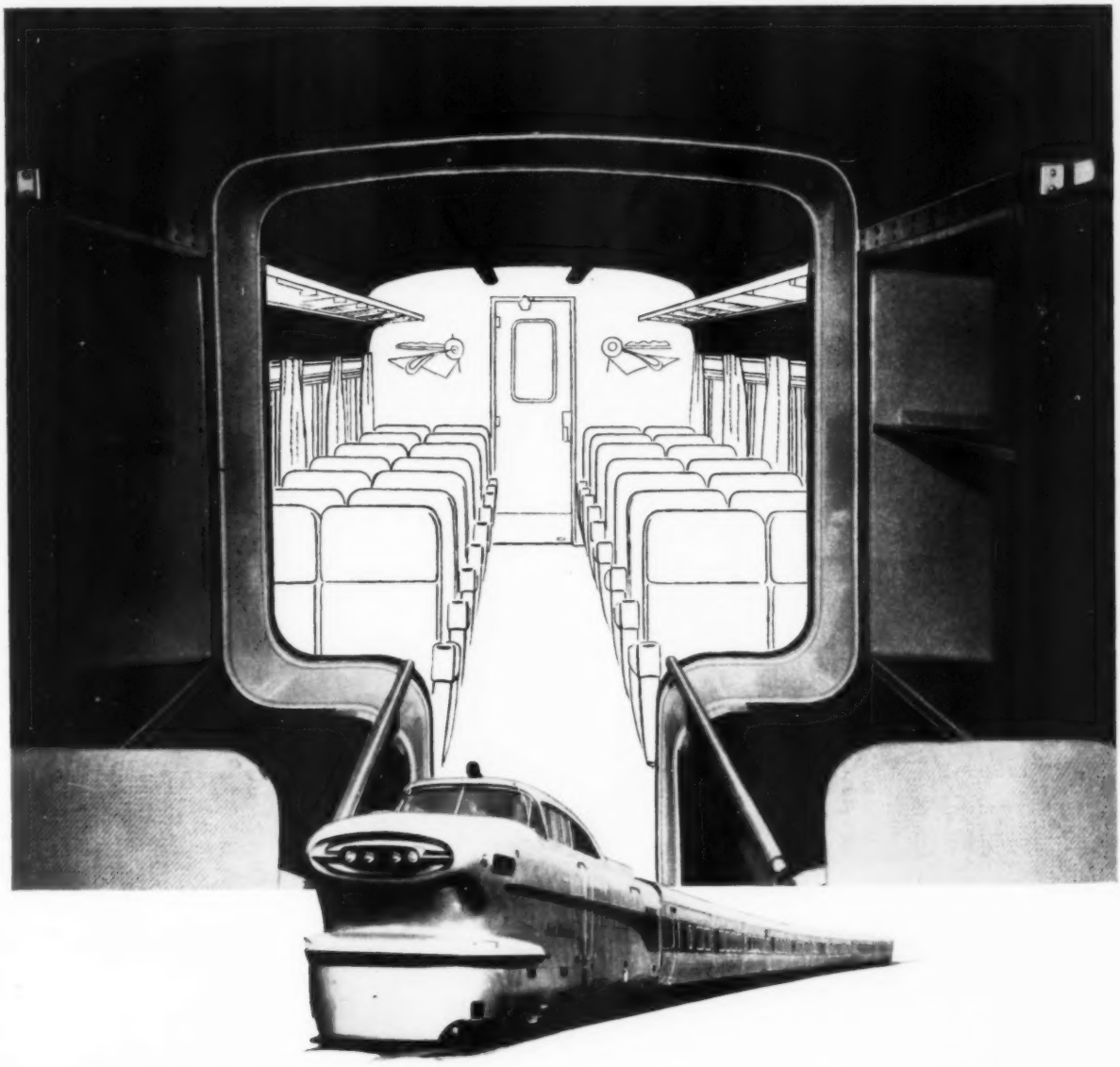
Hercocel—Hercules' cellulose acetate—another member of the growing Hercules plastics family, keeps products on the move in design, production, and sales. The General Electric Portable Mixer is typical of the products that take advantage of this versatile material. Its flame-resistant housing, beautifully styled for the modern kitchen, is lightweight but strong, chip proof and stain-resistant—an example of the many products today that rely on economical, easy-to-mold Hercocel.

See Hi-fax at the Plastics Show ...Booth 830 New York Coliseum June 11-15

In the Interiors of the New ACF "TALGO" Trains



NYGEN TOLEX® Takes the Curves Beautifully

The interior panels of the sensational new ACF "Talgo" coaches are covered with Nygen Tolex supported vinyl fabric. They chose Nygen Tolex because it tailors so beautifully to the compound curves in wheel wells, luggage racks and ceiling panels, without pleating, folding or wrinkling. Nygen Tolex is available in a wide range of weights, colors and patterns, suitable for nearly every design application. See Sweet's Product Design File 3C/Te.

For samples write:

THE GENERAL TIRE & RUBBER COMPANY
TEXTILEATHER DIVISION
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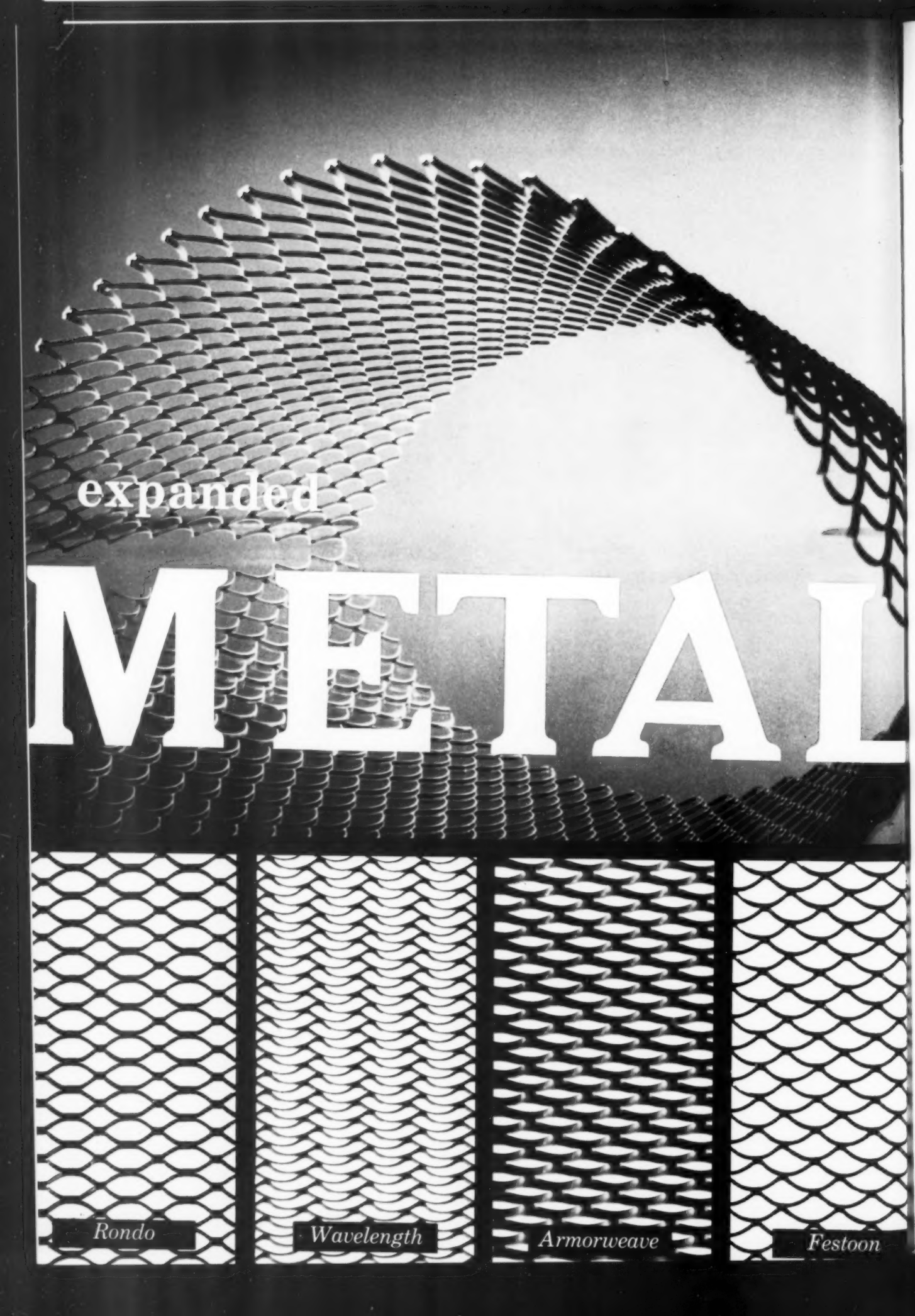
GENERAL PLASTICS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METAL
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Wavelength
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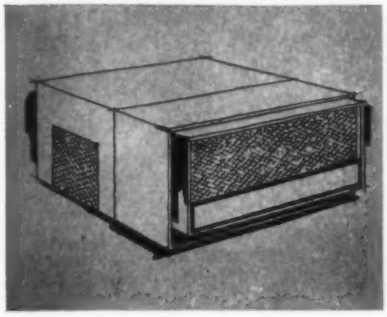
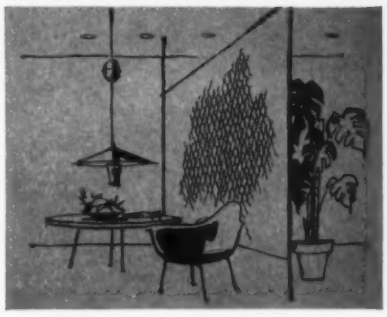
Festoon

WITH EXPANDED METALS...HORIZONS ARE EXPANDING FOR DESIGNERS IN MANY FIELDS



IN PRODUCT DESIGN . . . these metals serve many needs. Utility racks, fruit bowls, bird cages, powder boxes, window displays, storm door guards, TV and radio grilles—but a few suggestions!

IN FURNITURE DESIGN . . . benefits of these new see-through metals are many. In chairs, tables, screens, cabinet doors, magazine racks, lamps, new U.S.G. Expanded Metals lend new beauty and utility.



IN INTERIOR DESIGN . . . architects, decorators will find these versatile meshes ideal for screens, room dividers, lighting units, shelves, ornamental trims, grilles, partitions. Possibilities are endless!

to carry out your ideas...in new meshes that are lighter, more attractive, stronger than solid sheets

A new expression . . . for everyone concerned with design, manufacture and sale of products for better living! Four new U.S.G. Expanded Metals—RONDO, FESTOON, WAVELENGTH and ARMORWEAVE—join long-popular EXPAND-X*, to offer design possibilities unlimited. These dramatic new meshes, versatile enough to carry the main design theme or to serve as ornamentation, promise quick and widespread acceptance of products that utilize their beauty and charm. Cold-drawn from a solid sheet of metal —aluminum, or carbon steel, and, in some meshes, stainless steel—these new expanded metals are strong and rigid, yet lightweight and easy to fabricate. Whatever your product, U.S.G. Expanded Metals will help to make it *better.*

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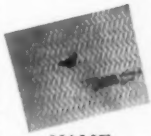

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for

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OPEN DESIGN CONTEST

First prize:	$1,000
Second prizes:	
consumer product:	$150
industrial or technical product:	$150
architectural or decorative:	$150

Open entries are restricted to product designs already in production or in tooling by December 1, 1956.

II.

STUDENT DESIGN CONTEST

First prize:	$250
Second prizes:	
consumer product:	$75
industrial or technical product:	$75
architectural or decorative:	$75

Entries must be postmarked not later than SEPTEMBER 30, 1956.

CONTEST JUDGES

JOHN ARNOLD
associate professor,
mechanical engineering
Mass. Institute of Technology

GEORGE A. BECK
industrial design manager,
Television Receiver Dept.
General Electric Co.

WILLIAM T. CRUSE
executive vice president
Society of the Plastics Industry, Inc.

HIRAM McCANN
editor
Modern Plastics magazine

JANE FISKE MITARACHI
editor
Industrial Design magazine

JEAN REINECKE
design consultant
Reinecke and Associates,
Chicago

For information and entry forms write to: Ladd J. Orr, IDI, Contest Advisor c/o CADILLAC PLASTIC AND CHEMICAL CO., 15111 Second Avenue, Detroit 3, Michigan.

Entry forms and information also available at Cadillac branches:

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Yield (p.s.i.)	D638-52T	3380—5020
Break (p.s.i.)	D638-52T	3470—5240
Elongation (%)	D638-52T	56—66
Flexural properties:		
Flexural strength (p.s.i. at break)	D790-49T	6400—8500
Flexural modulus (10^6 p.s.i.)	D790-49T	0.23—0.30
Rockwell Hardness:		
(R scale)	D785-51	62—94
Izod Impact:		
(ft. lb./in. notch)	D256-43T	2.7—11.0
Heat distortion:		
(°C.)	D648-45T	59—70
Water absorption:		
% Sol. lost	D570-42	0.00—0.08
% Moisture gain	D570-42	1.5—1.8
% Water absorption	D570-42	1.6—1.8

Celanese Corporation of America, Plastics Division,
Dept. 152-F, 290 Ferry Street, Newark 5, N. J.

Send me New Product Bulletin NP-16 on Forticel Plastic.

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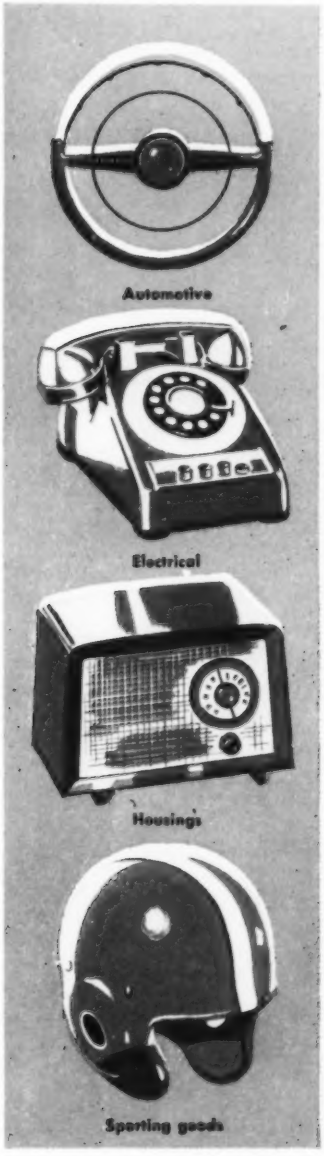
You could call FORTICEL *the "write" plastic!*



New Celanese Molding Thermoplastic offers unique balance of properties for wide range of product manufacture

Today, America's most popular fountain pens and mechanical pencils are being made of Forticel. And this has happened within months of the introduction of this brilliant, new Celanese Plastic!

For the same reasons that Forticel is the *right* plastic for everything from automobile arm rests to portable radio cabinets. Forticel has overnight become the accepted plastic in the writing instrument field.

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- **Durable Surface Lustre**
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Forticel combines in a single material perhaps the best balance of properties of any thermoplastic. What the penmakers have discovered it can do for their precision products, is indicative of what it can contribute to product improvement in a variety of fields: automotive, electrical, personal items, toys and sporting goods.

If you haven't already evaluated the new Forticel, send for Product Bulletin NP-16. Use coupon. Celanese Corporation of America, Plastics Division.

Celanese plastics

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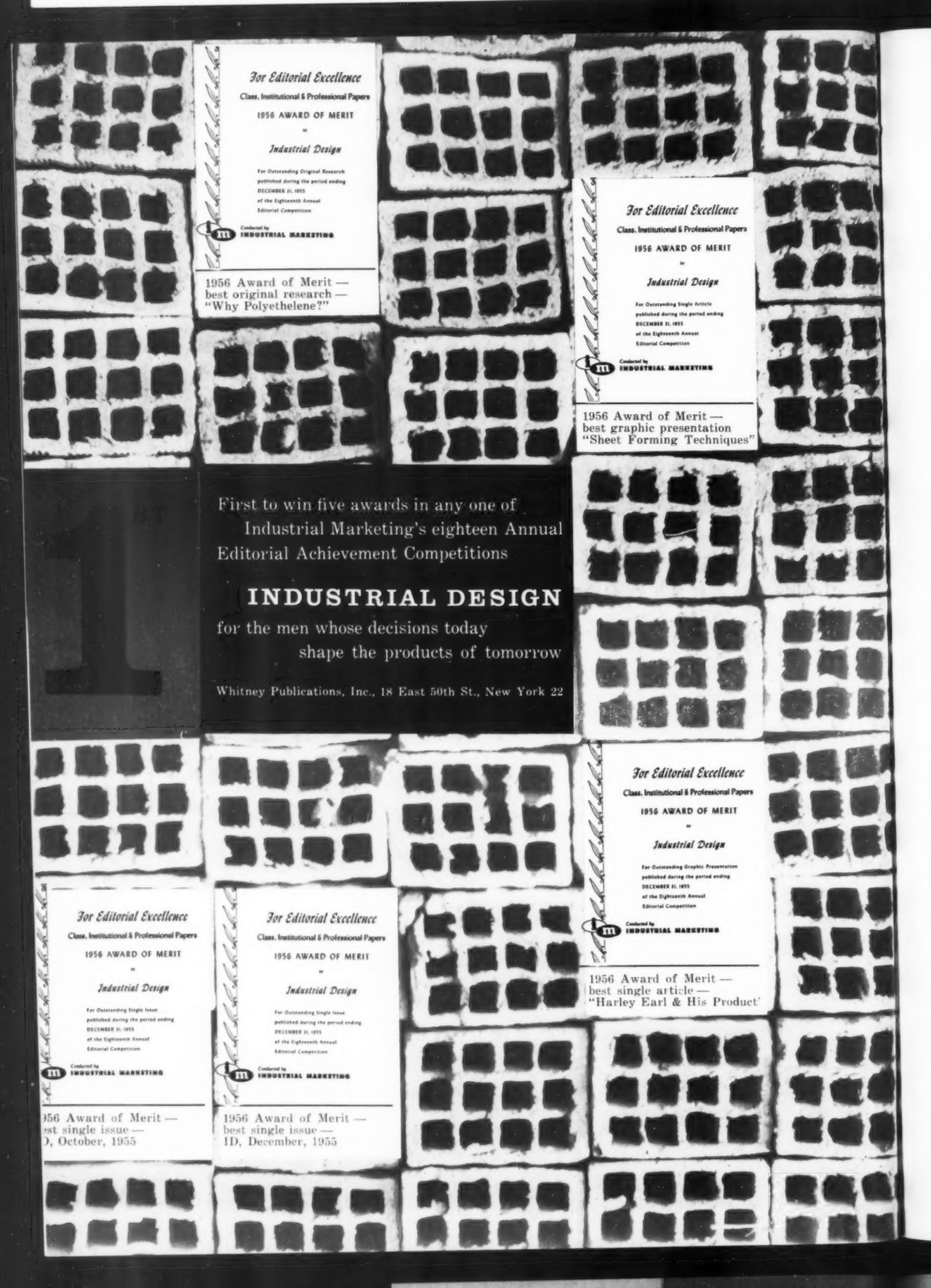
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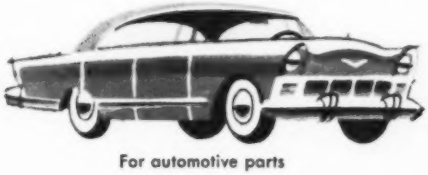

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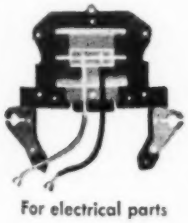

For electrical parts

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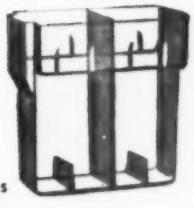

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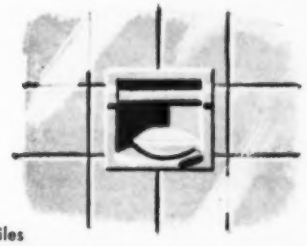

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CYMAC thermoplastics will be featured in Cyanamid's exhibit at the 7th National Plastics Exposition, June 11-15, which will be held in the New York City Coliseum.

Manufacturer of interior auto trim reports:

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"We've shifted to the use of laminates with 'Mylar' on all 1956 trim," reports National Automotive Fibres, Inc. "Metalized and then embossed, 'Mylar' is used to make decorative, non-tarnishing and scuff-resistant interior car trim that will, in fact, outlast the door panel itself."

with Du Pont MYLAR® design–cut costs by 80%"

"We achieved new beauty and economy in interior door trim by replacing conventional metal with materials using Du Pont 'Mylar'* polyester film," reports National Automotive Fibres, Inc., Findlay, Ohio. "This remarkably strong film has given us a freedom of design never before possible. Because 'Mylar' is extremely flexible, we are not limited in the creation of new types of attractive patterns.

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*MYLAR *is Du Pont's registered trademark for its brand of polyester film.*

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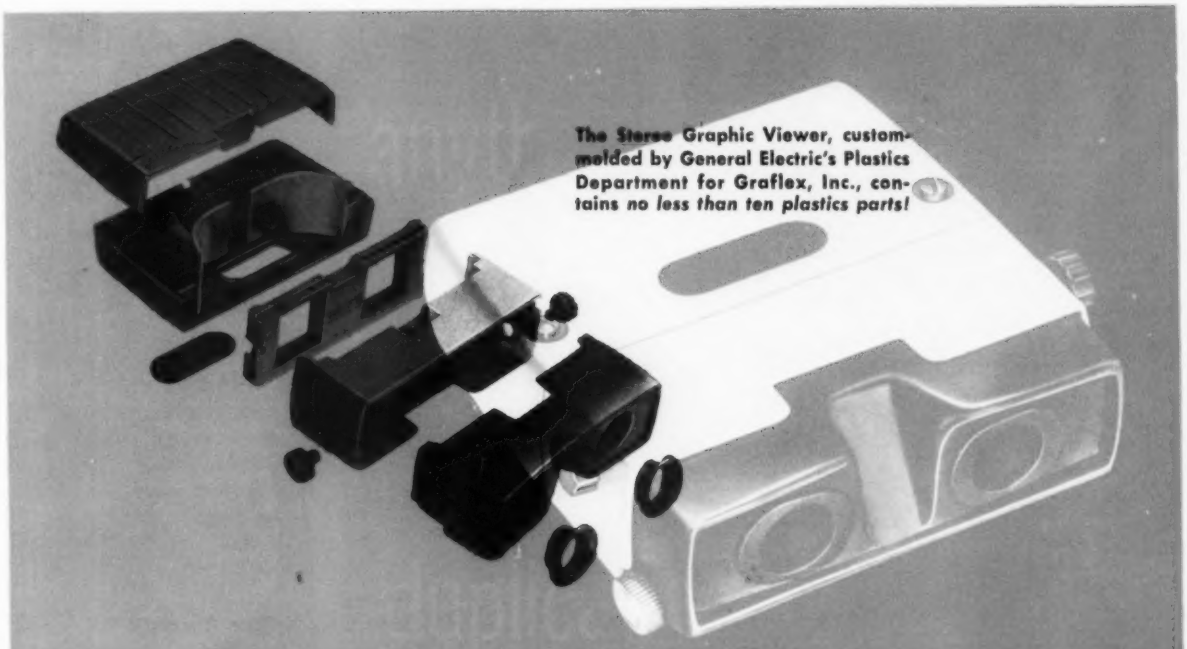
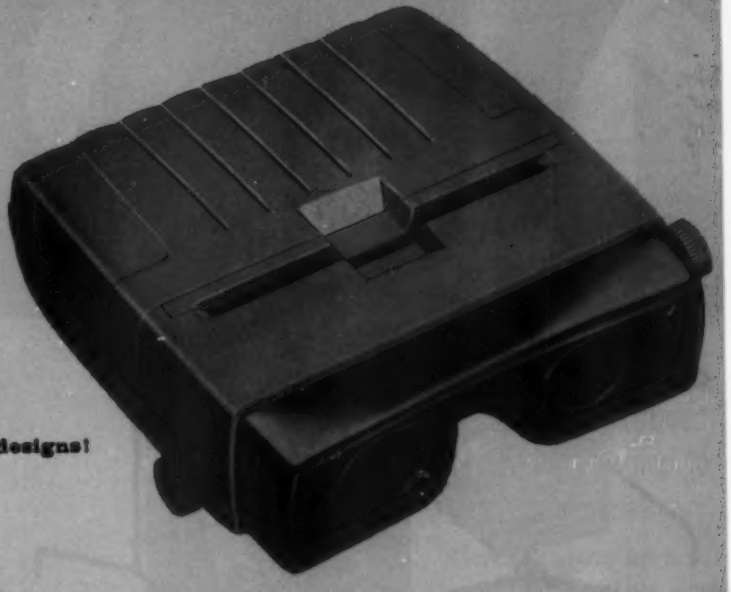


The Stereo Graphic Viewer, custom-molded by General Electric's Plastics Department for Graflex, Inc., contains *no less than ten plastics parts!*

This viewer has 10 plastics parts



This ten-part viewer affords a glimpse of the *design potential* of plastics. Plastics, today, offer the industrial designer a highly flexible, creative medium. Through plastics, you can achieve lightness without sacrifice of durability . . . streamlined compactness . . . dimensionally accurate parts for quick assembly and economical mass-production. Color? It can be *molded in*—for *permanent* beauty!

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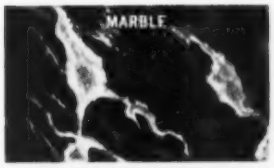

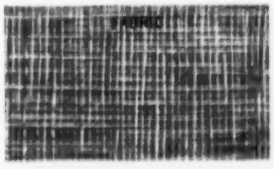

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postwar Plastics decade

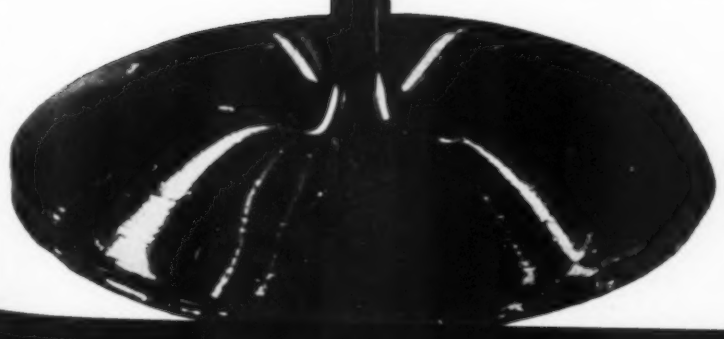
a brief history of a major industry

The Seventh National Plastics Exposition, sponsored this month by the Society of the Plastics Industry, is an invitation to survey not only the present and future of plastics, but the critical decade just past. We would like to call the ten years since the war the time of the big change in plastics, for in the period from 1946-1956 they have grown from a promise into a major basic materials industry. In the same time, industrial design has grown from a sales gimmick to a critical activity of top management. Both fields are young and have grown up at an awesome rate—but this is not an era for haphazard growth. The plastics industry has been guided by an unusual degree of design and planning. On 14 subsequent pages, case studies explore the product designer's part in bringing plastics to the American market. By way of introduction, it seems appropriate to investigate the basic industry itself. It is easy to forget how many men stand behind a man-made material, or to overlook the fact that the making of a synthetic material is a creative act that is *design* in its broadest sense. And it is hard to remember that the giant plastics industry is so new. For these reasons, the passing of a decade seems to mark a significant piece of industrial history—a good point to evaluate the facts and philosophies that have made plastics an important—and successful—industry.

The plastics industry is not merely a new industry; it is a thoroughly modern one. It so symbolizes our century that it could hardly have been conceived in an earlier one, for many reasons:

1. The pace of the industry is unique to our time. In 1909, if you said "resin" you probably referred to a natural product of the red bug Tachardia lacca, a product called shellac. In that year, Dr. Leo Baekeland made a useful synthetic resin by combining aldehydes and phenol, and before World War I "phenolics" were successful to the tune of millions of tons a year. Even so, plastics were small potatoes among basic materials until after the war, when they suddenly became serious competition for the traditional "basic materials," surpassing lead and zinc in annual tonnage in the mid-forties, and copper in 1950. They have paced aluminum for about five years, and were ahead in 1955, giving them the distinction of outselling all the non-ferrous metals. In 1955, for instance, it was 1,800,000 tons of raw plastic against 1,550,000 tons of aluminum, 1,467,000 tons of refined copper, and 1,031,018 tons of slab zinc.

2. Though plastics are now a leading basic material, you will not find the words "plastic" or "synthetic resin" in most of the statistical surveys of the Census



Molasses-like phenolic flows onto cooling floor. (Monsanto.)

P

Bureau, Securities and Exchange Commission, or Federal Trade Commission. The omission is perfectly reasonable: plastics are not members of any major materials group like ferrous or non-ferrous metals (refined minerals), nor of any special categories like leather or wood. Plastics are a product of the modern chemical industry, which seems to define a method, or a branch of science, rather than a material. Plastics may be made from air, water, coal, oil, wood, milk or other organic substances, but the outcome is a new molecular arrangement bearing no identifiable—or classifiable—relationship to its familiar ingredients.

3. The business of producing synthetic resins is not a business to be entered into one foot at a time. It nearly always must operate on the scale of a full-fledged industry, depending on energetic scientific minds and tremendous investments in scientific production equipment. The electronics industry, another postwar giant, is still being advanced by countless pioneers in tiny basement workshops; others, like the automotive industry, have adopted automation by degrees, as it seems practical and wise. But the production of synthetics on a useful scale requires such immense plant investment that it depends from the outset on large-scale forethought—on the most advanced technology, planning and design. One reason is the complexity of the chemical processes—requiring complex production equipment—and another is their critical nature—necessitating exacting control, particularly during polymerization. Not all polymerization is equally complex: polyethylene is a simple synthesis of ethelene gas under high pressure, but the method is too explosive to be carried out at the relatively slow pace of the old-fashioned production line. The production of nylon, currently one of the most complex, as the flow chart of Barrett's Plaskon nylon molding compound shows, requires production of organics, monomers and polymers in four separate full-scale plants. Final conversion of caprolactam into nylon, which takes place at National Aniline's $30,000,000 polymer plant in Chesterfield, Virginia, is supervised from a central instrument room by a handful of highly skilled operators and production men. In another industry such a degree of automation might be news, but the nature of the chemical industry has made it sheer everyday necessity.

4. The act of transforming raw materials into new substances, though it uses the tools of science, is a creative act. In this real sense plastic materials are designed. The difference from traditional basic materials, with refinement as the only road to improvement of given properties, is fundamental. Chemicals may be formulated purely experimentally, or they may be planned to meet a strict set of specifications. But the industry that creates original substances operates on a creative conviction: that man's opportunities to make and build are no longer limited to nature's traditional building blocks.

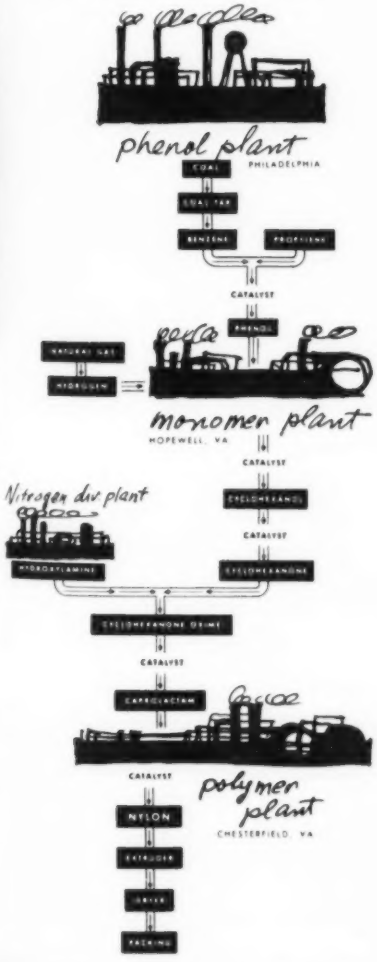
After World War II, entering a new era in which plastics would clearly be abundant, the consumer was hard put to decide whether the bright new synthetics were wonder materials or cheap substitutes. And even today he is not always sure that the question has been clearly answered. This ambiguous reputation may be traced to the fact mentioned above: plastic development has been spurred by an effort to meet a given need; often the need has been for a replacement for natural materials in short supply, and these replacements have been applied as substitutes. The first plastic, for instance, came about because of a shortage of ivory for billiard balls. John Wesley Hyatt was inspired to mix pyroxylin with solid camphor in 1869. His highly successful "celluloid" was used, with pink coloring, for dentures; white celluloid went into collars, cuffs, shirt fronts and curtains—a bizarre beginning that probably marked a high point of frivolity for the industry. Baekeland, 40 years later, typified the industry's serious attention to purpose. A hard-working inventor, he set out to achieve a useful synthetic resin when he began experiments with phenol and formaldehyde, which scientists already knew would boil together and harden into a mass, and would react all the more violently if heat were applied. Baekeland perceived that this explosion could be controlled by applying pressure,

and his courageous experiments yielded an amber-like substance which he foresaw could be used in 40 industries. His discoveries made the public conscious of "plastic" in the form of phenolic clock bases, iron handles and table tops. It was even more widely used by the electrical industries to replace rubber insulators.

A number of plastics joined the family before 1940: cellulose acetate, cellulose butyrate and ethyl cellulose were developed as improvements on the original flammable cellulose nitrate; urea was created to make bright color possible in a phenolic-like material. Vinyls, polystyrene and acrylic, offering radically different characteristics, were all made available in the thirties, but did not get off to an illustrious start; acrylic, for example, found its first market as a textile coating and glass adhesive. In some ways they were all too early; users could not yet envision ways to put them to work, and phenolic continued for some time to mean "plastic" in the public mind. Visitors to the World's Fair of 1939 will recall that Bakelite's phenolic exhibit was the biggest display for the industry. Somewhat flashier, DuPont showed toothbrushes being molded and tricky uses of Lucite for piped lighting. Though impending plastic miracles colored the vision of the world of tomorrow, the prewar world was far from a plastics world.

What got the plastics industry underway was the second World War, with its vast demand, quickened development, testing and use. Styrene plants sprang up overnight to provide an essential ingredient for synthetic rubber. Nylon, introduced to the public as a wonder fabric, found important new uses in gears and bearings. Polyesters, uniquely useful to the military because they transmitted microwaves, did not see the light of the open market until 1947. Acrylics poured into plants making aircraft enclosures, and polyethylene, which the public had not yet seen, became a critical insulator in cables, radar and electronic equipment.

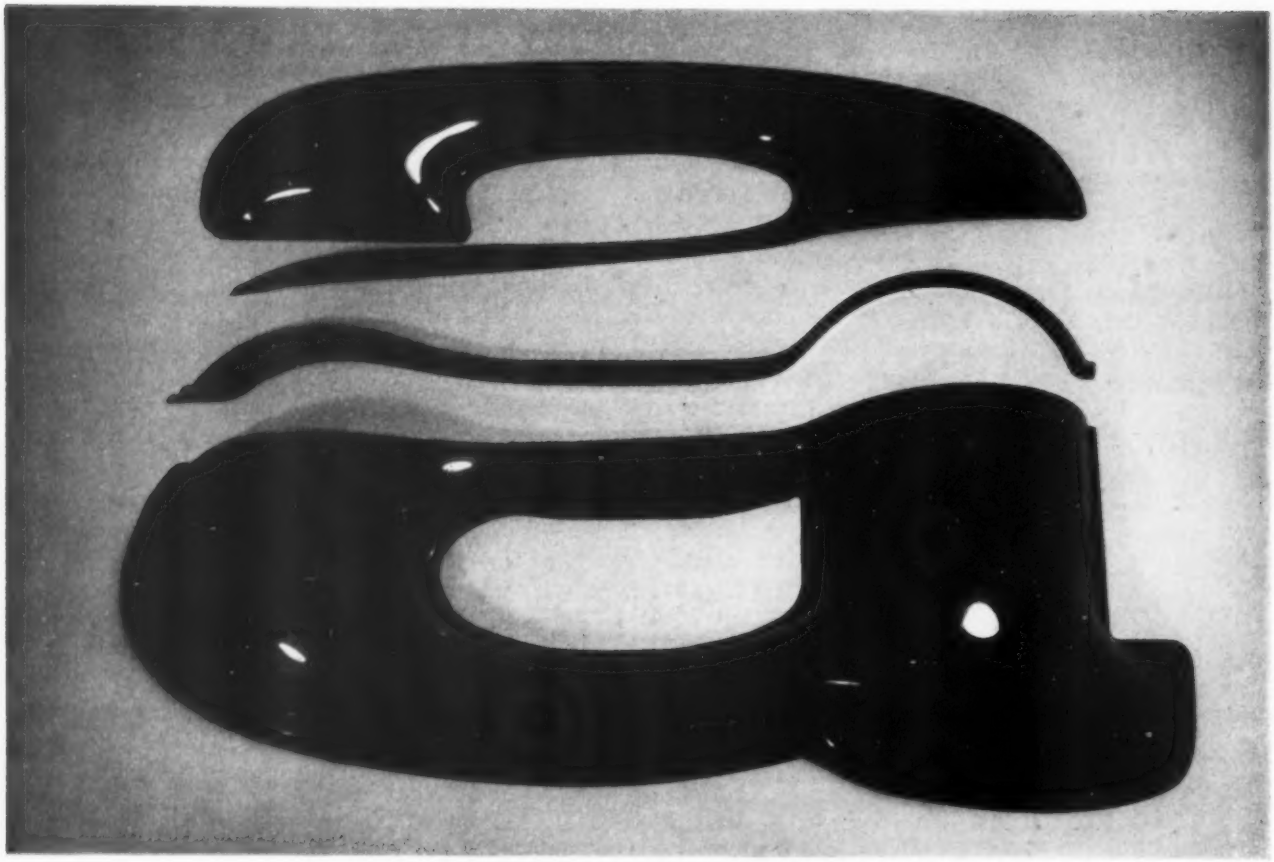
PLASKON
Nylon Molding Compound 8200

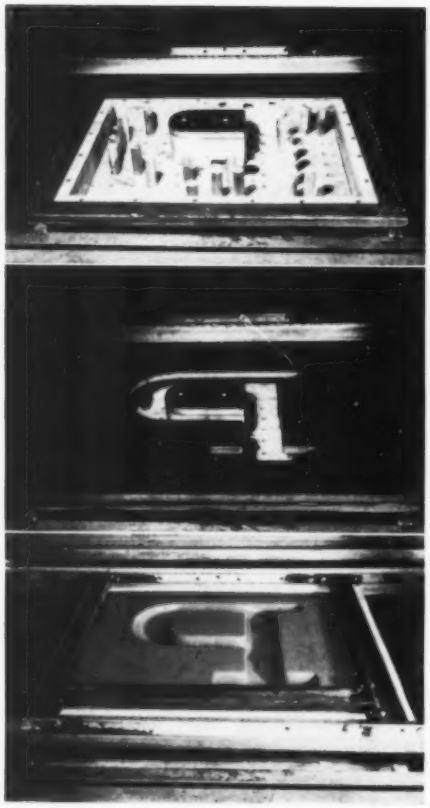


What the consumer did not know, when plastics invaded his world with new vigor and new variety in 1946, was that they were already a war-proven success. It would have been very strange indeed if they had failed to capture his approval. Yet in switching from a military market to the wary world of the consumer, the industry faced a new set of tests — the consumer's tests of standards and quality. The producer, with vast wartime productive facilities, *had* to sell hard; success was not just desirable, but necessary. But he suddenly found himself in a market he could not control. He could design the raw material and describe its abilities, but the design of the end product was out of his hands. That is why the story of the postwar market boom, a continuing boom which describes success born not only of need but of demand, can be credited to thousands of hardworking people—molders, manufacturers, designers, engineers, professional groups, and the ingenuity of the supplier himself. It depends on a lively era when the public is quick to accept change. It depends on a world in which product design is an important everyday function—in many phases of business.

Is there a product designed in 1956 for which plastic is not considered? Is there, conversely, a new synthetic that is not offered as design material? The industry-designer relationship has not always been so openly interdependent. In pre-war years, a designer's acquaintance with available plastics might have been limited to a handful of samples; his knowledge of their properties had to depend on luck in finding an informed molder or chemist or company technician. In the early days, design in plastics was a genuine experiment, and results ranged, as might be expected, from apt to grotesque. Today, as the stories on pages 54 and 62 tell, the industry is prepared not only to sell to the designer, but to produce to his needs. Today the industry depends on the designer to span the gap between manufacturer and consumer (pages 56, 64) and often finds him, more than a user, a pioneer of new prestige for plastics. For just as design, to the industry, has meant an extension of market possibilities, plastics have stretched the designer's possibilities—having become, since the war, a basic influence and a new creative instrument.

P 1 A supplier opens a new market with design service





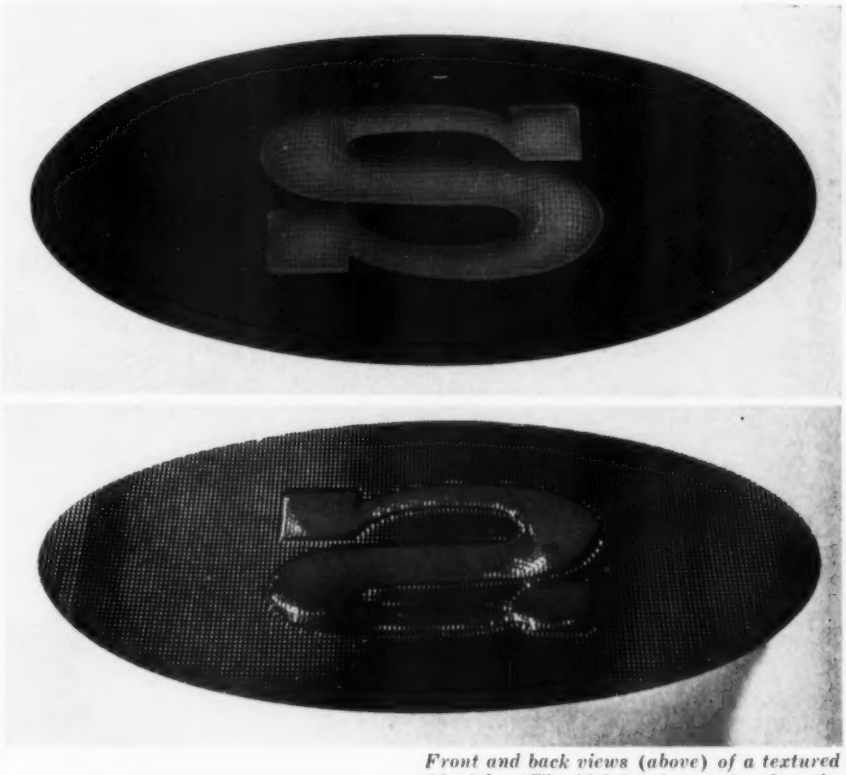
Robert Monahon, the designer behind the Rohm & Haas sign design program. The pictures on the left show three major steps in "Air-forming" Plexiglas letters. The molding box (top) has a grid of holes for wooden pegs that can be arranged to support any letter form. A Masonite letter form is placed in the molding box (center). The form is covered with a sheet of heated Plexiglas which is drawn by air pressure into the hollow to make the letter (bottom). When the Plexiglas has cooled, the letter is removed, trimmed, and can be painted or sprayed if special effects are desired. The large, sliced "a" at the top of the page shows how the depth of draw varies with the width of a letter stroke. This can be controlled by designing the letter itself to avoid radical differences between stroke widths.

supplier: Rohm & Haas
material: acrylic sheet
product: outdoor signs and letters

Robert Monahon of the Design Laboratory of Rohm & Haas has travelled some 25,000 miles in the past year to find out how the field of plastic signs and letters could be improved. As part of an expanding program at R & H, in which designers go into the field to help *its* customers better serve *their* customers by using acrylic materials properly, Monahon visited architects and sign buyers across the country. Their common complaint was the limited number of alphabets suited to modern buildings. Monahon concluded, after his tour of the fabricators' customers, that to make better signs and letters available would improve the market for all Plexiglas signs, but accomplishing this would take two things: 1) to overcome the cost of tooling up complete alphabets for 2-part molds, a more economical method of forming letters from acrylic sheet, using equipment that is standard with most fabricators; 2) a program to acquaint molders with the new method, demand, and suitable alphabets.

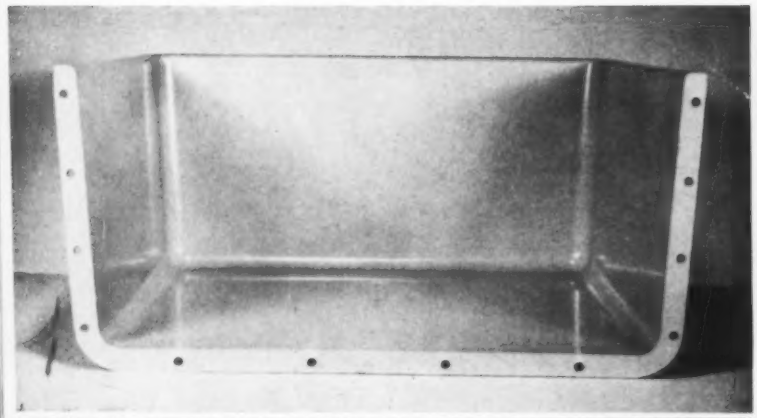
Working with R & H's Fabrication Laboratory, Monahon came up with a simple ring-forming technique using vacuum or air pressure. The molding ring for each letter is merely a sheet of Masonite with a letter form cut out of its center with any common cutting tool. It is placed in a molding box (opposite), in which any ring can be accommodated simply by adjusting the positions of the supporting legs pegged into the grid below. The new method is called "air-forming," and the cost of tooling for airformed letters is estimated to be only 10% to 25% of the cost of plug and ring tooling that is normally used for acrylic letters.

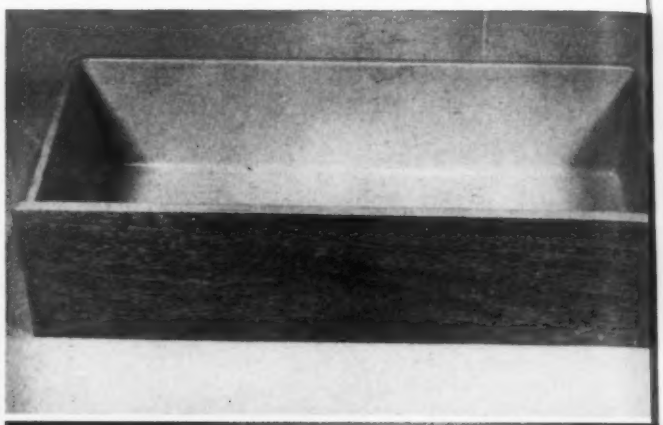
From the design standpoint, air-forming has definite implications. Letter surfaces and corners are always rounded, and cannot be flattened or squared. The depth of draw, controlled by air pressure, varies with the width of each stroke on a letter; consequently, strokes of different widths on a single letter will produce variations in the depth of draw. Monahon does not regard this as a disadvantage, but recommends that the thick-to-thin ratio of strokes be limited to 2½ to 1. Excessive differences in draw for certain letters can be minimized by adjusting basic letter styles to avoid sharp corners, delicate serifs, and exceptionally open stroke junctions (Bodoni is preferred to Copperplate, for instance), and by controlling air pressure. Since good results can be achieved in a wide variety of styles, R & H feels the market can be supplied.

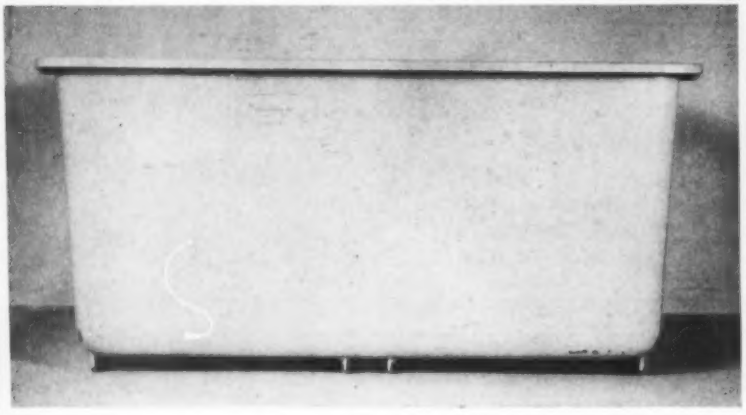


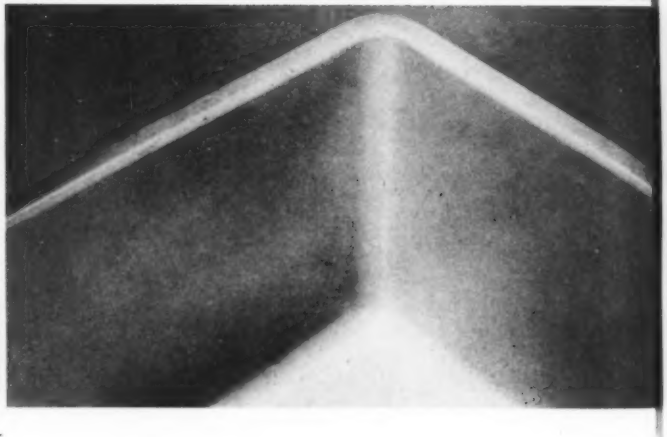
Front and back views (above) of a textured Plexiglas "S" which has been painted on the back to bring it out, under backlighting.

P2 A new product type is adapted to mass market demands









Four views of G.E.'s aquamarine thermoplastic drawer show its dual suspension methods (the top, with reinforced webbing, the bottom with rail center guide) and the rounded corners. From four possible ways to mount the wooden front, Broyhill and Ward selected flange and screw method.

Developed at Pratt Institute by Victor G. Canzani and Luigi A. Contini, the plastics furniture experiment with vacuum-formed styrene drawers was under Ralph F. Hansen, Manager of Monsanto's Market Development Department.

product: molded drawer
material: high impact polystyrene
molder: General Electric
manufacturer: Sears, Roebuck

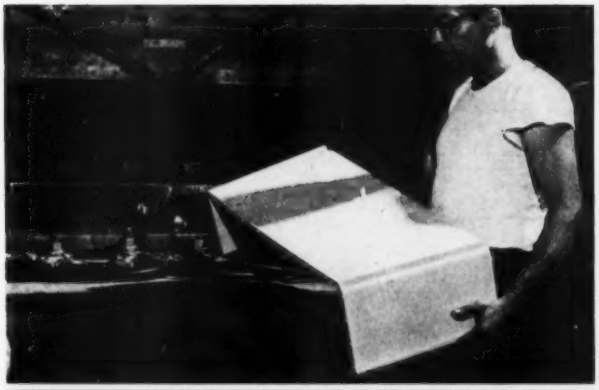
Designed to be installed in two sets of bedroom furniture, this three-sided polystyrene drawer can be turned out at the rate of 5,000 a week by injection molding machines at G.E.'s plant in Decatur, Illinois. It is the outcome of a chain of events which culminated when the molder, represented by G.E.'s product planner A. F. Forni, approached manufacturers with an idea for large-volume drawer production.

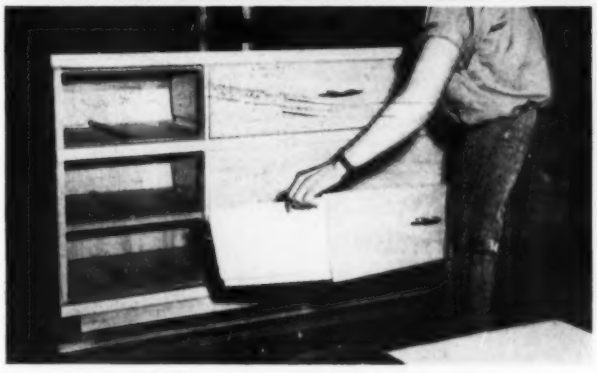
Plastic drawers, which transform some ticklish cabinet work into a simple operation for the furniture manufacturer or the Do-It-Yourselfer, have been on the market for several years. Knoll-Drake, among others, makes a phenolic one, offering such advantages as smooth working surface, built-in finish, ease of cleaning and humidity resistance. But phenolic has color limitations (black or brown) and, lacking the impact strength of polystyrene, must be molded with thick walls. Monsanto pointed out styrene's possibilities in 1954 with an experimental group of furniture designs, utilizing high impact styrene, melamine and vinyl butyral. The pilot group (left) with vacuum-formed styrene drawers in daffodil yellow, turquoise and oyster white, was shown at the mid-winter Furniture Market and also to Sears, Roebuck.

Meanwhile A. F. Forni, whose job is to develop broad markets for General Electric's Plastics Department, independently worked out a program to produce polystyrene drawers by injection molding. Sears was immediately receptive to his plan, and designing was turned over to H. G. Witzgall of G.E.'s staff, who consulted with Sears and the two manufacturers, Broyhill and Ward. Forni's market research pointed to better consumer acceptance of a wood front, which had to be joined to the drawer.

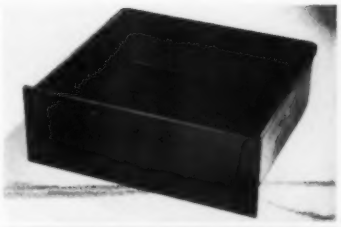
The first design, with a side rail about an inch below the top rim, was abandoned because it was difficult to mold, and looked frail. Witzgall moved the guide flange to the top, to be cored out and reinforced with webs (which were placed in relation to the stress exerted by a loaded drawer), and this gave better balance.

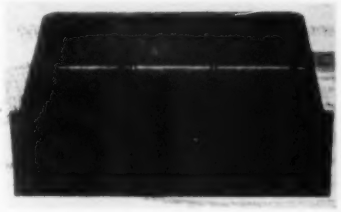
Other molders are now experimenting with drawers of urea and fiber glass, Boonton with premix compounds. At the right is its sample in brown, made of phenolic resins and sisal fibers.



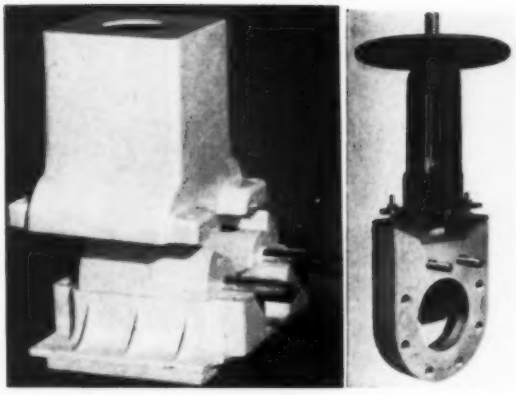


Top: Drawer is removed from the injection molding machine at G.E.'s Decatur plant. Center: A. F. Forni (right) points out drawer features to Sears' distributor. Bottom, the drawer, having been mounted with a wood front at the furniture factory, is being assembled in the case goods at Broyhill's plant, Lenoir, North Carolina.





Right: Bakelite's original black phenolic drawer, molded by The Richardson Co. and by Boonton Molding Co., whose experimental sisal drawer (below) has smooth surface, fibrous appearance.



Products made from Thermaflow's compounds are hamburger-making machine (left) for Holly-Matic, Chicago, and lower half of valve, W. G. Rovang, Oregon.

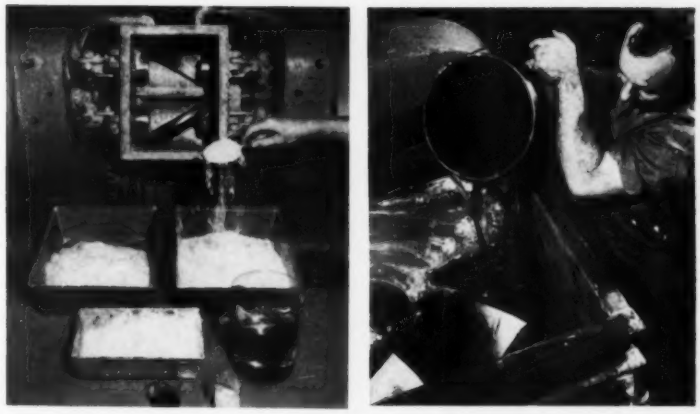
product: F55 hammer handle
material: premix-molded fiber glass
manufacturer: Fayette R. Plumb, Inc.

Much-discussed developments in "premix" compounds are currently bringing speedier volume production to reinforced plastics, and opening up new design possibilities. "Gunk molding" with resins and waste fibers is not new, but the research of several suppliers has made it possible to control both ingredients and results, and to mold compounds at considerably lower pressures with greater flow than before.

The hammer handle, left, made of fine, unidirectional glass fibers coated with a special blend of polyester resins carefully combined before molding, is one of the few premix products on the market so far. Developed by Fayette R. Plumb of Philadelphia, maker of hickory-shaft hammers for 100 years, it demonstrates the kind of research and testing that often lies behind a product pioneering a new formulation.

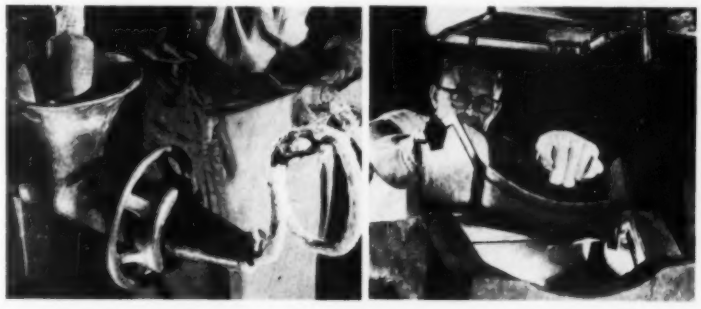
Research on the F55 hammer began in 1951, when Plumb management felt that a tool handle superior to both wood and steel should be sought, possibly in new plastic compounds. A joint research project was set up with the Molded Insulation Co., and for more than three years numerous resins and compounds were evaluated, molded into handles, and subjected to rigid tests (left). Finally, a combination of glass fibers and polyester was found whose superior performance would justify as much as a 15% higher tool price. As a final hammer handle evolved, the grip section could be placed closer to the steel head—a gain in force—because of fiber glass' lower specific gravity. An inch shorter, the handle feels less wieldy than hickory because it is heavier and not so well rounded, but it dampens shock more effectively, and is unaffected by heat, moisture, sunlight, oils and chemicals. Plumb now produces its own materials through the Plumb Chemical Corp., and is investigating premix for its other tools, while merchandising its new hammer for $4.49.

Premix, also used in large volume by Woodall Industries for automotive, appliance and electrical parts, is suited to critical and tiny moldings which would be impracticable for mat or preform molding. Their appearance varies from a rough surface with fiber glass and polyester resins, to smoother with nylon, to perfectly smooth with sisal fiber and phenolic resins. All types take paints and enamels, and any color can be mixed into the formula. Each premix compound has particular shaping and surface qualities—waiting for designers to realize them attractively in consumer products.



Glass fibers, clay filler, mold lubricant, black pigment and benzoyl peroxide paste pigment are typical ingredients for premix molding. Beaker contains vinyltoluene type polyester resin, being poured (right) into mixer.

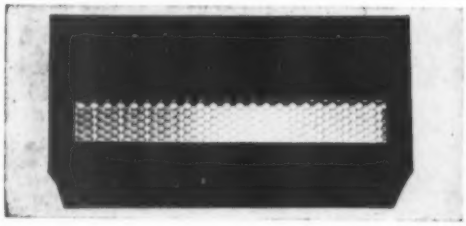
After the batch of premix has been thoroughly blended, chopped fibrous glass is added (left). The completed premix, with glass-polyester compounds, is removed by tilting mixer and dumping it into a receptacle.

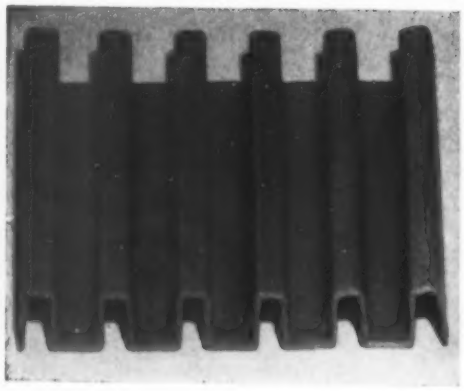


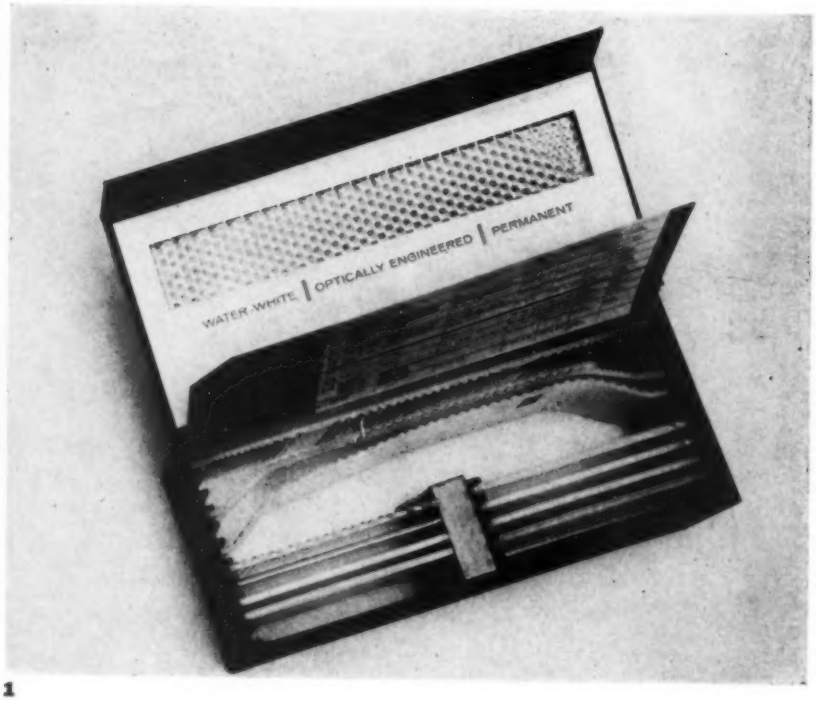
The mixture is extruded into continuous rope to be made into preforms, the rope facilitating handling during molding (left). The heater part being removed from compression press was molded in matched metal dies.

Other automotive parts made from premix are (left) automobile arm rests, placed on cooling fixture after molding to prevent warpage, and garnish molding (right) being sanded after cooling at Fabricon Products.

4 Making the most of a proven process—three kinds of extrusion







1

2

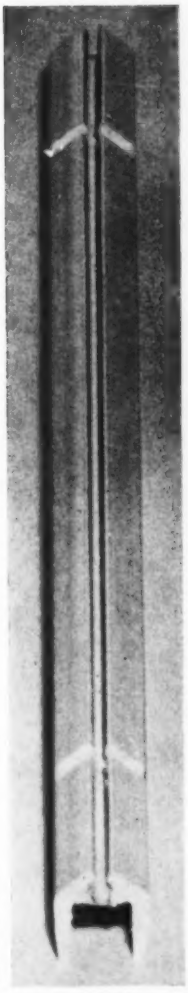
product: frames for three packages
materials: polyethylene, polystyrene, cellulose acetate butyrate
suppliers: Dow Chemical Co., Bakelite Co., Eastman Chemical Products, Inc.
extruder: Anchor Plastics Co.

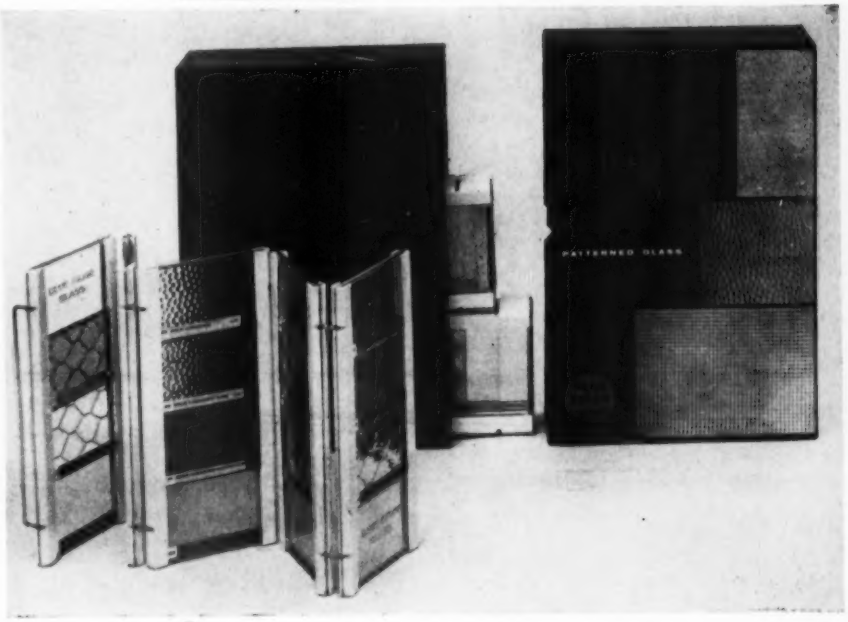
Extrusion is a process that has long offered economies in fabricating many different materials. The packages on these pages exemplify one extruder's effort to develop applications that have virtue above and beyond the proven economy of extrusion. Though the packages themselves have a common denominator—all are designed to hold fragile objects—each employs a different plastic, selected by Anchor and the designers because its characteristics of cost, resiliency, color or appearance could be fully exploited.

1. This box for samples of glass of various sizes was designed by the Corning Glass Works Design Department. Because the frames that hold the samples are part of the container, not an element in a display, appearance and quality were not the critical factors, and an economical plastic could be considered. Styrene, which was chosen for the modular extrusion, could nevertheless be colored a bright blue to contribute to the color scheme of the box's interior. A special adhesive was formulated to provide a strong bond between the frames and the box itself.

2. Clarinet reeds must be pampered; their thinly shaved tips split and chip with the least abuse. The Fischer Musical Instrument Co., in packaging and distributing imported reeds in a simple box, settled on a thin polyethylene extrusion shaped to hold a nest of four reeds, gripping the blunt ends with a cushion-like force and leaving the delicate tips free from pressure. Polyethylene has no plasticizer to migrate to the reeds, and with a water absorption rate of less than .01%, the danger of moisture damage is eliminated.

3. Appearance of the extruded plastic was important in this glass sample package, also executed by Corning's Design Department for Blue Ridge Glass Corp., because the hinged framework was to be part of the folding display itself. Anchor and the designer selected Tenite II, Eastman's cellulose acetate butyrate, because it takes a smooth finish and permits a richly solid extrusion that is still flexible enough so that metal hinges may be snapped into grooves to join two frames together. Extruded white Tenite is cut to length, slots are milled, hinges snapped in, the deep groove lined with foam rubber strips to cushion the glass. The units are shipped to Blue Ridge for assembly.





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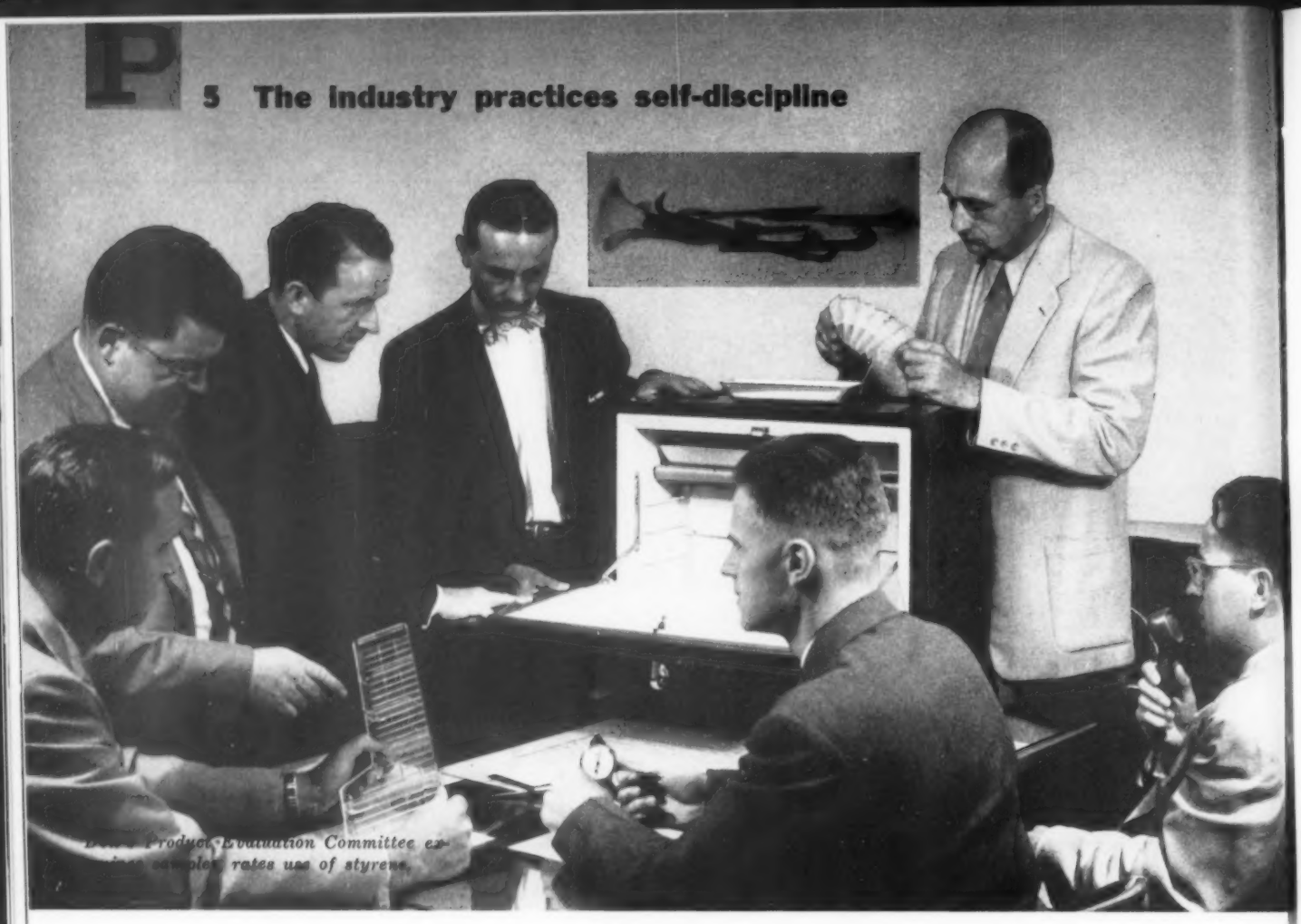
P 5 The industry practices self-discipline



Dow's Product Evaluation Committee examines samples, rates use of styrene.

Suppliers' technical services test materials: left, Dow's dunking machine, testing the effects of detergents on polystyrene kitchen wares. The series includes impact, heat and cold resistance, flexural, color and light stability tests. Right, one of Monsanto's testing machines in Springfield, Mass.

Suppliers give detailed recommendations on the use of their formulations. Left, one of Bakelite's publications, right, Dow Chemical Company, Midland, Mich.

DOW

BAKELITE Extra High-Im

In a recent experiment, fittings molded of several impact styrene materials were subjected to a destructive compression test. Those molded of BAKELITE extra high-impact styrene were the only ones which did not shatter when pressed between the jaws of a vise. The extreme toughness of EMD-2155 also recommends it for use in children's toys where its excellent surface gloss, good mold reproduction, and color stability are of

The short life of a toy made of "plastic" symbolizes the very real problem that the entire industry faced in recent years. The postwar market, even more than the prewar, had an insatiable hunger for materials regardless of quality; molders were inexperienced and hurried, polystyrenes were as fragile as glass, and it didn't take half as long for plastics to acquire a bad name as it did to undo the damage. In the last eight years, the industry as a whole has made an unprecedented effort to discipline itself, to agree on chemical standards, and to influence the end uses of its materials.

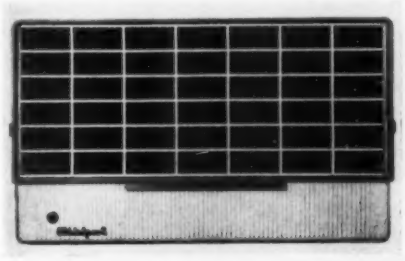
One of the first steps taken after the war was the establishment, by suppliers such as Dow and Monsanto, of Product Evaluation Committees. Focussing on troublesome styrene, Dow invited manufacturers to submit toys and housewares to the scrutiny of specialists who analyzed the application of the material; they gave detailed reports to 219 molders in 1948, their first year.

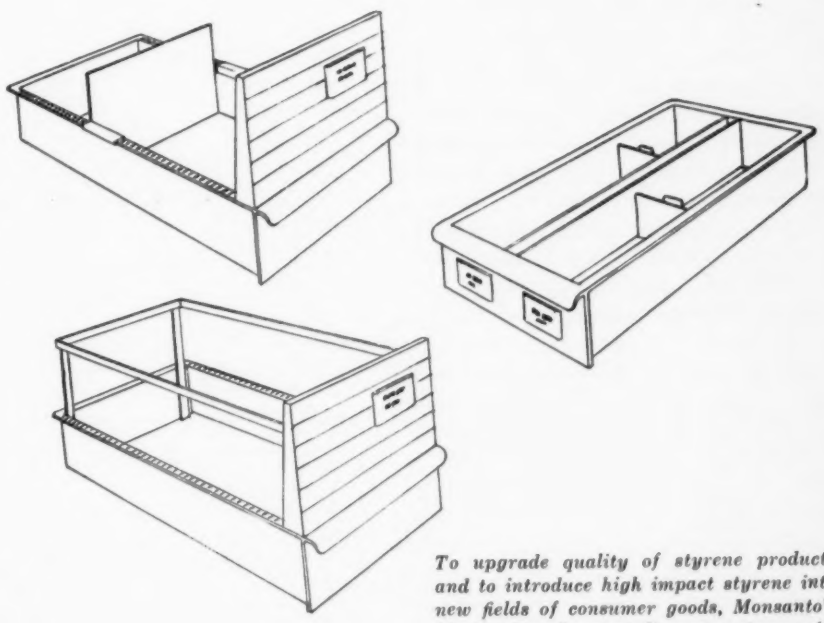
The self-regulating efforts of the industry continue to expand. All major suppliers publish quantities of technical literature and serve their customers (many of them small manufacturers) by comprehensive Technical Services, **which test products, develop markets, and introduce new formulations. They also improve existing formulations, such as once fragile polystyrene that has become the workhorse of the industry, entering such quality products as the air conditioner (right) and the G.E. drawer, pages 56-57. Last year Koppers started a competition among molders for the best styrene housewares. Monsanto, beginning in 1954 with a grant-in-aid to Pratt Institute's Industrial Design Department, has sponsored many experimental designs, now retains a design consultant, Richard Neagle, to explore new uses.**

How far the industry has come in establishing new confidence is suggested by the now common practice of brand identification — equating the quality of the plastics material with the name of an individual supplier. In some instances, conscientiousness in the public's behalf leads to super-conservatism in design recommendation, an influence that was seen until recently in the extra thickness of melamine dinnerware, emphasizing the proven sturdiness of the material. Design in plastics, as well as machine technology and the market, still tends to lag behind the research laboratory, which has already developed polystyrenes that will not melt up to 250° Fahrenheit.

Winner of Honorable Mention in Koppers' 1956 Design Competition for Plastic Molders: one quart watering can made of regular polystyrene, Quality Molding Co., Chicago, Ill. Retail price: 69 cents.

Air conditioner grille, the RCA Whirlpool, designed by Henry Dreyfuss, employs 24 extruded polystyrene rods, brass colored, 3/32 inches in diameter, heat sealed in one operation by molder, General American Transportation, Chicago, Ill.





To upgrade quality of styrene products and to introduce high impact styrene into new fields of consumer goods, Monsanto's Market Development Department commissioned experimental designs for low cost office furniture by Richard Neagle. Samples above are one-piece molded styrene file drawers, part of multi-colored styrene and vinyl Executive Unit designs.

P6 Plastics and the question of quality

An open letter to users of plastics, covering a number of open questions: Is there trouble today in our plastic paradise? If the consumer accepts plastic as never before, does she demand it for its appeal and its beauty? How can traditional satisfaction and prestige be designed into a family of untraditional materials?

by Jane Fiske Mitarachi

Over a year ago, Lunt Silversmiths of Greenfield, Massachusetts, a respected manufacturer of traditional sterling tableware, decided that it should pursue a new concept in silver. Lunt wanted to reassert sterling in the minds of customers who were ready to pay sterling prices for stainless flatware partially because of its elegant contemporary design. Oddly enough, the solution to this problem of product prestige turned out to be plastic. There were many reasons for choosing plastic in this case, but Lunt's designer, Nord Bowlen, was thinking first of style.

At the outset, Bowlen felt that a combination of sterling and "something else" would provide a rich contrast of color and texture that seemed suited to flatware for a less formal table style. Working with hard rubber as a modeling material, he evolved prototype forms for a four-piece setting. He experimented with handles of various tones and textures, and before long concluded that the contrast of a soft, dull black and gleaming silver offered the smartest combination for his design.

What material offered sufficient quality to be combined with silver? Bowlen's design called for an 'inlay" joint between handle and base, and the idea of joining the parts with exposed silver rivets led to the idea of a molded handle. Molding would provide both the rivet holes and the step for the silver inlay, and could of course reproduce the desired handle shape as well.

To a craftsman and traditionalist, the idea of settling a design before the material was chosen would be sacrilege, but the method is singularly appropriate to plastics, which are almost as nearly a chart of specifications as a group of materials.

As Bowlen began to investigate moldable synthetics, the nature of the demands on his then-hypothetical handle quickly eliminated several of the more familiar ones. The material had to have color consistency, a soft matte finish which was nonetheless durable, flexibility under stress, resilience, stain resistance, inertness to common grease, oils and detergents. And, very important from a merchandising viewpoint, it had to be able to withstand the daily tortures of the dishwasher.

Believing that nylon or Teflon were probably the only real contenders, Lunt finally went to DuPont with its specifications. DuPont recommended that "Zytel" nylon would meet the physical requirements (it was particularly suitable because it was virtually unbreakable or unchippable, with slight flexibility) and tested it thoroughly under the specified conditions of use. The supplier warned, however, that nylon would present shrinkage problems in molding, but Lunt decided that other factors outweighed this problem. In addition to its physical advantages, Zytel's shiny molded surface could be buffed to achieve this soft matte surface that was the crux of Bowlen's "Contrast" design.

The job of molding, turned over to the Prophylactic Brush Company, required several months. As DuPont had warned, it proved difficult to achieve the close tolerances that would permit a perfect joint with the silver. The problems of shrinkage and a critical mold cycle were ironed out primarily by handworking the interior of each mold until the pieces could be perfectly formed.

After the silver and nylon are joined, grinding, finishing and buffing of both materials gives the perfect joint required by the inlay design. At the same time the silky black surface is given to the nylon, to heighten the contrast with the silver. Zytel, Lunt points out to its customers, can be cleaned with ordinary silver polish. The polishing action on silver itself, because it is not a hard material, serves to round off and soften the rough edges of scratches and to give a rich patina to the metal. In the same way and at the same time, the wear on the matte nylon surface may be given its own kind of patina.

Based on a talk given to The Home Fashions League of New York

Lunt is by no means the first flatware manufacturer to turn to plastic handles, but it may be the first with the courage to decide that plastic can be luxurious enough to the hand and eye to command luxury prices—and to get them. At $18.75 for a four-piece setting, there is every chance that "Contrast" will be competing with traditional silverware in term of traditional elegance and richness and craftsmanship, a bracket in which durability is pretty much taken for granted.

This is not to say that most plastic products are failures, but that they frequently do not compete on the highest level. They do not say, "Buy me because I am beautiful," but "because I am practical," or 'See how much I look like the materials you like." And the consumer, fully appreciative of the virtues of plastics, indicates that she is also aware of their shortcomings in sheer satisfaction. Magazines indicate that quite a few women are by-passing easy-to-keep vinyl and polyester, and are spending good money for hard-to-keep Siamese silk and handwoven wool, unpolished teak and fragile rice paper. People who should, by all rights, be buying Formica tables often choose mahogany instead, and throw over a vinyl cover during cocktail parties.

Does this happen because plastics are "cheap?" That answer is too easy, and they usually are not.

The reason may be found in an unusual predicament facing plastics today. They arrived late on a marketplace of materials dominated by distinct and interesting personalities: the sheen of oiled wood, the matte-like grain of ivory and ebony, the crisp polish of lacquer, the patina of leather, the fibrous texture of paper. Uncertain of their own personalities, and unable to compete with the traditional concepts of beauty in materials, plastics have retreated to a kind of visual sackcloth, seeking consolation in serviceability.

What is it that gives traditional materials their distinction? *Structure*: often we can see how a material grows, as in a wood grain. Or we can see how it was created by a manufacturing process—the weave of a fabric, for instance. Structure in turn gives an effect of *depth*, of dimension. Whether or not this is a real third dimension, like rough plaster on the wall, the material breaks up light so that its surface never appears to be flat, and it changes subtly in different lights.

Working with a traditional material brings out other qualities: its malleability or rigidity, the tensile strength of its fibers, its natural weight. Often there is an organic variety or irregularity within a set pattern that makes a material interesting to look at. All of these qualities tend to express themselves in the character of a finished object, just as a gabardine dress will take on a form that obviously distinguishes it from chiffon. Banging, polishing, scrubbing, dunking, the effects of wear and age all tend to add to the definition of materials with which we are familiar, which we understand from an historical lifetime of seeing them worked, and used, and worn, and mellowed. Not so plastics: produced by invisible chemical miracles, impermeable and—ideally—unchanging, they offer no such intimacy with their character, to give us an intuitive sense of their beauty.

What, then, is quality? The word has two meanings. One suggests inherent value, or "good goods," and is meaningful only because of value associations. The basic meaning here is *the essence of a material*, its total inherent character. Any material from burlap to crystal can have quality. A material that lacks character lacks quality, and this adds up to cheapness. Any application that can give the impression of quality that isn't there is cheap — a poor use of material.

Since plastics don't grow cell by cell, there is no natural structure to admire. They have no organic shape to give them life, they are not formed by hand or turned on a potter's wheel, and they lack natural color and tex-

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What material offered sufficient quality to be combined with silver? Bowlen's design called for an 'inlay" joint between handle and base, and the idea of joining the parts with exposed silver rivets led to the idea of a molded handle. Molding would provide both the rivet holes and the step for the silver inlay, and could of course reproduce the desired handle shape as well.

To a craftsman and traditionalist, the idea of settling a design before the material was chosen would be sacrilege, but the method is singularly appropriate to plastics, which are almost as nearly a chart of specifications as a group of materials.

As Bowlen began to investigate moldable synthetics, the nature of the demands on his then-hypothetical handle quickly eliminated several of the more familiar ones. The material had to have color consistency, a soft matte finish which was nonetheless durable, flexibility under stress, resilience, stain resistance, inertness to common grease, oils and detergents. And, very important from a merchandising viewpoint, it had to be able to withstand the daily tortures of the dishwasher.

Believing that nylon or Teflon were probably the only real contenders, Lunt finally went to DuPont with its specifications. DuPont recommended that "Zytel" nylon would meet the physical requirements (it was particularly suitable because it was virtually unbreakable or unchippable, with slight flexibility) and tested it thoroughly under the specified conditions of use. The supplier warned, however, that nylon would present shrinkage problems in molding, but Lunt decided that other factors outweighed this problem. In addition to its physical advantages, Zytel's shiny molded surface could be buffed to achieve this soft matte surface that was the crux of Bowlen's "Contrast" design.

The job of molding, turned over to the Prophylactic Brush Company, required several months. As DuPont had warned, it proved difficult to achieve the close tolerances that would permit a perfect joint with the silver. The problems of shrinkage and a critical mold cycle were ironed out primarily by handworking the interior of each mold until the pieces could be perfectly formed.

After the silver and nylon are joined, grinding, finishing and buffing of both materials gives the perfect joint required by the inlay design. At the same time the silky black surface is given to the nylon, to heighten the contrast with the silver. Zytel, Lunt points out to its customers, can be cleaned with ordinary silver polish. The polishing action on silver itself, because it is not a hard material, serves to round off and soften the rough edges of scratches and to give a rich patina to the metal. In the same way and at the same time, the wear on the matte nylon surface may be given its own kind of patina.

Lunt is by no means the first flatware manufacturer to turn to plastic handles, but it may be the first with the courage to decide that plastic can be luxurious enough to the hand and eye to command luxury prices—and to get them. At $18.75 for a four-piece setting, there is every chance that "Contrast" will be competing with traditional silverware in term of traditional elegance and richness and craftsmanship, a bracket in which durability is pretty much taken for granted.

This is not to say that most plastic products are failures, but that they frequently do not compete on the highest level. They do not say, "Buy me because I am beautiful," but "because I am practical," or 'See how much I look like the materials you like." And the consumer, fully appreciative of the virtues of plastics, indicates that she is also aware of their shortcomings in sheer satisfaction. Magazines indicate that quite a few women are by-passing easy-to-keep vinyl and polyester, and are spending good money for hard-to-keep Siamese silk and handwoven wool, unpolished teak and fragile rice paper. People who should, by all rights, be buying Formica tables often choose mahogany instead, and throw over a vinyl cover during cocktail parties.

Does this happen because plastics are "cheap?" That answer is too easy, and they usually are not.

The reason may be found in an unusual predicament facing plastics today. They arrived late on a marketplace of materials dominated by distinct and interesting personalities: the sheen of oiled wood, the matte-like grain of ivory and ebony, the crisp polish of lacquer, the patina of leather, the fibrous texture of paper. Uncertain of their own personalities, and unable to compete with the traditional concepts of beauty in materials, plastics have retreated to a kind of visual sackcloth, seeking consolation in serviceability.

What is it that gives traditional materials their distinction? *Structure*: often we can see how a material grows, as in a wood grain. Or we can see how it was created by a manufacturing process—the weave of a fabric, for instance. Structure in turn gives an effect of *depth*, of dimension. Whether or not this is a real third dimension, like rough plaster on the wall, the material breaks up light so that its surface never appears to be flat, and it changes subtly in different lights.

Working with a traditional material brings out other qualities: its malleability or rigidity, the tensile strength of its fibers, its natural weight. Often there is an organic variety or irregularity within a set pattern that makes a material interesting to look at. All of these qualities tend to express themselves in the character of a finished object, just as a gabardine dress will take on a form that obviously distinguishes it from chiffon. Banging, polishing, scrubbing, dunking, the effects of wear and age all tend to add to the definition of materials with which we are familiar, which we understand from an historical lifetime of seeing them worked, and used, and worn, and mellowed. Not so plastics: produced by invisible chemical miracles, impermeable and—ideally—unchanging, they offer no such intimacy with their character, to give us an intuitive sense of their beauty.

What, then, is quality? The word has two meanings. One suggests inherent value, or "good goods," and is meaningful only because of value associations. The basic meaning here is *the essence of a material*, its total inherent character. Any material from burlap to crystal can have quality. A material that lacks character lacks quality, and this adds up to cheapness. Any application that can give the impression of quality that isn't there is cheap — a poor use of material.

Since plastics don't grow cell by cell, there is no natural structure to admire. They have no organic shape to give them life, they are not formed by hand or turned on a potter's wheel, and they lack natural color and tex-

ture. Thus far by definition alone, they represent neither "goodness" nor quality.

What plastics *are*—resins that start in powder or pellet form and are heated to a liquid state before becoming solids—gives them moldability as a characteristic, and several qualities as a by-product: plastics may vary from precision of form to fluidity of form. They are generally light in weight with a warm surface that is sometimes waxy. Although that surface may acquire the texture of any metal it contacts during molding, it is easy to get a flawlessly smooth glossy surface by chrome plating the molding dies—and almost everyone seems to be doing just that.

What plastics offer, then, is perfection of shape, perfection of surface. But there is such a thing as being too perfect. Without surface variations and organic imperfections, without a weave or a pattern of growth, is it possible to achieve a real quality in a synthetic material?

With such pliable stuff as plastic, it is tempting to turn it into forms we already know. But a real quality does not, obviously, come from exploiting its agreeable passivity, but rather its more affirmative character. We have had our day of vinyl table cloths printed with exquisite lace patterns, of molded basketweaves and imitation Permastone wall coverings; but imitative as they were, they cannot be blamed on a conscious effort at imitation. Plastic's reputation as a substitute material has come mainly from unconscious *assumptions*, from imitation that was *unintentional*. Manufacturers and designers have assumed that what was smooth must be shiny as gold, what was clear had to sparkle like crystal, what was white must be ivory and what was black must be ebony. Without purporting to fool anybody, they have erred only in their inflexibility about traditional values. This, in turn, forced the consumer to measure plastics by *her* traditional standards—small wonder that plastics came off second best. Whether or not she knew why, she sensed that the glitter or imposed texture implied a quality of material that wasn't really there.

Take dinnerware. China and porcelain have traditionally been made with a sparkling protective glaze, and when melamine dinnerware was introduced, it, too, had a high gloss. Manufacturers no doubt assumed that a "glazed look" was what everyone expected of dinnerware, or at least what everyone associated with an unporous sanitary *look*. Unfortunately, this effect in the two materials is quite different. The fired glaze on china is transparent, and the material beneath is chalky and usually translucent, giving an effect of visual depth and sparkle because light is diffused by the surface below the glaze. The gloss on melamine, on the other hand, is merely a surface polish on an opaque material, a shallow gloss that cannot possibly have the liveliness of a true glaze. The one exception is black melamine, which achieves the effect of depth because the color itself absorbs enough light to produce a reflectivity that is convincing. Boonton's recent attempt to give melamine dinnerware a new quality of depth, by using a translucent filler in a lightly colored translucent resin, has produced a light-transmitting effect that seems appropriate to the material.

This lack of depth in untranslucent forms may be called the personal problem of melamine and other thermosets containing filler materials; properly viewed, it is a character to be exploited, too. Another group of hard-surfaced thermoplastics, styrenes and acrylics encounter problems and possibilities arising from glitter and, particularly, clarity. A third group, notably nylon, polyethylene and vinyl, have in common the ability to take a soft waxy surface and some translucence. It is interesting that the members of this generally non-glittery group are easiest for the general consumer to identify, not so much by name as by their distinctive character. If plastics are to gain ground on the quality market, design must be relied on to enhance the inherent and untraditional qualities of all three groups. It is here that Lunt's bold pursuit of a distinctive surface quality for nylon suggests one logical direction; others may be found in translucence, and light qualities.

Hard as chemistry can make them, plastics are not yet diamonds, and under ordinary household use they will inevitably show wear. A glossy surface shows up a scratch like a spotlight, just as it accentuates fingermarks and dust. The hard-gloss surface on melamine and styrene household products is customarily defended for sanitary reasons. But it is possible to argue that one scratch in a hard surface is just as bad as an unevenly scratched matte surface, and perhaps worse, if it is conspicuous.

Matte finishes are usually more compat-

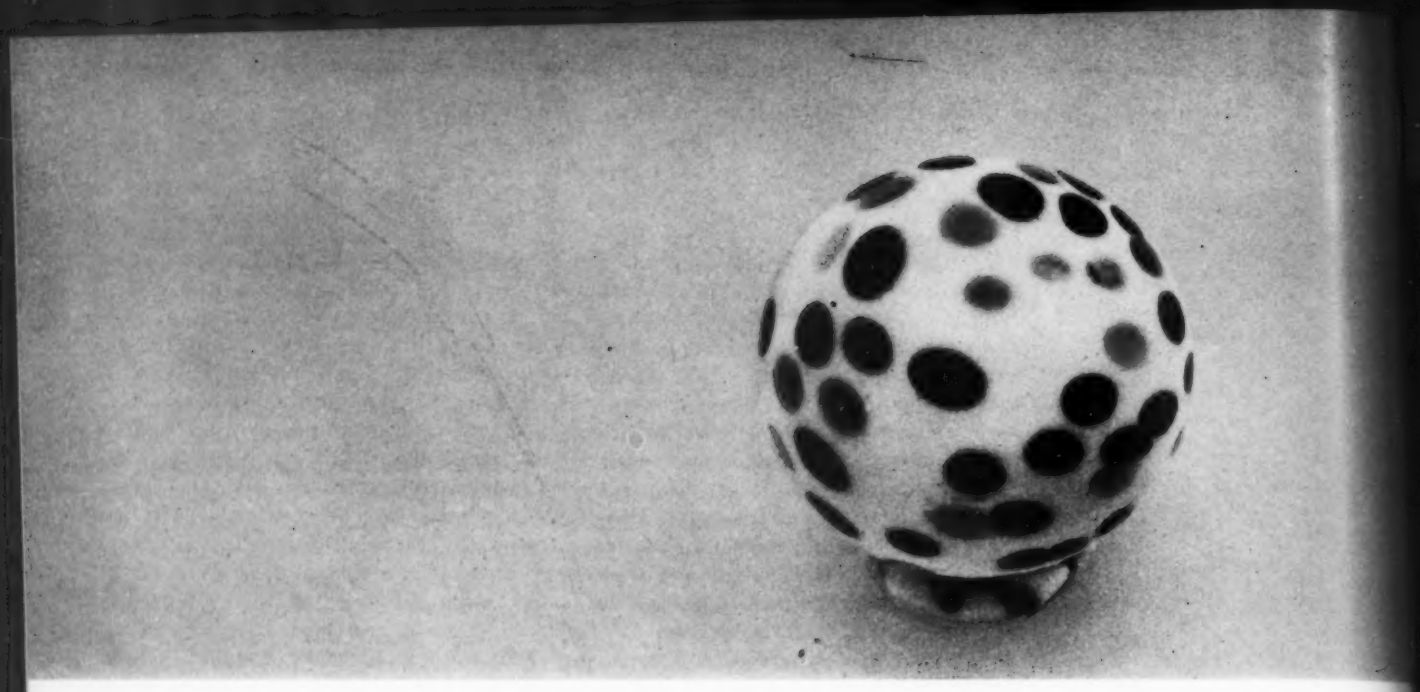
ible with other materials in the home, for the very reason that Lunt indicated in specifying a buffed nylon with silver: contrast. The average home is so well equipped with gleaming materials — chrome and stainless in particular — that it is a trick to compete. Just because a material *may* be shiny doesn't mean that it *must* be; the aging of the gloss tends to counteract its convincingness, with the result that it soon looks cheap.

In terms of texture, plastics display some unique traits. It is possible to add texture to molded plastic without achieving anything tangible. Texture under glass, as the phenomenon might be called, has risen to bizarre heights with the clear plastics used for medallions and nameplates, as well as with the mottled dinnerware whose filler is visible but smoothly encased in resin. Yet with sufficient solidity and boldness of form to give the encasing material a quality of its own, the effect can be rich indeed.

It is in lighting that many workaday plastic materials come into their own. Clear plastics have obvious inadequacies compared to plain glass, but translucent vinyls, polyesters and acrylics suggest special and intriguing new possibilities. They offer a combination of light diffusion and control, and in the process of factoring light they take on a new personality: depth. In lighting fixtures, the matte finish of styrene, vinyl and polyester contributes both diffusion and textural interest; the same materials used in permanent ceilings of light, in plain, corrugated or embossed sheets, may be colored to compensate for fluorescent illumination—a combination that could be both practical and decorative. As a replacement for glass in walls and windows, translucent reinforced polyester or acrylic panels filter daylight agreeably, and offer a range of colors that become more vibrant when naturally backlighted.

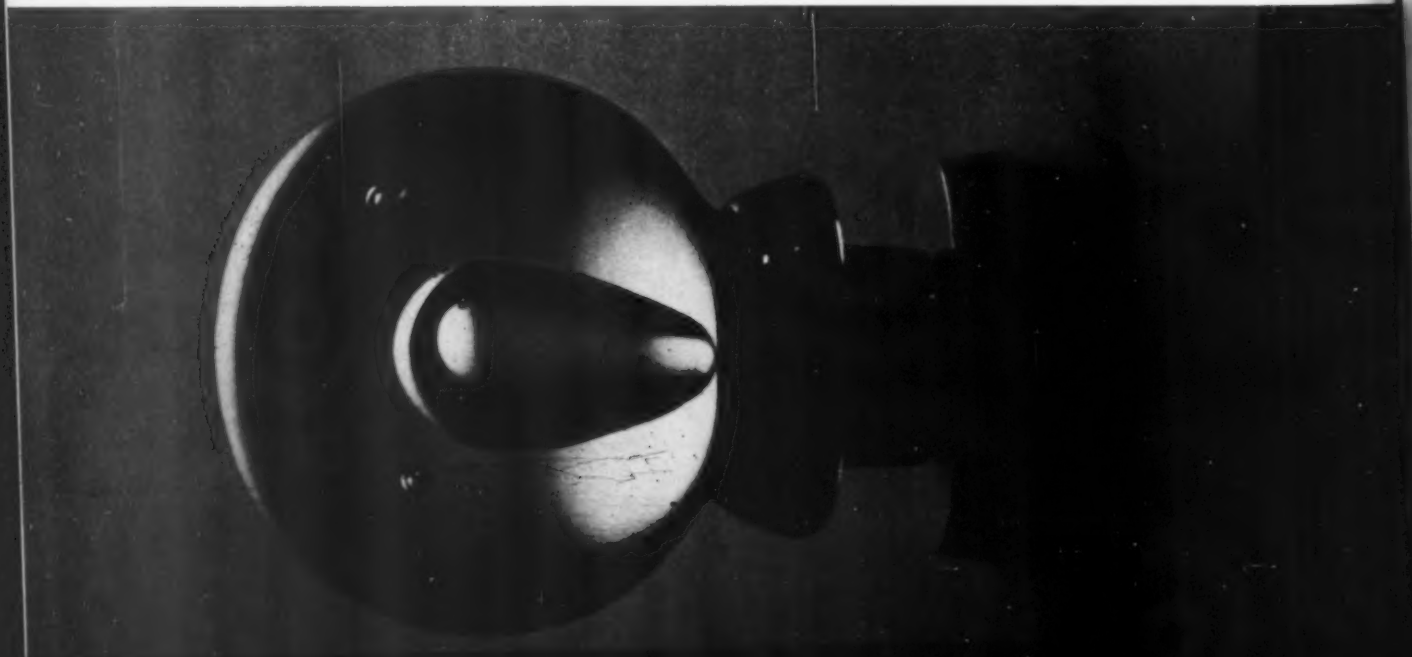
The possibilities of lighting plastic, of course, also present some hazardous temptations. Acrylic is an outstanding example. Its clarity and light-piping ability has seduced users to assume that it must be used to simulate jewels or crystal. While there is probably nothing as unconvincing as Lucite candelabra, unless it is a Plexiglas engagement ring, unimaginative assumptions and bad uses of glitter do not negate the material's excellent possibilities. Acrylic sheet can also be frosted, either during casting or by post-finishing, a direction that would seem to have some exciting applications in unusual lighting installations and decorative panels. It is also possible to give original and *un*imitative textural effects to cast and molded acrylic, clear or opaque—a direction that has already been charted by several excellent applications in bowls and trays with gently grained surfaces.

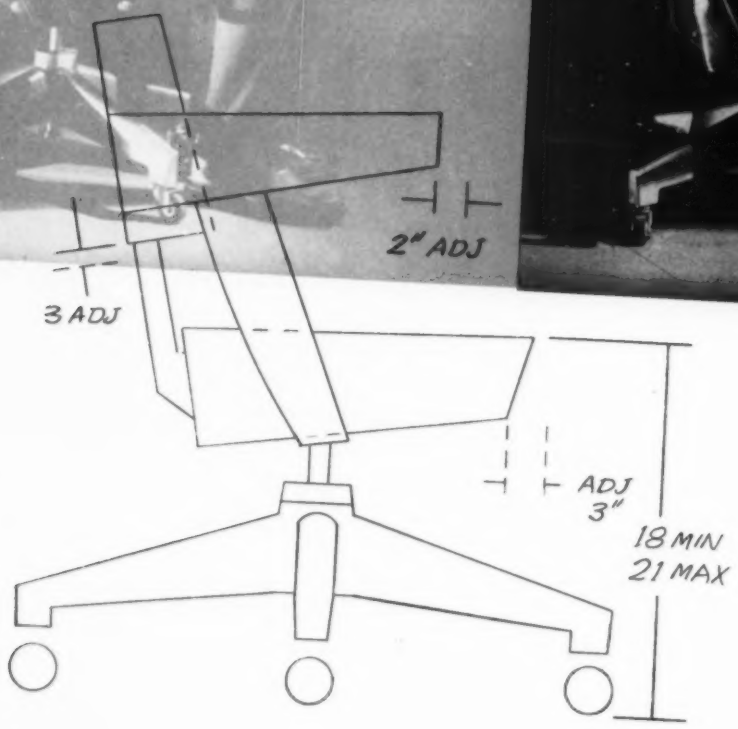
Appreciation of beauty in any material has a lot to do with our long-term knowledge of it. As we use and live with it, we observe not only the way it performs but the way it changes and mellows. If age adds enrichment as a knife adds character to a chopping block, our response is to equate satisfaction with beauty. If time discolors or mars the brilliance or hardness we have been led to expect, it is hard not to consider the material cheap — no matter how sound the product itself may remain. Quality, in short, is as much a matter of visible effects as of physical performance — a matter of how material continues to look as it continues to serve. Appreciation of the qualities of plastics will continue to increase if the character that is designed into them is as durable as the materials themselves; such quality can best be designed into plastic by a frank exploitation of the things that make plastics unique, as Lunt designed both immediate prestige and long-term satisfaction into its nylon handles.



Hardware becomes an art gallery

Opening the door to artists and craftsmen to reassert their influence in ornamental building hardware (and to designers and consumers to view the doorknob more imaginatively) Yale & Towne Manufacturing Co., specialists in the lock and latch, showed 85 knobs and escutcheons at New York's Wildenstein Gallery in May. Architect Philip Johnson designed a latch in brushed aluminum; Venini showed multicolored glass drawer pulls, and knobs like 19th century paperweights. Leger's ceramics were bold, geometric statements in primary colors; and Mirko's bronzes took the form of curvilinear fishes and birds with antique surfaces. The company's Styling Department, under industrial designer Glenn Holland and consultant Van Day Truex, displayed experimental designs not in mass production but available for custom orders, using luxurious materials — gold, silver, ebony and crystal — the latter, in collaboration with Corning Glass Works, enclosing decorative bubbles.
Milky glass above by Paolo Venini; below, Corning Glass. Opposite: Leger, Venini, Johnson and Mirko.





Man-tailored chair *Engineered to fit any figure scientifically it had to be designed to meet all distortions gracefully*

photos by Tom Yee

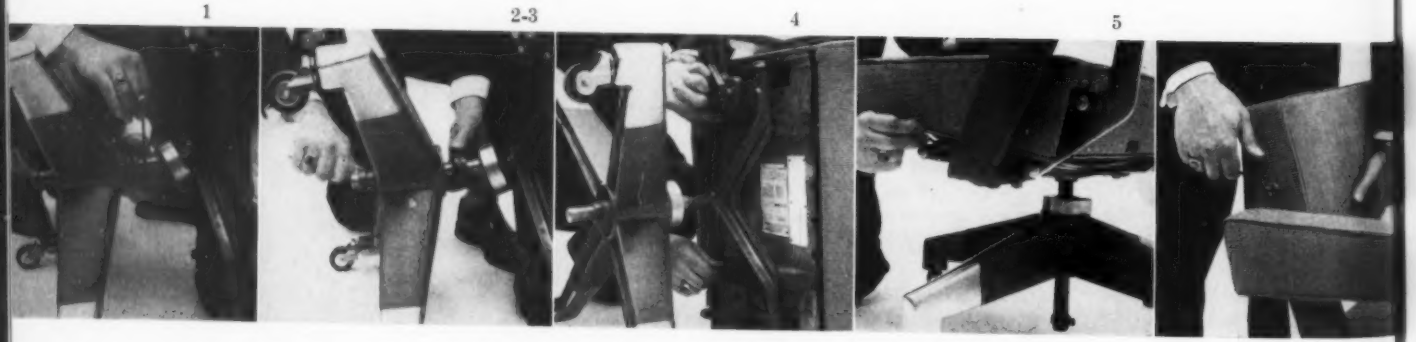
The gentlemen on the facing page, whose physiques are somewhat dissimilar, are relaxing in desk chairs that are tailored to their individual dimensions. It happens to be the same chair in two extremes of adjustment—a chair that might be compared in function to the shoes that are molded to the foot like a cushioned skin. As the designers of these "duck" shoes have found, the most healthful solution is not always the most graceful, because in conforming to the requirements of the body it is often hard to conform to the best interests of design. Raymond Loewy Associates, Chicago, faced such a problem when it was retained to redesign the Do/More posture chair, an object with complex moving parts and scientifically determined dimensions. It was their job to reconcile science and art, to build in proportion and balance so that the chair looked well, no matter how gravely distorted by the individual figure.

The Do/More Chair Company, as its name suggests, is in the business of selling chairs, but the company regards the chair *per se* merely an implement for selling a method of seating. Health, comfort and efficiency is affected more by the *way* we sit than by the object we sit on, according to Do/More, whose expressed objective is to offer a chair that makes proper working posture almost unavoidable. To this end, the firm employs a fleet of "service men," tailors of a sort who fit each chair when it is delivered to a customer. This service group is as large as the sales force in some areas, but Do/More regards it not as overhead but as an extension of the product, on the theory that the best proven results will sell the most chairs, and the proper result in posture chairs can be achieved only when it is fitted by a specialist. The chair, in fact, is designed so that the customer *can't* do it himself, because the sitter tends to adjust to the slumping, dangling, slouching and other posture faults to which he is accustomed. After Do/More provides the anatomical fit, it offers to service its customers every six months to see that everyone remains happily seated.

As the first American manufacturer of posture chairs, Do/More has built itself a market on the efficiency-producing features of its product. But in recent years the company encountered an unexpected market problem. Chairs could be sold to executives who wanted orthopedic advantages for themselves and their employees, but more and more often were refused by decorators, purchasing agents or office managers because they were clumsily out of place in contemporary offices. Last year Do/More commissioned RLA to reshape several posture models into a stylish new form, tailored not only to the customer but to the customer's contemporary business interior—and to follow through with a complete line of office seating units. The limitations, and the resulting line, are described on the next pages.

The first American posture chair made by Do/More, in 1923, *(top) offered more adjustments than its appearance suggests. Today's open-arm executive model features a firm tilting back, based on a patented spring triangle that proved to be a major problem in the redesign by Raymond Loewy Associates.*

Maze of tracks on die-cast aluminum spider (Sterling Brass Foundry, Elkhart, Ind.) indicates the complexity of mechanism needed for complete adjustability. Underside of zinc die-cast one-piece base shows how edges have been rolled for a smooth, snag-proof finish. (New Products Corp., Benton Harbor, Mich.) Back supports are chrome-plated stamped steel. (Dayton Rogers Co., Minneapolis.)



Steps in adjusting the open-arm model: 1. Friction lock on spindle fixes the seat height so that sitter's legs are straight and thighs rest flat on seat; retaining ring on bottom of spindle is also tightened. 2-3. Seat is positioned on adjustment track, and 4-way arm adjustment is tightened beneath seat. 4. Tension of backrest is fitted to sitter's weight by adjusting enclosed spring. 5. Backrest is raised to fit snugly against small of back, and small pivot lock is tightened.

The adjustment range of the Do/More chairs was established many years ago by the Posture Research Institute. It is based on basic posture principles, but must begin, Do/More stresses, with the customer's desire for proper sitting. There are five basic mechanical adjustments, each of which helps to achieve the body-chair relationship that keeps the spine, lungs, and internal organs in the prescribed position.
1. Height of seat from the floor. (With feet on the floor, weight should be distributed under the thighs and not concentrated over hips. If possible, desk height should be adjusted for eye and arm comfort.) 2. Depth of seat from front to back. (Clearance at the edge of the seat eliminates pressure under the knees; spine should project over the back edge so that there is no pressure on the tip of the spine.) 3. Arm rests. (They should be recessed so that chair can approach desk, and should be adjustable in width. Do/More arms have a lateral spread of ½" and forward movement of 3"; the arm height does not have to be adjusted.) 4. Position of the backrest. (The body should be held comfortably and the lower five vertibrae firmly supported. Do/More's backrest is both concave to encircle the back, and convex to hug the small of the back.) 5. Tension of reclining backrest. (It should support the sitter *firmly* when he sits normally, and "give" when he wants to lean back. Do/More's patented spring mechanism does this by an unusual reverse action: when the back is upright the spring is in tension, then *contracts* or eases when forced back.

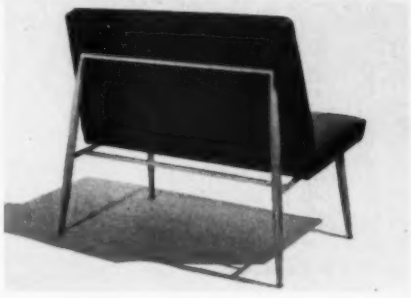
Of all the limitations posed by this complex chair, the last mechanism proved most troublesome to integrate with a neat design. Spring triangles on previous models had been hung on the outside of a notched seat, like exposed plumbing, or enclosed in bulky side pieces. On the new slab-sided club models, concealing the triangles was not much of a problem, but RLA designers wanted an element that would be inconspicuous on an open arm model as well, and would still be accessible for adjustments. The final design placed the spring tube under the seat, emerging through a notched back to join with the angled back supports (see 4, left).

Another problem was to design a die-cast base piece that could bear the thrust of the chair in all positions without looking as solidly grounded as it had to be. Previous Do/More bases, like those on most swivel chairs, were awkwardly large, made of many welded pieces. RLA worked out a one-piece zinc die-cast base and hub (Zamak #3) finished with chrome-plated scuff plates and topped with a zinc die-cast satin finish hub cap. Though the crisp contours require expensive dies and precision machining in attaching the plates, the result is a well-proportioned base of unusual grace. Edges of the base are rolled under in a post-forming operation, to eliminate snagging and scuffing and to give the piece a rich, sculptural finish.

The chair shown on the previous pages, #860 open arm executive model, was only one of seven swivel models recently introduced by Do/More; in addition there were three side chairs and a settee on tubular legs to fill out the line. Designing this line was in some ways a matter of developing new products from a few basic modules, since many of the components had to be interchangeable. Finally, RLA designers selected a series of leather, fabric, and Naugahyde coverings, then presented the chairs and upholstery samples in a lavish portfolio complete with interior sketches to show the style-conscious customer how Do/More chairs now fit into the contemporary office.

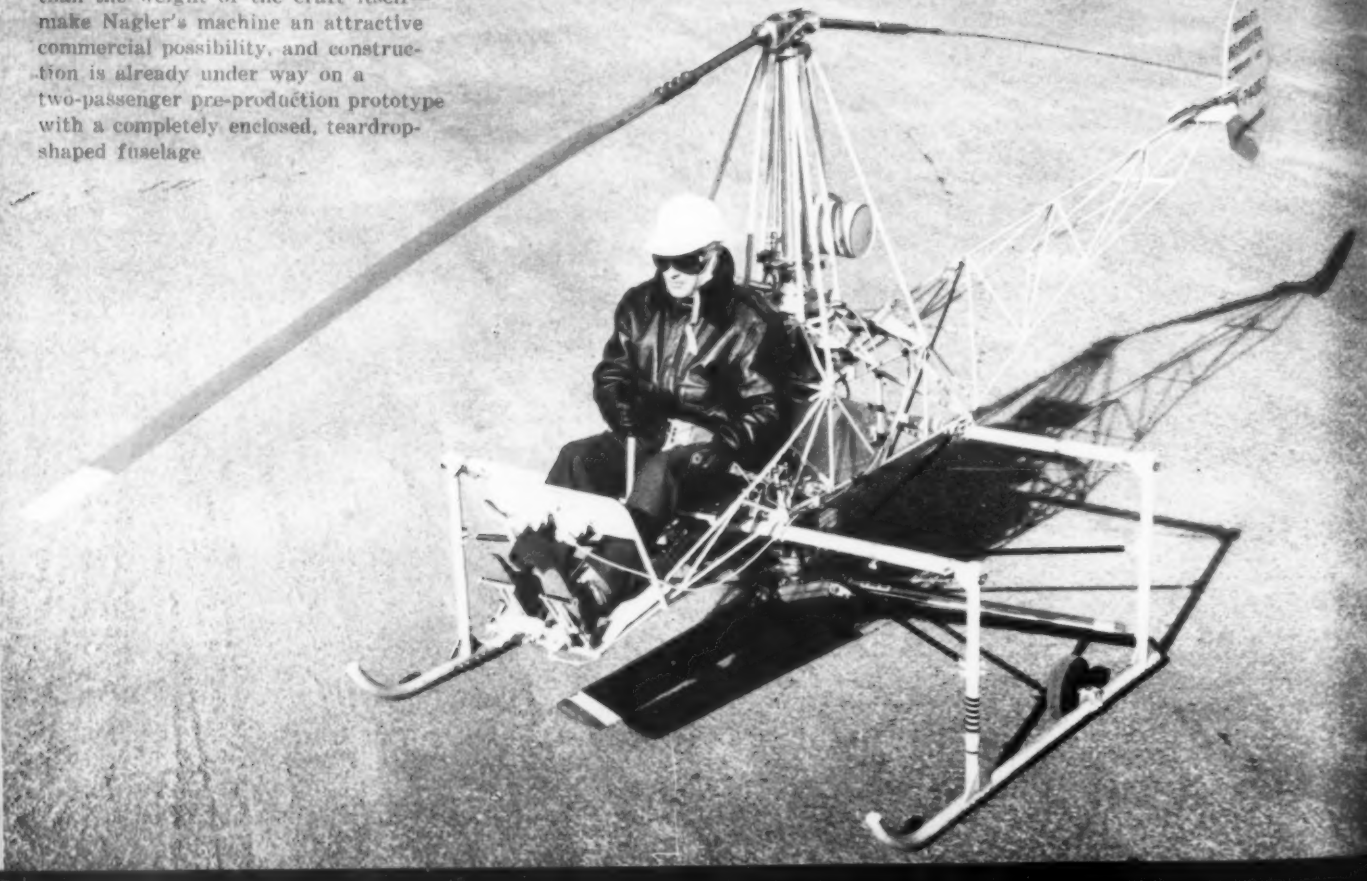
Armless model, top, rests on same base as club-arm high-back executive model; arms of latter are also used on side chair, below.

Three side chairs on tubular frames and a settee round out Do/More's line of nine seating units for modern offices.

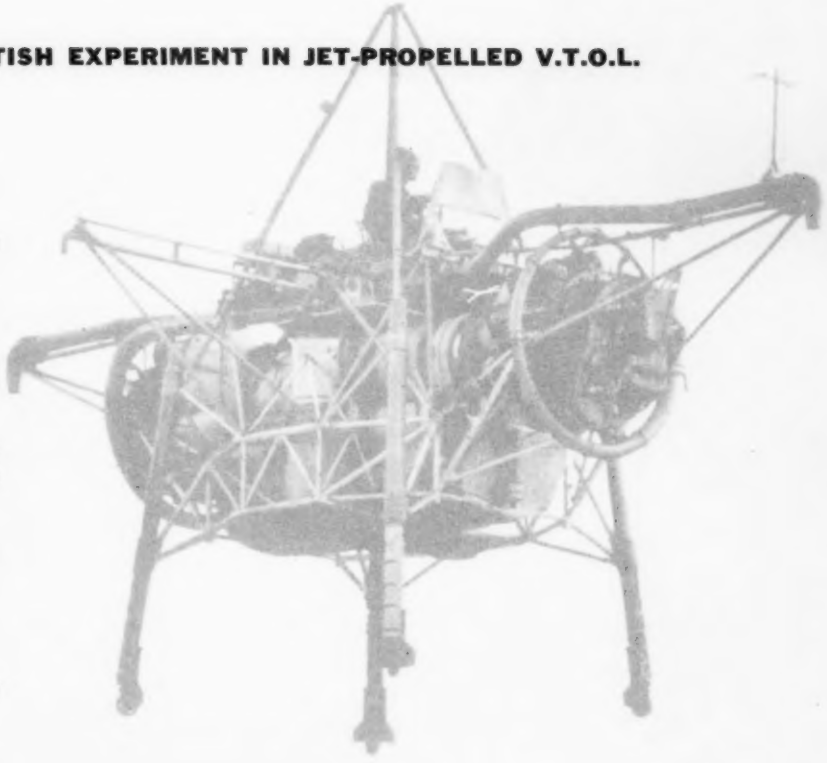


HELICOPTER NH-160: FIRST OF FOUR SIGNIFICANT AIRCRAFT DESIGNS

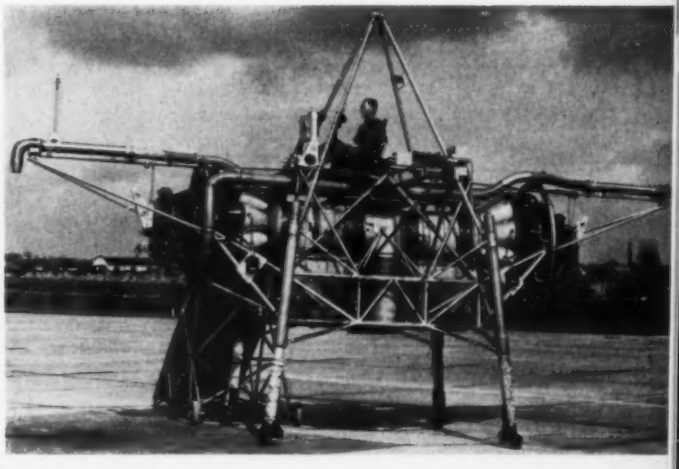
Embodying the provocative thinking of an independent helicopter designer, a strange-looking but sturdy test vehicle has been flying at the Westchester County Airport, White Plains, N. Y. Bruno Nagler's design objective in his latest rotary-wing craft was to isolate the torque-producing elements from the airframe, thus eliminating one of the chief helicopter difficulties—rotor torque reaction. The result is an integral coaxial unit consisting of an overhead 20-foot-span rotor of two extruded aluminum blades and a three-bladed, seven-foot-span counteracting rotor of wooden construction directly below the fuselage. To the rear of the pilot seat, with its crankshaft extending above and below, is a 72 h.p. rotary engine, which acts as prime mover for the two rotors and as a differential balance between them. In the absence of a tail rotor for directional control, pedals connected to grab-type brakes, one above and one below the engine, absorb some of the torque of either the upper or lower rotor and thus turn the craft by the imbalance of torque. Easy maintenance and easy flying—and a potential payload greater than the weight of the craft itself—make Nagler's machine an attractive commercial possibility, and construction is already under way on a two-passenger pre-production prototype with a completely enclosed, teardrop-shaped fuselage.



"FLYING BEDSTEAD": A BRITISH EXPERIMENT IN JET-PROPELLED V.T.O.L.



Not the latest but still one of the uncanniest agglomerations that men have made airworthy is the "Flying Bedstead," a wingless, jet-propelled Vertical Take-Off and Landing craft. It has been under development at the Rolls-Royce works in Hucknall, Nottinghamshire, for several years. Unlike Convair's "Pogo" (ID, December 1955), which requires the pilot to take off and land from his backside, the "Flying Bedstead" is designed to carry him in a normal position through every phase of flight. Two R-R Nene engines have been set horizontally in opposition, one at either end of the frame. No attempt was made originally to develop special engines; instead, the simplest and lightest frame was built which could house existing engines. The jets are ducted through 90° so that both engines discharge downwards, directly against the force of gravity. The pilot sits on a platform above the two engines. The control moments which he needs to balance the machine are supplied by jets of compressed air which are discharged through nozzles at the ends of the extended arms. The air for these nozzles is bled from both engines, and the pilot, using a conventional control column and rudder arm, regulates the flow through the nozzles. In this way he provides the pitching, rolling and yawing moments which he requires. Since the initial 1954 tests in tethered and free flight, work has continued on the problems of heat, noise and safety. And the design of the most efficient engines and an airframe to employ this principle is being considered.



INFLATABLE AIRPLANE: GOODYEAR'S EXPERIMENT WITH A NEW MATERIAL

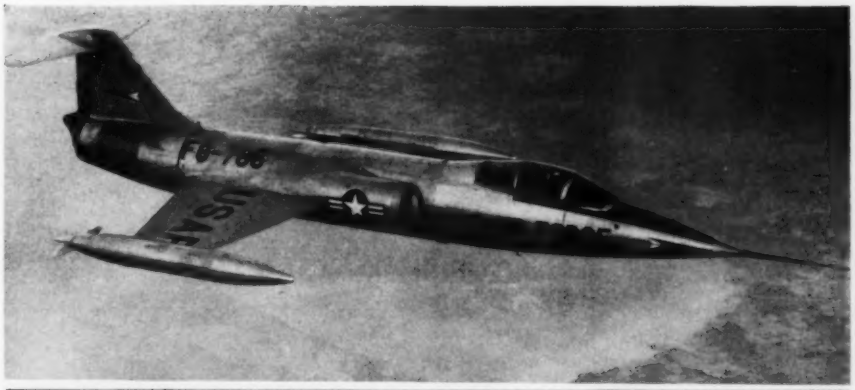
Goodyear's inflatable airplane, first flown in February of this year, may not be the portable air flivver for the back of everyone's station wagon, but it is a development that interests the armed forces as an emergency escape vehicle. Designed and developed by the company to test the possibilities of rubberized Airmat fabric as a structural material for aircraft, the single-seat monoplane has reportedly aroused the interest of the Office of Naval Research. The wing, tail, and pilot's seat were tailored out of two strips of Airmat. Thousands of strong threads of varying lengths are tied at correlated points on the inner surfaces of the two strips. When air is pumped in (Goodyear uses a conventional vacuum cleaner for both inflation and deflation), the expansion at any given point is governed by the length of the thread at that point. The less critical conical shape of the fuselage was fashioned out of standard airship fabric, which has long been used for lighter-than-air craft. Powerplant is a 40 h.p. pusher-type motor mounted on a tubular metal support behind the wing, the only other metal part being the support which connects the wheels and the pilot's seat with the fuselage.

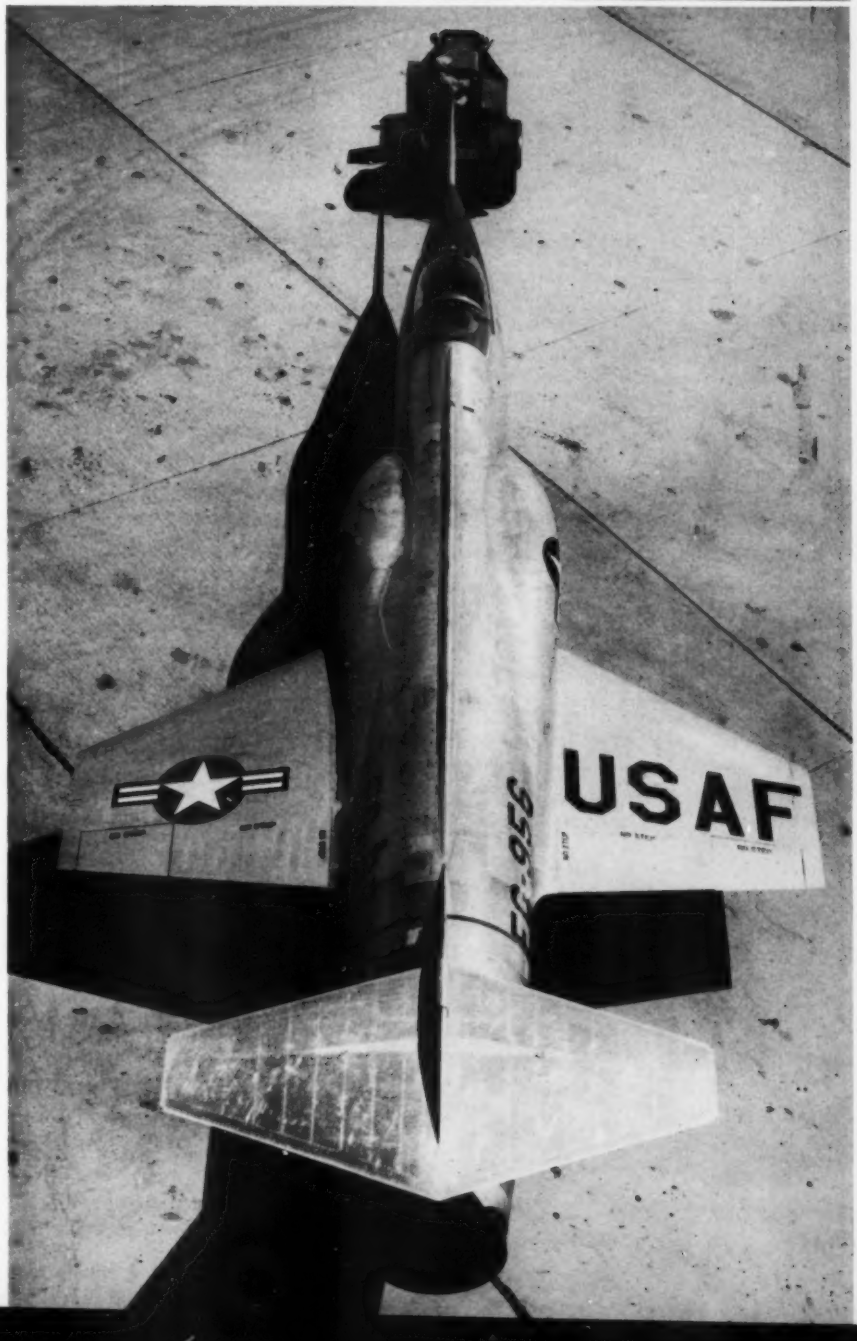
LOCKHEED F-104A: A FIGHTER THAT IS LIGHTER, LESS COSTLY, AND RAZOR-WINGED

Aeronautical developments of the deadliest sort were disclosed recently in a demonstration at the Air Force Jet Center in Palmdale, Calif., where 160 picked observers watched Lockheed's F-104A Starfighter barrel roll, swoop, dive and climb at speeds unofficially estimated at better than Mach 2 (1,324 m.p.h.). (In the photo, below right, special covers conceal air scoops just forward of the wings—for security reasons.) The design objective behind its development was stark: "to get maximum kill probability per dollar invested," according to C. L. Johnson, Lockheed Vice President of Research and Development, who reported that such a plane has been in the works since 1951, when Air Force experience in Korea clearly pointed up the need for a lighter, faster, more maneuverable fighter. On February 28, 1954, the F-104 (above right) made its first flight, two years before the 104A. Besides an articulated spine running from cockpit canopy to vertical fin, the major difference between the production 104A and its prototype is the powerhouse; a new General Electric J-79 turbojet engine, replacing a Curtiss-Wright J-65, has increased the plane's speed by an estimated 150 m.p.h.

Small as jet fighters go, the F-104A is 54'9" long, 13'6" high. Its weight is said to be about half that of standard fighters, and its cost about half, despite being equal or superior in most operational aspects. "Its design avoids complexity," Johnson says simply, " . . . and lends itself well to volume manufacture."

The thinnest wings flying today are the F-104A's most unusual feature, evolving out of extensive research, including desert tests of wing models on five-inch rockets. Thickness at the wing's center has been calculated as 1¾". The leading edges are so keen, at any rate, that felt sheaths must be fitted over them to protect the ground crew when the plane is not flying.





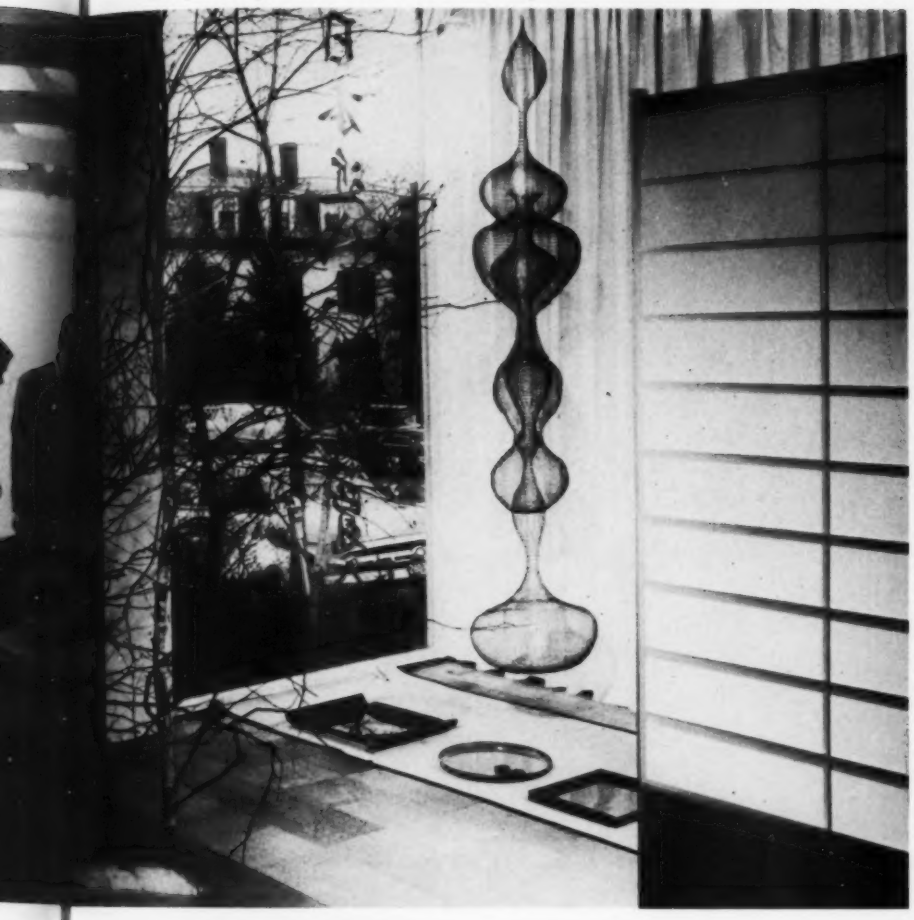
DESIGNS FROM ABROAD

An exhibition of Japanese household objects comes to Cambridge

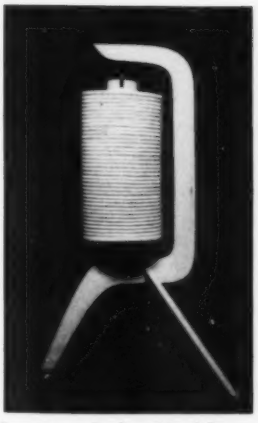
Last month Design Research, Inc., a design office and shop for carefully selected home accessories and furniture in Cambridge, Massachusetts, devoted most of its space to Japanese household objects and fabrics. Chosen by leading Japanese architects and designers, the products were complemented by nine pieces of wire mesh sculpture by American-born Ruth Asawa. Representing the Japan Committee on International Design, the exhibition created an island of Oriental finesse and calm, and a significant stir in design circles. Sponsors who helped to organize and import 280 tools and artifacts, many in their classic forms, included four government agencies in Japan—and nine distinguished deans, teachers and museum directors from the vicinity of Boston.

Toys, tea cups and yard goods in abstract geometric patterns gave intimate reflections of everyday life in Japan, while the installations carried out the scale and the open spaces of the Japanese house, with *ikebana* arrangements of tree-trunk slices, twigs, leaves and stones. Just as screens, porcelain, straw and paper products from Japan have been adapted to Western interiors, some Japanese are adding Western rooms in their houses for an exotic touch, and a home market has been created for chairs (opposite page) and other products alien to a floor-oriented decor. The tea ceremony with its delicately wrought utensils remains unique, and particularly interesting were ordinary hand tools, which are not as often displayed here. Some from the large collection are shown on the next pages: handles, traditionally, whether in wood or steel are gracefully joined and light in weight; the refined shape of the garden shears presents an extreme contrast to the primitive simplicity of the axes, saws, and knives, with their sharply angled blades.

Sculpture by Ruth Asawa enhances lacquerware and screens.

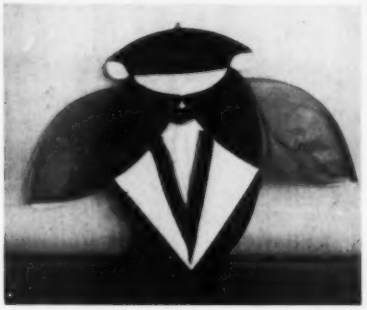


Fabrics and saki cups have geometric patterns.



Lantern, designed with stand.

Teaset with dark blue stripes.

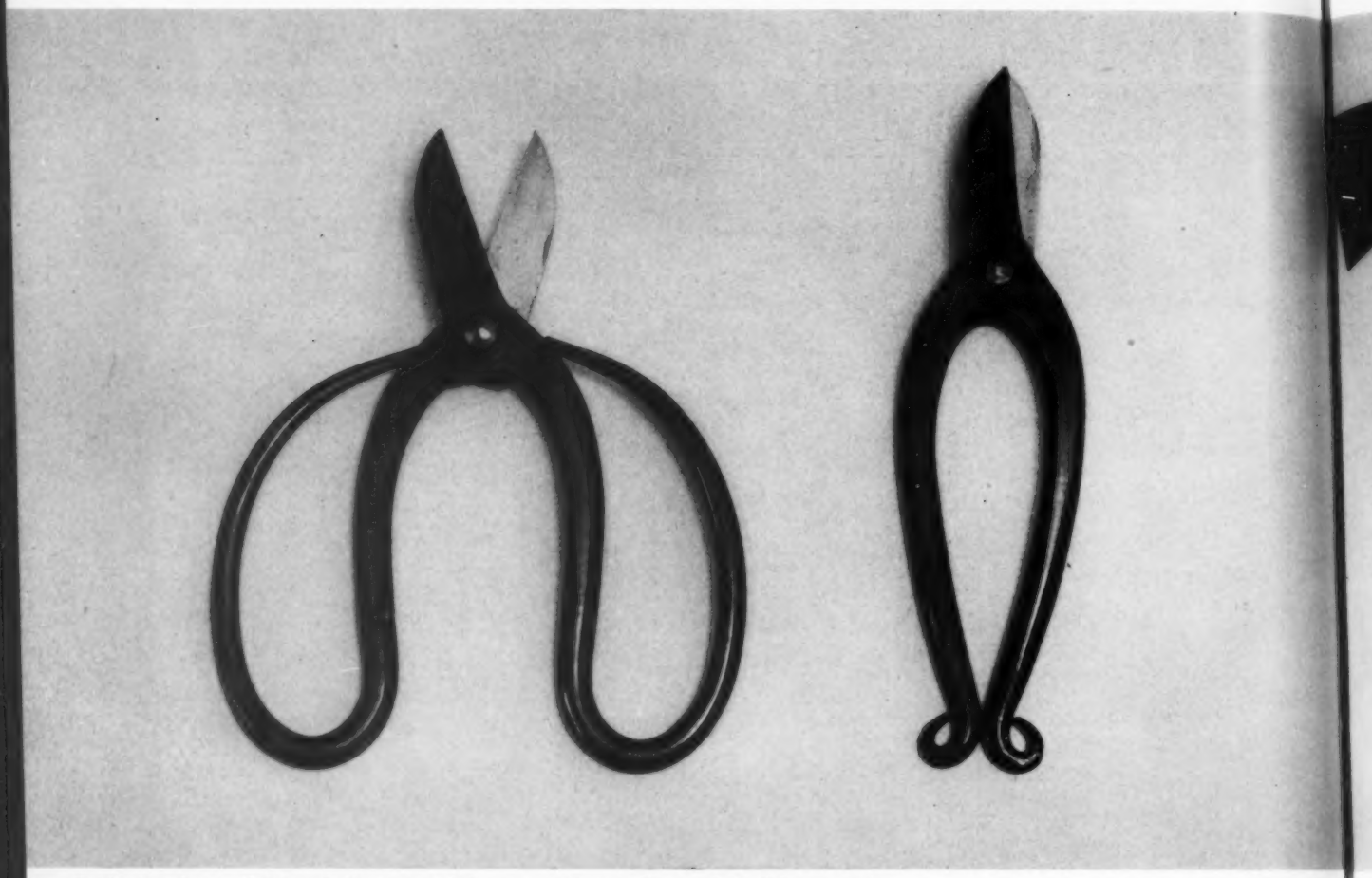


Large locust-like kite.

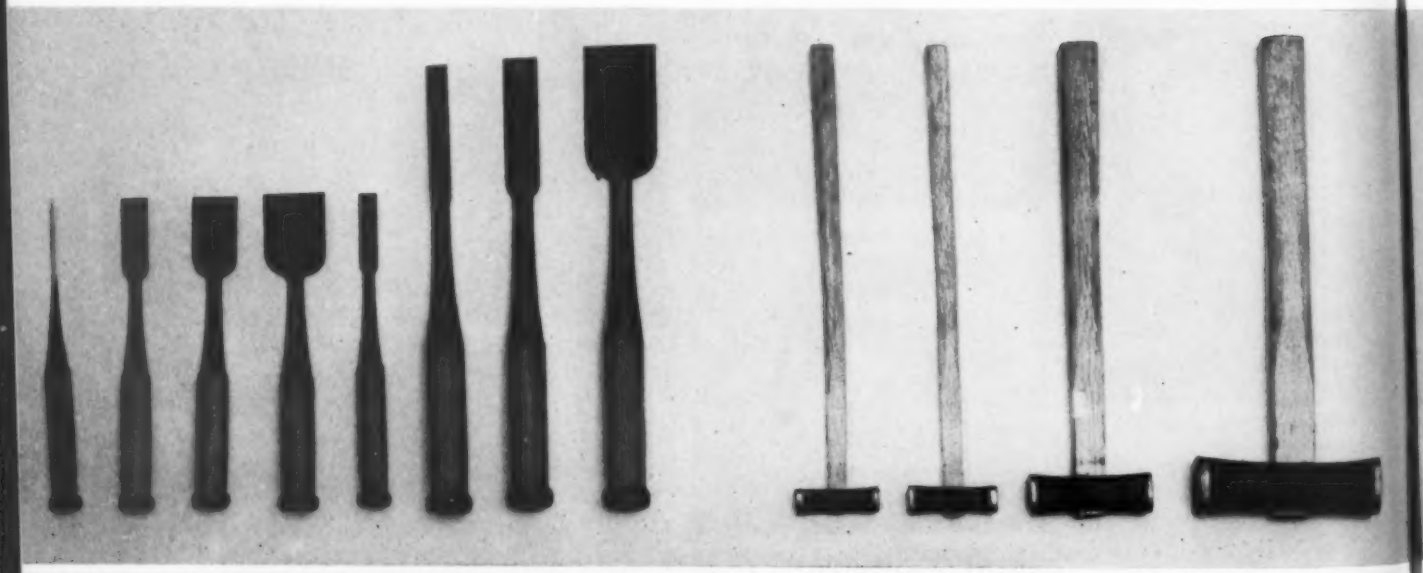
Chair, left, uses artificial suede, right, rope.

Four Kokeshi dolls.

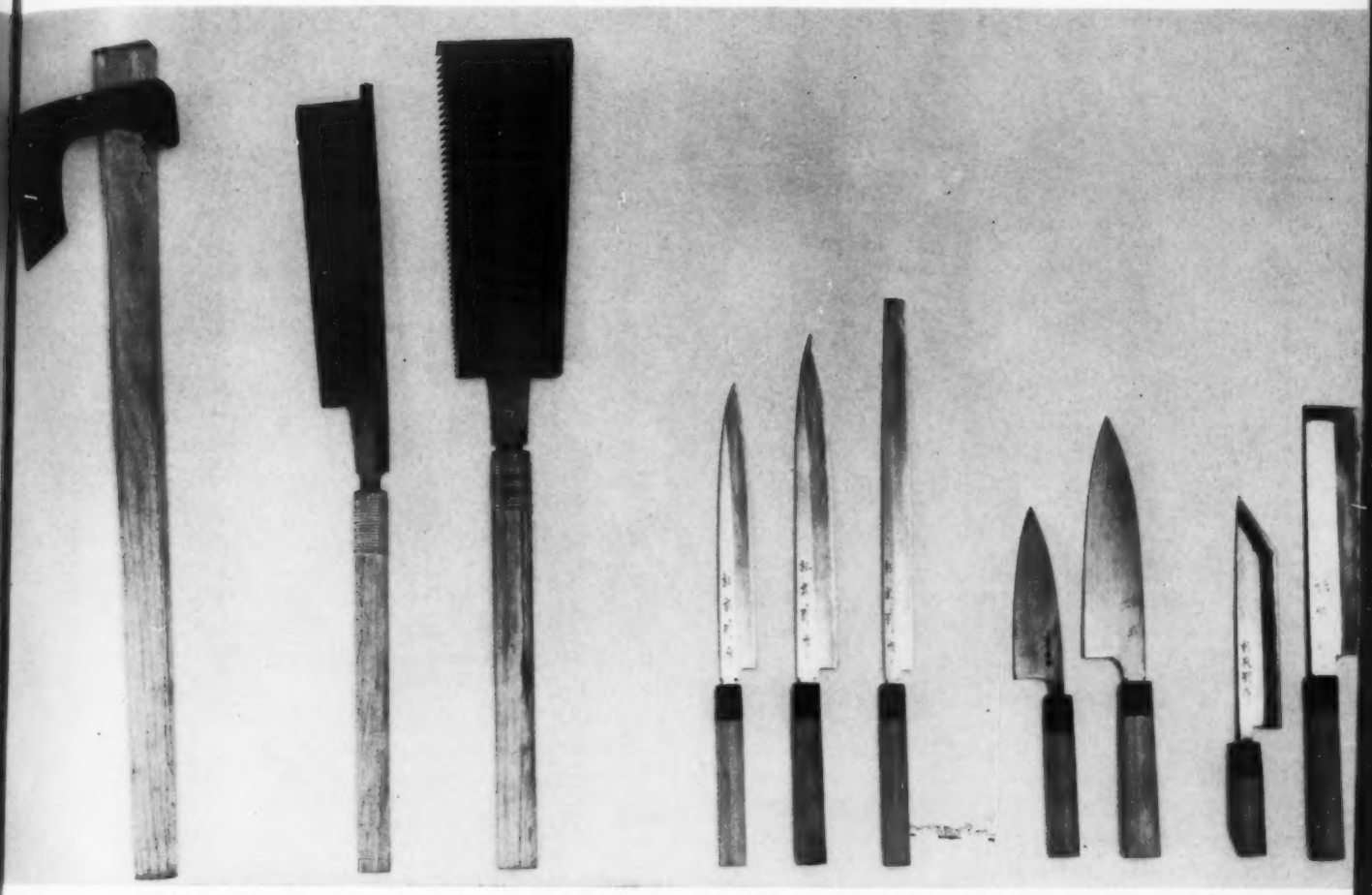
Hand implements in the Japanese exhibition are both rudimentary and refined



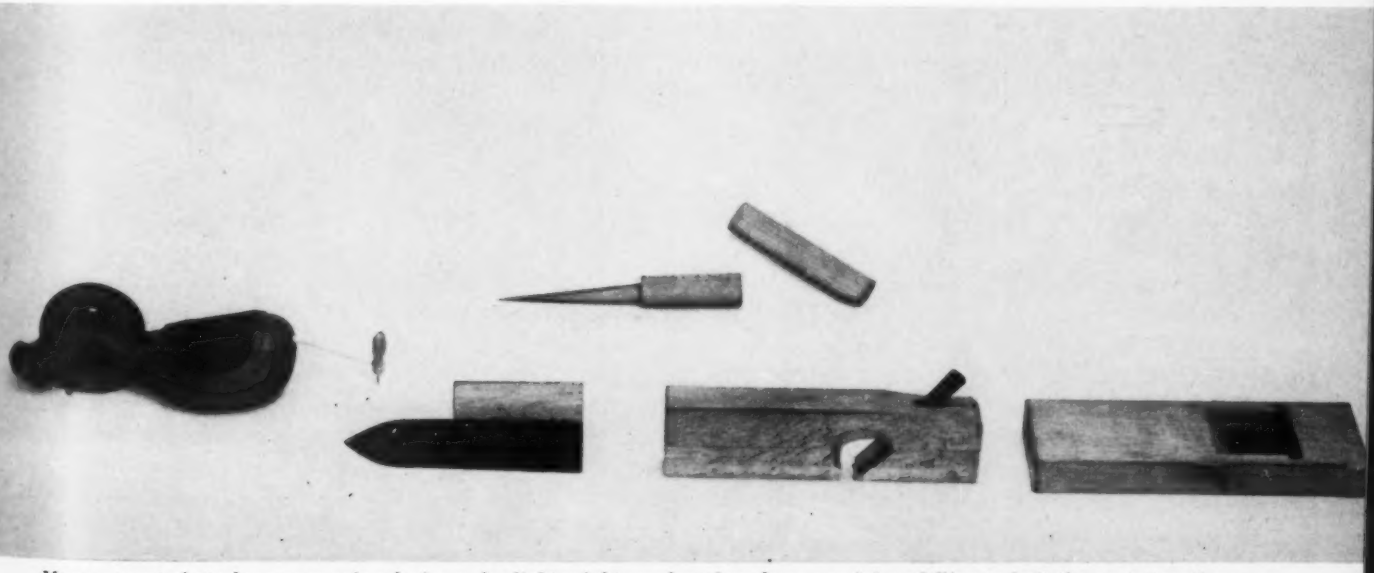
Gardening shears (left) and clippers (right) are curved according to their different actions.



A selection of carpenter's tools: chisels have long graceful necks, hammer heads are blocky and blunt.



Axe, saw and small knives illustrate a simple expressive method of fastening metal and wood.



More carpenter's tools: a measuring device and a lightweight wooden plane have careful modelling to knit the parts together.

This is the second of three installments of case studies from Don Wallance's book, **Shaping America's Products**, published this month by **Reinhold Publishing Company.**

Shaping America's Products — II: Design and craftsmanship

Despite the continued growth in size and importance of very large manufacturing corporations, small and intermediate-size production units continue to be an important factor in American production. Small firms (up to 100 workers) account for about 23% of the national product, intermediate-size firms (100 to 500 workers), and large firms (500 and more) together account for the remainder.

These figures, however, include manufacturers of basic materials, where there is a preponderance of large firms. In some industries, such as furniture and apparel, small and intermediate-size enterprises account for a much larger proportion of total output. In others, such as earthenware, glassware, and, of course, automobiles and electrical appliances, the preponderance of large firms is greater than for industry as a whole. Actually, of course, smallness in industry is relative. A small firm in the auto industry would be gigantic in the furniture industry.

Our special concern with small industry, however, is related to its qualitative rather than its quantitative role in American production. In many fields it is the small plant which supplies the needs of a growing quality market with products that meet high standards of design and workmanship. And it is in the output of small industry that we find the origins of many major design trends.

Perhaps an important factor in the survival and creative role of small industry is the widespread American urge to achieve personal independence and freedom of expression in one's work. This has provided a large reservoir of enterprising and creative people to exploit the possibilities offered by small industry. T. K. Quinn, a former vice president of the General Electric Company, argues that virtually all new achievements in technical research have been initiated by small industry. Citing the electrical appliance industry, he writes ". . . not one single distinctively new electrical home appliance has ever been created by one of the giant concerns — not the first washing machine, electric range, dryer, iron or ironer, electric lamp, refrigerator, radio, toaster, fan, heating pad, razor, lawn mower, freezer, air conditioner, vacuum cleaner, dishwasher or grill. All were the original inventions of smaller concerns. The record of the giants is one of moving in, buying out, and absorbing after the fact." This may be an overstatement, but it points up the uniquely creative role of small industry. And it holds true of esthetic as well as technical creativity.

The smaller firm which requires a relatively small portion of the total market is not compelled to design its products to the levels of conformity usually demanded by salesmen and store buyers for the mass market. On the contrary, the small firm can often compete more favorably by emphasizing a higher level of design and quality, and offering innovation rather than conformity. An increasing demand for well-designed and well-made products for modern living has opened up new possibilities for the small industry aiming at a quality market. The extensive publicity given to products of outstanding merit by home publications, home departments of newspapers, and museum exhibitions and publications through the "good design movement" has provided the small producer of quality products with free publicity that only large industry could normally afford. A familiar example is the Sitterle white porcelain pepper mill, which has become a classic. This and other Sitterle porcelain ware has been publicized on a scale quite disproportionate to the production, all of which is done by Harold and Trude Sitterle.

Because the products of these firms generally represent the most advanced approach in their field and have not yet received widespread consumer acceptance, successful marketing requires creative merchandising methods and informed and sympathetic sales people. At the wholesale level this has been provided by sales organizations and salesmen to whom the design and quality of what they sell is a matter of primary interest and conviction. On the retail level this kind of creative merchandising has been provided by the emergence since World War II of the "contemporary" specialty shops, a direct outgrowth of the "good design movement." These small shops have performed a pioneering role in the promotion and display of well-designed modern home furnishings. Their influence is increasingly evident in department stores and other channels of mass distribution.

The problem of maintaining high standards of craftsmanship in small industry is not essentially different from that in large-scale industry. In one respect the problem is greater, because small industry can rarely afford the degree of mechanization which removes quality from the control of the individual worker. On the other hand a closer relationship between manage-

in small scale industry

by Don Wallance

ment and workers opens up possibilities for cultivating more workmanlike attitudes and higher quality production. One finds instances, especially among the very small firms such as Menlo Textiles and Blenko Glass, where a typical personal relationships have been established between management, designer and workers. The Herman Miller Furniture Company, a fairly large firm as "small" industry goes, has experimented with the Scanlan plan in order to give the workers a greater stake in production and thereby create a more craftsmanlike attitude. When Winslow Anderson was the designer at Blenko Glass, he developed a working relationship by which the glassblowers became a part of the design process.

It is hard to tell just how such factors as automation, atomic power and government business policies will ultimately affect small industry. At present, however, the role of small industry as a source of new and better products and in supplying an individualized quality market make it a vital factor in the American economy. It is in small industry that the possibilities for progress in product design seem most promising.

The origins of the well-done products turned out by small industry can often be traced to a single resourceful individual, who is likely to be the head of the firm. He is generally highly creative and energetic, simultaneously active in design, business management, and the technical aspects of the firm's activities. His technical resourcefulness, imagination, and a "better mousetrap" philosophy are often the most valuable assets of the firm. Men like Sam Ornstein of Amelia Earhart Luggage, Mike Belangie of Menlo Textiles, Harold Hirsch of White Stag Manufacturing Company, and others are "master-craftsmen" in the sense that they have made major contributions to nearly every aspect of the products they manufacture. Above all, they are motivated by a personal interest and pride in the intrinsic merit of the things they make. This kind of creative and craftsmanlike approach to business competition provides a sound basis for the survival of small business in our economy.

Special interest attaches to the many instances encountered in small industry where excellent forms have been created by a business man — technician with no special training in the arts, and often without conscious esthetic design. One might jump to the conclusion that professional design training is unessential or even a handicap in the creation of genuinely good forms of lasting appeal. One should bear in mind, however, that the instances of this kind, while surprisingly numerous, are exceptional rather than typical of industry as a whole. They do show that integration of designing, making, and marketing under a creative individual with a feeling for form and a craftsmanlike outlook is conducive to the creation of well-done things. But untrained individuals with an intuitive feeling for form are by no means a commonplace in present-day industry. Any consistently high standard of design in industry must depend to a large extent on the professional designer. Frequently the head of a small business enterprise is a trained designer or artist-craftsman who has gone into business as a means of maintaining control over the entire process of design and manufacture, as well as for the greater monetary return possible. This type of enterprise is discussed at greater length in the chapter on handcrafts.

The industrial designer as a professional specialist is playing an increasingly important role in small industry. Unfortunately, under prevailing conditions, the trained, technically competent designer is seldom "brought into the family" and made a sufficiently integral part of the organization for truly integrated and comprehensive design. Effective utilization of the designer depends on a working relationship that permits freedom for creative work integrated with the technical and business activities and needs of the company. It is partly a budgetary problem of providing, from the relatively limited sales of the small company, sufficient compensation to enable the designer to spend the time and effort required for really effective work. Nevertheless, one finds many instances of the business heads of small manufacturing enterprises who have had the vision and enterprise to make their organizations focal points of design and technical progress. While this type of design policy has frequently proven sound business policy, the motivation often goes beyond business considerations *per se*. One of the revealing aspects of the case studies is the extent to which many business men seek through their products an outlet for self-expression, a satisfaction in work well done and a means of attaining public and self esteem. Whatever the motivation, a growing number of small manufacturers, especially of products for the home, are looking to progressive design as a means of survival and growth.

Pitcher and glass (above) and ship's decanter (below) are representative blown-glass Blenko products.

an excerpt

1. *The designer-craftsman in small-scale industry*: **Blenko Glass**

In the past, the design of blown glass objects was the job of the glass blower himself, but in recent times, the blower seems to have lost his disciplined taste and sense of form. In glass blowing, as in other industries, there has been a trend to separate the functions of designing and making. Design may be turned over to professional designers who have had no direct glass blowing experience themselves, or it may even be taken over by salesmen. At the Blenko Glass Company, a unique working relationship was developed between designer and production workers whereby both functioned as a creative team in the development of new glass forms. Most glassware — whether blown or pressed, utilitarian or decorative — is now made by highly mechanized processes. Blenko is one of a few small plants which still perpetuate the handcraft tradition of glass blowing.

The history of the Blenko firm goes back to 1893, when William Blenko, a skilled British glassmaker with long experience in the art of manufacturing stained glass for windows, decided to establish a plant in the United States. Blenko made glass by the muff process: molten glass is blown to the shape of a cylinder, the ends are cut off, the cylinder is slit, and upon reheating it opens into a flat sheet. The first Blenko plant, at Kokomo, Indiana, failed in the face of a long established prejudice that fine colored glass could only be made in Europe. In 1922, after several additional failures, Blenko started a plant at Milton,

A Blenko craftsman, after blowing a hot globule of glass into a bubble, spins and shapes it according to the prescribed design.

West Virginia, with his son, and at last American stained glass studios began to buy Blenko glass in quantities sufficient to keep the plant in operation.

The Blenkos began to make "off-hand" blown tableware and decorative pieces during the Depression, when the demand for stained glass windows practically ceased. Although Blenko resumed the manufacture of stained glass after the Depression—it is still the only plant in the country which makes colored sheet glass by the muff process—it continued to make the table and decorative glassware which are now its principal products. Today the plant has 10 "shops" or glass blowing teams operating on two shifts. The day shift makes "offhand" glassware; the night shift makes colored sheet glass. Since the death of the elder Blenko some years ago, his son, William H. Blenko, has taken over the entire job of operating the plant.

Up to 1947 most of the Blenko pieces were designed by William H. Blenko, who is an experienced glass blower himself. In 1947 he decided that the company needed someone who could devote full time to design and asked the advice of the New York State College of Ceramics at Alfred, New York. The school suggested Winslow Anderson, a graduate student. The job appealed to Anderson because he was offered the complete freedom of the plant and the opportunity to work directly with the blowers. Anderson was with Blenko for seven years before he left to take a job

as design director for a larger company.

The nature of the glass blowing process makes it especially difficult to relate design and manufacture. Because of its high temperature in the working state, glass can be manipulated for only a very short time, and separate parts must be joined together at precisely the right moment and the right temperature. This means it is impossible for a single person to form any but the very simplest objects, and glass blowing is customarily done by teams of five to seven men, known as a "shop," under the direction of the blower, who is called a "gaffer." The blower must be capable by temperament of working as part of a group—a quality not always found among artists and craftsmen. The blowing and off-hand forming of glass is a highly skilled craft which requires many years of training. It is difficult for the modern trained designer to work directly in the medium because of the years of apprenticeship required, followed by constant practice to maintain one's deftness, and the necessity for physical habituation to the intense heat radiated by the glass.

Anderson's objective from the outset was to reduce the gap between designing and making as far as possible. In developing new forms he worked directly with the shops; but he did not work in the glass himself. This was not only because of the physical difficulty of working in glass but was also a matter of policy. As Anderson puts it, "The resulting product is more meaningful to the glassworker if he has felt himself associated with it from the first. If I were capable of designing and producing the original models myself, then the worker would be reduced to the position of a servant and laborer only, and it would be impossible to build much enthusiasm in him. Without enthusiasm, the craftsman would not develop the full gamut of his skill."

In developing new forms, no drawings were used. Anderson felt the material should lead and both blower and designer follow, responding to the rhythms and guiding only as opportunities presented themselves. Before this method of working had been perfected, a new design was based on full-scale contour drawings. Often many pieces were made before a perfect sample was obtained, and even then, it was difficult in subsequent production to achieve another piece of exactly the same character as the original, especially if there was any great time lapse between production of the original and its reproduction. The workers who tried hardest to adhere to the drawing seemed to take the longest to learn to produce it in quantity with ease.

In a talk, "Off-Hand Design for Off-Hand Glass," given before a meeting of the American Chemical Society, Winslow Anderson describes glassmaking practice at Blenko. "Often a new idea springs from nowhere, but most often the glass, while in motion to become something else, reveals extraordinary forms and potentialities. At these moments the men hold or 'freeze' the glass and it is put into the lehr for future reference."

As an example of how this may work Anderson relates the following experience. One day he was with a glass blowing shop that was producing the No. 920 decanter. Anderson was talking with one of the men when the finisher inserted the piece into the furnace opening, or "glory hole," for reheating. Apparently the distraction of the conversation resulted in careless handling, for when Anderson looked into the furnace he saw that the neck of the piece had sagged. He immediately perceived the possibilities of a new decanter form in the curved neck and called out "Stop!" The finisher, accustomed to working with Anderson, knew this was the signal to hold the shape exactly as it was for further study. Under Anderson's instructions, another member of the shop gathered up a piece of molten glass, deftly formed it into a handle, and fused it onto the bent decanter, to create what las later designated the No. 948 decanter, one of the firm's best selling pieces and a "Good Design" choice.

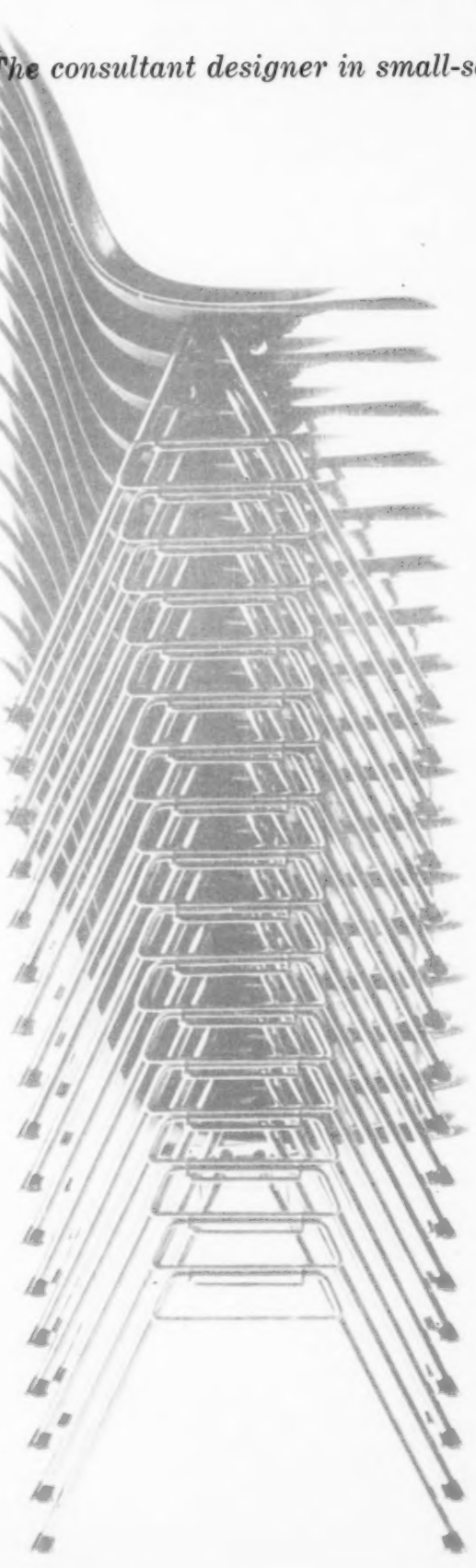
"The new piece, once obtained," Anderson explains "is then repeated as often as possible, and the men thus become fixed or set in their reflexes. It often takes a month or two after a new shape has been developed for them to get into the full swing of confident production. Even after a new shape has been worked out collaboratively by the designer and one of the shops and measured drawings have been prepared to fix its dimensions within rough limits (generally plus or minus one-eighth inch), successful reproduction of the piece depends to a large degree on the innate sense of form of the blowers, which develops gradually as they associate and work with the designer. The feeling for form varies greatly among individual blowers; some sense the designer's intent quite readily while in other cases the designer must work patiently until complete understanding is achieved. In order to help the workers he sets upper and lower limits within which the most important dimensions must fall. But since the blowing of glass cannot be interrupted to take detailed measurements, the worker during the actual course of production must depend to a large extent on his eye and feeling for form. In the case of all workers, extraneous factors may contribute to success or failure at any given time. Such things as the weather, social problems within the plant, or some accidental factor, may serve to create a mood which makes good work impossible."

The Blenko plant is probably not very different in its methods and organization from similar plants in the Eighteen Century or earlier. Except for a few minor pieces of mechanical equipment, all production is by hand and mouth. Wooden molds made from the logs of local apple trees are used as an aid in roughly forming pieces and imparting a surface finish. Since the high heat of the glass makes for a very short mold life, two skilled craftsmen are kept busy making duplicate molds by virtual hand methods.

The composition and quality of the glass itself and the precise formulation of the mineral salts and oxides used for coloring it are the responsibility of the plant chemist. Blenko glassware is made in a variety of colors and in plain, "seeded," or crackled glass. Most of the pieces depend for their appeal on simple forms, color, and texture; the natural irregularities that result from off-hand forming are frankly retained to contribute to the charm of the pieces. All the blowers have been trained by Blenko himself, as there is no other glass blowing plant in the area. The age level of the blowers is surprisingly low.

While at Blenko, Anderson's way of working directly with the glass blowing "shops" in the creation of new glass forms was largely conditioned by the nature of the glass blowing process itself, and his approach could not be literally applied to other industries. But his unique attempt to bring designing and making closer together points up a direction in which other industries might well move.

2. *The consultant designer in small-scale industry*: **Herman Miller Furniture**



Eames-designed molded plastic stacking chairs.

The influence exerted by the Herman Miller Furniture Company on the furniture industry as a whole is entirely disproportionate to its own output. The history of Herman Miller is inseparable from the progress of modern furniture in America.

D. J. DePree, president of Herman Miller, began his furniture career as a clerk in a Grand Rapids furniture factory in 1909. In 1923 he joined forces with his father-in-law, an experienced furniture production man, to buy out a moderate-sized factory that was producing expensive bedroom suites of typical Grand Rapids design. DePree was interested in period furniture and wanted to make authentic reproductions of fine quality, but he soon found he had very little to say about design or quality. His factory was under continuous pressure to produce new things for the jaded buyers who came to the four markets which took place each year. The buyers imposed their ideas on sales representatives and these in turn on the factory. He was cut off from any contact with the people who actually bought and used his furniture: some stores even removed the manufacturer's label from his furniture.

DePree could see no way out of this morass. It seemed to him that the more he changed his designs, the more they remained the same. Furthermore, the firm's tight financial condition made any attempt at independence extremely risky. The southern furniture industry was just beginning to challenge Grand Rapids as the major furniture producing center of the nation, and Herman Miller felt the squeeze with the rest of Grand Rapids.

Toward the late Twenties DePree saw an exhibition of French modern furniture. His interest was aroused at once and he had his designer copy a bedroom suite. Around 1929 Gilbert Rohde, a former photographer and commercial illustrator who had already designed some furniture for Heywood-Wakefield Company, suggested that he design several modern bedroom suites for Herman Miller. As reimbursement, Rohde asked either $1,000 per suite or three percent royalty; since DePree didn't have $1,000, they agreed on the royalty.

When Rohde's designs arrived DePree thought they looked like vocational school furniture. A local banker with an interest in the company roared with laughter when he saw them. DePree wrote to Rohde asking that he revise the designs. In a long, tactful letter Rohde explained his approach and firmly stated that the designs would have to be used as submitted or not at all. DePree decided that Rohde knew what he was talking about and went ahead to manufacture the suites as designed. The sales soon justified his decision.

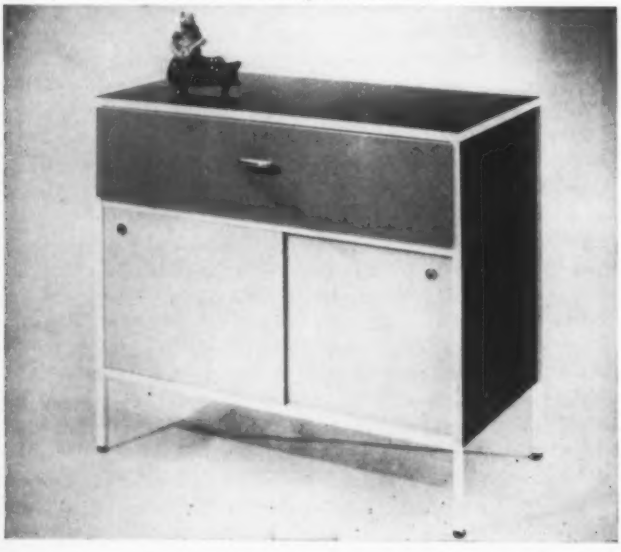
This was the beginning of a new direction for the Herman Miller Furniture Company. Rohde persuaded DePree that he was selling not merely furniture but a way of life. DePree was particularly impressed by Rohde's emphasis on honesty in design.

Among the early customers were the two Wanamaker stores, which agreed to take on the line if Herman Miller would set up model rooms. In the New York store sales were high despite the fact that the salesmen did not know how to sell furniture of this type, but in Philadelphia sales were very poor. Jim Eppinger, whom DePree had taken on as Herman Miller sales manager, went to Philadelphia to find out

Early Rohde-designed desk.

Suspended vanity by Nelson.

End table by Nelson with aluminum base, micarta top. One of six units in Nelson Steelframe series.



why and discovered a complete lack of understanding and interest among the store staff. Once he went out on the sales floor and made a $4,000 sale to a single customer; the department head was furious and cleared the line from the store. This experience convinced Eppinger that the department stores could not be counted on. The opening of Herman Miller showrooms in Chicago and New York in 1939 and 1940 marked the complete vindication of DePree's idea that the showroom was the best sales medium.

Although acceptance of the furniture was well established and sales held up quite well through the depression years, the company's financial position continued to be tight. Toward the late Thirties, in an effort to widen acceptance still further, Rohde began to take advantage of the company's long experience with fine detailing, and put increasing emphasis on serpentine fronts, exotic matched veneers, inlays, and other luxurious details. When Rohde died, in 1944, this trend had become quite pronounced.

During the war period DePree and Eppinger made a careful search for a designer to replace Rohde. DePree saw an article in *Architectural Forum* about Storagewall and was greatly impressed by the thinking behind the designs. An interview was arranged with George Nelson, co-designer of the units.

DePree gave Nelson a year in which to design a new line. The new designs reaffirmed the simple, functional approach of Rohde's earlier work, and included a number of new special-purpose pieces and many refinements of detail reflecting the progress of furniture design in the preceding decade.

In 1946, when he had been working with the company only a short time, Nelson saw the new molded plywood chairs of Charles Eames at a preview at the Museum of Modern Art in New York. He phoned DePree to come to New York at once and see them. DePree, when he arrived, was not greatly impressed by the strange new chairs, but Nelson and Eppinger persuaded him by their enthusiasm that here was a freshly conceived, bold application of modern technology to provide quality furniture at a low price—an as yet unrealized objective for Herman Miller. DePree pointed out that production of Eames chairs could probably only be undertaken by cutting into the production of Nelson's designs. Nelson said that would be fine—he wanted his work to stand on its own merits, and besides, Herman Miller would soon be big enough to handle all the work of both designers. Henceforth Nelson was, in effect, the design director of Herman Miller, making over-all design policies and bringing in the work of other designers to round out the line.

The relationship of the designer to the factory has varied with each of Herman Miller's designers. Rohde had a thorough knowledge of furniture materials and production methods. New designs were prepared in his New York office and sent to the factory with detailed scale drawings. The workers in the plant had a high regard for his technical competence; after Rohde's death, if the firm received a

Three Herman Miller pieces designed by Charles Eames; (top) molded plastic chair with an upholstered foam-rubber pad; (center) steel-frame and foam-rubber sofa; (bottom) lounge chair and ottoman with upholstered molded plywood shells.

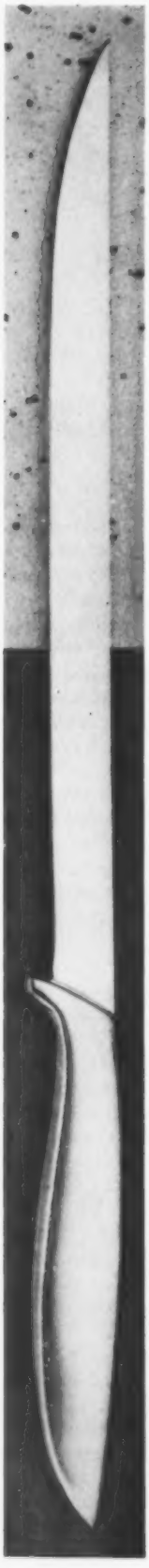
detail from one of its designers that seemed impractical from a production standpoint, the comment sometimes overheard in the shop was, "Rohde would have done it right."

Until very recently, Nelson's designs, like Rohde's before him, were mostly based on materials and fabricating methods traditional to the furniture industry. Successful realization of these designs depends largely on the kind of traditional craftsmanship which still prevails in furniture plants of the Herman Miller type. Although the plant is equipped with standard wood fabricating machinery, and production operations are quite specialized, quality of the finished piece depends to a considerable extent on hand fitting and finishing. The extensive use of veneered edges, mitred joints, and similar details, together with the unadorned surfaces, places a premium on meticulous workmanship. Yet despite the industry's long tradition of craftsmanship, the maintenance of standards is a difficult problem. Final inspection cannot be entrusted to the workers themselves, but is done by management, including DePree.

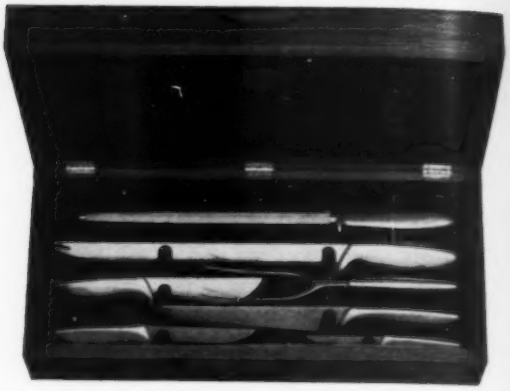
The relationship of Herman Miller with Charles Eames is unique. Eames operates his own experimental workshop in California, where he initiates design projects and follows through on every phase of development up to and including tooling. In some cases Eames has even handled quantity production in a small plant adjoining his workshop. This plant has now been taken over by Herman Miller, so that once Eames has developed the initial design idea, the company pays for further development.

With the introduction of new methods of furniture construction, such as Eames' molded plywood chairs and the Eames and Nelson metal and wood storage furniture, quality is less dependent on the craftsmanship of the individual worker. In the case of molded plywood or plastic chairs, for instance, once molds, presses, and other tooling are completed and such details as time, temperature, and pressure cycles are worked out, actual production involves routine operations.

DePree's relations with his workers typify his serious concern with the ethical implications of his business. When he first took over the factory with his father-in-law, he brought with him the prevailing attitudes of management toward production workers. He referred to them as "birds" and had been taught by old-timers in the business to "treat them rough." In time he began to take a personal interest in the men and recognize the worth and individuality of each. He could see that the quality of his furniture was related to the personalities, attitudes, and morale of his workers. A religious man, he decided that his former attitude was inconsistent with the Scriptures. DePree has now adopted the Scanlan plan, which encourages the individual worker to identify himself with the plant as a whole by a profit-sharing arrangement and by production committees through which he can express his ideas for improving production and quality. DePree expects that the system will provide new incentives for craftsmanship and will enable him to entrust quality inspection to the workers themselves.



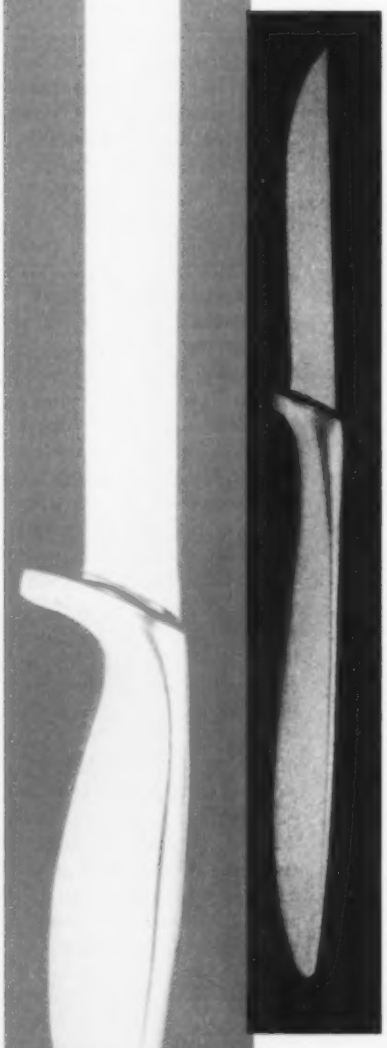
Bottom deck of Gerber's 24-piece Armory set



an excerpt

3. *The small manufacturer as designer-craftsman:*

Gerber Legendary Blades



Left to right: "Balmung," a nine-inch carver; "Snickersnee," a 12½-inch pronged carver and server; "Miming," a three-inch steak knife.

The creation of Gerber knives was the result of an interesting combination of talents—those of a mechanic-craftsman, an enterprising advertising man, and a versatile graphic arts designer with some technical and product development experience.

During the Thirties, David Murphy, a mechanic on relief, started making carving knives of unique construction in a shed in his back yard. He ground the blades from large power hack-saw blades and cast an aluminum handle around the shank so that blade and handle formed an integral unit. He then shaped and ground the cast aluminum handle to look like a stag handle. The hack-saw blades, of high carbon steel treated for tough metal-cutting jobs, provided an excellent cutting edge and could be chrome plated for corrosion resistance and appearance.

At this time Joseph Gerber, who had started his career as a printer, was the director of one of the leading advertising agencies in the Northwest. Gerber was looking for a suitable gift to send to his many business and personal friends, and thought of sending them saw-steel carving knives like the Barlow knife he had had as a boy and the keen leather-cutting knives he had seen in a display at the Pendleton Roundup. He heard of Murphy's knives and started giving them to his friends. Since he was not satisfied with the shape, he turned several of the knives over to Joe Pollock, art director of the agency, for redesign.

Although primarily a graphic arts man and illustrator, Pollock had had considerable contact with technical and production problems and preparation of designs and mechanical drawings. In the Northwest, where specialized services are not always available, an advertising agency like Gerber's may perform any kind of service from industrial management consultation to product design. Pollock decided to disregard conventional knife forms and start fresh. He wanted to shape the blade and handle as a harmonious unit which would express their unusual integral construction, and to give the handle a comfortable, hand-fitting shape. While Pollock prepared the original drawings, sketches, and measured drawings, Gerber's ideas and criticism were an important factor. When the new knives had been ordered from Murphy, a simple walnut box was designed to provide a case for each knife. Gerber wrote a descriptive piece about the knife that was printed and enclosed in the case.

The gifts proved so popular that Gerber began exploring the possibility of manufacturing the knives for sale. The need for refinements in the shape of the handle became apparent, for functional as well as aesthetic reasons; the original design had failed to provide adequate protection for the forefinger, which tended to slip onto the blade. This time Pollock worked with balsa wood models which he carved himself, making a number of variations before he was satisfied. Casting molds were ordered, and the first knives were made by Murphy for sale. Abercrombie & Fitch in New York and Gump's in San Francisco were the first to be interested.

After the war, sales increased rapidly and the present shop was set up. New York's Museum of Modern Art selected Gerber knives for one of its "Good Design" exhibits. The Portland Museum of Art installed a permanent exhibit of Gerber knives in a glass case. The prestige and publicity which resulted from this kind of recognition were important factors in stimulating sales, but Joseph Gerber's promotional talents were undoubtedly even more important. His flair for catchy names (he is credited with creating the term "deep-freeze" when the freezer industry was in its infancy) is expressed in such knife names as "Excalibur," "Durendal," "Ron," and 'Shorty." It is interesting that while museums and others have acclaimed the knife for its excellent design, especially in the shape of the handle, Gerber's advertising rarely touches on this aspect of the product but always stresses the technical virtues of the blade.

Refinements in the shape of the handle continued to be made; for example, a crisper silhouette for the finger guard. A major weakness showed up in that the knife, when it was placed on its back with the edge facing up, did not fall over on its side and thus presented a hazard; this was corrected in 1948 by slightly reshaping the back of the handle. Since the introduction of the original knives, several new items have been added to the line. The combination carving knife and server, called "Snickersnee," was conceived by Joseph Gerber. A new holding fork has a plated aluminum handle and tines of stainless steel made in Indiana by a new pressure casting process. This fork is an excellent running mate for the blades.

Gerber blades are manufactured in a small one-story shop by about twenty workers. Operations consist primarily in grinding and polishing the blade blanks into finished knife blades, casting the aluminum handle onto the blade, and grinding and polishing the handle and blade to a smooth finish. Except for some edge-grinding operations on special machines, all the operations, including shaping of the blade and handle, require skill and judgment on the part of the operators. The final shape of the knife as well as its finish can be altered appreciably by the operators of the grinding and polishing wheels. This is especially true in the case of the relatively soft aluminum handle, whose shape may be changed considerably between its emergence from the mold as a rough casting and its final polishing. At one time it was necessary to change the handle contour in one area because it was almost impossible to maintain the original contour during grinding and polishing. The knife therefore owes much of its flawless shape and finish to the skill and judgment of the workers and to constant checking and supervision by the shop superintendent and by Pollock and Gerber.

Gerber's sons, Francis R. Gerber and Joseph R. Gerber, Jr., now run the business, which consists of the knife-grinding plant; an administration building at Willamette, Oregon, housing an order department, the research, finishing, inspecting, and shipping divisions; and a box plant, owned by the knife business. Today the knife grinding plant is operated by a group of former employees, who work on contract. In addition, the company is customer of a plating business which hard-chrome-plates the blades, and another plant which plates the handles.

Hard-chrome-plating on steel was developed in 1950, and no Gerber knife has been made since then without this finish—the "Siegfried" finish. The steel on the blades is so hard (Rockwell C-62) that no sharpening steel would touch it until 1954, when a steel was found with a finish of chromium carbide, a metal of gem hardness. Gerber is still working on the problem of imparting corrosion resistance to the blade steel without impairing its cutting edge. Early in 1954 a method of chrome-plating the handles was developed so that they will not tarnish in caustic, which is used in dishwashing machines.

German chemical porcelain, above, which evolved from shapes devised by chemists, represents the tradition of anonymous design.

an excerpt

4. *Anonymous design in small-scale industry*: **Coors Porcelain**

Although chemical porcelain ware is not strictly within the scope of these case studies, which are concerned for the most part with consumer products, these wares are of special interest because of their widespread influence on the form of today's products, because of the timelessness of their appeal, and because they represent the ultimate in flawless craftsmanship and technical quality in ceramics.

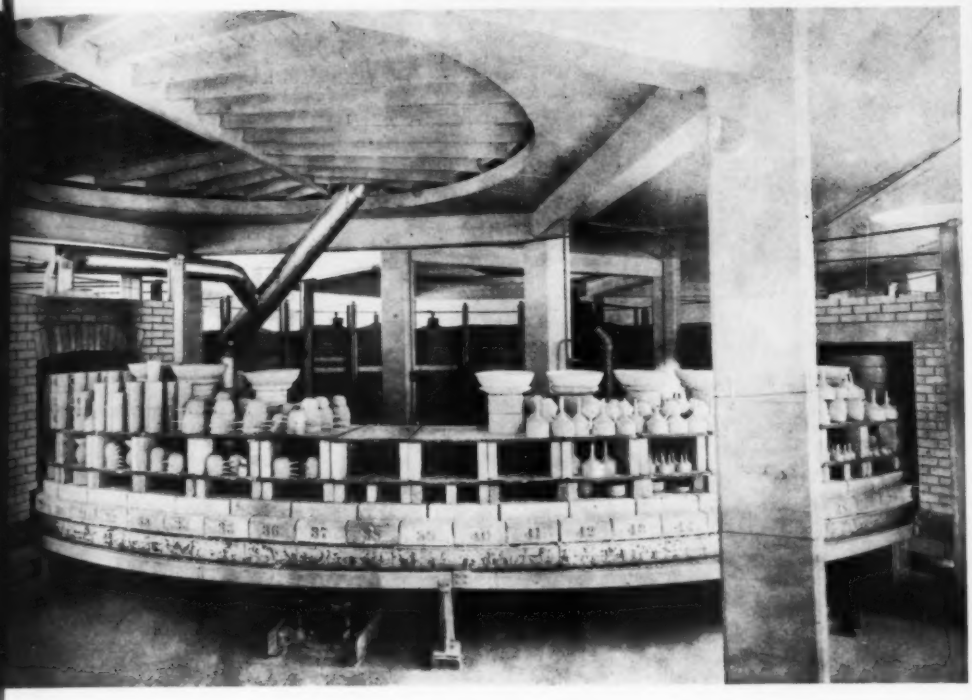
Toward the end of the 19th century, the late Adolph Coors, Sr., a German immigrant, established the Coors Brewery in Golden, Colorado. It is still one of the leading breweries in the Far West. In connection with the brewery, he later established a bottle-making plant, and, out of this, in turn, there developed a pottery plant for making beer mugs and other domestic ware.

During World War I, American scientific laboratories found themselves completely cut off from the sources of chemical porcelain ware in Germany, which had been virtually the sole source of supply since porcelain had come into use nearly 150 years earlier. The Department of Commerce circularized the American pottery industry widely, inviting interested firms to enter the chemical porcelain field. Among those who undertook the job was Adolph Coors. Execution of the project was turned over to his son, Adolph, Jr., now president of the company.

The requirements for chemical porcelain are extremely exacting, especially with regard to strength, uniformity, and resistance to thermal shock and surface deterioration. With the assistance of a corps of technicians and scientists, Adolph Coors, Jr., engaged in wholehearted research and experimentation to learn how to produce wares of the required standards; no expense was spared for equipment and talent. Whether because of the thoroughness of Coors' research, the unusually fine quality of the local clays, or for some other reason, Coors was the only company that succeeded in producing chemical ware comparable in quality to the original German product. It has had a virtual American monopoly in this field ever since.

When Coors began to make chemical porcelain, the shapes were copied directly from German models or catalogs. It seems unlikely that the German originals were "designed" by anyone. They are more probably the result of long evolution and refinement of shapes originally devised by chemists to suit their own needs. Coors has taken its place as a contributor to this careful tradition. Its present line, with few exceptions, is quite similar to the pieces illustrated in a German catalogue of 1913 (above).

Three phases in the making of Coors chemical porcelain: (left) clay models mounted on turntables are shaped by hand to precision tolerances; (below) perforated "dissolving" cones are hand-dipped in porcelain enamel; (below left) laboratory ware is fired by being passed slowly through a circular tunnel kiln, where temperatures up to 3000° Fahrenheit are maintained.



Coors has no designers as such on its staff. The four model makers were trained in the plant. One of them, Maurice Jones, is responsible for developing the shapes of the company's supplementary lines of domestic and restaurant china, some of which are quite well done. Occasionally, a scientist conceives the need for a new type of porcelain laboratory equipment and sends Coors a sketch of his idea, which is turned over to Jones for translation into a model. If there seems to be a demand for the article, it may be added to the catalog as one more contribution to the century and a half of development of porcelain chemical ware. Undoubtedly this pattern of product creation, with the mold maker as its focus, was originally responsible for the forms of the laboratory porcelain.

Craftsmanship at Coors is dictated by technical necessity. If laboratory ware does not meet certain minimum standards, it cannot be used. All of it, for example, must be fired at temperatures of 2700°-3000°F.—far higher than domestic porcelain. In order to maintain these standards and to reach even higher technical levels, the firm maintains a well-staffed research laboratory where new processes and products can be run off under actual production conditions prior to testing. Ceramic materials for special technical and electrical purposes have been developed with tensile strengths ranging from 10,000 to 25,000 pounds per square inch (compared to about 3,000 pounds per square inch for ordinary pottery and about 45,000 pounds per square inch for ordinary steel). Improved materials have made possible unusual fabricating techniques such as precision threads and even ceramic screws. Although most potteries must assume that it is impossible to hold ceramics to rigid tolerances, some of the Coors jiggers are precision machined. Considerable work has been done with dry pressing techniques, which are used in the production of electrical insulators and balls for ball mills.

Coors' high standards are reflected in the large percentage of ware which is rejected and destroyed, sometimes for reasons imperceptible to the untrained eye. This uncompromising craftsmanship is reflected throughout the plant, where immaculate cleanliness and order prevail, and workers are less hurried and more intent even on routine production operations than is usually the case.

Although Coors is proud of the beauty of its wares as well as their technical perfection, the company has been somewhat surprised at the interest and inquiries from designers and small accessories shops.

TWO TRADE SHOWS

Alcoa's exhibit area

Report on the First Design Engineering Show

Stimulating better understanding of the role that the design engineer plays in industry was the theme of the First Design Engineering show, May 14 to 17, in Convention Hall, Philadelphia. It was the first national show to be devoted entirely to this aspect of engineering and was enthusiastically met by 12,500 visitors, who had the opportunity to inspect new materials, new processes, and new components exhibited by some 175 companies.

A four-day conference on the technical aspects of designing and professional problems of design engineers was held concurrently with the show under the auspices of the Machine Design Division of the American Society of Mechanical Engineers.

The exhibits: Exhibits ran the gamut from plastics to aluminum, extruding to welding. New types of fasteners, bearings, adhesives, coatings, and all kinds of electrical and electronic equipment were shown and, more important, seen by people actively engaged in the design engineering aspects of every industry. The atmosphere was one of a mutual exchange of ideas and information between visitors and exhibitors, and, interestingly enough, among the exhibitors themselves.

Many of the processes and products being shown were new and, in some cases, untried in application. It was evident that manufacturers were as eager to get new ideas for new materials to stimulate sales for established products in accepted applications. One exhibitor, one of the nation's largest companies, reported that he received literally dozens of new and feasible suggestions for the use of his product that had not occurred to the company.

CORNING GLASS WORKS, for example, had an impressive display centered around a large rotating chunk of raw glass. New developments being emphasized included camera windows that maintain high optical qualities under extreme temperatures. These windows, which are made of fused silica with a low index of refraction, are designed to protect delicate instruments and cameras from high skin temperatures of supersonic aircraft, guided missiles, and for use in wind tunnels.

A new process for coating metals, ceramics, and even wood was demonstrated by POLYMER PROCESSES, INC. Known as the Whirlclad coating process, it involves dipping a heated part into a "boiling" bed of *dry* "fluidized" powders. Finely divided plastic powder in a tank is fluidized by an ascending current of gas or air. The article to be coated is preheated to a temperature above the melting point of the coating material such as polyethylene or nylon, is immersed in the fluidized powder, withdrawn after a predetermined time, and allowed to dry. What happens is that the heat from the article causes the powder to adhere to it and melt. The advantages of the process, which was developed in Germany, are that no solvents are needed for coating, it gives a uniform coating to irregular shapes, and a relatively heavy coating can be applied with a single dip.

DUPONT'S large display featured new developments in synthetic fibers from their Textile Fibers Department. Most of the products shown were experimental and included synthetic fiber paper and non-woven fabrics. ALCOA, whose unusual exhibition area is shown in the insert on the opposite page, had examples of new applications and fabrication processes for aluminum, new methods of coloring it, and giving the light metal new textural properties.

GENERAL ELECTRIC'S booth included a huge mock-up of a small appliance motor, designed to show exactly what makes it tick. Other interesting items included a new low-cost, high-production metal stitching machine, by ACME STEEL COMPANY, a method that is being used more and more to join one metal to another or metal to non-metallic materials. HELI-COIL CORP. was one of the many fastener exhibitors; they demonstrated how wire thread inserts require no more wall thickness than a conventional tapped thread yet give strong, permanent threads in aluminum, magnesium, and plastics. FROMSON ORBAN COMPANY, INC., displayed continuously anodized and dyed aluminum strips in coils, a recent development of a European producer. MINNESOTA MINING AND MANUFACTURING COMPANY featured new, self-curing Polyisocyanate foams for insulating and reinforcing voids between structural members. In the field of high-temperature insulation, LIBBEY-OWENS-FORD GLASS FIBERS COMPANY showed how glass and quartz fibers can be used for insulation up to 2,500°F. LEHIGH CHEMICAL COMPANY actually manufactured Anderol synthetic grease in their booth and the HEIM COMPANY demonstrated how a spherical bearing, when used as a rod end, will transmit

Corning photosensitive glass. The nameplates above have a permanent three-dimensional effect from exposure to ultraviolet light and heat treatment.

Polymer Whirlclad coating process. A heated object is dipped into powdered plastic which is fluidized by an ascending current of air. The heat melts the plastic, forming a uniform coating.

force and motion at varying and changing angles. These are but a few examples, but they indicate the tone of the show: it was a gathering of new concepts on display for people who have the ability—and the responsibility—of putting them to work in industry.

Technical sessions: Large audiences attended the four technical sessions which discussed Value Analysis in Product Design; How to Get and Train Design Engineers; Selecting Engineering Material for Products; and Recognition, Reward, and Rights of Employees' Inventions.

A. D. Bentley of the Value Analysis Section, General Electric, defined value analysis by saying, "Value analysis is a scientific and sensible evaluation of whatever costs money. It covers parts, assemblies, services, processes, and ideas." He pointed out that popular conceptions like "Plastics are brittle," "We are already using the best processes," "We are doing it about right," or "We are up to date on what's new," are usually wrong—at least partially—because they are based on incomplete information which is a combination of fact and falsity. Mr. Bentley continued by saying that attitudes must be changed, more information must be supplied at the point of decision, and this information must be used properly. "Some of the building blocks of better value," Mr. Bentley concluded, "are better purchasing, better materials, better use of specialty products, better use of available facilities, better processes, newer processes, better human relations, and a need to test for value."

Emphasis was placed on the need for an engineer to have the desire to continuously improve himself, during the session concerned with How to Get and Train Design Engineers. A. A. Johnson of the Switchgear Division, Westinghouse Electric Corp., stated that engineers, in the normal course of their daily work, receive training in other than the purely technical requirements of their jobs. In addition, he said that Westinghouse has educational programs that include design school, graduate study program, business and management program, human relations training course, and advanced management training. Professor Chester Linsky of Pennsylvania State University, in discussing the "real or imaginary" shortage of design engineers, said, "In order to make more effective use of available engineers it will pay to make a serious study of your design department, its personnel and its activities." To do this, six things are essential, according to Professor Linsky:

List every design job;

Determine types of personnel handling these jobs;

Do these jobs need to be handled by engineers?;

Establish the type of manpower needed for certain jobs;

Determine whether any engineers are handling technicians' jobs;

Determine where the actual shortage of designers exists.

He summarized by saying, "In order to make more effective use of available design engineers, management need only develop and use the latent abilities of its personnel to the highest professional level possible — and the problem will pretty well take care of itself. Educate management to tap these potential jackpots and everyone benefits. Skilled designers could be assigned to jobs requiring their expensive talents."

In the final technical session, William A. Steiger, Manager of the Patent Department, Westinghouse Electric Corp., said that invention effort must never lag, and added, "The greatest demand in industry today is for people who have a capacity for creative thinking." He pointed out that Westinghouse has established a program to stimulate inventive thinking by giving awards to employees for new product ideas whether they are patentable or not. The awards vary from $25 to $5,000 and, Mr. Steiger emphasized, are strictly confined to inventive suggestions and not confused with exceptional contributions of a non-inventive nature, which are rewarded by salary adjustment. Westinghouse started its program five years ago and during that period has added 4,000 names to its list of inventors. He stated, "We are convinced that such a plan will not only give Westinghouse a stronger patent position but a stronger competitive situation product-wise." The success of the First Design Engineering Show, with its combination of creative displays and technical sessions, resulted in an immediate announcement that the show will be held again next year. In fact, even before this year's event was over, contracts were signed with the new York Coliseum for the Second Design Engineering Show, May 20 to 23, 1957.

Report on the AMA Packaging Show

by Walter B. Stern, Technical Director of Packaging, Raymond Loewy Associates

1. *Clear styrene is formed into six sizes of "Goblettes", an eat-out-of-the-container package.*

This year's exhibition extends and commercializes last year's innovations

Preceded by breathless publicity of "naked" square eggs packaged in heat-sealed polyethylene cups by Cornell University, of conveyor-belt packaging for endless strips of bacon in aluminum foil, and by a flood of announcements about food packages that could be boiled, baked, roasted and poached, the 1956 National Packaging Exposition, staged by the American Management Association, got under way in Atlantic City in April and was visited by thousands. While the 1955 show, which took place in Chicago, was predominantly a demonstration of exciting new ideas, this year's exhibition showed its major strength in the perfection, commercialization and extension of last year's ideas. Discussed and illustrated on this and the following two pages are some of the less publicized items of vital interest to anyone involved in packaging.

Vacuum metallizing: Foiltone Products Inc., a subsidiary of National Research Corp. of Cambridge, Mass., has perfected a process which will vacuum metallize polyethylene, Mylar, or paper in roll form. This 60-foot-per-minute process promises to replace aluminum foil laminations of these materials in many instances of decorative use, although it furnishes only the visual qualities and not the protective virtues of foil. Vacuum-metallized kraft, produced so far only in limited quantities, is one of the most interesting innovations.

Appetizing containers: Clear polystyrene goblets (1), for packaging of food products, are the first attempt at forming an "eat-out-of-the-container" package with appetite appeal and persuasive re-use possibilities. Six sizes in Monsanto styrene were shown by the Wilpet Tool and Manufacturing Co., Kearny, New Jersey.

Fanfold corrugated: An unusual solution to the problem of storing a variety of five-panel corrugated containers for pipes, tubing, jalousies, window shades, awnings and other products of extreme or varying lengths was demonstrated by the National Container Corp., New York. "Fanfold" is a system of producing and delivering 1400 to 1600 linear feet of single-wall (or 800 feet of double-wall) corrugated board in a palletized bundle, accordion folded in 4-to-8 foot folds, custom designed and scored to fit the shape and circumference of the product to be packaged.

Pre-stretched film: The Specialty Papers Co., Dayton, Ohio, has worked with the Goodyear Tire & Rubber Co. to develop a pre-stretched Pliofilm paper or board lamination which, while offering most of the properties obtained by ordinary laminations of this type, has, according to the manufacturer, produced more feet-per-pound yield than any other plastic film so far laminated.

Polyethylene zippers: Polyethylene bags with a polyethylene "zipper" closure made without additional parts were shown by Plexigrip Inc., New York, and the Polyfab Co., Los Angeles. Their bags were felt to be a major improvement over previously shown polyethylene zip-closed bags and envelopes.

2. Hermetet is a system, originally European, of forming a carton with an integral inner liner.

4. Left to right: low-cost styrene food containers, transparent and metallized; corrugated aluminum foil cheese container; cellulose acetate or rigid vinyl container for preserved foods.

3. Cubitainers consist of a semi-rigid, cube-shaped polyethylene insert which is placed in a handle-equipped corrugated outer carton, inflated and then filled.

Triple-wall: Corro Ltd. of New York demonstrated a new triple-wall corrugated fiber board combining three rows of corrugating medium and four kraft liners, converted into regular slotted containers. Suggested as a substitute for wooden and cleated boxes, it has extremely high compressive strength and cushioning properties, and a Mullen test beyond the range of most available commercial testing equipment.

Silk-screen jig: Photoprocess Screen Manufacturing Co., Philadelphia, exhibited for the first time a simple, inexpensive, versatile, cylindrical silk-screen printing jig for color printing round glass containers by manual operation. The jig is adjustable to any container from two ounces to approximately one gallon size.

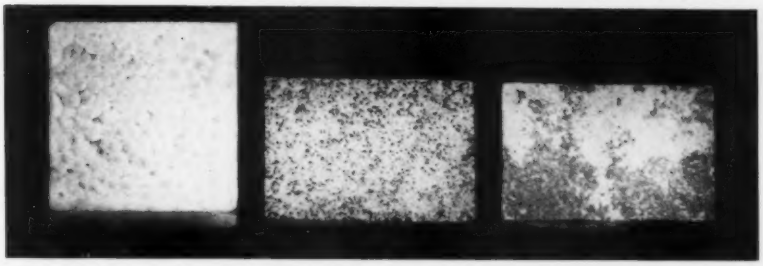
Hermetet system: Rights as principal licensee in this country have been secured by the Gardner Board and Carton Co., Middletown, Ohio, for the Hermetet system of packaging developed in Norrkoping, Sweden and Sutton (Surrey), England. Basically, Hermetet (2) is a system of forming a carton with a heat-sealed inner liner that is air-proof, sift-proof, moisture-proof, odor-proof, and grease-proof, depending on the type of liner used. Unlike the previously used "bag-in-box" style, Hermetet liners are an integral part of the carton itself and are formed, inserted, attached, filled and sealed in one operation within the carton. They are so sift-proof that they can accommodate liquids without leakage, and they have the outstanding advantage of being reclosable after the customer has opened them. The "Hermic X" packaging machine, operating on the exposition floor. showed unusual carton size adaptability and compactness of design.

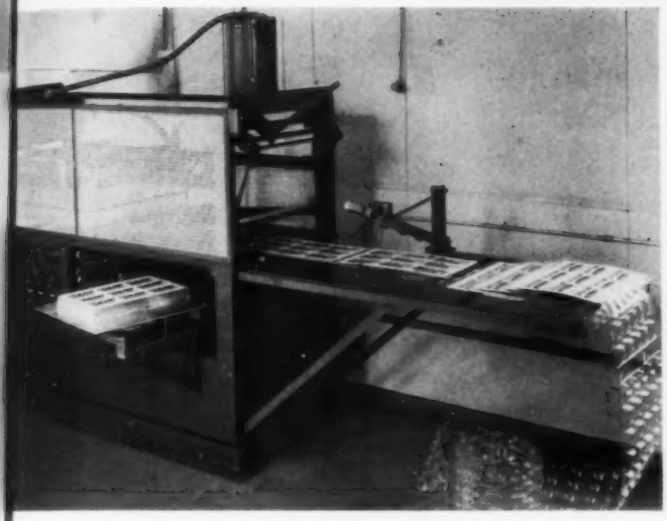
Cubitainer: Another important development in moisture-proof containers shown for the first time was the Cubitainer (3), made by the Hedwin Corp., Baltimore, from Bakelite polyethylene. Designed for one-way shipment, Cubitainers consist of a semi-rigid, cube-shaped insert in a handle-equipped outer carton of double-faced corrugated board. Suitable for packaging almost any liquid or powder requiring protection from contamination, soilage, corrosive action or moisture, Cubitainers seem to compete successfully in cost with conventional liquid containers, weigh less, and, with inserts collapsed and stacked, cut shipping costs and save storage space. Conventional packaging equipment can be used to inflate the collapsed insert by air pressure, set up the carton, and assemble the two. After filling, the Cubitainer is sealed for shipment by heat-sealing the end of the spout, which folds flat as the carton is closed for shipment.

Vinyl ribbon: Rapid Ribbon Corp., New York, showed a new type of plastic ribbon, a vinyl loop, tie or bow similar in finish to silk ribbon. It is readily reusable and can be snapped on the package in seconds, since it will stretch over twice its original length and recover its original size after application.

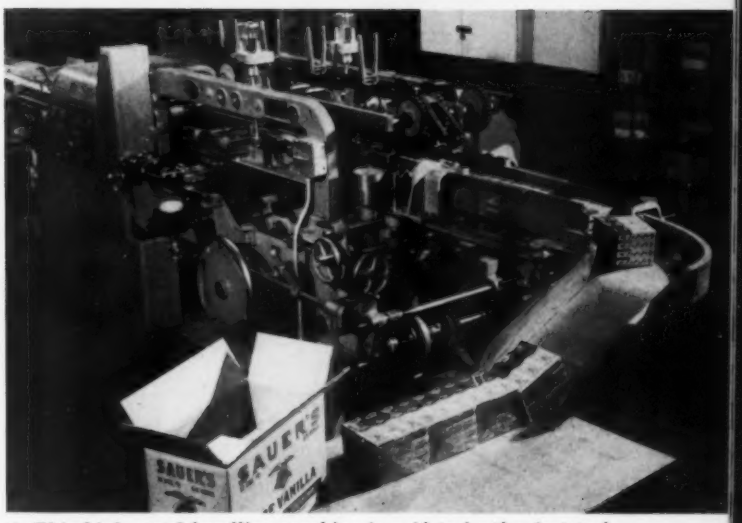
Styrene food boxes: An array of light rigidized and, in some cases, metallized Lustrex (Monsanto) styrene food containers (4, left) were displayed by the Plax Corp., New York. They are made at a cost approximating paper board, but have an extremely attractive appearance. This is the same process now proposed for disposable plastic drinking cups made of the Monsanto styrene by Crown Plastic Cup Co., Fort Worth, for coffee vending machines.

5. *Interesting changes in expanded styrene were made in the past year by varying the pellet size (left), and by using colors for mottled effects (right).*





6. *Auto-Vac's Skin-Pak machine is designed for either packaging or low-profile drape forming applications.*



7. *This high-speed bundling machine is said to be the first to be modified for sealing Mylar with benzyl alcohol and heat.*

Corrugated foil: Further imaginative techniques for rigidizing were demonstrated by the new corrugated aluminum foil containers (4, center) used by Kraft for pasteurized cheese spreads, and by Hedwin's Snap-Pak (4, right), which uses extremely light wall cellulose acetate or rigid vinyl to produce an attractive, transparent, lightweight, tamper-proof container for preserved foods. Stackability, excellent display value, and all the advantages of a snap-on closure are available at a price level approximately 40% lower than traditionally molded items, according to Hedwin. The illustrated item is being merchandised by C. M. Pitt, Baltimore.

Styrene foam: Packaging with expanded styrene, demonstrated last year only by the Ambassador Plastics & Manufacturing Corp. of Chicago, has in the meantime been taken up by several other processors, and interesting changes are being introduced by varying the pellet size (5, left). However, little appreciable progress has been made during the year in coloring this material, mottled and dappled effects (5, center and right) being the only notable innovations.

Large scale: Two indications of the extension of packaging into extreme dimensions are a "portable garage" made from polyethylene-coated cloth by Budge Manufacturing Co., Philadelphia, and the "Bemiswall" low-cost folding walls and doors made from impregnated and coated jute by Bemis Bros. Bag Co., Minneapolis. The walls or doors fold to approximately one-tenth of their open length, hanging free on nylon runners without floor tracks, and are made in neutral, green, beige, and gray with hardware in matching baked enamel finishes.

Skin packaging: Typical of the commercialization of last year's experimental processes is the fact that plastic vacuum forming for blister packs or skin packs was demonstrated by seven companies, two of which — Product Packaging Engineering, Culver City, Calif.; and the Auto-Vac Co., Bridgeport, Conn. (6)—offered for the first time low-cost vacuum-forming machines capable of experimental or pilot forming and packaging of the utmost size versatility. The comparative lack of imagination among exhibitors was indicated by the fact that almost all of them seemed to feel that skin packaging could be demonstrated most strikingly by packaging a pocket comb.

Heat-sealed Mylar: Many instances of bundling with Mylar, Du Pont's polyester film, were furnished at the show, together with the first bundle heat-sealed in Mylar on high-speed automatic packaging machinery. The first commercial modification of a standard packaging machine (7) utilizing benzyl alcohol and heat to seal Mylar was put into service only a few months before the show at the C. F. Sauer Co., Richmond, Va., manufacturers of food products. Thus a tremendous array of new packaging opportunities is being opened up for the strongest and clearest of plastic films, and other adoptions may be expected in the near future.

These are but a few of the significant developments displayed in Atlantic City. Without question, the AMA Packaging Exposition and Conferences have become the most important, informative and stimulating packaging review in existence. Any designer even remotely associated with packaging questions should consider annual attendance a must.




Program Chairman Karl Fink

Package designers versus three big questions

Mass Packaging and Good Design: Are they compatible?

Beall Margulies Mitarachi Constantine Lionni

Leo Lionni, *Art Director,* Fortune; *President, A.I.G.A.*: To make an analogy, I would want to be an architect, not a builder. I would want to be the LeCorbusier or the Gropius of the packaging field, concerned with design but above all with the larger social implications of the package. I would have no ambition to be a speculative builder who builds a contemporary colonial ranch community because that is what people are said to want.

Self-service has forced an emphasis on the competitive aspects of packaging, while completely neglecting all its other functions. My house, created to be a pleasant environment, is invaded by the vulgarities of the supermarket shelf. Packaging does not face its dual function: one is the supermarket, the other is the home. The only package that has solved both is the book jacket, which can perform as a poster when you buy it, and can be taken off when you get it home. Is it the fault of package designers? I don't believe so. I accuse an unimaginative competitive system that has not found a way to be successful and civilized at the same time. But we designers have a responsibility to make a less chaotic, more coherent visual environment for everybody. I suggest this as a theme for our personal conscience, and possibly for discussion today.

Walter Margulies, *Lippincott & Margulies*: I would like the luxury of wanting what Leo Lionni wants. I would like to live on a cloud without any responsibilities, controls or clients. But I think the only reason a client hires us is to increase the sale of his merchandise. Toothpaste must be bought under competitive conditions in a supermarket by people who do not understand LeCorbusier. If Mr. Lionni designs its package, he would do a very good design. But after a short time in our field he would design not the way he would like to see it, but the way it would increase the sale of the toothpaste. . .

Lester Beall: We try to tell our clients that good design is a very necessary part of their business, and have persuaded several accounts to go into long-range programs that include product, package and graphic design. With our small group we are not in a position to offer the client extensive "mass motivation" research, but we do offer a kind of personal research which I believe is very important. I personally cover a good deal of ground to determine the exact conditions surrounding the package. Most important, though, I think we have to sell management on the *intuitive* rightness of our approach. . .

Mildred Constantine, *Assistant Curator of Graphic Art, Museum of Modern Art*: The Museum collects sculpture, painting, posters, moving pictures and packages, because we think that the package has the same art qualities as, say, a work of architecture. When we plan a packaging exhibition, as we are now doing, we try to define the package: Is it just a label on a can—and 20,000 different labels on the same can do not make another package —or is it a new concept? We want to broaden the concept of the package in the light of all new developments in materials. But we are concerned with it from the artist's viewpoint: What has the designer done to extend the idea of the package, to bring to it his personal concept of what packaging is. We cannot make a distinction between mass production and good design. We believe that design is design.

Lionni: In rebuttal, I want you to know that conditions on this "cloud" I inhabit are o.k., and quite remunerative. Perhaps I could turn things around and say that Mr. Margulies lives in the clouds, where he deals with simple facts and data, and we of the so-called avant garde do the dirty work of accepting a larger kind of responsibility for our work.

Margulies: I do think that the Museum's exhibition should make it clear that good designs do not necessarily make effective packages.

Constantine: You're assuming something awful, which is that the two are incompatible. We have no way of knowing what makes packages "effective"—and I doubt that any of the polls really do either—but we do know what is good design, and we show it. We don't accept the fact that packaging is, or has to be, bad, but believe that there is wonderful packaging, and that is what we exhibit and collect.

Lionni: I find that advertising is becoming more civilized, because the whole attitude in selling is changing. The old backslapping approach is giving way to a more reasoned one, and I am optimistic that the future of packaging may be headed that way, too.

Three panel discussions, featured on the Package Designers Council's first all-day symposium in Silvermine, Connecticut, presented lively opinions about designers' methods and responsibilities.

Creative Use of Market Research Techniques: Does it help?

Walter Stern, *Raymond Loewy Associates*: We have developed a market plans division to formulate, for our clients, programs that will integrate all of our organization's services. We find that it is more desirable to design on the basis of a clearly defined program, and that the overall cost to us and our client is usually less on a planned basis. While no amount of research will substitute for the creativity and judgment of an experienced designer, the clients have an increasing desire to buy sales insurance through counterchecks on the designer's recommendation. If such research is planned, executed, and, most important, interpreted in collaboration with the design, it can benefit both participants.

Robert Neubauer, *Robert Neubauer Associates*: Many brave designs have wound up in the files or in the wastebasket for lack of client bravery, or because of inability to convince the client that the brave new design could compete. If this assurance can be derived from surveys, I'm for them 100%. But I don't think research has come up with what Lester Beall called the "intuitive rightness" of a designer's skill.

Today, lots of the motivation studies come out and tell you, put an oval around the tradename. There have been good designers who didn't have the benefit of such tools. Georges Wilmet used lots of ovals, just because he believed in ovals. . .

Egmont Arens, *Egmont Arens Industrial Design*: A package is a method, a vehicle of communication that tries to say something to consumers. By using symbols that they will recognize, we tell our story. To keep from getting stale it is important to introduce new symbols from time to time. The job of the artist, then, is to create them and to teach people their meaning, thus opening new fields to designers who can then speak in a new language. . . . Research can report and interpret, but the hardest job for the designer is to take the finished research, pull all the elements together, and add something purely creative to make them work.

Francis Blod, *Design Associates*: We have brought the supermarket into our office, set up a laboratory in which we can recreate any marketing environment. We take into consideration all the objective information we can get, but the laboratory helps us create designs that are distinctive and that we feel will do a job. I think security for the client is most likely to come from the designer who can use research as a tool to back up his own good designs. And I think that the future of successful packages is good clean design.

Approaches to Design: What makes an organization click?

Walter Landor, *Walter Landor Associates*: We try to reach the consumer deep down in her subconscious, where the heartstrings release the purse-

strings. We are determined that no design shall be reminiscent of another, that no similarity of style shall creep into our work, because each client needs a unique personality for his product, based on his particular needs and conditions.

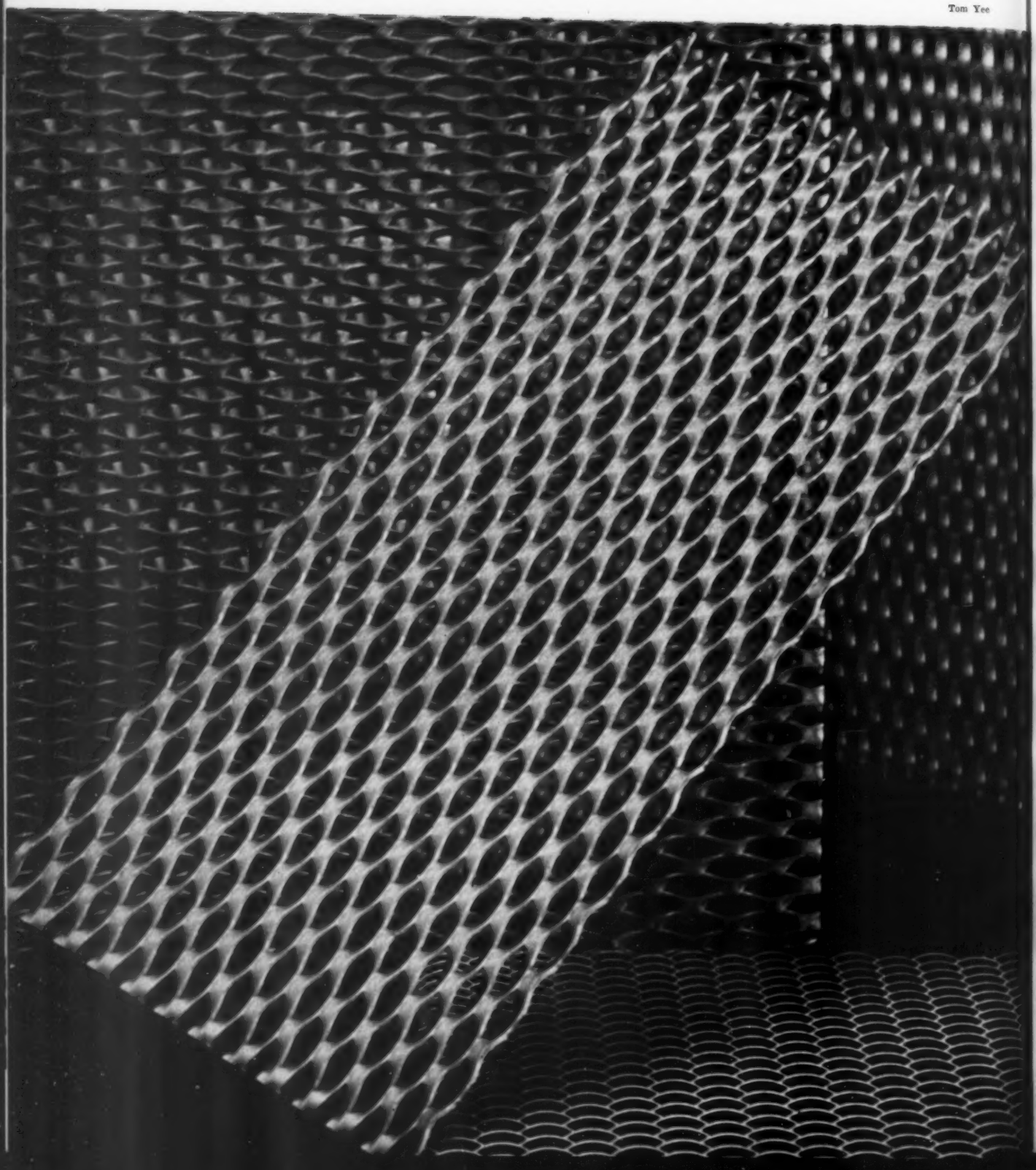
We try to operate as a creative group of optimum size, rather than as a series of individuals. The big problem is how to lead the group without dominating it, how to give each member a spirit of participation. The score of a group effort depends not merely on the brilliance of each member, but on the skill of the leader to keep ideas flowing toward the ultimate goal. . . . In the end we want a package that promises pleasure — the pleasure of using the contents *and* of having the package around. There is a fine but important line between designing to sell hard and designing to be desired.

Jim Nash, *Jim Nash Associates*: I believe that the soundness and ingenuity of a design organization's approach to its client's problem is what keeps it stable and successful. I always stress the importance of a good trademark, because it quickly identifies the manufacturer, is easy to remember, but

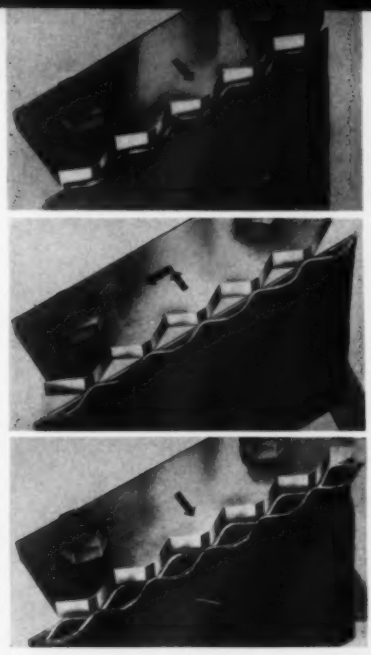
should not depend on color for effectiveness. We use any kind of research that lends sound direction to professional judgment, but the one kind I have not always been happy with is color research. So many factors are involved that it is not possible to isolate the problem to the use of an ideal color alone. In all our tests for memory value and appeal, strong design has outweighed color every time.

Robert Sidney Dickens, *Robert Sidney Dickens, Inc.*: Before taking on a client, we always warn him ahead of time about how we work, and find out if he is willing to accept us as designers with all our limitations and possibilities, not as a research outfit. We warn him if there are any design decisions to make, we will make them. If the clients understand us from the start, it leaves us free to design. I find out his problems, get the facts, and when we get the design firmed up we narrow it down to one solution—the one we

feel is right, and are prepared to defend with a lot of facts he gave us in the first place. When we're done, we've had a lot of fun, and I plan to keep package design a fun business.



Tom Yee



The latest in meshes

U.S. Gypsum courts designers with new expanded metal patterns

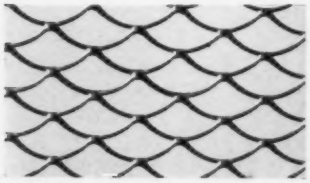
In 1885 Mr. John Golding of Boston, toying with his pen knife, cut a number of parallel slits in a piece of heavy paper, stretched it, and found a diamond mesh. This discovery, so the story goes, became the foundation of the expanded metals industry, which has been producing diamond meshes ever since. Not until the furniture shows of last January had the die-hard diamond-mesh convention in American expanded metals been flaunted, except on small-scale runs. Then United States Gypsum introduced four new patterns. With Rondo, Festoon, Wavelength and Armorweave, Gypsum hopes to move expanded metals out of the ranks of routine industrial materials and into the product designer's and architect's active file of decorative materials.

U. S. Gypsum, which grossed $219,000,000 last year supplying diverse materials, especially gypsum, to the building industry, got into the expanded metals business when they decided that metal lath belonged among their products. Gradually, new uses were developed in industrial plants for the metal meshes—as machinery guards, partitioning, open shelving and catwalks. For these various purposes, Gypsum marketed their diamond mesh, called Expand-X (below right), in numerous sizes and gauges, in both the naturally angulated form and flattened, in carbon steel and stainless, in aluminum, and, by special request, in copper and other expandable metals.

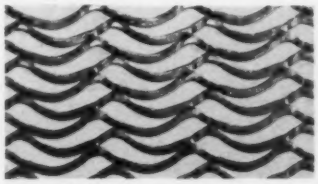
The method for making Expand-X, as illustrated in the photos above, is an elementary cold-working process: (top) the blunt-edged, serrated knife, positioned at right angles to the sheet, takes its first bite, slitting the metal at regular intervals and thrusting the strands outward; (middle) the knife is raised and moved over to the center of the bond, and the sheet moves forward the width of a strand; (bottom) the knife bites again, completing the first row of diamonds and, at the same time, expanding the first half of the second row. The operation continues in this way until a full sheet has been expanded.

Expanding increases the original sheet area up to three times, patterning without the waste of perforating methods, and the uncut bridges that join each row of diamonds provide truss, giving the expanded sheet greater strength and rigidity than solid sheet of the same size and gauge. U.S. Gypsum knew the advantages of their product — its ability to cover large areas with minimum weight and cost per square foot; its combination of openness and strength; its ease of fabrication—and they knew that if more than the conventional diamond could be offered, the applications for expanded metal could be more than industrial. So, two years ago, an investigation into possible departures from the regular Expand-X pattern was initiated at Gypsum's Warren, Ohio plant under the supervision of Charles Alvord, then works manager, and Donald Cooper.

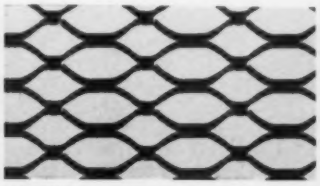
By changing the knife configuration and varying strand thickness, they turned out some 42 variations in mesh design. Gypsum's merchandising and sales heads were called in to review the new designs. All agreed that here was a unique and potentially useful product, but they felt the need for guidance on the refinement, final selection and suggestion of possible applications, particularly in product areas. So Gypsum's J. S. Offutt and J. K. Bolton, merchandise managers of industrial sales and industrial hardboard and steel, respectively, and director of advertising B. G. Pomfret approached George Nelson & Associates for design advice. Nelson started off by advising on the material itself; for instance, he suggested that if aluminum Armorweave were color anodized before being expanded, it would provide a two-color effect, the freshly cut edges of natural aluminum dominating from one angle, the color-anodized surface dominating from another (photo opposite page). He assisted in the final selection of production patterns and submitted sketches of possible applications in product and furniture design. Nelson's sketches suggest the possibilities of screening and containing with a material that can be at once economical and decorative. And as the photograms on the following pages indicate, where nuances of light, reflected and transmitted, are desired, Rondo, Festoon, Wavelength and Armorweave provide some subtle effects.



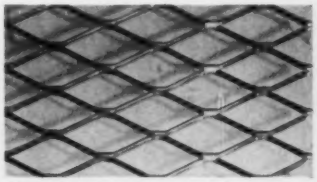
Festoon



Wavelength

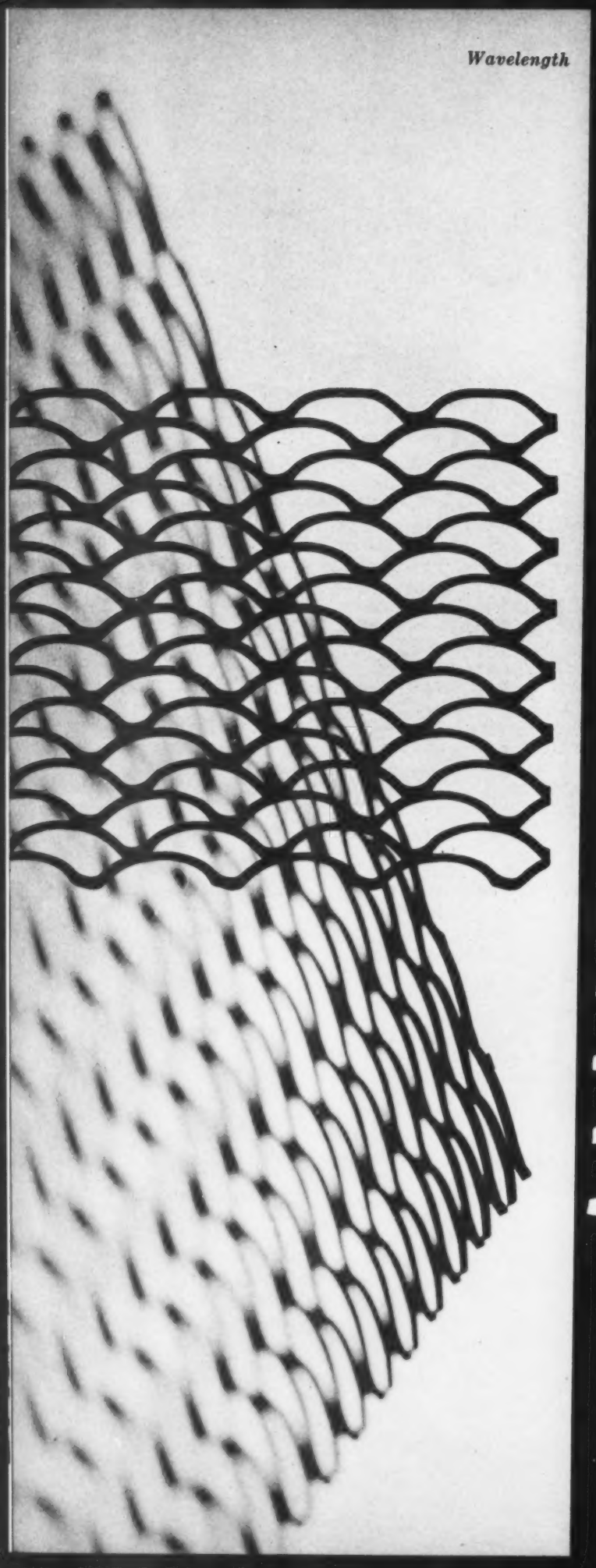


Rondo

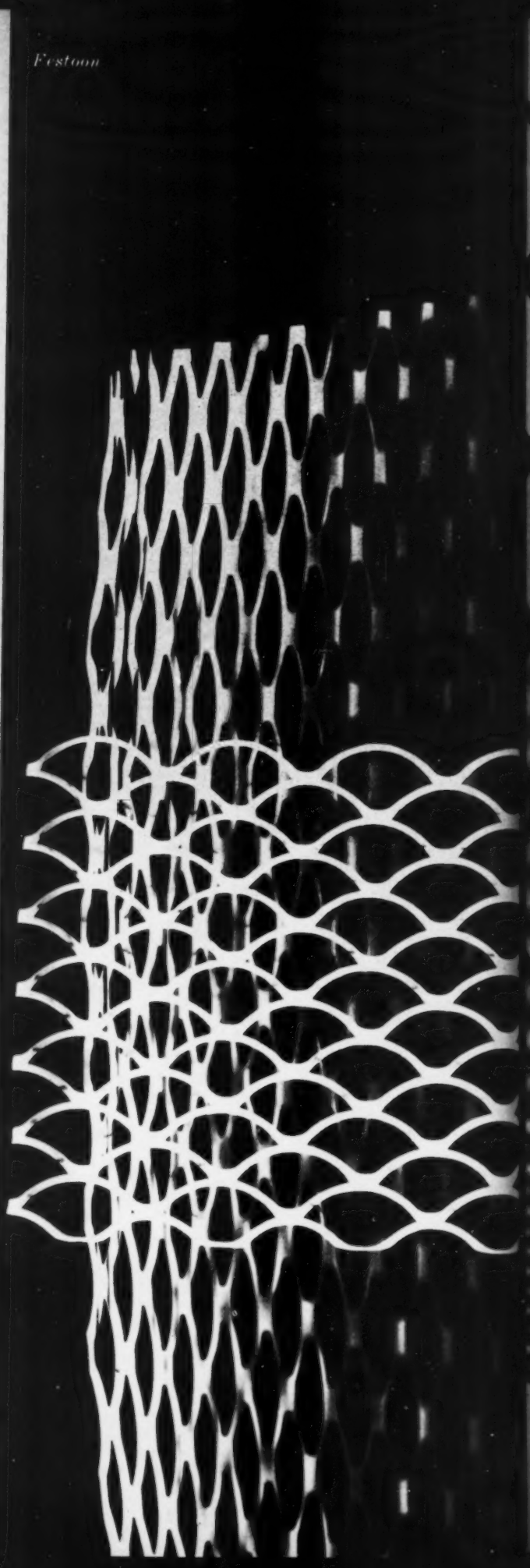


Expand-X

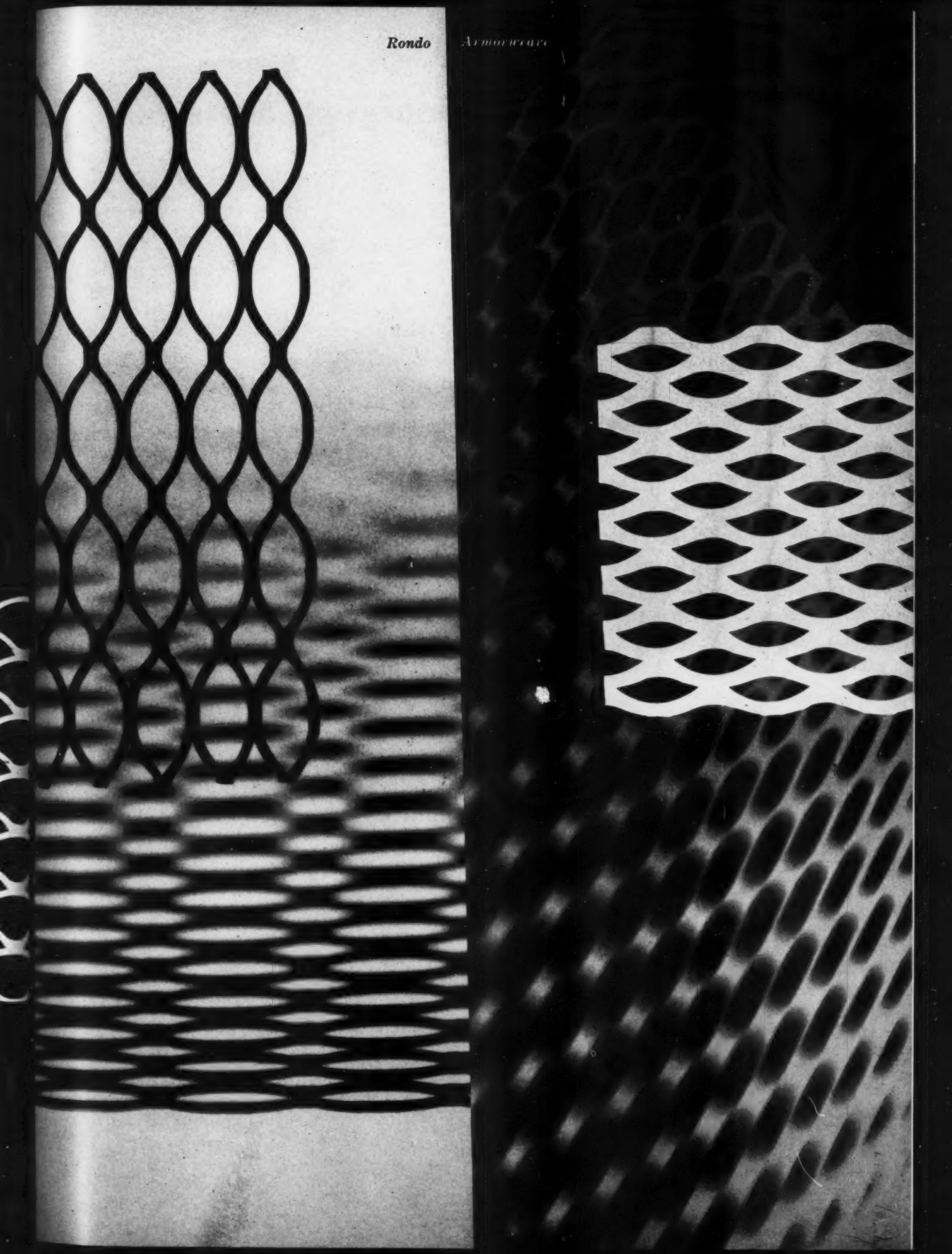
opposite page: Armorweave



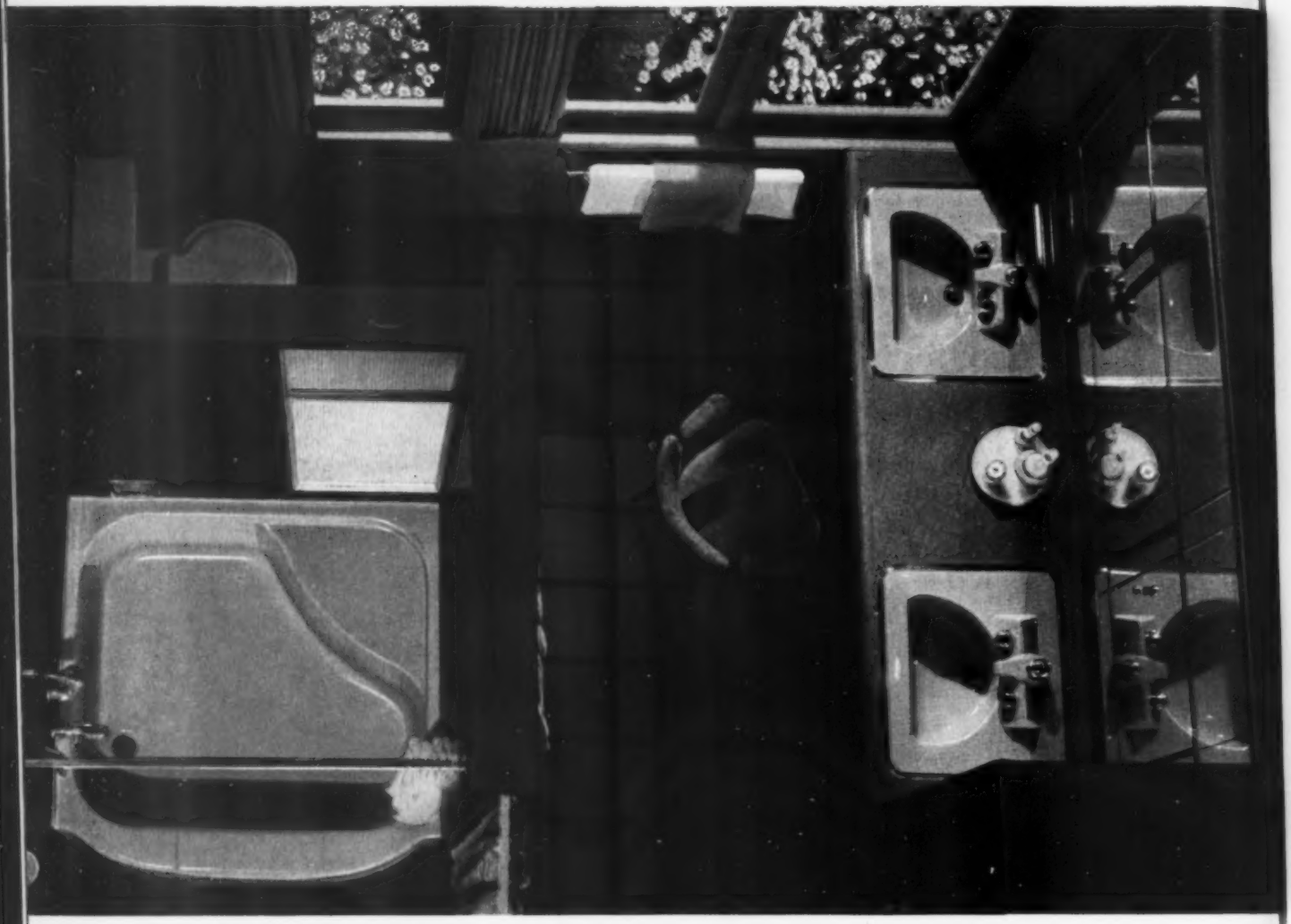
Wavelength



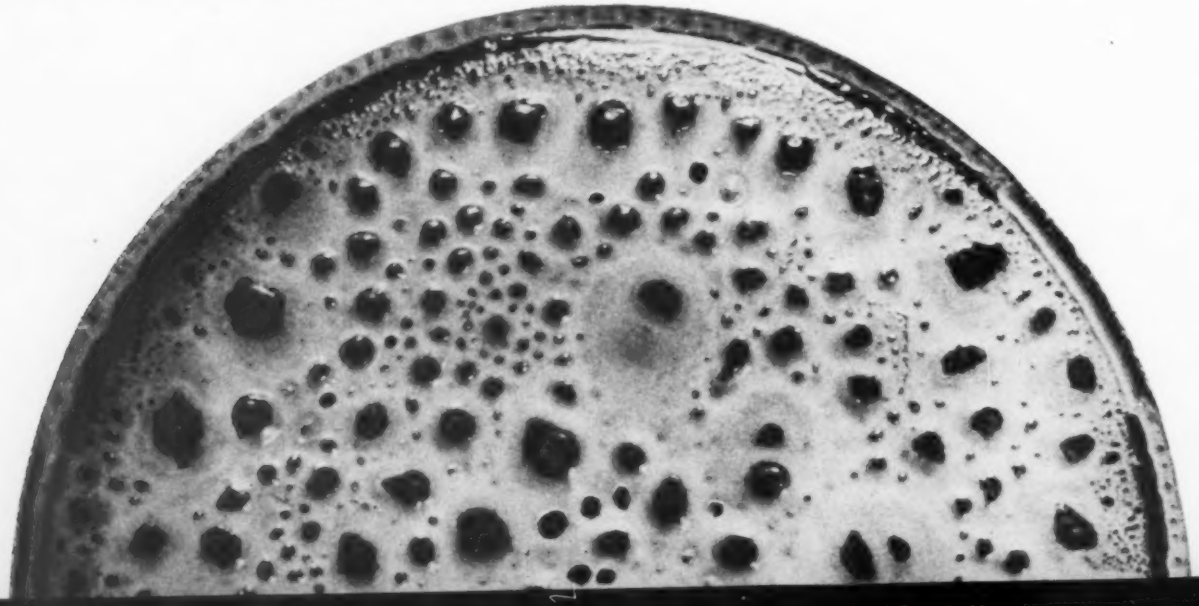
Festoon



Color Problems—III: Inorganic Materials



A contrast in surface textures obtained with inorganic coatings. The blue bathroom fixtures made by Crane illustrate the precision in color matching and surface smoothness that can be obtained on dissimilar base materials. The volcanic effect on the platter below, the work of ceramist F. J. Von Tury, personifies the effect of the critical element in giving inorganics their properties and character—heat.



by Douglas G. Meldrum

A survey of the difficulties — and desirability — of coloring ceramics

The slogan of the ceramic tile industry is "70 centuries of service," which seems fair enough since archaeologists have found 7,000-year-old tiles on shrines between the Tigris and Euphrates Rivers that are still a brilliant blue and show no signs of wearing out for another 7,000 years. Small wonder that producers of ceramics promote their products as investments in permanence—or that such permanence of color and material requires an investment.

It is reasonable that inorganic materials which have survived the endurance test of many centuries should, for the same reasons, be the only materials able to withstand the stresses of many of man's most recent developments. Because they are practically indestructible, ceramics are finding applications in rockets, jets, nuclear reactors, and electronic machines.

The mark of a fine ceramic in years past was that no other dish or tile or vase was exactly the same; a slight difference in shape gave similar objects the signature of the artisan who made them; variations in color tone and consistency gave a distinctiveness that was desirable. Today, however, with ceramics used more widely on an industrial basis, consistency is as important as character, and standards for mass-producing products made of inorganic materials are rigid.

A problem in pink

Two ceramic engineers, surrounded by charts, lists of figures, and dozens of pink tiles that looked identical to an untrained eye, recently had a discussion in the color laboratory of a leading sanitary ware manufacturer. The problem at hand was not a particularly new or complicated one to them, nor was it unanticipated. But to anyone not intimately involved with the manufacture of products using inorganic materials, it emphasized the fact that though the ceramic industry is indeed highly scientific and technical, it retains a great deal of the art that has been handed down from father to son for centuries. Most of the age-old secrets of technique and color in ceramics are generally known and understood, but the nature of the materials used and their behavior demands a rare combination of scientist and artist in those who shape them.

The difficulty facing the two ceramic engineers at the Trenton Potteries of the Crane Company was superficially simple: they were trying to match pinks for various bathroom fixtures. Most bathroom fixtures are made from two basically different types of inorganic materials and are fabricated by two different methods: wash basins and toilets are glazed vitreous china, bathtubs are porcelain enameled cast iron. The same inorganic glaze materials cannot be used for both vitreous china glazes and porcelain enamel, because they do not produce the same colors at the different firing temperatures used for the two processes. The problem of the ceramic engineers was to select inorganic glazing materials that would produce the same color for both types of coatings. They could have done this scientifically by using information obtained from a spectrophotometer. But, because different surfaces affect what the eye (but not the instrument) sees by reflecting light differently, they usually rely on their artistic sensitivity to match colors visually under controlled lighting conditions. Ceramic engineers must take into consideration how fixtures are going to be used; different light sources must be anticipated—fluorescent, incandescent, sunlight. A match is made, within a close range, that will give the greatest color similarity with different types of finishes under most conditions. Of course, a washbasin with a fluorescent light over it will not look exactly the same as a tub with incandescent light shining on it; or if a color-conscious housewife wants to brighten her bathroom even more with yellow curtains, her pink, or green or blue fixtures will vary in shade depending on their relative positions to the curtains.

The problem of pink solved by the Crane engineers demonstrates that color in ceramics depends upon the material the object is made of, its shape and design, its use, the type and ingredients of the coating, and, above all, the temperature at which it is or must be fired. Heat — high heat — is both the blessing and curse of ceramics. High firing temperatures are necessary to give ceramics their desirable characteristics such as durability, abrasion and heat resistance; but these same high temperatures make them difficult to control particularly where color is concerned, because of the extreme sensitivity of pigments to heat.

The art of fire

The ceramic industry might, indeed, be called "the art of fire." The word itself comes from "keramos" which, freely translated, means "burned stuff." Modern production of ceramics depends upon the ability to know both what happens to inorganics under high heat and how to control these reactions with precision. The bathroom fixtures and the platter on the opposite page were made by essentially the same process, using similar inorganic materials. Both results were deliberate: the smooth, color-matched finishes on the Crane fixtures make a striking contrast with the bubbling broken surface on the platter made by Von Tury. The important factor is that both effects can be *re*produced through close control of the body material, the coating material, the method of application, and the firing. Because the slightest inconsistency in any of these phases will affect the resulting color and texture, we shall discuss each of them as part of color problems with inorganics.

The body, as well as the glaze, determines the color of a ceramic

Inorganic body materials

A ceramic body is either porous or vitreous or, expressed a little differently, either porous or not porous. The term "semi-vitreous" is used widely and is synonymous with "semi-porous." The preference for "semi-vitreous" as an indication of porosity is obvious, just as "99 and 44/100 per cent pure" sounds better than "56/100 per cent impure." The most porous bodies are earthenware, which will absorb water readily. Vitreous bodies include porcelain, stoneware, and china. The raw materials for all ceramic bodies are in general the same, and include clay, feldspar, and flint. The particular type of body (based on porosity) is determined by the quality and proportion of the raw materials.

Each type of body matures at a different temperature, ranging from low (about 1740° F) for earthenware up to 2600° F for fine porcelain. Ceramic bodies may or may not be glazed, depending on the desired results. In familiar unglazed earthenware the porous surface is desirable for its attractive texture and color. There are many types of tile that are unglazed and have homogenous color and a variety of textures, discussed on page 110. Glazing problems are paramount to the ceramist and probably the most complex and delicate part of the production picture—and, like much of the coloring in ceramics, a highly empirical affair.

Making a glaze: colorless colors

Every glaze consists of three basic elements: a glass former, an opacifier, and a stain. Using equipment and processes similar to those for paint-making (Color Problems II, ID April, '56), ball mills are used to mix carefully measured ingredients. Viscosity and drying time have a direct influence on production time and efficiency. Improper viscosity can result in a too thin or too thick coating and consequently poor firing. Each batch of glaze is checked by spraying a sample on a tile, which is run through the complete baking cycle in a kiln. The color, surface, texture, and quality of the coating is then checked against the established standard in the color laboratory and, if satisfactory, the glaze is applied to production pieces.

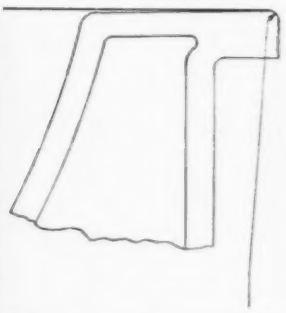
This "complete cycle" method is the only way the color of glazes can be checked, and often it takes many test cycles before the desired shade is achieved. The reason is that inorganics are unstable in themselves and each batch of each material must be checked individually and in combination with others in a formula. Also, ceramic glazes in their unfired state are surprisingly drab; most of them have no distinctive color and look very much alike until brought to life by fire. Their anemic appearance, in fact, makes it necessary to introduce marker dyes into the formulations. These are *organic* colorants which burn out at about 500° F during firing and have no effect on the final color which is determined by inorganic materials. This use of organic colorants demonstrates one reason inorganics must be used to color ceramics: organics cannot tolerate the necessary heat.

In general, the basic compounds for inorganic colors that are in greatest demand are these: chromium for greens, cobalts for blues, chrome-tin combinations for pinks, lead antimonates for yellow, oxides of iron and

photos: Louis A. Cavallo

A skilled operator sprays an even coating of ceramic glaze on a sanitary fixture.

A "lazy susan" is used at Crane to speed up glaze spraying.



Crane Company recommends ⅛ radius on top edge of lavatory to prevent white edges on colored ware.

chromium for browns, black oxides containing cobalt-chrome-manganese for grays.

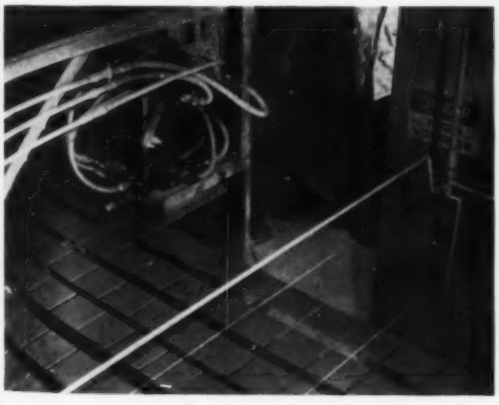
Applied ceramic colors can be divided into two main groups: stains and overglaze colors. Stains are glazes fired at the same time that the ware is baked, while overglaze colors are applied over a previously fired glaze.

Applying and firing a glaze

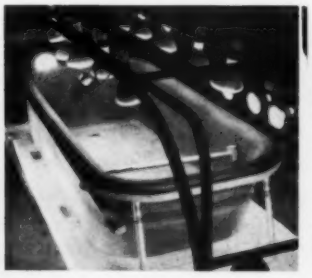
The manufacturer has several alternatives in choosing an inorganic color to fire on a ceramic body. (Porcelain enamel on metal is treated on page 112.) The actual application of the glazing material can be done by brushing, dipping or spraying. Spraying is by far the most extensively used, and proper application depends mainly on the skill of the operator. Electrostatic and automatic spray machines are being used for some applications, particularly tile, but, by and large, hand spraying is the answer for ware with other than flat surfaces.

It has been pointed out that both the body and the glaze can be fired simultaneously or they can be fired separately. It seems logical that the least troublesome method of producing colored ceramic ware would be the one-fire method, with both glaze and body baked at the same time. Single firing does have its time and cost advantages, but there are other elements to be considered. Many ceramic bodies have high firing temperatures and, even with inorganic colorants, the higher the firing temperature, the greater the restriction on the range of colors available. Red lead chromate, for instance, will not withstand temperatures above 2093° F. Consequently, if the body needs a higher temperature to mature, another inorganic red colorant must be used if a one-fire process is desired, and this would definitely increase costs because the production of high-temperature red colorants such as colloidal copper is complicated and expensive. Thus, although the one-fire process is desirable for some reasons, the two-fire or overglaze method is still popular and sometimes more economical.

The influence of heat on ceramic colors has changed a good deal since the days when the position of a piece of dinnerware in a kiln frequently determined its color, because temperatures varied in different parts or levels of the kiln. Modern kilns are electronically controlled and the ware moves through them at a constant rate at a controlled distance. However, it is a frequent practice to fire ware of different colors at the same time. This necessitates using colorants that can be fired at the same temperatures. Mixing different oxides for various colors and shades of color is a highly skilled technical operation. The cost of inorganic colors cannot be figured on the per pound cost of the mineral oxide used to obtain a certain color. Different oxides have a more potent color effect than others. Cobalt oxides for blues, for instance, are expensive, but they are the cheapest sources of this color: as little as one part in 500,000 is detectable and one part in 10,000 is intense. There is no hard and fast rule about what excess heat does to inorganic colorants. Some will get darker, others will lighten, and still others will burn out completely. However, new methods of heat control and the development of more stable coloring oxides makes color consistency something that is taken for granted.



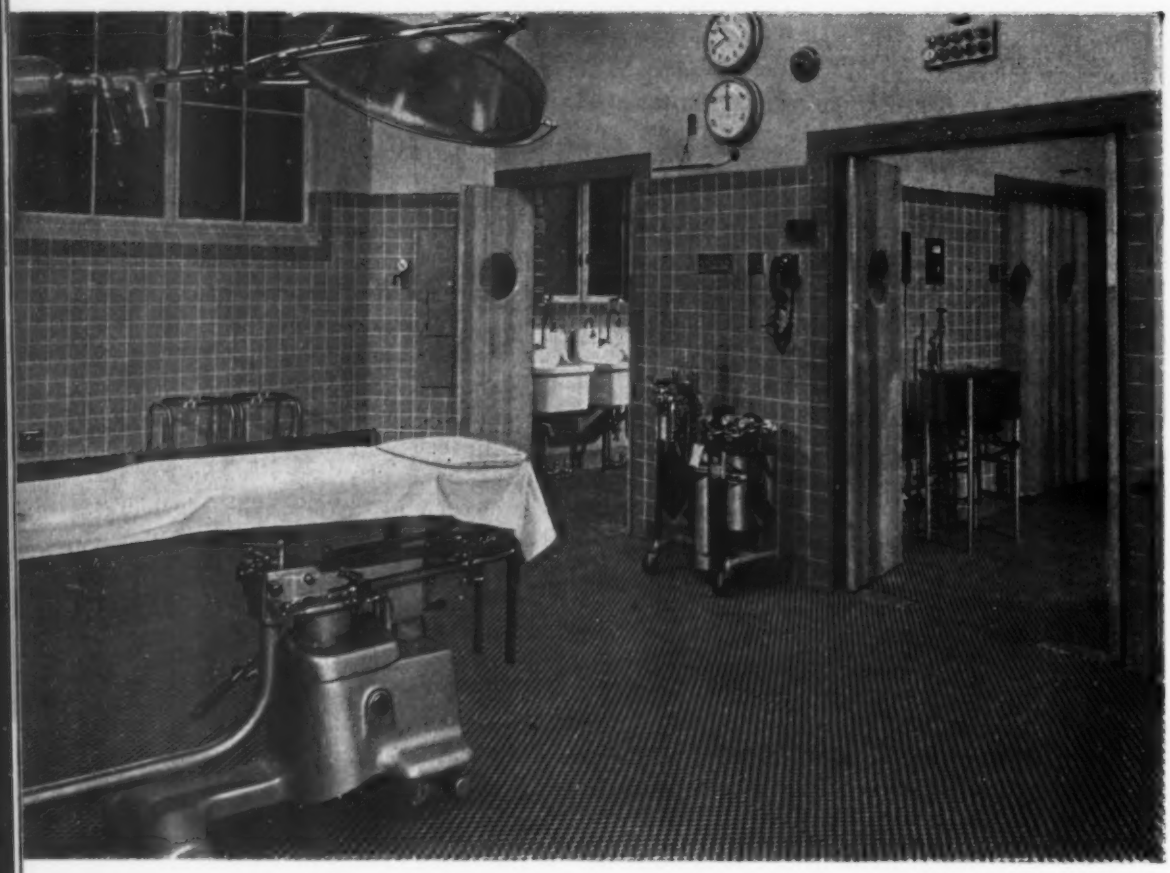
Electrostatic spraying methods are used at the Bettinger Corp. to coat tiles with inorganic colors.



An earthenware bathtub is dried under infra-red lamps.

Sanitary ware, having been sprayed with colored glazes, is loaded onto trucks that will carry it through a kiln for firing at the Crane Potteries. During firing the pieces will shrink 12 per cent.

Modern methods give wall and floor tiles color consistency



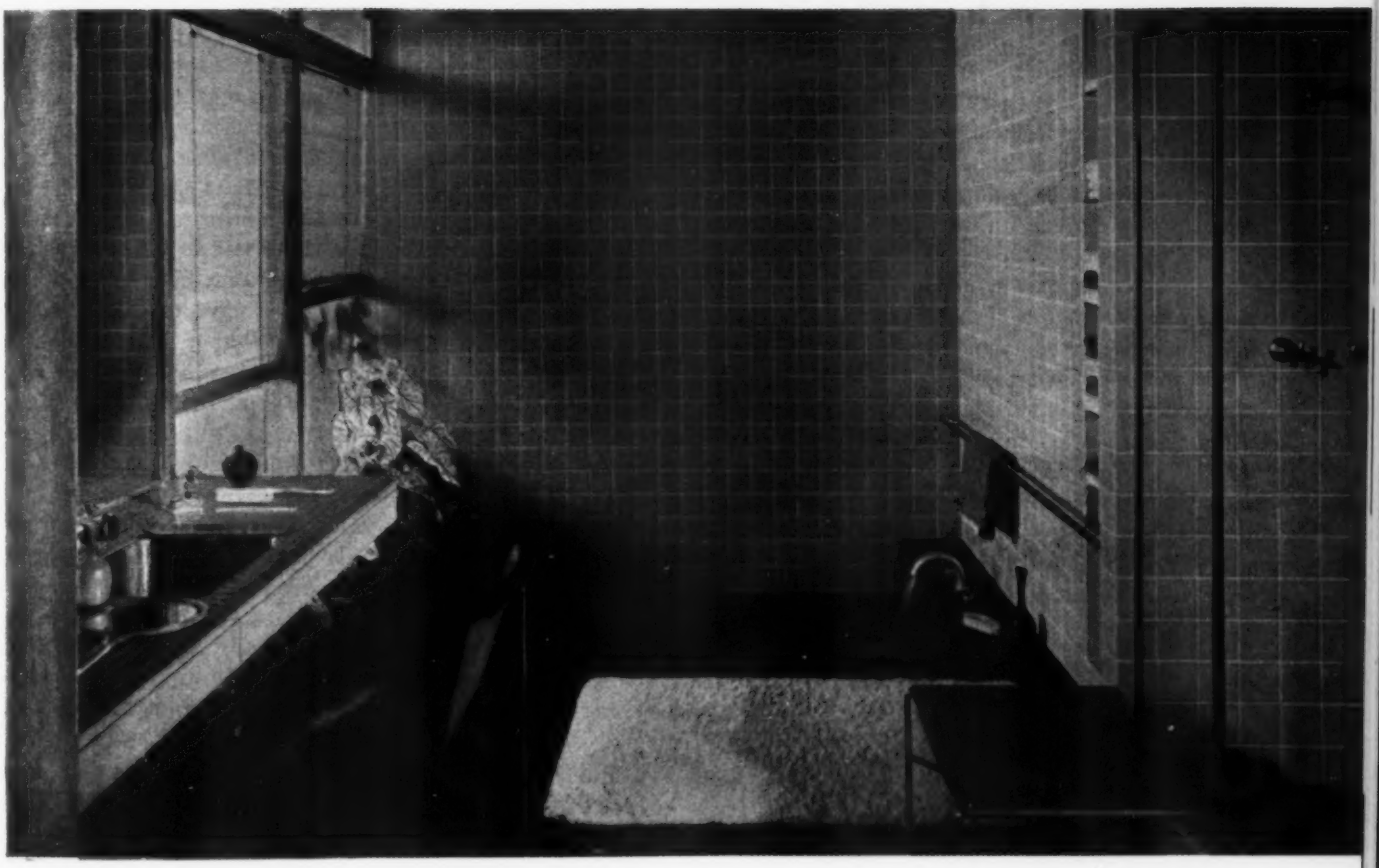
Color — better colors and more colors — is undoubtedly one of the main factors in the spectacular production picture of the wall and floor tile industry: 99,146,000 square feet of tile were produced in 1949 compared to 190,672,000 square feet in 1955. The Tile Council of America and tile manufacturers are becoming increasingly active in the promotion of tile for its decorative advantages as well as its practicability. For certain applications tile cannot be beaten — subways and tunnels are obvious examples — but most subway stations leave a lot to be desired in appearance with their cold, uninspiring tiling. Official figures list ceramic tile sales in the following order of popularity: pink, gray, green, yellow, blue, beige, peach. White is not included among the seven most popular colors. Although it is possible to produce any color, dark or pastel, in tile, there is a practical limit to the number a manufacturer can make.

Green and gray are, today, familiar in hospitals; bathrooms have walls and floors of colored tile that contrast or harmonize with the colored fixtures; schools, factories, and offices are being made brighter inside and out with colored tile. It is, however, the combination of highly practical attributes and decorative possibilities that make ceramic tile a sound investment. Young children find it virtually impossible to mark the glazed tile on their kindergarten wall in their first experiments in calligraphy. Factory owners find that employee morale rises and maintenance costs lower when cafeterias, rest rooms, and working areas are tiled in color.

Wall and floor tile are used to several advantages in the operating room shown above. The walls of glazed tile are easy to keep sterile and, because of their color, offset the necessarily brilliant lighting. The hazard of anesthetic explosions is eliminated by the floor which is a ceramic tile made by the American-Olean Tile Company and Mosaic Tile Co. with fired-in control conductivity. The tile itself dissipates dangerous static electricity, the cause of these explosions.

Unglazed tile

The color in unglazed tile, as in unglazed pottery, permeates the body. Colors and textures are obtained by mixing various materials, such as granite or certain oxides, with the tile body ingredients. After the tile has been pressed into the desired shape, it is fired. The smoothness or roughness of the surface is determined by the raw materials, for the same reason that they affect the porosity of ceramic pottery. Unglazed tiles are usually used for floors because of their exceptional



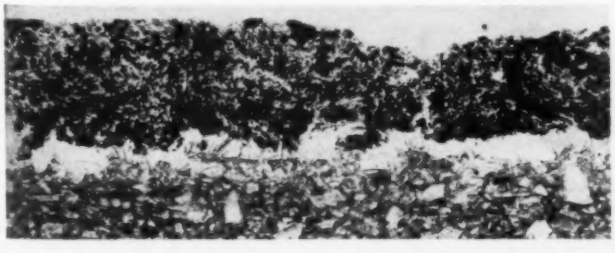
durability. Even after many years and the passage of many feet, the integral color remains the same, and there is no glaze to be scratched or worn away.

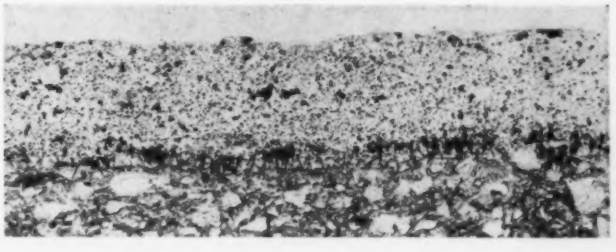
Glazed tiles

There are two kinds of glazes — crystalline and mat. The difference is determined by the size of the crystals that are formed in the glaze as it cools after firing. For crystalline glazes, crystal-forming ingredients such as zinc silicate or manganese oxide are introduced. Mat glazes also contain crystals, but they are so small and evenly distributed that no individual crystals are visible and the light is diffused. For mat glazes the alumina, barium, or zinc content of the material is increased.

Color in ceramic tile, like sanitary ware, pottery, or artware, is difficult to control. Each step in the mixing, glazing, and firing must be very closely watched to avoid expensive rejects. Mass production methods have been incorporated to some extent because of the high volume of tile manufacturing, yet each tile is inspected and "sounded" for invisible cracks. A flaw, pin hole, crack, or chip means a wasted tile which, according to one ceramic manufacturer, is a double expense; not only is it an intrievable loss, but, since there is nothing more worthless than a broken or imperfect ceramic, it usually costs money to get rid of them.

Two microscopic cross-sections show the results of two methods of firing a ceramic glaze. The difference between the two-fire (left) and the one-fire methods (right) is very obvious: with the one-fire method, the glaze becomes a part of the body and, because it is non-absorbent and non-crazing, will resist penetration by acids and the influence of radical temperature changes.





Porcelain enamel — how it is made and applied to a product

Porcelain enamel, an important member of the inorganic ceramic family, is a glass coating fused to metal. Despite the fact that almost everyone refers to this durable and decorative finish as "porcelain" enamel, it is actually, according to the authorities, "vitreous" enamel. Porcelain is one given formulation of clays, not necessarily those used; "vitreous" refers to the non-porous nature of the enamel. The use of the word "porcelain" may be attributed to a desire to distinguish this inorganic coating from organic enamels, and to suggest the true durability of the finish.

There are many good reasons why a glass-on-metal coating is valuable. Frequently the strength and flexibility of a light or heavy metal combined with the properties of a ceramic finish are highly desirable for a product. The ability to obtain these coatings in all degrees of color has introduced myriad possibilities for design and decoration of products which depend on abrasion, acid, and heat resistance.

Making a frit

Raw materials for porcelain enamels are inorganic oxides, minerals, fluorides, or salts. Predetermined proportions are weighed out and mixed thoroughly, smelted, and the molten glass is drawn off into a tank of cold water. This is known as the "quenching process," and it breaks up the glass into a "frit." The inorganics that give individual physical properties to each frit can also give it various colors, which often proves troublesome. The frit is then ground in a ball mill to the proper particle size for use. There are two methods of grinding frits — wet and dry. The same kind of a mill is involved in both processes, the difference being that for the wet process water, clay, and inorganic salts are added.

There are many porcelain enamel formulations for use on different metals and for varying characteristics, the most common use of which is on sheet iron and sheet steel. These usually consist of several coats which are applied by the "wet process" described below. Either the "wet" or the "dry" method of coating can be used for castings, with dry favored for larger pieces.

The application of porcelain enamels

If the wet process is to be used for applying porcelain enamel, a ground coat is applied by dipping or spraying after the metal has been cleaned and pickled. This

Making porcelain enamel "frit" at Ferro Enamel Corp. Molten glass (left) passes from a continuous smelter to water-cooled rollers. The sheet of compressed particles emerges from the roller (above) and falls into a vibrating hopper prior to milling.

The stress resistance of porcelain enamel is established at Ferro by cross bend test. This determines the amount of bowing an enamel will tolerate before the coating cracks or crazes.

coat can be baked before the cover coat is applied, but frequently both coats are baked simultaneously. The ground coat seals the metal and promotes good adherance. Cover coats are usually sprayed on, but can be dipped or flow-coated. Baking temperatures are, as a rule, in the range of 1500° F, but recent developments in low-firing enamels now make it possible to fire at temperatures near 1000° F. For dry process enameling, surface imperfections are removed from the casting by blasting, and a thin ground coat is applied by spraying, dipping, or flowcoating, and dried in a furnace. The casting is removed from the furnace when it is red hot and enamel powder is dusted onto the surface. The casting is returned to the furnace when it cools and the operation repeated for the proper thickness.

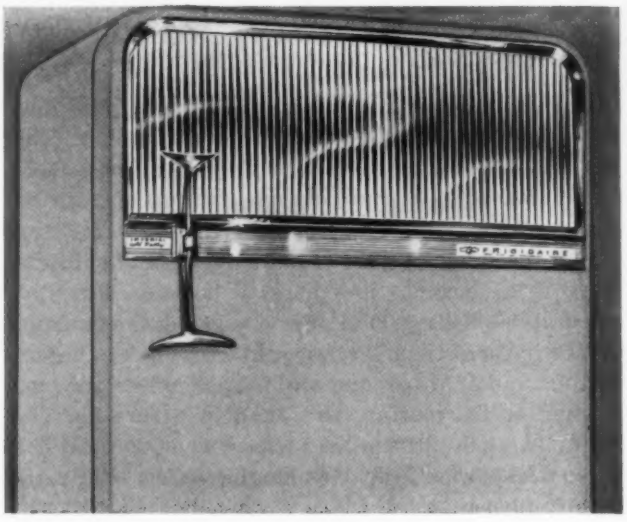
Colored porcelain enamels

Most of the familiar white opaque porcelain enamels use titanium dioxide as an opacifier because it gives high opacity and excellent acid resistance. However, with the exception of some pastel shades, titanium enamels cannot be colored satisfactorily. Frits whose ingredients produce by-product colors ranging from dark to nearly transparent are available and, by adding other color oxide tints or ceramic pigments, almost any color can be produced. The Fletcher Enamel Company, for instance, uses oxides of cobalt, chrome, cadmium, selenium, and gold to color enamels for their cookware, chosen because they are stable at fusing temperatures of 1500° F, are non-toxic, and non-volatile at very high temperatures. Oxide materials vary quite radically in cost; cobalt oxides used for blues are inexpensive compared to gold oxide, which is used for pink.

The addition of lead in the coating material will tend to brighten most colors, and zinc oxide will enhance blues. Color matching by blending is particularly tricky because all the enamels being blended must have been milled to the same fineness and have the same specific gravity. Minute amounts of materials can make major differences in color: Vikon Tile Corp. reports that a variance of more than 1/10th of a gram of materials in batches of 30 gallons cannot be tolerated. And, weight of application and firing temperatures will create color drift if they are allowed to vary, particularly when pastel colors are involved.

Porcelain enamel powder is "dredged" on a red hot metal bathtub. The coating is built up by a succession of dredging cycles.

Three colorful products illustrate different porcelain enamel problems



Ceramic colors on toasters

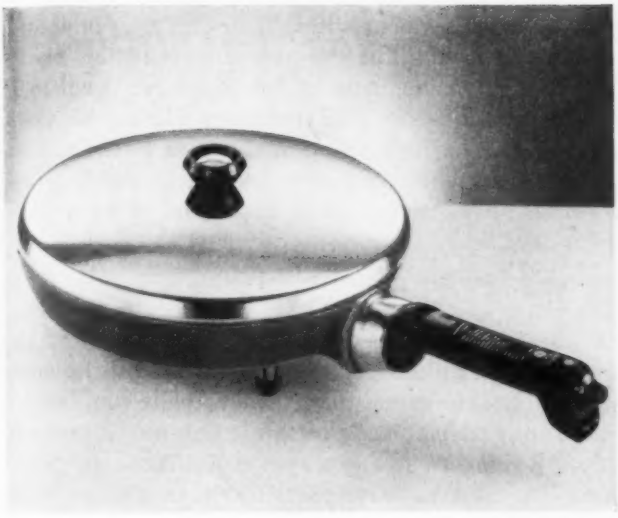
The three products on these pages — a toaster, a refrigerator, and an electric skillet — all involved inorganic colored coating problems. Each serves to illustrate, for different reasons, the use of color in new places and why a colored coating cannot be arbitrarily selected and applied without careful consideration of many elements in design, materials, production, and end use. Desired characteristics of a coating will determine the ingredients that can be used; and these ingredients will, in some cases, limit other characteristics. Porcelain enamels that fire at low temperatures for instance, are necessary for aluminum but are not as durable as those that fire at higher temperatures.

The yellow toaster, recently introduced with a new Westinghouse line in pastel "confection" colors, is vitreous enamel applied to a formed steel body. Requirements for these toaster finishes, in addition to color, were: durability to withstand normal handling and assembly; resistance to household hazards such as grease, detergents, acids, and abrasion; and flexibility for assembly and service. A two-coat lead base enamel applied .004 to .005 inches thick was found to meet the flexibility requirements which demanded a ½ inch movement of the open ends of the casing without fracturing or crazing the finish. To give the vitreous coating a good bond with the steel, exacting preparation of the base metal was necessary. Careful cleaning was followed by a substantial deposit of chemical nickel, which promotes adhesion. The casing was double-sprayed and fired at a temperature of approximately 1200° F, following the application of each coating. The toasters are available in "lemon yellow," "mint aqua," "nougat white," and "frosting pink," colors which match the complete line of 58 Westinghouse appliances.

Organics versus inorganics for refrigerators

The Frigidaire illustrates problems of color matching with inorganic coatings and exemplifies the relative merits of organic and inorganic materials. Traditionally, the interiors of refrigerators are coated with porcelain enamel, while the outside surfaces are coated with either organic or inorganic finishes. The Frigidaire is produced with either type of outside finish; the organic finish has a primer coat of modified epoxy resin and a top coat of modified alkyd, and is available in pink, green, gray, and yellow, as well as white, whereas porcelain enamel for the outside costs from $30 to $40 more and comes in white only. Using both organic and inorganic finishes on the same product in this way creates color matching difficulties. Not only are there the usual problems of matching separate pieces, like doors and side panels that are coated with the same kind of finish, but of matching surfaces coated with basically different types of finishes — organic and inorganic.

The question of organics versus inorganics is particularly evident with refrigerators. Porcelain enamel companies are making a concerted effort to produce one-coat enamels with low-firing temperatures to reduce costs and production problems, while manufacturers of organics are developing finishes with properties of hardness and impact resistance that might make them logical substitutes for porcelain enamel for some applications. Both have made rapid and recent progress: some of the alkyd-ureas have properties that approach those of porcelain enamel and improved, low-firing frits for aluminum (next page) are becoming readily available. It should be pointed out that many of the new organic coatings obtain their improved properties from heat, which, of course, also adds to production problems.



Porcelain enamel on aluminum

The turquoise electric skillet by General Electric is aluminum with a coating of colored porcelain enamel. Recently developed porcelain enamels with low firing temperatures were the key to this application. Aluminum, depending on type, will melt at temperatures between 1100° and 1215° F, which obviously excludes the use or regular enamels with a firing range of 1550° to 1600° F. New frits that fire in the neighborhood of 980° F have made it possible to combine the design and selling advantages of durable color with a metal that offers inherent values of lightness, resistance to oxidation, and good heat distribution. The range of lightfast colors that can be applied to aluminum castings includes both full and pastel tones, and they will not fade under normal cooking and cleaning conditions. Porcelain also increases abrasion, scratch, and acid resistance.

KEY

Ratings
4+ outstanding
4 excellent
3 good
2 fair
1 poor

			COLOR RETENTION - on aging	COLOR RETENTION - elevated temp	COLOR RETENTION - exterior	GLOSS RETENTION	HARDNESS	FLEXIBILITY	EXTERIOR DURABILITY	ABRASION RESISTANCE	SANITARY PROPERTIES	ALKALI RESISTANCE	ACID RESISTANCE	DETERGENT RESISTANCE	SOLVENT RESISTANCE	GREASE RESISTANCE
PAINTS and PLASTICS	spray on	Air dry to 500°F	2	1	2	1	1	3-4	1	1	2	1	1	1	1	1
STUCCOS	trowelled on		3	1	3		2	2	4	3	1	3	1	4	4+	
DECORATIVE MARBLE	mason		3	1	3	3	2	1	3	2	2	3	1	4+	4+	3
PORTLAND CEMENT	mason		3	3	4			1	4	3	3	4	1	4+	4+	3
PORCELAIN ENAMEL	carpenter	1000° TO 3000° F	3	4	3	4	3	2	3	3	4	4	4	4+	4+	4+
BRIGHT GLAZES	tile setter		4+	4+	4+	4+	4	1	4+	4	4+	4	4+	4+	4+	4+
PLATE GLASS	glasier		4+	4+	4+	4+	4	1	4+	4	4+	4	4+	4+	4+	4+
MAT GLAZES	tile setter		4+	4+	4+	4+	4	1	4+	4	4+	4	4+	4+	4+	4+
CHINA	factory		4+	4+	4	4+	4	1	4+	4	4+	4	4+	4+	4+	4+
CERAMIC MOSAICS - quarry and brick	tile setter or brick layer		4+	4+	4+	4+	4+	1	4+	4+	4+	4	4+	4+	4+	4+

Color: inorganic materials

This chart shows graphically that high temperature is the key to the characteristics of durability and resistance to acids, abrasion, detergents, solvents, and grease obtained with inorganic materials. It can also be seen that ceramics cannot compare with plastics or paints as far as flexibility is concerned. The temperature ranges indicated are broad: some porcelain enamels, for instance, can be fired at temperatures below 1000°F.

In spite of the many difficulties involved in dealing with inorganic materials, the art and industry of ceramics is expanding rapidly and through its growth and development the constant cry for color and more color is being satisfied in more and more areas. The popularity and availability of certain colors is closely related; it would be impossible for purple bathtubs to be popular if no one could produce one. The figures below show the popularity of colors for bathroom fixtures for the past three years. They do not necessarily indicate the consumer's actual preference if he had an infinite choice, but rather show preferences for the colors that were actually available. Yellow, for instance, has gone up in popularity for all fixtures, but it still ranks low in overall popularity. The reason for this can be attributed to the fact that manufacturers have been slow in adding yellow to their lines. Pink is obviously at the head of the list, while ivory, very popular not too long ago, is currently on the way out. Perhaps the most significant figure is the percentage of colored fixtures (all colors) to total production.

COLORED SANITARY WARE SALES

	% of colored fixtures to total production	Pink Coral	Green	Blue	Gray	Tan	Yellow	Ivory	Red
1953	15.7	30.9	24.4	21.0	2.4	10.0	2.6	4.9	2.8
1954	18.8	31.2	21.1	18.8	8.8	10.1	4.0	4.2	1.8
1955	23.0	32.9	19.3	17.7	11.2	10.2	5.1	2.4	1.2

A change in the emphasis on the bathroom from a purely functional room to something of a showplace has undoubtedly stimulated the acceptance and eagerness for colored fixtures. According to the Crane Company, the important factor about the change in colors for plumbing fixtures has been in *shade* and *tone*. Blue and green fixtures are, by no means, new. But, in recent years their shades have been modified so they are more interesting, more pleasant, and easier to match with other elements. Bright red fixtures are an example of this trend toward pastel shades; few, if any, red fixtures are used in homes, but pink and coral lead the market.

Selecting a color line

On top of all the production and technical headaches that are involved in the production and application of inorganics, there is the eternal question of what colors to invest in. The Porcelain Enamel Corp., a Division of the Bettinger Corporation, went through the throes of such an operation three years ago when they decided to produce a line of ceramic-on-metal tile (photo, page 109). Their experience was probably not unique, but it serves as an example of what considerations must be taken into account. Some of the requirements of their color line (and this was before they had begun to think in terms of specific colors) were these: Their tile must match or harmonize with the established colors used by leading manufacturers of bathroom fixtures, towels, kitchen appliances, and so forth; the number of their colors must be restricted to a practical and economical range for production and dealer inventory reasons; there must be harmony within their own color line; and, of course, they must be able to produce the colors finally selected. The main point of the Bettinger problem is that more and more manufacturers faced with color problems are using a practical approach in their selection; they realize that a product, any product, regardless of its color must fit in as part of a complete color scheme.

Designing for inorganic coatings

The shape of a product to be coated with an inorganic can, and frequently does, determine the quality of the finish. When an inorganic coating is fired, it becomes fluid: not to the extent that it will actually run, but because the material has a certain coherence, it tends to "pull" on uneven surfaces as it cools. Thus, the thickness will tend to vary, particularly in places where there are sharp edges, and the resulting difference in density produces uneven coloration. Sometimes there will be a line where the base material shows through. This effect may be deliberate on artware, but is hardly desirable in commercial products. So, radii should be kept fairly large and rounded, ⅛ of an inch being generally accepted as the practical limit. Just as ceramic coatings tend to pull away from sharp edges, they will build up on very small inside radii and produces overintense color, another design feature to be avoided.

Though some of the basic design factors when inorganic coatings are involved may seem elementary, according to porcelain enamel and ceramic people, they are frequently the cause of disappointing results or increased costs. The method of applying the coating, for example, must be considered during design stages. If a product is to be sprayed, hand or automatic, all surfaces must be accessible to the spray. For dipping and flow-coating, provision must be made for proper draining of excess material.

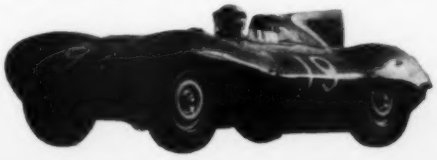
Crazing and wrinkling

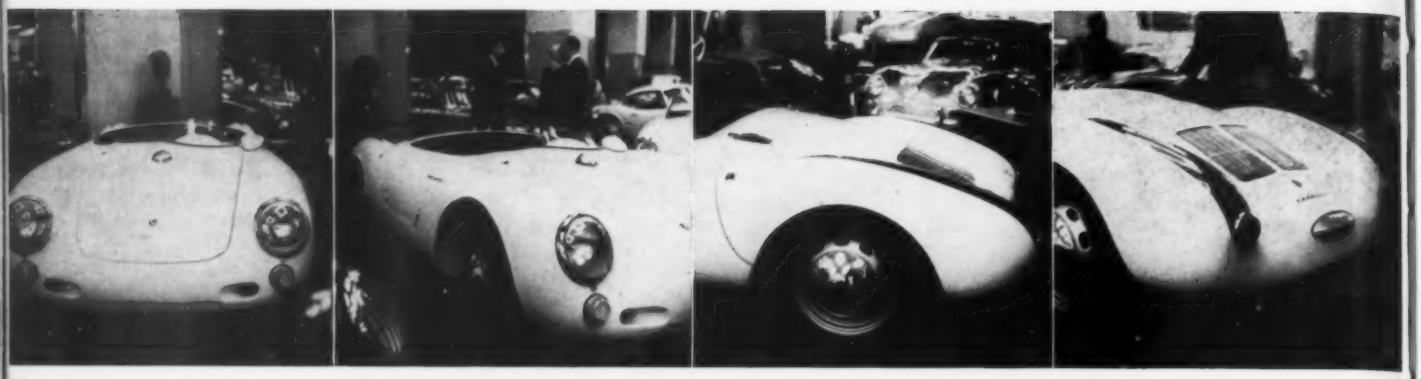
When it is realized that a ceramic body shrinks in the neighborhood of 12 per cent during firing, it is obvious that the glaze must also shrink. Crazing is a familiar sight and sometimes deliberate. But the manufacturer of commercial ceramics make every effort to avoid it. If, during firing, the glaze shrinks more than the body, it will be put under a strain and crazing results. Conversely, if the body shrinks more than the glaze, the finish will become wrinkled. Either effect is undesirable and is avoided by making sure that the glazing material has the same coefficient of expansion as the body — one more complication with inorganic colors.

There are many more special and highly technical problems found in applying inorganic colors which require the highly specialized knowledge of a ceramic artist in each individual case.

International Auto Show

The International Automobile Show held in New York's new Coliseum early in May was not exactly a traffic-stopper. Foreign cars just haven't the novelty they had at their first major showing here in 1952. Most of the cars were already on display in local showrooms, and it was plain that the exhibitors had little hope of stumbling on an unplumbed market for their foreign wares. Nevertheless, for anyone interested in design there were some fine new examples of the competent and imaginative work of Europe's best designers. The American section offered a rather frightening revelation of the wild fancies raised in the minds of our own automotive designers by thoughts of sport and luxury. In this European context it is all too plain that America's designers are not overly concerned with serious problems of form. A few highlights of the show are pictured above; some standouts are discussed on the following pages.—*d. a.*

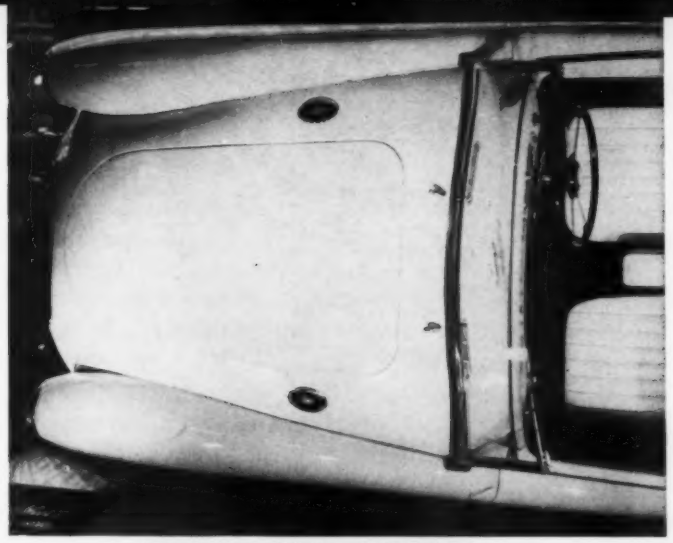




The real standout of the auto show, in many minds, was the new Porsche Spyder, which, though undeniably bloated, is not quite the porpoise that it appears in photos. Of all Detroit's design ideas, the bloated look has probably received the most criticism; Porsche's contours, exaggerated to new extremes, are successful because of their adherence to the concept: bloated in every direction, they are truly sculptural, too well modeled to be flabby. The billowing of the sides over the inset wheels is an apt expression of the concept, elaborated further by the generous outline of the wheel and cockpit openings. Details like headlights, intakes and necessary joints are so grandly disposed across the broad nose that the absence of chromework is hardly noticed. Rear-engine Porsche needs no front grille; Spyder also foregoes bumper.

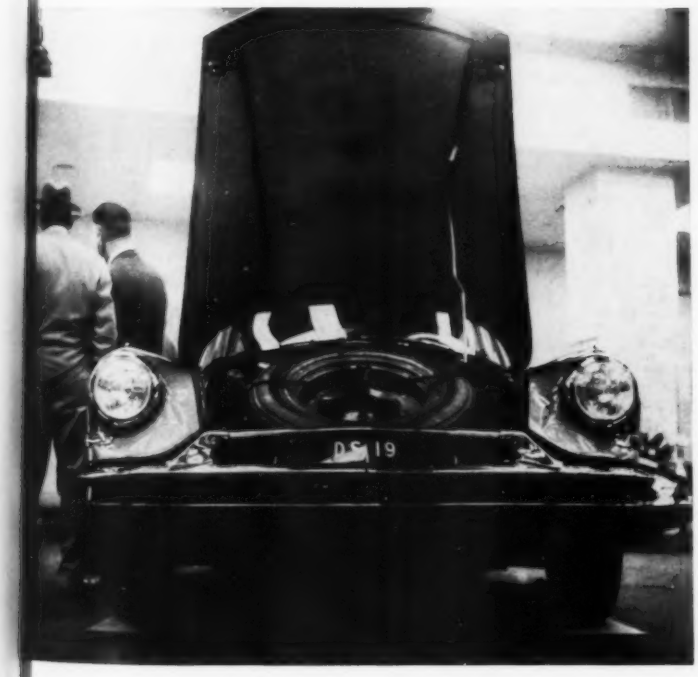
Closeups of six standouts

Among the more extreme of the sleekly Italian cars are the Ferraris, of which two new models are shown here. In its general proportions, the Ferrari is similar to some newer American cars, being long and low yet bountifully endowed with trunk space. Like many Italian cars it emphasizes a long nose and roof, and contrives to make the trunk look shorter by a long slope on the rear window. Ferraris are especially noteworthy for their detailing. The side modeling of the sedan (third from top) is an inversion of the American sweepspear: a line running along the lower body rises to the window at the rear fender. What makes the line attractive is the simple fact that it coincides with joints—which designers too often try to ignore out of existence. On the fender of the convertible there is a sharp, restrained version of the fanciful wing that has adorned some of our "experimental" cars. The broad simple grille and narrow wraparound bumper, attractively unentangled, are among the other distinguished details of both Ferraris.



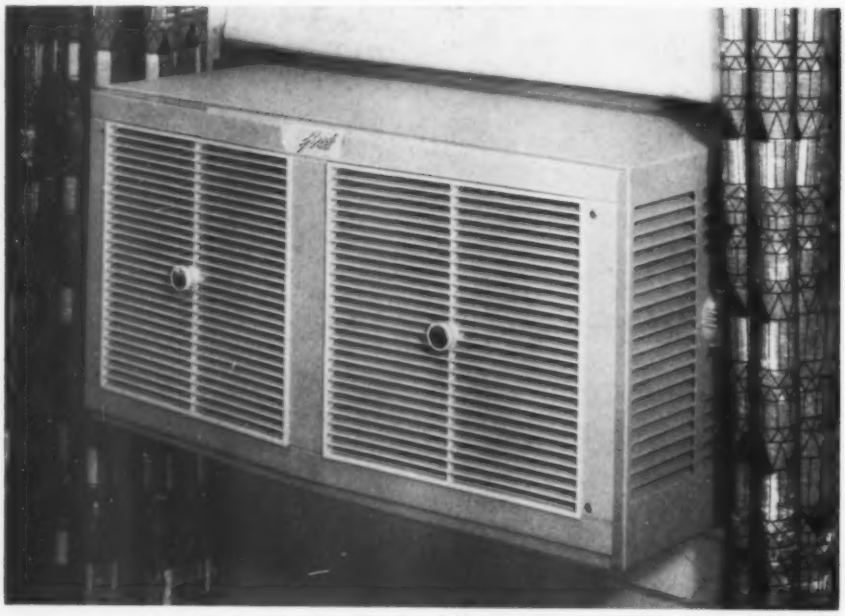
The low sculptural body of the Porsche is derived from the streamlining of the true racing car, an influence to be found, in a leaner version, in the rakish Austin Healy (far left). Addicts of the MG TC are no doubt saddened to find that the new model can be told from the Austin Healy only after a little study. Gone is the appealing old-fashioned aggregation of parts — now smoothed over in modern formed metal. Nevertheless, MG is more straightforward than many cars in this style. Its top view (left) points up a lesson in good design: the fenders, though melted into the body, are not simply speed lines but a shaped element of the design. Mercedes coupe (below) is one of the neatest in the race-car idiom. Uncompromisingly serious, detailed with the precision of a German instrument, its outline, though sporty, is neither rakish nor cute.

at the I.A.S. reveal the European designers' devotion to form and detail

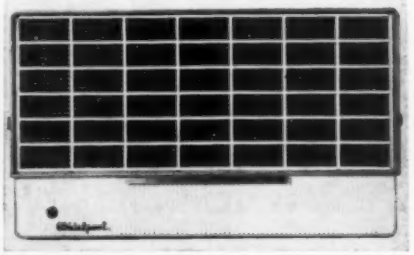


The new Citroen DS19 rear-engine sedan is a shocker, as flashy in its way as anything out of Detroit, but on second glance the suave molding, attenuated lines, and broad plain surfaces are clearly European. Though the total effect is too extreme to be pleasing, beneath the exaggeration the concept is interesting. The car springs forward from an abruptly tapered rear. The metal cover is a neat bit of sculpture, tightly drawn over widely-spaced wheels to obviate the boxy overhangs that disfigure most modern cars. The slightly curved windshield and big side windows slope nicely into the design. Joints are neat and the metal is cleverly cut to save stampings: there is no skirt beneath the door, for instance, and windows are finished with gaskets instead of metal strip. Among many engineering innovations, a central hydraulic system lifts entire body to choice of three driving heights, with top and bottom position for automatic wheel jacking. Tire is in front compartment, with intake on underside.

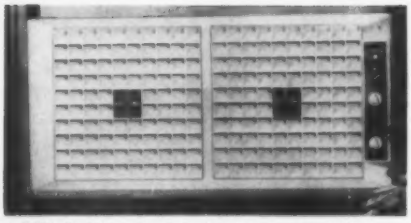
Air conditioners this year look trimmer, and in some cases slimmer, retreating from sight with more becoming modesty in appearance or size. Grille designs represent two approaches: some, like Whirlpool and Carrier, try for an overall unified effect, reducing as much as possible the expression of function in the facade. Others follow the necessary structural division—vertical or horizontal—determined by intake and outlet areas. The result is either quiet articulation (Westinghouse) or bold emphasis (Hotpoint) of vents and louvers. A long-sought goal has been partially overtaken: miniaturization, with GE and Mitchell leading the field. More imaginative handling of high-impact polystyrene lends many of the new machines greater quality appeal than before.



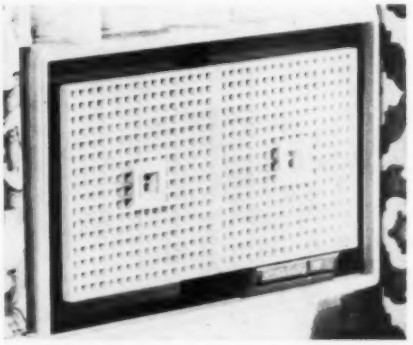
↑ **York** shows a ½ H.P. air conditioner in the DeLuxe line. Boxy, business like and frankly functional, it is specially suited to offices and professional premises. $189.95.



↑ **RCA Whirlpool** achieves a covered-up, unified look, with a wide grill interspersed with thin bands. Air flow is directed by means of a rotating disc **behind** the grille. Designed by Henry Dreyfuss, the custom model comes in mocha and ivory. From $259.50.

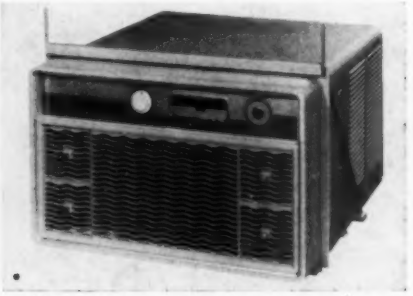


↑ **Mitchell's** miniaturized air conditioners, called "pancake" models, have been engineered down to a depth of 16¾ inches. Except for the visible control panel, the overall egg-crate grille is unobtrusive. Variably installed, "pancakes" retail from $379.95.

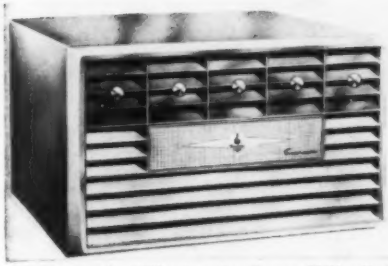


↑ **Crosley's** Power Miser uses up to 40% less current than standard models. The knobs repeating the form of the grille opening, and hidden controls, make this one of the neater models. $319.95.

↑ **Servel's** Eldorado model comes with six colored pushbutton controls. Only the conspicuous louver knobs break up the generally conservative aspect of the beige and tan casing. Retails at $339.95.

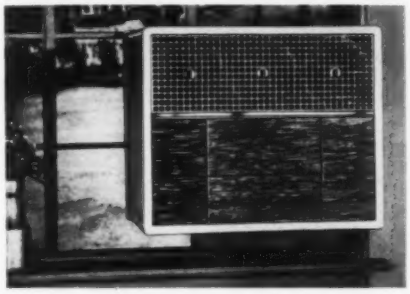


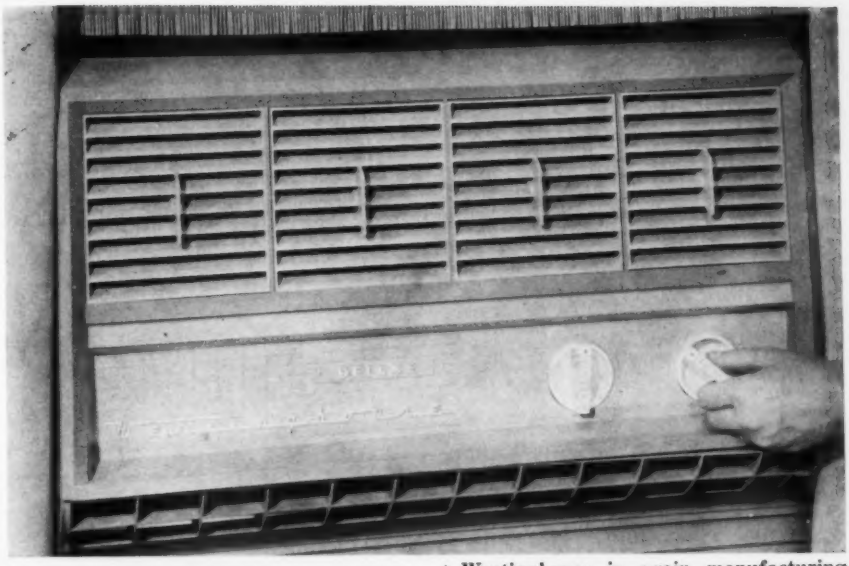
↑ **Gibson's** air conditioner in beige comes with a do-it-yourself mounting. Though it can be installed flush with the drapery line, the scalloped grille and ornamented panel do not help it go unnoticed. $299.95.



↑ **Emerson's** "Electronic Germ-Killer" destroys air-borne bacteria in addition to doing its job of cooling and ventilating. The overall conservative pattern of the machine is broken only by the centrally placed control panel. ¾ H.P. for $349.

↓ **GE's Thinline**, shown here in casement installation, is only 16½" deep. The decorated metal grille design is both unusual and pleasantly unobtrusive. From $299.

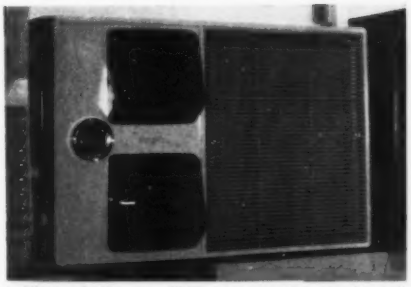




↑ **Westinghouse** is again manufacturing its own air conditioners. The Deluxe model comes in Alpine gray, with open grille below for intake. An accessory to this line and the Custom models is an electronic air cleaner. Deluxe series start at $259.95.

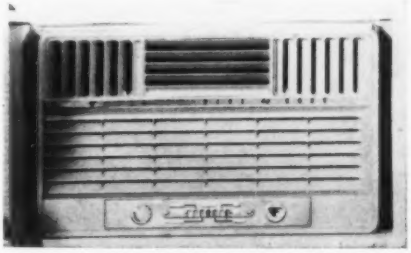
↑ **York's** Custom model, though bulky, follows the trend to hidden controls. It filters as well as warms (or cools) the air. In muted gray, the ¾ H.P. machine sells for $379.95.

↑ **Carrier's** International line, which has the intake located below instead of on the front, shows a minimum of detail and grille. Result a smart anonymous look, in soft gray. From $269.95.

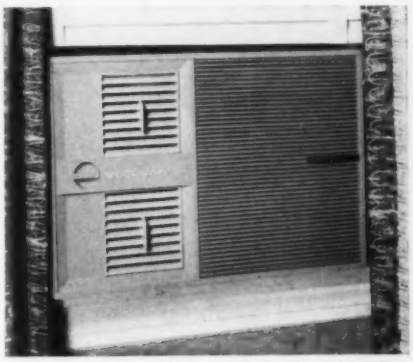


↑ **Hotpoint's** ¾ H.P. is neatly designed, although the projecting louvers are more than eye-catching. It features single dial control. $289.95.

↑ **Vornado's** Custom unit is neat, almost nautical in appearance, with porthole vents that have become a trademark. Though this design does not promote efficiency, the vents, in combination with the linear grille over the intake, combine to give it an elegant look. It features pushbutton controls, and can be mounted on a portable roll-away stand or installed normally. From $289.95.



↑ **Cory Corporation's** Freshn'd-Aire Constellation, a pushbutton appliance, comes with an accessory "Style-Gard" panel which covers the entire face of the machine when it is not in use. From $359.95 to $499.95.



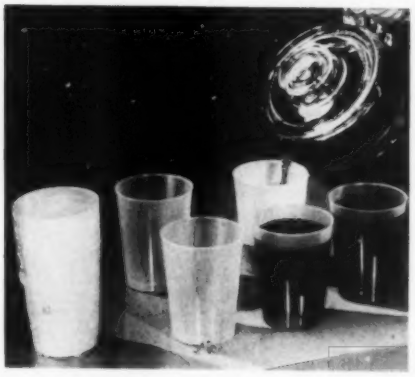
↑ **Westinghouse** shows a refined and understated model. Pencil-slim louvers over the intake of the Special RW "Seventy-Five" give it a clearly architectural relation to its surroundings. In Alpine gray, with single dial control. $274.95.

Housewares: a post-script to our April Review confirms the increasing popularity of plastics, portability, and disposability.

↑ **Plas-Tex Corporation's** polyethylene garbage can is light in weight, rust proof, completely washable. Choice of colors: red, yellow or green. Capacity: 10 gals. $7.98.

↑ **Jack Keefe Mfg. Co.'s** traveling accessory, the Koffee-kit will heat four cups of water or milk. The aluminum pot works on AC or DC, will store two plastic cups and spoons, and 2 oz. jar of instant coffee. Lid, handle and base are black phenolic. With zipper case and cord. $7.95.

↑ **Chemex Corporation's** newsworthy Newsbar will hold, depending on your preferences, breakfast or cocktails (with five trays worth of ice in the moat), a large daily at a 30° angle, a double-spread tabloid at 60°. Molded in one piece from U. S. Rubber Royalite, in light blue. $15.00.



↑ **Crown Plastic Cup Co.** of Fort Worth, Texas will bring disposable plastic cups to the consumer market this summer. Molded out of Monsanto's Lustrex styrene, "Crown-cups" hold up to 9 oz. In red, green, yellow, pink and white. Six for 17 cents.

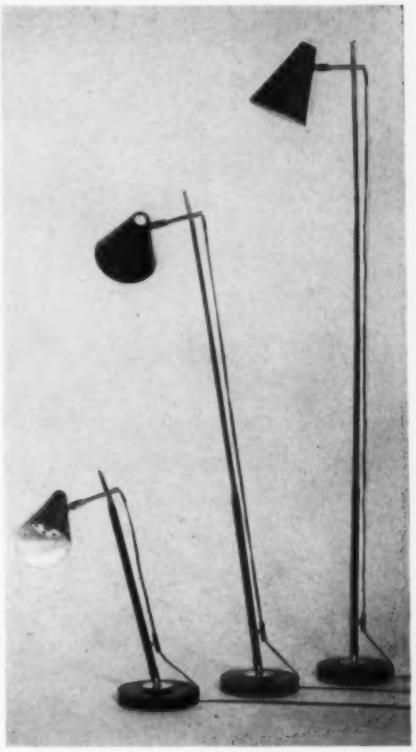
↑ **Plastics Mfg. Co.** of Dallas introduces two-tone Texas Ware, molded in melamine by a new process whereby resins of two colors flow in the mold and are fused. The interior color is generally a lighter variant of the exterior, or white. 16 pc. starter set for $17.95.

← **Landers, Frary and Clark** asked Carl Sundberg to redesign the Universal Coffeematic for 1956. The 10-cup chrome model shows the new non-drip spout, base, heat-guard handle, and crown-shaped top. Standard features of the Coffeematic: cold water pump, Redi-lite, and flavor selector. $29.95. Eight cup model is $24.95.

Lighting: New developments aim for better light and handsomer fixtures in usual applications; in two cases they are sportily specialized.

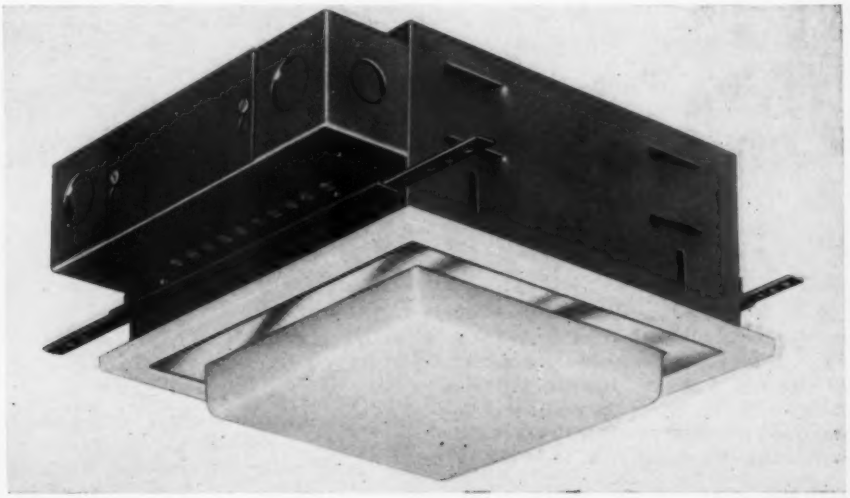
↑ **Lam Workshop** makes a bid for the bridge-players' market with a Bridge-Shade-Diffuser combination. The diffuser snaps in to cover entire bottom of shade. Result: no shadows. Shade is molded in fluted off-white high-impact Styron. 14" diam. $6.95.

↓ **Lightolier's** black and white striped lawn parasol is a smart lighting accessory for driveways and pools. Red-capped, it is made of rust-proof aluminum, and equipped with 12' of molded rubber cord. Designed by Maurizio Tempestini. Height 28". $15.00.

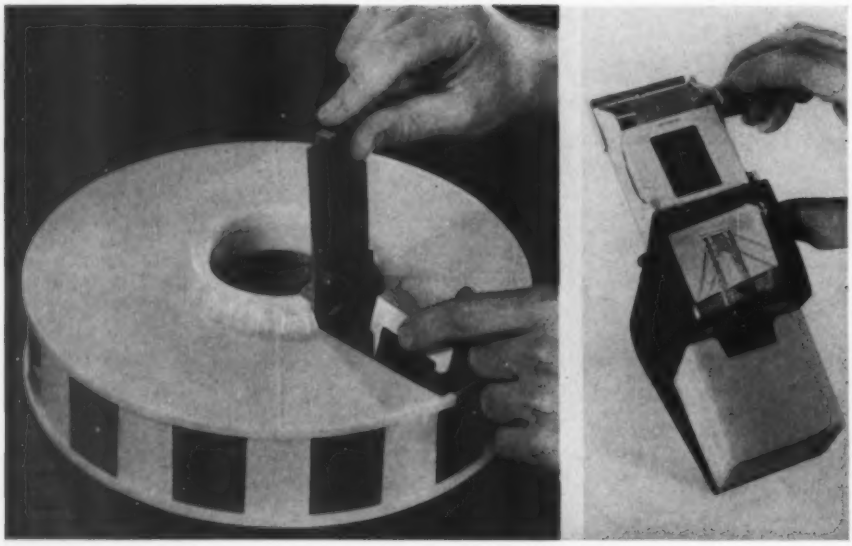


↑ **O-Luce** of Milan sends us this versatile telescopic lamp via Altamira of New York. The shade is enameled metal, (black or white), the 3-section rod is brass, the base marble. It has swivel joints at base and neck of lamp. 60" high when extended, 22" when depressed. $75.

↓ **Litecraft's** pre-wired recessed incandescent downlight is 78% efficient, with the result that fewer units are needed to light a given area. 60 and 100 watt models. $16.55.



↓ **Timely Lighting Products** is showing a complete line of lighting fixtures designed by Leon Gordon Miller. The lamp-bearing wheel below, of white enameled steel, is 40 inches in diameter. Spokes, rods and trim are brass. $625.00.



↑ **Zadiix Products Co.** molds high-impact Bakelite styrene into a pair of products for the 35mm. fan. The storage case, 10¾" in diameter, will hold 300 slides in 12 labeled compartments of 25 each. A lifting bar built into the rotating top raises the contents of the desired compartment. Ivory finished, with compartments in red, green, or black. $5.95. The self-illuminating viewer, 5" high is operated by a spring trigger which pulls new slide out of feeder, pushes old one into storage bin. In black and white, it is lit by two flashlight batteries. $9.95. The combination sells for $13.50.

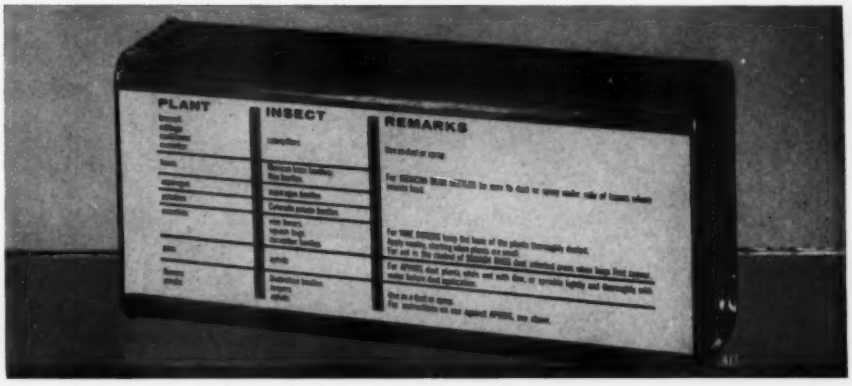
↑ **Clemson Bros.** introduce a new Star hack saw frame designed for use in close quarters. The easy-to-grip handle of Eastman Tenite butyrate is molded directly on the steel frame, which will adjust to either 10" or 12" standard blades. In either red or green, the butyrate handle is highly resistant to oil and moisture. $3.25.

↑ **Waldes Kohinoor Inc.** designed the Hook-Zip to eliminate the bother and cost of sewing on accessory fasteners to compensate for side pull on zippers. Identical inter-engaging hooks lie flat on the tape above the chain and assure alignment. Hooks match chain finish. Wholesale only. $7.54 per 100 for 7" size.

↑ **Lawnscape Corp.'s** all-purpose machine would, Nature permitting, plant and manicure the greensward in one fell operation. Basic units are a 24" dual rotary-type mower, aerator set and water-filled roller. Operating in reverse and turning on a bare 3 ft. radius, Lawnscaper distributes fertilzer, seed, or insecticide from one or all of the four polyethylene-lined fibre drums on the trailer. Distribution rate is controlled by direct reading gauges in the driver's seat. Not for sale, Lawnscaper is loaned to dealers on franchise.

↑ **Sears, Roebuck and Co.** displays its Craftsman power tool attachments in clear, practical boxes sporting the company colors (blue, yellow, black and white) and photographs of the contents. Designed by Fred M. Gore, Dallas.

↓ **Niagara Chemicals** shows a new line of pest-killer packages styled by Design Associates. To simplify use and identification on hardware shelves, they designed a new logotype, cut product names, charted instructions, and coded basic powder types by package color. Square canister replaces round because it is easier to read, display, and pack in bulk.

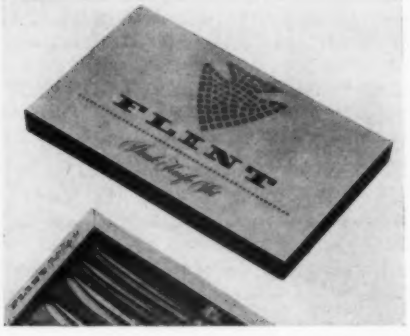


↑ **A. Reich & Sons** of Kansas City, Mo. ship select fruit in a gay printed and die-cut carton designed by Hinde & Dauch. The two-piece Prepak has double thick corrugated walls, die-cut handles and self-locking assembly. Bottom is gold and black, top is red and black printed on white.

↑ **Eveready** Photoflash packaging and display boxes cheerfully advertise the merchandise with a bright new symbol. The red, blue and white cartons were redesigned by Robert G. Neubauer, Inc.

↑ **Brace Pharmaceutical** packages its new drug as discreetly as possible without having it shrink from sight. Quiet motif and lettering, subdued colors (pink, lavender, white) were chosen to characterize the nature of the product. Counter appeal is gained by use of contrasting black of display box, and for those mystified by the subtlety of it all, free explanatory leaflets are provided. Styled by Design Associates.

↑ **Rush Eraser Company** identifies its products with self-explanatory packaging designed by Homer Martin Associates. A new trademark and the colors orange and black are consistently used for quick recognition of the line.



↑ **Ekco Products** packages steak knives in a new gold, black, and white box which aims at quality through bold simplicity. Ingredients: strong lettering, neat proportions, and decorative use of the arrowhead trademark.

1956 BLOCKSOM & CO.

UPHOLSTERED FURNITURE DESIGN

$3,5

OBJECTIVES OF THIS CONTEST. Today, more than ever before, the great middle-class market is design conscious. It is, therefore, Blocksom's objective to stimulate and encourage both designers and manufacturers into producing well-designed, functional, well-built furniture in the moderate price range to answer the needs of this ever growing market. By sponsoring this contest, Blocksom will draw attention to the great number of good designs and talented designers available to the manufacturer. Similarly, it will help bring the public the kind of furniture they want—at prices they can afford.

WHO IS ELIGIBLE? Any professional designer, contract designer, designer employed by furniture manufacturing companies, or furniture manufacturers who do their own designing, living in the United States or Canada, may submit ONE design (drawings, construction details and specifications) for a sofa *and* matching upholstered chair.

FULL MERCHANDISING RIGHTS GRANTED. Blocksom & Company, manufacturers of *Paratex* rubberized curled hair, will grant full merchandising rights to award winners—designs may be marketed as BLOCKSOM DESIGN CONTEST AWARD WINNERS.

JUDGING OF ENTRIES. Awards *will be given* to the best designs entered in the contest. Basis for judging will be originality, and practicality of production at moderate prices. Judging will be carried out by a committee consisting of prominent authorities in the fields of furniture merchandising and design. Winners will be announced at the Chicago Winter Furniture Market in January, 1957.

HOW TO ENTER THE BLOCKSOM DESIGN CONTEST. Send the contest coupon no later than September 1st for your official entry blank, specifications for designs, and complete instructions on preparing and submitting your design. *Completed entries* must be postmarked no later than November 1st, 1956. There is *no entry fee.*

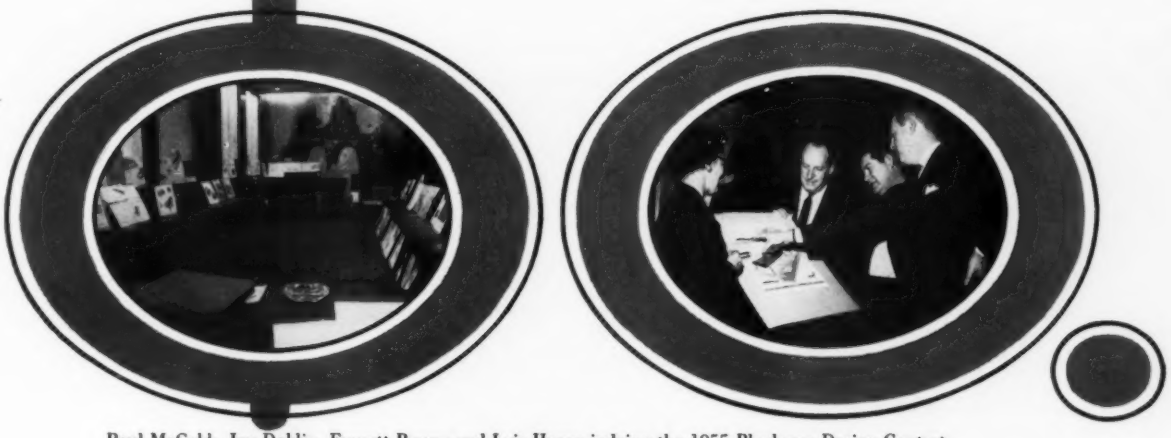
Special Note to Furniture Designers. *During the contest period, you will doubtless design a number of new pieces for one or more of your clients. Select the one you think best and send it as your entry. It is eligible whether or not your client decides to produce it.*

BLOCKSOM & COMPANY

Manufacturers of Paratex rubberized curled hair

Main Offices and Plant: Michigan City, Indiana • Branch Plants: Etowah, Tennessee, and Los Angeles, California

CONTEST FOR PROFESSIONAL DESIGNERS



Paul McCobb, Jay Doblin, Everett Brown and Lois Hagen judging the 1955 Blocksom Design Contest.

CASH PRIZES

$2000. FIRST PRIZE

$1000. SECOND PRIZE

$500. THIRD PRIZE

PLUS EXHIBITION OF WINNING ENTRIES AND POTENTIAL SALE TO LEADING MANUFACTURERS

In addition to the cash awards, winning entries will be seen by thousands at the Chicago Winter Furniture Market in January, 1957. Any manufacturer interested in buying these designs will be referred to the designer. In the case of contract designers, designs will be turned over to their company if requested by contestants.

In all cases, designer retains the sales rights for his entry.

CONTEST CLOSES NOVEMBER 1, 1956

Mail this coupon immediately for complete information and instructions—Give yourself sufficient time to prepare your entry.

Design Contest Board
Blocksom & Company, Dept. IND, Michigan City, Ind.

Gentlemen: Please send me complete information and entry blank for the Blocksom Design Contest.

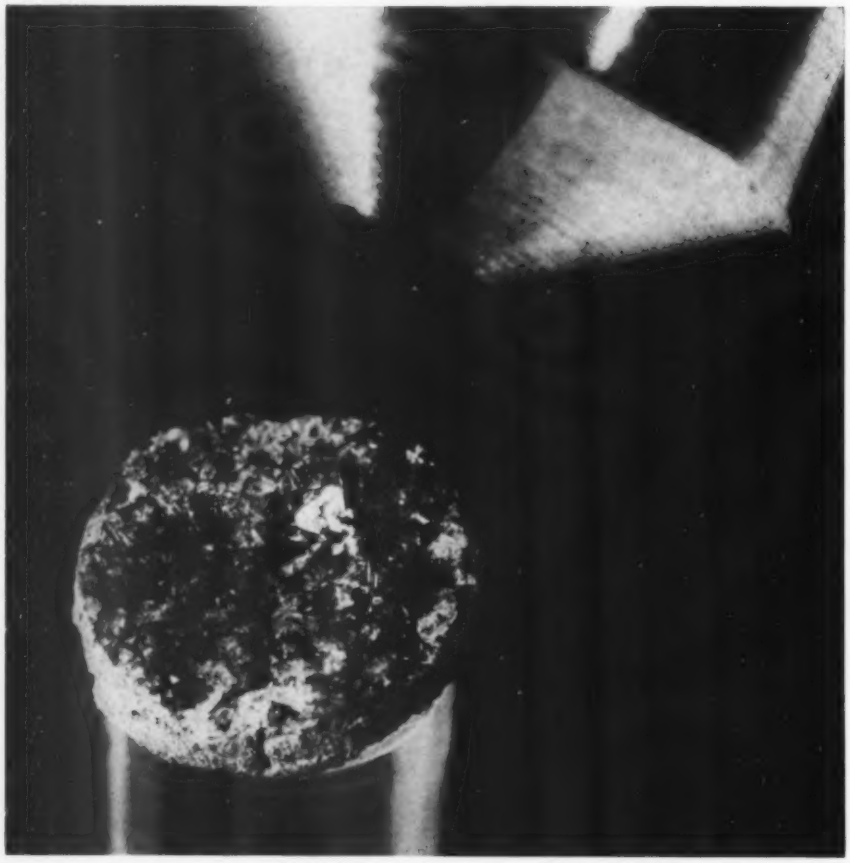
NAME_____

COMPANY (IF ANY)_____

ADDRESS_____

CITY_____ ZONE___ STATE_____

TECHNICS *a catalog of new products, materials, processes and finishes*



Quantity production of synthetic diamonds predicted by General Electric
Cluster of earliest man-made diamonds presented to Smithsonian Institution

Man-made diamonds have been in the news since they were first produced successfully in General Electric's laboratories in 1955. A recent announcement by GE, indicating that they are on the threshold of being able to make the synthetic stones in quantity and at a marketable price, changes them from a laboratory curiosity to a practical substitute for a very expensive, but necessary, industrial tool.

Every year the United States buys about 90 per cent of the 2½ tons of industrial diamonds mined in Africa and South America, paying more than $50,000,000 for them. The development of practical synthetic diamonds will be both an economy for industry and insurance against the possibility of a shortage.

General Electric is not concerned with the manufacture of diamonds for purposes of adornment or of gem size; rather they are attempting to make them widely available to industry as cutting and grinding tools as harder and stronger materials have been developed to withstand higher speeds, stress, temperature, and performance.

It is reported that extensive tests prove synthetic diamonds equally good and perhaps superior to the natural product for such industrial uses. The actual method of man-making diamonds has been placed on the list of defense secrets by the government: the only known fact is that they are the result of the ability to maintain high pressures and high temperatures on carbon for long periods of time; 2,700,000 pounds per square inch and 5,000° F.
Manufacturer: Carboloy Department, General Electric Company, Detroit 32, Michigan.

Better brass coating discovered

New formula for brass plating found to give brighter finish faster

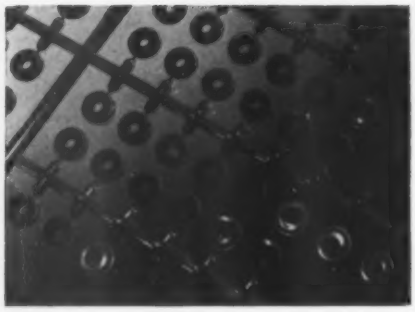
Door knobs, costume jewelry, or other products using brass coatings for their attractive appearance, will stay brighter longer because of a new method of brass plating developed by a graduate student at Michigan State University, Phillip O. Sawyer, working on a project sponsored by the Keeler Brass Company of Grand Rapids, Michigan.

Manufacturers using brass plate often have trouble when coating steel or zinc-base die castings. To make brass plating thick takes a lengthy processing time, and the dull brass deposit must be buffed, increasing production costs. A thin coating of brass is shiny, but does not wear well. Commonly used solutions rarely produce shiny brass plate in thicknesses greater than 25 millionths of an inch. Sawyer found that when sodium orthoaminobenzoate and sodium phenylxanthate were added to the plating bath deposits would remain bright in thicknesses up to about 1,000 millionths of an inch and reduce plating time by a tenth.
Source: Michigan State University, Lansing, Michigan.

Fishing reel for coil winding

New method of coiling wire for electrical windings saves time and money

Borrowing a technique from fishermen, Minneapolis-Honeywell is converting its coil-winding department from casting to spinning reel methods. Wire is coiled in loops in special 100-pound pails, much like a spinning reel, rather than wound on spools. The new method will decrease waste, increase production, and give savings in handling and shipping. Estimated savings for the company are $15,000 annually.
Manufacturer: Minneapolis - Honeywell Regulator Company, Minneapolis, Minnesota.



300 parts molded at a time

Tenite battery washers made in large quantities using injection molding

A combination of the flow characteristics of Eastman's Tenite polyethylene and rapid injection molding make possible multiple molding of three hundred battery washers at a time, or 30,000 an hour. The washers, used as seals in pencil-size batteries made by Ray-O-Vac Company of Madison, Wisconsin, are good insulators and will not break or corrode. In production at Evans-Zeier Plastic Company, the small pieces are found to strip easily from the overall casting when it comes from the mold.

Manufacturer: Evans-Zeier Plastic Company, Route 1, Madison 4, Wisconsin.

Epoxy resins now available in tape

Two new epoxy resin tapes have been developed for easy insulation

Epoxy resins, which have gained wide acceptance as electrical insulation because of their high dielectric strength, high resistivity, mechanical strength, chemical resistance, adhesion to glass, metals, and other materials, and their resistance to thermal degradation, have been made into

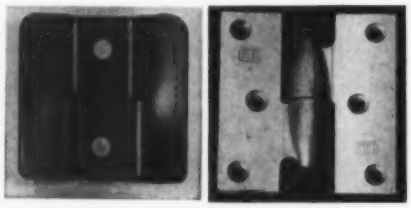
handy tape form by the Minnesota Mining and Manufacturing Company. "Scotchcast" resin tapes are being produced in two forms; a glass cloth and a non-woven polyester mat, both impregnated with a thermosetting epoxy resin. They are designed for Class B electrical insulation and find use in coils or conductors, insulating field-windings, torroidal windings, forming channels, anchoring transformer leads, and as outer covers, inter-layer, and inter-winding insulation in transformers. Type X-1045, the polyester mat tape, has a dielectric strength in excess of 1000 volts per mil of thickness and a volume resistivity of 10^{15} ohms at 96% R.H. Type X-1035, glass cloth, has a dielectric strength of 1000 volts per mil and a volume resistance of 10^{12} ohms at 96% R.H.

Manufacturer: Minnesota Mining and Manufacturing Company, 900 Faquier Street, St. Paul 6, Minnesota.

Two new handy hardware products

A hinge and a hanging device are simple and serve their purposes effectively

Simplicity of design and operation are the major features of the two new devices illustrated below. On the left is a new securing mount for attaching objects of all weights to any kind of surface. It is a two-piece, interlocking unit that permits secure hanging ⅛ of an inch from surfaces. Made in two pieces of the same shape and dimension, the Flushmount, as it is known, is used by attaching one piece to the wall or surface and the other to the object to be mounted. The two parts are simply interlocked for hanging. Flushmounts are being produced by the Harvest Manufacturing Company in two dimensions, 1" x 1" and 1½" x 1¾", and in a variety of models for handling various types of hanging problems.



The knuckle hinge on the right, known as the Soss Olive Butt, has the attractive appearance of an olive knuckle hinge, but is as easy to install as a butt hinge. A door mounted on these hinges can be removed when it is open without removing any pins or screws, but when the door is closed, it cannot be removed, a protection against vandalism. A fixed hinge pin rotates within a heavy-duty nylon bushing which eliminates oiling and provides silent operation. Right or left hand hinges are available with various finishes for either 1⅜" or 1¾" interior and exterior doors.

Manufacturers: Harvest House Manufacturing Company, 453 South Robertson Blvd., Beverly Hills, California.

Soss Manufacturing Company, P.O. Box 38, Harper Station, Detroit 13, Michigan.

Plastic panes provide protection

Ultraviolet light cannot penetrate new colored reinforced plastic window panes

The harmful effects of ultraviolet light are being defeated by a new type of window pane, made of plastic reinforced glass fibers and special ingredients that filter sunlight in much the same manner as suntan oil prevents ultraviolet light from burning skin. Designed for use in build-

ings where industries store materials that can be harmed by ultraviolet light, the plastic panes are molded by the Reinforced Plastic Division of the Firestone Tire and Rubber Company. Firestone uses the windows to protect stores carrying their own tires and claim that they have potential uses in other factories to protect textiles, plastics, chemicals, and other materials that have enmity to sunlight.

Made in many light-fast colors that are molded into the plastic sheets, it is reported that the windows permit up to 50 per cent of visible light to pass through them—more than ordinary painted glass currently in use for the same protective purpose. They are installed by the usual glazier's methods, are almost unbreakable (a hard blow with a hammer leaves a mark, but will not shatter them), and they are easier to clean than ordinary glass. They are more expensive than plate glass, but offer savings in maintenance and replacement costs.

Manufacturer: The Firestone Tire and Rubber Company, Akron, Ohio.

New automatic molding machine

This 2-ounce automatic injection molding machine is the first to use vertical operation. F. J. Stokes Corp., Philadelphia.

Cold air can be used to heat buildings

Compound compression is the key to new heat pump that uses below freezing air for heat developed by York

For over a century, scientists have been trying to develop an economical and practical heat pump that will use air to cool as well as heat. One of the primary difficulties has been the inability to utilize outside air at temperatures much below freezing. The York Company, however, feels that they have beaten this problem, and have introduced a heat pump that will heat a building using below freezing air, rather than fuel as a heat source. The York heat pump operates on the principle of compound compression which has been used for years to create low temperatures for ice cream plants and the frozen food industry. The compound compression principle removes heat from air, even when it is below freezing temperatures, by cooling it to still lower temperatures. To do this, outside air is passed over specially-designed coils, the heat is removed by a refrigerant, and is then elevated to a usable temperature by a compound compression cycle. This heat can be used to produce hot water which can be circulated in a regular heating system, or to heat air for forced warm air heating. During warm weather, the system simply extracts heat to chill water or air, which is then circulated to cool a building.

In the past, single stage compression systems have been used in temperate climates to heat and cool buildings, but when the temperature of the air goes below freezing, they need expensive supplementary electric resistance heating. The compound compression system in the York equipment lowers compression ratios and increases output during very cold weather, without using supplementary heating systems. During warm weather, the York heat pump automatically switches from compound to single compression.

The York system is in use or being installed in two new buildings; the Heironimus Department Store in Roanoke, Virginia, and in the Ballinger Building in Philadelphia. Since the size of unit is governed by the size of compressor and area to be heated, York officials say that their heat pump system is feasible for small home installations and they anticipate production of such a model sometime in 1957. The significance of the heat pump system is that only electricity is needed for operation. By using air as a direct heat source, rather than coal, oil, or any other fuel, direct fuel costs are saved and the drain on some natural resources is eased. There is, of course, the possibility of using atomic energy as the electrical power source.

Manufacturer: The York Corporation, York, Pennsylvania.

Plastisol thickness tripled by new formulation

Vinyl can be sprayed and provide thick, tough film that is resistant to corrosion and abrasion

A new plastisol that can be sprayed at thicknesses three times greater than previously possible has been developed by the Metal and Thermite Corporation. The new coating, known as "Unichrome Super 5300," permits film thicknesses of 50 to 60 mils to be applied in one coat, giving protection to tanks, ducts, and other large equipment. The compound is based on vinyl resins and is resistant to the corrosive action of strong acids, concentrated caustic, salt solutions, and other corrosive materials. It is claimed that Unichrome Super 5300 gives a satin-smooth, tough, flexible finish which absorbs impact without chipping, withstands abrasion, and has desirable acoustical and electrical insulating properties. Gun application of the full solids content of vinyl plastisol is possible without a diluent and, as it is sprayed, there are no seams or joints where corrosives might penetrate.

Manufacturer: Metal and Thermite Corporation, Electroplating and Coatings Division, 100 Park Avenue, N. Y. C.

Manufacturers' Literature

Copper Alloys. The Beryllium Corporation, Reading, Pa. 8 pp. Condensed information on both standard and special methods and procedures used to heat treat beryllium copper wrought and casting alloys; complete tables of physical and engineering properties of various alloys, with data on melting, furnaces and annealing.

Digital Measuring Instruments. Non-Linear Systems, Inc., Del Mar, California, 27 pp. ill. Information on digital voltmeters, digital ohmmeters, digital readouts, data reduction systems, peak reader systems, digital recording systems, AC-DC converters and binary decimal converters, with section on principles and applications of the digital voltmeter.

Ferromagnetic Plastic Material. Polypenco, Inc., Reading, Pa. 24 pp. New set of bulletins describing Ferrotron ferromagnetic plastic material, both in flexible rod and tape and rigid powdered iron cores, with graphs on physical and magnetic properties.

Magnetic Tapes and Films. Minnesota Mining and Manufacturing Co., Dept. A6-114, St. Paul, Minnesota. 12 pp. Information on physical properties and magnetic properties for three acetate base tapes, three polyester base tapes, three oxides; and six magnetic films, with oxide coatings.

Metal Finishing Standards. Allen Manufacturing Co., Hartford 2, Connecticut. 12 pp. Facts on metal finishing with a discussion of purposes for various types, thread fits, formulas for calculating thread sizes before plating, quality requirements, etc.; section on surface treatments, with corrosion resistance table and outline of test methods.

Metal Stampings. Dayton Rogers Manufacturing Co., Minneapolis 7, Minnesota 24 pp., ill. Shows the design and construction of dies used for short-run operations.

Micro-Miniature Metal-Ceramic Receiving Tubes. General Electric, Tube Department, Schenectady 5, New York 20 pp., ill. Design and construction innovations of the micro-miniature metal-ceramic receiving tube are described, with application data, operating characteristics and construction features.

Molded Fiber Glass. Molded Fiber Glass Co., Ashtabula, Ohio. 16 pp. ill. Guide for designers interested in the application of molded fiber glass to specific products; describes molding process and various mechanical, electrical and chemical properties, also fabricating operations.

Shingles and Shakes. Creo-Dipt Co. Inc., 986 Tonawanda, New York. Data sheets and color charts with "Optional Kolor Plan" describing applications of red cedar shingles, shakes and available colors.

Circuit Selectors and Stepping Relays. G. H. Leland Inc., 123 Webster Street, Dayton, Ohio. 11 pp., ill. Engineering data on Ledex Relays, control circuits, circuit wafer switches and their applications.

Wirebound Boxes and Crates. Wirebound Box Manufacturers' Association, 327 S. LaSalle St., Chicago 4, Illinois. 8 pp., ill. Illustrations of materials, outdoor and indoor stacking and warehouse applications of wirebound boxes and crates.

Wire Thread Inserts. Heli-Coil Corporation, Danbury, Conn. 22 pp., ill. Design manual and catalogue of wire thread inserts to obtain strong stainless steel threads in the light metals, plastics, wood, iron and steel, with section on inserts for pipe threads.

Zinc Base Die Casting Alloys. Henning Bros. & Smith, Inc., 91-113 Scott Ave. at Randolph St., Brooklyn, N. Y. 23 pp. ill. Reference booklet on Zamak (zinc base) die casting alloys, describing mechanical and chemical requirements, also sand castings, zinc alloy stamping dies, No. 2 die metal, antimonial lead punches, zinc alloys in slush and permanent mold castings, lead alloys, with charts on aluminum die casting alloys.

Index to Advertisers in This Issue

Classified

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Positions Wanted

INDUSTRIAL DESIGNER—*Versatile, with creative ability in unusual field of product design. Thorough knowledge of industrial materials and processes. Successful experience in styling, engineering and production. Desires position with expanding, diversified manufacturer. Box ID-82,* INDUSTRIAL DESIGN, *18 E. 50th St., N. Y. 22.*

MODEL MAKER—*Scale and full size—metal, wood and plastics—desires position with industrial design company. Experience 20 years. Box ID-85,* INDUSTRIAL DESIGN, *18 E. 50th St., N. Y. 22.*

INDUSTRIAL DESIGNER—*Young capable with thorough knowledge of materials and processes. Experienced in product styling, exhibit and display work. Desires permanent position with small appliance manufacturer or industrial design office. Will locate north, west or north east. Box ID-81,* INDUSTRIAL DESIGN, *18 E. 50th St., N. Y. 22.*

PRODUCT ENGINEER—*Professional service to Industrial Designers on product and structural projects: electrical, mechanical elements, manufacturing processes, sources and specifications of components and materials. One critical detail, or complete functional design. Technical liaison with clients. Seasoned experience in consumer and industrial products, familiar with industrial design profession and problems. Project or continuing retainer basis. Arnold E. Rudahl, 527 E. Putnam Ave., Greenwich, Conn.*

Help Wanted

ARCHITECTURAL AND DESIGN PERSONNEL AGENCY—MURIEL FEDER—*A personalized placement service for top level architects, designers, engineers, draftsmen, interior decorators, and home furnishing personnel. Selective contacts arranged in a confidential and professional manner. Interviews by appointment. 58 Park Ave., New York. MU 3-2523.*

HELEN HUTCHINS PERSONNEL AGENCY—*Helen Hutchins, Licensee—Joan Curry, Associate. Specialist Industrial, Architectural, Interior Design; Decorative Arts, Trades, Home Furnishings. Helen Hutchins' long association with a leading industrial design organization insures intelligent and individualized screening of all types of personnel for industrial designers. 767 Lexington Ave., New York 21, N. Y. TE 8-3070. Interviews by appointment.*

PRODUCT DESIGNER—*For position in a well established California industrial design office. Man or woman with several years experience in a design office. Prefer experience in sketching and rendering, selecting materials, mechanical layout and detailing, and knowledge of manufacturing processes. All inquiries will be answered and held in confidence. Box ID-83,* INDUSTRIAL DESIGN, *18 E. 50th St., N. Y. 22.*

PACKAGE DESIGNER—*For position in a well established California industrial design office. Man or woman with several years experience with package design firm. Preferred experience should extend from preliminary roughs to finished art work. All inquires answered and held in confidence. Box ID-84,* INDUSTRIAL DESIGN, *18 E. 50th St., N. Y. 22.*

Advertisements

IN ADVANCE. BOX ADDRESS COUNTS FIVE WORDS.

PRODUCT STYLING SALES EXECUTIVE—*One of the largest industrial design organizations in New York has an opening for a sales executive to contact nationally known manufacturers regarding product styling. He should have the following background and characteristics: Substantial experience in marketing, advertising, and merchandising. Knowledge of materials and manufacturing techniques and ability to use this experience effectively. Creative, imaginative and inventive, yet practical. Able to verbalize ideas rapidly whether oral or written. Ability to understand motives of others and to size up complicated human relations situations. Enjoy contact work and find persuading others rewarding. Able to work with sustained concentration and to pay proper attention to both details and the overall aspects of the job. An effective organizer and administrator able to grow into a position of top level responsibility and decision making. Our staff knows of this ad. Replies will be held in strict confidence. Box ID-86,* INDUSTRIAL DESIGN, *18 E. 50th St., N. Y. 22.*

INDUSTRIAL DESIGNER *needed in fast-growing industrial design firm in Southern California. Firm designs a great variety of products. Opportunity for rapid advancement for person willing and able to assume responsibility. Minimum of three years' experience, with some engineering background. Please air mail full particulars as to age, education, experience, salary expected, and work samples if possible. P. O. Box 4140, Pasadena, California.*

INDUSTRIAL DESIGNER (EXECUTIVE)—*If you are a talented creative designer on diversified product development seeking an opportunity to further broaden your experience and/or improve your position, contact in confidence:* E. BURTON BENJAMIN ASSOCIATES, *104 South Michigan Avenue, Chicago 3, Illinois. DEarborn 2-0246.*

DESIGNER FOR PLASTICS

Industrial Designer to join design group staff developing new uses for Plexiglas Plastics. Unusual variety of work, including automotive, aircraft, appliance, industrial & scientific applications of plastics. Attractive new building in Delaware Valley near Bristol, Pa.

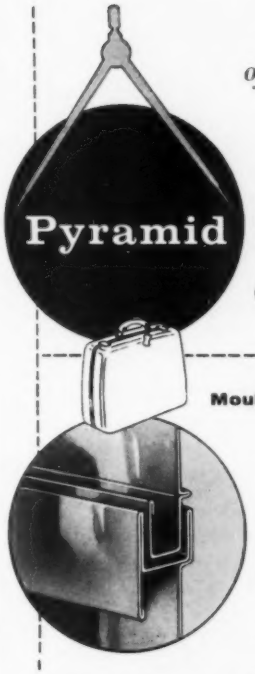
Permanent position for a 1956 graduate or a man with up to 5 years' experience. May involve some travel for consultation on customer problems.

Full details of experience, training, educational background and salary requirements should be included in your letter, which will, of course, be treated in confidence. Suburban housing readily available nearby.

ROHM & HAAS COMPANY
Department O.T.E. #9
5000 Richmond Street, Phila. 37, Pa.

INDUSTRIAL DESIGN for October, 1956 will be essential reading for designers, product development executives, consultants, and management in every industry. Everyone on your staff concerned with product planning and design will want to read INDUSTRIAL DESIGN in October. The subscription card inside the back cover, mailed today, will start subscriptions at once and assure delivery of October copies.

Watch for it: October INDUSTRIAL DESIGN



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Mouldings made "case" history...

in one of America's leading luggage lines by adding the finishing touch to smart styling with these intricately formed bezels. Rolled to shape and bent to exact case contour, they covered raw edges, added structural strength, provided dustproof construction.

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For Your Calendar

June 4-8. Time Study Appreciation Course, Engineering Institute, University Extension Division, The University of Wisconsin, Madison 6, Wisconsin.

June 9-24. 1956 Boston Arts Festival, Boston Common.

June 11-15. Seventh National Plastics Exposition, Society of the Plastics Industry, New York Coliseum, New York.

June 11-15. Society of the Plastics Industry Conference and Annual Meeting. Commodore Hotel, New York.

June 18-20. American Society of Heating and Air Conditioning Engineers. Residential Air Conditioning Symposium. The Shoreham, Washington, D. C.

June 21. American Society of Industrial Designers, New York Chapter meeting, "Industrial Design in Europe Today." Speakers will be Misha Black, British industrial designer, Jacques Vienot, President of the Societe D'Esthetique Industrielle, France, and Jupp Ernst, head of the Werkkunstschule, Kassel, Germany. Museum of Modern Art Auditorium, 8:30 p.m., $3.00.

June 23-July 1. International Design Conference, Aspen, Colorado.

June 25-29. International Housewares Show. New York Coliseum, New York.

June 26. Society of the Plastics Industry. Plastics Structures Division Conference. Hotel Roosevelt, New York.

August 25-September 9. National Homefurnishings Show. New York Coliseum, New York.

September 10-15. Perkin Centennial Celebration, sponsored by the American Association of Textile Chemists and Colorists, Waldorf-Astoria, New York City.

September 17-21. Instrument Society of America. 11th Annual International Instrument-Automation Conference and Exhibit. New York Coliseum, New York.

September 25-28. Iron and Steel Exposition. Public Auditorium. Cleveland, Ohio.

August 29-November 4. American Fabrics Exhibit. Museum of Modern Art, New York.

October 1-5. National Hardware Show. New York Coliseum, New York.

October 15-19. National Business Show. New York Coliseum, New York.

October 17-19. Convention of the American Society of Body Engineers, Inc., Rackham Memorial Building, Detroit, Michigan.

October 21-24. Eleventh annual Protective Packaging and Materials Handling Exposition, Kiel Auditorium, St. Louis, Missouri.

October 22-25. Technical short course, Society of Industrial Packaging and Materials Handling Engineers and National Protective Packaging and Materials Handling Competition, Kiel Auditorium, St. Louis, Missouri.

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Chrome-like Plastic Extrusions
as well as extrusions with the high gloss and lustre of
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Suitable for trimstrips, functional mouldings for cabinets, panel joining strips, printed, decorative designation strips and other mouldings where visual appeal is important.

The brightness and depth of polished metal ... the economy and practicality of plastic extrusions . . . these are now yours with Anchor's new "Third Dimension" extrusion process. Bright metal foils are permanently embedded into thermoplastic extrusions, providing a finish that won't wear or scratch off . . . can't rust or corrode . . . will not be affected by perspiration and fingerprints.

A "Third Dimension" (Depth) has been added to plastic extrusions! Shapes are **extruded to your specifications** in

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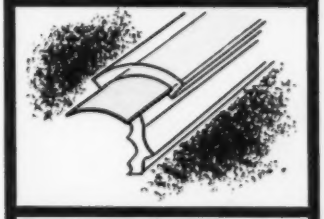
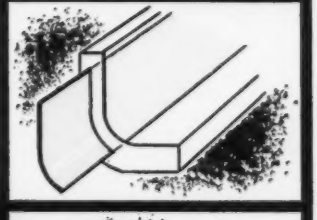
and other cross sections. "Third Dimension" extrusions can be bent, drilled or mitered. Color selection is almost unlimited. Finished extrusions can be printed, silk screened, hot stamped, or otherwise decorated.

Write for samples of "Third Dimension" extrusions as well as for a copy of our new edition of "Extruded Plastics" describing all our services. Anchor engineers will be pleased to discuss possible applications with you, no obligation of course.





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We cordially invite you to see samples of these as well as other extrusions at our booth #327 National Plastics Exposition, New York Coliseum, June 11th to 15th.

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Tenite Butyrate is a durable plastic—that's the obvious conclusion to be drawn from the performance of these signs.

For these are familiar emblems of American Automobile Association affiliated clubs. You'll find them used by AAA members from Maine to California.

Attached to trunk lids, bumpers, or license plates, the durable plastic emblems are exposed to summer heat, winter cold, rain, snow, humidity, road chemicals, abrasive dirt and mechanical shock. They serve for years—thanks to the toughness, corrosion resistance and outdoor durability of Tenite Butyrate.

Tenite Butyrate is a plastic chosen for many tough jobs. It is used for outdoor signs . . . for oil field pipe . . . for color telephones. In short, whether for demanding duty or lasting beauty, Tenite Butyrate offers a hard-to-find combination of properties.

What about the products you make? Could the bright colors, light weight or rugged strength of the versatile Tenite plastics add more sales appeal, better performance or longer life? We will be glad to help you or your molder evaluate Tenite Butyrate, Tenite Acetate or Tenite Polyethylene for any use. For more information, write to EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

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