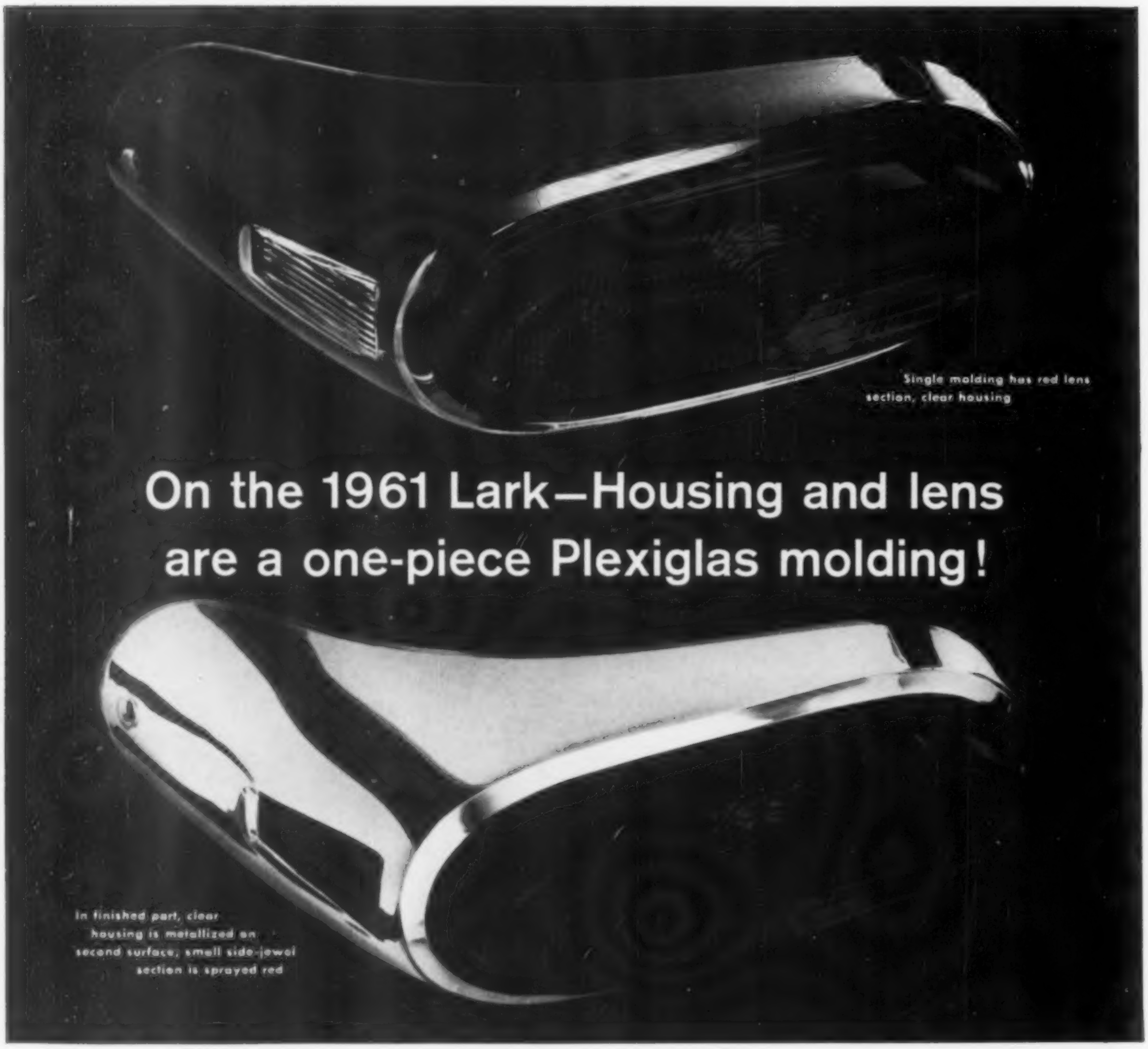
INDUSTRIAL DESIGN

September 1961 $1.50 per copy

The Designer and the Engineer



The 1961 Studebaker Lark one-piece tail light "assembly" shown above is produced by double-molding red and crystal-clear PLEXIGLAS® acrylic plastic. The combined lens-and-housing is a first-time part in the automotive industry.

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PLEXIGLAS

SEPTEMBER, 1961 VOLUME 8 NUMBER

9

INDUSTRIAL DESIGN

Published for active industrial designers and the executives throughout industry who are concerned with product planning, design development, and marketing

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COMING

IN OCTOBER—*Packaging with films*

IN NOVEMBER—*Finishing metal with metal*

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FRONTISPIECE: Model of Donald Deskey Associates' cubed structure for displays in Seattle's Century 21 Exposition to be previewed next month.

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COMING IN THE DECEMBER 1961 ISSUE OF INDUSTRIAL DESIGN.

8th ANNUAL DESIGN REVIEW

An informative review of the year's production, and a valuable permanent reference, it will feature products that are outstanding because of:

- new functional improvements
- notable solutions to familiar problems
- solutions to new and unique problems
- engineering developments
- apt use of materials, components, finishes
- effective merchandising ideas
- innovations in product form

The Annual Design Review, to be published in December, is a portfolio of the year's major design achievements in consumer products, packaging, professional and industrial equipment, materials, architectural components, and programs and devices for selling and corporate identity.

INDUSTRIAL DESIGN

INDUSTRIAL DESIGN

...the magazine for the men whose decisions today shape the products of tomorrow

.........A suggestion

Possibly your 1961 advertising program has been held up wholly or in part but you are now in a position to make up lost ground.

If so, substantial use of the advertising pages of our December issue is suggested.

If the past is a criterion we can assure you that the 8th Annual Design Review will be read and referred to again and again by the leading independent and company designers here and abroad --- and by the manufacturers of the some 300 products and packages that will be shown and described -- and too, by the competitors of these manufacturers.

Your advertisement in this long-lived issue will be noted repeatedly by the men who design products and packages and who specify the materials and processes for these products and packages.

> ".....We peruse your magazine in depth....Depth means from cover to cover and includes a good look at all ads....When we find a material's information in your magazine, we pay special attention to it."
>
> Robert Sidney Dickens, ASID/PDC
> Dickens Incorporated

> ".....I examine your book carefully for news and announcements about new materials, adhesives, inks and closures that help me to design from the beginning".
>
> Morton Goldsholl
> Morton Goldsholl Design Associates, Inc.

> ".....I personally feel that package material advertising would be a welcome addition to the magazine, especially that which deals with new materials and processes".
>
> Martin Schnur
> Schnur Appel

Closing Date: November 10th, 1961

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Whitney Publications Inc.
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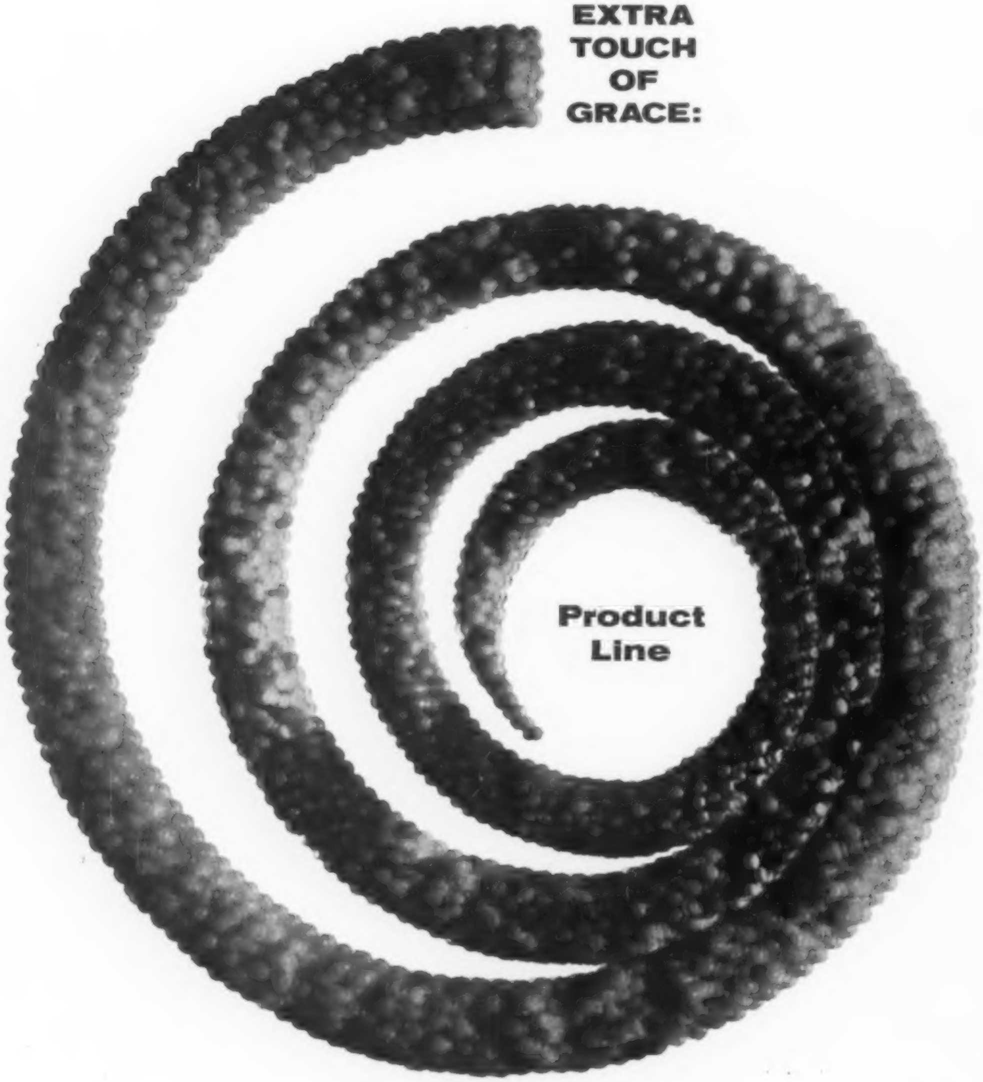

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INJECTION MOLDING: Housewares, toys, appliance and industrial parts; flame-retardant high density polyethylene for special applications; materials handling devices, such as tote boxes.

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Grace polystyrenes include general purpose resins, rubber modified compounds, and graft polymers. Some examples include general purpose crystal for easy and medium flow for thin-wall parts; heat resistant crystal for housewares; modified medium impact compounds for packaging applications; modified high and high-medium impact compounds for housewares, industrial goods. Also available are sheet extrusion grades for vacuum formed packaging, and high and extra high impact strength graft polymers for such applications as appliance parts, housings.

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Your Grace representative has all the technical details on the Grace product line. And don't forget to ask him how the Grace Service Plan can help augment your own organization in these other important service areas: market research, product design, mold design, market development, technical service, product and industry information, financial counseling, delivery and merchandising. Find out how to put that extra touch of Grace to work for you.

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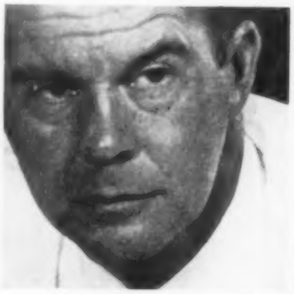
GRACE PLASTICS

IN THIS ISSUE

Brandenburger

Sooy

Stone



Clement

Stevens

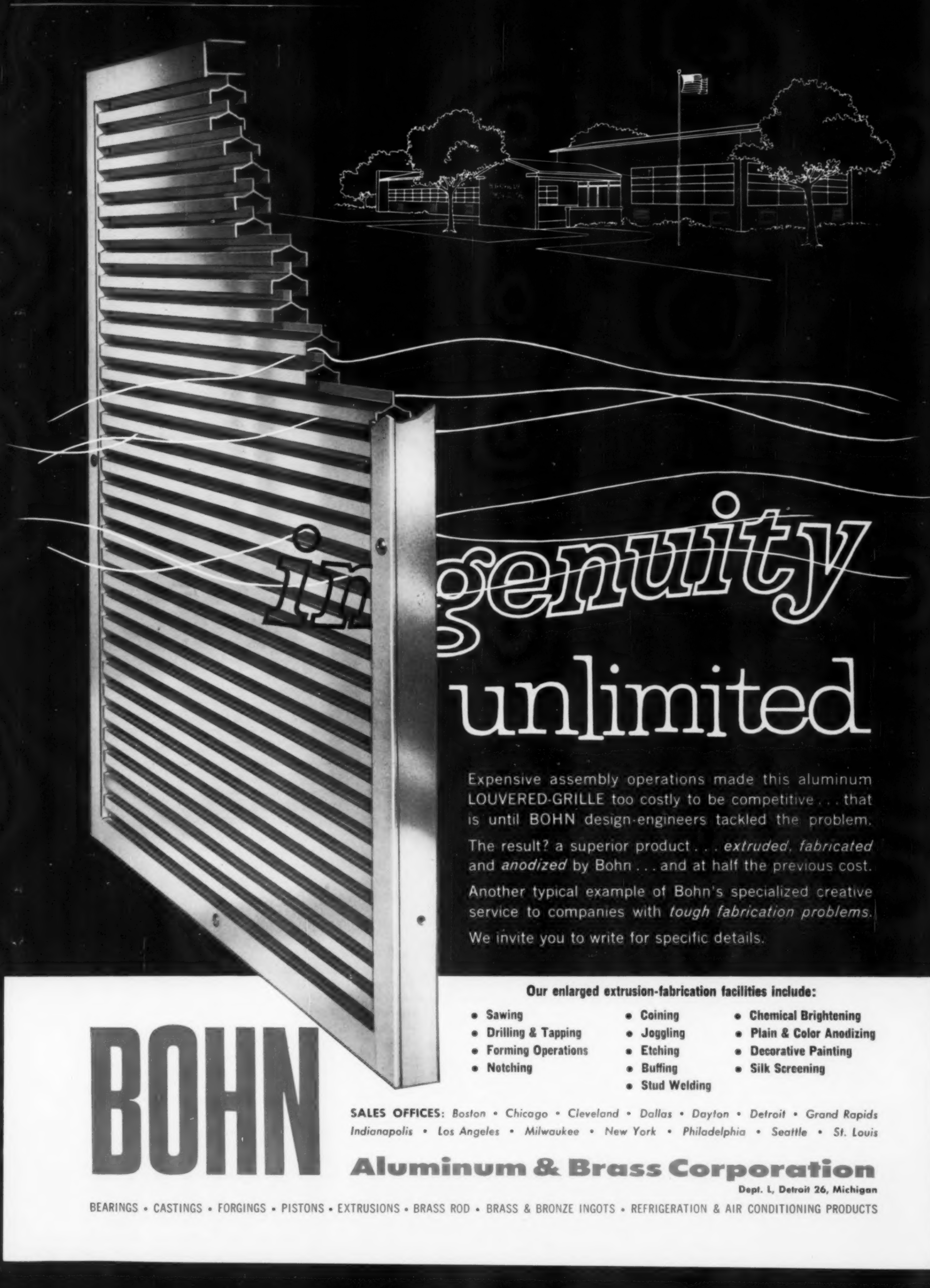
Leo J. Brandenburger, author of the article on engineering in design education (page 74), has ample background from which to draw his material. He did his "field work" during six years as associate professor of design at the Philadelphia Museum College of Art, as well as during the years it took to get a B.S. from the University of Utah, an M.S. in mechanical engineering from the California Institute of Technology, do graduate study at Columbia University, and get a degree in industrial design from the Chouinard Art Institute. His engineering and design experience includes six years as a research and structural engineer, and work in the design offices of Howard Ketcham in New York, Fred Storm in Los Angeles, and Carreiro Design Associates (as an associate) in Philadelphia. He is now writing a book on "Aesthetics and Design Through Structure." ID's article will be part of it.

Harry Sooy, package designer and director of technical packaging at Robert Zeidman Associates (page 96), was working in an Atlantic City art studio in 1939 when the war introduced him to technology: he was an engineer on a B-24 and an aerial gunner. Later, in Stalag 17, he returned to art, whiling away the hours between prison-camp duties with sketching. He joined Raymond Loewy Associates in 1949 as a package designer and picked up engineering knowledge on the job. His extra-curricular interests include music, designing hydroplanes and building model airplanes.

Orie Stone, head of Orie Stone Associates, is a consultant packaging engineer (page 100) who became that by slow degrees. When Stone was a student at New York University in the '30's, with an interest in art history and oil painting, he had "no idea that such a field as package engineering existed." Then he got a job with Robert Gair Company in 1935 as a modelmaker, and from there on he learned the business by being in it. His three-man firm, opened in 1956, includes a mechanical packaging specialist and a modelmaker, and develops carton constructions and packaging machinery.

Carl Clement, who introduces this year's WESCON selections (page 90), is chairman of the 1961 WESCON Industrial Design Committee. Clement is a designer whose activities have brought him into considerable contact with engineering. On receiving his degree in industrial design from the University of Washington, he joined the engineering staff of Hewlett-Packard as a designer, and in 1957 became manager of the firm's industrial design department. He is a guest lecturer in design at Stanford University, and he belongs to the Institute of Radio Engineers.

Margot Stevens was an art teacher in the primary schools of Pelham, N. Y. when she assigned her first and second grade classes the project of drawing the machines on page 86. Not exactly an authority on mechanical processes, she has since left teaching because she could not keep up with the mechanics of the profession ("all those student records and order forms for supplies"). A graduate of the Rhode Island School of Design, she has a Master's degree in art education from Hunter College, and is at present doing freelance graphic design in and around New York City.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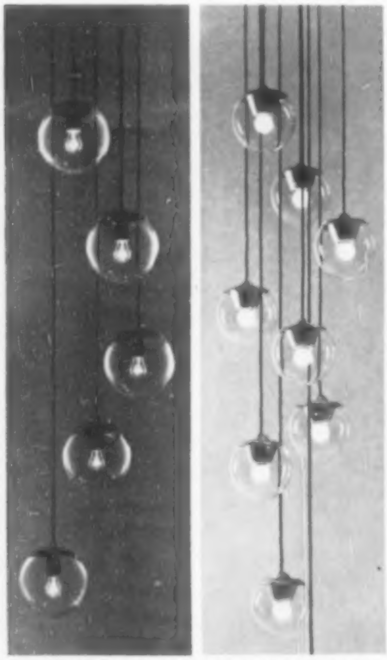
LETTERS

Double Identity

Sirs:

On page 97 of the June issue of INDUSTRIAL DESIGN an iron and glass lamp by Robert Salem was published. We wish to inform you that this is a copy of one designed several years ago by Geno Sarfatti. Regularly since 1957 we have produced this lamp and exported it throughout Europe.

Because we believe your magazine could not support this untruth, we ask



Salemlights (left); Sarfatti lights (right).

you to publish this letter. It is our experience that too often European products are copied in the United States.

Arteluce Soc. Acc.
Milan, Italy

Mr. Salem's reply follows.—Ed.

Sirs:

Arteluce's letter presents a situation that occurs frequently in designing, that being a similarity of solution by two individuals to a single basic problem. The amazing thing to me is that it occurred in two different countries.

I have never found it necessary to copy or adapt another person's design, since I sincerely believe that design is a personal expression and should be respected. I have never seen Mr. Sarfatti's fixture, nor have I had the privilege of meeting him personally.

My intent in designing Salemlights was to create purely decorative lighting—to give the grandeur of simple elegance and warmth that clear crystal can give, with little concern with over-all illumination, which is evidenced by the use of the clear filament bulb.

The crystal spheres were technically developed to overcome the glare factor of a clear filament bulb, and the detailed canopy was designed to carry out the shape of the sphere in order to give the sphere a floating quality.

Robert Salem
San Francisco, California

Protection for the playroom

Sirs:

In an era when few editors consider the broader implications of the material they publish, it was with a sense of relief, as well as pleasure, that I read your July editorial.

The Norden bombsight ad is a classic case of psychological myopia. And there are too many other examples, from advertising to manufacturing, that show the same blind, business-as-usual attitude.

Recently I came across a feature article in a trade magazine telling distributors how to merchandise bomb shelters, including one that can double as a children's playroom. It seemed wacky not to find any implication, or concern, about the kind of personalities children might develop while growing up in bomb-proof playrooms. (But there's no profit in that kind of thinking, and maybe we'll learn a better method to grow a paranoid population.)

I think you put it rather well in pointing out that constructive change involves responsibilities that few are willing to accept. After all, there is always the capo's (concentration camp prisoner-turned-guard) rationalization that "if I don't do it, someone else will." However, as a leading sociologist put it, "If I don't do it, at least I personally will not be responsible for its having been done."

Bernard Landis
New York, N. Y.

Clarification

Sirs:

You are to be congratulated on your interesting and provocative coverage of my talk at the IDEA convention in Pittsburgh on April 7th, and on the excellent comments of a number of educators. There appear to be certain misconceptions, however, concerning some of my remarks and I would therefore like to clarify the ASID position.

1) My talk in Pittsburgh primarily concerned the student-professional-educator relationship as it looks to the practicing industrial designer, and in this connection I touched upon the ASID School Approval Program being organized and developed by the Education Committee of ASID.

2) The program itself is being projected on a two-year basis. The object being to give ample time to both professionals and educators to become better acquainted, adjust their problems to one another, and in this way find a solution beneficial to the student.

3) Unhappily the words "School Approval" seem to have engendered a notable list of misconceptions concerning the ASID's original intent. Therefore at a Board of Directors meeting on August 2nd, the problem was reviewed and a decision made to change the name of the program from "The ASID School Approval Program" to "The ASID Scholarship Guidance Program." The new name to coincide and tie-in with ASID's Scholarship Award plans, scheduled for announcement at the ASID annual meeting in October. This clarification will we hope remove the misconception that we are attempting to accredit schools of higher education in industrial design.

Our primary concern in the beginning, and our primary concern today, is in joining with the industrial design teachers to support and encourage those schools that reflect a social and professional responsibility to their students and to the profession at large.

Raymond Spilman
President, ASID

Errata

The light bulbs used in the Herman Miller showroom (July issue, pages 66-67) were specially coated, rather than painted, with a silvery reflecting band; the process is by Silvray Lighting, the bulbs are by G.E.

The design of the Fairchild rear view projector for 8 mm movies (August issue, page 83) should have been jointly credited to Dan November of the Fairchild staff, and Lippincott & Margulies.

REVIEW: BOOKS

Italian Window Display

Modern Design for Italian Show Windows and Shops. *By Bruno Munari. L'Ufficio Moderno, Milan, Italy. 170 pages. Illustrated in color and black and white. Text in Italian, German and English. Available in America through Wittenborn & Company, New York.* $12.50.

Designers interested in show windows (which happen to be Italian) will like this book for several reasons. Besides dozens of imaginatively designed contemporary windows, it shows interior displays, lighting, signs, and point-of-sale devices with attractive shots of what can be hard-to-photograph subjects. Bruno Munari has not encumbered his book with any text save brief captions, and his one-page introduction remarks merely that displays must be clean, not dusty, and that, among other things, interiors should be "pleasant, well illuminated, without bad smells." He delves no deeper into the complexities of window display—perhaps because it is difficult to go much deeper, at least with words. Good window display can start with such basic rules as the author lists. Beyond that, it will depend on the inventiveness of the designer. And the windows shown here are attractive precisely because they are designed by some of Italy's most imaginative men — Zanuso, Scarpa, Sambonet, Peressutti, Menghi.

It is discouraging to compare the design process behind these attractive windows with that of typical American counterparts (how often nowadays do Dreyfuss, Deskey, or Nelson bother with similar display jobs?). But it is also a mistake. These windows are no more typical of Italy than Macy's or Saks's are typical of America. Those who know Italian design only through magazines may not realize how different—for better and for worse—is the Italian design situation from the American. For example, one is astonished to discover in this book not a single Roman show window! Milan claims 50 of the shops represented while the other 11 are scattered through several smaller Italian towns. This concentration of design business in one city gives a sense of community (along with a sharp sense of commercial intrigue) to the Milanese designer, but for the future of Italian design it can't be healthy. At present a tiny top group of design-conscious Italian firms, represented in this volume by the ubiquitous Olivetti, and by Motta, Pirelli, and Borsalino, buys design from a small top group of Milanese architects. But, for the most part, beyond this rich blend of the cream of Italian commerce with the cream of Italian designers, Italian show window design scarcely exists.—*A.F.*

Compleat Square

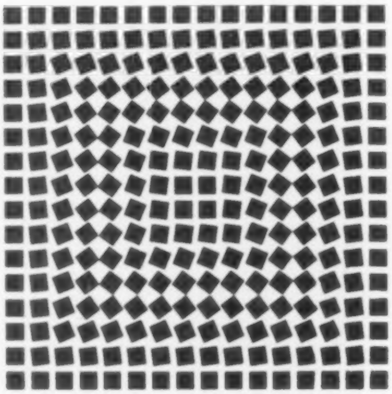
Discovery of the Square (Il Quadrato). *By Bruno Munari. 87 pages. Text in Italian and English. Wittenborn & Company, New York.* $3.60.

Reviewed by William Lansing Plumb

Bruno Munari is known chiefly in this country for his graphic design but in his native Italy he is also known for his many designs of objects based on basic geometric forms. Now Munari has created what is, in effect, "the Compleat Square," a brief encyclopedia of the history, principles, and usage of the square from agora to ziggurat.

For the American reader, the only difficulty is that the text is in Italian. This is minimized, however, by a very readable and accurate translation.

This is not a reference book. It is, rather, a book for the designer who concerns himself with the history of forms in relation to the history of civilization. The subject matter covers the period from the earliest known civilization to the present. The book includes such subjects as the use of the square to determine proportions in ancient Egyptian painting, Leonardo's studies of human proportion, and Corbusier's modulor. It includes such diverse matter as a diagram of the proportions of the facade of the Palazzo Farnese and one of the very few descriptions in Italian of how to do a do-si-do in a square dance.



Experiment in textural variation, Ulm. 1957.

The book's impact is accurately reflected in Belloli's poem on page 13:

the field
square
the square
square
the city
square
the prison
square
the tomb
square
the tent
square
the skin
square
the pupil
square
the square
is
society

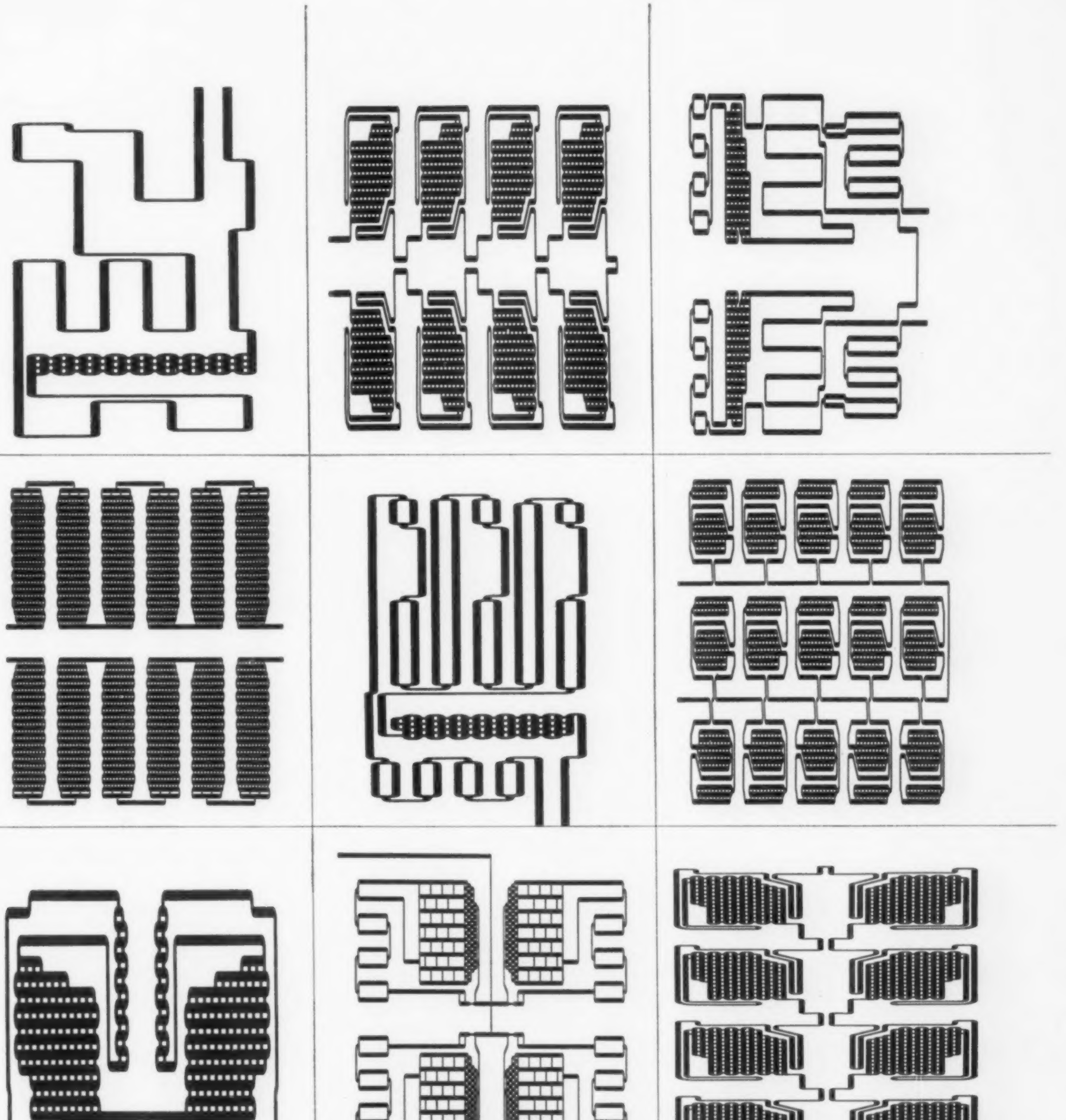
WILLIAM LANSING PLUMB is an industrial designer who has lived in Italy and worked for Gio Ponti, the architects Frattini and Bettonica, and as a design consultant for La Rinascente department stores. He is now with Eliot Noyes & Associates.

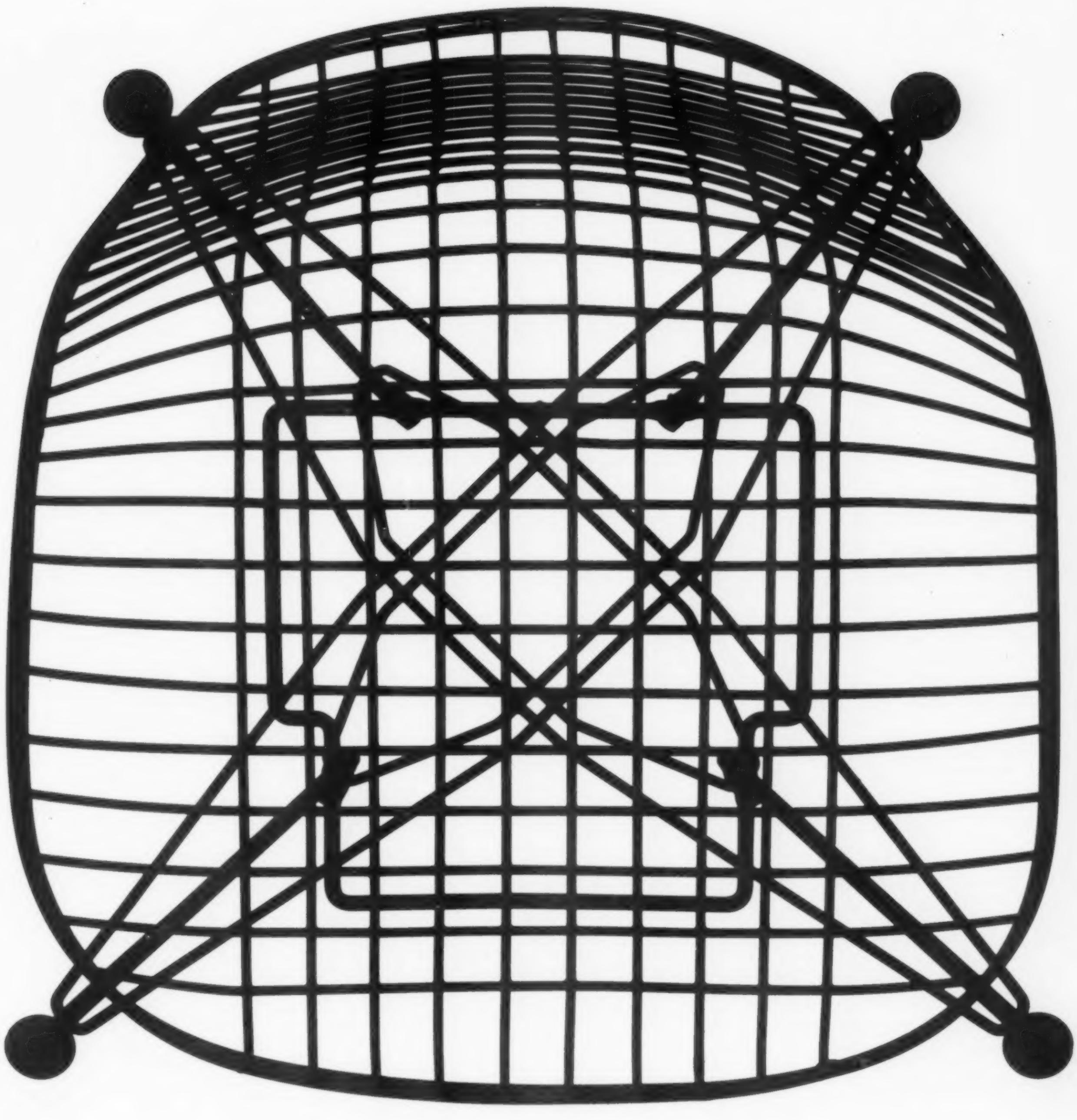
Guide to movie-making

Motion-picture Production for Industry. *By Jay E. Gordon. 352 pages. Illustrated. Macmillan, New York.* $8.00.

This book is designed primarily as a detailed guide for *in-plant* film-making. As such, it is thorough, knowledgeable, and prosaic. It covers all of the steps in standard industrial motion picture production — equipment purchase, script preparation, direction, art, animation and sound, editing, and distribution — and, while it will never inspire anyone to become D. W. Griffith, it does make the point that aspirations of that order will probably not serve the film needs of, say, the Wabash Pressed Steel Company. It cannot, of course, teach anyone how to make a film, but for a company man charged with this responsibility it is a sound, useful working tool.

Unfortunately it promises—and doesn't keep the promise—to be more, namely a "significant aid to the film producer's client." A book like this *could* be such an aid. But this one includes so many circuitous excursions into the obvious, and is edited with such hostility to liveliness, that no one not specifically interested in a given production detail is likely to be lured into reading it. However there is a sensible glossary, a good bibliography that will lead the reader to better books on the subject, and a reference list of films about films.—*R.C.*





NEWS

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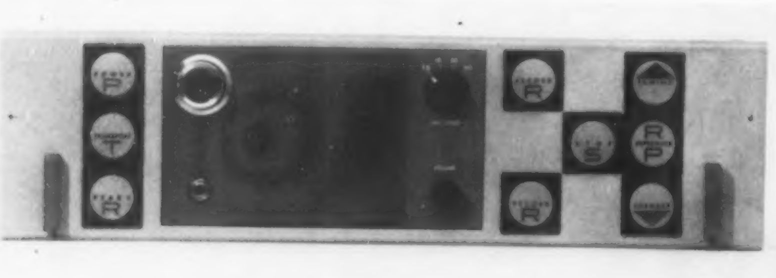

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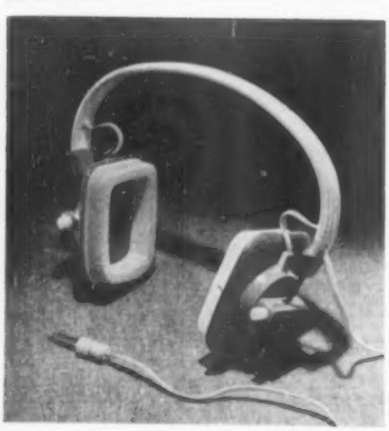
U.S. products in Venice

3



4

Chosen to represent U. S.

Fifteen products, examples of American industrial design, have been chosen by a joint jury of ASID and IDI to represent the U.S. in Venice at the international design exhibition sponsored by the International Council of Societies of Industrial Designers in conjunction with its Second Assembly, September 14-17. The fifteen were chosen from nearly 300 entries covering work done over the past three years. The photographic exhibition was open to 24 member groups in 18 countries.

Selected for inclusion in the exhibit are: the Burrows Equipment Company moisture recorder (left, 3), designed by Latham, Tyler, Jensen; Sylvania's Argus Camera Division slide projector (above, 5), designed by Raymond Grosso of Harley Earl Associates; Gray Manufacturing Company's stereo phonograph arm (above, 1), designed by Peter Quay Yang; Clevite Electronic's brush headphones (left, 4), designed by J. M. Little and Associates; plastic dinner tray and serving accessories for American Airlines (above, 6), designed by Walter Dorwin Teague Associates; Ampex magnetic tape recorder/reproducer (control panel is shown above, 2), designed by Frank Walsh and F. Arden Farey of Ampex.

U.S. Industries Clearing Division's horizontal engine lathe, J. M. Little and Associates design consultants; Ford's 1961 Lincoln Continental, designed by George Walker, Eugene Bordinat Jr., Elwood Engel, John Najjar, Robert Thomas, and Don DeLaRossa; Teleregister's reservation keyset for United Airlines' "Instamatic" system, designed by Laird Covey; IBM core storage unit, designed by C. F. Graser, industrial design manager, and IBM staff; Westinghouse AM/FM radio, designed by Bronislaw Zapolski; Jefferson Electric's desk clock, designed by Dave Chapman and Doug Anderson, of Dave Chapman, Inc.

Kimberly-Clark business papers box, designed by Morton Goldsholl Design Associates; Burgess cellulose marine and household sponges, designed by Dave Chapman and Hal Hester of Dave Chapman, Inc; Johnson & Johnson Micrin bottle, designed by Donald Deskey Associates, Inc.

After closing at Venice's Fondazione Cini Isola di San Giorgio Maggiore, the exhibition will tour Europe.

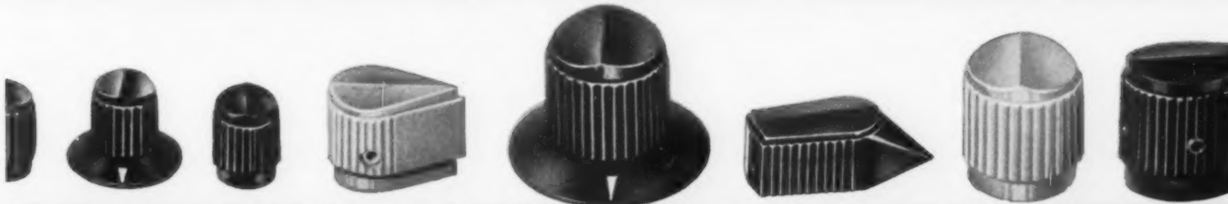
The selection committee was composed of John Griswold, Chairman, Jack Collins, Joseph Parriott (alternate), Jaap Penraat, William Renwick, Peter Quay Yang, Bronislaw Zapolski, and John Vassos (honorary member).

Design conference scheduled

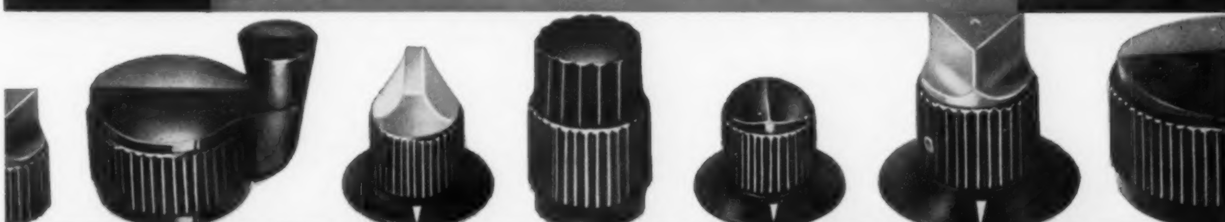
Sponsored by an informal organization of Syracuse University industrial design

(*Continued on page* 18)

TO GIVE YOUR INSTRUMENTS



THE PRECISION-ENGINEERED LOOK



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INDUSTRIAL COMPONENTS DIVISION

alumni, the eighth Annual Industrial Design Conference will be held September 22 and 23 at the Top-o'-the-World hotel at Lake George, N. Y. Topics to be covered include: Plastics in Design; Product "Overdesign"; Electronic Product Design; Human Factors; Machine Esthetics; Quality Control; Toy Design; and Architectural Sculpture. If time permits, a design panel discussion will be held on Saturday, the 23rd. Further information may be obtained from co-chairmen David Chase and Philip Stevens of Stevens-Chase Design Associates, Split Rock Road, Camillus, New York.

Roads on exhibit

Roads — elevated roads, multi-lane highways, interchanges, runways, and roads incorporating buildings and towns — are the subject of a photographic exhibition running at New York's Museum of Modern Art through September 17. One of the newest roads included in the display is the Helicoide de la Roca Tarpeya (below), now under construction in Caracas, Venezuela. It is a shopping center, comprised of a continuous chain of stores, which is formed by a spiralled road built against a hillside and was executed by architects Jorge Romero Gutierrez, Pedro Neuberger, and

Helicoide under construction

Dirk Bornhorst. Also included in the exhibition are New York's West Side Highway, the Rhine Bridge approach in Mannheim, Germany, and an elevated traversing road by Nervi. After closing at the MMA, the show will travel to other museums around the U.S. It was directed by architect-engineer Bernard Rudofsky in collaboration with Arthur Drexler, Director of the Museum's Department of Architecture and Design.

Inpak forum

"Management's Role in Packaging Today" was the theme of a forum held in New York on August 8 sponsored by Inpak Systems packaging agency and by the J. Walter Thompson advertising agency. Delegates were drawn mainly from the International Marketing Institute of the Harvard Business School.

Speaking at the forum were: Ernest Frawley, Harvard Business School; Nathan Shipee, Inpak Systems; Peter Baker, Arthur D. Little Company; William Murphy, J. Walter Thompson; Enid Edson, package designer; Walter Ronayne and Ira Wheeler, Celanese Corporation; and Charles Southwick associate of Inpak Systems.

New York World's Fair

Exhibitors at the 1964-65 World's Fair in New York are beginning to announce tentative plans for their displays. Some time ago the Coca-Cola Company announced that it would construct a bottling plant with machinery so advanced that "even today some of its electronic equipment is still in the drawing board stage." The *Pepsi*-Cola Company, on the other hand, said recently that its exhibit would be a greatly enlarged version of its Disneyland "Golden Horseshoe," a replica of an old-fashioned Western saloon.

New York City has released some of the details of its own projected exhibit: an enormous scale model of Greater New York, with every block of the five boroughs shown in a horizontal scale of one inch to 100 feet. Lester Associates, Inc., model designers, plan to show every building in the city, as well as sidewalks, parks and tugboats. The maps' length, from the Bronx city line to the tip of Staten Island, will be 160 feet, and its width, from New Jersey to the Nassau county line, will be 100 feet. Visitors to the exhibit will inspect it from suspended cars moving around the perimeter of the display, simulating a helicopter trip around the city. Each of the four-passenger cars will be equipped with a tape recording which will point out spots of interest. All this will be installed in the present City Building at Flushing Meadow.

Food at the Fair is still in flux. Restaurant Associates, operators of the Four Seasons and the Rikers chain, which had a contract for 15 food concessions at the fair, canceled its contract in a dispute about its projected advertising methods. The restaurant chain had wanted to erect signs 30 feet high over its booths on the fair grounds, and to sell space on the signs to food, soft drink, and beer companies. The Fair Corporation, which rejected this plan, also rejected Restaurant Associates' charge that the fair was "anti-advertising." Stuart Constable, vice-president of the Fair Corporation, said, "This whole fair is a great big fat advertising thing."

Meanwhile, however, The World of Food, Inc., announced that it would build a five-story palace of food at the fair. The organization is headed by Jim Jones, president of Republic Graphics, Inc., specialists in promotion for the food industry. Individual food companies will rent space in the pavilion, and The World of Food will provide such services as landscaping ("edible gardens," displaying exotic fruit and nut trees) and entertainment, in the form of lectures by culinary experts and special events, such as the Bachelorette Day, whose theme will be "How to *Meat* an Eligible Bachelor." (Italics theirs.) But the pavilion's sponsors expect that the greatest attraction will be several "Gourmet Snack Bars", offering international specialties.

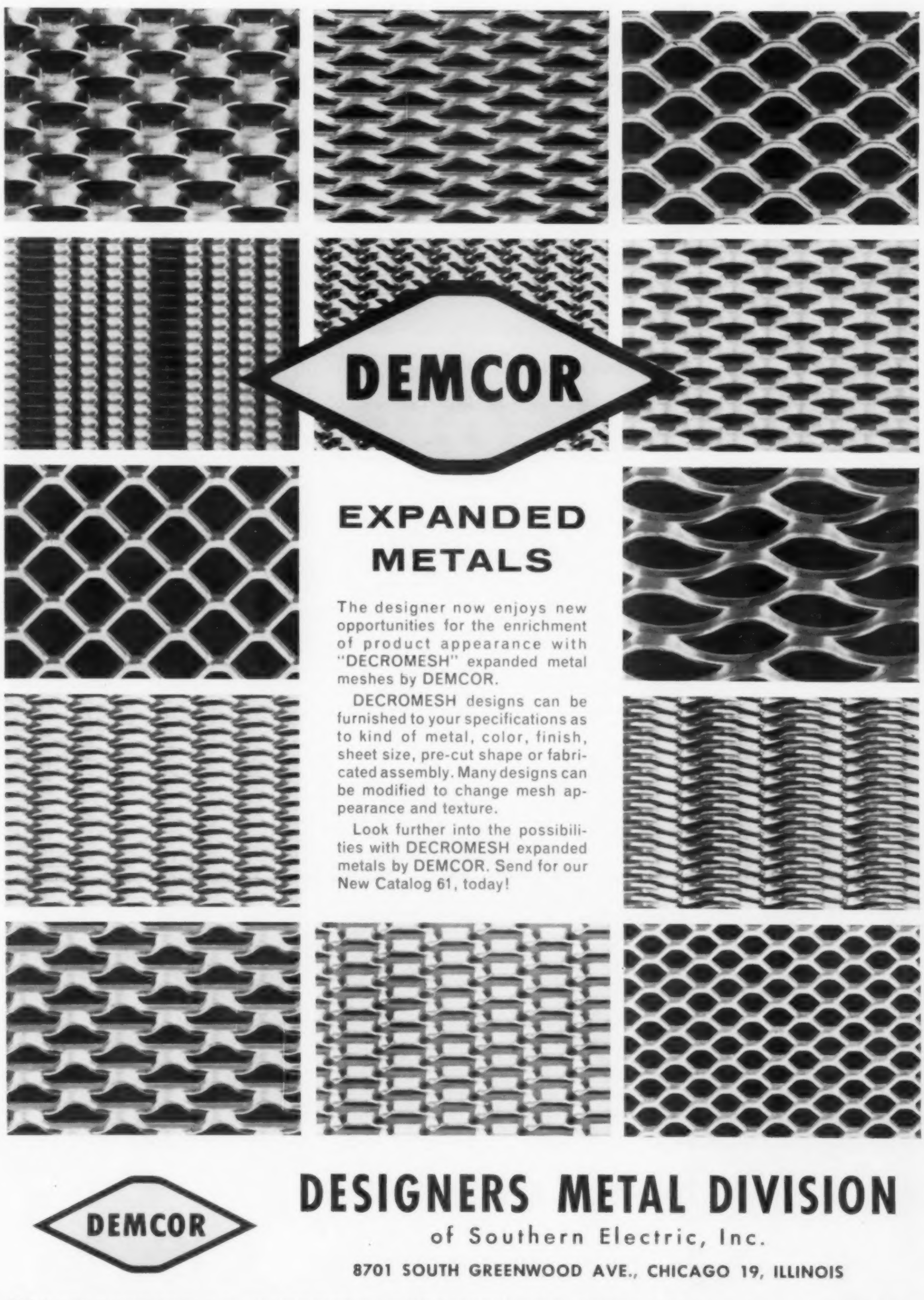
"Moon Room" unveiled

A "Moon Room," the prototype of a unit designed to give safe, comfortable housing to a man on the moon, was unveiled recently at The Franklin Institute in Philadelphia. The room was created by astronomer Dr. I. M. Levitt, director of the Institute's Fels Planetarium, and was sponsored and built by The Decker Corp. It is intended to inform the public and also to solve in advance some problems of normal living on the moon. Because of the tremendous temperature extremes on the moon, it is envisioned that man will have to live beneath the surface in a giant cave covered with a plastic-lined inflated balloon to simulate the earth's atmosphere. Discarded rockets, of no further use, sliced into seven-foot cylinders, will form the walls of housing and storage units. Furnishings and colors for the room (below) were executed by Philadelphia designer Harper Landell. The folding bed and adjustable chair are cushioned with a lightweight polyure-

Moon Room prototype

thane foam and are capable of supporting 30 pounds, moon-weight of a 180-pound man. Desk, table, and cabinets are all of rigid urethane; the table holds a two-way tv unit and microfilm projector for reading.

(*Continued on page* 20)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NEWS *continued*

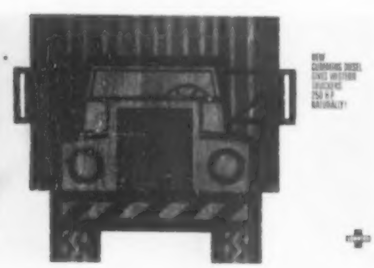
A thin sheet of plastic foam protects the floor from dust. The exercise unit on the rear wall is designed to prevent rapid muscle deterioration due to the weight differential. Colors chosen for the various sections and items of the room were coordinated to provide maximum comfort: dormitory area used shades of green; work area contains shades of blue — both colors being absent on the moon — exercising equipment is orange (for stimulation), and exposed walls and ceiling are off-white for improved illumination. Decker hopes to build several more "Moon Rooms" for display in various cities and foreign countries.

AIGA extends deadline

Deadline for entries to the American Institute of Graphic Arts 1961 Packaging Show has been extended to September 15th. All packages introduced in either the United States or Canada between May 1, 1961 and July 24, 1961, are eligible for inclusion in the exhibit. The jury for this year's show is comprised of: Lester Beall, Bruce Beck, Francis Blod (non-voting), Gene Federico, Martin Prehn, and Marion Zelenko. The actual date of the showing has not yet been announced, but will occur some time late in 1961, at a yet unspecified location. After this first showing, the material will travel to libraries, schools, universities, and graphic arts groups in the United States. Further information can be obtained by writing to AIGA Packaging 1961, 5 East 40th Street, New York 16, N. Y. All entries should be mailed or delivered to the same address.

Auto museum in Milwaukee

With his own collection of antique and famous automobiles as a basis, Milwaukee designer Brooks Stevens has established an automotive museum on a 4½-acre site located on the outskirts of that city. About 50 cars are on display, Stevens' own collection having been augmented by donations or loans of friends and other collectors. Among the vehicles in the museum are a 1905 one-cylinder Cadillac roadster, a $380,000 specially-built Cadillac, the last Mercedes-Benz out of Nazi Germany, and a number of famous racing cars. The museum is open to the public every day.



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The Art of Advertising

"The Art of Advertising," an exhibition of award-winning examples of the work of art directors, will begin a national tour early in the fall. Sponsored by the National Society of Art Directors, the display consists of works chosen as best in regional art directors club shows in the United States and Canada. Among the pieces (all done in 1960-61) to be displayed are: the Cummins diesel engine ad (1): Thomas Durfee, art director, Nicolas Sidjakov, artist; Ansul Chemical's annual report (2): Robert Vogele, art director, Antonio Frasconi, artist; film strip for Brown Show (3): Jim Cunningham, art director, Robert Blair, artist; newspaper ad for Joseph Magnin (4): George Coutts, art director, Betty Brader Ashley, artist.

in decorative plastics KENT DOES THE THINGS THAT HAVEN'T BEEN DONE BEFORE

How much can you demand of one decorative plastic injection mold? The men who designed these units know. They required unusually large three-dimensional plaques, with perfect uniformity of finish throughout. To enhance the dimensional effect, multi-color spray finishing and vacuum metallizing were done entirely on the rear surface of the clear plastic. The units were made to close tolerances for mounting, and had to be proved durable enough for years of outdoor use.

For the Pepsi-Cola plaque, Kent also developed a new, translucent blue finish — and created an effervescent effect by designing a textured background around the sparkling bubbles.

Plenty of room for production problems, there; but Kent's process engineering group tackled and solved them all. Both jobs were done from start to finish within Kent's four walls, permitting close quality control.

Call on your Kent sales engineer for the unusual in effect, size or volume. He is particularly helpful in the "rough idea" stage of your design.

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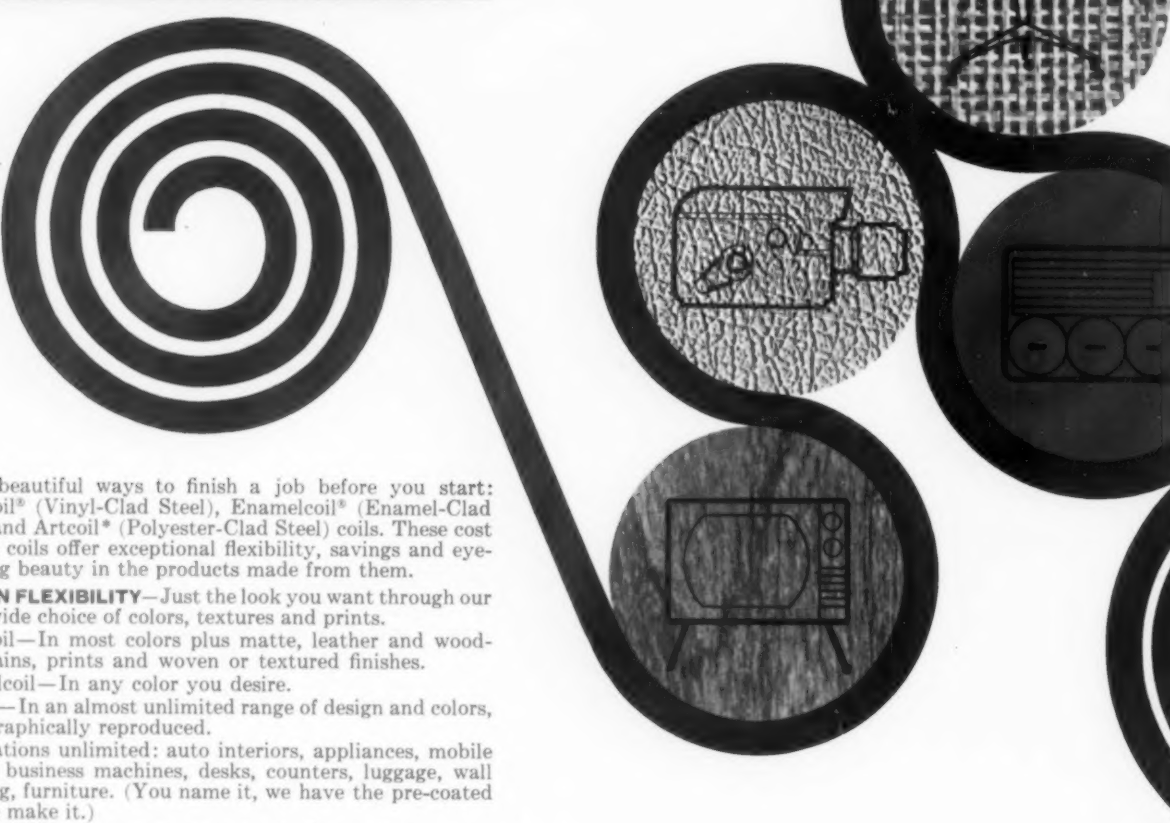
A BEAUTIFUL FINISH TO START WITH ... AND SAVE WITH:

PRE-COATED STEEL COILS FROM ENAMELSTRIP



Three beautiful ways to finish a job before you start: Vinylcoil* (Vinyl-Clad Steel), Enamelcoil* (Enamel-Clad Steel) and Artcoil* (Polyester-Clad Steel) coils. These cost cutting coils offer exceptional flexibility, savings and eye-catching beauty in the products made from them.

DESIGN FLEXIBILITY—Just the look you want through our wide, wide choice of colors, textures and prints.

Vinylcoil—In most colors plus matte, leather and wood-like grains, prints and woven or textured finishes.

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Applications unlimited: auto interiors, appliances, mobile homes, business machines, desks, counters, luggage, wall paneling, furniture. (You name it, we have the pre-coated steel to make it.)

PRODUCTION SAVINGS—No cleaning, tumbling, spraying, dipping, rustproofing, baking or drying. Less scrap loss; reduced investment in finishing equipment, space and labor requirements; lower insurance costs; longer die life. No fabricating restrictions—you can bend, crimp, drill, pierce, emboss, deep draw, roll form or lock seam most finishes—work them to the very limits of their tough steel base without damaging their durable coatings.

SALES APPEAL—Your product has immediate customer appeal because of its finished beauty, its resistance to scratches, scuff marks, stains and corrosion.

The competitive edge is yours when you start with a beautiful finish. Specify the good looks and long life—the savings and flexibility of these modern pre-coated steel coils from Enamelstrip. Contact your nearest National Steel Sales Office for complete details.

*Trademark


ENAMELSTRIP
ALLENTOWN, PENNSYLVANIA

NEWS *continued*

People

APPOINTED: **Peter Tighe Quinn,** formerly on the design staff of Eastman Kodak Company, and **David T. Dubbink,** to the staff of Peter Muller-Munk Associates, Pittsburgh. . . . **John H. Roberts,** previously director of Art Associates Limited's Packaging Division, as director of Stewart & Morrison Limited, Toronto. . . . **Arthur C. Haggstrom** as vice president in charge of product design and development at Lecro Research Development. . . . **Neil F. Smith** (right), formerly with Knoll Associates, as director of product design and development at Emeco Corp. (Smith will also hold a similar position at Standard Furniture Company.) . . . **Theodore Levitt** (right), of the Harvard Graduate School of Business Administration, to the plans board, and **Phillip J. Luth** (right), as vice president of store planning and interiors, at Lippincott & Margulies, New York. Luth was formerly a department head in the same section. . . . **Richard C. Hollander,** previously vice president, as director of public relations at Stephan Lion, New York. . . . **Joseph J. Kaleba,** formerly engineering supervisor at Controls Company of America, as manager of product design and specifications at Shure Brothers. . . . **John McDougall,** formerly manager of materials and equipment engineering, as director of manufacturing engineering and development at Ford Motor Company. . . . **R. P. Perry** as director of product development at Bemis Brothers Bag Company. . . . **George J. Muller,** previously manager of technical service, as manager of special projects group at Taylor Fibre Company. . . . **Herbert A. Ehrenfreund,** previously president of Valley Plastics (his own foamed packaging firm), as project engineer specializing in packaging development at DeBell & Richardson, Hazardville, Connecticut. . . . **Frederick M. Spaugh,** formerly with General Electric, as product planner at Henry Pratt Company. . . . **Earle C. Sherman** as manager of mechanical development for the folding carton operations at Olin Mathieson's Packaging Division. . . . **James Riddle,** head of the American Wing at the Metropolitan Museum of Art and member of Mrs. John F. Kennedy's advisory committee on fine arts for the White House, as president of the newly formed Drawing Society, a national foundation of art collectors, artists and museum curators. . . . **Robert L. Anderson,** previously chief engineer at Hertner Electric Company, as project manager at Designers for Industry, Cleveland . . . **Stephen C. Carroll** of Maurice E. H. Rotival & Associates, as associate professor of architecture-planning at Columbia University's School of Architecture . . . **James K. Cox** as manager of the advanced development department at Hughes Aircraft displays laboratory. . . . **Alfred J. Jakstas** as conservator of the Art Institute of Chicago.

Ehrman *Luth*
Levitt *Smith*

RESIGNED: **Jerome Allan Donson** as director of the Long Beach Museum of Art. He has held the post since 1956.

ELECTED: **Ernst Ehrman** (above), of Ehrman & Reiner, New York, as chairman of the Package Designers Council's eastern chapter . . . **Richard Hornick,** as president of the Midwest Human Factors Society.

AWARDED: To **George H. Gustat,** the distinguished service award of the American Institute of Industrial Engineers. . . . to **Thomas E. Moon,** the 1961 Holley Medal of the American Society of Mechanical Engineers for developing a machine to help transplant corneas.

Company News

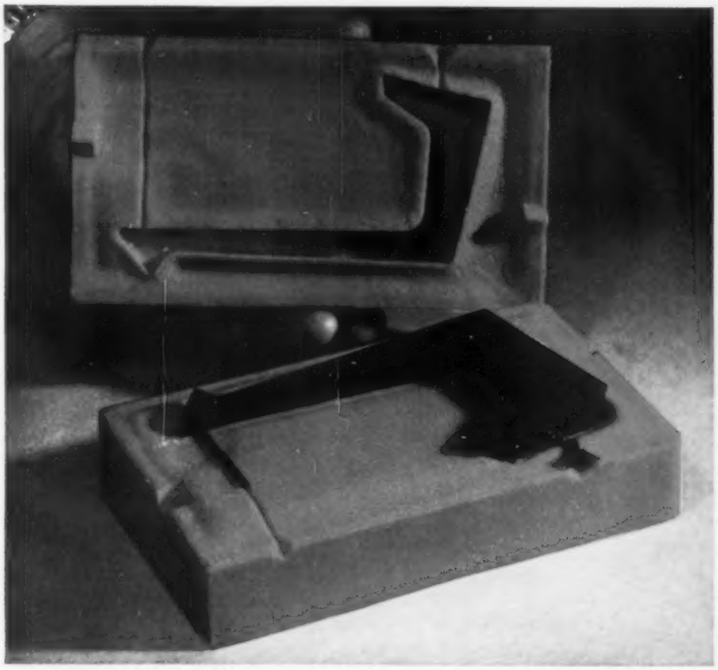
RETAINED: **Alcott Associates,** Islington, Massachusetts, by the Spaulding Fibre Company to develop new uses of vulcanized fiber. . . . **Harley Earl Associates,** Warren, Michigan, by Textron's E-Z-Go Company to design an electric golf cart, by Grill Meats to conduct a corporate identity program, and by Woodward Shops to develop a package design program. . . . **Bramwell Lieber,** Reseda, California, by Electronic Enclosures. . . . **Lawrence H. Wilson Associates,** Detroit, by Design & Manufacturing Corp. . . . **F. Eugene Smith Associates,** Bath, Ohio, by J. Koch Company to design a men's clothing store, and by Alside Homes and Solid State Transistor Laboratories, to conduct their respective corporate identity programs. . . . **Scharfenberg-Polivka-Gale,** Hopkins, Minnesota, by G. H. Tennant Company as design consultants. . . . **Norman Cherner Design Associates,** New York, to design institutional and office seating for the Helikon Furniture Company. . . . **Painter, Teague & Petertil,** Chicago, by Bowser, Inc. . . . **John A. Gait Associates,** Wheaton, Illinois, by Gitsware Corp. . . . **Bruce Kamp Associates** to design an electronic golf instructor for Victor Electronics. . . . **Walter Dorwin Teague Associates,** New York, by Litton Industries, American Airlines, Pearson Corporation, Fieldcrest, Inc., Consolidated Diesel Electric Corp., and Moore Business Forms.

ESTABLISHED: **Design Consultants Incorporated,** 520 North Michigan Avenue, Chicago 11, Illinois, by William Winterbottom and Frederic Roberton, both formerly with Loewy/Snaith. . . . **EFR Display Associates,** 252 East 52nd Street, New York, New York, by Frank Perry and Fred Richman. The new firm will specialize in floor and counter units and motion display.

EXPANDING: The **Packaging Association of Canada** with the opening of an office to service its Quebec chapter at the Industrial Arts Building, 4467 St. Catherine Street, W., Westmount 6, Quebec, Canada. . . . **Donald Deskey Associates** with the addition of extra space to their offices at 575 Madison Avenue, New York, and to their research and development facilities at 315 East 62nd Street, N. Y.

GOING PLACES: **Carreiro/Sklaroff Design Associates** to 204 West Rittenhouse Square, Philadelphia, Pennsylvania. . . . **Alan Berni & Associates, Inc.** to 733 Third Avenue, New York. . . . **Ohio Displays, Inc.** to 10252 Berea Road, Cleveland 2, Ohio. . . . **Visual Communications, Inc.** to 1200 Elmwood Avenue, Sharon Hill, Pennsylvania. . . . **Michael M. Gutbezahl** to Colonade Park, 25 Clifton Avenue, D-1009, Newark 4, New Jersey. . . . **Fordyce & Hamby Associates** to 717 Fifth Avenue (the Corning Glass building), New York.

Perfect prototypes fast



Make lifelike parts with molds of Silastic RTV

Silastic® RTV helps you produce either simple cavity or split molds quickly and inexpensively. Supplied as a fluid silicone rubber and catalyst, Silastic RTV flows smoothly, filling every crevice. Reproducing the finest detail in a matter of minutes or hours — depending on the RTV system used — it sets up at room temperature to a firm, flexible silicone rubber capable of tolerating casting temperatures up to 500 F. With it, you can produce parts that are as near perfect as possible in many plastics and molten alloys.

Easy does it! Here's how to produce a split mold with Silastic RTV.

A. After the original part has been partially embedded in paraffin, (or some similar material) Silastic RTV is poured into form producing one half of mold (shown rear).

B. Alignment notches are cut in first half of mold, surface is coated with release agent and RTV is poured to form perfectly mating second half.

C. Clamp the two RTV molds together, drill your sprue hole and air vent and cast prototypes that are perfect "stand-ins" for the original.

Silastic RTV is easy to use, produces accurate molds quickly. Mold casting materials release readily from Silastic RTV without parting agent. It's the perfect mold-making material for making inexpensive duplicates for market testing or sampling, and for short production runs.

For detailed information on Silastic RTV, write Dept. 5621, Dow Corning Corporation, Midland, Michigan.

first in silicones

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COMING NEXT MONTH

Ikonogenesis

Terms like "corporate identity" and "total design" and "family resemblance" and "brand image" leap with such alacrity from the mouths of designers and the mouthpieces of design offices that a new term is bound to seem at once refreshing and suspiciously warmed over. Ikonogenesis, or image building, is designer Crawford Dunn's way of describing a program of controlling all of a company's visual elements. In an article that explains the customary difficulties in the way of achieving really effective images, Dunn compares the efficacy of visual image building with traditional advertising and public relations efforts.

Revolution in textiles

For centuries weaving has been man's primary way of converting vegetable and animal fibers into cloth, but the loom, no matter how fast, is not fast enough to keep pace with the needs of the major fabric-using industries. Furthermore, to function efficiently, the power loom must produce a standardized product. In October, textile designer Jack Lenor Larsen discusses the resurgent interest in some old and little-used techniques for forming and finishing fabrics—techniques that offer the possibility of greater production and/or greater variety in texture, and also discusses experiments with new ways to shape man-made fibers into three-dimensional forms.

Flexible, transparent packaging

In 1939 package designers had an easy time specifying a flexible, transparent film. Cellophane was all there was, and about $40 million worth of the film was used that year. By 1947, cellophane was still alone in the field and had nearly doubled in sales over 1939. Twenty years later, although cellophane sales were estimated at $274 million, there was some competition: polyethylene, Pliofilm, polyesters, Saran, and cellulose acetate were used on more than $200 million worth of packaging. ID's story on flexible, transparent films will explore the growing markets for transparency, which films are being used, and why they are specified.

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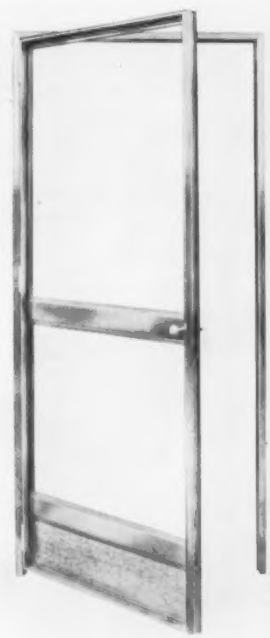
Sundberg and Ferar: it all began
with a better mousetrap

Sundberg and Ferar talk design

When Carl Sundberg and Montgomery Ferar were getting their design firm started during the depths of the depression, one of their first jobs was to build a better mousetrap. It had four holes, and they called it the "Mouseoleum." It sold well, and started them on their way. Today, Sundberg-Ferar is the largest appliance design firm in the United States—7 associates and 70 designers work in an ultramodern headquarters building near Detroit. Over the years, Sundberg and Ferar have never swerved from their premise that the American public has basic good taste. Give shoppers a choice between good and bad and they'll generally pick the better-designed product.

Carl Sundberg contributes a wide range of experience to the firm with a background of art schools and factory production lines. The spectrum of their abilities approaches the complete with Monte Ferar, MIT honor graduate and holder of two degrees in architecture. Since their early days, they have designed products as varied as the clip for an automatic pencil, 5-ton trucks, factories, homes and churches. Millions of consumers are buying and using Sundberg-Ferar-designed automobiles, automatic coffee makers, refrigerators, stoves, and perfume atomizers. Sundberg-Ferar designed the cabinet for UNIVAC, the Remington-Rand computer that predicted the outcome of the 1956 Presidential election. People type on Sundberg-Ferar-designed typewriters, dig holes with draglines they developed, guide boats and airplanes with their navigational equipment, enjoy coffee and soft drinks from Sundberg-Ferar-designed dispensers.

As designers of consumer products (including most of Sears Roebuck's appliance line), Sundberg-Ferar may be the target of criticism from a current school that decries "change for the sake of change." To this observation, Sundberg-Ferar has a response: "Newness is not vulgar, despite what some critics say. Honest newness—and the improvements that go with it—is what is needed. A product can be beneficial and honest to itself—and be



new at the same time. We've got to change and improve to stay alive. In this country it is far more dangerous to be too conservative in your design than to be too advanced," says Montgomery Ferar.

How advanced are Sundberg and Ferar? Consider Monte Ferar's views on the kitchens of tomorrow: "Kitchens have come a long way since the wood-burning stoves of Grandma's day. We've gone from the ornate, to the round, to the current architectural square look. Does design history repeat itself? Not in this case. The squared-off architectural look will be with us as long as we have kitchens. As space becomes more valuable, kitchens will become smaller and we'll have to design to use all the vertical space."

As for appliances, Sundberg predicts a trend to "portable built-ins" designed to be free-standing with a built-in look. Says Ferar: "More and more, Americans are becoming mobile. We want to design our appliances so they will look built-in no matter how many times they're moved."

Ferar also sees refrigerators that will be roomier inside but no larger outside. All major appliances will be matched. "We want women to choose their appliances the same way they now choose their silver," says Ferar.

How do materials fit into the Sundberg-Ferar concept of "newness"? Few materials are newer than today's steels, and no materials are as versatile, as functional and as long-accepted as steel. It's not surprising that Carl Sundberg and Monte Ferar use a lot of steel. "A designer must *know* material—what it is, what it will do," says Carl Sundberg. "He keeps up with new developments. Materials are his clay. He must have empathy with them." About 90 percent of the products Sundberg-Ferar designs use steel because it is usually the material that is functionally suited for the job. Like most designers, they have found steel the most economical, strongest, and most versatile of the materials they use. In an average year, some 500,000 tons of steel go into Sundberg-Ferar-designed products, a far, far cry from the early days of the better mousetrap. USS is a registered trademark.

USS United States Steel


Electrical Appliance
Now is the time for all good manufacturers to lower lettering costs.
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Now, with BEETLE® urea plastic, you can mold in multi-colored lettered decorations—and save on production costs! By incorporating a resin-impregnated foil during the molding of keys, dials, levers and knobs, you avoid costly after-decoration. There's no scoring, no painting, no silk-screening. The pattern is part of the molded Beetle plastic. It won't chip off, scratch off or wear off. And you still enjoy these proven Beetle plastic advantages: hard, lustrous surfaces; resistance to detergents, oils and grease; good electrical properties; heat resistance; unlimited range of color possibilities.
P.S. Now is the time for all good BUSINESS MACHINE MANUFACTURERS to look into BEETLE for lettered decoration.

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Tensile							
Stress at Yield	73° F.	psi	9,000	6,200	6,800	5,100	D638-58T
Stress at Failure	73° F.	psi	6,800	5,200	6,200	4,500	D638-58T
Elongation at Yield	73° F.	%	3.3	3.2	2.2	2.5	D638-58T
Elongation at Failure	73° F.	%	45**	70**	25	40	D638-58T
Modulus in Tension	73° F.	psi	420,000	300,000	380,000	290,000	D638-58T
Impact Strength							
Izod ½" x ½" Bar Mld. (.010" Notch Radius)	73° F.	ft. lbs./in. of notch	1.1	4.3	0.9†	3.6	D256-56
	0° F.	ft. lbs./in. of notch	0.8	2.0	0.6†	1.5	D256-56
	−40° F.	ft. lbs./in. of notch	0.6	1.4	0.6†	1.1	D256-56
Izod ⅛" x ½" Bar Mld. (.010" Notch Radius)	73° F.	ft. lbs./in. of notch	1.3–4.0	6.0–8.5			D256-56
	0° F.	ft. lbs./in. of notch	0.7–1.2	2.0–2.6			D256-56
	−40° F.	ft. lbs./in. of notch	0.6–0.8	1.1–1.8			D256-56

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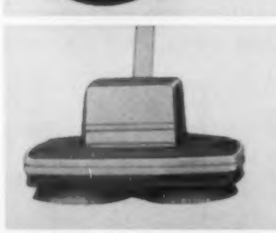

MARPROOF FINISHES THAT FOIL STAINING TOO ...M&T TEXTURED AND SMOOTH SPRAY-ON VINYLS

Beauty...distinctiveness...color...you get all of these visual qualities with the new spray-on vinyl finishes from M&T.

But that's only half the story. These coatings give your product a lasting coat of "armor" that withstands just about all the rough service users can give it. The finish absorbs impact without chipping, doesn't fade, won't stain despite constant handling.

With this *sprayable* vinyl coating you can cover even the most complex parts (impracticable with laminated vinyl finishes). It produces a rich-looking texture or satin-smooth finish on plain surfaces ... or reproduces the design of patterned metal.

Designers and producers of appliances will find M&T coatings ideally suited to their products. Not just for decorative texture and eye-appeal, but for long-term *durability*. There is hardly a finish that offers so much resistance to service hazards such as food acids, household chemicals, detergents, alcohol and water. Write for more information.

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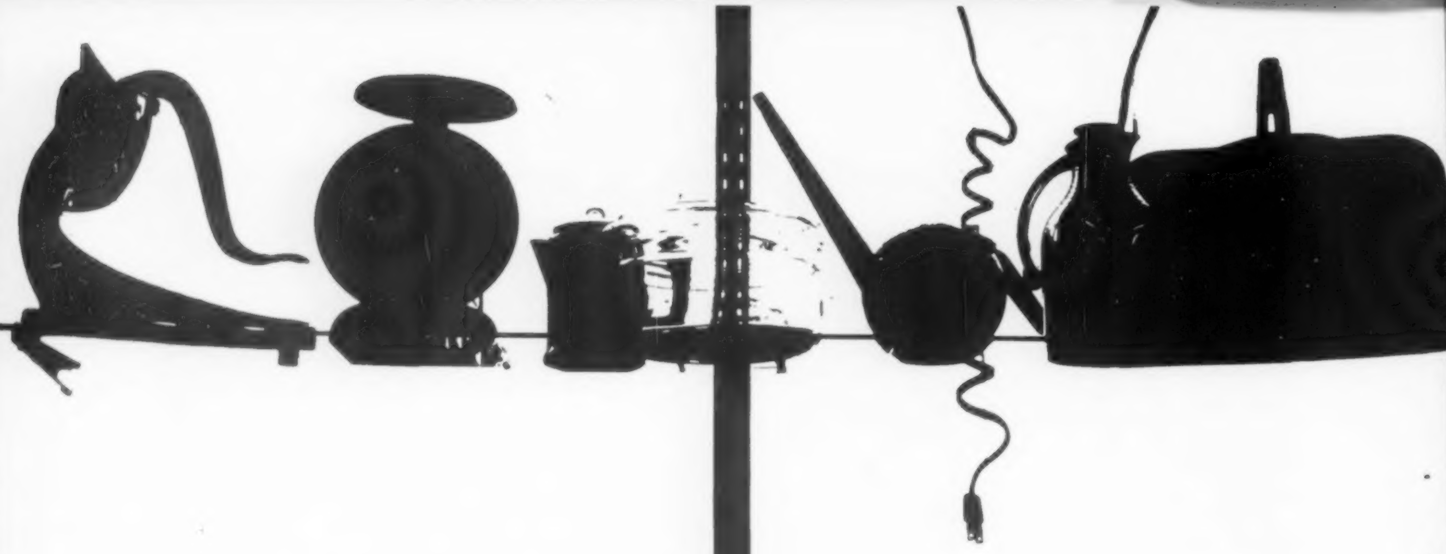

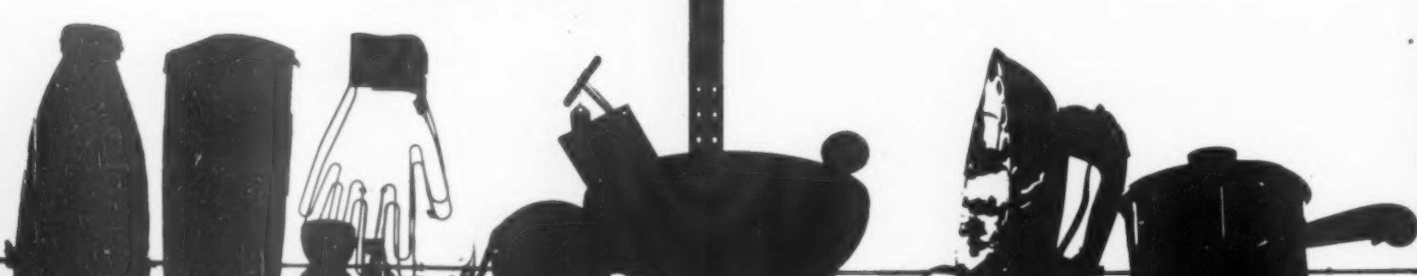

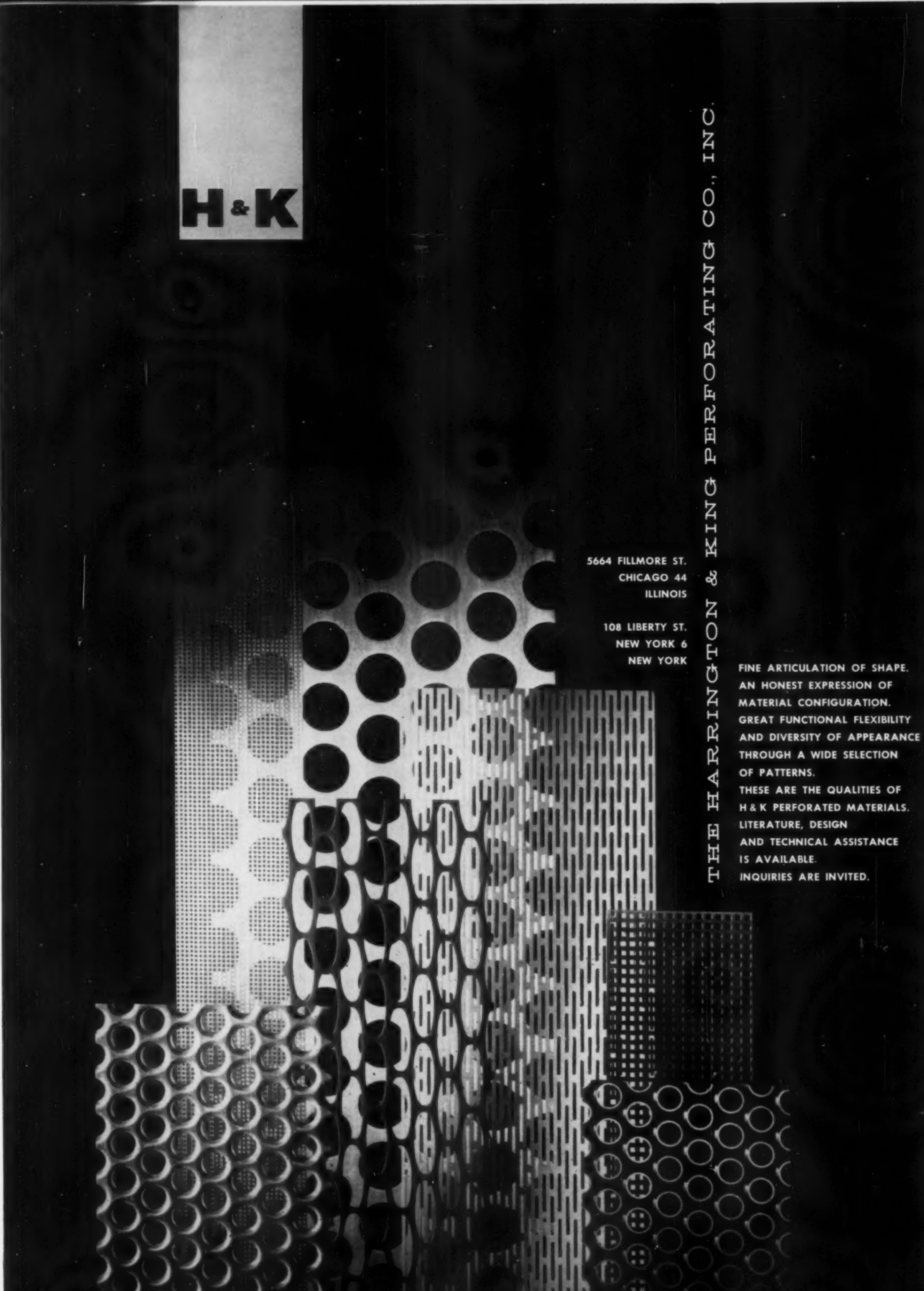
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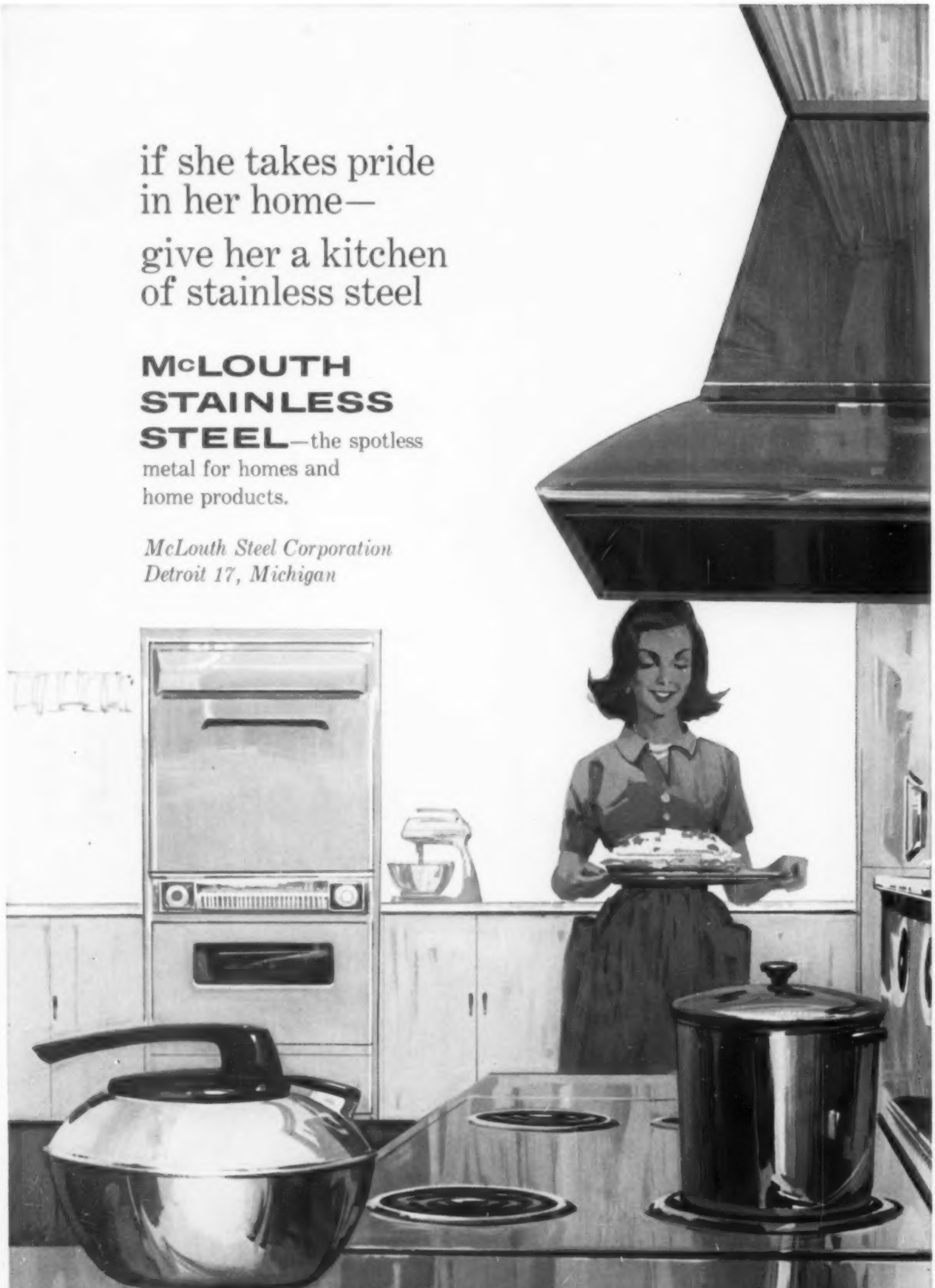
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THE FARMER AND THE COWBOY

Inevitably designers and engineers work on the same products. And just as inevitably, they work on them together, more or less. Yet often it is less when it ought to be more. Clearly there is a good deal of misunderstanding, seeming conflict of interest, and just plain petty backbiting in the designer-engineer relationship. The purpose of this special issue is to analyze what could be the most important working relationship in industrial production, and explore ways in which it might be enhanced to the credit of both engineers and designers and, more importantly, to the benefit of consumers and manufacturers.

The problem in this case is, by now, easy to state. It was succinctly set forth most recently this summer by Professor Misha Black, of London's Royal College of Art, in a paper delivered at the Hatfield Technical College. "The reservations of an engineer when asked to accept an industrial designer as a colleague are understandable," Black says. "They arise first from the human weakness which suspects that this new appointment is a criticism of his own ability."

Pointing out that engineers now accept without question the desirability of working with other specialists, just as surgeons recognize the necessity of anesthetists, Black suggests that the problem will be resolved in time. But he goes on to say:

"The other cause for lack of enthusiasm for collaboration is more serious. It arises from the engineer's deep distrust of the whole operation of industrial design. He suspects that the designer is concerned purely with superficial style, with fashionable frippery completely separated from, and sometimes detrimental to, the function of a mechanism."

There we have the dilemma. If the designer does a mere styling job, he looks like a parasite living off the organic health of engineering. If, on the other hand, he gets involved in structure and function, he is accused of taking on responsibilities that are the engineer's professional birthright.

Sometimes all the talk about designer-engineer collaboration seems to come down to Rogers and Hammerstein's tuneful admonition that "the farmer and the cowman should be friends." Of course they should: the goals of engineering and industrial design are not, in any sane situation, in conflict. But sanity is no easier to come by in industry than in life generally, and happy endings are harder to achieve in product development than in musical comedy. Here, as in "Oklahoma," the conflict has to do with the fencing of territory. Probably no one would challenge designer Henry Joe Police's assertion that "the main solution to the problem of professional relations between designers and engineers is mutual respect." But how do we get it? One way is by looking behind the myths for any facts that may counter or support them.

Myth: the designer is superficial, a stylist who is equipped by temperament and training to do nothing more than frost the bread of life and call it cake. He is the cowboy: dashing on a palomino, clever at stunts and rope tricks, given to lavish boasting and showing off; his guitar attracts the attention of management, but his high-heeled boots are impractical for walking on solid ground.

Supporting fact: This *is* true of some industrial designers. Furthermore, it is true that many designers exasperate engineers by their bland assumption that they needn't *know* anything, and that it would be detrimental if they did because technical understanding would block their creativity. (Do the most creative designers ever use this argument?)

"I wish industrial designers had a better awareness of costs and materials," says Robert E. Callihan, engineering section head of the electromagnetic section of Sperry Products. His wish is echoed by Mannin, Maxwell & Moore's chief engineer for instruments, C. R. Du Bois, while Nick Johns, chief engineer of Data Control Systems, states flatly: "Industrial designers have no conception of dimensions. They bring in a pretty drawing to scale and when you check it you find that everything's off an inch. You can't even make a working model." And these are engineers who have had *successful* experiences with industrial designers.

But although the myth has the validity of some supporting facts, there are other facts to put it in perspective.

Fact: Some design offices are close enough to engineering services to have their own engineering affiliates. In Detroit, Harley Earl has an engineering affiliate firm with 30 engineers. Kenneth Van Dyck (see page 60) has a similar dual setup in Westport, Connecticut.

Fact: Some industrial design offices use staff engineers to handle development problems on design assignments. Milton Immerman, partner at Walter Dorwin Teague Associates, reports that the Teague office currently has 53 "engineers." These break down into 27 graduate engineers (electronic and mechanical), 11 "trained" engineers, and 15 industrial designers that Immerman says he'll "match with any graduate engineer." What kind of engineers seek work in a design office? Usually, says Immerman, the engineer who is tired of being pigeonholed. (Also, some come because they prefer rendering to engineering drawing; Immerman says these are the ones they do not hire.) The Raymond Loewy/William Snaith office estimates that 25 per cent of its product designers are engineers, reports the increasing use of a team system: one designer working with one engineer. Furthermore, the firm is beginning to assemble a new "product development division," to be staffed largely by engineers. The South Pasadena, California office of Keck-Craig Associates assigns, on an average, twelve mechanical patents and six design patents to their clients each year. A recent engineering assignment of theirs was to completely change the "philosophy" of a high-speed drive mechanism in a punch card handling machine (without much changing its appearance). "Most of our pure engineering work," says partner Burnie M. Craig, "has to do with troubleshooting, or with the redesign of *portions* of machines and instruments. But when we design a whole product we feel strongly that the result is, in general, functionally superior to products designed by firms whose principals do not have our engineering training."

Fact: Some company design departments (see page 50) are staffed by designers whose engineering knowledge facilitates communication with engineers throughout the development process.

Overriding fact: A great many industrial designers, while not engineers and not offering engineering services, have the technological awareness, and the mechanical perception, to make functional contributions that the engineer often lacks the perspective to make himself. (See pages 66 to 69.)

Myth: The engineer is essentially both narrow and uncreative, a highly trained mechanic congenitally unable to view a product in any context larger than the working of its parts, wholly oblivious to the requirements of marketing, use, convenience and appearance. He is the farmer: solid, stable, and square; but so set on plowing a deep straight furrow that he can't see the world on either side.

Supporting fact: This *is* true of some engineers. Furthermore engineers often necessarily become so much absorbed in the process of making a product work that they forget that the plant model shop is not the environment in which it must ultimately work. (Sometimes they forget too that, before it can work at all in the projected environment, someone must buy it.)

Just as the designer is damned if he tries to get deep into a problem (meddling) and damned if he doesn't (styling), so is the engineer often suspect when he becomes concerned with the very things designers say he doesn't care about. Designer Peter Quay Yang complains of engineers who try to be designers and who, having no feeling for style, end up adding chrome and making pretty renderings. That seems like a twist, but is not uncommon. George Payne laments that "sometimes after working with designers, engineers feel that enough has rubbed off to make *them* designers." And Henry Joe Police, whose work as a staff designer at Thompson Ramo Wooldridge keeps him in constant close touch with highly specialized engineers, puts it this way. "Most engineers think of themselves as designers and, I agree, they are. It is only when they begin to style a product (by adding trim and identification) that they become poor industrial designers."

But this myth too is subject to challenge.

Fact: Engineers have, at the moment, a better record in the creation of beauty than designers have. (Even in the 1959 poll of "the 100 best designed products of modern times," a poll juried by 100 people whose selections might be expected to show a bias towards "designer-design," many products — and probably those least likely to be questioned—are the creations of engineers.) Unquestionably this is due in part to the fact that their record is longer (Leonardo comes earlier than Loewy). But having made that allowance, few designers would balk at Misha Black's contention that "there is no doubt that the engineers of the 20th century have produced the most memorable symbols of our time."

Fact: Often with dullards, as with thieves, it takes one to tell one. For example, Charles Eames, working with the engineers at Stephens-Trusonic, called them responsive, creative, stimulating. A duller designer might have found them dull.

Fact: Most engineers have to make a number of choices (the color coding of wires in a circuit, the shape of a prototype) that, being functionally arbitrary, are customarily resolved on esthetic grounds. And there is no question that engineering prototypes are often handsomer than the refinements that follow them.

The relationship between the designer and the engineer will mature when each is able to see clearly the nature of both roles. The demand is mutual, but without doubt, at this stage in our development, the heavier burden of proof is on the industrial designer. Engineers and designers must indeed meet each other halfway, but the designer has the longer half to go. Like many journeys, this one begins with education.

How much engineering is a designer taught, and how? It depends on where you look. Since academic industrial design departments sometimes belong to a college of engineering, and sometimes to a fine or applied arts school, the character of the departments varies accordingly.

So does their approach to technology. Generally, engineering information is given to design students in three kinds of courses: those created for engineers, those slanted towards designers but taught by engineers, those taught by industrial designers.

At the University of Bridgeport, design students take the same engineering courses (12 credits worth) that the engineers take. And at Kent State, the industrial design department even makes a point of insisting that technical courses *not* be oriented towards design.

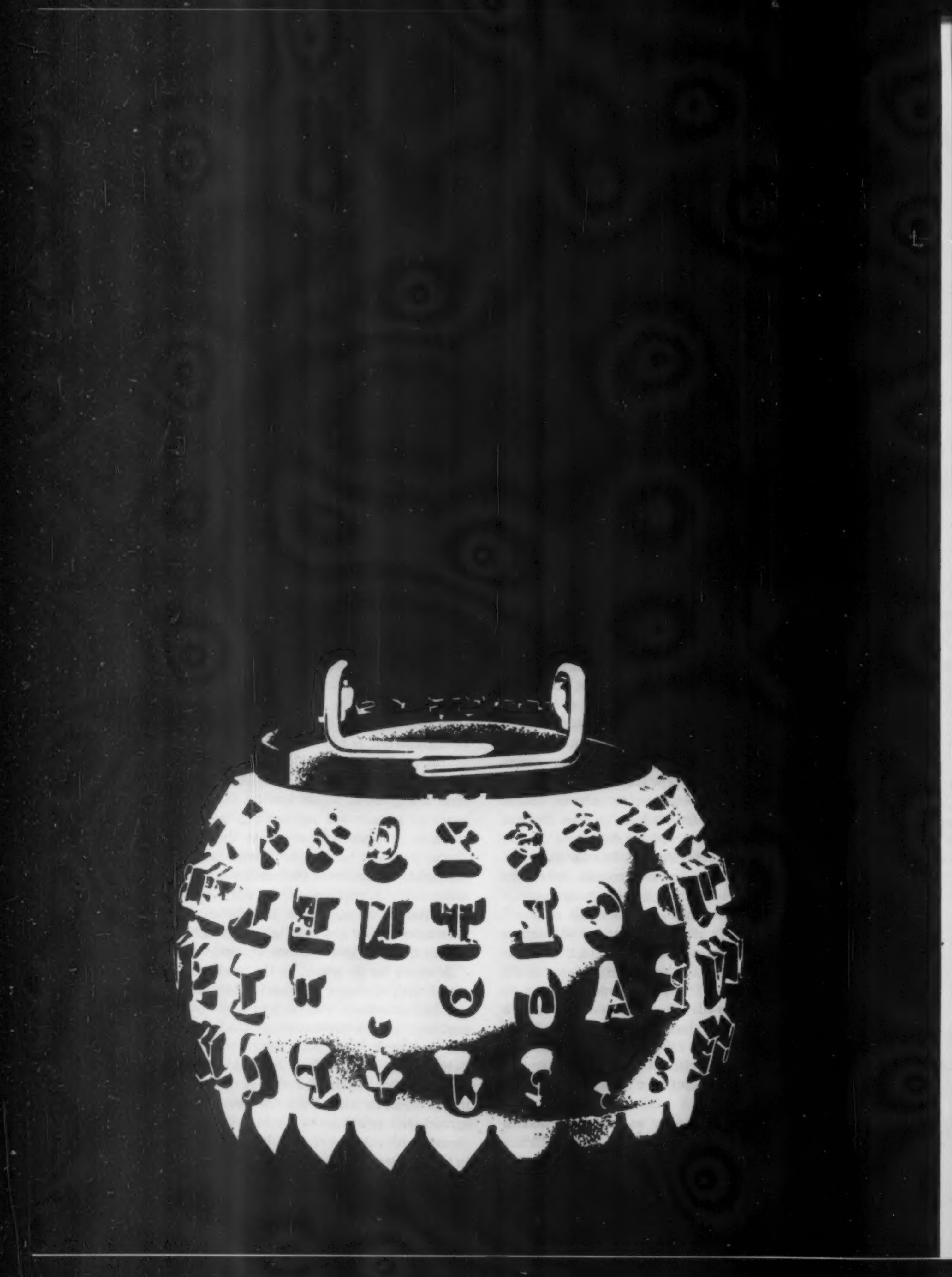
On the other hand, the Chicago Art Institute's Joseph Palma, Jr. believes that the engineering knowledge product designers need is more practical, less theoretical than that taught in the engineering schools. Some schools, like IIT, offer design students courses that are taught by engineers but designed for designers. Carnegie Tech's department (like Pratt's) has an engineer-designer, Richard Felver, who presents what he describes as "just as much engineering as possible without making the students lopsided or ill at ease." What does make them ill at ease? A number of teachers candidly reply: mathematics. Felver says, "unfortunately we have some very talented artists who could not survive engineering," and Cranbrook Academy's Howard Brown admits that "how much engineering I bring to students has been based on the rather tenuous scheme of figuring out how much my strongly art-oriented students will take without defecting." One approach to that problem is outlined on page 74 by Leo Brandenburger.

Is the "slanted" course really engineering? James Shipley, at the University of Illinois, says: "When people talk about engineering courses for design students they are usually talking, I have come to believe, about a kind of course dealing with applied technology, industrial processes, and simple mechanical problem-solving that really isn't engineering at all in the contemporary sense." Educators tend to emphasize that the designer is expected not to know how to be an engineer but to know how to work productively with those who are. At the State University of Iowa (which does not *require* design students to take engineering, but *asks* them to use some elective time on courses like mechanical drawing and mechanical processes), Professor John Schulze says the designer needs the humanities more than he needs the "narrow skills of the engineer," and asserts positively that "courses in anthropology and higher mathematics have proved far more worthwhile than most engineering courses."

Few would argue with the statement made by John Coleman of Art Center: "The more students know about engineering the better, providing they know even more about design." The problem is that, as industrial design has broadened in both claim and practice, the number of things a designer is supposed to know in every field has proliferated. He needs more engineering, of course. But he also needs more art, more general culture, more ergonomics, more psychology, more economics and (like the engineer) more English. The paradox of design training is that while the specialist has become the man of our time, our time keeps advertising for a generalist. The industrial designer has answered the ad, but how can he qualify himself for the job?

Shipley thinks he can do it only by spending more time preparing for it. Pointing out that a smattering of engineering, or of anything else, is not conspicuously useful, and that educators in all fields distrust the survey course, he projects an ideal education for an ideal designer. It would include something like three years of science and engineering, and would require seven to nine years of study at the college level and above, followed by two or three years of on-the-job internship. He believes that such a comprehensive education will be required of designers sometime in the far future, but only after the design profession has grown rewarding and prestigious enough to demand it, just as medicine and law now demand it.

So much for prophesy. In the meantime, designers—armed with whatever engineering knowledge they have acquired in schools and on jobs — *do* collaborate with engineers in the production of the goods that people live and work with. Both design educators and practicing designers are fond of making the distinction that Professor Arthur J. Pulos, at Syracuse University, makes when he says, "The engineer is primarily concerned with relating the machine to its work; the designer, with relating the machine to man." Inevitably, in the process, they relate to each other. The following 56 pages show how.—*Ralph Caplan.*

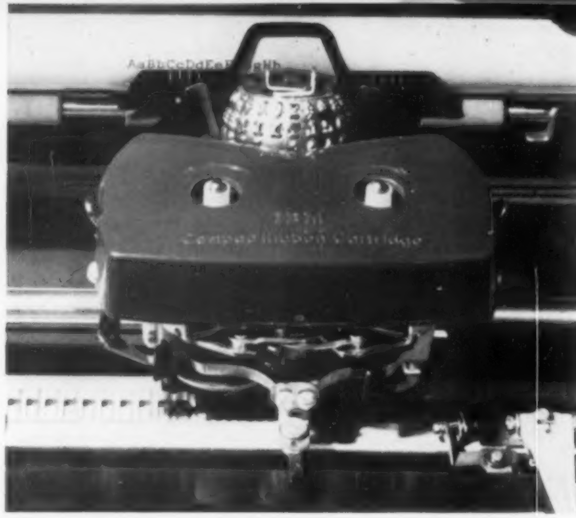


CARRIAGE TRADE Consultant Eliot Noyes' long-term program for International Business Machines has been one of the most widely cited examples of effective designer-engineer collaboration. The sphere at left represents the latest step in that program: an engineering achievement behind the design of an electric typewriter that trades carriage and type bar for a single typing element.

The heart of the Selectric typewriter is this golf-ball-size sphere which moves across the page on a traverse rod, dipping and whirling to position the desired character against the paper. Molded of plastic and then electrically plated, the element comes in six different type faces and can be switched in a matter of seconds.

Perhaps the most spectacular recent example of designer-engineer collaboration was introduced late in July, when International Business Machines Corporation proclaimed the availability of its Selectric typewriter. This is a machine without type bars or movable carriage. It types by means of a single sphere-shaped element bearing the usual alphabetical characters, numbers, and punctuation symbols: the sphere moves on a bar across the face of the paper, and whirls and tilts to select the character hit by the typist. The concept itself is not new — some toy typewriters in the past have operated on the same principle, but without electricity. And a high-speed printer which uses a mushroom-shaped single element was invented in 1946 by H. S. Beattie, now manager of IBM's electric typewriter engineering division.

Development and research toward a single-element



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typewriter began in 1951, when experimental machines, using an octagonal cylinder which moved across the paper, were built by John Hickerson, an IBM engineer. The printing impressions were "rear-strike": a hammer at the rear of the machine forced the paper against the ribbon and type element positioned in front of the paper. Although these front elements were bulky, and obscured much of the writing line, they nevertheless demonstrated the feasibility of single-element typing. Hickerson continued his investigations, and by 1954 was able to demonstrate a typewriter model with a spherical front-printing element which permitted adequate visibility for the typist. The earliest spheres were open at top and bottom, looking something like a napkin ring. Finally they evolved into the present shape—something like a truncated golf ball with 88 characters positioned in four rows.

By this time the engineering concepts of single-element printing were clearly enough defined to permit thinking about the typewriter's shroud and visible detail, and Eliot Noyes (IBM's principal design counsellor since 1947) was called in. In addressing himself to the beguiling idea of a carriageless typewriter, Noyes commented:

"For this new kind of machine, we wanted to create a very simple form which would feel like a complete, single shape, and which would express the fact that . . . there is no movable carriage. The shape which evolved is a little like that of a large, smooth stone, with scooped out areas for the keyboard and platen area."

The first Noyes model was plaster, as were several subsequent developments. Later, other covers were made of epoxy resins, molded in dies also made of epoxy. By making plastic castings instead of using sand molds, IBM engineers were able to translate the Noyes designs into tangible, testable covers in as little as four weeks. The old method would have consumed months. Slow motion picture studies of finger action during normal typing operation resulted in a contoured keyboard in which each row of keys meets the fingertips at a different angle. Noyes cites this detail as "a genuine and conscientious attempt to amend a machine so that it is better than what went before."

The suave outlines of the new machine are an effort to express through design what engineering has engineering has achieved: the elimination of a once-basic component. Noyes explains his aims this way:

"The continuity of shape on the sides and the open form of the platen knobs help to dramatize the new carriageless aspect of the Selectric. Against this basically simple shape, the keyboard and the various controls become careful and interesting accents of color and brightness."—*R.B.*

1. Moving along its bar, the single-element type sphere can travel over a sheet of paper with remarkably little vibration. Because it has no carriage, the Selectric saves approximately 15 inches of space needed with ordinary machines to accommodate carriage movement at either side.

2. Typist need never touch Selectric ribbon. It is sealed in a cartridge which can be removed in mid-sentence and changed for another color if necessary. Ribbon reverses automatically, and allows three writing positions to prolong its life.

3. Slow motion film studies of typists dictated the different angles shown for the key faces in this drawing from the Noyes studio.


IBM

ON COMPANY TIME In addition to, and in conjunction with, its consultant program, IBM also employs staff designers at each of its major installations. Ironically, this leader of the numbers business is embarrassingly unable to tell how many designers it has in the organization (perhaps because the query is too simple for computers, and no one remembers how to count), but there are 20 designers at its Poughkeepsie, N. Y. plant, where data systems are developed. Here is how one company design department, which includes "industrial design engineers," makes a highly specialized product useful and agreeable to its operator.

In a company whose whole foundation is engineering excellence, the purpose of an industrial design department must be to make that excellence both apparent and accessible to prospective customers and users. Department 203 (Industrial Design) at IBM's Poughkeepsie installation therefore must depend for its existence on efficient communication with the 2000 or so engineers and technical experts that make up the bulk of the Development Laboratory of the Data Systems Division. Just to keep afloat in this sea of engineers, the designers need the special advantage they enjoy in IBM's corporate insistence on the importance of design generally. They are helped further by the engineering background of the department manager, Cal Graser, who took a B.S. in mechanical engineering at the University of Michigan before he turned himself into an industrial designer.

The Development Laboratory is a highly complex structure, consisting actually of three separate laboratories: Technical Development, Systems Development, and Tele-Processing Systems. These are in turn organized into teams of engineers, each responsible for a specific project. Attendant on these projects is a whole constellation of central services: Customer Engineering, Serviceability Engineering, Reliability Engineering, Purchasing, Materials Testing, etc. Industrial Design is one of these central services, and it, in turn, is divided into three sections: appearance design, the largest division, staffed by nine designers; human factors engineering, with a staff of three; and industrial design engineering, whose eight members act as a link between design concept and production. While only one member of this group has any formal engineering training (and only one is a graduate industrial designer), their background in engineering drawing and their experience in actual production problems serve as a constant check on the practicality of the department's work. In many ways, the design department is similar to a consultant design office, and like a consultant design office, it may in the course of the year deal with many different projects, each staffed with a different group of engineers.

Last year, one such project was the 7080 computer console, for a solid-state commercial computer system, the rough equivalent of the 7090 scientific system. Functionally, the ancestor of the 7080 is the 705 vacuum tube system, which, however, demands much more space and a completely different form from the newer solid-state computers. The 7080 engineers were still working out the electronics of the system when, in 1959, they first presented their requirements to the industrial design department. This first meeting took place on neutral territory, so to speak, in the Product Planners' laboratory, on a hill at some distance from the other buildings.

Forces were evenly divided: Graser had four of his staff members with him, and they conferred with five engineers: the project manager, an engineer whose special responsibility was the console, and three others for the electronics. Graser had never even met this group of engineers, which is not unusual, (and some of *them* were working together for the first time too.) Since the engineers were still undecided about what would go into the insides of the console, they would only estimate their specifications for the outside: 25 pushbutton switches, 15 butterfly toggles, and 100 to 120 lamps and switches covered from the operator, yet available for servicing; standard IBM electronic modular gates; memory storage-select keys with seven 101-position strip switches; provision for a typewriter with fanfold paper-feed; and provision for the addition of a console card reader to be defined later.

These last two requirements illustrate some of the special problems involved in designing for IBM: a diverse product line, planned and manufactured in many different parts of the country, must be so harmonious that any two separate elements can be used together. In this case, the space left for the typewriter had to accommodate either the standard Model B or the new typewriter (page 47), whose existence was still a secret from much of the company. And the console card reader was at this point scheduled to be designed and produced at IBM's San Jose plant.

These, together with a production schedule, were the ingredients tossed in the design department's lap, to be unsorted and rearranged. How they did this is recorded in a series of twelve progress reports, spaced at regular intervals from the project's beginning in 1959 to its completion in 1960. First of all, to the engineers' requirements they added their own. The console should look like other IBM products, yet retain

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Designers at IBM are divided by specialties. Cal Graser (1 and 2) manages a department composed of Human Factors Engineers Al Thompson and Art Schroeder (3); Appearance Designers, including Walt Kraus and Joe Talerico (4 and 5); and Industrial Design Engineers — shown here are Ken David and Don Stenabaugh (first and second from left, 6 and 7), conferring with designers from the Endicott plant.

IBM's new 7080 computer console, shown here, with its accessory cardreader, against a background of the 705 system it replaced, is the joint product of company design and company engineering.

a separate 7080 identity. In whole or in sections, it should fall within the standard dimension for shipping. It should look like a complete entity, with or without the card reader. Finally, the console should contain sufficient work surface and storage space so that no additional tables and cabinets would be needed.

By the time the second report was issued, the designers had built a mockup of their ideas for the console and won two arguments with the engineering department. The first had to do with the angle of the wing containing the printer (typewriter). On the 705 console, that wing had formed an obtuse angle with the main indicator section, and the engineers argued that the wide angle was necessary to enable an operator standing in front of the main section to read the printer output. Engineers had daily been driving back and forth between their own building and the design department, and the designers, who preferred a printer wing set at right angles, saw opposition building up and had prepared their ammunition. They called in the engineers and product planners for a formal meeting to demonstrate that the operator would, in fact, be seated in front of the console and could more easily check a right-angled printer. Furthermore, a printer at such an angle could be read by two operators seated side by side.

The second argument had to do with the size of the console. Industrial Design had sent two of its human engineers to study working installations of the 705. They discovered that operators were pulling tables up to the console to hold their stationery, paper clips, coffee cups, and that the result was an un-IBM-like untidiness. The engineers insisted that IBM was not in the office-furniture business, and that the console ought to contain only the bare electronic essentials. But they quailed before the terrible vision of clutter conjured up by the designers, and agreed that the console should be enlarged to contain more work surface and storage space.

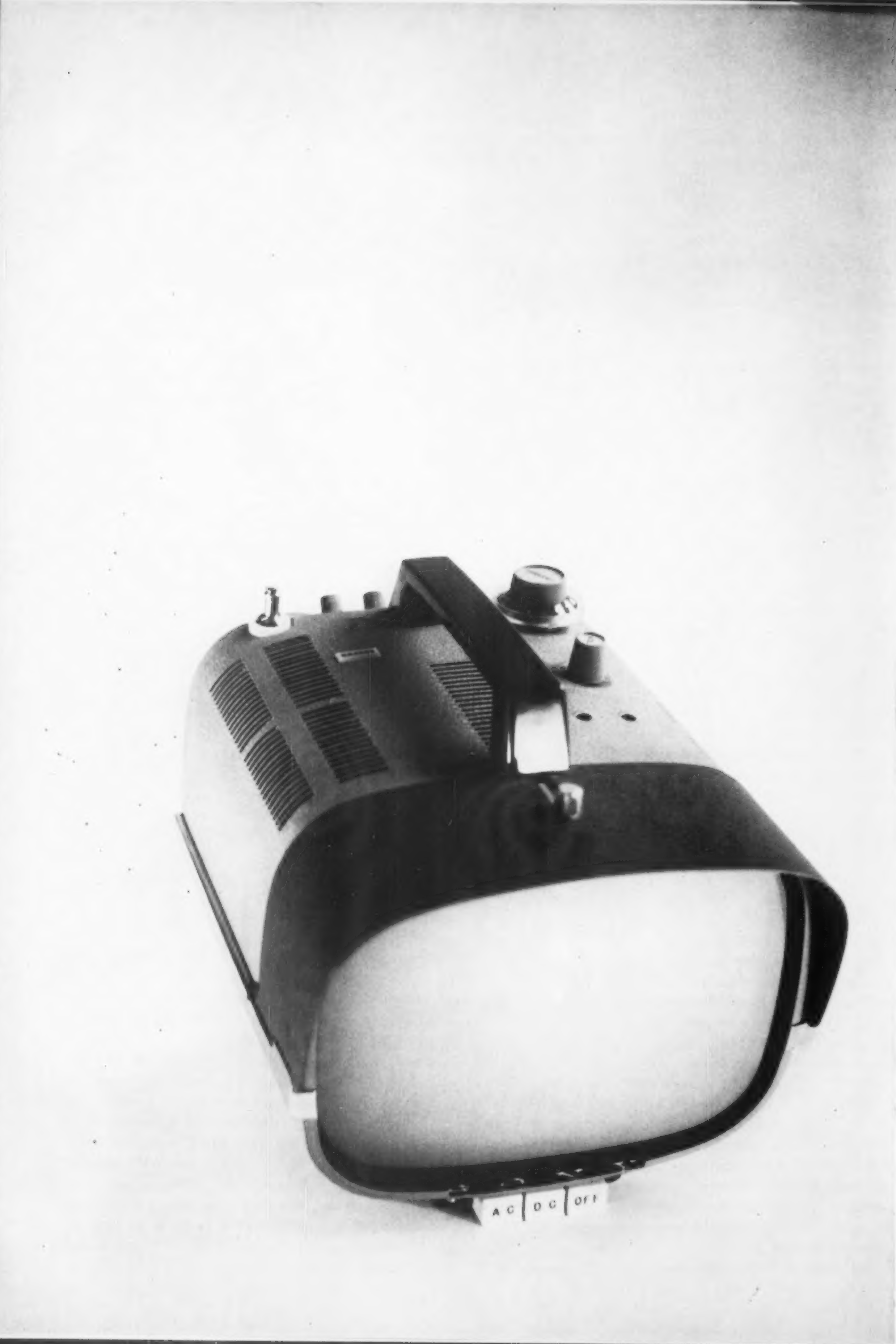
The third progress report noted that a full-scale appearance model was being constructed for a Design Review. This is a full-dress function that is standard procedure at IBM. Periodically, design managers from IBM locations all over the country, together with Consultant Director of Design Eliot Noyes assemble at one installation to inspect work currently in progress and to discuss its compatibility with whatever projects their own departments are involved with. This review, as it turned out, resulted in no change in the basic form of the console. Details were changing every day, however, as the engineers changed the number of required switches. (In this connection, the design department specified a type of switch not manufactured by IBM, and this required some wait before the engineers approved it.)

The Human Factors engineers at this stage were interviewing IBM service engineers to find the arrangements and forms of access that made for easiest maintenance. They were also responsible for deciding which of the many possible methods the computer would use to communicate with its human operators. For example, they decided to install an Alpha-numeric readout to translate the machine's binary language into human language. Manual controls which required precision were located to suit the right-handed majority. In cooperation with the product planners, the human factors engineers formulated reference information for the operator, and placed it directly on the console instead of on the card that was formerly used and often lost. Finally, they worked out a new housing to contain both the indicator light and the controlling pushbutton. This substantially reduced the number of lamp housings and consequently the apparent complexity of the machine.

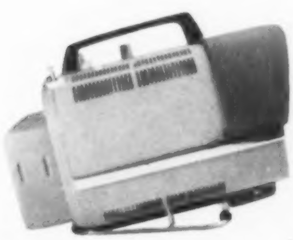
The real work of the Industrial Design Engineers was just beginning at this point, about halfway through the project. As each phase of the design was complete enough, they checked it directly with the manufacturing division instead of with the 7080 engineers. (Although final specifications would be released through the 7080 engineers, this direct liaison between the design department and the plant eliminated one time-consuming step.) Then, when they were sure that their proposed materials and construction techniques were practicable, the Industrial Design Engineers began the preliminary design layouts, or the "reduction-to-hardware phase," as it was called in the progress reports.

By the chronological midpoint of the project, the design department had a final and approved appearance model of the console (constructed by the model shop which serves the whole Development Laboratory) and its work from then on consisted simply in refining those details that did not affect the overall appearance. From the original symmetrical form, the console had assumed an asymmetrical shape to allow for the card reader. (As it turned out the card reader was designed and produced at Poughkeepsie rather than San Jose, but it formed a whole spearate project.) Below the console, in space not taken up by the electronic gates of logic, compartments had been provided for stationery, program cards, and service manuals.

A month before the project came to an end, the Industrial Design Engineering group had assembled a working prototype of the console, and was in the process of turning over detailed part drawings to the 7080 Engineering group, who could make changes in these drawings only with Graser's approval. Although with release to production the 7080 project came formally to an end, the industrial design department has continued, and will continue, to work with the engineers on any modifications that affect the appearance of the console.—*U.C.*


AC
DC
OFF

With the advent of semi-conductors, electronics engineering made possible the design of a variety of portable products that were once housebound because of size, weight, and power requirements. One of the leaders in creating these tiny appliances is Sony—a Japanese firm which last month introduced to the American market a transistorized **EASTERN BABY FOR ADULT WESTERNS.**



With typical Oriental skill the Sony Corporation of Japan has channeled some almost mystical market research into a product just introduced to the American market—a portable, transistorized television set. Although the set was developed, produced, and first sold in Japan, the idea for it came from president Masaru Ibuka and executive vice-president Akio Morita of the Sony Corporation of America. Sony — which likes to think of itself metaphorically as a marmot, constantly alert for new kinds of sustenance — put the idea into action with little of the preliminary fuss which accompanies such moves in the U.S. For instance, when the set was introduced in the U.S., Ibuka and Morita's conviction that there was a ready and expanding market here for personal or second tv sets, that the market for regulation tv had reached saturation, was never thoroughly substantiated by research. And the specifications of the set itself were not the result of a "carefully controlled scientific analysis": about two dozen Sony employees were asked their opinion about sizes and shapes, and the *means* of these opinions became specifications.

This may look like the sort of thing that has been going on for centuries in the Orient, where intuition is a basis for action, and business may be more often transacted in the tea house than in the conference room. But Sony is a highly sophisticated corporation, run efficiently and profitably according to Western business precepts. Yet it still comes as something of a shock to Western sensibilities to see a simple design solution executed simply.

Last month Y. Kamoji, chief product planning engineer of the Sony Radio Division, and K. Yamamoto, one of Sony's chief industrial designers, were in the U.S. ferreting out new materials and production processes. They accepted ID's invitation to answer some questions about the working relations of designer and engineer as they applied to the development of the Sony portable tv (ID June, 1960), and to take the difficult position of speaking for J. Yasuda, head of the design unit which worked on the tv, and for S. Shimada, chief engineer on the project.

ID: Mr. Kamoji, what were the chief engineering problems in creating a tv set this small?

KAMOJI: Our problem here was to develop entirely new components to fit into a small space and be suitable for use with transistorized circuits.

ID: How did you solve it?

KAMOJI: For one thing, we worked out a smaller, more efficient electron gun for the picture tube. It requires less power—13 watts. Also, our tuner is only a little more than one-tenth the size of a standard tv tuner. It is completely transistorized.

ID: Did your engineers present this miniaturized circuitry with the idea that designers would be able to create something around it? Or did Sony designers have an idea of the kind of set they wanted and ask the engineering department to try to build it?

KAMOJI: Design and engineering were done together, cooperatively. This is standard at Sony with new products. That's why I can't say that either came first, but of course we had a lot of knowledge about transistor circuitry from our experience with radios.

ID: What would you say was the biggest design problem in fitting the components into a case?

YAMAMOTO: Arranging all electrical components into space limited by the eight-inch picture tube, its width, height, and length.

ID: Can you outline the steps you took in developing this set?

KAMOJI: Yes. First we had to develop very high-frequency, high-powered, Silicon Mesa Transistors. Next we had to make a picture tube requiring low power consumption, suited to transistor circuitry—very difficult. Then we developed special tv circuits for transistors. All tv circuits before had been developed for vacuum tubes.

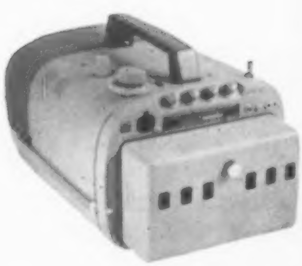
YAMAMOTO: After these innovations, we arranged the components and designed the exterior.

ID: Would you tell us something about the marketing objectives?

YAMAMOTO: A transistor tv can eliminate about 85 per cent of ordinary tv failures from burnt out vacuum tubes. Also, we hoped to create a market for personal tv sets. This set is light—17 pounds, actually, including the battery—and can be used with an ear plug. Aunt Mary in California or Aunt Aiko in Kyoto can take the set onto the porch on a summer night and not disturb the neighbors.

ID: Mr. Yamamoto, you said that the idea came from the American branch; does this mean that the transistor tv was designed specifically for the American market?

YAMAMOTO: No. It was not designed for any particular market. We've been selling this set in Japan for 18 months. When you showed it in ID, last June, it was being sold only in Japan. It was introduced in



Respondents to ID's questions in photograph at the right, and in other photographs on this and opposite pages, are from left to right: A. Hashamoto, a Sony employee, currently a student at Columbia University's Graduate School of Business Administration, who acted as interpreter; Y. Kamoji, chief product planning engineer of the Sony Radio Division; and, K. Yamamoto, one of Sony's chief industrial designers.

the United States in May. Plans are being made now to market it through Sony outlets in Shannon, Zurich, and Hong Kong.

ID: Did you make a lot of tests to determine the best size of the picture tube for good visibility?

KAMOJI: Ah, yes. It's a personal tv. We assumed it would be placed at arm's length from the viewer. We got about two dozen of our Tokyo employees together and asked their opinions of the best size for a personal tv set picture: 75 per cent said eight inches, 15 per cent wanted something bigger, and the rest, 10 per cent, something smaller.

ID: How was the material for the case determined?

YAMAMOTO: We wanted it to look professional and dependable. Also, a portable set needs a strong case. So we used pressed steel, with a fine, wrinkled, baked lacquer finish.

ID: Who made this decision?

YAMAMOTO: The chief project designer, in consultation with the chief project engineer.

ID: How did you determine the angle at which the set rests?

KAMOJI: Very easy. We used two measures: number one, the height of the average coffee table relative to the eye level of a viewer sitting in an average chair; number two, the height of an average night table relative to eye level of a person in bed at arm's length from a night table. The set is used a lot for in-bed viewing.

ID: Mr. Yamamoto, why does the set rest on a framework base rather than a solid one, and for that matter, why a fixed base at all, rather than an adjustable one?

YAMAMOTO: For light weight and strength. It was the chief designer's decision.

ID: Why is the battery attached to the rear of the set in a case of its own?

YAMAMOTO: When the set is being used on regular ac current, the battery can be taken off. This way you don't have to carry the battery, an extra four pounds, from room to room.

ID: How many engineers worked on this project?

KAMOJI: Over one dozen graduate engineers from the Research and Development Department.

ID: How many industrial designers?

KAMOJI: One unit. The design center at Sony has several units. Usually each unit, about half a dozen designers, is assigned to a particular project.

ID: Did you use consultants?

KAMOJI: No outside consultants were used on this project, but we do use them sometimes.

ID: Do you think that manufacturers here will imitate your transistor tv?

YAMAMOTO: We already have one imitator. An Italian firm—they call themselves "Somy"—makes a slightly different, but essentially the same, set, plainly marked "not made in Japan."

BLUEPRINT FOR HARMONY

A designer with wide experience in the "engineering industries" explains why industrial design enlarges, rather than limits, the scope of engineering practice*

BY PETER MULLER-MUNK

My many years as an industrial design consultant have taught me that our most deeply entrenched opposition in any new client company is usually its engineering department. Until we are able to convince engineering that industrial designers are not all charlatans and that our presence on the scene does not belittle their authority, all of our efforts are bound to fail.

When we finally succeed in piercing the "cordon sanitaire" of engineering reserve, it is because we have convinced engineering that, far from invading its territory, we actually enlarge it. For no matter what the engineering objectives are, they must ultimately serve people. This is as true of a spectrophotometer and an automatic system for the making and counting of aspirin tablets as it is of an electric sewing machine or a pencil sharpener. Admittedly, the relative contribution of engineering is greater in the spectrophotometer than in the pencil sharpener. The point is that, while the engineering process deals with calculable relationship, its product results become exposed to instinctive evaluations and reactions.

A set of engineering drawings for a high-speed printing press represents a definite statement of its parts, its size, and its expected operation. As such, from the engineering point of view, they are not often open to discussion, certainly not with an industrial designer. The critical handicap of such blueprints of a printing press, however, is their inability to print a newspaper, for they are only a symbol of a machine. Only the final press, when it is built, will do what the engineering drawings and calculations said it would do; but, in addition, it will also produce a whole series of other effects which were of no concern to the engineers but which are of vital concern to the industrial designer and even more to the purchaser and operator of the machine.

Engineering performance alone, therefore, is not enough; it must be related to and integrated with the reactions it will create in the purchaser or user, and with the physical conditions under which the product will be operated. Safety and other controls must be spaced and positioned differently when operated with work gloves than they need be if they are activated at the touch of a finger. Shiny surfaces might look elegant on an adding machine in the showroom but will produce eyestrain for the poor bookkeeper who has to use it. I, therefore, suggest that we broaden the concept of performance to include the total image of the product so that it includes not only its en-

** Based on a lecture sponsored by the European Productivity Agency.*

gineering characteristics but also its psychological effects and its adjustment to its total environment — both human and otherwise.

While I believe that industrial design is just as important for the "engineering industries" as for the industries that produce our more traditional consumer products, it is nevertheless true that the strongest impetus for industrial design came from the latter, perhaps because the results were a bit easier to measure. Historically, at least in the United States, industrial design established itself by proving what it could do with refrigerators, toasters, vacuum cleaners, and all the million and one appliances of our daily lives.

The relation of engineering to design in the consumer goods industries is that, with the consumer products, it is more often the design objectives which influence engineering; whereas this is not nearly so common in the engineering industries. In our work with Westinghouse, for instance, our office is responsible for the long-range planning of their line of major appliances. Our recommendations affect the total concept of refrigeration, laundry, food preparation and storage, and of their relation to each other. Of course, research and engineering play a prominent role in indicating what mechanical, electrical, or other means are available and what can and cannot be done in a given time and within a given budget for tooling. It is the design concept, however, which determines the essential engineering characteristics; and I believe this is typical for the industry as a whole. Most emphatically, credit for the end results—successful acceptance and corporate leadership—should go to both parties, never to one alone, because it is ultimately impossible and fruitless to determine how much of product acceptance is due to design and how much to engineering. A great deal of damage has been done to the alliance of engineering and design by the violation of this rule of shared credit, and I might as well admit that my profession must take most of the blame.

Turning now to the engineering industries, I firmly believe that the correct position of industrial design is of crucial importance in the development of capital goods, of machine tools, heavy equipment, and specialized devices. One of the handicaps to a more general employment of industrial design by the engineering industries is lack of knowledge within the industry. You can always manage to find a newly-designed coffee grinder or pressure cooker in some fashionable magazine, but a beautifully proportioned oil derrick or industrial furnace goes unnoticed, nor do they lend themselves so easily to after-dinner conversation. Yet I am of the opinion that American industrial design has distinguished itself in this area above all others, although its achievements, unfortunately, are little known abroad.

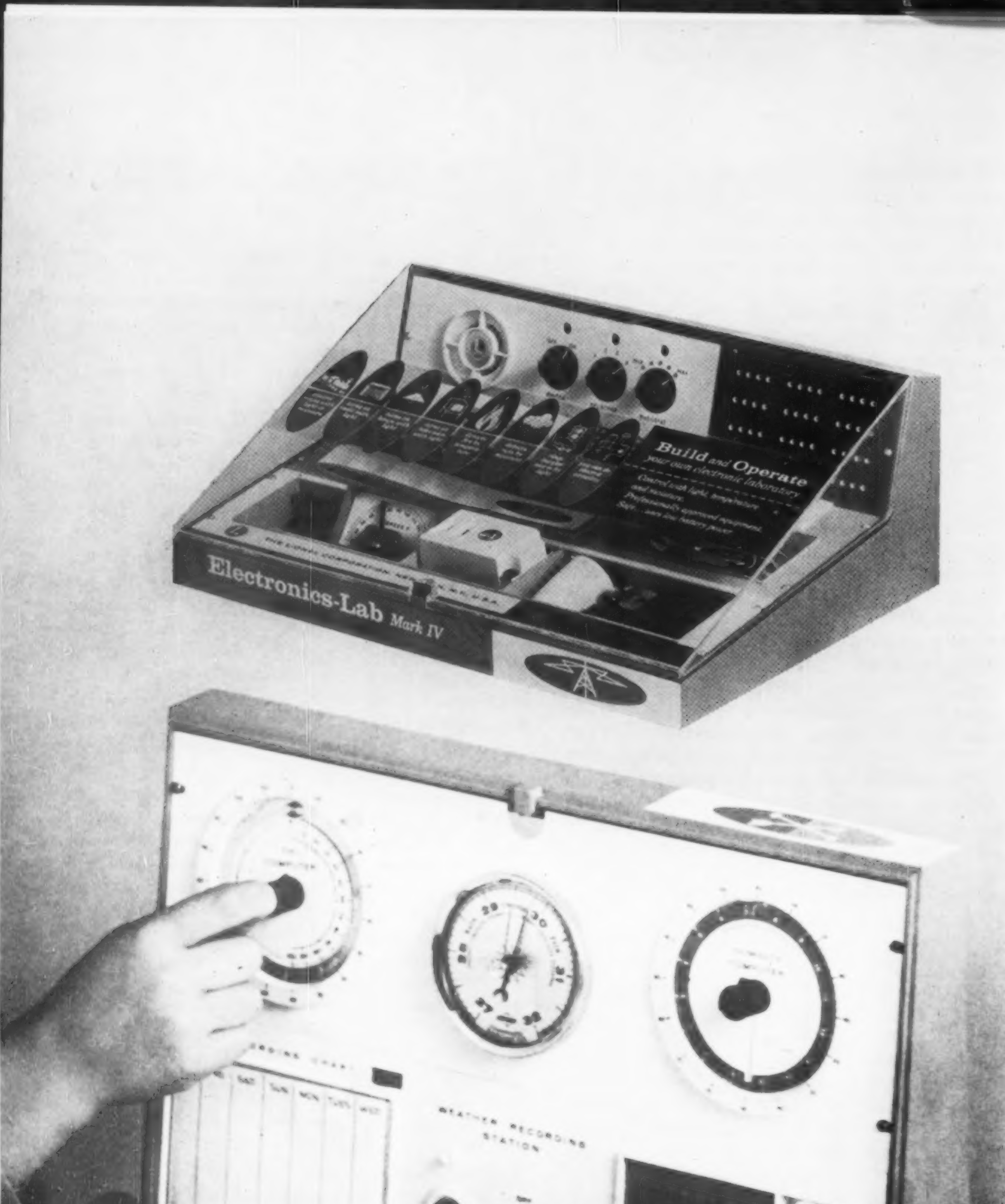
The argument which is usually advanced by the engineering industries is that their products exist and are judged for performance only, that appearance plays no part in the selection of an injection-molding machine or an automatic mail sorter. Furthermore—and this is perhaps the crux of the argument—the average engineer with responsibility for the design of a generator or a concrete mixer believes instinctively (1) that his design principles are the most economical and functional and (2) that industrial design can, therefore, only add something that is not necessary to an already perfectly conditioned product.

Neither of these two attitudes is, in reality, tenable. Performance, or rather the confidence in expected performance, is heavily conditioned by the degree to which it is expressed externally. The operational processes of an automatic mail sorter must be clearly understandable and apparent to a knowledgeable purchaser, not to mention the operator. The disposition of the joining of parts, the sequence of motions, the position of the operator in relation to the machine, the use of colors, and the location and form of controls —all of these elements are subjects for design just as much as for engineering. And in spite of what engineers tell me at the beginning, a surprising amount of option remains between alternate solutions.

The second argument, the one that thinks of design as an unnecessary addition to an already self-sufficient composition—has its basis in an equally deplorable misunderstanding of the nature and function of industrial design. Annoyed by the impatient requests of the sales department to add sex appeal to a bulldozer and a little frightened by a remark from the boss that "maybe we should call in an industrial designer to get his opinion," some of our most able engineers try to turn themselves into industrial designers. They visit a few industry exhibits, they look at a few design magazines, and what happens? All the worst clichés and the most superficial mistakes of amateur designers are revived by engineers turned into designers. If an experienced industrial designer had had a go at the problem, he would have been infinitely more restrained and more respectful of the character and function of the engineered product.

If engineering and design work together as a team, the members of which understand their different professional qualifications and limits, then such products of the engineering industries will acquire a monumental beauty and refinement that will influence the purchaser and the operator and even the beholder.

I should like, therefore, to paraphrase the different positions of engineering and industrial design this way: engineering provides the vocabulary and grammar; industrial design arranges these fundamentals until their composition becomes style. Separately, we can produce no more than a dictionary; together, we create a language.


Build and Operate
your own electronic laboratory
Electronics-Lab Mark IV
WEATHER RECORDING
STATION
Weather Station Mark 2

IN THE PLANT AND OUT consultant designers work with engineers. Here are five fairly typical medium and small sized offices which use various representative techniques. One of them gets physically close to engineering departments by placing designers in the client's factory on a regularly scheduled basis.

1. Van Dyck Associates, Inc.

"I think there is more rapport between creative people in different fields than between creative and non-creative people in the same field," says engineer John Montgomery in explaining his compatibility with the industrial designers he works with. A year ago, Montgomery and industrial designer Kenneth Van Dyck set up Van Dyck & Montgomery, Inc. to do product engineering and development work. Actually, Montgomery had been doing exactly that for some months as a member of Kenneth Van Dyck's design firm, Van Dyck Associates, but it had become apparent that there would be personal financial advantages in having the engineering and industrial design services legally separated. Professionally the new arrangement is the same as the old: there is close interdependence and the two firms share the same building in Westport, Connecticut. Van Dyck & Montgomery, Inc., with a staff of four engineers, including Montgomery, can now offer consulting engineering services in electronics, magnetics, optics, acoustics, and mechanics. Its services are available to Van Dyck Associates on a consulting basis and vice versa, allowing either firm to initiate product development work.

The Signa Guard shown here was developed for the Radio Corporation of America by both firms. This is how it happened. RCA, needing a device that would permit them to use "scrambled" signatures on pass books and credit cards, approached American Optical Company. After some preliminary investigation, American Optical came up with a series of fiber patterns that would reconstitute illegible signatures from a previously coded scramble of lines and squiggles. The patterned optical elements had to be incorporated into a conveniently usable, attractive housing. For this job they sub-contracted with Van Dyck Associates.

There were two basic problems. Any credit card or pass book had to be lined up exactly in register with its coded optical element; otherwise its signature would remain illegible. And because there was a series of codes, and therefore of optical elements, the elements had to be replaceable—easily and without danger of damage—by bank tellers, garage mechanics, or hotel clerks. The crux of the answer seemed to lie in the configura-

Two of the science kits developed by Van Dyck Associates for the Lionel Corporation are shown on opposite page. With the electronics kit (top) one can do some fairly complicated wiring and work with remote control devices. The weather kit (bottom) displays wind gage components (in the foreground), shows simple computing devices for humidity and THI rigged by Lionel engineers and VDA designers.

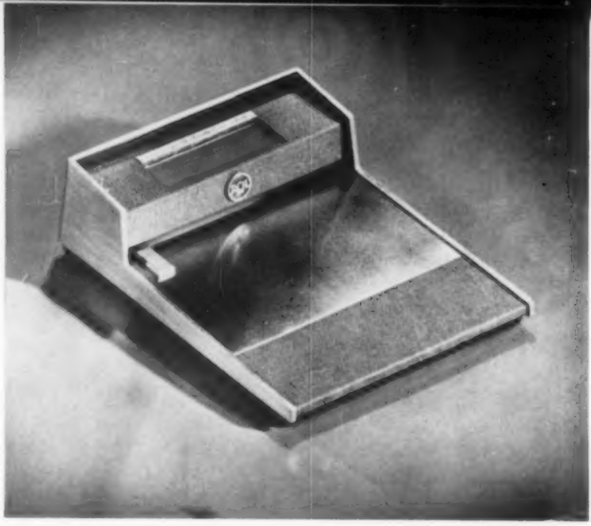
tion and the material of the optical element, and Van Dyck Associates turned to Van Dyck & Montgomery for engineering assistance. If the solution seems simple, it is so partly because of the thorough cooperative study that preceded it.

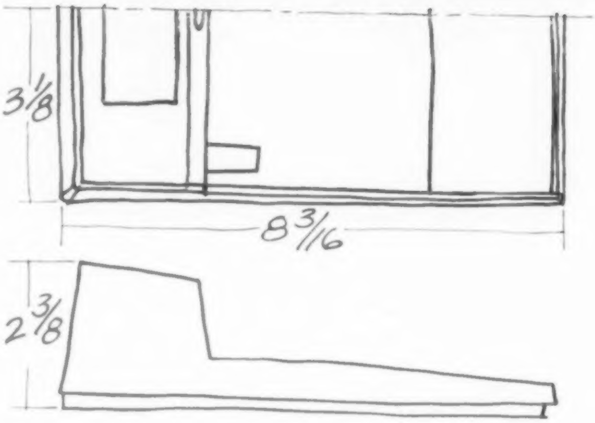
It was obvious to both Montgomery and American Optical that if the optical fibers were embedded in some sort of transparent material, this would simultaneously provide both a fastening surface for a registration device and a protective coating. But this material had to be optically correct in order not to distort the image. The problem was resolved by encapsulating the fibers in an epoxy, which incidentally also gave the element added strength. Then, having determined, in collaboration with American Optical, a rectangular shape for the element, Montgomery was able to screw a flat stainless steel plate to its rear edge. Projecting slightly below the bottom surface of the epoxy slab, it provides a registration block against which the credit card or pass book can be butted when slipped beneath the element.

With Howard Weber, VDA's designer on the project, Montgomery decided on a sand-cast aluminum stand to house the optical element (two screws hold the element to the stand), and Weber then dictated the stand's dimensions by determining the amount of space needed for a standard credit card or pass book to fit beneath the optical element. Weber also specified that the aluminum around the aperture be covered with a gray vinyl laminate to cut down reflection from overhead lights, making the signature easier to read.

Van Dyck Associates' usual way of working on an account has been established largely by its association with the Lionel Corporation. In 1955, shortly after Van Dyck set up VDA, J. L. Bonano, vice-president in charge of engineering for Lionel, called in Van Dyck and asked him to provide long range design service, working in the Lionel plant one day every two weeks. "I felt that by having him in the plant on a regular schedule we could have greater control over the designer and save costs by eliminating waste motion," says Bonano. This working arrangement, novel only in its scheduled regularity, is preferred by Van Dyck. His designers do a lot of their designing sitting right at a desk in the client's engineering department, where they appear regularly once a week or once every two weeks. The frequency varies with the needs of the client and the demands of the project. In this way, Van Dyck feels, the bugs can be worked out of a design before time is spent on costly renderings whose beauty belies the item's producibility.

During the past six years Van Dyck Associates has worked on most of the Lionel toys, from box cars to rocket launchers. Their most recent project was the development of a series of science kits (ID, April 1961). Using four basic kits, the consumer can work with





RCA Signa Guard (above) contains an optical element which unscrambles coded signatures. With the lever at lower left, VDA designer Howard Weber provided a means of changing the unit's fixed margin. By adjusting the lever, unit can be made to accomodate a card or pass book of greater or lesser width.

plastics ("make mercury capsule by rotational casting"), electricity ("build burglar alarm"), weather, or the simulated inventions of great inventors.

By the time this project was planned the client-designer relationship had matured sufficiently for Lionel to feel secure in turning the entire thing over to VDA. Although the Van Dyck designers, notably Harry Jones who headed the project, worked largely on their own, they occasionally consulted the Lionel engineers. For instance, there was cooperation in trying to rig a simple wind gage for the weather kit — one which could be manufactured easily and, equally important, one which would be easy to set up and operate. Most wind gages are fairly complicated, depending on dials and electric motors and sometimes long flexible shafts which connect the instrument on the roof with a gage in a room beneath. Jones and the Lionel engineers wanted to have a remote-reading wind gage. Together they decided to connect a plastic velocity-measuring device by wire to a small, low-voltage light. Jones worked out a lot of the details himself. As the wind rotates the arms of the device, a switch at its base is opened and closed, sending an electrical pulse down the wire to the light. By counting the number of light flashes in a minute, one can determine the speed of the wind.

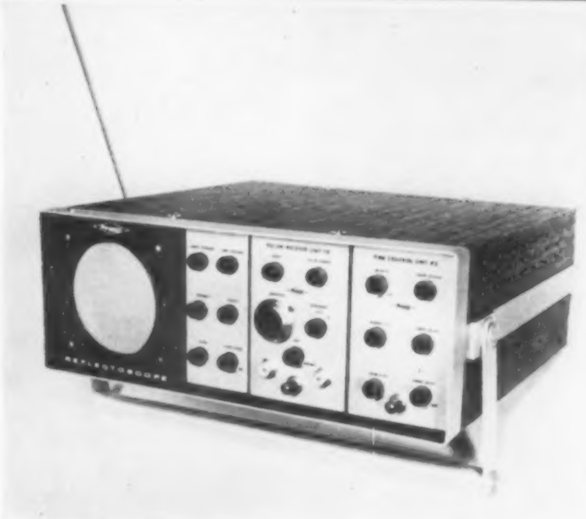
The tooling for Lionel toys is highly sophisticated. "These people are masters of tricky tooling," says Jones. "They do things others wouldn't dare to do — like using metal-to-metal shut off dies." This production complexity makes Lionel engineers prefer to work with designers who have a knowledge of production. One engineer says: "The Van Dyck people do graphics and human factors well but so do others. Their value is in their technical knowledge and approach." Jones has three years of college engineering training and once spent eight months in a trade school for machinists. This is the sort of technical background Van Dyck, who has a physics degree from Carnegie Tech, likes his designers to have, although it more often comes from experience than from formal training. (The average Van Dyck designer has worked for ten years before joining VDA.)

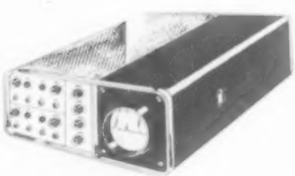
Another Van Dyck point of emphasis is personability. Because VDA designers do so much work in the client's plant, the personal frictions that lose accounts are a greater than normal threat. K. J. Parry, Lionel's Engineering Administrator attests: "One thing that has helped Van Dyck more than anything is the terrific personalities of his people. They are easy to talk to, fun to shoot the breeze with," suggesting that perhaps some engineers can be reached more through a Dale Carnegie course than a production methods course.

But Van Dyck enjoys his involvement with engineering, and from the beginning most VDA accounts have been technical. For instance, an early project was the redesign of the Sperry Products Reflectoscope. The

Kenneth Van Dyck (above) and John Montgomery (below) separately head the firms of Van Dyck Associates, industrial designers, and Van Dyck & Montgomery, product engineering and development, but the two firms frequently collaborate on assignments. Montgomery was for five years chief development engineer for the Dictaphone Corporation.

While redesigning the International Equipment Company's centrifuge (below), Van Dyck tripled his normal design time, putting in about nine days a month at the IEC plant instead of the usual three. To make it possible to operate the centrifuge without stooping, Van Dyck moved the controls from the side to a panel on the top (new model, bottom).





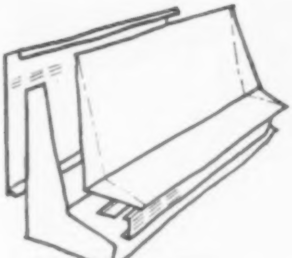
Shown above are two of the sketches Van Dyck did in the Sperry Products plant in determining the proper silhouette to give their reflectoscope. The unit's original bulk was eliminated in the low silhouette design of the final product (top).

original unit was bulky (it took two men to carry it), weighed about 75 pounds, and was awkward to service. Van Dyck proposed that its case be made of aluminum sheets braced by an inner aluminum frame. By thus eliminating front and back steel castings and a wrap-around steel cover, he cut the weight from 75 to 38 pounds. A low silhouette that eliminates the bulk was chosen with the Sperry engineers after Van Dyck had drawn a flock of sketches during one of his regular visits, thus reducing the number of renderings necessary. Van Dyck also called for the use of plug-in components. Instead of being wired directly to the unit, the components now plug into its back. Maintenance is made easier by allowing the removal of an entire component without taking the reflectoscope out of operation, and he made the top removable for easy access to the interior circuitry.

Another early Van Dyck client was the International Equipment Company. While working for them as a general design consultant, Van Dyck realized that the IEC centrifuge needed redesign. IBC's chief engineer was in the hospital, so Van Dyck and one of his associates at that time took on the project themselves. Base and motor housing of the centrifuge were cast, requiring 11 separate castings. By using sheet steel, Van Dyck reduced these parts to four. The square-cornered shape that resulted fit easily and logically into laboratory space, and permitted storage of materials in the front of the unit. And no longer was it necessary to remove a casting to get at the motor: access was through the storage space. Van Dyck procured parts: control knobs, door handles, casters, etc. His associate made the engineering drawings.

Van Dyck Associates, however, is an industrial design firm, not a firm of engineers. And although their technical orientation leads them to accounts in the engineering industries, their contribution to the account is not always technical. For example, in working on the Digital Equipment Corporation's programmed data processor, VDA's assignment was to make the unit more flexible. The processor works with fantastic speed, about two and one half times faster than the closest thing to it. Information is typed into it with a standard typewriter, and seconds later an analysis of this information appears on a cathode ray screen. The arrangement of the information in the processor and the order in which the answer or analysis is fed back is regulated by a control panel. VDA designer Robert Pfister learned from the project engineers that the wiring of the unit would permit the components to be separated. He designed stands for them which permitted easy, comfortable operation and which looked compatible whether they were bunched together or widely separated. Because of tooling commitments, DEC engineers dictated fabrication: sheet steel. "Luckily," says Pfister, "the 'square look' is in."—*E.C.*

Using sheet steel fabrication dictated by the Digital Equipment Corporation's tooling, VDA designer Robert Pfister gave the programmed data processor (opposite page) flexibility and made its operation easier. The front of the control panel (1) forms an obtuse angle, presenting an easily accessible face for positioning lights and knobs. Pfister made the cathode ray tube (2) and its stand a separate unit, avoided prosaic rectangular box housing.



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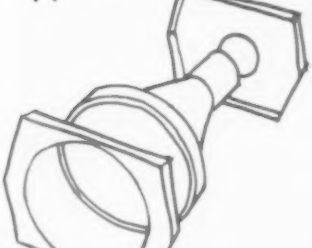

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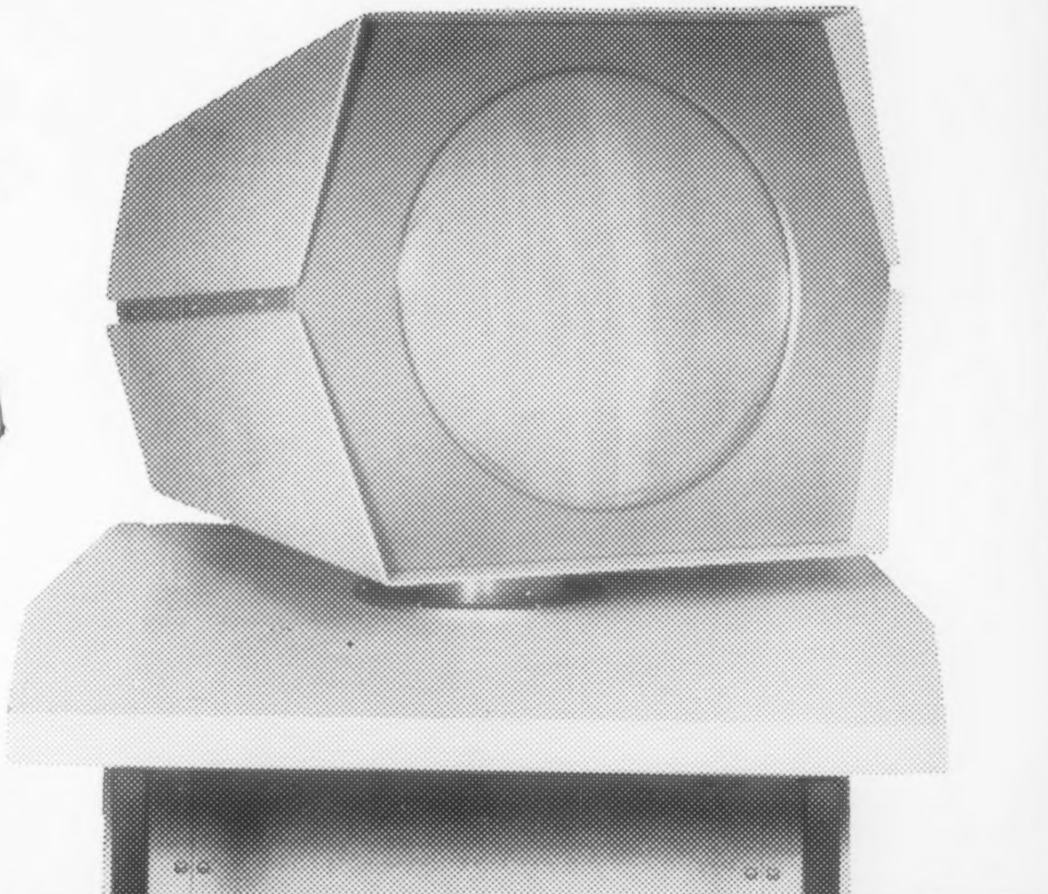

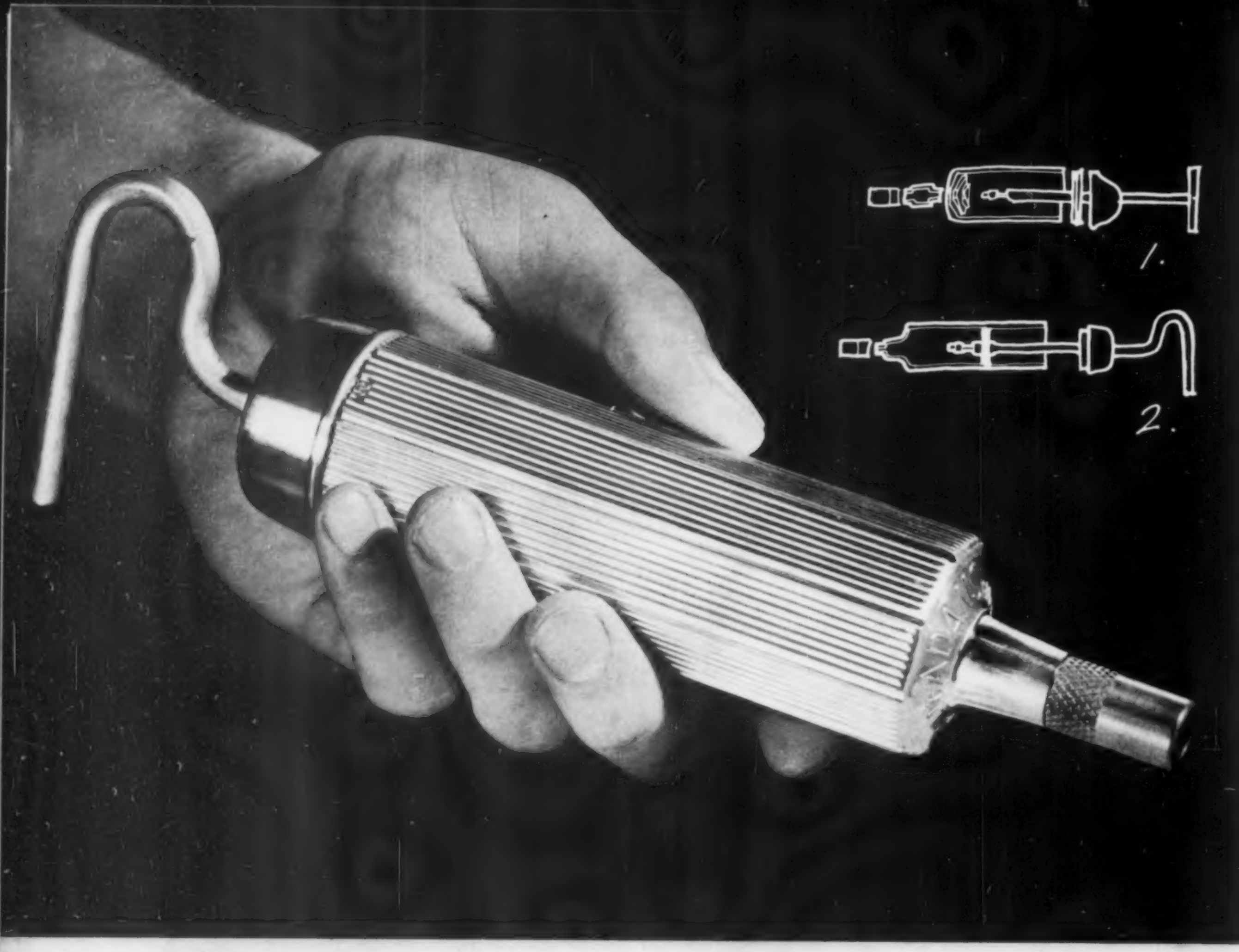
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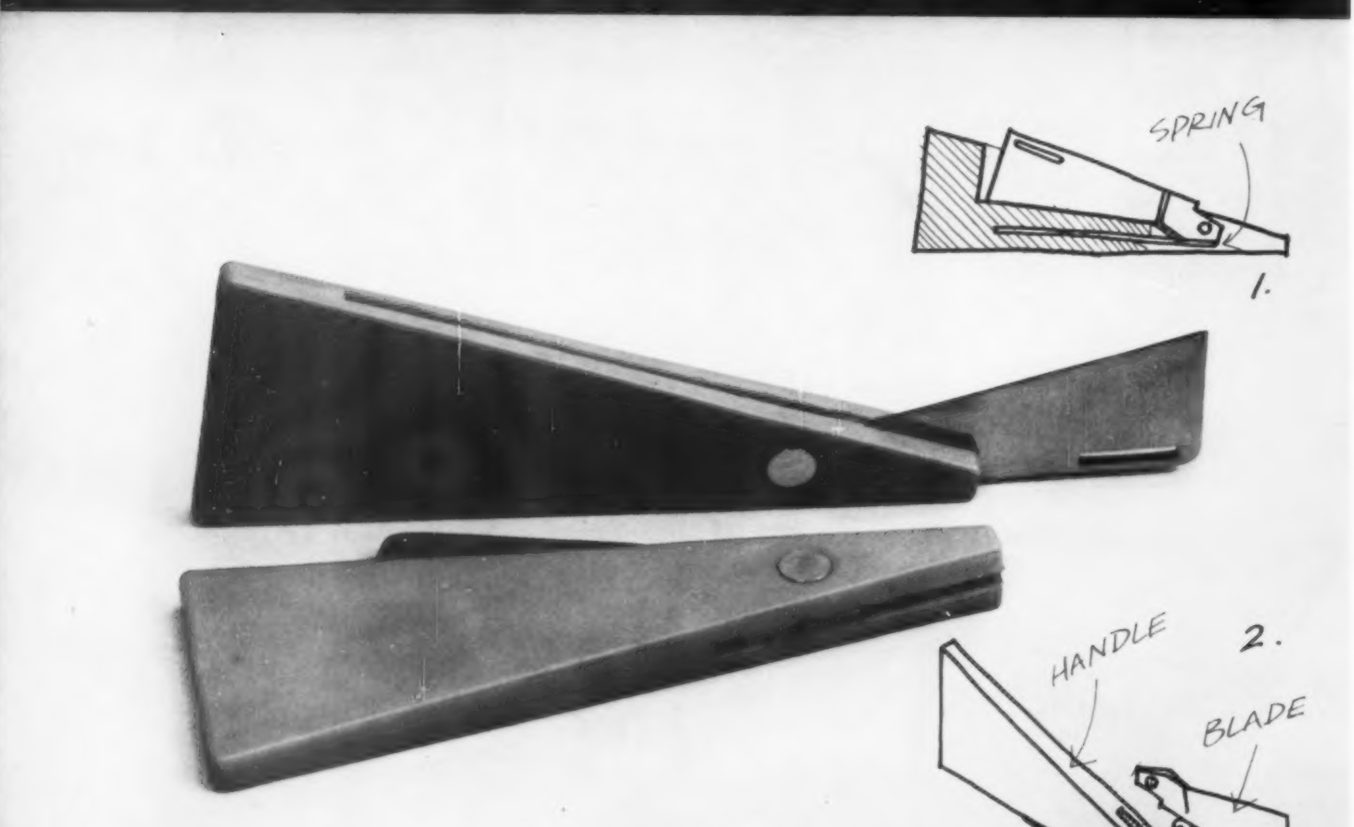
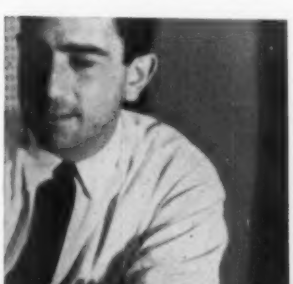

SPRING
1.
HANDLE
2.
BLADE
SPRING

Singer's diagrammatic drawings (opposite page, top) illustrate how his grease gun design (2) achieves an economy of parts over conventional model (1).

2. Roger Mark Singer

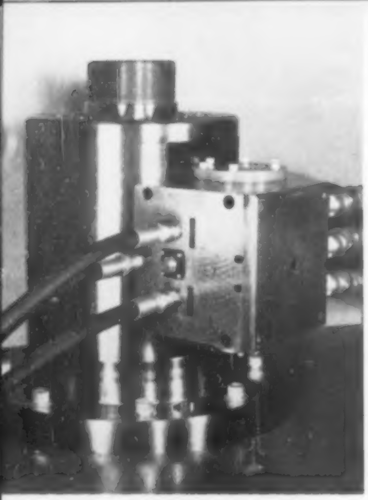
Industrial designer Roger Mark Singer finds it easy to talk shop with engineers, since he is one. Registered as a professional engineer in New York State, Singer handles a number of technical design accounts, and he says that often his combination of engineering knowledge and design approach helps him decide on production innovations his client's engineers may overlook. His project for the Adams Grease Gun Company, Inc. was to design a grease gun that would be less costly to produce than the competition's, and still be as compatible as possible with the existing Adams tooling. The standard grease gun has a deep-drawn steel shell body which takes four separate machine operations to produce, and embossing the trade name adds an extra step. The neck between the body and the tip assembly is a screw machine part, which adds still another production step. Singer's solution specified an aluminum impact extrusion, so that neck and body can be produced in one piece in one operation, cutting the total production steps (including embossing) from six to two. Also he recommended that the handle (traditionally two pieces) be a single steel wire rod. Total production cost was cut by one third, Singer says. To minimize the unpleasant multi-colored effect of extruded aluminum, he specified grooving, cutting seven grooves the length of the body on each of the nine sides. The body is nine-sided to prevent rolling on a flat surface and to permit a firmer grip with a greasy hand than the standard round one; at the same time, it is close enough to round to rotate easily in the hand during use.

Gersin's florist's knife (opposite page, bottom) is assembled in three steps: insert spring in handle; position blade in handle; fasten rivet through handle and blade.

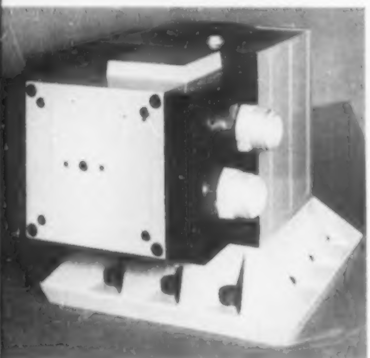


3. Robert Gersin Associates

Robert Gersin of Robert Gersin Associates, New York, has a fairly conventional industrial design background (Master's from Cranbrook, design work for the Navy, teaching at the Philadelphia Museum School of Art), but he feels no lack of technical training. He believes that many designers do what must be called engineering —on relatively simple mechanical products. Except for a brief consultation with a metallurgical engineer about the spring (to see if it could be an extruded wire), Gersin worked alone on the florist's knife he developed a little over a year ago for LMG Products in Boston. Ordinary pocket knives usually used by florists to cut stalks of flowers or plants are surprisingly ill suited to that type of work. Hard to hold, they cause thumb and forefinger callouses. Furthermore their production is complicated: a typical one has 11 parts, made from three materials — stainless steel, cellulose acetate, brass—and their exteriors are often hand finished. By reducing the number of parts to four—blade, handle, spring, and rivet — Gersin made assembly a simple three-step operation. The handle is injection molded nylon, sturdy and easy to produce; blade, rivet, and spring are stainless steel. To make the knife comfortable to hold and convenient to use, blade and handle meet at an obtuse angle, forming an area for positioning the stalks in cutting, and the heaviest part of the tapered handle has been extended forward of the joining rivet, covering part of the lower edge of the blade and forming a platform against which the thumb can press in cutting. As it moves away from the blade, the handle flattens and widens so that it fits snugly into the palm, and will not turn or slip in use.



Rounded cast iron body on an early prototype (top) of Paul Wrablica's hydraulic shaker design was not as economical to produce as the square one finally adopted (left). Evenly spaced bolts around base permit the unit to be mounted on wall or bench.



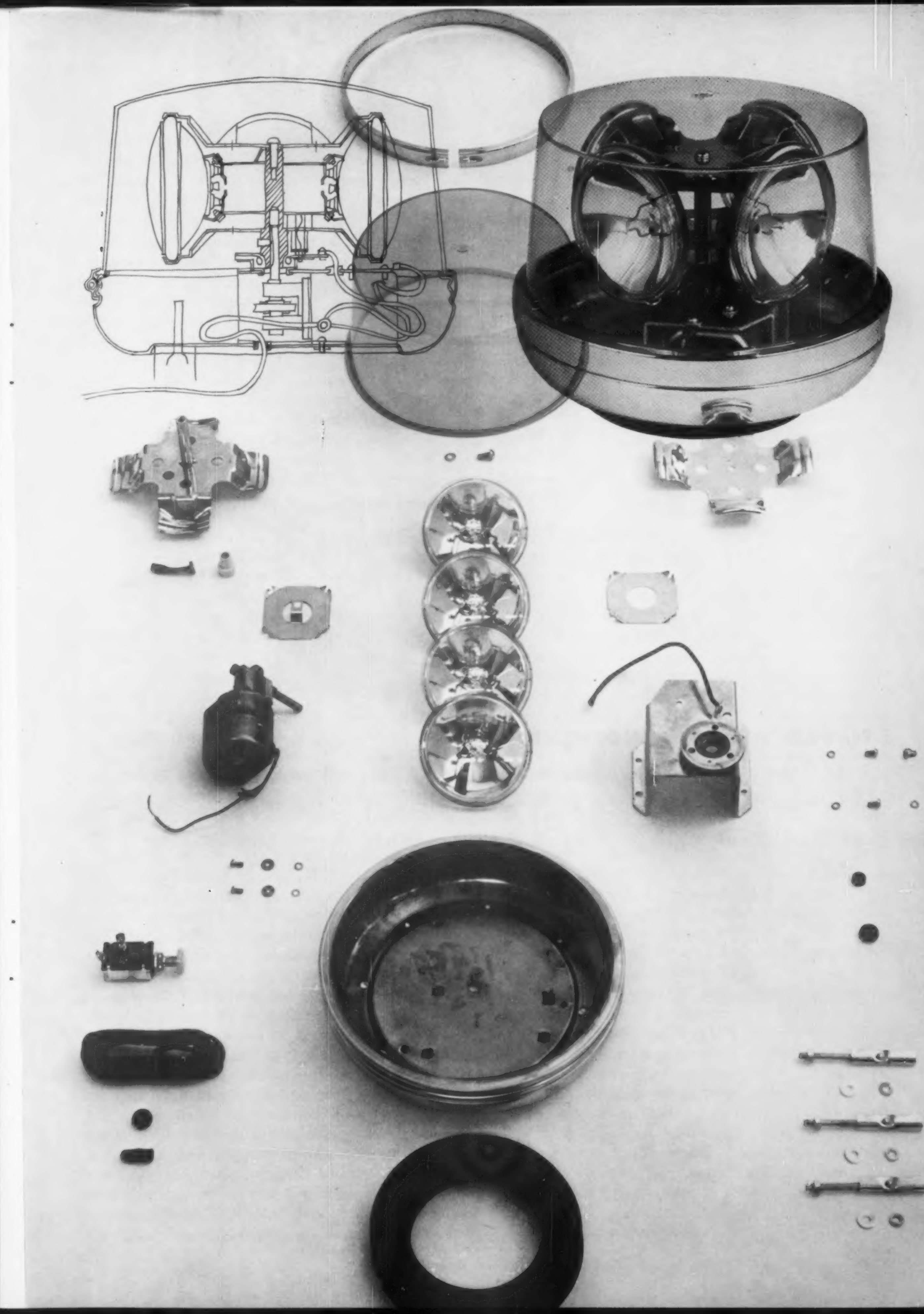
4. Paul Wrablica Associates

Like most industrial designers, Paul Wrablica has a more than passing interest in how things work. But Wrablica has channeled this curiosity into extra-curricular engineering courses, and as a result has acquired a reputation for getting below the surface of technical design assignments. His New York design firm, Paul Wrablica Associates, frequently makes recommendations that improve the internal engineering or the production processes of the machinery or equipment it is called in to design. For example, in working for MB Electronics on their hydraulic shaker, shown here, Wrablica was given a standard design assignment: to make the machine convey a feeling of strength and distinction. A hydraulic shaker is used to test the fatigue limits of heavy structures to vibration and shock. It must be fairly impervious to violence and wear from any one of a number of machine shop hazards: water, heat, grease, accidental blows by heavy objects. The engineer's suggestion was to wrap up the entire mechanism in a nonfunctional, sheet metal jacket, hiding the one unchangeable part — a square servo valve. Wrablica demonstrated that a single cast iron body, fitting snugly around the servo valve, would better achieve the appearance they wanted. Also, he pointed out, it would eliminate unnecessary parts, reduce the chance of rattles, and cut tooling costs. Finally, to maintain clean, functional lines, Wrablica convinced the engineers to replace six small diameter hoses with two larger ones. Investigation proved, as Wrablica had guessed, that the fluid flow remained the same.

5. Stevens-Chase Design Associates

To extend their product line the R. E. Dietz Company (warning lights) asked Stevens-Chase Design Associates to develop from scratch a safety and emergency vehicle signal light. Stevens-Chase, a technically oriented, upstate New York design firm, is well equipped to handle design engineering details in this sort of work: all their designers have worked as design engineers or draftsmen in industry, and they regularly use consultant engineers on a part-time basis. In checking the legal requirements for this type of light Philip Stevens and David Chase found several states trying to initiate legislation for better safety lighting on school buses. To meet this potential market one major specification was necessary: low silhouette, permitting buses fitted with the light to clear their garage doors. They also decided to have the mechanism whirl a full 360 degrees, giving equally spaced flashes from each of four lights. In standard units the light oscillates over 180 degrees, providing an almost constant light, instead of the more desirable contrast of alternate red flashes and darkness. For the unit to rotate 360 degrees, Stevens and Chase had to find a way to carry power to the light. An ordinary wire would be twisted off as the light whipped around. They worked out a continuous contact in which a spring holds a carbon brush against a revolving brass ring. And then, to find a motor generating sufficient power but still small enough to be fitted comfortably into a low silhouette, they consulted Rae Manufacturers. Rae had a motor that was suitable with minor modifications, and provided a connecting gear train according to Stevens-Chase specifications.

Philip Stevens and David Chase (above, left and right) used a brass base and an acrylic housing for their low-silhouette signal light (opposite page). Small, six-volt motor which powers light's 360-degree rotation is shown (left, center) among the disassembled parts.



I NEVER WAS AN ENGINEER claims industrial designer Don McFarland. What he means by the disclaimer is that, despite his engineering training, his instincts were always those of a designer. In a review of the twists in his career, McFarland explains why he thinks that designers are born and not made.

BY DON McFARLAND

Although I was educated and trained as an engineer, and practiced engineering for the better part of 10 years, I feel that "I never was an engineer." I choose the negative past tense in describing my own case in order to explain what I feel to be the essential difference between a designer and an engineer.

Just to lend credence to my statements, let me briefly describe my background. Seventeen years of knowing positively that I wanted to be an aeronautical engineer led me to Rensselaer Polytechnic Institute in Troy, New York, from which I was graduated with a B.S. in Aeronautical Engineering in late 1942. While at RPI, I learned many things, but one of them stands out in my mind as having been worth the whole four years. I had chosen, as my senior thesis, to develop a theoretical approach to determining the "induced velocities of helicopter rotor blades." Up to then, most rotor blade work had been done empirically. After laboring mightily with the complex effects of four blades simultaneously rotating and translating—each one affecting the other —I pulled the whole thing together and proudly presented to my advisor, Dr. Paul Hemke, Dean of Aeronautical Engineering, a thick package of computations. He thumbed it quickly and stopped on the last page where a long formula stretched across the page twice. He shook his head slowly, saying, "No, this isn't right." But since no one else had ever done this, how could he know I was wrong, I asked. Dr. Hemke's reply was: "things in nature are essentially simple — your answer is too complex to be right." He turned out to be correct in that instance, and many times since then, in both engineering and design projects, I have reflected on this when a problem seemed to be getting out of hand.

Vought Sikorsky (later to become Chance Vought Aircraft) in Stratford, Connecticut, was apparently more impressed with my drafting skills than with my helicopter theories, since I was hired into Vought's engineering drafting room rather than Sikorsky's aerodynamics department. But after two years of spinning rivets with a compass, something happened that is important to my thesis.

While being overwhelmed daily in the drafting room by AN standards, I had made friends with the aerodynamics and development people and spent lunch hours reading classified reports about transonic air speeds and theoretical jet engines. Soon my crib notes and tracings of graphs were sufficient to permit me to design (including performance analysis) a theoretical all-jet fighter. With complete immodesty and utter disregard for organization structure, I sent it to the chief engineer. Two days after receiving the worst lacing I've ever experienced for breaking every company and government rule conceivable, I was transferred from "acres of draftsmen" to the design, or development, group.

The point is that I was not a good rivet thinker—my mind and abilities seemed to function better conceptually. In the drafting room I was good at dreaming up a better basic approach to a problem, but seemed to lose interest in the nut and bolt stage.

After several years of designing Navy carrier fighters and a cargo transport airplane, I felt the fire leaving me. More airplanes didn't seem to be enough, and the cycle from conception to production was prodigiously long. Furthermore, much of my satisfaction was involved in seeing the end product, and although I was a private pilot, I couldn't fly any of the planes I had had a hand in creating. My approach to airplane design had always been esthetic as well as functional, and I spent many hours arguing with my fellow engineers that "a good-looking airplane is a good airplane." Somehow this was all wrapped up in an esthetic philosophy relating to the beauty and efficiency of nature, and a rigorous technical thesis that air moved over pretty (or faired) surfaces better than over ugly ones. This old favorite of an argument has yet to be won or lost.

I must have been a fairly uni-directional guy during these years since the profession of industrial design never really penetrated my professional world. But just at this critical stage I saw an article in *Look*, describing the successful career of a man who had started as an engineer but applied his creative and esthetic talents to every thing from lipsticks to locomotives — not as an engineer, but as an industrial designer. The man, of course, was Raymond Loewy. This kind of work seemed to fit my abilities and stimulate my imagination.

After reading every published word on industrial design—and there was precious little in those days—and taking painting instructions to "loosen up" (that's what one book prescribed), I packed my airplane work and life drawings under my arm and went to see Raymond Loewy, Walter Teague, Henry Dreyfuss, and hosts of others. I never actually got in to see Loewy, Dreyfuss, or Teague—nor should I have expected to. I didn't get in to see Norman Bel Geddes either. The elevator operator in the apartment building where he had his office wouldn't let me go up, saying, "only girls can go up today." This made me curious about the new profession I had chosen, but I learned later that he had been interviewing models for a special project. My very unprofessional portfolio didn't seem to generate any interest among those I did see—there were no toasters, refrigerators, or furniture photographs in neat acetate envelopes. My briefcase had only photographs and drawings of airplanes I had designed, cockpit layouts, pilot seats, etc.—but I guess it was too specialized. Today, as I look back, it reminds me of Ray Spilman's story of the designer talking to a prospective client who manufactures typewriters. The clients asks, "Have you designed typewriters? The designer answers, "Yes." "Have you designed portable typewriters?" Again the designer responds, "Yes." "Have you designed green portable typewriters?" This time the designer is forced to say, "No." The client dismisses him with a wave of his hand saying "Oh well, you couldn't help us —you don't have the experience."

Finally, General Electric, starved for engineers, hired me. Although I started as an industrial designer, I discovered some time later that personnel had me scheduled sooner or later for engineering.

In the 12 years I worked at GE, I served variously in industrial design, advance engineering, and product planning. I have observed engineers as an industrial designer, industrial designers as an engineer, and observed both as a product planner. I applied to the American Society of Industrial Designers as soon as I was eligible, and was accepted in about 1951. After being active on committees and as a chapter chairman, I was elected to the presidency in 1958, chairman of the board in 1959 and to the board again in 1960. So much for history and credentials.

Cargo Transport author worked on in 1946.

I have often been asked how I made the switch from engineering to industrial design. I don't think I ever really made a switch—I was always an industrial designer even when I was an engineer. To explain this is to state the "essential difference" between designer and engineer which I promised to explain earlier. In doing so I will probably lose a lot of my engineering friends and make some enemies I have never met. Because to make my point, I will inevitably make black or white statements which, of course, aren't applicable to all cases or all people. Nevertheless, I have found them to be true enough, often enough, to be generally valid.

The engineer is trained to think in technical terms when solving problems. Furthermore, all thinking should be rigorous, based on provable fact, and preferably related to past experience. (This is one of those black and white statements.) This works fine for steam turbines, but when the human factor enters the picture, it is no longer sufficient. To digress for a moment, our loss of the space race thus far may be partially credited to ignoring the human factors (propaganda) and taking the rigorous approach — pyramiding knowledge and experience — rather than the imaginative approach which might have given us the million-pound solid fuel rocket sooner.

To get back on the track again, the engineer's approach is from the inside out—he believes this is starting from the beginning. In many ways he is right. However, the designer is trained to think conceptually and starts with the complete product as the ultimate user would experience it, and works backward into the details required to make the concept work. It is this very point that drives engineers to complain about the impracticability of designers. They are worrying about things the engineer isn't ready to worry about because they aren't important to him then, or perhaps ever. The beginning for one is the end for the other.

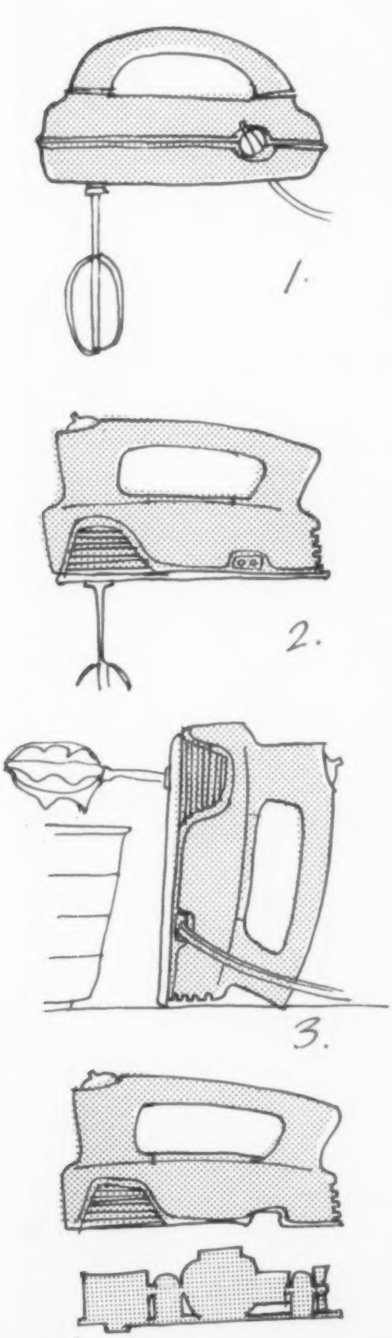
The fact is that both are right. A successful design must be started from both sides—or both beginnings, depending on which camp you're in. When the engineer realizes that his job is made easier by having a direction established through a designer's concept, then the two men can work together with understanding, if not in complete harmony. Bill Dennler, presently the general manager of General Electric's Major Appliance Division in Louisville once said to me, "when the designers and engineers come to an agreement too easily — then the solution is probably no good because one of them must be dominating the situation." Disagreements are healthy —and most good ideas have come out of trying to do what appears to be impossible. I have heard many an engineer grudgingly admit that he would never have achieved a given new result if he had not been driven to it by a stubborn (but likeable) designer. The engineer should keep an open mind and try to find a way to make the designer's concept work, and the designer should make every effort to understand the engineer's objections and modify his design accordingly.

An example of this occurred early in my design career at GE. Prepared food mixes were becoming popular, and we were making a small portable mixer which would be held in the hand. Engineering at once determined the minimum power required, designed the smallest and lightest motor practical, and wrapped a two-piece clam shell die cast around it with a plastic bail handle (Fig. 1). We were given this prototype and asked to "style" it. The approach was sound and logical —from a technical point of view. But from the user's angle—it left much to be desired. There was no base or bottom to set it on when not in use. The die-cast housing could easily chip glass mixing bowls. There was no way to set it down without soiling the counter, when the beaters were messy. The switch was located in such a way as to require operation by the other hand. We designed (not styled) a mixer with a flat bottom surrounded by a soft vinyl gasket which acted as a bowl bumper and a non-marring base (Fig. 2). We incorporated the old flat-iron heel stand to allow the beaters to drip back into the bowl and the switch was relocated for easy one-hand operation — and a removable cord set allowed wall mounting without the unsightly cord tangle (Fig. 3). Besides the benefit to the housewife, the gasket turned out to be a vibration and sound absorber (which was patented) and the basic design permitted complete motor assembly and testing independent of the case (Fig. 4).

It is easy to understand why the designer wants to be involved at the earliest possible phase of a development program. Since he thinks from the ultimate user back to the product details, he finds himself increasingly hamstrung the further the project has progressed before he is asked to contribute his ideas. Too often, his opportunity to participate comes so late that he functions as little more than a "stylist."

In making the change from an old, established, and accepted profession to a young, tenuous, and struggling profession, many problems arose. I found that the

Sketches below follow development of GE portable mixer from engineering prototype (1) to designer's version, incorporating flat bottom (2) heel stand and wall mounting (3) and simplified assembly (4) that is completely independent of the housing.



almost smug security of being an engineer and, therefore, being completely accepted and understood by the public, my friends, my peers, management and even my family, no longer existed. To outsiders I was forever explaining what industrial design was. To fellow engineers I was suddenly on the defensive and had the feeling of being a renegade. The press seldom used my title as an industrial designer—but frequently changed it to "industrial engineer." Never having been a "joiner" or a conformist, I think I secretly enjoyed being misunderstood and trying to walk the tight line between being defensive and being a crusader.

I discovered that the designers accepted me first—perhaps after discovering that my being able to "talk the language" assisted the design group in selling its ideas. The engineers were wary and sometimes resented technical suggestions which they considered to be their province. I found this was mostly my own fault. For a time I had tried to take advantage of being both kinds of people, but soon discovered that this wouldn't work. When I applied my engineering training and experience to industrial design problems, the design proposals simply were more readily accepted. There were fewer technical problems apparent to the engineer—but I did not attempt to do his job for him. Gradually, the engineers found that I would listen and understand their point of view—and would seldom propose impossible solutions.

I suppose unquestionably this made me a less exciting kind of designer—at least in the eyes of my fellow designers. When I was manager of a design group, designers often felt that I was overly critical of ideas which weren't practical. Perhaps so, but if the designer had any reasonable basis for his idea, I encouraged him. I had seen too many ideas torn to shreds because of being poorly prepared and inadequately supported. As director of a consulting design office, I now find my engineering background to be of considerable value since many companies are still concerned about the "impractical" industrial designer.

But in spite of my own history, I do not believe that more engineers should turn industrial designer, or that more engineering be taught to designers in school. I think some engineers are in fact excellent industrial designers even though they don't claim to be. Engineers who think conceptually and have a natural talent for proportion and color—plus an understanding of what makes people tick, if they are consumer-goods engineers—are designers in the broad sense. Most engineers do not fit this description, and training won't help. Conversely, most designers will never be engineers—although there are exceptions on this side, too. There will always be the designer who is interested and inquisitive enough about engineering problems to come by sufficient engineering knowledge to be a good technical designer without technical training.

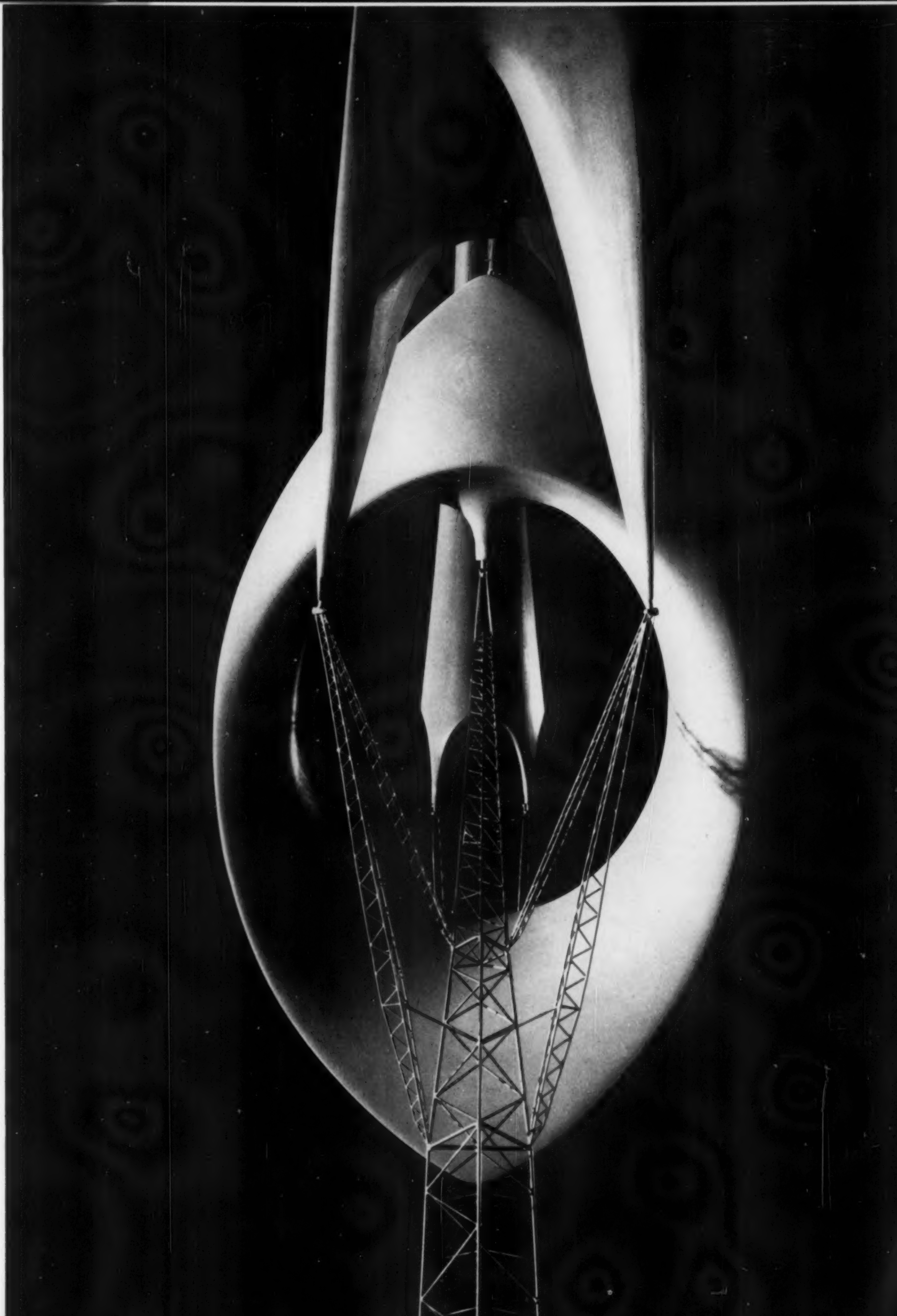
Designers and design educators have strong convictions on the subject of how much technology neophyte designers ought to be taught. Leo J. Brandenburger is an engineer, designer, and teacher who has more than convictions; he has a technique. Here he states the convictions, and demonstrates some of his own techniques for teaching **"ESTHETICS AND DESIGN THROUGH STRUCTURE."**

BY LEO J. BRANDENBURGER

Many of the misconceptions and prejudices regarding technology and the sciences spring from the casual contact that designers and design educators make these fields. The stereotyped image of the unimaginative, factual, down-to-earth engineer with his slide rule, who puts facts and figures into a formula and automatically obtains an answer, is no more accurate than the concept (prevalent among many engineers) that an industrial designer is just a technical illustrator. Unfortunately, designers generally do not have too much opportunity to become well acquainted with research or technical personnel. Most of their contact is at the production level, where economics dictate and where limitations force a very hard-headed approach. In spite of conferences and various other efforts, there is still far too little liaison and communication between top levels of the two professions and there is even less of it at the educational level. Even with extensive and concerted effort, there still would not be anywhere near a full measure of success until there were enough men proficient in both the arts and sciences to bridge the gap. When this does happen, however, the student of design will appreciate that the philosophy of the sciences and of technology has less to do with the stereotyped image of the engineer than with Galileo and Newton, Edison and Einstein.

One great reservoir of untapped design talent is the student who has a natural bent for both the arts and sciences but who generally gravitates to the sciences. It is not difficult to recognize art talent in its pure form or to recognize an aptitude for pure science. But there is a great deal of talent which falls between the two,

Page 75: detail close-up of typical problem showing structural concept of the arch. Photo and model by the author.



and due to our educational system, this is generally not recognized. A student must concentrate his efforts in either one field or the other, and is rarely encouraged to develop in the two fields simultaneously. It is a cold fact that, with industrial design education as it now is, the majority of such students see much greater opportunity and challenge in the sciences.

A student, for example, who has the latent ability and talent to design and assemble the components of a radio and do the case as well, would much rather work with the guts if given a choice. Unfortunately, because of the common view of industrial design, and because of what the student casually sees, he is very much led to believe that this is the choice he has to make. Obviously, design schools are wrestling with the problem of making design more than just a matter of doing a case, or just a matter of "packaging," but when compared to the multitude of truly exciting things that are happening in the sciences, examples of design in our schools that really transcend the level of packaging are still far too isolated.

When a student with these dual talents *does* take design, the result is often a great deal of stimulation, generating fruitful mutations in teaching procedures and philosophy. However, the student's analytical ability still is not exploited and developed anywhere near his capacity, and this aspect of his creativity is all too often prejudiced and dissipated in favor of the fine arts approach. The goal is not to put the emphasis on the scientific approach either, but to find a mutually fortifying balance between the arts and sciences.

Judging by the number of graduates who find good positions, the design schools of today are very successful. The students are learning skills and developing talents which are unique to this profession and which no one can deny are fulfilling basic needs of our economy and industry and, we hope, of our culture. The excellence of the top schools is in no little way due to strong art departments and to faculty imbued with the spirit and love of such art. But, as fruitful as this may be, it is also this intensity and devotion to the arts which in many aspects is limiting, because the arts are like a jealous mistress demanding full and undivided attention on all matters. This promotes a strong feeling, although most everyone will declare to the contrary, that the artists have a monopoly on creativity. Also, once the formula of success has been established, it becomes increasingly difficult to introduce new concepts which might disturb the proven pattern. One way to get around this and start fresh without the encumbrances of any habits or traditions is to throw out the "mistress," and this drastic method, no doubt, has had a lot to do with the "revolt" at Ulm. The schools in this country, however, have not been standing still, and there is a discernable trend toward greater emphasis on invention and conceptual thinking; but the process is certainly an evolutionary one rather than a revolutionary one.

The desirability of training the student to be inventive and to be a conceptual thinker is universally acclaimed, but that is no guarantee that much will be done about it. Basic training requiring blood and sweat must provide the foundation for such effort. It seems that it should be easy to distinguish between styling and design, and in extreme cases it is, but the products of our schools prove that, uncomfortably often, styling predominates over design in spite of sincere efforts to make just the reverse come true. Conscious effort is made to elevate major problems far above the level of case design, or packaging, to a high level of creativity, and the student is admonished to "get off the ground and up on a cloud. The sky's the limit." But this is much easier said than done. With most students, the problem *still* turns out to be merely packaging! The only difference is that instead of an actual item, it is a fantasy that is packaged.

Several years ago design education throughout the country precipitated a flurry of helicopter design which is still too typical of many assignments today. Now a helicopter is a mechanism more complicated than, say, a steam turbine, and all of the technical considerations are going to dictate the helicopter's appearance down to even minute details. It is obviously foolish for a student to attempt the design of a steam turbine since he knows nothing about it, so why is he allowed or even encouraged with great aplomb to do a helicopter, a formidable task for even a senior engineering student with the unlimited help of the engineering faculty? With elaborate, beautifully executed drawings or models, students have hoodwinked both themselves and various faculty members into feeling that a conceptual thought had been experienced (and, in fact, one such model of a helicopter won a competition judged by professionals a number of years ago) without actually having an original idea, or coming to grips with a tough problem. Ideas for flying tugboats or flying observation stations for forest fire control and so on are interesting, although certainly not unique, but they do not warrant the time and energy to assemble surface shapes and forms which are nothing more than subconscious derivatives of things we have been seeing for years. In spite of good intentions and the desire for originality, this approach does not come up to even the level of packaging, since it does not require the brains or judgment that a good package does.

Problems which appear at first glance to be modest and somewhat mundane are very often just the ones which present excellent opportunities for development and invention. The results are invariably more penetrating and convincing than a problem presented on an overly ambitious and grandiose scale. It is often the simplicity and directness of such a problem that makes it a tough nut to crack, but if all of the factors are well within the understanding and scope of the student, he is able to come to terms with it.

The problem could even be one of packaging per se, and if originality is used in solving it in a unique way or in meeting unusual stipulations, the experience and execution can far transcend the level of mere packaging. If the challenge and intrigue are there, as they certainly can be even at this level if guided by an ingenious faculty, the student will receive effective experience in problem solving and will learn to think and to juggle relationships so that he can work efficiently on a problem at any level.

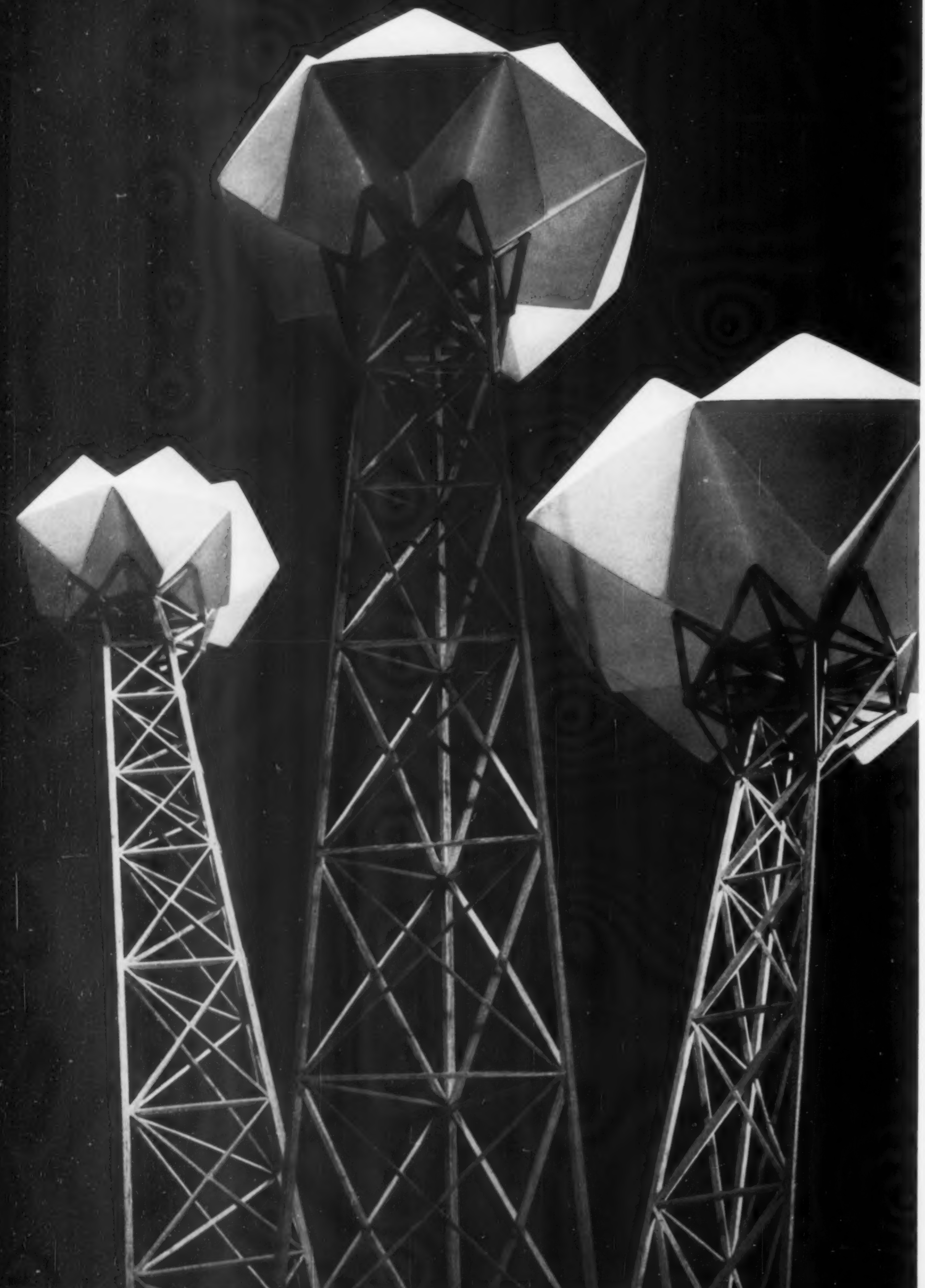
One class, for example, was given the problem of developing a vacuum-formed plastic container for a given category of merchandise. The results had to be workable, and this involved extensive use and testing on the vacuum forming machine. As the students worked with the material and discovered its limitations and what it could do, ideas evolved and improved until they were nothing like the original concept. Ideas begot ideas, and the behavior of the material and the processes involved suggested still more ideas. Even students who had a hard time getting started with an idea often found themselves ending up with having to make the frustrating choice between a number of likely possibilities for more exhaustive investigation within the time limit. There were many failures, of course, but an investigative process such as this is essentially one of trial and error until success is eventually achieved, and the degree of success depends largely on the dedication and application of the student. The shapes had been developed to utilize the material most effectively and to perform a function, but there was also an esthetic impact which probably would not have been there if the project had been handled by an engineer. It was impossible to tell where technology stopped and esthetics began; they were one and the same thing. The results were fresh and had a vitality that combined handsome appearance with potentially interesting surfaces for graphics. A number of fastening devices and containers were developed that suggested possibilities in entirely new areas.

Problems of this sort, which require a lot of preliminary study and work, and whose results are not immediately apparent, are put in unfavorable competition with grandiose, spectacular assignments, like flying automobiles or the layout of an airport, which provide the romance and visual excitement that are expected in a design department. Since the research and knowledge required are far beyond the realm of the student, the results must be superficial. But this drawback is always circumvented by having the student project far enough into the future so that details can't be disputed and by imposing very general limitations on the problem. This is ostensibly done so that the student's imagination will not be limited, but what it actually does is to provide an escape mechanism. If the student finds he is running into a situation which he doesn't understand or which is difficult to solve, he doesn't have to exercise any brain power in tussling with the problem because he can get rid of the thorny part so easily just by changing the conditions. Or if he wants an exotic effect like a completely transparent building, all he has to do is to say that by the time it is built technology will have advanced to the point where it is possible. An honest objective criticism of such a project is impossible since it is like trying to judge the workability of a fairy tale. This sort of an assignment, however, can be very entertaining, just as a well-told fairy tale can be entertaining, and it's the sort of thing that draws the visitor's attention. The type of imagination which produces a fairy tale is confused with the intuition, the blood, the sweat, and the tears which all go into the making of true invention. This is one of the important battles in the war over the best way to teach design.

Example: teaching structure without math

Most scientific principles are simple when reduced to their fundamental concept. The ramifications and combinations of principles can appear to be very complex, and are, but when broken down and taken step by step they can become easy. But this very simplicity sometimes makes a principle difficult to comprehend, especially if it involves relationships which the student hasn't experienced before. For example, the concept of the color red has great simplicity, but it would be impossible to explain just exactly what "red" is to a blind person. In presenting new ideas or concepts, an instructor must be ready to supply the necessary background or make it possible for the student to gain the prerequisite experience. This is one of the most difficult things to do in teaching. Also, the very simplicity of a concept is apt to make the instructor feel that it is self-evident, and mistakenly assume that the class can follow. Many students have been so indoctrinated with the idea that any technical or scientific subject has to be difficult that when they are presented with a new concept that is easy to understand, they are somewhat bewildered; they feel that there must be something more to it, that they must be missing something. However, an experienced instructor can make relatively easy any science and technology class that an industrial design student might take.

The sciences and technology are just another approach to the problem of design; they are one of the essential ingredients in this whole matter of problem-solving, not only beacuse of the factual information



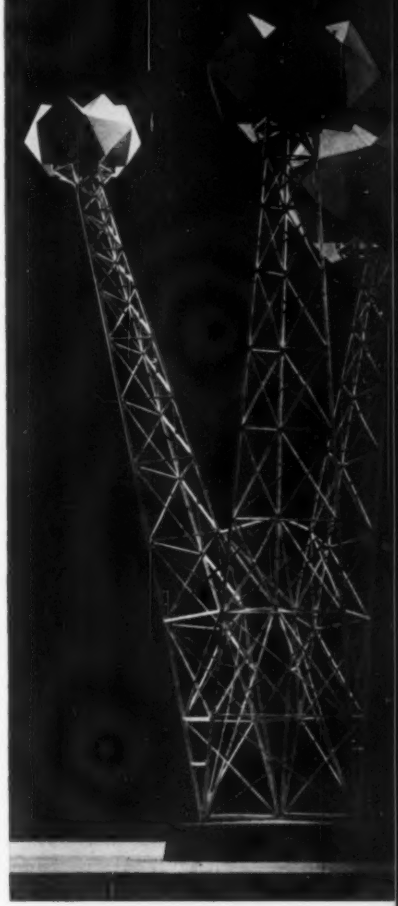
they provide but also because of the mental stimulation and development they engender. If such subjects are taught with inspiration and not just by rote, they help every student to build a strong, vigorous philosophy of design, to seize upon the essentials and throw out the superfluous. When he learns how to analyse relationships, he finds that his intuition is quickened and he is well on the road to invention.

Any formulas or set of rules must be approached with great caution since they are dangerously apt to take the place of logic. All of the processes must be reasoned out step by step. Students subconsciously want to take the easy way out when they encounter a new problem or a new idea, and even though not aware of it themselves, they are looking for rules and directives so that they will know just exactly what to do when they see the situation again. But a science absolutely can not be taught this way. A researcher's main job is to handle situations that have not been encountered, or even thought of, before.

When a student finds that a study of structures, for instance, is not a matter of complicated formulas or involved manipulations of the slide rule, his inhibitions and fears evaporate and his confidence develops. By nature he loves to construct, and when there is a challenging objective based on logical principles which he can understand, he invariably plunges into the problem with great enthusiasm.

The assignment shown here, a basic one in the study of materials behavior, illustrates this teaching concept. It concerns a structure, or truss, which has to support at specified heights a given number of forms of a minimum weight. This is preceded by many quick three-dimensional "sketches" utilizing balsa and cardboard. This is essential in helping the student prove the theory and form a mental image of how structural components behave. The solution of the problem depends on a few fundamental principles which are easy to follow. Before going into detail on various results of the assignment, however, it would be well to quickly trace the development of these principles far enough for some insight into how a foundation is prepared for the student. It will be noted that for the time being there are no formulas, no arithmetic, and no math. The concepts are qualitative in nature, yet very concrete in what they reveal about structure.

A match or a small piece of balsa can be used to demonstrate the first basic principle: if a piece of balsa one sixteenth inch square by an inch long is taken between the thumb and forefinger as a column and compressed, the balsa very likely will come close



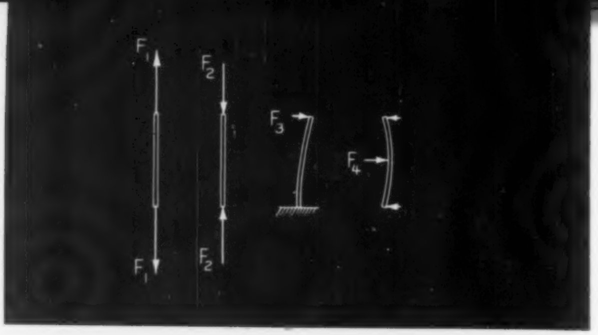
Above: Typical problem assignment: balsa structure weighing two to three ounces can support eight to nine pounds. Weights are plaster. Photo by A. Renzetti, model by Mitchel Sielicki. Page 78: detail close-up.

to puncturing the skin before it breaks. Yet it is easy to break it up into many small pieces merely by bending between the fingers. Thus, it is very strong when subjected to a straight compression force, but weak when subjected to bending. It likewise follows that it would also be strong when subjected to a straight tension force. This is demonstrated graphically by the four identical members loaded four different ways in figure 1: the forces, F_1 or F_2, causing tension or compression, can be much greater without breaking the member than the forces, F_3 or F_4, directly causing the member to bend.

An observation about length: if a member is in tension, its length will not affect its strength, but if it is in compression, its strength can be considerably affected by how long it is. When its dimensions are in the right proportion, it can have tremendous strength, but if it is too long and flexible, it will tend to buckle under compression. This type of deformation is not to be confused with the infinitely more destructive type of deformation due to forces causing direct bending. This observation is represented graphically in figure 2.

Two simple and obvious facts have been outlined in the two preceding paragraphs. In fact their simplicity often makes it psychologically difficult for the student to realize their significance and profundity. From these observations we can draw a principle that makes it possible to develop very light, efficient structures. According to the first observation a structure should be designed in such a way that its members are subjected to only a straight tension force, or a straight compression force, and any condition which subjects a member to a bending stress should be eliminated. According to the second observation, compression members should be made as short and stubby as practicable without becoming unnecessarily heavy.

Several quick experiments suggest how a simple structure might be constructed using the tension-compression principle. A weight is hung from a series of strings as shown in figure 3a; the strings are all obviously in tension. In figure 3b the string AB is replaced by a rigid member AD. It seems logical that the tension force in the string AB has now been replaced by a pure compression force in member AD since both of these forces act on point A in the same direction. Tests will quickly show that the configurations in figures 3c and 3d are not nearly so strong since the rigid member is obviously subjected to bending forces. If the rigid member in figure 3d is pin-connected at point D (able to rotate about point D if the other end were free) a couple of other ob-



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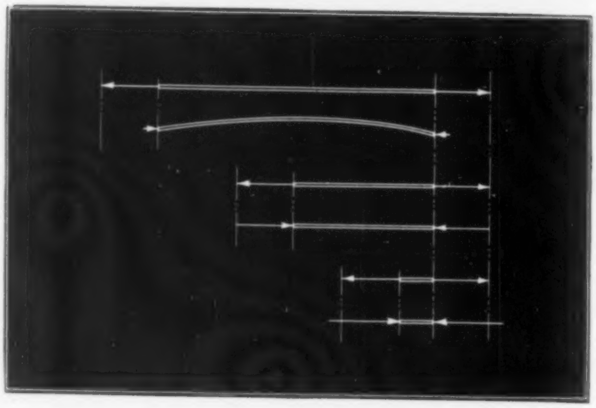

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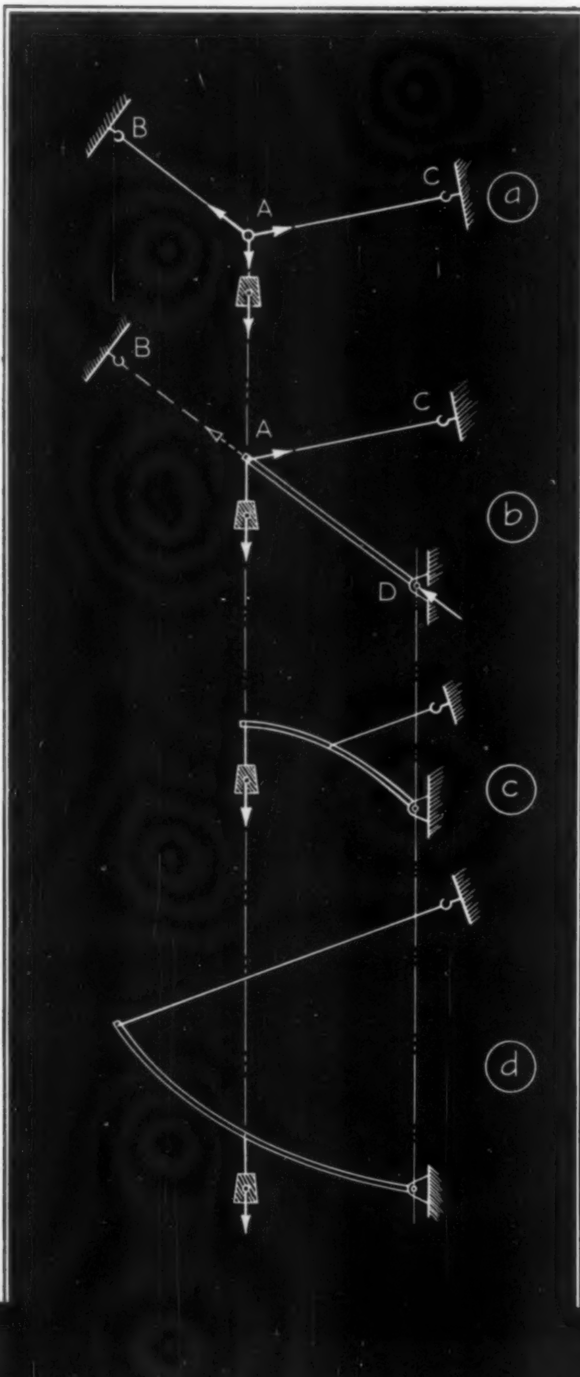
Figure 1: Simple but fundamental concept in design of structures: F_1 or F_2, subjecting member to straight tension or straight compression, can be considerably greater than F_3 or F_4 before failure.

Figure 2: Length of member under compression can have pronounced effect on strength; under tension, length does not matter.

Figure 3: a) Strings AB and AC are subjected to straight tension forces as indicated by arrows acting on ring at point A. b) String AB has been replaced by rigid member AD which exerts force on ring at point A in same direction as string AB did. Rigid member, then, is subjected to compression force only. c and d) Rigid member is subjected to bending forces in each case, so these configurations will be much weaker than that of b.

3



vious considerations prove beyond a doubt that it is in pure compression.

The observations and concepts discussed thus far are a beginning. Similarly, the development of the theory is continued step by step so that the student has some means of evaluating a fairly complex structure. He should be able to tell whether or not a structure is a true truss, one that has only tension or compression in its members. Figure 4 illustrates structurally sound principles and figure 5 shows bad construction which the typical student should be able to analyse readily. For simplicity, the concepts are first kept to structures in one plane only; when the student has a good grasp of this, three-dimensional structures are studied, as shown in figure 6.

Much more is involved than merely using some system of "triangulation". Although a truss does involve a series of triangles, the mere use of some system of triangles can be an insidious trap since this frequently leads to serious weaknesses as shown in figures 5 and 6. Also, the underlying principles which led to the development of the truss lead as well to structures which involve no triangles whatever, as will be seen in a subsequent section.

All this material would be covered in a basic engineering text, but in quite a different manner. The observations and concepts with which we have been concerned thus far most likely would not be mentioned, since they would be considered mathematically self-evident. The properties of a truss would be succinctly described in one sentence: "any structure composed of linear members, pin-connected at the joints or otherwise fabricated so as to allow infinitestimal angular deflections, may be assumed to have only tension or compression forces acting on its respective members." An engineering or science student would take this as a mathematical fact, and after working through a number of problems, he would begin to see the significance of the statement. But for a design student who has not had the background or prerequisite experience, this would have little or no meaning and he would be lost before he got started. However, the ideas embodied in the statement are simple and well within the scope of the average student.

For the dexterous design student, three-dimensional sketches provide an effective link between theory and practice; they help to give him a feeling of intimacy and involvement, where a theoretical, abstract presentation would leave him cold.

Old illustration board or shirt boards, masking tape, and string are good materials for trying some quick three-dimensional sketches. Cardboard has a lot of strength when properly used, but can be flimsy if not used according to sound structural principles. For this reason it is much better than other materials, such as wood, which are strong enough to compensate for illogical structures. It is a good idea to start with some moderately easy objective, such as supporting a weight midway between supports fifteen to twenty inches apart, using as *little material* as possible. Keep the construction in one plane, at least for the first few trials. Students very typically want to fly before they can crawl, and with unbounded enthusiasm will start to construct a Victorian dome before they know what they are doing. The danger is that the great enthusiasm can turn to frustration. This can be avoided by insisting that they stick to a simple, direct approach, and that the structure at first be kept in one plane. When tested with an actual weight, structural mistakes quickly reveal themselves and cannot be rationalized away, and the student consequently finds that even a simple approach can become a major challenge, absorbing all his energy.

As the student builds the structure and tests it by gradually adding weight, he finds that certain members are in tension and other members in compression. The cardboard in tension is very strong and can be left as is but because of its flatness it has just about zero strength in compression. It can easily be made strong in compression merely by taping on another strip of cardboard at right angles to the first strip. Figure 7b shows the type of result that might develop from such an experiment. Many of the joints will have to be reinforced and various members will have to be made heavier in the process of testing, but much can be learned by observing where and how failures tend to occur and how the joints tend to push and pull.

This sort of an exercise should not take more than an hour or two. Much more can be learned by trying several approaches than by spending too much time on something elaborate. Many different things can be tried, such as seeing how far a weight can be cantilevered from a wall, or how great a distance can be spanned with a minimum of effort and material. No toes have been smashed yet, but a lot of relaxing laughter always results from near misses. Nevertheless, the objective is real and serious.

After the student makes a series of quick preliminary sketches, and has some experience in how a truss behaves when properly fabricated, he can undertake a more ambitious project. The first major problem may require that a series of three or more weights, ranging from two to six pounds, be suspended anywhere from 25 to 40 inches above ground level. Total minimum weight is usually 12 to 15 pounds. The prob-

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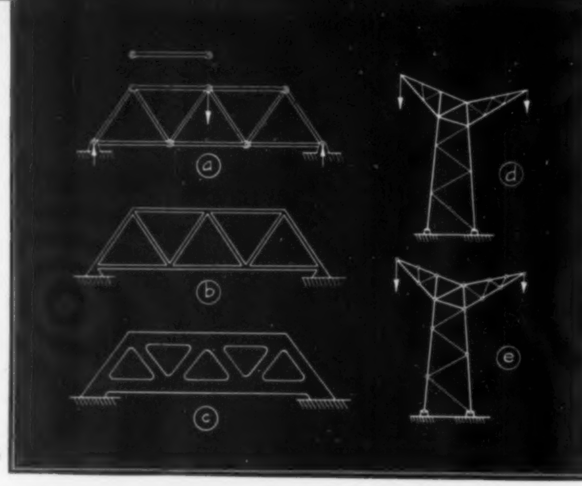

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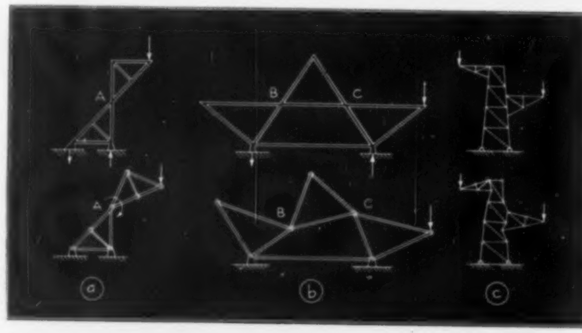

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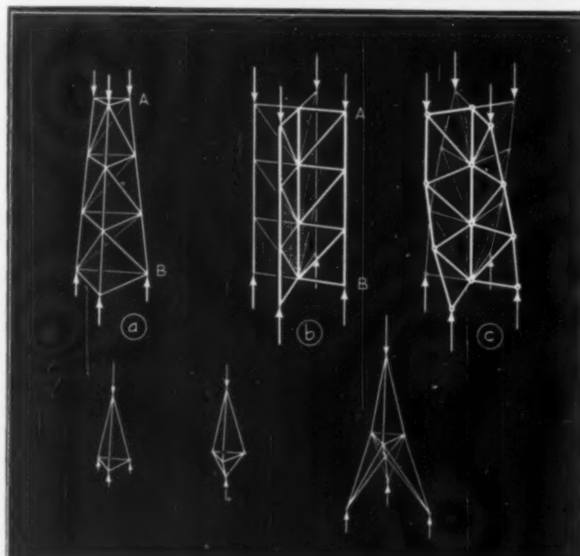

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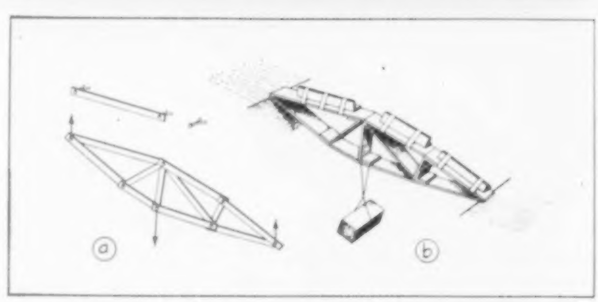


Figure 4: a) Structure fabricated with pin-connected joints, and members with only two connecting points (as shown by isolated member) means respective members are subjected to straight tension or straight compression. Any load must also be applied at joints.
b) Solid-jointed structure can be a true truss (pure tension or pure compression only) if based on structure which will work if fabricated as in a.
c) Members are too heavy for structure to be considered true truss, but configuration is still sound.
d) When reconstructed with members pin-connected at two points as in a, structure retains strength and shape as in e.

Figure 5: Reconstructed according to method in 4a or 4d, structure would have no strength at A, even if joint were solid.
b) By same token, this structure would deform; joints must be solid for it to work at all, but B and A would still be weak.
c) Typical of student mistakes which become obvious under criteria of members pin-connected at only two points.

Figure 6: Same testing method can be extended to three dimensions by thinking of ball & socket joints at ends of members.
a) Structure would retain shape and strength.
b and c) Proves that structure would deform in spiral about a central axis, revealing basic weakness. Typical mistake: member AB supported in one plane only can be displaced by force perpendicular to supporting plane. In a, AB gets stability from two-plane support.

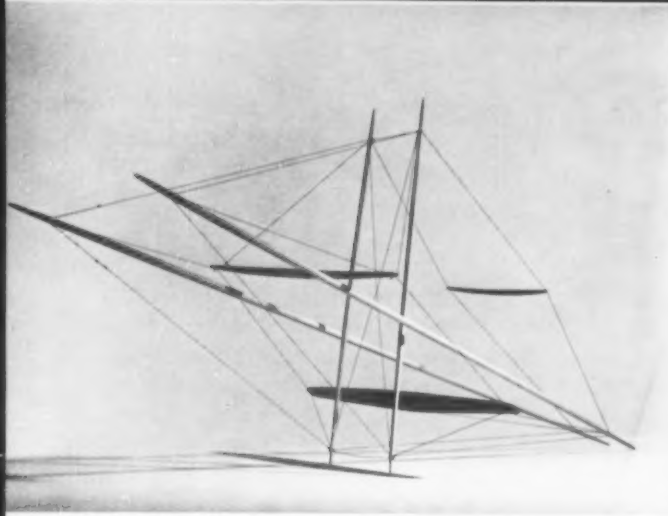
Figure 7: Structural sketches of cardboard.
a) Student should supplement first few sketches with others demonstrating principles above. Strips of stiff cardboard with hole at each end, and cotter-pin type of paper fastener, are good for this purpose.

lem is more challenging (the additional factor of balance must be considered) if weights of unequal mass are specified. The problem of balance leads to considerations which are basic in the development of theory for the assignment that will follow. There are a number of stipulations that can make a student think of three-dimensional, spatial relationships instead of limiting his concept to one plane. The most important requirement, however, is that the structure shall be made of balsa wood; the maximum size member shall have a cross section 1/8 inch square, with smaller members used where possible. If two members are glued together lengthwise, so as to effectively form a larger member, the maximum dimension shall still be 1/8 inch square. Thread may be used as part of the structure.

Experience has taught that balsa wood of the size stipulated is an excellent material for this sort of a problem since it has more than adequate strength for the required task if properly used, but will immediately show any structural mistakes when the weights are applied.

Traditionally, when a student gets started on the assignment, he wants to sketch out a number of ideas graphically, but he should not be allowed to spend too much time doing this since it can be very misleading. For someone tackling this sort of thing for the first time, it is too difficult to ascertain from just a graphical representation whether the principles are being correctly applied. It is much better to make three dimensional sketches, half- or quarter-size, using small thin pieces of balsa wood taped at the joints. Also, this helps tremendously in understanding the three-dimensional character of the problem.

Judging by the problem as stated, and by what may seem to be rather confining limitations, it might be supposed that the individual results of the class would all be very similar, but this is not true. There will be certain unavoidable similarities, since the main purpose of the problem is to test and to learn a couple of basic principles, but the diversity of valid answers has always turned out to be one of the interesting aspects of the problem. First, the student is never allowed to forget that he is a designer, or an artist if you like, and there is every opportunity for him to express this fact in the way he designs and handles the weights, about which the specifications say very little, so that there is almost complete freedom as to how they can be treated. One of the major objectives is to create beautiful forms, beautifully arranged in space, which are consistent with the idea of weight and with the structure that will support them. An excellent way to approach the problem is to work on the weights and their spatial relationships, keeping in mind that they



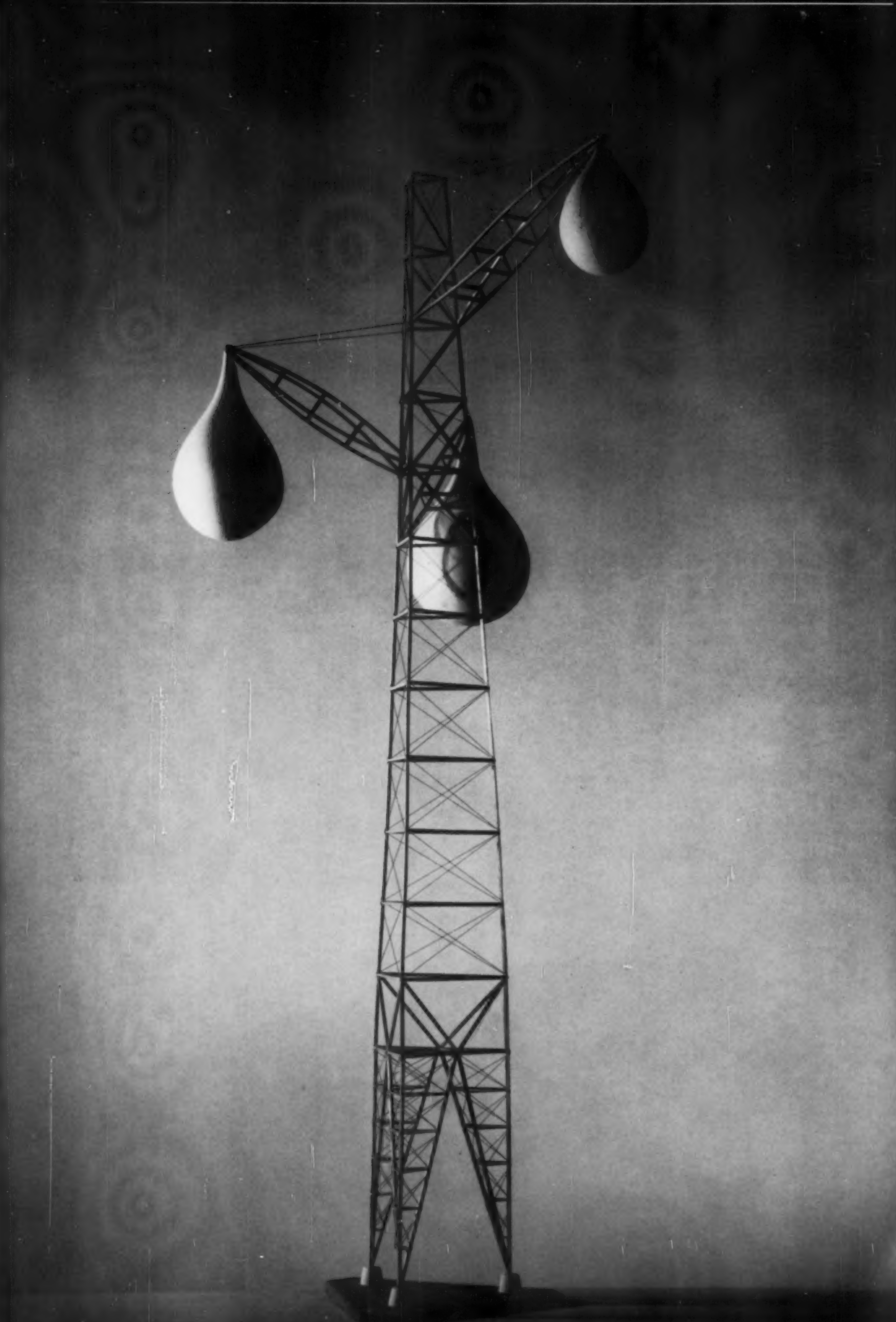
Above: Change-of-pace problem is not structural (no weight support) but structure is primary consideration. Problem states that no two rigid members can touch, that they must be essentially straight, that they may be connected only indirectly with thread. Student, after good deal of three-dimensional experiment, learns to work in harmony with major influential forces of configuration. Photo by author; model by Richard J. Bova.

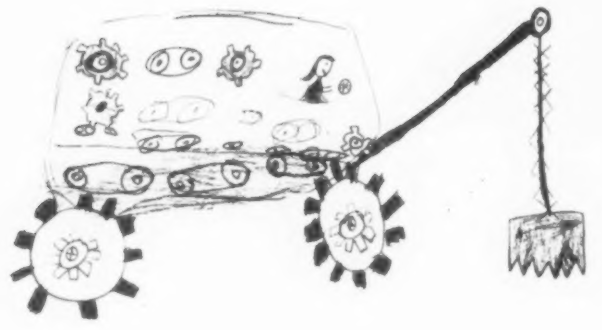
Right: efficient use of thread is alternate solution to that on pages 78 and 79. Photo by the author; model by George Greenamyer.

must have a physical and esthetic relationship to the structure, then to make a supporting structure that performs its function as economically and directly as possible. If the problem is well handled, it frequently takes on a very strong sculptural flavor. This potential makes lead weights or other heavy metals less attractive, since they are invariably small, insignificant appearing and very disappointing. Plaster is a good material since it gives the weights an ample mass, which in turn effectively dramatizes the potentials of the structure.

One way to obtain a variety of solutions is to change the specifications of the problem. Certainly this can be done from one class to another, but it can also be done within a given class and it is very interesting and informative to observe the large variation of good answers for the same set of conditions. When the student goes to work on the problem, and has to solve various details, he soon finds that the specifications are not nearly so tight as they may appear to be initially, and that there is a lot of room for interpretation. More important, the individuality of the weights also imposes unique physical conditions which must be solved in building the structure so that the structure itself will have a certain individuality. But, as mentioned previously, the structure must be as economical of material and as direct as possible, a point that can't be overemphasized. As soon as the student starts playing with structural shape for the sake of shape or form, or to be different, he is doomed. To stand secure when the weights are added, the structure must first of all be soundly engineered, and the surest way to achieve this is through simplicity. When this is accomplished, there will be enough complexity and visual excitement; anything more would be greatly overburdened and awkward. It is a good idea to think of the construction material as having the value of pure gold so that no more will be used than is consistent with security (in the case of airborne structures this is literally true, since every pound overweight can cost thousands of dollars in lost payload during the life of the aircraft).

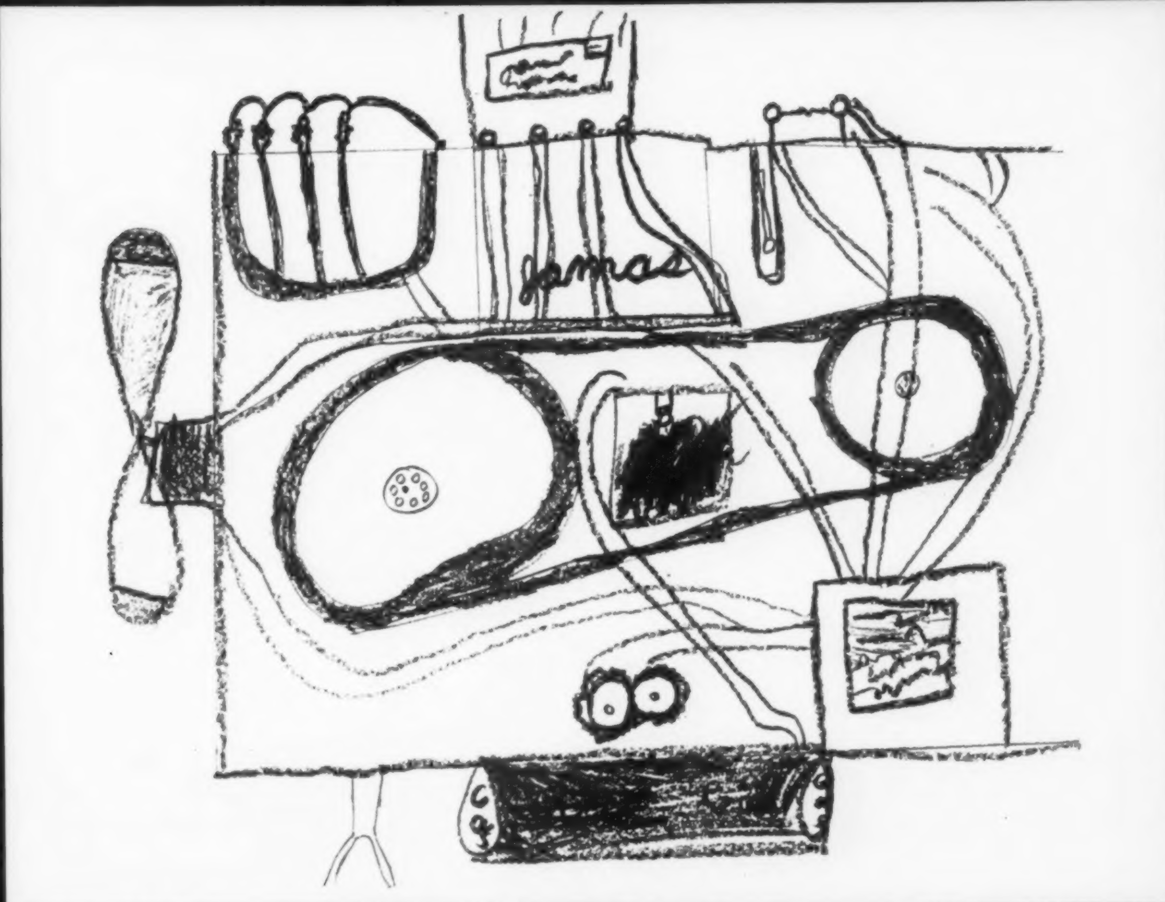
The solutions which have by far the greatest esthetic impact are those in which the weights have been sensitively handled, and in which the structure has been stated as directly and economically as possible. The student cannot depend on the facility of his pencil or on esthetic images he has absorbed in a superficial sort of way; the structural problem requires that he get down to basic ideas and principles and build from this point up, otherwise his solution absolutely will not work. When he has had a number of such experiences, he begins to develop a constructive philosophy which will carry over into other classes.





CHILDREN DISCOVER MACHINES *Up to this point in the issue, all the experts have agreed that the designer's technological awareness ought to begin as early in life as possible. To find out how early that could be, we asked art teacher Margot Stevens to assign her first and second grade students a design problem: draw a machine. Miss Stevens found that her pupils accepted as a matter of faith and record that cars move, boats glide, and switches bring Captain Kangaroo to the tv screen; but most of them had no concept of a machine as such. She tried to say to them what a machine is: it does things in the same way over and over again; it moves by itself, but is not alive like a dog. To let the children see what a machine might look like, Miss Stevens led them out of the classroom and into the faculty parking lot, showed them the engine of her Volkswagon, gently encouraged them to look for a dynamic relationship between parts. Draw a machine like one you've seen, she told them, or make one up for yourself. Selections from their "totally new concepts" are shown here and overleaf. Students were not required to build working models.*

Top: To first-grader Cathy Hobbs a machine is something to get in and operate. So, like Alfred Hitchcock, and Fra Lippo Lippi, she put herself in the picture.
Right, above: The fate of the letter dropping into the magnetic slot at the top of Peter Romano's direct air mail system might be a matter of concern to some, but the intention is honorable. At its center is a bonfire.
Right, below: This machine took inventor Teddy Barbour six laborious art periods to complete. Its purpose has not yet been revealed to the world.

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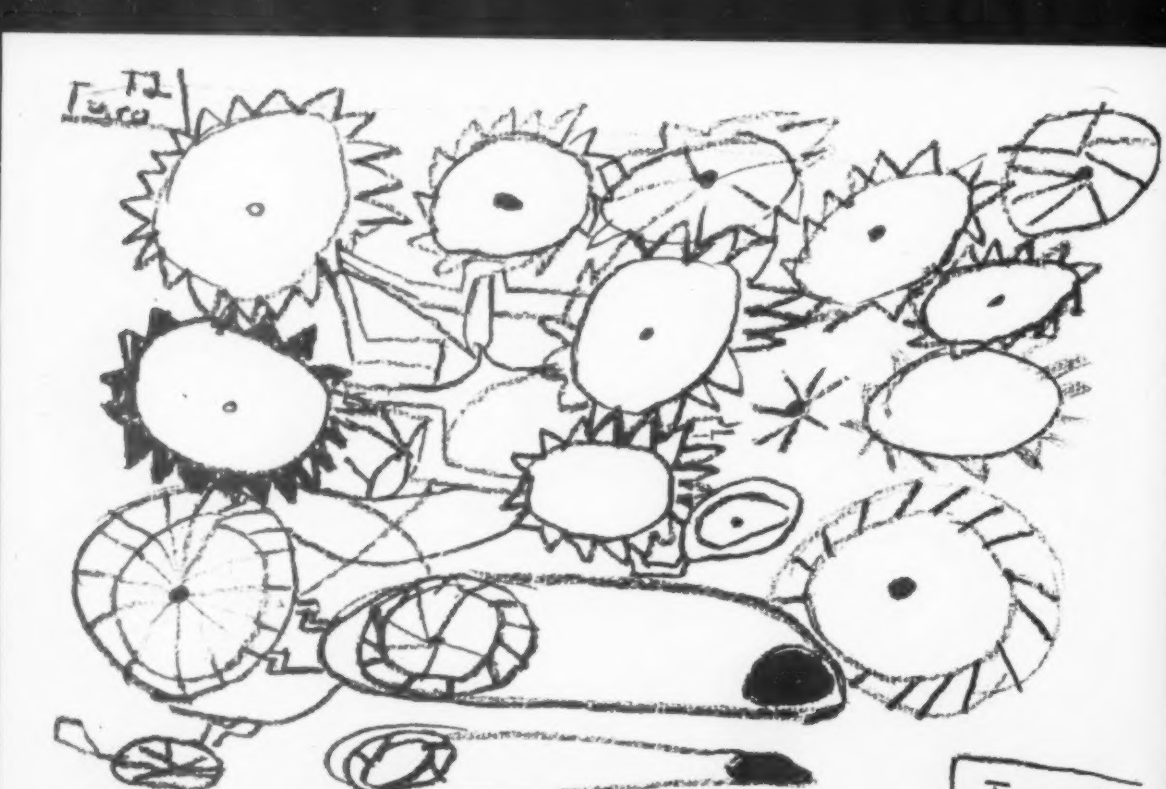
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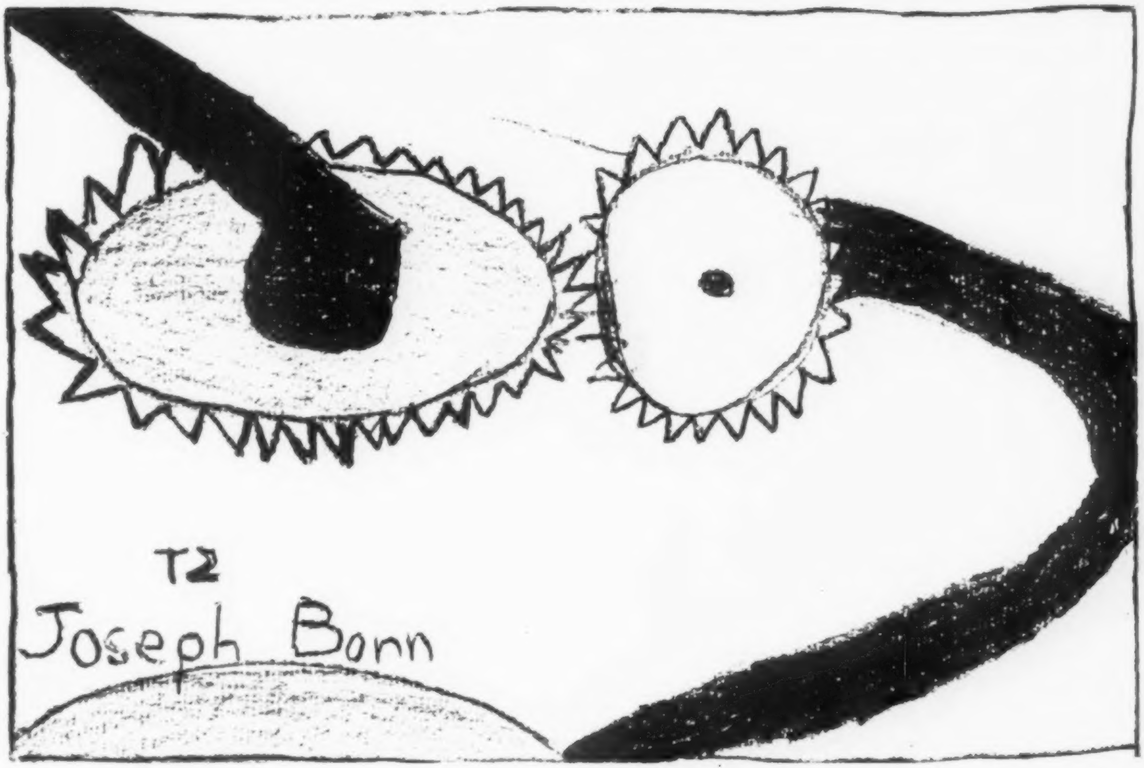
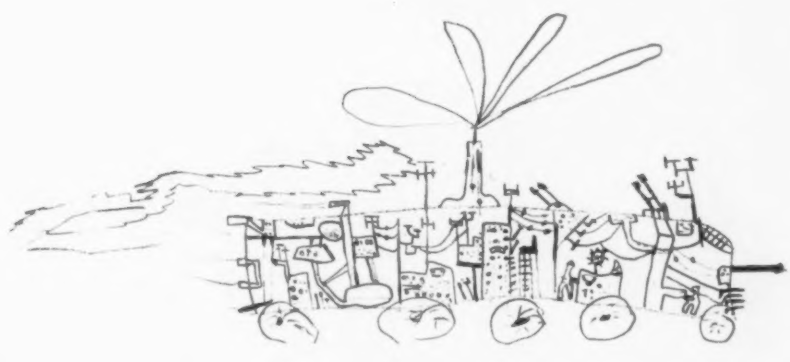
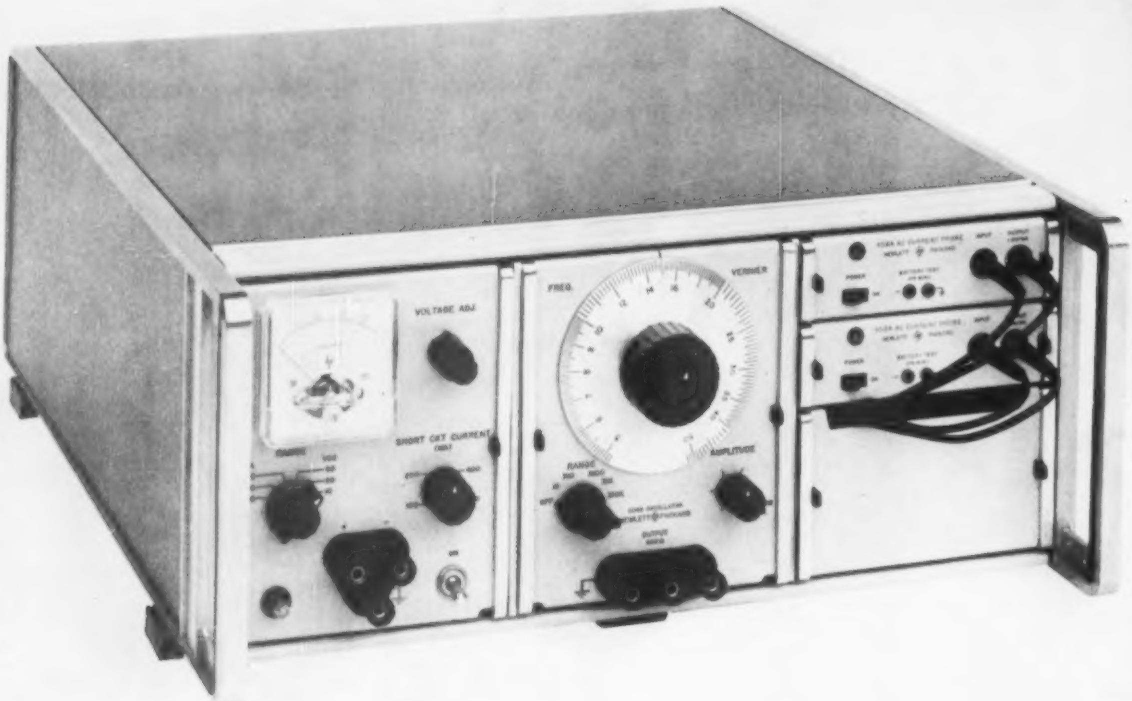


Top left: The function of Claudia Ryan's nervous assembly of mobile members is unimpeded motion.
Bottom left: To Tara Sheehey, a machine is the sum of its round and pleasant parts.
Above: Joey Bonn focuses on the interaction of components, transmitting movement.
Right: Eric Strahl's highly sophisticated complex of gadgets moves, sees, listens, shoots, transmits messages, and performs certain other important operations.

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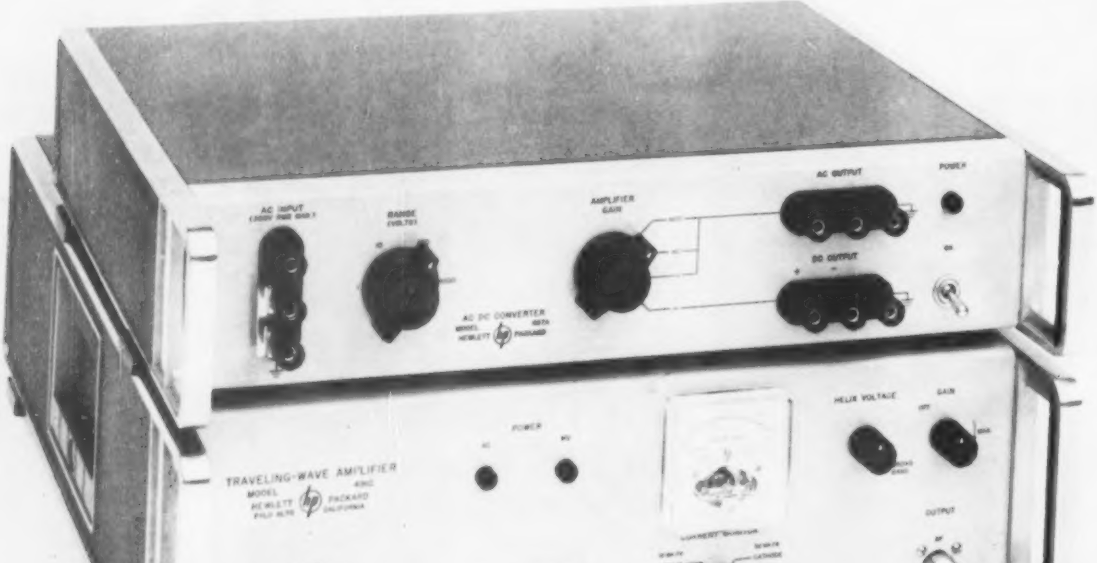

AC INPUT
RANGE
AMPLIFIER GAIN
AC OUTPUT
POWER
DC OUTPUT
AC DC CONVERTER
TRAVELING-WAVE AMPLIFIER
HEWLETT PACKARD
HELIX VOLTAGE
GAIN
OUTPUT
INPUTS

Electronics has come a long way toward replacing romantic love as the West Coast's most vital industry, as names like Barrymore, Shearer, Harlow, and even Deanna Durbin have given way to names like Beckman, Ampex, Hewlett-Packard and Fisher Berkeley. As the industry has grown, the stature and quality of its design has grown, and the industrial designer has become an important figure in a technically complex engineering operation, as borne out by **THE WESCON AWARDS.**

BY CARL CLEMENT, Chairman, WESCON design committee

Electronics Enclosure System: Hewlett-Packard Company. This system for packaging and transporting instruments holds instruments singly or in series (opposite page, top); with the addition of flanges, clips them together in rack-mounts (opposite, bottom); and provides a cover and handle for carrying (above). Of five top winners, it best met the main competition criterion: "contribution to the industry." Design Director: Carl Clement. Project Engineering Supervisor: Carl Clement.

The challenge that the electronics industry presents to the industrial designer is obvious, but the production complexities of the challenge may not be. The urgency to capitalize on technological "breakthroughs" tends to telescope the time between development and production. The first prototype is often the final product, and there is neither the time nor the large production run to allow for the kind of refinement that characterizes consumer product development. Furthermore, a new technological development may cause sudden and drastic changes in the course of a development program, and a designer must be able to adjust to them with a speed and flexibility not normally required of him.

For all this, the industrial designer has become steadily more influential in the industry, largely because competition has made the industry emphasize marketing, and because of the designer's sensitivity to human factors. There is no better evidence of this than the Industrial Design Awards program at WESCON — the show and convention sponsored annually for the past 13 years by the Western Electronic Manufacturers Association and the Los Angeles and San Francisco sections of the Institute of Radio Engineers. Last month in San Francisco the five products shown here were given WESCON awards of excellence. They were chosen from 23 merit award winners.

WESCON is truly an engineering show: it is planned and executed primarily by electronics engineers to show developments to electronics engineers. Its outstanding success has been due largely to the imaginative approach of its directors, who have complemented the show's hundreds of technical exhibits with unique and interesting events.

One such event, the Industrial Design Awards program (now known throughout the industry as IDA) is of special interest to all industrial designers. It includes an industry-wide competition to select and honor the electronic products showing the best original industrial design. A panel of practicing professional industrial designers judge the entries by three criteria: visual clarity of function, ease and safety of operation, and appropriateness of appearance. The program was introduced by the 1959 WESCON Board of Directors, who established an executive committee for industrial design and allowed it to operate in complete freedom, within reasonable budgetary limits. The committee, composed entirely of industrial designers, selects the IDA judges.

While the IDA program is significant in itself, of greater significance to industrial designers is that it was conceived and promoted by another profession: engineering. The industrial designers selected for the executive committee were quick to see the program as not just another design exhibit but as a unique opportunity to "clarify the role of the industrial designer as a member of the electronics development team." To emphasize this close working relationship, the committee set up the competition so that honors for outstanding products were shared with participating engineers. This seeming sacrifice of authorship came as something of a surprise to the WESCON Board of Directors and to the engineers who were honored. But it helped place the proper emphasis on industrial design as an integral part of product development in this highly technical field.

This year the committee went even further in using its presence among engineers to advantage. Joint meetings, before the show, of the WESCON board and of planning committees, where designers sat with engineers, were recognized as opportunities to promote industrial design. In addition to customary oral progress reports, the industrial design committee used graphics and models to illustrate month-to-month accomplishments in preparation for the show. This approach was greeted enthusiastically by the engineers, and helped to strengthen the design-engineering bond.

The Industrial Design Awards have also made designers increasingly aware of the design aims of electronic instruments. In an industry as complex as electronics, designers need a periodic reminder that the industry's end products are, in reality, tools — highly sophisticated, complicated tools. By definition they are intended for human use, and their utility depends largely on the ease and effectiveness with which they can be used. Creating electronic tools which meet this criterion is, of course, a primary responsibility of the industrial designer.

Also, the IDA program encourages each WESCON exhibitor to give his products a professional appearance and a simplicity of operation which will stimulate a desire to purchase, give confidence to the user, and instill pride in the person who made it.


1


2


3

1. FM-Transmitter, 830B-1: Collins Radio Company. Designed to fit the Collins' corporate image, the transmitter, used by broadcasting stations, has unusual white background meters.
Designer: John Evert of Zierhut/Vedder/Shimano Associates. Project Engineering Supervisor: Mitchell K. Cannoy.
2. Hand Phone: Kaar Engineering Corp. Two-way radio is aluminum with light-to-medium gray epoxy finish.
Designer: John Crane of Walter Landor & Associates. Project Engineering Supervisor: Norman C. Helwig.
3. Scopemobile: Tektronix, Inc. All parts of this tilting oscilloscope transport are aluminum except the bottom tray which is steel.
Designers: Gale Morris and Archie Yergen. Project Engineering Supervisor: Leon Prentice.
4. Recorder/Reproducer: Precision Instruments Company. Unit has push button controls. Front opens for loading, unloading and maintenance.
Designer: Leonard Albrecht. Project Engineering Supervisor: Robert L. Peshel.


PRECISION INSTRUMENT
PI
FAST FWD.
TEST
ADJ. A
LEVEL
1 2 3 4 5 6 7
INPUT
1 2 3 4 5 6 7
OUTPUT

ENGINEERING THE PACKAGE Product designers talk about the desirability, and occasional difficulty, of working with product engineers. Package designers say less about their relationship to package engineers, perhaps because graphic design is so obviously the designer's province that no engineer is ever likely to wonder what the designer is doing on the scene. But what *is* he doing on the scene? And can he afford to leave structural design entirely to engineers?

Who designed the sardine tin? Who invented the keg-lined beer can, the aerosol, the roll-on dispenser? The first soldered sardine tin was developed—for better or worse—in 1876 by Julius Wolff, a Maine canner. But the designers of the other packages are all packaging engineers. That these design advances were the work of engineers rather than designers ought to be surprising. But the fact is that package engineers design the majority of the new structures and closures that come on the market. "The trouble with designers" says designer James S. Ward, "is that, because they feel they must sell themselves as businessmen, they hardly ever design any more, they merchandise."

In addition to designing packages, the "package engineer" does a variety of other jobs in the packaging industry. Often he is a promotion man. He oversees the packaging system—from the time a bottle is filled until it reaches the retailer's shelf. He may also test packages for strength, adaptation to temperature changes, and quality of material. Usually he is employed by the converter or materials supplier, but he may also work for a product manufacturer or a design office. For example, Peter Schladermundt Associates, Latham, Tyler, Jensen, and Harley Earl Associates all employ graduate engineers who work on packaging structures. Harley Earl even has its own engineering subsidiary, HEA Engineering, which also designs package machinery.

This overlapping of function makes the term package engineer confusing. Ralph Thomas, head of Bristol-Myers' big packaging laboratory, says, "We call structure and closure designers 'development engineers'; 'package engineer' is a name for anyone in packaging." To Charles Finsilver, packaging director at Lippincott & Margulies, "a packaging engineer is familiar with the cams and shafts on a piece of packaging machinery." Hugh Horner, director of package design and development at Charles Pfizer & Company, thinks of the package engineer as the man who selects the machine which will make the package or as the man who selects materials and decides how they should be utilized in a package. Like Bristol-Myers, Pfizer puts the design of new structures and closures under the heading of development.

With proprietary interest in their separate nomenclatures, designers refer to the development of packaging structures and closures as "design," while engineers call it "engineering." James Field, technical director of the Packaging Institute, biggest organization for packaging men, ties down the relationship between designer and engineer this way: "The purpose of the package is to contain a product, to protect it, and to sell it. The engineer functions in the first two areas; the designer in the third. This means that the designer works more often in consumer packaging, the engineer in industrial packaging."

The actual training of structural packaging engineers—like the work they do—varies a good deal. Although more than 15 colleges offer courses in packaging, only Michigan State University gives a B.S. degree in package engineering. Their program requires that 35 per cent of the student's education be in engineering and the physical sciences; 14 per cent in English (Basic Communication Skills) and the humanities (Basic Humanities). In practice, few package engineers are graduate mechanical or chemical engineers; the majority are men with a knack for design engineering who have learned their trade on the job. For example, J. F. Stilling, now a package engineering consultant, originally trained in marketing, then got technical packaging experience with Anaconda, Reynolds, and Continental Can. On the other hand, Donald Deskey Associates includes two graduate mechanical engineers and six designers with engineering experience who work on package development. Robert Vuillemenot, executive vice president in charge of Deskey package design and development, says that more than half of their packaging work involves structural problems. "The consumers," says Vuillemenot, "are looking for more individuality in what they buy. Therefore, we try to make a package distinctive in terms of structural design as well as graphic design." He thinks that the Deskey workshop—with vacuum forming equipment, a photographic laboratory, and a flat-bed gravure press — is well equipped to handle such problems.

While the Deskey package engineering service is more extensive than that offered by most industrial design offices, it is not unique. Walter Stern, vice president in charge of Loewy/Snaith packaging, believes that his firm's industrial design viewpoint is an important contribution to package engineering. "Since package engineers tend to be more production-minded than consumer-minded, the designer's sensitivity to consumer packaging needs is a big asset," says Stern. It gives him a special advantage in engineering package improvements so obvious (like the pour spout on the cereal box) that the customer will buy on the strength of them.

Early this year the Loewy/Snaith office developed a series of Christmas gift wrap packages for the Cleo Corporation that did just that. Cleo (the name invented by the Loewy/Snaith office as more attractive than the former Memphis Converting Company) realized that to push their own line of papers ahead of competitors they needed a special sales gimmick. Loewy/Snaith's answer was to put the rolls of paper into a display-window-and-handle folding carton that the customer carries from the store without waiting for further packaging. He may use it later as a storage container for unfinished rolls since the specially patented clasp is sufficiently sturdy to withstand repeated openings. On the back surface of the most expensive package in the line, the designers embossed and scored Christmas tree decorations which the customer can push out, fold, and use. Cleo's president believes that it was the design of the new packages that more than doubled Cleo's sales at the New York Toy Fair four months ago.

Nearly all major materials suppliers engineer structures and closures as part of their services. Plastics companies like Minnesota Mining and Plaxall, foil suppliers like Reynolds and Kaiser, and glass companies like Thatcher all have structural developments to their credit. Yet manufacturers express grave reservations about supplier engineering services. As the packaging director of a major drug company said: "Supplier package engineering? Of course we have to use it sometimes, but we don't like to." Failure to meet production schedules, lack of individuality in design, and disputes over patent ownership would incline some manufacturers to seek structural design services from other sources—if they were available.

Although neither industry nor industrial design has yet gone far in answering this need, there is one growingly popular solution. The package engineering consultant who has come up through the ranks of supplier firms and broken away to form his own consulting office now offers his clients exclusive structures and independent judgment in exchange for a fee. Another answer is the laboratory set up by the product manufacturer himself. At Charles Pfizer, for example, both graphic and structural design are under the direction of one man, Hugh Horner. "Counting myself," says Horner, who is a mechanical engineer, "we have three men doing package development work. One is a chemical engineer and the other has 14 years of on-job engineering experience. At Pfizer," Horner continues, "any development work is usually a joint effort between a future supplier and ourselves. We seldom use consultants for structural development. But for appearance design we have called on both Robert Neubauer and Eron & Eron. In addition, we have three graphic designers on our own staff."

One of the most elaborate package development facilities operated by a manufacturer is Bristol-Myers' 8,000 square foot laboratory in Hillside, New Jersey. Under Ralph Thomas, the eight-man staff includes three other graduate engineers and four technicians. Besides developing packages (including the original roll-on Ban dispenser) for more than four new products yearly, the Package Research Department cuts production and materials expenditures by at least 10 per cent of former figures.

Why don't package design and industrial design consultants do more package engineering? The answers are complex. Some, like Lippincott & Margulies, could afford to offer structural engineering services, but are deliberately geared to solve the problems of marketing a package rather than the problems of making it. Other design offices state frankly that the supplier, given his intimacy with production machinery and materials, is better able to engineer new packages. And they discover that even when their own solutions are practicable, production men resist innovation — especially from an outside source. Finally, there are many design offices who *say* they do construction work and *would*, but are seldom asked to. For these design offices — and they represent a majority — the question may come to be: how can you afford *not* to provide package engineering with your services?—A.F.

Robert Zeidman Associates: merchandising

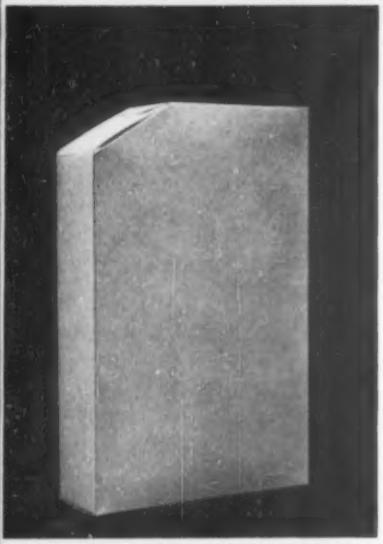
"The product manufacturer who develops a competitive packaging edge often loses it rapidly when another company picks the same structural 'innovation' from his supplier," claims Robert Zeidman. He feels that his firm gives its clients a more lasting advantage over competition by developing a structure whose patent the client retains. Since Zeidman, like all package designers, emphasizes merchandising in design, he thinks of structural package engineering in these terms too. The package for Bon-Ami's new tube of Bon-Dent denture cleaner is a case in point.

Since Bon-Dent will be purchased at least half the time in supermarkets, Zeidman wanted a container with maximum display surface. Harry Sooy, technical director of packaging at RZA, worked out a folding box construction which stacks on the shelf, provides a large billboard area, requires no transparent overwrap—and which Bon Ami can patent if they wish.

In accord with an Ernest Dichter report indicating that many denture wearers prefer brushing to soaking their dentures, RZA next developed a graphic solution suitable for "the competitive environment of drug store and supermarket merchandising." The smiling dentist on the final package — familiar as the last tv commercial—makes no claim to originality, but emphasizes that Bon-Dent is for brushing dentures.

1. Package is latched before folding front panels into position.
2. Flaps A and B are turned inside to form a background panel for product and to strengthen walls.
3. Flaps on C are bent toward inside of package until seated.
4. Flaps on D are bent toward inside of package, then pressed into place over crimped end of tube.


D
A
B
C
1.
D
B
A
C
2.
D
A
B
C
3.
4.
bon-dent
DENTURE CLEANER CREAM
NEW... FOR
DENTURE
WEARERS
FULL OR PARTIAL
MOST EFFECTIVE DENTURE CLEANER
DEVELOPED BY MODERN RESEARCH
bon-dent
DENTURE
CLEANER
CREAM
bon·dent
DENTURE
CLEANER
CREAM
Brush...as your
Dentist recommends!
CONTAINS
HEXACHLOROPHENE



1. Design of Post cereal blank is extremely simple, requires neither the metal nor the extra heavy board of usual pour-spout packages. To secure pour spout for shipping, small overlapping tab is lightly glued. After purchaser breaks this seal, the tab continues to hold spout in closed position.
2. Graphic treatment of front panel highlights flip-out spout; only rear panel explains that linerless container gives more protection than conventional package.

General Foods: a corporation produces a box

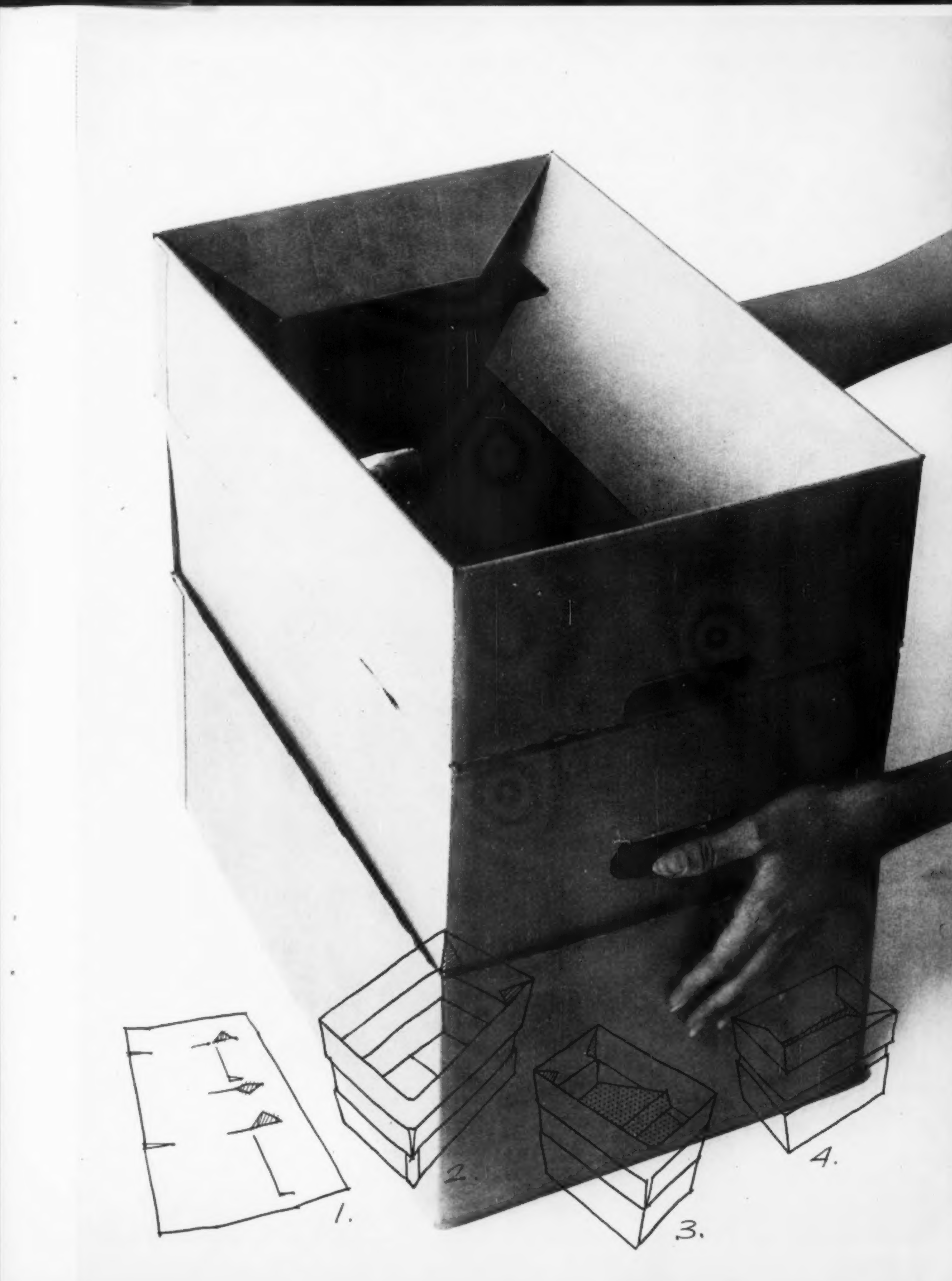
The significance which this giant corporation attaches to packaging is indicated by their designation of a corporate packaging group which coordinates divisional packaging operations across the country. This group directed by William Enzie advises all divisions on developments in converting and materials. Enzie's group works out some structural and graphic solutions themselves, calls in consultants for others. In addition, packaging solutions at General Foods may come from packaging groups within any of the product divisions, or from the Carton and Container Division. For example, the new Post Cereals package incorporates two advances made by the Carton & Container Division: a wide-mouth pour spout for bulky cereals and a new laminated board which eliminates the need of a paper liner. By 1959 the Carton & Container Division had developed a three-ply board with wax laminated inner and outer surfaces. With the liner problem solved, package designer Harlow Bunger could then develop the simple but effective paperboard spout construction which General Foods believes will—in addition to its convenience — give twice as much protection after opening as the standard cereal package.

Mead Corporation: the supplier experiments

Can this product be packaged in paper? This is the question that paper companies constantly try to answer in the affirmative, and the Mead Corporation is no exception. Like most big paper suppliers, Mead not only sells paper and paper cartons, but also designs the cartons as an extra inducement to customers. What is different about Mead is the scope of its research and design facilities. Some 200 scientists and research specialists at the Mead Research Center in Chillicothe, Ohio, constantly develop new kinds of paper and paperboard. And in Cincinnati, Mead's New Products Division applies these materials to new packaging structures for customers and potential customers.

Just recently, for example, project manager Clifford H. Keith, who is trained in both industrial design and the fine arts, developed for Mead an unusually structured container for fruit and produce (right), intended to compete with traditional wire-bound wood crates. Still being test-marketed and not yet in full production, it offers several potential advantages: it can be shipped knocked down and set up in about three seconds by unskilled labor; and it has a specially designed sealless, telescoping closure which permits buyers at wholesale markets to open the carton and spot check its contents simply and quickly. The new carton is lighter weight than its wood counterpart, and Mead hopes to sell it for five to 20 per cent less.

1. One-piece blank designed for most economical use of board. In fabricating, one fold is made and two sections of tape are applied. To reduce shipping and storage costs, container is shipped K-D.
2. Container is quickly formed by simply squaring the unit and pressing bottom panels into place. Upright fitting extension is half the width of container.
3. After container is filled, it is closed by pressing down on top of walls, causing center flaps to spring from side walls.
4. End wall angles lock lengthwise flaps securely in place.


1.
2.
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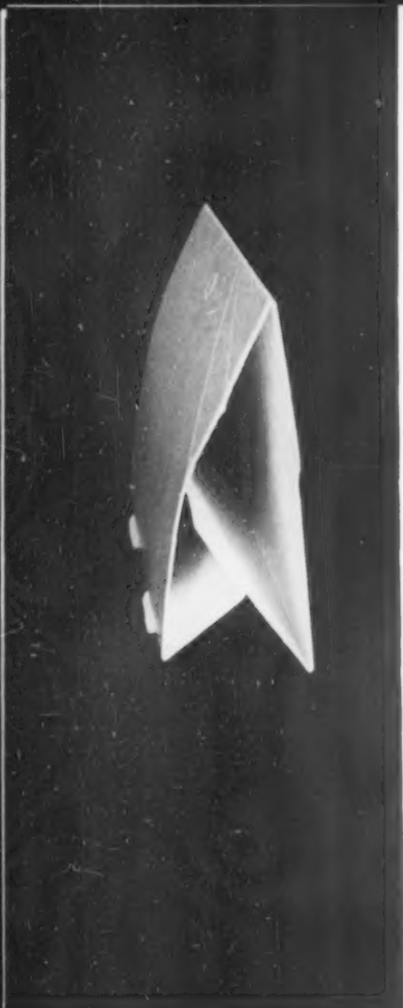
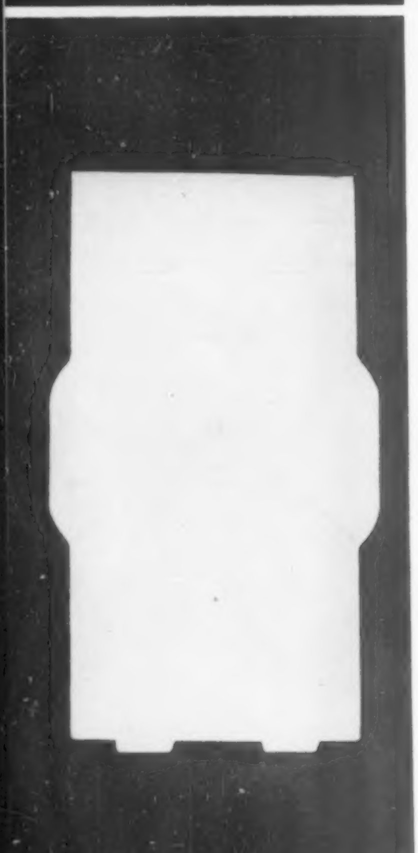




1. Rectangular gripper band blank uses minimum boxboard. Score lines at A are folded for gluing into completed form. Glue is applied to narrow band at one end.
2. Gripper band is delivered flat by carton manufacturer.
3. To assemble, base is pressed downward until the two tabs engage the slots. This locks the band in open position ready for loading. With band loaded, flaps are pressed into locked position. The secondary 22-degree angle score line makes it easier to fold in the 45-degree angle score line. The length of these score lines determines the gripping action of the unit.

Orie Stone Associates: consultants to consultants

"We feel that structural package engineering and our design work should go hand in hand," says package designer Francis Blod. To offer both services to their clients, Francis Blod Design Associates has retained Orie Stone Associates over the past three years. After mastering folding box constructions during 15 years at Robert Gair Company, where he ultimately became director of package development, Stone formed his own consulting office five years ago.

This spring the Cornish Wire Company, a division of General Cable, called in Stone with a request for new package designs. Cornish, whose products are sold largely in Sears, asked Stone to redesign all packages in line with Sears' policy of upgrading its packaging. In this case it was Stone who then invited Francis Blod Design Associates to join him in making a single, surface-structural design task force. What they found was that the Cornish line of extension wires and appliance cords were in themselves attractive, but the packaging was uncoordinated and flimsy. The lightweight cords were held together with wire ties, while the heavy-duty cords went into plain corrugated containers. The designers realized that clerks were not replacing the wire ties when they broke, and loose cord lay in the bins like spaghetti.

After developing more than 20 different structures, Stone, together with the Blod staff, came down to three basic structures (right) to accommodate some 35 different sizes of wiring. Then Fred Feucht of the Blod staff developed a graphic approach to give the line the desired quality look, and added silhouettes showing end use for each type of cord. The diagrams at right show Stone's folding box construction for gripper band package.

DESIGNER AND ENGINEER: END


SEARS
50 ft. heavy duty
extension cord
SEARS
SAFETY
COLORED
SEARS
15 ft. household extension cord
A
C
A
C
1.
A
C
2.
C
3.

TECHNICS *new products, materials, processes and finishes*

Air-supported warehouse

Air-supported structure lowers storage costs by 80 per cent, can be moved to new sites at will

The cost of storing automobile tires is reported to have been cut 80 per cent by warehousing them in an air-supported building. Shaped like a Quonset hut, the building is 180 feet long, 60 feet wide and 30 feet high. It requires ½ pound of pressure per square foot for inflation. At this pressure, the building roof is said to be capable of supporting a 1,000 pound weight suspended from its center. The structure is suitable for many types of low-cost warehousing.

Total erection time was two days and the units can be deflated, moved to a new location, or rolled into a small bundle for storage in just a few hours. The fabric used in the structure is a translucent nylon cloth coated with B. F. Goodrich Geon vinyl resin. Daylight coming through the translucent walls and roof reportedly gives enough illumination to supplant artificial light.

Ballast for the building is provided by 70 tons of sand placed in a sleeve along the entire bottom edge.

The building has a double-door air lock to maintain air pressure while goods are being moved in and out. Each door is 10 feet high and 10 feet wide. They open one at a time to prevent air loss. Other openings are a pedestrian door and an emergency door at the opposite end of the hut. *Manufacturer: CID Air Structures Company, Chicago, Ill.*

Inflated and deflated warehouses

Quality control equipment

Automated instruments test electrical components and circuits, classify data, compute trends, lower production costs

A new line of quality control instruments automatically tests electrical components and circuits, classifies data, and computes trends. According to the manufacturer, the equipment reduces quality control costs enough to pay for itself in two years or less. The line includes ten instrument systems ranging from relay testers and transformer testers to circuit testers and transistor classifiers.

American industry, according to the manufacturer, spends an estimated total of 35 to 50 billion dollars annually on quality control. In many industries, the cost of quality control approximates the total cost of direct labor or of purchased materials.

The equipment is designed to save money by preventing rather than merely rejecting failures in product or process. It provides a continuous, automatic program to gather, summarize, and present data, make appropriate decisions, and initiate proper corrective action.

This is how it works: test fixtures and sensors measure significant product factors and compare them with a preprogrammed sequence of test reference values; an evaluation and decision function automatically interprets the measurements, normalizes the data, and provides signals to adjust the process or sort out the product; a data presentation and recording function provides printout records of product performance, and finally, a feedback system provides information flow between appropriate functions and actuates mechanical devices for handling, classifying and adjusting the product.

In addition, a computer is used to predict, on the basis of measurements of various samples of production, a trend or change in a manufacturing

Automated relay tester

process. This gives warning of progressive error which may put the process out of control, and makes it easier to help discover the significant variables in any new process. When these are known, the computer may be used to control these process variables automatically. *Manufacturer: General Electric Company, Schenectady, N. Y.*

Largest floodlight

Floodlight producing light equal to 400 60-watt household bulbs, is suggested for large parking lots

Development of the nation's largest and most powerful light source for general floodlighting purposes has been announced. Suitable for large-area floodlighting, the lamp is a 6000-watt combined mercury fluorescent tubular light source, five feet long and four inches in diameter. The mercury arc tube, one inch in diameter, extends the length of the lamp. The lamp produces an amount of light equal to 400 60-watt household incandescent bulbs.

The lamp will have applications where it is desirable to have a few powerful lamps rather than many conventional floodlights. Such areas might include plazas, public squares, pedestrian malls, commercial shopping centers, and large building fronts.

6000-watt floodlight

Although the glass tube of the lamp is heat resistant, blower cooling will be required to limit the lamp's temperature to less than 700 degrees F. The lamp weighs 6½ pounds and straps must be used to help support it in a fixture. *Manufacturer: General Electric Company, Large Lamp Department, Cleveland, Ohio.*

Increasing metal die life

Microscope determines exact amount of metal to grind away in order to resharpen die cutting edges

A new precision measuring microscope provides a method of increasing die life, thus reducing production costs. The unit, called the Die-Wear microscope, can determine the exact amount of metal which must be ground away to properly resharpen the cutting edge. It is extremely important to maintain precise measurements, since each 0.001 inch of die metal produces a certain number of stampings; the smallest amount ground away unnecessarily reduces the life of the tool.

The microscope can measure die wear over a range of 0.020 inch to an accuracy

Microscope measures die wear

of plus or minus 0.0005 inch. The instrument can also be used for measuring bevels, burrs, and fillets. *Manufacturer: Bausch & Lomb, Inc., Rochester, N. Y.*

Reflective metal

Polyester film permanently laminated to aluminum sheet offers high reflectivity, easy fabrication

A highly reflective laminated sheet metal has been developed that can be bent, drilled, punched, crimped or formed without any harmful effects. Called Dynasyl, the sheet consists of metallized polyester film permanently bonded to aluminum sheet with a high strength adhesive that allows it to be shaped to severe extremes without impairing the reflective surface. The material can be used in lighting reflectors, and as decorative trim for radio and tv cabinets, appliances, vending machines, etc. It is said to be exceptionally resistant to most acids, alkalies, greases, oils and solvents. It is also resistant to outdoor weathering and salt spray. Dynasyl can withstand a temperature of 275 degrees F. over an extended time period. It has already been adopted as a reflector for very high-output fluorescent lights in several airport runway lighting systems. *Manufacturer: W. J. Ruscoe Company, Akron, Ohio.*

Conveyor belts turn corners

New idea in conveyor belt systems permits use of curved belts to move objects around corners

Redistribution of the stresses within curved conveyor belt systems now enables them to go around corners without buckling or distorting. The new system

Conveyor belts

is expected to have wide applications in mail, luggage, and packaged goods handling.

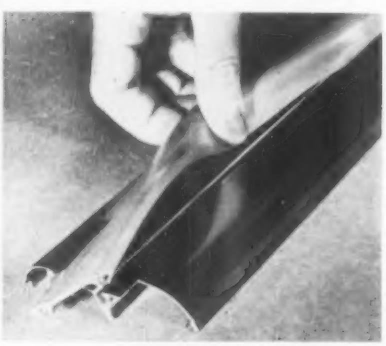
Curved systems are used to transfer materials or packages from one belt to another moving in a different direction. In the past, a barrier was used to divert packages from one belt to a second. However, the barrier often scuffed and broke delicate products and objects tended to gang up at the barrier causing uneven distribution on the takeaway belt. The new system eliminates these problems by maintaining a continuous flow around the corner that places the packages in transit on the second belt in exactly the same position as on the first, without contacting side frames or other diverting barriers.

The new curved belt is inlaid with radial steel rods which keep it flat on the conveyor bed even at high speeds. The radial stresses are concentrated along the inside edge of the curve, rather than along the outside edge where they would be more likely to tear through the belt. *Manufacturer: Goodyear Tire and Rubber Company, Akron, Ohio.*

Door threshold

Stainless steel threshold lasts life of house, is said to give absolute protection against drafts

A stainless steel threshold has been introduced that is said to last the lifetime of a house, provide 100 per cent protection against cold drafts, and be competitive in price with present thresholds. The new threshold requires no special caulking or inserts to achieve an efficient seal. It has instead, a vinyl seal strip that conceals the holes for fastening the threshold to the door sill. The seal snaps into retaining channels and is replaceable without removing the threshold. The seal is said to remain securely in place even under heavy traffic. The threshold is pre-notched for door



Stainless steel threshold

jamb and stop and requires no additional cutting for standard door widths. It is furnished in lengths up to 72 inches. *Manufacturer: United Industries, Inc., Chicago, Ill.*

Wind-up radio

Radio runs on wind-up mechanism which stores power to be used in rescue and supply-drop operations

A wind-up mechanism powers a new radio which uses no batteries or other power sources. Each complete winding-up supplies power for two hours of

Wind-up radio

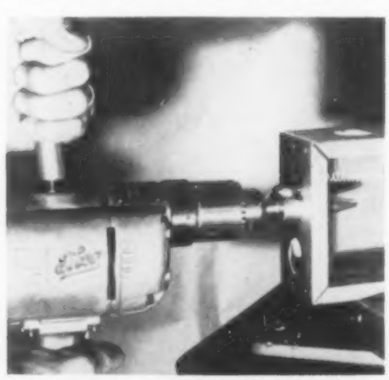
operation, and, according to the manufacturer, the mechanism can be rewound indefinitely. The radio is expected to be useful in both rescue and supply-drop operations. For remote-control applications, it could be made to respond to a coded signal. Small enough to be carried in one hand (it weighs six pounds), the radio has a range of from 75 to 125 miles. *Manufacturer: GPL Division, General Precision, Inc., Pleasantville, New York.*

Drilling thin materials

Cone-shaped drill produces variety of hole diameters in thin metal, plastic, or other material

Lower tool costs, fewer tool changes, and elimination of separate finishing steps in some drilling operations are made possible by a new drill shaped like a cone. The drill can produce a variety of hole diameters (from ¼ to 4¼ inches) in metal, plastic, or any relatively thin material.

In sheet metal work, it does away with circular hack sawing or knockout punching. Its 7/32-inch diameter point is small enough so that no center drilling or pre-punching is necessary to start a



Cone-shaped drill

hole. The drill is said to remove a continuous chip and leave no burr inside the hole, so that subsequent finishing operations are unnecessary. *Manufacturer: Scully-Jones and Company, Chicago, Ill.*

Radiation detector

Fountain-pen-size radiation detector provides constant audio-visual indication of radiation levels

A 3½-inch miniature personal radiation detector, the size of a fountain pen, provides a continuous audible and visual indication of radiation levels. Particularly valuable for radiation laboratory workers, the device emits chirps and light flashes at frequencies in proportion to the amount of radiation in an area. It is powered by a mercury battery

Radiation detector

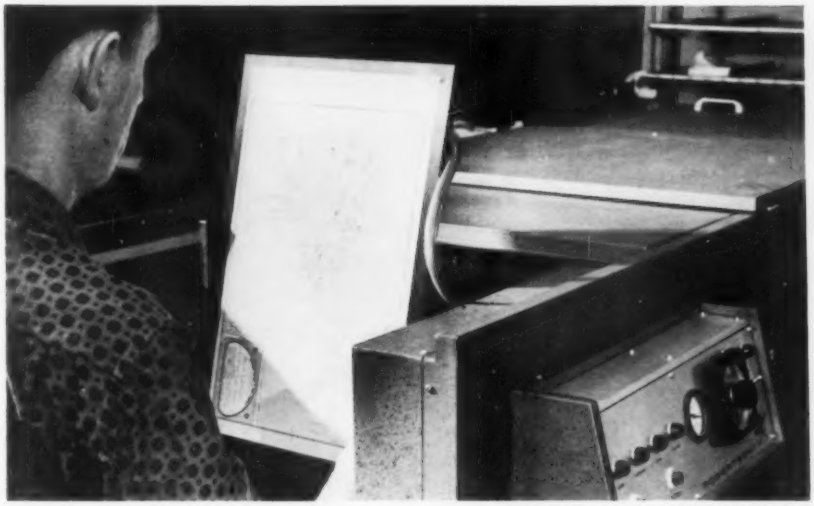
and housed in a stainless steel casing. *Manufacturer: Nuclear Materials and Equipment Corporation, Apollo, Pa.*

Engineering drawings

Electrostatic copying device produces low-cost paper offset plates in one minute, replaces blueprinting

An electrostatic camera/processor machine that automatically produces low-cost paper offset plates in one minute is reported to have successfully replaced blueprinting processes at the Chicago Bridge and Iron Company. The company uses this machine, the Electricon, to process up to 200 masters a day and to run multiple copies from each. The black-on-white copies do not fade and are all the same size, thus facilitating field handling.

Electricon produces offset plates from any black-on-white, color halftones, drawn, written, typed or printed material, and it enlarges or reduces size. It is operated by one person; material to



Offset plate maker

be copied may be set up in a few minutes' time. Finished plates are delivered in one minute. The cost of each offset plate—including depreciation of equipment, operating power, maintenance, labor, taxes, and all materials—is 68 cents. Although a single blueprint costs 15 cents per copy to reproduce, the process allows many inexpensive copies to be made from each master offset plate. Expenses are cut further because darkroom facilities are not needed. Three models are available, producing plates in sizes of 8½ by 11, 11 by 17, and 17 by 22 inches. *Manufacturer: Robertson Photo-Mechanix, Inc., Chicago, Ill.*

Foamed aluminum

Metal foam, produced for decorative and other applications, can be cut or pressed into shape

Aluminum in a foamed state is now available for the first time. The product floats on water and is one-twelfth the weight of solid aluminum. Present commercial applications have been concentrated in the decorative and building fields, and products include a line of room dividers and folding screens as well as acoustical tile. Potential uses for the foamed aluminum include rustproof automobile mufflers, water skis, novelty items, and solar screens. The metal foam is produced by mixing molten aluminum with certain chemicals that produce gas bubbles within the metal and expand it in much the same way that bread is baked. By regulating the amount of trapped gas, the metal can be made in various densities. The foamed metal may be machined, cut with a bandsaw, nailed, glued, bolted, screwed or pressed into shape. *Manufacturer: Dynamic Metals, Inc., Houston, Texas.*

Air bearing motor

Motor shaft rotates on pressurized air, never needs oiling, operates at extremely high speeds

Pressurized air cushions the shaft of a new motor and allows it to spin with almost no friction. By eliminating the problem of friction, or heating, as well as the need for conventional lubrication, such motors gain high reliability and can be operated at speeds of up to 500,000 revolutions per minute. A motor running at these speeds could be used in applications where size is critical, such as in a missile or computer, to deliver performance impossible from an oil-lubricated motor of similar size. They might also be integrated directly into household refrigerators — in this application, the motor shaft would be cushioned by the gas refrigerant. *Manufacturer: IMC Magnetics Corporation, Westbury, N. Y.*

Automatic button stitching

Automatic button stitcher is twice as fast as manual methods, sews more uniformly, more efficiently

Sewing buttons, one of the most tedious operations in the clothing industry, has been automated. A new button stitcher has been developed to stitch buttons on clothing twice as fast as it was done by hand methods. The machine also stitches more securely and uniformly than by hand, since, unlike a hand-stitcher, it will always take the same number of stitches through button holes, and the same number of winds in making the post and securing the thread to keep it from unwinding. The machine can be adapted to stitch nearly any button, both two and four hole styles with parallel or cross-stitching. *Manufacturer: American Machine & Foundry Company, New York, N. Y.*

Explosive forming

Combination of explosive forming and welding simplifies production of doughnut-shaped missile part

By combining explosive forming with welding in the fabrication of a torus-shaped (doughnut-shaped) missile fuel tank, many of the welds conventionally required have been eliminated. Fabricators are very anxious to do away with as many welds as possible because they raise production costs and reduce reliability. In the current instance, the number of separate welded pieces needed for the 18-foot diameter tank was cut from 40 to 12 and the length of the welds was reduced by 60 per cent.

The complicated torus tank is fabricated separately in two pieces, each the shape of a hollow doughnut sliced in half. First, six pieces of sheet metal are welded together to form each half. Then, this "preform" is placed in a

Exploded metal fuel tank

die and filled with water. An explosive is suspended in the water and detonated, forcing the preform into the rounded shape of the die. Two of these shapes are then welded together on their edges to complete the hollow torus shape of the tank. *Manufacturer: Martin Company, Baltimore, Md.*

Lights at sea

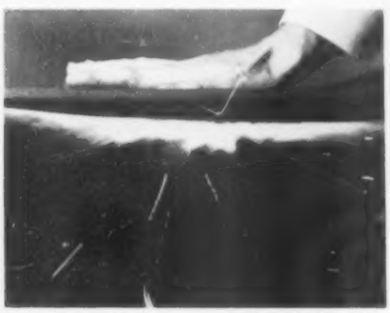
Distress lamps for emergencies at sea are turned on by chemical action of salt water

Distress lamps that light when their power source is immersed in salt water have been developed for use at sea. The power source is provided by positive silver chloride and magnesium cell plates which are chemically inert until immersed. Trademarked Aqualites, the lamps are produced for makers of life vests and rafts, and boat owners. Two of the lamps have a minimum burning time of 8 and 12 hours, respectively, and a third, designed primarily for use on airline life jackets, burns for 20 hours. The 8 hour model costs $2.30. *Manufacturer: Engelhard Industries, Inc., Newark, N. J.*

Briefs

A quick sampling of new materials, products, and processes

Silicone rubber, only $\frac{1}{8}$-inch thick, can protect the human hand against 5000 degree F. oxy-acetylene torch flames, and could be useful in protecting space vehicle missile parts from the heat of



Silicone heat shield

space flight. After 60 seconds' exposure to this temperature the back of the sheet reached only 100 degrees F. When subjected to 9000 degrees F., the sheet reached only 450 degrees F. after six minutes' exposure. *Manufacturer: General Electric Company, Silicone Products Department, Waterford, N. Y.*

A new epoxy formulation provides a tough, smooth, non-contaminating interior coating for vessels used in the brewery, winery and allied industries. Tradenamed Pfaudlon 201, the coating is said not to influence product quality, color, taste or odor, and it may be easily cleaned by conventional or clean-in-place means. It is applied by spray-coating and then heat cured. It is particularly valuable in constructing and coating at the job site because it works well on objects of exceptional size. *Manufacturer: Pfaudler Company, Division of Pfaudler Permutit, Inc., Rochester, N. Y.*

Moldings for plastic laminate desk, table-top, counter top and wall installations exactly match the appearance of popular laminates including Formica, Pionite and Micarta to provide a finished look and a continuous flow of line and color. Called Karwood Matching Mouldings, they are extruded from aluminum and covered with a pressure-sensitive veneer in a choice of more than 2700 varieties of color and pattern. They are available in several shapes and sizes including dividers, inside and outside corners, clampdowns, and end caps. *Manufacturer: Keller Products, Inc., Manchester, N. H.*

Wire cloth can now be produced in woven-to-width dimensions at savings of up to 50 per cent. This economy is made possible by new high-speed wire ribbon looms that turn out the narrow widths at high speeds. The narrow wire cloth is used typically for small parts where a selvage or nonraveling edge is required on both sides. Brass, copper, bronze,

Wire loom

steel, and stainless wires can be woven in widths from $\frac{3}{4}$-inch to 8 inches and in meshes from 4 through 80. *Manufacturer: National-Standard Company, Reynolds Division, Dixon, Ill.*

Polyvinyl chloride tubing is available for transmission of gases, acids, alkalies, petroleum products, sea water and other active chemicals or materials. Trade-named Clearflo, the tubing may also be had in a food grade formulation said to handle delicately-flavored substances securely. The tubing is transparent, non-porous, and resists staining, bacterial growth and dirt accumulation. It is also supplied in two reinforced versions. *Manufacturer: Newage Industries, Inc., Jenkintown, Pa.*

A tough, flexible adhesive has been introduced for bonding natural and synthetic rubber, vinyl, fabrics, leather, and wood to themselves or to glass, steel, iron, and other surfaces. The product, CO 350, is expected to be particularly useful to plastic fabricators and jewelry manufacturer. The bond is said to be permanently flexible. *Manufacturer: Chemical Development Corporation, Danvers, Mass.*

Stainless steel parachute

Stainless steel wire has been manufactured into parachute cloth that may be used to help return an Air Force space capsule to earth. The wire is drawn so fine that even though it is tightly woven the material is transparent. *Manufacturer: W. S. Tyler Company, Cleveland, Ohio.*

Decorative self-adhesive material in 33 colors and 12 embossing patterns of simulated leather and linen prints has been announced. Called Dec-a-Tex, the material comes in thousands of combinations of colors and surfaces and can be further processed by silk-screening, hot-stamping and die cutting. Suggested applications include decorative covering and recovering of luggage, card table tops, furniture, dashboard trim and other decorative uses. Dec-a-Tex has a temperature range of minus 20 to 250 degrees F., and high resistance to greases and oils, creep, fading, shrinkage and abrasion. *Manufacturer: Fasson Products, Painesville, Ohio.*

A hollow pressure vessel has been made from ultra-high tensile strength steel wire, wound over a thin plastic core. Shaped like a Bermuda onion, the vessel was constructed to test its potential as a fuel container for missiles. The wire used has a tensile strength of more than 600,000 pounds per square inch. *Manufacturer: Bendix Corporation, South Bend, Ind.*

Hollow pressure vessel

Epoxy resin-glass fiber helicopter part is stronger, lasts 5 times longer than metal. Air deflecting contravanes, mounted directly on the engines of Sikorsky S-58 helicopters, are subjected to engine vibration. Formerly made from metal, such contravanes became inoperative after about 3 million cycles in a test machine.

Now, contravanes made of glass fiber impregnated with a BAKELITE Brand epoxy resin are being used in this important assembly. Manufactured by the Fibremold Division, Hampden Brass and Aluminum Company, the epoxy-glass combination has exceptional ability to dampen vibration and resist fatigue. Tests show no failures after 15 million cycles! As an extra bonus, the epoxy-glass part cuts weight 11½ per cent.

TO GAIN STRENGTH, REDUCE WEIGHT, SAVE TIME

...design it with easy-to-fabricate epoxies

Epoxy-glass "spinners" dampen vibration, maintain strength despite alternate icing and heating. Predicted long, reliable service life is one of the outstanding features of epoxy resin-glass cloth propeller "spinners" now being used on Grumman "Mohawk" airplanes.

The epoxy-glass cloth "spinners," which incorporate de-icers for the aircraft's propellers, possess excellent tensile strength and fatigue resistance—very important properties for a part that is subjected to severe vibration. The wire heating elements, that are laminated right in with the glass cloth and impregnated with a BAKELITE Brand epoxy resin-based compound, have excellent electrical insulation. The strength-to-weight ratio of the "spinner" is high.

In addition, the manufacturer, Fibremold Division, Hampden Brass and Aluminum Company, reports that production costs are substantially lower since using the epoxy resin-based compound.

Epoxy resin-glass cloth laminate saves 80% of cost of large laminating tool. The Tapco Group of Thompson Ramo Wooldridge Inc. has dramatically proved the merits of epoxy-glass laminate tooling. A parabolic-shaped laminating tool about 15 feet long and seven feet across was built of BAKELITE epoxy resins laminated with glass fibers. The big tool, its surface smooth and flawless, was made and placed in production in a minimum amount of time. The company claims this epoxy-glass tool saved them approximately four-fifths the estimated cost of a tool made from other materials.

New and practical applications for epoxy resins—often in combination with other materials, such as glass fiber and metal—are being introduced by ingenious designers in many fields. No other resin commercially available offers so many advantages: exceptional strength—stronger than other plastics—even under wide temperature ranges . . . excellent resistance to most chemicals, water and weather . . . ease of fabrication that saves untold hours of production time and costs. Some of the newer applications for epoxy resins include filament winding, electrical encapsulation and embedment, fabrication of large storage vessels and containers.

For more information about BAKELITE Brand plastics—epoxies, polyethylenes, phenolics, styrenes, vinyls, and polypropylenes—mail the coupon today. See Sweet's Product Design File, section 2a/ui, for a list of properties.

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FREE LITERATURE *available from manufacturers, on materials, components, processes, machines*

Materials—Plastics

Urethane. Nopco Chemical Company, 175 Schuyler Ave., North Arlington, N. J. 12 pp. Ill. Booklet illustrates uses of pour-in-place urethane for insulation, potting, cushioning, and packaging. Properties and typical formulations are given.

Silicone fluids. General Electric Company, Silicone Products Department, Waterford, N. Y. 20 pp. Ill. Technical reference booklet describes the range of major silicone fluids and their varied applications as hydraulic and damping fluids, dielectrics and lubricants, antifoam agents, coatings for ceramics and glass, and as additives to urethane foams.

Phenolic molding compounds. General Electric Company, Chemical Materials Department, Pittsfield, Mass. 6 pp. Ill. Folder CDC-394 presents guide for designing with phenolic molding compounds, lists typical applications and properties, and compares costs with those of metals.

Materials—Metals

Aluminum-vinyl laminate. Aluminum Company of America, 720 Alcoa Building, Pittsburgh 19, Pa. 20 pp. Ill. Brochure contains 39 samples of Alcoa Vynalate, a new aluminum-vinyl laminate for decorative applications. Included are technical data and suggested applications.

Small appliance heating elements. Hoskins Mfg. Company, 4445 Lawton Ave., Detroit 8, Mich. 8 pp. Ill. Technical bulletin describes properties and performance of Hoskins alloy 750, a special iron-chromium-aluminum resistance material developed for use as heating elements in small appliances and other devices with operating temperatures of less than 2050 degrees F.

Sheet metal structures. International Steel Company, Evansville, Ind. 60 pp. Ill. Design manual describes Lindsay Structure and applications to which it is suited. Lindsay Structure is a die-drawn, pre-stressed metal panel said to utilize the full inherent tensile strength of metal in sheet forms, eliminating the need for braces, gussets, and struts in many enclosures. Also described are methods of assembly, including special applications such as inside corners, panel-inside construction, double walls, lining, insulating, and waterproofing.

Sintered titanium. Mechanical Research Division, Clevite Corporation, Cleveland 8, Ohio. 2 pp. Ill. Bulletin presents properties and application information on sintered titanium and illustrates how this form of titanium costs less than the wrought form. The bulletin is the first in a series of engineering and design briefs that will cover such areas as fiber metallurgy, tungsten composites, powder metallurgy, and other advanced materials applications.

Stainless steel. Eastern Stainless Steel Corporation, Baltimore, 3, Md. 18 pp. Ill. Brochure describes the facilities, services, and products of the company.

High-strength alloys. Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa. 28 pp. Ill. Booklet treats a variety of high-temperature, high-strength alloys used in aircraft, missile, and other applications where corrosion resistance and strength at high temperatures are needed.

Alloys. Riverside-Alloy Metal Division, H. K. Porter Company, Riverside, N. J. File folder describes complete line of copper-base, stainless steel, and nickel-base alloys.

Beryllium. Standard Pressed Steel Company, Jenkintown, Pa. 16 pp. Ill. Brochure describes research to overcome shortcomings of beryllium for structural applications; includes a history of the use of the metal, and a review of its technical properties.

Components and Machines

Clamps, couplings, joints. Marman Division, Aeroquip Corporation, 11214 Exposition Blvd., Los Angeles 64, Calif. Brochure describes clamps, couplings, and joints for maintenance and original equipment requirements.

Electronic transformers. General Electric Company, Schenectady 5, N. Y. 28 pp. Ill. Bulletin GEA-7121 lists features of electronic transformers for military applications. The bulletin discusses reliability and specifications and tells how various specifications affect design and construction.

Vibratory materials handling. Syntron Company, 1278 Lexington Ave., Homer City, Pa. Ill. Catalog 616 describes specifications and uses for vibratory materials handling equipment.

Hose couplings. American Coupling Corporation, 31739 Mound Road, Warren, Mich. 12 pp. Ill. Catalog gives dimensions and features of line of automotive and industrial hose, couplings, adaptors, and connectors.

Steel conduit. National Electric Division, H. K. Porter Company, Porter Building, Pittsburgh 19, Pa. 4 pp. Ill. Bulletin 713 describes Sheraduct conduit, a rigid steel electrical conduit galvanized to protect against corrosion and color coded with vinyl.

Panel instruments. Daystrom, Inc., Weston Instruments Division, Newark 12, N. J. 6 pp. Ill. Bulletin discusses features, selection and uses of 2½ and 3½ inch matched panel instruments available in round or square Bakelite cases.

Steel laboratory equipment. Metalab Equipment Company, Duffy Ave., Hicksville, N. Y. 64 pp. Ill. Catalog describes steel laboratory equipment and furniture, giving construction, manufacturing, and finishing details.

Terminal panel wiring block. AMP, Inc., Eisenhower Blvd., Harrisburg, Pa. 4 pp. Ill. Folder gives complete specifications on a new modular terminal panel wiring block. Trademarked Termi-Blok, the product is designed to replace barrier boards

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A LOOK AT TRANSPARENCY

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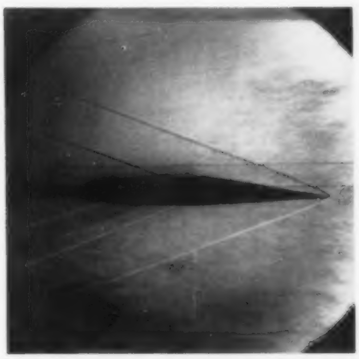
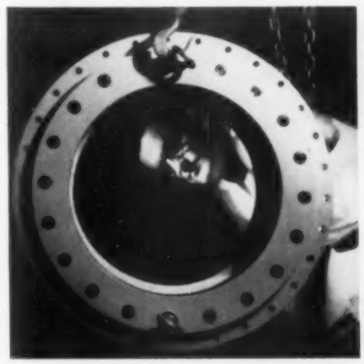
This small compendium on transparency-plus may give you an idea or two on how to get a look at whatever you'd like to watch.



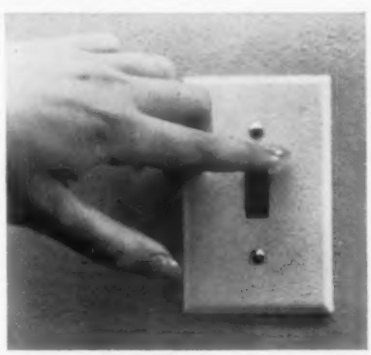
The window through which this schlieren photograph was taken is 99.999+% fused silica, the most transparent glass for visible light ever made. Its extremely low coefficient of expansion gives it extremely high heat shock resistance. Couple these properties with a low refractive index variation and complete absence of physical flaws, and you have a window glass for such applications as this North American Aviation supersonic wind tunnel.

To study the impact of two opposing gas waves traveling at Mach 80, physicists at Boeing Laboratories take photographs through a 12-foot length of 6″ O.D. PYREX glass pipe. This is the same borosilicate glass we use in pipe for chemical and food processing plants and for drainlines and heat exchangers.

A quarter-inch polished plate of PYREX brand infrared reflecting glass keeps this steel mill crane operator cool. The glass bounces as much as 93% of the infrared, yet transmits about 75% of the visible light.



This is a radiation shielding porthole which lets sailors on nuclear-powered submarines look directly, and safely, into the reactor chamber. It's made of a high-lead-content glass which stops gamma rays. For other hot cells, we've turned out shielding windows as big as five feet thick and nine tons heavy.



The mercury that makes this light switch noiseless is enclosed in a PYREX® tube. Transparency makes preassembly inspection easy. Other features: the mercury can't corrode the glass; the glass serves as electrical insulation, and it can be sealed to metal.

A different kind of heat comes from a welding torch. This VYCOR® brand glass nozzle lets the welder keep a close eye on his work, but isn't affected by the heat. VYCOR brand glass is 96% silica, approaches fused silica in heat shock resistance.

Four-paned spaceports go into the Project Mercury capsules. Two panes of VYCOR brand glass and two of aluminosilicate glass provide optical quality plus the space traveling necessities of great physical and thermal strength coupled with low weight.

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and terminal boards presently in use in switchboards, control panels, industrial instrumentation, and other applications where maximum distribution of control and versatile power control circuiting are essential.

Combustion air blowers. Spencer Turbine Company, 486 New Park Ave., Hartford, Conn. 8 pp. Ill. Reprint gives design fundamentals, and information on selection, of gas combustion air blowers.

Lift truck masts. Raymond Corp., 223-186 Madison St., Greene, N. Y. Brochure describes a new three-stage telescoping mast which greatly increases (as much as 25 per cent) the range of elevation of the company's line of narrow-aisle electric fork lift trucks.

Electronic air cleaners. Westinghouse Electric Corporation, Sturtevant Division, Damon Road, Boston 36, Mass. 8 pp. Ill. Catalog 1450 describes the characteristics of electronic air cleaners and how they can be applied to collect oil mists resulting from operation of industrial machine tools.

Portable tube polisher. Hi-Shear Corporation, Torrance, Cal. 2 pp. Ill. Bulletin describes features of a new tube polisher for cleaning and polishing the exterior ends of boiler tubes to remove mill scale, rust, and other deposits. The unit is driven by an air motor which spins a pair of abrasive belt sanders and simultaneously rotates them rapidly and continuously in a 360 degree circle around the tube end to be polished.

High-vacuum valves. Consolidated Vacuum Corporation, 1775 Mt. Read Blvd., Rochester 3, N. Y. 28 pp. Ill. Bulletin 10-1 describes features and applications of various high-vacuum valves, baffles, and traps.

Miscellaneous

Emergency lighting. Electric Cord Company, 432 Plane St., Newark 2, N. J. 12 pp. Ill. Booklet shows consequences of power failure and how property owners can avoid risks. The probability and costs involved in power failures are given as well as information and features of Light Warden battery-operated emergency lighting equipment.

Equipment production capabilities. Pioneer Tool and Engineering Company, 7401 W. Lawrence Ave., Chicago 31, Ill. 22 pp. Ill. Brochure outlines capabilities and facilities for production of components and assemblies for stable platforms, magnetic memory computers, hydraulic pumps, fire control, and other equipment.

High-temperature coatings. Swedlow, Inc., 6986 Bandini Blvd., Los Angeles 22, Calif. Bulletin describes flexible coatings, rigid foam coatings, and painted coatings as high-temperature insulation, particularly for missile and rocket equipment.

Metals production. Kolcast Industries, Division of Thompson-Ramo-Wooldridge, Inc., Box 250, Minerva, Ohio. 28 pp. Ill. Brochure presents capabilities for development and production of investment castings and superalloys.

Commercial glasses. Corning Glass Works, Corning, N. Y. 16 pp. Revised booklet B-83 gives mechanical, electrical, and optical data on 32 commercial glasses, as well as information on thermal stress, heat transmission, and expansion coefficients.

Product development. Cerand Corporation, 285 Columbus Ave., Boston, Mass. 12 pp. Ill. Brochure tells how Cerand works with management, especially in the civil engineering and construction fields, to develop new products and evaluate existing products.

Process liquids and gases. Pfaudler Permutit, Inc., Rochester 3, N. Y. 16 pp. Ill. Guide describes process equipment—for handling liquids or gases—fabricated from Glasteel, Nucerite and other materials for corrosion resistant service. Also covered is equipment for water treatment, gas analysis, aeration, demineralization, and waste treatment.

Printed circuits. U. S. Engineering Company, division of Litton Industries, Inc., 13536 Saticoy St., Van Nuys, Calif. 10 pp. Ill. Brochure presents specifications for all types of printed circuits, including flexible, flush, multi-layer, and plated varieties, and describes the firm's design and production capabilities.

Philco computer. Philco Corporation, 3900 Welsh Road, Willow Grove, Pa. Brochure describes the Philco 2400 computer.

Paint for polyolefins. Bee Chemical Company, 2700 East 170 St., Lansing, Ill. 2 pp. Data is presented on a new paint for use on flame-treated or chemically oxidized polyethylene or polypropylene. Called P-38, the paint is a fast touch-dry spray coating with good mar resistance and flexibility.

Water conversion. General Electric Company, Schenectady 5, N. Y. 8 pp. Ill. Bulletin GED-4135 reports on the company's thin-film process for distillation of salt and brackish waters.

Honeywell 400 computer. Minneapolis-Honeywell Regulator Company, Wellesley Hills 81, Mass. Brochure outlines features and applications of the medium-scale Honeywell 400 computer.

Reinforced fiberglass. Glastronics, Inc., 699 Tarkiln Hill Road, New Bedford, Mass. Brochure discusses industrial applications of reinforced fiberglass and compares it to other fabricating materials.

Stairs. Stairbuilders, Division of American Stair Company, Route 66, McCook, Ill. 10 pp. Ill. Bulletin describes a series of prefabricated, one-piece, steel-reinforced stair products.

Pencils. J. S. Staedtler, Inc., Hackensack, N. J. 24 pp. Ill. Catalog describes a wide variety of pencils for various uses: Mars-Lumograph Duralar pencils for work on drafting film; Mars-Lumuchrom pencils for color coding on tracings; non-reproducing pencils for making temporary notes on drawings; and other drafting pencils, leads, and holders.

Chemicals: Hooker Chemical Corporation, Box 344, Niagara Falls, N. Y. 16 pp. Reference digest reviews information on 88 Hooker chemicals that are commercially produced, including acids, alkalies, chlorine, phosphorus, etc. For each chemical a thumbnail description, physical data, chemical formula, uses, and types and weights of shipping containers are presented.

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Product and Industrial Design Engineer—*Four to ten years' experience in one or more of the following consumer goods areas: business machine's photographic or microfilm equipment or graphic arts; must have keen design judgment and extensive association with economical manufacturing processes; must have worked on the board and be familiar with drafting practices. Fee and relocation expenses paid. Salary commensurate with experience. Write immediately in confidence to Theodore S. Jones & Company, Box 41, Milton 87, Massachusetts or phone OXford 6-3221.*

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Index to Advertisers

CALENDAR

September 14-16. Second general assembly of the International Council of Societies of Industrial Designers. Venice, Italy.

September 16-19. National Association of Furniture Manufacturers' supply, equipment, and fabric fair. Conrad Hilton Hotel, Chicago.

September 20-21. Industrial electronics symposium. Bradford Hotel, Boston.

September 21. "Packaging for Vending Machines," sponsored by the Canadian Package Design Council. King Edward Sheraton Hotel, Toronto, Canada.

September 25-28. National fall meeting of the American Welding Society. Hotel Adolphus, Dallas, Texas.

September 25-28. Industrial building exposition and congress. New York Coliseum.

September 25-28. Annual convention and exhibit of the American Hospital Association. Atlantic City Auditorium.

September 28. New products workshop of the Association of National Advertisers. Waldorf Astoria Hotel, New York.

September 28. "Plastic Packaging." A technical institute sponsored by the Packaging Association of Canada. King Edward Sheraton Hotel, Toronto, Canada.

October 5. Society of Plastics Engineers regional technical conference on plastic foams. Hotel Lafayette, Buffalo, N. Y.

October 5-6. Research and development administrators' workshop. University of Wisconsin, Madison, Wisconsin.

October 5-8. Annual meeting and conference of the American Society of Industrial Designers, devoted to design and technological innovations as they influence industrial planning. Ambassador Hotel, Los Angeles, and Catalina Island, California.

October 9-11. Annual national electronics conference sponsored by the National Electronics Conference, the American Institute of Electrical Engineers, Institute of Radio Engineers, Illinois Institute of Technology, Illinois and Northwestern Universities. International Amphitheatre, Chicago.

October 10-11. "Manufacturing with Space Age Metals," a seminar sponsored by the American Society of Tool and Manufacturing Engineers. Sheraton Hotel, Philadelphia.

October 12-13. New England sectional conference of the Society of the Plastics Industry. Wentworth-by-the-Sea, Portsmouth, N. H.

October 18-20. Annual national packaging forum of the Packaging Institute. Biltmore Hotel, New York.

October 21-29. "Electric City, U.S.A." Annual electrical appliance exposition. New York Coliseum.

October 23-27. Metals exhibit and conference sponsored by the American Society for Metals. Cobo Hall, Detroit.

October 26-27. Annual meeting of the board of trustees of the Industrial Designers Institute. Statler Hotel, Boston.

October 28. The annual symposium of the Industrial Designers Institute on the theme of "Pivoting Forces." Summerset Hotel, Boston.


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