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6 June 1959 $1.50 per copy

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JUNE, 1959 VOLUME 6 NUMBER 6

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.

CONTENTS

Coming

IN JULY—Plastics for the designer. Part 1 of a three-part series on the physical characteristics, production costs, and end products of various types of plastics.

IN AUGUST—Soviet fair in New York.

COVER: Simplified elements of one of the simpler forms of fastening, the nut and bolt, announce ID's first article in a new series on fastening techniques, starting on page 56.

FRONTISPIECE: The form at right, which looks remarkably like the result of the fusion of earth strata, is actually a micro-photograph of the section of two pieces of wire joined by the cold welding process.

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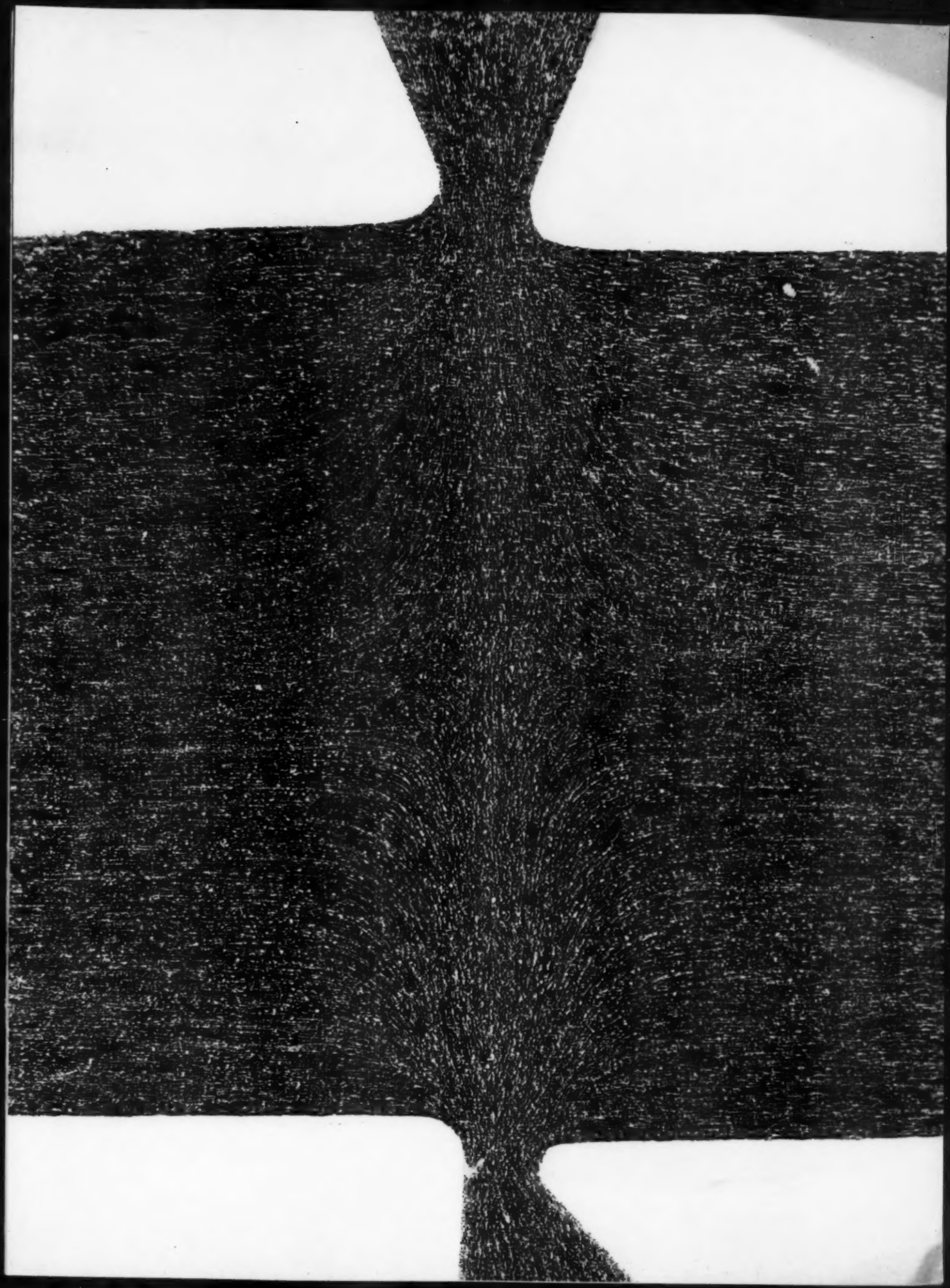


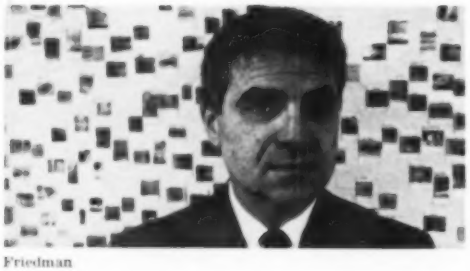
in this issue...

Golden

Teague

Beinert

Corn



Friedman

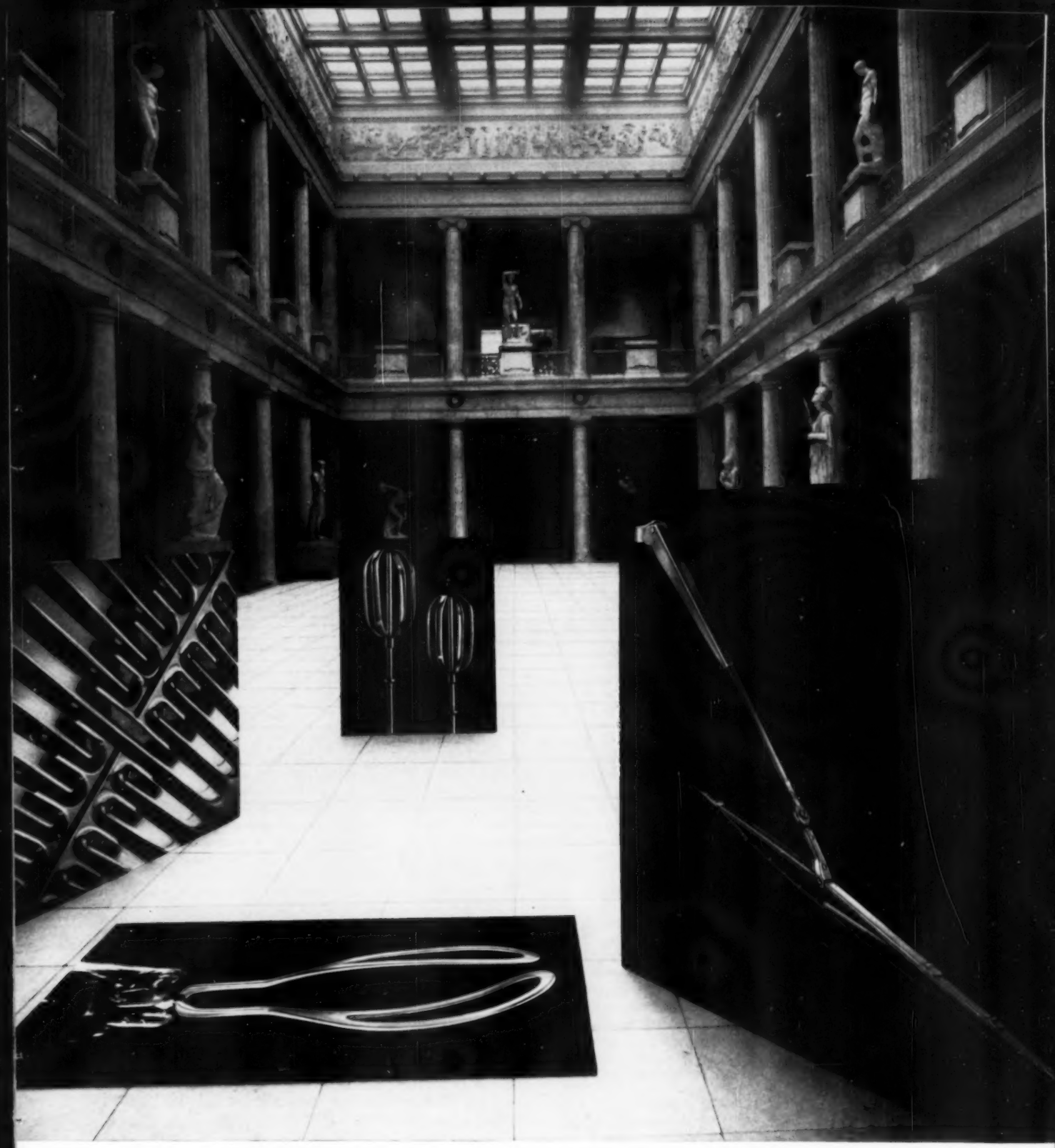
Sanford S. Golden, D.D.S., whose dissatisfaction with the usual physical arrangements in a dentist's office led to the development of a new kind of dental chair (see page 76), practices in Los Angeles in what he describes as a "penthouse office." One of his patients, a Paramount Pictures public relations man, suggested the name for his chair. Dr. Golden's future plans for his Euphorian Curve include its incorporation into aircraft seating, theatre seating, and office clerical seating (he is in process of preparing a paper on its use in the last category).

Walter Dorwin Teague, Jr., a partner in his father's firm since 1954, was in charge of translating Dr. Golden's idea into a production model chair. In the past three years his design activities have included responsibility for four U.S. exhibits in Europe, in the course of which he has become a rather regular commuter to the Continent. Normally he commutes from the WDTA New York office to a home up the Hudson — sometimes traveling in a vintage Bugatti. He is also the new owner of a fiberglass-hulled auxiliary sloop which he is busy outfitting — partly in custom Teague-designed equipment.

John Beinert, who, like Teague, is a yachtsman (Belle Harbor Yacht Club, Babylon Yacht Club, and South Bay Cruising Club, all on Long Island) is a natural to write on boat-hull design (see page 52) for still another reason: in the practice of industrial design he was once a boat-hull designer. Currently his one-man office in New York does product design ranging from aircraft interiors to stapling devices. He was an associate editor on *Architectural Forum* for eight years, an associate of Henry Dreyfuss for nine, and for the past eight has had his own office.

Belmont Corn, Jr. is president of Displayers, Inc., the firm which collaborated on the design of some, and installed many, of the exhibits in the International Trade Fair (see page 80). Mr. Corn, past president of Exhibit Producers & Designers Association, is currently a member of the Marketing Committee of NAM. He has been exhibit consultant to the Oklahoma Semi-Centennial Exposition, the State Fair of Texas, and the Oregon Centennial Exposition. Off-duty he coaches community (Scarsdale, New York) basketball, plays golf, is the voice behind the mike at Columbia University (alma mater) home football games.

William Friedman, who joined the Albright Art Gallery in Buffalo, New York, as visiting curator in September, 1958, specifically to put together the design show reviewed on page 46, had previously been professor of design at the Indiana University. He has served as design consultant at the Art Institute of Chicago and the Stanford Research Institute and, as associate director of Minneapolis' Walker Art Center, was responsible for the shows Man and Clay, Knife-Fork-Spoon, and Le Corbusier: The new Spirit.



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LETTERS

The conscience of the designer

Sirs:
Some months ago (November 1958) ID published an article by C. Wright Mills entitled "The Man in the Middle," which was a somewhat less than flattering appraisal of the designer's contributions to himself, to industry, and to the society which he ultimately serves.

It seems to me that the heart of Mills' thesis is the consideration of public and private morality. We all are familiar with the statements of aims and ethics published by the various professional societies of design. These have to do mainly with the designer's working relationships, his obligations to his client, and his attitudes towards other professionals. Now this too is morality but of a very specific sort. The kind of morality I mean is concerned with the way our efforts affect the larger society. In a world of exploding populations and exploding nuclear devices, of contracting natural resources, in a world in which urbanization and supra-nationalism are making enormous advances, all of us must as never before question the consequences of our actions.

May I suggest that ID publish more articles like "The Man in the Middle," and that professional societies, the schools, and all of us as individuals concerned with design spend at least as much time on the questions of "Why" as we do on considerations of "How."
Fred Eichenberger
Assistant Professor of Design
College of Applied Arts
University of Cincinnati.

Flashback on finales

Sirs:
Because time has marked me with only fifty-three years as of this writing I was somewhat flabbergasted to find myself grouped with the "grand old men," though the company in which R.S.C. included me is certainly distinguished. So distinguished that it gave me further cause to be flabbergasted.

Ralph S. Caplan, who I take it is the writer of the column signed R.S.C., [March editorial] is very likely referring to my production of *Lonelyhearts* when the charge is made "limits his (mine) exploration to discovering new places to misapply the same old happy ending." There are many who became furious with me because I changed the ending of Nathanael West's novel. Perhaps that was an error. If so, it was made for reasons other than my desire to supply a happy ending.

But I wonder if R.S.C. accuses me of misapplication because of my indicating in *Sunrise at Campobello* that F.D.R. survived his attack of polio and went on to become President? Or, in *Battleground*, was it a misapplication to say that the 101st Airborne held Bastogne successfully? Was I also guilty in the *Battle of Gettysburg* by having Meade defeat Lee? In *Go for Broke*, the 442nd Battalion made an enviable record that repaired many injustices to the Nisei. Was this misapplication?

There are some films on which I have worked that have endings that are not classified as happy: some that come to mind are *Crossfire*, *They Live by Night*, *Bad Day at Black Rock*, *Pilot Number Five*, and *Bataan*.

So it seems to me that R.S.C. may be too young to act as a qualified judge of my work. Certainly I am grateful to him for his listing me among men to whom I would seem an unwelcome stranger. However, ask Mr. Caplan to have hope. My new play, *The Highest Tree*, has a tragic ending — simply because it is required.
Dore Schary
New York
The fact that Mr. Schary did not distort recent history in the productions he mentions has nothing to do with the fact that he did distort Lonelyhearts. *There is nothing wrong with a happy ending; there is something very wrong with attaching one to a good unhappy novel. — Ed.*

Lackluster Symbology forum

Sirs:
As a forum to help clarify the nature of, and attitudes about, Symbolism, the recent "Symbology" conference in New York City [see May ID] seemed overly vague to me.

In preparing the conference, the organizers apparently overlooked the redundancy of content in most of the speeches; references to material that should have been common knowledge to the particular audience. This did much to lessen the potential spice of the subject matter for the time allowed.

The lack of stimulation by the chairmen in eliciting some spirited controversy was conspicuous. It is certain that a few courageous remarks will stir any meeting to more keen insights and commentary if the atmosphere is conducive. A controlled debate may not have provided as much ego gratication for those bent on a flattering, mutual admiration session, but I'm sure the real 'guts' of the subject and its peripheral relationships could have been much more thoroughly examined.

The only talk that stimulated some new reflections upon the topic was given by George Nelson.

Too bad that a long trip didn't result in a return with some 'live' ammunition.
E. Paul Meylan
Project Director
Consultants for Product Design
Los Angeles

Museum design: notes and comments

Sirs:
I have just seen the excellent article, "The Designer in the Museum," in the May issue of Industrial Design.

The subject matter of the article has been of great interest to me ever since I entered upon a museum career, and there is no doubt but that the proper designing of museums will gain in favor as time goes on. Your article will be an aid to all of us in the profession.
G. Ellis Burcaw
Curator, Commercial Museum Division
Department of Commerce, Philadelphia

Sirs:
I was complimented by the confrontation of the Guggenheim installation shot with the "less sparse" arrangement of the Archduke Leopold's Collection; and interested by the point you made about the normal level of visual saturation in museum visitors.
James Johnson Sweeney
Director
The Solomon R. Guggenheim Museum
New York

Museum addendum

It has been called to ID's attention that Richard Detrich, vice president in charge of design for General Exhibits and Displays, Inc., builders of the exhibits for Hinsdale Health Museum, worked on the design of some of these exhibits along with Donovan Worland, chief design consultants to the museum.

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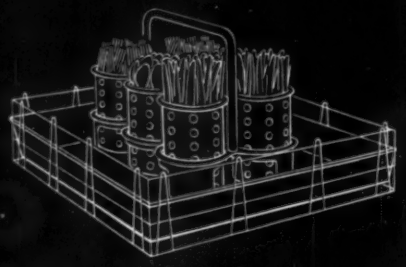

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Brittleness Temp.	D-764-52T	°F.	—200	—180	—160	—100
Impact Strength, Izod (⅛" x ½" injection-molded bars)	D-256-54T	ft. lb./in. notch	23	18	13	3
Tensile Strength, Max., 0.2 in./min.	D-638-52T	psi.	3700	3600	3500	3300
Elongation, First Tensile Yield Point	D-638-52T	%	25	25	25	25

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Refractive Index	D-542-50	n_D^{25}	1.54
Hardness, Shore D	D-676-49T		65
Stiffness	D-747-50	psi.	150,000
Water Absorption (⅛" specimen, 24 hr. immersion @ room temp.)	D-570-54T	%, wgt. gain	<0.01
Flammability	D-635-44	in./min.	1.0
*Mold Shrinkage, length		in./in.	0.03 to 0.05
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BOOKS

Technics Rococo

A DIDEROT PICTORIAL ENCYCLOPEDIA OF TRADES AND INDUSTRY: *Manufacturing and the Technical Arts in Plates Selected from "L'Encyclopédie ou Dictionnaire Raisonné des Sciences, des Arts et des Metiers" of Denis Diderot. Edited with introduction and notes by Charles Gillispie. 485 plates in 2 vol. Dover Publications, N. Y.* $18.50.

The republishing after nearly 200 years of the famous Diderot plates* on 18th century manufacturing and technical arts marks a major milestone in the publishing world; in the design world it opens a pictorial mine of vast scope.

The Encyclopedia (whose original text has not been republished) has been called "the crowning work of the Enlightenment," and the copperplates which the Dover edition presents are among the finest achievements in the graphic arts of the 18th century. The quality of these illustrations is exotic to modern eyes. Artisans glide through tanneries and soap factories like sleep walkers, and the accompanying letters and figures sit like horse flies upon their victims. The rococo style of these engravings, emphasized by laborers who pose like Watteau's gentlemen, seems today incongruous in the technical setting.

The Encyclopedia's influence in supplanting medieval secretiveness about mechanical processes with openly available technical knowledge, and its ideological support of the liberalism which came to flower in the French Revolution are fully described in Mr. Gillispie's polished introduction. During the next five years Dover will bring out other volumes from the Encyclopedia on Music, Art, Science.—*A.F.*

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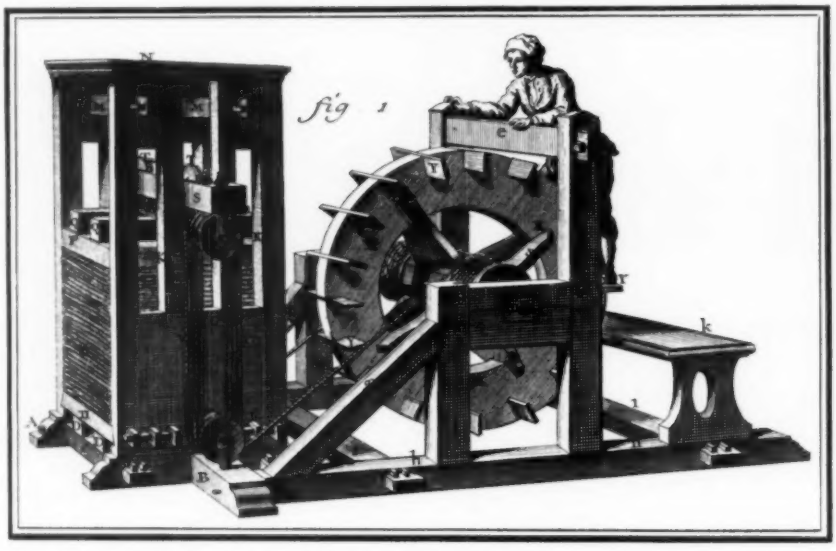
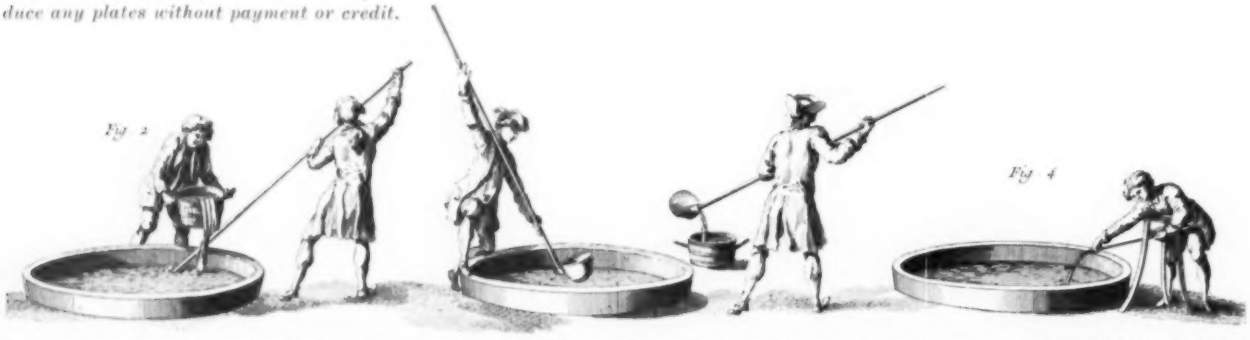
Wigmaking, which was supported by aristocrats, is one of many extinct arts reported.



Vertical treadmill converts expended energy of climber into strong power of compression.



Soapmaking (above), agriculture, printing, textiles, etching, shipbuilding, military arts, are among varied subjects included.

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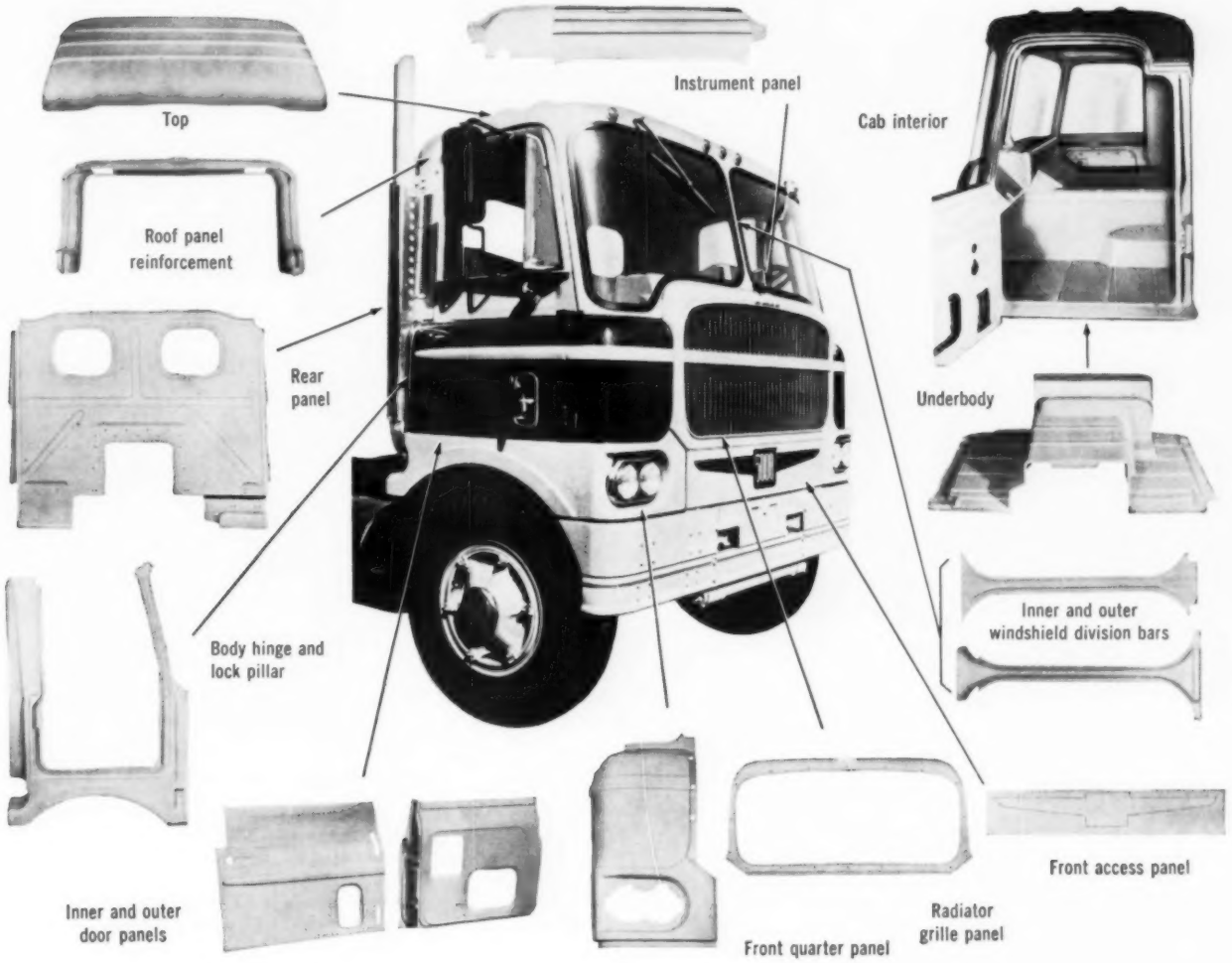

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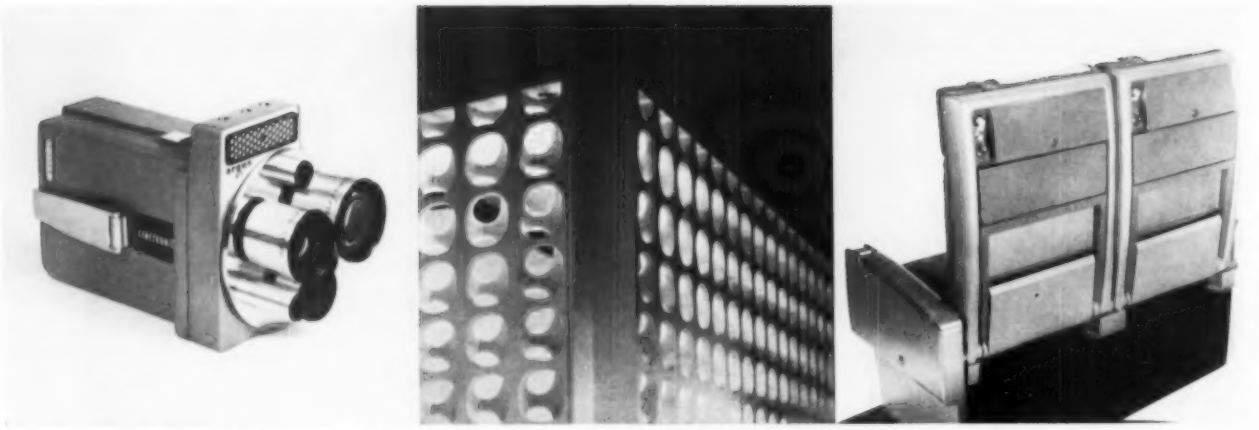
NEWS



Designers of an Argus movie camera, Modular Sculptural Block #5 and the Palomar Unitized Seat won IDI's Design Awards this year.

IDI announces annual design awards

The IDI's ninth annual presentation of Design Award medals, on June 18 at the Hotel Ambassador in Chicago, this year honored the designers of an aircraft seat, a sculptured building block, and a movie camera. The awards are given on the basis of the designer's "noteworthy and fresh approach to design and function, coupled with a practical use of appropriate materials in a product that is mass produced and nationally distributed."

In giving their award to designers of the Palomar Unitized Seat for Douglas Aircraft Corporation, the jury said: "Working within the rigid framework of commercial aircraft requirements, the design team has achieved an integration of convenience, comfort and safety together with use of appropriate and harmonious materials resulting in a design of exceptional merit." Harvey Bjornlie, Jack Graves, Harold Jencks, and Edward Klarquist of the Interiors Design Section at Douglas developed the seat, which eliminates overhead utility installations and allows flexibility in seating to accommodate fluctuating passenger loads.

Edwin Hauer, who designed Modular Sculptural Block #5 (ID, December, 1958) for the Art and Architecture Division of Murals Incorporated, also received an IDI award medal. Said the jury, "This structural concept of pierced and sculptural form creating continually varying effects results in a design unique in its combination of basic function and beauty."

The third IDI award went to designers at Harley Earl Associates for the Cinetronic Electric Eye Movie Camera for Argus. In the opinion of the jury, "the well organized components, the simplicity of form, and the dignified handling of detail in consideration of use, function, and essential quality reflects an outstanding example of industrial design." Designers of the camera were Ray Grosso, Fred Hertzler, and Dominic Saporito.

This year's panel of judges included Robert E. Redmann, president of IDI; Paul R. MacAlister, founder of the awards program; Theodore G. Clement, designer at Eastman Kodak; Bernard Grae, designer for RCA; Joseph Parriott, designer for Becker and Becker Associates; Carl Reynolds, automotive designer; Carl J. Bjorncrantz, head of the design division at Sears, Roebuck in Chicago and chairman of the jury.

ASID reschedules national meeting

The American Society of Industrial Designers' national meeting has been rescheduled from a fall date in North Carolina to a November 12-15 meeting in New York so that a new program, devised by ASID's board of directors, can reach an expanded audience. To bring industrial design forcefully to the attention of industry management and the business community, the board proposes to present a program which will answer the business man's questions about design and appeal to ASID members at the same time.

The program will include four "industry sessions" at $10 per session for members, $20 per session for non-members (this is expected to cover costs of the meetings). A business meeting and other society affairs will be conducted separately from the industry-oriented sessions.

Executive Communications, Inc., a firm specializing in planning and conducting meetings, has been retained to organize the program in cooperation with ASID executive officers. They will also interview industry management to determine their interests and problems before developing a program. ASID president Donald McFarland has asked to hear member reaction to the revised plans.

Silvermine symposium meets in fall

"Polydirectional Horizons" will be the theme of the Sixth Annual Design Symposium of the Southern New England Chapter of the IDI to be held on October 10 at Silvermine, Connecticut. George Goshco, of George Goshco Associates and chairman of this year's symposium, says that the conference will emphasize such current trends on the design scene as the break-up of the large design office, the growing demand for the small, independent design consultant and for the staff designer, and the need for a single design society.

Mr. Goshco says that panel members have not been selected yet, but will probably include speakers on design, science, marketing, and anthropology. John Vassos will be program chairman.

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PDC presents case histories

For their fourth design symposium, held on May 16 at the Silvermine Guild of Arists, the Package Designers Council chose not to have a symposium at all. Rather, they offered a presentation of seven "project histories" of recent package design programs, presented by their designers, and followed by an open discussion from the floor.

The morning's program began with Gerald Stahl, of Gerald Stahl Associates, who outlined his firm's design of U. S. Plywood Corporation's Weldwood line. Ernst Ehrman, of Ernst Ehrman Industrial Design, explained the problems in packaging a line of food additives for Merck & Company. Martin Prehn, of Donald Deskey Associates, traced the evolution of the new container for Johnson & Johnson's liquid baby cream, illustrating with slides the emphasis on research and development of graphics. George Gilder, of Alan Berni & Associates, presented the development of a self-selection package program of Pyrex and Corning Ware for Corning Glass.

In the afternoon Walter Stern, of Raymond Loewy Associates, used 100 slides to show what the designers saw, how they interpreted it, and what they finally did in an extensive design research program for American Cyanamid's animal health products. Charles Magers discussed his Christmas gift packaging of a line of direct-sell merchandise for J. R. Watkins Company. Arch Drummond, of Walter Dorwin Teague Associates, gave a report of the Teague office's packaging of General Food's institutional food line.

Most of the open discussion dealt with the validity of certain kinds of research, the basis of graphic choices, and the necessity of establishing specific design objectives. Ralph Caplan, editor of INDUSTRIAL DESIGN, was moderator of the discussions held at the conference.

World design groups surveyed

A first attempt to correlate data on industrial design organizations throughout the world has recently been announced by designer Peter Muller-Munk, president of the International Council of Societies of Industrial Designers.

As of June, 1958, 33 organizations in 20 countries were concerned with industrial design and the professional status of designers, according to Mr. Muller-Munk's report. The combined membership of the 21 societies which replied to ICSID was 6,614; the Americas, 941; Europe and the United Kingdom, 4,996; Asia, 599; and Africa, 78. Of the total membership, only 2,450 are practicing designers. A dozen societies have mixed membership, in which industrial designers are represented along with architects, engineers, craftsmen, and decorators. Only nine of the total 33 societies are exclusively for professional industrial designers.

Design organizations finance their activities in a variety of ways: ten operate from membership dues only; seven receive government support in addition to membership dues; seven operate exclusively on government subsidies.

"There appears to be a crying need for international agreement on what constitutes professional industrial design practice as distinguished from engineering, architecture, craft production, and 'styling'," said Mr. Muller-Munk after concluding his survey. In addition to this study, a second study on industrial design education by Enrico Peressutti, vice president of ICSID, will be presented when ICSID meets in September in Stockholm.

Triennale to highlight home, school

"The Home and the School" as they exist in city, country and suburb, has been selected as the theme of the 1960 Triennale which will run in Milan next July 18 to November 4. Although participating countries, whose displays will be located on the first floor, will be at liberty to select their own subjects, they will be urged to follow the Triennale theme.

The mezzanine area and the great staircase between the first and second floors will be assigned to products using a single material (which has not yet been selected). For the first time the Triennale will also emphasize the work of individual designers. In the park area surrounding the Triennale building, there will be a series of individual shows of designers who have worked for the home or the school.

The United States, and most European countries (including a number of Russian satellites) will participate. Japan, Mexico, Brazil, and possibly China are also expected to exhibit, but Russia is not.

Transportation a la carte

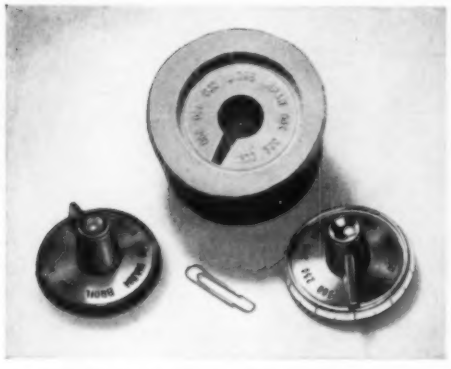
A former airplane pilot, now an aircraft maintenance man, who has long believed that the needs of private plane owners would not be completely answered until someone developed a craft that operated on land, sea, and air, has now done just that. Ogden L. Martin, of Fremont, Nebraska, has FAA approval for experimental flights in his unique vehicle (above) whose cabin is itself the airfoil, or lift agency, and in fact looks like a cross-section slice of a plane wing. Further lift, as well as aerodynamic stability, is provided by large dorsal fins at each side of the cabin which can be raised, lowered, or adjusted for wing area from controls within the cabin. The engine and propeller are mounted on top of the cabin, facing the back; behind it is a rudder/tail fin. The cabin's trailing edge has two adjustable ailerons.

Mr. Martin has already driven his machine from his home in Fremont to nearby Scribner Air Base, and although he has flown it only a few feet off the ground, says that "it has already done more than it was originally designed to do." He claims, however, that it easily travels the legal highway speed, and will travel over shallow water at high speeds. It is equipped to serve as living quarters.

New savings in time and expense: This epoxy coil-winding form is easily removed from a flexible RTV silicone rubber mold which took less than 2 hours to make. Total cost dropped from $86 per pair in hardwood to $16 per pair in plastic. Delivery was cut from 3 weeks to 2 days.

General Electric RTV silicone rubber opens up new fields in tooling and model making

Flexible, needs no parting agent, low shrinkage, duplicates glossy surfaces and fine detail



High-quality prototypes: RTV (room temperature vulcanizing) silicone rubber accurately reproduces surface finish and fine detail. This prototype control knob and other more complicated parts are easily removed from molds without using parting agents. Shrinkage less than 0.2%.

Precision, low-cost tooling: Previously machined from plastic laminate at a cost of $175 each, this fixture is now produced in a two-piece RTV mold at a saving of over $150 per part!

Ideal for casting fragile parts: 20 epoxy duplicates of this fragile actuator ring (.030" thick) were produced in this RTV mold. Even broken machine parts can be reassembled and used as a master to mold new parts.

For application data on RTV silicone rubber write General Electric Company, Silicone Products Dept., Section E6159, Waterford, New York.

GENERAL ELECTRIC

Silicone Products Dept., Waterford, N. Y.

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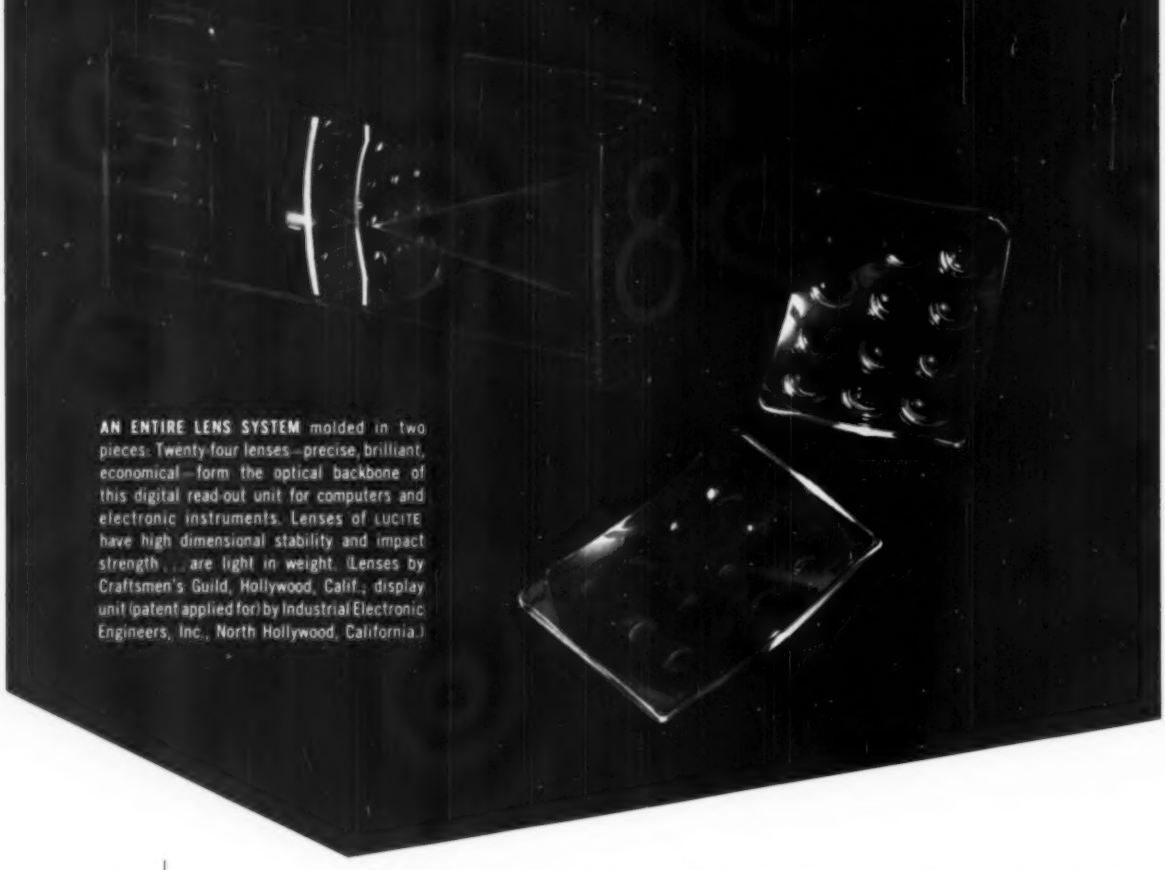
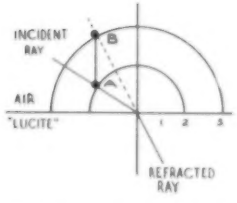


AN ENTIRE LENS SYSTEM molded in two pieces. Twenty-four lenses—precise, brilliant, economical—form the optical backbone of this digital read-out unit for computers and electronic instruments. Lenses of LUCITE have high dimensional stability and impact strength . . . are light in weight. (Lenses by Craftsmen's Guild, Hollywood, Calif.; display unit (patent applied for) by Industrial Electronic Engineers, Inc., North Hollywood, California.)



EASY WAY TO FIND THE ANGLES. The index of refraction of LUCITE is 1.49. Since this is practically a 1.50/1 or 3/2 ratio, it is easy to construct the path of a light ray through LUCITE. Draw two semicircles as shown, centered at the point of intersection of the incident ray. Draw a perpendicular from point A on the inner circle to point B on the outer circle. The continuation of the line drawn from B through the origin gives the path of the refracted ray.

EVEN if LUCITE did not possess its brilliant transparency, you would want to use it in your designs for its other valuable properties. LUCITE is a strong material—stronger in some respects than plastic materials that are known primarily for high strength. LUCITE is outstanding for resistance to sunlight, weathering and many classes of chemicals. The resin can be economically molded with a high degree of accuracy. With recent developments in LUCITE, the design possibilities are rapidly widening.

WRITE FOR VALUABLE NEW BOOKLET. Title: "A New Look at the Product Design Qualifications of a Popular Plastic, LUCITE." See how LUCITE makes possible new uses, greater sales potential. The address: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room L-21-6, Du Pont Bldg., Wilmington 98, Delaware.

In Canada: Du Pont of Canada Limited, P. O. Box 660, Montreal, Quebec.

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BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Coming in the July 1959 issue of

INDUSTRIAL DESIGN

Plastics for the Designer, Part I

In the first of a three-part series which will constitute a complete designers' guide to plastics, Robert Rockwood, a long-time specialist in interpreting plastics to designers (see ID, April 1956), will discuss the individual materials used in plastics and the various methods of forming, and will follow this with profiles of the various plastics, explaining their physical characteristics, production costs, and typical end products. Part II will deal with selecting the right plastic or plastics for a specific end product; Part III will itemize sources of technical information for the designer to use in solving special problems.

Design in Japan

Now that Japan's exports to the USA no longer fall exclusively in the 5- and 10-cent store category, Japanese industries are using industrial designers to engineer and style their products, products that compete here. Who these designers are, what their formal training is, and how they go about designing for an unfamiliar culture, and for their own, will be taken up in a special ID report.

Design Review

A sampling of recent packaging in America and Europe will highlight noteworthy examples of graphic design and mechanical developments.

Re-design

A British manufacturer has recently introduced a miniature portable phonograph comparable in size to a 35mm camera. ID's short feature will explain how turntable mechanism and pick-up arm are fitted into a small package.

Design Engineering Show

A review of products and processes shown at the exhibition in Philadelphia's Convention Hall which ran concurrently with the fourth annual Design Engineering Conference sponsored by the American Society of Mechanical Engineers.

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

INDUSTRIAL DESIGN
is published monthly
Subscription rates: $10.00 *for one year*
$18.00 *for two years*
$24.00 *for three years.*

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

"Russian styling not up to mark"

"New York seems rather near to Moscow for me," said Konstantine I. Rozhdestvensky, chief architect and designer for the coming Russian exposition, at a recent interview in the New York office of George Nelson, chief designer for the American exposition in Moscow (ID, April, 1959). Mr. Rozhdestvensky, along with Alexey Manzhulo, general director of the Russian exposition, arrived in New York at the end of May to prepare for the exposition which will open at New York's Coliseum on June 30. They will be joined by over 100 Russian engineers and technicians, 80 guides, and 30 interpreters.

In discussing the design of the coming show, Mr. Rozhdestvensky, who has designed "exhibits in every country but Australia" and was chief Russian architect at the Brussels Fair and at the New York World's Fair of 1939, said that traditional Russian art forms would be combined with newer ones. For instance, all posters, murals and charts on the Seven Year Plan will be in the style of Vladimir Majakovsky, who developed a series of posters for Tass in the '20's and established a tradition of graphic art.

Since Russia has not exhibited in the U. S. since 1939, the present show will be especially large. Its fifteen sections will be devoted to industry and the Seven Year Plan, agriculture, atoms for peace, electronics, science, optics, building construction, medicine, education, higher education, light industry, food, culture (paintings, graphics, sculpture), and fashion (modeled by men and children as well as women). Only about 20 per cent of the material to be shown was on view at the Brussels Fair.

"Unfortunately, styling is not yet up to the mark," Mr. Rozhdestvensky candidly admitted in discussing the state of industrial design in the Soviet Union. Although design shops and styling "institutes" exist, he explained that so far the country has been too busy simply turning out goods to concentrate on design and styling. Turning to America, he said that "the United States has found a national style of simplicity, solidity, and great scale in its architecture and design but not in painting." But he said that he had not yet seen the selection of painting and sculpture now on its way to the U. S. exhibition in Moscow.

Designer Nelson meets Russians Manzhulo and Rozhdestvensky (l to r).

ICSID meets in Stockholm in fall

The International Council of Societies of Industrial Designers, which was formed in June 1957, will hold its first General Assembly in Stockholm this September 16-18.

The first session will open with a welcome by Count Sigvard Bernadotte, chairman of the organizing committee, and a welcome by Peter Muller-Munk, ICSID president. There will also be a report on ICSID activities since its formation and a report and vote on the constitution and bylaws. A dinner will be given on the first evening by the Swedish Society of Industrial Designers.

Sessions on September 17 will be devoted to finances, selecting a date for the Second Assembly, and election of new officers. In the afternoon there will be a discussion, led by Paul Reilly, COID of United Kingdom, on the definition of industrial design.

The last sessions, on September 18, will include a report by Enrico Peressutti, Italian designer, on the training of industrial designers, and reports from a member of each participating nation on the state of industrial design in his country.

The assembly will also offer a full social program, exhibits, and visits to design schools and other places of interest around the city. Registration will be $20 for delegates, $25 for observers from member societies, $30 for other observers, and $10 for wives. Reservations should be made before June 30 to the ICSID, First General Assembly, Artek, Nybrogatanl, Stockholm, Sweden.

New sterling competition opens

The American Craftsmen's Council has announced a major competition for the design of sterling silver flatware under the patronage of the International Silver Company, which will provide awards for the winning designs and produce at least one of the patterns for wide distribution.

The competition will be conducted in three stages. For the first stage a number of designers and craftsmen from all over the world have been invited to submit designs to the Committee of Selection. These entries (for which designers will receive an honorarium of $500) and non-commissioned entries must be in the hands of the committee by August 15.

Models will be made of entries which pass the first stage, and these will be judged by a jury of awards in January, 1960. Each of five Prize Awards will receive $1,000, with a minimum of $5,000 in royalties assured to designs selected for production by International Silver.

For the third stage, Thomas S. Tibbs, director of the Museum of Contemporary Crafts, will assemble a comprehensive exhibition on sterling silver, showing the historic development as a background for all of the designs submitted in the competition. The exhibit will open at the museum in September, 1960.

Art of paper sculpture exhibited

The fine art of folding paper into abstract forms and representational figures is the subject of a new exhibition at the Cooper Union Museum, New York, running through August. The show is in the nature of an historical survey and includes examples of the exquisite Japanese "origami" as well as the work of contemporary craftsmen from Europe, the Orient, and the United States. Supplementing the actual examples are ancient books on the crafts and a selection of derivative objects such as a Breton coif, a sculptured lamp.

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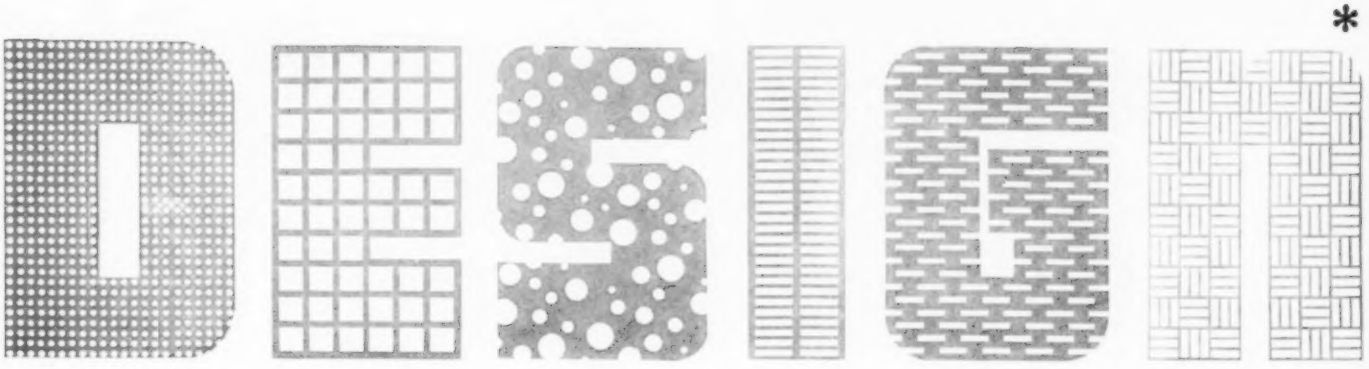

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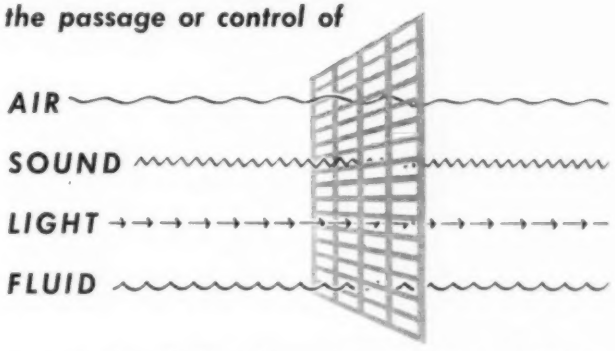

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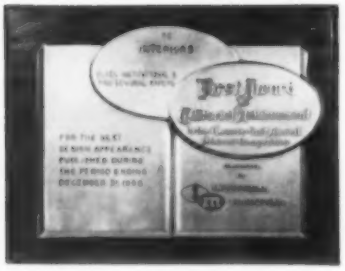
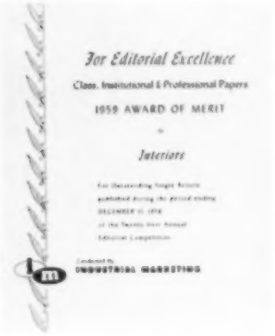


First Award for best graphic presentation by a Class, Institutional or Professional Publication in INDUSTRIAL MARKETING'S *21st Annual Editorial Competition for Business Publications.*

Certificate of Merit for the best single article by a Class, Institutional or Professional Publication in INDUSTRIAL MARKETING'S *21st Annual Editorial Competition for Business Publications.*



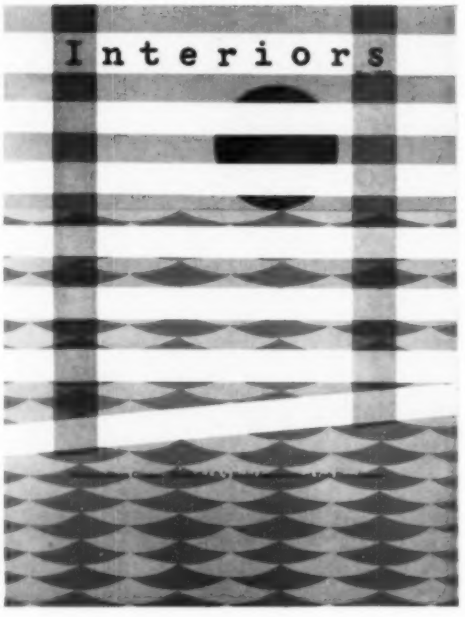
for distinguished

to INTERIORS

These 1959 awards for editorial excellence are just one measure of INTERIORS' consistent success in achieving its objective: *to provide the most creative, most stimulating, most complete coverage in its field.*

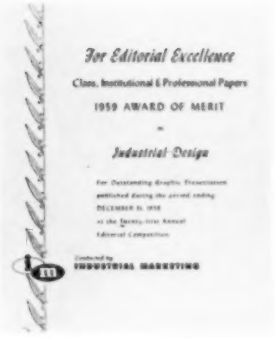
Significantly, these awards are the latest in a total of 19 awarded to INTERIORS by *Industrial Marketing* for editorial achievement—including 11 first honors.

But perhaps an even more important measure of INTERIORS' editorial service and quality, is its readers' form of recognition: subscriptions bought and paid for. For this, too, is a vote of confidence "for distinguished editorial service." And it is registered by 24,000 judges—almost 30% *more* subscribers than the field's second publication —among the three major groups of design professionals: interior designers, architects and industrial designers.



First Honors: Jesse H. Neal Editorial Achievement Awards, Classification 1, Type B; presented by the Editorial Division of the Associated Business Publications.

First Award for best single article by a Class, Institutional or Professional Publication in INDUSTRIAL MARKETING'S *21st Annual Editorial Competition for Business Publications.*



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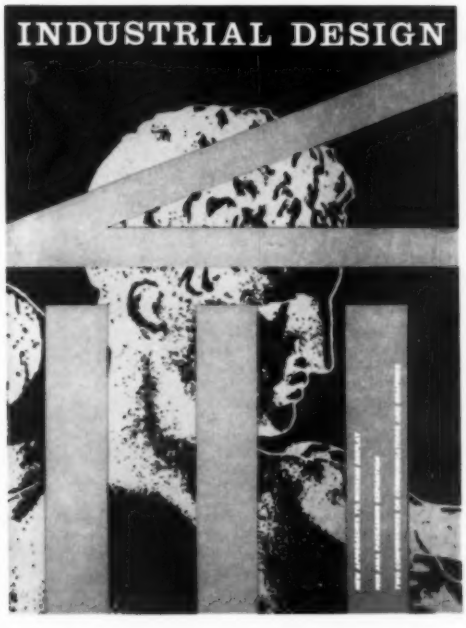
First Honors: Jesse H. Neal Editorial Achievement Awards, Classification 1, Type A; presented by the Editorial Division of the Associated Business Publications.

editorial service

to INDUSTRIAL DESIGN



In less than five years of publishing, INDUSTRIAL DESIGN has received 15 awards for editorial excellence.

These four 1959 editorial achievement awards characterize INDUSTRIAL DESIGN's most important quality: service to its readers, to its field.

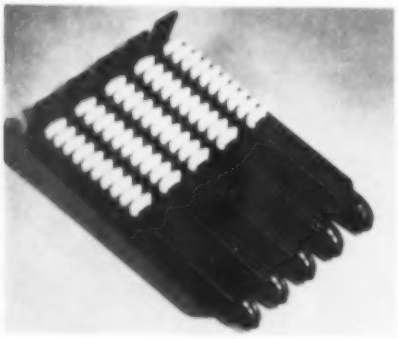
Each plaque reflects the magazine's success in fulfilling its very reason for being— to present the most important developments in design... informatively, interestingly, effectively.

Today, INDUSTRIAL DESIGN is the only publication completely serving the industrial designer... the man in industry who literally "creates" practically every product we use. Edited specifically for the designer's on-the-job, at-the-planning board needs, every issue is a portfolio of new ideas, trends, concepts and applications. Designed to spark fresh thinking, to inform, to stimulate creativity, it is the designer's *design* magazine.

WHITNEY PUBLICATIONS, INC. 18 EAST 50th STREET, NEW YORK 22, N.Y.

The abacus enters the classroom

The abacus, mathematical calculator of the Orient, has been fabricated in modern polystyrene for new duty in American grade schools across the country. Called the Ginn Arithme-Stick (below), it combines the traditional functions of the abacus with a new computer principle to make a modern classroom tool. The snap-apart sticks may be used singly to teach elementary concepts or combined for use



as a computer, number board or abacus. Addition, subtraction, multiplication, division, counting, per cent, ratio, fractions, decimals, bar graphs, games and averages can be taught as the child operates his "stick."

Dr. Robert L. Burch and J. William Larkin, Jr. designed the device and hold the patent on it. Ginn and Company, long-time publishers of text books, distribute it, and Morningstar Plastics custom-mold the boards out of Styron 475, the snap-on bead counters out of Polyethylene.

New designer marketing service

Designer Displaycase, a permanent exhibition center for suppliers to the furniture and appliance industries, opens this month at One Park Avenue in New York. Dozens of display samples by participating firms, and complete information about them, will be available to designers. The new organization will also furnish information about products in furniture, appliance and allied industries through its library and information service.

To augment the exhibitor's advertising program, Designer Displaycase will distribute a monthly newsletter to 12,000 designers, product managers, and purchasing agents. Each issue will include articles by well known designers, descriptions of new exhibits and new products as they are introduced, and an article featuring a participating firm. Inquiries derived from the newsletter will be forwarded to the participants. An annual buying directory with a complete illustrated guide to exhibitors' products will be sent to 8,000 designers and purchasing agents.

Annual cost of participation in the complete Designer Displaycase marketing program, based on a minimum three by seven-foot display case, is $686.

Automatic highway at Model stage

Highway safety may some day be taken out of the capricious hands of the individual driver, and the day may not be far off. GM Research Laboratories recently unveiled a scale-model automatic highway which proves, according to Dr. Lawrence R. Hafstad, vice president in charge of the laboratories, that "automatic vehicle control is progressing from the dream stage."

The 1/40th scale model of the system reported in ID, March, 1958 simulates a four-lane divided highway on which four miniature buses roll around the oval highway at either of two pre-determined speeds equivalent to 30 and 60 mph on a full-size highway. The vehicles are steered by an electro-magnetic system which allows them to follow a magnetic path created by low-frequency electrical current from a cable embedded in the road. An electronic computer takes the signals from the cable and actuates a servo system to steer the car.

The guidance cable in the pavement is a crisscross wire in the center of the automatic lane, which also provides a means of measuring car speed. Another cable provides a speed control signal, while still other circuits regulate the speed of all automatic vehicles for safe spacing. This is done by dividing the highway into control sections or blocks—200 feet long on a full-size highway. When a car is in a particular block its speed determines automatically the speed of vehicles in two blocks or sections behind it. If a car is stopped in the automatic lane, the car following it is stopped in the first block to the rear, and this chain reaction backs up along the highway as other vehicles come within control range of preceding cars.

Seattle to open international fair

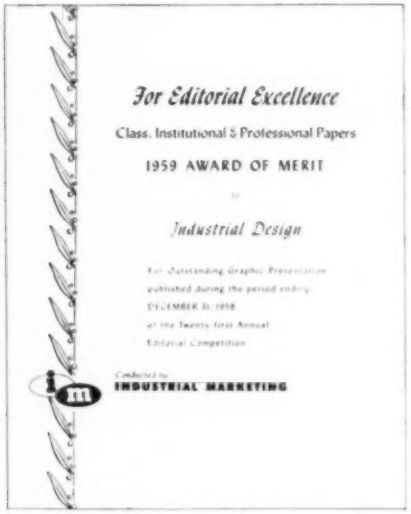
"Century 21," the nation's first international fair in more than two decades, will be held in Seattle during 1961 and 1962. The state of Washington and the city of Seattle will provide $15,000,000 to sponsor the exposition, which eventually will represent an outlay of more than $50,000,000. Allen Beach, who directed U.S. exhibits at Brussels, will serve as exhibit director.

ID wins four editorial awards

INDUSTRIAL DESIGN captured more editorial awards in 1958 than in any other year since it began publishing in 1954. In addition to winning two awards in the Associated Business Publications' annual Jessie H. Neal editorial competition, it also won a first place and an Award of Merit in the twenty-first annual competition for editorial excellence conducted by Industrial Marketing.

In the Jessie H. Neal competition ID won both of the first awards given for publications with circulation up to 10,000.

In the class of institutional and professional papers ID received Industrial Marketing's plaque for the "best single article" in the institutional and professional publications class. The winning reinforced plastics report was thus honored twice last year. Industrial Marketing also presented the magazine with an Award of Merit for "outstanding graphic presentation" in 1958. Since INDUSTRIAL DESIGN began publishing, it has won 13 awards in the Industrial Marketing competition and 3 awards in the A.B.P.



ID won two Jessie Neal (only one shown) and two Industrial Marketing awards in 1958 for editorial excellence in its class.

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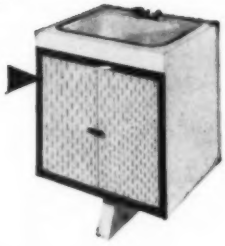

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For years TV designers have been at work on the improvement of TV set design to eliminate certain inherent disadvantages and provide a less bulky set. TV and glass engineers have created a new method of lamination that brilliantly accomplishes long-standing design objectives.

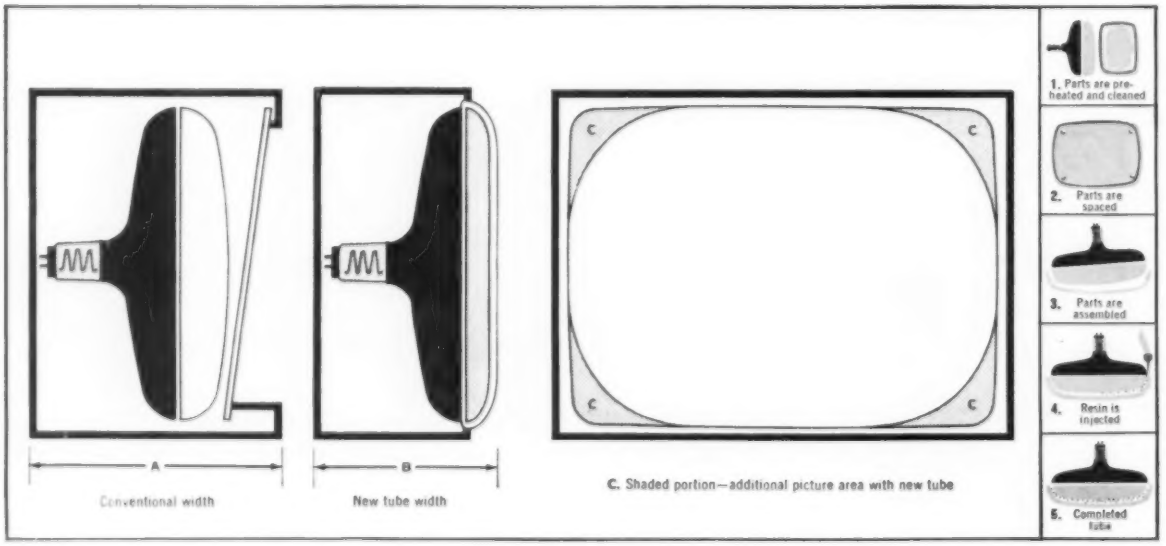
This latest example of the ability of Dow resin chemists to come up with major breakthroughs in plastics technology is a unique method of laminating a contour-fitted glass panel directly on the face of television tubes.

From the set designer's point of view, this allows reduction of the thickness of TV sets by inches and can provide new slim elegance for the set of tomorrow. Eliminating the separate panel of safety glass assures a *better, brighter picture* in two ways. First, the dead area between tube and conventional implosion panel is gone—entirely removing this dust-catching corridor. Second, a brighter TV picture results because elimination of the separate implosion panel increases light transmission and removes a distracting source of reflection between tube and panel.

Greater usable picture area on the tube is now possible also, because of the increased strength of the tube face provided by the new lamination with Dow epoxy resin. Up until now, TV tubes have been circular or oval in shape, masked by the set frame to appear square. With this new Dow lamination, the design of a virtually square tube becomes practical—and increased picture fidelity a reality.

This TV industry advancement was made possible in part by the *basic* position Dow holds in the manufacture of epoxies—including those used in making this new type of laminate.

The special facilities required for epoxy resin research—along with the know-how necessary to translate research results into production in minimum time—have been busy for years at the Dow laboratories in Midland, Michigan and Freeport, Texas. Right now, perhaps, they are working on problems of interest to your business. Why not investigate—today?



TYRIL® ***takes wide range of temperatures.*** Tyril, a recent development in the Dow family of thermoplastics, is providing both the manufacturer and the user of the milk dispenser shown here, with a "new look". Tyril has excellent resistance to temperature extremes. To the housewife that means trouble free service in the refrigerator, beauty on the shelf; yet at dishwashing time it can stand scalding hot water. To the manufacturer, the exceptional dimensional stability of Tyril permits close tolerances in moving parts.

TOUGH TACKLE ***for outdoorsmen***

Perhaps no one is more susceptible to something new than the fisherman. Yet he demands that it be trouble free. Again, out of the family of Dow plastics, another manufacturer found the material that provided the perfect combination of newness and functionality. In designing the handle and reel housing of this fishing outfit, the designer chose Tyril. Superior toughness, resistance to heat and cracking pay off for the fisherman. Its excellent molding characteristics and machinability pay the manufacturer in production economies.

OTHER DESIGNS

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TYRIL—A quality insulated serving jug and matched insulated tumblers made of Tyril! Smooth, semi-lustrous finish in a wide color selection. Won't absorb food odors.

STYRON—Several formulations were used in these colorful fishing lures: general purpose Styron for decorative characteristics, high impact Styron for strength.

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Saarinen's hockey rink at Yale

SOM's Banque Lambert

Exhibits, competitions, and awards

Form Givers at Mid-Century, a comprehensive exhibit defining the role played by contemporary architects, will be on view at New York's Metropolitan Museum of Art through the summer. Included will be work by Fuller, Gropius, Harrison, Johnson, Saarinen, Skidmore, Owings & Merrill, Stone, Breuer, Nervi, Zehrfuss, Mies van der Rohe, Wright, Sullivan, Neutra, Aalto, and Le Corbusier. Later in the year it will be shown in Boston, Pittsburgh, Minneapolis, and Richmond.

The International Council of Societies of Industrial Design is organizing a **photographic exhibit of design** through its member societies throughout the world. The exhibit, which will feature the most outstanding examples of industrial design produced during the last five years, will be on view in Stockholm during the ICSID meeting in September. Entries in America are being accepted by the ASID no later than June 15.

Entries are now being accepted for the annual **Hess Brothers Versatility in Design Contest** which honors products that serve more than one purpose. Entry blanks may be obtained from Hess Brothers Awards Committee, Suite 1019, 27 Madison Avenue, New York 22.

TAC, **The Architects Collaborative**, of Cambridge has been awarded the 1959 Boston Arts Festival Architecture Award for their design of the William F. Pollard Junior High School in Needham, Mass.

Collan Kneale (below) has been awarded the $500 Motorola Scholarship as the "best potential industrial designer in the junior year" at the University of Illinois.

People

APPOINTED: **Richard Figgins** (below) and **Richard E. Hitchcock** (below) as co-executive directors of design for Sundberg-Ferar . . . **Theodore Black**, (below) **Raymond Avery** (below), and **Raymond Stoy** (below) as designers for Robert Zeidman Associates . . . **John Gale** (below) as vice president in the new Minneapolis office of Charles Butler Associates . . . **Felix V. Waser** (below) as chief designer in the graphics and packaging department of the W. B. Ford Design Associates . . . **Richard H. Brunell** (below) as president of the Kansas City Art Institute and School of Design . . . **E. Gilbert Mason** (below) as director of design, research, and marketing at the Hardman Tool and Engineering Company . . . **H. Aldworth Christian** (below) as vice president in charge of the retail store interiors and planning division of Charles Luckman Associates . . . **E. Theodore Lorenz** as head of the industrial design division of Mast Development Company, Davenport, Iowa . . . **Maurice V. Schoenbrun** as director of engineering for George H. Kress Associates . . . **Justin Fabricius** as vice president in charge of retail development, planning and architecture at Raymond Loewy Corporation . . . **Frederick W. Hertzler** and **Robert Plantholt** as design associates and **Alfred Gruber** as project director in the market planning department of Harley Earl Associates . . . **James K. Gerrie** as director of product research and design of the Cal-Dak Company and the Plas-Tex Corporation, which recently merged . . . **William T. Hoffman, Joseph John DeVito, James Wong**, and **John Umpleby** as staff members at Becker and Becker Associates . . . **Harold Neal Minick** and **Norbert T. Buiter** as designers at Lawrence H. Wilson Associates . . . **Ed Axel** as director of combined art facilities for Lewis Barry, Inc., trade show marketing counselors . . . **Jack Meeker** as director of the new industrial design department at Jensen Engineering Company, Kansas City, Missouri . . . **William B. Winterbottom** as director of product design, and **Nettie Hart** as director of color and decorative design, at Raymond Loewy Associates in Chicago.

HONORED: **George Nelson** with the Trail Blazer Award for creative design by the National Home Fashions League . . . **Raymond Loewy** with a promotion to the rank of Commander of the French Legion of Honor . . . **Buckminster Fuller** (below) and **Jean Felix Piccard**, pioneer balloonist, with honorary degrees from Southern Illinois University . . . **Edward Larrabee Barnes** with the Brunner Memorial Prize in Architecture by the National Institute of Arts and Letters . . . **Harry Bertoia**, sculptor; **Leo Lionni**, art director; **Just Lunning**, president of Georg Jensen; and **Gyorgy Kepes**, graphic designer for "the distinction they have brought to their professions" at convocation ceremonies of the Philadelphia Museum College of Art.

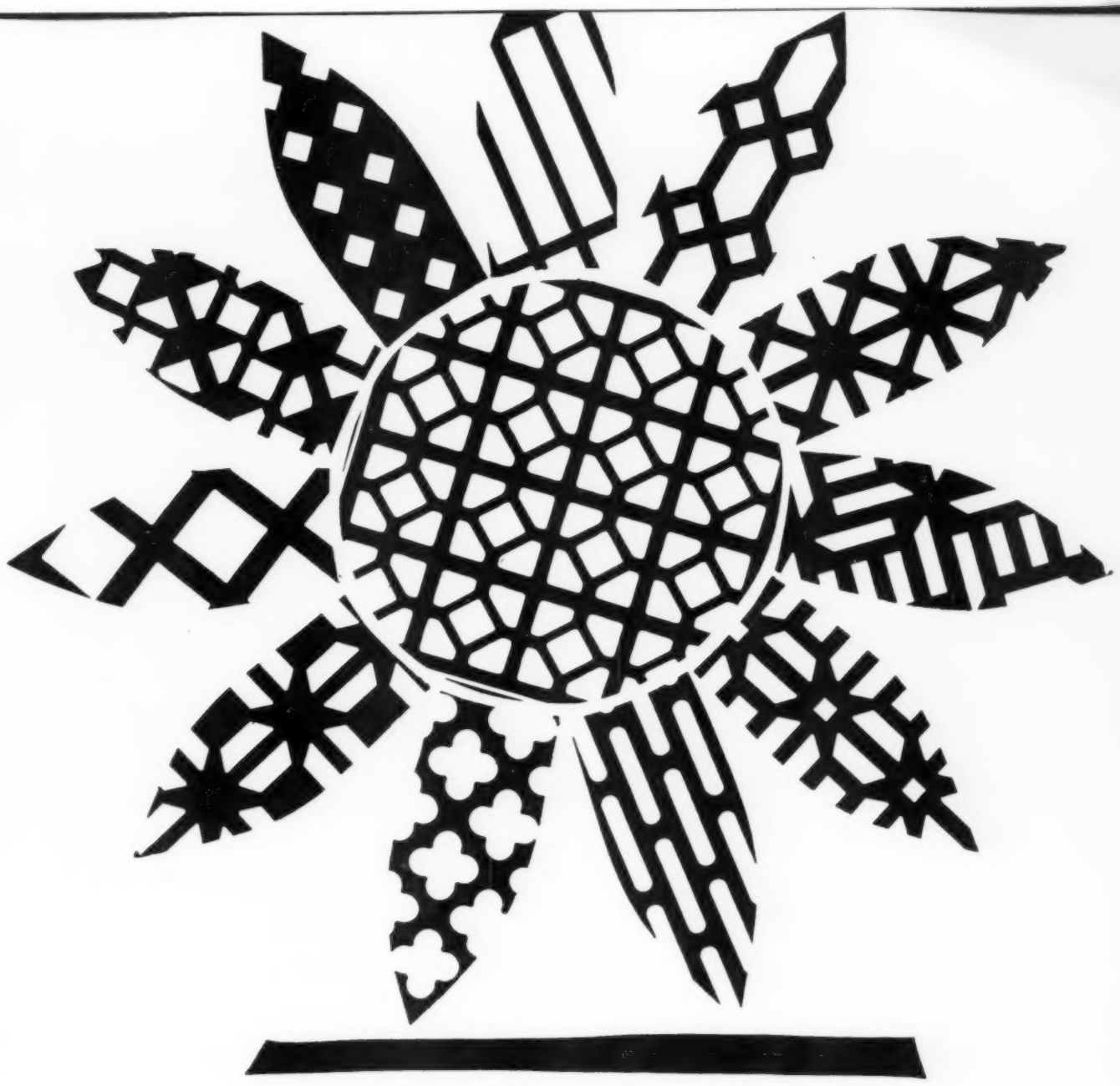
Company News

RETAINED: **Bruce Kamp Associates** to create a corporate identity program and redesign a new line of production equipment for Lanston Monotype Company . . . **Stowe Myers** to design the U. S. exhibit at the Tunis Fair . . . **Becker and Becker Associates** by the city of Boston to do a space analysis for the proposed city hall and state office building.

NEW OFFICE: **Jake Millard Williams** will specialize in toy design in Atlanta.

GOING PLACES: **Lawrence Singer** to 605 Fifth Avenue . . . **Saul Bass** to 7758 Sunset Boulevard, Los Angeles.

Christian *Avery* *Black* *Stoy* *Waser* *Hitchcock* *Figgins* *Brunell* *Fuller* *Mason* *Kneale* *Gale*



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NATIONAL STANDARD

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The conscience of industry

We are scribbling this 20,000 feet beyond belief in a Viscount aimed at some design students in Atlanta, Georgia. It is only fair to warn the reader that we are drinking a Martini. This particular Martini was not inspired by the prospect of meeting students, nor is it to induce sleep. Its function at this otherwise lucid altitude is to take away a bad taste, for we have been brooding over an acrid exchange we had a few weeks ago with a prominent designer and his press agent.

At some point in an otherwise innocuous conversation about "taste," we had touched lightly but somewhat gratingly on the dead-tired-but-always-willing-to-be-aroused question of whether a designer was committed to do his "best" even when all the client's instruments indicated that the public would accept — indeed, *craved* — his "second best." By now nothing that can be said on the subject is likely to take any designer by surprise; the whole debate has long been one of the seven deadly scenes of the profession. But the press agent *was* taken by surprise, and he in turn offered a new angle that may be called, in scholarly terms, an original contribution to the field. "How," he asked incredulously, "can you introduce a *moral element* [verbal italics his] into a simple commercial transaction?"

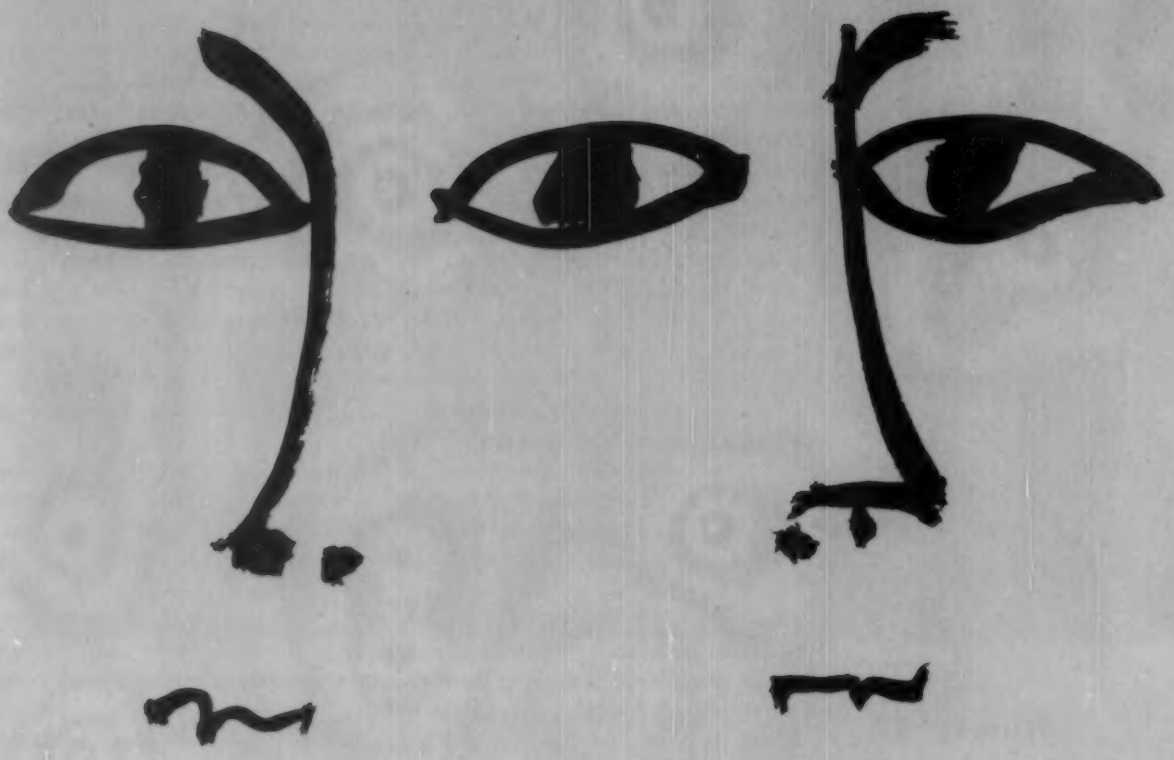
"It's easy," we said, trying to slide away from the subject with a gag. But he repeated the question — his head shaking laterally with the wonder of it all — and added, "I'm asking sincerely."

We were astounded, for we believe he *was* asking sincerely. Oh, there's nothing startling about the question itself: it was raised publicly a few years ago by one of the client relations men from Lucky Luciano Associates at the time that firm was closing its New York office, and none of the inquiring senators batted a partisan eye. The disturbing element in our conversation was not the question but the fact that the questioner was not a narcotics pusher — or a member of any of the other registered professions customarily identified with this philosophic stand — but rather a normal private citizen representing an industrial designer. And representing him well, or at least widely.

Even more disturbing was our own failure to answer him satisfactorily. What do you tell someone at a time like this? Do you say that since commercial transactions represent exchanges of value, there has got to be a moral element in them? (No, too academic.) Do you say that civilizations are built on the premise that *every* transaction between man and man is a moral transaction? (No, too preachy, too holy.)

"You still haven't told me," he said, and he had us there. We hadn't told him. Maybe no one ever will.

Meanwhile, over — we guess — Charlotte, N. C., we scour our own clouds (visibility fair) for an answer, convinced that there must be one in a world that has students at the other end of its flights. And that may be the end to explore. Design students tend to look up every once in a while and ask what kind of world they will be designing *for*. Well, here is one sobering aspect of it: it is a world in which a man who is not a burglar can, with a perfectly straight face, ask impatiently what on earth morality has to do with commerce. But — much more important — they will be designing for a world in which they, perhaps better than almost anyone else, can answer his question. For, in mass-production manufacturing, design *is* the moral element, and the designer, who has been called "the conscience of industry," is responsible for introducing it, if any introduction is needed. — *R.S.C.*



The practice of architecture and the practice of industrial design at times come so close together that their practitioners seem to have a common eye, but there is some disagreement about where it is, what it sees, and who benefits most from its vision.

WHERE TWO PROFESSIONS MEET, THEY OVERLAP

By WILLIAM HENRY

Early this month two Yale professors of architecture joined in publicly predicting a world full of houses that could be erected by unskilled homeowners. There was just one hitch: "First, industry must mass-produce a tiny reversible 'heat-cool' unit, build prefabricated houses around this unit, and then fly the parts to all corners of the earth."

If industry does produce such a house, the event will mark — at least at one point — the fusion of architecture and industrial design. In the meantime, the two professions move closer together, frequently rubbing each other, often the wrong way.

The shaping of buildings and the shaping of products have always been inextricably tied, and it has often been true that the same men were responsible for both. But historically these men were architects, and their products were designed for a particular building. A more recent phenomenon is the extent to which mass-produced products have become determining factors in shelter design. And more recent still is the tendency for industrial designers to collaborate with architects on various aspects of shelter design, and — in the case of such special-function buildings as stores, factories, showrooms, restaurants, service stations — actually to design the buildings themselves. Similarly, architects have in some instances designed needed components which later *became* mass production items.

An area so broad that architects design commercial fixtures and product designers create buildings raises some questions: What sort of product does an architect design, and why? What kind of building does a designer conceive, and how does it happen that he is invited to conceive any at all? The questions are difficult and likely to sound impudent. The answers are difficult, and likely to sound emotional. But the fact of two overlapping professions remains. Although architecture and industrial design face the world from somewhat different angles, they tend increasingly to share a common eye, as in the drawing at left. Overleaf is a preliminary attempt to look at what this common eye measures.

Philip Johnson's building products show how architecture provokes product design

Special lettering, by Elaine Lustig, set into marble lobby walls, demonstrates architects' concern for details. Typeface, which resembles Egyptian, is used throughout the Seagram building in many materials.

Bronze mailbox doors in ground floor lobby weigh 122 pounds each, require specially constructed hinges to carry weight almost double that of conventional doors.

Photos: J. S. Ward

Philip Johnson

Basin trim is priced competitively with equivalent off-the-shelf items. These items will be used in new Union Carbide Building.

Lever door-handles and locks are available in quantity. This design is only one with unbeveled bezel.

Commode and basin (not shown) are examples of Johnson's "clean up." Both have been made part of Richmond's regular off-the-shelf line, because of "endorsement by the discerning consumer."

Philip Johnson, associate architect with Mies van der Rohe on New York's Seagram Building, has used the $43 million bronze tower as a showcase for some of his ideas about what manufactured building products should look like. Although many architects will design door hardware and plumbing fixtures specially for their buildings, Johnson — who has been publicly concerned with the level of public taste ever since 1932, when he became Director of Architecture at the Museum of Modern Art—wanted to start what he calls a "clean up" of designed building products. To this end he offered to give his designs free to the manufacturers who made them.

In most cases his products have been put on the market, but in the process Johnson was like a man looking for a hotel room at convention time, knocking on every door and being told to go elsewhere. According to Johnson, none of the big plumbing fixture manufacturers would touch his jobs because they would be too much trouble; finally, The Speakman Company and Richmond Plumbing Fixtures division of Rheem Manufacturing Company made up his designs without treating them as complicated, special orders. One glass maker found it impossible to stop his production line for the one day it would take to fill Johnson's order. (Franklin Glass Corp., the firm that did make it, has sold enough of it to be out of stock until next year.) Yale and Towne made the door hardware because their president is a friend of Johnson; Cutler, the mail chutes because the chairman of their board sits on the board of the building's general contractor. Considering that floor-to-ceiling glass walls are bywords of modern architecture, Carrier was surprisingly late in agreeing to make an air conditioning unit that for the first time makes such curtain walls practical.

Industrial designers and architects, whatever the distinctions in their practices, have at least one point in common: both create designs primarily for use rather than for esthetic contemplation. One main difference of course is that since the architect's end product is not machine-made (although its components may be) he does not need to become intimately involved in the problems of mass production. Nevertheless their orientation to design is often much the same, and so are their disciplines. Eliot Noyes, who practices in both fields, sums up this communality in speaking of his own training and experience: "The Bauhaus training involved a general attitude toward design as a whole, making little distinction between one's attitude toward the design of products or architecture, even though as a practical matter one tended to specialize in one field or another. This made good sense to me at the time, as it always has since."

In practice there are still other reasons for their complex and close-knit relationship. For one thing, there is the increasing use of industrially made, prefabricated building components. Industrial products have of course influenced architecture ever since a mill operator conceived the idea of pre-cutting lumber to the most frequently specified sizes. But the standardizing of lumber lengths is a picayune influence compared with such contemporary examples as preformed curtain walls, complete with interior and exterior finish, or pre-assembled plumbing walls, containing all the piping and connections needed for a bathroom. Sweet's Catalog is a rich lode of similar examples. At the bottom of this page architect Richard Neutra expresses himself on the industrial designer's influence in this area.

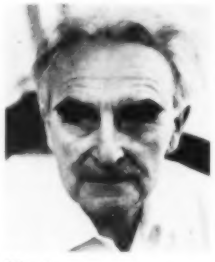
The two fields are also increasingly interrelated in the design of certain building types which house complicated commercial, industrial, or institutional operations. Buildings have always existed to supply usable space for functions to take place in, but traditionally the architect's role has been to provide volume, dimensions, entrances and exits, and fenestration suitable to particular activities. He did not customarily have to become involved in *detailed* studies of what these activities were, how they were carried out, and what they proposed to achieve. In short, he did not so much have to analyse the function, as to know what it was. While nothing precludes an architect's handling such an analysis (and many large architectural offices do) the fact remains that the endless minutiae of building codes and structural systems are quite enough detail for the average architect to cope with. Pre-architectural studies for such complex operations as department stores or business offices, furthermore, raise problems in programming and planning that the architect seldom contends with—but that the industrial designer lives with constantly and so is unusually well equipped to handle. The modern department store, for instance, is like a large vending machine in which all the design

Two views of the architect-designer relationship by two practitioners of the different fields

Muller-Munk

Designer Peter Muller-Munk: "More and more of the components of architectural structures are under our care and it is full-time professional care of a pretty high order. . . . The two professions need to get together, not just by accident but through an acceptance of their relative roles in the control of our environment. . . . Instead of acknowledging the fraternity, architecture shrugs off industrial design as an ill-bred and meretricious fad. . . . The standard architectural approach to industrial design is to throw up a wall on which the names Mies, Frank Lloyd Wright, Gropius, Saarinen, appear in different arrangements. This is calculated to throw the designer into properly abject confusion. If he should recover sufficiently to still be around when the last glass is empty, a reference to the industrial designer's personal responsibility for the latest automotive monstrosity will deliver the coup de grace.

"At the top of both professions there is agreement that they are dependent on each other, but the platform on which collaboration occurs remains too small."



Neutra

Architect Richard Neutra: "Architecture venerably predates grand scale automated fabrication in the modern sense, which is the spirited industrial designer's domain. A 'who is who' of imaginative enterprising fabricators is his potential client list, but it is also a guide into the synthetic quarry, so to speak, of the contemporary architect. Plastic hardware, light and plumbing fixtures, ready-made shower stalls and circular stairs, two-tone, three-door, wall-hung refrigerators, fold-out sewing machines and lazy susan TV sets are all neatly pre-dimensioned building blocks, processed by the industrial designer long before this sort of prefab supply reaches the over-all plan-maker, the arch-composer or architect. This professional, however, in his sometimes lonely experimental ventures, co-existing and collaborating with an individual consumer, instead of a quantity producer, may still, on occasion, by his more or less improvised antics, stimulate his brother professional, the industrial designer, the protagonist of the true mass transactions that style our planet, and will do so more and more."

elements must work toward the end of selling the owner's wares. Similarly a large business office is a place in which complex, machine-like processes occur, where the space must work before it can be beautiful.

Between these two examples of overlapping function—the one concerned with the programming of space, the other concerned with the building's physical components—lie a whole range of contact points at which the designer and architect meet and work with each other—in most cases, harmoniously. Becker & Becker, an industrial design firm that does a lot of space planning, stress that they work as part of an architectural team; Henry Dreyfuss, who impinges upon architecture only in the course of doing corporate identity, makes it clear that his job is "not to play architect, but to oversee design in all areas, to determine all things that go into a company's 'look,' down to the smallest sign." And Peter Schladermundt, who, like many industrial designers, is himself an architect by training, has been retained by architects (among them, Voorhees, Walker, Smith & Smith) to do store planning. In some cases, however, the overlap leads to resentment which gets expressed on the architects' side by denunciations of the pernicious influence of industrial design on popular taste (see the statement by Peter Muller-Munk at the bottom of page 36). But the knife of criticism has two points and no handle and in some cases the architect's disgust is justified. Muller-Munk has more to say on the subject: "When I drive through our countryside or try to thread my way through the city, quite a good deal of architect-designed stuff that I see is, unhappily enough, not the architectural statement of a Mies or a Gropius. I am, alas, led to conclude that in architecture, like almost anywhere else, the top is small and the base not only big but often ugly. Heaven knows, we industrial designers make our mistakes, too, but let us not pretend that we are the only ones."

It would seem that the more extreme criticism from architects stems less from esthetics than from a competitive concern with commissions. And it is true that designers like Raymond Loewy and Brooks Stevens compete with architects for jobs in certain fields. The Loewy office has made a specialty of stores, and Stevens, who feels that he can make a contribution "wherever appeal to the customer is the important thing," has designed "showcase" factories for some of his product-design accounts. Even in residential design, which is thought of as the sanctum of the architect, an industrial designer like Norman Cherner (whose work is discussed on page 44) will skim some of the cream from the architect's pot; and George Nelson's industrial house (ID, January 1958) is an indication of still another foothold in the architect's traditional territory. Clearly, the designer is unhampered by the strict definitions of the older profession, and in outlook and training is prepared to turn his

A design office whose major activity is planning finds a welcome from architects

The brothers Becker: Jules (left) and Nathaniel

Nathaniel and Jules Becker are partners in Becker & Becker, a New York design office specializing in space planning: "The trend appears to be to welcome the space analyst as an increasingly valuable liaison between architect and client as well as a work arm. We don't supplant the architect, but bring our experience and knowledge of design to bear on problems concerning the human occupancy of space. Every architect knows that polling his client and assessing the client's wishes—which may be no more than personal caprices—is time and work added to the project, when he should be free to concentrate on more purely architectural considerations. Even in cases where the architect originally objected to our being engaged, his resistance broke down when he saw what we could do for him. We inquire into existing functions, gathering statistics about present and future requirements, and translate our data into a workable program—a bottom on which the architect can base his design. He benefits from the certainty that his building is within sound functional limits, thereby satisfying his client as to his wants and needs."

hand to almost anything, from designing a logotype, to designing the stationery it is printed on, to designing the building in which the letter is written.

Leon Gordon Miller is a case in point. Although his office does both interiors and product design he is at the same time involved, on several levels, in a large city-planning project. His major role on the latter job is that of design planning consultant to Western Reserve University Medical School in Cleveland, Ohio, but his affiliation with the school began on a considerably smaller scale. Several years ago he was retained to design a new laboratory table that would meet the requirements of a new approach to medical training: the study of a disease as it affected the entire body, as opposed to the study of a single part of the body and all the diseases to which it was prone. This project grew until it culminated in what is now known as the Miller Multi-Discipline Laboratory, and was followed by a commission to design specialized equipment, cabinetry, and storage and control systems for the school, as well as to participate in pre-architectural planning and programming for new medical school buildings, and to develop a modular system of space and furnishings as a basis for their architectural design. This led to his appointment as planner and design coordinator for all health-science components in Cleveland's 20-year civic development program, called University Circle. The project, involving an 800-acre site, aims at the creation of an integrated center for 30 educational, medical, and cultural organizations, including Western Reserve, Case Institute of Technology, Cleveland Museum of Art, Cleveland Institute of Art, Mt. Sinai Hospital, and University Hospital. Miller's province includes a 98-acre triangle devoted to four of Western Reserve's schools: medicine, nursing, dentistry, and social and applied science. It also includes the county morgue and a number of other, smaller, health-science institutions. He defines some of his work, and justifies it, at the bottom of this page.

Although Miller's work for the university does not involve merchandising—which is the route most commonly taken by designers into the field of architecture—he feels that the project is one for which the industrial designer is well suited. The problem, as he sees it, is one of channeling a flow of traffic through an area, and as such it is similar to that of the commercial office or store. Large numbers of students, doctors, patients, and ambulances, must move from one place to another briskly, smoothly, and directly. In addition, the complex of buildings must be attractive as well as practical, a combination of requirements that he thinks the designer is particularly well equipped to meet.

Raymond Loewy Associates' latest large-scale architectural project would seem to bear him out, for the Loewy office also is engaged in a city-planning project, a cultural center for the city of Montreal, Canada. The designers were retained

The designer develops growth patterns, anticipates needs

Miller

Leon Gordon Miller, Cleveland industrial designer: "The designer must understand how to evaluate a problem; he must have the ability to analyze function. . . . In planning for optimum occupancy of a single site by a group of buildings whose internal operations overlap, the need for information pertaining to interior function is essential. In planning a logical relationship of these structures, all of the normal considerations pertaining to land use will apply, plus the crucial one of internal functions and their interrelationship. In his surveys, and through the techniques established by planners in the design field, a designer is able to develop growth patterns and to anticipate future needs. Basing his work on his knowledge of equipment and space and its effect on people, the designer can translate requirements of organic function into meaningful space terms. Site planners as a rule work from the general to the specific. We work outward from the specifics. In effect, our work augments that of more general planners in defining specific requirements for structures and their relationships within allotted areas."

One firm sees the architect as quarterback

Griswold of GHK

Two reception rooms for the Robert Gair Division of Continental Can Corporation, in a building at 530 Fifth Avenue, New York City. GHK used walnut paneling in both, rescaled logotype (in brushed aluminum) for use on wall, and designed the nameplates on door and above desk.

Photos this page: Siegfried Hermann

Showrooms for Underwood Corporation in Washington, D. C. (below, left), and in Chicago. In Washington, GHK planned new building, designed all furniture and graphics showing in photograph. Iron rods are supporting framework for typewriter displays that are design features of both showrooms.

Griswold, Heckel and Keiser, a New York industrial design and office planning firm, contend that the industrial designer is valuable as a designer of commercial interiors, because of his ability to translate business problems into visual terms. They hold that, in the way it functions, an office is like a diversified factory: its departments — sales, legal, administrative, etc.—must be set up like parallel assembly lines, each delivering a component (in the form of written material) of a finished product. The emphasis in office design is not primarily on making a good-looking interior, but on providing for its function. Usually, appearance has a good deal to do with it, because the operating elements of the office are people, not machines, and people will respond to a good-looking, well-designed office with increased efficiency and willingness to work. GHK does interiors, and the products and equipment that go into them, but no architecture as such. When one of their commissions involves a building not yet constructed, and it is necessary to change its shape or appearance to accommodate it to operations that go on inside, GHK will consult with the architect to resolve what they consider to be their joint problem. The New York office building of Commercial Investment Trust, Incorporated, contains an example of this kind of cooperation. In order to put CIT's legal department on one floor (which GHK's survey found necessary), the design of the building was modified to allow a floor large enough.

GHK feels that the architect is the quarterback of the team, so to speak. "But he has to recognize that the modern business building is complex, and that he needs the industrial designer as much as the mechanical or structural engineer; however the designer must realize that he is a consultant, not the boss."

by the Sir Georges Etienne Cartier Corporation, the agency behind the project, one of whose members is Bartley Morgan, a department store owner who had previously used the Loewy organization for planning one of his stores. Loewy's assignment was to serve as marketing and planning consultant, an approach that by implication treated the center as a merchandising problem rather than an extension of the City Beautiful movement. In their report the designers were concerned with such things as the economics of resident and touring theatrical companies; how to work auxiliary facilities such as restaurants and bars into the complex (and whether these would pay for themselves); the remunerative use of concert rooms and theatres for trade shows and sales meetings; as well as the customary city-planning analyses of traffic and parking, mass transportation, and street changes.

The direct antecedent of this approach is of course the Loewy office's extensive experience in store-planning, which forms the major part of its architectural work, and for which it has developed a special—and successful—technique. It treats a store strictly as a merchandising problem, letting esthetics fall by the wayside unless it contributes to the essential purpose of the store, which is to sell goods. As William Snaith, president of the firm, puts it, "The skill of a store designer is demonstrated in the successful interpretation of a store's unique character. It is not demonstrated in an esthetic architectural statement, although this possibility is not ruled out." Snaith says that RLA's forte is merchandising help—the planning of traffic flow patterns, of fixturing, of lighting; the positioning of departments and impulse sales areas, off-floor stock areas, of vertical transportation—to facilitate the transfer of goods from counter to customer. In effect this involves complete floor plans and detailed drawings, so that the architect employed has only to "wrap an envelope around the plan." The Loewy office insists that it does not compete with architectural firms, since the architects always have a separate contract with the client. But in fact the Loewy firm is usually instrumental in selecting the architect used.

Brooks Stevens frankly competes with architects, but makes a case for his invasion of their purlieux. Stevens says, speaking of his architectural design clients, "The auto dealer, the restaurant owner, they're not interested in monuments—only in how many people they can get to put money into the till. Take a shoe store. Of course an architect will do research—but still, he is likely to think of it as a wall structure. We think of it as a mechanism for selling shoes." Stevens claims he knows the businesses he designs buildings for as no architect does, because he is frequently involved in designing products for them or, as in the case of Miller Brewing Company, he handles their complete corporate identity from packaging to truck graphics.

Brooks Stevens explains his "minimal invasion" of the profession he originally studied

Stevens

Designer Brooks Stevens: "I believe that when a building's emphasis is on consumer appeal, the industrial designer is a logical choice. He is better qualified than the architect is to design a serviceable building that will make money, which is, after all, the aim of a business building. This is not to indict architects—it's just that in certain areas we have experience that they do not have. Take a shoe store, for example. If an architect were designing one, of course he would do research into the shoe business. Still, he would think of it as a wall structure. We think of it as a mechanism for selling shoes. With factory space planning, here again the industrial designer has more understanding: he's in and out of plants all day, and he knows the needs of both workers *and* company presidents! Do architects resent us? Of course they do. But whenever we design a building, we retain an architect—to see to lighting and heating, ventilation, structural steel, etc. and to put his seal on the job. I don't feel defensive about our minimal invasion of architecture. We work harmoniously with many architects."

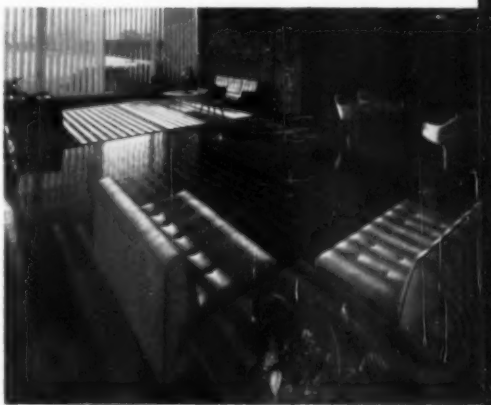
Corporate identity is also the entry point of Peter Schladermundt Associates and Henry Dreyfuss into the architectural field, though generally the two do not design buildings per se, but simply dictate their design personality. Schladermundt, however, has done interiors and, as mentioned before, store planning, while Dreyfuss occasionally does structures which he characterizes as "quasi-architectural." In elaboration he says that these projects "are not conceived of as buildings but as merchandising tools. A service station, for example, is an enormously elaborate vending machine which as a building does no more than provide an umbrella for the attendant. The reason we take on such prototype projects is that they are part of corporate identity programs. This emphasis on two criteria—merchandising and corporate identity—accounts for the distinction between the jobs we accept and those we turn down. If a client should approach us about some new factory buildings, we automatically refer him to a good architect. On the other hand when a major bank approached us about its facilities, we said yes. A bank, after all, is a mechanism for selling and performing a service."

The kind of control that both Dreyfuss and Schladermundt exercise over the final architecture is in the nature of design guidance for the client. Schladermundt sees himself as a "professional client"—i.e., he advises his client on architecture, and translates the client's desires into a design statement the architect can use. In the course of a corporate identity program for Socony, for instance, Schladermundt had to work a logotype he had designed into a scheme of a service station. He presented a sketch showing the logo used as a structural element of the building. If the proposal is accepted, Socony will turn over Schladermundt's drawing to local architects for each service station, and their design will be based upon it, but local availability of materials and local styles of building will dictate the final result.

At the opposite end of the spectrum are the architectural firms, like Welton Becket & Associates and Kahn & Jacobs, who have added industrial design departments to their operations and use them for industrial design problems connected with their architectural projects (although in the case of Kahn & Jacobs the department also handles packaging and product design assignments having no relation to architectural projects). Both firms are large, and the major part of their work is on large structures—office buildings, stores, airport terminals—whose functions require a complexity of fixturing and a degree of pre-architectural planning that make the addition of an industrial design department a logical part of their staff set-up. Becket feels that it is important for one firm to handle all phases of a project —pre-design research, architecture and engineering, special fixtures, interior decoration, and "all the multitudinous details of a complete turnkey job." It simplifies things for the

Three views of Stevens's award-winning factory show one designer's approach to architecture

The building at left is a Glendale, Wisconsin factory designed by Brooks Stevens Associates for the Square D Company, of Detroit. The plant was described by Factory *magazine as one of the nation's ten best new plants, "superbly equipped to manufacture, handle and test electrical products." The lagoon—a device Stevens has used before—serves esthetic and fire-control purposes. Designed to blend with an adjacent park, the plant is built of aluminum, stone, and earth-red brick laid with stacked joints and large expanses of glass. The general offices have perforated metal pan ceilings, fluorescent troffer lighting and vinyl tile floors. Architects on the project were Grassold-Johnson & Associates.*



client, of course, to offer him a complete design package. But in addition it means that the architectural office can solve all its design problems internally without having to spend time reconciling conflicting concepts, and without spending time and money in job duplication. The Becket firm has six industrial designers on its staff who participate in space planning, and who design special products for the firm's clients.

Kahn & Jacobs approaches industrial design slightly differently. Robert Jacobs says that industrial design is an extension of architectural thinking, and that no architect can afford to ignore it. Their move into the field was dictated also by the feeling that diversification was good for the firm, and that any move in that direction had to be toward the "sister art" of industrial design. At Kahn & Jacobs the industrial designer can be, and frequently is, an integral member of the architectural team. Felix Gilbert, head of the industrial design section, has in fact acted as project manager on one architectural job—interior architecture of the Empire Trust bank in New York. In Jacobs' opinion a bank interior is as much an industrial design problem as it is an architectural one. Special furniture is needed to fill precise functional requirements and to meet situations in which a knowledge of human engineering is an asset— specifically in the areas of the teller's stations. Besides this, a complex flow of paperwork must be channeled. And finally, since a bank sells intangible services, its total appearance must be a reflection not so much of an architectural esthetic —of pure and stately space—as of a corporate identity.

This brings the architect full-circle into the province of the industrial designer, linking the two fields into one. And this is precisely what seems to lie ahead for the field of architecture in the opinion of one architect, Peter Blake, and one industrial designer, Muller-Munk. In Muller-Munk's words, architecture is moving "from a craft status to an assembly-line status of pre-fabricated components", and he believes that more and more of the physical and functional aspects of building design will fall under the heading of industrial design. The obvious ultimate stage would be the design of the building *in toto* as a product. Overleaf we show how one designer is currently dealing with an "industrially-designed" house.

But the future of architecture is not industrial design. Rather, both professions must tend, as far as possible, to coalesce. A spokesman for George Nelson's office, all of whose partners are architects by training, says that "there is one body of opinion, one rationale, about design; and one group of people who have worked it out, architects, because architecture is the older profession, and its practitioners have had more time to think about it. That's not to say we should all be architects. In fact, the two fields are so complex that no one can really define his position completely." Muller-Munk continues the thought: "We must come out from behind the shelter of our drawing boards and together lay the foundation for a new profession." Overleaf we show how one designer is currently dealing with an "industrially-designed" house.

Raymond Loewy Associates create designs for selling, even when what they sell is art

Foley's department store in Houston, Texas, is an example of advance planning, as these two photos, taken 10 years apart, show. In their original survey for the store, the Loewy organization predicted that Houston's — and Foley's — growth would require seven more storeys, and provided for the expansion. Above, 1958; *below,* 1948.

William Snaith

The exterior of Lord and Taylor's Garden City, N. Y., branch store (above) shows by its use of the fashionable architectural vocabulary of the International Style that it caters to the high-fashion trade, as opposed to Foley's (opposite page) whose monolithic structure conveys an impression of solidity and dependability. The layout of L & T's Garden City interior (shown at right) continues the feeling given by the outside: departments are treated as boutiques.

The Montreal cultural center was conceived as a merchandising problem: how drama, music, the dance could be made to pay (with assists from restaurants, bars, stores). The rendering below shows only the Loewy organization's initial conception of how it should look. Building design by Canadian architects is now under way; Loewy functions on job as client's representative.

Raymond Loewy Associates' largest design department is concerned with space planning of stores, offices, factories and restaurants. In all cases their design is directed to getting the last inch of use out of a space. When they accept a commission to plan a store, for instance, the Loewy designers survey the client's present and future needs completely, down to how much space a pair of stockings takes up in the storeroom, and as far as whether the store will continue in its present form when the present owners die. They establish how much of what kind of space their client needs to sell his merchandise in his unique way, before they attempt to design a building that expresses the store's character. A high-fashion store like Lord and Taylor must present itself to the customer in a different way from Gimbel's, which should look as though it were chock-a-block with merchandise, as it is.

President William Snaith of the Raymond Loewy Corporation says:

"The most important job of the external appearance of a store is to project an image of the store. A store like Gimbel's should give the impression of being big and solid, to tell the customer that here she can get not only the most goods, but the best goods. It should be different enough from its neighbors to be noticeable. It should reflect the character of the community: a store that doesn't may never get built. Exterior character may sell a store locally.

"The interior should continue to project the store's character. The kind of display cases will show whether the store is a supermarket-type or a salon (where the customer is helped every step of the way); the kind of merchandise the customer first sees will tell her whether the store is a comfortable family institution or a no-nonsense modern business."

Norman Cherner

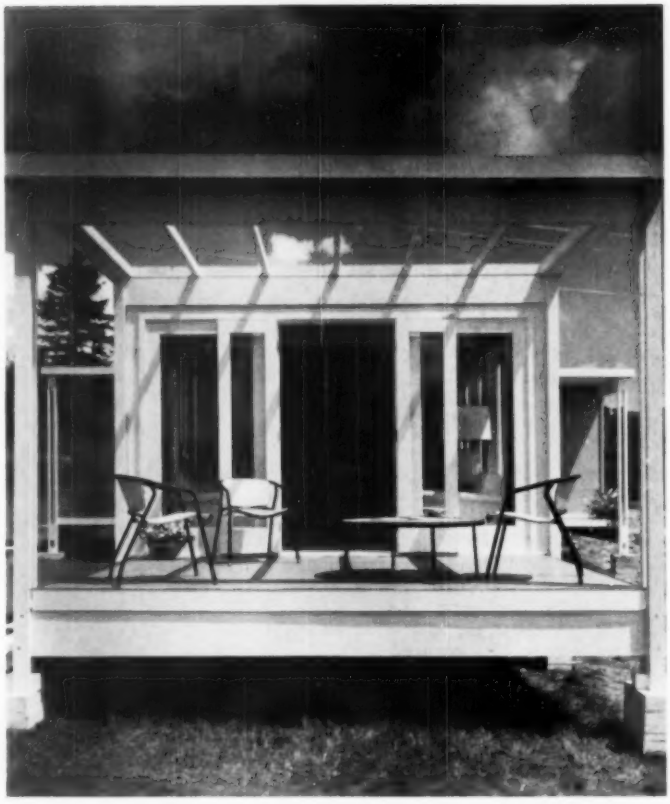
An industrial designer creates prefabricated houses

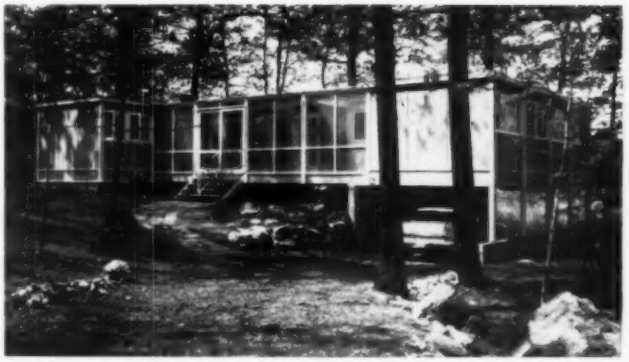
Norman Cherner is unusual among industrial designers, because his specialty is houses, which are normally regarded as the *exclusive* province of architects. He says that he works "with the house and everything that goes into it." Cherner—whose practice is about 50 per cent residences, the other half being furniture, glassware, and a small amount of exhibition, showroom and interior design—thinks of houses as just another industrial design specialty, no more curious to be engaged in than packaging, for instance.

His first houses were built in 1948: a co-operative community in Ramapo, New York. Since then most of his interest has been centered in residential design. He insists that his approach to a house is purely that of an industrial designer: the house is a product, and almost exclusively a combination of machine-made things.

As Cherner sees it, one man could do the planning and structural design for a house in the old days, but now, because technology has become more complex, no one with a predominantly esthetic training can handle the new techniques. The house-designer must be the directing force in a team with the technician. Confronted with a multiplicity of structural possibilities, each one of them too subtle and complicated for him to work out himself, he has to choose the appropriate structure intuitively, and get experts to work it out.

Cherner feels also that the house is no longer thought of as a permanent part of one's environment ("How many people," he asks, "spend their lives where they were born?"), but as a convenience "on the level of a paper plate," to be used until it no longer works and then discarded. "No one," he says, "thinks of a house, functionally or esthetically, as lasting for more than a generation at the most.





Two views of Norman Cherner's prefabricated house, the Prebuilt, which was designed for Penobscot Cabins of Camden, Maine. Above, the Prebuilt is shown erected at Camden preparatory to being demounted and shipped to the Vienna International Fair in 1957. At the right is Cherner's own house, the same Prebuilt, erected on a site in Connecticut. The basic units into which the house is divided are 4-foot by 8-foot stressed skin panels, which form both inside and outside walls; and the structural frames, or bents, which hold the house up. Foundations or posts set in the ground are supplied by the customer. The house comes in several packages, is trucked to site, complete with windows and doors manufactured to fit the 4-foot module.

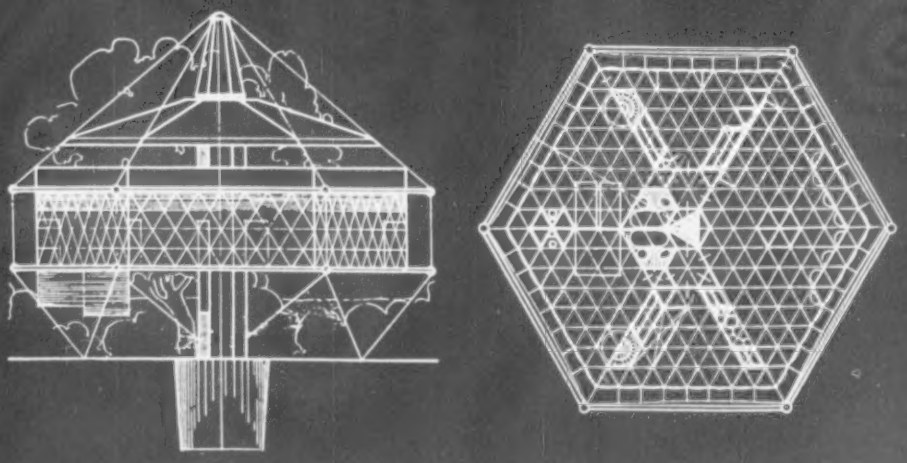
Architecture as product design: a possible future for the American shelter

The specter—or bright vision—of total pre-fabrication has hovered over architecture since wood was first cut to size. As residential structures have moved from the individually designed skeleton of the Cape Cod cottage, through simple-frame, balloon-frame, and plank-and-beam-systems, to laminated wood and stressed skin constructions, and, in the near future, molded plastic structures, building them becomes less susceptible to handling by one man. Larger and larger components of houses are manufactured, until domestic architecture becomes what Peter Muller-Munk calls "an orchestration of mass-produced parts."

A further step toward the fusion of industrial design and architecture in domestic architecture is the design of the house itself as a manufactured product. Carl Koch's Techbilt house and Cherner's Prebuilt are attempts at this, but both of them suffer—as products, not necessarily as houses—from having to compromise with all the old attitudes that govern people's reactions to houses as well as industry's present incapability of manufacturing a house. They are both conceived as assemblages of manufactured units, but they arrive at their sites knocked down, and need the services of carpenters merely to be erected. And to get them into habitable shape, plumbers, electricians, and other building tradesmen are necessary. Cherner says ruefully that his Prebuilt can be put up by "any do-it-yourselfer who is a skillful enough carpenter to build a house."

Attempts at designing truly industrial houses have been made by George Nelson (ID, January 1958), and R. Buckminster Fuller. One of Fuller's famous Dymaxion houses is shown below. After the second world war, Beech Aircraft Company was going to put a Dymaxion house into production, but difficulties of capitalization stopped it.

Fuller's dramatic expression of his faith in technology is still among the most tangible expressions we have of the still-to-be-realized industrially-produced house. Yet surely if the fusion of architecture and industrial design is ever achieved, it will be in the manufacture of such houses. In a later issue of ID the whole subject of prefabrication and the industrially-produced building will be considered in detail.



20TH CENTURY DESIGN: U.S.A.

An ambitious collection at the Albright Art Gallery surveys half a century of work to find a common design ground for American products.

More than 2500 products made in America during the past fifty or sixty years have been collected at Buffalo's Albright Art Gallery under the title "20th Century Design: U.S.A." The collection, selected solely by guest curator William Friedman, opened May 3rd and is about to travel to seven co-sponsoring museums throughout the nation. Dissatisfied with the more amorphous approaches to design exhibition, Friedman designed this ambitious and well-presented show to make a point: American design has matured enough to have evolved a recognizable "design vocabulary." Aided by a long background of studying American design, Friedman was able to organize work begun only last March into 1200 square feet of handsome products. (He had a basic staff of four people, expanding at times to as many as twenty.) Since the show will travel, Friedman and architectural collaborator Arthur A. Carrara, framed most of the exhibit around a versatile and dismountable steel grid structure manufactured by the L.A. Darling Company of Bronson, Michigan.

While it reflects the intended scope of the show—and while it is not unusual in a culture that encourages even art galleries and museums to invoke the charms of Madison Avenue in naming their more special works—the title is unfortunate. It is unfortunate because it implies a finality of definition which the show has not got, and it is unfortunate in its failure to adequately describe the real value of this exhibition. That real value, as we see it, is the dramatic demonstration of what an impressive lot of good American design there is. Curiously, the title's very inadequacy, and the show's failure to live up to the implicit promise of the title, intensifies one's awareness of the collection's importance. If we try to conceive the sort of show that *would* be

Items left to right and top to bottom
d: designer
m: manufacturer

COVERED SAUCEPANS / 1939— / stainless steel and copper / d: W. Archibald Welden / m: Revere Copper

TEA KETTLES / 1934— / aluminum / d: Lurelle V. A. Guild / m: Wear-Ever

BOWLS / 1942— / wood / d: Marcus Glynn / m: Woodbury /

BASKET / ca 1910— / wood / d-m: anonymous / distrib: Reding Novelties /

DECANTER / Tiffin / 1916— / glass / d-m: U.S. Glass

ICE BALANCE / 1913 (ca 1967)— / iron and brass / d-m: Chatillon

FLATWARE / Contour / 1951— / sterling silver / d: John Van Koert / m: Towle

ARMCHAIR / 1950— / chrome plated steel with fabric / d: Eero Saarinen; m: Knoll

ELECTRIC CALCULATOR / Figuremaster / 1948 (d 1940)— / plastic and steel / d: Jo Sinel / m: Marchant

PITCHER / 1955— / silverplate / d: Theodore E. Cayer / m: Reed and Barton

JARS / 1902— / glass / d-m: U.S. Glass

SMOKING PIPE / 1892— / wood and amber or rubber / d-m: Fischer / Lumberman; Full Curve

RESET PICK COUNTER / 1951— / enameled steel / d: Peter Muller-Munk / m: Veeder-Root

REPEATING SHOTGUN / 1912— / d: T. C. Johnson / m: Winchester-Western

LABORATORY CASSEROLES / before 1912 — / porcelain / d: anonymous / m: Coors

DINNERWEAR / Coupe / 1937 (1905)— / porcelain / d-m: Lenox

BASKET / ca 1910— / wood / d-m: anonymous / distrib: Reding Novelties

ELECTRIC MEAT GRINDER / 1954— / enameled and chrome plated steel / d: Alfred W. Marl / m: Oster

SALAD BOWL / 1946— / wood / d-m: Woodbury

OUTSIDE CALIPERS / ca 1885— / steel / d-m: Brown & Sharpe

BASEBALLS / 1926 (1876)— / leather, wool, rubber, cork / d-m: A. G. Spalding

FLY REEL / Pflueger / 1928— / aluminum and stainless steel / d: Walter Adams / m: Enterprise

DRAWSTRING PURSE / 1947— / leather / d-m: Enger-Kress

OVAL BOWLS / Grainware / 1952— / plastic / d: Charles McCrea / m: Plastic Productions

FREIGHT TRAIN / 1946— / wood / d-m: Playskool

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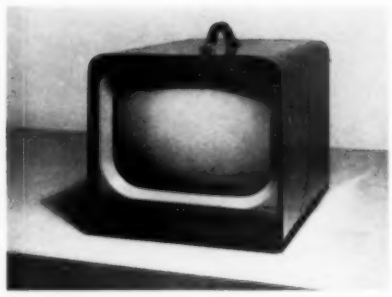

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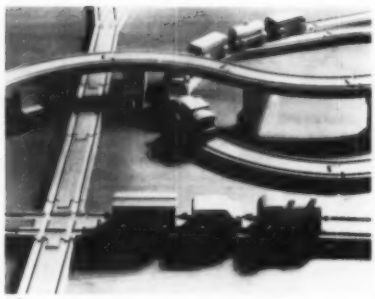

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accurately described by a name like this, we realize (with considerable satisfaction and pride) the impossibility of the task. What doesn't meet the eye at the Albright becomes a frame of reference for what does, and once inside we are allowed to see, sit in, and touch a lot of well-designed products.

As with any show, of course, questions like these come up: "Why did they leave —— out?" "Where is the 1934 hardtop cigar case?" But a study of the show emphasizes the abundance behind *its* abundance: even a show of this size can't hold everything that belongs in it. To be really fair one would have to give up the idea of housing this show in a museum, and resort to showing the products where they are: in the American home and marketplace.

Probably every design show has at least one visitor an hour who points to one of the objects displayed and cries out: "What's this doing in a museum? I've had one at home since '34." Such responses may be consoling even to those exhibit designers who have to fearfully watch the public glide past a year's hard work in half an hour. They serve to remind us of one of the most significant features of the 20th century product: since it *is* produced in mass, it has the rare privilege of becoming commonplace. The Albright collection is a collection of objects that many of us have come to take for granted. Their very familiarity saves them from the fate of feared and imposing "museum pieces." It may in face be true that the American Product represents the only creative form left that can mean something to most people without scaring them half to death.

Beginning with a "Source Room" showing several "historic" objects which may have had some influence on our present forms, the collection continues its introduction with the furniture of Frank Lloyd Wright and of Gustav Stickley —whose work in furniture and whose magazine "The Craftsman" did much at the beginning of the century to win acceptance for the direct and unadorned approach to object design. Here also is the work of Tiffany, Frederick Carder (who founded the Steuben Glass Works) and several fine examples of ceramic-ware by Charles Binns, founder of the College of Ceramics at Alfred University. The course of the exhibit moves on pleasantly through areas filled with such unexpected pieces as adjustable furniture casters and Squash Rackets balls, to the easily anticipated works of Eames, Nelson, Loewy, *et al.*

The excellence of the show itself is carried out in the photographic record of the individual pieces, now available in catalog form. John Szarkowski has taken extremely sensitive photographs which show an understanding of his problem all too rare in this field.

Work on the exhibit began while Friedman was still at Indiana University. During the late spring and summer he reviewed his personal files on designers and manufacturers so that by the time of his arrival in Buffalo the first letters of inquiry were ready to be mailed. Initial letters went to more than a thousand designers. Another thousand were sent to manufacturers. Anticipating the uncontrolled confusion which can result in handling records on a project of this

1 The central and largest display area of the exhibition shows products in various states of suspension and rest within the walk-around island platforms.

2 DINING CHAIR / ca 1910 / wood and leather d: Frank Lloyd Wright

ROCKER / Craftsman / ca 1910-1918 / wood and leather / d-m: Gustav Stickley

3 GLASSWARE / 1916 / glass / d-m: Frederick Carder

4 SAFETY GOGGLES / 1957— / plastic and glass / d: Fred G. Gay / m: Bausch & Lomb

SAFETY GOGGLES / 1953— / plastic / d: Fred G. Gay / m: Bausch & Lomb

SAFETY GLASSES / 1956— / glass and plastic / d: Fred G. Gay / m: Bausch & Lomb

SAFETY GLASSES / 1940— / glass and metal / d: A. G. Mowson / m: Bausch & Lomb

5 COCKTAIL TABLE / 1937— / steel and glass / d: William Armbruster / m: Edgewood

6 TELEVISION MONITOR / 1958— / enameled steel and plastic d: H. L. Kornfeld / m: Conrac

7 LOUNGE CHAIR / 1952-1957 / steel and nylon / d: Harold L. Cohen and Davis P. Pratt / m: Designers in Production

SIDE CHAIR / 1952— / steel and cotton string / d: Allan Gould / m: Hilda Lipkin

8 TEA KETTLE / 1934— / aluminum / d: Lurelle V. A. Guild / m: Wear-Ever

PRESSURE COOKER / 1947-1957; 1957 (1947)— / aluminum and wood or plastic / d-m: National Presto

9 LUGGAGE / Knocabout / 1951— / leather and brass / d-m: Hartmann

LUGGAGE / Caravan / 1957— / leather and brass / d-m: Hartmann

10 TRAIN, TRACK, AND BLOCKS / 1944— / wood / d: Marshall Larrabee / m: Playskool

11 FLATWARE / Design 2 / 1956— / stainless steel / d: Don Wallance / m: Lauffer (made in Germany)

size, Friedman, aided by his capable research associate, Miss Ann Wittchen, devised an enviable system for processing and keeping track of the overwhelming number of letters, follow-up cards, product descriptions, and case history questionnaires. Prints of 35mm photographs were made of almost all items up for consideration. Pinned to the wall outside Friedman's office, these made an efficient, and incidentally decorative, check on the status of each piece. When final selections were made, each manufacturer was requested to lend the object to the Gallery.

It is perhaps indicative of American manufacturer's awareness of the importance of industrial design that very few of them refused to lend their products. It is also interesting that the 1096 catalog items (since many of these items, such as dinnerware, have more than one piece, there are more than 25,000 articles in the collection) represent the works of only 400 manufacturers and 350 designers.

Although Friedman is careful to explain that for every item in the show there is another that might stand equally well for the same values and "design maturity," he did use the standard criteria—performance, durability, form—that most design exhibit judging comes to rest on. In considering form, he looked for pieces that effectively reflected the product's substance, as well as being sculpturally pleasing in themselves. The spirit of his choosing is set forth in the introduction to the show's catalog, which is available from the Albright Art Gallery for $2.75.

In terms of general availability and production, the products fall into three groups: the work of craftsmen between 1900 and 1920; products currently in production; and products which are no longer being made. Of these, the pieces now in production far outnumber the other categories, some of them having been manufactured for more than sixty years with little or no change in their design. It is sad to note that in trying to collect some out-of-production pieces, Mr. Friedman encountered unexpected difficulty in locating work which was introduced to the market as recently as four years ago. To find an example of its own skill, one manufacturer had to conduct a nation-wide canvass of its dealers to find a highly regarded major appliance first sold in 1956. Another, unable to find an unused set, paid the charges to have the only available model of its 1955 television receiver refurbished for the show.

One can only hope that soon someone will give thought and money to the responsible *preservation* of the more important examples of the machine-made product, as well as their temporary exhibition.—*J.S.W.*

1 STEMWARE / 1930— / glass / d-m: West Virginia

STEMWARE / 1958 (ca 1900)— / glass / d-m: West Virginia

MARTINI SET / 1957— / glass / d-m: West Virginia

2 ADJUSTABLE CASTERS / Scruswiv / 1954 —/ steel and plastic / d: Charles R. Nolle / m: Adjustable Caster

3 TILT BOTTLE / 1954— / glass / d: Landor / m: Owens Illinois (for Arrowhead and Puritas Waters / half-gallon

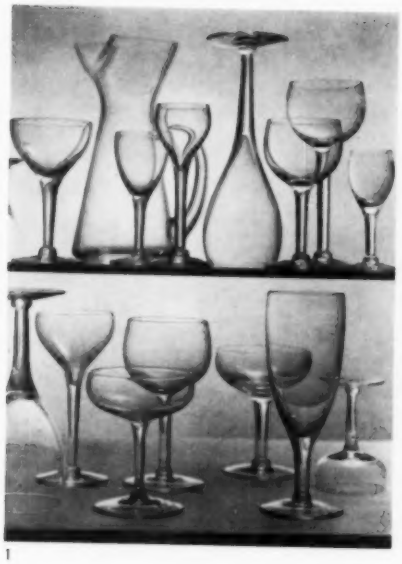
4 POCKET MAGNIFIER / 1932— / chrome plated brass and glass / d-m: Bausch & Lomb

LINEN TESTERS / 1939— / steel and glass / d-m: Bausch & Lomb

MEASURING MAGNIFIER / 1955— / plastic, steel, glass / d-m: Bausch & Lomb

WATCHMAKER'S LOUPE / 1930— / plastic and glass / d-m: Bausch & Lomb

Itinerary
Albright Art Gallery: May 3 to June 14, 1959
The Cleveland Museum of Art: July 15 to August 23, 1959
City Art Museum of St. Louis: September 14 to October 25, 1959
The Minneapolis Institute of Arts: November 23 to Jan. 3, 1960
San Francisco Museum of Art: February 1 to March 13, 1960
Dallas Museum of Fine Arts: April 4 to May 15, 1960
Portland Art Museum: June 6 to July 31, 1960
The Dayton Art Institute: September 12 to October 23, 1960



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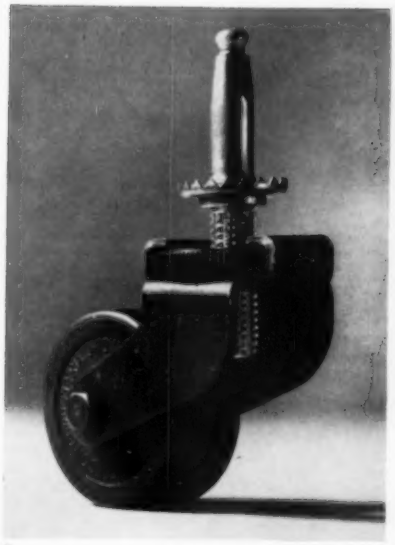

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Underwater photo shows planing surface of an outboard hull at low speed

The other side of the transom

by JOHN BEINERT

Shortly after the appearance of the article on Johnson Motors in the ID's January issue, designer John Beinert wrote to us and suggested a corollary story on the problems of designing the small craft that use outboard motors. Beinert's thesis was that the lack of coordination between hull and engine manufacturers led to wasteful and unsafe design because hull designers, never certain as to what kind of power plant the user would finally buy, were forced to design between absurd limits. Beinert was so convincing in presenting the problem that ID has asked him to expand his theories on outboard hull design in the following article.

What we need in the field of outboard motor propulsion is a more sensible marriage between motor and hull. This union is at present imperiled by woefully inadequate channels of communication and a jointly destructive self-centered outlook. While we applaud the technical achievements of the motor manufacturers, the lack of coordination between them and the designers of hulls and interiors leads to the same silly, wasteful design that we find in many Detroit products.

To draw a simple analogy, it is very much as though an automobile designer had to design a car in which the ultimate buyer could choose a power plant ranging from 50 to 250 horsepower. I daresay that there is hardly an engineer who could sanction the result either on the grounds of safety or economy of production and use. Yet this is exactly the problem over which the boat designer must chew his nails and curse in frustration.

Wasted space

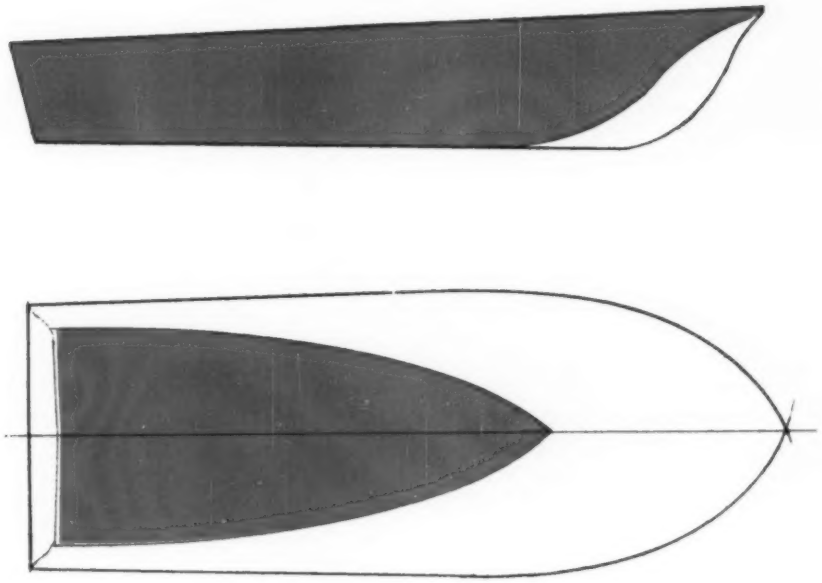
Without question, the outboard motor offers certain basic economies and conveniences that no inboard power plant can hope to match. But many of the economies and performance factors are negated by the restrictions on usable hull space brought about by the wide variety of horsepower choice. It would seem sensible to suppose that the complex of hull manufacturer, motor manufacturer, and dealer could analyze the ultimate use of each boat and indicate to the buyer the safest and most economical combination of motor and hull. Unfortunately, this hardly ever happens.

To illustrate, let's select an average 15-foot runabout for a breakdown on space requirements. Depending on either plywood or fiberglass hull construction, the hull and fittings will weigh between 300 and 500 pounds. Recommended horsepower is determined by multiplying the overall boat length by the overall stern width. However the designer must also consider minimum and maximum power limits: the 15-foot runabout can be controlled by a 10-horsepower engine, and at the upper range can conceivably operate safely at 70 horsepower. This range inhibits the designer seeking to style a boat that will operate at maximum performance figures for its size, weight, and configuration. Furthermore, the combination of motor, live loads, and operating characteristics begins to raise havoc with space.

First, for safe operation, the hull must have a forward configuration which will permit it to part the water efficiently under different conditions of speed and sea. By restricting the bow area, we lose a certain amount of livable area in the forward section of the boat. A bow deck approximately 60 inches long covers this space, and at best affords a sheltered area below for the stowage of light gear. Behind this is some six feet of passenger space divided into a driving area and a rear seat section. Allowance must be made for six passengers, although reasonable comfort can be promised to four only.

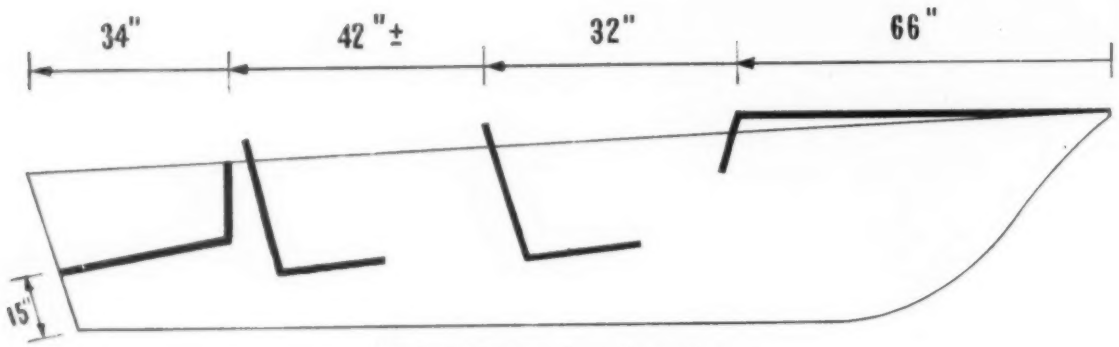
The tilt problem

The next area is the one that causes the trouble. Because most outboard motors are still started by yanking on a pull cord, hull manufacturers must permit access to the motor and a reasonable amount of space for the operator either to stand or kneel to get the engine going. Then, because of

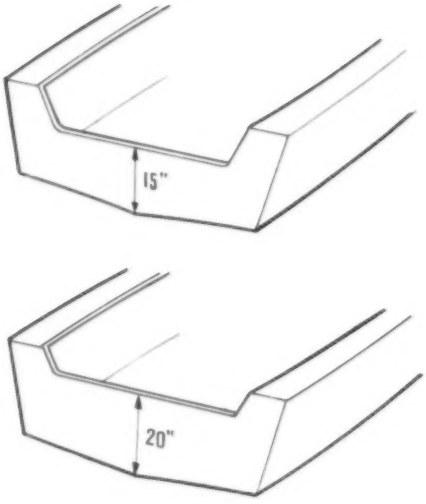


The Outboard Boating Club rule for determining boat horsepower capacity is to measure overall length in feet by overall stern width in feet. The drawings at the left of 15-foot boats with 68-inch stern widths show the fiction of this formula. Each of these boats has a different wetted area dependent on the boat's planing surface, which in turn is dependent on the boat's configuration. Yet according to the OBC formula, both the shaded and unshaded crafts are equal and should take the same size motor. This does not consider that the shaded boat was designed for higher speeds and performance levels than the general purpose hull. These boats are not equal, but the designer is forced to assume that they are. The boating industry should form a committee comprised of designers, naval architects, boat makers, and engine manufacturers (and perhaps chaired by someone from the Coast Guard) to determine a more workable formula for arriving at horsepower capacity.

Angles and inches plague the dealer recommending proper combination of hull and motor

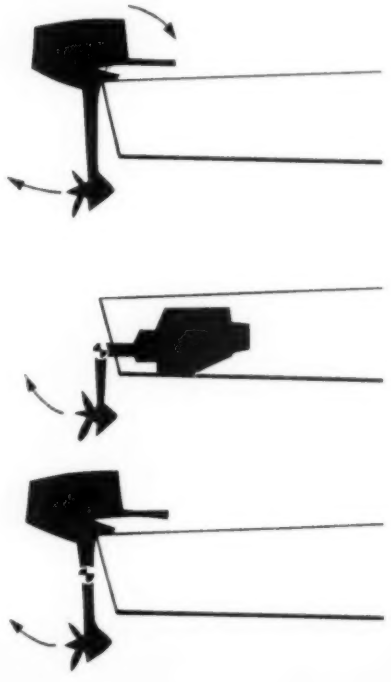


The drawing above shows the waste space in the average 15-foot runabout. The area under the foredeck can be used for storing gasoline and sea gear. But less than half of the craft's area is for the accomodation of passengers. All of the tilt space is lost.



Most boats have a 15" transom cutout. In choppy conditions, water slopping over this low transom can swamp the boat. 20" cutouts are available only on request. If motor makers supplied only long-shaft motors, hull manufacturers could standardize transom height, remove sinking hazard.

The first drawing below illustrates the normal tilt of an outboard motor. The bottom two drawings show two suggestions for saving space in the tilt area. A seat would be placed over middle motor. Both motors would have a hinge in their shafts which would enable shaft to kick up when it struck flotsam, without tilting the motor into the boat.



the speed at which the boat may operate and the possibility of inadvertently hitting a sandbar or flotsam, the motor must be allowed to tilt to avoid the hazard. Depending on the speed and force of impact, tilt angle may reach a full 90°. This means, then, that the clearance dimension from the stern of the boat to the most forward point to which the motor will tilt must accommodate the largest motor which is theoretically capable of operating the craft. At the present time, the clearance in this size boat may range up to 28 inches for a 70 hp motor. In addition to this clearance, it is also recommended that an additional three inches be allowed so that an arm hung over the rear seat will not be crushed.

One of the important design considerations in the performance of hydroplane hulls is the center of gravity of the boat in both loaded and unloaded condition. As weight is piled aft, the boat assumes a greater bow-up position. The motor is normally hung not on top of the transom, but somewhat below it, so that the average distance between the bottom of the hull and the uppermost position of the motor clamp is 15 inches. This doesn't lend itself to a very safe configuration, because as the boat pitches in storm conditions, water may occasionally slop over the low cut-out, increasing the after weight until it is possible for the boat to sink to the point where built-in flotation takes over.

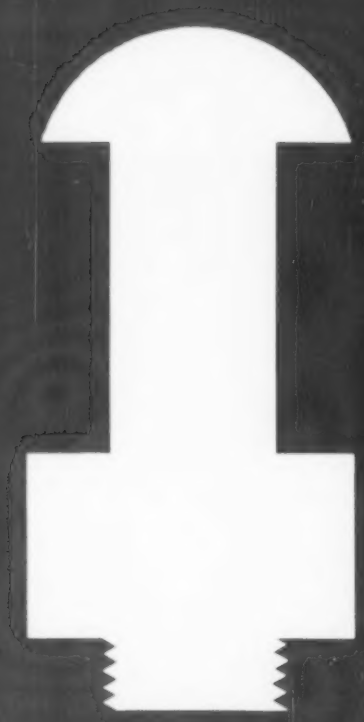
Transom mathematics

To increase the safety factor, some hull manufacturers offer a self-bailing motor well so designed that the water sloshing over the transom cutout may be drained through scupper holes let into the transom. This is an expensive refinement, for to be really effective the bailing well must be so well-sealed that no water can leak into the boat proper. Another solution to the problem has been undertaken by motor manufacturers who have sought to improve the situation with an additional five inches of shaft length. This would, of course, increase the height of the rear transom by a similar figure. Unfortunately, the hull designer must start with a 15-inch transom cut-out and hope that the hull manufacturer can on special order make a 20-inch cut-out available. If the motor makers provided nothing but long shaft motors, however, the sinking hazards of the 15-inch cut-out would be all but removed. Thus the hull designer has three alternatives when designing the after section of a boat: building in a self-bailing well and adding to the cost of the boat, building the transom higher and risking a sales decline because the customers do not want to spend the extra money for a long shaft motor, or closing his eyes to the problem and living with the existing situation. The alternatives are discouraging.

The welter of combinations

It would appear reasonable at this point to suggest that the hull designers and manufacturers produce hulls to fit given motors or horsepower ranges. There are, however, so many various types of motors that it is difficult to recommend the proper combination of motor and hull. If we consider the 3, 5, 7½, and 10 horsepower motors outside our frame of reference because they run smaller or special hulls, we must still deal with 15, 18, 20, 25, 30, 35, 40, 50, 60, 70, and 75 horsepower motors, or 11 different types. By judicious grouping, we can separate these into four divisions—15 to 20 horsepower, 25 to 40 horsepower, 50 to 60 horsepower, and over sixty horsepower. This means that four different hull types of one overall length would have to be produced to complement the four power plant groupings. But the majority of hull manufacturers find it difficult to finance the tooling for even one basic hull type theoretically capable of operating with motors ranging from 10 to 70 horsepower. Furthermore, each proposed hull may have as many as six interior design variations. One might suppose that these fittings and appurtenances could be used in each of the four hull types, but such is not the case, because each hull would have sufficient dimensional difference to void the possible interchange of parts. Therefore, unless the market place can absorb at least six times the number of boats now sold, the boating industry cannot possibly cope with the problem. There are few dealers who would be capable of stocking the inventory to satisfy a general range of demand.

What then can I suggest to make safer and more efficient motor and hull combinations? First, there should be lighter-weight motors on a horsepower pound ratio. Second, a long shaft motor should be made standard to eliminate transom cut-outs and the concomitant danger of swamping. And to achieve the best and safest transom configuration, this shaft should be designed to tilt on impact so that the motor proper need not tilt into the boat. Third, hull manufacturers should offer greater beam in the after section of their boats to increase buoyancy. Finally, it seems that far too many motor types exist within the present horsepower range, and that economy in manufacture as well as in cost to the consumer would indicate a reduction. I am convinced that if the number of power plants were reduced, hull manufacturers would look with favor on adding models to their lines that would offer compatibility with motors.



FASTENERS AND FASTENING TECHNIQUES

Tiny fasteners affect design in a big way. A means for giving shape to materials in sheet-form, they cannot be dispensed with in most fabrication techniques. Any product, any structure having a solid, one-piece look, is generally a composite of materials and parts turned into a single object with the aid of fasteners. These—be they nuts and bolts, inserts, tabs, adhesives, or welds —are always integral to the structure of the product, and in some cases also to its look. But, whether fasteners do in fact constitute a product's decorative aspects or are completely taken out of view, they are the tools that pull the parts together in myriad products in the fields of construction, transportation, office and industrial equipment, appliances and home-furnishing.

Fastener types fall into three main classes: welded joints, mechanical fasteners, adhesives. The materials with which each is used most advantageously, the various methods employed in product manufacture, and the effect of each on product make-up will be taken up in a series of three articles. The first— a guide to welding in product manufacture — analyzes the merits and drawbacks of this familiar joining method, points out applications in which no substitute is possible and those in which it should be avoided, discusses the standard methods in use in shops and those still part of industry's avant-garde, and indicates just how this fastening category can be a significant tool in design.

1

A GUIDE TO WELDING IN PRODUCT MANUFACTURE: JOINTS AND VARIOUS SEALS

BY ARTHUR GREGOR

To the engineer, welding is a separate branch of science which makes possible the joining of metals by fusion; to the designer it is a means to an end—a vital factor in unifying sections and combining parts into a planned object. Of all the fastening methods, joints achieved by welding are the most binding—they can, in fact, be "irrevocable." Consequently, strength in the joint itself is one of the main "strong points" of this method of unifying parts, and finding ways to improve the strength and prevent the joints from any possible breakdown by cracking or corrosion has been a main concern of the welding engineer. For the designer, *strength in the joint* is, of course, an attribute in favor of welding, but the method also holds a design choice which has particular interest for him: ne can conceal a weld or he can use it to help give a product its "look."

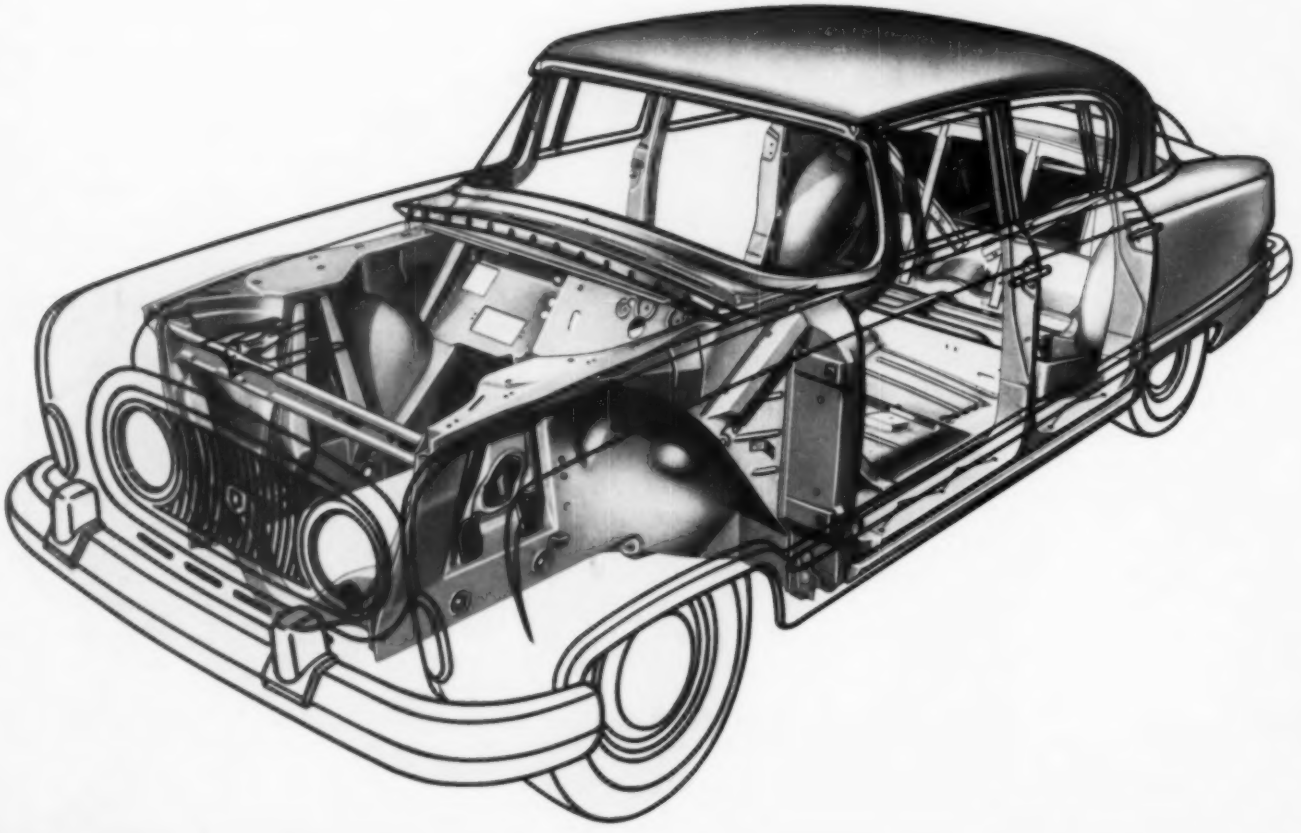
Welding is an excellent means for achieving a single-piece construction—that is, it is possible to end up with a product whose body has the strength and appearance of a single-piece unit by "hiding" the welded seams. Welded joints can be finished to match the base metals so that the joints actually disappear. But, as with the Mies and Eames chairs (see page 61 for joint in Eames chair), the weld can become part of the total structure, the "look" of the object. Such examples, in which the fabrication method becomes itself a design factor, are rare. In most cases where welding is part of product manufacture, it accomplishes the necessary job of attaching knobs, handles, rims, etc., and bonding sections of similar and—by the use of brazing—dissimilar materials. Welding is used for some such purpose in millions of beverage, food and chemical containers, cooking utensils, pressure vessels, structural components, process equipment, aircraft and automobile manufacture, etc.

A variety of factors determine the choice of welding over other fastening techniques. In large-quantity body constructions where thousands of fastening joints are needed (in the Nash body on page 58 about 8000 welds were made) and where automatic welding setups are part of a rapid mass production line, *economy* is a decisive factor. Welding offers a high degree of *adaptability* to existing fabrication techniques as a result of the many types of available equipment, varying from manual to fully automatic. Welded joints are *leak-proof* and make safe seals for vessels intended for gas or liquid. Regardless of the number or the complexity of parts, welding can produce a *single-piece construction.* In applications where many welds are needed, this method also results in overall *weight reduction.* Joints can be made in all types of sections without ruining the *contour* of the section since no overlapping is needed, and joints in extremely *thick or thin* metal, which would be very difficult with mechanical fasteners, present no problems when welded.

In product manufacture, welding is generally employed to advantage when any of these factors are crucial considerations. When they are not, other methods might prove a better choice. As will be discussed later, welding is a messy and time-consuming operation unless it is incorporated as an automatic process on the assembly line. None but the more complex equipment setups (see page 65) are capable of multiple operation, and the investment for such equipment is far too great for even the ordinary mass-produced item. Much of the standard welding equipment permits a single operator to work on one piece at a time only, and this time lag can be permitted only where weld joints are the only joint types that will meet the fastening requirements of a job. There are certain products (cars, truck bodies, tanks, coffee makers, some furniture, etc.) in which the joints are either so many or must be so strong that welding cannot be dispensed with, and the appropriate welding method must be incorporated within the existing production setup.

U. S. Army Photograph

In both vehicles welding was important aspect of construction. In 1955 *Nash, body and frame were welded to form single unit.*



In applications other than product manufacture welding offers some unique advantages; chief among them is *portability*. Most of the arc and torch welding methods (pages 63, 66) can be brought to the work on location, and welding is consequently used extensively in construction work, for maintenance and repair of metal structures and equipment, and in the building of machinery too heavy and too bulky to be moved along an assembly line.

Metals and methods

Welding, by definition, means the autogenous fusion of metals (by which is meant the fusion of two like metals, or the melting of two similar metals so that the outer portions may mix; this, when followed by cooling, fuses them together). All metals and alloys can be welded, but the success of the weld depends on suitable atmospheric conditions and the choice of the proper welding technique. The strength of the weld is determined by the physical and mechanical properties of two sections that have been joined by welding, and is measured in terms of these qualities: ductility, tensile strength, hardness, corrosion resistance and endurance strength. The reactions of the metal during the welding process that determine the high or low value of these properties are mostly: *oxidation, vaporization, change of structure.*

The effect of oxidation (the combination with air of some element of the metal that escapes during fusion) produces gas holes in the weld metal, or, in some cases, slag. Vaporization means the loss of some element in the metal which vaporizes at a temperature lower than the metal's melting point, and weakens the joint. A change of structure in the metal usually results in a change of physical properties or change of corrosion resistance, etc. But the degree to which these reactions can be harmful differ according to the type of metal and the welding process used, and with the right choice of method and proper precautions, "irrevocable" joints can be achieved for all ferrous and non-ferrous metals and alloys in a wide range of applications.

Methods and basic ingredients

To meet the requirements of different metals treated under heat, to enlarge the fabrication ability of welding and to keep pace with production methods of contemporary technology, a large number of welding processes have been developed over the years. The American Welding Society lists thirty-seven on its Master Chart Of Welding Processes, and this number does not include soldering or any of the more recent processes such as ultrasonic welding, which the Society has not yet categorized among the standards. This large number can however be broken down into groupings with sub-divisions, and the Society lists the main categories as: arc welding, thermit welding, gas welding, forge welding, brazing, flow welding, resistance welding and induction welding. Of these, four are most widely used throughout industry today—*arc welding, resistance welding, brazing* and *gas welding*—and it is these four plus the more recent processes including methods for welding plastic coated metals, which will be taken up later on (pages 62-69).

It is hard to say just when the history of welding began (there are references to forge welding as far back as the Middle Ages), but it is safe to assume that two fundamental problems have always surrounded the practice of joining metals by fusion: *heat and weld protection.*

In the early forge method considerable skill was required to bring the iron to a white heat without burning. But temperature was controlled by an airblast from bellows; the pieces to be welded were placed together on an anvil and were pounded together until a single piece was formed. To prevent the iron from burning (or oxidizing), which would result in a poor joint, coals were put under the metal and these consumed the oxygen before it could reach the iron being heated. This crude and impractical method was used for centuries until—with the advent of industry—more flexible and efficient methods had to be found. But essentially, the "ingredients" used then are those still employed today. Heat has to be created and oxidation and other joint deterioration have to be avoided.

Two kinds of heat are used in the most popular welding methods today: heat generated by gas (torch brazing, gas welding); heat generated by electricity (arc welding and resistance welding). Welds are protected from oxidation and other corrosive formation by either a flux or gas shield which, like the coal used in the primitive forge method, consumes the oxygen before it can reach the metal.

Most popular among the gas methods used extensively for one-at-a-time jobs is oxyacetylene torch welding. It was developed around the turn of the century as a result of a discovery by a French chemist, Le Châtilier, who had found that the combustion of acetylene and oxygen produced a flame having a higher temperature than any gas flame previously known. With the oxyacetylene torch almost all metals can be welded, although it is not practical with bulky objects nor for high speed on a production line.

A very high percentage of all welding done in industry (80 per cent according to one company's estimate) falls under the arc welding category, a group of processes forming welds with a high heat created by an electric arc. The method came into prominence during the First World War when it was used to repair damage to a scuttled German fleet. Today, there are many techniques using an electric arc as their heat element, and they differ mostly in the way in which each solves the problems of oxide and nitride for-

mation in the weld. Arc welding processes are the most flexible of the industrial metal fusion techniques; they range intype of equipment from manual (page 62) to automatic tape-controlled welding (page 69), and can be used on all metals varying in gage from very low to very heavy.

Another group of processes based on the use of electricity as the heat generating element are the resistance welding methods. Here heat is obtained not by an electric arc but by the resistance of the metal parts to the flow of electric current. Unlike other processes, these methods require no extraneous materials such as fluxes—the heat occurs *within* the material, which eliminates the danger of oxygen contamination in the weld—and mechanical pressure is needed to forge the heated parts together. Resistance welding methods, principally spot welding and seam welding (page 64) are very widely used in product manufacture. Extremely high production rates are possible; however, the equipment for applications where a great number of welds are needed (in the manufacture of automobiles, for example) is very expensive. The methods are especially well suited for light-gage metals but cannot be used with copper and copper alloys (the electrodes of the equipment through which the current is passed are made of copper and they would fuse with the base metal if it were also copper).

In recent years, new welding processes have been developed whose action is based on totally different principles of fusion; in fact, one of them actually depends upon the absence of heat for its performance. The bonds that result from cold welding (see ID August 1955 and page 68 this article)—a new method for fusing non-ferrous metals and their alloys through pressure alone—are formed in an interatomic "meshing" of two metallic surfaces. It is being used in such applications where conventional welding heat is harmful (hermetic sealing of aluminum and copper containers, semiconductors, butt joining of wire and thin rod, aluminum foil packaging, copper or aluminum leads or taps joined to motor, transformer coils, etc.)

Another new method uses vibratory energy as its source of action. Ultrasonic welding (page 68) joins similar as well as dissimilar metals by the introduction of high frequency waves in the areas to be joined. The vibration of the waves causes the metal to be bonded in solid state. The method has found widest use in joining metal foil and thin sheets to either equally thin or massive parts. Both these recent techniques are more "clinical" than most of the standard welding operations which are often messy, give off sparks, sputter, and scatter bits of molten metal.

Selecting the process

It would be very helpful indeed to be able to draw up charts that would tell at a quick glance *when* to use *which* process on *what*. Unfortunately, it seems impossible to arrive at any such neat formula. Too many factors are involved in the selection of a process, and the problem of elimination by which such a chart could be arrived at is complicated by the fact that almost every welding process is actually capable of handling most of the standard welding jobs. Nevertheless there are differences, and each major category has its advantages and disadvantages.

As far as the designer is concerned, it makes little difference which of the thirty-seven or so processes are used. He wants to get just what he has specified but this is generally a designation of the type of joint (rivet, weld, nut and bolt, etc.) without a listing of the specific welding technique; the choice of method is in most cases left to the production engineer.

But, since certain methods are particularly well suited for certain materials and operations, and each method can best be utilized in a particular way, the designer does well to confer with the production engineer on the type of equipment available and generally on just how to handle the welding problems in the most effective way.

Among the many considerations that enter into the selection of a process, equipment *availability* is foremost. Since large-scale welding units are expensive, welding problems may have to be solved strictly in terms of the equipment at hand. The other important factors that influence the choice of a method and should be kept in mind when evaluating joint requirements in terms of equipment ability, are: *gage and size of parts; finish and appearance desired; location and position of welds; number of similar welds; production rate required.*

Another condition which influences the choice of method is whether the work is done in the shop or, as in the case of construction jobs, in the field. Gas welding equipment is highly portable; resistance equipment, on the other hand, is usually permanently installed; and arc welding equipment, though generally movable, requires welding generators.

On the next eight pages the methods most widely used in industry are taken up in detail. The intention here is not to present a comprehensive survey of existing welding equipment or to define the problems that confront the welding engineer. Rather it is to suggest applications in product manufacture, and to show the type of equipment a designer is likely to find in a client's shop, production or assembly line. In each category, the most useful subdivisions are listed, definitions and descriptions of the processes are given, and the types of fastenings and welding operations, metals and material thicknesses for which each group is best suited are summarized for each case. The various methods for joining plastic sheets by heat will be taken up subsequently in an installment on adhesives and heat plastics. This guide to welding in product manufacture concludes with a detailed analysis of some of the newer welding techniques.

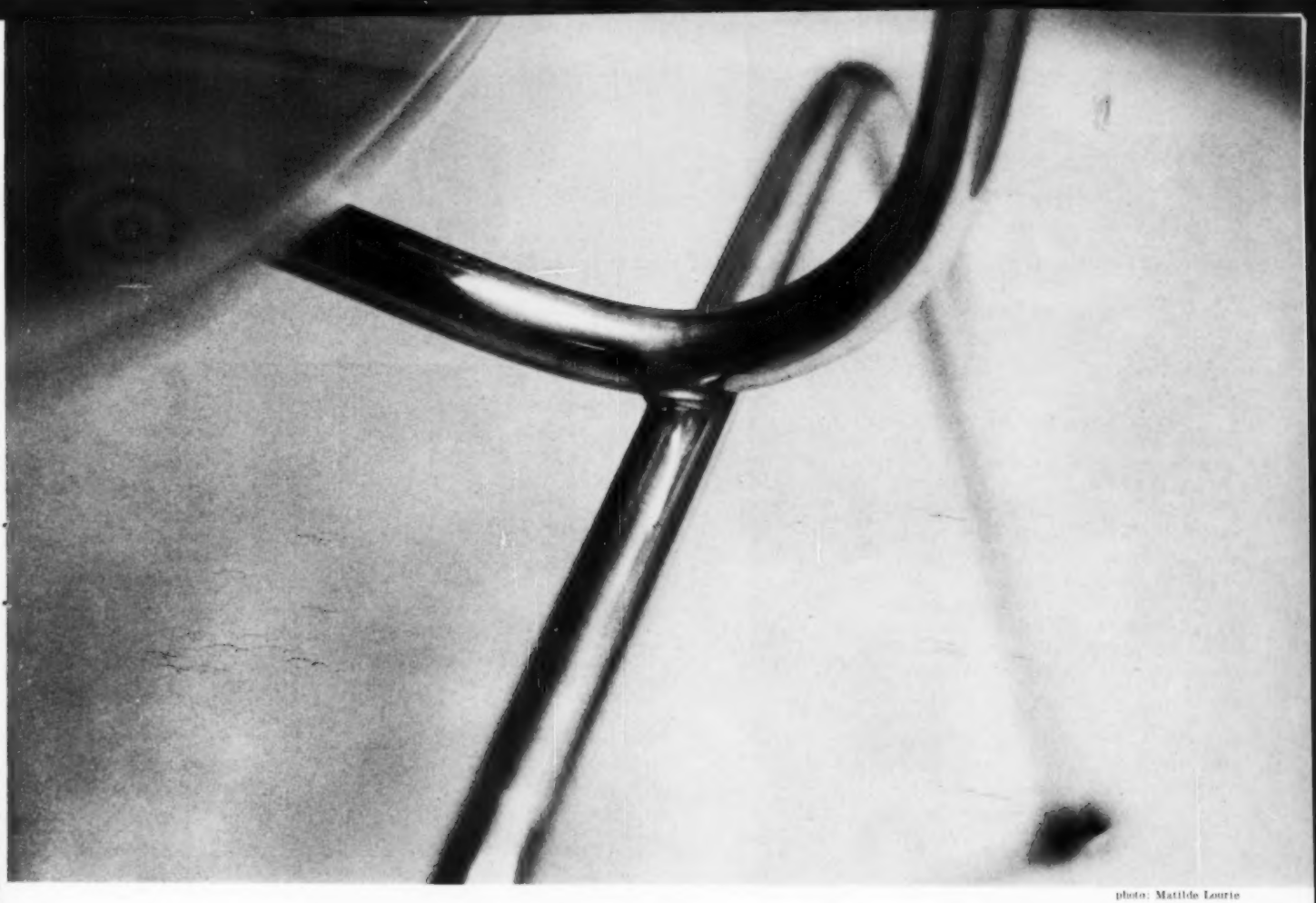
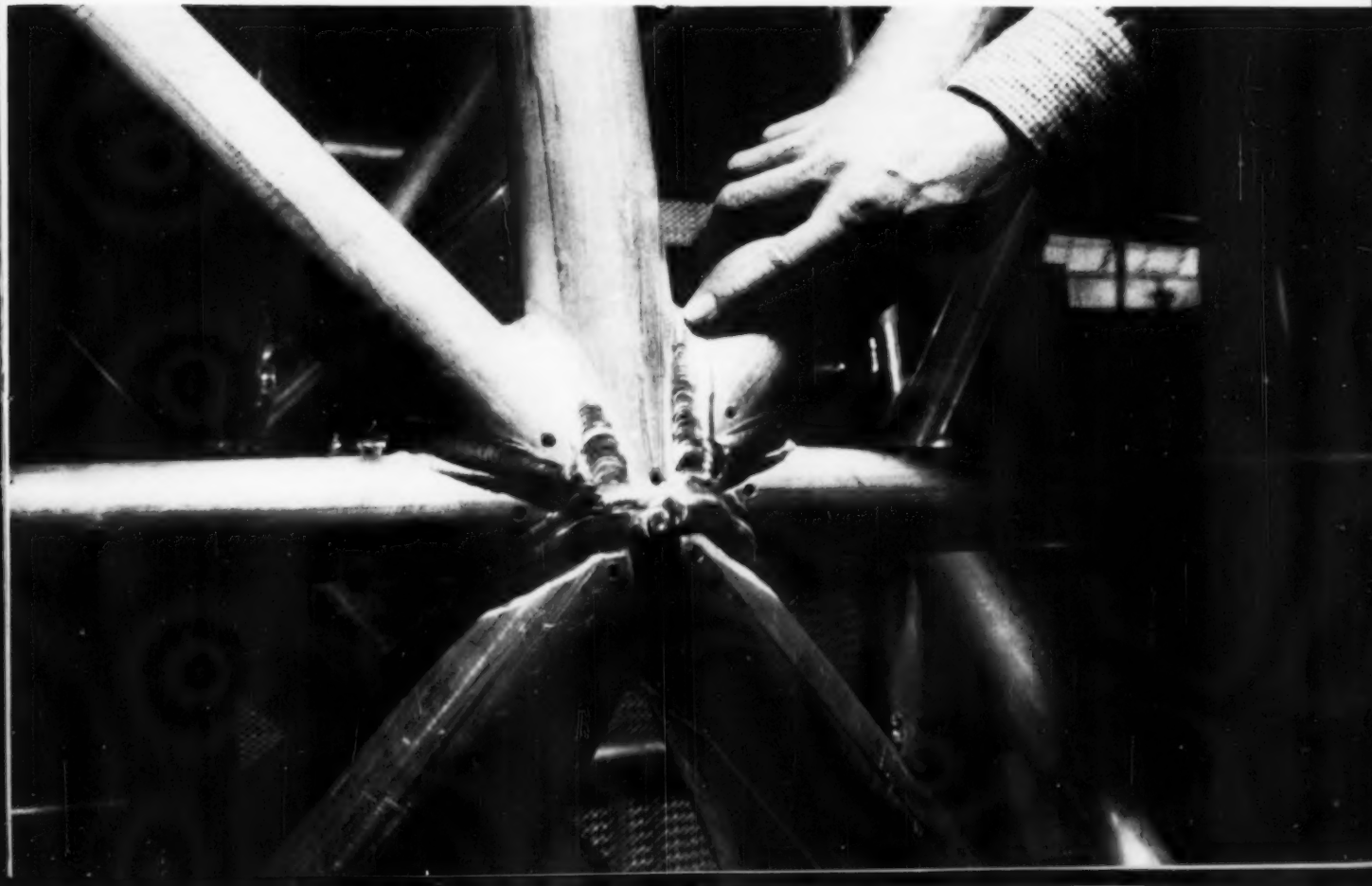


photo: Matilde Lourie

Welded joint is part of total design of Eames chair. Complex joint (below) unites tubes in radio telescope construction.



ARC WELDING / *manual and automatic, for all metals from foil to heavy plate*

Arc welding: *A group of welding processes wherein coalescence is produced by heating with an electric arc or arcs, with or without the application of pressure and with or without the use of filler metal.*

Under the general heading of "arc welding," the American Welding Society lists 12 methods. These differ mostly in the types of electrodes (arc-effecting parts) they use and in the means employed to protect the welded areas from oxide and nitride formations which are the cause of rust and other corrosive coatings. The heat created with these various processes is greater in some methods than in others and, consequently, certain methods are better applied to thick sections of strong materials than others. In applications which require less elaborate weld protection, the simpler methods can be used.

In arc welding, the electrodes needed are either *metal* or *carbon*. The electric arc is the high-energy spark formed when electricity passes across a gap between two terminals; these consist of a) the electrode, b) the metal to be welded. The heat in the arc depends upon the amount of the current and the strength of the voltage. The arc melts a portion of the base metal, but the weld achieved this way is not always sufficiently strong. For a good weld it is safest to melt a filler metal with the arc and let it flow into the molten pool; this helps to mix the two metals into a solid bond. With methods using metal electrodes, their material is usually the same as the metal to be welded, and the filler metal is supplied by the electrode itself; hence the term *consumable* electrodes for those methods using them. With carbon or tungsten electrodes (usually for hard-to-weld but light gage metals), a separate filler metal is introduced, and these electrodes are called *non-consumable*.

Either type of electrode is used with flux or a gas shield to protect the weld during the process. In those rare applications in which strength and ductility in the weld are not important, protection can be dispensed with. These fall under the *unshielded* metal-arc or carbon-arc category, while methods that do use a protective means are classified as *shielded*. The most-used methods follow.

photo courtesy: Aluminum Company Of America

Stick electrode arc welding, *best used for small area welds, is divided into two major types: bare or coated. With bare electrodes, which are bars of the same metal as the material being welded, flux is necessary. With coated electrodes (generally employed for welds in alloys) a flux containing coating is applied to the electrode. Method is popular in construction field or on large equipment. A coated electrode is used to weld brackets to head of process tank (above).*

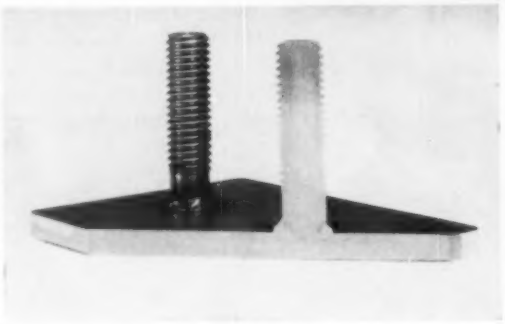


photo courtesy: Nelson Stud Welding

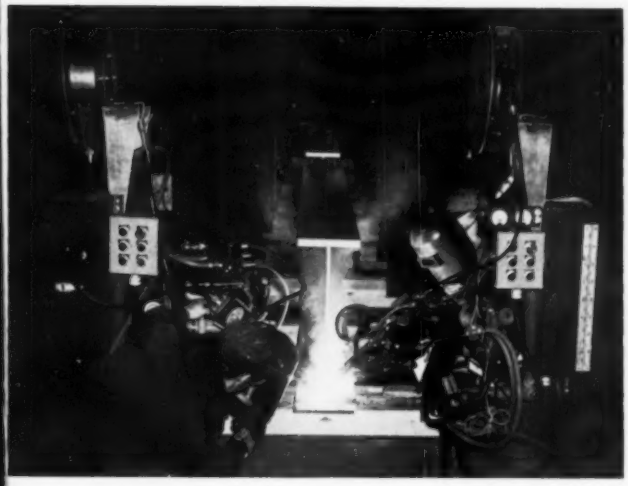
Stud welding *is actually a metal-arc process capable of attaching studs, other fastener types and projections to steel in a strong weld. It is a simple, manual method using a welding gun which controls the weld time and other welding variables automatically. It uses the stud or part to be attached as its electrode, coated at the tip, which fuses before it is driven into metal; complete fusion is obtained.*

Tungsten-inert-gas welding *is a non-consumable electrode method in which inert gases are fed through a gas hose into the electrode holder. Method produces very smooth joints that often require no further finishing; it can be adapted to automatic operation (joining caps to transistor base, right). Process also known as Heliwelding (by Air Reduction) and Heliarc (by Linde Company).*

photo courtesy: Air Reduction

photo courtesy: The Lincoln Electric Company

Gas-shielded metal-arc welding *uses a consumable electrode, which means that the filler metal and electrode are the same; the electrode wire is fed from spools or coils. The method is therefore capable of continuous high-speed welding, since the operator need not stop work to change electrodes and a shielding gas is used in place of flux. This is a powerful method capable of welding materials in all thicknesses; known as Aircomatic (by Air Reduction) and Sigma welding (by Linde). Twin Aircomatic units, electronically controlled, are shown below making simultaneous web and flange welds on an aluminum bridge girder. It is also used in the production of missiles and rockets, aircraft frames, chemical processing equipment, etc.*



Submerged arc welding *uses a consumable metal electrode and in place of a gas protection or flux, shields the area to be welded by a blanket of granular, fusible material. High welding currents are used, the melting rate of the electrode is higher and the speed of welding greater than in most arc welding methods. The process is usually started by striking an arc beneath the blanket of granular material which turns fluid and protects the weld area until the molten filler metal of the electrode displaces it. The process is used on one-at-a-time jobs for heavy structural and heavy metal applications.*

METHOD	USED WITH	USE FOR	GOOD FOR	POOR FOR
STICK ELECTRODE	most metals and alloys	small area welds	one-at-a-time jobs, construction, maintenance and repair	production line, flux needed
STUD WELDING	best with steel	welding studs and other fasteners	manual jobs in buildings and strong structures	standard weld operations
TUNGSTEN-INERT-GAS	light gage nickel, stainless steel, aluminum, brass, copper, and "hard-to-weld" metals and foils	single joints and seams	smooth finishes in light gage metals on production basis	heavy structural work
GAS-SHIELDED METAL-ARC	metals in all thicknesses, steel, aluminum, nickel, etc. and most alloys	complex, multiple joints	automatic operation on heavy equipment	light metals and light structures
SUBMERGED ARC	low-carbon steels, high-strength low-alloy steels, chromium in all thicknesses	high-speed welding	heavy joints in power vessels, ship building	ordinary, simple welds

RESISTANCE WELDING | *for seams and joints in thin metals; for high-speed production*

Resistance welding: *A group of welding processes wherein coalescence is produced by the heat obtained from resistance to the flow of electric current in a circuit of which the work is a part, and by the application of pressure.*

Contrary to arc welding, which lends itself best to attaching entire parts to larger bodies and generally to joining two adjacent pieces, resistance welding *clamps* pieces of metal together by heat and pressure. It is an excellent method for joining large surfaces of light-gage metals, and is used extensively in the manufacture of cars (see page 58) and mass-produced utensils and equipment.

Two non-consumable water-cooled copper alloy or copper tungsten electrodes are used to fasten pieces of metal inserted between them; currents up to 12,000 amps are passed through the electrodes for short periods. The current melts the metal at the point, or points, covered by electrode tips, fuses it, and with a few hundred pounds of pressure, a strong bond is formed.

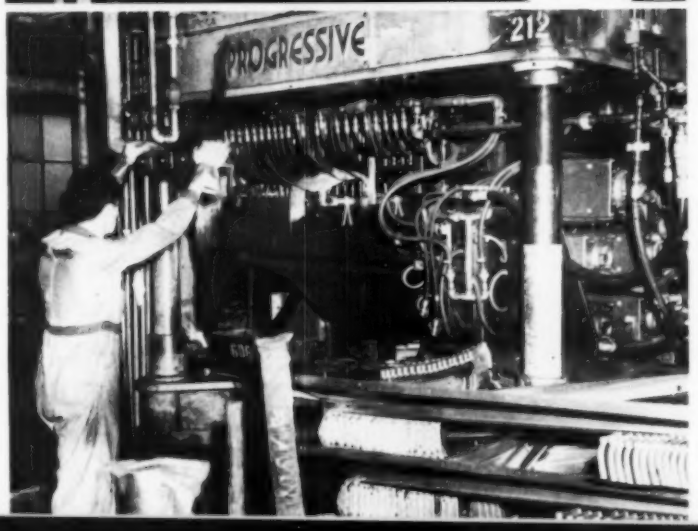
Metals welded by this method are not joined by fusion—as they are in other welding processes—but by heat generated within the metal, and by pressure. Flux or gas shields are therefore not necessary, and this helps to make this a high-speed multiple operation.

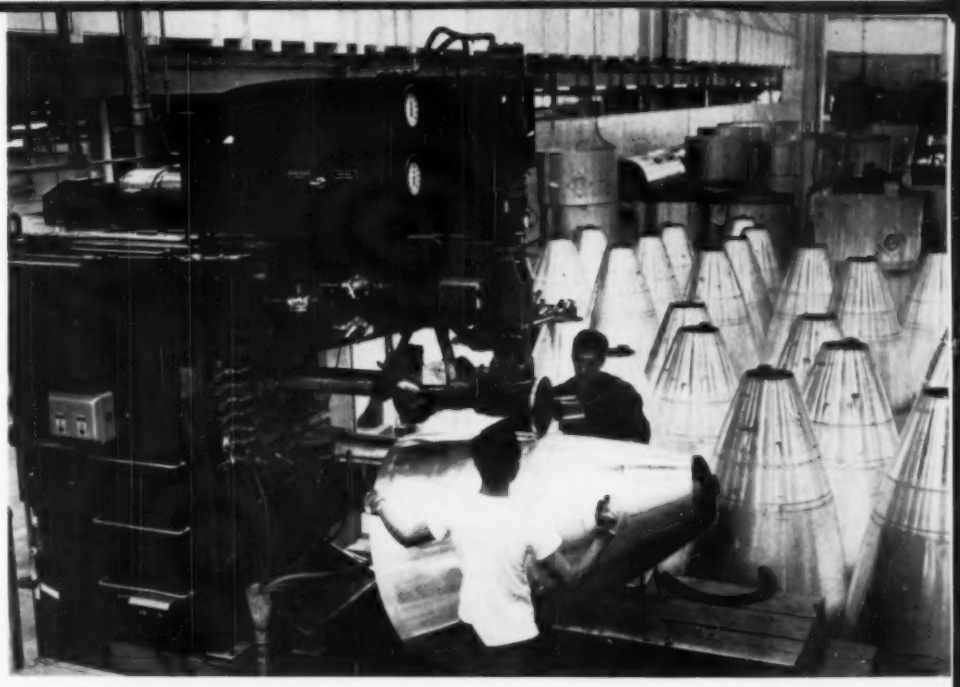
The equipment for resistance welding varies from small bench-type welders for one-at-a-time jobs to large complex installations in which elaborate work-handling devices and control equipment are included. The cost of complex equipment is high (about a quarter of a million dollars, or more) but savings in production rates are very considerable.

All ferrous metals can be welded with this method; non-ferrous materials require special equipment and very thorough cleaning of the surfaces to be joined. Copper cannot be used since resistance welding electrodes are made of copper and these would fuse with the base material.

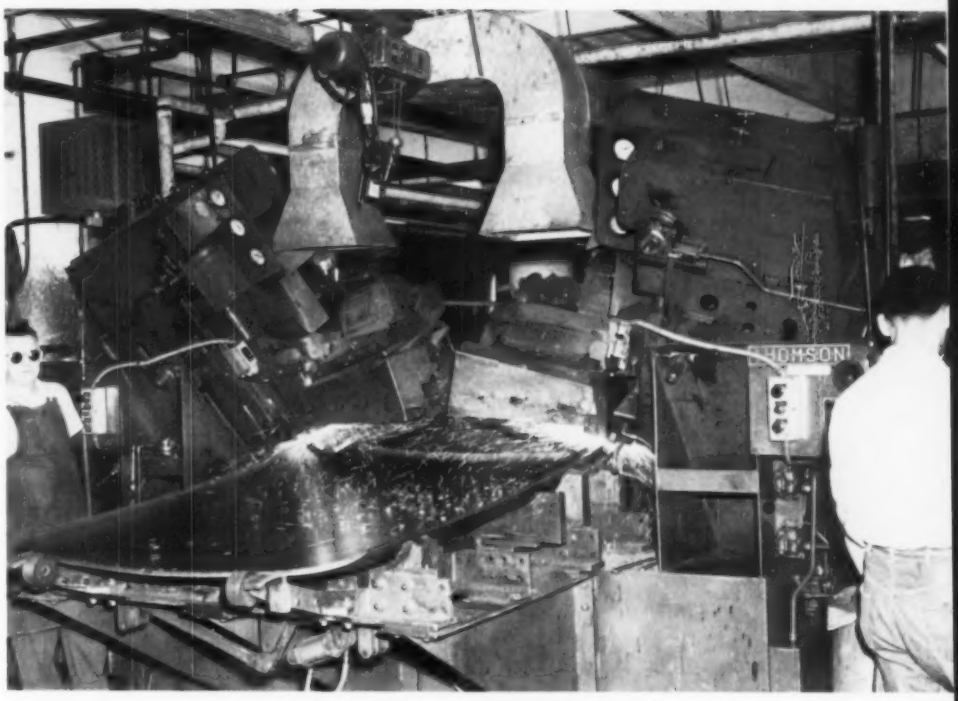
Resistance welding includes a number of different processes, of which *spot welding* is the best known. In this method the electrodes are held stationary while the weld is made; in a related method, *seam welding*, the electrodes revolve and are in motion during the welding operation. These two and a third method, *flash welding*, follow.

Spot welding *can handle one weld at a time or, in complex installations, can make multiple joints in automatic sequence. The parts to be joined are placed between the electrodes, which exert pressure; when the correct pressure is applied an electric circuit is formed. The variables in the setup—pressure, duration of current flow, welding heat—can be preset according to the type of material and material thickness, and an operation can be repeated at rapid rate. The electrode tip can be changed according to the type of weld needed and can be broad, pointed, flat. The method is used to join formed pieces at many points to build rigid structures, one spot weld at a time (below). In the picture at the bottom, a complex setup applied multiple welds in building the* 1959 *Rambler rear fender assembly.*





Seam welding, *an extension of spot welding, consists of making a series of overlapping spot welds by means of electrodes in the form of copper wheels; these rotate over the work to be sealed and apply welds under pressure. Several types of seam welds are possible, each requiring a different speed: a) pressure-tight seams need comparatively high speeds and use high currents; b) roll spot welding—a series of closely spaced spots—uses a lower speed adjustment. Any of these methods are particularly applicable to a succession of welds or seal-tight applications. At right, seam welding is used in fabricating a large aircraft fuel tank tail section.*



Flash welding *consists of placing two pieces of metal in an electric circuit adjacent to each other, in very light contact, and applying a voltage high enough to create a flashing action between the adjacent pieces of metal; this heats them to the fusion point and the weld is made by the application of sufficient pressure. This method makes possible the end-to-end welding of sheets and other extended sections, and yields high weld-strength and high production rates. It is widely used in the manufacture of automotive and aircraft products, household appliances, refrigerators, farm implements, etc. At right, flash welding is the method used to join sections of the roofs of the 1959 Rambler car.*

METHOD	USE WITH	USE FOR	GOOD FOR	POOR FOR
SPOT WELDING	light gage ferrous metals, aluminum, nickel and their alloys, zinc, magnesium.	welding sheets and formed pieces at many joints.	production setups from small runs to mass production of appliances, cars, airplane parts, etc.	copper and silver; heavy metal work; one-at-a-time jobs.
SEAM WELDING	ditto	succession of closely spaced welds; overlapping welds forming tight seals.	ditto also for leak-proof applications: pressure vessels, various types of containers, etc.	ditto also poor for single welds.
FLASH WELDING	ditto also, heavy gage possible	joining two pieces of metal end to end; welding one piece of metal to a projecting part of another piece.	welding two shafts, tubes, strips of steel; welding forgings or castings; forming rings, wheel rims.	copper and silver; one-at-a-time jobs; unidentical cross-sections.

GAS WELDING AND BRAZING | *for all metals, similar and dissimilar, of differing thicknesses*

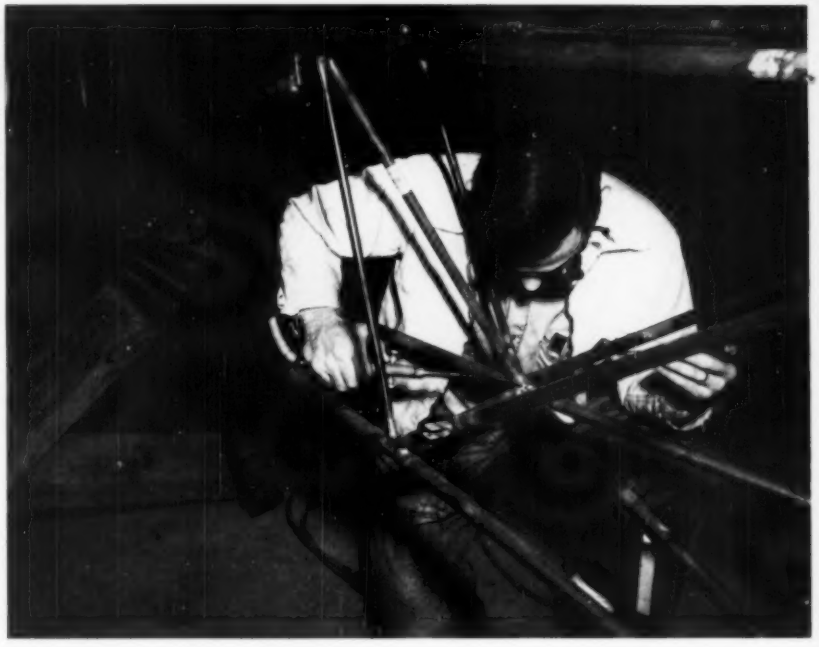
Gas welding: *a group of welding processes wherein coalescence is produced by heating with a gas flame or flames, with or without the application of pressure, and with or without the use of filler metal.*

The oldest of all welding processes and, in many ways the simplest, uses gas—oxygen, acetylene, hydrogen—as its heat-creating element. Oxygen supports the combustion of other gases; acetylene when mixed with pure oxygen, can produce one of the hottest flames known (about 6300°F); hydrogen is used for welding metals that melt at low temperatures. The most popular of these gases are oxygen and acetylene, used in oxyacetylene welding. All metals can be welded by this process, whose main advantages are portability and versatility. But it can only be used for one-at-a-time jobs and is a poor method for the production line—flux must be used on all jobs, and the process is slower than other methods. For maintenance and repair, however, it is the most economical means, and it is also widely employed in practically all of the metal-working industries.

Brazing: *A group of welding processes wherein coalescence is produced by heating to suitable temperatures above 800°F and by using a non-ferrous filler metal, having a melting point below that of the base metals. The filler metal is distributed between the closely fitted surfaces of the joint by capillary attraction.*

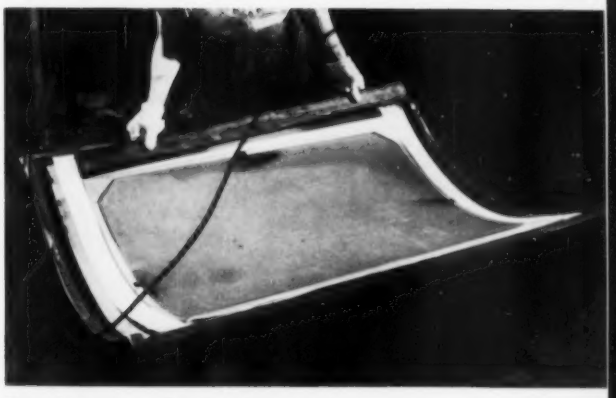
In brazing a non-ferrous filler metal is always used; the term brazing actually implies that a joint is made without melting the base metal. The joint is achieved when the filler metal is melted against the metals to be united while they are in such a condition of cleanliness and temperature that the metal welds itself to them. The method is similar to soldering which uses filler metals melting below 800°F. The chief attribute of brazing is the fact that dissimilar metals can be united by it; it lends itself to joining parts of differing thicknesses and masses. Among the most widely employed brazing methods is *torch brazing* in which the joint to be made is heated with the torch to a temperature above the melting point of the brazing alloy before it is fed into the joint. This, *furnace brazing*, and gas methods are shown on these pages.

photo courtesy: Linde Company



Oxyacetylene welding *is a gas welding process wherein coalescence is produced by heating with a gas flame obtained from the combustion of acetylene with oxygen. The gases are mixed in the welding torch which gives the welder control of the flame. In oxyacetylene welding the joint is made by melting the edges of the two pieces to be fused. It differs in this from a related method, braze welding, wherein the base metal edges are not fused but are joined by the bonding action of the metal deposited from a copper-base welding rod. Both methods can be used with all ferrous and non-ferrous metals in varying thicknesses. Simplicity of operation and portability make them popular methods for maintenance and repair of constructions and industrial equipment. They can handle almost any welding job and are limited in high production use by speed only. Oxyacetylene is employed (above) in welding a light aircraft frame.*

Gas welding *includes the oxyacetylene method, but other gas mixtures are used for different heats and applications. Oxyhydrogen, natural gas and propane are used with the standard welding torch for joining aluminum alloys. In gas welding the choice of filler metal is important. High purity aluminum, for example, is generally welded with the same alloy as the parent metal. Very tight seals are possible, and gas welding is used extensively on food-handling vessels and similar leak-proof utensils (above).*



Brazing *can also be done over large areas: the honeycomb panel (above) will be "cured" in a brazing furnace. Honeycomb construction is an important component in jet aircraft and other applications where strength is required but weight must be held down. The honeycomb material (stainless steel) is brazed between stainless steel skin sheets with a silver brazing alloy (a high-melting-point foil), in controlled atmosphere of the furnace. The flowing characteristics of the alloy melted on steel are seen below.*

METHOD	USE WITH	USE FOR	GOOD FOR	POOR FOR
GAS WELDING	all gages, all ferrous and non-ferrous metals and alloys; adjustments necessary with aluminum, copper, etc.	single joints, seams,	differing thicknesses and masses, joining sections, sealing vessels, tubes and pipes; one-at-a-time jobs	large area welds, mass production
BRAZING	all ferrous and non-ferrous metals, similar or dissimilar;	single joints, seams (torch brazing); large area welds (furnace brazing)	assemblies of steel, brass and copper parts;	mass production (torch brazing); single joints (furnace brazing)

NEW POWER CREATES NEW METHODS / *electronic impulses, ultrasonic waves, etc. replace heat*

A number of new processes have been developed recently for which definitions have not yet been set down by the American Welding Society. Some duplicate the work ability of standard methods, others are able to handle the very sensitive high-temperature metals, but all are the result of an extended use of new power sources.

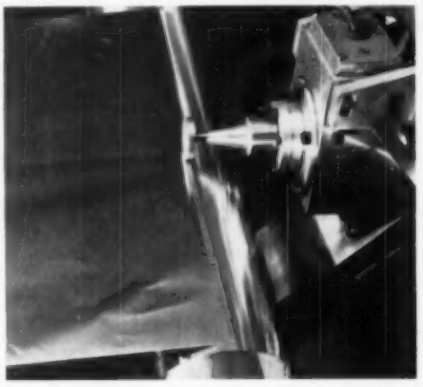
Ultrasonic welding (at right) induces high frequency waves in the metal sections to be joined, and the rapid, hammer-like vibratory energy "fuses" the metal in solid state. The method duplicates the ability of such techniques as spot and seam welding, but it is finding widest application in joining aluminum foil to thicker aluminum or dissimilar metals.

Beam welding (opposite page) is perhaps the newest of the new welding techniques. Developed by Air Reduction Company and announced a few months ago, the method employs high-intensity electron beams to weld exotic metals—beryllium, molybdenum, tantalum, etc. —in a super-pure atmosphere. These metals are oxidation-prone at a fantastic rate (see ID March 1959 for article on exotic metals), and need very special precautions during welding.

Cold welding (at right) is the most "unusual" of the new methods: it uses no heat at all. It is a quick operation that welds non-ferrous metals and their alloys through pressure alone. The method offers special advantages in those applications in which the conventional welding heat is harmful to the material.

Magnetic-force welding (at right) was especially developed by the Precision Welder and Flexopress Corporation of Cincinnati in conjunction with some other companies, to weld metal parts to vinyl-covered steel and other metal sheets. This is being done by adjustments in standard resistance-welding equipment by which the welding time is vastly reduced so that the heat does not reach the vinyl coating.

Tape-controlled welding (opposite page) was developed by the Linde Company; it is a multiple Heliarc method adaptable to fully automatic production programming. Punched tape is used to guide the operation and select the combination of torches.



Ultrasonic welding *is used by Aluminum Company of America to splice aluminum foil (at left). The roller which runs across the work vibrates at 50,000 cycles per second; the vibratory energy splices the metal in solid state. The spot in the stainless steel strainer material (below) was imparted by ultrasonic spot welding. The method leaves no molten metal in weld zone, the 6-mil diameter holes were not clogged during welding. The method can be used for much the same work as that done with standard spot or seam welding equipment.*

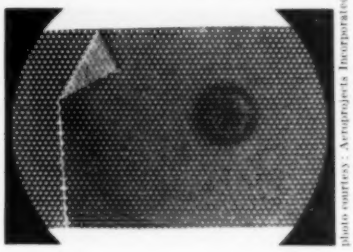
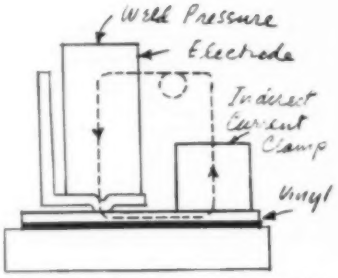


photo courtesy: Aerojets Incorporated



Magnetic-force welding *makes possible the welding of brackets and other metal strips and sections to vinyl-coated steel sheets. The steel surfaces are joined with a resistance weld which occurs in an extremely short weld time — about 1½ milliseconds—and does not harm the plastic surface. A high voltage is needed, and the welding force must build up fast enough to forge the material to be attached to the coated steel at the instant the steel is molten. The method is also referred to as* indirect welding *which means that the current is brought indirectly to the weld zone. In setup (above) current enters the uncoated side through electrode which supplies pressure, forging blow.*

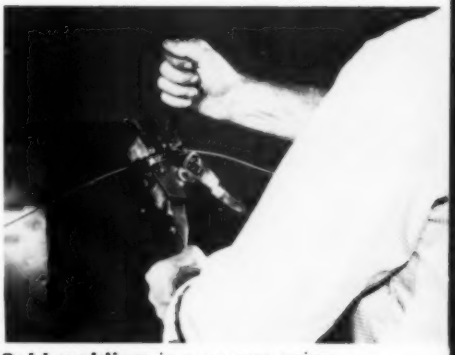
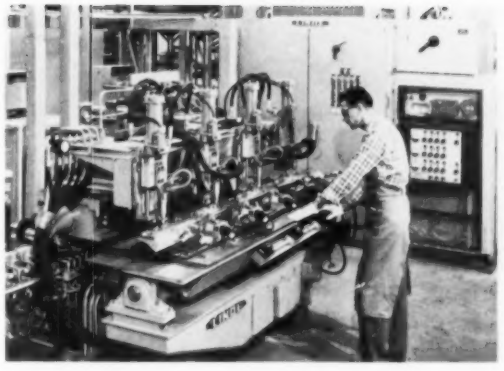


photo courtesy: Utica Drop Forge & Tool Company

Cold welding *is a process using only pressure as the weld-making power. For this reason it is an excellent method with such applications in which the welding heat causes troublesome effects. It is used to attach metal tabs to thin aluminum foil in many electrical products; to seal small cans that require hermetic sealing (for encapsulating transistors, diodes, rectifiers); to butt-join wire (above), rod, strip and plate; for hermetic metal to metal welds for sealing food products, chemicals, etc. Most of the cold welding tools are simple, hand-operated instruments that look much like pliers (above), but more complex automatic equipment is also available.*

Electron beam welding *was designed specifically to join reactive and high-melting-point metals. Molybdenum, beryllium and other exotic metals are very difficult to weld because of their rapid oxidation rate. In electron beam welding the metals are joined in a very high vacuum chamber which makes it impossible for the metal to be contaminated by atmosphere during the welding process. In the method a high intensity electron beam is used to bombard the materials to be welded. The electron beam process yields ductile, strong welds with good contour and is designed for critical applications in the missile and atomic reactor fields. The interior of the high vacuum chamber in which test materials are being welded is shown above.*

Tape-controlled welding *indicates the versatility of welding in adapting it to contemporary fabrication techniques. Convair Division of General Dynamics Corporation use tape-controlled, multiple-torch Heliarc spot welding machine (right) to produce "problem" parts for Terrier guided missiles. The programming of the tape-controlled welder is similar to the automatic setups for tape-controlled milling machines or jig borers; all of these permit a high degree of production flexibility. The performance is "inscribed" on the punched tape.*



METHOD	USE WITH	USE FOR	GOOD FOR	POOR FOR
ULTRASONIC WELDING	foil, strainer material	spot welds, seams	joining dissimilar metals	thick materials
MAGNETIC-FORCE WELDING	vinyl-covered metals	spot welds	brackets, etc.	plain metals
COLD WELDING	non-ferrous metals	butt joins, hermetic seals	wire-to-foil welds	thick section welds
BEAM WELDING	exotic metals (beryllium, molybdenum, etc.)	standard welds	oxidation prevention	standard metals
TAPE-CONTROLLED WELDING	thin-gage metals	spots, seams	complex operations, automated line	simple welds

How they work

NEW BLOOD AT FBDA

photos : Matilde Lauria

Peering from his office into his conference room, Francis Blod checks a plans meeting.

Francis Blod Design Associates illustrates the workings of a medium-size package design office that is trying to solve the problem of an independent office's line of succession

Marian Franco

Richard Tupper

Fred Feucht

George Stehl

For the past fourteen years, Francis Blod Design Associates has been located next door to New York's Stork Club, a location which Fran Blod considers "quite an asset." Two-hour lunches in this banquetted oasis have cemented business relations with many imposing packaging clients. Since 1954, Blod has tripled his staff, channelled his previously diffuse operation primarily into packaging, and added to his client roster such names as Squibb, Mennen, and Lily Tulip. Prior to specializing in package design (which today accounts for 75 per cent of FBDA's billing), the then five-man Blod office spread itself over product work, commercial interiors, and packaging and graphics until Blod decided that it was not feasible "to try to be a Raymond Loewy operation with a small group." Just last month, he took formal notice of the the pulling power of his name in the packaging field by changing the name on his door from Design Associates to the more proprietary FBDA—a switch which also avoids confusion with other consultant firms using the former title.

The case for the smaller office

Though it is true that there is little unique about the functioning of the Blod office, it is also true that the overall impression of any office is created not by its mechanical procedures but by the personnel working there. The route from solicitation of clients to presentation and acceptance of designs varies little—except perhaps semantically—from package consultant to package consultant. A successful medium-size office, however, (there are seven designers, one model maker, and two management people at FBDA) must demand, and concomitantly, *expect* more from its employees than larger offices in which function is rigidly stratified into layers of draftsmen, designers, account executives, and management. The smaller office's fluidity of job classification permits designers to develop tangential skills, an important element today considering Blod's estimate that only 30 per cent of a designer's time is spent on the board. This, he says, does not mean that the designer's job has been downgraded, but that the mystique of contemporary marketing has forced him to add complementary services which are necessary in seeking and keeping clients. Blod contends that a medium-size office functions more smoothly than a caste-conscious large one because the designer, in dealing directly with the client's marketing, advertising, production, and supply problems, does not get tangled in assorted lines of communication.

Youth wants to grow

Blod bolsters this conviction by bringing a genuine concern about the care and feeding of young talent to the problem of a design office's line of succession. Historically, the independent-thinking young designer has been anything but organization-minded. He has trained himself at one office until, calculating his chances for success, he has gone into business on his own. By specializing in the development of youthful designers with "exceptional" creative and contact abilities, Blod hopes to avoid this plague which has ravaged so many offices. (To be sure, young people do not set as high a value on their talents as do experienced designers, and they are far more malleable.) At present the average age of his design staff is 28. He declares that he is grooming his younger designers to assume management and ownership positions within the firm, and envisions the day when there are a number of names on his letterhead. Thus, under the supervision of Blod and his first lieutenant, marketing vice-president Richard Tupper, they range far from their drawing boards, have contact responsibility from pre-proposal planning to post-presentation servicing problems. Blod's clients like dealing with designers at close range; they say that they get a fresh approach unfiltered by echelons of management.

The following four pages treat the mechanics of this package design office.

1

"We don't really address the problem at this initial meeting, nor do we spell out how we will handle it. But when we walk out the door, we'd better have a damned good idea about what the client wants the designer to accomplish."

In February, 1957 Fran Blod hired Richard Tupper, a stocky, Madison Avenue-oriented advertising man still on the near side of 30, to take charge of his marketing services. Tupper is the perfect complement to the back room designers in the Blod office. Now a vice president, he speaks the marketing and research lingo that is often advantageous in client relations, and doesn't violate the youthful atmosphere that Blod has tried to cultivate. Together they take care of the long-range coordination of FBDA's services with their clients' marketing plans. Tupper solicits new prospects, writes proposals, and, after gathering together the minutiae of design planning sessions, commits design strategy to paper. This leaves Blod free to supervise the overall administrative and design functions of his staff.

Acquiring clients is a matter of seeking and being sought, and when it comes to the former, the Blod office is hardly reticent about promoting itself. A steady stream of direct mailings aimed at possible clients acquaints them with award-winning, profit-making work done by the firm in the past. Unsolicited prospects come through word of mouth and the recommendations of advertising agencies and people in the trade. Oftentimes a company on the prowl for outside design assistance is chary of publicly releasing either its name or the nature of the product under design consideration for fear of being inundated by offices looking for a commission. In this case, it uses its ad agency to screen prospective consultants. In feeling out the various independents, however, the agency is usually forced to drop at least a hint or two about the client and its products—hints which can usually be checked out in the advertising register against the agency's client list.

Initial interview

After this preliminary cloak and dagger work (where necessary), Blod and Tupper steep themselves in all available information on the prospect—its history, management, reputation, and past design experience—from material in their own files, from publications and from discreet inquiry. They then hold a staff meeting to prepare a preliminary outline of points to be covered in the introductory meeting. If, however, the agency has been successful in covering its tracks, Blod and Tupper present themselves to their prospective client with only crossed fingers, a hunch—and a portfolio.

Blod states that they don't try to "really address the problem at this initial meeting, nor do we try to spell out how we will handle it. But when we walk out the door, we'd better have a damned good idea about what the client wants the designer to accomplish." Through informal cross-examination, he and Tupper try to determine the assets and liabilities of the existing packaging, how the products are sold and displayed, if they will be promoted as entities or as a line (if there is more than one product), type and volume of advertising, specific marketing objectives, and detailed specifications of the package to be developed. Procedurally, they also try to find out to whom they must answer within the company, and how many people are to be involved in the packaging program. They also request immediate contact with the prospect's advertising agency because they have found an agency's copy platform and marketing plans to be invaluable in preparing a proposal, although, as in most packaging offices, "a distinct chill sets in" if the agency's art department tries to give esthetic guidance.

Proposal and billing

Back in their own offices, Blod and Tupper review the meeting with design director Bernard Bresky and the staff designer assigned to the project. There is no set pattern for selecting the latter; it usually depends on time schedules and past experience in the field to be treated. Both the designer and Blod hammer out a step-by-step list of the services and time required for the execution of the job. Notes are compared and revisions made as similar job records from the past are hauled from the files and used for reference. Depending on the client, FBDA has a variety of financial arrangements. On one-shot projects, an estimate is made of the number of man hours required to complete the design phase of the operation. This is then translated into dollars and included in the proposal. On single jobs of this kind, FBDA bills in one of a number of ways, depending on the size and duration of the project: a) single payment at the completion of a small assignment, b) an initial payment of roughly 20 per cent of total estimated costs with the balance payable monthly, c) advance monthly bills proportionate to the total estimated amount and project duration (this type of agreement usually applies only to single jobs over $10,000 which will require several months' work).

Long-standing clients who have intermittent problems are billed on a straight time basis from FBDA's work sheets

either progressively or at the completion of the work involved. For larger accounts offering a consistent work load, FBDA has established annual design budgets. These budgets cover design and supervisory time and are divided into twelve monthly installments. On these annual contracts Blod's office keeps hourly time records; if, during a given month, the work load assigned by the client does not require the full use of the budgeted man-hours, the time is funded and carried forward to the next month. Blod reviews these budgets quarterly, and if he is considerably behind his client in time expended versus payment received, he will request an adjustment.

Design strategy

Once the client has accepted FBDA's proposal and financial terms, Blod and his designers get to work on a design strategy which correlates all marketing objectives as well as production, distribution, and competitive considerations. The designers call upon all available research material, examine the supply structure the client has used in the past (and often make recommendations that the client switch suppliers), visit production facilities, and go into the field to evaluate existing displays. Sometimes the major design problem involves the consumer's conditioned reaction to the implication of a given product. In the past two years, Blod has handled two such delicate assignments—one a new package for Squibb insulin, the other a dispenser (for Clark-Cleveland, Inc.) of pills for the relief of menstrual pains. The Squibb project (ID, March 1959) was further complicated by the legal necessity of color-coding the packages according to the type and strength of the insulin content. Diabetics are usually sensitive at first about the use of insulin, and normally adhere to the brand recommended by their doctors. FBDA sought to design a less clinically foreboding package than was on the market, to help doctors ease their patients over their embarrassment at being labeled insulin users. Clark-Cleveland's Kurb, on the other hand, was aimed at unmarried women from 12 to 25, certainly a far less extraordinary market than diabetics, but one which forced FBDA to consider the contrary facts of a teen age girl's embarrassment—as well as her pride—in attaining physical maturity. The dispenser had to be feminine and discreet without the plain paper wrapper connotations of other hygienic materials. It is interesting to note that this project, originally estimated as a six-week job, actually took eighteen months at the conclusion of which Clark-Cleveland,

2

"Bernie watches over the whole show in the back room. On smaller jobs, he and the designers knock out the design strategy themselves without Dick's or my help. That way they get to know the score —better yet, that way they make the score."

Blod's back room is not a place where management fears to tread. Blod emphasizes "the team approach" with every member of the team suggesting and advising on all matters—design, marketing, research, production, and supply. At left, Blod discusses a design problem with Fred Feucht. Right, Dick Tupper and Marian Franco examine the various mockups of the Kurb packages. Bottom, Bernard Bresky checks a model prior to a presentation in FBDA's display room.

3 *"You learn a lot by examining what the client and his competition have done in the past. It's the best kind of research. What do I think of research? It's fine as long as no one tells me how to interpret it."*

photo: Harriet Page

photo: Lillian Tonnaire-Taylor

FBDA's designers do their own field research to saturate themselves with information on competitive and existing client designs. Left, a rain-soaked Marian Franco checks packages for electronic equipment at a retail outlet. Above, George Stehl and Fred Feucht indulge in a pleasanter form of research as they test a new Krueger beer tap handle at a New York bar.

Modelmaker Carlton Johnson checks clay displacement in water prior to making model. He first checks the displacement of a closed bottle of a specific ounce size in the water, noting the figure on the gage. Then he removes bottle and puts clay into water equal to bottle's displacement figure. He then makes model using all the clay necessary for bottle's ounce size.

4 *"With these shelves we can show the client everything just as it looks on the counter. It helps him evaluate how he stacks up against the competition."*

FBDA's presentation agenda:

1. *Review of objectives and specifications.*
2. *Presentation of client's existing packages with a discussion of their assets and liabilities.*
3. *Presentation of competitive and similar products only.*
4. *Presentation of all existing packages.*
5. *Presentation of new designs only, with explanation of various approaches.*
6. *Individual evaluation of new designs against a list of characteristics determined from design strategy.*
7. *Presentation of new, existing, and competitive designs in a typical display setup.*
8. *Secret ballot indicating first, second, and third choices.*
9. *Tabulation of client votes combined with votes of FBDA staff taken at design critique, and announcement of results.*
10. *Indication of results of FBDA staff voting prior to meeting, discussion among all present relating results to all phases of client's operation, and final decision for further action.*

apparently playing both ends against the middle, ordered a rock-hard-sell ad campaign complete to line cuts of muscle spasms, which to all intents and purposes seems to defeat the subtlety that FBDA had intended with its package.

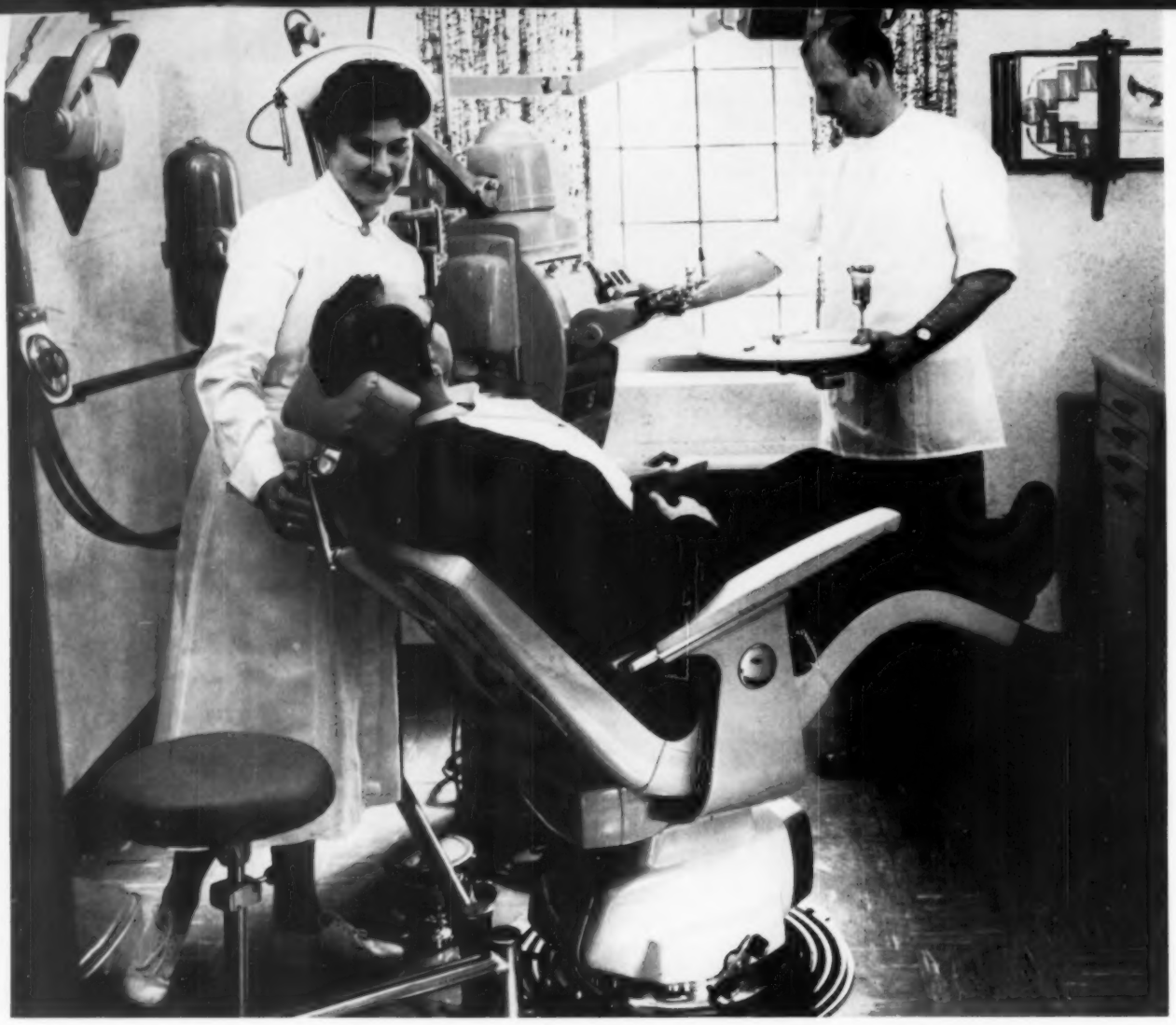
The back room at FBDA is presided over by Bernard Bresky, a seventeen-year veteran in the packaging field. Three other designers divide their time between design and contact. George Stehl, 34, heads up the product design department, while Fred Feucht, a 28-year-old former PDC scholarship winner and Marian Franco, 26, a quiet, attractive Art Center graduate, handle the bulk of the packaging accounts. Bringing together all the information that they have gathered from the client and their own wanderings, the designers explore every conceivable creative direction while trying to relate their efforts to the guidepost of the design strategy. Then they revise and refine the designs which they believe have the greatest potential. When the design group feels it has achieved a solution to the problem, it submits its work to FBDA management for formal criticism.

Critique and Presentation

For this internal design critique, Blod and Tupper serve as devil's advocates as they question the designer making the presentation. They try to hold conditions as closely as possible to those of normal client meetings. There is a statement of purpose, a review of past packaging, and then a step by step illustration of work done to date. Other designers not involved on the job are often called in to make the designer defend his position. By secret ballot, the staff rates each design on all points under consideration to see if it is consistent with design strategy. Those deemed most promising are selected for a showing to the client. Once these get the go-ahead, modelmaker Carlton Johnson makes full-scale models for a formal presentation to the client and his advertising agency.

Blod tries to conduct all his major presentations in his own offices where he has a flexible display installation that allows models to be viewed under some approximation of ultimate selling conditions. Display shelves line two walls of his conference room. A vertical sliding curtain closes all shelves except those which are under actual discussion. Blod states that quite often these design office sessions are attended by executives who might not be interested were the meetings held in their own offices with administrative interruptions. The designer thus has a captive audience for the duration of the presentation. Blod's clients seem to feel that this environment is most practical for evaluating designs because it allows them to deal not only with Blod and Tupper but with the designers responsible for the products on the shelf.

As outlined above, the presentation agenda is similar to that normally followed by other design offices. But, as stated before, the character of an office is seldom defined by its procedures; the people within the office give it its special stamp. Blod promotes FBDA's feeling of youthful enthusiasm tempered with and guided by his own practical experience. His concern with his heirs apparent has led him to mold articulate and creative young designers and management personnel who, he hopes, will not use his office to blood themselves in the design world. Rather he hopes that his encouragement of young designers and their continued good work will provide a long range foundation for his office under a multiple ownership and a multiple name.



Euphorian dental chair puts patient in reclining position with his head low enough to allow dentist to operate sitting down.

For a number of years a California dentist named Dr. Sanford Golden has been concerned about certain working conditions within his profession, and for the past six he has been actively engaged in doing something about them. The result of his activities is a new dental chair which he claims is the first major advance in dental seating in fifty years. It is called the Euphorian dental chair, and its euphoria spreads two ways—over the dentist and over the patient. Its significant point of departure from conventional dental chairs is a contoured seat and its goal is to resolve two problems: the tension and restlessness of patients, and the fatigue of dentists who must work all day standing up, and mostly standing still. Several years ago the Ritter Company, manufacturers of medical and dental office equipment, became interested in Dr. Golden's studies and underwrote the cost of medical research to investigate his theories. It also assigned to Walter Dorwin Teague Associates the job of incorporating Dr. Golden's principles into a production-model dental chair.

Initially Dr. Golden's studies were empirical. He observed the reactions of his own patients, he analyzed his own reactions, and he speculated: the dentist's physical discomfort impaired his ability to work with concentrated skill through a whole day; and to compound his troubles the patient's discomfort, combined with his apprehensions, made him a difficult and unpredictable subject to work upon. Dr. Golden concluded that the ideal solution would be a chair low enough to permit sit-down dentistry and comfortable enough to put patients in a benign and relaxed frame of mind, conducive to keeping their reflexes under control. To work with him on the development of such a chair he assembled an informal research team. His experts included an aircraft engineer, two orthopedic surgeons, and a physical anthropologist, whom he consulted on matters outside his own professional province. The outcome of this initial phase was a custom-built chair which he employed in his own practice, and which worked so well ("some of my patients fall asleep in it") that news of it got around in professional circles and it was brought to the attention of the Ritter Company.

As a supplier of equipment for the medical sciences, Ritter wanted far more comprehensive "scientific" proof of the chair's efficacy than Dr. Golden's studies had provided, so they agreed to support a thorough course of research at the UCLA School of Dentistry where Dr. Golden is an assistant professor in the Human Factors Division of the Department of Operative Dentistry. The research was to include electromyographic studies (in lay language, elec-

CHAIR CURVES TO CREATE EUPHORIA IN THE DENTIST'S OFFICE

UCLA research on fatigue in dentist and patient under working and sitting conditions encountered in conventional and experimental chairs included electromyographic measurements of muscle tension (above). Electrode attached to calf of leg registers muscle action through current changes.

Three collaborative agencies have come up with a chair for comforting both dentist and patient

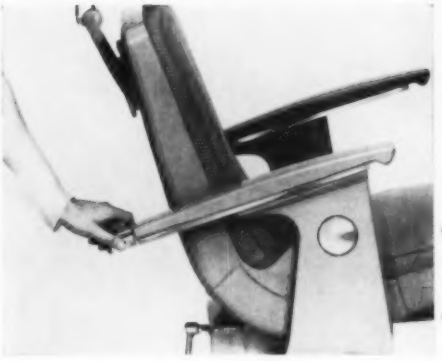
tromyography measures muscle fatigue through electrical impulses) and studies on respiratory metabolism. The studies were to be performed on both dentist and patient and were to cover all the physiological situations to which each might be exposed in the normal course of dental treatment. And they were to be parallel studies, performed with a conventional dental chair and an experimental dental chair built in accordance with Dr. Golden's principles. The purpose was to compare the amount of fatigue, stress, and tension engendered in both dentist and patient under new and old conditions of practice.

While this information was being assembled Ritter also retained the Teague office to work with its engineers on the design and engineering of a production version of Dr. Golden's chair. It was not the first such collaboration. Teague had previously designed a number of other pieces of Ritter dental equipment, among them the standard Model C dental chair whose familiar configuration will probably continue to appear in many dental offices partly because, as one dentist puts it, "its very familiarity is reassuring" and partly because some dentists, having already established a mode of working geared to the conventional chair, will continue to prefer it. But if the Euphorian chair predicates a new approach to dentistry, it also requires some reorientation on the part of the patient. There are certain patterns of behavior, commonly accepted, which will have to be altered. For one, there is the instinctive assumption that when the drill hits the nerve you have got to have the footrest to brace against. And on the Euphorian chair there is none.

The footrest, in fact, is one of the major faults in a conventional dental chair, since the patient who involuntarily uses it in this way also automatically alters his position in relation to the dentist. And the closer he approaches full-recline (the prerequisite condition for sit-down dentistry) the more apt he is to use the footrest for a brace—not only against pain, but against the unnatural position in which his body is placed. For the obvious fact is that the fixed position of the seat puts him in the paradoxical position of lying down sitting up. This fixed position seat is the second major fault in the conventional chair. The third is the height of the chair itself which, even when back and headrest are tilted full degree, still puts the patient's head too high for the dentist to operate upon sitting down without excessive reaching—thus substituting arm fatigue for leg fatigue. (Corollary to this, the dentist's tools, in a conventionally arranged office, are way around on the other side of the patient).

Freedberg Journal Bulletin Photo

Fiberglass seat shell is molded by Anchorage Plastics, before being shipped to Ritter plant for assembly with other elements.



Euphorian chair has very few adjustable parts: dentist need only adjust headrest, which comes in two versions — a single contoured cushion (left) and a double-cushion style. Arm slides forward and backward (above) to simplify getting in and out of chair; latch at back locks it in position. Arm is molded of polyvinyl chloride resin, eliminating the shock of metal's coldness. Footrest is stationary. Controls include a cluster of foot pedals, two of which control tilt angle through hydraulic actuator (under front seat); other two pedals raise and lower seat on pedestal.

All of these conditions except the tool arrangement are changed by the Euphorian chair (and this too will doubtless be altered, since Dr. Golden and his UCLA team are continuing their research for the Ritter Company with a view to re-designing other dental equipment and, in addition, the layout of the dental office). In the Euphorian chair the patient is cradled in a compound curve which supports almost all body types at every point of contact. In this it is not so very different from other contour or "health" chairs. But the designers provided that the Euphorian chair pivots on a central axis at its center of gravity and is contoured so that the patient's center of gravity corresponds to that of the chair and remains constant through all the degrees of tilt to which the chair may be adjusted. Also constant through all the degrees of tilt is the position of the patient's body, i.e. the angle of his back and the degree of flexion in his legs never change. Dr. Golden claims that the angles and curves of the Euphorian contour are so nearly ideal that most people can sit in the chair for twelve hours at a stretch without experiencing discomfort—which raises the possibility of another avant-garde concept in dental practice: the extended dental appointment in which, as Dr. Golden puts it, "we go through the whole mouth at once." In the meantime the Euphorian curve has more immediate benefits. The curve does permit a lower seating position, does allow the patient to lie back in comfort (if not in bliss), and does make sit-down dentistry a reality for those who may choose to practice it.

In developing the chair for the commercial market, the Teague designers started with Dr. Golden's Euphorian curve, in which they made one minor modification. They then developed a complete operational chair, introducing the necessary maintenance and mechanical features, built three operating prototypes, made complete working drawings, and specified materials and forming techniques to simplify production and improve function.

The minor modification in the original curve was the elimination of a lumbar pad included on Dr. Golden's version, which would have meant a more complex and more expensive forming process for the seat upholstery. But partly to compensate for it, and partly to cup the patient more securely over the pivotal center of gravity, the radii of the seat curve have been "sharpened." Also, to improve the seat's comfort the constant-thickness foam rubber is topped by a 1-inch pad of polyurethane, a material that retains a "memory" of forms placed upon it and so "fights back" less than standard foam rubber.

Teague designed the seat as two separate elements: a

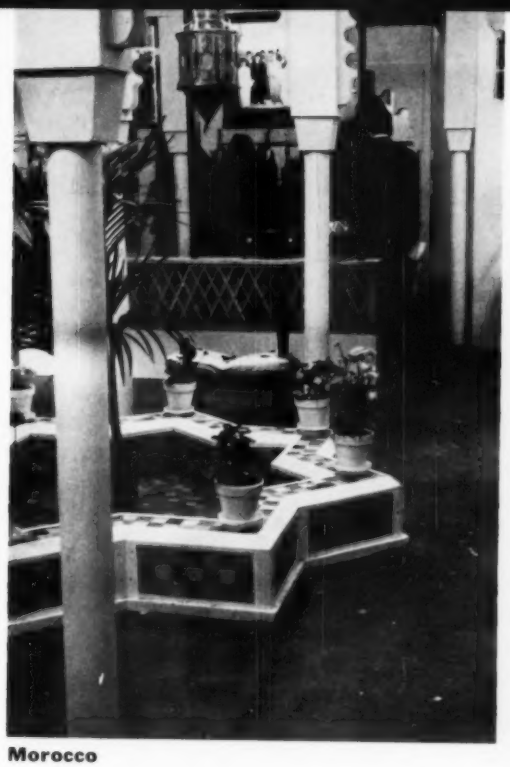
reinforced fiberglass shell, and a removable pad upholstered in a Trilok slipcover that can be taken off for cleaning. Trilok was specified because its air-pocket construction theoretically makes it more comfortable for prolonged sitting, and because it is less slippery than smooth-surfaced leather or plastic. The foot support however, because it takes more abuse, is covered in vinyl-coated fabric. The fiberglass shell (a new departure for dental seating) was specified by Teague because of its lightness—it can be pivoted with a minimal amount of power. It was fabricated not by Ritter—whose operations are confined to metal casting—but by Anchorage Plastics, selected by WDTA because of their experience as a manufacturer of large fiberglass forms—specifically, boat hulls. The crucial problem in its forming were the two triangular extensions on which the seat swings. These tended to pull inward when the form was released from the mold, and the solution, developed by Teague and the Anchorage engineers, is one that Teague thinks might well be adapted to other situations where additional strength is required in a fiberglass form. The shell has two lengthwise pockets molded into the back; these are filled with phenolic micro-balloons mixed with polyester resin, then topped with a second layer of fiberglass. The shell is suspended in a cast aluminum yoke which in turn is supported by a pedestal base very like that of the Model C chair except that it contains, beneath the front of the seat, an actuator motor which changes and locks the chair in whatever position the dentist desires. The motor is operated by foot controls. The arms of the chair are mounted on the yoke and thus remain in a fixed position through all degrees of tilt. But the angle of pitch, according to the Teague office, is comfortable in both reclining and upright positions, and the height is comfortable for almost all patients since the relative distance between shoulder and elbow is essentially the same for all body types. The chair arm, however, does move horizontally. It slides forward and backward to permit the patient to get into the chair with ease, and it locks in position with a device at the back of the arm that only the dentist can reach. This leaves the headrest as the one adjustable element in the Euphorian chair. In the opinion of the Teague office the lack of multiple adjustments is one of the chair's most important features, since it eliminates the preliminary conversational skirmish between dentist and patient as to what is comfortable and what is not. With this last point of possible enmity removed, euphorian dentistry may very well be the actuality that Dr. Golden claims it is.—*B.D.*

Photos: Mattilde Lourie

To those who had been exposed to the sophistication of Brussels and the careful displays the U.S. government has been assembling for foreign trade fairs, the privately-organized United States World Trade Fair, which took over the New York Coliseum May 8th to 19th, must have seemed an abrupt descent to the old-fashioned fair of small booths heaped with souvenirs, novelties, and the odds and ends that turn fair-goers into magpies. This was the third year for the show, which this time exhibited products from 63 countries and attracted an attendance of well over half a million. (A good part of this figure represents fleets of buses full of school children who descended shouting on the Coliseum, demanding shopping bags from bewildered Ethiopian exhibitors and causing barricades to be hastily thrown up in the Japanese pavilion.)

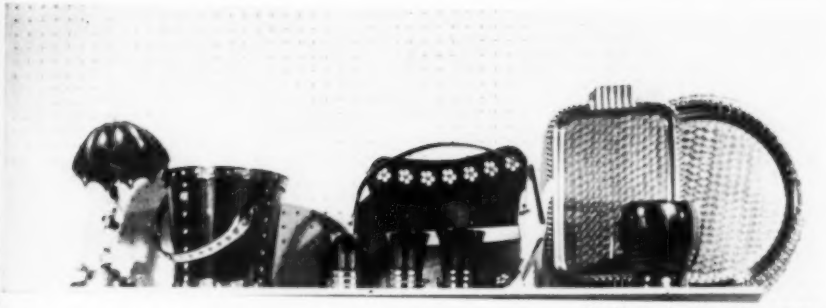
The second floor of the Coliseum, devoted to the national pavilions of 22 foreign governments, presented the only examples of conscious display technique at the fair. These were in many cases less an exhibit of specific products than an attempt to display the national charms—a matter of necessity for some of the least-developed countries, who had rented large floor areas and had nothing to put in them but bits of native embroidery and photographs of scenery and the Minister of Finance inviting more foreign investment. Morocco, for example, relied almost wholly on the Moorish arches and tracery of its pavilion (right), which sheltered only some carpets, cork, and a few bottles of North African wine. But in this case, as in several others, the poverty of the display might have reflected not only underdevelopment, but too easy a resignation to national cliches and a

THE WORLD TAKES ITS GOODS TO A FAIR →



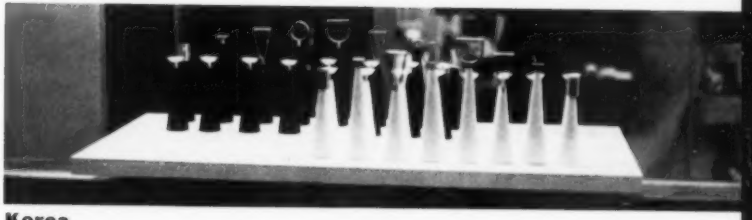
Morocco

Italy



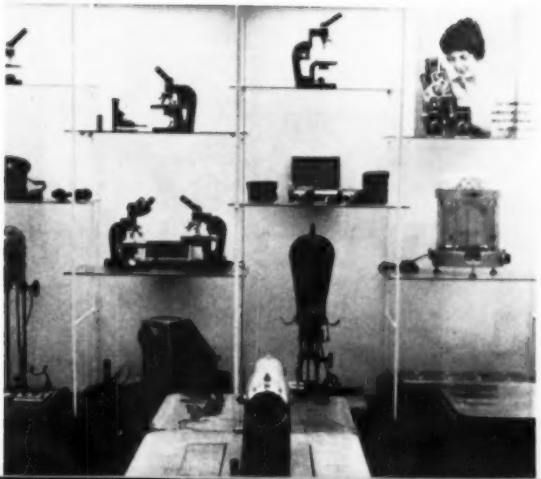
United Arab Republic

France

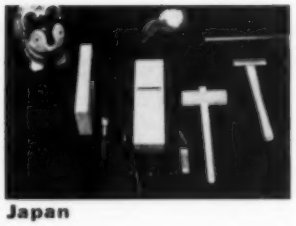


Korea

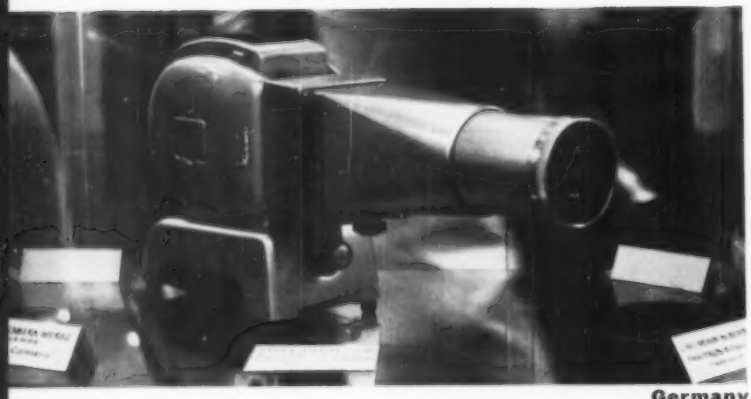
Poland



Yugoslavia



Japan



Germany

Israel

Japan

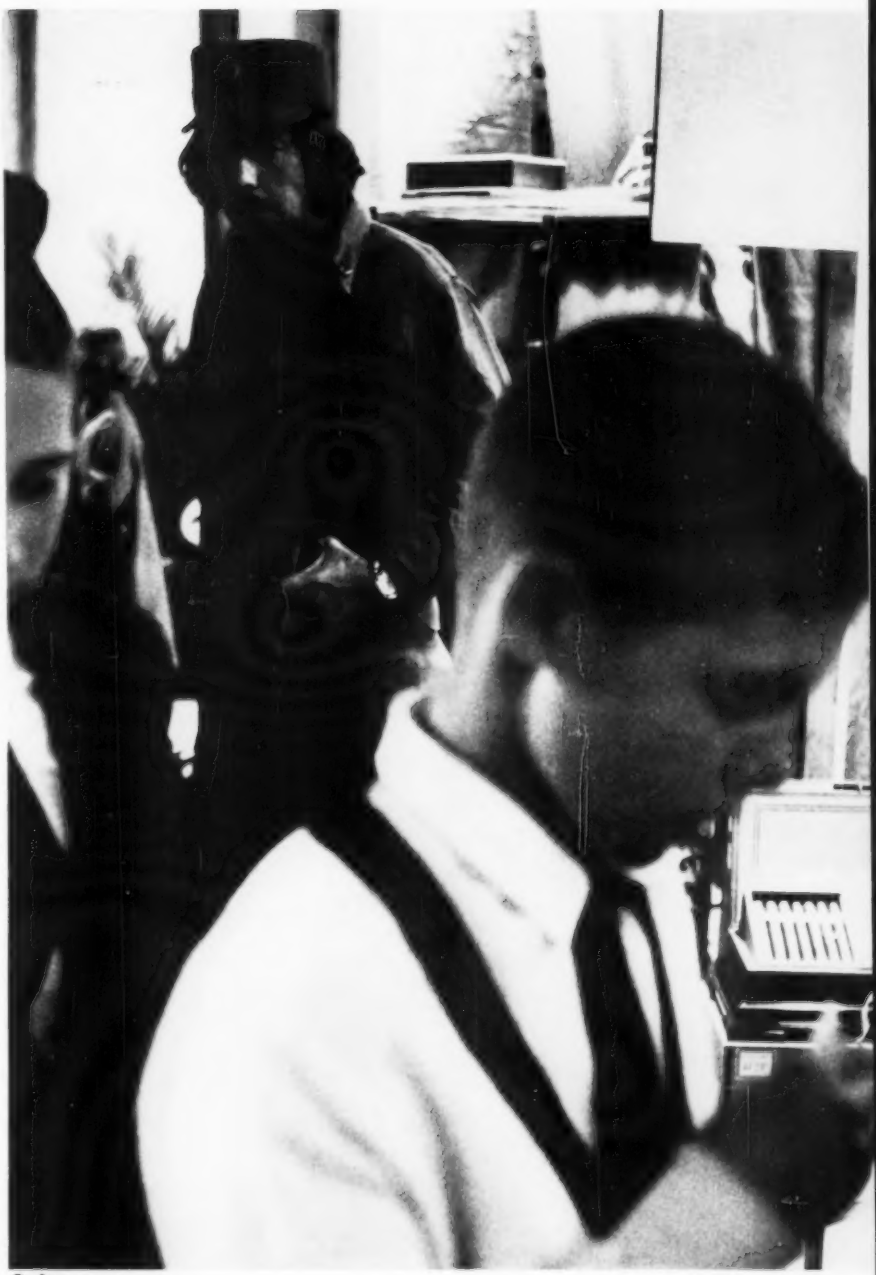
Czechoslovakia

lack of expert assistance in searching out striking and unhackneyed products.

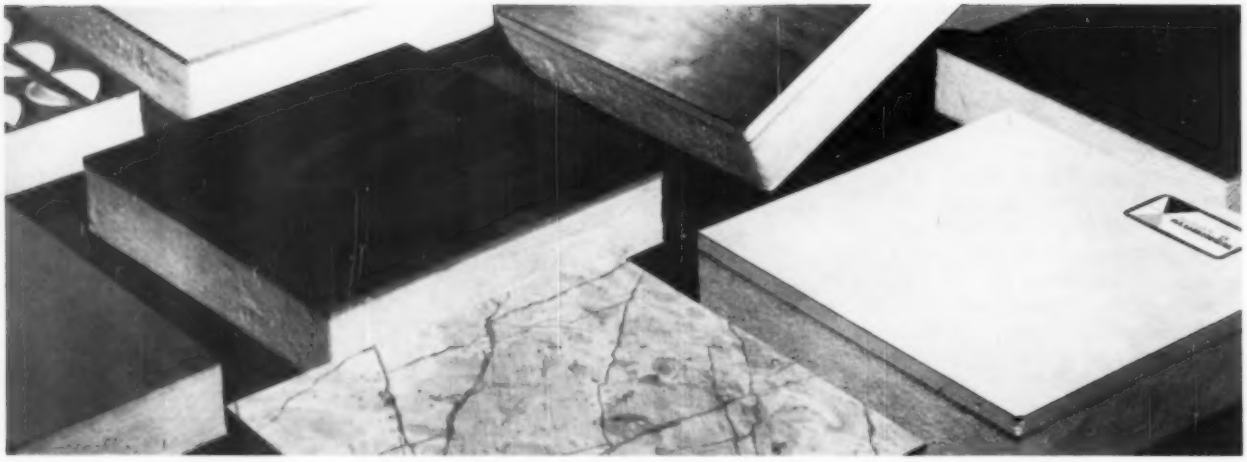
Where a country was taking its first steps toward a national economy, this was displayed proudly, with varying effects. Among its camel saddles and filagree bracelets, the United Arab Republic showed a couple of shelves of brightly-colored anodized aluminum trays and bowls (page 81), as modern as Woolworth, except that many of them had been hammered to resemble the traditional brassware around them. The Republic of Korea showed a group of handicrafts that had, with the assistance of an ICA team, been adapted to the Western market. The chess set on page 81 illustrates the combination of handcraft and sophisticated design that resulted from this collaboration.

The most highly industrialized countries could, and for the most part did, dispense with quaint architecture and local flavor to devote their energies to a grim determination to sell goods. Poland (page 81) and Yugoslavia (opposite) turned their pavilions over to plain showcases full of optical instruments, vodka and ham (Poland), and lead pipes, slabs of marble, and shoes (Yugoslavia). Some of the newest products were to be found not in the national pavilions but in the booths rented by private exhibitors. Only four manufacturers, from France and Germany, showed major appliances, and these were chiefly very small models, intended for use outside the kitchen or in trailers. Italy, as usual, showed a sensuous refinement in the most prosaic of goods: in the Pozzi bathroom fixtures on page 81, for example.

And, finally, Cuba showed *its* newest and newsiest product: a bearded freedom fighter blinking ominously at the crowd, who were handed packets of sugar bearing the legend: "Consume more Cuban sugar and we will purchase more from you."—*U. McH.*



Cuba

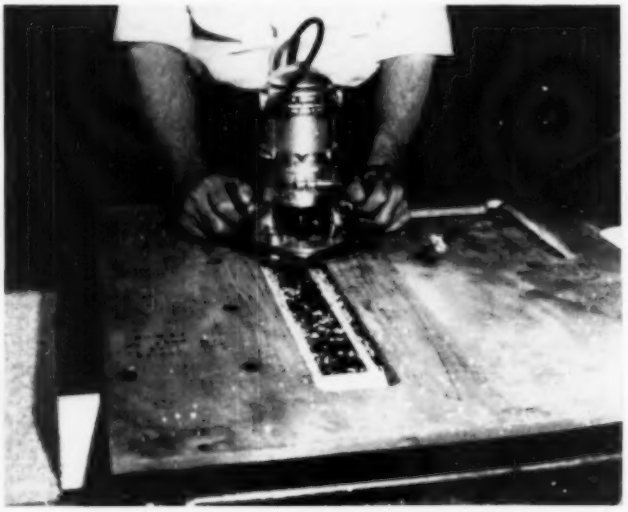


TECHNICS:

Sandwich panel offers light weight, strength

1. *Panel being notched and mitered with high speed saw.*

2. *Router being used to form depressions for machinery.*



A new panel construction component consisting of an expanded polystyrene foam core sandwiched between two sheets of aluminum has recently been made available in limited production quantities by Alcoa. The panel, called Alply, is said to offer a combination of strength, light weight, efficient thermal insulation, and production economy. It has been under development for almost two years, and it promises heretofore impossible simplification in the design and construction of appliances, buildings, trailers and a number of other applications. The first commercial use of the new product is in two new Westinghouse refrigerators, whose production is described below.

One great advantage of Alply is that ordinary electric saws can cut the material to shape, so that small runs of products can be made economically. John W. Craig, Westinghouse vice president and general manager of the electric appliance divisions, says that Alply may drastically change refrigerator manufacture. "Engineers have been confined to traditional shapes and limited to particular sizes of refrigerators because of the extremely high cost of tooling basic cabinets and inner food compartments," Mr. Craig said. "To tool a new outer cabinet of steel costs anywhere from $500,000 to $1,500,000. The cost with the sandwich construction method is no more than $3,000." He thinks that the method has potential application to almost any appliance, or other item, where the ultimate product has a cabinet or shell formed of three layers of different materials.

Though the fabrication method used in making the panel is proprietary, enough is known about it to give a brief description. Two metal skins with adhesives applied to their inside surfaces are fed into a machine. The foam is formed in place between the skins and the panel is then shaped to specification. With present production methods, the panel can be made in widths up to 4 feet and in unlimited lengths. Thicknesses range from 1 inch to 6 inches.

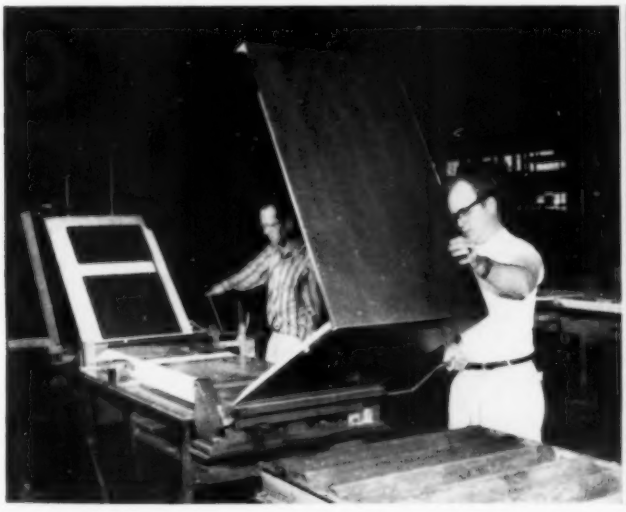
The core is produced from expandable polystyrene beads which form an opaque, white, odorless foam material which is non-toxic, self-extinguishing, and in addition, has no food value for plant or animal life. Core densities vary from 1.5 to 4 pounds per cubic foot, depending on the application. Higher density cores are stronger than those with lower densities. Where extra strength is required the core may be reinforced with additional shear webs. The panel in no case is recommended for use where it will be subjected to temperatures above 180° F. for any length of time to avoid material breakdown.

Finish possibilities, according to Alcoa, are limitless: it can be textured, formed, and colored by a variety of methods to achieve any desired decorative effect. The panel's versatility is increased by the use of facing materials other than aluminum, such as plywood, cement asbestos board, and hardboards. It is this versatility coupled with its great strength that makes Alply especially suited to residential construction. The panels used as wall and roof components could be quickly and cheaply put together to form a house. In addition, they are very strong for their weight: a 4 foot by 8 foot by 3 inch panel, weighing 39 pounds, could support 1500 pounds of distributed load.

The photographs below show the new Westinghouse refrigerator in the process of construction. In (1) a panel formed in the proper width is being mitered and notched with a high-speed radial-arm saw. In (2) a router and template are used to form depressions where mechanical components of the refrigerator will be placed. The top, bottom, and two sides of the refrigerator are being formed in (3) by bending the panel 90 degrees at each mitre. The assembled product, including doors, appears in (4).

Manufacturer: Aluminum Company of America, Pittsburgh 19, Pennsylvania.

3. *Assembling top, bottom and two sides of refrigerator.*



4. *Finished product, including doors.*

Multiple readout symbol generator

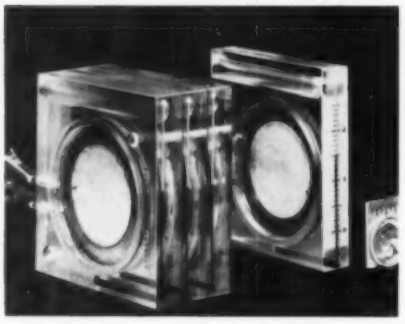
An electronic symbol generator of new design has been announced by the Skiatron Electronics and Television Corporation. A symbol generator is used to provide characters and symbols for such devices as stock quotation boards.

The Alphadyne (Skiatron's trade name) will be of interest and use to systems engineers in designing devices to track and identify aircraft or radar blips, and it can be used to write out navigation data for aircraft, telemetered data, and teletypewriter messages. The new technique embodied in the Alphadyne is an electronic version of the electro-mechanical character-forming system exemplified in the famous blinking lights that spell out the headlines around the New York Times Building. In that system, a paper tape resembling a player piano roll passes over a bank of switches, permitting contact only where the tape has been perforated. Where contact has been made a light flashes on. In the Alphadyne, a form resembling a complicated monogram is made up of bars of a fluorescing material. When certain bars in the shape are activated by an electric current they delineate certain characters: numbers or letters or arbitrary symbols. The Alphadyne's output can readily be applied to a distant oscilloscope, which the output of the customary photo-forming symbol generator cannot. Centralized character generation of this type means that a reduction of equipment size, weight and electronic complexity is possible when remote display is necessary. Images are clear and legible, according to the manufacturer, and character speed can be varied from 60 to 5,000 characters per second. A 20-character Alphadyne measures 8 inches by 12 inches by 17 inches; a 50-character machine is 12 inches by 12 inches by 17 inches. Manufacturer: Skiatron Electronics and Television Corporation, 180 Varick Street, New York, N. Y.

Ceramic discs measure voltage

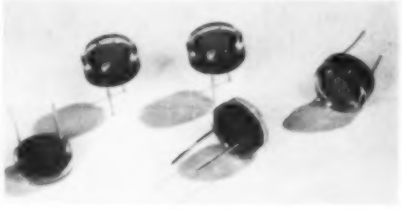
A new type of voltmeter, working on the principle of a parallel-plate capacitor, has been developed by the Mullenbach Division of the Electric Machinery Manufacturing Company. The voltmeter, which uses electrostrictive ceramic discs as the dynamic element, is not available yet for general distribution; so far, only prototype models have been built.

Each meter consists of a small transparent block enclosing two metal discs set parallel to each other. To each disc is bonded a smaller ceramic disc which has been coated on both sides with silver frit, forming a capacitor.



The ceramic plates move toward each other at the application of a voltage, causing the metal discs to cup. Colored fluid contained in a reservoir between the discs is thereby forced to rise in a capillary tube at the front of the meter. The amount of its rise is an indication of the strength of the voltage. An expansion chamber at the top of the block containing the meter prevents back pressure from building up.

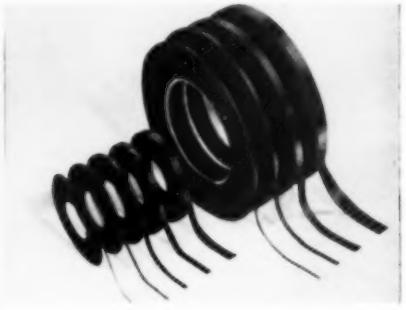
The prototype models measure less than $\frac{3}{4}$ inch in width, permitting a number of meters to be mounted in the space normally required by one meter of conventional design. Source: Mullenbach Division, Electric Machinery Manufacturing Company, 2100 East 27th Street, Vernon, California.



Light-sensitive resistor

A resistor whose resistance value changes with fluctuations of light intensity has been announced as available by the Ferroxcube Corporation, of Saugerties, N. Y. According to the manufacturer, it is ideally suited for automatic control of television picture brightness, and for other uses where circuit resistance must vary with light intensity.

The new resistor has a resistance ratio of 25,000 to 1 for a light intensity change from total darkness to 1,400 foot candles, which means that its resistance is 25,000 times greater in total darkness than it is in 1,400 foot candles of light. It consists of a cadmium sulfide cell with silver electrodes, and is said to eliminate the need for high-gain amplification stages in equipment, as well as to have a very long service life. Manufacturer: Ferroxcube Corporation of America, Saugerties, N. Y.



Printed-circuit drafting aids

Black pressure-sensitive photographic tape with clear, non-staining adhesive is available in precision-tolerance widths ranging from 1/64 inch up, in rolls 15 or 60 yards long. The tape, according to the manufacturer, By-Buk Company of Los Angeles, is ideal for use in making printed-circuit master layouts. It is also available in rolls 3 inches by 5 yards to be used when special shapes of pads or conductors must be formed. By-Buk also manufactures a complete line of black or white pressure-sensitive printed-circuit drafting aids, including "Kwikydot" overlapping donut pads, teardrop pads, universal corners, T's, and others. By their use, the drafting time spent in filling in solid black conductor and terminal areas on master drawings is eliminated, and changes can be made quickly, without erasing. Manufacturer: By-Buk Company, 4314 West Pico Boulevard, Los Angeles 19, California.

Phantom blue intermediate paper

An improved, non-reproducible, diazo-type intermediate paper has recently been made available by the Frederick Post Company of Chicago. The easily readable phantom blue lines on Post 206 PBT will not reproduce because they are transparent to light. Pencilled or inked lines drawn over the phantom blue lines will, however, reproduce.

Possible uses include the reproduction of original drawings that contain information not meant for general distribution. Manufacturer: Frederick Post Company, Box 803, Chicago 90, Illinois.

Transistorized analog computer

A new small-size analog computer capable of performing 95 per cent of the routine calculations encountered in normal engineering design problems has recently been put on the market. Electronics Associates' PACE TR-10 for the first time offers the individual engineer the assistance of analog computation in solving his everyday problems, in place of the drudgery of multiple hand calculations or the delay occasioned by waiting for time on crowded computer schedules.

The new computer uses fully transistorized components contained in a cabinet 15 inches wide, 17 inches deep, and 24 inches high, and weighing 80 pounds without accessories. The small size of the TR-10 was made possible to a new, extremely compact, transistorized DC amplifier. Two of the amplifiers, packed as a single, shielded unit, occupy a space measuring only 11½ inches by 5 inches by 6½ inches. Other components, such as comparators, multipliers, attenuators, and repeaters, are made to the same module as the amplifiers, so that the engineer using it can order from a wide choice of computing component combinations to meet his particular problem-solving requirements. Color coding of the elements of the computer permits its user to set up a problem in less time than it usually takes on a conventional analog computer.

Of particular significance, according to the manufacturer, is the possible use of the TR-10 as an educational tool, since it offers a precision analog computer at a cost within the budget of individual departments of most colleges and universities. As such it will be useful in demonstrating the basic physical and chemical concepts to undergraduates. Through its use the mathematical expressions that describe the performance of physical phenomena can be presented in a way that will give the student an insight into the fundamentals of science—instead of losing him in a maze of calculations.

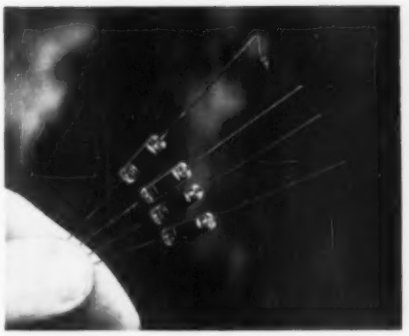
In chemical engineering, for instance, the fundamental concepts of mass balances and heat balances (which demonstrate that the amount of energy supplied to a system must equal the amount drawn from it, either as work or as heat loss) as well as chemical kinetics, can be shown. In mechanical engineering the principles of thermodynamics and the time response (delay inherent in any physical machine) of mechanical systems can be demonstrated. The computer can show the transient performance of electrical machinery, electronics circuits, and the theory of automatic control in electrical engineering. And as a turnabout, the physical meanings of the solutions of ordinary and partial differential equations can be shown.

Other areas where the TR-10 should prove useful are aircraft and missile design, chemical and petroleum flow-process design, and in the calculation of automotive and other small mechanical systems. Manufacturer: Electronic Associates, Inc., Long Branch, New Jersey.

Multipurpose weld shaver

Removal of weld beads and weld finishing, which have been multiple operations, can now be performed simultaneously with a new weld shaver developed by Zephyr Manufacturing Company, Inglewood, California. The weld shaver, which was designed primarily to meet the needs of the aircraft and missile industries, uses a rotating cutter to remove excess fillet and to shave beads down to the plane of the surrounding metal. The cutting wheel is mounted between two adjustable rollers that straddle and follow the bead on flat, concave and convex surfaces. The rollers can be set by an adjustable indexing ring that permits an operator to increase or decrease the amount of metal cut by increments of 0.0005 inch. A lock keeps the adjustment fixed.

The shaver is available in two models: one is designed for use on stainless steel, titanium and carbon steel welds; the other, for use on aluminum, magnesium, copper and brass welds. Both models are powered by a 1 hp air motor, requiring 90 psi air. The motor housing has a side handle for holding the machine, with a trigger switch and lock. Manufacturer: Zephyr Manufacturing Company, 201 Hindry Avenue, Inglewood, California.



Glass-enclosed resistor

A true glass-to-metal seal makes a new glass-enclosed, precision film resistor completely impervious to moisture, according to the component's developer, Corning Glass Works' Electronic Components Division. The resistor, which has recently been made available in engineering quantities, is the first glass-enclosed unit to meet the requirements of military specification MIL-R-10509C. Corning says that the quality of the seal is comparable to that of an electron tube, and is more resistant to physical shock.

Encapsulation does not affect electrical properties or make the resistor bigger, according to the company. It is expected to be used in missiles, aircraft, computers, radar systems, and other circuits where high reliability, long-term stability, and long shelf life are requirements.

The resistor's leads are sealed to the glass case and are welded inside to metal disks fused to the resistance element. Range of the ¼-watt unit is 10 ohms to 0.5 megohms at 300 volts and 70 degrees C. Manufacturer: Corning Glass Works, Corning, N. Y.

Color-coded turns-counting dial

VerniDial Model H5850, a turns-counting dial designed to fit shafts of potentiometers, variable capacitors, valves, and other equipment where extremely accurate setting readout is required, has recently been put on the market. The dial is available in seven colors—black, gray, off-white, yellow, orange, red and green, so that color-harmony requirements can be met, and circuit functions can be color-coded. The dial, working by a Geneva movement, counts to 20 turns by hundredths of a turn. Manufacturer: Howell Instrument Co., 3101 Trinity Street, Fort Worth 7, Texas.

Quick-freeze tester uses liquid CO_2

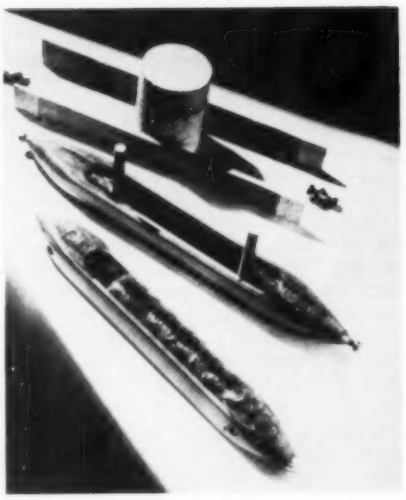
A temperature drop of close to 200° F. is achieved in less than 5 minutes with a new freezer cabinet for environmental tests that has recently been put on the market. The rapid cooling is achieved by using liquid carbon dioxide sprayed into the freezing chamber through a special nozzle. No compressor is needed.

The units come in 6- and 11-cubic foot sizes, and are available with temperature ranges of from minus 100° F. to room temperature, or from minus 100° F. to plus 300° F. According to the manufacturer, they operate to within two degrees of their rated temperatures. The cabinets are insulated throughout with 6 inches of fiberglass. Interiors are of stainless steel; the counter-balanced door has a Thermopane window in it, and there is a light to see what is going inside.

Among its uses are: testing metals for sudden temperature shock, testing plastics and rubber, quick-freezing of cultures and tissues. Manufacturer: Hudson Bay Company, 3070 West Grand Avenue, Chicago 22, Illinois.

Lightweight spark-plug tool

A new, lightweight, multi-purpose spark-plug service tool has recently been put on the market by Champion Spark Plug Company. The tool incorporates an electrode adjuster, an electrode file, spark-gap gages, and gasket-testing slots. Six stainless steel wire gap gages are molded directly into the red plastic handle; they range from 0.015 to 0.040 inch. Slots for determining acceptability of gaskets are cut into the handle. Two electrode benders, of specially hardened, rust-resistant high-carbon steel, simplify gap adjustments and avoid costly insulator fracture by bending only side electrodes. The tool is small and light enough to be carried in a shirt pocket. Manufacturer: Champion Spark Plug Company, Toledo 1, Ohio.



Plastic shuttles for high-speed looms

Formica has replaced dogwood as material for shuttles used on high-speed looms with the discovery that the plastic material is more resistant to the tremendous shocks a shuttle is subjected to as it accelerates from zero to 30 miles per hour and back to zero in a space of 10 feet. The new shuttles are roughly three times as expensive as the old, but they last six times as long, making them ultimately only half as expensive

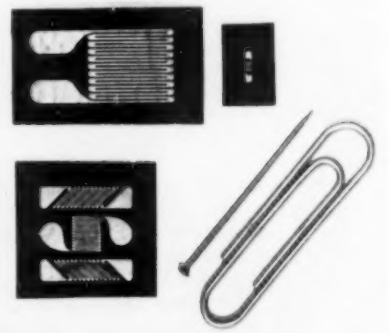
Multiple strips of uni-directional cotton duck, saturated with Formica resin, make up the sides of the shuttle. They are premolded into a frame, with a slot down the center for the bobbin. The pointed ends of the shuttle are formed later from a quantity of macerated duck which is also saturated with the resin. By using macerated material, the compound curves of the heavy ends are more readily molded. The ends are molded around steel tips which are machined to a point after the shuttle is completed. The steel tips are incorporated in the design so that the shuttle can withstand the shock of the "pickers"—heavy arms that strike the shuttle and propel it back and forth in the weaving shed.

The material used in the ends of the shuttle is preformed into plugs 3 inches in diameter and 1½ inches high. The plugs are then heated to molding temperature and forced under pressure into a mold. The final molding bonds the tips to the previously formed sides. After molding, the steel tips (already attached to the sides of the shuttle) are machined to a point. Source: F. J. Stokes Coporation, 5500 Tabor Road, Philadelphia 20, Pennsylvania.

Miniature strain gages

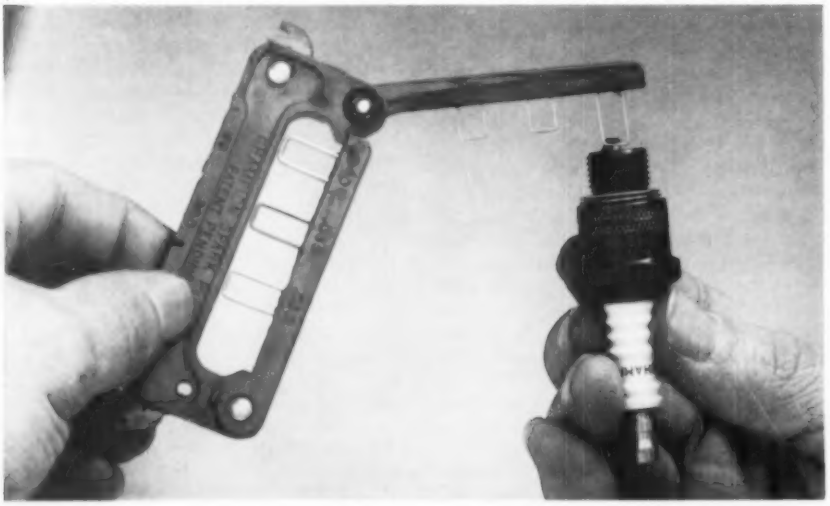
Three new Metalfilm strain gages will be in full production soon at Tatnall Measuring Systems Company. According to Tatnall, all three gages have diverse applications, of which the latest are on high-speed aircraft, missiles and jet engines. Two of the gages are fully temperature-compensated for four alloys, the third is not. They are all small, the smallest measuring 1/32-inch by 5/32-inch, the largest ½-inch square.

Of the three, the rosette gage determines magnitude and direction of principal strains; the miniature gage is used in areas around fillets, cutouts and holes, where strain will be very great over a small distance; the high fatigue-life gage,



which is said to last for from five to ten times as long as equivalent gages, is to be used in rapidly rotating or reciprocating machinery, such as gas turbines or internal combustion engines.

According to the manufacturer, all three types of gages incorporate advantages which are exclusive to Tatnall Metal-Film gages; extreme flexibility and conformability; large power-handling capacity; greatest accuracy and long life; maximum dimensional stability. In addition, the gages can be put to use in five minutes after application (with the help of Eastman 910 cement), while other kinds, in many cases, take hours to apply. Manufacturer: Tatnall Measuring Systems Company, a subsidiary of the Budd Company, Box 245, Phoenixville, Pennsylvania.



Manufacturers' Literature Supplement

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

MATERIALS—METALS

1. **Small Tubing.** Superior Tube Company. Special Analysis Memo No. 114. Describes tubing made from A-286, an alloy developed for high-temperature applications and lists its chemical composition and physical properties as well as the standard production limits for both seamless and Weldrawn (welded and drawn) tubing which Superior produces from the material. Its fabricating properties and applications are also discussed.

2. **Magnesium Alloys.** Dow Chemical Company. 28 pp. Describes recommended practices for working magnesium alloys of the thorium and rare-earth-metal families. Shop operations covered are machining, forming, joining, assembly protection and finishing. Tables listing tool temperatures, bend radii and various welding data are included.

3. **Window Catalog.** Albro Metal Products Corporation. 16 pp., ill., Catalog 17A. Contains company's line of custom-made metal windows designed for all architectural treatments. Types covered are reversible, sliding, projected, awning, single- and double-hung, fixed and hopper combinations. Includes full and half-size sections, installation photographs and a discussion of the special features of the respective window types.

4. **Stock Metal Stampings and Wire Forms.** Zierick Manufacturing Corporation. Sketches and plan drawings of lugs, clips, terminals and other standard parts are illustrated in this new catalog.

5. **Aircraft Tubing.** Ohio Seamless Tube Division of Copperweld Steel Company. 70 pp., ill. Technical handbook A-2, revised and up-dated, describes seamless aircraft tubing, carbon and alloy steels. It covers definitions, military and AMS specifications, sizes, tolerances, sampling, testing, packing, marking, machining, heat-treating, properties and mill practices. Information is presented with charts, tables, and drawings where applicable.

6. **Aluminum Machining Chart.** Peter A. Frasse & Company, Inc. Chart, Sec. G, No. 2 printed on cardboard stock 8½ x 11", 3-hole punched. Provides tables of recommended speeds and feeds for six different machining operations: forming, turning, drilling, boring, reaming and cutting off. A cutting speed conversion table is included.

MATERIALS—PLASTICS

7. **Plastic Catalog.** Cadillac Plastic & Chemical Company. 64 pp. Catalog of plastic sheets, rods, tubes, films, blocks and flat tubings. Cements, pigments and miscellaneous supplies are also listed. States available sizes, weights, color ranges, textures, purchasing specifications, grades and prices. Includes 2-page comparison table of chemical, electrical and mechanical properties. Enables easy price, properties comparison of acetate, acrylic, butyrate, Implex, Kel-F, Mylar, nylon, phenolic, polyethylene, polystyrene, high impact styrene, Teflon and vinyl in cast, extruded, molded and laminated shapes.

8. **Low Pressure Forming.** General Tire & Rubber Company, Bolta Products Division. 48 pp., ill. Gives complete data on low pressure forming of thermo-plastic sheet and covers such subjects as materials, storage, cutting and layout, heating, molds or formers, forming methods, machining and trimming, assembly, cleaning and polishing, decorating, design, cross-sectional control, cost and economics, case histories and technical assistance. Appendix provides names and addresses of material suppliers.

9. **Hand Lay-Up Polyester.** Interchemical Corporation, Finishes Division. Brochure describes new series of hand lay-up resins and accessory products especially designed to speed up the hand lay-up processes and make them more nearly foolproof. Contains complete information on these new resins.

10. **Heat-resistant Plastic.** Celanese Corp. of America. Brochure describes physical and chemical properties of heat-resistant plastic which comes in two varieties: Fortiflex A and Fortiflex B, the latter available in production quantities. Brochure includes test quantities of both kinds.

11. **Adhesive Plastics.** Coating Products, Inc. Brochure with price list itemizes company's large stocks of acetate, polystyrene, butyrate and ethylcellulose, as well as Mylar in many finishes and widths. Design engineering department gives assistance to designers and manufacturers.

12. **Design Qualifications of Lucite.** E. I. duPont de Nemours and Company, Inc. Booklet describes possible new product uses of Lucite as well as present applications.

13. **Glass and Plastic Packaging.** W. Braun Company. 104 pp., ill. Descriptions and pictures of a complete line of glass and plastic bottles and bottle-caps, and ceramic labels, with information on custom designing service.

METHODS

14. **Brick Floors.** Master Builders Company. 4 pp., ill., Bulletin E-27B. Contains complete information on brick floor installation featuring the preparation of corrosion-resistant and wear-resistant joints to reduce costly floor maintenance. Procedures and techniques for proper installation of new brick floors and repair of existing ones using special, non-shrink grout.

15. **Chemical Testing Services.** United States Testing Company, Incorporated. 4 pp., Bulletin 5901. Describes the company's line of chemical laboratory testing and research facilities. Products tested include: drugs and pharmaceuticals, chemicals and natural raw materials, fuels and

oils, pulp and paper, textile chemicals and dyes, paints, varnishes, soaps and detergents, food products, resins and plastics, and metals.

16. **Metal Spinning.** J. Schrader Company. 12 pp. Brochure describes metal spinning and hydroforming facilities being offered by the company.

17. **Diamond Fittings.** Wallace Supplies Manufacturing Company. 8 pp. Contains general information and prices on Tapered Diamond Slip Fittings. With these fittings almost any design of structure from frames, railings, stands, racks, tables, etc. can be made quickly and disassembled to be used again.

18. **Battery Plates.** C & D Batteries, Incorporated. 2 pp., ill. Bulletin announces the company's new method of plate-pasting employing automatic quality control by Accuray. Chart records from the electronic control instrument show how closely weight uniformity is maintained.

19. **Track Wheels and Rollers.** C. O. Bartlett Snow Company. Catalog No. 34 contains a stock list complete with specifications and data on the company's line of track wheels and rollers. They can be used on materials-handling equipment, industrial cars, trippers, lorries, conveyors, or a wide variety of track or rail-supported machinery.

20. **Roll File.** Stacor Equipment Company. Bulletin No. 610A describes low-cost filing unit for keeping up to 36 rolled blueprints, charts, drawings, or tracings.

PARTS AND COMPONENTS

21. **Thinline Motor.** General Electric Company. 8 pp., ill. Bulletin describes new Thinline motor—GEA-6927, rated from 1- to 5-horsepower in drip-proof, totally-enclosed constructions for limited space applications such as machine tools, fans, blowers, and food disposers. Includes description of product features, chart of interchangeable flange dimensions, and data on both models.

22. **Microwave Power Tube Selection Chart.** General Electric Company. 4 pp. Bulletin PT-29 lists the essential characteristics and typical performance data of unclassified microwave power tubes, both developmental and commercially available. Included are traveling-wave tubes, lighthouse-planar types, klystrons and packaged voltage-tunable magnetrons.

23. **Stainless Steel Fittings.** Tube Turns Division of Chemetron Corporation. 6 pp., ill. New light-wall stainless steel fittings and flanges for noncritical process piping are described. Illustrations show different methods of joining light-wall fittings and pipe, including a sequence of photos on making "rolled in" flanged assemblies. Charts give dimensions of the new line of fittings and flanges, design properties of 5 and 10S pipe, and dimensional tolerances.

24. **Office Copy Machines.** Peerless Photo Products, Incorporated. Bulletin describes the main features of the six different office photocopy processes which are in general use today, including the recently introduced monobath and "Quick Silver" processes as well as the established diazo, dye-transfer, infrared, and silver-transfer processes. Bulletin points out the relative merits of each method with respect to print quality, speed, convenience, and economy of operation. It also recommends the best process to use for specific copying problems, such as handling a wide variety of originals, applications where speed is of importance, or where it is desired to make multiple copies from the same original.

25. **Modular Storage Batteries.** Scranton Cellomatic Battery Corporation. Brochure I-1 describes various arrangements of one of three standard cell types in specially-designed dovetail base frames to satisfy many industrial storage battery requirements.

26. **Gas-Fired Unit Heaters.** L. J. Wing Manufacturing Company. Bulletin GU-100 offers construction features, physical data, dimensions and rating of company's gas-fired unit heaters.

27. **Floodlights.** Stonco Electric Products Company. Bulletin P-110. Describes new outdoor floodlights designed for locations where concentrated, high-intensity lighting is required. Lights can be used singly or in clusters for floodlighting of signs, displays, ball fields, recreation or industrial areas, piers, safety lighting, service stations, parking lots, or architectural facade lighting.

28. **Induced-Draft Fans.** Lehigh Fan & Blower Division, Fuller Company. 16 pp., ill. Bulletin L-3 describes company's complete line of induced-draft fans and includes drawings and charts of ratings and specifications as well as detailed instructions covering ordering procedures.

29. **Subminiature Ceramic Capacitors.** Mucon Corporation. 4 pp. Catalog J-1 describes complete line of subminiature ceramic capacitors made in twelve types of ceramic material and includes axial and radial leads, ribbon leads, stand-off units, multiple units and various terminal arrangements. Also shown are stock high-capacitance units for transistor circuit application.

30. **Manual Starters.** Furnas Electric Company. 8 pp. Bulletin 11B1 contains data covering design, dimensions, ratings, and prices of manual starters rated through 7½ hp AC and 2 hp DC.

31. **Pneumatic Valves.** Ross Operating Valve Company. Installation and maintenance information as well as dimensional and parts data about pneumatic valves are included. To facilitate easy reference, the valves are grouped according to methods of operation by air, cam, manual and solenoid.

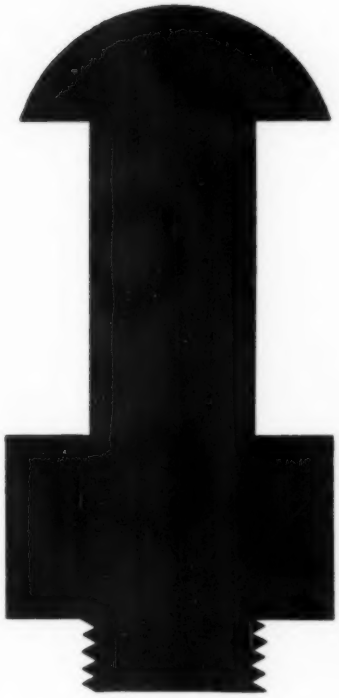
32. **Spectroscopes.** Gaertner Scientific Corporation. 4 pp. Bulletin 154-58 describes five different models of spectroscopes, as well as accessory equipment, which are used mainly for rapidly determining the approximate composition of materials, and for observing the spectral character of light emitted by sources or transmitted by filters.

MISCELLANEOUS

33. **Silicon Carbide-Bonded Graphite.** The Carborundum Company. Technical data sheet lists the description, properties, erosion test results, and fabricability of the new product.

34. **Velcro Closure.** Velcro Sales Corporation, Incorporated. A complete kit on this nylon closure is available to all designers. Materials in the kit include: fact sheets, available test reports, and a sample strip of the Velcro closure.

(*Continued on Page* 93)



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Manufacturers' Literature *(continued)*

35. Micro Probe Research. Philips Electronics, Incorporated. A literature list on micro probe research includes 73 articles which have appeared in domestic and foreign publications. Bibliography gives the name of publication, volume number, page numbers and year of publication.

36. Cooling Packages. Pesco Products Division, Borg-Warner Corporation. Loose-leaf catalog folder describes four electronic cooling packages. The packages are designed for use in electronics systems requiring air-liquid coolant medium, and are particularly adaptable to systems utilizing liquid-cooled power tubes in both airborne and ground installations. Included on each catalog page is a picture of the unit described, along with full specifications.

37. Material Handling. H. L. Bushman Company, Incorporated. Loose-leaf catalog on current Bushman material handling equipment covers Bushman Jib Cranes, Gantry Cranes, Grabs, Buckets and Coil Up-enders.

38. Magnetic Brakes. The Electric Controller & Manufacturing Company, Division of Square D Company. Bulletin 5000. The bulletin explains the construction features of EC&M Type WB brakes, which are available in six sizes to cover the complete range of 600-series motors. It also illustrates maintenance procedures, and contains selection charts for matching brakes to specific motors.

39. Silicone Rubber Selector Chart. General Electric Company. CDS-145 is designed to assist designers and engineers in selecting the proper type of silicone rubber for their particular requirements; contains data on applications, typical properties, primary classes, and standard industry and military specifications.

40. Wool and Synthetic Fiber Felts. Continental Felt Company. Folder shows possible applications of felt and includes samples, describes technical assistance facilities of company.

41. Bearing Lubrication. Miniature Precision Bearings, Incorporated. Manual supplies data and information of the various types and brands of oils and greases available to bearing designers and users, and deals with subjects such as oil and grease lubrication, properties of lubrications oils and greases, military specifications, standards, and special lubricants. Blending charts, nomographs and other data are also included.

42. Specialized Metal Containers. J. L. Clark Manufacturing Company. 12 pp., ill. booklet entitled Selling the Mass Market. Illustrations show several specially engineered packages by Clark that helped promote manufacturer's products.

43. Polyvinyl Plastisols. Chemical Products Corporation. Paper entitled Plasticol—A Labor-Saving Device gives four examples of the use of polyvinyl plastisols for production economies and ease of fabrication. Handling characteristics of these liquid dispersions are illustrated by applications as an automotive air filter seal, clay sewer pipe gasket, crown closure bottle seal, and self-sealing automotive trim fastener.

44. Power Saw. The DoAll Company. 10 pp., ill. Brochure describes the cut-off capacity and operating ease of the model C-24 DoAll Power Saw, which is designed for heavy-duty cut-off work.

45. Materials Handling. Tri-State Engineering Company. 8 pp., ill. Bulletin describes company's complete line of equipment for industry and includes illustrations of the various models of Cargotainers, conveyor guard and pallets produced by the company.

46. Adhesives for Bag Manufacturers. H. B. Fuller Company. Booklet features product descriptions on seam, bottom and band labeling pastes used by bag manufacturers.

Classified Advertisements

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ACCOUNT EXECUTIVE—*Associate required for package design division of industrial design firm. Should be able to contact at top management level. Experienced in supervision of design projects, and liaison between client and staff. Write Schnur-Appel, Short Hills, N. J.*

Index to Advertisers

For Your Calendar

Through June 30. "The Art of the Swiss Poster." Exhibit at Chicago Public Library.

Through July 31. "Contemporary Indian Crafts." Minneapolis. (Smithsonian Institution, traveling exhibit)

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 31. The Art and Technique of Paper Folding. Exhibit at Cooper Union Museum, New York.

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

June 17-27. International Plastics Exhibition, London.

June 21-27. Aspen International Design Conference. "Communications: the Image Speaks." Aspen, Colorado.

June 22-24. Fifth annual creative problem-solving institute. University of Buffalo, Buffalo, New York.

June 22-26. American Institute of Architects' 1959 convention. New Orleans.

June 22 - July 3. "Creative Engineering and Comprehensive Design." Course at Stanford University, Palo Alto, California.

June 24-26. Symposium of the nuclear industry division of the Instrument Society of America. Idaho Falls, Idaho.

June 30 - August 10. Soviet Union Exposition. New York Coliseum.

June 30. "Plastics for the Automotive Industry." Regional technical conference of the Society of Plastics Engineers. Sheraton-Cadillac Hotel, Detroit.

July 3 - 18. International Trade Fair, Chicago. Navy Pier Exhibition Hall.

July 6 - 10. Second annual institute in technical and industrial communications. Colorado State University, Fort Collins, Colorado.

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

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

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.

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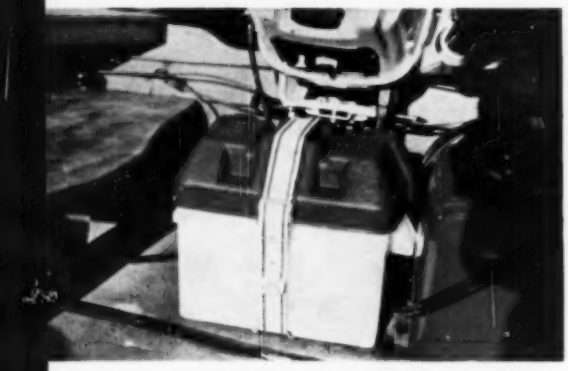

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