NDUSTRIAL DESIGN

August 1956 two dollars a copy

ie aluminum industry and design

rs '56: The driver's view

lor problems, IV: Plastics

Martin Rosenzweig

Rich colors, sparkling appearance of card box cover typify the beauty of PLEXIGLAS moldings.

Water meter cover molded of PLEXIGLAS has excellent clarity, high resistance to impact.

PLEXIGLAS gives weather-resistance, light weight, great strength to insulation clamp for power cables.

Designed with PLEXIGLAS in mind

Products like those shown above have proved successful because their designers and molders took advantage of the properties of PLEXIGLAS® acrylic plastic. Whether *your* requirements for a molded part are rugged durability or gleaming beauty, or both, PLEXIGLAS can provide the answer.

Here are the reasons why so many types of products in varied fields of industry today are planned to be molded of PLEXIGLAS—the resistance of this acrylic plastic to weather, heat and breakage . . . its crystal clarity, resulting in depth and brilliance of colors when back-surface paints and metallized coatings are applied . . . the optical effects possible . . . its ability to be molded accurately into complex shapes.

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VOLUME 3, NUMBER

4

INDUSTRIAL DESIGN

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

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Cover and frontispiece: *Martin Rosenzweig's photogram of coffee strainer perforations* (*opposite*), *the saucepan and the Alcoa Building on the cover combine to suggest aluminum's wide-spread applications. What the industry has been doing to promote aluminum through design is reviewed on pp.* 50-63.

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PUBLICATION OFFICES

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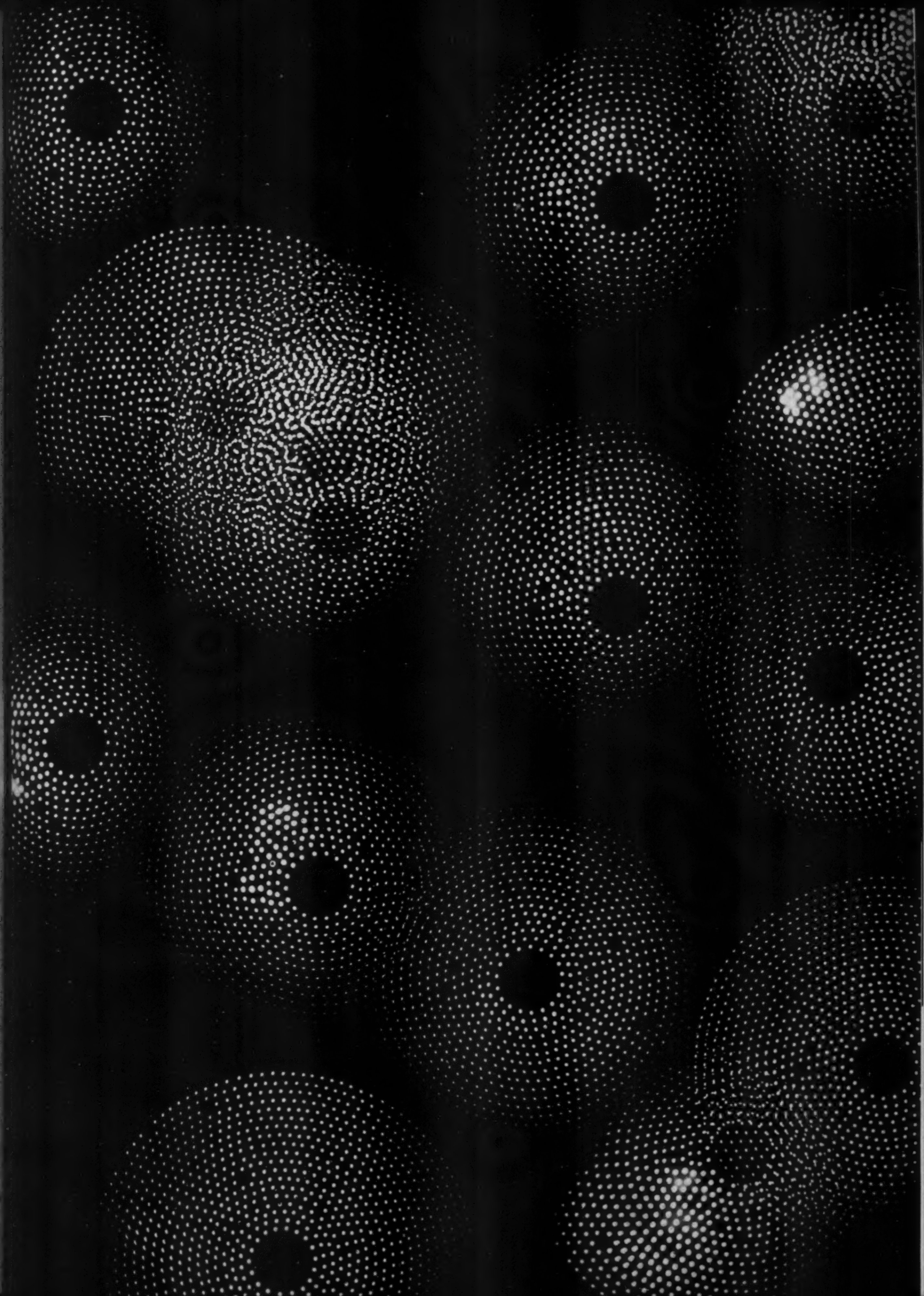


in this issue...


Birnie


Hershey


Fahnestock


WDTA


Nelson


Wright


Covey


Nicholson Bros.

Jim Birnie was hired by Reynolds Metals after the war on the basis of some pre-war experimental designs he had done for them in foil. In 1950 he became General Director of their Styling and Design Department, which is part of the Reynolds' General Sales organization in Louisville, (page 58).

Sam Fahnestock started his design career at the Cincinnati Art Academy in 1932. After a long stint as design engineer with the Sheffield Corporation in the Development Research Division, he proceeded to Harold Van Doren's office, to Don Dailey's (four years), had his own office for a while, joined Peter Muller-Munk, from '51-'55, then became traveling design consultant on aluminum for Alcoa last August, (page 56).

Franklin Q. Hershey was Chief Stylist for Ford in Detroit until last March. Moving to Oakland, California, he organized and is now Manager of a brand new Industrial Design Department at Kaiser (page 62), which is also trying various approaches to the promotion of aluminum through design. He is a member of the new San Francisco Chapter of I.D.I.

Walter Dorwin Teague Associates, whose handsome $70 million Air Force contract was reported in our April issue, designed the cabin of the Boeing 707 Stratojet shown on p. 64. The eight partners are shown here (l. to r.): Immerman, Ensign, Del Guidice, Teague, Harper, Peltz, Teague Jr., Brophy (Comptroller), and Conrad. Del Guidice was coordinator with the Boeing engineers (who are one of WDTA's traditionally long-term clients). Mr. Teague and first four partners listed above are members of the A.S.I.D.

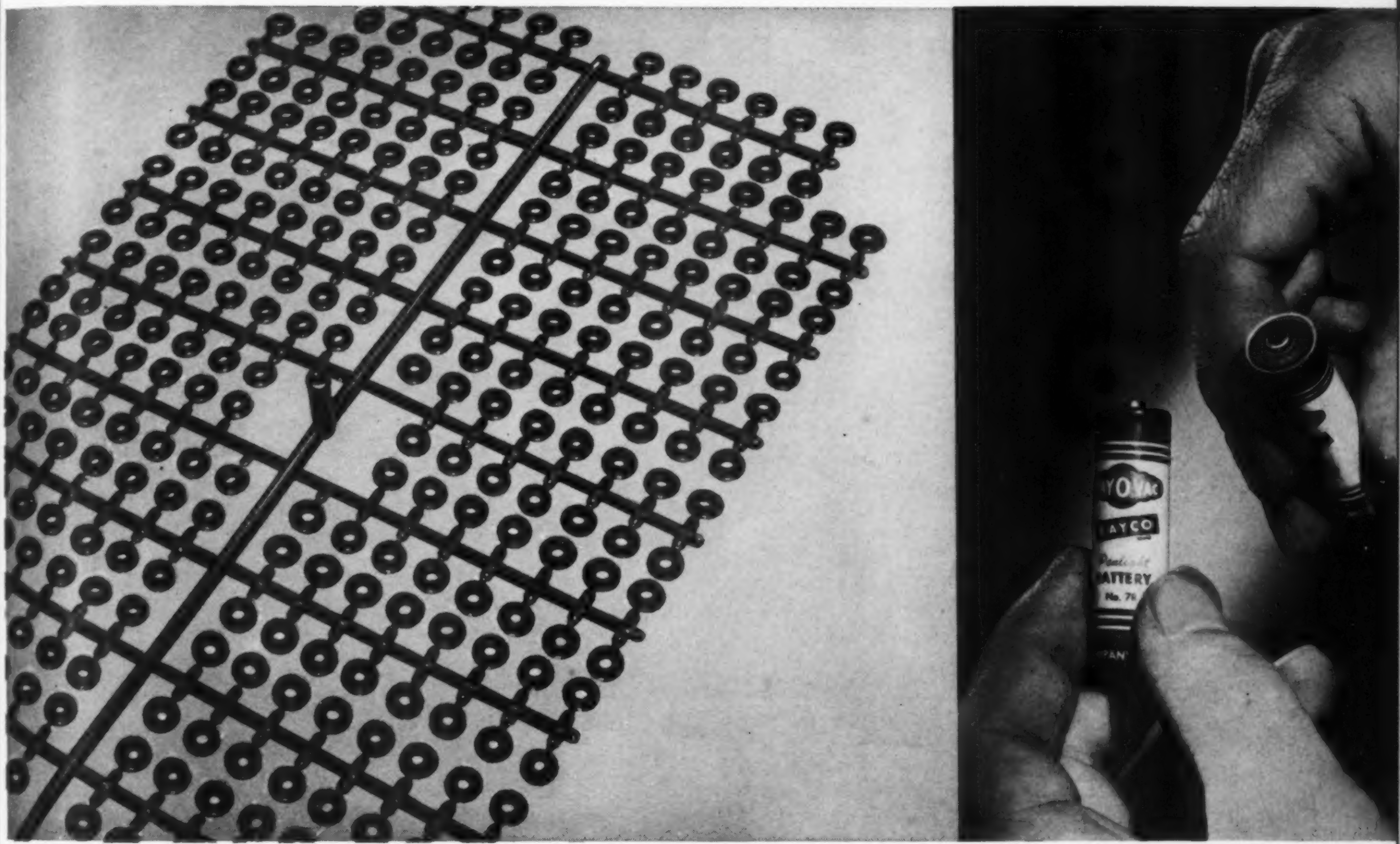
George Nelson has, as head of his own organization, found himself on both sides of the company designer's desk. Performing the role of director of design for Herman Miller (though not full time) he brought in two consultants; in working with such firms as Monsanto, U. S. Gypsum and General Electric Major Appliance Division, he collaborates with designers that he refuses to call "captive" on page 77.

Russel Wright, whose mission to SE Asia is described on p. 68, is widely known for his work in ceramic and porcelain tableware. A member of A.S.I.D., he is the author of "Guide to Easier Living." He heads Russel Wright Associates in New York City.

Laird Covey, who designed the Power Mower on p. 108 for Savage Arms, has been heading his own office since 1953. He was previously associated with GE for five years as a designer, and with Lippincott and Margulies for six as Director of Product Appearance Design. A member of A.S.I.D., he numbers among his clients the Paper Container Division of Continental Can and the Clock and Timer Department of GE.

Robert and Rogèr Nicholson are responsible for the interior and the exhibition fittings of the new Design Centre in the Haymarket, London. Robert (left) started out as a medical student, but soon after the war he and his younger brother, Roger, who began as a painter and illustrator at the Royal College of Art, joined forces to form an industrial design team.

With **TENITE POLYETHYLENE** 300 seals for dry cells can be made in one shot



Washers of Tenite Polyethylene molded for Ray-O-Vac Company by Evans-Zeier Plastic Company, both of Madison, Wisconsin

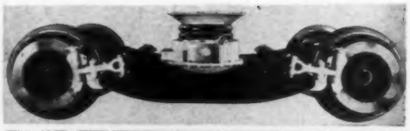
Every day sees new uses develop for Tenite Polyethylene. Here's one that's cutting costs and simplifying assembly procedures for a leading manufacturer of dry cell batteries.

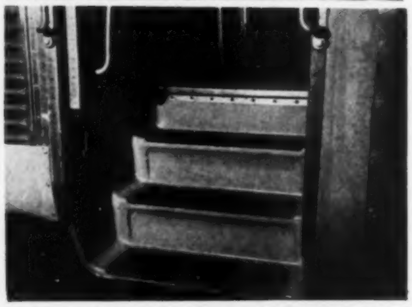
Formerly, dry cells were finished by pouring molten pitch around the carbon anode to seal the open end. But look how Ray-O-Vac speeds this operation. A molded Tenite Polyethylene washer is force-fitted over the carbon rod and the metal edges of the cell are then crimped into the washer. Result: a water-tight seal, no electrical leakage, and faster production.

Design of the individual washers was no problem. But the design of the mold itself was. For collectively, 300 washers in one shot represented quite an intricate molding. Needed was a plastic that flowed easily at normal molding temperatures to completely fill every one of the 300 tiny mold cavities. Small wonder, then, that Tenite Polyethylene was the plastic chosen by the molder of these washers.

This Eastman plastic has exceptionally good molding properties. Its fast, even flow permits use of more complicated molds than were ever before practicable with Polyethylene. Investigate for yourself the production economies that may result through use of easy-to-mold Tenite Polyethylene. Investigate, too, the ability of this plastic to add longer life, better performance or greater sales appeal to some product you make. For more information about this versatile plastic, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

TENITE
POLYETHYLENE
an Eastman plastic





Budd company introduces a lightweight railcar

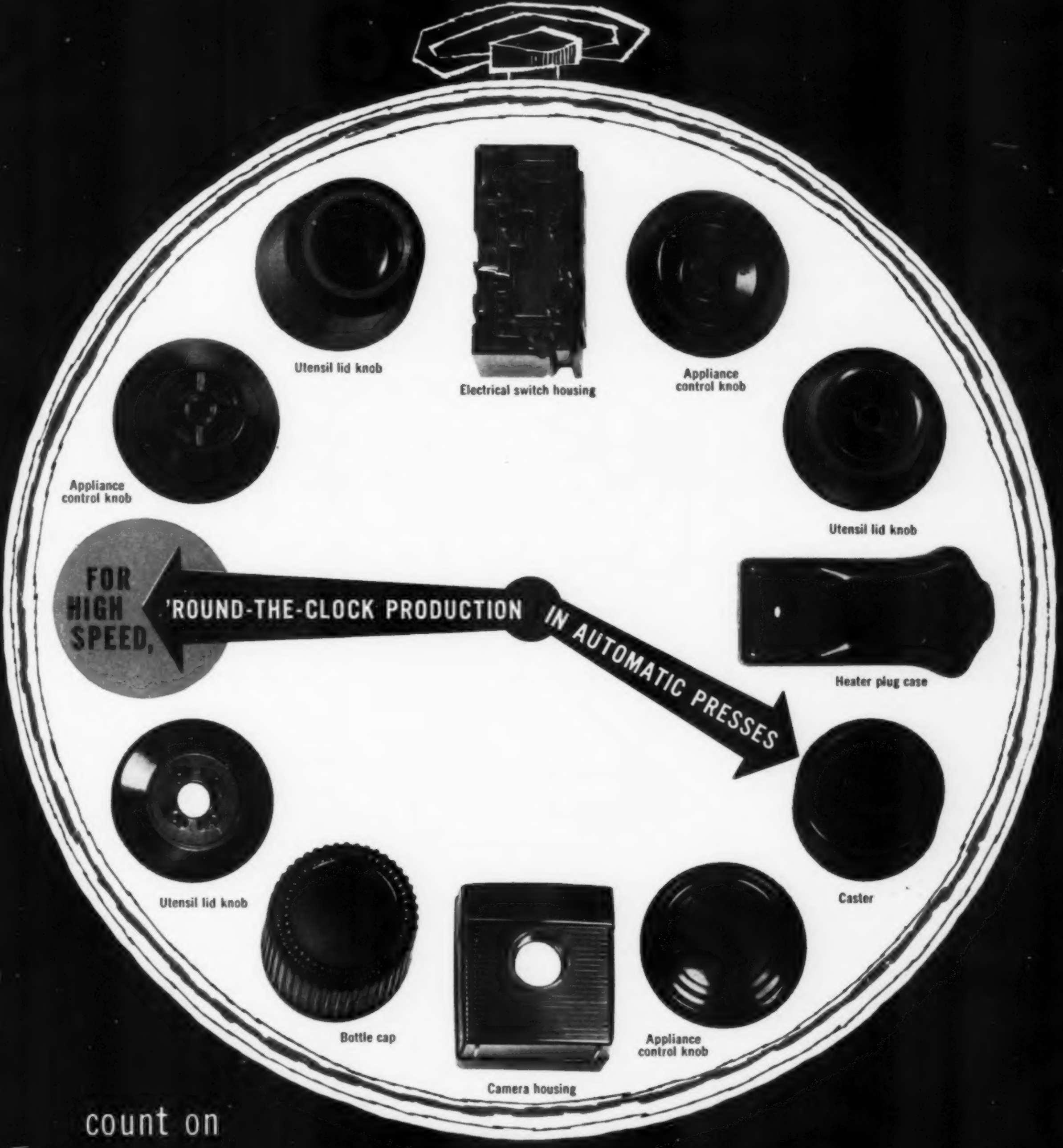
Pioneer III combines radical changes and standard sized car

A new candidate in what is becoming a race among manufacturers to build lightweight equipment for the railroads was unveiled on July 17 by the Budd Company. Kept secret for a year, the Pioneer III is a basic prototype which represents experimental work by Budd's Product Research Division. Maintaining a stainless steel outer shell and frame, traditional with Budd, the car's interior makes perhaps the most extensive use of plastics in any form of transportation to date — even to pipes of polyvinylchloride. Budd asserts that at 595 lbs. for each of the 88 passengers it carries, this is the most economical railway coach on the market.

Unlike the Talgo or Train X or Budd's own "Hot Rod" (described in ID's February 1956 issue), the Pioneer III is not proposed to revolutionize railroad design practice, but as a versatile replacement within the existing framework, to be used with head-end power. It operates on AAR tight lock couplers at standard height (although the body is lower) and, at 85 feet, is as long as standard cars. It has lighter, four-wheel trucks, with single air spring suspension, tubular axles and disc brakes.

Two design offices acted as consultants: Harbeson, Hough, Livingstone and Larson, Philadelphia architects, were color advisers; and industrial designers Becker and Becker of New York worked on all the three-dimensional applications of the plastics — seating, wall treatments, steps, light fixtures, luggage racks, air conditioning grilles, etc. Fixed seat units are molded in one piece of fiber glass reinforced polyesters, their shape benevolently influenced by Eames' original. The entire washroom is mounted into the car as a unit, with walls formed in one piece, prepiped and prewired. At each bay in the coach section, a single panel extends from the heater guard to the lower portion of the baggage rack; another combines the upper surface of the rack, the ceiling and half the air duct. The car is impressively stripped down to its barest essentials — no curtains, no sills and only single extruded aluminum moldings between reinforced plastic panels, whose bright colors are built in for hard wearing.

Budd engineers redesigned four-wheel truck, saving 25,000 lbs. per car (top). Reinforced plastic parts include steps, car skirts, battery boxes, one-piece lavatory unit and seating, upholstered in vinyl foam.



count on

Plenco 456 and 386 Black Phenolic Molding Compounds

More and more molders of gleaming appliance knobs, electrical outlet plates, terminal blocks, switch parts, camera housings, casters and other such items specify Plenco 456 Black for best results in automatic presses. This general purpose phenolic molding compound has low gas evolution and minimum "case hardening." Fast cycles can be obtained even on very thick sections. Readily accepts electronic preheating.

Plenco 386 Black—similar in formulation—is used in automatic press molding of products where non-bleeding characteristics are important.

These are but two of the many top quality phenolic materials developed by our engineers for specialized use in industry. We invite you to consult with us about *your* specific molding problems; it is very likely we already have the answer for you.

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Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

STA holds Allerton Conference

Under the co-sponsorship of the University of Illinois, the fourth annual Allerton Conference of Chicago's Society of Typographic Arts was held at Monticello, Illinois, May 11-13. Speakers were: **George Krikorian,** Promotional Art Director of *Look;* **Paul Bennett,** Mergenthaler Linotype Corp.; **Egbert Jacobson,** Container Corporation of America; **Elsa Kula,** artist-designer; **Zeke Ziner** and **Sam Lipschultz** of Morton Goldsholl Design Associates; and **Wayne Williams,** Raymond Loewy Associates.

Prior to the conference, a detailed questionnaire was sent out to STA members asking about their politics, their earnings, their professional attitudes. 268 designers, including seven industrial designers, replied, and their answers supplied the basis for roundtable discussions at the conference. (Among the information that was revealed is that 73 STA members read INDUSTRIAL DESIGN regularly. We shall include some of the most significant findings of the questionnaire in the October issue, which will be devoted to design life in Chicago.)

Designers of the world united

In April in Paris the first informal meeting of the International Coordinating Committee of Industrial Design took place, attended by representatives of the American Society of Industrial Designers, the British Society of Industrial Artists, and their French, German, Belgian and Italian counterparts, with India and Holland represented by proxy. Their intention is to act as a clearing house for major exhibitions, information and personnel, to organize international conferences, and to urge industrial design organizations in all countries to participate. A provisional Executive Board was elected: **Peter Muller-Munk,** President; **Misha Black,** Vice President; **Pierre Vago,** Executive Secretary and **Robert Delevoy,** Treasurer. The committee is working on a constitution which it hopes will lead to the formation of an International Society of Industrial Design Societies. The next meeting will be held in London early in 1957.

Parisian diners (l. to r.) Alberto Rosselli, Mme. Vienot, Peter Muller-Munk, Mme. Vago, Robert Delevoy, Mrs. Misha Black, Freiherr Von Pechmann are toasting the International ID Committee.

Left: "ThermaMeter," Premiere, Payloader; Messrs. Granville, Walker and Beck.

IDI awards its oscars

Industrial Designers' Institute award-giving time is here again, and, on June 21, three products were singled out at a luncheon in Chicago's Hotel Ambassador East by Walter C. Granville, chairman of the 1956 award committee. All industrial designers—individuals or teams—are eligible to submit entries. This year 128 of them qualified for final consideration. Winners were **William E. Clements** for the design of the "Therma Meter," a new version of the electric thermometer used in hospitals and produced by Medical Research Institute, Inc., Cincinnati, Ohio; **Jon W. Hauser,** St. Charles, Ill., for his design of the Model HH Payloader, a pneumatic-tired, four-wheel-drive tractor shovel manufactured by the Frank G. Hough Co.; and a seven-man team at Ford's Lincoln Division, which designed the 1956 Lincoln Premiere Series two-door hardtop. **George W. Walker,** vice-president and director of styling for Ford received the award for the group, which was made up of **Elwood P. Engel, Joseph Oros, Eugene Bordinat, Herbert Tod, Rulo Conrad** and **John Najjar.**

George A. Beck, of General Electric, IDI's national president, presented the gold medallions which represent the evaluation of designers by their peers. With **Walter Granville,** the award committee was composed of **George Beck; Aarre Lahti,** professor of industrial design, University of Michigan; **Sam S. Leotta,** independent industrial designer in Philadelphia; and **Paul R. MacAlister,** Chicago industrial designer who founded the IDI award program.

Dean Emanuel M. Benson, guest speaker, spoke some encouraging words: "A fabric, a plate, or a tool can be as evocative of a civilization as a poem, a building or a painting. And the fact that these objects may have been produced in the thousands or millions does not make them less precious. The snob appeal of scarcity only increases the price of an object, not its real worth." He concluded: "One of my sardonic friends recently complained that pretty soon he won't be able to buy a lousy-looking lampshade anywhere. I'd like to be around long enough to see this happen."

Officers of the San Francisco IDI chapter are: (l. to r.) Gross Wood, Richard Ketcham, Donald W. Brundage and George Kosmak.

Two California IDI chapters formed

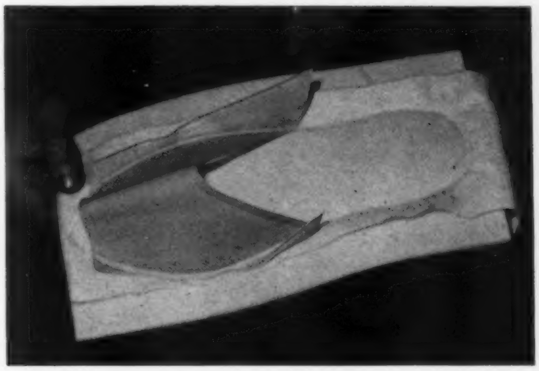
The San Francisco Bay area has established a chapter of the Industrial Designers' Institute, while the LA Southern California IDI was officially chartered as a chapter on July 7 in Santa Monica.

In San Francisco, **Richard Ketcham,** Ampex Corporation, Redwood City, was elected chairman, **George Kosmak,** vice chairman, **Donald W. Brundage** of Channing Wallace Gilson in San Francisco, secretary, and **Gross Wood,** treasurer. Charter members include: **Franklin Q. Hershey,** Kaiser Aluminum; **Gene Tepper,** of Smith, Tepper, Sundberg; **Harry Lawenda,** Keedler-Fauchere, and eight others.

Newly elected officers in the Southern California Chapter are: **George Jergenson,** Dean of the Industrial Design Department of Art Center School, Los Angeles, chairman; and **James Kelso,** Director of Design for Packard Bell Radio and Television Company, Los Angeles, vice-chairman. Present at the festive luncheon at the Miramar Hotel, Santa Monica, were **George Beck,** national president of the IDI, **Frank Gianninoto,** President of the Package Designers' Council.

Southern Californians and visitors are (left): George Jergenson, George Beck, Joseph Oros, Frank Gianninoto, James Kelso.

idea page | *A new lift for your product, new products for your markets*



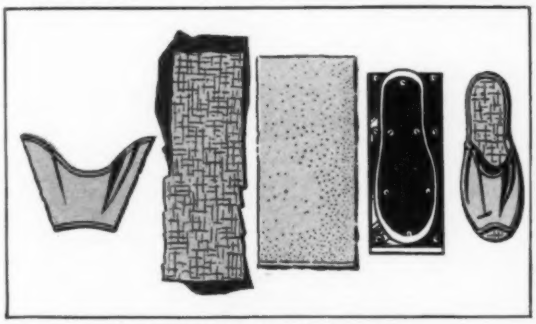
One-step manufacturing with heat-sealed vinyl foam

■ *For a wide range of products, you can combine virtually all manufacturing operations into a single processing step by using vinyl foam and new heat-sealing methods.*

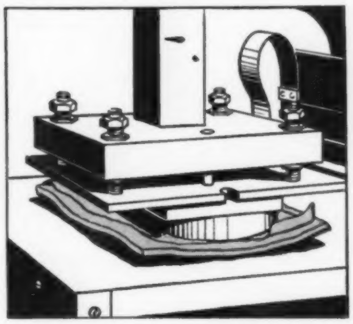
Vinyl foam heat-seals to itself, to vinyl film, to coated fabrics, Saran, and many other synthetic or natural fabrics. The heat-sealing—in one operation—can form, mold, and permanently bond together several component parts. You can eliminate production steps such as shaping, sewing, and gluing . . . and you can use a "tear-seal" die to eliminate preliminary cutting and the final trim finishing. Vinyl foam can give you:

- *Built-in cushioning*
- *Wear and abrasion resistance*
- *Unlimited choice of colors*
- *Resistance to soaps, oils, acids, alkalis*
- *Fire resistance*

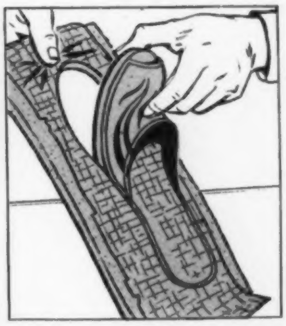
Three-piece lounging slipper is fabricated in one processing operation



Start with vinyl film top, vinyl foam insole, embossed vinyl film outersole.



Shape, mold, and permanently bond component parts in a "tear-seal" die with a single heat-sealing operation.



The "tear-seal" die allows the slipper to be removed by simple hand-tearing.

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You can also fabricate vinyl foam by die-cutting, splitting, skiving, molding, stitching, hot-wire shaping or forming. Monsanto manufactures plasticizers and vinyl resins for vinyl foam . . . but does not produce or distribute the finished formulations. For sources of vinyl foam sheets or slabs, write MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, Department ID-8, St. Louis 1, Mo.

Saran: Reg. trademark of Dow Chemical Co.

photo Samuel L. Fahnestock

Walter P. Paepcke, Container Corporation, addresses the Aspen Design Conference.

Aspen speaks boldly this year

The International Design Conference assembled again at Aspen, Colorado, June 25-July 1, for the sixth consecutive time, striking a significant critical tone. Throughout the three-day meetings on "Management and Design", "The Practice of Design", and "Education and Design", speakers from many countries revealed areas of common experience.

There were some interesting observations about design in the United States: **Gordon Lippincott**, Lippincott and Margulies, New York: ". . . I feel that much American design is good. Our apparent mediocrity seems to lie in the areas of highest mass production, where competition is most intense and where advertising and marketing budgets are the highest. Why, for example, do the electric irons, the TV sets, the washing machines now on the market look so much alike?" **F. H. K. Henrion**, Erwin Masey & Co. Ltd., London: "In order to explain different trends it is sometimes useful to exaggerate . . . thus it has been said that the creative approach in graphic design in the United States is to put the chart before the course. Statistics are ever more important in determining the course of any creative work."

Speakers were equally candid about the dangers of technology unbridled (**Jupp Ernst**, Kassel, Germany); how craftsmanship symbolizes the concept of quality (**Arthur Hald**, Sweden); handicaps to industrial design in Japan (**Sori Yanagi**). In October ID will cover details of the conference.

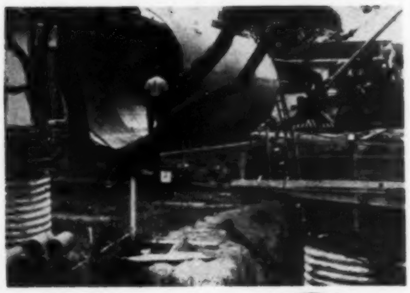
Design patent upheld in court

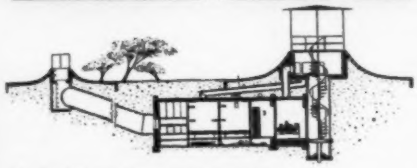
The case of Brunswick-Balke-Collender Co., Chicago vs. the Kuehne Manufacturing Co., Mattoon, Ill. resulted in a permanent injunction against the sale and the manufacture of Kuehne's line of school furniture, according to a Federal Court decision in June. Brunswick filed suit on the basis that their school furniture, introduced in 1953 and designed by Dave Chapman (ID: April '54), had been copied through a breach of business confidence. Keuhne and Brunswick had discussed the designs on the basis of Keuhne's sub-contracting the manufacture of the furniture, and soon afterward Keuhne entered the school furniture business with a similar line.

The court ruled that Brunswick's design patents were infringed, and that they were valid patents. Judge Barnes, who made the ruling, said that this was the first time in his judicial career that he has held a design patent valid.

U.K. confers on industry and society

Sponsored by the Duke of Edinburgh, a conference took place in Oxford, England, July 9-27, to discuss the impact of industrialization on the social structure of an unsophisticated community. 280 representatives from 29 Commonwealth countries gathered to hear lectures and to visit British industries firsthand. The significance of the event is its emphasis, with the firsthand reports of lecturers from India, Africa, etc., upon the social aspects of industrialization.





A Californian prepares

The pipe (top) 10' in diameter is being installed not in a sewer, but in what designer Paul Laszlo of Beverly Hills, California calls "the first real shelter for protection against A and H bombs." Laszlo's client requested complete living facilities and all the tools for survival, including oxygen tanks, masks and acetylene cutting equipment. All materials above ground are concrete and steel, with the shelter covered by 4' of ground. Entrance and emergency exit are designed with an aerodynamic shape "to reduce pressures inside the entrance to subsonic velocity"; and double filters on ventilating ducts and a sprinkler system are meant to decontaminate the areas around entrance and exit. To withstand pressure differentials, the shelter is equipped with doors sealed with a rubber strip and locked by lugs. The shelter is said to preserve 14 people from the worst.

Passenger truck proposed

Clark Equipment Company, manufacturers of materials handling, have designed a pod to transfer passengers from plane to terminal or vice versa, in the event that distant landings become common. Called a Mobile Cruiser, it is a simple frame and shell with seats, on a straddle carrier, powered by a gasoline engine. The pod is raised hydraulically to the airliner door and passengers walk into the plane. It would offer not only passenger convenience but a saving of costly jet fuel, taxiing on the runway.

School-made trailer tested

Conestoga '56 changed from a student design project first published in ID (February 1956), into a reality at the Philadelphia Museum School of Art when three students built a prototype and trailered west for the Aspen Design Conference. Harry Oakes, Richard DeFeo and Gary Horley pooled their ideas after their individual projects were published, and started construction of a prototype based on DeFeo's design after Brad Sheppard of the Strick Trailer Company offered to provide materials and the services of an engineer to build such a pilot model. The whole project originated last fall, when PMSA teacher Joseph Carreiro assigned the problem of designing a small utility trailer with sleeping accommodations for four and fully equipped for cooking and storage. It was to weigh less than 1,000 pounds, cost under $1,000, be completely demountable.

In transit, the model trailer shown above is 15 feet wide on a 20-inch high rectangle; the aluminum superstructure can be raised in five minutes, gives a six-foot ceiling; the canvas is white on top, with alternating panels of brown and bright yellow on the side. Four hammocks which roll up when not in use are in the same colors. The wooden floor (10' by 7') supports four modular storage cabinets that serve as benches.

The trailer's alma mater, the Philadelphia Museum School of Art, has been given a grant by the Yale & Towne Corporation of $5,000 as a result of a pilot study done last year in material handling equipment. The grant is to be used for basic design research.

Events

In honor of Sir William Perkin, who discovered aniline dyes, the **American Association of Textile Chemists and Colorists** is assembling an impressive program of talks and exhibits on color processes, through the week of September 10 at the Waldorf Astoria in New York.

Participating are 28 professional societies representing the worlds of chemistry and fashion. Papers will be delivered on the historical, psychological and industrial developments of color chemistry by leaders in the textile, plastics, pharmaceutical, leather, food and dye industries from the U.S. and abroad. Design, too, will be discussed in different contexts: **Walter C. Granville** will speak on September 12 on "Color in Industrial Design"; **F. M. Fordemwalt,** American Cyanamid Co., will speak on September 13 on "The Development of the Art of Textile Printing". Significant to designers in its technical inclusiveness, the week's program will be reported in ID's October issue.

The American Society of Industrial Designers has announced the dates of the national meeting: September 27-30 at Lake Placid, New York.

Fuller gives Illinois seminar

From July 9 to August 8, Buckminster Fuller conducted a seminar at Southern Illinois University which had the direct effect of assembling geodesic dome structures for its new and expanding design school. Harold Cohen, a former student of Fuller's and head of the design department at SIU, plans to move his whole department, including shelter, product and graphic designs, photography and city planning, under the translucent roofs of the domes erected by the students. Costs, estimated at $75,000, are being borne by industries, individuals, and philanthropic agencies.

The seminar, limited to 30 students, was taken for graduate or undergraduate credit, consisted of full-day lectures embracing Fuller's unique design philosophy.

Southern Illinois hopes ultimately to serve the design field with a Design Research Institute corresponding to Princeton University's Institute of Advanced Studies, assembling leading designers to continue private research, "accepted by the Design Research Institute as being meritorious and consistent with its basic objectives."

Philadelphia Museum School of Art's year-end exhibit features reinforced plastics.

IIT's Institute of Design annual open house includes Petras Aleksa's telephone kiosk, envisioned as amplifying and transmitting voices without separate handset.

CORNING GLASS BULLETIN

FOR PEOPLE WHO MAKE THINGS

Gadolinium and all that

Out Chicago way, at Lindsay Chemical Company, they're busy exchanging ions. Purpose? Obtaining commercial quantities of such rare earths as samarium, europium, gadolinium, terbium, dysprosium, erbium, thulium, ytterbium, yttrium, lutetium, and holmium.

At the heart of Lindsay's purposeful and plentiful piping and plumbing, you'll find a number of PYREX brand glass columns.

Glass because it provides complete visual control. PYREX brand glass No. 7740 because (as Lindsay people tell) it provides an absolute minimum (not *minimium*) of contamination and a flexible system that permits ready adjustment.

(Commercial: Chemists are only one breed of practical-minded men who have turned to a PYREX brand glass in one form or another to solve a particularly challenging materials problem.)

Facts: PYREX brand glass No. 7740 is a borosilicate glass having low alkali content and unusual capacity to withstand the ravaging attacks of most acids, and environments like steam under pressure.

This glass also displays a commendable capacity to cope with thermal stress, exhibiting a linear coefficient of expansion of 32.5 x 10^{-7} per °C. between 0° and 300° C.

It's a clear glass and can be handled as blown or pressed ware; also readily made into plates and panels, tubing and rod.

In one product development, even *one-piece molding* of a quite complex shape was profitably accomplished for a manufacturer of dentists' sterilizer trays.

PYREX brand glasses (including a number of interesting variations similar to 7740) offer an unusual challenge to those concerned with the successful and profitable solution of materials problems.

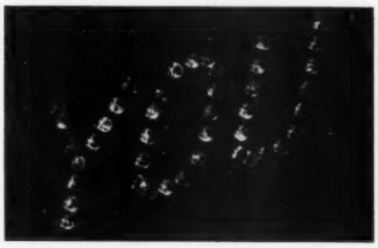
Some hints about the PYREX brand and other glasses by Corning *in use* can be gleaned from Bulletin IZ-1, "Glass . . . its increasing importance in product design." Free with the coupon.

On getting one's bearings

Glittering and glinting against a black velvet backdrop are these ¾-inch high letters spelling Y O U.

Forming this simple word took 43 jewel bearings, those minuscule mechanisms that contribute so much to the performance accuracy of many kinds of instruments.

These particular "jewel" bearings are made of glass, a *not* uncommon practice. Bearings made of glass get their start as cane—cane that we hold in manufacturing to a diameter tolerance of .0235". (Cane, by way of elucidation, is glass



industry jargon for what you probably call solid rod.)

At any rate, spaghetti-like strands of this cane are supplied by us to makers of precision instruments. Our job is purveying preliminary precision; we do *not* make the finished bearings.

Still, the glass itself might be of interest to you, since along with close tolerances, it possesses quite astounding surface hardness.

Specific values are somewhat difficult to spell out because of the conflicting methods extant for comparing various materials.

If you wish to pursue this point further, however, we'll happily supply you with all the details.

As a matter of record, hardness is just one of the many useful characteristics available in the glasses that Corning engineers today.

From amongst the thousands of formulas developed by Corning research, you'll find glasses that selectively transmit or absorb almost every form of radiant energy; glasses lighter than aluminum or heavier than concrete; ribbon-thin or brickwall-thick; sensitive or indifferent to temperature. In fact, you name the *combination* of characteristics desired and there's probably already a glass to fill the bill.

Of necessity this sweeping survey only begins to tell the story of glass as a basic material of design and construction.

For more substantial fare, we recommend one or more of the following: Bulletin B-83: "Properties of Selected Commercial Glassware," a slender but solid compendium of data; "Glass and You," a well-illustrated introduction to the working wonders of glass; or, "New Industrial Uses for Glass," a reprint of a survey article that appeared in *Product Engineering* last summer. Using the coupon will expedite matters.

Wanted: Men with materials problems

If you have a stubborn materials problem that might find its answer in glass, let's get together.

In searching for the answer, you may find it profitable to put to your use our research, application, design and production experience . . . *plus* facilities.

Time and time again we've been pleasantly surprised by the ingeniousness of people who have hit upon some new use for glass—a new use that we've helped put into practical and profitable shape.

Maybe you're next. Write, wire, or call.

Corning means research in Glass

CORNING GLASS WORKS, 54-8 Crystal Street, Corning, N.Y.

Please send me the following material: Bulletin IZ-1, "Glass . . . its increasing importance in product design" ☐; Illustrated Bulletin, "Glass and You" ☐; Bulletin B-83, "Properties of Selected Commercial Glassware" ☐; *Product Engineering* reprint ☐.

Name________ Title________

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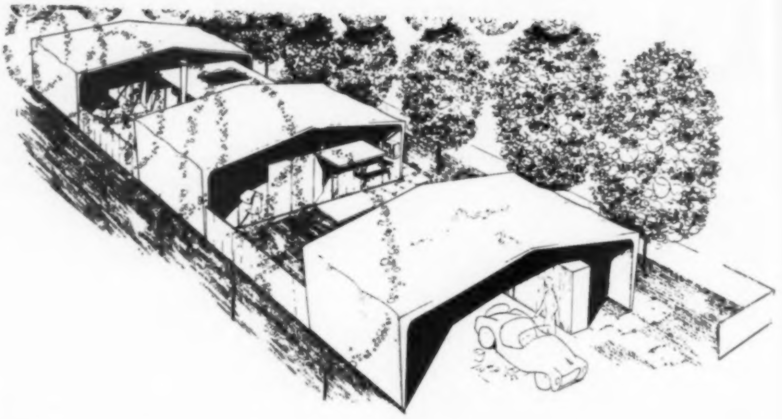
Plastic house awards

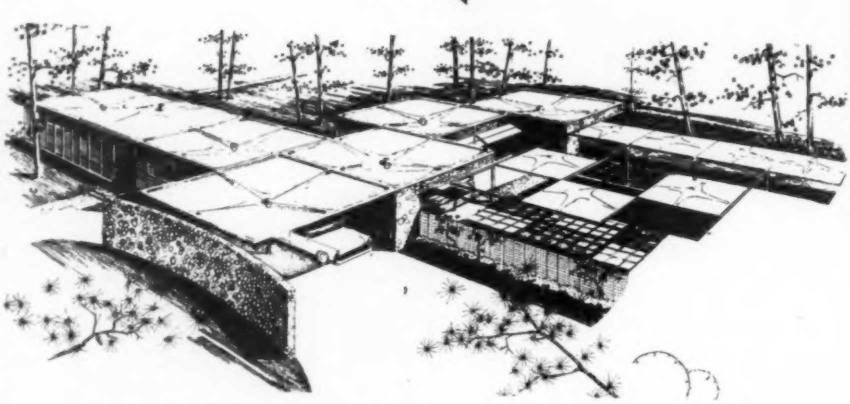
Names of 13 award-winning architects and students in the Plastics House Competition were announced last June at the Society of the Plastics Industry's Annual Conference, held at the Hotel Commodore, New York. **Philip A. Belk,** Chairman of the SPI Public Relations Committee, which sponsored the contest, gave cash awards for the first three prizes in the Best Houses category to: **William Goodwin,** Marblehead, Mass.; **Hermes & Colucci,** Cincinnati; and **John Dyal,** Boston (whose solution was interestingly similar to Monsanto's on page 116). In addition, prizes were awarded for designs utilizing plastics in featured living spaces: porch or outdoor living area, bath or dressing room, playroom.

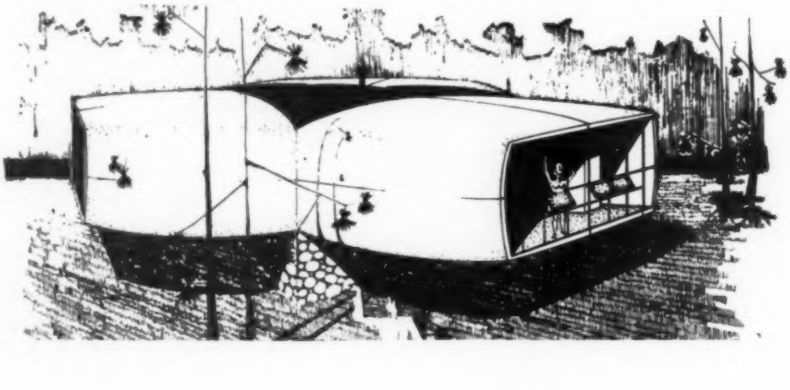
Designs had to be for houses not more than 1600 sq. ft. in area. The first three prizes (right, top to bottom) demonstrate not only different possible structural systems for plastics, but such innovations as molded kitchen cabinets, plastic panels for a pool enclosure, molded bathroom fixtures, and even, in the case of the third prize, a one-piece molding for the entire bathroom.

Other prize and honorable-mention winners were **Ted Bower, Seattle; K. E. Coleman,** Stillwater, Okla.; **Richard B. Frazier,** Cody, Wyo.; **J. Miller, Eric Bodtker, Ralph Dopmeyer, Peter Samton and Theodore Turk,** all of Cambridge, Massachusetts.

Selection of the winners was made by a jury consisting of architects **John N. Highland, Jr.,** Buffalo; **Paul M. Rudolph,** Sarasota; and editor **Hiram McCann** of *Modern Plastics* magazine. Professional advisor was **James T. Lendrum, A.I.A.,** University of Illinois.

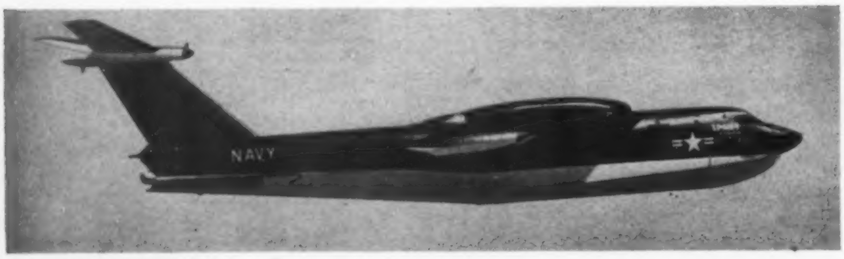






Gold Convair jets ordered

Convair has announced orders for 40 Golden Arrows, modified versions of the Skylark 600 medium-range jet transport originally announced in April. TWA is to receive 30, and Delta Air Lines 10. The Golden Arrow will be the first commercial transport, jet or otherwise, to sport a gold skin, and its top cruising speed is to be 609 m.p.h.



Titanium takes off

The second experimental model of Martin's XP6M-1 SeaMaster, flying above, is one of the first aircraft to make extensive use of high-strength titanium bolts developed last year by Standard Pressed Steel Co., Jenkintown, Pa. Titanium fasteners weigh about 57% as much as steel ones, and Martin has ordered $200,000 worth of them.

Competitions announced

Entry deadline for the Third Package Design Competition, sponsored by the **Package Designers Council,** is November 1. Awards and certificates will be presented in 21 categories, and a special feature is a $1,000 cash award donated by Alcoa for the most effective design application of aluminum foil in packaging. Further information is available from PDC, 12 East 46th St., New York. September 30 is closing date for **American Silver Co.'s** $1,000 Contest for the best new applications of thin gauge and/or high precision tolerance stainless steel. Entry blanks may be obtained from Prize Awards Committee, ASC, 36-07 Prince St., Flushing, N. Y.

DESIGNING WITH ALUMINUM

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 supplied on request. Address: Advertising Dept., Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.

NO. 20

ADVANTAGES OF ALUMINUM DIE CASTING

The die casting process permits high-volume manufacture of uniform, finely finished, highly complex aluminum parts at exceptionally low unit production cost. Among other advantages of aluminum die castings are high strength characteristics, low scrap loss and close dimensional accuracy. In some cases, even such details as tapped holes may be cast so dependably as to require no further machining. Additional qualities include these:

1. Metal may be distributed so as to give maximum strength at minimum weight.
2. Holes, slots and recesses may be cast to very close fits for moving parts.
3. Very thin sections and a great variety of shapes may be produced, often to configurations that cannot be obtained in a single piece by other processes. Thus, expensive and space-consuming assemblies may be replaced, in many cases, by a single die casting.
4. Inserts of other metallic and nonmetallic materials may be cast in place accurately.
5. A wide range of aluminum die casting alloys is available, each with special properties. All are suitable for standard plating and finishing procedures. All may be machined readily.
6. Properly designed dies offer a long service life, offsetting the initial tooling costs.

These features have led to the widespread demand for aluminum die cast parts ranging in size from tiny, fractional-ounce pieces to massive automotive engine blocks and to flange discs 44 inches in diameter. A recently developed die casting machine can produce cast units weighing as much as 65 pounds.

Die casting of precise, interchangeable gears, cams, rotors, bearings, housings and other members permits marketing of household appliances at prices that could not be met with other manufacturing methods. Tremendous quantities of aluminum die castings are used in the automobile industry to improve function, appearance and cost of trim parts, small-motor members, dashboards, window frames, lamp housings, knobs, grilles and even bumpers. The complexities of modern aircraft design are kept within bounds by use of intricate servo-mechanism components, and other operating members, die cast to accuracies measured in thousandths of an inch.

Die castings are made in a semi-automatic process, by injecting molten metal under high pressure into a reusable steel mold. After the casting solidifies it is ejected, and the die is closed to receive another measured quantity of metal.

The basic rules of design for good aluminum die casting are not essentially different from those applying to other casting methods. For example, practice has shown that best die castings result when the part is shaped as simply as possible, when section-thickness changes are gradual, when fillets and radii are of generous size, and so forth.

The casting engineer to whom these principles are familiar will have little difficulty in mastering the further essentials of die casting design.

Among these further rules are the following:

1. Keep weight as low, shape as simple, overall dimensions as small and dimensional tolerances as liberal as the functional requirements permit.
2. Sections should be of minimum practicable thickness and as uniform as possible, with transitions gradual and with sufficient draft to assure removal of castings from the die without distortion.
3. Surfaces to be finished should be accessible, with ejector pins located so as to avoid marring. A slight crown is better than a large, flat area contour.
4. Integrally-cast fastening elements may reduce overall assembly costs. However, unnecessary undercuts, recesses, projections and similar irregularities should be eliminated, as should avoidable coring. When cores are used they should be of substantial strength, shaped for minimum cost.
5. When coring is considered, especially for tapped holes, for very small holes or for holes in thin walls, the cost of coring should be compared carefully with the cost of obtaining these features by machining.
6. When permanent inserts are used, they should be anchored securely in the die, and placed so as to eliminate avoidable interference with die operation.
7. Design for flash removal, and for finish machining where necessary, should avoid unnecessarily deep cuts, and otherwise should maintain minimum cost and scrap loss.
8. Gating and venting should be arranged to permit entry of metal in an orderly manner, so as to reach all parts of the die cavity quickly, with a minimum of spattering, eddying and air entrapment.
9. Design foresight, as to proportions and harmony with mating parts, will contribute to good appearance of assemblies.

The above list necessarily is general and condensed. When these basic rules are followed, along with any further principles that may be recommended by Kaiser Aluminum engineers as applicable to a specific design, the aluminum die casting will offer superior qualities of function, appearance and service.

Selection of the proper aluminum die casting alloy depends upon application and desired features of the end product. Table 3 shows strength characteristics

TABLE 1

OPTIMUM CORED HOLE DEPTHS	
Hole Diameter	**Maximum Depth**
1/8"	5/16"
5/32"	1/2"
3/16"	5/8"
1/4"	1"
3/8"	1-1/2"
1/2"	2"
5/8"	3-1/8"
3/4"	4-1/2"
1"	6"

Note: For cores larger than 1", diameter/depth ratio is 1:6.

CONTINUED ON NEXT PAGE ➡

TABLE 2

PRODUCT STANDARD FOR ALUMINUM DIE CASTINGS		
Linear Dimension Tolerances, As Cast	Linear Flatness Tolerances, As Cast	Parting Line Tolerances, As Cast
Basic Tolerance up to 1": ± .004"	Basic Tolerance up to *3": .008"	Projected Area of Casting
		Up to 50 sq. in.: ± .005"
For Each Additional Inch, 1" to 12": ± .0015"	Tolerance For Each Additional *Inch: .003"	50 to 100 sq. in.: ± .008"
For Each Additional Inch over 12": ± .001	*Measured Across Maximum Diameter or Diagonal of Surface	100 to 200 sq. in.: ± .012"
		200 to 300 sq. in.: ± .015"

TABLE 3

Typical Mechanical Properties of Aluminum Die Casting Alloys						
Alloy No.	13	43	85	218	360	380
Tensile Strength in p.s.i.	39,000	30,000	40,000	45,000	44,000	45,000
Yield Strength in p.s.i.	21,000	16,000	24,000	27,000	27,000	26,000
Elongation % in 2"	2.0	9.0	5.0	8.0	3.0	2.0
Mold Filling Capacity	1	3	5	4	1	2
Pressure Tightness	2	3	3	5	1	2
Resistance to Hot Cracking	1	2	4	5	1	2
Machinability	4	5	2	1	3	3
Corrosion Resistance	2	2	5	1	2	4
Anodized Appearance	5	4	2	1	3	3

of representative alloys, together with their relative characteristics in other properties.

For example, if the proposed aluminum die casting were a thin-walled, intricate piece having a smooth, dense surface with good characteristics of strength and corrosion resistance, then alloy #13 or #360 might well be selected. The use of prime metal would insure uniformity and high quality. On the other hand, a heavier and less-detailed die casting might be made from an alloy of the #380 type.

Extensive research has established alloy specifications for all standard purposes. Where product volume permits, Kaiser Aluminum will make available highly specialized die casting alloys.

A variety of decorative and protective finishes are readily applied to aluminum die castings. When effects are desired other than the typically smooth, bright surface, such processes as buffing, brushing and tumbling may be used with great success. On all bare aluminum surfaces, a transparent coating of oxide forms naturally. In some alloys, the protection thus afforded may be increased by anodizing. Paints, varnishes and lacquers adhere firmly to aluminum, with a minimum of preparation. Aluminum surfaces offer the best known base for adhesive-sheet and decalcomania-type materials.

Thus, the manufacturing convenience and low unit cost of aluminum die castings production are complemented by similarly versatile and inexpensive finish processing.

The engineering advisory services of Kaiser Aluminum are available without obligation to manufacturers wishing to take full advantage of the desirable properties of aluminum die casting.

Prompt attention to inquiries regarding new designs, or the improvement of existing designs, may be obtained through the Kaiser Aluminum sales office listed in your telephone directory, or through any of our distributors. Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Building, 919 North Michigan Avenue, Chicago 11, Illinois; *Executive Office*, 7871 Kaiser Building, 1924 Broadway, Oakland 12, California.

KAISER ALUMINUM & CHEMICAL SALES, INC.
Room 7871 Industrial Service Division, 1924 Broadway, Oakland 12, Calif.

Please send, without obligation, the entire "Designing with Aluminum" series to:

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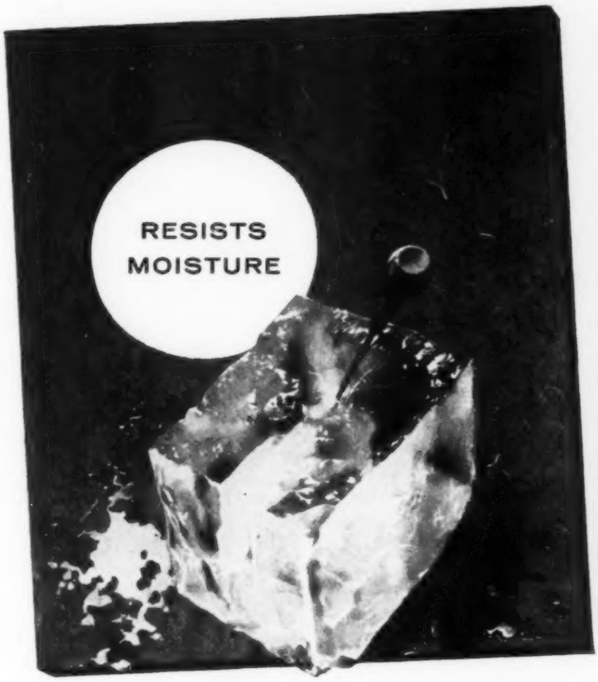
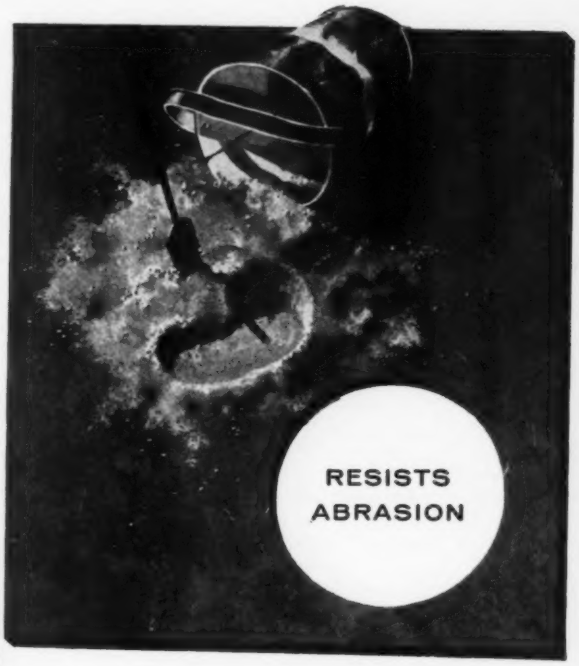
Kaiser Aluminum

see our catalog in PRODUCT DESIGN FILE or write for copy

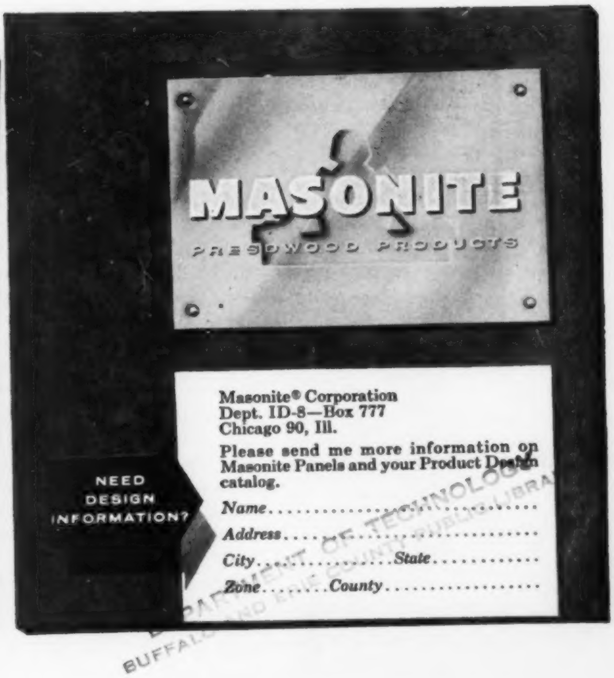
setting the pace—in growth, quality and service

Add extra quality...extra features
to your products with
MASONITE PANELS





(*44 types, textures and thicknesses for 1000 uses*)



Exhibitions: Zurich and Chicago

To demonstrate to Swiss industrialists, designers and consumers the vitality and importance of industrial design in America, Globus Department Stores, a Swiss chain, recently exhibited in their new Zurich headquarters a wide selection of consumer goods, designed and manufactured in this country (photo of installation above). Robert A. Kolli, chairman of Pratt Institute's I.D. Department, was asked by Globus to choose about 250 well-designed objects from every department-store merchandising field, in most cases not exceeding a retail price of $20, and a layout for the exhibition was performed at the Industrial Design School of Zurich.

Yusaku Kamekura's graphic art was exhibited by the Society of Typographic Arts in the Normandy House gallery, Chicago, through August 13. Members of STA noticed the Tokyo designer's package art in ID (June, 1955).

Crafts museum to open

The Museum of Contemporary Crafts, sponsored by the American Craftsmen's Council, will become the first museum of its kind in the U. S. when it opens at 29 West 53rd St., New York, on September 20. Pictured are Mrs. Vanderbilt Webb, president of the ACC, and Thomas S. Tibbs, the new museum's director.

Awards

Interior design students at Pratt Institute took part in a competition sponsored by **Finland House Lighting Corporation** for the design of a ceiling fixture, and their entries were judged by **Paavo Tynell,** Finnish lighting designer. **David Wagner,** director of Finland House (below left) presented the winning trophy to **William E. Maher** (below right) who graduated from Pratt in June. Next year, Mr. Wagner announced, there will be another lighting competition, open to design students throughout the country.

The American Society of Tool Engineers has been presented a special award by the **Industrial Diamond Association of America, Inc.** The award recognized ASTE's "service to the industrial diamond industry and to American industry in general by its sponsorship of the Industrial Diamond Symposium in Chicago, March 19-21."

Six architectural students at the University of Cincinnati's **College of Applied Arts** won awards in the annual competition of the **Illuminating Engineering Society,** Ohio Valley section. Top prizes, $25 each, were won by **Mark H. Beck** and **Michael E. Graves,** while **Laura Fox, Robert E. Hayes, William Phillips** and **Otto Parrish** won honorable mention for their lighting designs.

The First Annual Allmetal Stainless Steel Award winner is **John Hancock Callender,** architectural consultant. He wins a prize of $1,000 sponsored by **Allmetal Screw Products Co., Inc.**

People

Albro F. Downe has become Director of Package Design for Lippincott & Margulies, and **Norman A. Schoelles** was appointed Vice-President in charge of Package Planning. **John Podayko Associates** have been engaged by Lewis and Conger to plan the interior of its new quarters on Long Island.

Stanley F. Korol has joined National-U.S. Radiator Corp. as an industrial designer.

Sigman and Associates announce the appointment of Walter Sigman and Jack Keating to the newly created posts of Vice Presidents.

Raymond R. Fink has been recently appointed an instructor at the Institute of Design, Illinois Institute of Technology, in the product design laboratory.

Joseph Carreiro (left) Director of the Industrial Design Department of the Philadelphia Museum School of Art, has announced the opening of his new **office,** Carreiro Design Associates, Philadelphia.

Arthur D. Little Inc. of Cambridge, Mass. announces the promotion to the vice-presidency of both **Dr. Howard O. McMahon,** Science Director, and **William A. W. Krebs, Jr.,** director and secretary of its affiliate, Nuclear Metals Inc.

Alan E. Sherman has opened a design office in Clayton, Missouri, near St. Louis.

M. Fillmore Harty, former stylist for Ford Motor Co., has been appointed chief designer for Design Consultants, Inc. in Grosse Pointe, Michigan.

J. M. Little (left) announces the division of his design office in Toledo, Ohio, into an industrial design and an engineering section.

Admiral **J. I. Taylor** has been appointed Coordinator of Plans and Programs at Magnavox.

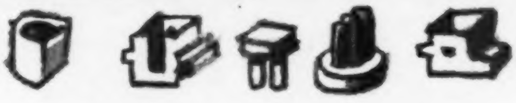
George A. Beck has been made Manager of Industrial Design for the Light Military Electronic Equipment Department at G. E.

Walter L. Koch, formerly Chief Product Designer for Irvin J. Gershen, has been appointed Coordinator of Styling for Rowe Mfg. Co., Whippany, N. J.

Good Design Associates announce that they have been engaged by the Kawneer Company as design consultants.

James S. Plaut, who has been Director of the Institute of Contemporary Art in Boston for the past 18 years, will become Director of Foreign Activities. **Thomas M. Messer** has been appointed to succeed him as Director of the Institute.

Paul Malcolm Heffernan, Professor of Agricultural Design, has been appointed Director of the School of Architecture at the Georgia Institute of Technology. He replaces Professor **Harold Bush-Brown,** who retired in June.



ingenuity of designers never ceases to amaze

Alcoa's Up-to-Dater on Impact Extrusions

News in four pages concerning rules for selecting impacts, finishing techniques, alloy selection, forward-reverse-sideward impacts and some impossible jobs. All solid stuff with very few commercials for tomorrow's design supervisors.

Rules of thumb in lieu of hunches

In the past 35 years of making impact extrusions, we've seen some lulus. Some we thought couldn't be made. Some were new applications and forms that we had never thought of. The ingenuity of designers never ceases to amaze us.

Some of these designers were so familiar with impacts that they just naturally considered them every place where they could save money. Others just had a hunch. Still others tried every other way before they hit on impacts. We don't want you to have to guess. And we certainly don't want you to have to try other fabricating methods. So here are some rules of thumb to help guide your thinking.

1. Parts requiring hollow sections—either tube- or can-shaped with one end closed.
2. Parts with walls or surfaces requiring zero draft.
3. Parts requiring lengths up to eight or ten times the diameter.
4. Parts requiring the strength of forgings.
5. Parts requiring tolerances down to $\pm$ 0.005″.
6. Parts requiring ribs, bosses or fins as integral parts.
7. Parts requiring low unit cost in mass production. (Often the savings in machining, fabrication and assembly made by impacts amortize tooling in relatively short runs.)

Where the finish affects the start

There are lots of products that can't go to market unless they've been painted or plated or colored in some manner. Thus, the finish is an important consideration right from the start, and the manufacturing process is often selected on the basis of smoothness of surface. To this end, we point with pride to the smooth texture of Alcoa Impacts. No parting line. No scale. No draft to cut off. Just a lustrous, rustproof surface of about 125 micro-inches, on the average. To this, many manufacturers add paint or lithographed inks (look at tooth-paste tubes). Others anodize in every color of the rainbow.

we point with pride to the smooth texture

Forward — Reverse — even Sideways

The first contact most designers have had with impact extrusions has been the reverse type. In this method, a metal slug is put in a closed die and struck with a punch. The metal squirts through the annular opening between the punch and the die, following the contour of the punch. This process has been called indirect extrusion, upward extrusion, backward extrusion or reverse extrusion. The last is best known and most accepted.

It is also possible to squirt the metal forward, through the die. Flanged parts with hollow or solid stems are made most economically by this method. This process, too, has lots of names: Hooker process, downward extrusion, direct extrusion and forward extrusion. Here, again, the best-known and most accepted terminology is the last.

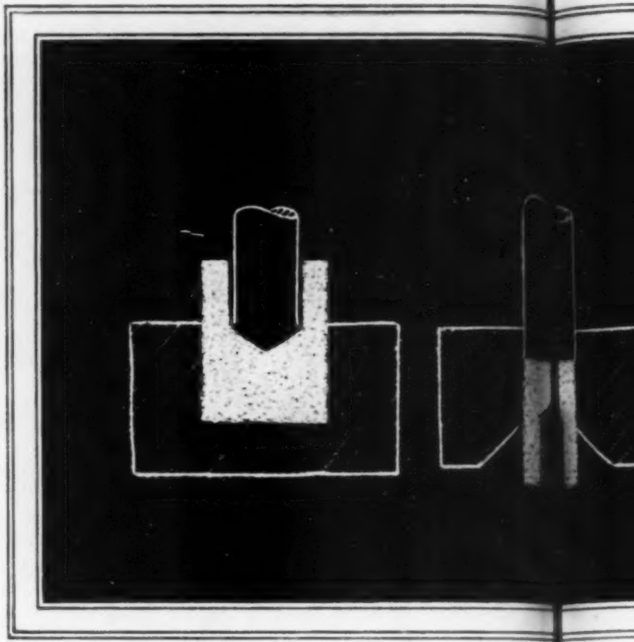
Now hang on. It is possible to combine a forward and reverse extrusion in the same place. This forms a part, hollow on both ends and solid in the middle. Like other impacts, it may have flutes, splines and bosses both inside and outside. The parts may be round, oval, square, rectangular or odd-shaped, and either symmetrical or nearly symmetrical about the longitudinal axis.

Still with us? Not only can we impact forward and reverse, at the same time, but we can also go sideways, too. Thus, it is possible to make parts with a central hub having arms or spokes radiating from it. These arms or spokes may also be varied in cross section. Sideways impacts cost more, but designers often are confronted with problems of producing a lot of such pieces. Usually such shapes as impacts would be cheaper than assembly and fabrication.

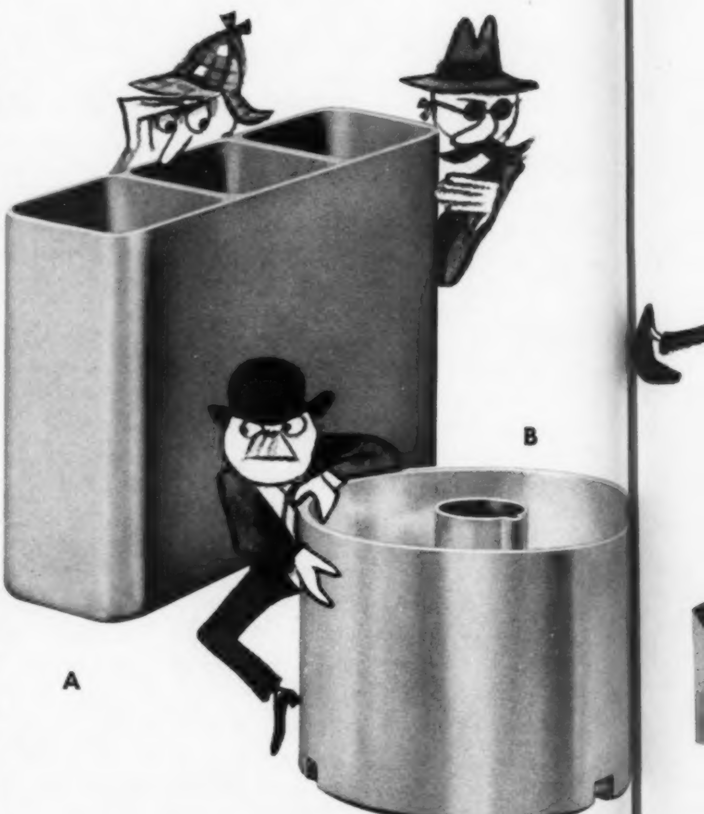
All of the foregoing should suggest to you that there is more than one way to bang out an impact. The best rule to follow is to suspect any closed-end tubular part or can-shaped part as susceptible to impact extrusion. And the best place to confirm those suspicions is at your local Alcoa sales office.

Some impossible jobs and a few difficult ones

Sounds like kidding, but many of the impacts you see across the bottom of these two pages would have made our production experts flip on edge ten years ago. Some still don't believe they are real. It's getting so that high-strength impacts of 7075 alloy and double-walled parts are downright commonplace. Asymmetrical parts are getting more common day by day. Forward-reverse combinations are old hat around our shop. More thinking is going into sideways impacts. Is all this well known among designers? On the chance that an idea may be lurking somewhere, check the five examples at the right.



more than one way to bang out an impact



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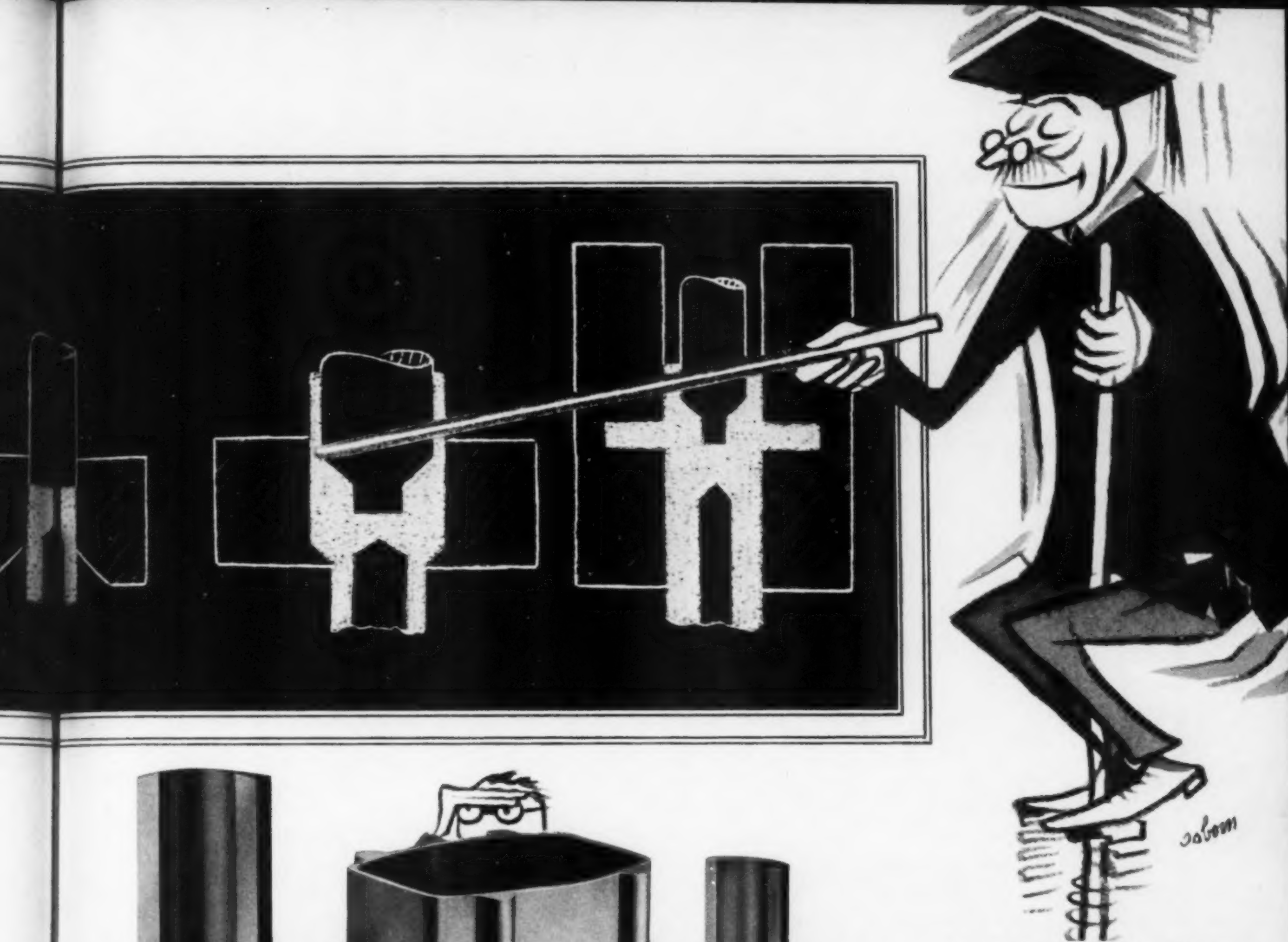
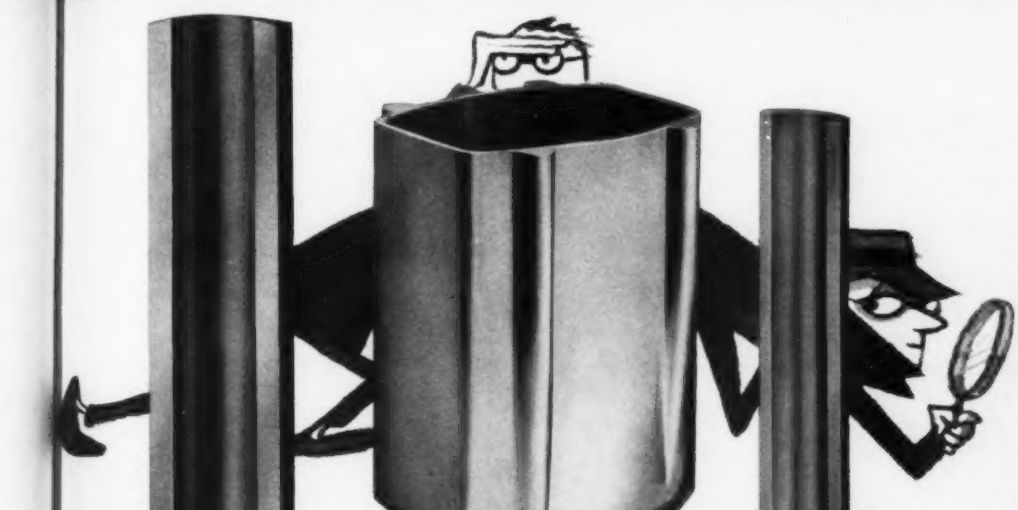




an idea may be lurking somewhere

Alcoa's Up-to-Dater on Impact Extrusions (continued)

is for alloy

In the alphabet of design, one of the first considerations is alloy selection. Designers have definite ideas about the tensiles and yields they need. They reconcile these requirements with the suitable types of fabrication available—and base their decision on the economies of the problem. In impacts, Alcoa offers six alloys with varying properties up to 75,000 psi tensile.

Naturally, the stronger alloy impacts cost more . . . but often they're worth it. Here is a quick run down arranged in ascending order of mechanical properties.

MINIMUM MECHANICAL PROPERTIES OF WROUGHT ALUMINUM ALLOYS COMMONLY USED IN ALCOA IMPACTS

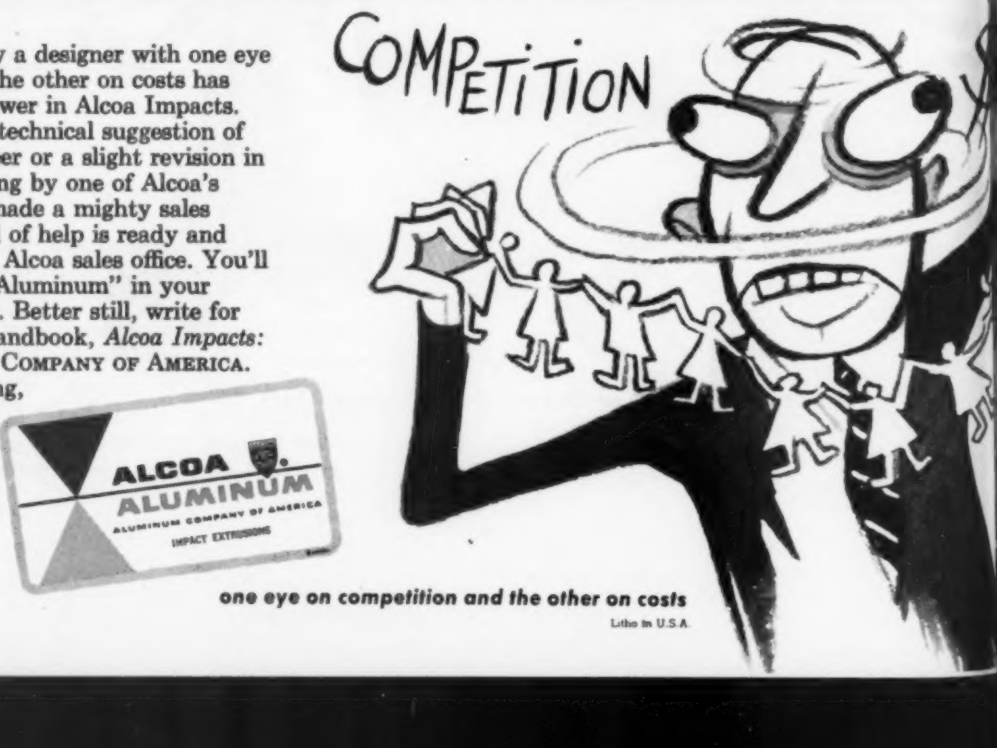
ALLOY AND TEMPER	TENSION				HARDNESS①
	WALL THICKNESS	ULTIMATE STRENGTH LB/SQ IN.	YIELD STRENGTH (SET=0.2%) LB/SQ IN.	ELONGATION PER CENT IN 2" OR IN 4D	BRINELL 500-KG LOAD, 10-MM BALL
1100-H152②	All	18,000	......	....	...
1100-F③	....	......	......	....	...
3003-F③	....	......	......	....	...
6151-T6	All	44,000	37,000	7.0	90
6151-T84	.040"-.093" .094" & Heavier	35,000 38,000	32,000 35,000	4.0 4.0	80 80
6061-T4	All	26,000	16,000	12.0	50
6061-T6	All	38,000	35,000	7.0	80
6061-T84	.040"-.093" .094" & Heavier	35,000 38,000	30,000 35,000	4.0 4.0	75 75
2014-T4	All	55,000	32,000	10.0	100
2014-T6	All	65,000	55,000	7.0	125
7075-T6	All	75,000	65,000	7.0	135

①Hardness test will be made only on the bottom of the part. It is used only when a standard-type tension test specimen cannot be obtained from the side wall.

②This temper designation applies only to parts that permit selection of a test specimen from the side wall and where guarantee of mechanical properties is required.

③Mechanical property determinations are not required for this temper.

Straight Talk—Many a designer with one eye on competition and the other on costs has found a practical answer in Alcoa Impacts. Oftentimes the solid technical suggestion of an Alcoa sales engineer or a slight revision in an engineering drawing by one of Alcoa's Impact experts has made a mighty sales advantage. This kind of help is ready and waiting at your local Alcoa sales office. You'll find it listed under "Aluminum" in your classified phone book. Better still, write for Alcoa's new design handbook, *Alcoa Impacts:* 32 pages. ALUMINUM COMPANY OF AMERICA. 1994-H Alcoa Building, Pittsburgh 19, Pa.



Your Guide to the Best in Aluminum Value

one eye on competition and the other on costs

Litho in U.S.A.

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OF *Cymel**

THERE'S A MATERIAL DIFFERENCE IN PLASTICS—which is why Stromberg-Carlson chose CYMEL Melamine Molding Compound 1077 for its new line of colored telephones available through independent telephone companies. One of the hardest synthetic materials known, CYMEL is extremely break resistant. Its "handling" qualities are unequalled—pleasant to the touch, resistant to scratching and perspiration stains. And it's readily available and moldable in an unlimited range of built-in colors. For a better plastic product—call on CYMEL.

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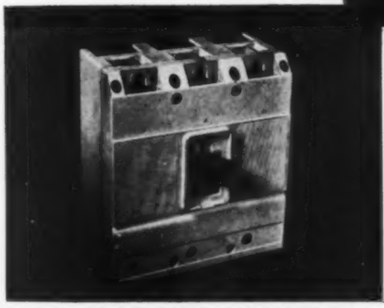

FOR HEAVY-DUTY ELECTRICAL APPLICATIONS, like this I-T-E 250 amp circuit breaker, CYMEL 3135 glass-filled melamine molding material offers high impact strength, easy molding in small or large parts, high arc and flame resistance, dimensional stability.

LIKE AN OUTSIZE TRUNK ON WHEELS, this reinforced plastic trailer is rented day after day, in all kinds of weather, for less-than-van-load moving. Reinforced LAMINAC® polyester resin makes the trailer light, strong, stable, shock- and corrosion-resistant, easy to maintain. Letters are molded right into the trailer body.

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for tomorrow's market. For more information on Hi-fax,
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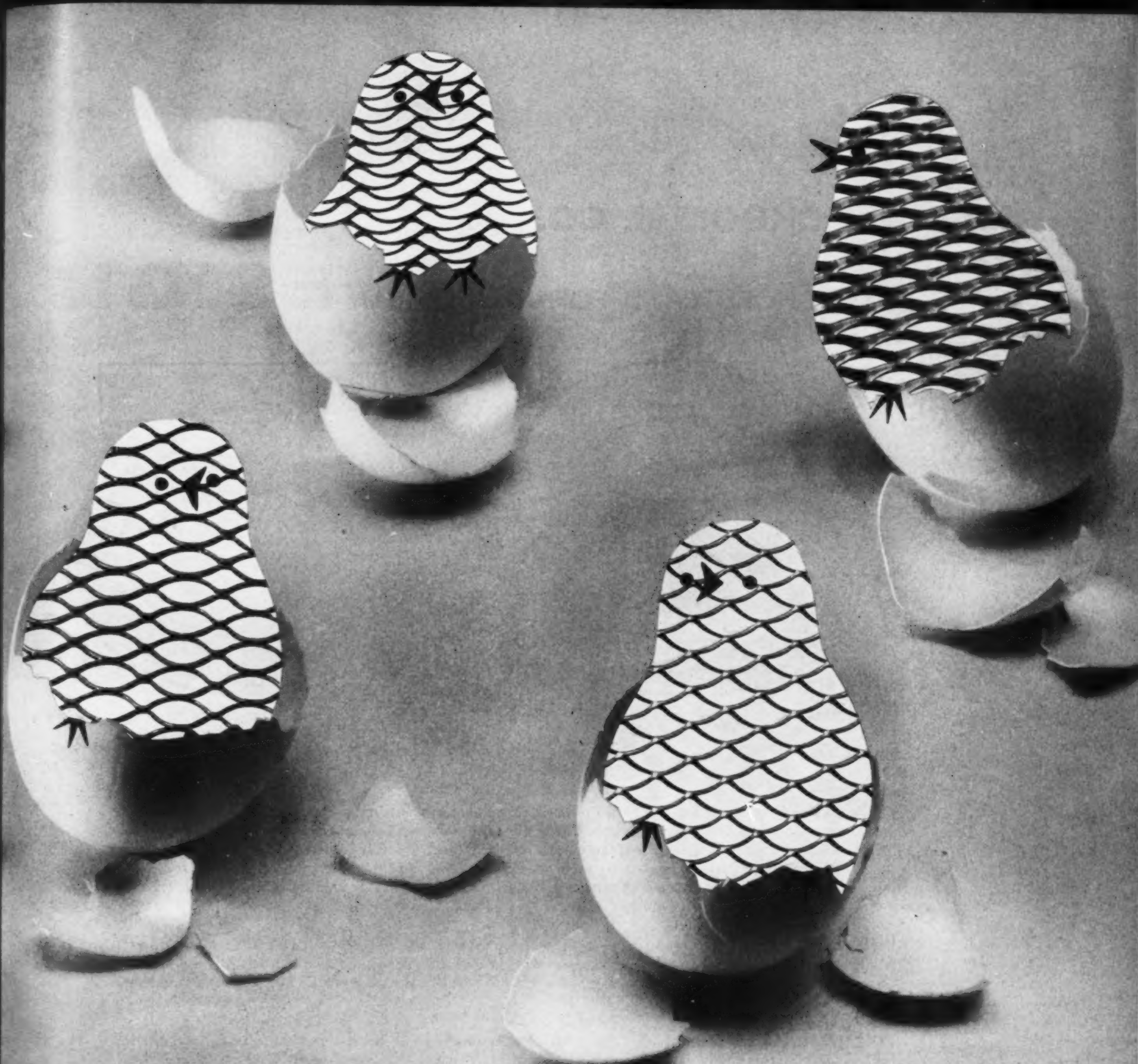

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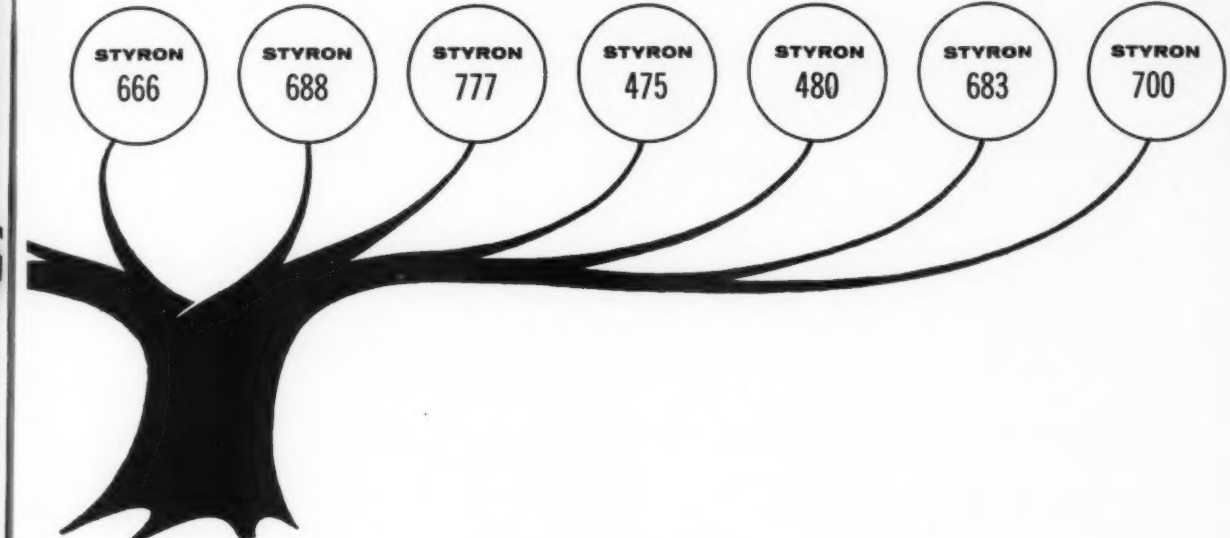

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**general purpose—
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Meets the special requirements for molding thin sections, deep draws, and parts demanding accurate dimensional control—such as containers, vials and housewares. Proved excellent for high speed automatic molding and large area parts.

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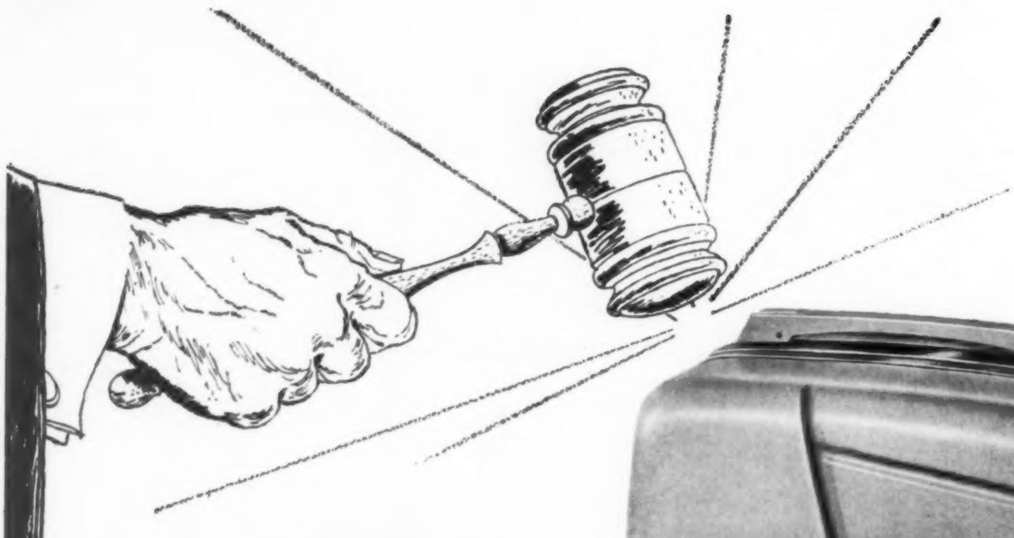

U. S. ROYALITE
WINS ANOTHER CASE!

"Impact" couldn't crack it!

Exhibit "A" — **The ROYALITE case of the new Revere "777" 8 mm. portable projector, is cleverly designed by Revere Engineers as an integral part of the machine. The removable cover contains a ribbed inner liner to which is riveted a reel support, cord retainer and lock. Revere, a user of Royalite cases since 1949, has pioneered in engineering its products for functional beauty.**

To win, time after time, in the trial of use and abuse, any "portable" must have an eye-appealing case that stands up under hard knocks. A case like that of the fine, precision-built "777" portable projector, *formed from* U. S. ROYALITE.

This tough, versatile fabricating material has the structural rigidity of plastic fortified with rubber for needed impact resistance. Supplied as a thermoplastic sheet, it is easily formed to complicated shapes with sharp detail on low-cost tooling, and for limited runs or prototypes, dies can be quickly and inexpensively made of wood or resin as well as metal. Needed supports and dividers to receive accessory parts can be formed simultaneously with the case, saving assembly operations.

U. S. Royalite thermoplastic sheets can be obtained in attractive standard or special built-in colors with glossy-smooth or dull textures. Various degrees of rigidity are obtainable, as well as flame-resistant (self-extinguishing) material. Contact us at once to see how Royalite can be turned into cases or covers for *your product*... cases that combine beauty, utility, and economy as never before. United States Rubber Company, 2638 Pulaski Road, Chicago 39, Ill.

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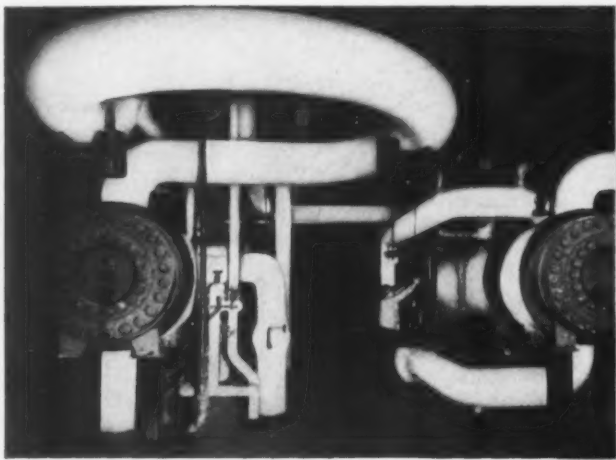
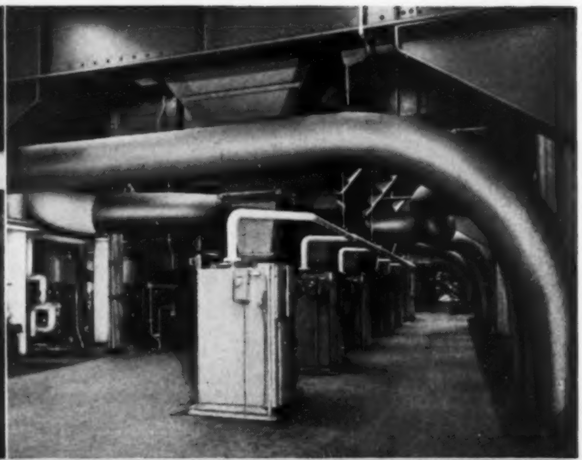
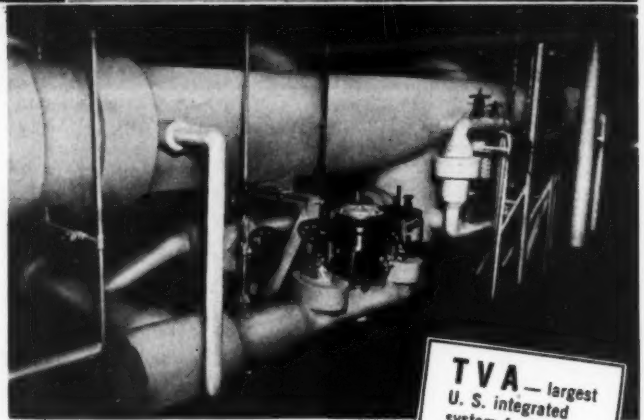
United States Rubber







In the Shawnee Steam Plant
Top left—
High pressure heaters No. 2 and No. 3 of Unit 6

In the Kingston Steam Plant
Top right—
Main steam lines of Unit 6

In the Johnsonville Steam Plant
Lower right—
Heater No. 5 of Unit 4

TVA—largest U. S. integrated system for power production—serves some 7,000 manufacturing establishments, either directly or through 150 distributors

Protecting costly insulation and equipment

in the steam plants of the Tennessee Valley Authority

Arabol Lagging Adhesive—developed to meet certain specific needs in World War II—is now the accepted, basic material for cementing lagging cloths of every type over insulation materials. It has the mechanical strength to hold the insulation permanently in place—on furnaces and on ducts and pipes carrying steam, hot water, ice water, cold air, gases and liquids of many types. It forms a flexible (vermin-proof) bond which expands or contracts with the insulating material, resists external humidity, solvents, repeated wetting and mechanical impact.

This adhesive dries to a semi-gloss white finish—forming an excellent undercoat if a finish coat is desired.

Arabol is proud of the fact that Arabol Lagging Adhesive was selected by the engineers of the Tennessee Valley Authority for use throughout these plants. Today, this adhesive is similarly in use in other plants and buildings—large and small—and on the *Superliner United States*, the *U.S.S. Nautilus* and ships of many types.

Somewhere in your business you use adhesives—in the making, labeling, packaging or shipping of your product. Somewhere near your business there is an Arabol plant or warehouse ready to serve you.

There are three yardsticks by which to measure Arabol service. The first is based upon our 71 years of pioneering in the making of adhesives—to meet the needs of a hundred industries—for a thousand end uses . . . the second is that you may call upon any of our five laboratories to help you find the one adhesives formula that best meets each of your adhesives requirements . . . the third is that you are served by a nationwide network of fourteen Arabol plants and warehouses. In the event of special conditions arising in any one area, you are served from another plant or warehouse with adhesives to the same exact specifications.

We invite the opportunity to submit samples for you to test in your own plant—under your particular working conditions—for your specific requirements, whatever their nature. That is the one kind of testing that assures you of satisfactory results. Your inquiry to Department 52 will bring a prompt response on any adhesives problem. For illustrated specifications on Arabol Lagging Adhesive, kindly specify Book #14.

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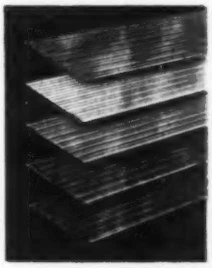
COLOR, DESIGN and "MYLAR" sell for Admiral

"Homemakers now have a choice of color panels to match their kitchen décor," reports the Admiral Corporation. "This do-it-yourself laminate surfaced with 'Mylar' and backed with pressure-sensitive adhesive gives us an inexpensive method of meeting the public's demand for color combinations . . . there are no special production or inventory problems, since these panels provide color flexibility with standard production models."



After considering many possible techniques for presenting color, Admiral selected a laminate with Du Pont "Mylar"* polyester film. They realized that "Mylar" is a tough, flexible material that resists abrasion, moisture and chemicals. It's dimensionally stable and long-lasting. Just as important, "Mylar" retains its bright, lustrous appearance while giving the metallic colors long-lasting protection from tarnishing.

Whether you make guided missiles or ladies' handbags, "Mylar" may help improve performance or increase the over-all value of your product. For more information on "Mylar" or decorative surfacing with "Mylar", send in coupon below.

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

In Canada, "Mylar" is sold by Du Pont Company of Canada Limited, P.O. Box 660, Montreal, Quebec.

E. I. du Pont de Nemours & Co. (Inc.)
Film Dept., Room I-8, Nemours Bldg., Wilmington 98, Del.)

Please send your booklet with swatches of decorative surfacing materials made with "Mylar" polyester film and names of manufacturers who supply them (MB-7, SF-4).

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Manufacturers and Designers are invited

to submit entries for

INDUSTRIAL DESIGN's 3rd ANNUAL DESIGN REVIEW

which will appear in the December 1956 *issue*

A major feature in the December issue of INDUSTRIAL DESIGN, the third Annual Design Review will be a portfolio of the year's major developments in industrial design. It will also help forecast the effect of these advances and innovations in the designs of the coming year.

What Will Be Included?

The Review will cover every facet of industrial design: new and redesigned products, packaging, materials, professional and industrial equipment, as well as appliances, housewares, and other consumer products. A comprehensive review of this scope, highlighting the ideas and accomplishments of an entire year, provides a valuable permanent reference for designers and manufacturers alike.

Who Is Eligible To Submit Material?

We invite contributions from designers (independent and staff), engineers, and manufacturers of finished products or of the materials used in these end products. We would like to make our selections from the largest group of designs possible, so feel free to submit as many entries as you wish.

How Do You Participate?

From designs placed on the market since September, 1955, choose those which you would like included in this annual review. These designs should represent the most significant work of your firm or design office. Perhaps a design has made a particular contribution in its field, has overcome special practical problems, offered unusual features or merchandising ideas.

How To Prepare Entries?

Send us one or more reproduction photos of each product (unretouched "salon" type), labeling each photograph clearly with the names of the product, the designer, staff member, or department in charge, and the manufacturer. *On the same label please include a brief note stating what you consider is unique and distinguished about the product you have selected.*

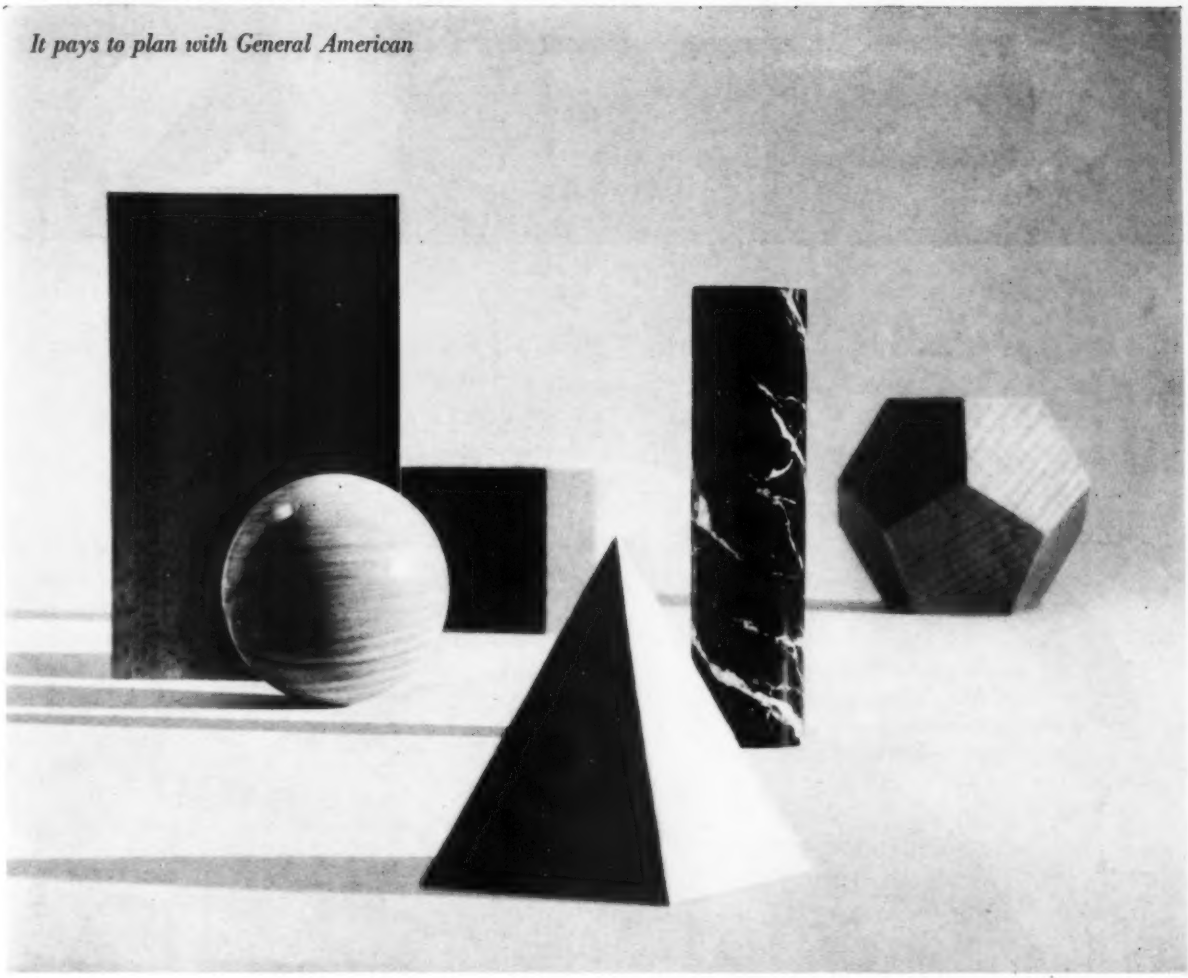
The following categories, though not in any way definitive, may give you some ideas for evaluating your products:

1. notable solutions to familiar problems and established product types
2. designs without prototypes; that is, designs for objects never manufactured before, which embody new approaches to unfamiliar problems
3. inventive designs: solutions based on new practical improvements in function and operation
4. engineering developments
5. apt and unusual use of materials, components, finishes
6. packaging design
7. new ideas for merchandising products
8. designs that had unexpected or outstanding consumer acceptance (with brief sales story)

There is no restriction on the number of photographs or designs submitted. Closing date for contributions is September 20, 1956.

INDUSTRIAL DESIGN

Whitney Publications, Inc., 18 *East* 50*th Street, N. Y.* 22 *N. Y.*



a whole new world of profit opportunities with **GEN®**

General American's new material offers unexplored possibilities for packaging, furniture, building and a host of other uses!

Now, anything that can be photographed can be duplicated on Gen—a completely new idea in decorative plastic sheeting. By means of an exclusive process, General American's Plastics Division now offers sheeting and formed parts that bear perfect reproductions of leather, marble, wood grain, fabric—any material, pattern or design.

Gen-715, the first of a series, can be vacuum formed on conventional equipment or produced to your specifications, by General American. It is available in standard widths up to 40 inches and in any desired lengths—thicknesses from .040 inches to .187 inches.

Where can you use GEN? In appliance interiors and housings? Product presentation and packaging? Furniture? Wall and ceiling tile? Advertising specialties? Displays and signs? Three-dimensional paneling? *Where can you use Gen?* Find out. Write to General American for samples and descriptive literature.

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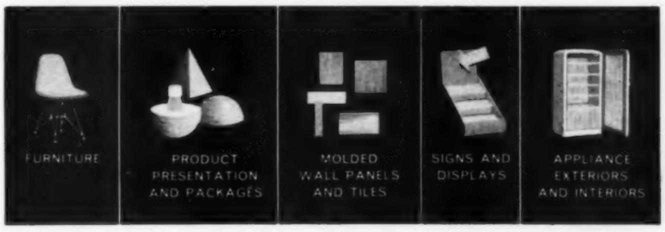
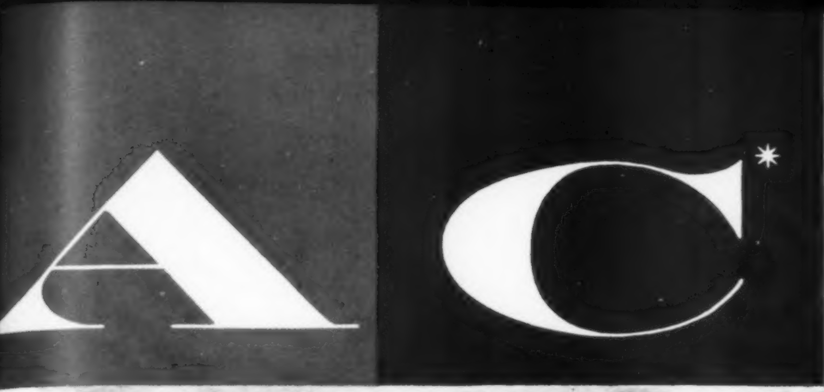



CYM
For



Methyl-Styrene Molding Compounds

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Announcing New Thermoplastic Molding Compounds...CYMAC

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NOW AVAILABLE—two compounds so heat resistant that products molded from them show no distortion after repeated, extended immersion in boiling water.

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2. CYMAC 201 Methylstyrene-Acrylonitrile Copolymer—offers better toughness, chemical and craze resistance than CYMAC 400—*plus* heat resistance, clarity, luster, and wide color range.

Both of these new molding compounds provide the added value of remarkable heat resistance at costs no greater than competitive materials.

These new methylstyrene thermoplastics are made possible by revolutionary new processes developed by Cyanamid. They will help you upgrade existing molded products, and find new applications in consumer and industrial fields.

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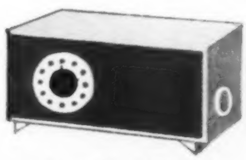
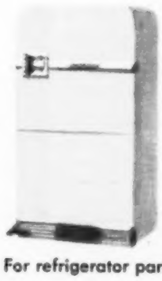
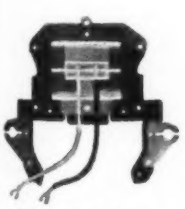

For radio cabinets


For refrigerator parts


For business machine housings and parts


For pen barrels


For electrical parts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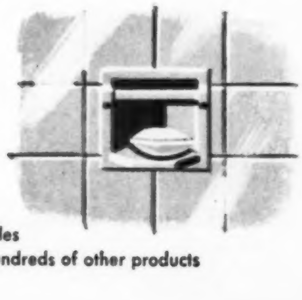
For battery cases


For wall tiles
. . . and hundreds of other products

—unlikely uses for Homasote

A beach towel

— it might be unwieldy to carry in a passenger car ... but the point is ... an 8′ x 14′ sheet of weatherproof material is big; quite a number of people could sit or lie on it. When you need *size* — remember Homasote.

A sound-deadening canopy

— over the speaker's rostrum — could often be a boon to the audience. The point is ... this homogeneous fibre board has a decibel rating of 0.23 at a pitch of 512 — many times better than plaster.

Homasote Insulating-Building Boards are now available in five thicknesses (from $\frac{15}{32}$″ to $1\frac{7}{8}$″) and in a wide variety of sizes and densities ... We have engineers and architects — long experienced with our products — whose services are available to you without obligation. May we cooperate on a specific current problem? May we send you literature broadly descriptive of Homasote in all its present forms? We invite your inquiry to Department H-20.

HOMASOTE COMPANY
TRENTON 3, NEW JERSEY

Why INDUSTRIAL DESIGN goes monthly (from 6 to 12 issues a year) starting January, 1957

At a time when inflation is both on paper and *in* paper — when a dollar bill barely buys the stock it is printed on — the decision to print twice as many of *anything* is not to be lightly made. The decision to double this magazine's publishing schedule in 1957, announced on a previous page, springs not from mid-summer headiness but from cool business facts. In the brief span of 15 issues, the publisher and editors have been roundly convinced that there is an abundant audience for a magazine about design in industry. We are proud but not boasting; we want to underscore a point. A magazine of this scope could never have survived the first uncertain months without the active support of professional designers; neither could it have endured on an audience of designers alone. The reason? Purely statistical: There are not enough men officially designated as "industrial designers" to support a commercial publication of a calibre appropriate to their professional rank.

Who, then, are our readers? For whom is a magazine called INDUSTRIAL DESIGN published? This question doesn't come up as often in August 1956 as it did in January 1954. But we occasionally run into someone — like the bespectacled visitor at a recent trade show — who fills us with a secure sensation of knowing who it is *not* published for. Shuffling through ID, this visitor remarked, "This seems to be filled with LARGE objects, and I'm only interested in small ones," whereupon he proudly displayed a little watch box filled with streamlined plastic needle threaders.

ID *is* published, as our masthead reveals, not only for active industrial designers but for any and all "executives concerned with product design, development and marketing." If this sounds like a bid for universal readership among men in industry, it is. There are few executives in manufacturing today — whether titled Vice President of Market Development, Chief Engineer, Manager of Product Planning, or simply President — who can afford *not* to be concerned with product design, development and marketing. And there are fewer every day who do not translate these concerns (sometimes lumped as a concern for "sales") into design activity of some sort. Admittedly the job of this design-minded executive, ranging from participation to supervision, is not as easy to pigeonhole as that of a "value analyst" or "gear engineer." But the very lack of boundaries points up its greater importance.

Management is responsible for the existence of a *design attitude* in industry today — nobody else could have done it. Designers are responsible for converting this into a *condition of action and change*. Their interplay is more dynamic, far more demanding on every man in the idea-to-product circuit, than the old quick sketch game called Styling. To consider designers apart from their management counterparts is, even for purposes of definition, unnatural; to write to each group separately about problems that are mutual is to cheat both sides.

That is why ID is not addressed to a single job title. It is written for a *type* of person who is defined by influence and attitude. That person's job equipment includes, among other paraphernalia, these things: 1) A grasp of the whole American marketing scene, whether the products that concern him are LARGE or small; 2) Insight into the consumer's needs, hidden and expressed; 3) The ability to translate that need into a better, more purchasable commodity — or to entrust someone else to do the same.

ID's growth is based on this fact: Just as designing is the function of the designer, design is a function of management. It takes as much know-how to engage a designer (there are many clients in top management on our lists) and to collaborate with a designer (there are many engineers on our lists) as it does to do the design (nearly all of America's professional designers read INDUSTRIAL DESIGN).

ID's job is to keep in communication the designing and non-designing participants in product creation, to convey the information that both groups need for collaboration. To do that job better, we are doubling our schedule in 1957. We are also doubling our staff and our editorial effort to be an effective meeting ground. We hope that, to all of you in this vital group of readers, ID can continue to be worth more than the paper —however dear — that it is printed on. *j.f.m.*

Top: A

Center:

Bottom

This is a report on the men to the left, the men behind the design programs of the three American companies that have been making aluminum and making markets for it, their individual differences, and their different ideas about design.

The aluminum industry and design

by Hugh B. Johnston

All aluminum, from the war to 1955, was divided into three parts — Alcoa, Reynolds and Kaiser. Statistics don't tell the story of this fast-moving threesome, but together they produced some million and a half tons of aluminum last year, more than double the 1950 amount. Statistics aren't satisfactory because the sharp rise in their production is underscored by a much steeper upsweep in public consumption, for government stockpiling and defense consumption have fallen off rapidly in the last few years. As America puts more aluminum into its everyday products, Alcoa, Reynolds and Kaiser — each in its own way and in its own good time — are getting more interested in the men who design the products. Here is a run-down on what the three have been doing about design:

—In 1950 Reynolds appointed designer Jim Birnie, with the company since the war, to organize and head up a Styling and Design Department, which now has 54 designers, draftsmen and renderers working on product, packaging and graphic assignments.

— In 1955 Alcoa set up a Market Development Department and hired Sam Fahnestock, an experienced industrial designer, to serve as a traveling consultant to design offices; since 1953 Harley Earl, Inc. has been retained for the company's own design needs and for experimental work with the metal.

— In 1956 Kaiser took Franklin Q. Hershey, Chief Stylist for Ford, to the West Coast and installed him as manager of an Industrial Design Department, a full-fledged offspring of the engineering-oriented Product Development Department.

The summary indicates a distinct divergence of opinion on how to approach design as an industry service. The differences in these design services and their order of appearance are traceable to evident company differences — Alcoa and Reynolds, so similar in purpose (i.e., sell more aluminum), could not be more unlike in method. The industry as a whole is committed heavily to enormously increased public consumption of the metal — all three are engaged in expansion programs costing hundreds of millions of dollars. Such commitment rests less on heady enthusiasm than on a calculated confidence in the industry's shrewd and methodical development of markets. Thus far, aluminum market development has been a continued success, borne of much research, much aggressive merchandising and, more recently, much use of design, product, packaging and architectural, as a creative stimulus toward better achievements in aluminum. Reading design as a crucial increment of future marketing is common to all three companies; individual differences in its interpretation and utilization should become apparent as we take a closer look at the design activities in each over the next 12 pages.

Aluminum is the most inexpensive of the non-ferrous metals and the youngest of all the inexpensive metals. When aluminum arrived on the market, the industrial scene was full of long-established metals being used in traditional applications. The problem was to replace them. Except in limited areas where aluminum's lightness combined with its low cost gave it immediate markets, it had to prove itself better than something else to be specified. To be better, it first of all had to be understood. This education process has been a major industry headache, for aluminum, like "plastic," is many things to many people.

Aluminum is the only metal available in every form known to the metal-working industry. Its alloys, all better than 90 per cent parent metal, range in tensile strength from 10,000 to 90,000 pounds per square inch. It can be finished by clear or color anodizing, hard coating, painting, lacquering, vaporizing, photosensitizing, sand and dust blasting, engine turning and coining, etching, ball burnishing, grit polishing, scratch brushing and porcelainizing. It can be perforated, expanded and textured in an infinite number of ways. Every day it is commercially drawn, stamped, spun, roll formed, punched, drilled, forged, welded and brazed. Because it is so versatile, then, the chances for exciting applications are equalled only by the chances for inept ones. We will find that the primary aluminum producers, though they differ markedly in emphasis, are using design as a creative stimulus and

Top: *Alcoa's Frederick J. Close (right) and Samuel L. Fahnestock*
Center: *Reynolds' David P. Reynolds (left) and James Birnie*
Bottom: *Kaiser's Ralph E. Knight (left) and Franklin Q. Hershey*

as an adjunct to sales. Even more, perhaps, they are interested in design as an implement of quality control. Aluminum is a low-cost material, but no more than polystyrene does it want to be regarded as cheap.

Alcoa and the industry's origins

There was a time not long ago when aluminum was not an industry but a rare metal, a drop in a laboratory crucible. Contrast this summer's aluminum price, around 23 cents a pound, with the going pound price in 1852 — 545 dollars. A century ago, though aluminum was known to be an element abundant in the earth's crust, the industry had not yet emerged from the laboratories — no economical method for obtaining it from its various ores had been discovered. The birthday of the industry as such can be set at Thanksgiving Day, 1888. This was the day Captain Alfred Hunt and a group of enterprising Pittsburghers began to make aluminum by a low-cost electrolytic process that had been developed by Charles Martin Hall, a 24-year-old Oberlin College graduate who had been trying for two years to get someone interested in his discovery. Captain Hunt and his men were his first takers, and the Pittsburgh Reduction Company, with Hall holding one-fourth interest, went into operation.

In the ensuing years business prospered for Pittsburgh Reduction, and a new name was adopted — Aluminum Company of America. Thimbles and collar buttons were among its first mature, if miniature, markets, and it was soon discovered that aluminum had a combination of properties well suited to cooking utensils. In a short time the cooking utensil industry was consuming the bulk of annual production, though battles were being won on other fronts. Aluminum cable was replacing copper for high-voltage transmission lines. Just before the turn of the century a long span of aluminum transmission line was laid across San Francisco Bay (and it is still in use). The building industry was using aluminum decoratively before 1900. Alcoa produced 10,000 pounds in 1905, and by then the price had dropped to 33 cents. Going into unexplored territory, Alcoa proceeded pragmatically. Its business was built on research, and the senior company is still far and away the leader in this respect (today it has around 700 men in its research divisions, as compared to about 100 each for Reynolds and Kaiser). Alcoa grew up in the conservative mold of Pittsburgh's mature and giant industries. Its officers took their responsibility as sole suppliers of aluminum cautiously and quietly. The automobile and home appliance industries woke up to the possibilities of aluminum, but Alcoa's monopolistic position discouraged them from banking very much on the metal — they did not want to be heavily committed to a single source of supply. Nonetheless, buyers beat a path to Alcoa's door. In 1939 the price was down to 20 cents, and 300,000 pounds were delivered. This was the last year in which Alcoa maintained its 100 per cent grasp on primary aluminum production in the U. S. In 1940 the Reynolds Metals Company, a foil processing concern, took up the business of making aluminum. The war soon kicked up a tremendous cloud of dust, and when Captain Hunt's successors looked out of the window in 1946, they found not one but two interlopers in the garden. Their attitude toward marketing began to change, and to change rapidly, until today Alcoa seems a somewhat intrepid descendant of its former self, a descendant not only aware of design but living in the most thoroughly designed aluminum structure in the world.

Reynolds Metals: aluminum's first noisemaker

The late R. S. Reynolds, founder of Reynolds Metals, got his training in his uncle's business, the R. J. Reynolds Tobacco Company. A sense of debonair showmanship and a flair for merchandising came to the aluminum industry for the first time with Reynolds, and they have had a telling effect on the marketing policies of Alcoa and Kaiser as well. Even in the Thirties, R. S. thought that aluminum foil should be more than an underwrap for cigarettes. He thought that he should be able to print on foil, and invested heavily in the development of presses and inks that would do it. And well before the process was ready, he had Jim Birnie, head of an independent studio, experimenting with package designs on foil. His supply of primary aluminum from Alcoa and European sources became inadequate just before the war, and R. S. Reynolds decided to make it for himself. Soon after the war R. S. was merchandising not only primary aluminum but a multitude of fabricated aluminum products. The emphasis was on *merchandise*, on selling aluminum by selling the ultimate consumer on it, a clearly evident departure from any Alcoa precedent. Alcoa had grown up on a largely industrial market — mill products — and its salesmen were largely engineers. Selling cigarettes, however, is a problem of getting the news to everyone; likewise with aluminum, as far as R. S. Reynolds was concerned. And he proceeded to select the vehicles that would acquaint everyone with what he had to sell.

In 1947 Reynolds Wrap was introduced. For the first time aluminum as a commodity was really popularized: aluminum in the guise of Reynolds Wrap was in the hands of every housewife, including the Alcoa executive's legendary wife, who reminded her husband one morning to "Bring back some Reynolds Wrap, will ya?" Alcoa was marketing a foil of its own, incongruously called Wearever Foil, but Reynolds had completely stolen the show. Aluminum foil to the majority of American housewives had become Reynolds Wrap. It must have been a succession of such episodes that led Alcoa managers to radically refurbish the old merchandising policies.

R. S. Reynolds still had his sights set on the general acceptance of foil-wrapped food packages. Reynolds Wrap, as a matter of fact, had been introduced largely as an attempt to break down a housewifely suspicion about foil next to foods, and its rapid success came as something of a surprise to the company. Foil packaging as a general thing could not be far behind.

Although the Styling and Design Department did not become an entity until 1950, Reynolds had been employing Birnie as a package designer and Bob Wemyss as a product designer since shortly after the war. The company got involved in design years before Alcoa or Kaiser for two main reasons: (1) because offering a design service as a supplement to sales was in line with the company's overall aggressive search for sales — design, the company felt, was a *rapprochement* with their ultimate consumer; (2) because the technicalities of designing on aluminum foil were most successfully coped with by men specially acquainted with the problems. Foil package designs became, and remain, the bread and butter of the Styling and Design Department. A seal program for Reynolds-wrapped packages was launched, and has swollen to preposterous proportions: last year three billion food packages carried the Reynolds seal.

R. S. Reynolds died in July, 1955, and his four sons are now in charge. They have continued to lead the industry in stimulating a popular enthusiasm for the metal, and their competitors are paying the compliment of emulation. Alcoa has suddenly gotten serious about household foil with its Alcoa Wrap, introduced this year, and a seal program for customers' end products got under way last year. Kaiser, as we have noted, recently organized an Industrial Design Department that bears distinct resemblances to the Styling and Design Department. Meanwhile, Reynolds forges ahead: Do-It-Yourself Aluminum, the latest gimmick, is turning up in 15,000 retail outlets.

Kaiser: the third comer

In 1946 Henry J. Kaiser entered the aluminum business, in part because Permanente Metals, a venture of his that produced magnesium for the war effort, had a raft of light metals personnel and no postwar magnesium market, in part because he thought that Kaiser-Frazer autos, in face of a steel shortage, could be made out of aluminum sheet. His interests leased (and subsequently purchased) three government-owned, wartime-built plants for which the government could find no other bidders. (Both Reynolds and Kaiser profited tremendously from anti-monopoly decisions that released Alcoa patents and restricted Alcoa from bidding for the vast production facilities built during the war.) That was ten years ago. Today Kaiser-Frazer autos are defunct, and Kaiser Aluminum is crowding Reynolds for Number Two in the aluminum industry.

But Kaiser has yet to make much of an impression on the consumer. In general, it has been growing up after the image of Alcoa. Like Alcoa, it thought of itself as a primary producer of aluminum pig and ingot and a supplier of mill products to converters. It did not want to compete in end products with its customers. But as Reynolds, and then last year Alcoa, emerged with household foil and seals, network TV shows and design programs, Kaiser decided that unanimity was the best policy. In March of this year the Industrial Design Department opened for business, offering to customers the same services as the Reynolds Styling and Design Department, and last month Kaiser sponsored its first network TV show. In addition, a consumer products division has been installed to take some steps in that direction. It is an ambitious company. If all goes according to calculation, two years from now Kaiser will have 30 per cent of the aluminum business instead of its current 27 per cent. This three-point difference will place it Number Two.

Pros and cons of a design service

For years Reynolds has been promoting a design service. Many designers, particularly in the packaging field, characterize this practice in supplier industries as "unfairly competitive." Degrees of "fair competition," of course, range like degrees of salt on a steak, but since the cry has been heard, and will undoubtedly be heard louder as the practice increases, the matter deserves to be aired. Having just hired an industrial designer to visit design offices as a consultant on aluminum (a job identical in concept to that of Barrett's Bob Rockwood — ID: April 1956), Alcoa will have no part of actively sponsoring a design service for customers. "We are not a company that has *captive* industrial designers," Market Development Manager Frederick J. Close says. "We want to help the industrial designer, not compete with him." Alcoa's advisory service is consistent with this sentiment, although admittedly, upon consideration and approval of a customer's design request, Alcoa will provide the services of Harley Earl, Inc. However, this sort of thing has not been encouraged, so far.

"We sure do!", Jim Birnie retorts when asked if his Styling and Design Department competes with the independent, his tone indicating a ready approval of a little spirited competition — again, a sentiment consistent with the company. "But remember," he hastens to add, "designers are welcome to come in here and stay as long as they like. And they do come, too. And we tell them what tricks we know about designing in aluminum." Birnie is convinced that no manufacturer will come to Reynolds for designing just to save money: "Too much is at stake to make design a bargain proposition. We won't design just anything, you know. A man came in here the other day with the idea that we'd design five related items. Two were aluminum, and three were something else. I told him we'd do the two aluminum items, but the others were no business of ours." So Reynolds provides individual designs in one material that benefit from a specialized knowledge of that material, something less than supervisory control over an entire product or package line. The latter service, Birnie feels, is the province of the independent consultant or company design staff.

The aluminum industry is in a footrace with itself. The following pages give the names and numbers, the tactics and countertactics, and the reader can decide for himself what are elbows — or eyelashes — in this business of promoting aluminum through design.

Alcoa policy: serve design offices and be served

"There are two remarkable things about Alcoa," one of its executives was heard to say. "One of them is aluminum, and the other is Fritz Close." An emphatically energetic sort, Close was Architectural Sales Manager four years ago when the Alcoa Building was completed, the most gigantic showcase—and laboratory—of aluminum applications that any architectural sales manager ever dreamt of. Close more than dreamt of this building; he had a great deal to do with teasing it into existence. Harrison and Abramowitz were the architects, but Close was the motivating force.

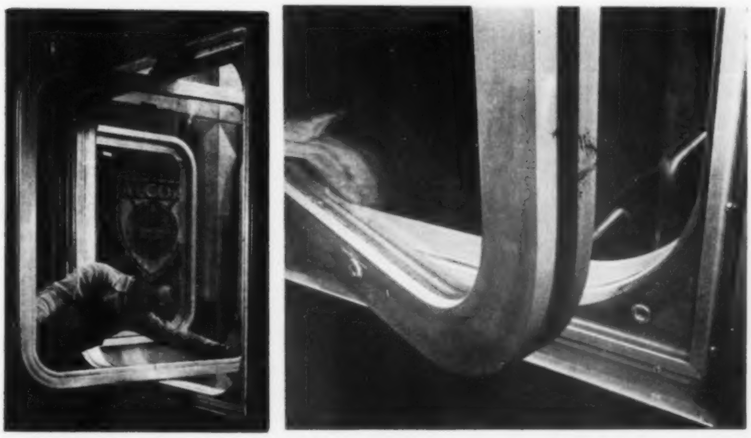
A year ago Close became a one-man Market Development Department at Alcoa. He soon made it two by hiring Sam Fahnestock (right) to travel around to design offices as a special consultant on aluminum. Fahnestock is a designer with ten years of experience in the offices of, successively, Harold Van Doren, Don Dailey and Peter Muller-Munk. With characteristic exuberance, Close describes Fahnestock's role: "His sole function will be to head up a group to call upon industrial designers, review and edit our literature for industrial designers, assemble and distribute a complete package of samples for industrial designers, and conduct members of the profession to locations where things are going on which we cannot take to their offices. And I can assure you you'll hear much more from Alcoa in the future than you have in the past."

Fahnestock has had his hands full since joining Alcoa. For the first few months he got acquainted with aluminum on a plant-to-plant tour. Since then, he has begun to visit design offices with a weighty two-suiter full of samples of aluminum finishes, forgings, fastenings and whatnot. He has spent part of his time in the Alcoa labs, tracking down or discovering for himself

answers to his own or designers' questions. He has devoted some time to following through on a design for an executive DC-3 interior (p. 57). And he has acted as liaison between the company and the producers on a film that is being made about aluminum finishes, a film that Fahnestock describes as "most unusual—no one standing by a desk and talking, not even process shots in the conventional sense."

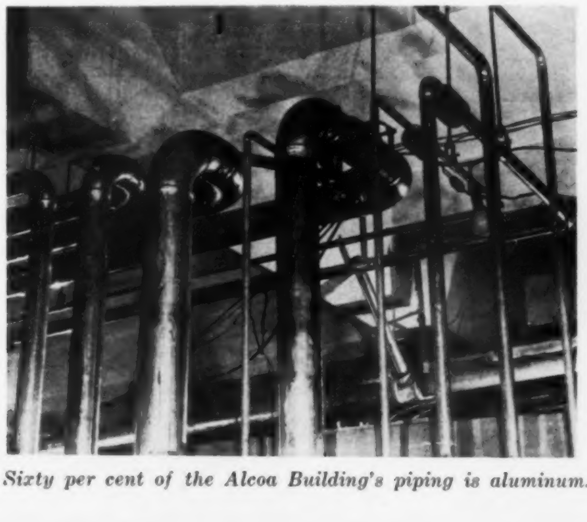
Sam Fahnestock is sure there is reason for such exertion: "When I was a designer in an independent office, I thought I was reasonably well informed about aluminum. Now that I've visited the plants and spent some time in the laboratories, I'm surprised at how little I knew." For him to teach other designers what he has learned, when and where they ask it, is half of Alcoa's answer to promoting aluminum through design. Harley Earl, Inc., on page 57, is the other half.

Sam Fahnestock, with samples, suitcase, and sedan.



Fitted with inflatable rubber tubing for weather protection, Alcoa Building windows pivot a full 360° for cleaning.

Building was first major structure to use aluminum wiring exclusively.



Sixty per cent of the Alcoa Building's piping is aluminum.

Fahnestock visits design offices as consultant on aluminum . . .

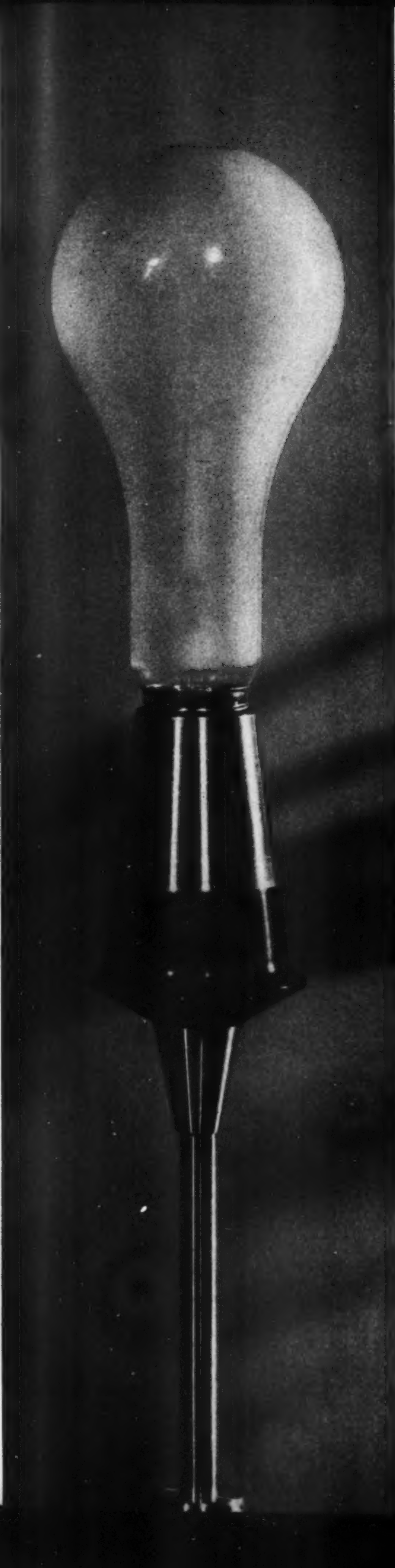
Alcoa's two-man Market Development Department, organized a year ago: Sam Fahnestock (left), traveling design consultant, confers with Fritz Close, Manager, in the latter's Alcoa Building office in Pittsburgh. Together they inspect a recent laboratory product: a two-color woven aluminum panel. "X" quantities like this are their stock in trade.

Fahnestock pays one of his regular visits to the Process Development Laboratories in New Kensington, Pa., base of Alcoa's research activities. After doing some experimental anodizing on his own, he inspects the weatherometer (second from right) with R. V. Vanden Berg, head of the Finishes Section, and together they go over some of the more recent significant samples.

With an additional item or two picked up in the lab, Fahnestock packs his suitcase of aluminum samples and (right) piles into the car for another round of traveling.

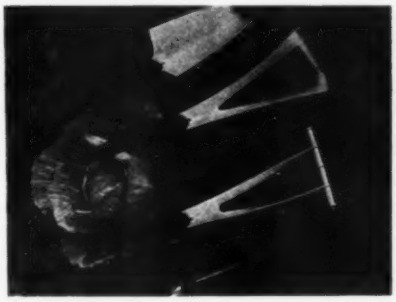
photographs this page by Hugh B. Johnston

Visiting Peter Muller-Munk's design office in Pittsburgh, Fahnestock unpacks his samples and solicits opinions from designers Roger Protas (left in first photo), Muller-Munk and Bob Renaud. Renaud (photo second from right) is examining a recent example of aluminum impact extruding.



. . . while Harley Earl, Inc. does Alcoa's designs

There are two sides to the design coin at Alcoa. Besides engaging Sam Fahnestock to serve industrial design offices, Alcoa in its turn has been served since 1953 by the design office of Harley Earl, Inc. H. E. Inc. has been retained both for Alcoa's own varied design needs — graphics (ID: Dec. 1955), exhibits, executive plane interior, etc. — and, perhaps more significantly, for experimental design work in market development — foil packaging and furniture studies, new patterns and textures, louvres and light sockets, among other subjects. Alcoa, with H. E. Inc., suggests that it is not going to let Reynolds get ahead in this important matter of finding new product areas for aluminum.



(↑) Garden tools of 75-S sheet

(→) Sign standard of tapered tubes

(↓) Alcoa executive DC-3 interior

(←) Natural- and black-anodized socket is attempt to undo an old convention.

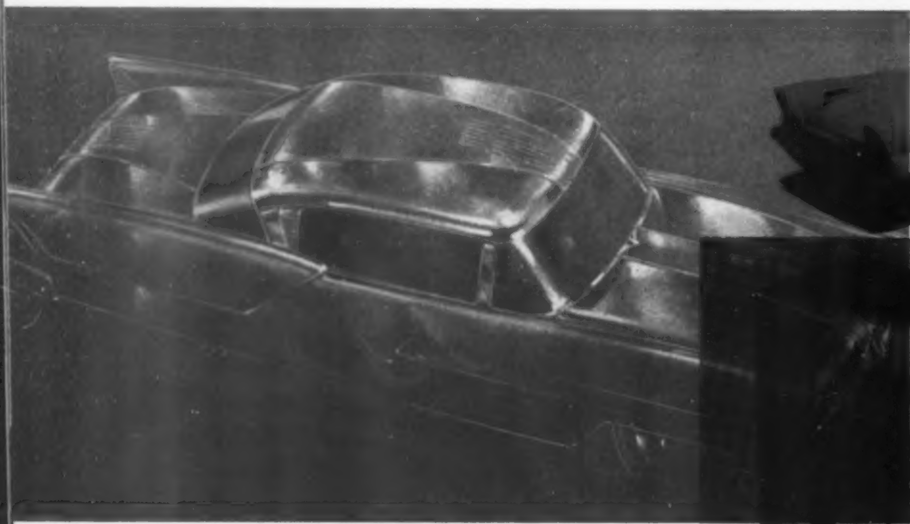
(↓) H.E. Inc. also designed wrap package, intended to give Reynolds Wrap a run.

Reynolds finds design a door-opener and customer-catcher

"One time we did a chafing dish design strictly as a presentation to a group of sales trainees. After the meeting the trainees went out on their own, and before long three of them had called in saying they had sold the chafing dish idea to somebody. So right quick we had to do up two more chafing dishes." Jim Birnie's anecdote demonstrates the quick-and-ready spirit that prevails in the Reynolds Styling and Design Department in Louisville.

Administratively, Birnie's department, unlike the Alcoa and Kaiser design activites, is not placed in Market Development. Birnie reports directly to David P. Reynolds, General Sales Vice-President. The distinction is significant, for at Reynolds, as described on the opposite page, there is a close coordination between sales and design. "The idea of the staff," explains Bob Wemyss, director of product design, "is to get aluminum into a manufacturer's set-up before the designs are frozen. Design is a door-opener for the salesmen, among other things."

Beside Wemyss' product design group, there is a packaging group, directed by John Curran, and a graphics group, under Bob Doherty. Architectural design was formerly part of the department, but now it is under a different jurisdiction.



To stimulate interest in aluminum in Detroit, Birnie's designers have been producing scores of automotive fantasies (one above). More than fantasies are five Lincolns, six Eldorados, three Packards and an Olds 98 which Reynolds had custom-built in Detroit this year for various sales managers, VPs, and Jim Birnie, whose white Lincoln Premiere (above right) sports a gold aluminum top, aluminum front and rear grilles, and aluminum side trim.

Right: Reynolds package designers consulted on popular new gold-foil Lux wrapper and helped put the Reynolds seal (far right) on three billion foil-wrapped food packages last year.

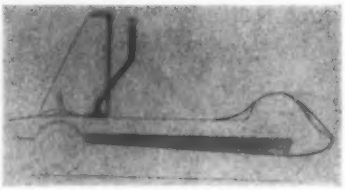
Gathered in conclave are the guiding lights of the six-year-old Reynolds Styling and Design Department: (left to right) John Curran, package design director; Bob Wemyss, product design director; Jim Birnie, general director; Gil Schmid, director of art presentations; Bob Doherty, graphic design director; Bob Winfield, administrative assistant.

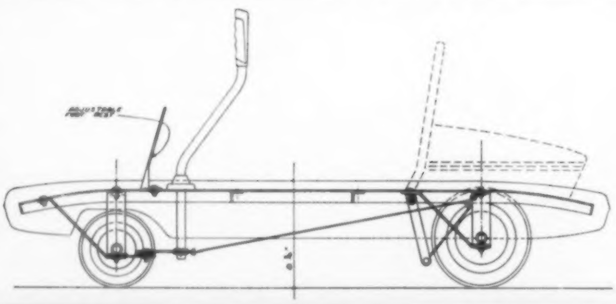
Reynolds procedure in procuring design requests is enacted to the right in two scenes: 1. (upper photo) Reynolds salesman (right) visits a potential customer. Together they discuss product possibilities and fill out a design request form, detailing products the customer manufactures or is interested in manufacturing, existing equipment, sales organization, size of aluminum account, etc. 2. (lower photo) Salesman returns to Styling and Design Department in the Reynolds general sales offices in Louisville and discusses request with Bob Wemyss (right), product design director. (Procedure would be basically the same with packaging design prospect, but in that case the design request form would be given to John Curran, package design director.) Sometimes an engineering prototype is also passed along. The design is then worked out and handed back to the customer, with the string attached that if he doesn't put it into production within a specified time, Reynolds will be free to give it to someone else or to use it themselves. The customer, however, is under no obligation to buy Reynolds metal. Chances are he will.

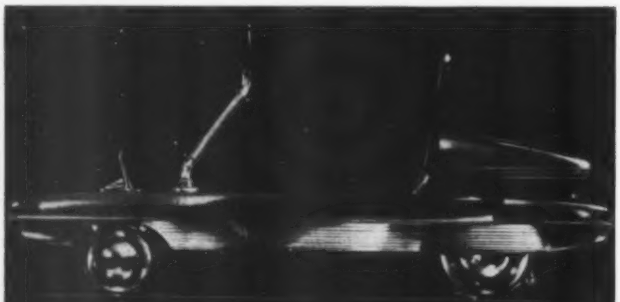
Product Division

In 1950 the various design activities that had been going on at Reynolds were consolidated in the Styling and Design Department. Jim Birnie moved over to Louisville from the company's main Richmond offices to become general director, and Bob Wemyss, who had been in Louisville, became product design director. There are now five designers on his staff, and in addition to customer designs (such as the coaster wagon below), they do speculative designs (such as the automobile sketches), company designs (such as a party boat now in the works for entertaining customers on the Ohio River), and merchandising designs (such as sketches of possible uses for do-it-yourself aluminum parts).

Pictured to the left and below is the design development of a child's coaster wagon from manufacturer's prototype through final rendering. It was designed in aluminum by Reynolds, and until it is on the market the manufacturer prefers to remain unnamed. The prototype (top) was a conventional wagon adapted to the joy stick principle — to be pushed right or left for steering, pulled back for braking. Shown below it, in sequence, are: an early design sketch; a mechanical detail of the side elevation; the final rendering.

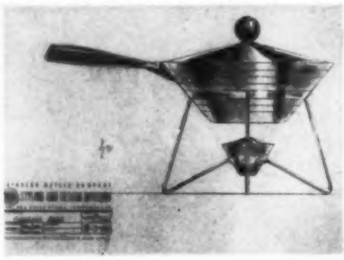


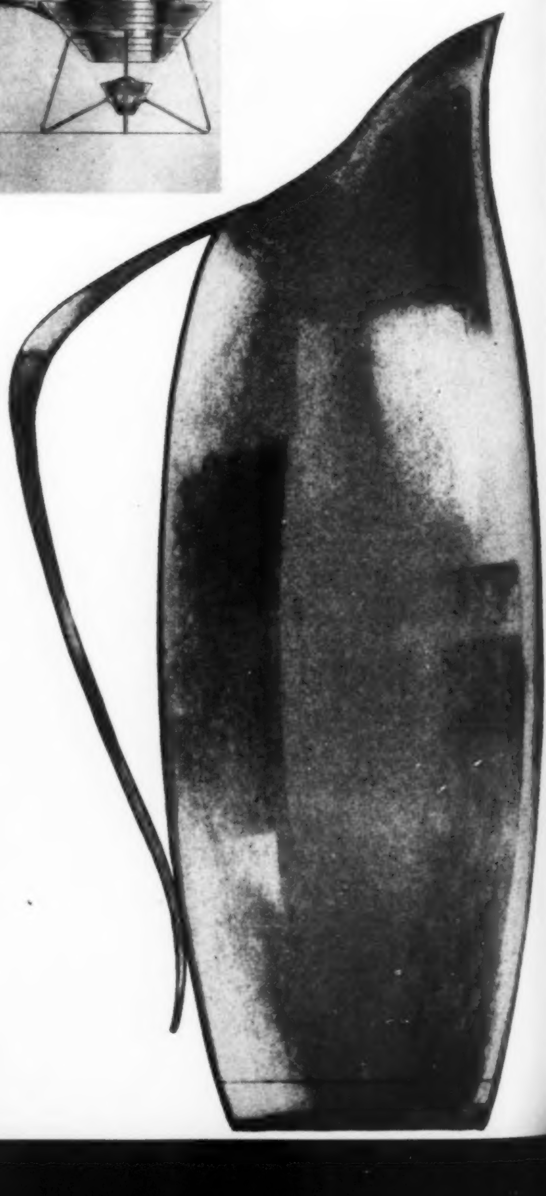


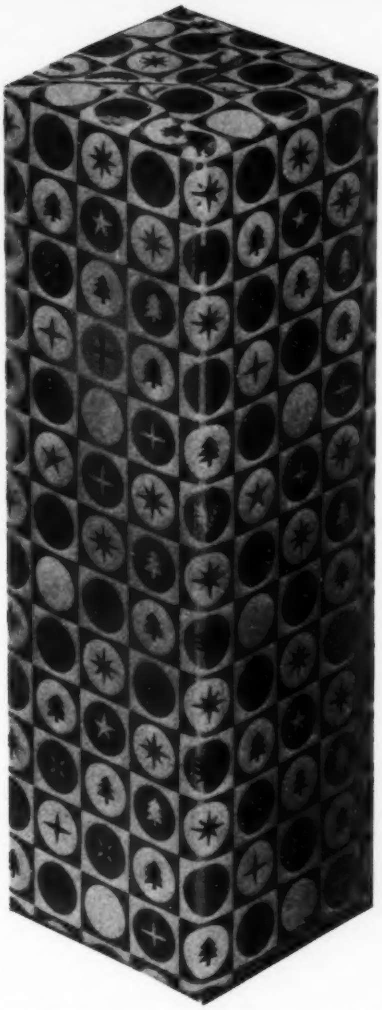


Complete line of Hiram Walker foil-wrapped 1955 Christmas packages was designed by Roger Bradfield, Minneapolis independent, who consulted with Reynolds foil designers throughout.

Chafing dish (see text, p. 58) and aluminum water pitcher are representative product designs from Jim Birnie's files.





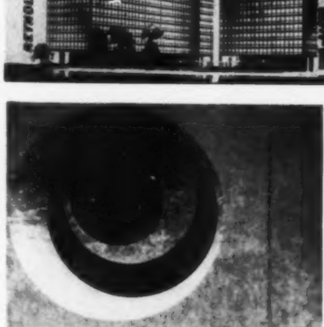


Packaging Division

Even as foil packaging is the biggest part of Reynolds' consumer approach (three billion seals last year, recall), package design is the biggest part of Birnie's department. Because designing and rendering on foil requires a very special knowhow, this group, directed by John Curran (shown below at right with designer Marvin Wilson), is particularly in demand—both for designs or redesigns and for consultation with independent studios.

Graphics Division

Bob Doherty (below, standing over assistant Dick DeNatale) has directed graphics for the past three years, largely on company assignments. Doherty and DeNatale, demonstrating a consistently clear and imaginative understanding of graphic elements, have designed traveling exhibits, letterheads, covers, etc., but their biggest (and most time-consuming) contribution to date has been the page layouts of two thickish volumes entitled "Aluminum in Modern Architecture," an expensively gotten up and excellently designed commentary to be published in the fall—by Reynolds.



Covers of brochure (above), presentation book (left) and catalog (below) are the work of Bob Doherty and Dick DeNatale.

Kaiser adds design as part of new consumer interest . . .

Young Kaiser Aluminum, growing by leaps and bounds, let out its belt another notch last March when it made room in its plans, and in its main offices in Oakland, for an Industrial Design Department. Frank Hershey, ex-Chief Stylist for Ford, went to the Coast to manage it; today his staff of four is getting down to work.

Almost since its beginnings ten years ago, Kaiser has had design activities in one form or another. For three years Product Development has had quarters of its own in Chicago, where the Kaiser general sales offices are located. This department, while including several industrial designers for styling work, has functioned primarily as a design engineering service for customers. It has concentrated on promoting a better utilization of aluminum's functional characteristics, and its emphasis in product development has been a largely technical one.

Industrial Design was added recently as a separate department: a) because the company felt the need to expand the services provided by Product Development to include specific assistance to the design profession; 2) because it wanted an office to meet its own design needs and to explore uses for aluminum in end products; 3) because, according to Ralph E. Knight, Development and Research Vice-President, fabricators too often were designing aluminum under practices more applicable to other materials and thus were not taking full advantage of aluminum's unique characteristics. Knight's particular point of departure in rationalizing his new design service is this matter of quality control: "For a long time we felt that our customers had pride of authorship in their products, but now it's clear that this isn't necessarily so. We used to give a customer whatever engineering know-how he needed, and leave it at that. In many cases he didn't have the trained people to carry through on the design, so now we're offering him *our* design facilities to help him use the metal to its and his best advantage. That's just as important as having the metal used at all.

"Though sales, of course, are our first consideration."

Franklin Q. Hershey (seated), Manager of I.D., and Walter B. Conner discuss preliminary design layouts for Kaiser display.

. . . and three more companies announce intentions

Making aluminum is a bright enough prospect in this country today that the ten-year monopoly of Alcoa, Reynolds and Kaiser could only be temporary. Three more companies are on their way into the business. One, indeed, is already in the thick of things.

Anaconda made it a foursome on August 15, 1955, when a $65,000,000 aluminum reduction plant was dedicated in Columbia Falls, Mont. Production was slight last year — about 5,000 tons — but Columbia Falls has a healthy 60,000-ton capacity which is expected to be reached this year. By late 1957 the company will be operating fabricating facilities as well. The necessity of eventually establishing some sort of design service has been acknowledged by the company. No steps in this direction have been taken as yet, however, and very likely won't until Anaconda is well into its fabricating operation.

Olin Mathieson also has more immediate problems than the formulation of a design service. Early this year Olin announced plans to enter the aluminum industry with the first fully integrated operation: alumina plant, reduction plant and rolling mill will be located on the Ohio River near Clarington, Ohio, and coal mined directly on the site will be used for power. Production is expected by January, 1958.

Harvey Aluminum, long a big supplier of aluminum mill products, will become the second West Coast producer when an Oregon reduction plant now under construction goes into operation. Currently Harvey has an established service that provides, not end product designs ordinarily, but special designs for extrusions, forgings, and other mill products that a customer or designer will incorporate into an end product.

As the aluminum industry and the practice of design increase in the coming years, there will be more of each in the other. The designer won't be able to leave aluminum alone, and it seems that the industry will return the compliment. There's more than one way to approach design. Aluminum will try them all — and probably invent a few of its own.

Harvey designers worked with customer to develop interlocking aluminum extrusion for rapidly demountable store display fixture.

Million-dollar modelmaking

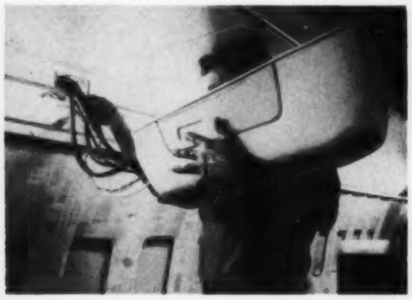
Industrial design has a Moby Dick of its own in Walter Dorwin Teague Associates' big mock-up, a full scale model of the Boeing 707 commercial jet transport interior, seating 108 passengers. Mr. Teague is shown above with Danforth Cardozo, who organized its top-secret construction in a block-square warehouse on 11th Avenue in Manhattan, rented and outfitted with a workshop for the purpose. Now the finished model, working in all details from running water to a team of stewardesses, and simulating the sound and lighting of an actual flight, is open for showings as regular as the Roxy's for the executives of airlines that have ordered the 5-million dollar plane—or are considering it.

The mere physical problems of building such a behemoth are impressive: 16,000 man hours of design and 26,000 hours of construction went into it; 54 contractors had to be coordinated in supplying such special features as galley and lavatory equipment, lighting, hardware, seats, etc.; and it required two people working full time simply to procure materials for the furnishings. Robert Ensign, Robert Harper and Walter Teague from the New York office and Frank Del Guidice, Director of WDTA's Boeing Task Force, which has been working on features of this interior for the past three years, were in charge of design. Total cost: $500,000.

But even more impressive was the client's trust in its consultant designers. Boeing had already gambled 17 million dollars on a prototype which made its first flight in July 1954. It paid off when the Air Force ordered 707's for tanker-transports, and a year later, satisfied that it would not interfere with military production, released the design for commercial use. (Tested through 500 hours of flying time, the jet averages 600 m.p.h., flies up to 40,000 feet.) Meanwhile Douglas announced plans to build a jet DC-8, and the airlines were forced to decide between a jet already built by Boeing with an unknown interior, or Douglas' jet, still on the drawing boards (some have ordered both). Since Douglas has had long experience catering to commercial flights, Boeing was anxious to present such customers as Pan American, American and Sabena with a superior cabin. WDTA's relationship to Boeing is ten years old, since they tailor-made the interiors of the Stratocruiser. To facilitate completion of the mock-up in seven months, Boeing set up a unique arrangement: although the work was to be a joint effort between WDTA and the Interiors Division of Boeing Engineering, no Boeing executive was to see the design until it was ready for full-scale presentation. The interior at the right was the client's first view of the design, presented with the sound effects of a jet engine.

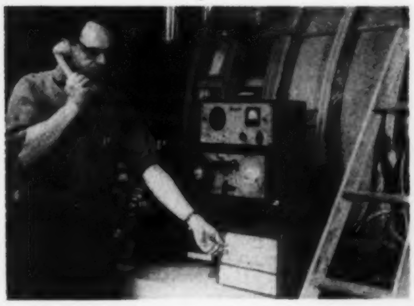
Walter Dorwin Teague Associates stage the customer's view of the Boeing 707

Top, Robert Ensign and others test hat rack height. Numbers, representing inches on a grid running fore and aft, locate seating. Above, the finished cabin.



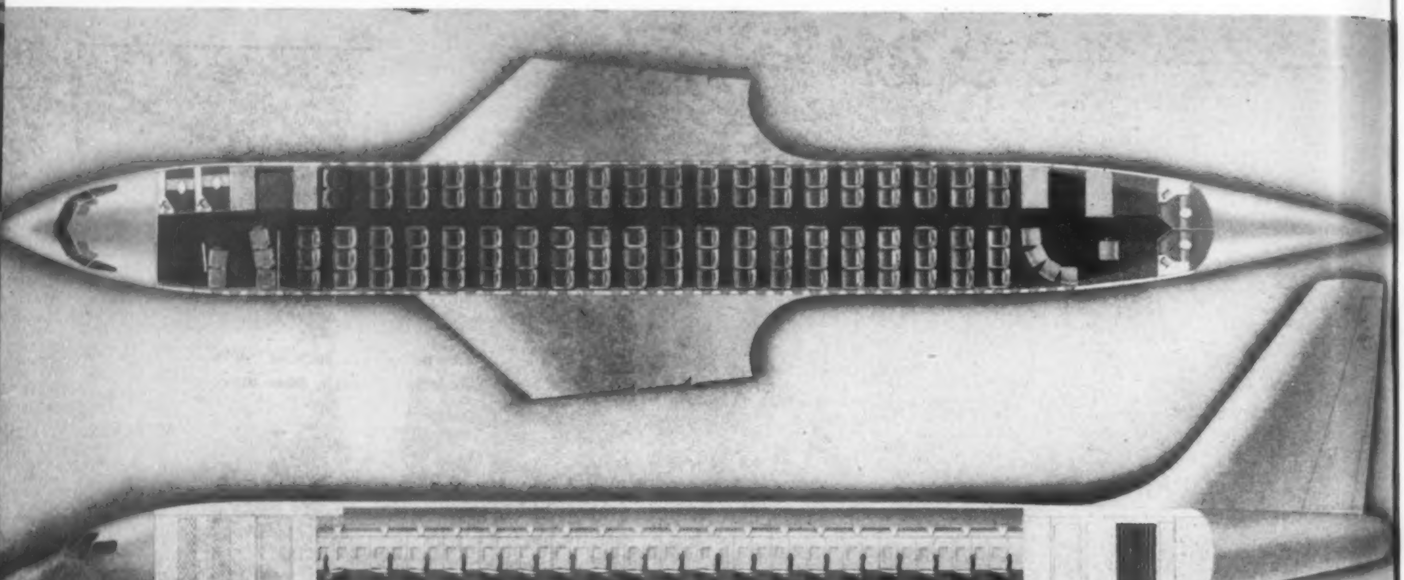
The passenger service unit is adjustable to the seat spacing, goes under the hat rack.

Designers touch up lounge area; pattern is on fabric, laminated under plastic.



Backstage at the mock-up, sound equipment duplicates engine noise.

Also backstage, plumbing and insulation are put in place for a working model.



Lavatories have been decorated in three different color schemes.

Seats, made by Hardman Co., Los Angeles, are movable on tracks.

Galley with colored vinyl materials was made by REF, Mineola.

Customers can alter interior layouts to suit desired passenger density

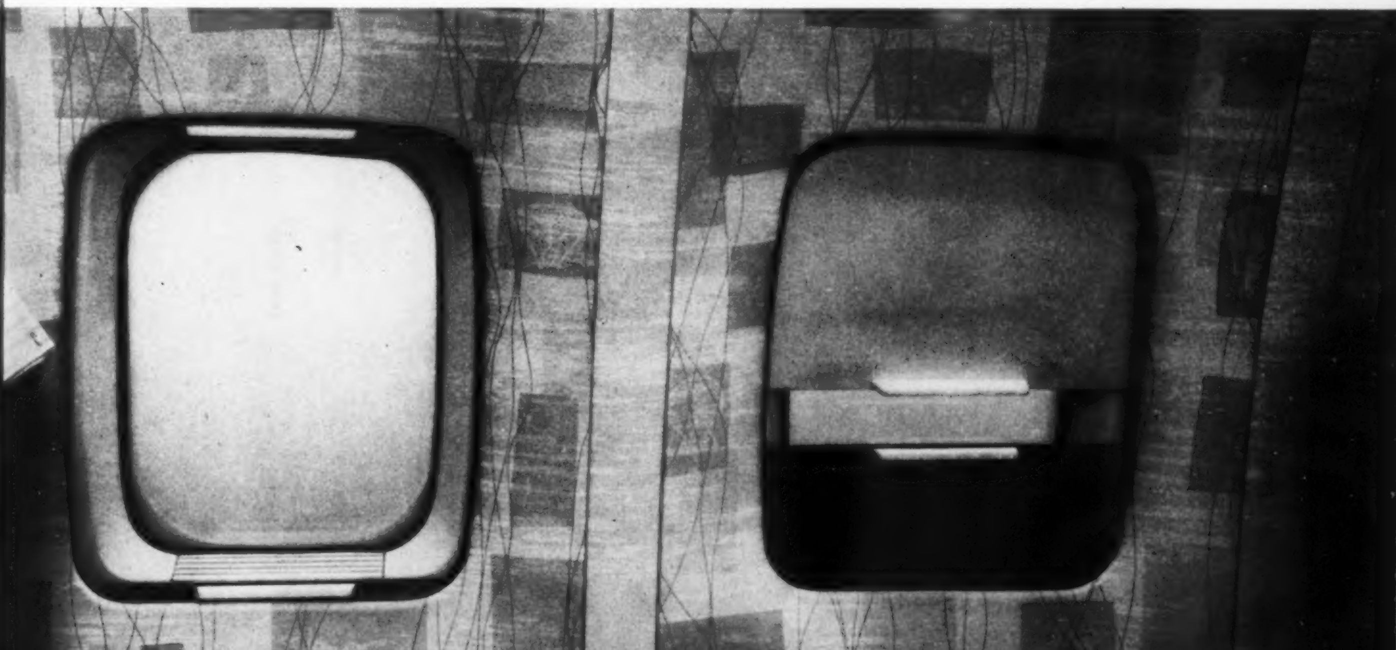
What Boeing executives saw, when admitted to the finished mock-up, was a bright interior in many colors and light, laminated patterns: five abreast seating upholstered in groups of red and blue; a galley with colored vinyl paneling equipped for pre-set trays and another to service frozen meals; two roomy lavatories fore and two aft. Opposite the door is a space 57" by 43" for hand luggage and a 140-inch coat rack, taking some of the burden from the hat rack which runs the 94-foot length of the cabin at a point well above the head of the average adult. They were pleased to learn that all panels were plastic, washable and easily replaced by snap-in sections, since jet travel is subject to high pressures and requires frequent examinations of the air frame.

Windows are 10½" by 14" for safety and to save weight, with two to each row of seats. Conditioned air passes between the inner and outer panes, preventing condensation; it enters the cabin through a perforated grille under the hat rack, while exhaust air is withdrawn through a grille at the floor level. Artificial light comes from three sources: fluorescent tubes running below the two hat racks; night light slots in the ceiling above the aisle; and five large dome lights supplied by Luminator, Chicago, which provide normal as well as dramatic effects—a sunset red glow or a dimming starry blue. In general, the facilities are not different from planes now in service. Outstanding features are the pod-shaped passenger service units and, instead of curtains, sliding plastic blinds, one a smoke tinted screen against intense sunlight, the other opaque to provide total darkness, for the speed of jet travel hastens the change from night to day (below).

The 12-foot diameter of the airframe can accommodate seating as tight as six abreast. The mock-up, representing first class, shows rows of five seats with 40" leg room; it represents the smallest of three 707 configurations that Boeing will build for the airlines, and on the basis of the mock-up, each company will request its own layout and color schemes.

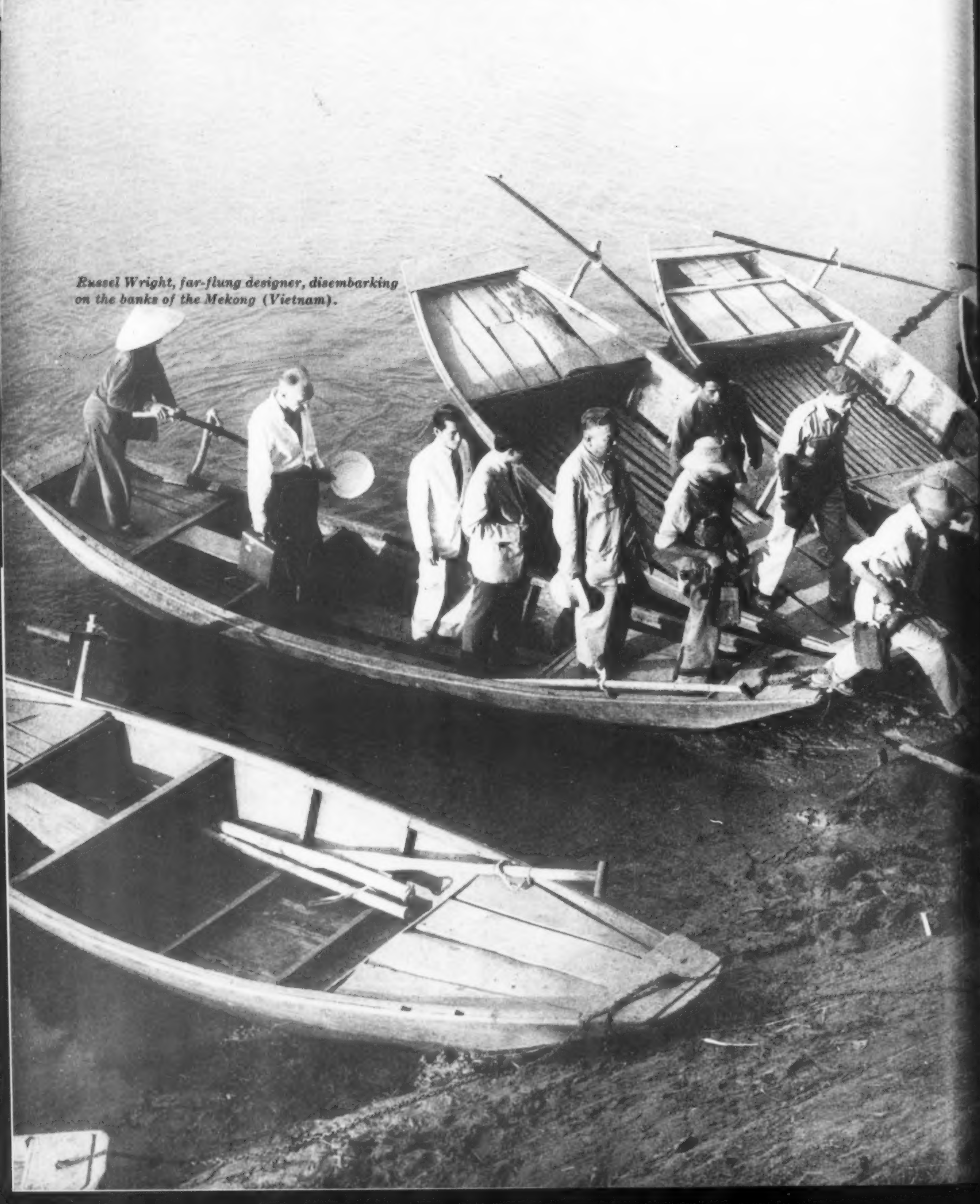
Rather than providing more restful and varied spaces with a feeling of openness for the passenger that corresponds to the experience of flight, the airlines' tendency in jet travel seems to be to get more and more people into a longer tube. WDTA designed for the high density which Boeing and the airlines envision for the jet age (fuel costs are high); intercontinental tourist class seats 148. (To counteract this increasing sense of eggcrate monotony, a trial in all tubes of travel, it is to be hoped that the airlines will encourage designers to experiment with some reverse seating and further divisions of the bulkhead; varying the color scheme and allowing lounge space for ten are only a step toward overcoming the problem of cramped quarters.)

Three months after the mock-up was begun, Boeing decided to enlarge the diameter 4" and raise the ceiling 7". WDTA had to scrap everything but the floor and make up three months work in six weeks. A great deal of activity still continues by WDTA's Seattle staff and Boeing, adapting the details of the mock-up to the customer's needs and to the production line.—*s. b.*



The designer as economic diplomat

The government applies the designer's approach to problems of international trade.



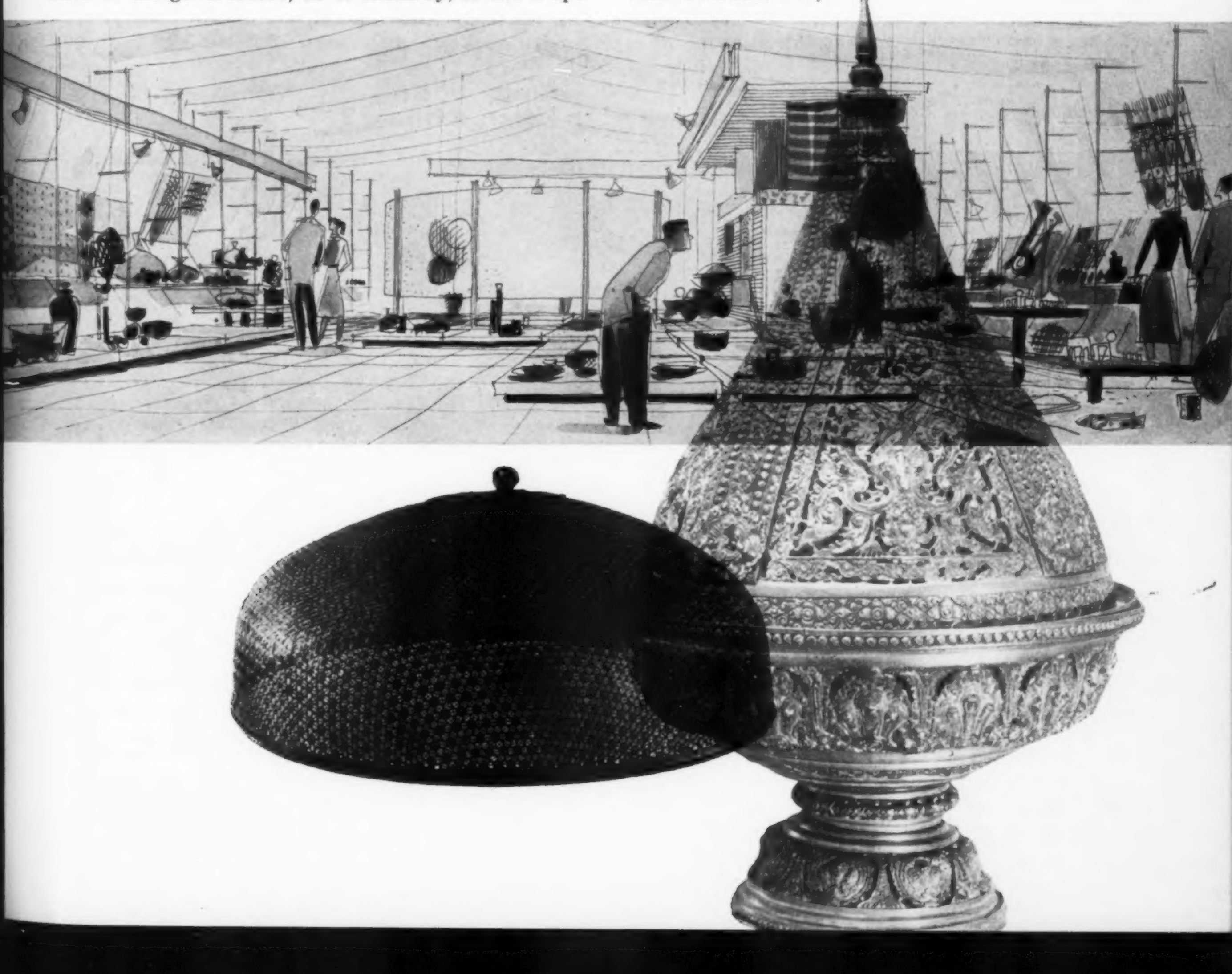
Russel Wright, far-flung designer, disembarking on the banks of the Mekong (Vietnam).

The application of the designer's talent to a government program is highlighted by the work of Russel Wright for the International Cooperation Administration. Mr. Wright recently completed a trip to five countries of Southeast Asia and staged an exposition of their native handicrafts in the New York Coliseum, but the story goes deeper than this. Its significance extends to the role of the designer in any type of investigation, and it is here spelled out in what is perhaps its largest context, the field of international trade.

ICA's purpose was to explore the possibilities of self-help in these countries through development of their handicrafts and small industries for export, and it hoped to determine their commercial potential on the American market. Since Mr. Wright does not claim to be an expert in Southeast Asian affairs, the casting of an industrial designer as an economic diplomat is far from self-evident.

What were the assumptions under which ICA could contract with Russel Wright Associates and his assistants on the tour, Ramy Alexander, handicraft authority, and Joset Walker, women's apparel and accessory designer? Like most industrial designers Mr. Wright is not a specialist but a generalist; what he has to offer to the government, as to industry, is not a specific body of knowledge but a method. To appraise the design of the foreign products was only one stage of his work: as in any design problem the main difficulty and the cherished goal was a unified solution to a many-sided problem. The result in this case was not a well-fashioned object but a *system* of evaluating, modifying and promoting such objects.

Wright approached the program as a designer would approach any problem, in stages, each one corresponding to an element of the complicated trade situation. His approach, typical in some ways, was personal in others. It is equally significant that ICA selected four other teams of designers to study other world areas. The firms of Peter Muller-Munk, Walter Dorwin Teague, Dave Chapman, and Smith, Scherr and McDermott surveyed handicrafts in Asia, Africa, Europe and South America with the same objectives of evaluating and advising on production for export. (The full program will be reported at the conclusion of these missions.) Where Wright's method differs from theirs is in facilitating contact between producers and potential American buyers through the medium of a show of handicrafts. This was only one stage, however, in a methodical investigation of the problem that is outlined overleaf.—*a. f.*



Step 1: Sounding Out the Market — Would you be interested . . . ?


BUXTON
FRED LEIGHTON'S MEXIC
FRED LEIGHTON
RITTER & RITTER
Importer
Around the World Shoppers Club

Russel Wright's first step was to sound out likely American firms on their interest in Southeast Asian products and handicrafts. In 150 letters he set forth the larger aims of the program, "to provide effective styling assistance to producers so that resulting increase of foreign trade will improve economic and living conditions" in the so-called "underdeveloped" areas. But he brought the issue home to the American market by emphasizing the craft traditions in these countries which are not duplicated in other parts of the world. And his basic interest in developing new resources had commercial possibilities for American producers by allowing them to incorporate foreign craftsmanship in their finished goods at a lower outlay than such experiments would cost here.

The answers, like those above, were almost uniformly encouraging. Importers indicated the articles which constitute their present trade and manufacturers indicated the kind of materials which could be used in their processes. Questions on the reliability of flow from these areas were raised, and some dealers desired more detailed information. The information that the designer had to obtain from the foreign producers was categorized in this way.

Step 2: How do they do it? Can we give them a boost?

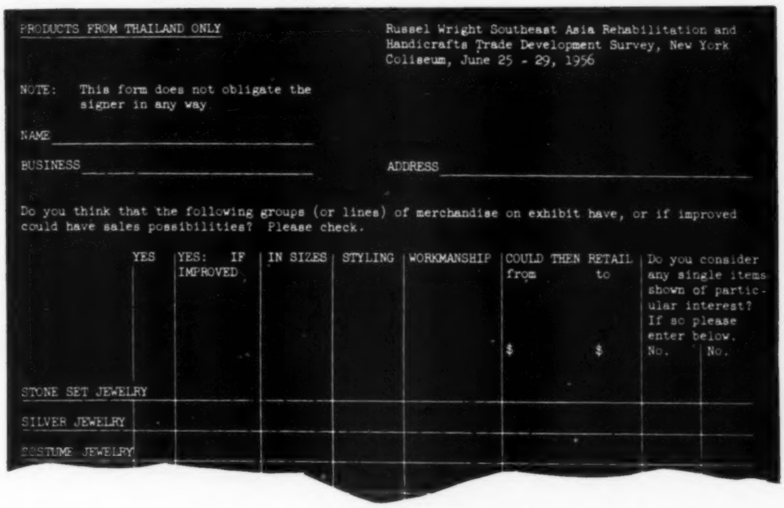
The next step was on-the-spot investigation, and this in turn was complex. In travelling to Cambodia, Thailand, Vietnam, Hongkong and Taiwan (Formosa), Wright had to consider more than the interests of the American market. The needs of these countries themselves were suddenly foremost. His most immediate decisions involved selecting some 1500 hundred items for display in this country, but these had to be chosen not only on the basis of their intrinsic design interest but also in the larger context of the economic needs of the countries. Wright met with trade leaders and government ministers and explored the methods of production, trade restrictions and ability of the industries to handle the potential orders. Methods had to be devised for stepping up production without disrupting the fundamental traditions of individual craftsmanship. Finally, proposals for the assistance of these countries through technological aid and instruction were to be formulated. Wright visited the industrial centers, but as the larger part of their production is by individual craftsmen, often in cottage industries, his travels took him into the farm areas for an over-all view of what these countries have to offer. He is shown here at refugee center, market and factory.

Step 3: A bazaar in the Coliseum

When the showing of products opened in the New York Coliseum on June 25 under the title, "Southeast Asia Rehabilitation and Trade Development Exhibit," Henry Cabot Lodge, Jr., U. S. Representative to the United Nations, was on hand to outline the aims of the International Cooperation Administration. His address made specific reference to the type of product on display, too, as he cited the value of the handicraft products not only in their inherent attractiveness but in their ability to stimulate interest in other lands and their encouragement of human values. "In our preoccupation with these vast development projects," he stated, "we should not loose sight of the smaller things which derive their particular value from the very fact that they are small—from the very fact that they are on the same level as the individual human being."

The show, which ran through June 29, was held simultaneously with the International Housewares Show at the Coliseum, and it offered a unique experience for members of the trade to enter the atmosphere of an oriental bazaar in its separate tented display area. Films of Wright's trip were shown in an adjacent tent and conferences with various trade groups were held. The bazaar is shown overleaf.

Step 4: Sounding Out the Market — Facts and Figures



PRODUCTS FROM THAILAND ONLY

Russel Wright Southeast Asia Rehabilitation and Handicrafts Trade Development Survey, New York Coliseum, June 25 - 29, 1956

NOTE: This form does not obligate the signer in any way

NAME ______

BUSINESS ______ ADDRESS ______

Do you think that the following groups (or lines) of merchandise on exhibit have, or if improved could have sales possibilities? Please check.

	YES	YES: IF IMPROVED	IN SIZES	STYLING	WORKMANSHIP	COULD THEN RETAIL from $	to $	Do you consider any single items shown of particular interest? If so please enter below. No.	No.
STONE SET JEWELRY									
SILVER JEWELRY									
COSTUME JEWELRY									

Since the show was not intended as a display of oriental "good design," but was a way of investigating buyers' reactions to the available products and talents, the key step was the discussion and notation of these reactions. Detailed questionnaires were provided with the usual catalogs of the show, and group conferences were held in each of the classifications of native goods. Most interest was shown in basketry, matting, pottery, hats, jewelry, silverware and lacquered goods. Armed with these comments and notations, Mr. Wright and his associates were able to correlate the needs of the American market with the information they had assembled in the Asian countries, and on this basis to formulate their proposals for the individual governments.

Three of these proposals have already been accepted, calling for the establishment of a handicraft promotion, demonstration and training center in Taiwan (Formosa), for a school of technical handicraft and design training in Cambodia with Wright as advisor, and for the development of handicraft products for export, also from Cambodia. Other recommendations deal with the establishment of demonstration centers, appointment of sales representatives, and negotiation of favorable trade and tariff agreements.

Crafts of five nations are displayed to importers and industries

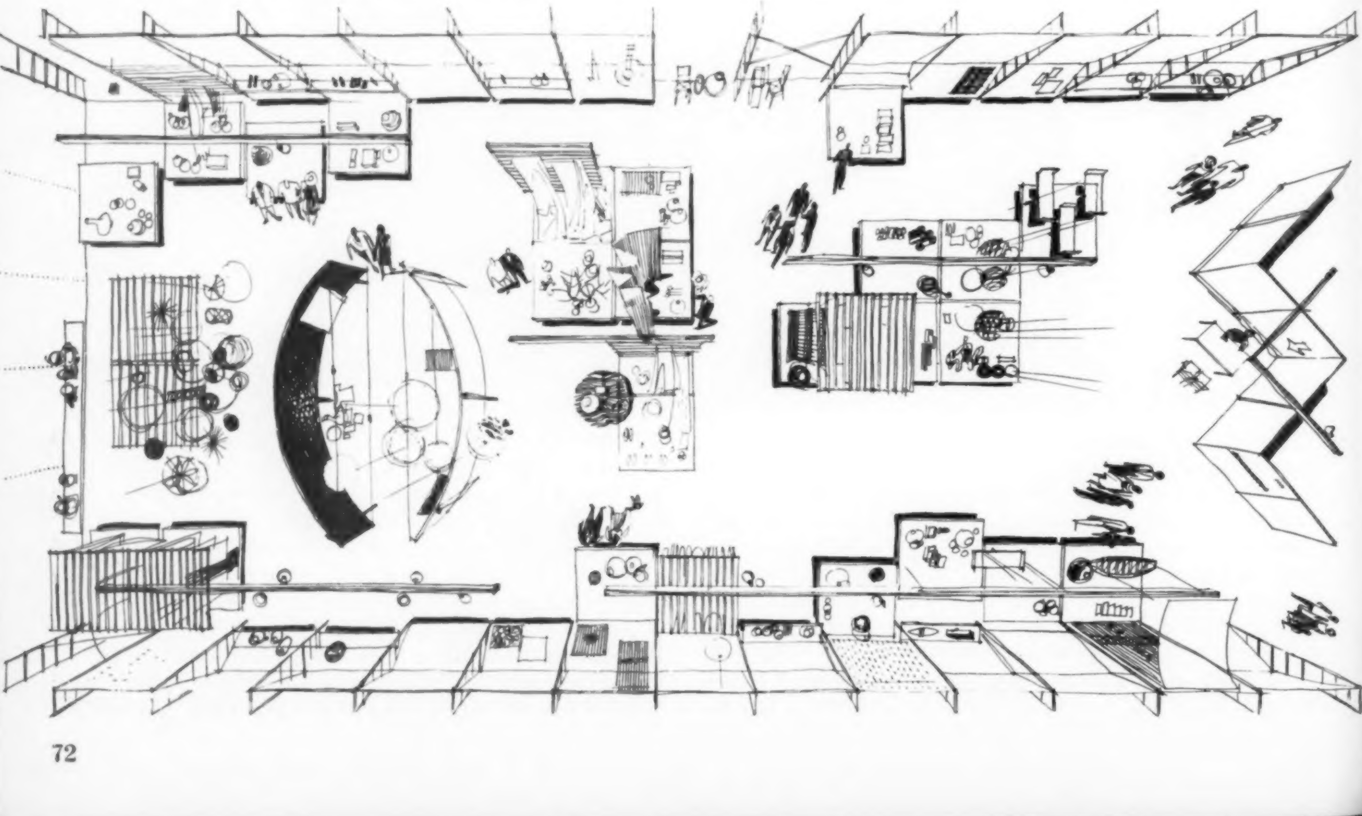
Mr. Wright wanted to show the oriental objects in an atmosphere natural to them, which would communicate the spirit of the places where they were collected. The installation of the Coliseum exhibit, designed by architects Romaldo Giurgola and Paul Mitarachi, was a successful and economical solution to this design problem. Favoring a bazaar arrangement which would suggest the informality of the oriental street-markets, and wishing to define the exhibit within the cavernous surroundings of the Coliseum, they contained the show in a tent-like enclosure made of white vinyl strips and scaffolding, which could be easily moved or replaced in the event of a road tour. The objects were suspended and arranged with some freedom but without the random clutter of the conventional bazaar. The tent space was divided visually with a single bold color as background for each of the five nations, and with mats and fabrics hung on the frames and partitions. By carefully placing the pottery, metalwork and other small objects on low tables, the designers caught the predominantly horizontal spirit of an oriental trading place without being literal.

The items featured were chosen for their market value and availability, rather than on their design value alone, but several types of goods were outstanding in the display. Exceptionally detailed silverwork from Cambodia, cane basketry and pieces of original and reproduced sculpture were noteworthy, and some examples may be seen on these pages.

The exhibit was, however, only a visible expression of the motives and results of the ICA program. The aim is to help the individual artisans and small enterprisers by expanding their markets, while allowing them to continue their traditions of work and life.

These are the considerations that have guided Mr. Wright and the other design teams, and the magnitude of the aims is thus larger than the designer is usually required to meet. The method employed and the practicability of the recommendations indicate the scope in which the talents of the designer as co-ordinator, analyst and trade consultant may successfully be applied. It is also significant for the entire profession that the U.S. government looked to designers for help in problems of international trade.

Top-view sketch of the exhibition, showing organization of distinct areas for five countries.



Cambodian exhibit above included impressive silverwork in glass cases, and suspended basketry. Side view below shows low horizontal arrangement of pottery. At right is partition introducing Hong Kong; critical political conditions made few products available; photos illustrated living conditions.

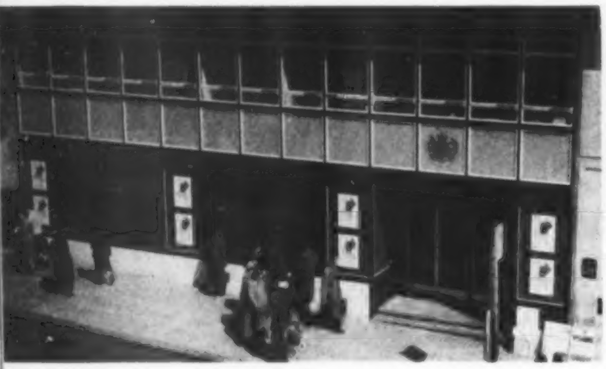
photos: Louis Reens

-section shows how vinyl strips were stretched from project-ipe, which was also designed to support cantilevered tables.

DESIGNS FROM ABROAD

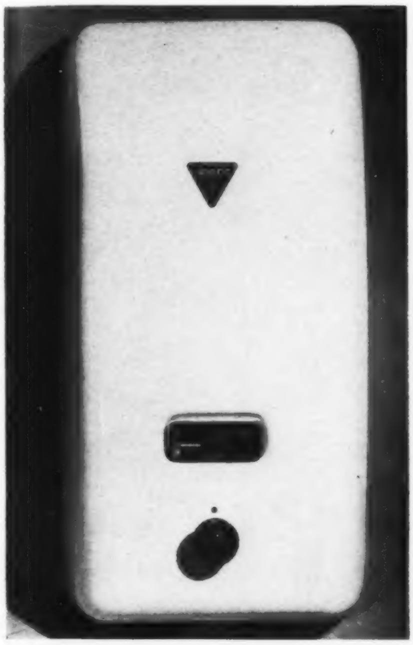
Doors are open at the Design Centre for a comprehensive survey of British goods

Taking as its slogan, "Look before you shop," (viz. the powerful eye of Hans Schleger's symbol, right), The Design Centre opened to the world in April in a bright-faced building near Piccadilly Circus. In a country which depends upon exports for economic survival, a London showroom jointly sponsored by industry and government, with 8000 square feet of space, has an important reason for being. Its instigators, the Council of Industrial Design, appointed in December 1944, boosted the spirits of an austerity-weary people with a major exhibition, "Britain Can Make It," in September 1946; in 1951, the Council was responsible for the exhibition side of the Festival of Britain. Its distinguished monthly magazine, *Design*, has built up public awareness; and its library of thousands of photographs, "Design Review," provides the source for the products that

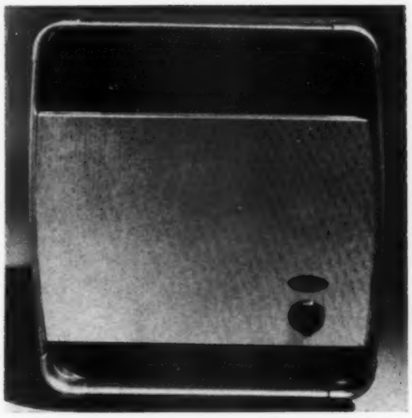


the Centre selects for display. A selection committee composed of Council members, industrial specialists and independent consultants is currently reviewing between 100 and 200 products a week. According to its Annual Report, "the bias of the Council's propaganda has always been towards encouraging fresh thought and design in both the old craft-based and the new technical industries, whether the inspiration for a good design is original and contemporary or basically traditional." The Council hopes that both domestic and foreign buyers will start their searches among the thousand well-designed goods at the Centre, the core of which will be furnishings for homes and offices, like those on the facing page.

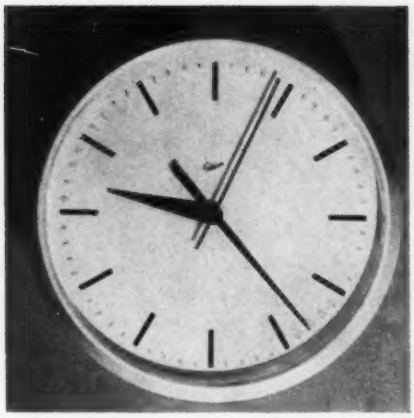
Visitors from abroad attended the opening, officially made by the Duke of Edinburgh. Left, Robert Nicholson, co-designer of the display, Dr. Walter Gropius, and Michael Farr, editor of Design. *At "Design Review" files is David Falk, Bloomingdale's.*



Ascot Gas Water Heater Ltd.'s Model 715 has a vitreous enamelled sheet steel case, is 31¼ inches high, weighs 39 lbs.



Belling & Co. Ltd.'s electric fire is available in three sizes, is made of steel, anodized aluminum and die castings.



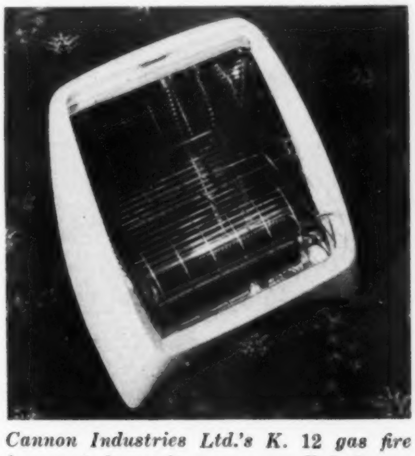
Baume and Co. Ltd.'s "Gibson" electric clock is designed by Jesse Collins and John Beadle in an aluminum casting case.

Adamsez Ltd.'s "Lotus" needs no flushing rim because of patent inlet. Made of fireclay, it comes in many colors.

Murphy Radio Ltd.'s portable television receiver weighs 28 lbs.; its cabinet is made of molded resins and fibers.

General Electric Co. Ltd.'s iron has snap-action thermostat and weighs 2-1/3 lbs. in chromium plate.

Precision Engineering Co. Ltd.'s "Waymaster" household scales has aluminum alloy body, plastic pan



Cannon Industries Ltd.'s K. 12 gas fire has cast iron vitreous enamelled frame.

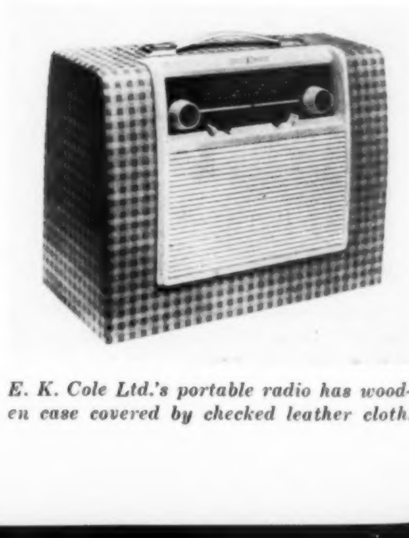
M. J. Building Products Ltd. manufactures Finnish designer Aarne Ervi's garden chair in tubular steel and canvas.

continued

The Design Centre in itself involved an interesting interior design problem on two floors: to create a display of varied objects that is constantly revised — yet through a permanently installed system. Two young designers, Robert and Roger Nicholson (commissioned by the Ministry of Works) found a strong but flexible solution: a grid system on a module of two feet, the aluminum ceiling grid filled in with colored Formica panels which are interchangeable, as are the lighting fixtures, spot or indirect as needed. A pleasing interplay of rectangles, aluminum ladder units anodized slate gray and glass or Vinide-covered shelf fittings provide a versatile framework, which can be readily adapted to the objects in color and in scale.

Concrete Utilities Ltd. makes "Highway X" street light of pre-stressed concrete. Design Centre shows model.

Mirroware Co. Ltd.'s "Colorama" saucepan is polished aluminum with lids anodized in various colors. Carmella Rossini is the designer.



E. K. Cole Ltd.'s portable radio has wooden case covered by checked leather cloth.

Part I of a series
by designers and executives
on the New Relationship
between Design and Industry

Are there real differences between the consultant designer and his company colleague? Can either claim to be superior?
In discussing an upheaval in the relationship among designers for industry, one consultant describes some visible differences—but debunks the classic debate:

"Captive" designer vs (?) "Independent" (!) designer

In the golden days of pre-industrial design, when a manufacturer needed some product design he generally went down to the shop and got one of the foremen to do it. Or did it himself.

In the golden days of industrial design he began turning to the gilded industrial designers, and got the full treatment.

Since the full treatment was quite often followed by an interesting rise in sales, the manufacturer was presently sold on design and designers.

Finally he realized that if he put the designers on a payroll instead of a retainer he got equivalent services for less money. Or thought he did, which had the same results.

Among these results was an economic threat to the independent designers. Or so it seemed.

It is a harmless foible of many professionals, designers included, to believe that they are somewhat differently motivated than workaday mortals. Workers may strike for seven cents an hour and corporate vice presidents may garner ulcers in reaching for that eventual $100,000-per-year-before-taxes paycheck, but the creative, dedicated professional has higher-level fish to fry, or so we sometimes like to think.

The facts, alas, fail to support the assumption. Workers and vice presidents often get non-monetary satisfactions out of their jobs, and there is evidence that the heart of the dedicated professional — when confronted with a stranger working his side of the street — beats with the same pure indignation as the heart of the oldest of all professionals.

For years, one of the most unusual and instructive sights on the professional scene was the battle of the American Institute of Architects to keep public agencies (hospitals, jails, etc.) from operating their own architectural offices. Needless to say, what offically pained the AIA so deeply was not the loss of fees to members, but rather the threat to the purity of the architectural profession. The battle was waged with great decorum, and public discussion concerned itself only with the moral issues at stake (*which* moral issues were at stake some of us never managed to figure out). However, the AIA leadership would have been deeply shocked by any suggestion that its motives were not much different from those of the CIO.

Now, in the profession of industrial design, we are doing it again. After barely a quarter-century of existence, we have divided ourselves into two opposed categories: "independent" designers and "captive" designers. The latter are full-time employees of businesses, mainly manufacturers.

The term "captive" is in itself revealing. It is derogatory, and it was brought into being by the "independents." It seems fairly obvious that no designer on a corporate payroll, particularly if he is getting a fair day's pay for a day's work, is going to think of himself as a prisoner. Meanwhile, independent designers work contentedly for clients who are almost without exception high-level corporate employees. Has anyone ever heard such a designer refer to his client as a "captive" executive?

The reason for pushing so hard at the point of economic competition as the basis of the existing professional split is that it seems to be *the* point, and that all other arguments are window dressing.

The reason for trying to deal with the subject at all, as far as I am concerned, is that it is an unhealthy situation. The division that has occurred in the design profession confuses its younger members, particularly students, reduces the effectiveness of the contribution required from it, and impairs its dignity. The industrial design profession has established a place for itself in a phenomenally short time. It is widely accepted as a useful service. But it is also still in the process of realizing its full potential as a service to a society going through a series of tremendous transformations.

Consider the matter from the viewpoint of an outsider. People who are not industrial designers — i.e., practically everybody — i.e., society in general — could not possibly care less how the needed service is provided or which category of professionals provides it. Why should they? Does anyone care if his paycheck is figured out by a bookkeeper or computed by a machine? The real problem is to furnish needed services, economically and at the highest reachable level. *How* this is worked out is of course a matter of concern to us as individuals, but numerically we are an all-but-invisible speck in the population, and the population just doesn't care. Does it make the slightest difference to the woman who just bought that pretty eggbeater whether it is a "captive" or "independent" eggbeater?

Either-or vs.-total flexibility

Consider, too, the behavior of business in areas where design is not involved. All manufacturers constantly face the problem of which components to make in the plant and which to buy on the outside. The problem is a complex one, and in an overall sense it never really gets "answered." More and more manufacturers do some of both, with each separate decision being made on the basis of many factors such as tooling investment, availability of skills, probable life of product, accessibility of sub-contractors, plans for future company development, and so on.

If industry meets its production problems using a wide variety of methods based on a totally flexible approach, why should the need for design service be resolved on an either-or basis?

Consider the matter of economy, which is of some importance to manufacturers. The costs of design service are not as a rule publicized, and it would seem reasonable to assume that the fees of independent designers vary within fairly wide limits. Nevertheless, it is probably not too far out of line to say that hourly drafting charges have to be somewhere in the neighborhood of three times the draftsman-designer's hourly pay. Thus a man paid four dollars per hour would be billed out around twelve.

It does not matter greatly whether this basis for design charges is used generally or not: whatever the private designer's method of billing, the manufacturer with a flow of design problems can run his own design studio for less. This service, like the selection of the kind of production used, is determined by more factors than direct cost.

Like other design organizations, our own works for a variety of companies in a variety of ways. There are a few which depend on us, not only for all design, but for product development as well. Other clients have procedures for working with a number of outside designers. Still others have their own staffs, but choose to supplement this facility with design consultants. In reviewing these very different situations within our own office, we have yet to find anything fundamentally good or bad about any of them. There is always a valid reason for the method adopted, and we have consequently fallen into the habit of recommending to clients that they never use our facilities before checking on the adequacy of their own.

The reasons for differences in the methods of handling design service are very numerous. Automotive and major appliance manufacturers have demonstrated that it is almost imperative to maintain an in-plant staff: their problems are complex, fast-moving, and highly specialized. Another company might set up a design studio to implement a policy of complete integration. A company of similar size and product might retain an independent office simply because it didn't want to be bothered forming its own staff, or because it felt it had more freedom in buying the kinds of service it wanted.

Whatever the full list of reasons for the varied choices being made in industry today, those which come to mind might lead to the conclusion that there is a trend to concentrate on staff designers in certain types and sizes of industries, leaving the rest of the field open to independent offices. But this is not what seems to be happening. Apparently the overall situation is too fluid to permit the rigid classification of categories.

To illustrate what does seem to be happening, it is necessary to indicate some of the differences between staff designers and the independent group. For there *are* differences. It is as far from the truth to say that both are *alike*, as to say that one is "captive" and the other "free."

Presumed differences

In discussions of the two general categories making up the design profession today, much has been made of supposed differences between the kinds of people who elect one career as against another. Independent practice, according to this view, offers high possible rewards combined with large risks, whereas company employment is less spectacular but more secure. This contention, naturally, leads to the conclusion that the risk-taking independent is superior to the individual who scuttles under the protecting wings of a benevolent corporation. There may be some truth in this argument, but I have not yet been able to locate it. The idea that security and corporate employment are synonymous does not check with the facts. I know companies that have drastically cut design staffs to fit changes in policy, and there are top company designers who have lost their jobs. You can find men in independent offices who have had steady employment for twenty years.

Other pieces of the argument fail to fit. For instance, there are some pretty exciting jobs being done by company designers. Who can say that these men are motivated by fears of insecurity? Also, the notion that risk-taking is associated exclusively with independent practice is hard to substantiate.

Doesn't the top company designer stake his job, so to speak, on the success of each new product group? Doesn't he also stake a large chunk of his company's security? Isn't unsatisfactory performance ever penalized within the corporate setup?

What is probably true is that few people are willing to make decisions where risk is involved. It is likely that these few are "superior," at least in a competitive sense. To date there is nothing to show that such people are found only in independent offices.

There is another argument heard occasionally. Men in both branches of the profession, impatient with the lack of harmony and understanding they sense in prevailing attitudes have said, in effect, "What is all the noise about? A good designer is a good designer and it doesn't matter where you find him." With the spirit of the argument I could not be more in agreement, but the well-intended effort to heal a breach obscures the most interesting and productive possibility in the whole situation: there *are* differences, and they could be exploited with benefit.

Real differences

The significant differences between the two groups *stem from their conditioning through work experiences.* The designer is not a finished product when he leaves school, but is continuously modified by what happens to him as he pursues his trade.

Consider, for instance, some of the things that happen to the typical independent professional. For one thing, nobody else cares whether he stays in business or not, so he has to develop whatever resources he has for this purpose. He becomes highly sensitized to passing opportunities he might otherwise overlook. He has to explain the value of his services to strangers, and in the process learns to become a better than average communicator. If he is at all successful he will work for a number of companies, often in areas which have little in common with each other. This spread of design problems, usually quite unpredictable in its variations, inevitably creates certain attitudes, methods and techniques designed for the widest possible applicability. In the end you get an organization which is strongly permeated by a special attitude and equipped with special — but unspecialized — facilities.

The designer who works as easily with a lathe as with a pencil, who sees no insuperable barrier between the making of a piece of furniture and a film, tends to be extremely fluid in his attitudes and confident when faced with a new kind of problem. This particular kind of skill has its disadvantages, of course, but it develops tremendous strength as well.

The strength of the independent office lies in the range of its experience, the relatively large number of "testing" situations through which its personnel must go (in dealing with new clients, unfamiliar kinds of problems, etc.) in its highly developed ability to communicate, and in its general flexibility in relation to almost any situation. Translated into action, this means an ability to bring a high level of detached perception to any problem, and this has a very special kind of value to management.

No place for prima donnas

Although in the largest of the manufacturing establishments some of these experiences are duplicated, the work experience of the staff designer, as a general rule, is different from that of the independent professional. One very significant difference is that it is made clear to him from the outset that design is just one phase of a cooperative process, and not by any means the most important. The company is not dazzled by its designer's spectacular publicity because as a rule he gets no publicity at all. In other words, the staff designer quickly learns some very important things about the relationship of design to overall product development and to corporate success.

The prima donna attitude is not encouraged within the corporate organization, which has very few jobs which can be handled by a single individual, no matter how brilliant. A staff man would not be likely to commit the egregious error of the independent designer who said that he had "designed" the such-and-such plane. He would take it for granted that a plane's most important characteristic, its ability to stay in the air, is quite unaffected by the industrial designer's contribution. This is a small point, since few designers are overburdened by delusions of grandeur. But the conditioning of the staff designer, which stems directly from his role as a functioning member of management, is not a small point at all. It is the core of his entire working education.

The practice of management today is more and more a matter of education. The growing size and complexity of business tends to impose stiff penalties on unsound procedures. The daily financial pages are testimonials to the speed with which poorly managed companies, even large ones, can slip into a tight spin. Modern management, in consequence, keeps putting itself through school in a variety of ways. The company designer, as part of management, also goes through this process.

Design training and management training have some elements in common, but not many. The design school necessarily creates a situation in which individual performance is almost everything, and the emphasis on esthetics — also necessary — does not always make for sympathetic comprehension of the problems of business and industry. Management training stresses the need to learn how to get people, particularly groups of people, to do things. "Doing" therefore acquires two completely different meanings in the mind of the company designer, and as a result of his double education he becomes a most interesting kind of hybrid — and incidentally, an adjunct to management with enormous potential value. The capable individual who can talk the language of business while retaining the designer's ability to see problems in an overall way is not in large supply at the present moment.

This, however, by no means exhausts the staff designer's value. Every company, no matter what the nature of its business, presents some kind of image to the world at large. This image is hard to describe in words, but it is a most valuable asset. It is a large part of what is in the customer's mind when he buys product A instead of product B. Any company's image is created by management (including design) through millions of daily acts which pile up to crystallize, not only into stated policy, but a kind of "feel" which the company acquires both for its own people and for outsiders. Because the staff designer lives and works within this framework — indeed, has helped build it — he can communicate its meaning with far more sureness and effectiveness than the outsider. But for this he pays a price: like other members of management he runs a constant risk of jelling when what is called for is fluidity.

Which is where the outside design consultant seems to be coming in.

Please note the use of "consultant." The independent designer has for many years played out the role of the expert — that is, he moved in, looked things over and wrote out a prescription. Management was eager — anxious — not to "inhibit" him. Sometimes the procedure worked and sometimes it didn't. With today's moves towards fuller integration of the skills available to a company, the indigestible "expert" has become something of a nuisance, and a menace to boot.

The new look in designers — whether staff or otherwise — includes an attitude of attentive listening.

The "captive" versus "independent" issue has just one thing wrong with it — it is not a real issue. If there is any question at all, it is whether the profession can mature to the point where each group understands and accepts the value of the other to its own work. This will probably not come easily. *It requires a change of attitude on the part of both groups.*

As industry is developing today, there are roles to be played which require the use of design professionals who have been differently oriented, but can work in harmony. Some of these *must* be staff people; others *must* be outside consultants. Actually, while the design problem is not looked at very often in this way, there is nothing especially new about the idea. A company with an advertising department also has an agency. Most companies with legal departments also retain outside firms.

Poachers invited

As long as the staff designer was primarily a designer (in his own eyes) he naturally had to guard his own preserve and chase off poachers. But he is beginning to become an integral part of management. A typical management attitude is that it couldn't care less through what channels it gets results as long as it gets them. When the management-oriented designer finally realizes that results are what he too is paid for, he begins to lose interest in massaging his own ego. Then the outside designer looks less like competition and more like a possible assist.

In this process of transformation the independent practitioner has been learning too. Humility, mostly. A respect for creativity in non-visual areas such as corporate management. One cannot possibly go through one product development program after another without ultimately learning that to create and maintain a successful company takes quite a bit of doing, most of it outside the province of the industrial designer. The lesson, when learned, releases an urge to join the team, through not necessarily on a full-time basis. This urge can be processed by management for its own purposes, which include not only the maintenance of stability, but the early recognition and acceptance of change.

The special qualifications being developed in the two groups making up the design profession are not basically in conflict, but complementary. Both, actually, were called into existence by the widening requirements of industry, which must have highly skilled specialists, and highly skilled non-specialists.

The barriers between the groups are, in any practical sense, meaningless, and anyway, ours is a time for pulling barriers down, not putting them up. Design, like technology, politics and war, is becoming an open game, and open games demand far more in the way of personal resources than closed games. We could be a lot worse off, for there are more road blocks behind us than ahead.

Nakashima

Shaping America's Products—III:

The craftsman as designer-producer

by Don Wallance

This is the final installment of case studies from Don Wallance's book, *Shaping America's Products*, published in June by Reinhold Publishing Company.

Prestini

The "hand trades" appeared as a separate category in the U.S. Census of Manufactures for the last time in 1899. Today it is doubtful whether everyday life in America would be noticeably affected if handcraft production — except in the building industry — were to cease. But, although the factory has virtually eliminated the craft workshop as a productive force, handcrafts still exert a creative influence. Moreover, the last ten to twenty years have brought a marked increase in handcraft activity.

Toward the end of the nineteenth century another great revival of interest in handcrafts took place. The Arts and Crafts movement was a revolt against industrialization, based on the idea that integrity of design and workmanship in ordinary objects and a fusion of art and daily life depended on restoring the artist-craftsman as the source of useful goods. The Arts and Crafts movement failed to reach its objectives, and the conditions which gave rise to it have continued to exist. Western man seems to have lost the capacity for making things beautifully as a matter of course. Industrial work, usually fragmentary and repetitive, does not provide the satisfaction and psychological balance that derives from making a complete object through personal skill.

Mahseed

Unlike the Arts and Crafts movement, the current revival is not dominated by a few leaders, nor has it any recognized body of doctrine. An important aspect of the current revival is its grass roots character. The phenomenal growth of leisure-time craft activity could be an important factor in creating a large body of discriminating consumers, for making and shaping things is an excellent way of developing one's sensibilities. More directly related to our subject, however, is the activity of the professional artist-craftsman who designs and makes in his own workshop a complete object for sale. A growing number of people seem to be looking to the arts for a congenial and creative way of working and living that, rightly or wrongly, seems to them unattainable in business or industry.

Eames

Both cultural and economic factors have contributed to an expanding market for hand-made things. The impersonal standardized products of mass production and sleek new synthetic materials, while endowed with their own distinctive qualities, have not yet proven satisfactory as a total environment. There is a real need for things that are personal in character, for accidental irregularities, for natural materials and textures. Meanwhile, the continued high level of economic prosperity since the war has created a growing market for the relatively expensive wares of the craftsman, providing an economic base for his work.

Contemporary handcrafts are necessarily interwoven with machine craft. The attributes of beauty and workmanship characteristic of machine-made objects — precision, impersonality, and the elegance of an object pared to its essentials — are reflected to a considerable degree in the work of many of our best craftsmen — in the chairs of Nakashima, which represent a fusion of hand and machine processes, in Prestini's turned wood bowls. More important than the immediate effect of tool and material is the pervasive influence of an environment dominated by the machine, which the most isolated craftsman cannot escape. The contemporary artist-craftsman is a far cry from the untutored craftsman of pre-industrial times, who produced excellent and beautiful things without conscious concern with "design." Today's craftsman no longer works within an established tradition, nor is he a simple artisan contributing an essential skill to the common life of the community. Today, while maintaining contact with the soundest traditions of his craft, he must relate his work to the conditions of a highly industrialized society.

A few craftsmen still retain the anti-machine bias of the Arts and Crafts movement, ascribing superior moral or esthetic qualities to handmade things. An increasing number, however, are coming to regard the question of hand or machine tool as irrelevant and emphasize a feeling for form, uncompromising integrity, and fusion of design and execution as the special contributions of the designer-craftsman.

In another sense, however, the moral outlook of the Arts and Crafts movement is still prevalent. Many have turned to the crafts as a means of livelihood out of abhorrence for material and money values, which they believe contaminate the business and industrial world to an extent that makes creative work of integrity virtually impossible. These craftsmen also seek a simple and rural way of living and working that is more human in scale than anything available in connection with industrial work. Under the circumstances, it is hardly surprising that the artist-craftsman is isolated from the mainstream of our industrial society. The craftsman generally shuns any contact with industry, and industry on its part has shown little interest in utilizing the craftsman's creative abilities.

Perhaps the influence of the individual designer-craftsman is not to be measured by the extent to which he inspires fashions for industry to exploit. The work of our best handcraftsmen helps to perpetuate a feeling for quality and a dedication to perfection that may approach the obsessional, yet are all too readily undervalued in the headlong pace of modern life. In a period of great stress, when we are still seeking ways of reconciling modern technology with human needs, when meaning, order, and dignity in daily life seem elusive, the best of our craftsmen are demonstrating a way of maintaining human values and integrity that can rarely be realized in industry as a whole. But this has been achieved at the cost of social and creative isolation. While the pattern of living and creative work adopted by many of today's artist-craftsmen justifies itself by keeping alive these values in one sector of our economy, it offers no solution for most people.

Craft Workshops Into Design Laboratories

It is close to thirty years since Walter Gropius predicted that "the old crafts workshops will develop into industrial laboratories." Gropius foresaw that the integration of art and technique — of designing and making — associated with the traditional handcraftsman, would ultimately become the prevailing pattern of creative work in modern industry. In industry as a whole, "design" and "engineering" are still separate procedures. It is a step forward if teamwork is fostered by the organizational set-up, but truly creative teamwork can come about only when the specialists involved have achieved a common level in outlook and sensibility.

Among the rare examples of the real craft workshop idea are a small but growing number of craftsmen who use their workshops as experimental design laboratories for factory production. This type of designer-craftsman often explores new areas and directions overlooked by industry. He is a skilled craftsman in that he is thoroughly familiar with technical processes and makes his own models and prototypes, but he does not place special value on handwork for its own sake. Hand, mind, and workshop are a means of fusing the technical and esthetic factors involved in product creation for mechanized production. This kind of integral designing fosters the sensitive use of materials and machine processes that we associate with the pre-industrial craftsman. It is likely to result in fresh forms and avoid drawing board stereotypes.

These design workshops *could* be an integral part of a manufacturing company. That many of them are not reflects the fact that industry as a whole does not accord free exploration and research in design the same recognition and support it gives to pure scientific and technical research. Design exploration in industry is generally tied more closely to the immediate needs of the market than to the intrinsic aspects of the problem.

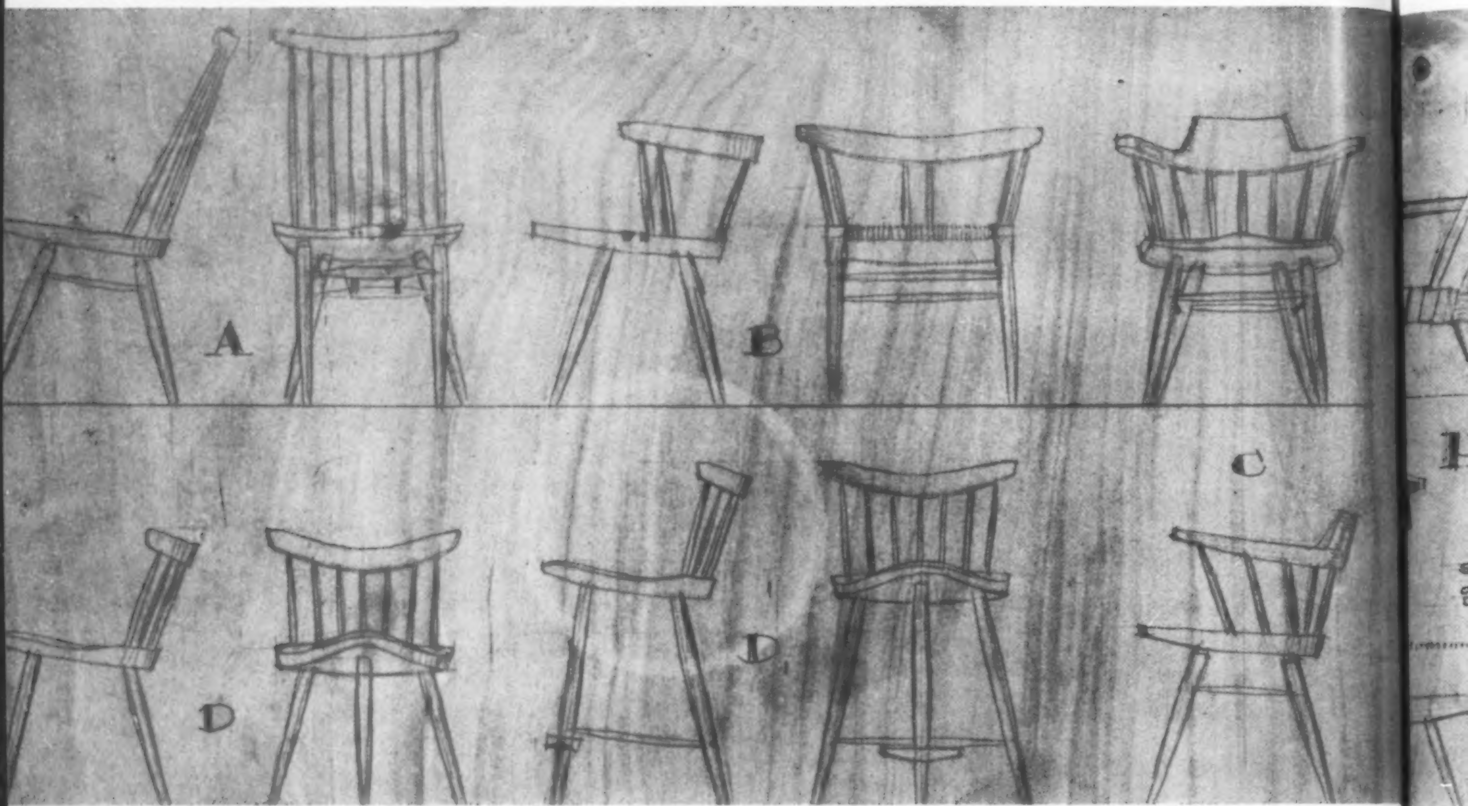
The work of these designer-technicians points a way which may ultimately receive wider industry support, both by increased collaboration with the independent explorer and by creating the conditions necessary for work of this kind in the factory itself.

Nakashima with his daughter Mira in one of his workshops.

1. *Furniture craftsmanship as a moral ideal:* **George Nakashima**

George Nakashima has become a symbol of craftsmanship as a creative force and a moral ideal. His widely publicized chairs, tables, and cabinets have influenced both craftsmen and the designers of mass-produced furniture. But the way of life that Nakashima represents is possibly more important than the furniture for which his shop is justly famous.

Although Nakashima refers to himself simply as a woodworker, his training and experience include a diploma from the Ecole Americain des Beaux Arts, Fontainebleau; a degree in architecture from the University of Washington; an M.A. in architecture from M.I.T.; and extensive work as an architect in Japan, India, and the United States. In mid-career Nakashima turned from "paper architecture" to woodworking in order to achieve a kind of integrity in his work and life that he feels cannot be attained in a design office or within the mainstream of industry. To Nakashima, designing and making are inseparable. He disdains to "live by his wits" and believes that the designer of houses or furniture should be the builder of them. The architect who uses wood should be a carpenter—and, according to Nakaphoto previous page: Ezra Stoller



shima, it takes five years to make a competent carpenter and ten years to make a real craftsman.

For Nakashima, craftsmanship does not necessarily mean *hand* craftsmanship. Although his furniture is traditional in material and construction, he uses machine tools and production methods as far as is possible without compromising the intrinsic qualities of the material. As a result, his furniture is surprisingly low priced for its quality, competitive with high grade factory-made furniture.

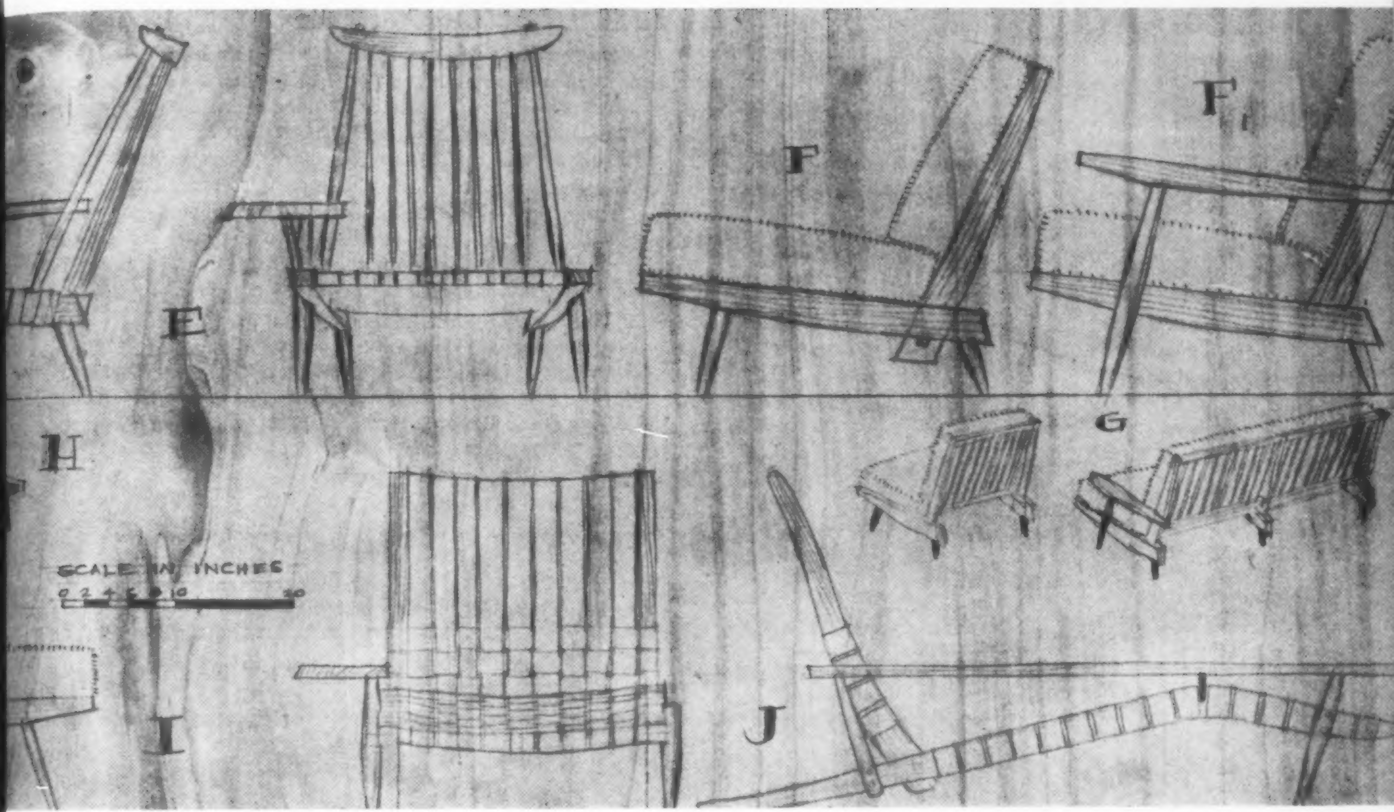
Nakashima's woodworking shop, showroom, home, and storage building, all built by his own hands, overlook a lovely wooded valley among the hills of Bucks County, Pennsylvania. An environment for creative working and living as a unified experience, they represent ten years of incredibly hard work and tenacious adherence to principle.

Nakashima returned from Japan, where he had been working in the architectural office of Antonin Raymond, shortly before war broke out in the Pacific. Nakashima, his wife Marion, and their infant daughter Mira were evacuated from the West Coast and interned in a war relocation center for Japanese Americans. In 1943 the Nakashimas obtained their release from the center under the sponsorship of Antonin Raymond. After working for a year as a farmhand on the Raymond farm, Nakashima rented a small unheated cottage several miles from New Hope and set up a woodworking shop in a tiny open shed next to the house. His equipment consisted entirely of hand tools, and his first furniture was made for his house. Shortly thereafter, he made a number of pieces for a New York office, netting about 20 cents an hour. With $500 of borrowed money he purchased several machine tools and began to operate more efficiently. In 1946, Nakashima built his present shop on land near New Hope, equipped it with additional machine tools, and started on his own house—of stone, wood, and concrete—about 100 feet away. Meanwhile, the house in which they were living was sold and they were evicted to make room for the new owner. Until the shell of their new house was completed, the Nakashimas, including five-year-old Mira, lived in a 16 x 16 foot pyramidal army tent pitched near the building site.

A story in *Fortune* magazine resulted in a number of orders for furniture, including one from Bullocks-Wilshire in California for several dozen walnut chairs to furnish their stores and offices. Hans Knoll retained Nakashima to design a table and chair, fabricate models, and do some production, and in 1949 Knoll started manufacturing one of Nakashima's chairs in the plant of the Hale Manufacturing Company in Vermont. Since then he has had more than enough work to keep him busy.

Nakashima works directly with the material in developing a new design, whether for a building or a chair. It is essentially a sculptural approach, with a minimum of drawings and preliminary planning on paper. In developing a chair design a rough sketch may be prepared on a piece of wood or paper lying around the shop before Nakashima goes to work in the material itself. In the case of his house, a rough 1/8" scale drawing was prepared before construction began but was lost or discarded soon after, and virtually the entire house was built without benefit of drawings. Nakashima points out that the use of the metric module helped considerably.

Page from Nakashima's catalog



For Nakashima, there are no styles, whether "modern" or "traditional," but only good or bad, honest or dishonest. His own furniture reflects the influences of the Windsor chair, Shaker furniture, Japanese woodworking, contemporary forms, and above all the qualities and spirit of wood as Nakashima has come to know them through years of cutting, planing, turning, scraping, and sanding the material. All of these forces are fused into furniture forms that are distinctly his own.

Today Nakashima makes some of his furniture—particularly chairs—in fairly large quantities. He does not enjoy making the same item over and over again himself, but he feels that very large-scale, highly mechanized production of wood furniture sacrifices some of the important qualities of the material. Although the factory-produced chair may be a replica in structure and dimensions of the original, the lack of individual wood selection, hand detailing, sanding, and finishing results in a loss of some of the intrinsic qualities of the chair. Nakashima concedes, however, that more direct supervision of the production process by the designer himself might help to overcome a number of these shortcomings.

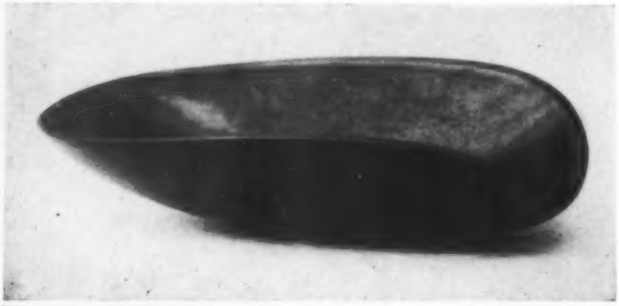
In his own production, Nakashima has worked out a compromise whereby kiln drying, planing, turning, saddle seat shaping, etc., are subcontracted to local plants. A few standard spindle and leg sizes are turned on automatic turners by the thousands and then cut to needed lengths, and sometimes hand planed in Nakashima's shop. Assembly, finish sanding, and finishing are also done there, since Nakashima believes that machine sanding cannot equal the quality of hand sanding. The shop is well equipped with standard but not specialized machine tools. All production is done by Nakashima and about eight woodworkers. When making a quantity of one item they perform identical operations on all pieces at the same time on the same machine setting, instead of making complete pieces one at a time.

A large, well-stacked pile of walnut, cherry, poplar, and ash is located near the shop to air dry before being sent to local kilns for scientifically controlled kiln drying. The use of solid wood, which varies considerably in its properties and its response to atmospheric changes, requires skill, judgment, and individual handling of each board. Today, the best quality logs go into veneers for plywood, so Nakashima obtains his choice logs at the source before they are grabbed by the veneer mills. The logs are rough sawn to Nakashima's specifications at local sawmills to provide boards in widths as great as 36 inches.

Nakashima does not use coated finishes such as lacquer or varnish because he feels they destroy the texture of the wood. He prefers to retain the natural texture and color by using no finish at all, but most of the furniture made for sale is finished with a combination of penetrating oils and sealers rubbed to a smooth, satiny luster.

Increasing recognition and growth have resulted in successive additions to the shop, the size of the woodpile, and the number of workers and subcontracting sources. George Nakashima's humble workshop has become a business enterprise, with Marion as its manager. But the spirit and quality associated with Nakashima furniture is still very much in evidence.

2. *Wood craftsmanship as the investigation of form:* **James Prestini**



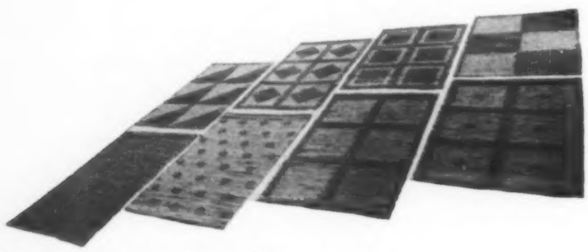
Recent hand-carved bowl (top); earlier lathe-turned bowl.

Although James Prestini's wood turnings enjoy an international reputation, his work in this medium has never been more than a part-time activity and one aspect of a much broader interest in technology and design. For Prestini, hand crafts and machine crafts both have their place as creative forces in an industrial society. A mechanical engineer by training, he worked for many years as a research engineer at the Armour Institute of Technology. His contact with basic and applied research, related particularly to the requirements of mass production, has led to an interest in the possibility of integrating art and technology at the research level. In other words, he thinks designers should work with technological people in the earliest stages of product development. He had an opportunity to test these ideas in practice when the Museum of Modern Art, in 1948, gave him a grant to collaborate with the Armour Institute in developing new furniture designs and construction based on research carried out at the Institute.

Prestini believes that the most important purpose of handcraft activity in a highly industrialized society is the creative experience rather than the end product. He feels that sensitivity to form is cultivated by continuing work with tool and material, a slow process for which there is no short cut. Good forms, even in mass production, reflect

3. *Textile workshop as an industrial laboratory:* **Leo J. Mahsoud**

Leo J. Mahsoud and weavers in his San Francisco shop



Permanent Tuft carpet designs

The Mahsoud workshop is the only one that the author was unable to visit personally. Mr. Mahsoud describes his own approach to textile design and technics in the following letter:

"I come from generations of weavers born in the town of Ghiordes, Turkey. The name Ghiordes is well known in the history of carpet weaving; the Ghiordes knot was the inspiration of ancient carpet weaving and is the foundation for the modern carpet industry throughout the entire world.

"The town of Ghiordes is where Alexander the Great cut the Ghiordian knot and won an empire. The famous Ghiordes prayer rugs are treasures of unlimited value in museums and the hands of collectors. The tying of the Ghiordes knot fascinated me from as early as my hand could hold wool yarn and reach over the warp threads of weaving looms.

"I came to America with the hope of arranging for the importation of our Turkish rugs and carpets. As my knowledge of English was poor, I accepted a job as stock boy in the carpet department of a retail store. In two years I became manager of the department, and later a general buyer. This gave me valuable experience in selling and buying, and most important, a chance to study the trends of home decoration in America. To my disappointment, I found that the motifs and color combinations that we had been weaving for centuries past were not in harmony with American decoration, and the popularity of our carpets and rugs was declining.

"After long correspondence with my family we decided to put aside a certain number of looms and convert them to new motifs, new colors, and particularly new textures. It was a costly, tedious transition, requiring eight trips to the old country, but so successful that we immediately entered into competition with European hand-tufted rugs and carpets.

the ultimate refinement that is achieved through complete mastery of a medium. Thus Prestini regards handcraft experience in at least one medium as essential for the industrial designer.

In one sense, Prestini's bowls do not fall within the scope of these studies, for despite their basic form as containers, they are more in the nature of sculpture than utilitarian objects. A bowl by Prestini might serve quite well as a salad bowl; indeed, his influence is seen in salad bowls now manufactured by innumerable craftsmen and factories. But in perfecting the forms of the turned wood bowls for which he is best known, Prestini has given relatively little thought to function. Even material is a secondary consideration, for these highly attenuated shapes, with their thin walls and delicate edges, could just as appropriately be made in plastics or metal as in wood.

Perhaps it was as a child watching his father, a skilled stone carver, at work that Prestini first developed a predilection for shaping materials. His interest in wood turning developed during the early thirties while he was teaching mathematics at the Lake Forest Academy, in Illinois, a few years after getting his engineering degree at Yale. During a Christmas holiday he spent a few days puttering around the school's workshop. This led to an increasingly serious interest in woodworking, and before long Prestini became shop supervisor.

Why this early interest in woodworking focused on turning, Prestini is unable to say, but he was soon spending more and more time at the lathe. His early turnings were influenced primarily by ceramic and metal bowls and bear little resemblance to the highly refined forms of his later work. Under the influence of an architect who taught at the Academy, Prestini became interested in the modern movement in design. In Chicago he came in contact with some of the designers, architects, and teachers at the newly established Institute of Design and was influenced particularly by Moholy-Nagy and Gyorgy Kepes.

Several years ago Prestini took a leave of absence from Armour Institute and returned to the region of Italy where his father first learned to work with stone to engage in pure sculpture—a sojourn from which he has just returned. He has continued to make bowls, but no longer with the precision and symmetry dictated by the lathe. His carved bowls, exhibited at the Triennale in Milan, are more fluid in form, more purely sculptural, and more expressive of handwork. At the same time, experiments with formed plywood as a sculptural medium testify to his continued interest in machine processes.

"Pretty soon people began to ask if I couldn't do some weaving here for faster delivery. Although I tried to avoid the issue, the demand was so great that I began to give it serious thought. After almost three years of constant experimenting and hard work, I created a new carpet of distinctive texture which I named Permanent Tuft and presented to the trade in 1936. My success with the Permanent Tuft wool carpet was very gratifying. It was a new challenge of craftsmanship. For a while, I found myself very busy conducting two undertakings, my imported line of hand-tufted rugs and carpets, and my weaving business in California.

"But the coming of World War II stopped my import line, and when this country entered the war the government froze all wool yarn, stopping my Permanent Tuft line as well. This brings me to the birth of the Perma-Weave rugs and carpets.

"With every available material frozen, I was looking constantly for some material to weave. In an isolated warehouse I spotted several cylinders of hemp yarn and began to experiment with various techniques of weaving it. My purpose was not only to obtain an interesting texture but to maintain the tradition of Permanent Tuft—a pile that would not pull out. Finally, after a considerable amount of experimenting and headaches, I submitted several samples to the trade for criticism. Their reaction was very favorable.

"This new line has several merits. It is well made and strong, and the texture pile is permanent. It can be woven in any color, either single, two-tone, or tone-on-tone. I can use cotton, hemp, wool, raw silk, synthetics—any yarn which is sufficiently strong and uniform. Recently I converted some of my hand looms for weaving all-wool textures, wool and hemp mixtures, and wool, hemp, and cotton—for example two cords of beige wool, one of black hemp, and the natural cotton. The rugs and carpets are hand-woven to order on semi-automatic looms of my own design. These looms could be power driven, but I prefer to have the line handwoven.

"Between 1933, when I first began experimenting, and the end of 1949, I have developed numerous techniques and inventions. Someday, for the good of us all, I will probably take each one and describe its merits. Some of them will surprise the large manufacturers beyond belief. Here I can only mention a few:

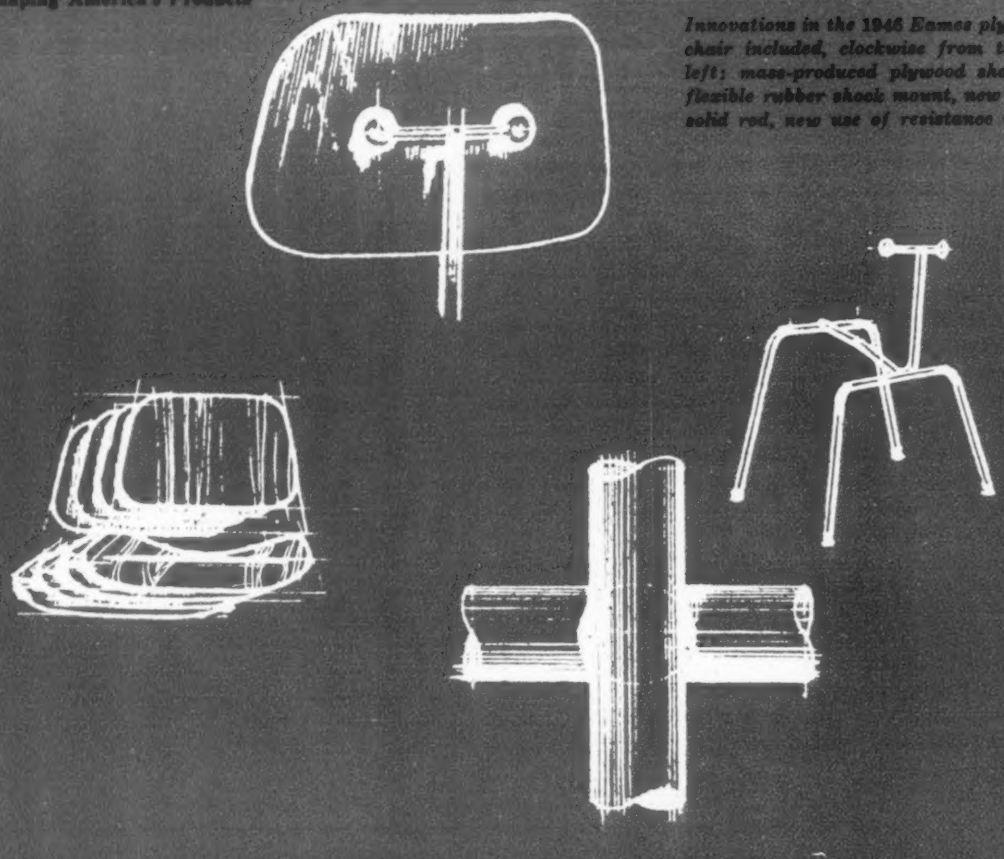
"The 'Ghiordian chenille weaving technique' eliminates the weaving of a heavy backing for chenille quality carpets. With my development, chenille carpets could be woven with inexpensive two-harness looms instead of the usual $15,000 looms.

"The 'automatic brush' or comb in one stroke brushes the tufts or chenille fur the entire width of the loom. The most progressive mills here and abroad still employ two weavers to do the brushing by hand.

" 'Direct warp feeding tufts units' produce tufts in cut and uncut pile, long, short, regular, or irregular, single or multiple textures, single or multiple colors, at a continued rate of five yards per minute. One weaver can operate ten units.

"The 'plastic weaving device,' after preparation of tufts and setting the units, will produce one 9 x 12 rug every four minutes.

"My utmost desire is to bring the price of hand-loomed rugs and carpets within the financial means of more Americans, so they can enjoy the beauty and charm of hand weaving."



Innovations in the 1946 Eames plywood chair included, clockwise from the left: mass-produced plywood shapes, flexible rubber shock mount, new use of solid rod, new use of resistance weld.

4. *Design laboratory for industrial innovation*: **Charles Eames**

Charles Eames is one of a relatively small number of contemporary designers who have created new generic forms. The furniture Eames has designed over a period of more than fifteen years has had a world-wide influence. But the style trends he has generated are no more important than the pattern of creative work they represent. Eames' workshop combines the characteristics of research laboratory, pilot production plant, and art studio. In his workshop, vernacular materials and industrial processes are infused with concepts drawn from the worlds of Mondrian and Arp, of Buckminster Fuller and John Von Neumann. He is an insatiable collector and photographer of everyday objects—pieces of hardware, tools, kites, toys, etc.

Such diverse interests applied to a simple object could easily result in the pretentious or precious. But Eames never allows himself to be diverted from the main objective—to unite utmost economy of means with intrinsic quality. In his work, all these forces are fused into forms that have a simple inevitability, almost anonymous in character, along with a freshness and individuality that are unmistakably his. Eames feels that design should be anonymous, like creative activity in other fields today. He deprecates those influences that tend to focus attention on the individual and establish canons of taste to which designers more or less consciously conform.

Charles Eames has designed a wide variety of objects, including storage furniture, tables, and toys. Recently he has spent a good deal of time making experimental films. But the designs for which he is best known, and which serve to illustrate his method of work, are a series of chairs.

Ever since the development of the Thonet bentwood chair, around 1830, inventors and designers have been intrigued by the possibilities for using new materials and techniques to produce chairs of great strength, lightness, simplicity, and comfort. Nearly a century after the invention of the Thonet chair, Marcel Breuer of the German Bauhaus developed the bent tubular metal chair. During the nineteen thirties, Alvar Aalto in Finland exploited the possibilities of bending and laminating wood veneers to make strong, simple chair structures. But the plywood forming techniques available to Aalto only permitted bending the material in a flat plane, which bears very little relation to the variable curves of the human anatomy.

When the Museum of Modern Art announced its international furniture design competition in 1939, Charles Eames, who was then teaching and working at the Cranbrook Academy of Art, entered with Eero Saarinen. Eames had a varied background in architecture, engineering, and related and unrelated arts and skills. Before entering the University of Washington in St. Louis he had already worked for several years at jobs ranging from grocery clerk to production worker and engineering draftsman in a steel mill. He had planned to study engineering, but an architectural scholarship turned up and he accepted it. After a period of study and work in architecture, Eames accepted a fellowship at Cranbrook, where he worked with Eliel and Eero Saarinen on architectural projects and started an experimental design department.

At the time when Eames and Saarinen attacked the problem of chair design for the competition, new techniques were being developed for compound forming plywood to make stressed skin aircraft components. Eames was intrigued with

Far left: wire-reinforced plaster mold for determining chair shell

Left: wood frame enclosing rubber bag for molding plywood

Above: model of molded plastic chair

Left: activity in Eames' shop

the structural and sculptural possibilities of molded plywood. A thin, jointless, stressed skin shell of laminated wood veneers could constitute the seat, back, and arms of a body-conforming chair and opened up the possibility of entirely new chair forms.

The first model for the competition chair was made of plaster on wire mesh reinforcement. In the course of developing the shape the plaster model was fractured and reset repeatedly. The problem of fastening the legs to the thin plywood shell without bulky and obtrusive joints was solved by a metal-to-wood bond of rubber based on new techniques. The overall conception and approach was daring but theoretically feasible, and the forms were elegant. The Eames-Saarinen molded chair designs received the first prize and were widely acclaimed as the most important development in the field since the Aalto chairs.

The Haskelite Company was selected to mold the chair shells, and the Heywood Wakefield Company to apply the upholstery, assemble, and finish. But although Haskelite engineers had expressed complete confidence in their ability to solve the production problems involved, difficulties began to crop up before the molds had been completed. Finally Eames and Don Albinson, one of his students at Cranbrook, moved into the Haskelite plant and went to work directly on the molds. This was the beginning of what was to prove a long and arduous struggle with plywood molding techniques.

When the chairs finally reached production, it was found that the molding techniques being used were very costly. Since wood cannot be stretched in forming like metal, compound shapes can be formed only by laying up pre-tailored strips of veneer over a form in successive layers, an exceedingly costly hand process unsusceptible to mechanization. Eames finally realized that this first approach led up a blind alley.

Charles Eames and his wife Ray left Cranbrook for southern California in 1941. They converted one room of their rented home there into a workshop and continued to experiment with plywood molding techniques at night and on weekends while Charles worked in the Metro-Goldwyn-Mayer art department during the day. This time they tried goring large flat veneer sheets with slots and openings designed to close upon themselves when placed over a curved mold. This eliminated the hand laying up of separate narrow strips of veneer and permitted processing and pressing veneers in multiple layers simultaneously.

In order to fabricate a sample chair shell Eames had to make a mold, fabricate a large, airtight rubber bag which could be inflated to apply fluid pressure to the veneers, and construct a heavy frame of two-by-sixes to restrain the considerable pressure of the inflated bag. The Eameses carried the materials for this undertaking into the house piece by piece at odd hours so the landlord would not suspect what was going on, and kept the room in which the work was being done under lock and key, day and night. When the apparatus had finally been constructed there remained the problem of inflating the bag, and a bicycle pump was put into service. After laborious pumping, the bag was brought up to the minimum required pressure of thirty pounds per square inch, but it turned out that the homemade bag was not completely airtight, so Charles and Ray alternated at the pump for three hours to keep pressure while the glue set.

After the war broke out Eames abandoned further work on the chair and applied the techniques he had learned to a variety of war production problems, including the development of a molded plywood splint for fractured limbs. During this period he also began to experiment with the new "cycle-welding" technique for bonding dissimilar materials. This was to prove important later in connection with the chair; at the time it was used for every kind of joining problem around the shop, including the making of tools and fixtures.

All of this wartime work was done under the overall control of Evans Products Company, a large manufacturing company that took over production of the splint for the Navy. Eames, however, was in complete charge of all technical work. The shop itself later provided the basis for the Eames design laboratory.

In 1944, with the war work still going on in the shop, Eames resumed work on the chair problem; this time he had far better physical facilities and technical know-how, and a small but versatile staff of mechanics, sculptors, and designers. Several chairs were made experimentally, using various techniques. But none of the methods Eames tried for forming a complete laminated wood chair shell proved practical for large volume, low-cost production.

At this point, Eames abandoned the idea of a one-piece shell and began to think in terms of a separately molded seat and back, or "petals," as he calls them. This at once simplified the molding problem by greatly reducing the size and depth of each forming. The components could now be formed in a hydraulic press instead of by costly bag molding methods. The separation of seat and back made it possible to mount them on flexible rubber mounts so that they would yield separately with body pressures. The "cycle-weld" technique was used for bonding the rubber discs to the wood.

Eames went to work on the fabrication of mock-ups and models assisted by a versatile group of artist-technicians that included Ray Eames, painter, Marion Overby, sculptor, and Don Albinson, who had worked with Eames on the original competition chair. Harry Bertoia, sculptor and metalsmith, did the welding on parts of the steel tools and later welded some of the samples for the steel frames. Margaret Harris, a costume designer, cut the patterns for the veneers. The shapes of the components were developed in full-size plaster mock-ups and transferred directly to experimental forming molds. The molds were modified again and again before the final shapes were arrived at.

In 1946, the Museum of Modern Art offered to exhibit Eames' new chairs. Eames was beginning to have doubts about the entire venture because of the many adverse reactions he was encountering to the radical construction and unfamiliar forms. He thought the exhibition would mark the end of the whole project. The widespread acclaim that greeted the show was thoroughly unexpected. Evans Products became interested in producing the new chairs, and a large furniture wholesale organization offered to undertake national distribution—if certain design changes were made. This Eames refused to do, and the Herman Miller Furniture Company finally took over distribution, and ultimately production as well (ID, April 1956). The production dies for the chairs were built in the Evans pilot plant under Eames' supervision. Eight years after the exhibition of his first plywood chair, Eames finally had a chair in production.

But it was apparent that molded plywood will always cost more than most forming techniques, especially metal stamping. When Eames received a research grant from the Museum of Modern Art in 1948 to work with the engineering department of the University of California at Los Angeles on new furniture designs, he turned to stamped steel. Not only did it offer the possibility of very low cost, but it reopened the possibility, which had proved impractical with molded plywood, of a one-piece chair shell. Eames therefore went back to essentially the same one-piece design that had been developed for the competition of 1940. A neoprene-base coating was sprayed onto the shell to remove the coldness of the metal and to deaden metallic sound. The original rubber shock mounts were retained, but a new stamped metal retainer for the mounts was developed.

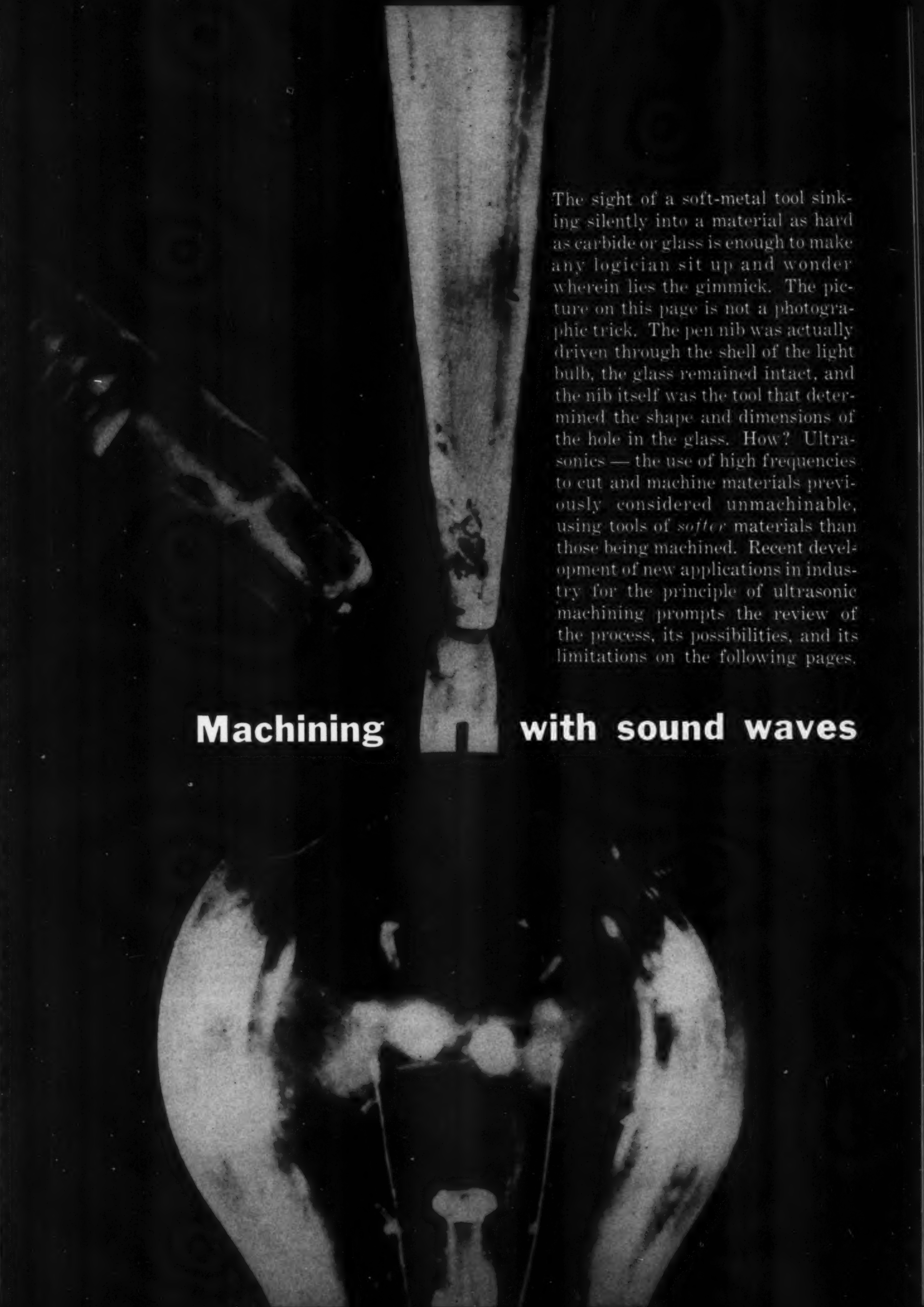
The metal chair was awarded second prize in the 1948 international furniture competition. But the die costs for a metal stamping of the size and depth required by the chair proved too high for the volume of sales anticipated, at least initially. Eames turned to Fiberglas-reinforced plastics, which are ideally suited to the production of large complex shapes of great strength and light weight. Tooling costs in this material were much lower than for stamped metal, but unit production costs were substantially higher.

The history of Eames' chairs is far from finished. In recent years he has worked with formed wire and continued his experiments with molded plywood. He is an insatiable and tenacious experimenter. He probes every detail of a problem and follows through on every aspect, including tool design, photography of models, and final packaging.

Eames has always been fascinated with the problem of designing structures with an absolute minimum of materials and weight, both for economy and for the light airy look of a structure whose stresses are well distributed among members pared down to a minimum. For the Fiberglas chair, Eames experimented with a light cage of steel wire, using forming and and welding techniques that were already widelv used in the manufacture of formed wire products. With characteristic thoroughness, Eames made over forty experimental structures of wood and wire in order to solve the structural and esthetic problems posed by wire cage construction.

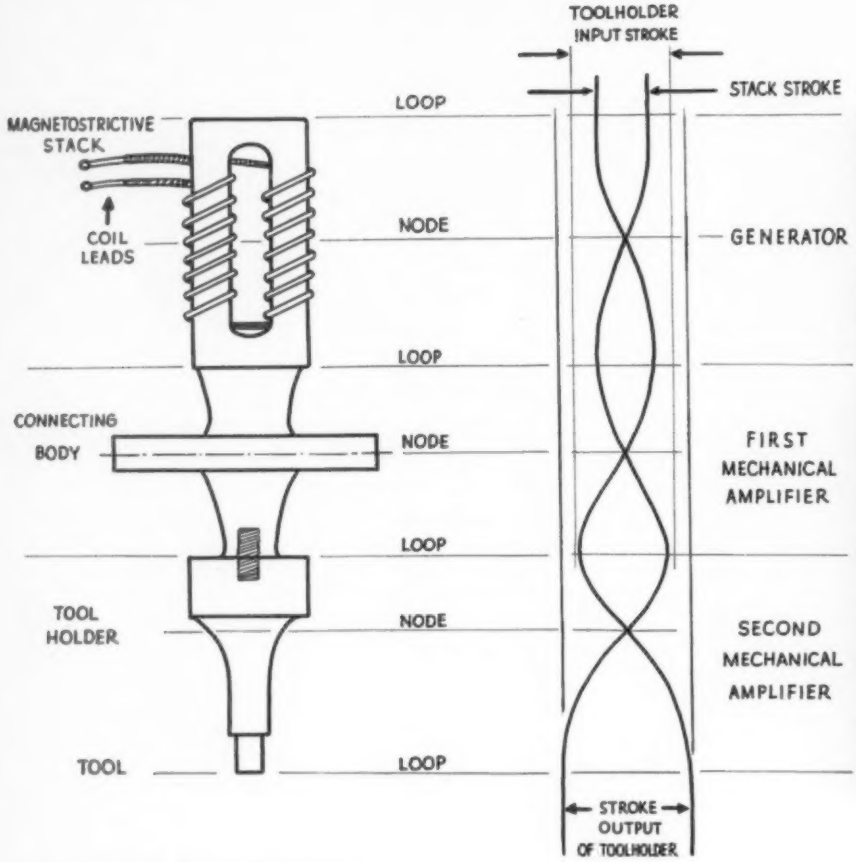
This passion for exploring and experiencing the nature of the materials and technical processes with which he is concerned requires the closest association, if not actual identity, between designer and technician. It also implies the availability of a design laboratory in which direct experimentation with tool, material, and form is possible.

The experimental shop and pilot plant that Eames took over from Evans Products is a well-equipped design laboratory and pilot production shop. Equipment consists of light machine tools for wood and limited metal fabrication, improvised presses for production of curved and flat plywood panels, drafting room, and areas for assembly of experimental models. Notably absent is the smart, well-appointed office and reception room typical of the successful designer. Except for the products and models themselves and bits of abstract and folk art scattered around, the place could be one of thousands of small job and production shops such as one finds in converted garages and stores in every American city.



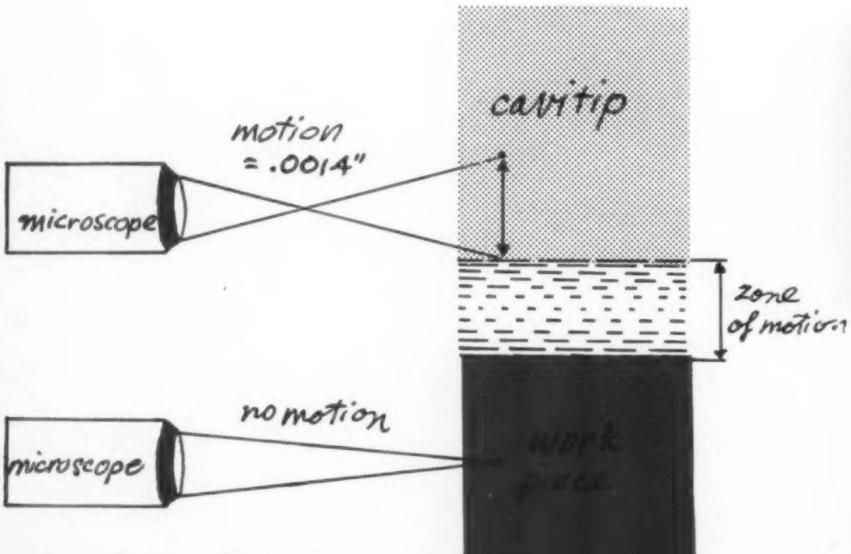
Machining with sound waves

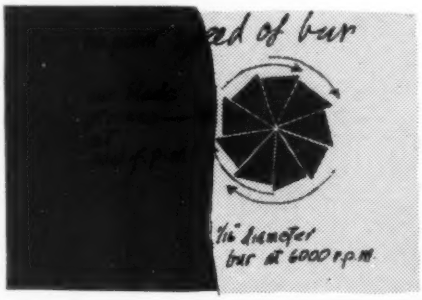
The sight of a soft-metal tool sinking silently into a material as hard as carbide or glass is enough to make any logician sit up and wonder wherein lies the gimmick. The picture on this page is not a photographic trick. The pen nib was actually driven through the shell of the light bulb, the glass remained intact, and the nib itself was the tool that determined the shape and dimensions of the hole in the glass. How? Ultrasonics — the use of high frequencies to cut and machine materials previously considered unmachinable, using tools of *softer* materials than those being machined. Recent development of new applications in industry for the principle of ultrasonic machining prompts the review of the process, its possibilities, and its limitations on the following pages.

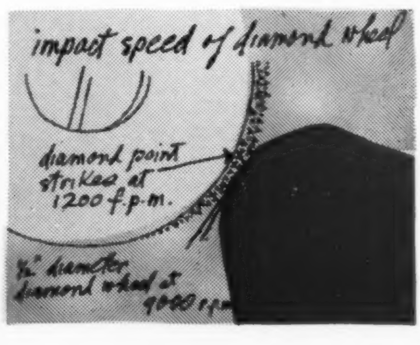


The principle of magnetostriction

A "stack" of nickel plates is surrounded by a magnetic field. As the magnetic field is varied, the metal expands and contracts. This movement is amplified mechanically by a metal transmitting cone and by the tool holder. The photograph on the right shows a tool in action. Fluidized abrasive flows constantly over the tool and the workpiece. This ultrasonic machine tool is designed by Cavitron Equipment Corp., Long Island City, N. Y. and marketed by Sheffield Corp., Dayton, Ohio.







Why ultrasonic machining is gentle

The diagram above shows how the tool vibrat[illegible]r and abrasive particles are driven against the workpiece just before the tool begins to reverse its direction for another cycle. Consequently, the impact speed of the tool is very low; it is calculated that the abrasive particles strike at .09 feet per minute. The comparatively higher impact speeds of the diamond wheel and the bur (right) cause noise and vibration.

How ultrasonic sound waves cut "unmachinable" materials

A noiseless ultrasonic impact grinding machine can be compared to the familiar noisy pneumatic drill: both tools vibrate linearly for their cutting power. Yet there is a basic and important difference between the two methods of cutting. The cutting tool on a pneumatic drill is in direct contact with the surface it is wearing away, while the ultrasonic tool never touches the surface of the object being worked. The similarity lies in the fact that a power source drives a cutting source: a pneumatic drill drives a chisel directly into a surface, an ultrasonic grinder drives hundreds of abrasive particles which are suspended in a fluid against a surface to wear it away. The difference—direct contact as opposed to indirect—is the key to the silent and smooth grinding action of ultrasonic machining.

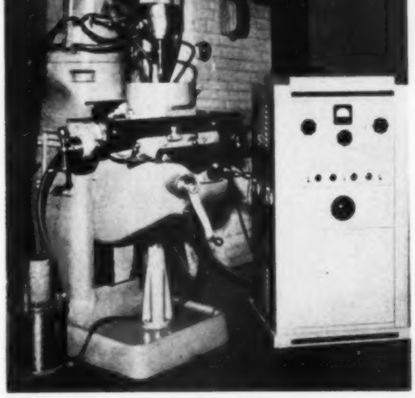
Dr. Lewis Balamuth, the inventor of the Cavitron process of ultrasonic machining, explains that, "An easy way to understand ultrasonic cutting is to think of the tool as a hammer, the workpiece as an anvil, and the thousands of abrasive grains between the two as so many chisels. On each downstroke of the hammer the hard, tiny chisels are driven with great force into the anvil, chipping out microscopic particles of the work." In effect, it is a process of erosion speeded up to a fantastic rate.

To appreciate how the ultrasonic process makes it possible to cut a very hard substance with great precision with a tool made from a soft material—defeating once and for all the aphorism that a cutting tool must be harder than the material it is cutting—it is necessary to describe in some detail the equipment and the principles behind its operation.

The equipment itself consists of four basic components: an electronic *generator* which converts 110 or 220 volt, 60 cycle alternating current into high frequency power; a *transducer* which converts the electrical energy into mechanical energy to cause a tool to vibrate linearly at ultrasonic frequencies; a *tool* which drives abrasive grit into the workpiece, machining away minute particles of the material; and a *recirculating pump* which supplies the tool and the workpiece with a continuous flow of abrasive grains suspended in a liquid. The abrasive grains, it has been pointed out, are the cutting edges of the tool. Standard commercial abrasives are used — coarse grits for rapid cutting and finer grits for finishing. The tool vibrates linearly a few thousandths of an inch for every stroke at a rate of about 20,000 times a second, driving the abrasive grits into the workpiece to form a cavity the same shape and dimension as the tool.

Magnetism makes vibrations

Some metals surrounded by a magnetic field will expand and contract as the magnetic field is varied. This characteristic, known as "magnetostriction," is the principle on which ultrasonic equipment operates. Cavitron uses nickel in its system because it offers a combination of tensile strength, corrosion resistance, and good magnetostrictive properties. The diagrams on the opposite page show how a "stack" of nickel plates is surrounded by wire carrying ultrasonic power supplied by the generator at frequencies in the ultrasonic range, or above 16,000 cycles a second. Electrical energy is converted to mechanical vibration as the magnetic field around the nickel stack changes and the nickel plates physically expand and contract. The motion is so minute—about 30 parts per million—that it must be amplified to give sufficient motion for a tool to be effective. Amplification is accomplished by a metal transmitting cone which, because of its length and shape, has the same natural frequency as the nickel stack. Further amplification is obtained from the tool holder itself, which is screwed into the first amplifier and has a tool brazed to it. In operation, the nickel stack, the mechanical amplifier, and the tool holder are "tuned." When they are in harmony, the machining tool vibrates 25,000 times a second and the tip moves about .0014 inch. The machine is brought into tune by varying generator output.



Ultrasonic machining equipment: recirculating pump (lower left), machining unit (center), electronic generator (right).

Ultrasonics vs. standard machining

A comparison of ultrasonic machining to standard methods helps to bring out some of its unique features. As the diagrams show, a grinding bur with eight blades and a diameter of 1/16 inch, will strike a surface 800 times a second with the blades moving 100 feet a minute on impact. A diamond disk with a diameter of ½ inch rotating at 9,000 rpm will strike a surface 300,000 times a second (a generous estimate) and the diamond points will be moving at 1200 feet a minute. Obviously, the diamond disk has more grinding action than the bur, by virtue of the number of impacts and their velocity. But, as it will be pointed out, there are disadvantages to striking a material with an object that is moving at great speed. With an ultrasonic machine, taking into consideration for the moment only the number of impacts per second, it is conservatively estimated that with every stroke of the tool 300 of the fluidized abrasive particles will strike the surface being machined. When an ultrasonic tool is vibrating at a frequency of 25,000 cycles a second, simple mathematics show that there will be 7,500,000 impacts every second.

To go back to the bur and the diamond disk, it is easy to see that the greater the speed of impact, the greater the shock to the surface of the material, and the greater the vibration, noise, friction, and resulting heat. It has been mentioned that the bur strikes at 100 feet a minute and the diamond disk at 1200 feet a minute. With ultrasonic impact grinding, the actual speed at which the abrasive is driven against the workpiece is very slow, a phenomenon which at first glance appears contradictory. Magnification of the linear motion of the tip of the tool shows that the abrasive grains are driven against the surface of the workpiece only at the end of the tool's cycle of motion, or just before the tip begins to reverse itself for another cycle. Consequently, the speed of impact of the tool is very low. It has been calculated that, under operating conditions, the cutting points of the abrasive particles strike at .09 feet a minute, or .0009 the rate of a bur and .000075 the rate of a diamond disk. This fact, in combination with the small force needed behind the tool for grinding (rarely over 10 pounds), and the absence of direct contact between the tool and the workpiece eliminates distortion-causing shock or stress to the material being machined, but machining is rapid because the number of impacts is so very high.

Sound waves silently cut the hardest materials in intricate shapes

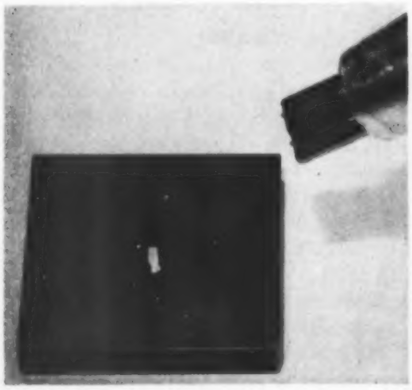
The ability to cut exceptionally hard materials, to make longer-lasting dies, and to use semi-skilled labor for close-tolerance machining are among the advantages that ultrasonic impact grinding offers to industry. But, ultrasonics is used for many other purposes than cutting and machining. The principle was given a great development boost during World War II through Sonar, now familiar to most people as an underwater detection and tracking device. Not quite so dramatic is the use of ultrasonic frequencies to rid parts of grease and sludge. Parts are immersed in a tank of fluid which is agitated by high frequency sound waves, breaking down the dirt and cleaning the parts perfectly.

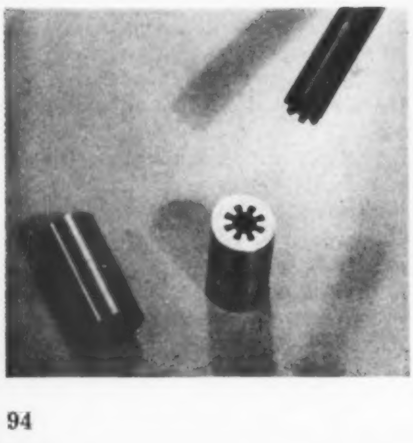
Die making, a major cost problem, can be greatly simplified by ultrasonic machining. Dies for typewriter keys, for example, can be made from regular type slugs. Two factors are involved here; the manufacturer wants the longest possible life from his die and, of course, wants to keep his tool costs low. Ordinarily, complex dies, particularly if they are small, must be machined in sections to obtain the necessary detail and contour. Using ultrasonic methods, small and complex dies can be cut from one piece of metal, and the tools, because they do not have to be harder than the die material, can be easily machined.

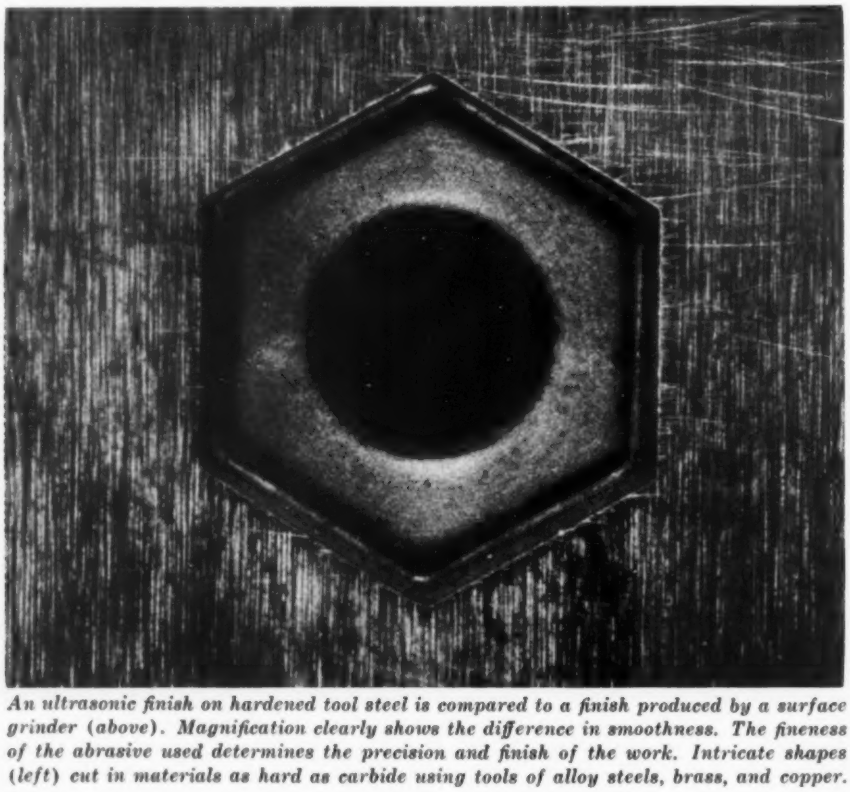
As a demonstration of the close tolerances that can be obtained with ultrasonic machining and to show that the actual grinding action is gentle, technicians at Cavitron machined a fine porcelain dish with a flat round cutting tip to a controlled depth. Penetration of the tool into the dish was stopped within .002 inch of the bottom. Examination revealed a smooth film of porcelain about .002 inch thick with no cracks or crazes. This spectacular demonstration has practical application for such problems as slicing wafers of germanium, a vital step in making widely-used transistors. Germanium slicing for transistors and the production of thin wafers of sapphire and quartz for jewel bearings and crystal oscillators make up a large portion of the cutting applications.

Ultrasonic machining equipment is in use today by makers of working tools and dies, electronic components, extrusion dies, wire drawing dies, automobile tire molds, etc. But it has limitations and is certainly not the answer to every die-maker's prayer. The size of the piece that can be cut is greatly restricted, as it is limited to about four inches square; this automatically puts this method of machining out of the question for many applications. To increase the area that can be machined, the capacity of the generator must be increased and there are practical limits to a feasible machine size.

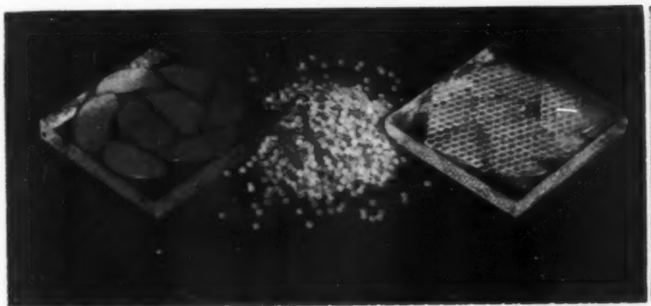
In dentistry and medicine, considerable work has been done, mostly on an experimental basis, to establish the practicability of ultrasonic cutting. It offers such obvious advantages for dental drilling as lack of vibration, probably the most bothersome and painful aspect of having a tooth drilled with a bur. Also, the action of the cool fluid, in which the abrasive flows over the surface being ground, virtually eliminates possible pain from heat. Other medical applications under investigation include cranial surgery, where ultrasonics might be used to cut windows in the skull. The equipment, however, is a major investment for a practitioner and its unfamiliarity to men in the medical professions and to patients indicates a long wait before it is commonplace.—*d. g. m.*

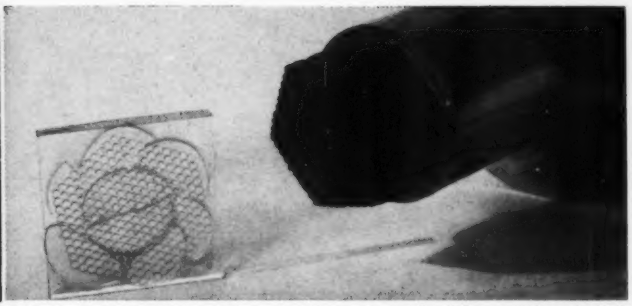




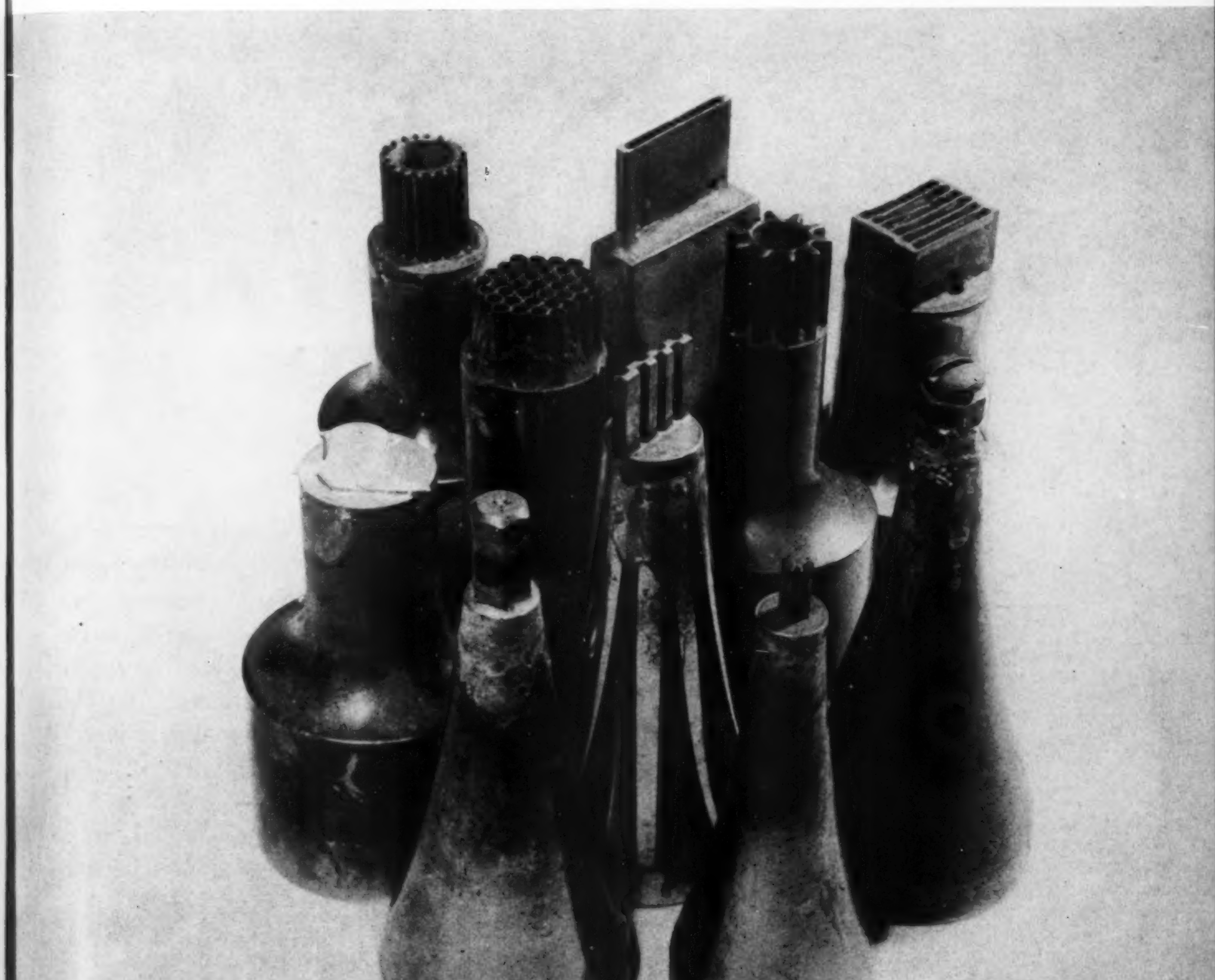


An ultrasonic finish on hardened tool steel is compared to a finish produced by a surface grinder (above). Magnification clearly shows the difference in smoothness. The fineness of the abrasive used determines the precision and finish of the work. Intricate shapes (left) cut in materials as hard as carbide using tools of alloy steels, brass, and copper.



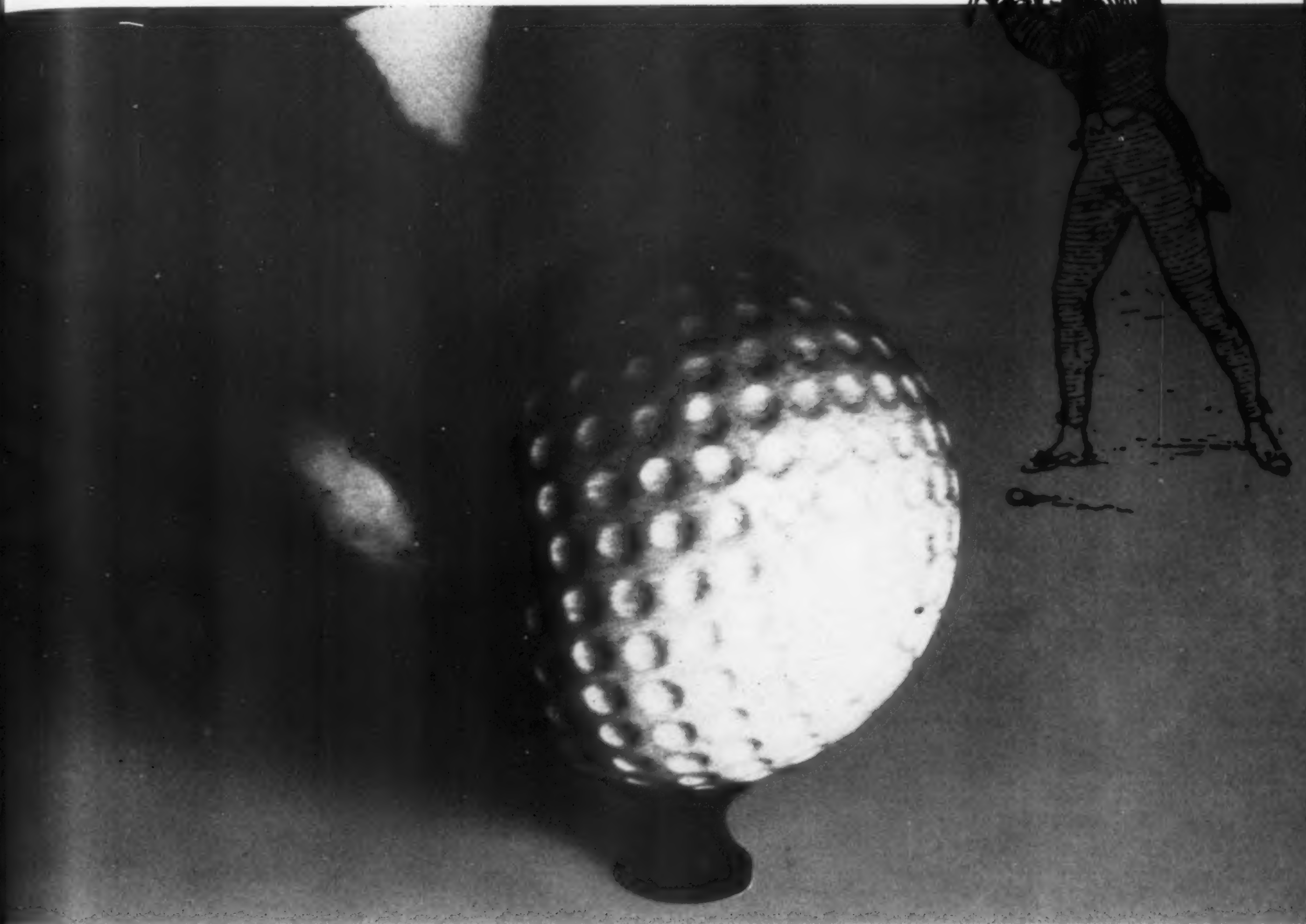


Germanium wafers are cemented to a glass plate and minute blanks are cut out 100 at a time in three seconds. The cutting tool is shown on the right. A collection of ultrasonic tools (below) indicates the variety shapes that can be used.



EQUIPMENT FOR TENNIS AND GOLF

Designed for impact



A tennis champion defending his title on the Center Court at Forest Hills, or a golf great making a round in the low 70's at St. Andrews, Scotland, share an interesting trait with a youngster in blue jeans on an asphalt court in Central Park and a Sunday golfer on a municipal course in Staten Island. All are profoundly attached to their rackets or clubs. Beginner or champion, each imparts a personality to his equipment, to the extreme that these pieces of wood and steel and gut and leather are sometimes regarded as animate and must bear the responsibility for a win or a loss. These feelings for sports equipment are not surprising, for rackets and clubs are designed as an extension of the player's own arm. Changes in the design and construction of these implements through the years are directly related to two things: the evolution of the games, and the personalities of the players. Demands for greater speed and distance and accuracy, coupled with an increasingly uninhibited approach to sports, required new shapes, stronger construction; and new materials and methods of fabrication sometimes radically affect tennis and golf. DOUGLAS G. MELDRUM

The evolution of the tennis racket

There is no rule of tennis—and never has been—that restricts the size, shape, or material of the implement used to hit the ball. In the middle ages it was done with bare hands, and might be today if the objectives of the game had not changed, if new materials or manufacturing methods had not been introduced, if sporting personalities had not provoked new trends.

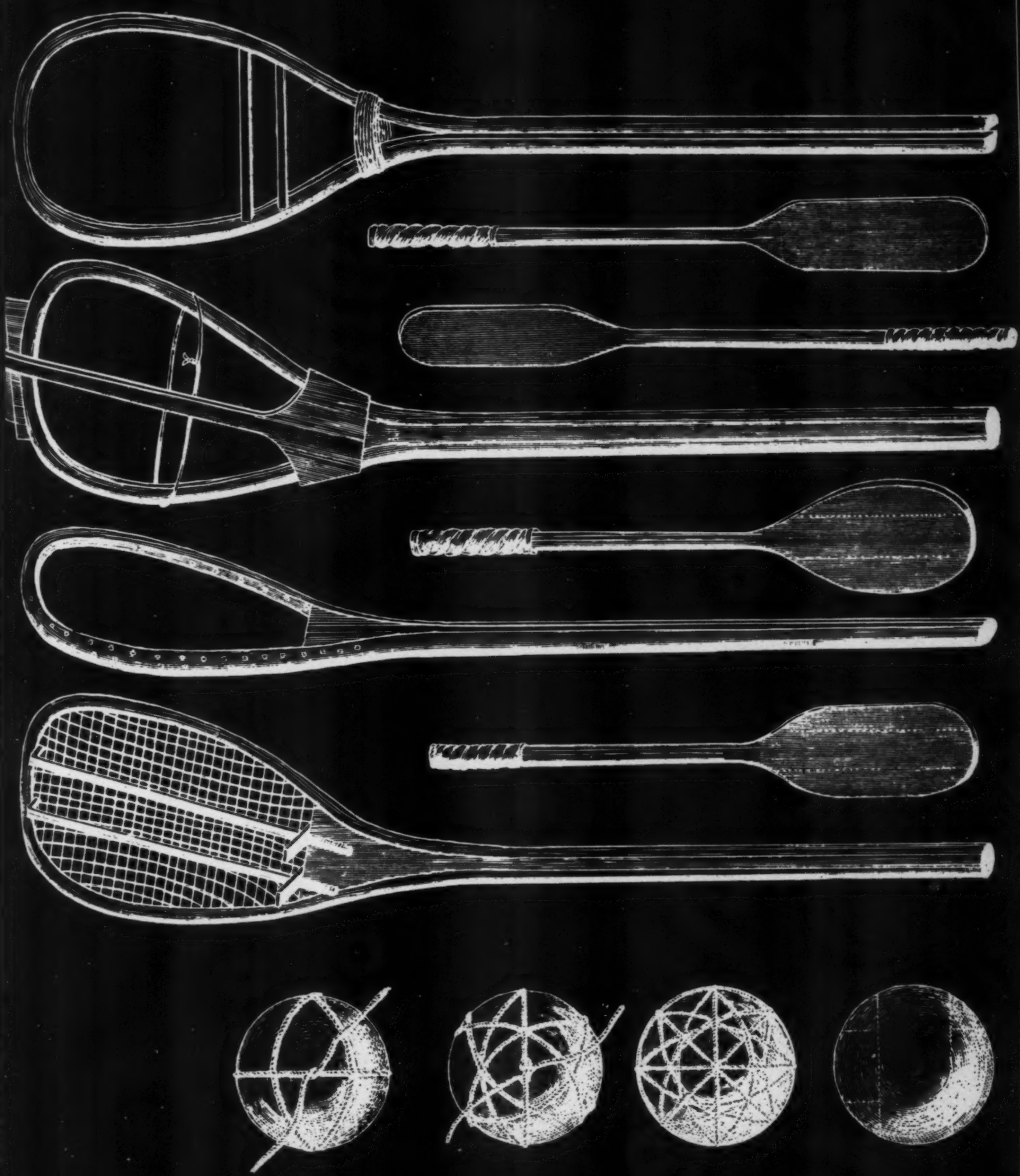
The earliest origin of tennis is lost in a confusion of games in which people hit or threw a ball back and forth: various theories relate tennis to lacrosse, which was played by American Indians, or to a sort of hockey indulged in by Byzantine horsemen. But it was probably "jeu de paume," or game of the palm, as it was known in France, that led directly to lawn tennis. This stately contest, popular among the aristocracy of Italy and France, was as strange by today's energetic standards as the costumes worn by the players. Male contestants adorned in pantaloons, with swords at their sides, hit a cork ball with their bare hands over a bank of earth two feet high—while women sat by and watched. The first racket, though no one knows exactly when it was used, was a logical successor to gloves and strips of leather or parchment bound around the hands. Sometime in the 14th century wooden paddles, known as "battoirs" or "palettas" came along. They were not immediately adopted by all players, and there are records of matches in which a bare-handed player stood up to a contestant armed with a paddle. Obviously, the paddle extended the reach of the player and enabled him to hit the ball harder, yet the game remained more of a test of defensive endurance than the hard-hitting offensive contest it is today. This remained true when the first strung rackets were introduced in the 15th century. The strings on these rackets ran diagonally across the open frame and were quite slack; horizontal strings actually looped around the vertical ones. Instead of being oval, the rackets had an off-center scoop that was good for lobbing. In 1856, French racket-makers changed their stringing methods, passing the horizontai strings over and under the vertical ones without looping them. This made it possible to string rackets tighter, a step that did not gain immediate favor. But as greater speed, vollying and an attacking game became popular, players found that tightly strung rackets gave better control and accuracy as well as more speed. All early tennis rackets were individually made, with one craftsman doing most of the work on one racket. Skillful as they were, the artisans could not prevent a perceptible amount of variance from one racket to the next.

Toward the start of the 20th century, a new tennis era began. Like many outdoor activities, it began to be widely adopted as a healthful and enjoyable form of recreation. As more and more people became enthusiasts, tournaments drew large crowds. The game was considered genteel enough for young ladies to play, even in competitions—it was indeed genteel enough to be played in long skirts—and some schools and universities recognized it on their physical education curriculum. Great names like the Doherty brothers, Renshaw, and Lawford were known internationally, and in the first year of this century English and American teams held their first contest for the trophy that personifies the international spirit of tennis—the Davis Cup. Concurrently, tennis equipment and manufacture changed too, as racket-making turned into a potentially big business.

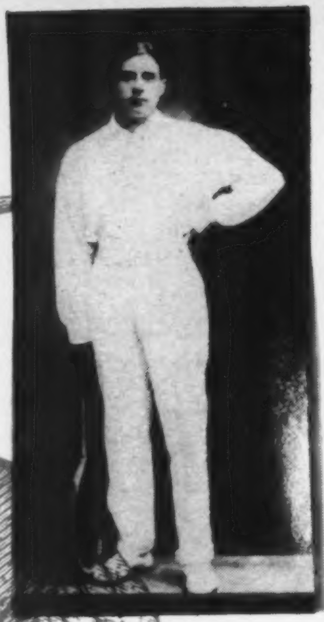
Early French tennis racket making methods and equipment are shown on the front and back green pages. On the right, steps show how a single piece of ash was bent in a loop which was then deliberately distorted to give it the "scoop" shape that was once popular. The back green page of the insert shows some of the tools and materials used by early tennis racket and ball makers.

On the center spread great tennis players are shown in action with the rackets they used. The variety of shapes and sizes of their rackets as well as the dress of the players is the story of the evolution of the game.

Picture credits: A. G. Spalding & Bros. Inc., pp. 96, 97; Dean Winans Mathey Library, pp. 96, 98; Bettmann Archive, pp. 97, 100; European Picture Service, pp. 100, 101; World Tennis, pp. 100, 101; Dunlop Tire and Rubber Corp., p. 103; Hugh B. Johnston, pp. 104, 105, 107; U. S. Golf Association, p. 106.

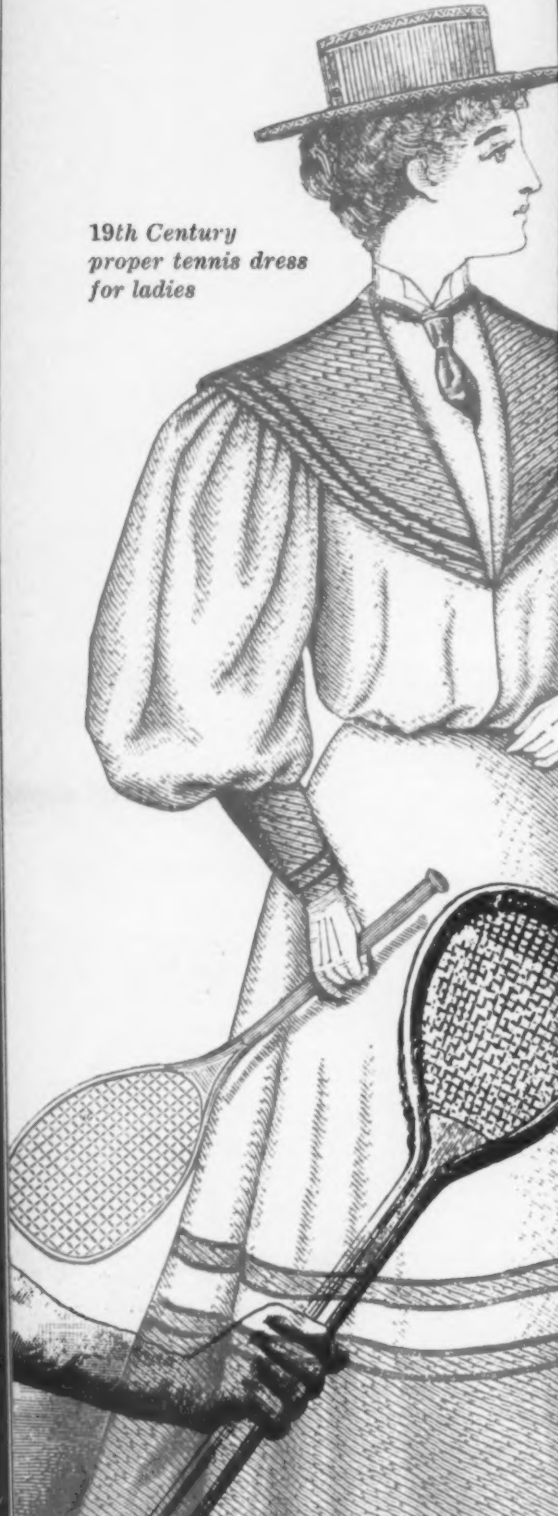


RACKETS THROUGH THE YEARS



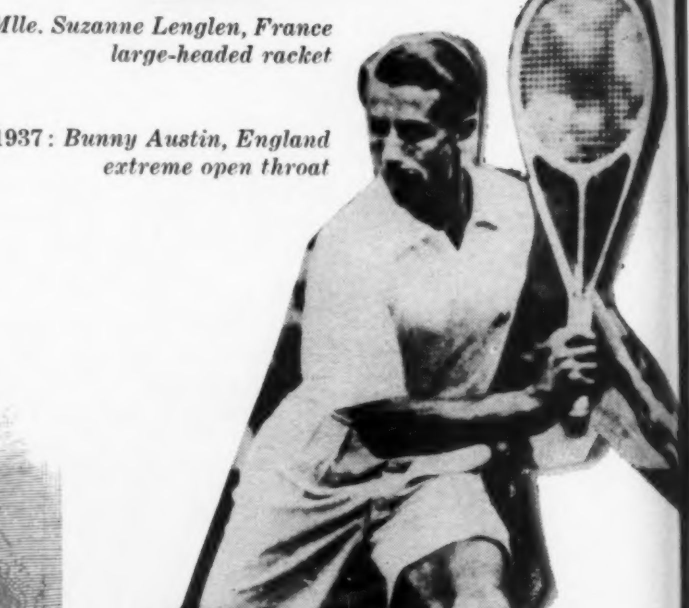
1902: *Hugh L. Doherty, England*

1900: *W. H. Larned, U.S.A.*
pre-lamination era



19*th Century*
proper tennis dress
for ladies

1919: *Mlle. Suzanne Lenglen, France*
large-headed racket



1937: *Bunny Austin, England*
extreme open throat

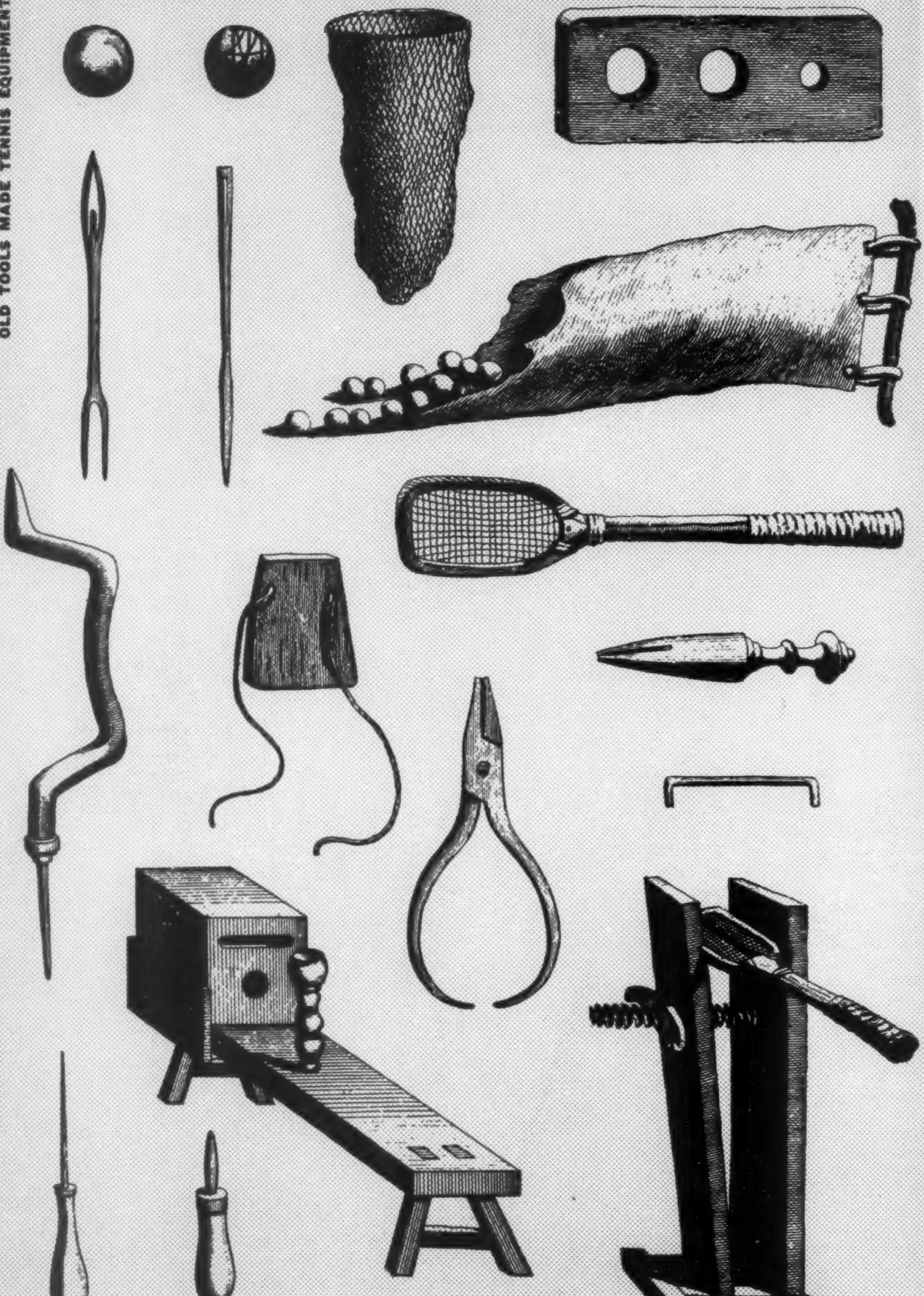
1920: ***William T. Tilden, II, U.S.A.***
open throat racket

1927: *Helen Wills Moody, U.S.A.*
no grip

1937: *J. Donald Budge, U.S.A.*
contemporary racket

1933: ***Jack H. Crawford, Australia***
square headed racket

OLD TOOLS MADE TENNIS EQUIPMENT



Tennis rackets assumed the oval shape they have today as game tactics began to include more extensive use of the smash, volley, and net play.

Simplicity of design, on the whole, has prevailed, and the standard racket has not changed much in 50 years. Variations in materials and design are interesting mainly for their lack of success. In the Twenties, steel frames and steel strings had a short-lived popularity. They were promoted for their permanence, but it was found that they had little else to offer. Champions generally have used rackets of standard sizes and weights, but they are not totally immune to novelty. Samples of some oddities are shown in the hands of famous players on the following spread. When "Big Bill" Tilden introduced the open-throat Spalding, which was promoted for its streamlined appearance, it enjoyed immediate popularity among players of every caliber. In the Thirties, the appearance of a square-headed racket at Wimbledon or Forest Hills told crowds that the Australian champions were competing. These had disappeared by the time that the Australian team took the Davis Cup in 1947.

Materials and fabrication

Wood has always been the basic material in the construction of a tennis racket. Old one-piece frames were made of ash (some steps in their manufacture are shown on the outside pages of the insert) and this wood is still best for most parts of the contemporary racket. Other woods, including beech, birch, hickory, obeche, sycamore, and mahogany are also used, and all of them may be found in a single racket.

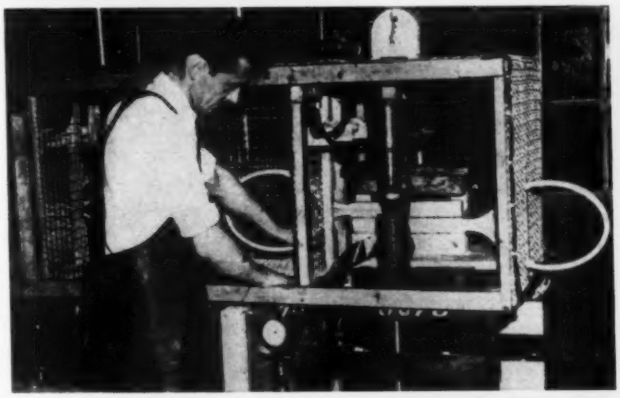
One of the most important developments in racket construction was the introduction of the laminated frame. Two- and three-ply frames were first produced in the '20's, followed in the '30's by veneers of eight or nine layers. Lamination radically reduced the common hazard of warping, made rackets stronger and somewhat thinner. But the weight was not greatly affected by lamination; the ideal weight of 14¼ to 14¾ ounces, established in the 19th century, has seldom varied.

Gut is traditional for strings because it can be strung tightly, yet has enough resilience to prevent a jarring impact. But new materials, in many cases, have proved very suitable. Nylon, now in wide use, is found to last well and to be unaffected by dampness. The grip is usually made of leather, but synthetic materials are sometimes used. Historically, the use of a grip is a rather recent innovation, which started from the strips of adhesive tape wound around wooden handles to prevent slipping—a trick that was a trademark of the American champion Helen Jacobs.

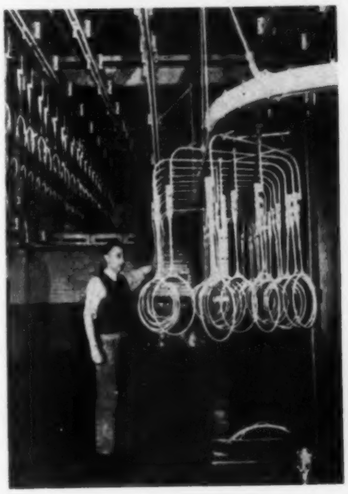
There is no question that modern production methods, like those shown on this page, have brought about enormous improvements in the quality of the tennis racket. Systematic mass-production methods produce exact duplicates year in and year out, and a player is not faced with a serious problem in adjusting to each new racket. Nonetheless, it is in many respects still a custom-made object, since in some steps the artisan must always pay personal attention to each racket. Many champions have rackets specially made to their specification, but they seldom vary substantially from the products available to everyone. When there is a real change today, there is usually a good reason for it. Bill Tilden, for example, injured the middle finger of his right hand at the height of his career. Infection necessitated the amputation of the first joint but, undaunted, Tilden had his rackets made with a slightly smaller grip and went on to complete what was probably the most spectacular and colorful career in the history of tennis.

Bending three racket crescents at a time in the Dunlop tennis racket factory at Waltham Abbey, Eng.

High frequency is used (below) to speed gluing. Two minutes are now required compared to two hours by older methods.



Thirty-two holes are drilled simultaneously in a racket frame.



Electrostatic spraying (left) speeds frame lacquering at Dunlop and coats almost seven times as many frames per gallon of lacquer.

Golf equipment—driven on by developments of materials and techniques

For a picturesque explanation of the origin of golf, it is necessary to hie to the highlands of Scotland. Centuries ago, an imaginative shepherd relieved the monotony and loneliness of tending his flocks by hitting stones into rabbit holes with his crook. Other shepherds took up the diversion and refined it. They identified a rabbit hole that they had "played" by pulling a tuft of wool from the back of a sheep and sticking it into a bush near the hole where their last shot was "sunk."

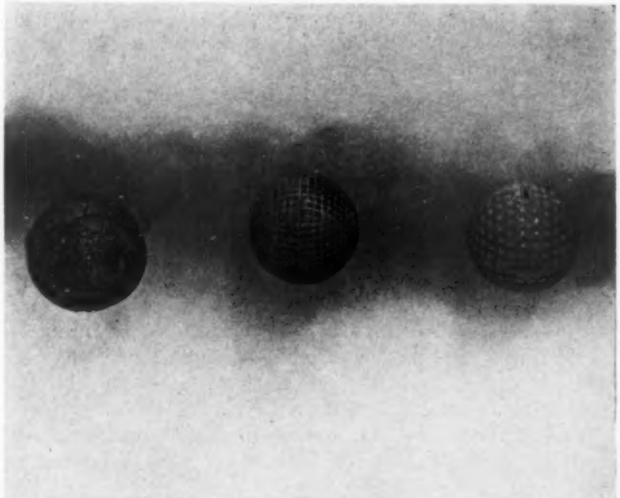
The Dutch had a game that competes for the claim on golf's origin, but it is hard to know whether they took it up before or after the Scotch started hitting things around in the Highlands. Known as "kolven," it was played anywhere—on ice, on turf, or on cobblestones. The equipment for kolven was much larger and heavier than the first golf clubs, but bore similarities in form.

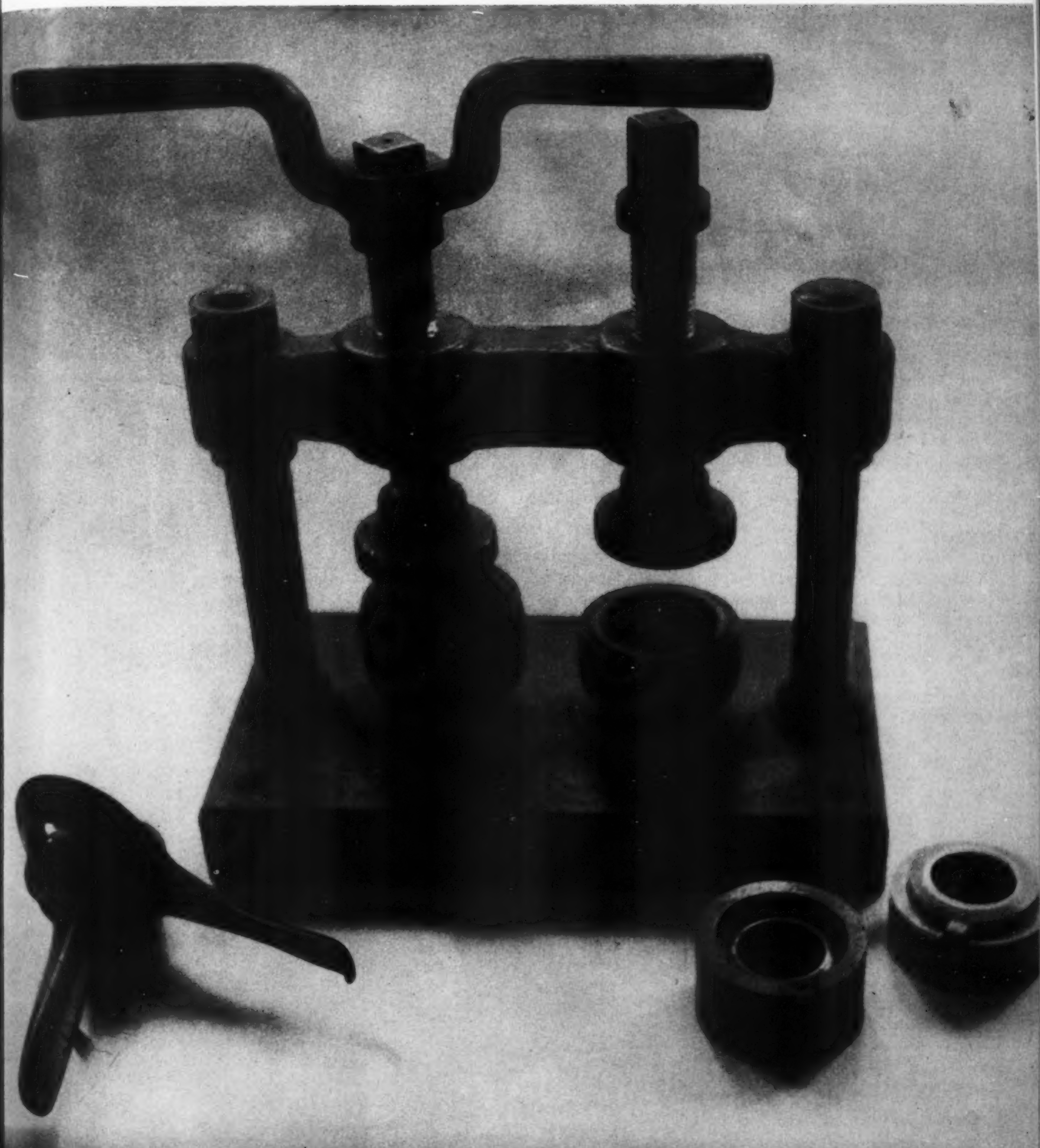
Since the 15th century, golf has grown consistently more popular. The foundation of the famous St. Andrews Club in Scotland, the shrine of golf, in 1774, was a milestone that gave the game international significance by drawing players from other countries where the game was being played by a limited number of people. But, since it was a game for the elite, there were only a few courses available in the whole world for play. A little more than a hundred years later—about the time the first American course was opened at Yonkers, New York, in 1888—it was on its way to becoming the great pastime it is today in many countries. The United States Golf Association estimates that in 1954, 3,500,000 men, women, and children were playing ten rounds or more a year. Other figures for the same year are significant: 4,071,245 golf clubs were sold for $26,000,505, 32,598,624 golf balls cost players $17,318,042, and 495,422 golf bags were bought for $5,217,791.

The golf ball

The evolution of golf equipment is a story of the advancement in the use of materials. There are three major eras in the history of golf equipment, each recognized by the type of ball used at the time. They are: the "feather ball" era, the "gutta-percha ball" era, and the "rubber ball" era. The type of ball determined in part the kind of clubs that were used and the materials the clubs were made of.

In the *feather ball* period, as the name implies, golf balls were stuffed with feathers. This does not mean that they





19th Century gutta-percha golf ball presses (above). Feather, gutta-percha, and rubber balls (left top) are shown above the clubs of their eras.

were particularly light; in fact, when the feathers were compressed tightly and covered with leather, the ball was surprisingly heavy.

The introduction around 1850 of a ball made of the natural gum *gutta-percha*, was met with stout resistance from traditionalists accustomed to the feather ball. With its smooth leather cover, however, the latter was a fragile object at best. A misplaced stroke would split the hide open and feathers poured out. The most important factor in favor of the gutta-percha ball was its economy—it cost one-quarter the price of the feather version, it was far sturdier, and it lasted much longer. Some historians give the gutta-percha ball credit for saving golf from early obscurity because of the high cost of balls. In use, the gutta-percha ball compared favorably with the feather one—open-minded players who used both types admitted, reluctantly, that the "guttie" had an equally good flight and putted well.

The *rubber ball* was invented in America in 1898 and had a strong influence on the construction of golf clubs. Rubber balls had much greater resiliency than the gutta-percha balls, making them go off the club much more lightly. The core is wound with some 100 feet of rubber thread which is covered with balata, a gum material resembling rubber.

Golf clubs

Golf courses were not always the lush well-manicured carpets of green they are today and a player was apt to run afoul of a variety of hazards. Long-headed clubs were supposed to be best for driving, but since it was difficult to get out of sheep tracks or cart ruts with long-headed clubs, some players had short-headed clubs made for special predicaments. Gradually more and more players found that short-headed clubs were fine for driving as well.

Woods have been made in many shapes, but four are standard: driver, brassie, spoon, and cleek. A driver has a fairly flexible shaft, while a brassie, which is used in the rough, is a little stiffer and has a brass plate fastened to its sole to protect it from abrasion from stones. Irons, on the other hand, all have fairly stiff shafts. Their heads are designed to make the ball take a certain flight. Irons have been made with heads of practically every angle, but there are only about ten in general use. Each one is designed to cope with a different problem in the lie of the ball or the necessary approach to the green.

The resilient rubber ball made it feasable to use steel instead of wood for club shafts. The reason is impact: if a gutta-percha ball is hit with a steel-shaft club, the player's hands will receive a bad sting. In gutta-percha days, grips were heavily padded to prevent sting even with wood shafts.

The grip itself has gone through an evolution involving a variety of materials. From 1850 to 1900, during the gutta-percha era, grips were large, with several layers of padding. Starting in 1901, the grip was much smaller because the rubber ball made padding unnecessary and new methods of holding the club were becoming popular. The overlapping grip, used almost universally today, would have been impossible with the thick padded grip. In the 1920's grips were put on steel shafts. To insure comfort when hitting the ball, they incorporated as many as six different materials and eleven assembly operations. Materials included paper, cotton, leather, tape, and wood. Contemporary grips, molded of rubber and cork, involve as few as three steps.

Charles B. MacDonald
First Amateur Champion, 1895

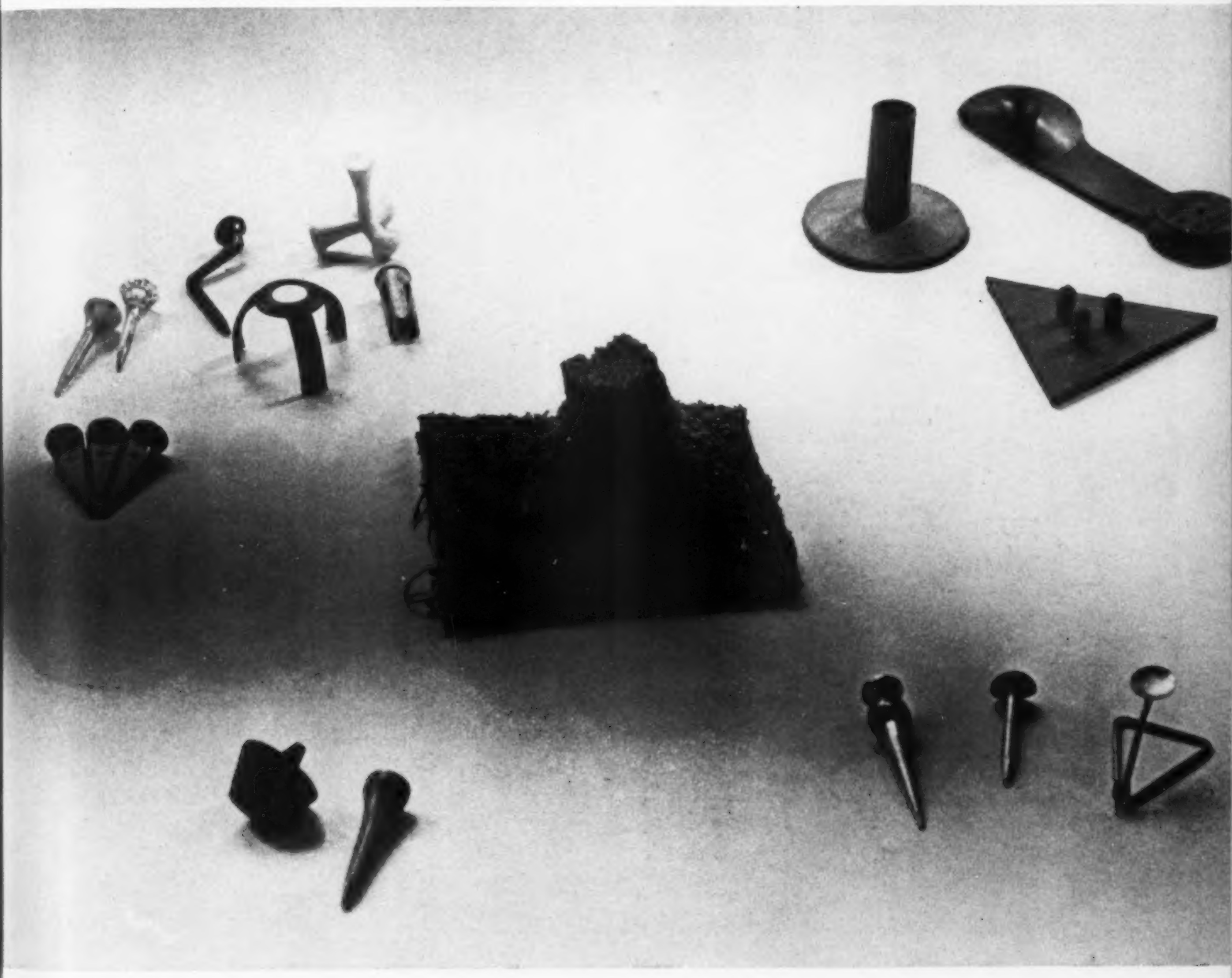
Robert T. Jones, Jr.
Amateur Champion, 1924, '25, '27, '28, '30

E. Harvie Ward, Jr.
Amateur Champion, 1955

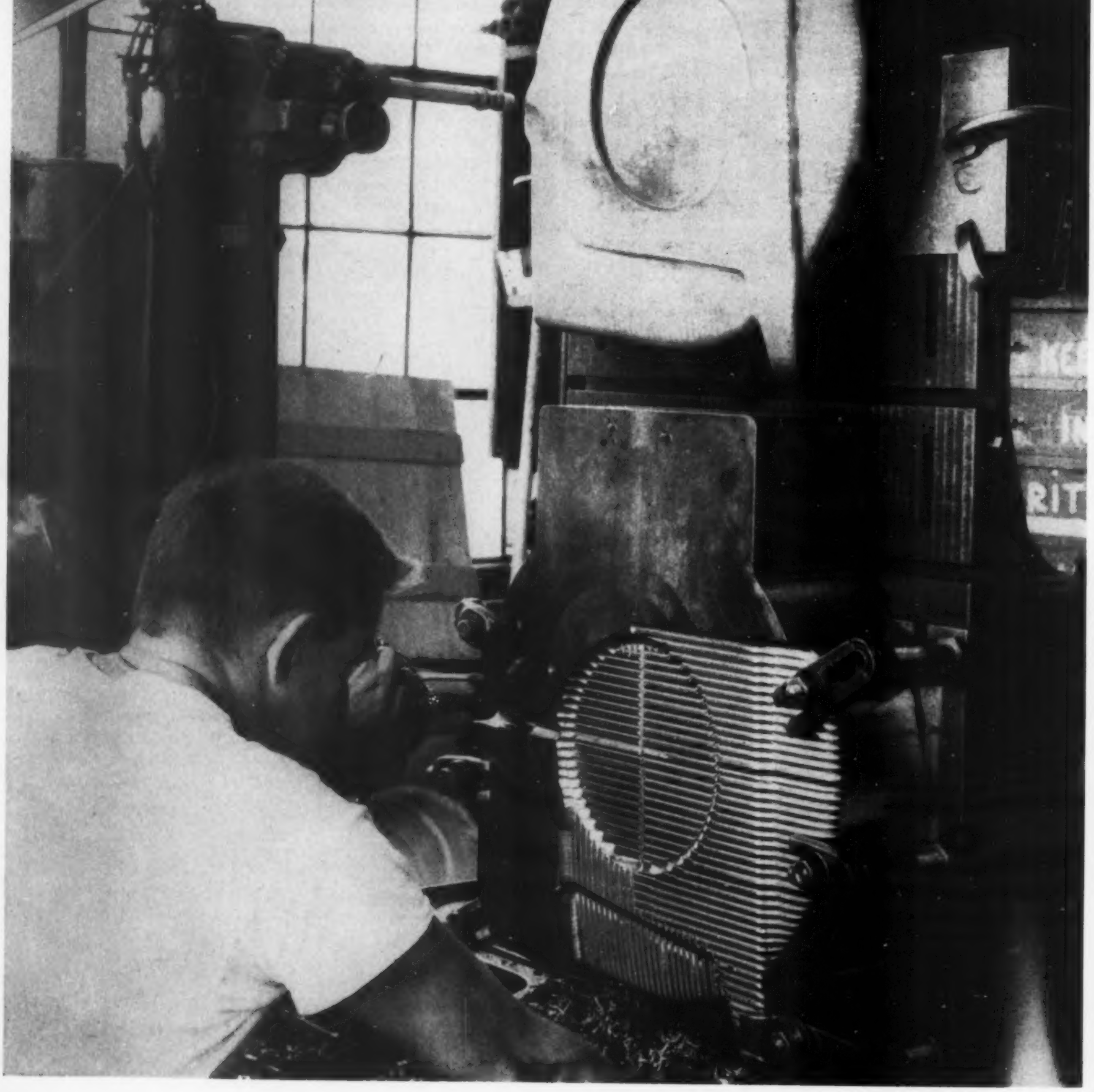
The wooden head of a driver takes shape in four steps from a clumsy block to an efficient implement.

A slab of iron is worked and formed to become the head of a golf iron.

A blob of sand, such as the one in the center of the photograph, was the first tee. They are now made of many materials—wood, steel, aluminum, plastic, rubber—and in many shapes.



Savage's civilized power mower



Designer plus engineer plus sales equals a new deck from stamped steel

In all exurbia no piece of equipment is more begged, borrowed and abused than a power mower. This year Savage Arms Corporation, known as makers of high-quality precision firearms, decided to redesign their line of lawn mowers, which they have traditionally engineered with a tough one-piece deck of stamped steel. Because of the strength and durability of a one-piece, 14-gauge steel stamping, and its competitive advantage over more vulnerable die-cast aluminum, they wanted to utilize it in a suitable and attractive form.

Laird Covey, an industrial designer, was brought in for close teamwork with a Design Committee: O. M. Knode, Vice President; W. E. Sullivan, Chief Engineer; A. W. Schenck, Sales Manager, all of whom are members of Savage's Lawn Mower Division. Engineering gave Covey the requirements in wheel size (as well as their staggered positions), hub heights, the specific engine, and Savage's unique feature of an adjustable grass deflector. Sales stated its desire to compete in price and in appearance with models in die-cast aluminum, which lends itself more readily to a complex shape.

The deck, therefore, was the crux of the problem. A trouble spot was the left front wheel, which had to be supported by a projection in the stamping, while the height of the deck was limited by the adjustable wheel position for various levels of grass cut. To achieve the impression of a flat, low form, Covey embodied an almost rectangular reinforcing panel to support the heavy motor within a low, circular-blade housing shape—a scheme which organized the dual function of the housing—that is, to shroud the cutting plate and to act as a chassis. The spiral expresses the rotary action of the blades, and counterpoints the left wheel projection.

In the early stages a clay model enabled Covey and Sullivan to work out details with the Bossert Division, Rockwell Spring and Axle Co. and the Worcester Pressed Steel Co. (Left, the punch is being cut at Bossert from a mahogany Keller model.) To the satisfaction of the designer, they were able to agree on the narrowest possible tolerance for the left-wheel projection. Members of the sales force are satisfied that Covey's design, which they watched through successive model stages, carries out their wishes and makes a strong contender for the fall Hardware Convention.

Laird Covey and W. E. Sullivan compare clay and plaster models. The new design relieves any tendency to wrinkle at the slope of the rear deck by the use of a ribbed area which also accents the spiral section.

Shimmering symbol, designed by Will Burtin, was made by DuPont from a 600-foot-long Lucite extrusion, and a Plexiglas sheet.

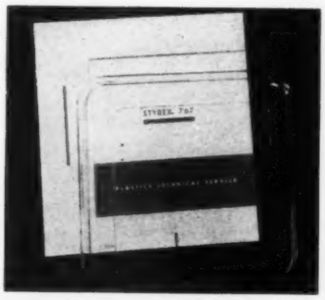
25 highlights from the Society of the Plastics Industry's 7th National

Plastics Exposition

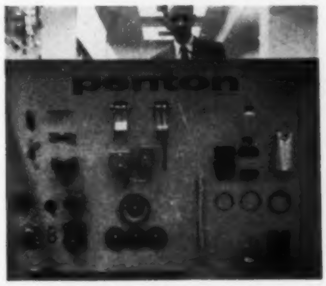
photos: mitarachi

If statistics tell a story, the 7th National Plastics Exposition, sponsored by the SPI in June, was a veritable tall-tale among trade shows: 36,700 visitors surveyed the ware of 227 companies decked around 71,996 square feet of Coliseum space. The show turned out to be worthy of the statistics, featuring not only three rings—DuPont's color TV, Monsanto's house, Bakelite's lab demonstrations—but countless side shows: sample-spewing machines and cascading pellets, spinning displays, and even a muscle man testing his brawn against super-strong styrene. But as much as a pageant of new techniques and materials, it was a display of the industry's vigor in improving and modifying almost every member of the plastics family; the following items have been grouped to highlight these family dynamics with oldtimer styrene and newcomer polyethylene taking the spotlight.

Newcomers



New combination of properties emerges from Dow's Styrex 767, a thermoplastic based on styrene and acrylonitrile, which Dow expects to develop into a full-fledged family after starting production this fall. It offers unusual clarity in clear colors, a good range of opaque colors, good strength properties, and resistance to many chemicals and solvents, including gasolene and kerosene.

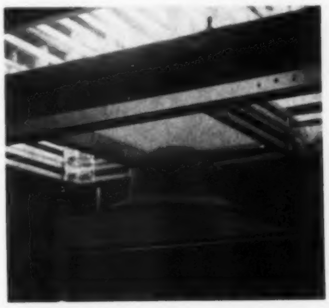


Workhorse contender: Penton, Hercules new thermoplastic, is still in experimental stages. Because it sets in a completely strain-free form, it has exceptional dimensional stability, plus improved chemical inertness, insolubility and strength at higher temperatures than most thermoplastics. When perfected Penton may challenge not only workhorse plastics but some metals for component applications.

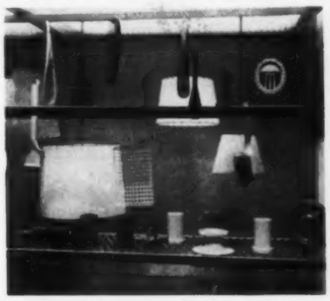
Styrene

Boilability of Cymac 400, Cyanamid's heat-resistant polymethylstyrene, was dramatized in a tank of steaming water. The new compound is comparable to ordinary styrene in moldability and price. Cymac 201 also offers improved craze and solvent resistance, and surface hardness.

Biaxially-oriented or "two-way stretch" styrene sheet, Plax's Polyflex, was shown in clear and translucent form; the latter is being vacuum-formed into panels for ceiling lighting. Clear sheet—printable, non-toxic, is recommended for all-plastic food containers and lids.



Vacuum-forming demonstration of Comet Industries (Franklin Park, Ill.) typifies the abundance of processing machinery that poured forth souvenir hats, throw-away cups, molded tubs and extruded tubes for eager Exposition visitors. Increasing use of pre-decorated high-impact styrene sheet was noticeable at the Show.

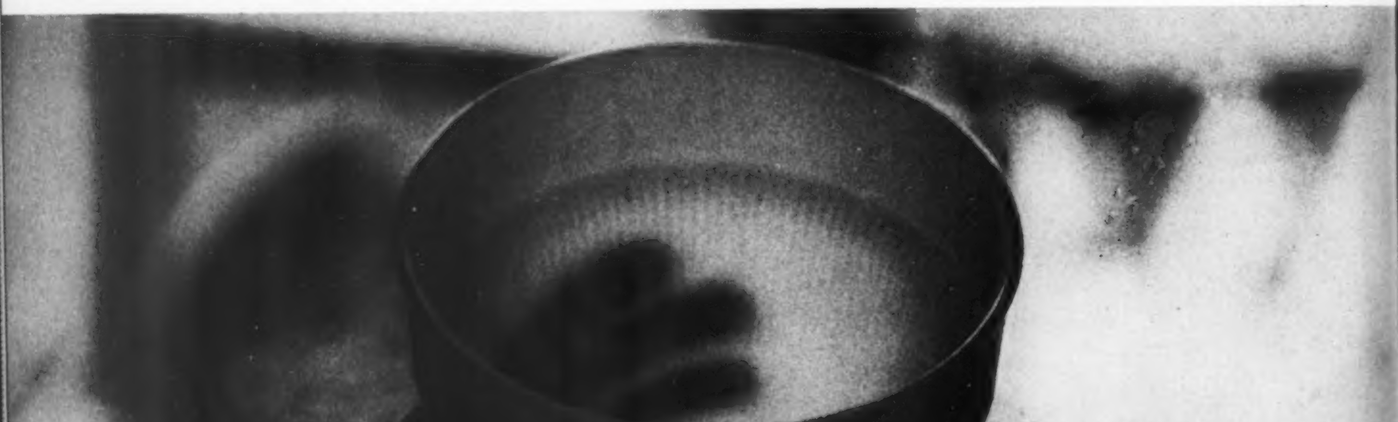


Toughness of improved styrene was suggested by products made of Goodyear's Plio-Tuf, notably combs, shoehorns, valves and pipe. Chemically resistant and moldable, this styrene alloy is stronger under impact and less brittle than conventional compounds, tends not to shatter but to break slowly and evenly, particularly at low temperatures.

Polyethylene made a strong showing at the Plastics Exposition in both new forms and new products — a fitting reflection of its growing success. One bit of news is the introduction by several firms of semi-rigid, high-density "low-pressure" polyethylene that stands heat in the neighborhood of 240°. Produced by either the Ziegler or Phillips method, this harder variety may take over jobs being done by other thermoplastic compounds. It will also be marketed as extruded sheet for sheet forming; according to Campco, the extruder, linear polyethylene sheet offers improved resistance to heat distortion and impact, even in thin gauges. DuPont, meanwhile, announced plans to double its capacity for a high-pressure polyethylene with properties approaching those of the linear form.

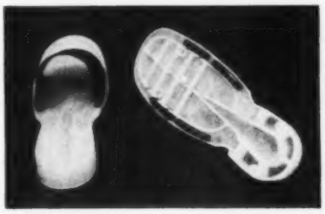
Rigidity, hardness, less permeability and higher surface gloss are features of Celanese Fortiflex, one of the prevalent low-pressure polyethylenes that gain rigidity and heat-resistance from a linear arrangement of molecules. Celanese suggests use in containers, housewares, electrical products.

Buoyant marine rope is made from Celanese polyethylene film. So light that it floats, rope also features some degree of elasticity, is non-absorbent and acid resistant, hence practical in water and chemicals. It may be woven in a variety of colors.



Translucent flowerpot of natural Hercules Hy-Fax low-pressure polyethylene, made by Gits Molding, makes good use of the material's harder surface, slight flexibility, and ability to transmit light. Sharp interior ribs add textural variation to the inside surface, and create a linear pattern that gives depth to the exterior. With a density of .945, Hy-Fax may be molded by injection, extrusion or compression, and is rigid enough for machine operations.

Sterilizable polyethylene bottle will be one potential application of Marlex 50, soon to be produced by Phillips Petroleum process. Like Fortiflex (left), it is less permeable to gases and oils than soft polyethylene, and because of high density (.96) offers greater strength, resistance to heat, and a less waxy surface that may be either glossy or frosted.

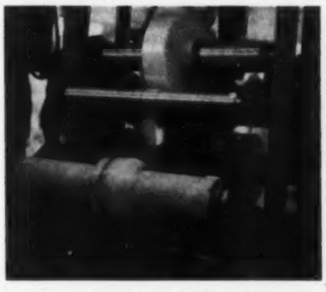


Flexible sandals, molded of Catalin Corporation polyethylene by Nu-Dell Plastics, get shape and rigidity from ribs molded into the soles. Ribs also keep feet above ground, provide a grip on shifting sand. Straps are rubber.

Weight of a man is supported by a polyethylene film enclosing a model greenhouse, one of the building uses explored by Spencer Chemical. Experiments with a full-scale polyethylene-enclosed greenhouse showed economy ($250 initial cost), light transmission 90% of glass, and crop results as good and often better than in glass-enclosed structures.

Featherweight disposable polyethylene containers by Plax may compete with some grades of glass for one-trip containers. Plax also demonstrated experimental polymethylene containers, interesting because of high temperature resistance and inherent rigidity that permits thinner wall construction.

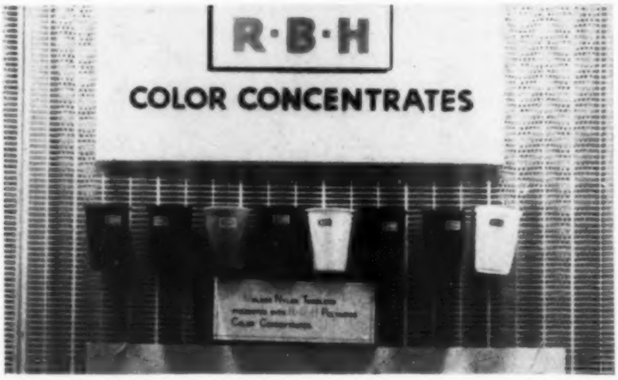
Self-sealing packaging material is used to protect Kodak sheet film: a foil core is laminated to a paper surface and a polyethylene film back. The latter acts as a moisture barrier and sealer when edge heat is applied, (right, above). Other applications for Eastman Tenite include polyethylene-coated paper, and flat tubing that is cut to length and sealed at both ends for transparent bags.



New technique for sealing plastic, foil or paper sheets by molten bead of extruded polyethylene was demonstrated by Bakelite. At speeds over 500 feet per minute sheets from separate spools run into high-speed roller; bead entering between them fuses them with a thin continuous band (shows black in photo).

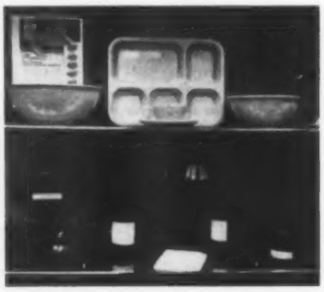
Nylon's story at the Exposition seemed to be continued popularity in industrial components and increasing experimentation in consumer products, both for molding and coating, as manufacturers learn how to stretch a pound of this more costly compound. Belding Corticelli introduced a nylon emulsion for bonding, coating and finishing that adds not only durability but texture to leather, wood, or plastic, while Interchemical Corporation revealed its ability to produce better color for molded nylon—another factor that will help propel it into the consumer market.

Experimental blow-molded nylon bottles turned up in Plax display (second and third from left) amid vinyl and polyethylene samples. In test-blowing nylon, Plax found it more resistant to permeation, more flexible and transparent than polyethylene, easier to print on—and two to six times more costly.



Bright clear colors in molded nylon—generally a troublesome material to color well—were part of a demonstration by Interchemical Corporation's Dispersion Division of the importance of careful selection of colorants, fine grinding, and skillful dispersion of colorants in molding compounds.

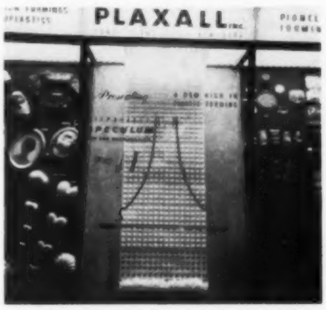
Other plastics made news in isolated showings: GE announced a single-stage phenolic molding compound, and Campco unveiled a provocative Mylar-to-modified-styrene lamination that opens new possibilities in large-scale heavy-duty sheet forming; L·O·F's micro-filter glass paper, softer than satin, M. W. Kellogg's fluorocarbon-based synthetic rubber that resists chemical attack up to 400°, and an abundance of foam products were—like the sampling shown here—among the highlights of the biggest plastics show ever held.



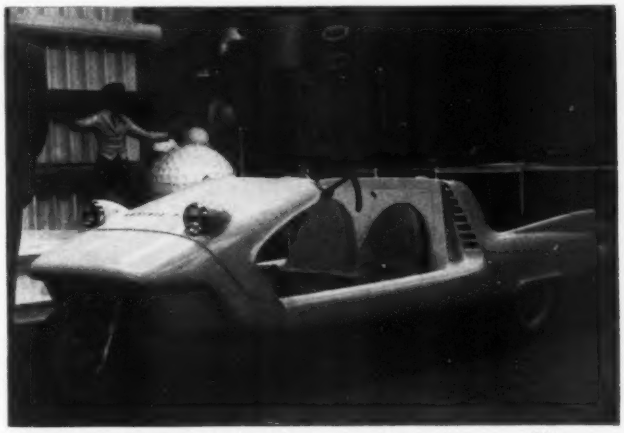
Premix molding compounds featured by Fiberite Corporation (Winona, Minn.) included phenolic and melamine reinforced with cotton, cellulose, sisal and asbestos fillers. Of special interest is a line of institutional dinnerware (top shelf) which is made to withstand hard knocks with melanine filled with cotton fiber.

Best-kept secret of the industry, as two-tone molding technique used by Plastics Manufacturing Co. has been called, continued to draw comment at the show. Best guess: after melamine piece is semi-cured, molds are opened and a thin coat of resin in second color is sprayed on; second cycle completes the curing. Two-tone Texasware dinnerware is marketed in several colorways. (See page 128)

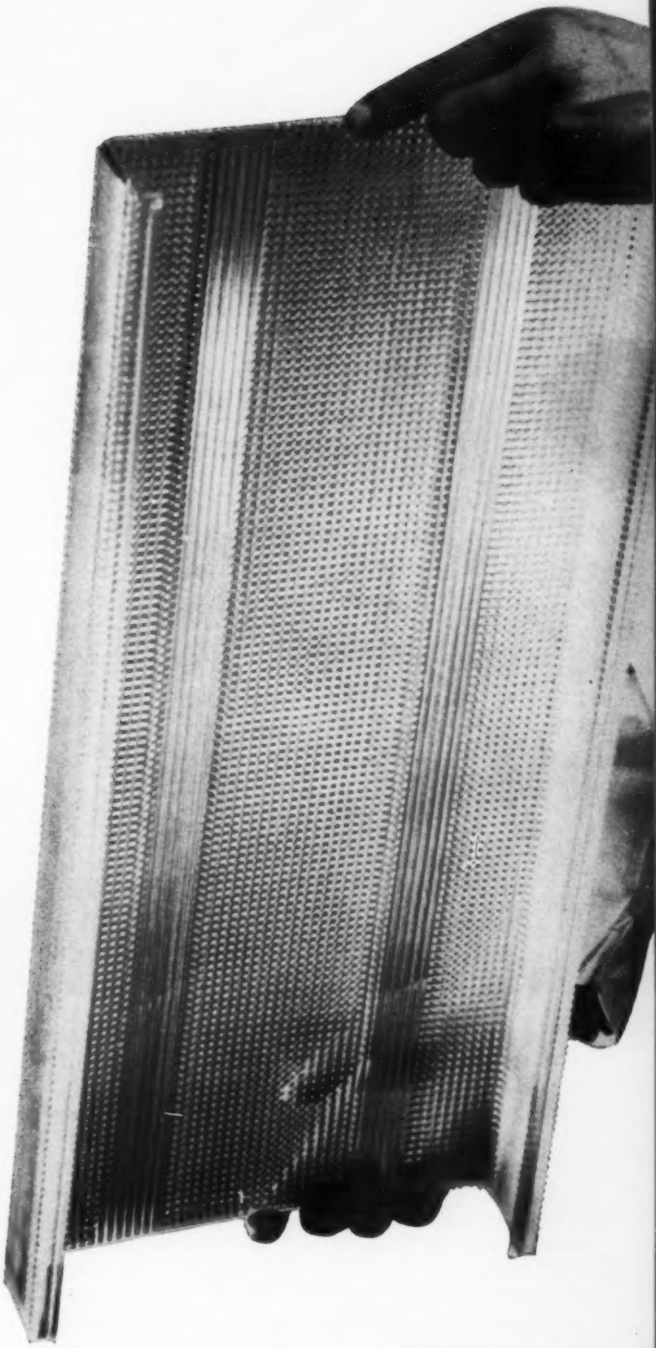
Full color range for phenolics is offered by Rexclad, an epoxy-based enamel made by Rexton Finishes (Irvington, N. J.). With a single-coat spray application (air, force dry, or bake) Rexclad is said to have excellent adhesion and heat resistance, bringing a full color range to products like Bakelite jar tops and iron handles.



Toughest forming job ever done, claims Plaxall, Inc., Long Island City, is a disposable speculum for ear examination. Pressure-formed of thin-gauge vinyl sheet with an undercut and a rolled edge (shown in enlarged section, above), caps are continuously formed, stacked, and ejected in acetate tubes wholely automatically. Sold by Welch Allyn, caps cost slightly over 1c each.

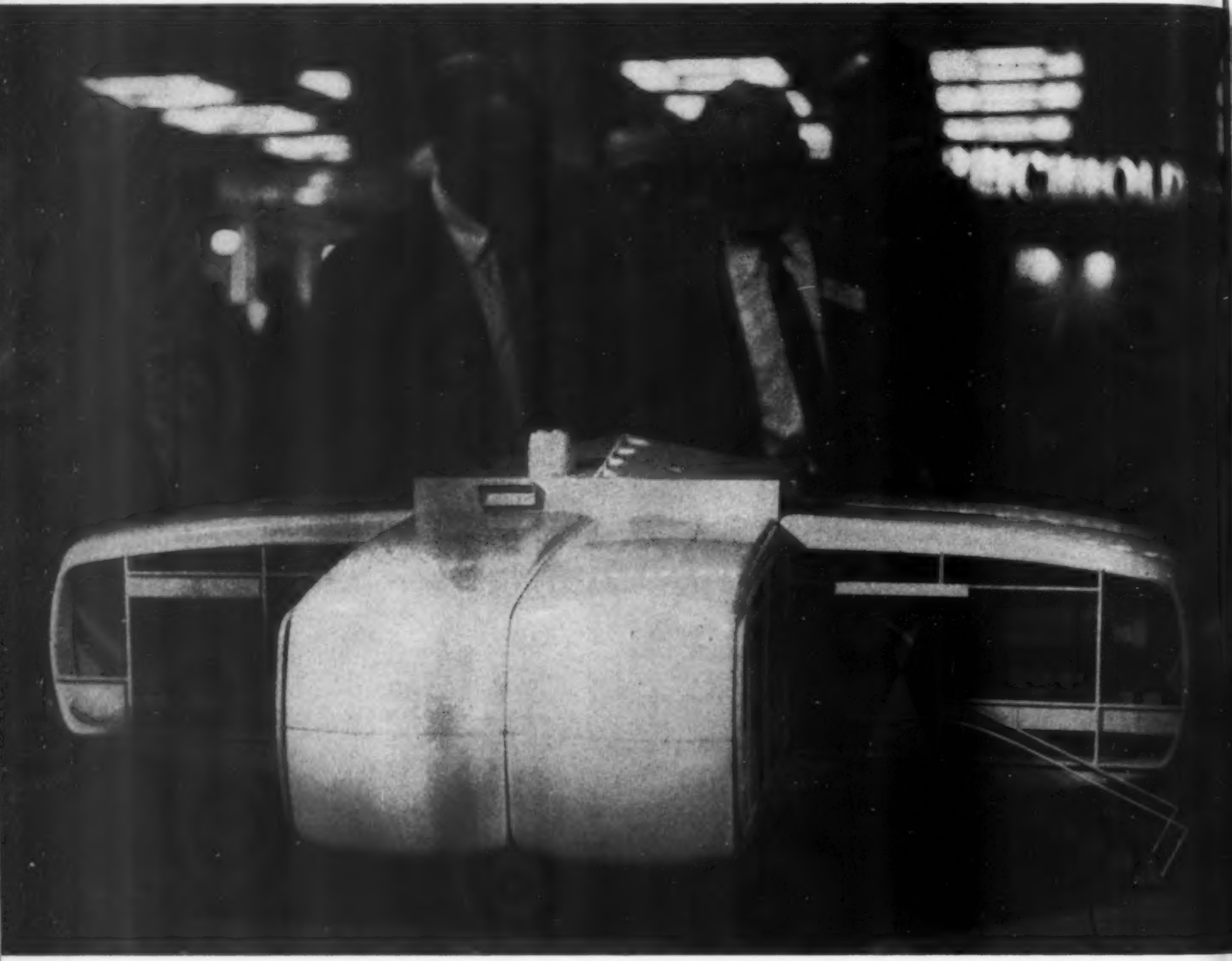


Star Car, Basson Industries' prototype for a utility car, features a two-piece molded fiber glass body mounted on a 3-wheel chassis of welded tubular steel. The Star is 10′ 5″ long, weighs 400 pounds, is equipped with a German J.L.O. engine that will carry it 70 m.p.h. at 80 miles to the gallon. Developed under Design Director Gilbert D'Andrea, it will sell for less than $1,000.



Precision-molded optical element of Rohm & Haas Plexiglas, called "Prismalume," is the key to a new ceiling-mounted luminaire designed by the Holophane Company. The light, shatterproof acrylic enclosure gives light control in all directions, provides a high level of downlight while eliminating glare from the direct viewing zone.

How to mold a house, and why: Monsanto's prophecy for mass production.



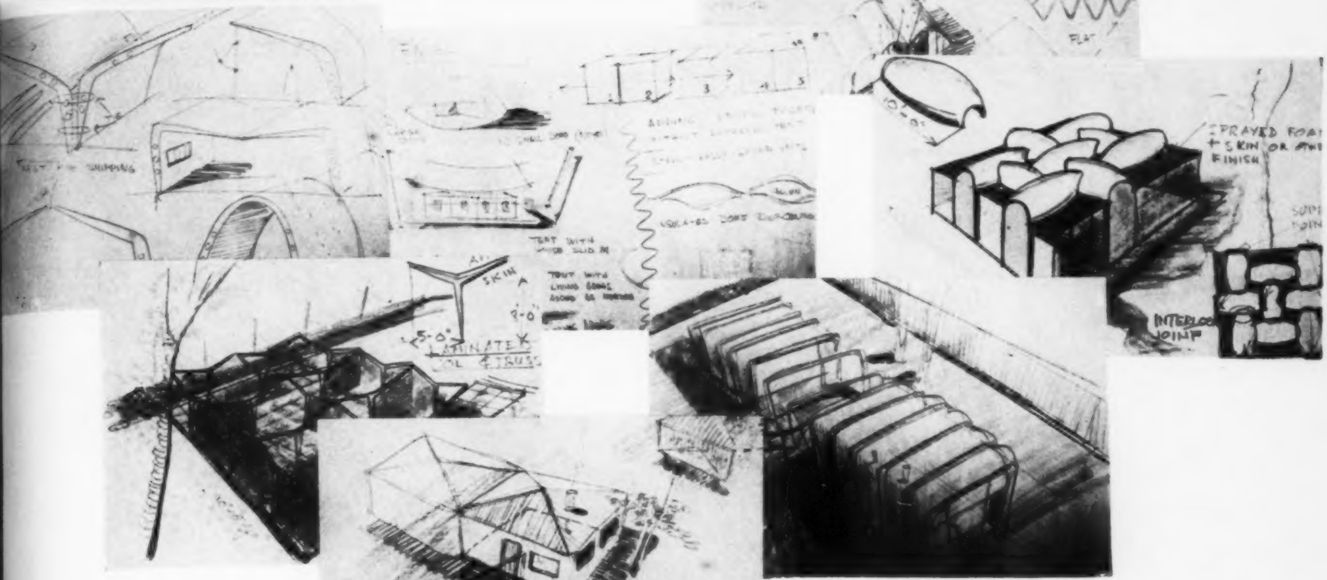
The idea of a molding as big as a house sounds like something that belongs in Disneyland, and it is. But in the form of a scale model that stopped traffic at the Plastics Show, it also represents one company's serious search for new building economies through plastic. The Market Development and Research Department of Monsanto's Plastics Division, headed by Ralph Hansen, decided several years ago to offer a research grant to M.I.T.'s architectural school for study of plastics in building. The outcome was a thorough study of plastics' potential not only in coatings and foams but in structures and total enclosures.

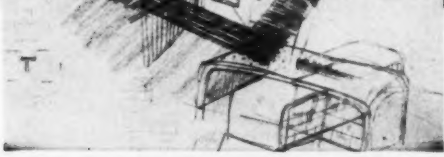
The thinking of the research group on structure, sketched on the facing page, shows not only how they reached their design, but why. "Envelopes and panels were obvious ideas," explains Luigi A. Contini, who, as head of the department's design research, worked closely with director Richard Hamilton and the M.I.T. group. "But they didn't exploit plastics fully. When we found a structural shape that would be impractical to construct in conventional materials, yet met the demands of sound planning, we knew we had a design worth developing in plastic."

Their first conclusive scheme (model, right) eliminated costly site work by minimizing contact with the ground, and exploited the moldability and strength of reinforced plastic in curved sections. One-piece, U-shaped tapered box girders formed from a foam-core sandwich, joined in pairs and hung from a central utility core, provided the floor, wall and ceiling of a 16′ square room. As engineering progressed, this original module was also split horizontally, and wall thicknesses were varied for strength.

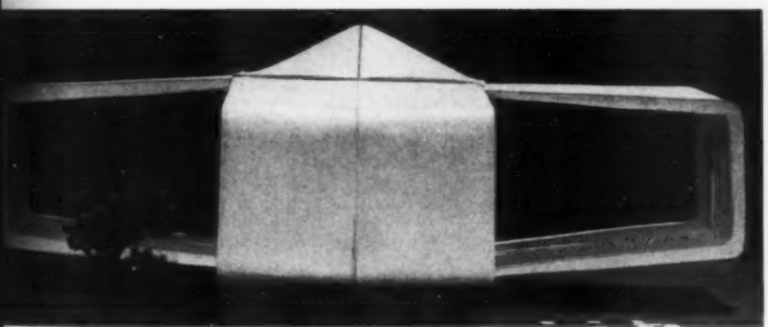
The task of molding the house has been turned over to Lunn Laminates, under the direction of Robert P. Whittier. Later this year the finished sections, weighing about 7 tons, will be trucked west and erected in Disneyland, where it will give Monsanto a taste of the public's reaction to the logical—and untraditional—ways plastic can add new dimensions to architecture, while opening new prospects for factory methods in the building industry.

French all-plastic house (l.) has round core of polyester ribs and sections; 3 bedrooms may be added as modules.

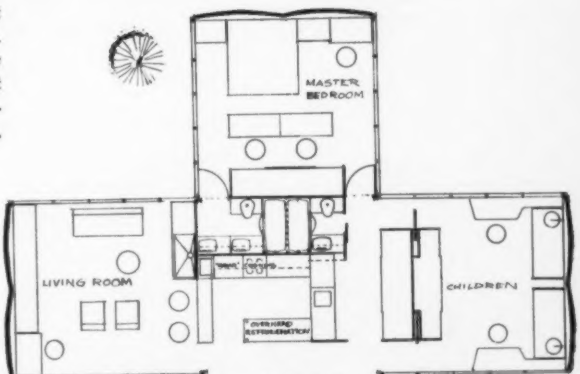




Evolution of ideas for a plastic structure, shown in sketches of the MIT research group, moved from tents and envelopes to molded arches (based on reinforced polyester boat forms) to structural spines. All were rejected because they were not uniquely suited to plastic. The idea of a one-piece roof and wall that finally emerged (bottom sketch) led to the first prototype model (left), which employed pairs of one-piece U-shaped wings. These were later divided horizontally, and sandwich thickness varied between 2½" and 4½" to provide stiffness and a plenum beneath floor. Sidewalls are frames that may be solid or glassed; concave interior end wall may be formed flat if desired.

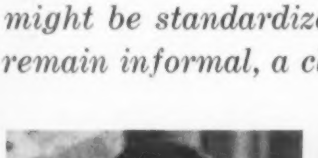


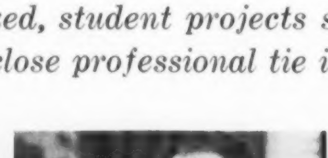
In the basic cruciform plan devised by architect Marvin Goody, Assistant Professor at M.I.T., 8 of the 2-piece U's form four wings around the core. Rooms may be added or subtracted, and cores may be multiplied to provide variations on the plan. The entire structure may be suspended a few feet from the ground, as in the model, or elevated to provide carports, or dramatically placed on slopes (below), probably the most exciting possibility.

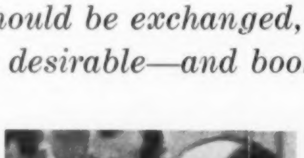


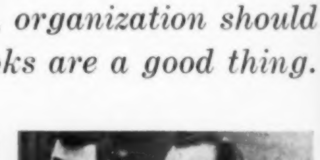
Educators' second symposium

ID presents an abridged version of a meeting at I. I. T. among leaders in industrial design education, wherein it was decided that competitions are dubious, curricula might be standardized, student projects should be exchanged, organization should remain informal, a close professional tie is desirable—and books are a good thing.


Shipley


Redmann


Benson


Chapman

Present at the symposium: **E. A. Adams**, Art Center School; **John E. Alcott**, Rhode Island School of Design; **E. M. Benson**, Philadelphia Museum School of Art; **Hin Bredendeick**, Georgia Institute of Technology; **Joseph Carreiro**, Philadelphia Museum School of Art; **Jay Doblin**, Institute of Design, Illinois Institute of Technology (host for this meeting); **Roger M. English**, University of Kansas; **George A. Jergenson**, Art Center School; **Theodore Jones**, Institute of Contemporary Art; **Robert A. Kolli**, Pratt Institute; **Aare K. Lahti**, University of Michigan; **John Maguire**, University of California; **Robert E. Redmann**, University of Bridgeport; **Irving Schecter**, The Ohio University; **James E. Shipley**, University of Illinois. The morning session began with the following four speakers:

First speaker: **James Shipley, University of Illinois**

Industrial designers never had it so good! It seems to me that we have come a long way in the past two decades. However, I want to touch upon four of our opportunities.

One great opportunity is philosophical. We need to hammer out a philosophy for industrial design which will be indigenous to what we actually do, a philosophy which will recognize our complex function in industry and in society and our *multiple* responsibilities.

Now I realize that some teachers have such a philosophy. Yet I am convinced that many of us do not. The proof of this is the startling number of young designers who are confused as to what they are and what they stand for, and who are frequently apologetic or resentful about some things that are inherent in industrial design. Our situation can be compared to that of our nation a hundred years ago, when it was striving to bring together the cultures of many older nations. We are trying to bring together, are we not, many different ideas and philosophies out of the roots from which we have sprung? And some of these ideas seem at cross purposes. However contradictory our antecedents may be, in fine arts, architecture and handicrafts, each provides an essential part to form the whole we call industrial design. When properly blended and balanced they can be brought together to form an emulsion.

The second opportunity is to develop an education which is truly broad and humanistic. The constants of design are *not* the technical questions of materials and processes, for these vary from one project to another. The constants in every design problem are people, their needs, their likes and dislikes, their traditions, their dreams. Yet the smallest portion in every curriculum (including my own institution) is that portion of studies having to do with *man*. We should have more courses in history, literature, sociology, psychology, anthropology, philosophy, economics, etc. We cannot include additional courses by cutting down on what we are now giving, for nothing would be gained by reducing the students' technical ability. The six or seven year program for the education of the industrial designer is inevitable.

The third opportunity is the possibility of encouraging industry to support more design research. Much of it should take place in the laboratories of schools and industrial institutions and be directed to the unrestricted search for new forms, improved performance, the utilization of new materials, processes, etc. Since industry will probably never experiment to any great extent with its bread-and-butter lines, because of the serious financial risk involved, it will be to its great advantage and to ours, if we can encourage the development of more pilot or experimental lines actually released to the public.

Our fourth opportunity is to increase the rapport between the practitioners and educators. I think it can be proven that the status of any profession in our society is almost in direct ratio to its interest in its schools. The highly respected professions of medicine, law, engineering and architecture are vitally concerned with their schools.

This rapport will take a lot of doing. Educators must whenever possible be engaged in research or practice as well as teaching. They should join the professional societies and become active members, and the practitioners must be continuously in touch with the schools. A lecture now and then, the publication of "ideal" curricula—all are steps in the right direction. A close and vigorous collaboration will be necessary to realize significant professional improvement—to develop a suitable philosophy, to strengthen curricula, to establish research programs, and to help secure better teaching and teachers.

Second speaker: **Robert E. Redmann, University of Bridgeport**

My intention is to ask a question. Perhaps only I am confused; I would be most happy to have a person or the group here supply a clear answer.

Students want accurate, precise answers to questions—and it's rough to concisely answer, What is industrial design? It tends to be like electricity. The scientist knows how to use it, gets results, but feels if he knew more about its essential nature, he could accomplish more with less effort.

Agreement is needed so that the public, industry, students and designers themselves are at one on their role. It would also save endless discussion now indulged in by designers at work, at informal gatherings, in academic sessions and in the professional societies.

Are industrial designers artists or engineers? If neither one or the other but both, is there a fixed percentage between both, or does it change? Here we deal directly in education because every school, usually differently from others, comes to a conclusion on this point, and then its program is organized around the decision.

Is the industrial designer a person who through intuition and sensitivity finds answers to complex problems, or is he one who depends heavily on statistical evidence for a direction or answer? This becomes more important each day with the growth of the Survey and the Marketing Department in many companies. Does the industrial designer have prime responsibility for a product, or is it a team effort with industrial design on a level with Sales, Engineering, etc.? Here we find a tremendous difference of opinion between many free-lance designers and staff designers. The free lancer may say that he should be responsible only to the president; the staff may say this is presumptuous.

As to ethics, is the designer ultimately responsible to the consumer or to the man who employs him? Suppose value is related to weight—the heavier the product, the more valuable. If the designer makes it look 200% heavier because the boss says to increase sales, what about the consumer who pays for a one-pound item and then gets only eight ounces? This may be idealistic but students question these matters, and the designer who says a student should have no ideals puts the future on quicksand.

What about the so-called "fringe areas" in industrial design? Is a package designer who comes up with a new structural principle for a cardboard container, and, in addition, makes it visually handsome two-dimensionally, an industrial designer? Is a textile designer who designs a pattern to be made and sold in millions of yards, which is then specified in next year's auto model by an industrial designer, also an industrial designer?

Finally, and merely to be brief rather than to say there are no others, is industrial design a profession or merely a business, like being a salesman or a marketing statistician? We love to talk like "professional people"—but what right do we have to this? Do we really know what a professional is? Are ethics, morals and responsibility to the patient involved? What if the patient dies, is the designer ever censured by his peers?

Arguments alone will not supply answers, neither will statistics from questionnaires. At this time I would like to suggest some approaches; their order is not rigid, although it is logical:

First, find the areas of least or no disagreement. Then we can decide not to argue about this point forevermore.

Next we might check over fields similar to ours, find what common characteristics exist and use these as guide posts in laying out a tentative goal.

Third, if all the varied activities within industrial design are surveyed, we may be able to determine areas that are common to all.

Fourth, decide if one basic description can possibly do the job.

I do not feel that sharpened thinking, such as this, is harmful to industrial design. It would be an acknowledgment of a responsibility we bear but have not faced up to. Frankly, what I am looking for is an "Einstein's Unified Field Theory" for industrial design.

Third speaker: **Dean Emanuel Benson, Philadelphia Museum School of Art**

The limitation of the designer today is that he is a superficial thinker with a great deal of cowardice. He is superficial because his instructors are. Basically we need a project for a foundation that is based on the reeducation of our instructors so that they are qualified not only to teach the subject for which they feel qualified, but to see the enlargement of that subject historically. We have a man who is regarded as one of the most gifted letterers in the country, but he has no knowledge of the development of characters from ideographs and hieroglyphs or, preceding these, the beginning of language. The students whom he trains are able to develop characters that apply effectively to a product, but they are always working on a superficial level. It seems to me that that instructor needs reeducation.

We are trying to make our students better than our teachers. I remember hearing what I thought then was a corny address at my daughter's graduation. The headmaster said: "We're not training you to fit into society, we're training you to alter society." That is precisely the issue on which we are to make a decision. All of us have opportunistic considerations. It is practical that we supply the kind of training for the student which will enable him to be employed, to be immediately useful and thoroughly competent. But where does he draw his nourishment? Where is he fed? Is he trained to observe the world so that he sees correspondences between the fields of chemistry and mathematics and art? Is he able to look at nature so that he can extract from his observation laws that are helpful to him in constructing his own images? Unless we can develop students with tremendous resourcefulness, I don't think we are really serving the best needs of society. The Ford Motor Company and every other automobile firm insist that the student be able to use the air brush and make large-scale renderings. This is certainly necessary, but how much more richly should we equip this student so that he is capable not only of doing what he is required to do, but of so proselytizing his objective of high standards that he ultimately converts the people with whom he works to higher standards of thinking.

I met a man the other day who took me to an automobile plant. When we were all through I asked him where he was trained. He said, "Really, I'm ashamed to say this but I never graduated from a design school. I went to the Academy of Design for one year and the Art Students' League for one year. Then, for two years, I traveled in Europe." There was a fellow who had a concept of where automotive design was going and where it would go, who understood its psychological problems, its sociological problems, who could see into the future and yet, without discouragement, help others to reach that future. He is the most valuable man that I have encountered in the automotive field and yet he does not have the studio type education. We have to make some allowance for people who don't conform to what our idea of an industrial designer is. Nor am I convinced that we ought to define it, because I have watched people try to define their problems and before they have concluded their definition, the problem is changed. Within this flux we have to have a permanent objective and that objective, it seems to me, ought to be deeply rooted in perception, in creative perception, and in what Mr. Shipley referred to as the pragmatic aspects of teaching.

I'd like to get back for a moment to Mr. Shipley's reference to lawyers being paid very well as teachers, and refer rather, to doctors who are poorly paid as hospital consultants but enjoy their identity with hospitals and who benefit professionally from that identity. It may be that industrial designers who are indispensable to the development of any design department in a school could benefit from their association and their identity with the school *if* the school had established a really solid relationship with industry. It's only because our relationship with industry is so inadequate that the industrial designer is hesitant to relate himself to us. I have found that in the field of advertising where the relationship has proved to be more solid in value, the practicing advertising designers are very generous of their time and energy.

Mr. Redmann asked the question, who is the industrial designer working for? For the business man, for the consumer? Basically I believe that we are working for the fulfillment of our relationship with society. I don't think that any fine designer ever really works for some reason. I think there is a wish to make the world a better place to live in. There are limitations that we have to recognize as to how quickly we can make that world better. But I don't think we'd be happy to make products for society that are simply financially profitable to us. All of us want to pay our bills and put a little money aside, but more than that, to leave the world a little richer than when we came in. Our best designers—students in the senior class at the moment—have a sense of dedication that I think is right in a student, with an idea of what industry wants and how to protect himself against exploitation. I think it's possible to produce the kind of student who has no antagonism toward big business, who will get along well in any situation.

Fourth speaker: **Dave Chapman**

Our challenge is to bring the problems of education and art into focus. I would like to point out sharp parallels between the business and industrial design offices and the design schools.

I believe that I can honestly say that never has a client walked in the door who did not bring two problems to us. One is symptomatic, the other is basic. Just like the man who goes to the psychiatrist and says that his shoulder aches, the business man tells you, "This product won't sell. Fix it." Down inside the complaint are the actual problems. We hope that some day a student will walk in the door who will help us with that problem—who will have enough bone and muscle in him so that in the long haul, he becomes a man.

The young designer must have the ability to mature and he must also have manual skill. It is also important that he have the ability to express himself. If you can't put it down, it ain't there! Sometimes we wish the young graduate came to us with dials on his chest showing how he rated in these qualities. We hope that he can come to our doors at least with the ability to pay his own way—not necessarily to make money for us.

After X years and months we find that having acquired a degree of proficiency in design, the young man is required to go beyond the areas of design per se, and other values prevail. I can't tell you exactly what they are—the ability to deal with people has something to do with it. These are the special, non-professional values which seem to determine just whether or not a man can become big.

Most people now practicing were not trained as industrial designers and lack this experience in evaluating the graduates. In one sense, therefore, I am here in the hope of learning how we can best use the products of your schools.

How can we get good teachers of industrial design?

Benson: As several of us mentioned earlier, we all have difficulty finding people to teach industrial design. Perhaps it can be solved by inviting industrial designers to visit the school; by limiting their responsibilities to that of guests, they can come in for a half hour and do a superlatively good job. This would require good planning on the part of the head of the department.

Schecter: Maybe it would be advisable not to get the top dog in the field, but someone who has been out in the world just six months or so.

Alcott: I'm not sure I agree. Students are very apt to want to form their own definition of the professional field. By the time they're seniors, they think they're better than their instructors. Industry comes in and offers them jobs at prices higher than their instructors are getting, and after six months they say, I'm doing what my boss is doing, I'm in a blind alley making the kind of sketches he is making. Yet after six months graduates still have a lot to learn. They are not ready to teach. I'd like to have them come back, but not too soon.

Schecter: I didn't mean that they come back to teach, but to explain their positions and let other students know what's going on.

Shipley: It is my experience that if you present only one or two practicing designers they're apt to give students the notion that the way it's done in their organization is the *only* way it's done. You need a cross-section.

As to the scarcity of teachers, I think the problem is purely financial. The average teacher of ID is fortunate if, after five years of teaching, he earns $5500 a year, while his classmates in business are averaging $8500. This is discouraging for a man with a growing family. One possible solution is for practitioners and teachers to join forces to persuade a score of large industries to contribute $100,000 a year to establish chairs of industrial design in 25 of our schools. $4000 to each school added to the regular teaching salary would be enough to attract and hold the best personnel.

Can we establish some policy about participation in student competitions?

Alcott: We don't like competitions between schools. The prizes are inadequate for the amount of work that goes into them. Often they are used as a way of getting something for nothing. Have any of you refused to enter?

Adams: Yes, and some of these things that come out of them should be burned before they are judged. The reason we don't enter them is that most of the problems posed in competitions have no connection with what we are trying to teach.

Benson: It might be useful if all competitions were fed through the design organizations. Maybe they would provide judges.

Shipley: The standards for evaluating competitions have been already formulated by the National Association of Schools of Design.

What value do these competitions have?

Doblin: They certainly give the students a little money, sometimes a lot.

Maguire: I think competitions help to unify the schools. They give some kind of common denominator which aims to raise certain standards and illustrate a professional philosophy and creed.

Carreiro: If we are professionals and want industry to consider us as such, competitions may not be the best way. This does not mean that there should not be a working connection between students and industry such as field trips and basic design research — but without any strings attached. If industry wants to support the schools, then let industry give outright grants, as they do to universities like IIT. It would add a lot more than competitions do to our professional standing if industry were to give aid in establishing graduate schools and design research. The schools, of course, must be careful how they accept such grants.

Jones: Architecture does parallel industrial design and there are many competitions in that field. Groups of schools compete together; the prizes involve European trips and scholarships. Beaux Arts competitions, of course, are for people on the graduate level, older and more mature.

Alcott: We have in-school competition. We're happy to have a real design problem brought in by outside firms.

Maguire: I agree that competitions could be put on by the ASID or the IDI. They can create a common bond between students, letting each school know what the other is doing.

Shipley: We entered the ASID Midwest Chapter Student Competition. I couldn't see any reason not to. They had nothing in mind but the advancement of student design, having the student submit simply the regular work he had done in school. On the other hand, if the ASID or the IDI were simply to handle the usual commercial competition for companies, I can't see how their approval would change the basic problems.

Carreiro: All schools cannot automatically accept to enter competitions. It depends very much on their individual curricula. Having a central competition committee might help to weed out those companies basically looking for "slave labor."

Redmann: Students buy a school's service and pay money for their education. I wonder if the head of a school is in a position to "accept" a competition. We are not sure that a competition really contributes to an education; it looks to us less and less like a desirable thing. It is not necessarily better because the IDI and/or the ASID OK'd it.

Carreiro: Perhaps we should keep them as an extracurricular activity, with the students making their own decisions. We could approve or disapprove of competitions as a professional gesture. We are perhaps assuming too much in bartering our students' time against questionable values.

Doblin: I'm not sure students have the prerogative of choosing to enter competitions. Is it our right to tell them, "Cut it out, you're interfering with our curriculum?"

Schecter: In competitions between schools, you don't have control. Therefore, the result is rivalry, not cooperation.

Doblin: I think, as educators, we should make up our minds about each competition. As we receive these invitations to enter, we should communicate, because we may find that some of them are good and others are not.

Is there any way in which we might standardize our courses?

Doblin: How do we evaluate design credits from other schools? Transfers present a tremendous problem.

Adams: Here's the way we do it. We look at a student's portfolio and say, "You can start here. We'll give you three months. If you can't do it, you start back there."

Maguire: Our conclusion is that the value of these visual subjects varies greatly, depending mainly upon the quality of the teaching.

Doblin: There are two types of standards, depending on the nature of the course: marks, and subjects covered. If a student comes to us with a B in math, he can transfer these credits anywhere. Maybe we should have quality standards in design curricula. Is there any way we could write our courses similarly?

Redmann: I don't think it's necessary to establish quality standards in design. It tends to eliminate the fringe areas—the people who may never do perspective well but end up in Sales. I don't think we should eliminate these people.

Alcott: All we're talking about is correlating A, B, or C students. F's are out anyway. In that sense we do have quality standards:

Benson: Why don't we make a test case, sending to each other descriptions of courses of our basic approaches, to the freshman course in mechanical drawing, for example, and see if we can come up with a common title for that one course.

Doblin: One of our biggest handicaps is lack of texts.

Adams: *We* consider it an advantage. Men who know the most, like Harley Earl, never write the books. They're too busy. A kid in a jam usually asks, Where can I get a book about it? Usually his trouble comes from lack of imagination, of creative thinking, and of misconditioning for a career in creative thinking.

Benson: I don't think we can ever dispense with the writings of the great thinkers for the sake of so-called advanced thinking. The elimination of books is not going to make people creative. We do need texts, but we'll never have handbooks of design.

Doblin: I wasn't thinking of texts on how to design. But we have nothing between us to standardize any of our thinking. We have no common ground, for instance, on auto design.

Adams: I think that's great.

Shipley: Sources of inspiration come from many places—talking, living, and books too, provide experiences.

How can we raise standards and improve teaching?

Maguire: I would like to propose the idea of exchanging problems—good and bad—with other schools.

Doblin: I have already asked you to collect slides of your students' work so that we could show them to ours. This would also serve to pull up standards in the "fringe" schools. If we could get together a program of our students' work and circulate it among the schools, it would help the caliber of teaching a great deal.

Alcott: I was glad to see in INDUSTRIAL DESIGN that camping problem you gave at Philadelphia. That kind of problem could be very helpful if passed on.

Carreiro: It's not necessarily that you would care to use it as a package problem, but you can use it as a springboard. Is that right?

Alcott: Yes.

Carreiro: I'm interested in everybody's problems and the way they go about solving them. It isn't the similarity that is interesting, but the diversity of approach. I think as teachers we designers each have uniqueness. That is why we should find a way to exchange our strong points—not pat formulas, not a handbook of design, but whatever approach, whether analysis or other methods, which we have found effective.

Maguire: Everytime we give a problem, we have a designer coming in at some phase for criticism.

Doblin: My idea was to bring a professional in on each problem, letting him put three or four students under his deadlines. Of course the scream of commercialism interfered, but next year I'm going to get a few designers to do this. It's a chance for the student to talk with the practitioner—to get the young designer to come in and work with these young students as a crew, not as the head of the company who tends to be the magician, but as the project director.

Shipley: Architecture succeeds in getting professionals to come for a year as resident critics. Industrial design has not reached that point yet.

Alcott: We don't have, and I hope we won't have, any kind of licenses, either.

Doblin: I think it would be valuable to record voices and photographs of work by outstanding designers, and have them tell what they did and why they think these designs are good.

Adams: I think it's even more illuminating to hear these men *off* the record. You should hear Loewy on the subject of the need for ethics in the young designer. The concern that he expressed to me and what he said to the students were totally different.

Doblin: We would also want to get the unknown designers to express themselves.

Shipley: The IDI is discussing the idea of recording its regional chapter meetings, including special speakers and panel discussions. These tapes would be edited by the IDI Education Committee and retained in a central library, so that any student group could borrow them.

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What is the nature and future of our organization of educators?

Doblin: I wonder about the National Association of Schools of Design. What has become of it?

Alcott: It's still going. Here is a resume of the first meeting held at the Metropolitan Museum in New York before the group was national. It was identical to ours last November in Philadelphia. They have discussed accreditizations and carried out a program to the point where regional offices have established credits for our type of school.

Carreiro: We must be very careful that we don't fall by the wayside and become a bureau of accreditization or in some other way lose our identity—or we'll have to face the same problems all over again.

Alcott: I'm all for this group sticking to industrial design, but if the NASD hadn't done its part we wouldn't be as far along as we are today.

I think it's a great idea that we had this meeting. I don't believe that the function of this group is to exchange credits. I think that the function of this group is to find ways to train designers in fields in which very few of us ever took a course. I never did. In 1922 they hadn't invented the term "industrial design" yet.

Benson: May I make a suggestion? I would say, never legislate anything here and never have elected officers. 50% of the time of some organizations is spent jockeying for offices.

Shipley: No other group is doing what we are trying to do here. The College Art Association is concerned largely with art history and the fine arts, the NASD with professional art schools in the general sense. Industrial design is a sufficiently varied and complex field to deserve its own educational organization. Let's stay as we are! And I agree with Mr. Alcott, let's forget the credits.

Carreiro: My purpose in calling the first meeting was the general dissatisfaction arriving from edicts stating that *this* or *that* was the ideal curriculum. Now who is to dictate the curriculum for any school? Industry or quarreling professional societies or the educator who is directing the course at the school? Who is the logical person to establish it but the people who have to carry it out? I don't mean to direct the growth of this organization—I only point out my reasons for calling the first meeting. At least we have had an opportunity to investigate the problems in the field. To the gentleman here who wanted us to agree on what we are going to do, I'd like to point out that I announced at the first meeting that it was not called in order for us to agree to agree, but merely to exchange ideas. Maybe we will find out that we cannot agree—maybe we will find out that there are more ways than one to skin a cat. But at least we will have a sounding board. I would like us to continue until we can bring into these meetings all those who have a stake in what we are doing. Not just professional groups. Industry and management should also be included, although they are not the people to dictate the curriculum either.

As educators we are interested not only in the product but in the process, the methodology and the thinking. In other words, in industry you produce an end product, the product itself. Our end product is not a toaster but the process that created the toaster, and the student as a literate, intelligent and comprehensive individual.

At Mr. Adams' invitation, the group agreed to hold its next meeting in April 1957 at Art Center School in Los Angeles, California.


Jergenson and Adams

Carreiro

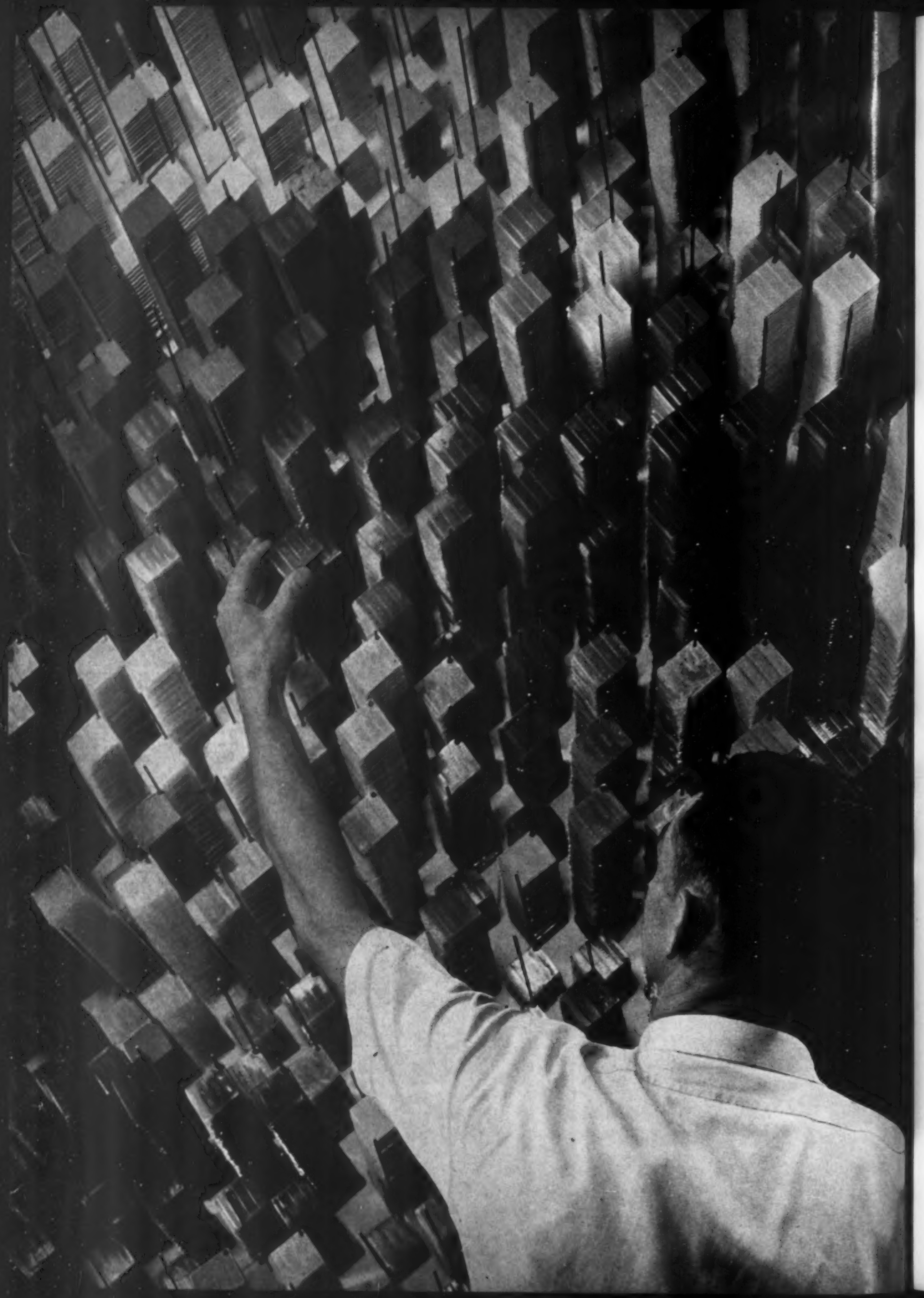

Alcott



Bredendeick

Doblin shows IIT work.


Doblin leads the discussion.

by Douglas G. Meldrum

Color Problems—IV: Plastics with integral color

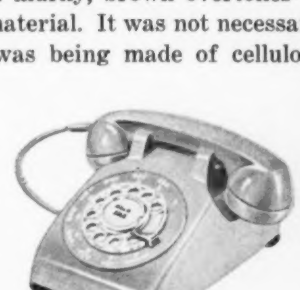
When a plastic material manufacturer states that he can make his molding compounds in 30,000 or more different colors, it may sound like a good sales story. It happens to be true, however. To the promotion man, the truth is "wonderful," but to the production manager, it is a source of headaches. The number of colors that can be obtained in certain molding compounds is virtually limitless. But each additional color complicates production, control, and standardization, and each color has individual characteristics, desirable and undesirable, that must be known and understood by the manufacturer.

A glance into the color files of any major plastic material manufacturer reveals row upon row of molded plastic chips in colors of every hue, tint, tone, and shade. The picture on the left shows a small section of one among many color chip cabinets in the Eastman color laboratory at Kingsport, Tennessee. There is a formula for each of these colors giving the exact amount of every ingredient needed to reproduce it identically. In spite of the fact that thousands of colors have been produced in plastic materials, an apparently impossible situation comes up daily in Eastman's laboratory: requests come in for still other colors.

The choice of a specific compound to make a colored plastic product is not a simple matter of selecting any plastic that has an affinity for color. This is, of course, a prime requisite that immediately eliminates many compounds. But after the obvious have been ruled out, a material must be chosen that has the best combination of other properties for the product, of which color is only one: taste, odor, heat stability, molding characteristics, strength, acid and alkali resistance, flammability, electrical properties, and, of course, cost. The requirements of the end product will frequently narrow the choice down to but a few — and conceivably one — possible compounds, with their inherent color qualities and problems. In this article we shall discuss the possibilities, and the limitations, of molded-in color in plastics, including how and where in the manufacturing process color is introduced into the plastic material, how new colors are formulated, and some of the color problems faced by manufacturers and fabricators.

American Telephone and Telegraph and Western Electric have worked for many years on making colored telephones. Some were produced in the early thirties, but were received poorly — the colors were deep and strong — with the result that of all colored telephones sold during that production period, 75 per cent were ivory and 15 per cent gray-green. With the introduction of the "500" set in 1950, and with the post-war color binge well on the way to becoming a full-fledged bender, A.T.&T. retained color consultant Howard Ketcham to help in the selection of a color line that would be suitable for homes, offices, factories — in any environment. It was Mr. Ketcham's job to choose a limited number of colors from which at least one would harmonize with almost any color scheme. Six colors were suggested: ivory, gray, red, beige, green, and brown. A survey made in all Bell System Companies investigated what colors customers had been requesting in past years. These colors turned out to include the same six, plus yellow and blue, on the basis of which A.T.&T. decided on a color line of eight. Having chosen the colors, the next step was to find out if they could be produced.

The "500" telephone, in black, is made from two types of plastics: the handset is phenolic, the stand cellulose acetate butyrate. Phenolic is used for the handset because it is inexpensive, durable, will not fade, and is easily molded. But the traditional incompatibility of phenolics with color — attempts to give it a light shade results in murky, brown overtones — necessitated a change of material. It was not necessary to look far. The stand was being made of cellulose

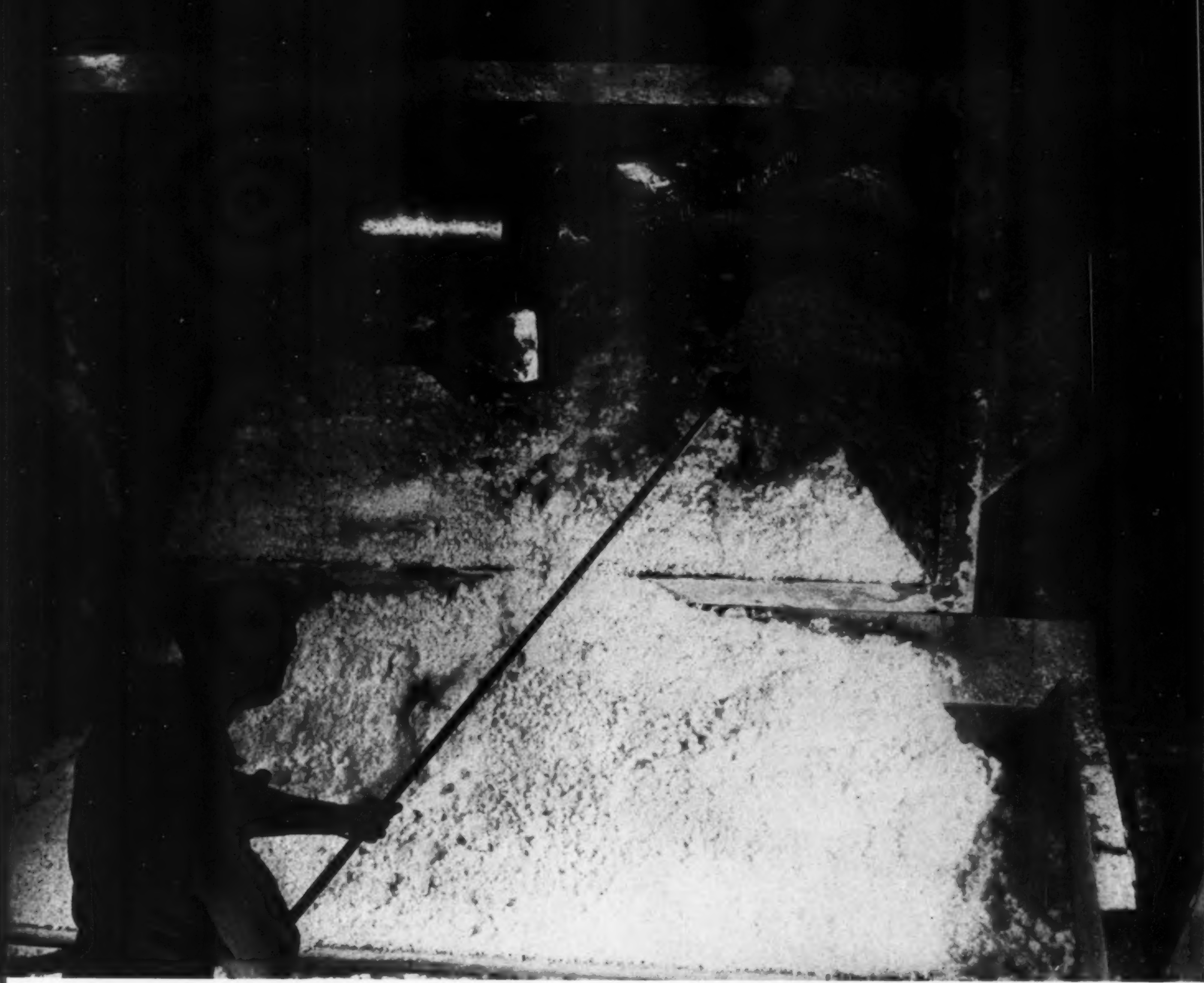


Color range in Tenite is indicated by the chips in Eastman's laboratory (left). The telephones are also Tenite.

acetate butyrate, a plastic that takes very readily to color. The decision to use butyrate — specifically, Eastman Chemical's Tenite — was not, however, the answer to all their problems. The switch from a phenolic to a butyrate meant a change from a thermosetting to a thermoplastic material, which naturally necessitated a different molding process, since a phenolic is formed in compression or transfer molds while butyrate is either injection molded or extruded. And in the course of switching molding methods, it was necessary to change the design of the inside contour of the handset. Molding problems for the handset had been discussed when the "500" set was originally designed, but were overcome by the choice of a phenolic, which does not demand rigid wall-thickness dimensions. For successful results, thermoplastics, on the other hand, must be molded with thin uniform walls. The combined talents of Western Electric and Bell Laboratory engineers resulted in a new male mold for the inside contour, keeping the outside shape the same, and they were ultimately able to mold the pieces from butyrate and achieve a lighter handset because of the necessarily thinner walls. The thin walls, incidentally, created an acoustical problem which was overcome by putting a ball of cotton in the handle near the receiver — an example of the sideline complications caused by color.

The difficulties encountered in producing telephones in color are not necessarily exceptional: every product produced in colored plastic has a similar history, involving comparable difficulties to a greater or lesser degree. In addition to the color considerations with plastics, the telephone project had another aspect: the dial is metal and the cord rubber, and these materials had to be finished in colors that would match the butyrate perfectly. Originally, some of the colored telephones were made with contrasting dials and cords to eliminate this problem, but for aesthetic reasons it was finally necessary to produce three different materials in identical colors. This was a matching problem involving finishes (Color Problems II, ID April, '56) and integrated color. The numbers and letters on current models are injection-molded of Tenite in a ring outside the dial itself.

In production, colored telephones are given very tender care. The constant hazard of contamination must be guarded against — a speck of dirt or dust can ruin an expensive molded piece. As soon as handsets come from their molds, they are slipped into open-ended plastic bags which are not removed until the set is installed. Molds must be completely purged before a new color can be formed, a precaution that is not necessary when exclusively black sets are being made. These and other extra production steps to protect colored telephones add up to a very familiar theme; color costs money and certainly creates complications.



Resin-saturated alpha cellulose is scraped from a double-arm mixer at American Cyanamid's Wallingford, Conn. plant.

How and when color is put into a plastic molding compound

Among the highly desirable characteristics of melamine and urea molding compounds is their colorability. This does not mean, however, that it is easy to produce these materials in color.

At American Cyanamid's Wallingford, Conn. plant, several million pounds of Cymel melamine and Beetle urea are produced a month. The finished compounds are packed in 200-pound containers and each batch is individually inspected for color, molding characteristics, grain size, flow, etc. This would indicate that for each million pounds of compound 5000 inspections are required. The diagram on the next page demonstrates why it is complex to produce uniform plastic materials in colors that are consistent. It also indicates that colorants are *not* thrown in after the compound has been made, to fill an order for a certain red or blue or green. Colorants are an integral part of the material and consequently their addition is an integral part of the manufacturing process. Since compound manufacturers depend on quantity and speed in production for profit, any "down time" for cleaning machinery—an essential chore when colors are changed—is expensive to them and, in the final analysis, raises the cost of the material. Nevertheless, because of demand, it is not exceptional for 20 or 30 new colors to be introduced at Wallingford in a month.

Manufacturing process

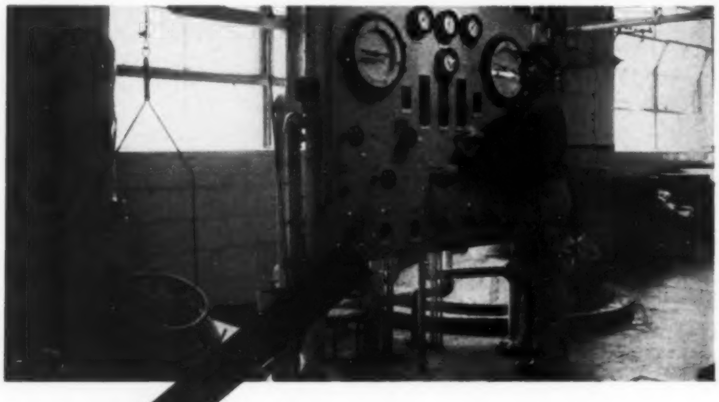
The reaction of melamine or urea with formaldehyde in a kettle forms a liquid resin, the first step in making melamine and urea molding compounds. For a translucent material, alpha cellulose, a fibrous material, is cut into small pieces and added to the resin, as indicated by the chart below, and mixed thoroughly in a double-arm mixer. The photograph on the previous page shows resin impregnated cellulose being removed from the mixer. This mixture is dried in ovens and then pulverized into powder which is put into ball mills. Then colorant, mold lubricants, and curing agents are added.

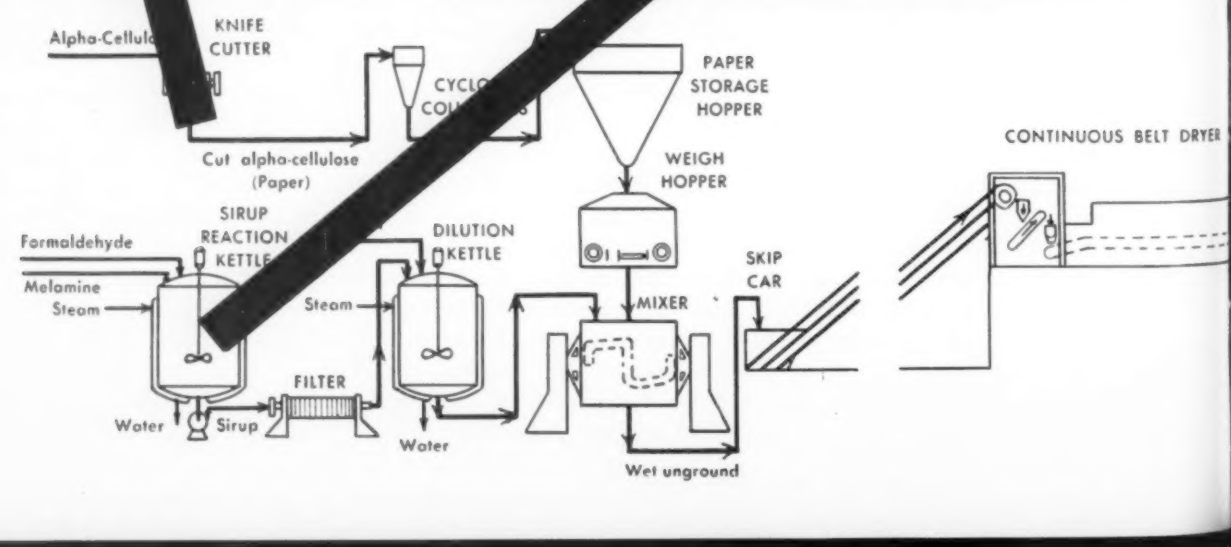
Many colorants must be eliminated at this point because they are not lightfast, have poor heat stability, are toxic, or fail for other reasons. Titanium dioxide, a white colorant, is the basis in most formulations. To obtain a molding compound that is translucent when it is molded, titanium is left out. The great demand for translucent dinnerware has made quality control an even more severe problem because, in eliminating titanium, most of the hiding power of the color formulation is removed. This often causes costly rejects for the manufacturer and molder because the slightest contamination or lack of perfect pigment dispersion shows up far more readily than in opaque ware.

While the melamine compound and colorants are being milled, color adjustments are made and checked against standards. After dispersion, the powder is removed from the ball mill, sifted and, if densification is required, run through a Banbury mixer which squeezes particles of the powder closer together, doubling their density. The compound is then packed in 200-pound batches, each of which is checked by molding sample disks which are inspected for color, pigment dispersion, translucency, and so forth.

Color formula adjustment

The establishment of a new formula in a color laboratory is not the end of the story. At American Cyanamid, new formulations created in the color laboratory at Bound Brook, New Jersey, are sent to the Wallingford plant and adjusted for large-scale production: colorants must be compatible with each other, with the material they are added to, *and* with the machinery in which they are mixed or ground. Laboratory ball mills differ in size and construction with production mills and the change of equipment brings different reactions on the colorants. For example, stainless steel tends to make pigments gray out if grinding is extended. When a formulation is being

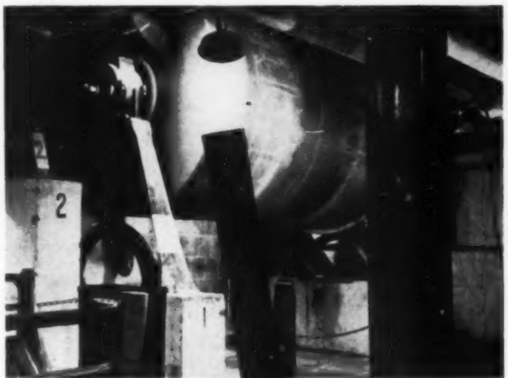


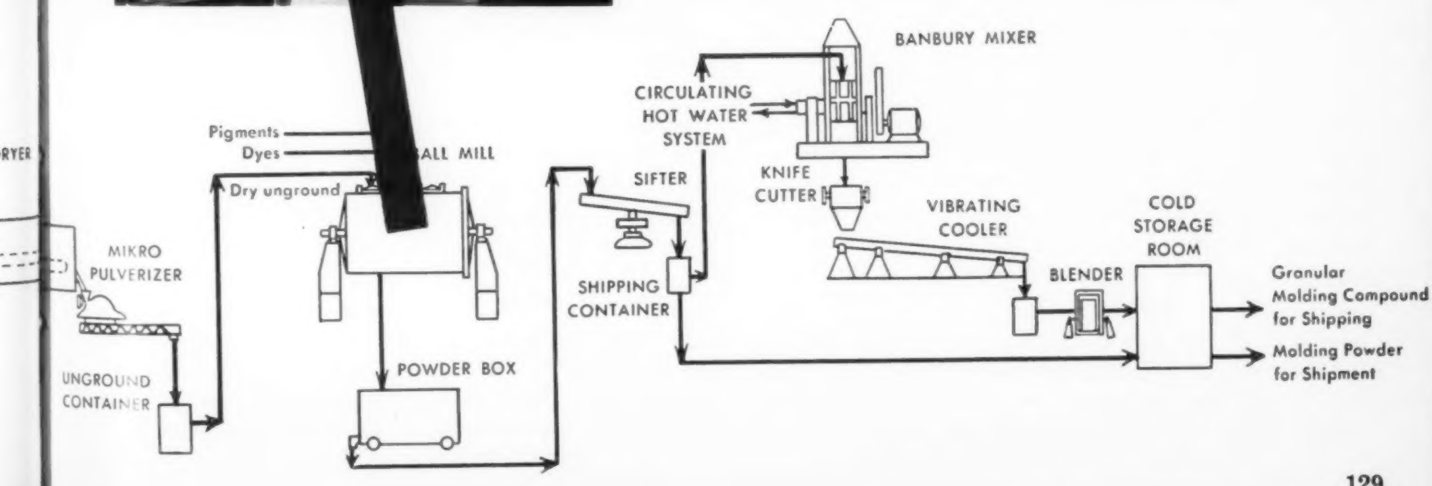


adjusted in the production plant, it is not the *types* of colorants that are varied, but their proportions. There is no fast rule for this adjustment—Cyanamid technicians rely heavily on experience.

One of the reasons for all the aforementioned checking and rechecking, adjusting and readjusting, is shown by the melamine dinnerware on the right. The range of solid colors such as those at the top, is practically unlimited, but some have their shortcomings. Reds are a special problem because all red pigments are not lightfast. However, cadmium colorants give excellent reds and stand up well in sunlight and, although they are expensive, they are used extensively for dinnerware. The design on the plate and saucer in the lower set is accomplished by semi-curing the base material, opening the mold before the cycle is completed and inserting a resin-saturated printed foil. The mold is then closed to complete the curing cycle and the foil becomes a permanent part of the piece. Foils are expensive and the process, known as "two-shot" molding, requires more skill than regular methods. The cup has a new effect called "color-on-color." This is also done by two-shot molding and introduces many new possibilities for the use of color. The precise method is still well-guarded, but for a guess see page 114.

Melamine dinnerware: solid colors in Florence Melmac dinnerware molded of Cyanamid's Cymel melamine compound by Prolon Division, Pro-phy-lac-tic Brush Co. Foil design and color-on-color is Texasware by Plastics Manufacturing Co., molded of Barrett's Plaskon melamine compound.





Color and quality

In earlier articles, it has been pointed out that when one desirable characteristic in a material or finish is gained, another is often jeopardized. Plastics are certainly no exception. They are especially subject to modifications for strength, quality, and color, and all these added ingredients influence each other for better and for worse. Perhaps the most critical aspect of molded-in color today is not *what* color can or cannot be achieved in individual materials, but what the ultimate *quality* of that color turns out to be. Here are some of the influential factors and results.

Fillers and modifiers

If fillers or modifiers are added to any plastic for strength, heat resistance or stability, the color rarely goes unaffected. Fillers for *phenolics*—woodflour, cotton flock, mascerated fabric and cotton cord—used in proper proportions will impart better molding characteristics and a smoother surface. Because of the natural muddiness of the phenolic resin itself, as we have said, light colors and brilliant colors are never possible; after a certain proportion of filler has been added (over 60%) the uniformity of even the available color range is harder to control and surface gloss is cut down.

For basically the same reasons, *melamine* colors—though easier to achieve—are usually marked by a slightly muted effect; this quality has been well exploited in the sophistication of some manufacturers' color schemes.

General-purpose polystyrene is lightweight, easily molded, inexpensive and readily colored in a wide range of clear bright hues that are transparent, translucent or opaque. The addition of synthetic rubbers gives the fairly fragile material greater impact strength, but simultaneously dulls the natural color to something between cloudy and opaque. This not only rules out transparent colors, but changes the quality of the available ones to a deeper and less brilliant range.

The great proportion of reinforced plastics are *polyesters*, using fibrous glass as a reinforcement. Other plastics are often used this way, however: *phenolics, melamines, silicones, epoxies, alkyds, cellulosics,* and *vinyls*. These may be reinforced with cotton, rayon, nylon, paper, and synthetic fibers. The very nature of the fibers that provide strength for these compounds alters the color and finish of the molded product. In both "premix" and usual methods, the fiber strands will be visible or detectable (even if the filler is colored to blend) and the surface will have less than the perfect gloss and intense color of a pure compound molded under high pressure. This natural texture has a very distinctive quality that can be exploited for many products. Those who wish a clear smooth colored finish on reinforced plastics are obliged to paint them after molding.

Uneven or spottled color effects are, of course, often purposely created by using two or more pigments that do not disperse in the same manner and that flow unevenly during molding. "Stippling" is done to disguise flow marks or textural variances by engraving tiny dots on the surface of the mold.

Polyethylene has always been easy to recognize by its combination of flexibility and strength, and its waxy surface and cloudy white or dusty colors. The somewhat pastel character is not so much a factor of the material itself as of its surface: softness will always produce a less vibrant color than a hard glossy finish. But in the main, polyethylene's color qualities have been the product of incomplete dispersion by molders, and more brilliant colors can and do result from pre-colored compounds in which pigments are well dispersed. The introduction of new low-pressure linear polyethylenes (see page 112) with hard glossier surfaces will undoubtedly result in a richer color effect. The question of improved color through better dispersion applies equally to *nylon*, which, until recently, was tinted primarily for identifying industrial parts.

Mix, match — or design?

The importance of these color qualities becomes painfully apparent when two or more plastic materials must be combined in one product or in matching a line of products. A manufacturer of blenders recently introduced a pink urea-based model with a pink polyethylene snap-on top. Even if technology had been able to produce identically colored compounds, a disturbing mismatch was inevitable purely because of the dissimilar surface reflectivity of the materials. The answer found by another manufacturer, for a styrene thermos bottle designed with a polyethylene mouth in a sharply contrasting color, seemed to face the distinct personalities of colored plastics more realistically.

The matching problem, of course, arises not only among plastics, and between plastics and other materials, but even with a single plastic, and here again design may be skillfully used to avoid unfortunate pretenses of perfect matching. A manufacturer of styrene wall tile, for instance, had a problem of color consistency with his product. Installation of the tile begins at the top of a wall and works down by rows. Two boxes of tile applied to the same wall might have been made six months and 10,000 tiles apart. Although the colors look virtually the same to the untrained eye, two large areas of dissimilar batches on the wall leave a very clear line of demarkation. The manufacturer's solution was not to improve already high color standards, but to redesign the tiles with a sloping edge so that the surfaces would never be absolutely flush. This slight change broke the line between tiles and made color variations unnoticeable.

Small amounts of molding compound and pigment are mixed in a laboratory ball mill—a step in the formulation of a new color.

The creation of a new color for molding

The morning mail at the Toledo color laboratory of the Barrett Division of Allied Chemical and Dye Corporation invariably includes an assortment of pieces of colored paper, fabric, metal, wood, almost any kind of material. To Homer Vandersoll, who is in charge of Barrett's color matching laboratory, these oddments are the basis for the establishment of new formulations for colors in Barrett's urea and melamine.

Making a new formula for a color follows a definite and deliberate pattern that is routine to Barrett colorists, but one that involves a variety of skills including, in cases when a sample is particularly bad, second sight. Samples come from fabricators of anything from handles and housings to buttons and baby bottles. Each step in the development of a new color formula is important both to obtain the desired color and also to give the compound characteristics required by the application. It has been pointed out that the end use can, and frequently does, determine the color and resin ingredients that can be included. The routine that is followed at Barrett from the moment a color sample is received at the color laboratory to the delivery of a molded color chip and a sample of the compound for trial by the customer is followed step-by-step on the following pages—the story of how one more color formula is added to their collection of thousands.


1


2


3


4


5

Here is how a new color is created:

1. **A color sample** is received at Barrett's color laboratory. The application is carefully considered to determine whether urea or melamine or some other plastic—even some other material—is the best for the job. Sometimes potential customers who have requested a sample in melamine must be told that it would be economically unsound to use the more expensive compound when urea would serve the purpose equally well. Someone intending to use urea, on the other hand, for a product that must withstand constant immersion in water would be advised that his results would be poor. The sample is matched against thousands of colors that have been produced by Barrett. These color chips—among some 30,000 several thousand are formulas for white—are kept in drawers to protect them from possible fading in sunlight.

2. **A color chip**—or series of chips—is compared to the sample under controlled lighting conditions. The light source can be varied to simulate natural, fluorescent, or incandescent light. (A perfect match in natural light is not necessarily a match under fluorescent.) Color formulations for chips that are close to the sample are studied to determine the approximate ingredients for a match.

3. **A sample formulation** is made of minute quantities of pigment carefully weighed on an analytic balance. Close control and meticulous records are essential at this stage so that adjustments can be made if the first attempt with a new formulation does not produce a perfect match—over twenty trials is not exceptional (each trial produces a new chip and formula).

4. **Pigments and resins** are put into a small ball mill for mixing, where porcelain balls grind and blend resin and pigments. Blending takes from 1½ to 5½ hours depending on the ingredients. These small mills contain up to one pound of material.

5. **Production tests** are applied to the colored molding compound after grinding. Color chips are molded in the Barrett laboratory in two thicknesses so that both reflected and transmitted light can be checked. These color chips are carefully compared to the original sample to determine whether or not they match. If there is any discrepency, adjustments in the formula are made and the whole procedure repeated. When Barrett technicians are satisfied they have produced a compound that matches the original sample and has the desired characteristics, a batch is sent to the customer for use with his forming equipment.

Photo Roy Stevens

Pigments are mixed for full-scale production of Barrett's Plaskon molding compounds.

In October: A report on the Perkin Centennial

As the three-armed lady above suggests, the '56 car carries an appalling number of gauges, controls, and push-button conveniences. The design problem seems obvious—to find space for these devices, organize them logically, differentiate them, and make them legible. On a hot mountain road it may be important for the driver to find the temperature quickly. Gliding over the deceptive smoothness of a well-patrolled super highway, he may want to keep a constant check on his speed. The dashboard, more than any other aspect of the car, poses an immediate problem in human engineering.

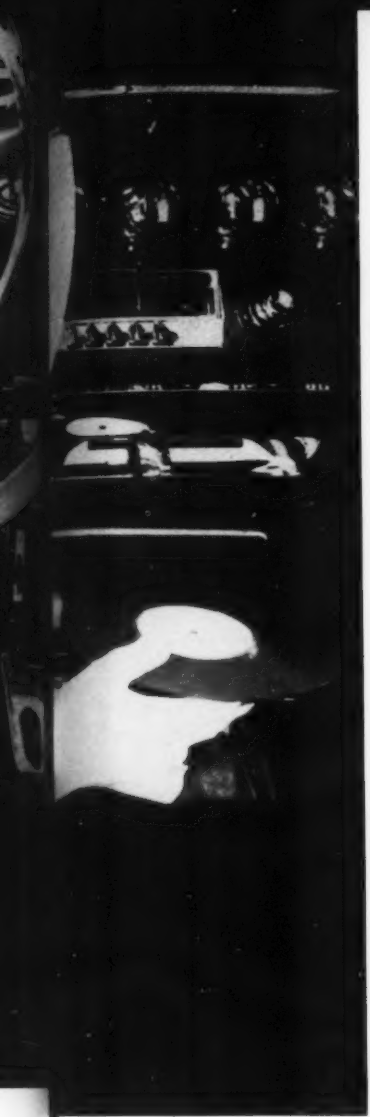
Yet logic and legibility are only one part of dashboard design. A second challenge—and often it seems the major one—is psychological. As a nerve center of the car, the dash-

Cars '56: the driver's view *by Deborah Allen*

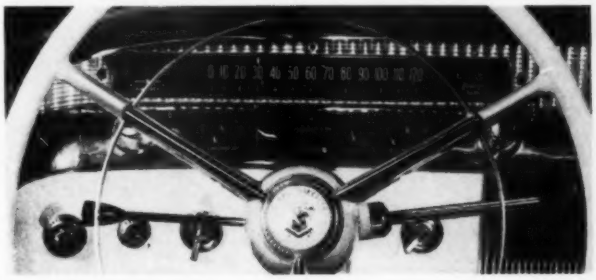
board explains and advertises its performance and builds up the pleasure and excitement of driving. Like most psychological problems, this one is complex: the car must generally look powerful and heavy yet fast and maneuverable, loaded with conveniences yet simple to master, safe yet daring, lush yet sporty.

In the following review we have emphasized function heavily for two reasons: it might be hard to trace accidents to a poorly placed speedometer, yet a good dashboard undoubtedly promotes comfort and confidence; furthermore, impractical arbitrary design is often synonymous with bad design, while logic tends to please. As a starting point to our discussion we have tried to disentangle some of the major motifs on which '56 dashboards are based.

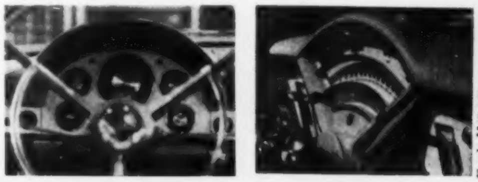
1. Luxury The "big" cars, Imperial (above) and Cadillac, go whole hog in the effort to combine luxury, power and easy driving. There is no compelling motif, but a general glittering disgorgement of conveniences. Yet grouping is simple, details fine, the wheel light.



2. Visual aids The growing complexity of the dash is countered by a trend toward simplified instruments, color coding, and other visual aids. A simple, fairly common example is the use of warning lights in place of meters for oil and generator. Buick (below) and Studebaker have gone much further: recognizing that visual aids can be inherently decorative, they have based the dash design on ingenious, color-coded instruments in an unusually orderly layout.

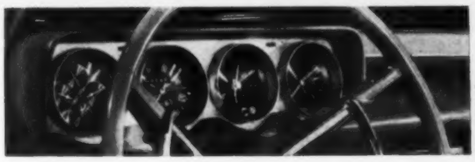


3. Sport Intimations of race cars, foreign cars, old cars and planes are contained in the round dials and flat dash of Studebaker's Gold Hawk (left). A dressier version of this dash gives a look of old-fashioned workmanship to the Packard line. The sporty look is especially useful for glamorizing low-price cars without encroaching on big-car grandeur, as the Ford line shows (right below): sporty Ford's hooded cockpit fans out in Mercury; on big Lincoln a long straight speedometer implies stately power; full circle is reached in Continental's wedding of luxury and sport.



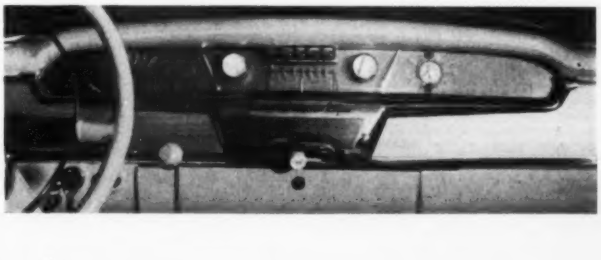
Ford; Mercury

Lincoln



Continental

4. Symmetry The impulse to make things symmetrical is perennial. A degree of symmetry is found on any dashboard; when the impulse is strong, the result is an escutcheon, into whose balance pattern the instruments are more or less arbitrarily fitted. An extreme version of the symmetrical layout is found in Nash (below), whose symmetrical escutcheon is symmetrically placed in the dashboard; one result is a speedometer of unaccountable shape partially hidden behind the steering wheel to the right of the driver.



Watch

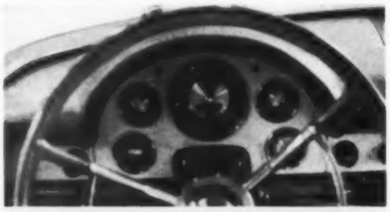
- speedometer
- mileage
- reset mileage gauge
- temperature
- fuel
- oil
- amperes (generator)
- tachometer (rpm)
- vacuum gauge
- turn signal indicator
- high beam indicator
- brake warning light
- clock

Work

- ignition
  - off-on
  - start
  - accessories
- shift
- lights
  - park-high
  - panel
  - map
  - fog
- windshield wiper
  - off-on
  - wide-fast
  - wash
- brake release
- hood latch
- convertible top
- mileage reset
- lighter
- ashtrays
- antenna
- heating system
  - heater
  - auxiliary heater
  - blower
  - defrost
  - vents
  - air conditioning
- radio
  - off-on-volume
  - station-tone
  - push-button station selector
  - city-country
  - front speaker-rear speaker
- record player

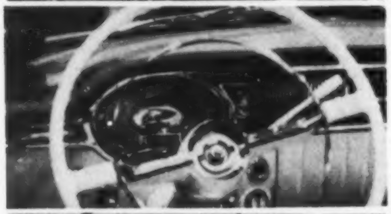
In listing the raft of instruments found in various cars (left) we have tried to separate standard items (white) from special ones (yellow), but there is no firm rule. These instruments are generally of two types: those to be watched and those to be worked. The ease with which they are found and used depends partly on design logic and partly on their adherence to familiar conventions. Major changes made for the sake of logic, as in the visual aid designs (opposite page) may be confusing if trusted conventions are broken. The most important "work" instruments—wheel, horn, shift, etc.—are radically specialized and unmistakable. However, the automatic shift is not yet standardized (far right). The wheel, though basically unchanging, may be good or bad. Sometimes an overdesigned wheel blocks the view of the instruments; again, poorly placed instruments may spread behind the wheel (right). The most critical "watch" instrument, the speedometer, suffers more variation than any other dashboard device (below).

Speedometer



The "conventional" speedometer, found on **Ford** (left), the Chrysler line, and the Packard line, is a circular dial numbered from 0 to 120, with 60 at the top. Like a clock, it can be read by the angle of the hand.

A variation on the dial, the semicircle lacks the advantage of codified hand positions but has other virtues, as **Chevrolet** shows: it can be very large, the shape is distinctive, the numbers are upright. Chevrolet's dash, while perhaps not beautiful, is very clear.

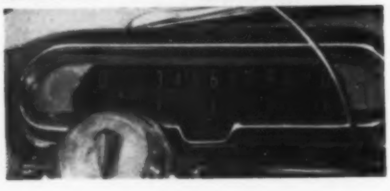


On **Oldsmobile** the dial is flattened to the oval form that is the car's motif. While an oval hasn't much to do with a circular swinging hand, requiring odd spacing and lapses in preciseness, the dash is generally compact and legible, a good example of "escutcheon" design.

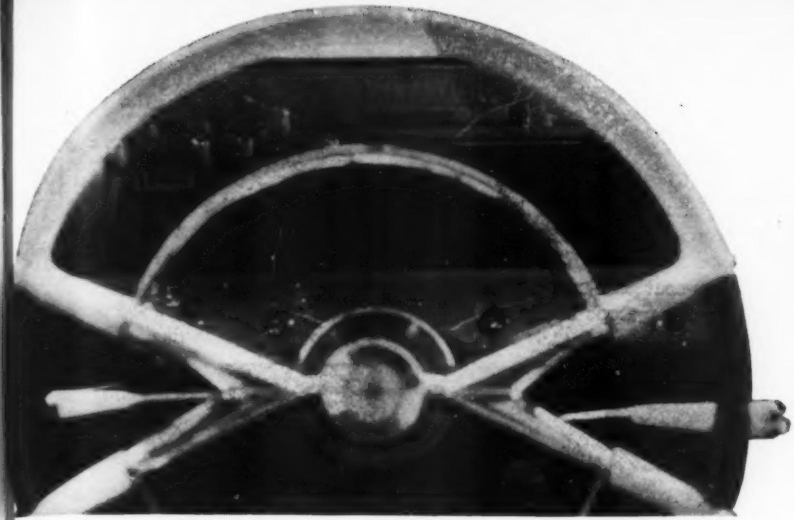
Cadillac's sweeping speedometer is prominent and clearly marked but shares Oldsmobile's drawbacks: a swinging pointer traveling a straight line does not appeal to logic. Large areas of chrome and glass invite reflections.

Nash adapts a long gauge to a swinging pointer by sloping the numbers, making them especially illegible. As previously mentioned, the Nash speedometer is behind wheel to right of driver.

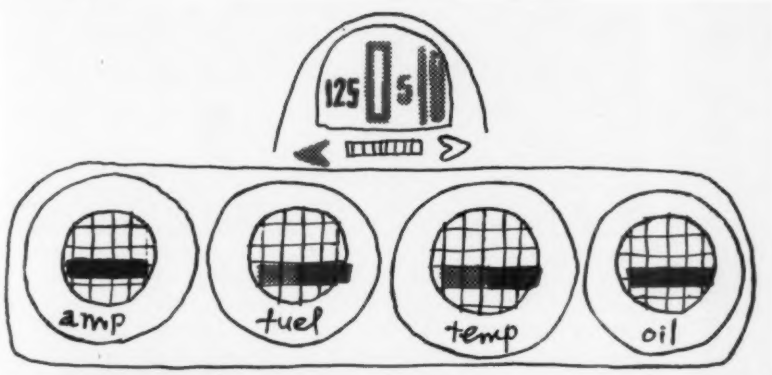
Lincoln's straight speedometer has a horizontal-moving indicator. Unlike a dial, a straight line depends on legible numbers; unaccountably, Lincoln's are highly stylized, white against off-white.

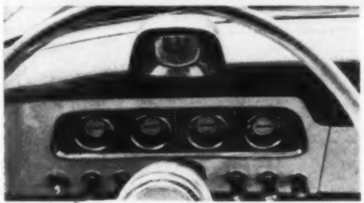


Hudson's straight speedometer has a ribbon indicator that fills the area from 0 to indicated speed with a band of color. It seems likely that the colored band adds to the legibility.

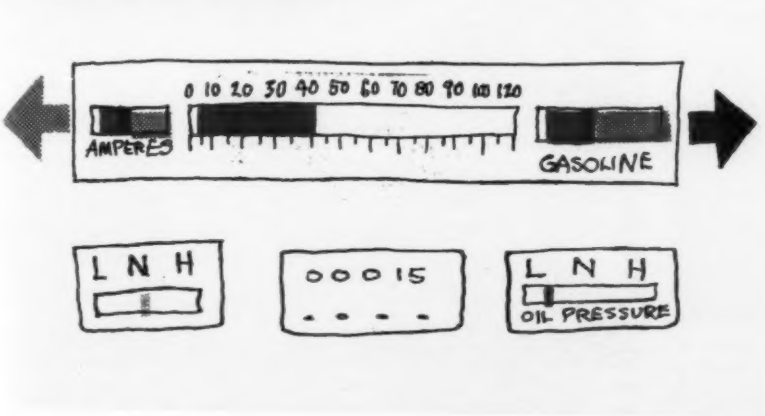


Visual aids

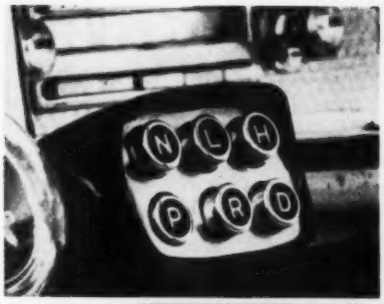




Studebaker's simplified dash may encourage the unmechanical lady but may also confuse her. The speedometer, numbered in green to 35 mph, orange to 60, and red thereafter, is clear and well placed, but you must spell out each swaying digit to know your speed. The gauges below look like four ribbon indicators but two are actually warning lights in disguise. The **Buick** (below) appeals to the mechanic as well as his wife by combining color with standard instrument markings. The result is logical and pleasing, though the various meanings attached to the colors might be somewhat confusing.

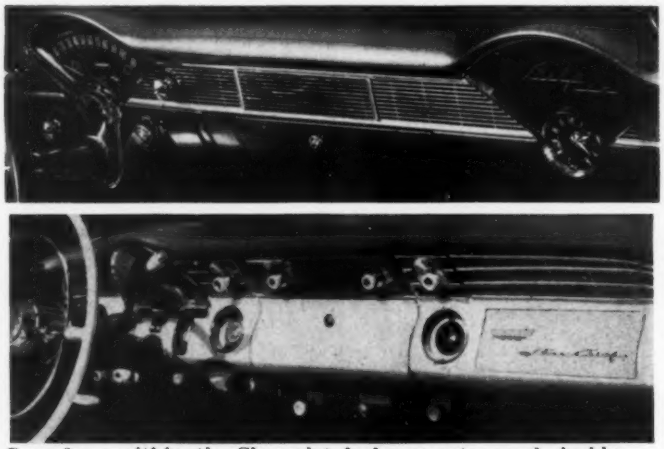


Gear shift



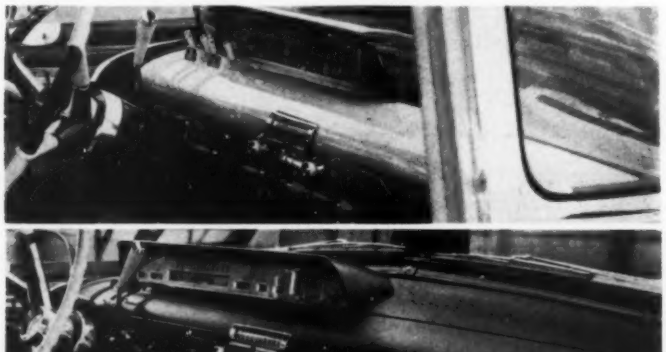
It seems quite possible that the use of a lever for automatic shifting will soon be outmoded. It is never easy to move a lever through a series of positions: disproportionate effort is required to avoid overshooting the mark, and a second look is usually necessary to make sure the move was accurate. By contrast, the new pushbutton shifts require one glance and minimum effort. Packard's control (top), in the familiar right-hand position, is hard to get at under the wheel; Chrysler's left-hand shift (bottom) may prove more convenient in the long run.

A glance at the mobile divan at left shows why the topography of the dashboard is so important to safety. Like most American cars, Chevrolet has a long steering post to give front-seat passengers plenty of room to relax in. As a result, if the car stops suddenly passengers have nothing to brace themselves against: they are literally thrown at the dash.



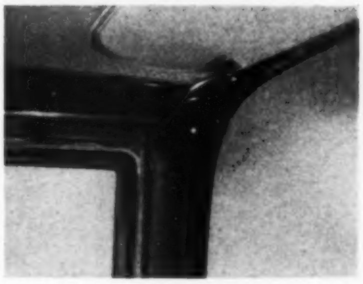
Seen from within, the Chevrolet dash presents an admirably clean and unmenacing surface (top). Pontiac's panel is recessed to keep a scattering of knobs out of the way of a hurtling passenger (bottom). It seems doubtful that the arrangement is foolproof. Many '56 cars have all the knobs behind the wheel, both for safety and for convenience.

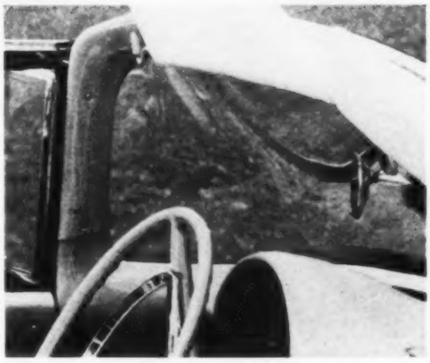
The most harmless dashboard may turn menacing when the ashtray is opened. Car ashtrays are frequently jagged-edged and sticky; while a head-on knock might close them, a side-swipe might not. There are solutions to this problem: Hudson's ashtrays are set in the cowl; Oldsmobile's are recessed—to open them you push in at the bottom.



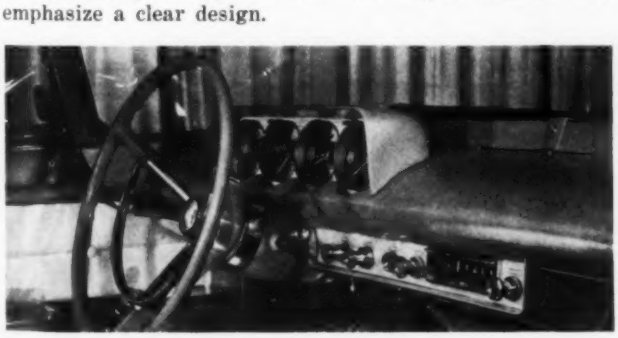
Safety padding, designed to cushion the blow in an accident, has everyday advantages as well. The reflections on a shiny painted dash are tiresome and confusing, and therefore dangerous. Padded surfaces are especially absorbent.

Joining

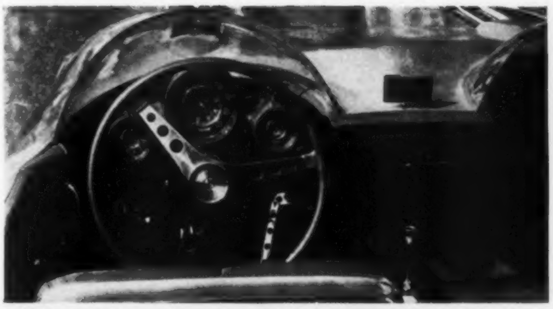




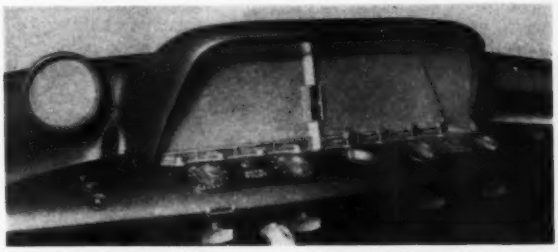
The unsightly collection of haphazard and ill-fitting joints shown above was chosen at random from publicity photographs of low-priced and high-priced cars. Some could be ascribed to bad workmanship, but a designer should know his workmen, and we are inclined to say they result from bad detailing. Often the failure seems to stem from a desire for continuous curving surfaces and a consequent reluctance to let joints coincide with the meeting of planes. Often, too, there is an inexplicable disregard for harmony among shapes and patterns. The Continental (below) is the only American car with an appearance of workmanship. Although it is the most expensive car on the market, the elegance of its interior is as much the result of design as craftsmanship. The joints look neat largely because they emphasize a clear design.



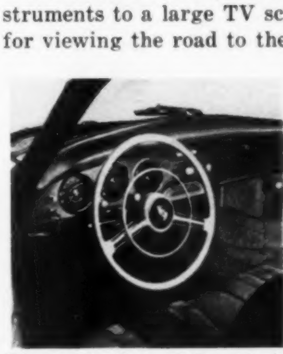
Influences



Presumably "experimental" cars give the purest expression of Detroits feelings about what dashboards should look like if nothing mattered but looks. Both Pontiac's Club de Mer (top) and Chrysler Corporation's Flight Sweep I contrast chunky, official-looking dials with a light wheel. Though either might be feasible in a stock car, the elaborate precision of their instruments is better suited to the laboratory than the quick pace of the road. It is interesting that among standard cars, Continental comes closest to this look.



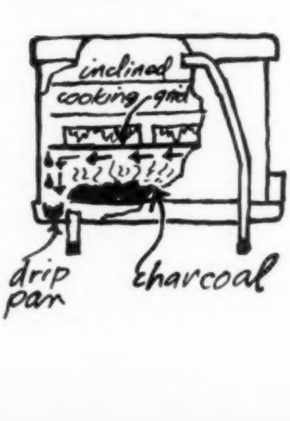
GM's Firebird III (above) subordinates the standard instruments to a large TV screen and a closed-circuit system for viewing the road to the rear.



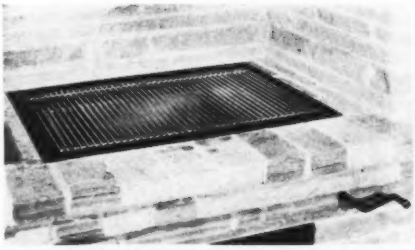
The restraint of Porsche's dashboard (left) is typical of European cars, which seldom deviate from a sensible arrangement of round dials and plain knobs. The bold loop of the new Citroen's wheel gives many window shoppers the willies, but it must improve visibility.

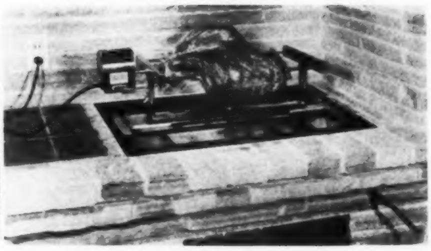
Barbecues not only continue to boom, but they seem to be getting better. Now that brazier manufacturers feel assured that open-fire cookery is a serious trend, they have projected the outdoor gourmets' serious interest in tastier results into more comprehensive designs, more ingenious devices. These must serve the principles of good charcoal cuisine, which are not difficult to engineer directly into the grill: 1) Heat must be controlled: easiest way is to vary distance from food by making one of two elements adjustable—the fire-box or the grill. 2) Ventilation must be controlled: too much draft will make a fire too hot for cooking, while too little will make it hard to start the fire. 3) Drip must be controlled: fat falling into the fire creates smoke that gives meat an acrid taste. This season's solutions range from elaborate and complete outdoor kitchens to simple but intriguing barbecues like the Cal-Dak Porta-grille. The variations between these two are numerous, and express particular concern this year for ways to make heat controllable. On the whole, barbecues in '56 are more scientifically conceived instruments and it shows in the fact that they look less like an accidental accumulation of pieces.

Cal-Dak Porta-grille, one of the best of the simpler new units, was worked out by barbecue expert General Harold A. Bartron and designer Melvin Best. *The grid has three levels of adjustment,* which makes it possible to select cooking temperature within 25 degrees, with a range (360, 400 and 440 degrees) that is sufficient for successful barbecueing of almost any meats. *Fat is prevented from dripping into fire* by a grid that is inclined and grooved, causing grease to flow along the underside of the rods and fall into a small drip pan at the back. A handy fire starter which confines flames to a small area makes it easy to ignite briquettes on the shallow flat base even in a high wind, and no amount of wind will blow it out because it operates like a chimney. The complete unit, including thermometer and fire starter, retails for $19.95.



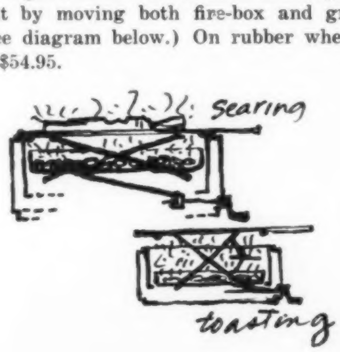
On the opposite page we have included the deluxe approach — portable outdoor kitchens that have everything including storage space and spice shelves. Overleaf are a variety of intermediate solutions plus some new cooking features. In each case the manufacturer's aim is obvious: a better barbecue for a better meal.

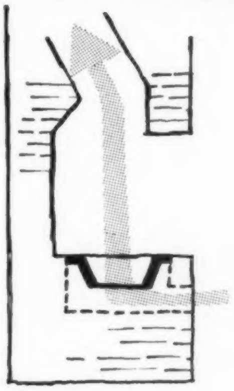




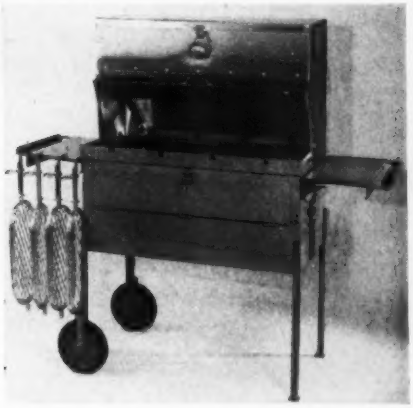
▲ **Goodwin's** built-in Hacienda is a basically simple architectural concept which can be installed in an indoor or outdoor fireplace. A special door is not required: a crank mechanism raises and lowers firebox, which is cleaned from the top. Air vents in the fireplace provide draft. (See diagram at right.) Basic unit, including folding skewer supports, $33.50.

▲ **Eclipse's** Imperial DeLuxe model is elaborately accessorized with electric motor, spit, hood and ample storage space. An ingenious double-action crank adjusts heat by moving both fire-box and grill. (See diagram below.) On rubber wheels, at $54.95.





▼ **Big Boy's** super deluxe model tackles everything including the drip problem. A steel baffle tray suspended under the grill catches drippings, drains them into glass jar. Crank adjusts fire box. Equipment includes motor and warming oven. $299.95.



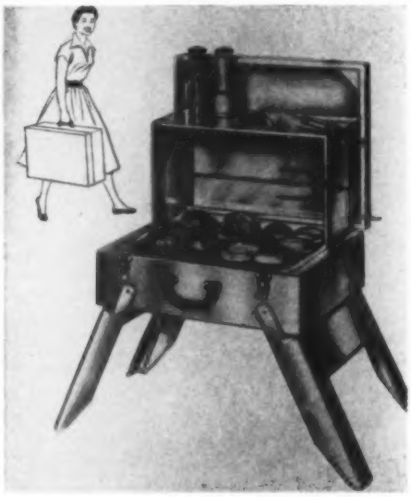
▼ **Jeff Lowry's** Texan Broil-O-Kart will serve a party of 20. Four basket grills allow searing and turning meat without using a fork. Firebox adjustment is 6½". The stainless steel hood is equipped with warming oven and heat indicator. Finished in green hammertone. Under $200.

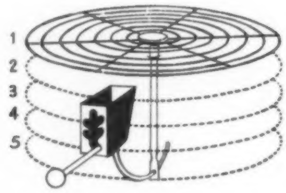
▲ **Royal Chef's** luxury grill, designed by Painter, Teague and Petertil, has crank-type firebox adjustment, roll top hood for smoke cooking, warming oven and a hinged door for access to fire. In black and coppertone, it boasts enormous storage space and side panels which can be raised for working surfaces. $109.95.

Manufacturers experiment with adjustment mechanisms — and other features

▲ **Majestic's** fireplace unit features a unique grilling surface. Tapered and notched bars minimize contact of food and metal, allow more direct heat to reach meat. Bottom grate can be adjusted for wood or charcoal burning, and doors are equipped with draft regulators. $40.

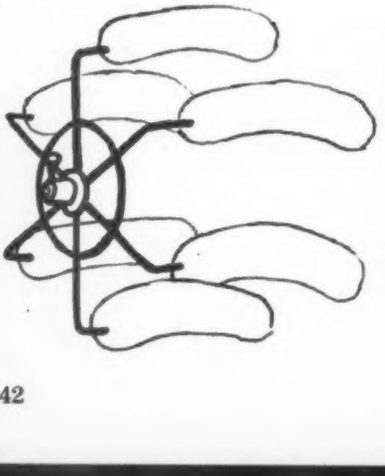
▼ **Kamkap's** aluminum Suitcase grill holds picnic food and supplies when closed. Open, it provides a complete grilling surface and spit. $24.98.





▲ **Royal Chef's** handsome smoker brazier is constructed of heavy gauge steel and comes with a coppertone smoker ring and cover. Grid lowers inside firebowl by means of a notched device, "Kwik-Flik" grid control (see diagram), which adjusts to five positions. Equipped with electric motor and spit, it retails at $31.95.

▲ **Big Boy's** slanted "Flip Grill" holds up to 20 hamburgers, all of which can be turned simultaneously. The grill is engaged in a series of holes at varying heights around the circumference of the stainless steel wind guard. Slant allows drippings to run off ends of grill rods. Unit may be used as a rotisserie by adding spit and motor. $24.95.



▼ **U. S. Associates** have produced a portable barbecue accessory called the "Roto-Wizard" which will turn a spit or Shish Ka-Bab Wheel (see drawing) for six months of weekends. Easily attached to grill or fireplace, the motor is constructed of diecast metal, operates on flashlight batteries. $17.98.

▲ **Desert Ray** Jet Flame Barbecue is equipped with a gas igniter (attached to tube projecting at bottom) that will get fire going in 90 seconds. Steel Copperlyte hood has heat indicator, is hinged in center for convenient opening. Grill is adjustable, has grease diverter. $44.95.

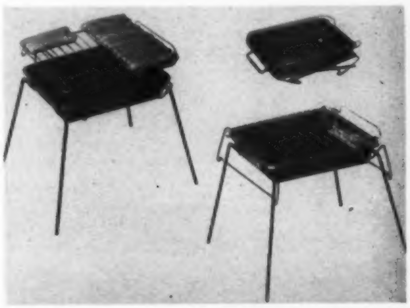
↑ **Pollard Co.'s** Bar-B-Grate is a combination barbecue and fireplace grate. The chrome grill raises or lowers six inches to six positions by lever action. When barbecue attachments are removed it converts into a permanent fireplace grate. $19.95.

→ **Mell Hoffmann's** deluxe tripod model, of heavy gauge stamped steel, adjusts grill height by means of a crank operated ball-bearing elevator. The legs are detachable. $18.95.

↑ **Kamkap's** grill will adjust to any height by means of lever type control. The plated legs fold under, are self-locking when opened. A sturdy work tray is attached to the heavy gauge steel bowl. $19.18.

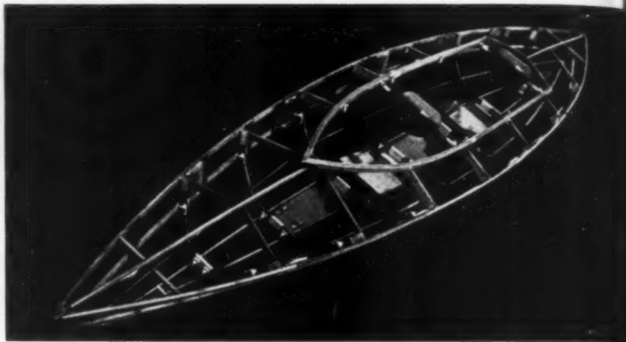
↑ **Union Steel Products** shows an interesting variation on the adjustment feature. Supported by steel brackets, the grill can be stepped down to four positions when it is slightly turned. Parts of a two-piece set called Patio Companions, the heavy steel firepan and the utility unit are on removable legs. $14.95.

→ **Bar-B-Bowl,** an economy barbecue with folding legs, has a reversible grill which will give two adjustments, high or low, for heat control. Equipped with its own carrying carton, it sells for a mere $4.95.



↑ **Virgo's** Stowaway grill is another example of extremely economical design. Grill height can be adjusted by raising or lowering drop-down bars at the sides. When legs are folded under, the compact little package is 3½" tall. Retails for $1.98.

Pleasure Craft on these pages are not in every case new, but they express a new concern for the boat as a product for everyman — a piece of recreation equipment that is economical, portable, and convertible. Some are for cruising and lazying, some for fast sailing, some for white water (rapids), and one for under water. As a group they display imaginative construction coupled with the use of good materials.

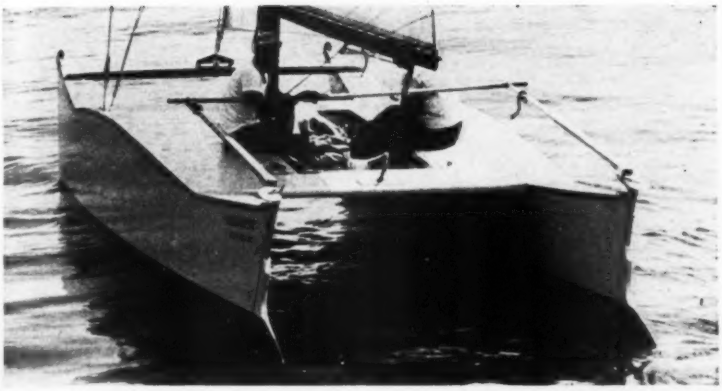


Klepper Co. of New York makes a two-seater foldboat that is practically unsinkable because of two air-filled tubes built around the gunwhales. The 5-ply skin (three of natural rubber alternating with linen and Egyptian cotton) can be patched like a tire if necessary. Extremely shock absorbent, the seasoned plywood and ash frame has 13 laminations per ½ inch of thickness. Ideal for white water paddling, it draws only 4½" of water. With 2 carrying bags, $261. With complete sailing rig $341.

Spalding of New York is showing an inflatable kayak made by Metzler of Munich. Weighing only 35 lbs., Neptun 2 is made of rubber-dipped canvas, has seven separately inflatable air compartments. Two rubber ballast buoys on each side, the bow piece and rudded keel piece are solid rubber, making it collision-proof. $140. One-man model, $89.50.

Folbot Corp's. square-stern runabout is constructed of vinyl-impregnated grass-cloth with a tearing strength of 500 lbs./sq. in. Framework is multi-ply imported birch fitted with brass; deck is closely woven duck in either blue or green. Weighing 98 lbs., it is 15′ long, 43″ wide, and folds into two bags. It paddles, rows, or sails 50 sq. ft. rig. With green deck, $179.

Trail-Craft of Clarksburg, W. Va. designed a versatile boat (left) that doubles as a trailer, tent camp and floating sun-deck. Of all steel-welded construction, it can be sailed, rowed, or motor propelled. It is particularly suited to duck hunting because of shallow draft, and beaching will not damage blue Vinylon finish. $235. With tent and four cots, $324.50. Another pleasure craft on pontoons is "Water-Skeeter," (right) molded by **Dallas Engineers** (Dallas, Pa.) of Bakelite polyester resins and Fiberglas. Each pontoon is 9′ long and bulkheaded into four airtight compartments. Weighing 125 lbs., measuring 66″ across, it is powered either by outboard motor, or by pedals geared with sprocket and chain to paddlewheel in rear. $279.

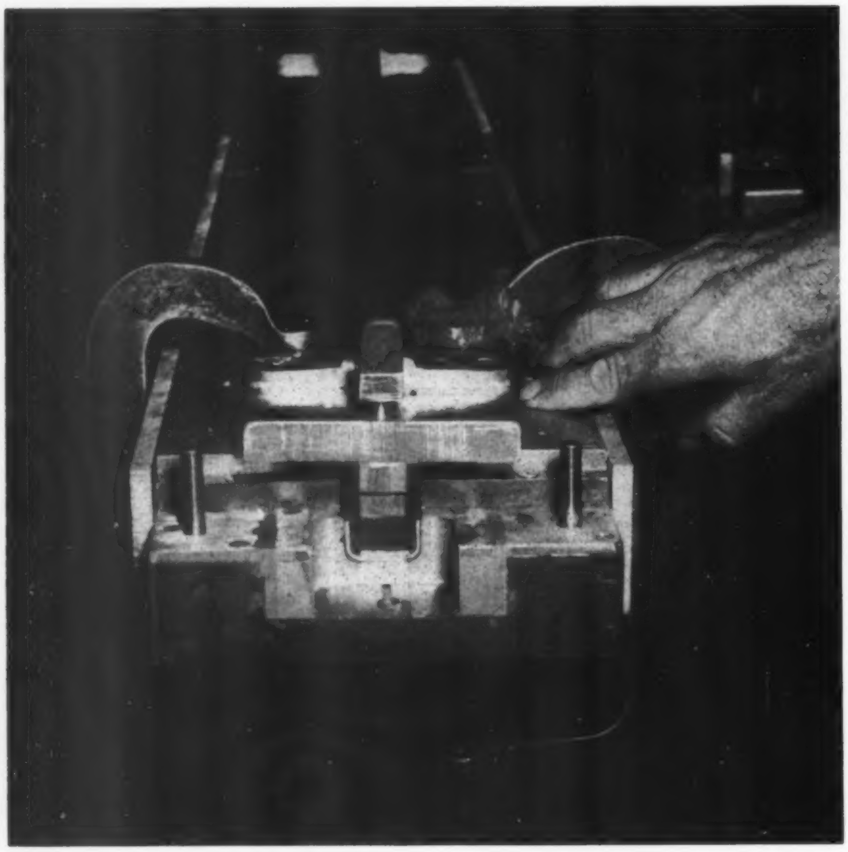


Catamarans, by eliminating ballast necessary in a single-hulled boat, gain both transverse stability and greater riding moment. The increase in stability, which is proportionate to the beam of the boat (not only the outside beam but also the beam of each hull) increases its ability to carry sail. Greater speed, therefore, is coupled with the fact that less weight is needed to keep the sail up. *NARAMATAC,* designed as a day sailer and racing boat by Robert B. Harris of Great Neck, N. Y., is 25 ft. long, sloop rigged, carries a sail area of 272 sq. ft. $3000.

Alcort of Waterbury, Conn. designed the "Sailfish," an elaborate surfboard, for those interested in minimum initial cost, time and trouble in sailing and mooring their craft. Easily transportable, the Sailfish is constructed of fir plywood, oak and Philippine Mahogany. Length is 11′ 7½″, beam 31½″. It carries a 65 sq. ft. sloop rig and has a crew capacity of 300 lbs. Standard kit model sells for $188. Available also factory finished, and plastic-surfaced.

Healthways of Los Angeles is importing the Italian-made "Sea Horse II," a delightful miniature 2-man submarine designed for underwater fishing, exploration, survey or salvage. Operating on a 25 h.p. gasoline marine engine (forward and reverse), it obtains air for combustion through a 60 ft. snorkel. It will carry to 2 gals. of gas, allowing it to cruise underwater 25 miles without refueling. Fifteen feet long and weighing 700 lbs., "Sea-Horse" surfaces and dives on a 2-tank compressed air system. Naturally, pilot and passenger bring their own underwater breathing apparatus. $2995.

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



New precision is given to metal shaping, machine tooling and welding in these remarkable machines. Above is the Lockheed process of shaping sheet metal to high tolerances by means of a "two-way-squeeze" in forming. Below left is the Griscom-Russell torch for delicate welding of tubes with thin walls, and at right the electronic controls of the Inchworm Motor that guides machine tools.

High-precision metal shaping method

Lockheed engineers have developed a method of shaping sheet metal parts to tolerances of virtually ±0 on big presses. Known as compression forming, the development eliminates the need of hand checking and straightening, and is used on parts for high-performance aircraft which require precision manufacturing.

Compression forming represents a new use of the standard rubber hydropress, a huge hydraulic metal-forming machine. A plunger built into the die transmits pressure at 1000 p.s.i. down through a rubber pad to the main body of the pre-formed part. This pressure causes the metal to spread out and fit itself to the over-all contours of the die. A fraction of a second later, a second compressing action is exerted on the outer edges of the part. As a result of this "two-way-squeeze," the part is contoured to the exact shape of the die.
Manufacturer: Lockheed Aircraft Corp., Burbank, California.

Welding precision with new torch

Tubes with extremely thin walls used in nuclear power plants for ship propulsion can now be automatically welded. A torch developed by The Griscom-Russell Co. employs an inert gas tungsten arc welding process and joins tubes for nuclear heat exchangers to a tube sheet with a small bead around the end of each tube.
Manufacturer: The Griscom-Russell Co., Massillon, Ohio.

Microinch tolerances with electronics

The Inchworm Motor is a linear actuator developed by Airborne Instruments Laboratory to fulfill the needs of industry for a powerful feed mechanism that is accurately controllable in the range of millionths of an inch. It has found its first application in the machine-tool field, replacing the lead screws in centerless grinders producing hydraulic components.

The name describes the operation: the Inchworm literally steps along in microinch steps, expanding and contracting like its familiar green namesake. Employing a physical phenomenon called the magnetostrictive effect (see page 92), the armature of the motor shrinks under the influence of an electromagnetic field, snapping back to original size when the magnetic field is de-energized. A pair of clamps operating with the armature convert the expansion and contraction undulations into forward and backward motion.

Advantages of the machine include elimination of massive mounting to avoid vibration problems, of constant checking, and of frictional wear.
Manufacturer: Airborne Instruments Laboratory, Inc., Mineola, N. Y.

Hardware gets smaller and smaller

Terminal lugs and rivets are now being designed for the extremely compact component packages which are realizing increased application. These tiny parts can be seen but only just. They are rather attractive articles in themselves, burnished with 24 carat gold. The terminal lug is designed with a continuous convex curvature throughout its length to provide maximum pressure per unit area by spring tension against the rivet head. Also available are tools for handling these items.
Manufacturer: Circon Component Company, Goleta, California.

Metal tubing bends by hand

A new line of bendable tubing for electrical conduit, air lines, insulating and protective covers is being offered in this country. Three types — all metal, two layers of metal with one of paper, and one layer of metal with two of paper — are exceptionally strong and durable, yet may be bent to installation on the spot or cut with a hacksaw or knife. The tubing is made in a variety of materials for special uses.
Manufacturer: The Flexaust Company, New York, New York.

Brush wire made uniform

By eliminating guesswork and reducing manual operations, the new bunched wire will enable brush manufacturers to produce uniform, balanced brushes more efficiently. The material is expected to have greatest application in high-speed brushes where exact strand count will help guarantee balance. Fifty-pound quantities are wound on a core in continuous lengths to simplify feeding into brush-making machinery.
Manufacturer: Worcester Wire Works Division, National Standard Company, Worcester, Mass.

New material for felt-tip pens

Easy flow of oil-base ink and water-base pigmented ink is made possible by a new blend of wool felt. Used in the new Flomaster Felt Tip Pen, it combines the effects of India ink, charcoal, drawing pencil and brush. Wool with a small amount of synthetic fiber permits writing on metal, paper, wood, glass, porcelain, cloth, and plastics.
Manufacturers: American Felt Company, Glenville, Conn. (felt), and Cushman & Denison Manufacturing Company, New York, N. Y.

Chemical coating by new process

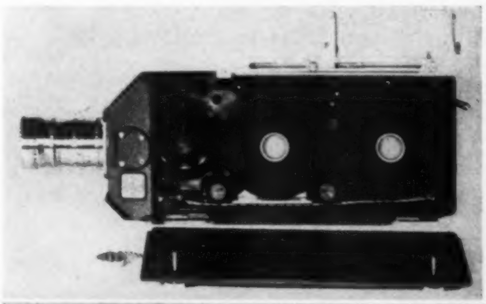
Kanigen is a new method of coating alloys of iron, copper and aluminum for corrosion resistance without electricity. By chemical deposition from solution, large and difficult-to-coat shapes are covered with a uniform layer, obviating the need for special grinding to bring the product to required specifications. Applications include protecting metals against iron contamination, providing aluminum with a soldering surface, and the surfacing of some plastics, glass and ceramics.
Manufacturer: General American Transportation Corporation, Chicago, Illinois.

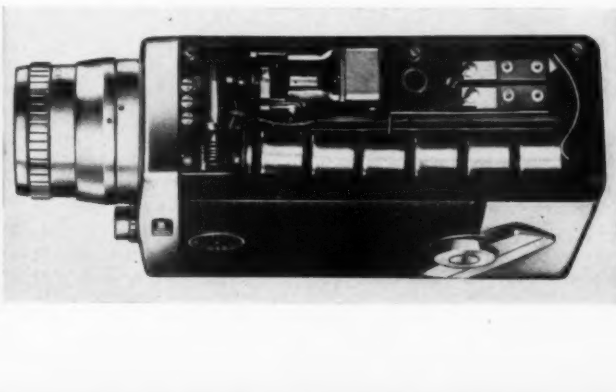
Plastisol with a new wrinkle

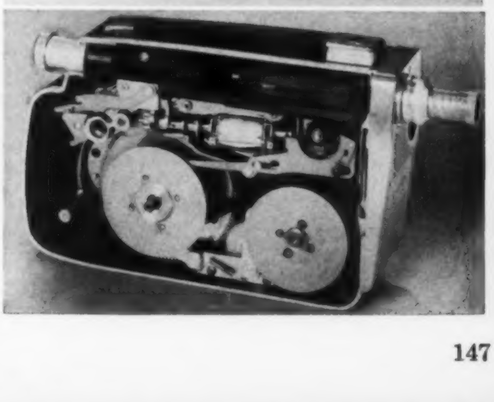
Applied by spraying, a new wrinkle plastisol may find use as a finish for typewriters and other office machines. It has excellent abrasion, perspiration and chemical resistance and is being developed in a full line of colors.
Manufacturer: The Stanley Chemical Company, East Berlin, Conn.

New developments in motion picture cameras

The Bell & Howell 16mm magazine loading camera shown below builds the lightmeter into the camera for fully automatic exposure adjustment. An "electric eye" adjusts the lens iris to varying outdoor and indoor light conditions, and changes the opening as the light intensity changes. The amount of light striking the reticular lens is transformed into electrical current—the more light, the more current. Like the human eye, the iris of the lens contracts in bright light, dilates as the light decreases. Shown at right is the Fairchild "Motion Analysis" Camera which is capable of taking 5,000 pictures per second (the Airborne model takes only 2,000 per second), and at lower right is the Eastman-Kodak "Neg'ator" motor which provides more film per wind and requires less space than previous models in the same class.





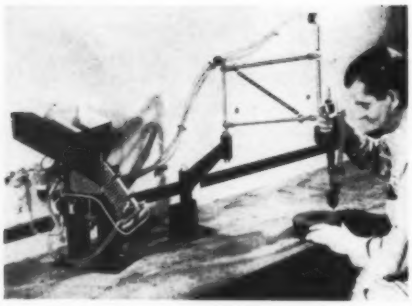


Yet another scraper, but . . .

A white epoxy resin which forms a permanent bond with metal and wood makes possible the manufacture of a contour scraper that does not require the use of dangerous and messy blades. Its twenty-six prongs travel over flat and irregular contours without damaging the surface, flexible enough to give with the curvature and yet firm enough to dig down into the grooves. Available imbedment materials were found unsatisfactory for joining the metal prongs to the handle, and the new liquid epoxy offered the required durability, firmness and flexibility.
Scraper manufacturer: Rerecich Company, Brooklyn, N. Y. Resin manufacturer: Marblette Corporation, Long Island City, N. Y.

New connector for outdoor systems

Kaiser's "ALCUnectors" are handsome electrical connectors for joining aluminum to copper conductors in severe natural environments. Extensive tests show that they resist galvanic corrosion better than previous methods of joining, and outlive the conductors which they join. In one form it consists of deep aluminum and copper cups butt-welded together at the closed ends and hermetically sealed in a rubber ball and cement union.
Manufacturer: Kaiser Aluminum and Chemical Corporation, Oakland, California.



Tool mount both free and fixed

"Radarm," the invention of Edgar Moore, a Canadian engineer, is a fundamentally simple production aid of great versatility. The suspended tool swings overhead freely from a position above the work table, while the design of the arm makes it possible to maintain the same angle of operation on successive pieces. Fitting a wide variety of portable tools by means of a self-aligning clamp, its construction reduces breakage, operator fatigue and surface marking. Ball bearings are used throughout, and the adjustable arms are maintained in desired tension by springs of various sizes required to accommodate tools of different weights.
Manufacturer: Pneuma-Serve, Inc., Cleveland, Ohio.

Non-woven fabric for industry

Lantuck, as the new material is called, is specially finished to take clean, sharp imprints and comes in an unlimited fiber variety. Random distribution of its fibers makes for balanced strength as reinforcement, not only for noiseless gears and other mechanical parts but for shoes, handbags, clothing and luggage. Although non-woven fabrics have been in existence for more than eight years, this one is produced by a new process which is applicable to an unlimited variety of natural and synthetic combinations. Instead of the customary method of combing card-webbed fibers in a parallel direction, the new material forms a web in a random pattern of individual fibers.
Manufacturer: Wellington Sears Company, New York, New York.

Engraving machines at lower cost

A new French machine, of novel design and unusual compactness, promises to solve the majority of engraving and copying problems that heretofore required specialized equipment and skilled labor. The models for three-dimensional and two-dimensional work are capable of engraving in relief or intaglio and can be used on such widely different items as die casting molds, signs and printed circuits. No special skill or training is required to operate it.
Manufacturer: Scripta Machines, Paris, France.

Fuse with six lives

The manufacturer tells us that this is "the most important news" he has ever released, but the interest lies in psychological rather than technical matters. The chore of locating and replacing a blown fuse may be "frightening and dangerous" for some people, but the security offered in this automated fuse is based on the very simple idea of switching off from one circuit (the broken one) to another—inside the same

fuse. Each fuse is good for six blow-outs. And for locating it, if you haven't a flashlight, there's a "tiny neon beacon that guides you straight to it." It's quite like TV, in fact: you just switch from one "channel" to the next. The TV set upstairs will then go on again. Each capacity-size of fuse comes in a different color to prevent interchanging.
Manufacturer: A. Lawrence Karp, Greenwich, Connecticut.

Bringing the work to the drill

A new radial drilling machine reverses the conventional procedure of swinging the tool into position over the piece, by incorporating a fixed arm design with a motorized table that moves the piece into position. The advantage of this arrangement stems from the rigidity of the tool mount during the drilling itself: as part of a highly supported mounting, the spindle is extremely resistant to torque-loosening, friction and vibration, and it is therefore capable of drilling and boring to high precision. Further, the spindle is specially fixed in its quill so that it never leaves the quill guide throughout the entire length of its stroke. Since the greatest possibility of error occurs at the moment of entry of the drill into the material, this extra rigidity is important for close tolerances.

The fixed arm remains at the same height throughout the operation, and can be swung 360° into position. The table is, on the other hand, the main positioning agent in the operation; it, too, can be swung through 360° and moves vertically on the column (placing the workpiece at the appropriate height).
Manufacturer: S & S Machinery Company, Brooklyn, New York.

Nickel and brass coated wire offers advantages

Steel wire that is coated has both resistance and decorative characteristics for many applications

Steel wire coated with nickel and brass is now commercially available for applications where corrosion resistance and appearance are important factors. Produced by the National-Standard Company, nickel-plated wire can be used in the lamp, radio, and television industries as grid supports, lamp leads, and small parts. It is strong, corrosion resistant, and has a lustrous finish and, as it is steel jacketed with nickel, saves as much as 95 per cent nickel metal over standard nickel wire. A coating is deposited directly on rod or wire and the material is then drawn by conventional methods to finished sizes which range from 0.010-inch to 0.310-inch. The wire is known as Fernicklon and is available in bright or mat finishes and, it is reported, can be annealed, shaped, and worked without chipping or flaking the coating. It has been used to replace stainless steel in automobile antennas, indoor television antennas, and other applications where a decorative finish that resists tarnishing is desirable. Pre-plated wire is especially advantageous for certain spring products: closely coiled helical springs that are coated after forming, for instance, do not receive protection where adjacent coils are close together or in contact. Brass-coated wire is also available in sizes from 0.072-inch to 0.310-inch, but is recommended only for decorative effects in the furniture and accessories field, such as curtain rods, drapery hardware, indoor television antennas, and fireplace equipment and grilles.
Manufacturer: National-Standard Company, Niles, Michigan.

New type of floats made of unicellular rubber

Sealed-cell rubber floats will not fail due to puncture and can be used in many liquids

Floats made of hard unicellular rubber sponge that are suitable for use in water, oil, gasoline, or other liquids over a wide temperature range are being made by the Parker Appliance Company. The material is of minute, sealed-cell structure, and, according to Parker, is lighter than cork, resists fungus growth, needs no protective coating, maintains stable weight and volume, and is not subject to water-logging. The new floats can be drilled and machined and, unlike metal floats, will not fail because of puncture or vibration.
Manufacturer: Parker Appliance Company, 17325 Euclid Avenue, Cleveland 12, Ohio.

Portable water-cooling tower is versatile

Completely equipped water tower can be shipped as a unit for immediate use almost anywhere

A water-cooling tower that is portable and can be shipped as a unit containing an entire cooling plant is being made by the Badger Manufacturing Company. The unit is presently being used in conjunction with portable oxygen-generating plants in remote locations and, according to the manufacturer, may well be the answer to the need for water cooling facilities in many water-starved plants in the United States and abroad. The unit is on wheels and is equipped with all necessary accessories such as pumps, strainers, electrical control equipment, pressure gauges, and thermometers. It is designed for a capacity of 240 gallons per minute of 115°F water reduced to 90°F. Constructed of steel, the tower is packed with 20-inch Fiberglas.
Manufacturer: Badger Manufacturing Company, Cambridge, Mass.

Manufacturers' Literature

Blue Print Holders. Momar Industries, 4323 West 32nd St., Chicago 23, Ill. Information and pictures are available on two types of large blue print holders, which hang the prints by clamps that do not pierce the material.

Carbide Compositions. Kennametal Inc., Latrobe, Pa. 44 pp., ill. Prepared specifically for design engineers, "Designing with Kennametal" provides mechanical information required to design parts using cemented carbides.

Defense Research. Avco Manufacturing Corp., New York, N. Y. 60 pp., ill. A handsome coverage of research in communications, aviation, power and human engineering.

Electrical Motors. U. S. Electrical Motors, Inc., Box 2058, Los Angeles 54, Calif. 8 pp., ill. A catalog of the line of open-type Uniclosed designs, totally-enclosed and explosion-proof types, Varidrives, Synchrogears, and right-angle worm gear models.

Glass Cloth Laminates. Dow Corning Corp., Midland, Mich. 4pp., ill. A brochure on glass laminates bonded with silicone resins, with a list of current manufacturers and fabricators of such laminates.

Industrial Lighting. Smithcraft Lighting Division, Chelsea 50, Mass. Two 4 p. folders. Described are heavy-duty fluorescent lighting fixtures and Mercury fluorescent lighting. Includes photometric data and specifications.

Lumber. Small Homes Council, University of Illinois, Urbana, Ill. 8 pp., ill. Free until Sept. 1, then 10 cents. Gives essential facts about lumber and its use in home building, for selecting materials for particular purposes.

Pattern Metals and Decorative Glass. Croname, Inc., 3701 Ravenswood Ave., Chicago 13, Ill. Two 6 p. folders. Discussed are the use of stock embossed patterns for decorative trim and the application of decorative glass.

Perforated Materials. The Harrington & King Perforating Co., 5664 Fillmore St., Chicago 44, Ill. 128 pp., ill. A general catalog of standard patterns, with complete information on sizes, centers, open area, and fabrication facilities.

Polyester Molding. Interchemical Corp., Finishes Division, 224 McWhorter St., Newark 5, N. J. A brochure of bulletins on "gunk-molding" of reinforced polyester resins, discussing physical properties, methods of handling and accessories.

Precision Fasteners. Standard Pressed Steel Co., Box 883, Jenkintown, Pa. 30 pp., ill. A catalog of fasteners and pressed steel shop equipment, including tables of specifications and dimensional drawings.

Seamless Steel Rings. ALCO Products, Inc., Box 1065, Schenectady, N. Y. 16 pp., ill. A description of production of seamless forged and rolled rings, with a chart of specifications.

Vibration and Shock Control. T. R. Finn, Inc., Industrial Division, 200 Central Ave., Hawthorne, N. J. 4 pp., ill. Describes the basic theory of vibration isolation and shock absorption, with basic data, formulae and graphs.

Welding Alloys and Equipment. Weldaloy Products Co., 11551 Stephens Drive, Van Dyke (Detroit), Mich. 54 pp., ill. A catalog of welding electrodes, accessories, and materials, with recommendations on special alloys.

Index to Advertisers in This Issue

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Miscellaneous

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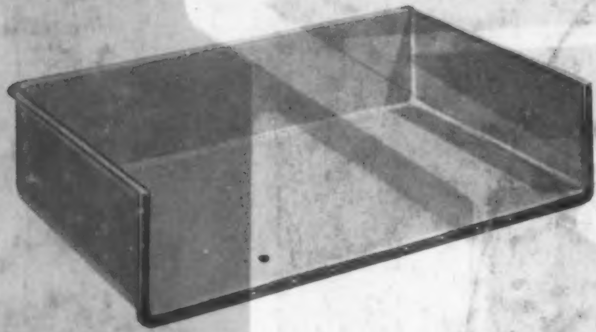
For Your Calendar

August 14-September 30. Society of Typographic Arts. Exhibition of designs from Society of Industrial Artists, London. Normandy House Gallery, Chicago.
August 21-24. Western Electronic Show and Convention. Pan Pacific Auditorium, Los Angeles.
August 25-September 9. National Home Furnishings Show. New York Coliseum, New York.
August 29-November 4. American Fabrics Exhibit. Museum of Modern Art, New York.
September 9-13. Superama. National Supermarket Non-Food Exhibit. 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.
September 16-October 22. Italian Arts and Crafts. Smithsonian Institution Traveling Exhibition. University of Georgia, Athens, Georgia.
September 17-21. Instrument Society of America. Eleventh Annual International Instrument-Automation Conference and Exhibit. New York Coliseum, New York.
September 20-24. Motion Picture Industry International Trade Show. New York Coliseum, New York.
September 24-28. 1956 Trade Fair of the Atomic Industry. Navy Pier, Chicago.
September 25-27. Atomic Industrial Forum Conference on "Management and Technology for the Atomic Industry." Morrison Hotel, Chicago.
September 25-28. Iron and Steel Exposition. Public Auditorium, Cleveland.
September 27-30. National Meeting of American Society of Industrial Designers. Lake Placid Club, Lake Placid, N. Y.
September 27-30. Institute of High Fidelity Manufacturers. New York High Fidelity Show. New York Trade Show Building, 36th Street and 8th Avenue, New York.
October 1. Society of Typographic Arts. Work of Jacques Nathan-Garamond, Industrial Designer. Normandy House Gallery, Chicago.
October 1-5. National Hardware Show. New York Coliseum.
October 1-22. Recent Work by Harry Bertoia. Smithsonian Institution Traveling Exhibition. San Francisco Museum of Art, San Francisco.
October 1-31. European Glass Design. Smithsonian Institution Traveling Exhibition. Toledo Museum of Art, Toledo, O.
October 11-12. Society of the Plastics Industry, New England Section Conference. The Wentworth Hotel, Portsmouth, New Hampshire.
October 14-16. International Sanitation Maintainence Show. New York Coliseum, New York.
October 15-19. National Business Show, New York Coliseum.
October 17-19. Convention of 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.
October 22-26. National Industrial Development Exposition. Detroit Artillery Armory, 8-Mile Road, Detroit.
November 12-16. National Industrial Development Exposition. New York Coliseum.
November 26-30. National Exposition of Power and Mechanical Engineering. New York Coliseum.
December 4-5. Seventh Society of the Plastics Industry Film, Sheeting and Coated Fabrics Division Conference. Commodore Hotel, New York.
December 8-16. National Automobile Show. New York Coliseum.



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