INDUSTRIAL DESIGN

7 *July 1959* *$1.50 per copy*

PLASTICS FOR THE DESIGNER

A guide to material specification

How Japanese products are shaped

AllianceWall
porcelain-on-steel
in coils, sheets
laminated panels

your choice of 3

easy-to-use forms of porcelain on steel!

28 glass-hard, non-fade colors for your selection. Now AllianceWall porcelain-on-steel is available in three easier-to-use, easier to *sell* forms. Order color-fast, stain-resistant AllianceWall in coils up to several hundred feet in length . . . in 4′ x 12′ sheets . . . or the material of your choice in laminated panels up to and including 4′ x 12′! Important, too, AllianceWall porcelain enamel on steel in *any* form offers complete flexibility . . . lets you saw, trim or drill on *your* production line. Send for full information today!

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JULY, 1959 VOLUME 6 NUMBER 7

INDUSTRIAL DESIGN

A monthly review of form and technique in designing for industry. 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 AUGUST — An analytical review of the USSR's Exhibition of Science, Technology and Culture now on view at New York's Coliseum.

IN SEPTEMBER — Controls in both home and industrial equipment.

COVER: One of the basic tools in the selection of plastics, a ring of plastic color chips, is the subject of a photogram on this month's cover. Our first article in a series on plastics for the designer starts on page 32.

FRONTISPIECE: Japanese railroad wheels with their axles make a pattern and a point in this month's frontispiece (photograph courtesy of Consulate General of Japan). A closer look at the Japanese product can be found on pages 54 to 69.

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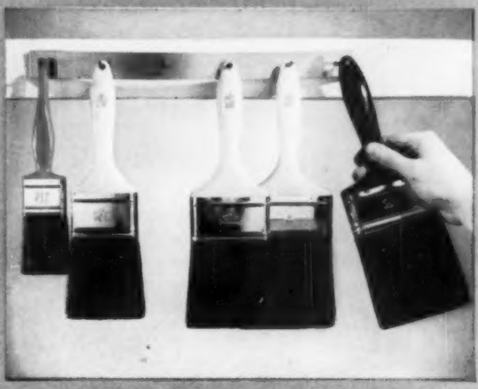
Pro-fax gives wood the brush-off

Pro-fax replaces wood in this new line of TUFLITE paint brush handles, providing a superior product at lower material and production costs.



Pro-fax gives TUFLITE handles in the popular Beavertail style all the merchandising features important in the fast-growing "do-it-yourself" market.

TUFLITE handles are lighter and more durable than wooden models, have a finish that is impervious to solvents, and will not crack, chip, peel, or wear off. Available in a rich array of handsome colors, they are the first plastic brush handles offering colorful styling in a low-cost product.

Not only lower in original cost, TUFLITE handles also cut the cost of brushmaking. Unaffected by humidity changes, they speed handle assembly, eliminating rejects due to shrinkage or swelling.

TUFLITE paint brush handles manufactured by H. V. Hardman Co., Inc., Belleville, New Jersey.

Hi-Fax® serves soap in style

A handsome globe molded with Hi-fax, Hercules high-density polyethylene, makes Bobrick's new

line of soap dispensers an attractive asset to any washroom. Much safer, too, since the globe won't crack or shatter if dropped when being refilled. They have a soft lustrous snow-white finish that's easily kept like new by simple damp-cloth cleaning. Bobrick selected Hi-fax after testing other materials for durability and resistance to chemicals. Globes are blow-molded by Olympic Plastics, Inc.

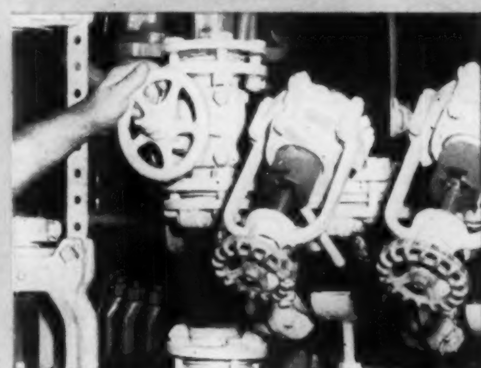
Design Hi-lites

From a designer's standpoint, a new spectacle case molded by Parmalee Plastics for U. S. Safety Supply Company is one of the most exciting uses of Pro-fax seen to date. The cover, hinge, case, and latch are all one piece of Pro-fax molded in a single shot, in a cleverly designed mold. A true plastics paradox, the case and cover depend on the *rigidity* of Pro-fax in achieving a durable, protective package for a delicate product, while at the same time the molded hinge relies on the *flexibility* of Pro-fax in thin-wall sections. If that weren't enough, the resilience of Pro-fax makes possible a strong, snug-fitting latch, which nonetheless releases readily under delicate thumb pressure.

Using the same basic idea, a variety of other such Pro-fax packages suggest themselves for products like cosmetics, tools, toys, or personal goods.

40 months' resistance to corrosive acids

Here's a "proved-in-action" case history of Penton®, Hercules chlorinated polyether—the new thermoplastic polymer with exceptional resistance to corrosion at elevated temperatures. The valve at left in this photograph is a Hills-McCanna diaphragm valve with a cast iron body lined with Penton. It is continuously exposed to carbon



tetrachloride, hydrochloric acid, and wet chlorine at temperatures up to 85°C. The valve has operated in this highly corrosive system since September 29, 1955 without a single failure in over forty months. Indicative of the corrosive atmosphere is the use of Haveg, glassed steel, porcelain and Pyrex for other valves and piping in this system. To learn more about Penton in valves, pipe and fittings, pumps and meters, flame-sprayed or whirl-sintered parts, write to Hercules for your copy of "The ABC's of Penton for Corrosion Resistance", and the technical brochure on Penton's properties and uses.

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THREE NEW MATERIALS FOR THE PLASTIC INDUSTRY

CP59-6

HI-FAX® HIGH-DENSITY POLYETHYLENE • PRO-FAX® POLYPROPYLENE • PENTON® CHLORINATED POLYETHER

in this issue...


Oestreich


Rockwood


Suzuki


Sueyoshi


Koike


Ouchi


Hoffer


Fujikawa


Downsbrough


Steuer


Magers

Dr. Dieter Oestreich, the industrial designer whose article on form (page 70) is published in the original German in *Werk*, has written for ID before (see February 1957). Dr. Oestreich is responsible for the appearance of the products of such European concerns as Brown, Bovari and Company, Voigtlander, and Kuhlman.

Robert Rockwood, author of the three-part treatise on how to pick the right plastic for the job-in-hand, the first installment of which begins on page 32, is an industrial designer who has made a career of plastics (see Traveling Plastics Specialist, April 1956), currently is affiliated with Polyplastex United.

Fukuji Suzuki, a contributor to ID's story on design in Japan (page 54), was a member of the first Japanese industrial design team to visit the U.S. (in 1956), has his own office in Tokyo and also teaches design at Tokyo's Chiba University.

Kikumaro Sueyoshi is director of the Japan Center for General Merchandise (an organization whose functions are explained further along in this issue) and with Mr. Ouchi (below) was a member of the group of industrial designers who recently toured the U.S. to talk with American businessmen.

Hiroshi Ouchi originated, and is head of, the industrial design department of Hitachi, one of Japan's largest manufacturers of heavy machinery and appliances. A lawyer by training, Mr. Ouchi studied painting and became interested in graphics while he was on the staff of Hitachi's advertising department.

Frederick Hoffer, an American serviceman who remained in Japan after the war to become a consultant designer (his first client: Toshiba, manufacturer of electrical appliances) originally studied architecture and, before the war, worked in New York as both architect and designer.

Iwaturo Koike, a Japanese industrial designer now touring the U.S., was educated in metal-working arts and crafts at Tokyo University (where he now teaches industrial design), entered the field through his work with Japan's Industrial Arts Institute.

Edward Steuer, designer of the drop-front file carton for Bonafide Mills' floor tiles (page 87) comes from Pittsburgh, studied design at Chicago's Institute of Design, presently lives in New York. He has worked at Raymond Loewy Associates and is now with Designs for Business, Inc.

Gyo Fujikawa is a California-born commercial artist, a graduate of Los Angeles' Chouinard Art Institute. At one time an employee of Walt Disney Productions, she currently free-lances and is responsible for the Beech-Nut baby food packaging reviewed on page 86.

Charles Magers, whose line of packaging for Watkins' products is reviewed on page 87, once worked in Chicago and New York, now has his own office in his farmhouse near Princeton, New Jersey, where his studio window overlooks deer ("sometimes 20 at a time"), cows, and rabbits.

Virginia Downsbrough, whose impression-collecting students were spotted by an ID editor's wife at the Alice in Wonderland statue (see page 76) in Central Park, is teacher-director of the nursery school affiliated with Finch College, but spends her long summers on Cape Cod where—among other things—she weaves under the occasional tutelage of Marianne Strengell of Cranbrook Art Academy.

LETTERS

More practice needed

Sirs:
We read your editorial, "Sic, Sic, Sic", in the May issue, and found it not only interesting and well written, but very, very true. Now—why don't you practice what you preach!
F. R. Blair
R. B. Williamsen
J. F. Truitt
Ford Stylists, Ford Motor Company
Dearborn, Michigan.

Breathless

Sirs:
After seven breathless months working on the design of the United States Exhibition in Moscow, I enjoyed your article in the April issue of ID on our efforts in the first days.

I wish to point out one slight error, however. I worked with A. Richard Denatale and Robert Doherty in developing a corporate program for Reynolds Metals Company while I was there as Exhibits Director. This program was developed under the direction of Jim Birnie, Director of Design.
Philip B. George, Associate
George Nelson & Company
Sokolniki Park
Moscow, U.S.S.R.

Sirs:
I was delighted with the excellent story on welding in the June issue of Industrial Design, and overwhelmed by the vast amount of information you got together in so short a time.
John J. Johnston
Air Reduction Sales Company
New York, N.Y.

Does design seek its own level?

Sirs:
If the average industrial designer could somehow manage to recover an ounce or two of those noble convictions which he threw in the litter basket after his first month in the work-a-day world, his conscience might be profoundly disturbed by the searching letter from Professor Fred Eichenberger in your June issue. The Professor is to be commended for *publicly praising* your publishing of the astringently penetrating article by C. Wright Mills (November '58 ID), on the malaise of the industrial world.

He suggested that you continue to print similar articles, for he believes that individuals concerned with design should question the consequences of their actions.

But isn't his a rather dangerous suggestion? For the minute designers become deeply concerned with serious self-analysis, with making a stab at intelligent value judgements, and with worrying about "public and private morality", they may well find themselves back in the bread lines.

In a society distinguished for its unparalleled apathy, the controversial personality is apt to find himself *persona non grata* in the best social and business circles. It would take an uncommonly idealistic and courageous designer to attempt to break through the I'm-running-a-*business*, I've-got-a-payroll barrier. And if he were found guilty of encouraging his fraternity brothers to make such things as material sacrifices for the sake of an ideal, he could easily invite disparaging labels, such as Security Risk (artistic variety).

According to the advertisements for one of the country's most influential magazines, there is now a big "Boom at the *Upper Level*". It seems that some ten million well-educated, affluent, Upper Level Americans now make the decisions and establish the trends for the rest of us—who, presumably, squat uncomplainingly on the more uncomfortable *Lower Level*. We are told that the U.L.'s sit up on their lofty perch with our wholehearted consent, and, what's more surprising, with our admiration as well.

Do you suppose that C. Wright Mills or Professor Eichenberger could hazard a guess as to what *Level* the industrial designer belongs?

To your boards, slaves!
Raymond Wing Jean
Architect & Industrial Designer
New York, N.Y.

What's up

Sirs:
I think your article on "What's Up In Helicopters" is the most accurate, complete, and informative that I have seen in my brief time in the business. The picture that it presents of the state of our industry is as fair as is possible. I have taken the liberty of referring two recent inquiries concerning our industry to your article. I think that it will help these people soberly to appreciate the problems which we face, and yet do so in an optimistic manner.
Weston B. Haskell, Jr.
Assistant to the President,
Kaman Aircraft Corporation
Bloomfield, Connecticut.

Sirs:
Many of us laymen, having watched the comparatively slow progress of helicopter development, are wondering why these machines haven't quite lived up to their promise of cheap, popular transportation. Your recent article on this subject ("What's Up in Helicopters", April ID) was very interesting and quite informative. Especially commendable was your theoretical approach, outlining the drawbacks of helicopters and the technical problems inherent in their design.

However, I noted only one passing reference to ducted propeller propulsion. Having seen the Piasecki aerial jeep which employs this idea, I wonder if it isn't a significant development?
Lawrence W. Hansen, Office of Inf. Services
Stewart Air Force Base
New York

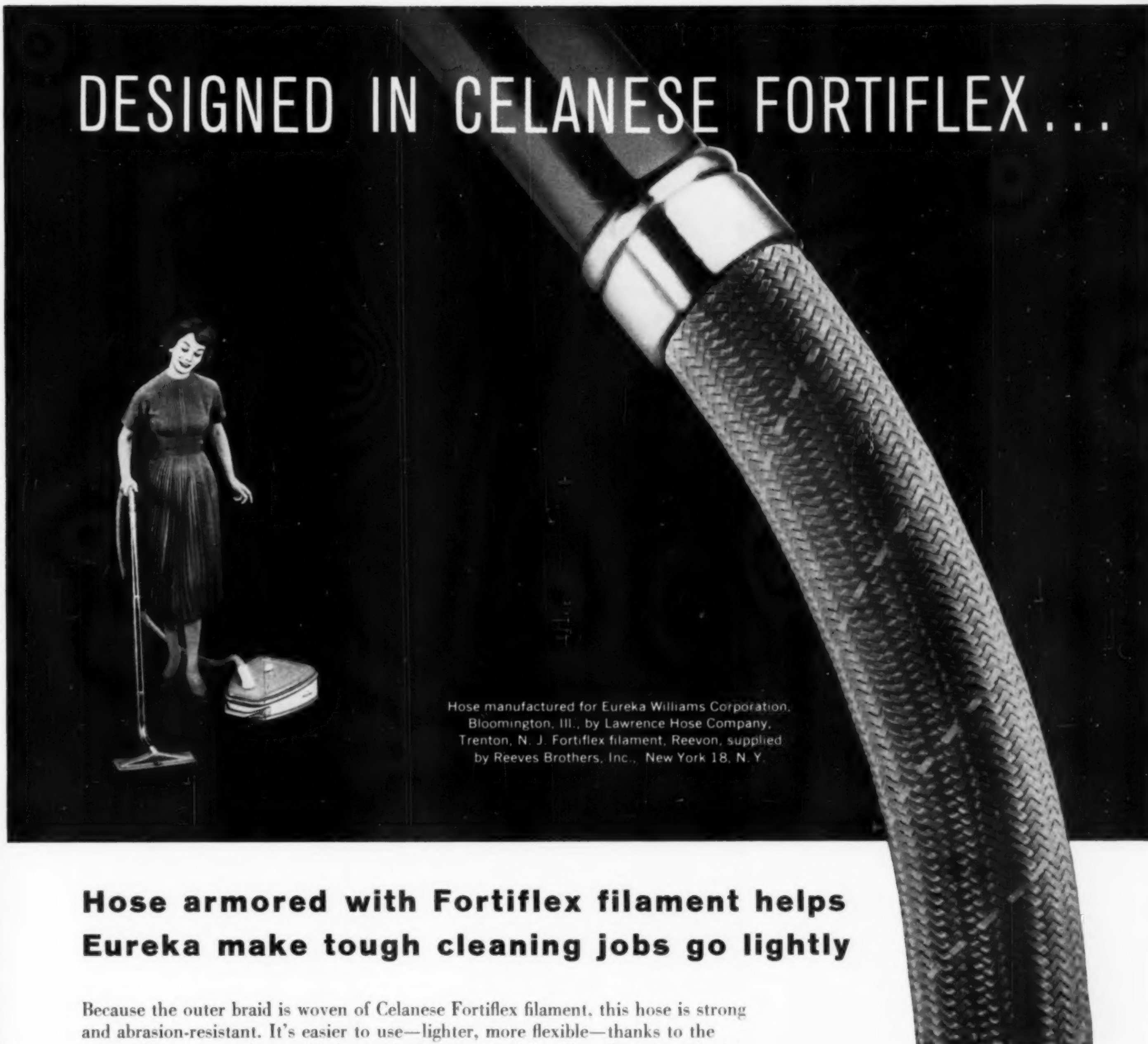
The Piasecki aerial jeep, described in our Annual Design Review, December 1958, *page* 108, *is reportedly being developed for civilian use.—Ed.*

Errata

Design in Chicago Exhibit: the brochure credited to John Massey (April issue, page 20) should have been credited to E. Willis Jones.

The June story on the Albright Art Gallery's exhibition, "20th Century Design: U.S.A.", stated that 25,000 articles were displayed in 1200 square feet of space. There are 2500 articles in the show, and they occupy 12,000 square feet of space.

In the June issue of ID (News, p. 26) the address of the Hess Brothers Versatility in Design Contest was incorrectly given. It should be Suite 1019, 527 Madison Avenue, New York 22.


DESIGNED IN CELANESE FORTIFLEX...
Hose manufactured for Eureka Williams Corporation, Bloomington, Ill., by Lawrence Hose Company, Trenton, N. J. Fortiflex filament, Reevon, supplied by Reeves Brothers, Inc., New York 18, N. Y.

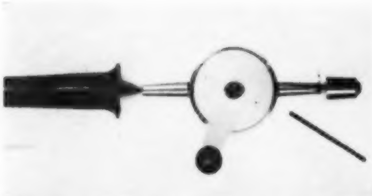
REVIEWS

ASID student competition

Nine portfolios won distinction from among nearly 60 entries representing design schools across the country in the ASID Student Competition held this May. Of ten possible top awards, judges chose the winning nine for a combination of creative thinking, design ability, consideration of materials and manufacturing techniques, sales and merchandising, and technical proficiency in each project.

Most of the students developed extremely polished presentations, so much so that presentations tended to overshadow design solutions. Evaluating the entries must have been difficult because they included a wide range of products designed for the most varied assignments by both junior and senior students. For instance, some schools assigned projects emphasizing form, some inventiveness, and others stressed "practical" projects in which the student had to specify materials and manufacturing processes in detail. To balance their judgments, the jury asked each entrant to submit three projects, at least one showing full development of a problem—sketches, mechanical drawings, and photos of finished models.

George Payne was chairman of the competition this year, and the jury included Russel Wright, Peter Muller-Munk, Dave Chapman, Robert Hose, and ASID president Donald McFarland. A product designed by each of the prize winning students appears at right and below.



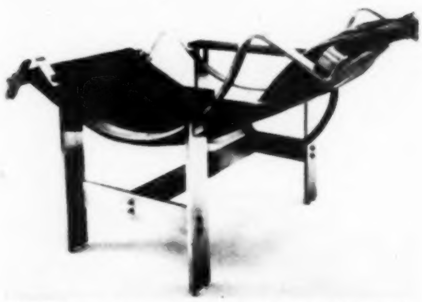
Aluminum hand drill with nylon gears. William Stumpf, University of Illinois.

Outboard motor by Robert Graf, Pratt.

Stefan Unger's mailbox, University of Illinois.

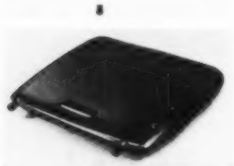
Portable refrigerator by Joseph Lawe, Pratt.

Jerry Caruso's clock, U. of Ill.



Reclining chair with plastic cushion and aluminum frame by Lee Radtke, IIT.

William Babcock's camera. University of Illinois.



Matsuo Okobayashi's portable chair, IIT.

Hammer by Orville Larson, University of Illinois.

style is stainless steel

Stainless Steel is the only surfacing material with a hard lustrous finish that is always in style, withstands exposure to all kinds of wear and has a low maintenance cost for the life of the building.

No other metal offers the freedom of design and fabrication, economy of care and the durable beauty that serves and sells like Stainless Steel.

McLOUTH STEEL CORPORATION, Detroit 17, Michigan

specify

McLOUTH STAINLESS STEEL

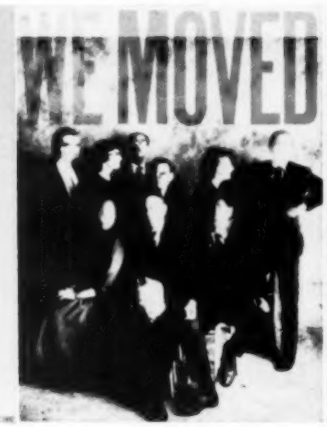
HIGH QUALITY SHEET AND STRIP

for architecture

NEWS

1

2



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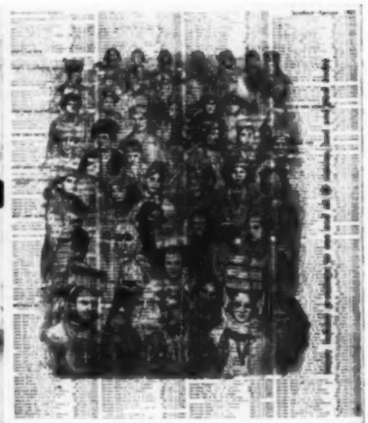

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AIGA selects year's best graphics

In combining their Fifty Advertisements of the Year show with their Design and Printing for Commerce 1958, the American Institute of Graphic Arts last month created an exhibition that gave the public a wide-ranging and distinguished cross-section of some of the best in current commercial graphic art.

Nearly 200 examples were selected for the Printing for Commerce section of the show on the basis of their "integration of original concept with excellence of production." As instructed, the jury deliberately selected a sufficient number of examples to insure coverage of "representative" contemporary work. Entries in the smaller Fifty Ads section were selected for the same combination of originality with production quality.

Jury for the Fifty Ads section included Herbert Matter, Charles Walz, and George Tscherny, show vice-chairman. Those serving on the Design and Printing for Commerce jury were Robert Brownjohn, Albert Christ-Janer, Gene Federico, Leo Lionni, and Noel Martin. George Nelson was chairman for both shows.

The exhibition was on view at the Time, Inc. Gallery in New York, and an exact duplicate was shown at Rochester and at the Dallas Graphic Arts Center. It was also seen at the Aspen Conference until the end of June. In the fall it will open in Kansas City and the University of Southern Illinois in Carbondale.

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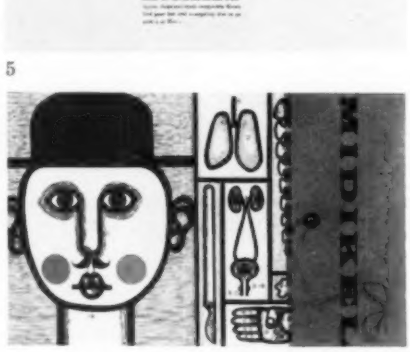

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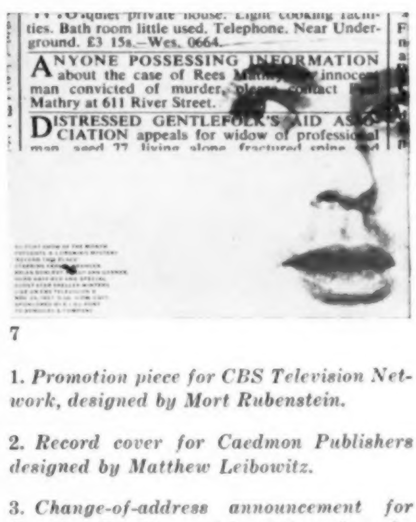


7

1. *Promotion piece for CBS Television Network, designed by Mort Rubenstein.*

2. *Record cover for Caedmon Publishers designed by Matthew Leibowitz.*

3. *Change-of-address announcement for Douglas D. Simon Advertising, Inc. designed by Gene Federico.*

4. *Season's greeting card for Bud and Simone Andre by Hayward R. Blake.*

5. *Advertisement for Cox's millinery store designed by Arnold Varga.*

6. *Instruction manual (in Spanish) for Parke Davis and Co. by Norman Gorbaty.*

7. *Title-piece for DuPont Show of the Month for CBS Television by Tom Courtos, Kurt Weihs (designers) and William Golden (art director).*

Manufacturers and Designers are invited

to submit entries for

INDUSTRIAL DESIGN's 6th ANNUAL DESIGN REVIEW

which will appear in the December 1959 *issue*

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

What Will Be Included?

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

How Do You Participate?

From designs placed on the market since September, 1958, choose those which you believe represent the most significant work of your firm or design office. Send us one or more unretouched reproduction photos of each product, labeling each photograph clearly with the names of the product, the designer, staff member, or department in charge, and the manufacturer and suppliers. *On the same label please include a brief note stating where we can see the product you selected, what you consider is unique and distinguished about it, and in what respects the use of materials, components and manufacturing techniques was unusual.*

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

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

There is no restriction on the number of photographs or designs submitted. *Closing date for contributions has been extended to September 21st,* 1959.

INDUSTRIAL DESIGN

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

PLASTICS PLAY LEAD IN NEW SALES SEASON

Rapid-fire developments in versatile thermoplastic materials herald sure-fire successes on the sales front. As the new products make their public debut, plastics are increasingly conspicuous by their presence. These chemically engineered materials are lightweight, yet strong and durable. They save pennies on the production line, look like a million in the show window.

Take Verelite*, newest in the fast growing Dow lineup of polystyrene materials. Designed specially for interior lighting applications such as grids and diffusers for fluorescent fixtures, it is light stabilized offering superior resistance to yellowing. It is now available in several different granulations for both extrusion and molding.

*TRADEMARK

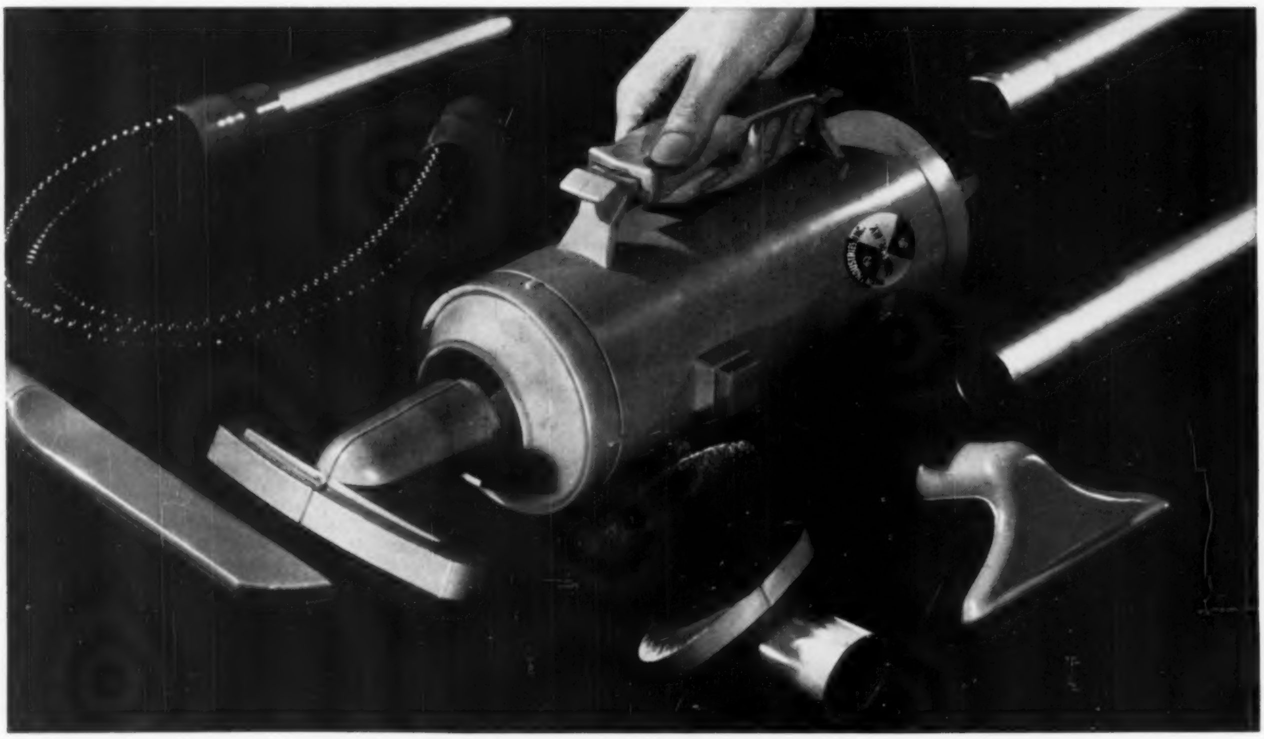
LIGHTWEIGHT STYRON MAKES VACUUM CLEANER SALES HUM

Dow thermoplastic replaces other materials, delivers production economy, attractive appearance.

The manufacturer of the compact vacuum cleaner shown below put plastics to full use in redesigning his product. The result is a lightweight, extremely portable and attractive unit that stimulates sales and gives the production man fewer headaches.

Styron® 475, one of Dow's high impact thermoplastics, was used for the housing and other rigid parts. The flexible parts are vinyl. The cleaner is available in two models, one for the home (pictured below) and one for industrial use. Lightweight Styron 475 makes the industrial version ideal for cleaning radio tubes, electronic equipment, electric motors and other products with hard-to-get-at corners and crevices.

In addition to a smartly styled appearance and a wide selection of colors, Styron 475 provides a warm touch pleasing to housewives. Compared to materials previously used, it trims costs by eliminating several fabrication and assembly operations. Like all Dow plastics, it gives the designer broad latitude and its quality is consistent and uniform. This contributes to greater production efficiency and fewer rejects.

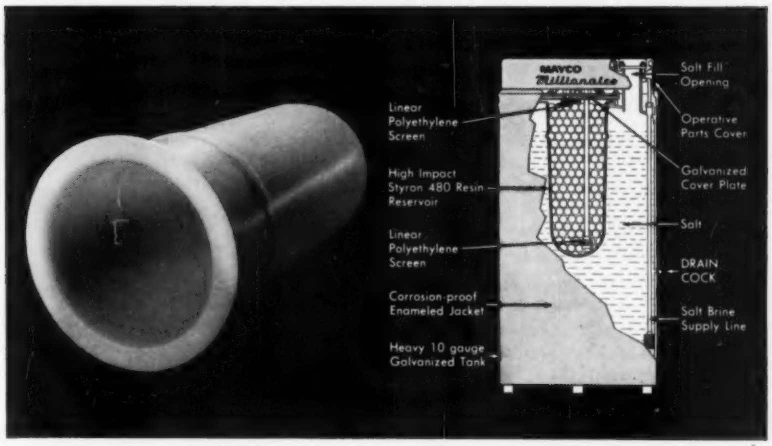


This compact, time and effort saving portable vacuum cleaner lightens the work of the housewife and the maintenance man. Its components are molded of tough, versatile Styron 475.

PLASTICS PERFORM

when pressure's on

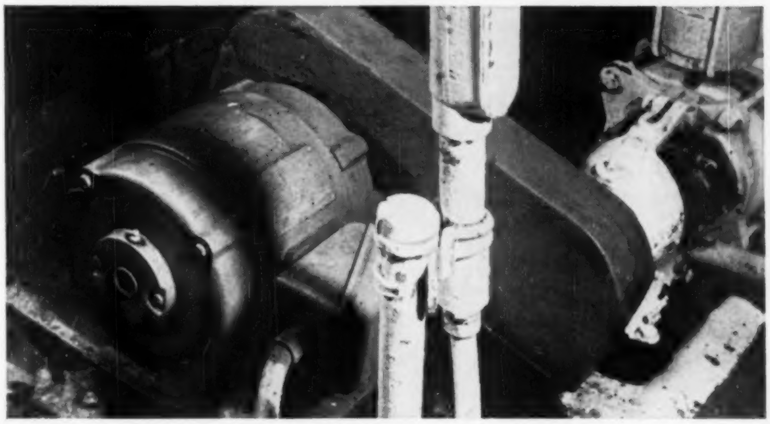
This water softener creates a vacuum in its recharging cycle, producing up to 120 lbs. pressure on every square inch on the surface of the tank. That's one of the many reasons Styron 480, Dow's *extra* high impact thermoplastic, with its great strength was chosen for the job. As Styron is rustproof, there are no corrosion problems. The excellent moldability of Styron helped in making this large, thick-walled reservoir. This application is typical of many developed for manufacturers by a plastics molder offering integrated design and production services.



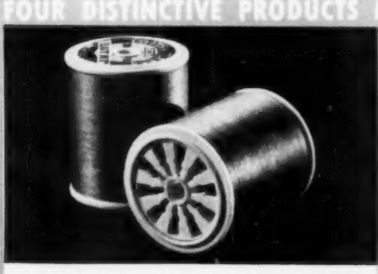
ACID VAPORS

can't hurt this motor!

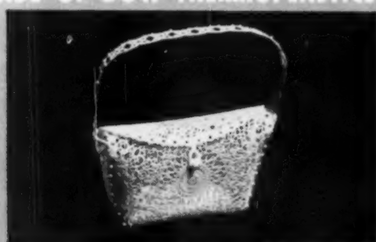
This electric motor is located in a most unfavorable position—right in the middle of a chlorine plant. But the highly corrosive vapors and the ever-present moisture can't get at the vital parts because they're fully encased in a tough protective bed of epoxy resin. The motor has been in service more than two years without a single failure. Dow Epoxy Resins give greater over-all protection to all types of equipment because of high purity, rigid specifications and production dependability.



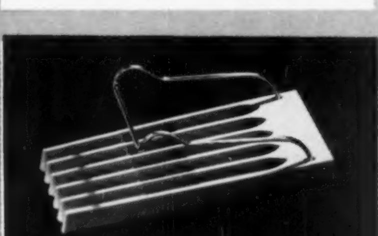
FOUR DISTINCTIVE PRODUCTS MADE OF DOW THERMOPLASTICS



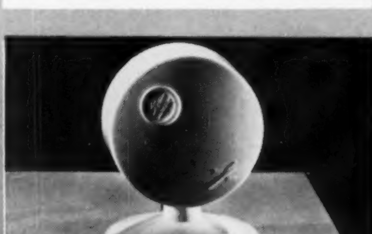
STYRON 475. Even the time-honored thread spool can be improved by plastics! No wood grain imperfections to worry about in smooth-surfaced, colorful Styron 475.



POLYETHYLENE. The extremely intricate mesh design of this Communion bag thoroughly demonstrates the excellent flow characteristics of Dow Polyethylene 990M.



TYRIL®. Tyril, a copolymer of styrene and acrylonitrile, provides rigidity, craze resistance and freedom from cracking in this unique pants hanger.



STYRON 475. Fine surface gloss, impact resistance, color selection and excellent electrical properties make Styron 475 ideal for this indoor TV antenna housing.

FOR MORE INFORMATION

. . . about the versatile Dow plastics and the products discussed on these two pages, write to us today. THE DOW CHEMICAL COMPANY, Midland, Mich., Plastics Sales Dept. 1701BR7.

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DOW

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Building products

Knoll merges, will offer low-cost line

In an unexpected development in the design world, Art Metal Construction Company, one of the largest manufacturers of metal office furnishings, purchased Knoll enterprises, famous pioneers in architectural furniture, for an undisclosed sum last month. The three Knoll companies, Knoll Associates, Knoll International, and Knoll Textiles, will continue to operate as independent concerns, and Florence Knoll, who with her late husband Hans Knoll founded the business in 1943, will continue to act as president while serving as director of design and research for Art Metal and as a member of its board of directors. One of the most important results of the merger will likely be a line of mass-produced metal furniture coordinated with the regular Knoll line. This will be a major step in the metal office furniture field, where outstanding design has not been emphasized.

According to sources at her office, Mrs. Knoll has for some time been interested in broadening the company's activities. Experience in furnishing the new offices of Connecticut General Life Insurance Company made Mrs. Knoll aware of the wide gap between office furniture and equipment for executives and that available for clerical and lower echelon personnel. Mrs. Knoll is now studying Art Metal's whole line with a view to designing moderately-priced, metal office furniture which will include desks, chairs, file cabinets, and shelves. The Knoll office indicated that the kind of mass production which the new line will require would not have been financially possible without the alliance with Art Metal.

At present Knoll has no plans for expanding its own line as a result of tne merger, and it will continue to produce such famous design items as Saarinen's womb chair, Mies' Barcelona chair, and Bertoia's wire chair.

Gartler and Abraham's prize-winning project for new cultural center in Belgian Congo.

Congo to get cultural center

A boldly imaginative plan to develop a modern cultural center in the heart of Leopoldville, capital city of the Belgian Congo, has just reached the first stages of fulfillment with the completion of an architectural competition for designs for the new center. The Belgian Association for the Cultural Center of the Belgian Congo donated one hundred and twenty million Belgian francs toward the project. The planned complex of buildings will be located south of the government palace in Leopoldville in a luxurious park of tropical vegetation. It will include a large and a medium-size auditorium, a museum of Western civilization side by side with a museum of African culture, libraries, and a theater. The buildings will be given to the Congolese people by the Belgian government. The Association hopes that ideas developed from the competition may be utilized in plans for the new center.

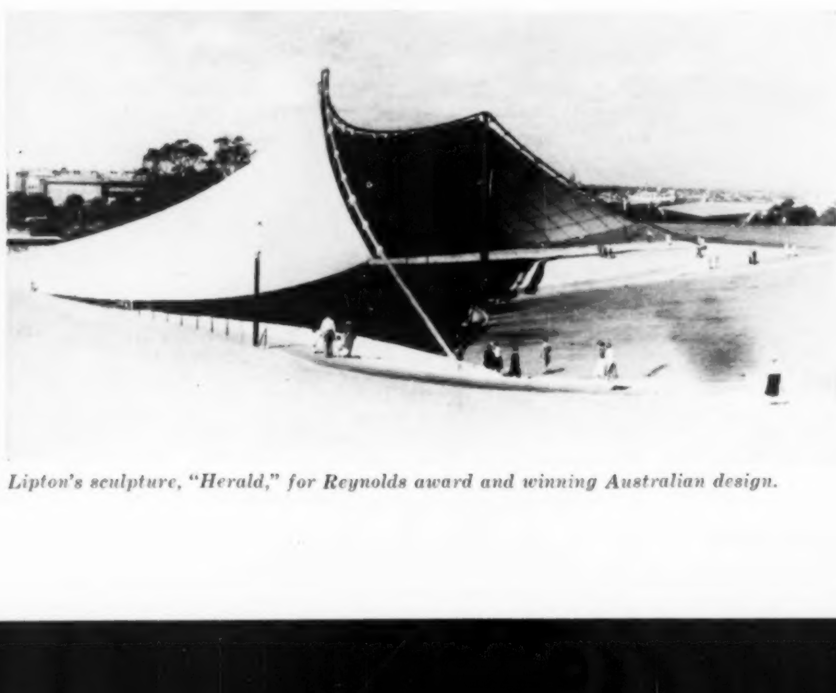
Architects from 25 countries submitted more than 125 projects to the competition. Under the chairmanship of California architect Richard J. Neutra, the jury awarded no first prize, but gave the second prize of 50,000 Belgian francs to three projects. These included designs by P. Humblet, Belgian Congo; F. F. Gartler and R. Abraham, Austria; J. Zbigniew, J. Ghyrosz, and K. Lukasiewicz, Poland.

Music bowl wins Reynolds award

The $25,000 Reynolds Memorial Award for 1959, awarded annually for the best use of aluminum in architecture, has been given this year, to the firm of Yuncken, Freeman Brothers, Griffiths and Simpson for the Sidney Myer Music Bowl (below) in Melbourne, Australia. Barry B. Patten was design director for the project. The special American Institute of Architects jury commended the architects for creating "a complete skin vocabulary: the skin, its connection, and its fabrication method," and for developing "a most significant building material application — an aluminum sandwich applied to a cable frame."

The structure, which looks like a giant circus tent open at one end, has a 40,000 foot aluminum roof which covers nearly one acre of the amphitheater and houses 2,100, at the same time acting as an acoustical projector for another 20,000 seated on the lawn outside. The roof is suspended from 35 longitudinal wire cables fastened at one end to a main cable and at the other to a heavy anchor block. Transverse cables fastened to a long concrete anchor strip buried 10 feet under ground hold the roof down.

The $25,000 honorarium and a cast aluminum sculpture (below) by Seymour Lipton were presented the architects during the AIA convention in June.



Lipton's sculpture, "Herald," for Reynolds award and winning Australian design.

Boxcars go "Century Green"

Conventional boxcar red has been discarded by Peter Schladermundt Associates in favor of "Century Green" in a group of experimental boxcar graphic designs PSA has developed for the New York Central Railroad. As part of a program exploring ways of giving their rolling stock a new look, the railroad asked Schladermundt (above) about a year ago to develop a new insignia and color scheme. The reaction of shippers, employees, and the general public to the new color and insignia is still being tested before its adoption on the Central's 100,000 cars.

The new insignia retains some of the characteristics of the well-known New York Central oval, but gives more emphasis to the company name. The color selection was preceded by a detailed analysis of the colors used by other railroads. The designers believe the new turquoise has the vibrance and impact of colors conventionally used while being pleasing to both men and women. Traditionally boxcars have been painted red because it weathers well and costs little. The new green will cost little more than the old red.

Noyes designs shelter, gets award

In a busy June designer-architect Eliot Noyes saw his versatile new shelter structure (right) for Alcoa's Forecast Collection unveiled at Chicago's International Home Furnishings Market and in Philadelphia received the Annual Design Award from the recently renamed Museum College of Art.

For the 15th project in Alcoa's program of commissioning outstanding experimental designs in aluminum, Mr. Noyes created the Gazebo, a startlingly simple 20-by-20-foot aluminum roof structure supported by thin columns. It can be used for cabana, boat house, commuter platform or carport. In discussing his new design, Mr. Noyes pointed out that it should bring out the ingenuity of the owner since he can "invent" so many uses for it. "It is re-usable," he added. "You can yank it up, and it is as good as the day it was installed." It is virtually maintenance-free.

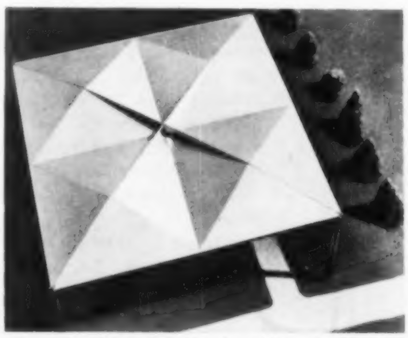
Color can be utilized dramatically in the Gazebo. The underside of the roof is structurally divided into four squares, each in turn diagonally divided into four triangles, formed so that each division indents upward to provide different planes. These provide natural divisions for decorating, and since the surface is sheltered, any type of finish will have durability. "Not only is the existing design flexible in itself," says Mr. Noyes, "but possible variations may be developed using the design as a point of departure." Multiple 20-foot units may be joined to form large structures, or portions of the top can be left open to provide a combination of shelter and exposure to the sky, as in an open-air market.

Two weeks before the showing of the Gazebo in Chicago, Mr. Noyes addressed the commencement class at the Philadelphia Museum College of Art. And on the occasion, Walter Dorwin Teague, who is a member of the board of governors, presented Mr. Noyes with the college's highest honor, the Annual Design Award. The school, which has been known for years as the Philadelphia Museum School, changed its name this spring when it was accredited by the Middle States Association of Colleges and Secondary Schools.

Sundberg-Ferar to build new home

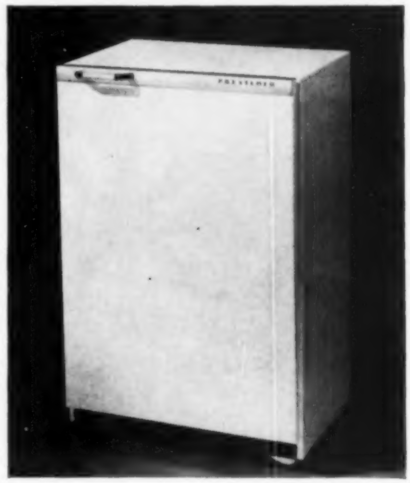
The Detroit design firm of Sundberg-Ferar has just begun construction on a $300,000 office building to house its growing organization. Plans for the new structure have been designed to provide a two-storey steel, glass and concrete building with 18,000 square feet of working floor space.

Situated on eight acres of wooded, rolling land along the River Rouge in Southfield, a northwest suburb of Detroit, it will provide accommodations for more than 100 designers and model builders. In addition to being sound-insulated and air-conditioned, it will have electronic dust-collecting equipment. The first floor of the building will house a model shop, while the second floor, with a separate entrance at a higher ground level, will contain graphic design studios, executive offices, conference rooms and model display facilities.



Noyes designs Gazebo for Alcoa Collection

Next to the main building, Sundberg-Ferar plan to have a guest house for out-of-town clients, a lighted parking area with accommodations for staff and visitors, and an experimental pond for testing the boats, outboard motors, fishing tackle and water sports equipment which the company designs. The entire project is scheduled for completion in January of 1960.



Refrigerator wins top British prize

A Prestcold refrigerator has won the Duke of Edinburgh's Prize for Elegant Design, offered for the first time this year, at the London Design Center. It was selected from among the 16 "designs of the year" (ID, May, page 14). C.W.F. Longman of the engineering department of the Prestcold Division of the Pressed Steel Company and E. H. Wilkes, consultant designer, were the designers of the refrigerator, which the jury commended for its precision of assembly, well-shaped handle, neatly lettered name plate, and absence of "self-conscious streamlining" and its "styling coupled with almost classical proportions."

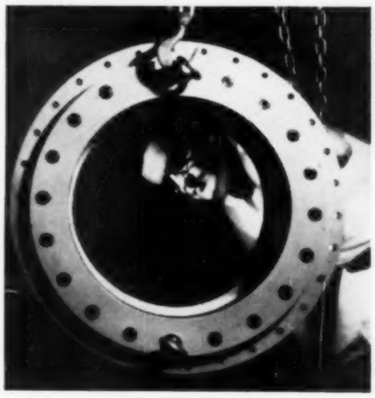
Shortly after this and the other British design winners were announced, Robert Harling, in an article in *The Sunday Times*, criticized the Council of Industrial Design for not making sufficiently stimulating choices. The Council shows complacency toward raising British design standards, Mr. Harling said. "What we desperately want," he concluded, "are exhibitions of the Ten Worst Designs of the Year, or Fifty Designs that Could be Improved, plus a few strong protests from outraged manufacturers. Then the Council would show that it was fighting for design instead of dabbling in the subject."

THIS IS GLASS

A BULLETIN OF PRACTICAL NEW IDEAS FROM CORNING

NEW PICTURE WINDOWS FOR NAVY'S NUCLEAR REACTORS

In the "older" models of the Navy's nuclear subs, a periscope was used for checking reactor operation.



Not so in today's subs. Now you'll find giant peepholes—windows that let you look directly into nuclear compartments.

These windows are made from a combination of Corning high-lead-content glass and a plastic. The latter shields against neutron bombardment. The high density *glass* (6.2 cc, the equal of iron for shielding) protects against gamma rays.

Just for the record, seagoing radiation windows are only one part of a rather extensive line that Corning makes.

To date, for example, we've handled the shielding window problems of some 200 "hot" cells. Such windows often approach Gargantuan proportions . . . like the five-foot-thick, nine-ton job we finished recently.

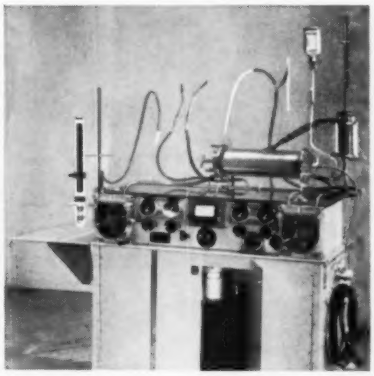
The big advantage for you, the user, in all this . . . aside from the fact that you can get any combination of three very special glasses we make for shielding . . . is *simplicity*. You just tell us your energy level, wall thickness, and the viewing area you need. We do the rest . . . ship you a window that's *ready to install*. It's as easy as that.

Added incentive: The most recent design change we've come up with involves a more pronounced *taper* than was previously used. This makes for less weight, easier installation, better fit.

Delve further into this subject by checking the box in the coupon, labeled "Radiation Shielding Windows." This will bring you a detailed booklet. Or drop a note outlining what's on your mind to Plant Equipment Sales Department.

THE HEART OF THE MATTER

During certain operations involving the heart, both the heart and lungs are given a rest.



But the functions of these organs still must go on. So ingenious machines take over. Like the Kay-Cross rotating disc oxygenator that does the work of the lungs, controlling the CO_2 and putting in pure oxygen.

The main component of this oxygenator is a series of discs, so designed that blood spreads out without foaming or bubbling.

Comes the commercial. These metal discs must be enclosed in a container. And the people who make the oxygenator, Pemco, Inc., chose a PYREX brand glass to hold the discs.

For good reasons. First off, this PYREX brand glass lets you keep careful watch over the *color* and *flow* of the blood, both very vital considerations to the medical men who use this machine.

Then, this PYREX brand glass is *inert* chemically. It does not add to or take from the blood in any way. There is no pickup, no side effects.

And, because this glass has a low coefficient of thermal expansion, 32 x 10^{-7}in/in/°C., the entire machine can be steam sterilized *without* any fear of danger from thermal shock.

While this particular application may be far afield from your work, one of the PYREX brand glasses may still turn out to be the answer to one of the tough design problems you are now facing.

You'll find that this transparent, corrosion- and thermal-shock-resistant glass is available in rod, tubing and flat glass. And it can be worked into a wide variety of special shapes by automatic pressing and blowing machinery.

Perhaps the best approach for you is to avail yourself of two well-detailed reference folders, B-83, "Properties of Selected Commercial Glasses," and IZ-1, "Designing with Glass for Industrial, Commercial and Consumer Applications." Use the coupon.

YOU CAN MAKE GLASS BREAK THE WAY YOU WANT WHEN YOU WANT

Tempered glass breaks in a very special way —we call it "dicing"—and that has led to some very special uses:

Rupture discs—Say you're holding a liquid or a gas in a container and at some precise moment you want to release it suddenly and smoothly. You can insert a tempered glass disc in your container, a disc that has been prepared to disintegrate at a given pressure.

The pressure can be applied by the fluid or by a small charge attached to the disc. When you want it to go, the glass will shatter instantaneously and homogeneously into small pieces.

Probable uses for this include safety valves on process equipment and as a substitute for intricate valving on fuel injection systems. Using PYREX brand Glass No. 7740, you can cross corrosion off as an inhibiting factor on valves. Pressure ranges run from 100 to 1000 psi.

Metal samples and billiard balls—Glass is also being used in the form of tubes to remove samples from molten metals . . . the glass crazes but holds together long enough for your sample to cool into a smooth cast; then you strip off the glass and you're ready for analysis. The plastics people are using glass molds where they want smooth surfaces . . . billiard balls, for example; when the plastic cools you just chip away the glass.

Want glass that breaks how and when you want it? Write to our Industrial Components Sales Department, spelling out your problem.

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Coming in the Aug. 1959 *issue of*

INDUSTRIAL DESIGN

Russia in New York

In August, ID will report on the USSR Exhibition of Science, Technology and Culture at New York's Coliseum: on its exhibit techniques, the industrial progress reflected in its products, the effectiveness of its design as a means of communicating information and as a tool for propaganda. The products displayed, and their relative importance in the show, will be compared with products shown in ID's previous study on Soviet design for industry (November, 1958). The impact of the show on American viewers will be considered in two ways: how they respond to the products as products, and how they view them as reflections of an alien culture and economy.

Aspen Conference, 1959

As in past years ID will present a comprehensive review of the program and participating panelist's remarks at the International Design Conference in Aspen, Colorado, which this year explores the subject: "Communications: The Image Speaks" in an effort to determine how symbols evolve, and what makes them succeed — or fail.

Plastics for the Designer, Part II

In the second installment of his guide to plastics for designers, Robert Rockwood will elaborate on the profiles of the various plastics presented in Part I (this issue) by explaining in detail how designers can determine which plastic is best for a particular product application. Helpful charts will show the working characteristics of the various plastics — their strength, appearance, maintenance factors, cost, etc. — and in his text Mr. Rockwood will analyze and explain the process of selecting the proper plastic to fit the requirements of the design job.

Design Review

Recent developments in television design — the introduction of the square tube, increased portability, and the inclusion of tv equipment in "furniture" components — will be examined in Design Review, the monthly synopsis of change and improvement.

Each issue of **INDUSTRIAL DESIGN** *delivers to the desks of designers and executives a definitive review of contemporary design ideas and techniques.*

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$24.00 *for three years.*

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

Philco takes the picture tube out of the chassis
...protects it with a face of tough Butyrate plastic

The new line of Philco Predicta TV sets is another example of how Tenite Butyrate plastic can be used to improve the design and sales appeal of products.

Thanks to the toughest "face" on TV—a one-piece molding of clear Tenite Butyrate, tinted to minimize glare—Philco now features a picture tube that is dramatically set apart from the chassis.

Although many factors contributed to the choice of Butyrate here, the basic consideration was its inherent toughness, since a separated picture tube would be exposed to extra hazards.

In Butyrate, Philco engineers found a material with all the toughness and impact resistance they needed. Moreover, this Eastman plastic also satisfied the other requirements involved... light weight... optical clarity... resilience... easy moldability... high dielectric strength.

Incidentally, the color that imparts an eye-easing tint to the face is part of the plastic itself. Philco designers were able to specify the color desired, and Tenite molding compound was supplied to the molder in an exact match. Result: the tinting color is an integral part of the face, not merely a coating that might wear, chip or flake off.

If you are designing or redesigning a product, consider Tenite Butyrate whenever you need a truly tough plastic. Easy to mold, extrude or vacuum-form, Tenite Butyrate is available in clear and colored transparents, translucents, opaques, metallics, and variegations to match your specifications. For more information, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

TENITE
BUTYRATE
an Eastman plastic

Exhibits and Awards

A geodesic dome of translucent plastic and an **aluminum "space frame,"** both designed by Buckminster Fuller, will be on view at the Museum of Modern Art's outdoor exhibition area throughout the summer. This will be the first large-scale demonstration of the space frame, or octet truss, used as a horizontal span and vertical support.

"Elegance to Scale," an exhibition of **twenty miniature rooms** designed by well-known New York decorators, will be on view at the Museum of the City of New York through September 20.

"Sight and Insight: A Contemporary Portfolio of Creative Photography," will be exhibited at the IBM Gallery in New York through July. The work of 30 photographers from this country and abroad will be included.

A seven-foot diameter sphere (right) which will serve as the "centerpiece" of the Form Givers at Mid-Century exhibition now open at New York's Metropolitan Museum of Art has been designed by Don Kunkel and Howard Cotton, both

Not a window fan but flying research unit

juniors majoring in produce-shelter at Southern Illinois University. The sphere is held together by equal tension forces between the members, applied through wires running across the members. Based on a theory developed by Buckminster Fuller, the system has been described as a three-dimensional picture of molecular arrangements.

"Design for Power," an 18-minute sound and color film about the use of high pressure hydraulics in heavy-duty equipment, has received the annual Chris Award for the best film produced in the business and industry category during the preceding year. The film was produced for Denison Engineering by Austin Productions, Inc., of Lima, Ohio.

"New Dimensions in Comfort," a 13½-minute film on the use of urethane foam as a furniture cushion material, is now available from Allied Chemical's National Aniline Division.

Kunkel holds sphere based on Fuller concept

Experiment

Model of strange-looking vehicle (left) under development by Chrysler's Defense Operations Division for the Army Transportation Corps operates by twin rotors set within barrel-like ducts.

People

APPOINTED: **Oscar Nitzchke** (below) as director of architectural services for Jim Nash Associates . . . **Herbert E. Krugman** (below) as director of market research for Raymond Loewy Associates . . . **Alexander B. Musichuk** (below), **David K. Munro** (below), and **Donald C. Craddock** (below) as associates at Smith, Scherr & McDermott . . . **Norman Worrell** (below) as chairman of the professional design division at the Kansas City Art Institute and School of Design . . . **Vincent Mankowski** as assistant director of research and development at clearing division of U. S. Industries, Inc. . . . **Harold Neal Minick** and **Norbert T. Buiter** as designers at Lawrence H. Wilson Associates . . . **Harold V. Dayton** as associate in charge of research in materials and finishes at James R. Patterson . . . **Howard E. Bahr** as assistant director of design for Corning Glass Works . . . **Dr. William C. Knopf** as technical director of U. S. Industries Technical Center . . . **Hideo Sasaki** as professor of landscape architecture at the Harvard Graduate School of Design . . . **Charles J. Lawson** as director of manufacturing services for IBM . . . **John C. Pitchford** as project manager at Benson-Lehner Corporation . . . **George Levine, Martin Griffin,** and **Ernest Doeschler** as designers at Becker and Becker Associates . . . **Robert E. Steele** as manager of product planning for Transac computers at Philco . . . **George H. Levine** as manager of market research for Laboratory for Electronics, Inc.

HONORED: **Walter Dorwin Teague**, who has been made an Officer of the Order of Merit of the Republic of Italy . . . **E. G. Kimmich**, chief engineer of industrial products design for Goodyear Tire and Rubber Company, who has received the Award of Merit of the American Society for Testing Materials . . . **Gregorio Zolko**, who has been awarded first prize of $5,000 in the competition to design a new state capitol for Rio Grande do Sul in Porto Alegre, Brazil.

ELECTED: **Lyle F. Boulware**, president; **Frederick M. Pyle**, vice president; **Robert Stroup**, secretary; and **Allan A. Travis**, treasurer; and **Jack A. Thalheimer**, as chairman of the board of the T-Square, Philadelphia's architectural club . . . **Harold L. Humes**, president and **Robert W. Cutler**, vice president of the Building Research Institute . . . **Russell C. Weigel** as president and director of the Society of the Plastics Industry.

Company News

RETAINED: **Good Design Associates** by the Delta Electric Company . . . **Bruce Kamp Associates** by Lanston Monotype Company, Anken Chemical Company, and Bates Manufacturing Company . . . **Palma-Knapp Associates** by Sunbeam Corporation and by Hammond Organ Company . . . **Reinecke and Associates** by Westclox, division of General Time Corporation, and by the Burlington Basket Company . . . **Norman Cherner** by the Reynolds Feal Corporation to develop household products from their aluminum joints . . . **Sundberg-Ferar** by the Westfield Manufacturing Company . . . **David T. Kline** as consultant design director by Art-Line of California and by the Light House Lamp and Shade Company.

NEW OFFICES: **Domenico Design Associates,** 104 East 40 Street, New York . . . **Leon Wirch Associates,** 250 East 52 Street, New York . . . **Stuart and Gunn, Industrial Design,** 370 Lexington Avenue, New York . . . **The Greenhouse,** 254 East 51 Street, New York, to serve designers, architects, and decorators by offering, installing, and maintaining foliage plants for interiors . . . **B. H. Hellman,** 245 Fifth Avenue, New York for sales promotion and publicity in home furnishings.

Stuart *Gunn* *Nitzchke* *Munro* *Musichuk* *Craddock* *Krugman* *Wirch* *Worrell*

1. John B. Ward, General Manager, New Products, Corning Glass Works 2. James Birnie, General Director, Styling and Design, Reynolds Metals 3. Peter Muller-Munk, FASID 4. Raymond Sandin, Hotpoint Company (ASID) 5. Russel Wright, FASID 6. George Beck, General Electric (IDI) 7. Dave Chapman, FASID 8. Carl W. Sundberg, IDI 9. Jens Risom, IDI 10. H. Creston Doner, Director of Design, Libbey-Owens-Ford Glass Co. (IDI) 11. Donald Deskey, FASID 12. Walter Dorwin Teague, FASID 13. Paul M. Koons, Head of Design Styling, National Cash Register (ASID) 14. Rudolph H. Koepf, Manager, Industrial Design Department, Data Processing Division, IBM Corp. (ASID) 15. Benton Dales, Whirlpool Corp., Research and Development, (ASID) 16. Jack Collins, ASID 17. Walter P. Margulies 18. J. Gordon Lippincott 19. Raymond Spilman, FASID 20. Jean Otis Reinecke, FASID 21. Walter Landor 22. Nathaniel Becker, ASID; 23. Jules Becker 24. Arthur N. BecVar, Manager, Industrial Design, Appliance and Television Receiver Division, General Electric Company (FASID) 25. John L. Cox 26. George Nelson 27. Jay Doblin, Director of the Institute of Design, Illinois Institute of Technology (FASID) 28. Henry Dreyfuss, FASID 29. John Vassos, IDI 30. Don Wallance 31. John Monteith Gates, Director of Design, Corning Glass and Steuben Glass (AIA) 32. Harley Earl, 33. F. Eugene Smith, ASID 34. David Painter; 35. James Teague, ASID; 36. Victor Petertil, ASID 37. Montgomery Ferar, IDI 38. Howard Ketcham, IDI 39. Don Dailey, ASID 40. L. Garth Huxtable, ASID 41. Paul McCobb, ASID

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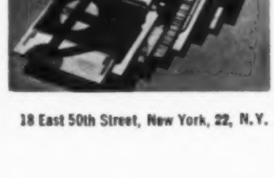
. . . the magazine for the men whose decisions today shape the products of tomorrow.



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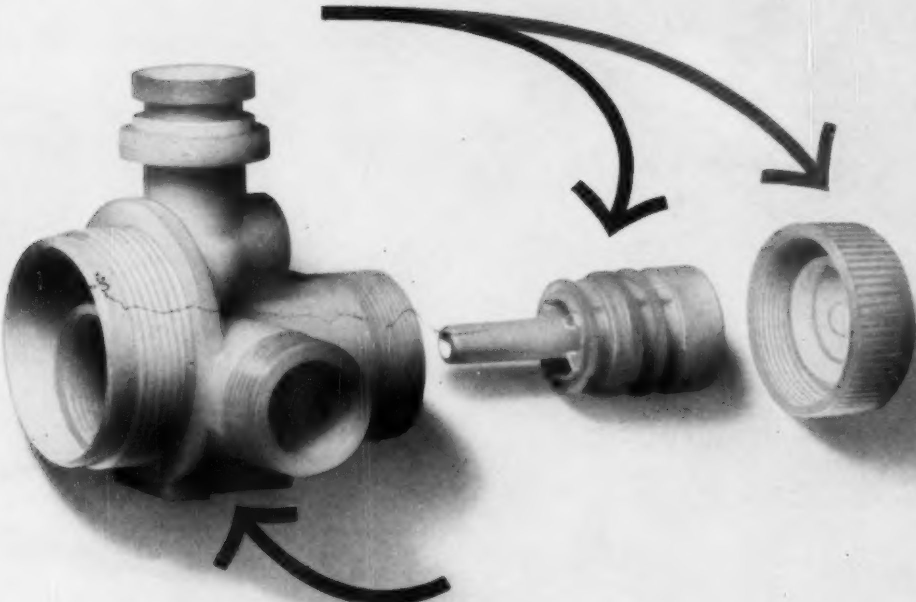

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PACKAGING — Beautiful aerosols that can't dent or shatter are blow-molded of ZYTEL 42 or injection-molded, from ZYTEL 101. They are light in weight, resistant to the action of propellents and most spray mixtures. Colors can be combined by spin welding.

HARDWARE — Blocks made of Du Pont ZYTEL nylon resin prove their high strength under heavy loads. They resist the elements almost indefinitely and require little or no lubrication. Parts of ZYTEL have excellent resistance to abrasion and impact.

Design can do

The designers of the American National Exhibit in Moscow (ID April, 1959) labored under the conviction that their biggest problem in displaying the artifacts of American life lay in making the abundance believable to Russian eyes. Now the Russians are exhibiting in New York, and their designers appear to have been equally concerned with the problem of credibility; understandably, their solution is vastly different. It's too early to say accurately how they're doing, but certainly the loudest spectator response thus far has been disbelief of one kind or another — either disbelief that the material on view is a reliable representation of what is actually available in the Soviet Union, or retroactive disbelief of the years of American newspaper articles describing Russia as a have-not nation.

It occurs to us that credibility as a design problem is not peculiar to these two exhibits, nor is it peculiar to nation-to-nation communication. Design most often has to do with the relation between producers and consumers, two groups that have grown increasingly loth to believe one another.

We suspect, for example, that few consumers seriously *believe* the claims of most advertising although, for reasons only God and David Ogilvy know, they are willing to base some choices on it. Not even the most unthinking men believe that thinking men prefer the cigarette so generously attributed to them, though they may be favorably amused by the idea. (We have not been able to check the rumor that this particular advertising campaign was underwritten by the American Gagwriter's Association, in the interests of supplying tv comedians with fresh material. It probably is not true.)

That what's sauce for the goose may be applesauce for the gander is suggested by the evidence that manufacturers don't believe consumers either. For the latter, having learned the status-by-association play from the former, have been using the master's own stick to beat him with. Motivation research, as distinct from more superficial questioning, is itself motivated by the researcher's painful and expensive discovery that consumers lie. What they say they want may in fact not be what they want at all; and, more to the point, what they say they will buy may be equally unreliable testimony. Consequently research has gone underground in an effort to bypass the consumer's ego (thus cutting out the middleman) and reach his id, where the buying power is. At the other end of the line, some advertisers find in subliminal perception studies the intriguing possibility that they too may get under the surface, like a spy who, discovering that the false beard no longer fools anyone, operates from the closet where it won't show.

The fact is that we have all cried wolf at least once too often, each in his own way. Product design itself has been enough tainted with incredibility that one of our largest companies boasts of "products that can do what they look like they can do." Time was when this would hardly have been a spectacular claim; but now that it's something for advertisers to shout about, it may be something for industrial designers to talk calmly about. The Chinese have talked calmly about it for centuries, and even have a word for it — *nêng*, which is translated as "can do." It is the best and briefest way we know to describe what design can make a product able to say for itself. — *R.S.C.*

What you need to know about

by ROBERT ROCKWOOD

PLASTICS

The plastic billiard ball—originally conceived as a substitute for the expensive ivory ones—has rolled into a major industry that offers a rich variety of material solutions to designers who know how to choose and specify plastics.

P1 *Plastics for the Designer, Part I*

PLASTIC adj. 1. Giving form or fashion to matter. 2. Capable of being molded: pliable. 3. Pertaining to modeling or molding; sculptural. n. 1. Anything moldable; specifically any material, natural or synthetic, which may be fabricated into a variety of shapes, usually by the application of heat and pressure. 2. Chem. One of a class of organic compounds synthesized from hydrocarbons, proteins, cellulose, or resins, capable of being molded, extruded, cast, or otherwise fabricated into various shapes.

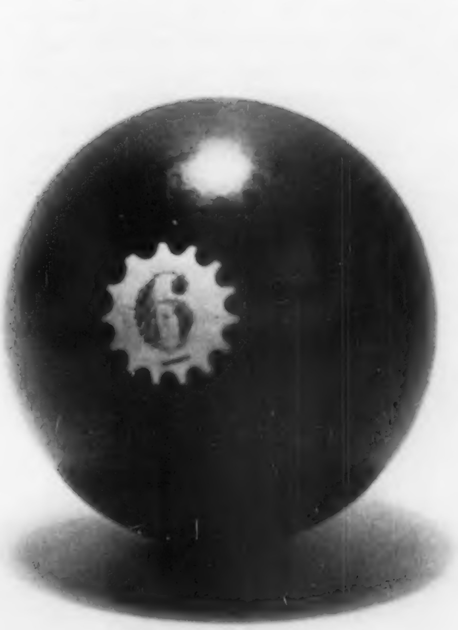
So says the dictionary, and in this case there is no real reason to scorn the dictionary definition. For industrial designers, the term *plastic* in either the adjectival or nominative form, is as rich and evocative as a poem. The designer himself gives form to matter (which is really what designing is) and increasingly the matter is one of the synthetic materials known as "plastics."

INDUSTRIAL DESIGN has not been guilty of ignoring the subject. In June, 1956 the editors devoted a good part of an issue to plastics. But this was a "review," covering what the industry and designers had done with synthetic materials up to that time. Since then we have learned to accept plastics even more than we did at that time, the result being that we tend to take them for granted—often without understanding them. Now, with the refinement of older plastics and the introduction of newer ones, it is more important than ever before that designers know what synthetic materials are available to them, and how they compare with each other.

Do designers know this? As one who, after training as a designer, has spent several years in the plastics industry interpreting materials to industrial designers, I contend that they do not. Since this is likely to be challenged, let me explain.

I am sure that most material suppliers feel that they furnish the design profession with adequate information about their products. And I am equally certain that the plastics publications and societies feel that they too are doing a good job of presenting up-to-date information about the fields they represent. Yet the industrial designer who is ignorant about plastics is not a unique figure, or even an unusual one. He falls generally into one of two classes: those designers who feel that the field is too specialized for them to understand, and those designers who assume wrongly that they know as much as is necessary. Both suffer, and so do their clients, including the ultimate client, the consumer.

It is of course true that suppliers, magazines,



newspapers, and trade societies supply a lot of written material on plastics. But most of us cannot put it to use in developing a product until it has been translated. And who bothers translating it? Unless you are familiar with such terms as Rockwell Harness, Izod Impact, A.S.T.M. Test Method number, most information garnered from standard sources means very little. How many of us who are not chemists know the difference between an aliphatic hydrocarbon and an aromatic hydrocarbon? Yet these are terms commonly used in describing a plastic material. I don't want to suggest that this is a deliberate effort to confuse—after all, special knowledge requires special terminology—but it certainly doesn't make things any easier for the designer.

Our synthetic world

The belief that plastics is a form of magic only chemists can understand is widespread, and to some extent it has been fostered by the plastics industry itself, as each material has been hailed as the answer to the designer's every dream. Yet with a minimum effort any designer can build a vocabulary requisite to a basic understanding of the world of synthetic materials—a world in which we are inextricably involved. For the consumers we design for are in contact with some form of plastic every hour of the day: their wash-and-wear clothing, their easy-to-keep vinyl floors, their quietly closing refrigerator and car doors, and their radio and tv housings, and knobs. Plastics include those items like give-away picnic spoons, that we shrug off as "cheap"; items like handles for silver flatware, that we associate with quality and elegance.

The product as plastics

Materials information for the designer is helpful in proportion as it relates to his point of view, which is: a concern with the end product. What designers need to know about synthetic materials is, quite simply, what they can do—particularly what they can do as compared with each other. It is equally important to know that they cannot do, but just try to find this information!

That is the reason for this guide. In this article—the first of three—I will try to present the basic information that experience has taught me designers need on plastics and their fabricating methods. With this as background material, I will, in the second article, develop ways in which you can determine what plastics will *not* do the job you have in mind. Then I will show how the remaining materials (those which might do the job) can be compared. This should serve as a basis for understanding more technical information when you need it. And the third article will explain how to get this technical information, and from whom. I will list trade names and generic terms, and tell which companies can supply what information. Of course with plastics as with anything else, one of the most important points of investigation is to know what it is you want to know. I hope these articles will equip you to decide that, and that you become familiar enough with the material under discussion to know when the enthusiasm of a supplier's representative is inspired more by salesmanship than by fact. No material does everything equally well, and we are becoming wary of expressions like "new dimensions," "dream material," "unlimited scope."

Learn-it-yourself

I said that plastics can be understood by non-chemists, but I did not say it was easy. It requires effort, and there is no painless way to acquire the small basic vocabulary. It doesn't happen by osmosis, or by reading a magazine. As with learning anything else, you have to do it yourself, and although the following material has been digested and reduced to its simplest terminology, it will still contain some language unfamiliar to you. Undoubtedly some will think it is still too complex, and others will think it is oversimplified, and that in an effort

Plastics for speaking into, or for wearing, suggest the range of early applications

Some of the most successful plastic products range in character from so prosaic an object as the phenolic mouthpiece on the old wall telephones to so glamorous, and emotionally charged, items as the nylon hose that supplanted silk stockings as one of the American woman's small attainable dreams.

to create simple categories I have made too many generalizations. Probably both objections have some foundation in fact.

But I am not proposing to make anyone a plastics expert, nor am I one myself. Everything presented here I had to find out "the hard way" and I am writing it in the hope that it will be for many of you "the easy way"—so easy that you can put it into use at once. Nothing here is new or original. That is, nothing but the point of view, of both reader and writer, which is that of design.

A billiard ball snowballs

Plastics are not new. Their industrial use in the United States began in 1869 when an Albany printer named John Wesley Hyatt set out to capture the ten thousand dollar prize offered for a substitute for ivory billiard balls. He didn't win the prize, but he did conceive a new product called Celluloid–a product that soon became the basis of the Albany Dental Plate Company.

In 1909 Dr. Leo Baekeland obtained a controllable reaction between phenol and formaldehyde, and gave us not only the versatile phenolic resins but the familiar trade name "Bakelite." Since phenolics could be produced only in dark colors (because they discolored when exposed to light) a demand for a similar material in white and pastel shades developed, and urea plastics met this need. Urea, a white crystalline powder made from ammonia and formaldehyde in Germany, was introduced in this country around 1930 with the manufacture of "Beetleware" (American Cyanamide). Another urea plastic, "Plaskon" (Allied Chemical Corp.) was developed at the Mellon Institute in Pittsburgh in 1930 to satisfy the demand of Toledo Scale Company salesmen who found a 165-pound scale too heavy to carry around as a sample.

The plastics industry has been growing fantastically ever since, and the greatest development occurred during the second quarter of the 20th century. Production in 1922 totaled 6,000,000 pounds, while in 1950 production–exclusive of the synthetic rubbers, solvents, synthetic fibers and plasticizers–had reached more than 2,000,000,000 pounds. In January of this year, one of the industry's most reliable papers estimated that the 1958 consumption of synthetic resins and cellulosics, including surface coatings, was 4,157,200,000 pounds.

So plastics are here to stay, and their staying will be less frustrating for both designer and supplier (and/or fabricator) if the former understands the special qualities of individual materials. The first step is to realize that "plastics" denotes a group of materials all of which fall into one of two basic categories: *thermoplastic* and *thermosetting*.

Thermoplastics . . .

Thermoplastic materials are those that *repeatedly* soften when heated and harden when cooled. This is possible because the material goes through only a physical change, and is unchanged chemically. The common analogy is water, which can be frozen to form ice–which can in turn be heated to form water. The liquid water and the solid ice differ physically, but chemically of course they are the same.

. . . and thermosetting

Thermosetting materials are those which, under heat and pressure in the forming process, go through a chemical change, which cannot be reversed. Here, the analogy is an egg which, when subjected to heat, becomes a hard-boiled egg. No known process can ever convert it to the fresh runny egg it was in the beginning. (This discovery was first revealed in non-technological language by the author of "Humpty-Dumpty.")

Now, keeping the two basic families in mind, let's see how the plastics are converted into end products; for, to a great extent, these processes, and their limitations, determine the size and shape of the end product.

Plastic products grow in prestige from give-away premiums to symbols of contemporary taste

The depression saved the infant industry, when cereal and soap manufacturers discovered that plastic prizes in packages would stimulate lagging sales.

In [illegible], a century after their discovery, one of the vinyl resins ([illegible]) was developed into a safety glass superior to any [illegible]

The award-winning Schick razor, designed by Carl Otto and [illegible] in 1950 is postwar example of plastics used to enhance the appearance of a product.

THERMOSETTING PLASTICS

FORMING METHODS ARE DETERMINED BY A CHEMICAL CHANGE IN THE MATERIAL

The methods for molding thermosetting materials are much more limited in scope than those for thermoplastics, again because of the basic characteristic of the materials, which, once they are formed, are forever locked in molecular chains that cannot be changed back into their original form.

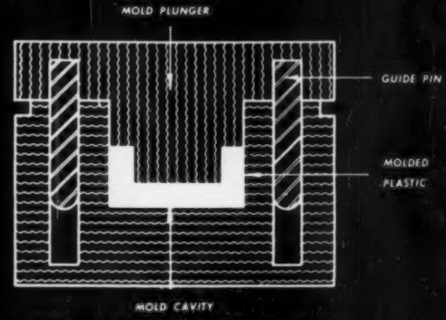
Compression Molding: This method, the preferred one for producing parts of large area or deep profile, is most generally applied to alkyds, melamine-formaldehyde, urea-formaldehyde, and phenolics. The plastic material, either loose or pre-formed, is charged into the pre-heated mold and the two halves are brought together, usually under low pressure. As the mold closes, the softened material is forced into all parts of the cavity; final and complete filling out occurs under high pressure just before the mold is completely closed. Normally, compression molding is not recommended for intricately designed articles containing undercuts, side draws, small holes, and inserts, since the flow of material under high pressure may distort or break pins, or dislodge inserts. Such parts should usually be made by plunger or transfer molding (below).

Plunger or Transfer Molding: In this variation of compression molding, the plastic granules are heated in a chamber outside the mold and then forced through channels into the heated, closed mold.

Laminating: Laminates, which come in two forms – high-pressure and low-pressure–will not be discussed in any great detail in these articles. High-pressure laminates, more familiarly known by their trade names, Formica, Micarta, Textolite, etc., are supplied by the manufacturer in a finished form which permits the designer little or no control over their design or form. Low-pressure laminates are sometimes referred to as reinforced plastics, and have already been the subject of an entire ID issue (October, 1958).

Compression molding:

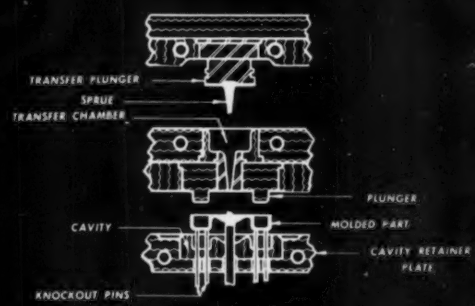
Illustrated is a typical compression mold with the dies closed and the plastic already molded. In this process the entire die is heated, the mold plunger, riding on the guide pins, is closed, causing pressure and forcing the plastic molding powder to soften and flow, thereby filling out the mold cavity. There are many types of molds used for compression molding, depending upon the parts being molded and the type of material to be molded.



COMPRESSION MOLDING

Transfer molding:

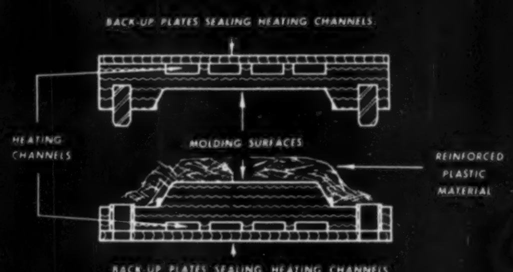
This diagram shows the entire mold in the open position. In operation, the die is closed and heated, then the molding powder is placed in the transfer chamber and the transfer plunger is closed, causing the molding compound to soften and forcing it into the closed die cavity. Hence, the term "transfer", i.e. the material is actually moved from one portion of the mold into another.



TRANSFER MOLDING

Reinforcing:

Diagram shows the molding die in the open position, with chopped reinforcing material placed over it. Resin will be poured over the reinforcing material and the die will be closed, forcing and distributing the resin through the reinforcing material. In this method of molding reinforced plastics, the heat of the die causes the resin to cure quickly. When the die is opened, the molded piece is ready for removal and requires no additional finishing.



REINFORCING

Phenolics

Although scientists were interested in phenolics as early as 1870, it was not until 1909, when Dr. Leo Baekeland announced the first *controlled* reaction of phenol and formaldehyde, that they became commercially important.

PROPERTIES: The various phenolic molding compounds are often designated by the characteristics they impart to finished products, i.e. general-purpose, impact-resistant, heat-resistant, etc. As a group, they are hard, rigid, and strong, and can withstand temperatures up to 300 degrees Fahrenheit. In fact, they are poor conductors of heat, which makes them useful as electrical insulators and as handles for cooking utensils. The usual phenolic compounds show a marked tendency to discolor when exposed to light; consequently dark colors are recommended. Their indoor aging characteristics are good, and parts molded of phenolics are not adversely affected by water, alcohol, oils, greases, mild acids, and common solvents.

AVAILABLE FORMS AND FORMING METHODS: Phenolics are available as molding compounds with various fillers (depending upon the property desired in the end product), and as pre-forms, boards, and blanks for subsequent molding. They are also produced as resins for impregnants, bonding agents, coatings, and foam. Finished products are produced by compression, transfer molding, casting, and laminating.

END-PRODUCT APPLICATIONS: Phenolics are used for control knobs, handles for electrical appliances, washing machine agitators, and furniture drawers.

Amino Plastics

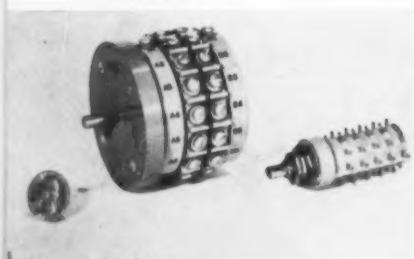
The aminos, urea-formaldehyde and melamine-formaldehyde, were developed in 1929 and 1939 respectively.

PROPERTIES: Both urea and melamine have a glossy surface, and come in a full range of light-fast colors, translucent and opaque. They are odorless, tasteless, non-toxic, and scratch-resistant. While they are strong and rigid, they are not unbreakable and should be guarded from sharp blows. Articles molded from the aminos are unaffected by detergents, cleaning fluids, nail polish remover, alcohol, oils, and grease. Both have excellent electrical qualities and both will perform at temperatures as low as minus 70 degrees Fahrenheit. Urea will withstand continuous operating temperatures as high as 170 degrees Fahrenheit; melamine, 210 degrees Fahrenheit. They are dimensionally stable, and for indoor use will remain so permanently. Neither will burn or soften in contact with flame, but charring or discoloration may occur.

AVAILABLE FORMS AND FORMING METHODS: Aminos are available as molding powders or granules, as foamed material, in solution, and as resins. Finished products can be made by compression or transfer molding, or laminating with wood, paper, etc.

END-PRODUCT APPLICATIONS: In molded products, urea is represented by closures, electrical devices, buttons, stove knobs and handles; in resin form, it is used for coatings, plywood adhesives, and paper and textile treatments. Melamine has been widely used for dinnerware; it is also used for distributor heads, buttons, and hearing aid cases. It is the top surface in high-pressure laminate materials, and in resin form has the same uses as urea.

Alkyds



Alkyd plastic was developed in 1926 and was widely used initially in the manufacture of paints, enamels, and lacquers. It was introduced as a molding compound in 1948.

PROPERTIES: These materials have excellent dielectric strength, high resistance to electrical leakage, and excellent arc resistance; they also have excellent dimensional stability under high temperatures and good resistance to moisture. Molded alkyd parts withstand acids, ketones, esters, alcohol, chlorinated compounds, and essential oils.

END-PRODUCT APPLICATIONS: Alkyd molding materials are used for automobile starters, fuses, electric motor mounting cases, television tuning devices and tube supports; they are also used in the formulation of paints.

Casein

Formaldehyde-hardened casein plastics were developed in Europe and their manufacture began there about 1900.
PROPERTIES: Casein plastic is a strong, rigid material, resistant to blows and flexing. It takes a brilliant surface polish and has a wide range of near-transparent and opaque colors. Products made from it can be dry-cleaned and are not affected by contact with such liquids as gasoline, nail polish, organic solvents, and chemicals.
AVAILABLE FORMS AND FORMING METHODS: Casein is available as rigid sheets, rods and tubes, as a powder, and a liquid. Finished parts are made by machining the above forms.
END-PRODUCT APPLICATIONS: Typical uses include buttons and buckles, knitting needles, adhesives and toys.

Cold-Molded

Cold-molded plastics, thermosetting materials developed about 1909, fall into three categories—bitumin, phenolic, and cement-asbestos — and differ basically from the other, more common plastics in that they must be baked after removal from the mold.
PROPERTIES: Cold-molded plastics will resist high heat, most alkalis and solvents, and water and oil. They also have good arc resistance.
AVAILABLE FORMS AND FORMING METHODS: These plastics are available as compounds. Finished articles are produced by molding and subsequent curing.
END-PRODUCT APPLICATIONS: Among their end uses are switch bases and plugs, furnace covers, jigs and dies.

Epoxies

Simple epoxies have been known for over a century and used in the form of coatings; newer uses involve laminating and molding.
PROPERTIES: Epoxies produce dimensionally stable molded items that offer excellent resistance to chemicals, impact, and abrasion. They can be cured at or near room temperature, with or without pressure.
AVAILABLE FORMS AND FORMING METHODS: They are available as molding compounds, resins, foamed blocks, liquid solutions, adhesives, coatings.
END-PRODUCT APPLICATIONS: Epoxies are used as coatings for appliances, plant structures and equipment, as well as flooring. They are combined with glass fibers in the manufacture of reinforced plastic products, and are also used in the manufacture of tools for a variety of mass-production operations, and in the composition of adhesives for bonding dissimilar surfaces.

Polyesters

Although the term polyester actually includes a number of different formulations encompassing a whole family of materials, it is now more commonly used in a narrower sense, designating the resins used for reinforced plastics; these were developed in 1942.
PROPERTIES: Because they can be formed under low or no pressure and at low or room temperatures, reinforced polyesters are adaptable to forming large parts—up to 500 square feet in area. Polyester parts are strong and tough, the strength and rigidity being determined by the selection of the resin and the amount of reinforcing material. They have high dielectric qualities. They can be cast clear and transparent, or can be molded in the form of laminates in varying degrees of opacity and in different finishes.
AVAILABLE FORMS AND FORMING METHODS: Polyesters are produced as liquids, dry powders, pre-mixed molding compounds, and as cast sheets, rods and tubes. Pre-mixed compounds made from these resins are used for compression and transfer-molded parts for automobiles, electrical appliances, fixtures, and tools; they are also formed into end products by molding, casting, reinforcing, and impregnating.
END-PRODUCT APPLICATIONS: Polyesters are used to impregnate cloth or mats of glass fibers, paper, synthetic fibers, cotton, and other fibers in the fabricating of reinforced plastics for use in boats, automobile bodies, luggage, aircraft components, interior partitions, furniture, translucent roofing and skylights.

P1

Silicones

Silicones are a type of engineering plastic developed in 1943.

PROPERTIES: Silicones show excellent resistance to the effects of heat, oxidation, and weathering; they are water-repellent and highly resistant to mineral acids and corrosive salt solutions. They also have very good dielectric qualities; in particular, they retain these qualities after exposure to high temperatures and moisture.

AVAILABLE FORMS AND FORMING METHODS: They are available as molding compounds, resins, coatings, greases, fluids, and as silicone rubber. They are converted into end products by compression, transfer, and extrusion molding, coating, calendering, impregnating, laminating, foaming, and casting.

END-PRODUCT APPLICATIONS: The electrical industry is the largest user of silicones, employing them for coil forms, switch parts, and as insulation for motors and general coils.

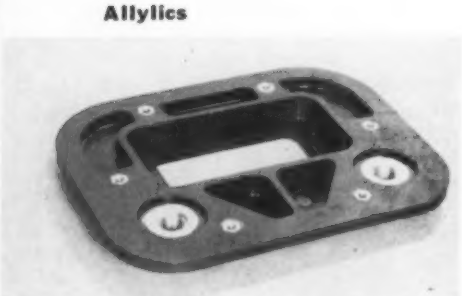
Urethanes

PROPERTIES: These plastics have attracted increasing industrial interest since 1955. They can be produced in varying degrees of hardness and toughness, and are remarkably shock-resistant. Elastomeric (i.e. stretchable) types have unusual resistance to abrasion and tearing; foams show similar qualities and in addition have shock-absorbing, heat-insulating, and sound-proofing properties. They are light in weight, and come in a variety of colors. Urethanes will adhere to a diverse list of materials—they are among the few substances that will effectively adhere synthetic rubber to synthetic fibers in the manufacture of tires, and they will unite rubber with metals and ceramics. The cured plastics are resistant to a wide variety of deteriorating agents such as many common chemicals, organic solvents and oils. They are highly water- and moisture-resistant, and rot- and vermin-proof. Urethanes are excellent insulators. They can be fabricated and cured at room temperature, or slightly higher.

AVAILABLE FORMS AND FORMING METHODS: Urethane foams are of different forms, and are the reaction products of isocyanates and other materials such as polyesters, polyethers, and epoxies. Urethane protective coatings, adhesives, elastomers, and potting compounds are developed from the same parent materials. They are formed into end products by molding, casting, extrusion, spinning, and coating.

END-PRODUCT APPLICATIONS: Urethane foams have become important in cushioning, mattresses, insulated clothing, packing, rug underlays, crash pads, and lightweight structural components. Solid articles formed of urethane include printing type, elastic rolls, abrasive wheels, cable insulation, tire treads, and airplane structural parts. Coatings of this material protect and decorate wood, metals, rubber, concrete, paper, and many other products.

Allylics



PROPERTIES: Allylics, developed since World War II, offer good electrical properties and retain them under conditions of high heat and humidity: allylic resins will withstand temperatures of up to 350-400 degrees Fahrenheit, with special resins available that will withstand continuous exposures up to 450-500 degrees. They have low moisture absorption, a high stain-resistance, and excellent resistance to the effects of weather. They are odorless, tasteless, and insoluble. Allylics can be formulated in pastel colors that have good color retention at elevated temperatures.

AVAILABLE FORMS AND FORMING METHODS: Allylics are available in many forms: as molding powders with a variety of fillers, or in prepreg (i.e. preimpregnated) combinations with coated glass fiber and other textiles.

END PRODUCT APPLICATIONS: Typical products made from allylics include transfer- and compression-molded electrical connectors, appliance handles and knobs; low-and high-pressure laminates; and as moisture-protective coatings for either industrial or decorative application over plywood, particle board, and other laminated materials.

Forming methods are determined by a physical change in the material

Thermoplastics

HOW THEY ARE MOLDED OR FORMED; VARIATIONS AND ADVANTAGES OF EACH PROCESS

The methods discussed in brief below are the basic ones for molding or forming thermoplastics. There are variants of each, developed to meet the complexities of certain jobs or parts, but the latitude of possible techniques depends essentially on this type of plastic's quality of changing physically, but not chemically, in the molding process.

Injection Molding: The most commonly used method for producing thermoplastic end products borrows most of its principles from the older art of die-casting: granular material is fed into one end of a heated cylinder, is softened, and is then forced from the other end into a closed mold where it cools and hardens. This process takes thermoplastic resins in the form of small pellets called molding powders and converts them into shaped articles ranging in weight from 0.0002-ounce washers to 15-pound battery cases. Most injection machines are designed to work with molds that separate along a single plane, which means that articles must be designed to be conveniently ejected from such molds. However, by designing special molds with multi-surface parting and automatically retracting plugs, more complex shapes with undercuts, side projections, etc. can be molded. Also, metal inserts that are not too large can be molded into the articles by positioning the inserts in the empty mold cavity before injecting the plastic.

In the molding process the pellets—usually cubes, spheres, or stubby cylinders—drop from the hopper into the injection cylinder when the ram is in retracted position. On the injection stroke the ram comes forward rapidly, forcing the pellets into the heated part of the cylinder and compacting them around the torpedo, or spreader. The torpedo is centered in the cylinder by fins which also conduct heat to it from the electrically heated cylinder wall. In this manner a thin layer of the pellets is heated by both torpedo and cylinder. Each successive stroke of the ram forces them further into the melt zone until finally the melted material is forced from the cylinder into the mold. Normally there will be several cavities in the mold; the melt, entering the center of the mold through the sprue, reaches the cavities via small channels called runners. Once in the cavities, the melt loses heat to the cold metal of the mold and starts to "freeze" at the outside surfaces. When a sufficient thickness has frozen, the mold opens and ejector or knockout pins poke the pieces out of the cavities. The mold is closed and the entire cycle repeated.

Extrusion molding: This is the method used to form thermoplastic materials into tubes, rods, filaments, profile shapes, film and sheeting (film includes thicknesses up to and including 10 mils, sheeting refers to thicknesses over 10 mils); it is also used to coat wire, cable, and cord.

In extrusion, dry plastic material is fed from a hopper into a long heating chamber through which it is moved by a continuously revolving screw. At the end of the chamber the molten plastic is forced out through a small opening or die, which shapes it into the desired form. As the plastic extrusion comes from the die it is fed onto the conveyor belt where it is cooled—usually by blowers or immersion in water.

To produce wide film or sheeting the plastic is extruded in a tube which may be split as it comes from the die, then stretched and thinned to the desired dimensions, or it may be inflated as it comes from the die until the walls reach the desired thinness—and then split. This last process, i.e. the inflating of the tube, has recently been used in the forming of bottles, jars, etc. and is termed *blow molding.*

Calendering: Thermoplastics can also be formed into film and sheeting by calendering, a process in which the plastic compound is passed between a series of three or four large, heated rollers which squeeze the material into a sheet or film, depending upon the space between the rollers. Calendered plastics can be smooth or mat-finish, the latter produced by textured surfacing on the rollers. Calendering is also used to apply plastic coatings to textiles or other supporting materials.

Vacuum-forming: The majority of plastic articles formed from sheet plastic are shaped by vacuum-forming, a process in which both heating and forming take place in one machine. The sheet is heated until it is soft, a vacuum removes the air from between it and the mold, and atmospheric pressure forces the softened sheet against the mold. In its simplest form it uses a straight vacuum only (the natural product of which is a curved or blister shape) and employs a special machine intended for just this purpose. But simple vacuum-forming can also be performed on combination drape-and-straight vacuum machines which also employ the natural tendency of the softened plastic to drape against the mold. Products made by this process are necessarily of a low-profile type, since a deep cavity would create too thin a plastic form. The rule of thumb generally used is to specify straight vacuum-forming only where the diameter of an opening is at least twice the depth.

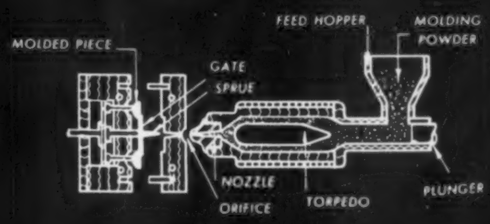
In the past year vacuum-formed plastic sheets, printed or silk-screened, have been used as point-of-purchase placards or special packaging, and have become big business. The graphics are first painted on a formed master sheet which is then returned to its original flat state and serves as a pattern for silk-screening or printing on subsequent plastic sheets prior to forming.

There are many variations of straight vacuum-forming: straight forming over a male mold, drape forming over a male mold, drape molding into a female cavity, and forming into a female mold with a helper. For faster production there are processes such as automatic rollfeed drape forming, which is completely mechanical and requires no attending operator; and for economy there is extrusion vacuum-forming, a process in which the hot plastic sheet is vacuum-formed as it emerges from the rollers or dies of a sheet-extruder set-up.

Pressure Forming: Unlike vacuum-forming, which provides only about 14 psi pressure, pressure-forming machines can provide up to 150 psi. The equipment is heavier (for instance, only metal molds can be used since the pressure will break down most other materials) and more expensive, and the production process is usually slower than vacuum-forming, but the results are sharper definition of shapes and better detailing.

Injection molding:

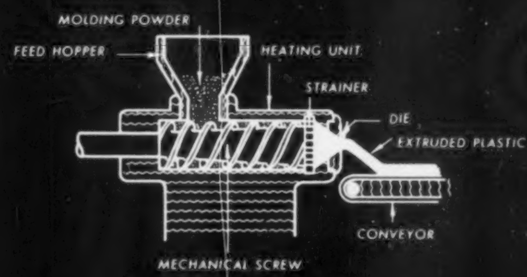
Granules of thermoplastic molding materials are placed in the hopper where they are dropped by gravity into the heating chamber and melted. On each stroke of the plunger the softened material is forced through the sprue and into the die cavity where it cools and hardens. The die is opened, the finished part is ejected, and the die closes again. With each complete stroke of the plunger more material is let down from the hopper, melted, and forced into the die.



INJECTION MOLDING

Extrusion molding:

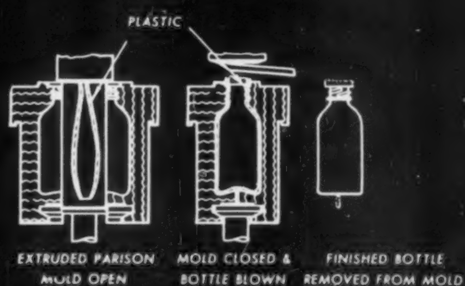
This process is similar to injection molding, except that it is on a continuous basis, rather than a part-by-part basis. The molding powder is placed in the hopper and moves down into the heating chamber by gravity, where it is softened by heat and simultaneously forced forward by the screw until it passes through the die (which gives the material its shape) and is cooled. The conveyor carries the extruded material away for further cooling and any additional working which may be required.



EXTRUSION MOLDING

Blow molding:

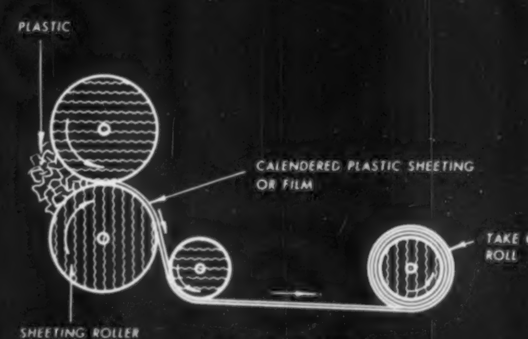
Diagram at left shows the mold in the open position with the extruded plastic film in position ready to be blown. In the second diagram the mold has been closed, the plastic heated to its softening temperature, and air blown into the cavity forcing the plastic to conform to the contour of the mold. It is then cooled to harden it to this finished shape, after which the mold is opened and the blown bottle removed.



BLOW MOLDING

Calendering:

The raw plastic material is forced through the heated sheeting-rollers. The distance between these rollers determines the gauge of the finished material and the rollers may also emboss any texture that is desired. The extruded film is cooled and rolled up on the take-off roll.



CALENDERING

Polyethylene

Polyethylene, a thermoplastic developed in 1942, is one of the fastest growing of all plastic materials. It is available commercially in three types: high-pressure (also referred to as conventional or low-density polyethylene); medium-pressure polyethylene; and the newest, low-pressure polyethylene (which is also called high-density, stiff, or linear polyethylene).

PROPERTIES: Polyethylene is strong and flexible except in very thick pieces, and is therefore very resistant to breakage. As its density increases, so too do its stiffness, its resistance to creep, its impermeability to liquids and gases, its film brittleness, and its flex life. Generally polyethylene remains flexible at temperatures as low as minus 100 degrees Fahrenheit. Some formulations can withstand boiling water and can be washed in an automatic dishwasher. Its maximum use-temperature in unloaded containers is 220 degrees Fahrenheit. Polyethylene offers low dielectric loss and high resistivity. At room temperature it has excellent resistance to permeability by liquids and water, but if it is to be used for a packaging application its resistance to the material being packaged should be checked—it is moisture-proof but it allows the passage of oxygen. Polyethylene is also highly resistant to chemicals, and is unaffected by food acids and household solvents. It is unaffected by short contact with cleaning fluid. It is odorless, tasteless, and non-toxic. Finished products have a wax-like feel and can be transparent, translucent, or opaque. In some instances it is supplied in certain stock colors, but dry blending of the material permits a wide range of colors in addition to these. Product identification can be handled by hot-stamping; lacquering and printing are possible if surfaces are pre-treated. Labels of pressure-sensitive adhesives will bond satisfactorily to clean polyethylene surfaces.

AVAILABLE FORMS AND FORMING METHODS: Polyethylene is available as a powder sheet, film, filament, rod, or tube. It may be formed into a finished article by injection, compression or blow molding, extrusion, calendering, coating, casting.

END-PRODUCT APPLICATIONS: Almost half of the conventional polyethylene goes into housewares: bowls, buckets, wastebaskets, garbage cans, containers, etc., as well as closures and squeeze bottles. Toys account for 10 to 15 per cent. High-density polyethylene is being used increasingly for industrial applications such as tote boxes and other large parts.

Polystyrene

Polystyrene or styrene was discovered in 1839 but was not produced commercially until 1935. Since that time, many commercial improvements have been made. Styrene can be combined in many ways (polymers and copolymers) to produce a broad range of materials, each of them offering specific, and different, physical and chemical properties. Styrene types are usually identified by these properties, i.e. general-purpose polystyrene, heat-resistant polystyrene, light-stable polystyrene, etc.

PROPERTIES: Polystyrene is available as a crystal-clear transparent, translucent, or opaque material in a rainbow of colors. It is tasteless, odorless, and nontoxic, and can be used in contact with food. Its electrical properties are exceptionally good. It is not harmed by continuous use at food-freezer temperatures, and parts molded of heat-resistant styrene retain their dimensional stability in boiling water for short periods, although they cannot really be called boilable. Styrene will burn slowly if subjected to flame. It is impervious to the action of most foods, drinks, common household acids, oils, alcohol, and vinegar, but should not be specified for parts that come in contact with citrus-rind oil, cleaning fluids, gasoline, turpentine, and nail-polish remover. It behaves well under ordinary household use, but parts that will be subjected to severe impact or flexing should be designed in impact-styrene or rubber-modified compounds. It should not be cleaned with abrasives.

AVAILABLE FORMS AND FORMING METHODS: Polystyrene is available as molding powder and granules, sheets, rods and similar shapes, and as foamed blocks, liquid solutions, adhesives, and coatings. Finished products can be formed by injection molding, extrusion, laminating, and machining.

END-PRODUCT APPLICATIONS: Typical products of polystyrene include portable radio housings, wall tiles, kitchen items, refrigerator food containers, toys, and cereal-box premiums.

Polyvinyl Chloride

Although the existence of vinyl resins was known for over 50 years, it was not until 1936, when they were combined with a plasticizer that made them softer and more flexible, that they became commercially important. Vinyls are produced in seven major types, all of them thermoplastic. But only three – polyvinyl chloride, polyvinyl chloride-acetate, and polyvinylidene chloride (or Saran) – are commonly of interest to the designer. The other types fall into such end-use applications as the interlayer for safety glass, paints, adhesives, flash bulb linings, gaskets, industrial hose, and low-cost electrical assemblies.

PROPERTIES: Polyvinyl chloride is hard, tough, transparent, and is produced in a wide range of colors as well as crystal-clear. It can be rigid, or it can be plasticized to a high degree and still maintain appreciable strength. Vinyls, with the exception of some non-rigid types, are unaffected by prolonged contact with water, oil, foods, common chemicals, and cleaning fluids such as gasoline and naphtha. In addition, they are resistant to oxidation and are self-extinguishing. Vinyls generally can withstand heat up to 130 degrees Fahrenheit, but should be kept from direct contact with a heat source. They perform well at lower temperatures, such as food-freezing levels. If used for outdoor applications, light stabilizers must be added.

AVAILABLE FORMS AND FORMING METHODS: Polyvinyl chloride is available as resin, latex, coatings, dispersions, plastisols, and foam. It can be converted into a finished product by molding, extrusion, and calendering.

END-PRODUCT APPLICATIONS: One of the largest uses of this vinyl chloride resin is for electrical insulation. But it has a host of other uses such as work gloves, auto seat covers, handbags and luggage, floor covering, garden hose, phonograph records, and formed parts such as vacuum cleaner attachments.

Polyvinyl Chloride-Acetate

PROPERTIES: This resin is a combination of polyvinyl chloride and vinyl acetate and the resultant copolymers (as the combination is called) are odorless, tasteless, water-resistant, and self-extinguishing. It retains the toughness and chemical resistance of the polyvinyl chloride, but has increased flexibility.

AVAILABLE FORMS AND FORMING METHODS: Polyvinyl chloride-acetate is supplied in the form of sheets, rods, tubes, granules, powders, and dispersions. They can be fabricated in stock forms by standard molding, extrusion, calendering, casting, and can be formed into specific end products by compression, injection, and slush molding, and by extrusion and calendering.

END-PRODUCT APPLICATIONS: This resin is extruded into rods and tubes; other end uses include upholstery, luggage, gaskets, and packaging applications.

Polyvinylidene Chloride

PROPERTIES: This vinyl has a higher softening point – 160 to 335 degrees Fahrenheit – and extremely low water vapor transmission. It is exceptionally resistant to oil, grease, and chemicals, and is non-flammable.

AVAILABLE FORMS AND FORMING METHODS: Polyvinylidene chloride is available as molding powder, sheets, rods, tubes. It is particularly well suited to injection molding and extrusion, but can also be made into end products by compression and transfer molding, and by standard casting techniques.

END PRODUCT APPLICATIONS: It is used in weaving upholstery fabrics, draperies, and weather-resistant screening, as well as for rigid pipe fittings. In film form it has been used for a variety of heat-sealed packaging applications.

Rigid Vinyls

Rigid polyvinyl chloride materials, also known as unplasticized PVC have become well known because of their combination of chemical and physical properties. Chemical inertness is often their prime recommendation. Rigid PVC materials will not support combustion. Basic end uses for rigid vinyls are pipe, extruded profiles such as gutters, downspouts, framing elements, automotive trim and many other extruded shapes. Development of extruded sheet will probably develop end products in packaging laminates and lighting components.

Cellulose Acetate

There are four types of cellulosics, all of them thermoplastic. The oldest, cellulose nitrate, is also the oldest of the synthetic plastics–dating back to 1868. Cellulosic acetate sheets, rods, and tubes appeared on the U.S. market in 1927, followed by cellulose acetate molding powders. In 1938 cellulose acetate butyrate molding materials appeared on the market, and the most recent of this family, cellulose propionate, was introduced in 1945.

PROPERTIES: Cellulose acetate is notable for its toughness and high-impact strength. It is stable at room temperatures, has good resistance to discoloration and deterioration from sunlight, is a good electrical insulator, and is odorless, tasteless, and non-toxic. It comes in a wide range of lustrous colors, both translucent and transparent.

AVAILABLE FORMS AND FORMING METHODS: It is available as pellets, sheets, film, rods, tubes, strips, and coated cord. It can be formed into end products by injection and compression molding, extrusion, and blowing and drawing of sheets.

END-PRODUCT APPLICATIONS: This material is used extensively for toys, beads, cutlery handles, etc. In sheet form it is widely used as a packaging material. Vacuum-formed sheeting is used for fabricating displays, for custom packaging, and for small household and personal products.

Cellulose Acetate Butyrate

PROPERTIES: The primary physical characteristics of this material are a hornlike toughness, high-impact strength, uniformity of texture, and dimensional stability under normal variations of temperature and weather. It is resilient, has low heat conductivity, and comes in a full range of colors as well as crystal clear transparent.

AVAILABLE FORMS AND FORMING METHODS: It is available in pellets, sheets, rods, tubes, strips, and as a coating. It can be made into finished products by injection and compression molding, extrusion, blowing and drawing of sheets, laminating, machining, and coating.

END-PRODUCT APPLICATIONS: Cellulose acetate butyrate is used for screwdriver handles, housings, packaging, blisters, automobile arm rests; molded parts can be readily vacuum-plated to a mirror-like metalized finish.

Ethyl Cellulose

PROPERTIES: Ethyl cellulose retains its toughness and resiliency at sub-zero temperatures besides offering good dimensional stability over a wide range of temperature and humidity conditions. It should be kept away from cleaning fluids, oils, and solvents.

AVAILABLE FORMS AND FORMING METHODS: It is available as granules, flakes, sheets, rods, tubing, film, and foil. It can be made into finished products by injection and compression molding, extrusion, drawing and machining.

END-PRODUCT APPLICATIONS: It is used in football helmets, bowling pin bases, floor sweeper parts, and similar products which take heavy abuse. It is also used for flashlight cases and furniture trim, for refrigerator breaker strips, and for various extruded tubings.

Cellulose Propionate

PROPERTIES: This is an unusually stable material and is absolutely odorless. Its toughness and shock-resistance characteristics, similar to those of ethyl cellulose, are very good. Weatherability characteristics are superior to cellulose acetate. Articles produced from cellulose propionate can be printed and lacquered without fear of tackiness.

AVAILABLE FORMS AND FORMING METHODS: Cellulose propionate is best suited for injection molding and extrusion.

END-PRODUCT APPLICATIONS: It is currently used for automotive parts, pens and pencils, telephone housings, toys, radio and tv parts, and sun glass frames.

Acrylics

Acrylics constitute a whole family of plastic materials, all thermoplastic, developed in 1931.

PROPERTIES: An acrylic offers exceptional clarity and good light transmission: in crystal-clear form it can pick up light on one edge and transmit it around curves, unseen, until it reaches the opposite edge. Weather does not affect its transparency, physical stability, or electrical properties, and it does not become brittle at low temperatures. Parts molded from it should not be subjected to boiling water or steam sterilizing, but normal hot water temperatures will not affect it. It is odorless, tasteless, and non-toxic, and is strong, rigid and resistant to sharp blows although its surface scratches easily. Acrylic is unaffected by most household chemicals, bleaching compounds, window cleaning solutions, waxes, and most foods; it is attacked by perfume, gasoline, and cleaning fluid. It is available in colorless form, and in a full range of transparent, translucent, and opaque colors.

AVAILABLE FORMS AND FORMING METHODS: Acrylics are available as rigid sheets, rods and tubes, as molding powder, or in the form of solutions, adhesives, and elastomers. Finished products can be produced by fabrication from sheets, rods, and tubes, by hot-forming of sheets, by injection and compression molding of powder, and by extrusion and casting.

END-PRODUCT APPLICATIONS: Acrylic sheet is the standard material for transparent canopies, windows and instrument panels on aircraft. Large sheets, edge-lit, are used as radar plotting boards in shipboard and ground control stations. They have also become the standard material for faces and letters of outdoor signs, display fixtures, and vending machines. In molded applications they are used extensively for such items as automobile tail-lights and stop-light lenses, and as medallions and name-plates for products.

Nylon

Nylon is the generic name given to the family of polyamide resins developed in 1938, whose chemical compositions are related, though not identical.

PROPERTIES: Nylon is resistant to extremes in temperature: it can safely be boiled and steam-sterilized, and is not adversely affected by freezing. It is tough, with good impact strength, and it is resistant to abrasion (although scouring powders and steel wool should not be used to clean nylon parts.) Coffee, tea, and colored foods will stain it rather easily, but it is unaffected by common workaday chemicals, greases, and solvents – except mineral acids. It has good electrical characteristics. Natural nylon is milky white; however it is easily colored in a full range of opaque and translucent colors.

AVAILABLE FORMS AND FORMING METHODS: Nylon is available as a molding powder and as sheets, rods tubes, and filaments. Finished products are made by injection and compression molding, and by extrusion.

END-PRODUCT APPLICATION: Nylon is used for gears and bushings in household appliances, calculating equipment, automobile speedometers, and windshield wipers. It is also used in automobile and refrigerator door-closing devices. In filament form it is used as brush bristles and fishing lines. Nylon's newest application is in the field of aerosol bottles.

Polypropylene

PROPERTIES: The most distinctive property of this very new thermoplastic (first commercially produced in 1957) is its light weight—it is among the lightest plastics available. It is odorless and colorless, but a wide range of colors can be obtained by conventional techniques of mixing with pigments and/or dyestuffs. Polypropylene articles are exceptionally resistant to heat–they can be used at temperatures in excess of 300 degrees Fahrenheit, and can be sterilized. Parts made from this material have excellent electrical properties even at high frequencies, and since its water absorption is practically nil, these properties are unaffected by humidity. Polypropylene products exhibit fine detail, high finish, and excellent rigidity.

AVAILABLE FORMS AND FORMING METHODS: It is available in pellet form suitable for injection molding and extrusion. It can be compression-molded, fusion- and centrifugal-cast, metal surface-coated, and vacuum-formed.

END-PRODUCT APPLICATION: It is used for pipes, fittings, valves, packaging, films, and heat-sterilizable bottles.

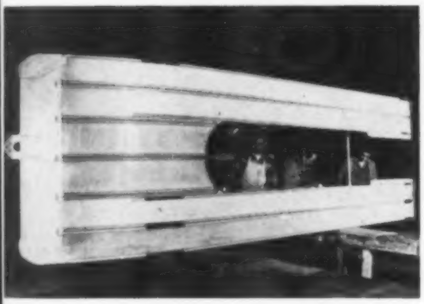
ABS Plastics

PROPERTIES: ABS (acrylonitrile-butadiene-styrene) plastics, developed in 1948, are strong and tough and combine outstanding impact strength with high mechanical strength. Some formulations have excellent toughness in temperatures as low as minus 40 degrees Fahrenheit. Parts made from these materials remain dimensionally stable over a wide range of conditions, have good electrical properties, and withstand heats of 175 to 212 degrees Fahrenheit. They are resistant to acids, alkalis, salts, and—in many cases—to aliphatic hydrocarbons.

AVAILABLE FORMS AND FORMING METHODS: ABS plastics are available as powder or granules for injection molding, extrusion, and calendering, and as sheet for vacuum-forming.

END-PRODUCT APPLICATIONS: Typical uses for these materials include wheels, football helmets, business machine trays, children's skates, and radio cases.

Fluorocarbons



PROPERTIES: There are three types of fluorocarbons, a thermoplastic group developed about 1943. All of them are resistant to extremes of heat and cold, retaining their strength and dielectric properties at temperatures ranging from minus 320 degrees to 550 degrees Fahrenheit. The fluorocarbons are strong, extremely hard, and have a high-impact strength; highly resistant to chemicals, they don't absorb water.

AVAILABLE FORMS AND FORMING METHODS: Fluorocarbons are available as powder and granules, sheets, rods and tubes. Finished products are made by compression molding, extrusion, and machining.

END-PRODUCT APPLICATIONS: Fluorocarbons are used in many industrial applications such as valve seats, pump diaphragms, laboratory tubing, and in applications in the electronics field.

Acetal Resin

Acetal resin (polyoxmethylene) is the first resin of its kind. DuPont has developed and produced it and expects to have it in commercial manufacture, under the name of "Delrin" sometime this year.

PROPERTIES: Acetal resin is rigid without being brittle, is tough and resilient and retains both these properties under adverse conditions of temperature and humidity. It is tasteless, odorless, nontoxic, and has excellent colorability.

AVAILABLE FORMS AND FORMING METHODS: Acetal resin will be offered in compositions suitable for general-purpose injection molding and extrusions. It will come in certain basic colors.

END-PRODUCT APPLICATIONS: It is exexpected to compete in the field of formed parts whose manufacture is not dominated by die-cast metals. Typical products will probably be aerosol bottles, shower heads, bushings and bearings, and automobile parts such as instrument cluster housings, door handles, and window cranks.

Polycarbonate

This resin, only recently developed and not yet in full production, promises a new class of plastic materials with some outstanding properties. It is the product of General Electric research, is called "Lexan," and is expected to be in full production by late 1960.

PROPERTIES: Polycarbonate is a transparent, light amber color and is odorless and tasteless. It will transmit light, is unbreakable, and resists heat generated by supersonic speeds. It is a good electrical insulator with toughness and resistance to creep deformation, it is self-extinguishing, and is stable at temperatures as low as minus 100 degrees Fahrenheit and as high as 250 degrees.

AVAILABLE FORMS AND FORMING METHODS: Polycarbonate is currently available in cylindrical pellets suitable for injection molding. However it will very likely be made available in forms suitable for film, extrusion, coatings, fibers, fluids, and elastomers.

END-PRODUCT APPLICATIONS: Camera cams, terminal block control disks, etc.

THE TWO FAMILIES: *who belongs where*

THERMOSETTING MATERIALS

Alkyds

End products may be obtained by: compression molding.

Allylics

End products may be obtained by: compression and transfer molding, lamination, coating and impregnation.

Amino Plastics: Urea and Melamine

End products may be obtained by: compression and transfer molding and laminating with other materials.

Casein

End products may be obtained by: machining of sheets, rods and tubes.

Cold Molded

End products may be obtained by: molding and subsequent curing.

Epoxies

End products may be obtained by: compression and transfer molding of premix compounds (involving epoxy resin and fiber reinforcement), lamination, casting and foams.

Phenolics

End products may be obtained by: compression and transfer molding, casting and laminating.

Polyesters

End products may be obtained by: reinforcing, molding, casting, impregnating and premixing.

Silicones

End products may be obtained by: compression molding.

Urethane

(Some formulations may be thermoplastic)
End products may be obtained by: compression molding and casting.

THERMOPLASTIC MATERIALS

ABS Plastics

End products may be obtained by: injection molding, extrusion and calendering. Also by vacuum forming of sheets.

Acrylics

End products may be obtained by: Injection molding, extrusion and casting, also by fabricating of sheets, rods and tubes, and by hot forming sheets.

Cellulosics

Cellulose acetate
End products may be obtained by: injection molding, extruding, laminating, machining and coating, also by blowing and drawing of sheet.
Cellulose acetate butyrate
End products may be obtained by: same processes as cellulose acetate.
Cellulose propionate
End products may be obtained by: injection molding and extrusion.

Fluorocarbons

End products may be made by: Compression molding, extrusion molding, extrusion and machining. Also from sheet tubes and rods.

Polyethylene

End products may be obtained by: injection and blow molding, extrusion, calendering, coating and casting.

Polystyrene

End products may be obtained by: injection molding and extrusion, laminating and machining.

Vinyls

Polyvinyl chloride
End products can be obtained by molding, extrusion and calendering.
Polyvinyl chloride-acetate
End products can be made by: injection and slush molding, calendering, casting, extrusion and coatings.
Polyvinylidene chloride
End products can be obtained by: injection molding and extrusion.

Polycarbonates

End products can be obtained by: injection molding and extrusion, coatings and fibers.

Acetal resin

End products can be made from: injection molding and extrusion.

REdesign

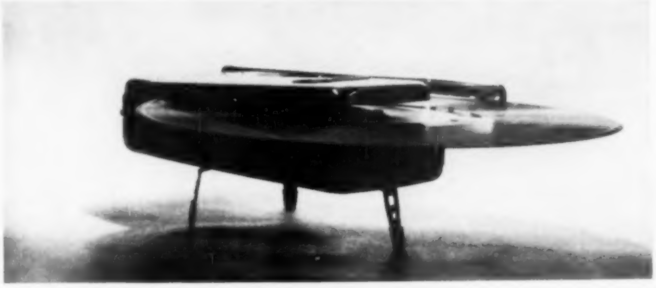
Like the chicken-without-a-bone of folksong fame, a record player without a turntable seems like a contradiction in turns. Yet the Wondergram—a truly miniature player weighing about two pounds and measuring $8\frac{11}{16}$" x $4\frac{3}{8}$" x $2\frac{1}{16}$" — has none. The machine, just now in production, spins records on one of two neoprene driving wheels mounted on a common shaft, and sized and positioned to move records at either $33\frac{1}{3}$ or 45 r.p.m. The wheels run on a motor powered by four flashlight batteries and regulated by a dual fly-weight centrifugal governor. Since power consumption of the motor under load is approximately 45 milliamps, the machine provides about 30 hours of continuous playing on one set of batteries.

It works like this: the lid is raised, and the pickup arm swung out, which turns on the motor and amplifier circuit. When the record is placed on the spindle, it automatically comes in contact with the proper driving wheel: e.g., a 7" record contacts only the inner drive wheel, which moves it at 45 r.p.m.; larger records contact only the other wheel, which is set slightly higher. For stability, the record is held by two additional tiny wheels. One of them is set in the chassis plate, and the other one is on the underside of the lid; thus lowering the lid puts the right amount of pressure on the driving wheels. Thus the machine "bites" the record lightly and holds it firm while it spins, so firm that the machine doesn't even have to be set on a flat surface to operate.

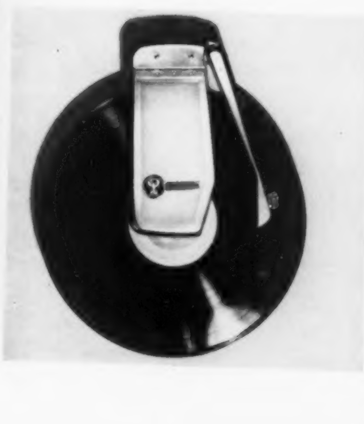
The speaker is on the bottom, and three legs pull out to provide sounding space between speaker and surface. The tone is similar to that of a miniature transistorized radio, and is adequate for informal purposes where portability is at a premium. When the set is not in use, the pickup arm is held securely in place by a spring-fed catch that is engaged by the edge of the lid.

Lid, pickup arm, and chassis plate are gold anodized aluminum, and the molded cellulose acetate housing is available in four colors. Manufactured by Camp Bird Ltd. of London, the Wondergram will soon be nationally distributed here by Teltech International Corporation, 431 Fifth Avenue, New York. The unit will retail for $49.50.

BRITISH DESIGNERS ELIMINATE TURNTABLE TO PROVIDE PERIPATETIC MUSIC LOVERS WITH A TRULY PORTABLE RECORD PLAYER



Above: an overhead view of the Wondergram in action, spinning a 12" record. Left: Legs fold out to let tabletop act as sounding board for speaker, which is on the bottom of the machine. (Original prototypes: Italian designers discovered space was needed for resonance.) Right: features combining compartment with screen, are spindle adapter stored on underside of lid, and record cleaning on underside of battery access plate. Tiny DC motor (shown with head removed) has centrifugal governor by ball bearings.



MADE IN JAPAN

A changing culture and a national emergency demand new forms and new ways of shaping them

by URSULA McHUGH

The three words above are likely to appear on the bottom of almost anything; some critics say it is the only stamp that distinguishes Japanese design. For despite the wishful thinking and the wistful talking of Japan's new industrial designers, and of their clients and government, design in Japan does not have a clearly-defined national character. Nor has the designer himself been established. Industrial design as a profession is newer in Japan than elsewhere, and the designer—unlike the craftsman who could impress his personal mark on a traditional form—must find new forms.

The new forms he is finding today in Japan are very often Western—or at least Westernized—in part because that is the direction his own culture is taking. (Ideally, designers say, they would blend the old and the new; in practice, this may produce the electric hibachi shown opposite, where the central heating element is surrounded by pulverized ashes—a vestigial reference to the traditional charcoal hibachi.) However, the search for new forms is even more the result of the hard facts of the Japanese economy; national survival depends on raising the level of exports sharply.

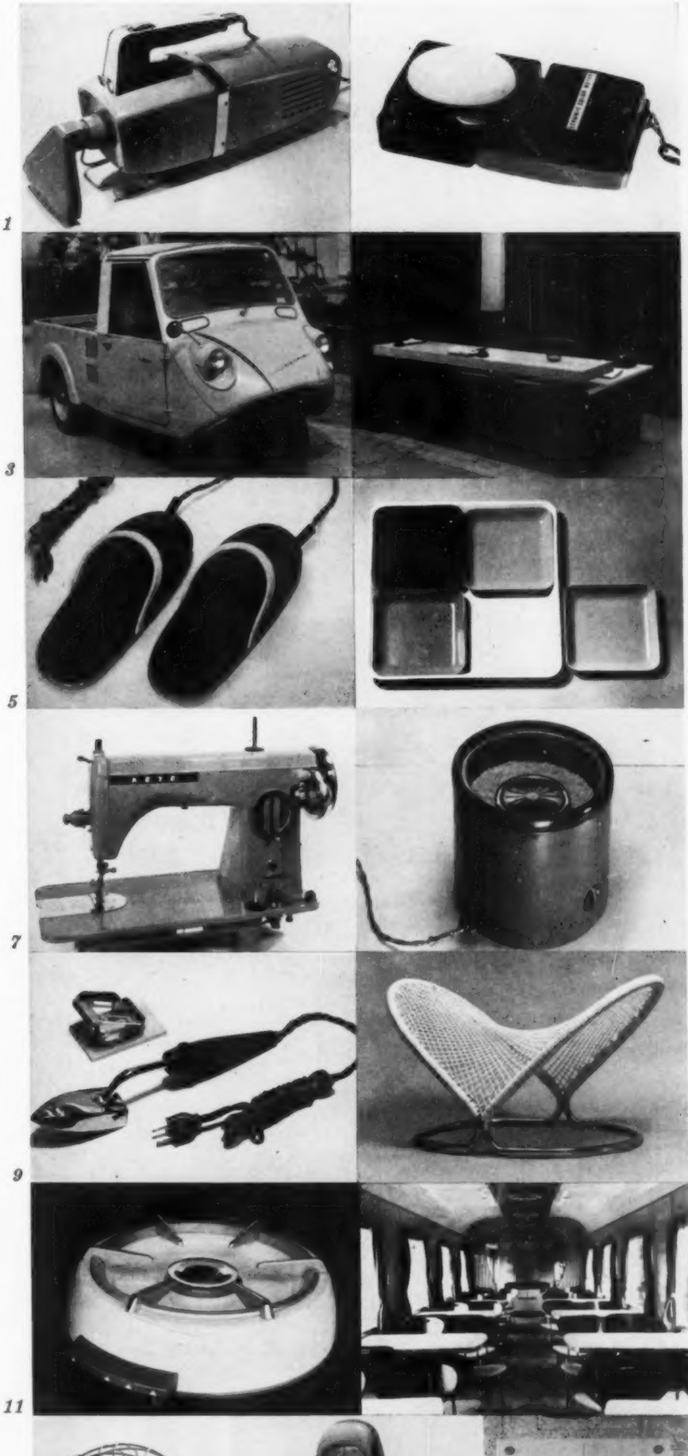
The need for exports

Japan is now about a third of the way through a five-year plan which will end in 1962, at which point, it is hoped, annual exports will have reached a value of $4,730,000,000. (In 1958, exports were valued at $2,876,000,000.) Japanese economists, in speaking of this plan, refer not to the good things that will happen if it is fulfilled, but to the tragic things, in terms of unemployment and national bankruptcy, that will happen if it fails. Japan is trying to support a population of 92,000,000 on an area which is about the size of Montana, and three-quarters of which is so mountainous as to be wholly inarable and largely uninhabitable. In foreign trade, it is competing against much wealthier and more highly industrialized countries, and it is competing not to narrow the gap but to prevent it from becoming wider. It is an over-simplification to say that, industrially, Japan is where we were sixty years ago or England was a hundred years ago. Our standard of living was never so low, we were never presented with so completely strange a culture to assimilate, and world conditions allowed us time for the luxury of making mistakes.

The process of Westernization, and, consequently, of industrialization, is not completely new to Japan. In 1873 the first of a long series of government-sponsored technical teams arrived at the international exhibition in Vienna, to present Japanese arts and crafts to Europe and to absorb as much miscellaneous information as possible. (As far as design and architecture were concerned, this was not, perhaps, the happiest period of Western civilization to learn from.) Now, however, the West is important not merely as a source of inspiration and technique, but as a paying customer. Before the war, Japan's principal customers were the other Asian countries. As these develop, however, they are finding that they can make for themselves the simple manufactures that Japan used to sell them. In the past few years, Japan's principal trading partner has been the United States, which in 1958 accounted for 34.8 per cent of Japan's imports and 23.7 per cent of her exports.

Japan has dealt with this cold fact of her economic life with method—and sometimes with imagination. The president of one of the electrical manufacturing plants has bought a Cadillac and a Chrysler (he is one of the richest men in Japan) and has had his photographers take detail

At right are some representative Japanese products, many of them new to Americans. (Note: Even where they are not intended for export, control switches on appliances are marked "On" and "Off," since these indications do not exist in Japanese.) 1. Hand vacuum cleaner designed by Yoichi Sumida for the Yaou Electric Company. 2. Color meter by Yoshio Akioka of KAK Industrial Design, Ltd., for Sekonic Electric Company 3. Light tricycle truck K360 by Jiro Kosugi for Tokyo Kogyo Company 4. Information desk for the Mitsubishi Exhibition Center in Tokyo by Isamu Kenmochi Design Associates 5. Electric foot warmers, metal covered in suede, by the design staff of Toshiba Electric Company 6. Relish plates by Shogoro Terashima for Shinyo Plastics Company 7. Sewing machine, model S II by Kyushichi Miyajima for Koyo Seiko Company 8. Electric floor heater with double-walled metal casing, by the design staff of Toshiba Electric Company 9. Kimono pleating iron with stand (notched ring in handle is control switch) by the design staff of Toshiba Electric Company 10. Hyperboloid stool of nylon cord and steel tubing, by Nori Sinoto for Kosuga and Company 11. Portable gas cooker by Bunro Matsumoto for Hakamada Kinzoku Company 12. Interior of express train's dining car by Fukuji Suzuki for Hitachi, Ltd. 13. Fan by Masa Minakawa for Fuji Electric Company 14. Machine for testing hardness of industrial diamonds by Frederick Hoffer for Akashi 15. Modular refrigerator (sections are independent) by Yoshikazu Mano for Matsushita.



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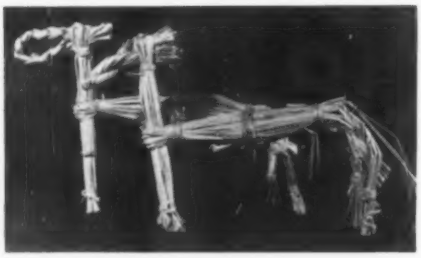
Behind industrial Japan stands a rich design tradition in which useful objects are art



The [illegible] and [illegible] display some of the techniques and materials of traditional Japanese crafts. Top: an iron kettle, from Morioka, in Iwate Prefecture. (Japanese iron has a high chrome and nickel content that retards rust.) Middle: toy horse of straw, supposed to carry the god of good fortune. Bottom: containers of thin wood veneer, used much like sheet metal. Right: modern ceramic sculpture by Taizo Hara, based on Japan's well-known [illegible].

pictures of every inch of the cars. His idea is to have his designers translate the American taste expressed there into electric appliances for export to America.

Japanese workmanship

Several of the characteristics which seem particularly Japanese would seem adaptable also to Western industry and Western design. The simplicity and austerity of the modern movement itself started in Europe as a fashion for everything Japanese. Standardization too is a completely familiar concept for Japan. The dimensions of the tatami mat, for example, are the unit upon which all Japanese architecture is based. When several of them are laid together, their joints will meet so precisely that a sheet of paper cannot be forced down between them, and yet they are made by hand and by many different hands.

Typically, a Japanese artisan has an instinctive feeling for his material; not only for its natural form, but for its capacities. He can calculate the exact thickness necessary to do a job, and will not waste a millimeter extra for the sake of a solid appearance. His calculations, however, stand up only as long as he knows what the job is and how his product is going to be used. Finally, he is highly skilled in making forms he understands—some of a Japanese carpenter's tools are as delicate and highly refined as a mechanic's.

Manufacturing pattern

The manufacturing system is overwhelmingly one of small enterprises. There are exceptions: there are several huge electrical manufacturers, for example, and in these the relation between manufacturer and designer is the closest to the American pattern. Japanese heavy industry was originally the creation of the government. The merchant-samurai alliance that came to power with the restoration of the Emperor in 1868 went methodically about the task of turning a feudal kingdom into an industrial force to be reckoned with. They chose a few key industries (shipyards, iron works, railroads) and built these and trained their technicians with government money. Light industry, however, which could get along without heavy capitalization or modern technology, was left to its own devices. These small enterprises depended (and still do) for their profit on an unlimited supply of cheap labor. In 1957, average wages in manufacturing, the lowest-paid of Japanese industries, were $54 a month.

The advantages of this system for the designer are the availability of precise handwork and the flexibility afforded by designing for small-quantity production. The system's disadvantages come chiefly from the fact that no one makes much money. Japanese industry cannot afford to spend much on research, which means that it may be deficient in a number of technical processes. And more immediately, it cannot afford to spend much on paying an industrial designer's salary or fee. A manufacturer operating on no margin of safety cannot afford to experiment, and what he wants from a designer is immediate sales. The significance he gives the word "designer" must often be wounding to professional pride. A china manufacturer says: "We have some of our designers stationed in New York at all times to keep abreast of the latest stateside trends in color and design."

Handicraft tradition

His statement is particularly ironic in view of the number of Western ceramists who have been coming to Japan to learn, and emphasizes the separation between Japanese design tradition and contemporary industrial practice. The fields in which this tradition was exercised are very few, corresponding to the simple needs of a Japanese household: pottery, baskets, lacquerware, textiles, toys. But there is traditionally in Japan no rigid separation between utility and art. The highly refined philosophical system which found its objective expression in the tea ceremony insisted that a beautiful object was completely beautiful only when it was put to use. And, on the other hand, an object intended for an exalted use, or an exalted user, was not distinguished by its embellishments: the Katsura Palace is, if anything, more severely functional, inside and out, than the common traditional Japanese house, of which it is a kind of ideal version.

The folk art movement which began in the '30s, largely under the direction of Dr. Soetsu Yanagi, has attempted to revive this tradition, but there is still almost no relation between the craftsman who has, typically, graduated from a technical high school and served an apprenticeship with some village group, and the industrial designer, who is educated almost wholly by translations from the West.

But an account of the industrial and craft background does not explain the common image of Japanese design. How has it happened that a country with a vigorous folk art tradition and a highly developed sense of fine workmanship has acquired a reputation for shoddiness and imitation?

Another problem is the push for price reduction. Makers are pushed to reduce prices, told that A maker offered so and so, B so and so and you can make it to such and such price. And the maker has to accept the order in order to live on, with little profit. Such naturally makes their products cheaper in quality thus inviting shame on Japan's face. Who makes so?

—from a letter from a Japanese consultant designer

American buyers in Japan: why they go, where they look, what they want, and how they get it

The Japanese design we see in this country is very largely controlled by the decisions of American buyers, and what they have to say about how they come to these decisions may illuminate, in a number of ways, what the Japanese designer is up against. Three New York buyers, whose stores prefer that they remain anonymous, have just returned from shopping expeditions to Japan, and each has brought back very different products and a very different image.

"The Japanese people have no original ideas and they never will have," says the supervisor of buyers of one of our largest five-and-ten-cent store chains. To remedy this national lack, the store operates a clipping service, he explains, producing from a lower drawer a large scrapbook filled with pages cut from American magazines, with likely items circled in red. Every six months, the scrapbook, its stock of original ideas renewed by his industrious American clippers, travels with him to Japan, where manufacturers are invited to estimate the lowest price at which they can reproduce the items–or rather, to quote his careful distinction, "We don't reproduce; we copy." The store, naturally, makes no attempt to commission the imitation of designs it *knows* are patented, although, since many of them originate in other countries, it doesn't always know. In any case, he assumes that the Japanese manufacturer will check on the patent. They aren't always as scrupulous as he could wish, he says; occasionally a shipment to his store is stopped at the American port of entry because of patent infringement.

Since the scrapbook isn't always sufficient as a source of originality, the store also maintains a corps of shoppers. One of their finds stood on the deck in front of him, a rather Teutonic pottery elf ("Made in Germany" was stamped on the bottom), still carrying the label and price tag of the Fifth Avenue department store where it was bought. This too had gone with the buyer to Japan, and only that morning photographs of the copies had arrived for his approval. The Japanese elves were identical with their German ancestor except that their arms were in a slightly different position. But, the buyer said, the letter that accompanied the photographs was another proof of the Japanese incapacity for original thought. The buyer had asked the manufacturer to produce a similar German girl elf to go with a boy elf, and now here was a letter saying the Japanese were unable to do it, and could the buyer send a sample. "What are you going to do with people like that?"

The motive is economy

Half his store's imports are from Japan; why does he go there to buy? To find new items—items, that is, new to his store because in their original version they cost too much for him to stock. As an example he pointed across the room to a stylized artificial fruit tree. "That cost $35 uptown." But in a room down the hall, he explained, he has a girl who's very clever with her hands, and he called to his secretary to fetch in a sample of her work. Her copy of the fruit tree, a much smaller version, will be sent to Japan for mass reproduction and will eventually sell in the dime stores for $3.98.

The things he goes to Japan for involve, naturally, a good deal of hand labor, since he finds that wholly-machine-made objects can be bought more cheaply in this country. He buys no electrical appliances in Japan, because, he says they couldn't get Underwriters Laboratories clearance.

Folkart won't sell

What about traditional Japanese designs? Toys, for example, form a large part of his purchases, and toys are a very old Japanese craft. But Japanese toys, he says, are cheap stuff –too cheap for his stores. Japanese children are satisfied with a couple of paper streamers that sell for next to nothing. He explained: "Japanese kids' play thinking is forty or fifty years behind our own."

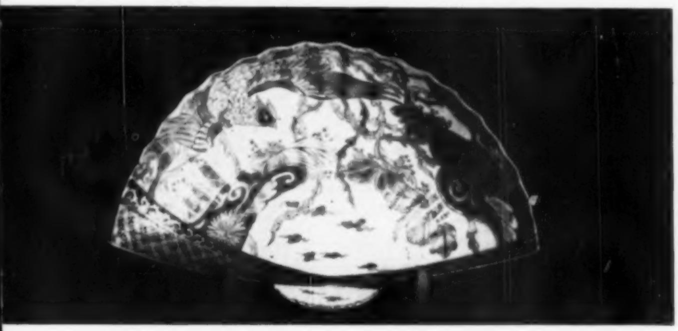
But did he find nothing in Japan he wanted, if not for the store, for himself? Certainly; he goes twice a year and always comes back well over his $500 quota. "Look at this." Putting down his cigar, he produced a string of pearls from his pocket–a souvenir of Japan for his wife.

Had he any complaints about the quality of the things he buys for the store? No, "You get the quality you pay for." He was disgusted with Japanese packaging, however, and produced flimsy cardboard boxes already beginning to disintegrate although they had just been unpacked. On the covers were crude representations of Western children playing with the toys contained within. "The Japanese are very bad on color. We have to bring our own colors with us." Did he meet any designers? "They have no designers, only copiers."

Middlebrow

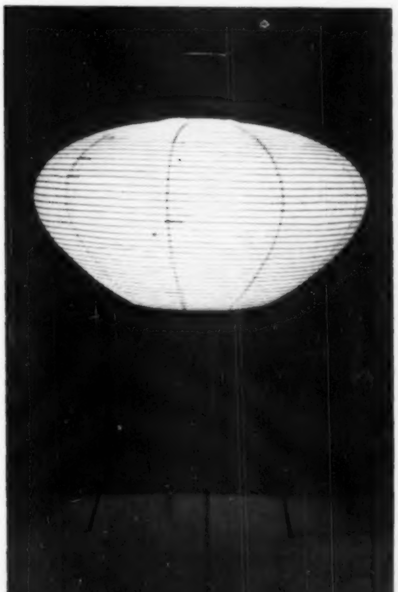
A buyer for a large, medium-price department store was more hopeful about the future of Japanese design. The chief difficulty, he said, is that the Japanese don't recognize the necessity of introducing fresh designs every six months, but, he noted, they're learning. On his buying trips he has to keep repeating, "That's very nice, but what can you show me that's new?" He brings with him sketches made by the store's designers, to serve as a guide to the manufacturers, although he also buys a certain amount of brightly-colored and exotically-shaped china which is sold at a sort of knick-knack stand on the store's main floor. With the current vogue for Oriental decorations, these sell very well. An electric coffee pot of white ceramic is also doing well, following

Lowbrow: an example of the kind of frank imitation to which Japan's only contribution is cheap production methods.



Middlebrow: an example of the pseudo-Japanese product designed to fit the Western stereotype of the Orient.

Highbrow: an example of an adaptation of a traditional Japanese design: Bonniers' Noguchi lamp, with American lighting element.



some initial difficulty, when the Japanese heating elements had to be replaced with American parts.

He is more interested in new design, he says, than in cheapness. (In the store's dinnerware department, however, the least expensive china is that from Japan.) On the other hand, he doesn't want to carry originality too far. The last time he was in Kyoto, an artist-craftsman wanted him to buy some pottery "with an abstract design", and, though tempted, he caught himself in time: "No, I'm not being paid to be a missionary."

Highbrow

The president of a store whose elegant and rather expensive merchandise stands on the border between utility and art paused in a discussion of the influence of Zen Buddhism on Japanese esthetics to brush aside the whole question of copying. Since he is not interested in typical objects, he said, he certainly would not be interested in copies of typical objects. As a matter of fact, many of the things he wanted to buy–mostly original ceramic pieces–were too expensive for him. Even things like fine lacquerware are more expensive in Japan than lacquerware made elsewhere (the same quality of lacquer is unobtainable elsewhere). Not that high prices mean that these objects are profitable to their makers; it is getting harder and harder to obtain them as the craftsmen become rarer.

But as for the other object—the Japanese-made product that has been specifically adapted to American household use–it is always he or another American designer who does the adapting. Lacquered paper and bamboo waste-paper baskets, fan-shaped placemats, wooden salad servers–all use traditional Japanese materials, methods, and motifs, but it took a Western eye to see how they might be used.

Practical obstacles

His complaints? Partly they stemmed from the practical difficulties of communication and from the differences in business methods. Export agents in Japan charge a 25 per cent commission instead of the 10 per cent that is the rule elsewhere, because of the complications of getting goods out of Japan. Freight is enormously expensive, which means that he must be prejudiced against bulky objects which will neither collapse nor nest. Partly he complained about the professional jealousies he encountered on his trip – the touchiness that meant he could not invite one designer to come with him to visit another ones' studio. But, most seriously, he complained of the poverty of contemporary design in Japan, a poverty, he concedes, chiefly attributable to its recent beginnings. He found Japanese designers younger and more enthusiastic than their American colleagues, but with, unfortunately, little to be enthusiastic about. In fact,

[redacted]

[redacted]

he confided, lowering his voice to communicate the intellectual heresy, "The Japanese are phonies."

The opposition's case

The manager of a Japanese specialty store in New York has complaints of his own—all directed at the American consumer, who, he claims, displays unerring bad taste and forces him to stock objects that will satisfy it. The restrained, traditional Japanese designs stocked when the store was first opened did not sell well, and subsequent revisions in stock have been in the direction of American gaudiness. (On the other hand, since everything sold in the store in New York is also sold in its Tokyo branch, gaudiness must sell in Tokyo too.) Although the store speaks of preliminary market research, its activity in this direction seems to consist in observing the kind of souvenirs bought by members of the Occupation Forces on leave in Tokyo. The American firm that manages the store's public relations is also responsible for trying to discover contemporary uses for the traditional Japanese objects the store sells. Often, it says, it is hard put to it. Flashes of inspiration, like putting flowers in a hibachi or magazines in a low music stand, are all too rare.

A hopeful portent

For all the charges and countercharges, there is evidence that, under circumstances conducive to product development, Japanese design can hold its own in originality and in technical excellence. Take the Japanese camera, for instance. In the past few years it has achieved a high reputation for quality, an impressive sales record in this country, and, most impressive of all, it has developed a truly original form. It could be pointed out that there is a fairly long tradition of camera-making in Japan, that this too passed through a stage of imitation, that it utilizes the national talents for precision and hand-made standardization. And, finally, no one who has seen a Japanese tourist can doubt that photography is a Western activity which has become as Japanese as baseball.

In conclusion, we would like to say a word to American buyers. You will get more profit by making use of Japanese good design upon your business. What a pity it is that Japanese credit and her pride are so much injured and let Japanese designers make sad by the fact that they are compelled to imitate foreign goods by the people in a position of customer!

—from a letter from the manager of the design department of a Japanese electrical manufacturer

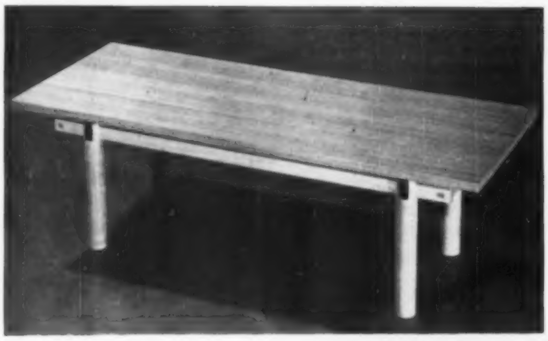
The Japanese government has been the most important force in establishing industrial design, just as it was, before that, the most important force in establishing industry. In 1928, the Ministry of Commerce and Industry set up the Industrial Arts Guidance Institute, chiefly to promote local handicrafts among the depressed farm villages of northeastern Japan. The Institute served as a training ground (and also as about the only available source of employment) for many of Japan's present industrial designers. The emphasis in the beginning was on crafts, and this tendency was encouraged to some extent by the foreign visitors, like Bruno Taut, the German architect, who came to lecture at the Institute and found more to admire in Japan's traditional arts than he found in her new industry.

The administrative office which directs the government's design activity is the Industrial Design Section of the Ministry of International Trade and Industry, established a little more than a year ago and headed by Shin-ichi Arai. Its first problem has been that of design piracy, domestic and foreign. Japan receives about fifty design claims a year from other countries. The government already requires that goods for export be inspected for quality before they leave the country. (Products that pass this requirement receive the "JIS-mark" above.) Beginning next fall, products that fall into categories likely to cause difficulties must also be inspected for possible patent infringements. This follows a pattern already established for textiles and resembles the system used by the private association of pottery manufacturers.

More positively, the government also issues a "Good Design" label (above), awarded to export products selected by the Committee of Design Promotion, an advisory group of private designers. (Designers not on the committee point out that the first selections were weighted heavily in favor of the committee members' own designs.) MITI has also set up a permanent exhibition center for handicrafts, called Craft Center Japan, and will shortly open a Design House to display Japanese industrial products.

Foreign exhibitions of Japanese products are usually

The designs on this page are the work of the government's Industrial Arts Institute. Some of the designs, principally furniture, are undertaken at the request of other government agencies for their own use. Some are prepared for exhibition abroad at government-sponsored trade shows. Others are intended to serve as prototypes for private manufacturers, and are often the result of a specific petition relayed from the small manufacturer to the IAI through an intermediary trade organization. The process is cumbrous, however, and as much as five years may elapse before the manufacturer receives his design. The baskets and the bowl are examples of the IAI's attempt to prepare modern designs for traditional techniques.



handled by the Japan Export Trade Promotion Agency, which also conducts a certain amount of market research abroad. Its expositions, however, have not met with a great deal of success. Partly, American buyers complain that they are unable to secure enough of such elementary information as price and delivery date. More than that, however, they have too often found the designs themselves disappointing. To remedy this, at least in the field of arts and crafts, JETRO has invited a number of American designers to visit Japan to inspect existing handicrafts, advise modifications, if necessary, and help set up distribution channels in the United States (the Russel Wright plan.) JETRO's announcement of this sounds a little like Cinderella waiting to be discovered by her fairy godmother: "American design experts will be called upon to uncover obscure, but worthy, Japanese designs."

The government has also invited a number of American designers to act as touring consultants to manufacturers. In some cases they need do no more than explain puzzling facts of American life. One designer was approached by a man whose factory turned out several thousand salad bowls a month. He wanted to know what Americans did with these containers. Another designer will make no predictions as to the success of his recommendations: in several cases his suggestions met with cries of congratulations mingled with murmurs at the strange coincidence. It seems that one of his colleagues, who had made a similar tour a year earlier, had criticized those very same points.

Gordon Chadwick, of the George Nelson office, spent three weeks early this year visiting what he concluded dizzily must have been every single furniture manufacturer in Japan. These, he found, are divided into two categories: makers of expensive custom furniture, at present for the Japanese market only; and manufacturers of mass-produced furniture for both the domestic and foreign market, of very much lower quality and workmanship than the custom furniture. These are basing their appeal to the American market on their ability to fill orders–usually comparatively small orders–at very low prices. Basing his recommendations on the argument that Japanese ability to compete on this level is handicapped by agent's fees, import duties, and shipping costs, Chadwick urged the manufacturers to compete on a different level: one of higher quality and individual design. In his opinion, the position of the designer, underpaid and undervalued, is responsible for Japan's failure to produce a distinctively national furniture style. Furniture designers themselves, he found, where they existed, were inclined to underrate their own tradition of lightness, simplicity, and a feeling for the natural form of wood. Instead, they have been working their way through Western styles and are now in their Bauhaus period.

The government maintains extensive consulting services of its own. Its original emphasis on local handicrafts continues in 150 prefectural laboratories scattered throughout the country. MITI directs two research institutions, the Nagoya Industrial Technological Laboratory, for research in ceramics, and the Industrial Arts Institute in Tokyo. Although nominally a research institute, it serves also as a consultant office, and also, its critics claim, as a source of free design. Under pressure from the designers' associations, it has withdrawn somewhat from its consultant activities, but its members still prepare the prototype designs for many of the government-sponsored trade shows. Its bulletin, *Industrial Art News*, directed to designers, manufacturers and retailers, is concerned less with design philosophy than with a review of specific products, some of them the work of the IAI, many of them foreign, and, complete with specifications, presumably up for grabs. Designers employed by the IAI find it difficult to maintain their private practices and become in effect full-time employees.

In contrast to the government's bulky design organization, the private design associations are many, small, and comparatively weak. Some of these were originally formed for specific occasions; the Japan Design Committee, for example, was formed just before the Milan Triennale and received some government support in its preparations for it. Another group is presently making plans for a World Design Conference in Japan, on the pattern of Aspen, to be held in April, 1960. Its Preparations Committee, which includes Isamu Kenmochi, Riki Watanabe, and Sori Yanagi, three of Japan's best-known designers, has begun to circulate preliminary inquiries and schedules among foreign designers.

A number of independent designers belong to an association called the Japan Committee on International Design, but the largest industrial design group is the Japan Industrial Designers' Association, founded in 1952 and said to be patterned rather closely on the ASID. Its membership and interests are centered largely in Tokyo. It has at present 54 regular members: one government official, 11 teachers, 25 consultant designers, and 17 company designers. Besides this it has 21 associate members "who are interested in I.D. and want to be industrial designers in future." A number of manufacturers "of understanding" act as sustaining members. The association defines its most urgent problem as that of strengthening cooperation between designers and small industry, which until now has been disinclined to spend either money or time on the design process. JIDA's official pronouncements have disclaimed any desire to model Japanese design on the American pattern, which does not, it says, according to the association, suit the demands of actual production facilities in Japan.

An American designer reports on a group of company departments and the products they design

The organization of industrial design departments within manufacturing companies is a very recent innovation. In 1957, and again in 1958, Alfred Girardy, a consultant to the Russel Wright office for this purpose, visited Japan under the sponsorship of the Japanese government and the Electrical Industry Association. His report to the ICA can be read as a kind of eye-witness account of the company design department in its formative stage: the point at which the company's management was persuaded, often reluctantly, to produce their designer from a back room and listen to what he had to say.

Girardy's professional qualifications included a spell as Manager of Design and Product Development at Westinghouse, a similar job at Montgomery Ward, and fifteen years of private practice. He spent about a month in this country preparing for his assignment: writing his lectures and having them translated into Japanese, drawing up charts illustrating operating procedure in design offices and departments, and in general assembling his props and developing the details of his routine.

Electrical manufacturers are among Japan's largest industries. The two whose products are shown opposite, Toshiba and Mitsubishi, were both developed originally with government money. Most of the companies that Girardy visited (he visited 13 in all) were large enough and Westernized enough to be capable of organizing and maintaining an industrial design department, and Girardy devoted his efforts largely to that end. His tour was a comparatively leisurely one, at least on paper, since he could spend a week or more with the larger companies. These had so many branch factories, though, that the tour itself added up to a good deal more than 13 visits.

Typically, his tour would include a preliminary and ceremonial session with management, a tour of the plant, a lecture on the place of design in modern industry, and a film-showing to prepare an informal atmosphere for the question-and-answer period which followed. This was one of the most difficult parts of the program, since the designers present felt themselves on a much lower level than management and tended to be diffident in venturing opinions or even questions. Finally, Girardy delivered very specific product critiques–critiques which were received considerably more eagerly than his more general advice.

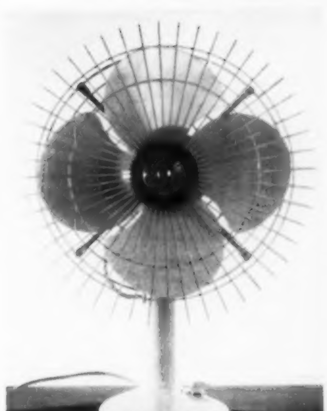
He attributes the unsatisfactory position of the company designer in Japan to a number of factors, all a result of misunderstanding what an industrial designer is. (On Girardy's first visit, for example, the highest echelons at Mitsubishi were unaware of the existence of their own design department.) Until very lately, product appearance, where it was given any attention at all, was the work of anyone who showed a flair for it and could be spared from his other duties. Generally, it was someone who ranked low in the social hierarchy and consequently in the factory hierarchy. In rare cases, a painter, sculptor, or professor of esthetics might be consulted.) Only recently have departments begun to hire university graduates–there have of course only recently been university graduates to hire. These, however, are generally not nearly so well-trained as the engineers with whom they are grouped. They usually receive a year's training with the engineers in order, as one Engineering Manager puts it, "to learn common sense." Their own attitude is often that they are definitely not engineers, and they may wear berets to prove their Beaux-arts heritage. The new designer is immediately put into the union with the engineers and takes up his residence in the factory compound–in a company house, or, if he is single, in a dormitory. (Despite this regimentation, almost none of the young designers with whom Girardy talked showed much interest in establishing private practices. And changing from one company to another is, he says, unheard of.)

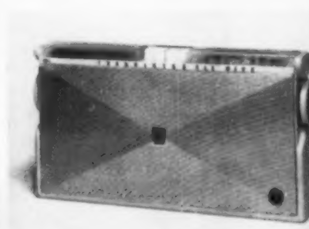
The follow-up

On his second visit, eight months later, Girardy was pleasantly surprised to find that many of his suggestions aimed at improving the status of the company designer had borne fruit. Several companies had begun to expand their departments and, more important, to listen seriously to the designers' recommendations. On the other hand, Girardy feels, there is still no real comprehension of the meaning of market research, and product planning is, in consequence, rather haphazard, so that designers tend to devote their energies to a great variety of random modifications of an existing pattern. Another result of this deficiency in market research is the huge inventories that many companies maintain at considerable financial strain—inventories so huge that some products may have become obsolete before they reach the distributor.

As for the products themselves, Girardy emphasizes, he was never dissatisfied with the quality. Most of the products he inspected were not available on the American market; ironically, he concluded that their high quality and consequently their high cost would probably keep them out of this market. His suggestions were directed largely to reducing the cost of the appliance by eliminating unnecessary hand work or needlessly expensive materials. Many of his question-and-answer periods were devoted to eager discussions of the American discount house; Girardy feels it will be a long time before the Japanese are prepared to compete with American products designed for quick-and-easy obsolescence.

Alfred Girardy delivers an animated lecture, casting aside formality in his zeal to communicate. The translator is Hiroko Suzuki, whose ability to throw herself into the spirit of American design has impressed a whole series of visiting industrial designers.





Above are three representative products of the Mitsubishi Company, whose industrial design department was organized in 1954 with a staff of seven. It now has twenty members, directed by Y. Maeda. Products shown here are intended for sale within Japan. The washer, much smaller than a Western model, has a control panel that shows a certain American influence. The fluorescent lamp, comparatively inexpensive to manufacture, contains a typically Japanese decorative motif.

One of the largest of the electrical manufacturers Girardy visited was Toshiba, whose design department was established in 1953, and some of whose products are shown above. It now contains twenty designers, directed by Takeshi Watanabe. Toshiba was the first to introduce the rice cooker, above, designed by Yoshiharu Iwata, an invention which is said to have been the salvation of many Japanese marriages. The solidly-constructed fan is equipped with plastic blades.

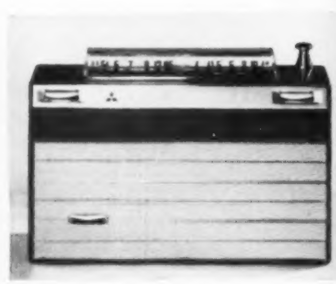
Japanese design and designers show an emerging self-confidence in a variety of handsome products

Microphone "Primo," designed by Jyunnosuke Kawa, of KAK Industrial Design, Ltd., for Primo Sound, Inc.

Motorbicycle (125 cc) designed by Raykichi Yura for the Meguro Manufacturing Company, Inc.

Minolta camera (35mm), designed by Yoshio Akioka, of KAK Industrial Design, Ltd., for Chiyoda Kohgaku Seikoh Company, Ltd.

Pick-up truck "Jupiter," designed by Tokujiro Kaneko for Shin Mitsubishi Company, Ltd.



Transistorized radio; staff design of the Mitsubishi Company.

Fluorescent lamp designed by Kyushichi Miyajima for Shinko Lamp Company.

Crystal vase designed by Masakichi Awashima for Shizuku Glass.

Toyopet Master 197, six-passenger car designed by Louis Sugahara.

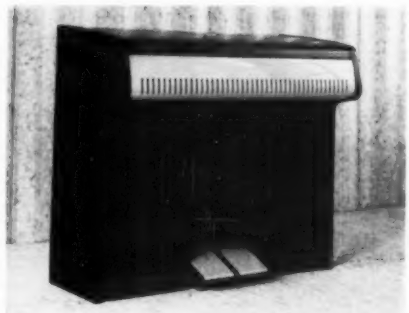
Cercline fluorescent lamp, fiberglass shade and iron legs, by Toshiba design staff.

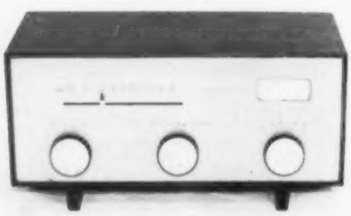
Coating gage designed by Jyuonnosuke Kawa, of KAK, for Densoku Kogyo Company.

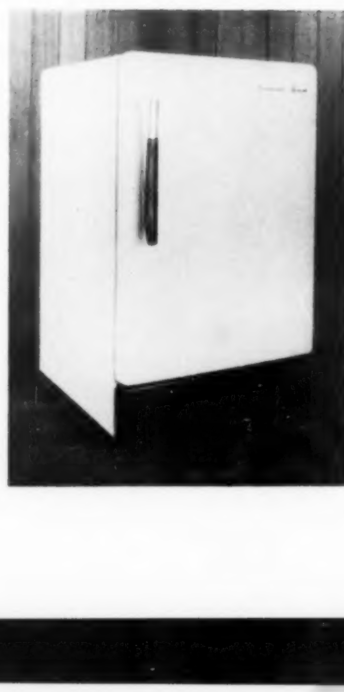
Blender by Yoshikazu Mano for Matsushita Electric Company.

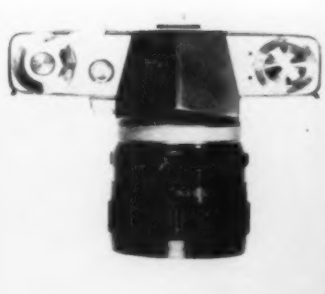
A group of products by GK shows the work of one of the few large design offices in Japan

Most of the large and cheerful young group on the page opposite are former students of Iwaturo Koike (see Contributors, page 8), a teacher of industrial design at Tokyo University of Arts, who now acts as advisor to their design office. The products shown on this page are all team efforts: the bicycle design and the organ were directed by Ekuan Kenji, the tuner and the camera by Iwasaki Shinji, the refrigerator by Shibata Kenichi.









The GK design staff

The independent designer in Japan is a rare animal and he has to work hard for survival. Larger enterprises usually prefer to train and maintain their own design department; smaller manufacturers cannot afford a designer's services, especially when they can get these services from the IAI for nothing. There are a few large design offices like the GK group above (GK doesn't mean anything; the members just liked the sound of the initials) or the KAK group, whose work is shown on the preceding pages; but most consultant designers work alone. Even the larger offices are more loosely organized than American offices. It is not unusual, for example, for a staff member to have a number of accounts of his own, sometimes even accounts in competition with products designed by his office. And every designer, whether he works in a group or alone, must be versatile, since specialization is virtually unknown. Recently a young consultant who had designed an electric meter for a large manufacturer was asked by the satisfied company president to design a complete houseful of furniture for the president's newly-married daughter.

The older men who are now established designers in Japan received their professional training long before industrial design was taught or practiced, and they are, consequently, mostly self-taught. A number of them were trained as architects, others are products of the crafts revival of the '30s, and still others were originally painters or sculptors. None has a technical background. Many of them got their start in industrial design through jobs in the IAI, which served not only as an empirical training ground but also as an introduction to future clients.

Fukuji Suzuki's career, if not typical (there are so few consultant designers that no one of them can really be called typical) is at least illustrative. Suzuki is widely respected as one of the soundest–albeit one of the most conservative–designers in the country. He was graduated from Chiba University–then an arts and crafts school–35 years ago and immediately entered the furniture department of the largest Japanese department store. After a few years he left and worked in a number of architectural offices in order to learn more about interior design. In 1939 he opened an independent office: badly-timed, for Japan was in the midst of the war with China, and the passenger ships whose interiors represented most of his design activity were all sunk and his embryonic "industrial art and craft" practice failed. During the war he suffered many personal hardships, and did not revive his practice until some years after the war, when he built a small house on a burned-out airfield and again opened his design office. Until recently, he had to accept the smallest jobs that came his way.

Now he has 14 fairly regular clients (with several of them he has no formal agreement.) He also acts as consultant for Wood Furniture Mutual Sales Union, a group of sixty very small furniture makers. In the past two or three years he has designed the interior of an express train (see page 55), radios, watches, bank offices, trademarks, and the label for a box of matches. Occasionally a company employs him to organize its design department—he has passed a government examination qualifying him to do so. Besides this, he lectures twice a week at Chiba University, and at the request of the prefectural government of Iwate is directing an investigation to determine whether the wooden chests which are a local handicraft are adaptable to the modern market, which means, also, to the export market.

The way of the beginning designer is certainly smoother than it was for his elders, but it is still comparatively difficult for him to get an education. If he wants to go beyond the high school level, he can take the entrance examination for the Engineering Department of Chiba University, which has 15 full- and part-time instructors in industrial design, or for the Fine Arts Department at Tokyo University of Arts, which has six instructors divided among graphics, industrial design, and crafts. These facilities are inadequate for the number of students who are interested in design; at Chiba, where 120 students are enrolled in the department, six out of seven applications for admittance are rejected. (Chiba has, however, recently opened an evening course in industrial design, taught by Michitaka Yoshioka, whose graduate work at the IIT Institute of Design was reviewed in ID last November.) Professor Shinji Koike of Chiba, who, although he is not a designer, has been called the most influential figure in Japanese industrial design, has persuaded MITI to dispatch a Design Education Study Team to the United States in 1960.

Dr. Koike agrees with his colleagues at Tokyo University of Arts that it is comparatively easy for a young designer to get a job in Japan. Students try first for jobs with large industries in Tokyo or Osaka, partly because there they can get the technical training they need. Of the 116 industrial design students graduated from Chiba since 1953, the largest number (35) have gone to work for manufacturers of electrical appliances. The next largest group (29) went into advertising agencies, and ten into transportation. Only four found jobs in design offices.

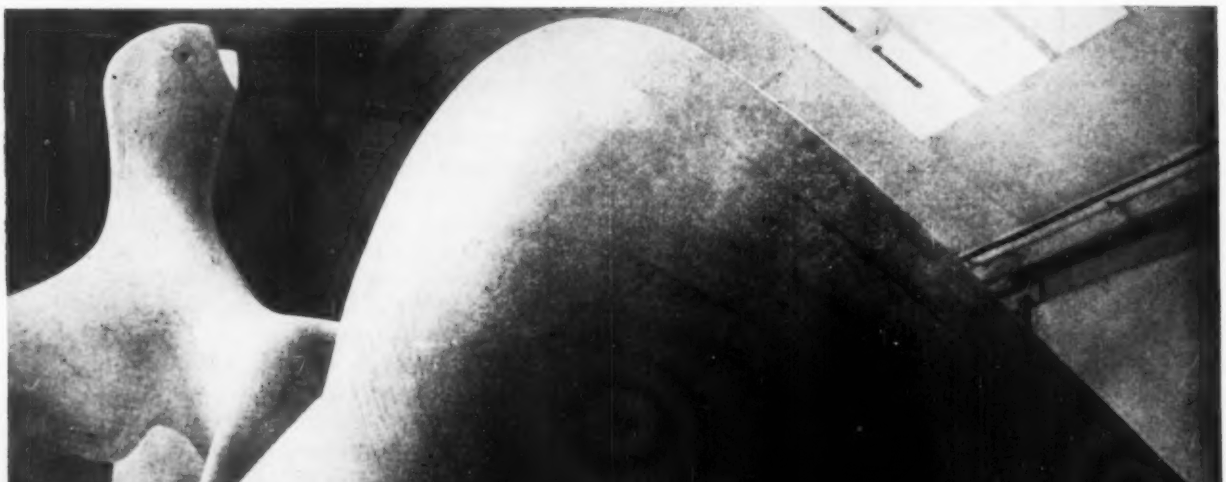
There seems to be general agreement, in a field where agreement is hard to come by, that what the Japanese industrial designer needs is more technical knowledge and a greater familiarity with the resources of his own tradition. More than that, he needs the courage of his convictions–convictions which are justified by the designs shown here and on the preceding pages.

SOME MODERN APPROACHES TO THE PROBLEM OF FORM

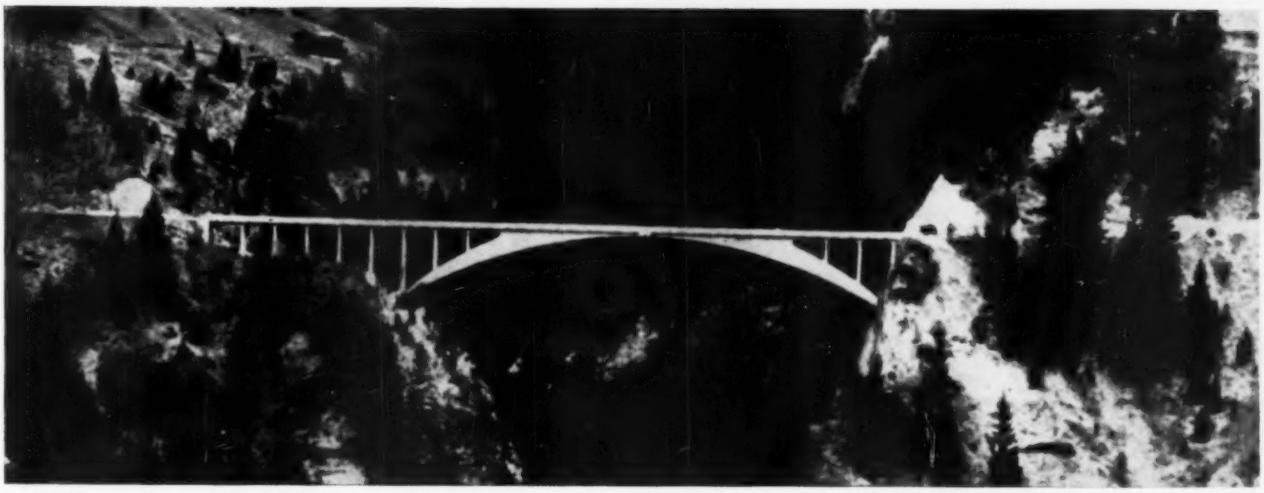
The designer's expression of dynamic tension can be seen in contemporary sculpture, buildings, bridges, and in the products of industry

by DR. DIETER OESTREICH
Translated by Edith Gilmore

Leslie Caron



Henry Moore: "Liegende," 1951



Robert Maillart's Salginatobel Bridge

A striking feature of modern art is its tendency to consist of forms in tension. In contrast to the techniques used by artists of earlier eras—who tried to make each work internally stable, completely harmonious—artists today try to remove weight and solidity, to negate tectonic elements, to dematerialize a work. These aims, conscious or unconscious, result in works whose tensions hold them in a state of balance or suspension within a given force field.

In the twenties El Lissitzky demanded that all architecture incorporate these tendencies: "We have conquered the foundation; we are no longer bound to earth, but these achievements are not enough. We must overcome gravity itself, create hovering forms and a dynamic architecture."[1]

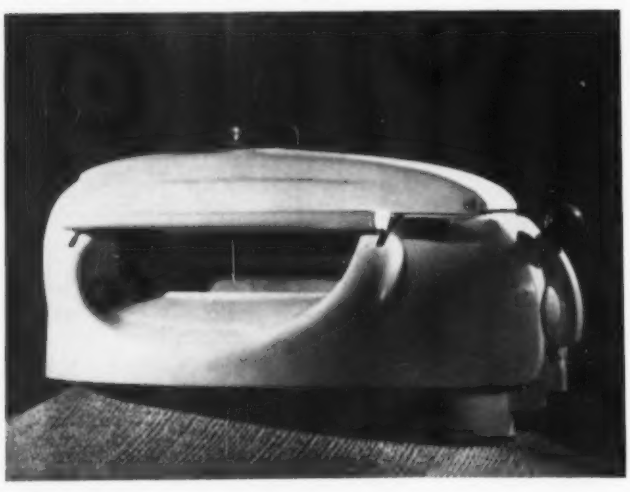
And architectural ideas have, of course, changed. Witness the fact that it is now the frame of a house that bears its weight, rather than the walls. Inner walls are now no longer inevitably used to limit and define rooms; often they are replaced by glass, the most "immaterial" of all building media. All kinds of rational, practical theories have been evolved to show that a building ought to "hover" on its supports—a complete reversal of all classical concepts of supports and the weights they carry. Pillars were once thought of as a base, as a portion of the foundation, but they now belong intrinsically to the building they carry. Le Corbusier, for instance, stresses this new conception by ornamenting the lower parts of the pillars of his house in Marseilles. This house could be raised from the ground only as a unit, a whole, its "legs" included, whereas a Greek temple would have to be taken apart, piece by piece.

In pictorial art there is a parallel tendency to depend simply on pure outline and graphic framework; forms are abstracted to produce an effect of flatness; the artist, that is, abandons the depth-illusion which has been a basic aim of painting since

Le Corbusier's Marseilles apartment house

Swiss watchmaker's tool

Dethen washing machine and wringer



the fifteenth century. The trend away from depth-illusion reaches its peak with the pure color and line of non-objective painting.

Though painting and architecture show similar trends, the same does not hold true for modern sculpture, a field in which we find an enormous range. At one end of the continuum we might place Maillol's static, constructed works. (Although he is no longer alive, he belongs to the same generation as Despiau, Barlach, and others. There are not many representational sculptors of significance alive today.) At the end of the scale furthest from Maillol we might place Calder's mobiles; since they not only hang, but move, they represent the greatest possible release from the static.

The variety and contrast of modern schools of sculpture can be accounted for by the fact that there has been a shift of interest away from the physical appearance of human beings. The human body was once the chief, almost the exclusive, stimulus that set a sculptor to work; and it was used as a symbolic expression of certain values and ideals. This kind of symbolic expression, however, has been replaced by a need for a psychological or metaphysical expression of man and his role, (Klee's *urbild*) and here the sculptor's difficulties begin. It is futile for him to cling to the sculptural idiom of an era gone by; but equally unsatisfactory is the reduction of man to a few bits of welded metal. Contemporary sculptors, it is interesting to note, often use animals as models, and use them, moreover, in works that aim at arousing strong emotional responses in the viewer. A sculptured animal can express such qualities as courage, intelligence, dignity, strength, power, and mystery. Also, of course, an animal's body can be more completely and satisfactorily abstracted than a human body, since in people the essence of the personality is chiefly mirrored in the face. The difference is clear if we try to picture an animal bust; where such exist they usually represent a species or a characteristic of a given species.

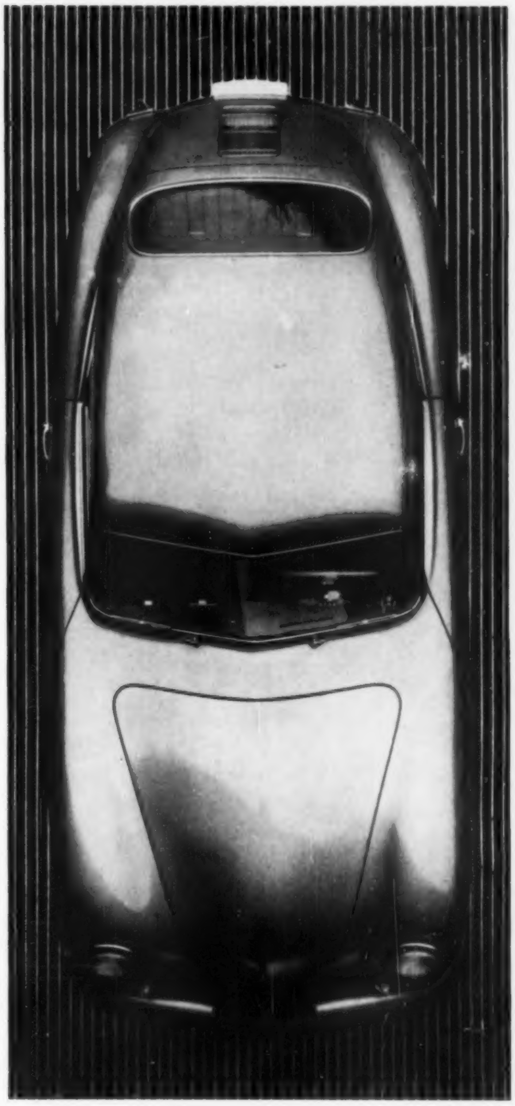
Even Henry Moore, whose works express so much of the quality of contemporary life, cannot successfully use the human body as a model. When he does so, his creations, insofar as they depend on theme, carry no conviction. He is so "obsessed by the material, and the relations of inner and outer form .... that he ignores content. He makes mobile our reactions to form."[2] His abstract works are "forms in space which allow the viewer's imagination, if it is capable of making associations, to envisage every possibility."[3] Because these sculptures are not bound by form they achieve a strong, elementary power. Moore does not, in fact, need any suggestion of the human in his work to give it organic warmth and breath. His forms are thrillingly dynamic, full of plastic tensions. They do not swell; rather they are like a skin which fits tightly on a "piece of pulsing life." It would be impossible to break or cut into one of Moore's forms without leaving a gaping wound behind. Under the taut surface, however, one senses the frame which supports it, and the frame is an integral part of the whole. It often happens that these sculptures touch the base only at a few points; the dynamic tensions in each separate part (and in the relations of the parts to each other) make them non-static, like modern painting or architecture; yet they are static, according to Moore himself, "in that the center of gravity lies in the base."

The field of industrial design has recently displayed some of the characteristics that we find in Moore's work. Three-dimensional art, like two-dimensional, tends to express the feeling of an era. That is, non-objective sculpture and well-shaped products of industry are akin to each other in the strength of expression common to both. (It is interesting to note in this connection that while architects used often to do sculpture as a sideline, today they often devote some time to industrial design.)

The new feeling for form found its first expression about the turn of the century in *art nouveau*. Konrad Lange demanded that form be used to give independent organic life to dead material, to make material live, strive, grow. New concepts and phrases appeared: "gripping, muscular arms," "swelling limbs," "living organisms." Decades later Henry Moore formulated these tendencies: "When the sculptor understands his material, has a knowledge of its possibilities and its constructive build, it is possible to keep within its limitations and yet turn an inert block into a composition which has a full form-existence, with masses of various size and sections conceived in their air-surrounded entirety, stressing and straining, thrusting and opposing each other in spatial relationship—being static in the sense that the center of gravity lies within the base (and does not seem to be falling over or moving off its base)—and yet having an alert dynamic tension between its parts."[4]

The trend to organic plastic tensions was (except in the case of Antonio Gaudi) at first expressed in somewhat meager, non-muscular works. And before it was well under way, it was violently counteracted by New Functionalism, a contemporary and highly influential school of thought with a completely different concept of form and its functions. Geometric forms, stress on the skeleton, smooth surfaces—these are the characteristics of the new trend in design which found its first significant expression in buildings by Adolf Loos and Gropius, and this emphasis on constructed, sharply angled shapes spread rapidly into other fields. Its influence, in fact, was never seriously challenged until the discovery of streamlining, a principle anticipated and applied by such designers as Loewy and Teague in the field of automobile design. Though streamlining was evolved at first for functional reasons, it soon developed its own esthetic laws and resulted in closed, plastic, "planed" forms.

We thus have three approaches to the question of form, the muscular-dynamic, the rectangular-cubical, and the plastic-rounded. For years they existed side by side, sometimes as antithesis, sometimes neutral with respect to each other. But since the war there has been a tendency toward a syn-



Porsche

Olivetti Lettera

thesis; a framework can be sensed under the plastic forms, giving them a feeling of construction; taut surfaces have become elastic, like a dancer's closely-fitting tights. This new plastic quality, it should be remarked, has nothing in common with the mobile, swelling quality of baroque art; on the contrary, it is austere, slender, controlled. The difference is that between a Reubens woman and the athletically slender–not bony–ideal woman of our own period.

The Museum of Modern Art in New York chose one of the best examples of the new feeling for form when the Museum's collection of industrial products was begun with the Olivetti typewriter. It is not surprising that the designer's name, Marcello Nizzoli, should be Italian, for Italy has, of course, a long tradition of sensitivity to plastic expression, and the influence of Italian design has been strong since the end of the war, particularly with regard to cars; witness the superbly designed automobile bodies of Pinin Farina, Ferrari, Ghia, and others. In its "Ten Automobiles" exhibit, the Museum included the Porsche, one of the best examples of modern design, a car which has a look of race and elegance, like a carefully bred animal.

The forms of many modern objects, considered simply from an optical point of view "release joy in the viewer's tactile sense."[5] This is no platitude, as is proved by the fact that blind people took great pleasure in feeling Henry Moore's sculptures with their hands when his works were exhibited in Dusseldorf after the war.

Almost all materials used in mass production today – metals, glass, plastics – are amorphous in structure. Such materials have no inherent tensions; they can be poured, pressed, extruded, welded without seams, etc. Often they must be made into very precise forms, capable of withstanding pressures or offering minimum wind resistance. These characteristics mean that such materials meet modern ideas of form halfway. Nature, of course, has long since evolved her own functional organic shapes; the most famous example is the egg shell, made to slip easily through the hen's body and able to withstand enormous pressure. Likewise, a tendency to organic form is immanent in many industrial products, as we see by the evolution of the car from its original box shape.

For architectural and engineering construction there is also available a new amorphous material—concrete–which lends itself well to modern experiments with shape. The pillars of Le Corbusier's Marseilles house are braced against the ground like human legs.

And concrete combined with steel has opened up completely new technical and esthetic possibilities. These have not yet been thoroughly explored, though Robert Maillart's subtle, beautiful bridges are examples of what a master hand can accomplish. In them a particular quality of the concrete finds its perfect expression; the attraction of the bridges is actually based on the fact that it is impossible to tell by looking where the steel supports are: the strength of the bridge must be "felt" into it. A layman is often not able to do this, and so tends to dislike modern constructions. Luigi Nervi, an Italian engineer, is like Maillart in his unconventional use of steel and concrete, and some aspects of his work resemble, oddly enough, the organic ornamentation of *art nouveau*.

The turn from the rationally constructed form to organically-grown and irrational shapes is becoming more and more evident, especially in the work of young designers and artists everywhere. Reason and science, which in any case have already pushed on to the borders of the irrational, are beginning to lose the basilisk-like attraction which they have exercised for so long a time. Man, shivering in the cold of abstract conceptualization, seeks a path out of the crystalline world he has built for himself. Ortega y Gasset observes: "We shall see, in fact, that life will not allow itself to be pushed aside.... we are confronted, therefore, with a dark, new crisis. Pure reason and science arose to combat revelation; but life itself, that is to say vital reason with all its claims to rule, now combats pure reason. . . . It is interesting to note that it is almost always the same area of life in which a new faith first begins to stabilize itself, namely in art."[6]

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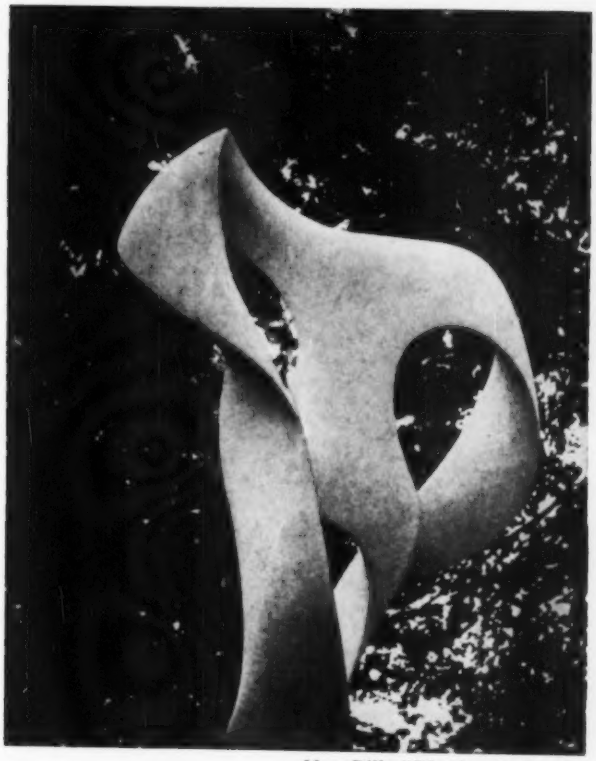
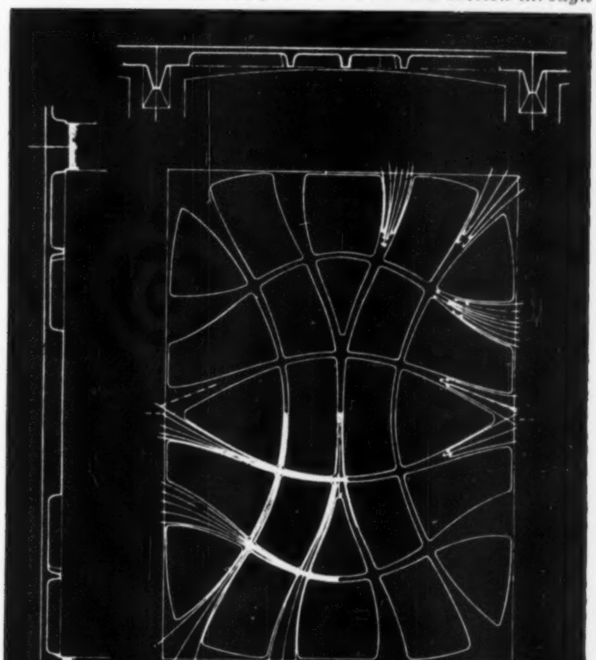
1. El Lissitzky, "Die Überwindung des Fundaments . . . in Neues-Bauen in der Welt": Russland, editor El Lissitzky, Vienna, 1930.
2. WERK, 1950, Vol. 8. Translated from a discussion of the Moore Exhibition in Bern in 1950.
3. Ibid.
4. Henry Moore, cover of exhibition catalog, Kunsthalle, Bern, 1950, Switzerland. Exhibition sponsored by British Council, catalog printed by Percy Lund, Humphries & Co., London and Bradford.
5. Hermann Obrist, "Neue Moglichkeiten in der bildenden Kunst," Leipzig, 1901.
6. José Ortega y Gasset, Das Wesen geschichterlicher Krisen, "Esquema de las crisis y otros ensayos," Madrid 1942.



Max Bill: "Rhythm in Space"

Luigi Nervi: Plan and section-through



Statue for playing on up in central park

Photographed by Matilde Lourie

Jose de Creeft's Alice in Wonderland employs principles applicable to the design of toys and playground equipment

For a number of years the official position of educators and psychologists towards children's play equipment has tended to run counter to the phenomenon that occupies this and the following pages. A child's play, according to modern concepts, should be conducted with materials whose form and surface hide their meaning in abstraction so that the child can make of them what he will —and in the process develop his own creative instincts. This makes good theory, and there is no gainsaying that it works out well in practice, too. Also, it has produced some extremely handsome toys and playground equipment. But it does seem possible that adults may have been overly concerned about the repressive and limiting aspects of representational objects. Children are forever confounding their elders: their world is not always what we think it is, and their responses not always what we think they will be, and nowhere is this truer than on the delicate point of what constitutes the real and the imaginary. To surround children with depersonalized abstractions may be a well-meaning but unnecessarily protective projection of the grown-up world's troublesome associations with reality.

The photographs in this folio, which seem to support this slightly heretical view, are of Central Park's newest statue, Jose de Creeft's sculpture of Alice in Wonderland and the Mad Hatter, the White Rabbit, and the

(Continued on page 80)

"There are nice places and dangerous places under these mushrooms . . ."

Children's comments describe Alice as everything from a ladder to a friend

"Her hand is like Mommy's, and her hair is just like Janie's hair!"

"The clock is all mixed up, it's in Roman numerals and it's the wrong number."

"How did this caterpillar get so big?"

*"I am climbing to the top of the world and Alice is helping me . .
I can put my foot on the bow at the back of her dress."*

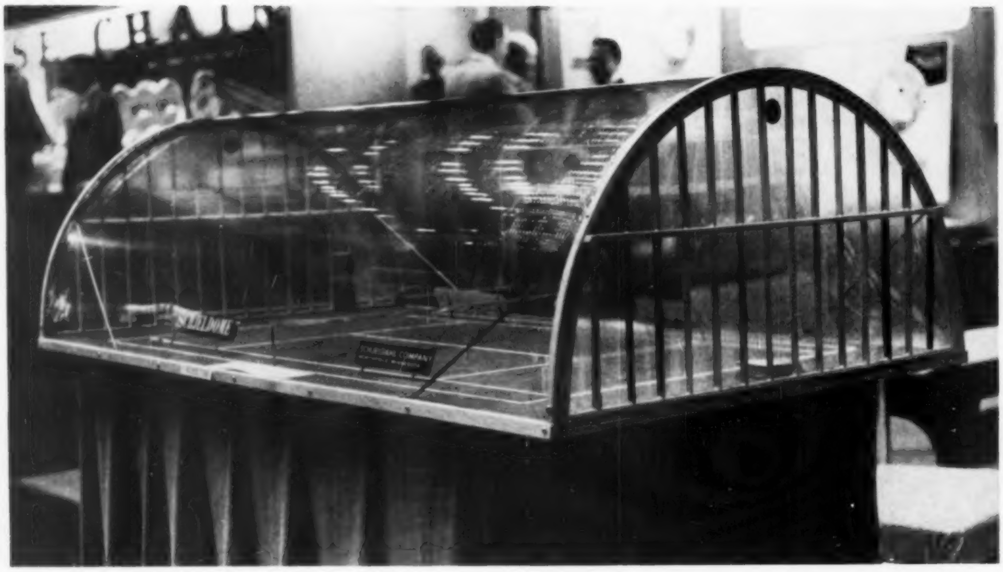
*"I found a cat up here and
I am going to give it a bath."*

"It's as big as a table! Let's eat our lunch up here."

Chesire Cat. There are also some other creatures whose inclusion is a matter of artistic license. The group is a gift to the children of New York from George Delacorte, Jr., in memory of his wife. It sits on a low rotunda in a ring of trees just above Conservatory Lake. De Creeft has deliberately designed it with appealing textures and outcroppings and secret nooks that are an open invitation to exploration, which, in itself, is a departure from the usual purpose of a statue. To the children, Alice is a "real" person, if larger than life; she sits amid a clump of recognizable mushrooms. And from mid-morning until dusk on any clear day, she swarms with whooping, chattering children.

The captions that accompany the photographs are the children's own comments, drawn from the term papers of a group of Finch College students who were sent by their instructor, Mrs. Virginia Downsbrough, to "observe how children used the statue" as the concluding assignment in a course in nursery school methods. What they observed seems useful to anyone concerned with the problems of designing for children. As the pictures and the captions indicate, children "identify" with the statue, take liberties with it, and create situations from it that are different in spirit from those suggested by abstract play sculpture. In Mrs. Downbrough's words, "There is something reassuring about Alice's human form, an implicit safety in her reality.' "—B.D.

"Are you under there? No, we're up here . . . I am in a jungle . . . I am on top of the world . . . Give me a hand, Alice . . . This is what I really call getting lost, every day getting lost here, just having a nice day of our own."



The Dobeckmum Company *featured a model of a tennis court enclosure constructed with a special polyethylene film lamination. This fire-proof structure, made by the Schjeldahl Company, Northfield, Minnesota, is kept inflated by air pressure at only* 1 *psi higher than prevailing atmospheric pressure. A full-scale version of the model would cost roughly* $5,000. *This is* $30,000 *to* $45,000 *less than a glass building of the same size. In addition to the low construction cost, the "Schjeldomes" require less heat than a conventional enclosure, as the transparent plastic roof does not reflect the rays of the sun.*

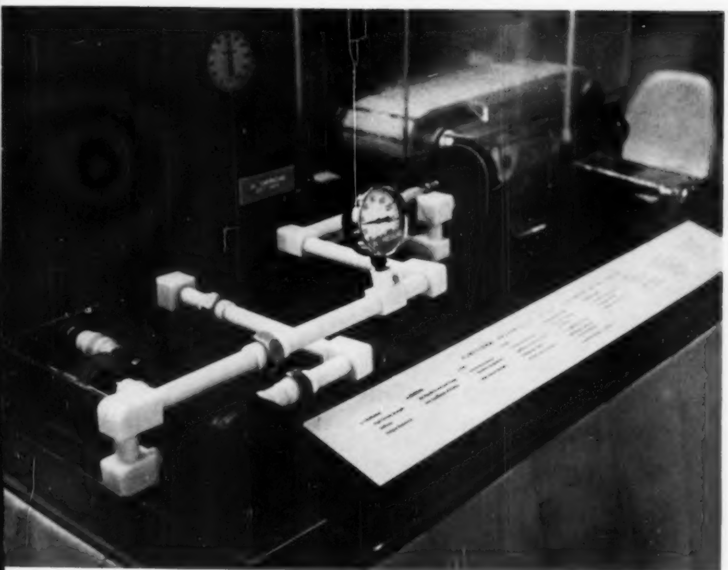
DOES BIGGER MEAN BETTER?

The fourth Design Engineering Show poses the question of whether a trade show's success is measured by its size or by the amount of useful information imparted to its visitors

Philadelphia's Convention Hall resembled a huge Babylonian bazaar late in May as the fourth Design Engineering Show returned to the city of its 1956 premiere. Four hundred companies set up their booths on the floor space where presidents have been made – the anointed few between the basketball nets on the air-conditioned first floor, the rest strung nearly into South Philadelphia in the sweltering, cavernous basement. Over $10 million was poured into the various exhibits (many of which were guarded by company employees wearing multi-colored bandsmen's jackets and wilted smiles), as visitors tramped over 125,000 square feet of auditorium to view 12,000 components and a profusion of numbered and trademarked materials.

But for the industrial designer, the overall effect of the show was disappointing. Several stated (while bathing their feet in epsom salts) that professionally they were more attracted to the quality of the booths than to the products or materials on display. As usual, the aluminum companies had striking exhibits; so too did U.S. Steel and U.S. Rubber. The fiberglass-reinforced plastic parasols looming over the Owens-Corning Fiberglas booth daily drew thousands of visitors interested in getting a preliminary peek at one type of shelter now being set up at the American Exhibition in Moscow (ID, April 1959). However, there was generally little design innovation in evidence, and designers complained of the absence of styling in most of the industrial components. There seemed to be no harmony between the engineering and the design of a product; it was in fact almost as if the various motors, valves, and regulators had been styled as an afterthought. Fasteners, finishes, and graphics (logotypes and nameplates) too often warped rather than blended with the natural linearity of a product. The Design Engineering Show, in short, is well named; design here is a most subordinate modifier to engineering.

Many companies showed products or materials for which they saw no immediate application, largely in the hope that designers and engineers would see some. Attracting wide interest was a "do-it-yourself" kit introduced by Overseas Commodex, Inc. of Detroit. The kit—virtually an erector set for engineers—contains gears, shafts, drive belts, and similar components–150 elements in all–to permit the designer to assemble a prototype of almost any kind of mechanism, thus eliminating expensive drawings and models. The 4700-piece-large kit sells for $400. Kaiser Aluminum and Chemical Company showed a model of an all-aluminum car styled by Kaiser engineers to suggest to the automobile manufacturers the practical application of aluminum in tomorrow's cars. Similarly, Armstrong Cork Company was exhibiting



DuPont's *Delrin acetal resin is being tested in an extensive field evaluation program. The new polymer has a low coefficient of friction, resists solvents, has dimensional stability, and recovers from deformation. It can be used for bearings and cams.*

Minnesota Mining's *Scotchweld film adhesive bonds supporting members and leading and trailing edges of helicopter blades. The use of this film adhesive increased the life of the rotor blade 90 percent over previous riveting methods used.*

Eastman Chemical's 901 *adhesive can be used to bond either metallic or non-metallic materials. This adhesive is a chemical which reacts within itself and causes the adherends to bond together during this process of inner reaction. It is colorless.*

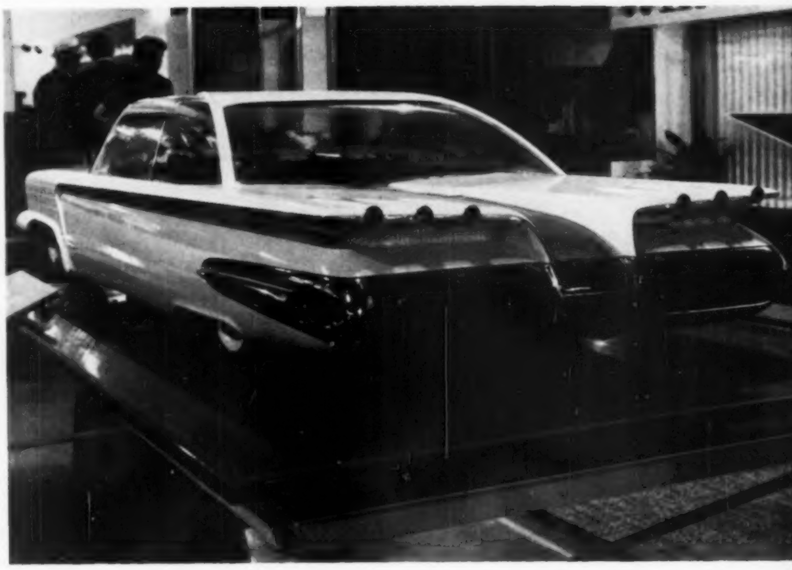
Anchor Plastics *has developed a new shrink-fitting thermo-plastic based on cellulose acetate. The material is supplied in finished extruded forms, either round, rectangular, or of special configurations in any opaque, translucent or transparent color.*

several new synthetics that have not even been named yet. Armstrong's booth had a direct line to company laboratories in Lancaster, Pennsylvania so that visitors could discuss the material and possible applications with lab technicians.

Perhaps the most useful contribution of the show is to annually introduce the designer to the rich and varied selection of new and improved materials. Again, the big splash was made by the synthetics. U.S. Steel gave its first public showing to a new vinyl-coated steel (ID, May 1959) that enables the metal to have leather, fabric, or wood finishes. Minnesota Mining and Manufacturing Company unveiled an expandable foam sealer in liquid form that can be squirted into uneven and hard-to-reach voids to exclude dirt, moisture, and other contaminants. MMM achieved the sealer by combining a heat-sensitive foaming agent to a liquid neoprene formulation. This rubber-based adhesive product will replace present pre-foamed flat stock, which is thick and can be cut only to fill known voids. Flame retardant laminates were shown in great abundance with special emphasis on the 500°-600°F range in paper-based epoxy. Haynes Stellite and Union Carbide Metals Companies announced several experimental columbium-based alloys with 40,000-psi ultimate tensile strength at 2400°F. Although the new alloys can be hot-worked in air, they still require protective coatings for prolonged service at elevated temperatures. At a do-it-yourself booth, Eastman Chemical Products, Inc. let spectators try its new 910 adhesive. The material sets instantly and develops high-strength bonds in a matter of minutes. It requires no heat, pressure, or catalyst, and forms bonds with virtually all materials. Dupont demonstrated its Delrin® acetal resin as a good candidate for properly engineered ball and roller bearing components.

Exhibitors this year placed strong emphasis on comfortable working conditions. Adjustable drafting boards and new work tables combined the functional qualities of old style drawing boards with the comfort and prestige of a desk. The German Nestler board, for example, distributed in this country by Ozalid Division of General Analine & Film Corporation, uses a counter-balanced parallelogram linkage controlled by foot-pedal locks to allow movement to any angle or height. Newark's Stacor Equipment Company has a similar board, but with a built-in reference table placed where it is most convenient to the designer.

Many equipment manufacturers displayed modified fasteners and fastening methods. McLean-Fogg Lock Nut Company offered a set of lock nuts and screws that required more torque to remove than to put on. The key to their locking action is the toothed, slightly tapered surface provided on



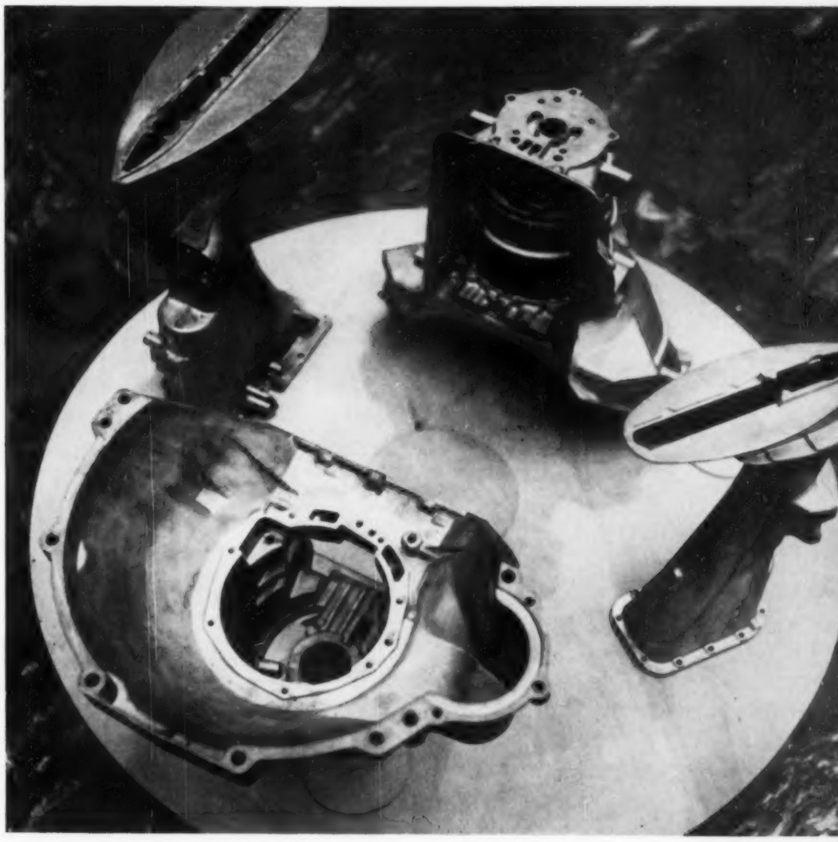
Kaiser Aluminum and Chemical Company's *model of an all-aluminum car was styled by Kaiser engineers to suggest to auto manufacturers the practical application of aluminum in tomorrow's cars.*

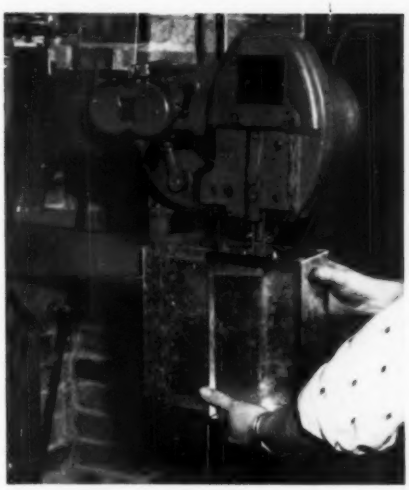
A varied assortment of products consolidates gains made in materials in last few years

the flats. Eaton Manufacturing Company showed two new fasteners for use by the metalworking industry, a self-drilling, self-tap screw designed to eliminate pre-drilling and costly alignment problems during the assembly of products fabricated from sheet metal, plastic, and wood, and a standard hex nut pre-assembled with a spring-lock washer.

But in spite of the prevalence of the word "new," which seemed to echo from every booth, visitors were likely to come away from the show with the lingering thought that "... it's a grand old song, but I've heard it all before." There was a need for a disciplined hand to curb the indiscriminate display of products and materials, and there was further need for a better floor arrangement to bring order to the chaos in the aisles, thus ending the enervating and haphazard search for exhibits that bear some relation to each other. Still, these are complaints that have been made since the show first started; yet each year this design engineering showcase gets bigger and bigger, perhaps validating the buckshot approach. But the danger inherent in this conception is that the bigger and more disorganized the show becomes, the more it resembles a giant sales convention, and the less it benefits those who design, use, and specify products and materials—G.D.

Doehler-Jarvis's *die castings featured one-piece castings of the engine blocks of various automobiles, as well as outboard motor shafts. The company gives detailed design and engineering assistance concerning the application of alloys for die castings.*





Acme Steel Company *demonstrated a low cost, high production mechanical fastening technique. The method, known as metal stitching, consists of forming a wire stitch, driving it through the pieces to be joined, and clinching it on the other side. The stitching machine is used for the stitching of both metallic and non-metallic materials.*

Eaton Manufacturing Company's *self-tap, self-drill screw is designed to eliminate pre-drilling and costly alignment problems during assembly of products fabricated from sheet metal, plastic, or wood.*

General Electric's *new Thinline motors are for manufacturers who must mount motors in a limited space. These new motors are up to eight inches shorter and 26 pounds lighter than standard flange mounted motors. The shorter length means users can meet their machine horsepower requirements with smaller motor installation space.*

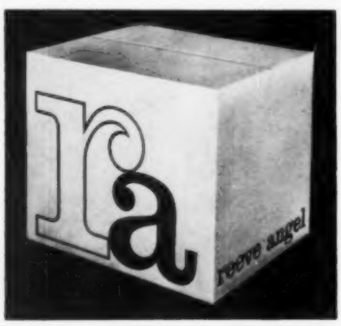
DESIGN REVIEW

Mid-year selection of packaging indicates a trend toward greater sophistication and elegance where it might be expected—in cosmetic packaging; and where it might not be expected—in fertilizer sacks and shipping cartons. Three capsule case studies on pages 88 and 89 suggest the growing range of the package designer's function—from graphic designer and product merchandiser to mechanical innovator. Innovations and experiments appear on the last spread.

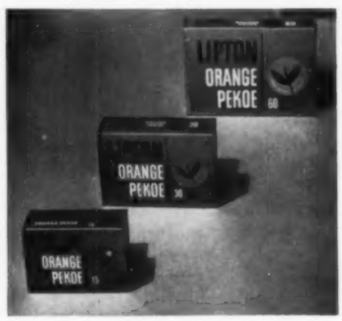
↑ **H. J. Heinz** has marketed a new Hot Ketchup and houses it in a new bottle, one of few departures in its history from old shape. Designed by Armstrong Cork Company.

↓ **Whole package face** acts as trade mark in Thrive fertilizer sack which features big lower case "t" against green, brown and orange background. Designed by Walter Dorwin Teague Associates.

↑ **Merck's** extensive Animal Health line uses symbols to indicate type of ailment medicine treats, as for pink-eye above, and types of animals who may use it. Repetition of forms and colors unify whole line. Ernst Ehrman Industrial Design.



↑ **Shipping cartons** whose major design element is the company initials have been created as part of a company corporate identity program for Reeve Angel, producers of filter paper. Large "ra" is the company trade mark. Eckstein-Stone.

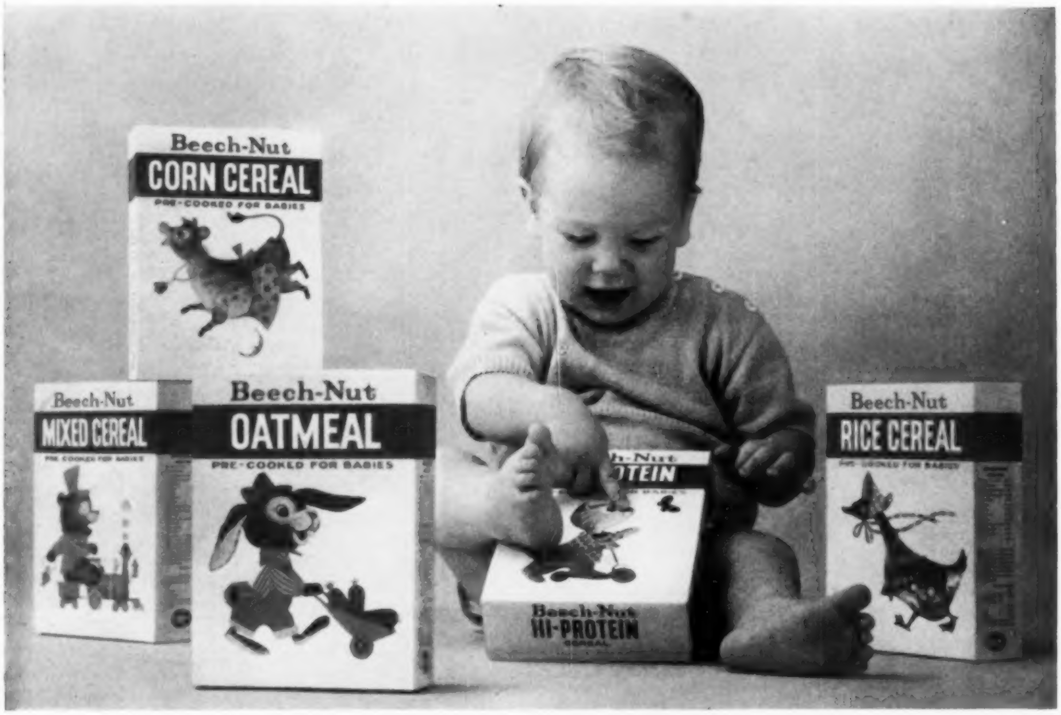


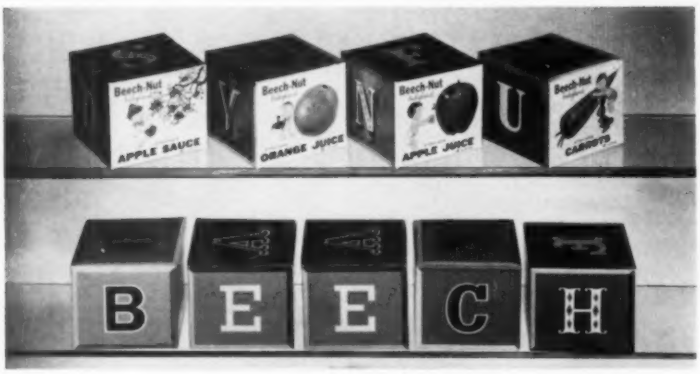
↑ **Tea packages** for Lipton's Canadian market substitute a tea leaf symbol for the familiar captain. The rich colors are shaded orange with black and gold on one line, maroon-brown with black and gold on other. Frank Gianninoto & Assoc.

↓ **Yardley of London** presents a new motif, a bold "Y" in black, gold and terra-cotta against stark white, to introduce its new line of masculine toiletries. Packages designed by Donald Deskey Associates.

↑ **Avon Products'** new Vita-Moist Cream makes an elegant vanity-table appeal in its urn-shaped container of yellow glass. Lettering and top design are silk screened in gold, top, white urea. Max Rogers design; Donald Deskey Assoc., container.

↑ **Clairol's** packages for its professional hair coloring products use a flexible key to identify each product in the line through variations in the color and design of the sash mark at the top. Basic colors are white and gold. Lippincott and Margulies.





Beech-Nut creates Babyland, Birds Eye develops similar theme

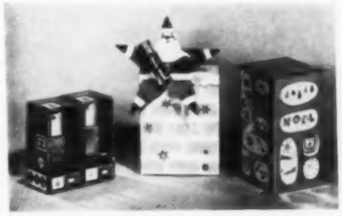
When Beech-Nut Baby Foods' large line of prepared foods, trial packaged as alphabet blocks (above), won four graphic and packaging awards this year, the events climaxed a graphic design program which has been a success ever since its inception two years ago. At the outset, Young and Rubicam, agency for the line, recommended a theme that could run through all selling media: packaging, promotional displays and consumer premiums. The result was Babyland, a whimsical country populated by diapered citizens who busy themselves preparing and producing baby foods assisted by a collection of friendly animals. Graphics for the program have been developed by an independent artist, Gyo Fujikawa (alphabet cartons are by Tanner Brown, Inc.) When consumers wrote in about using the cereal box characters (above) to decorate children's rooms, Y & R prepared home decorator kits of the animals, followed this with Babyland mobiles, merchandised both as premiums.

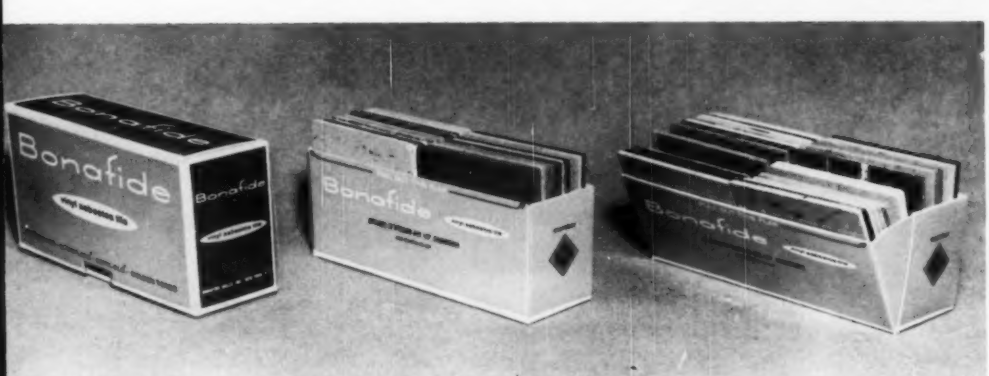
Substituting "Dr. Denton's" for diapers, Birds Eye has introduced its first-of-the-kind frozen instant baby foods with a graphic program notably similar in concept and style to Beech-Nut's. Birds Eye's new foods — pre-cooked, dehydrated frozen granules which reconstitute in 30 seconds—may force other baby food makers into a new form of processing and packaging. Birds Eye's packages are water-resisting, folding cartons, Jell-O box size. Graphic program for line was prepared under the direction of R. G. Neubauer.

Modern Packaging

Watkins presents "home-sell" graphics

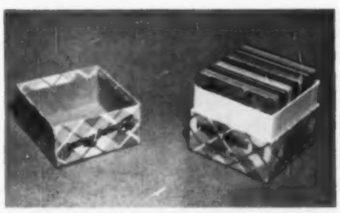
When Charles Magers began to redesign an entire line of packages for the J. R. Watkins Company, he based his thinking on the fact that the firm's household products are sold door-to-door by over 11,000 independent dealers. Since the products did not have to out-shout competitors on the retail shelf, he developed packages (right) which are recognizable through a total image rather than a strong logotype, and which pleasantly substitue simple format for a blatant one. The numerous conflicting graphic styles of the old packages were dropped in favor of a family line treatment which divides all products into one of three color groups. To improve Watkins Christmas-packaging programs, Magers eliminated simple but unexciting foil sleeves in favor of successively more complex packaging (above). Although dealers take care of "gift-boxing," popularity of the packages convinced them that the extra time spent was worthwhile.





Drop-front adds convenience

In the course of developing a corporate identity program for Bonafide Mills, Inc., Edward Steuer has come up with a neat solution to the problem of packaging tile samples. The former box (right) gripped samples so tightly that dealers tended to dump them all out to get at one tile, and since they often grouped samples on their shelves by color, they disregarded company containers. To solve this dual problem, Steuer developed a partial drop-front box (above) which allows the user to view each sample in file-through fashion. This has induced purchasers to keep the box, which remains as a selling aid for the company. To distinguish one company line (right) from the other, Steuer has created an individual graphic style for each.



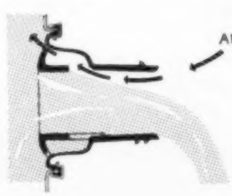
Innovations and experiments shown here indicate some original modifications which contribute a continuing refinement in certain types of packaging (for pills and spices, below) and suggest previously unthought of uses for others (the steak grill and the muffin tin packages opposite). Both the mechanical innovations on this page and the Alcoa "concept" experiments opposite reflect the hard-working imagination of a package designer.

← **Safety seal** for clear plastic lids requires user to remove red polystirene ring inside lid skirt before it may be opened. Leak-proof and tamper-proof. Dixie Cup Division American Can Company.

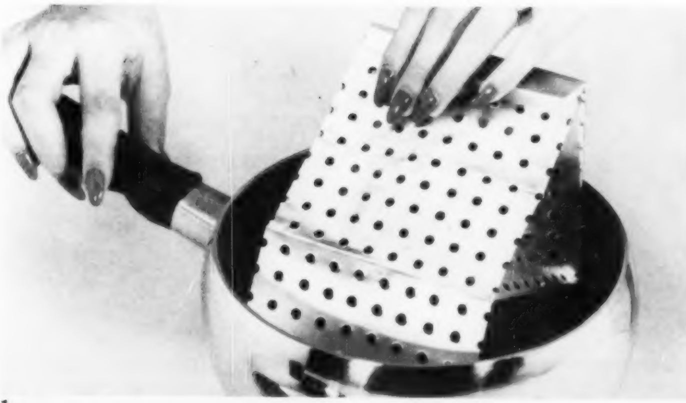
↓ **Spiral closure** of polyethylene resin replaces cotton now used in pill vials. Designed by Frank Dougherty of Dougherty Brothers, Buena, N.J., for Mead Johnson & Company, Evansville, Indiana.

← **Roll-on applicator**, long familiar for other products, has been adopted by Reese Finer Foods for garlic oil. Bottle and closure by Owens-Illinois, Toledo, Ohio.

↑ **Hermetic glue-flap**, tuck-top combination closure provides siftproof sealing plus sure reclosing. American Can's Marathon Div., surface design by Durkee.



↑ **Self-venting FlexSpout** provides steady, controlled flow and eliminates "glug" pouring. Consists of spout with diaphragm across top, resealing cap, and seal. Spout retracts for easy stacking. Mahlon Rieke, Rieke Metal Products Corp.



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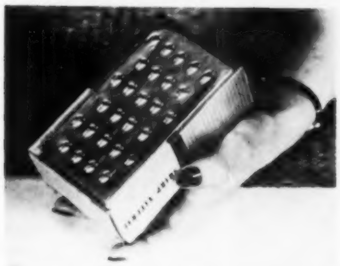

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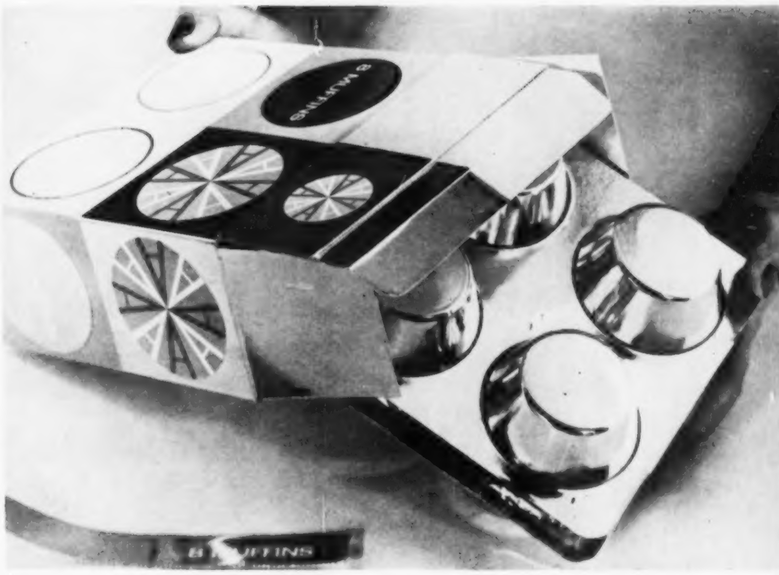


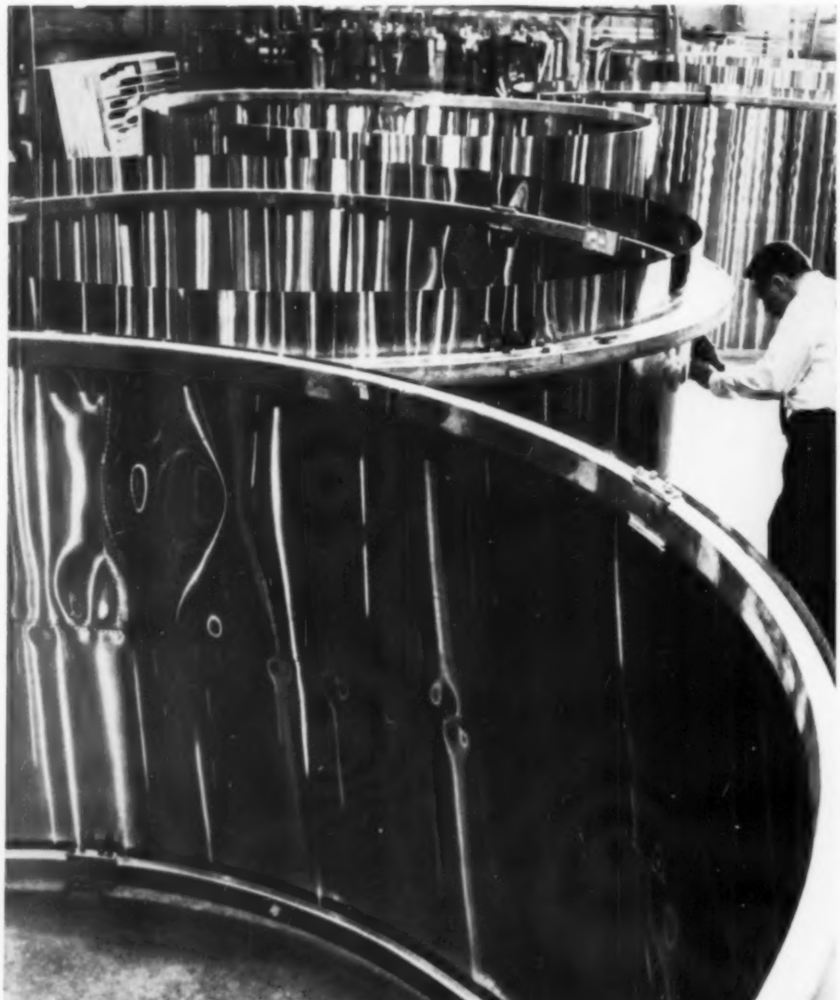
4

Alcoa experiments

To solve major problems in packaging and develop new uses for aluminum at the same time, Alcoa has commissioned Harley Earl to design a series of experimental packages which create entirely new functions for many traditional packages. The program, which has been underway for several years, has resulted in more than 50 new designs, and adaptations of some of them, such as the container-grill above, have already appeared on the market. The Earl group has to date tackled such problems as making the package double as both preparation and serving utensil, making the package attractive for home use by devising removable selling copy, making messy cooking utensils disposable. Among the answers they have developed are a plunger top for salad dressing bottles which prevents dressing from sticking to its sides; butter in individual quarter-pound foil dishes which can go right on the table; bacon in foil rolls which may be torn off by the strip; a double boiler package for cheese rarebit. Descriptions of five Earl designs follow. (1) Macaroni and cheese combination package and cooking utensil includes outer package of foil laminated on board, inside package of perforated foil which holds macaroni and cheese. After macaroni cooks, pouch becomes colander. (2) Grease problem is eliminated in this foil steak package. Ridges at bottom create grill which may be discarded after use. (3) Package and preparation utensil are one in this aluminum foil grater which contains its own cheese. After use, grater may be discarded, eliminating mean job of washing it. (4) Muffin mix package contains its own cooking utensil with mix already inside individual tins. As muffins cook, heat expands the tins until they break seal and muffins pop up. (5) Problem of storing partially-used cheese is solved with this telescope package.

5

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



Pressurized stainless steel tanks

The main body of the Atlas, America's first intercontinental ballistic missile, is made of a skin of stainless steel so thin that the body is kept under pressure to retain its shape. The big rocket vehicle is of course not new—it has been in production since 1956 and has been flight-tested on several occasions—but the use of thin sheets of stainless steel in this capacity illustrates a novel production technique.

The stainless steel is used to form the missile's propellant tank; production details of this important part of the Atlas have only recently been disclosed by the Ballistic Missile Division of the U. S. Air Force's Air Research and Development Center and Convair Division of General Dynamics Corporation. The tank measures about sixty feet in length and ten feet in diameter, and has no internal framework. From the propulsion section to the nose cone, the tank walls form the complete airframe, which is as light as it is tough: its thinnest wall section meets a specification for minimum tensile strength of 200,000 pounds per square inch. The material for the tank is made of a specially developed cold-rolled austenitic steel and is produced by the Washington Steel Corporation, Washington, Pennsylvania; it is delivered to Convair in coils consisting of long, flexible bands about one yard wide. The steel has a very high strength-to-weight ratio, good resistance to heat, cold and corrosion, and is easily welded and formed.

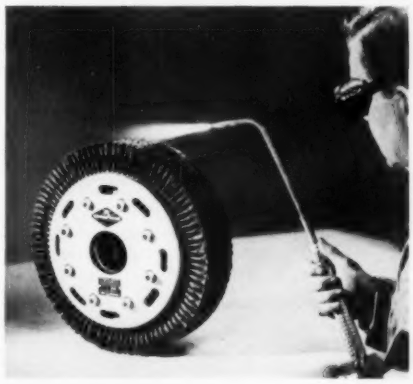
The skin of the Atlas tank is made by joining the ends of a band in an edge-to-edge weld (butt-weld), which is reinforced with an underlying strip of stainless steel. During this process the thin-gage steel is held in circular form by temporary supporting rings (left). After the tank is completed, the supporting rings are removed and pressurization maintains the shape. Gas is used for this and the pressure is strong enough to erase any wrinkles on the tank's surface. The actual steel skin gages vary throughout the entire Atlas structure and are tailored to meet local stresses. Twenty-seven sections are used in all, and several of them are thinner than the wall of a milk carton; the heaviest skin gage is less than 40-thousandths of an inch. The airframe is so constructed that it can easily be converted for use in other space vehicles with no change in basic design or tooling. Manufacturer: Convair, Division of General Dynamics Corporation, San Diego 12, California; Material Supplier: Washington Steel Corporation, Washington, Pa.

Combination finishes on metals

There is now available a new category of decorative metal finishes for such metals as aluminum, bronze, brass, and stainless steel in any gage and size. The new finishes, known as Brushtone, and made by Croname, are a combination of bright metal and metallic satin metal; they can incorporate a variety of pattern designs, emblems, diagrams, surfaces or drawings. The brush-strokes of the finishes can be horizontal, vertical, diagonal, spun—alone or in combination. Brushtone can be used as a background finish with lithography, etching, anodizing, frosting, enameling, embossing and with the standard Croname textured patterns (see ID, June 1958). The finish is supposed to withstand all standard machining operations normally performed on decorative parts. Application possibilities for the new finishes include most appliances, automotive parts and industrial instruments. Manufacturer: Croname Incorporated, 6201 Howard St., Chicago 48, Illinois.

Plastic skin packaging

A new kind of packaging system using transparent butyrate sheet has been made possible by a machine developed by Washington Steel Products, Inc., Tacoma, Washington. In the new system, plastic sheet is heated and drawn skin-tight over the products being packed, so that they are enclosed and held securely. Materials and labor are saved, because no backing board is necessary. Items to be packaged are positioned on slightly elevated locating fixtures on the machine. The plastic sheet feeds from a continuous roll to the forming area of the machine where it is heated and "draped" over the article being packaged. The method is expected to promote the use of plastic in packaging such items as doorknobs, hinges, powder, lipstick and similar items. Manufacturer of machine: Washington Steel Products, Inc., 1940 E. 11th St., Tacoma, Washington; of material: Eastman Chemical Products, 260 Madison Ave., New York 16.



Wheel without rubber

The strict demands of space flight on component materials for space vehicles has resulted in the development of a new kind of tire. Such a tire, to be used as a landing wheel, could not be of rubber or fabric since it had to be able to withstand the temperature shock of a space ship's passage through the thermal barrier on its re-entry into the earth's air mass. Goodyear Tire & Rubber Company recently unveiled its new space-tire—a wheel constructed entirely of wire. According to the company's general manager, the tire will withstand temperatures in the 1,000° to 2,000° F. range in flight and during landing.

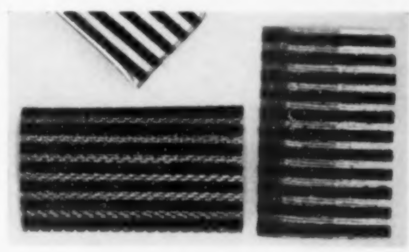
The new landing "gear"—blow-out-proof as well as melt-proof—retains the load deflection characteristics of its forerunner. It also has a higher rolling resistance which ensures greater safety in slowing down the craft. The new wheel weighs about forty pounds, is fourteen inches in diameter and four inches wide. It has been tested on the company's dynamometer, which simulates landings at different speeds and at various loads and thereby assures its ability. Manufacturer: Goodyear Tire & Rubber Company, Akron 16, Ohio.

Commercial production of Lexan

General Electric has announced that a plant for the commercial production of Lexan (ID, December 1958) polycarbonate resin will be in operation by the end of 1960, land having been acquired and plans drawn recently. Up to now the supply of Lexan has come from GE's pilot plant in Massachusetts. Some of the products made of Lexan are: electrical connectors and other insulation parts, ball bearings, coil forms, extruded shapes. Source: General Electric Chemical and Metallurgical Division, Pittsfield, Massachusetts.

Rayon flocking on metallized surface

The combination of rayon flock on metallized Mylar has resulted in a new group of decorative materials manufactured by Coating Products, Inc. Called Mirro-Brite Fiesta Mylar, the material consists of rayon flocking in stripes on various metallic finishes and embossed patterns. The production sequence of the combination material runs as follows: transparent Mylar is metallized, embossed and laminated to vinyl or other backings; the material is also available with pressure-sensitive adhesion. The standard width of the colored striped flocking is ¼-inch but other widths can be ordered in a wide range of colors. The decorative patterns are available on several types of Mylar laminates, and in addition on unsupported vinyl, adhesive-backed vinyl, vinyl-backed fabrics or latex-impregnated paper. The combination materials can be ordered in continuous rolls 54 inches wide or cut-to-size sheets, or die-cut to specifications. Samples and data are available on request. Manufacturer: Coating Products, Incorporated, 101 West Forest Avenue, Englewood, N. J.



Iodine reduces lamp blackening

A small amount of gaseous iodine added to the inert gases normally used to fill certain tungsten-filament light bulbs is said to add appreciably to their effective life, according to General Electric's Large Lamp Division. One of the factors that causes light bulbs to lose efficiency is the blackening of the inside surface of the bulb by particles of tungsten that evaporate from the filament while the light is burning. Traces of iodine added to the mixture filling the bulb combine with these evaporating tungsten particles, preventing them from settling on the glass and darkening it. The resultant tungsten iodide circulates through the bulb and as it passes near the filament it is decomposed by the filament's heat, allowing the iodine to start its cycle again, while the tungsten settles back in the filament.

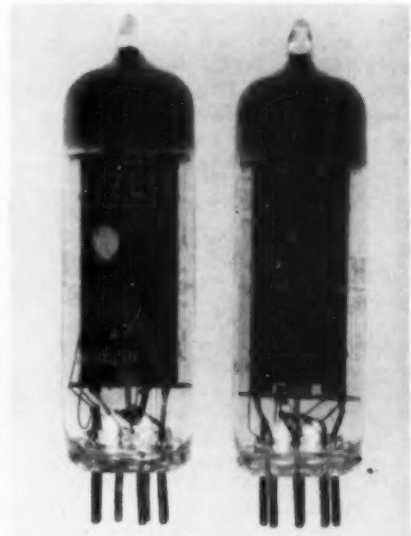
The principle of the iodine cycle has been known for many years, but it was too erratic and unreliable for use until recently. At present the iodine cycle principle is being used in a small wingtip marker bulb for aircraft. They are expected to be used wherever GE's Quartzline lamps are used now. Production in sample quantities is under way now, with August availability promised. Bright, efficient, "square" beam obtained with new Quartzline incandescent lamp is shown below. Manufacturer: General Electric Company, Cleveland 12, Ohio.

Magnifier and illuminator

A new visual aid, which both magnifies and illuminates the work upon which it is directed, has been put on the market by the O. C. White Company. The aid, called Magni-Lite, consists of a color-corrected 3-diopter magnifying lense and a circular 22-watt fluorescent lamp which surrounds the magnifying lens. With the visual aid comes a fixture that permits adjustability and positioning of the light and lens. Double arm units extend out to 40 inches. Table stands and several brackets and clamps for vertical are horizontal surfaces are available. Manufacturer: O. C. White Company, Worcester, Massachusetts.

Improved brass rod

Chase Brass & Copper is marketing a new free-cutting brass rod called 3 Mark Rod which has close straightness and length tolerances. The properties of the new brass rod are important particularly for users of high-speed screw machines. These machines have rapid spindle speeds and the straightness of the recently announced rods makes for quieter operation with less vibration of the machine. The length and straightness accuracy of the 3 Mark Rod also make possible a smoother operation of magazine feeders attached to the machines with which the brass rods are used. They are available in round, hexagonal, octagonal and square forms. Manufacturer: Chase Brass & Copper Company, Waterbury 20, Connecticut.



Dummy tube produces heat

A simulacrum of a radio tube that generates the same amount of heat as the real thing, but does nothing else, has been put on the market by Research Council, Inc., of Waltham, Massachusetts. "Physically and thermally," the manufacturers say, "the Thermion is identical to any vacuum tube of the same size class: in essence, a complete and accurate thermal analogue of the electron tube under study." (The Thermion is seen above at right.)

An aid that permits increased design reliability, this new thermal analogue tube represents a hitherto unused concept in system evaluation and is particularly useful for reliability design before the prototype stage.

The device permits the designer to make mock-ups of his systems to determine best layout of components for efficient heat dissipation; to select accurately the best hardware for the thermal conditions of his design; and to design the best enclosure for the thermal characteristics of his system. Manufacturer: Research Council, Inc., 1062 Main Street, Waltham 54, Mass.

Manufacturers' Literature Supplement

A bibliography of currently available technical brochures dealing with materials, methods, components, and machines

MATERIALS — METALS

1. **Glassed Ductile Iron Fittings.** The Pfaudler Company. Bulletin 977 contains charts, photomicrographs, fitting specifications and general descriptive data. The charts compare ductile iron with mild steel and grey iron in terms of tensile strength, yield strength and elongation; and indicate that ductile iron fittings are 2½ to 3 times stronger than conventional iron fittings after glassing.

2. **Cold Drawn Stainless Steel Wire.** Uddeholm Company of America. 77 pp., ill. Book describes the general qualities of 27 different types of ferritic, austenitic, ferritic-austenitic and martensitic stainless steels available from the company. Also includes data on tolerances, mechanical properties, magnetic properties, available finishes, sizes, forms and applications.

3. **Extrusion Applications.** Precision Extrusions, Inc. 2 p. bulletin "Extrusioneering News". Covers cost-cutting extrusion applications and technical data for design engineers and purchasing executives.

4. **Nickel Silver and Phosphor Bronze.** The Seymour Manufacturing Company. 40 pp., ill. Technical data book for designers, engineers and production men. Information for efficient use of nickel silver and phosphor bronze. Contains chapters on Temper, Nickel Silver, Phosphor Bronze, Nugild, Bending and Forming Strip, Rod, Annealing and Cleaning, Flat Wire, and Tolerances.

5. **Wire Products.** Riverside-Alloy Metal Division, H. K. Porter Company, Inc. 6 pp., ill. Up-dated folder includes summary of the kinds of ferrous and non-ferrous wire which the company supplies. Also includes non-ferrous alloys and wire sizes now available.

6. **Plasma Arc Plating.** Linde Company, Division of Union Carbide Corporation. 8 pp., ill. Booklet entitled Plasmarc Plating describes the new plasma arc service for metals in the high temperature range.

7. **Non-ferrous Alloys.** Centrifugally Cast Products Division, The Shenango Furnace Company. 8 pp., ill. Bulletin No. 157. Contains detailed alloy chart showing comparative specifications, chemical analyses and the minimum physical properties of Shenango non-ferrous alloys. Also describes a broad range of component parts and assemblies regularly produced by the centrifugal method.

8. **Aluminum Finishes.** Reynolds Metals Company. 28 pp., ill. "Finishes for Aluminum" explains theory and method for five major types of finishing operations — mechanical, chemical, anodic, organic and porcelain enamel — including their advantages, disadvantages and costs.

MATERIALS — PLASTICS

9. **Chlorinated Polyether.** Hercules Powder Company. The ABC's of Penton for Corrosion Resistance. Technical brochure on Penton's properties and uses in valves, pipe and fittings, pumps and meters, flame-sprayed or whirl-sintered parts.

10. **Tenite Butyrate.** Eastman Chemical Products, Inc. Information available on molding, extruding or vacuum-forming of this material.

11. **Nylon Resin.** E. I. duPont de Nemours & Company. Brochure entitled Designing with Zytel Nylon Resin contains technical information about this material.

12. **Molded Nylon Parts.** Chicago Molded Products Corporation. Information available on plastics for compression or transfer molding.

13. **Polyvinyl Dispersion.** Chemical Products Corporation. Chem-o-sol brochure gives information on this coating and molding material. What it is, how it can be used, what its important properties are and how it can be applied.

14. **Polyester-Glass Equipment.** Haveg Industries, Inc. 28 pp., catalog P-11. Describes the range of applications of the company's polyester-glass industrial corrosion-resistant equipment. Includes the physical properties, chemical resistance properties and technical equipment applications such as complete exhaust installations, bubble cap, sieve plate or packed counter current towers, over-the-road tank trailers and other equipment.

15. **Formica.** Formica Corporation. Designer's Fact Book contains more than 50 industrial laminated plastic grades for products ranging from truck wheels to printed circuits. Included are a comparator chart itemizing the qualities of Formica's most popular grades; a listing of materials by military specification number, plus designer's information on all standard and special grades manufactured.

16. **Heat-Resistant Finish.** Midland Industrial Finishes Company. 4 pp., ill. Brochure contains a complete table of properties, characteristics and application data of Sicon, a silicone-base finish composed of silicone resins that is highly resistant to heat, moisture, oxidation and ultraviolet radiation. Several applications of the finish are detailed in the brochure, among them: missiles, aircraft, and consumer products such as home incinerators and charcoal ranges.

17. **Tubings and Sleevings.** Irvington Division of Minnesota Mining and Manufacturing Company. 6 pp., ill. Contains physical and electrical data, application information and the main features of the company's line of coated tubings. Covered are silicone-rubber-coated tubing, silicone-varnished glass-cloth tubing, varnished glass-cloth tubing, varnished rayon tubing and vinyl-coated glass-cloth tubing. A cross-reference chart gives the NEMA temperature rating of each type of tubing, the class and type, voltage grades, standard and special sizes, standard and other colors, standard packaging lengths and appropriate military specifications met by the tubings.

18. **Mill Shapes.** The Polymer Corporation of Pennsylvania. 4 pp., ill. Folder describes all availabilities, including rod, strip, tubing, tubular bar, plate, tank linings, pipe, special castings, fabricated parts and coatings of Polypenco Penton chlorinated polyether resins.

METHODS

19. **Self-Adhesive Materials.** Fasson Products. Samples and descriptive brochure available on this company's nameplates, trims, emblems and service diagrams, made of self-adhesive materials.

20. **Rhodium Electroplating Processes.** Sel-Rex Corporation. 20 pp., ill. A technical exposition of rhodium's metallurgical properties features graphs and charts showing rates of deposition under various operating conditions. Includes information on bath preparation and control of several different rhodium plating formulations; determination of rhodium in plating solutions; equipment required; current densities recommended and general operating instructions.

21. **Speedomatic Troffers.** Smithcraft Lighting. 6 pp., ill. The folder details for architects, engineers, contractors and other lighting specifiers many features of Speedomatic troffers including the telescopic door frame which automatically adjusts to assure perfect fitting, even in irregular ceiling openings. Also includes 13 pages describing the company's spot boxes, a variety of shielding media and a complete ceiling index.

22. **Cost Comparison of Metal Parts.** Apollo Metal Works. The Metal Parts Finishing Cost Guide is designed for determining and comparing costs involved in metals finishing procedures such as premises-finishing of parts, off-premises-finishing of parts, and use of pre-finished metals.

23. **Design Suggestion Samples for Metal Stampings.** Dayton Rogers Manufacturing Company. These sheets are of interest to design engineers of stamped products, methods engineers, expeditors, and anyone else involved in die-cut stampings.

24. **Rubber Seals.** Minnesota Rubber Company. 24 pp., ill. Fact Book provides information such as the size numbers and dimensions of all common industrial O-rings and the Minnesota Rubber Quad Ring. These sizes are cross indexed for easy comparison with many of the commonly used dimensional specifications. Book also includes reference charts covering aeronautical material specifications, SAE-ASTM material specifications, MIL-R-5847C specifications, U.L.-approved rubber compounds, information about media in which various rubber compounds can be used, and many other facts concerning rubber.

25. **Automatic Systems.** Atronic Products, Inc. 4 pp., ill. Brochure describes briefly company's products available for sorting, counting, inventory control, and selective separation of mixed products on conveyors and related equipment.

PARTS AND COMPONENTS

26. **Bearings.** Briney Manufacturing Company. 4 pp., bulletin AB-57-1. Describes antifriction arbor support bearings utilizing a new load-equalization design principle and includes specifications and construction details of bearings for use in standard milling machines.

27. **Hook Lock.** Simmons Fastener Corporation. Data sheet describes this latching device for use on rigidly specified military cases and commercial containers.

28. **Molded Cups.** The Garlock Packing Company. 6 pp., ill. Bulletin AD-145. Describes the latest types of molded cups for pump pistons, hydraulic service and for pneumatic equipment. It details the construction, recommended service and available sizes of rubber and synthetic rubber, leather, reinforced synthetic rubber, metal-bonded and metal-reinforced and homogeneous cups.

29. **Unitized Motors.** General Electric Company. 12 pp., ill., bulletin GEA-6882. Discusses efficiency, new bearings, and the insulation system of the Unitized motors. A four-page technical bulletin is included which gives construction features, electrical performance, mechanical variations, and dimensions of the new Unitized four-pole, 59-frame, shaded-pole and permanent-split capacitor motors.

30. **Fibre Cans and Tubes.** National Fibre Can and Tube Association. 4 pp., ill. Pamphlet details the versatility and economy of fiber cans and tubes and reports on a survey of 800 manufacturers who are present users of fiber cans and tubes for packaging and shipping containers.

31. **Retainer Rings.** Ideal Stitcher Company. Bulletin details the forming and installation of retainer rings on electronic controls, motor shafts and other applications in a single operation.

32. **Thermistor Temperature Control.** Fenwal, Inc., 2 pp., ill., bulletin MC-179. Gives complete specifications, available temperature-sensing probes and suggested applications for packaging, printing, synthetic fiber processing, and general industrial storage for new transistorized thermistor controller, Series 535.

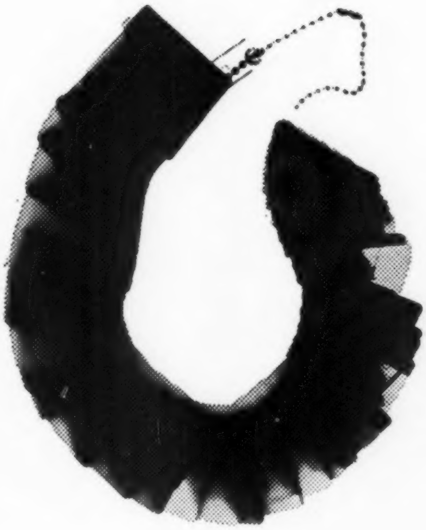
MISCELLANEOUS

33. **Porcelain-On-Steel.** Alliance Wall Division, Allianceware, Inc. Information available on Alliance Wall in coils, sheets and laminated panels.

34. **Office Furniture.** Standard Pressed Steel Company. 16 pp., ill. Catalog on the company's office furniture line illustrates the various types of work stations that can be formed with this line. In addition, instructions are given on how to plan an office, making full use of available space. Dimensions and pictures of all units and components are shown along with several typical office layouts.

35. **Allis-Chalmers History in Cartoons.** Allis-Chalmers Manufacturing Company. 32 pp., ill. Booklet gives capsule facts about nuclear research and development, power generating and electrical transmission and distribution equipment, processing machinery, farm and industrial tractors, harvesting and road building machinery, and all of the other product lines manufactured by Allis-Chalmers in this country and abroad. Data is presented in form of cartoons.

36. **Plastic Dall Flow Tubes.** B-I-F Industries, Inc. 4 pp. Bulletin No. 115.20-1. Describes the company's expanded line of Builders-Providence Insert-Type Plastic Dall Flow Tubes for primary flow metering. It contains descriptive text, dimension drawings and tables and charts.



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37. Electronic Function Plotter. Computer Equipment Corporation. Reprint of a technical article describes the plotter which combines analog and digital electronic techniques to achieve curve-plotting accuracy of 0.01 per cent for frequencies ranging from 3 cps to over 400 KC.

38. Electrical Connectors. Burndy Corporation. 12 pp., ill. Brochure includes photographs and engineering drawings of the company's principal connector types used in missiles and their ground-control equipment. Environmental and performance standards of connectors for missile electrical and electronic circuits are reviewed. The brochure outlines how connectors are engineered for the electrical characteristics, flexibility and reliability required of guidance, propulsion-control and telemetering systems and discusses the installation of connectors for missile electrical systems.

39. Research and Development Facilities. The H. K. Ferguson Company. 24 pp., ill. Booklet describes and pictures laboratories and development complexes in the fields of basic research, nuclear research, aeronautical and missile research, special research, and depicts modern auxiliary features incorporated by the architect-engineer-builder.

40. Analyses in Visual Communication. United States Testing Company, Inc. 6 pp., ill., bulletin 5903. Bulletin describes the company's services in the testing of advertising design and copy, and the visual and psychological aspects of package design. It also gives brief descriptions of other services offered by the company.

41. Photocopying Guide. Peerless Photo Products, Inc. What Not to Copy is available in the form of a wall chart which can be hung close by photocopying equipment. The guide lists the type of documents forbidden by Federal law to be copied photographically.

42. Lighting Recommendations. American Home Lighting Institute. Two bulletins—Guide to Advanced Light for Living and Minimum Light for Living Standards—to be used in planning installed lighting for residences. The first includes new developments for top-bracket residences and the second is revised to include a checklist of fixture requirements.

43. Electrolytic Conductivity Equipment. Industrial Instruments Inc. 32 pp., catalog. Contains general information and listings.

44. Drafting Equipment. Alfred Mossner Company. 100 pp., ill. The catalog features wood and steel drawing tables, plan files and drafting room furniture of all types as well as a complete line of surveying equipment and supplies, drawing pencils, leads, inks and drafting tapes, slide rules, triangles, T-squares, and templates, drawing instruments, diazo and photographic papers, office copying machines, new lettering devices, graph papers, and tracing papers, Mylar and cloth.

45. Filing Systems. Plan Hold Corporation. Illustrated catalog describes the company's vertical and roll filing systems. New and improved items included are of special interest to engineers, designers and architects.

46. Cupola Patching and Ladle Lining Material. Daniel Goff Company, Inc. 4 pp., 2 color, Bulletin 915. Describes production techniques involved in using Goff Ammo as well as a complete list of Goff products for the foundry industry.

47. Reusable Instrument Shipping Cases. Continental-Diamond Fibre Corporation. 2 pp., ill. Describes and illustrates the low-cost vulcanized fiber containers which are designed for transporting all types of delicate instruments and electronic equipment. The construction details of these containers are also described and the bulletin presents in tabular form complete information on available sizes and specifications.

48. Electrical Connectors. Crouse-Hinds Company. 48 pp., bulletin 2711. Describes company's complete line of plugs and receptacles in environment-resistant construction.

49. Mounting Systems. Lord Manufacturing Company. 12 pp., bulletin 714. Describes the company's capabilities in the field of engineered systems for shock, noise and vibration control. Examples of standard, special and high-performance mounting systems in the latest missiles and advanced jets are explained and illustrated.

50. Computer System. Minneapolis-Honeywell Regulator Company. Booklet outlines the speeds, capacities and overall performance qualifications of the Honeywell 800 system and gives specific examples of how its design logic and other features contribute to its use and economy in scientific computation.

51. Industrial Wheel. Disogrin Industries, Inc. Folder describes features of polyurethane-tired wheel designed for general industrial applications including superior load-carrying capacity, resilience, abrasion resistance, and tensile strength. Also includes a detailed specification list for sizes available, their respective load capacities, weight and catalog numbers.

52. Curtain Wall System Catalog. Owens-Illinois. 12 pp., ill. Explains in detail the company's curtain wall system and includes such information as component parts, erection, details, technical data, specifications and panel types, sizes and colors.

53. Ultrasonic Cleaning. Circo Ultrasonic Corporation. 12 pp., ill. Booklet called "Tips on Ultrasonic Cleaning" includes a simplified explanation of the basic principles of ultrasonics, a description of the generating equipment and transducers required for ultrasonic cleaning, a discussion of applications, and a list of questions and answers about ultrasonics.

54. Expansion Joints. Expansion Joint Division of Badger Manufacturing Company, 6 pp., ill. Bulletin is intended as a "brief digest of information on the nomenclature and selection of Badger S-R Joints . . ." and contains general information on flanges, liners, covers, temperature ratings, etc.

55. Miniature Temperature Controls. Fenwal Incorporated. 4 pp., ill. Brochure MC-182 describes nineteen different midget and miniature Thermoswitch controls; dimensions, temperature range, electrical ratings, and available modifications are given for each unit. Brochure also includes description of Fenwal's newest hermetically sealed miniature control, model 32411 which has contacts set to open on temperature rise.

5910 in 1955
7991 in 1956
8978 in 1957
9802 in 1958
10000 PLUS in 1959

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So, we thought you would find the above year-by-year tally of our paid subscribers to be of interest. As you can see, "ID" has not only been successful, but its pace of growth continues to exceed our own most hopeful expectations.

We are well aware that we have as many men to thank for that performance as we have loyal readers, and you may be sure we will fulfill the resulting obligation in the one way that counts most—by making each new issue of "ID" of ever greater value, to each one of our subscribers.

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Index to Advertisers

For Your Calendar

Through August 10. Soviet Union exposition. New York Coliseum.

Through August 16. "Recent Sculpture USA." Museum of Modern Art, New York.

Through August 16. "Fulbright Designers." Hagerstown, Maryland. (Smithsonian Institution, traveling exhibit)

Through August 16. Sixth exhibition of outstanding school buildings, USA. Sponsored by the American Institute of Architects. The Octagon, Washington, D.C.

Through August 30. "Forms from Israel." Museum of Contemporary Crafts, New York.

Through August 31. The art and technique of paper folding. Exhibit at Cooper Union Museum, New York.

Through September 6. "The New American Painting." Museum of Modern Art, New York.

Through September 7. "Form-Givers at Mid-Century." Exhibition of architecture, sponsored by *Time* magazine and the American Federation of Arts. Metropolitan Museum of Art, New York.

Through September 12. Mexican stone sculpture from before the Spanish Conquest. Museum of Primitive Art, New York.

Through September 15. "Glass 1959". Exhibit at the Corning Museum of Glass, Corning, New York.

Through December 1959. "Decorative Arts: 50 Years of Collecting." Newark Museum, New Jersey.

July 25-September 5. American National Exhibition in Moscow. Moscow, U.S.S.R.

August 2-12. Third national heat-transfer conference and exhibit. Sponsored by the Heat Transfer Division of the ASME-AIChE. University of Connecticut, Storrs, Conn.

August 17-28. Courses in "Frontier Research on Digital Computers." University of North Carolina, Chapel Hill, North Carolina.

September 1-3. 14th National ACM Conference. MIT, Cambridge, Massachusetts.

September 6-16. Production Engineering Show. Navy Pier, Chicago.

September 8-18. Packaging Exhibition. Grand Hall of Olympia, London, England.

September 6-16. Machine Tool Exposition. International Amphitheatre, Chicago.

September 9-12. Exhibit of the Electron Microscope Society of America. Ohio State University, Columbus, Ohio.

September 9-November 8. International Packaging Exhibition. Museum of Modern Art, New York.

September 16-18. First General Assembly of the International Council of the Societies of Industrial Designers. Stockholm, Sweden.

September 15-October 18. "American Prints Today." Exhibit of the Print Council of America. Achenbach Foundation for Graphic Art, San Francisco. (The exhibit opens simultaneously in Baltimore, Boston, Cincinnati, Los Angeles, New York, Philadelphia, and Washington.)

September 20-26. 14th annual conference and Instrumentation Show of the Instrument Society of America. Palmer House and International Amphitheatre, Chicago.

September 21-22. 8th annual meeting of the Standards Engineering Society. Somerset Hotel, Boston, Mass.

September 21-25. Congress of the International Council for Building Research Studies and Documentation. Rotterdam, Holland.

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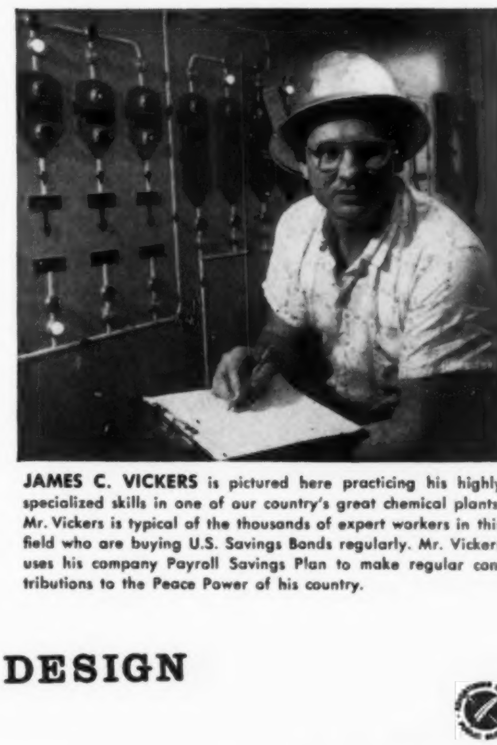

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