INDUSTRIAL DESIGN

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VOLUME 2 : NUMBER 4

INDUSTRIAL DESIGN

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

CONTENTS FOR AUGUST, 1955

Frontispiece: *Magnetic cores, each one slightly larger than the head of a pin, are woven into copper-wired screens like this one to form the memory of IBM's forthcoming 705 electronic data processing machine; it is being designed by Sundberg-Ferar, who also did the recently introduced 702 (pp. 38-39). In the 705's main memory section, there will be 35 core planes, each containing 4,000 of the tiny ferrite cells.*

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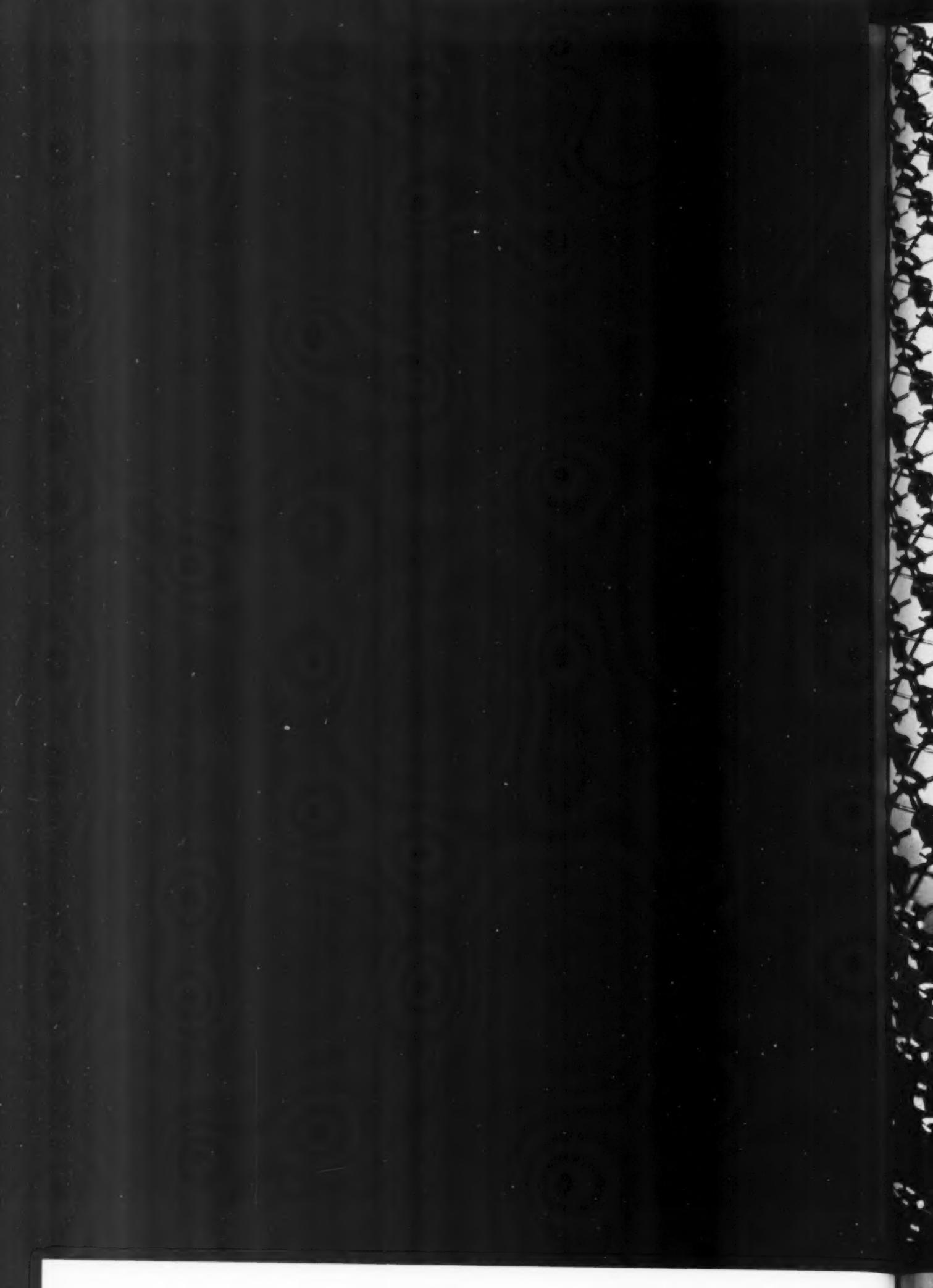
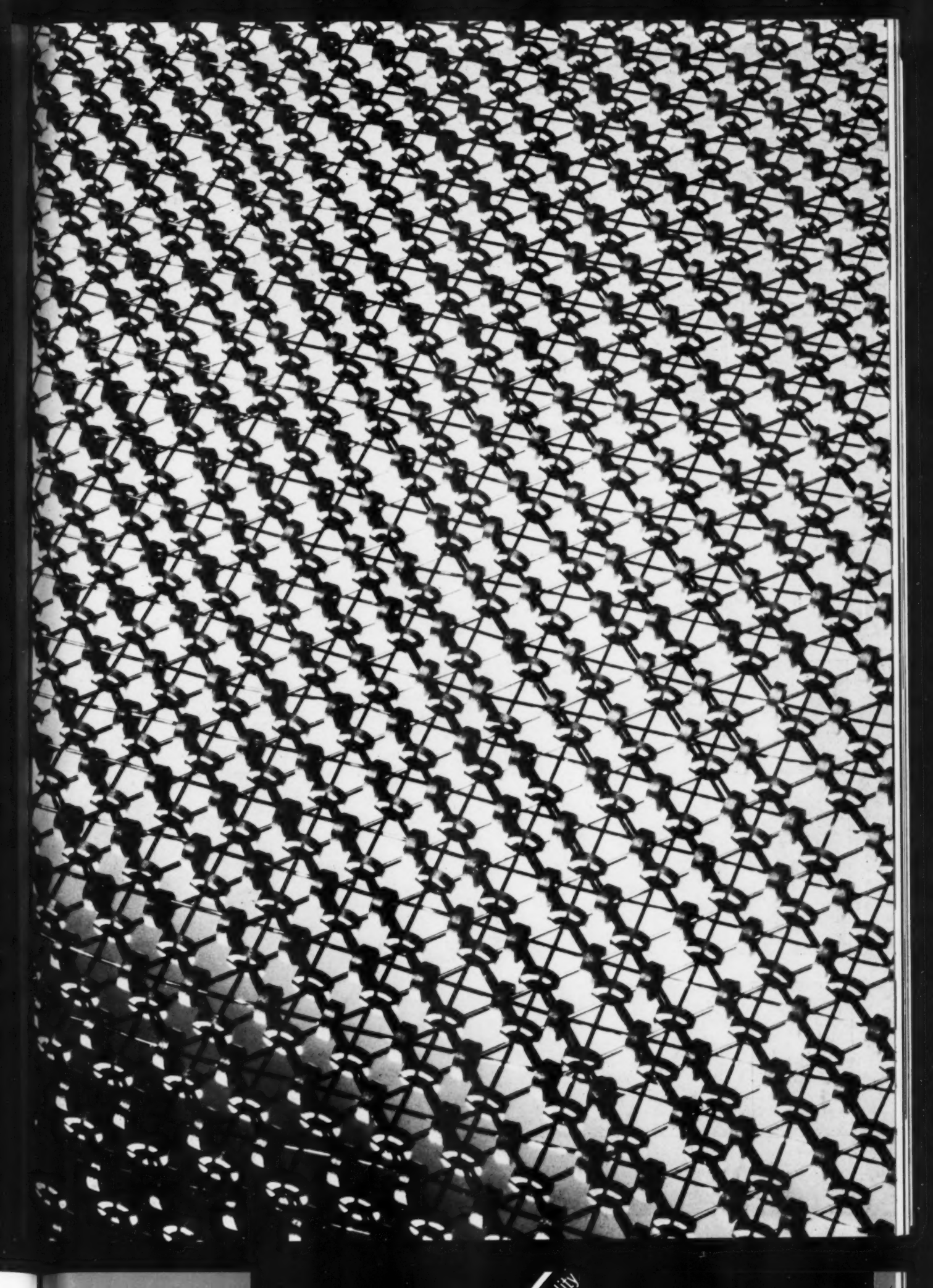




in this issue...

Gutheim

Bachner

Rand

Deaton

McCobb

Bennett

Butler

Noyes

Sundberg

Ferar

Kress

Frederick Gutheim reports on the Swedish fair, H55, on page 77, as one who has directed exhibitions for the State Department and the U. S. Information Agency and major conferences on planning and architecture. With his own offices in Washington as Editorial and Planning Consultant, Mr. Gutheim is also Contributing Editor of *Progressive Architecture*, author of *The Potomac* and *Housing as Environment*.

Edward F. Bachner, Jr., who prepared the vacuum-forming article that begins on page 78, was born and bred to his subject. His father is one of six brothers who founded Chicago Molded Products Corporation in 1919 and is now chairman of the board. Mr. Bachner is head of the Campco Division and serves as vice-president in the parent company.

Paul Rand's "ideas about ideas" on page 64, ID's second in a series of layouts by outstanding graphic designers, are supported by a remarkably successful career from the age of 23, when he was art director of *Esquire*. Voted one of the 10 best art directors in a 1954 A.D. Club poll, Mr. Rand's advertising art has been published internationally. One of his books is *Thoughts on Design* (Wittenborn and Co., N. Y.).

Charles U. Deaton stands by his open bank-vault door (pages 88-93), but banks are not his only habitat. A self-taught industrial designer, he has worked in Chicago, New York and St. Louis, designing appliances, office furniture, desk accessories, as well as bank buildings in 34 states—at the moment one in Denver, Colorado, where he has a new office.

Paul McCobb, who designed Bell & Howell's hi-fi console (pages 50-55) made an early reputation as a furniture designer, opening his own showroom, Directional, in 1950, and has since branched out in other areas as well. Recent accounts include cabinets for Singer and TV sets.

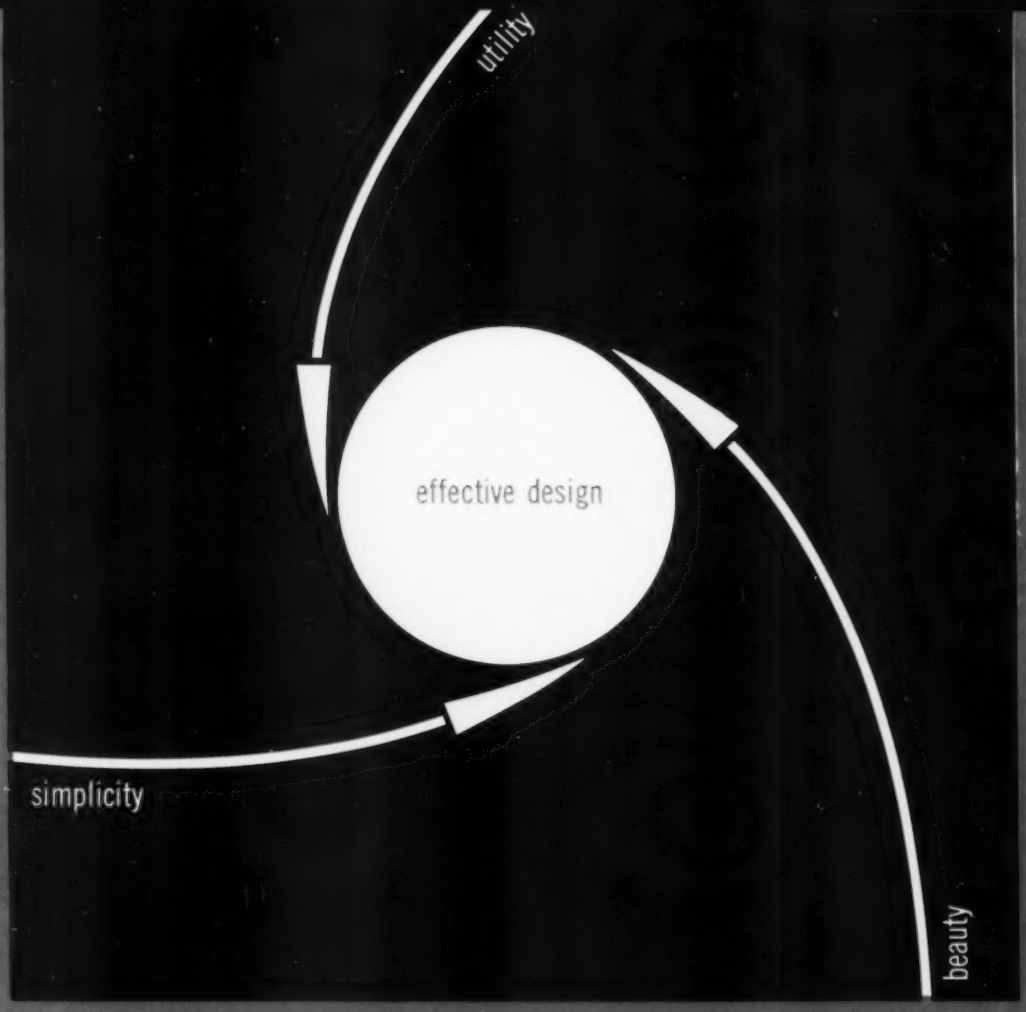
Frank P. Bennett, vice-president of engineering of the TDC Division of Bell & Howell Company, started making his own hi-fi sets in 1942. He is a member of the Society of Photographic Engineers and The Instrument Society.

Charles W. Butler, before he did the Viscount interiors (pages 32-33), worked on many transportation problems as a member of Raymond Loewy's staff from 1944-49. Then he started his own office, where he has been designing cabins for executive planes as well as cockpits in military planes and, recently, power tools for Toro Manufacturing Company.

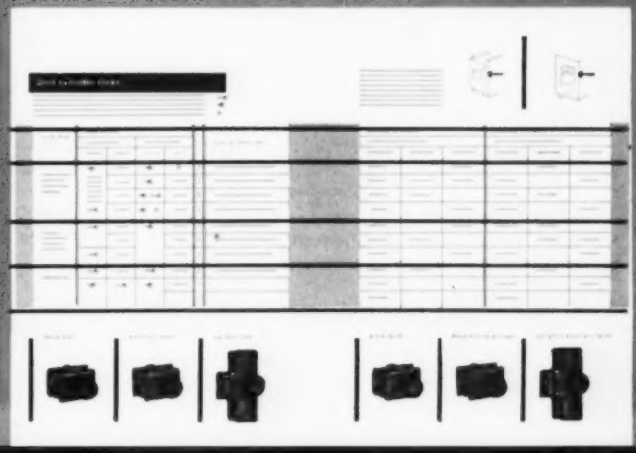
Eliot F. Noyes, besides being IBM's consultant and a busy industrial designer (pages 36-41), is a practicing architect. After taking a M. Arch. at Harvard in 1938, he directed the industrial design department at the Museum of Modern Art for three years and has taught architectural design at Yale.

Carl Sundberg joined **Montgomery Ferar** in 1934 to form one of the earliest industrial design offices, after both had left the General Motors Styling Section. Two years ago, with a staff of 36 designers, they moved into their own building in Royal Oak, 10 miles from Detroit, and last year opened a branch office in New York, where the consultant designing for IBM takes place.

George H. Kress, IBM Industrial Design Director, has overseen the design staff and called in consultants for the past 12 years, prior to which he was the company's designer of displays and exhibits.



Product information should be designed, subject to the usual standards—utility, simplicity, beauty. The catalog design shown below, though but one visual unit of many in a manufacturer's catalog, illustrates the application of design principles to product information. For fifty years, Sweet's has pioneered in the field of product information that best suits the needs of buyers and sellers in industry. Sweet's Product Design File is a system which gets product information into buyers' offices in convenient bound collections of catalogs. Sweet's Catalog Service– designers, producers and distributors of manufacturers' catalogs, 119 West 40 Street, New York. Offices in principal cities. [Division of F.W.Dodge Corporation]



LETTERS

Education: "A recurrent theme whenever designers get together"

Sirs:
You make me feel like a tradition-directed citizen in an other-directed society. Frankly, I have that "left-out" feeling.

It was a blow to find that we were about the only university with an industrial design program to be left out. Then there was the misleading statement: "We don't cover the institutions which offer only highly specialized training such as Michigan State's Bachelor of Packaging Technology." To bring you up to date, the Department of Art at Michigan State has been offering an industrial design course for about six years. The newly formed packaging program is in the Dept. of Forest Products, School of Agriculture, and has no direct connection with us.

To add "grrr" to "grr," I find that on page 10, the item concerning the executive committee of the Detroit Chapter of the I.D.I. did not include the educator members: Professor Lahti of the University of Michigan and myself.

Of course this personal trivia doesn't take away from the generally excellent design education review. We are trying to strike a reasonable balance between what might be called the theory schools and the practical schools. With a broad liberal arts curriculum and a limited number of design students, I try to tailor the courses to what I believe to be the students' needs.

Robert S. Alexander
Michigan State College
East Lansing, Michigan

Sirs:
Needless to say we were delighted to see your analysis of design programs in colleges throughout the country. We were deeply disturbed, however, at the inaccuracy in your references in the chart to our institution. We have never given degrees in conjunction with academic credits from other institutions.

We have been accredited for years to give both a Bachelor and a Masters. Instead of requiring, according to the New York State standard, 38 hours of academic study, we have always required 46.

Robert M. Church
California College of Arts and Crafts
Oakland 18, California

Sirs:
To clarify the source of the error referred to by Mr. Alexander and Mr. Church, I did not receive a bulletin from the California College of Arts and Crafts and therefore could not include the actual data of their curriculum in my survey. I merely listed the school and the degree offered. This data comes from the S.I.D. Bulletin No. 1, 1953 edition, and is, as far as I know, supplied by each individual school.

The survey did not include Michigan State because again I followed the S.I.D. bulletin, in which Michigan State was not listed. When we began the survey, we planned to obtain a complete list of all schools teaching industrial design. This idea was abandoned for lack of time, but our aim was mainly to demonstrate the general pattern of design education today, and for this purpose I felt that a representative list was sufficient.

I would like to commend you on the story of design education. It is a wonderful service for the profession. . . .

I have only one misgiving about a remark in regard to the design approach at Georgia Tech. I do not advocate abandoning the individual and intuitive approach, if such were possible. What I do oppose is the "slip-shod" methods which often hide under its guise—an approach which is always loaded with physical and/or mental inertia. Methodology in design is not and never will be the cure-all; its purpose is to initiate and facilitate the intuitive faculty within the individual. . . .

Hin Bredendieck
Associate Professor
Georgia Institute of Technology
Atlanta, Georgia

Sirs:
. . . Concerning the chart on pp. 37 and 38, please take note of the title page layout attached which gives me co-authorship with Professor Bredendieck. The charts and the curriculum were, in fact, my work under his direction, and the analysis and typography were his work. He, as director of this laborious project, has generously given me associate authorship.

William C. MacPherson
Richard McCarthy Associates
Atlanta, Georgia

Sirs:
The article on education represents a major contribution to the profession in pointing up divergent doctrines. We need technicians, of course, just as we need model makers and other craftsmen. But for future growth of the individual as well as the profession, the standard should be the "whole man."

I would suggest to a student:
A. Select an academic school with a rounded program in humanities. You will avoid the trade school approach, a 9-to-5 mechanic working with an air gun.
B. Select an academic school with professional educators working as a faculty team. You will avoid exposure to the "strong man" — a superhighway going from point to point and missing everything in between.
C. Select an academic school with engineering overtones. You will avoid the arts and crafts approach—an artist working in a technological vacuum, completely non-environmental.

Harold Lewis Malt
Malt & Ness, Industrial Consultants
Buffalo, N. Y.

Sirs:
Congratulations upon your recent article. Education is a vital issue in any profession and certainly deserves a prominent position among the many aspects that constitute ID. I anticipate the continuation of your credible survey of the various education systems for industrial designers and discussion of the principles that surround them.

David G. Moore
Industrial Designer
Johnson City, N. Y.

Sirs:
"Education of a Designer" was an excellent report of ID education in the United States. Your perceptive survey and evaluation of a particularly difficult subject is a significant contribution to design schools, the profession and industry.

I hope your article will serve as an impetus toward their unselfish interaction.

Nicholas T. Argiro
Industrial Designer
New York, N. Y.

"The Sky's The Limit"

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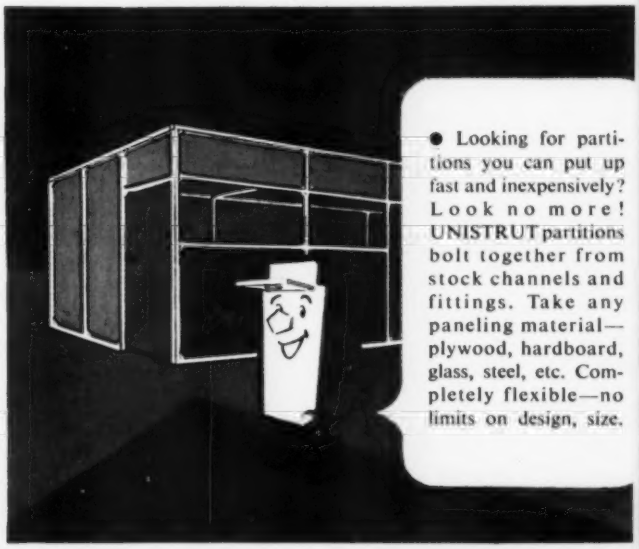
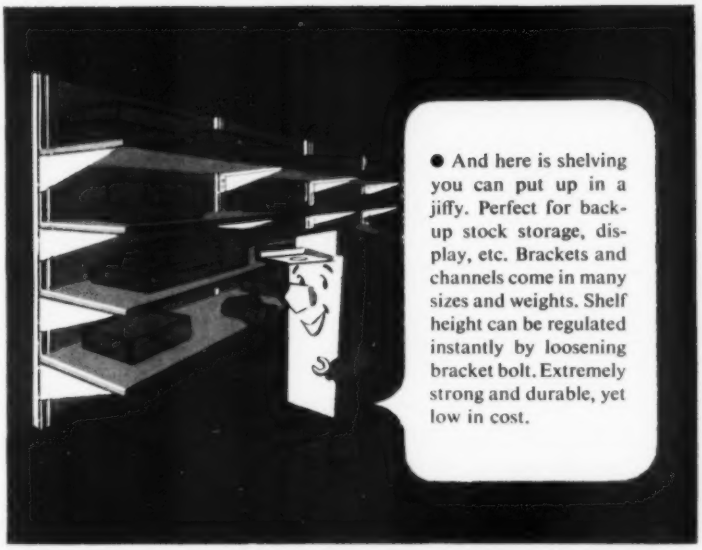
Mr. Strut shows how UNISTRUT® framing and imagination build almost anything

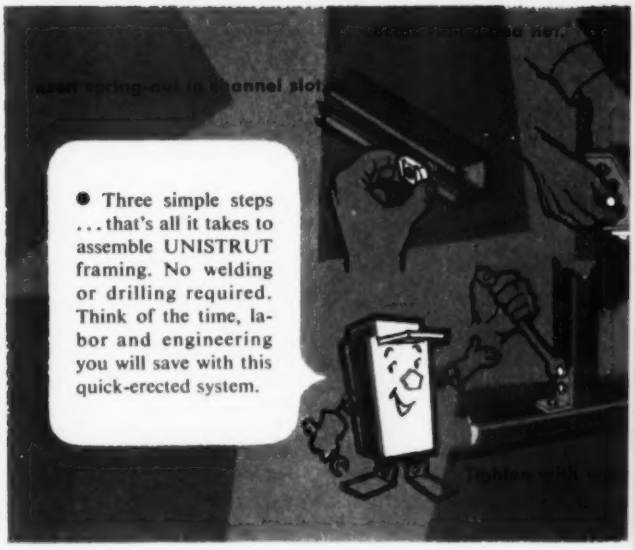
● Racks for every purpose!!! With UNISTRUT framing you let storage needs and space determine rack dimensions. Steel channels and fittings bolt together quickly. Racks may be changed or altered any time without material loss. Sturdy channels support tons, yet are not heavy or bulky.



● Looking for partitions you can put up fast and inexpensively? Look no more! UNISTRUT partitions bolt together from stock channels and fittings. Take any paneling material—plywood, hardboard, glass, steel, etc. Completely flexible—no limits on design, size.



● And here is shelving you can put up in a jiffy. Perfect for back-up stock storage, display, etc. Brackets and channels come in many sizes and weights. Shelf height can be regulated instantly by loosening bracket bolt. Extremely strong and durable, yet low in cost.



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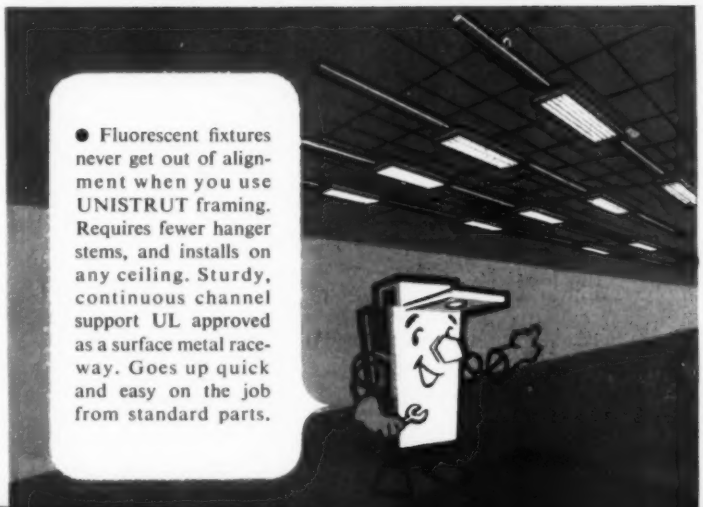

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Other patents pending

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A theme that can continue on through the night

Sirs:
. . . I am afraid the article on design education is little more than a superficial skimming. . . . What is needed are exploratory side trips to the educational institutions involved in the teaching of industrial design, getting to the grass roots, the people actually involved in the instruction . . . the pros and cons of educating a designer are born in intimacy with the curricula and interpretation of these curricula, on the playing field and not in the grandstand.

Such an investigation should be all inclusive; many small schools without degree courses are doing a creditable job in training designers—some with standards high enough to shame the accredited schools. All these things need to be brought out if you desire a complete picture of "the education of a designer." And if the quality of design education is to endure the swing from "how well" to "how cheaply" can we educate, an objective analysis of the facts is necessary that we may all benefit from the successes and failures of others.

Broaden your "education of the designer" direction, repeat the discussion, and may it then bear palatable fruit.
Leland C. Smith
Professor in charge
Industrial Design
Alabama Polytechnic Institute
Auburn, Alabama

Sirs:
Your articles on education show a real interest and a thorough look into the picture. However, it is unfortunate that nowhere in your articles are found the words "merchandising" and "human relations." Industrial design is so completely related to and governed by merchandising factors that anyone seriously training for a career in this profession should have an awareness of this consideration.

It is no secret that the finest esthetic solution to any product may not be readily accepted by those responsible for its manufacture. Therefore, it follows that no matter how handsome the solution, it must still be "sold" to management and its finer points controlled through the stages of mock-up, engineering and production.

It is apparent that people with routine design abilities can get and handle top jobs on the strength of organizational ability, marketing background, salesmanship, etc. If these can be dominant controlling factors in the design profession, it would be well to instill them into those going to all the trouble of obtaining fine esthetic backgrounds.
Charles T. Waltman
Waltman Associates
Chicago, Illinois

Sirs:
. . . You might have given greater emphasis to the major contributions made in education by practicing industrial designers. For example, there are some 10 or 15 members of the S. I. D. alone who actively engage in teaching either full or part time.

Hal Van Doren, who wrote the first practical book on Industrial Design, was not mentioned in your article . . . you overlook one of the longest teaching records in the professional field, compiled by Viktor Schreckengost, Director of the Design Department at the Cleveland Art Institute. Peter Muller-Munk instituted the first bona fide school of Industrial Design in the United States at Carnegie Tech and eventually brought that school from zero to one of the major educational design forces, particularly during the early years of the profession in this country. . . . Frank Del Giudice working out of the Teague office for the Boeing Aircraft Company has developed and instituted a course of industrial design at Washington State University in Seattle. . . . At Georgia Tech, aside from the fine work that Professor Bredendieck is doing, the school, through Director Bush-Brown, instituted an industrial design advisory committee to help guide the new program. This committee consists of Marshall Lane, Director of Design for the Co-Ca-Cola Company, Egbert Jacobson, Director of Design for the Container Corp. and, quite immodestly, myself as chairman.

I am very interested in the education of industrial designers, and since you are the most important publishing force in the field in the United States, I know that you, too, are equally interested in the future of the profession. That future begins at the school level and is upheld and kept going by the professional competence and success of those practitioners on a day-to-day basis in the field of industry.

Raymond Spilman
New York, N. Y.

Limitations of space forced us to confine our coverage to the directors of schools and departments or equivalent policy-makers; we regret we could not cite each professional who is contributing to design education.—Ed.

Sirs:
I welcomed the article on industrial design in the schools. The subject is a recurrent theme whenever designers get together. . . .

It is conceptual ability that qualifies industrial designers to discover and transmute marketable utilities into product form. The nature of such products may not be primarily dependent upon appearance and may require some imaginative engineering application which the designer is not qualified to perform. But the essential contribution is that of conceptualization.

If this view of a designer's function should become the prevailing one, it should be a relatively easier task to delineate what sort of education is needed by way of preparation. Primary emphasis should be upon fostering channeled imagination. Obviously you can't teach imagination. But you can emphasize its importance, evolve classroom problems that demand it and verbalize something of its nature. The foundation year at Pratt and elsewhere is, as much as anything, an exercise in imagination. This training for imagination should come early. Because it demands a certain attitude or "set" of the student, it is best administered to the young before other rigid attitudes are cultivated.

For the rest of the curriculum, I would include some familiarity with the humanities, engineering principles and techniques, and somewhat heavier dosages of marketing, which is again somewhat of an attitude or "feel"—and a thorough grounding in the designer's tools.

I would exclude those subjects intended as a "discipline" only. Calculus, for example, is rarely used by engineers, let alone designers. The teaching of subjects to cultivate mental discipline—without other utility—has become somewhat outmoded in the field of general education and the same reasoning should apply to education for design. In an already crowded curricula why choose calculus in preference to Latin or Greek?
Seymour Silverman
GE Electronics Division
Syracuse, N. Y.

Sirs:
TWO "I.D. OLOGIES" AT BAY

Out, physics! Out, math! Out, science!
per se!
I.D. is all art and no science, they say;
Superficial design from now on will be
taught,
With function the tag-along-after-thought.
The aim will be obscene ostentation,
(The sophists like chrome for decoration);
Designs pretentious and orgiastic,
Lumped out of any unanalyzed plastic.
Its melting point? So what! Why fret?
It's the prettiest plastic that they could
get;
From sine and cosine and coefficients
They'll sink to reliance on vague omniscience.
Comprehensive designers can hit the road;
They're chucking modulus for mode.

Natalie Hayes
Syracuse, N. Y.

NEWS

I.D.I. award winners are televised in Chicago with symbols of the past behind them. Left to right: Richard Montmeat; Balmer, Denny and Hertzler; and Randall D. Faurot.

I.D.I. hands out annual awards

Winners names are announced at a festive luncheon in Chicago

On June 23 President Robert L. Gruen presented the Industrial Designers' Institute's fifth annual awards, citing three products for their "noteworthy and fresh approach to design and function, combined with a practical use of appropriate materials." This year Paul MacAlister and Walter C. Granville, co-chairmen of the award committee that included national officers and chapter chairmen, honored Harley Earl Inc. designers, James G. Balmer, Carl B. Denny and Fred W. Hertzler (Sweepmaster); Randall D. Faurot of South Bend, Indiana (Lectracar Duo); and Richard Montmeat, staff designer of General Electric in Syracuse (#660 Convertible).

Guest speaker Charles E. Whitney, publisher of INDUSTRIAL DESIGN and *Interiors*, stressed the awards' significance: the recognition of high achievement by fellow members of the profession. "The pioneering has just begun," he said. "We still have a great deal to do to educate industry to the function of designers and the contribution they can make."

Two weeks later the award winners, with old-fashioned props and their own new products, were seen nationally televised on the "Home Show."

Designs go on at Syracuse

ID Alumni explain their view of University curriculum controversy

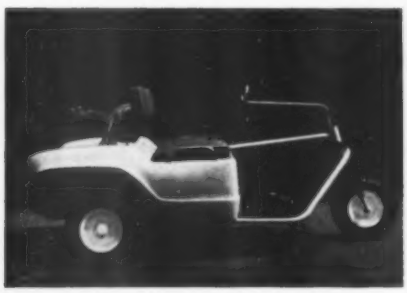
To bring the conflict at Syracuse up to date, (see ID's June issue), the Syracuse Industrial Design Alumni Association have released a statement about their feelings concerning the resignation of Professor Richard Koontz and his staff:

"When we heard of Dr. Lawrence Schmeckebier's plan, as the new head of the School of Art, to liberalize the comprehensive and technical Industrial Design program, we petitioned Chancellor William P. Tolley and Vice Chancellor Finla G. Crawford to make a careful study of the curriculum before supporting any changes. We told them that it had our unanimous approval, not only because of loyalty, but because of objective professional appraisals of the program.

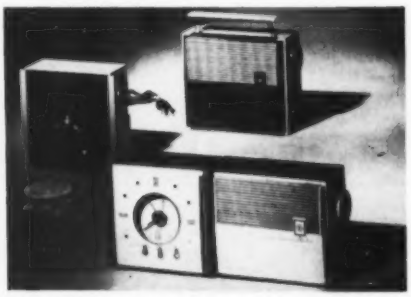
"Our representatives endeavored to establish Dr. Crawford's and Dr. Schmeckebier's attitude in the controversy. They were evasive and unable to give us a clear explanation of why a drastic change was planned in design; we were given no reason to believe that their primary concern was the student's professional welfare.

"Until the appointment of Dr. Schmeckebier, we had maintained a cooperative association with Syracuse. This year Dr. Schmeckebier did not deem it advisable to allow funds for a design conference at Syracuse. We voted to finance the conference ourselves; headed by Buckminster Fuller, it was a rewarding success. We regret that Dr. Schmeckebier's attitude has discouraged our participation in any future design conference at Syracuse."

Meanwhile Dr. Schmeckebier has been preparing a new faculty, as yet is not ready to make an official announcement of names. Unofficial sources say that Arthur J. Poulos is to head industrial design.



Leetracar Duo is manufactured by Versal, Inc., weighs only 600 lbs., runs on batteries.



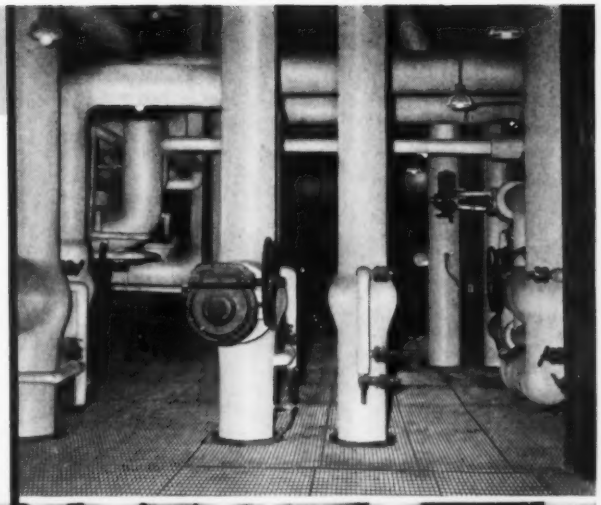
GE's #660 Convertible may be joined as a table model or used as two separate units.

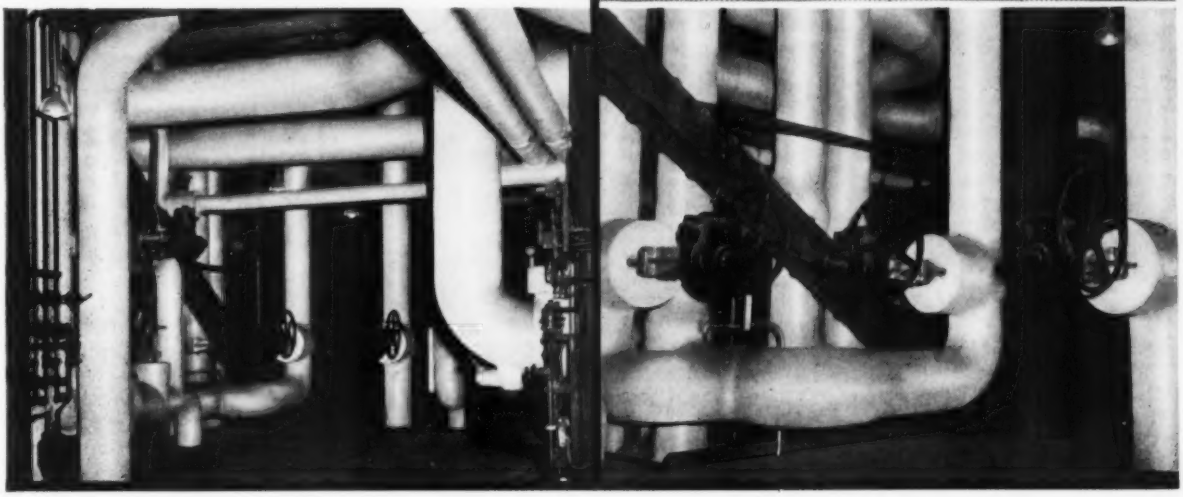
Bissell's new "Sweepmaster" is smaller and more compact, has a self-cleaning brush.

Potomac Electric Power Co.
Potomac River Plant—Alexandria, Va.

Stone & Webster Engineering Corporation
Engineers & Constructors

Standard Insulation Co. of Maryland
Baltimore, Md.—Insulation Contractors





Holding the insulation securely and lastingly in place

In the Potomac River Plant of the Potomac Electric Power Co., at Alexandria, Virginia, is one of the newest installations of Arabol Lagging Adhesive. This same adhesive was also used in the atomic-powered USS Nautilus.

Arabol Lagging Adhesive was developed during World War II to meet certain specific needs in the war effort. When the war was over, Arabol Lagging Adhesive "came ashore" – almost under its own power. Engineers, architects and insulation men in all fields of construction and maintenance recognized its value. Today, it is the accepted basic material for cementing lagging cloths of every description over insulation materials–on pipes and ducts carrying ice water, steam, cold air, hot water, gases and liquids of many types.

The formula for Arabol Lagging Adhesive is one of 10,000 developed in the five Arabol Laboratories – over the past 70 years.

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Somewhere in your business you use adhesives – in the making, labeling, packaging or shipping of your product. Somewhere near your business there is an Arabol plant or warehouse ready to serve you. There are three yardsticks by which to measure Arabol service.

The first is based upon our 70 years of pioneering in the making of adhesives – to meet the needs of a hundred industries–for a thousand end uses . . . the second is that you may call upon any of our five laboratories to help you find the one adhesives formula that best meets each of your adhesive requirements . . . the third is that you are served by a nationwide network of twelve Arabol plants and warehouses. In the event of special conditions arising in any one area, you are served from another plant or warehouse with adhesives to the same exact specifications.

We invite the opportunity to submit samples for you to test in your own plant–under your particular working conditions–for your specific requirements, whatever their nature. That is the one kind of testing that assures you of satisfactory results. Your inquiry to Department 30 will bring a prompt response on any adhesives problem. For illustrated specifications on Arabol Lagging Adhesive, kindly specify Book #12.

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★ ADHESIVES ? ARABOL ! ★

70

YEARS OF PIONEERING IN THE MAKING OF ADHESIVES

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For speedy and mobile aircraft spotting, Luria-Cournand Inc. has designed a prefabricated two-unit weatherproof radar station, which can be transported by plane or by three trucks: One unit, 32 feet long, is for radar operations; the smaller, 18 feet, is an auxiliary maintenance shelter. Adaptable in length because of its modular construction, the framework is made up of formed aluminum arches spaced four feet apart, to which are bolted molded fiberglas panels, seven by three-and-a-half feet.

A 14-man crew using ladders and wrenches can put up the shelter, install antennae and radar equipment and have power-generating units connected in about three hours. Designed to be simple and rapid to construct, the metal arches, roof and floor panels are completely interchangeable, as are the four sections in each arch which are joined in the field by pins especially developed for quick fastening. (see top).

Olive drab in color, the shelters are being produced for air bases in the U. S. by Luria-Cournand under contract to General Electric, who manufactures the radar.

Close *Brooks*
Oliver *Olivetti* *Nowland*

I.D.I. plans design symposium

Questions and answers on new dimensions will be exchanged at Silvermine

"Towards New Dimensions" is the theme of the Industrial Designers' Institute second annual symposium, sponsored by the Southern New England chapter. Continuing a series that was successfully inaugurated last year with a gathering on "New Forces in Design," this year's program is scheduled again for Silvermine Guild in Norwalk, Connecticut, on Saturday, October 1. There are facilities for 250 visitors, who will register at 9:30 a.m. for five topics, with exhibitions of light metals supplied by Alcoa and samples of Olivetti machines.

Roger L. Nowland, president of Nowland and Co., Inc., planners for major corporations, will report on "Marketing Research, Its Relation to Industrial Design." The president of the Olivetti Corporation of America, Dino Olivetti, will be introduced by Edward de Robert of the parent company in Italy and will tell "The Olivetti Story." Frederick J. Close, Manager of the Marketing Development Department of Alcoa, will speak on "Lightweight Metals, their Design Potential."

From marketing and design, discussion will extend to the latest developments in technology. Frank J. Oliver, Editor of *Electrical Manufacturing*, will describe a new philosophy of engineering design, "The Engineer-Scientist." Harvey Brooks, professor of Applied Physics at Harvard, will define the possibilities of nuclear power as a source of heat.

Chairman this year is Tucker P. Madawick of Raymond Loewy Associates.

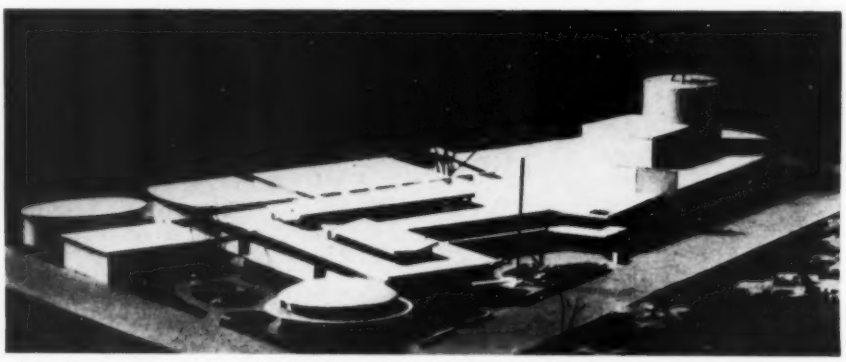
More trade fairs are coming

U. S. to participate in 14 fairs throughout the world during fall and winter

Representing further government work by American designers, more pavilions are going up from Pakistan to Indonesia to display the articles of life in the United States, including closed-circuit television, which will be seen in areas where it has never been before, the Department of Commerce reports. (See pages 72-77.)

One under construction at Karachi, Pakistan, designed by John Vassos, is small compared to his New Delhi pavilion, yet it covers 12,000 square feet and will show some of the same products, from knitting machines to the cabin of a Stratocruiser.

Opening August 18, the Indonesian Industries Fair will take place in Djakarta. A New York architect, Abel Sorenson, designed a pavilion about the same size as Karachi's; 26 American companies have contributed or loaned materials for exhibitions which will stress transportation and communication. Reflecting a great impetus among some of the so-called backward countries toward technology, five of the fall fairs are in the Far East.



American pavilion by John Vassos for the India Industrial Fair, New Delhi, covers 100,000 sq. ft. Karl Fink, Package Designers Council, did emblem for all fairs (left).

CORNING GLASS BULLETIN

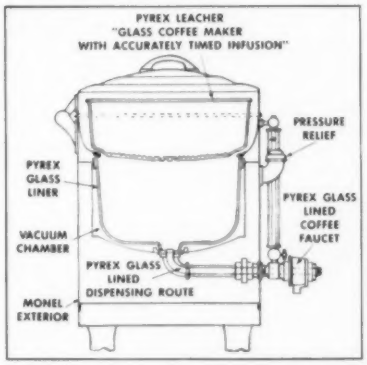
FOR PEOPLE WHO MAKE THINGS

"Urning" power

Coffee time these days is almost anytime.

And behind many a steaming cup there lies *glass*—a PYREX brand glass.

Take those big urns that gleam and glisten at your favorite snack shop. Outside, shining monel metal. But, on the inside, where the piping hot coffee is in the making, you'll find glass. As in this cross section of a coffee maker.



Glass liners of this type are made from that unusually versatile glass called PYREX brand No. 7740. And, for good reason.

This is a *balanced* glass. It has remarkable ability to take continuous heat, and still not crack when temperatures drop. It's mechanically strong, too, stands up under lots of physical abuse.

The clincher—glass neither *adds* to nor *detracts* from the taste. This glass will *not* contaminate by taking from or adding to what you make in it (or pipe through it)—coffee, milk, tomato juice, or something with even more zing, like fermented juice from plump grapes.

And any PYREX brand glass that handles foods and such is quickly and effectively cleaned with a minimum of effort.

Which suggests that the "urning" power of glass in some form might well be working for you.

As a start, take a look at "Properties of Selected Commercial Glasses"—Bulletin B-83; and/or Bulletin IZ-1, "Glass—its increasing importance in product design." Free.

Getting the mostest with the leastest

Taking to heart, with minor modifications, the advice about getting there "fustest with the mostest," we present Pattern No. 70 Low-Brightness Lens Panels.

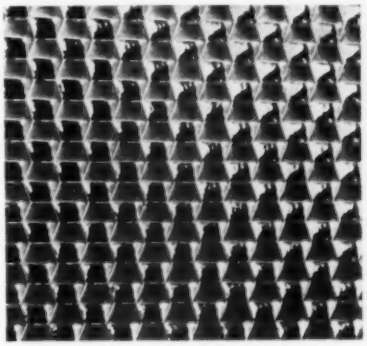
Said panels get there "mostest with the leastest"—*most* useful light, *least* glare.

Key to this light that's bright but not glaring is "a uniform configuration of six-sided glass pyramids"—otherwise known as prisms.

Prisms in light control are not new. But mass-produced, large panels, with prisms *built-in* represent quite an achievement in technology.

This we call to your attention not because you may have a problem of adequate lighting. We cite it, rather, as another indication of what lies behind the motto: "Corning means research in Glass."

Research activities have led us up a number of unusual glass paths. Case in point—glass that laughs at heat, that stands up to high temperatures (1200°C.) and chemical attack in the manner usually expected only of fused silica.



Other cases in point—glass that's optically perfect but capable of withstanding wind moving in closed wind tunnels at twice the speed of sound; glass that directs infrared and ultraviolet rays at will; glass that handles metal-eating acids with ease.

Among our 50,000-odd formulas for glass, there may be *one* with just the right balance of optical, thermal, chemical, mechanical and electrical properties, to solve one of your materials problems.

"Glass and You," a beautiful and informative booklet (if we do say so), will bring you up to date on how hundreds of our friends and customers are getting the "mostest" profits with the "leastest" trouble by making use of special glass researched into being by Corning. Write us for a copy—or check the coupon.

Reflections on some interesting bores

If the decision for precision falls to your lot, these bores may interest you.

These particular bores are the holes in thermometer tubing, a product we turn out by the mile. Practically invisible to the naked eye, these fine holes run to about ¼th the diameter of a human hair.

Yet, they are held to such exceptionally fine inside tolerances as ±.0003".

As you might imagine, mercury pushed into such a small space is hard to see. So, around the bore we build some ingenious white reflectors of white glass. Then, when we form the tubing, we build a lens into it.

Thus, with the help of a white background and magnifying lens, those who must can readily and accurately tell how *hot* hot is and *cold* cold is.

The picture shows a cross section of one type of thermometer tubing. The largest piece in the picture, some 80 times normal size, shows you something of the intricate internal construction of thermometer tubing.

Without modesty we pinpoint this precision in glass to show you what can be done. Tubing, thermometer or just plain tubing, comes in many sizes and types. Write if you'd like to know more about it.

Corning means research in Glass

CORNING GLASS WORKS

32-8 Crystal Street, Corning, N. Y.

Please send me: Bulletin B-83 ☐ Bulletin IZ-1 ☐ "Glass and You" ☐

Name_____ Title_____

Company_____

Address_____

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Army turboprops are in the news

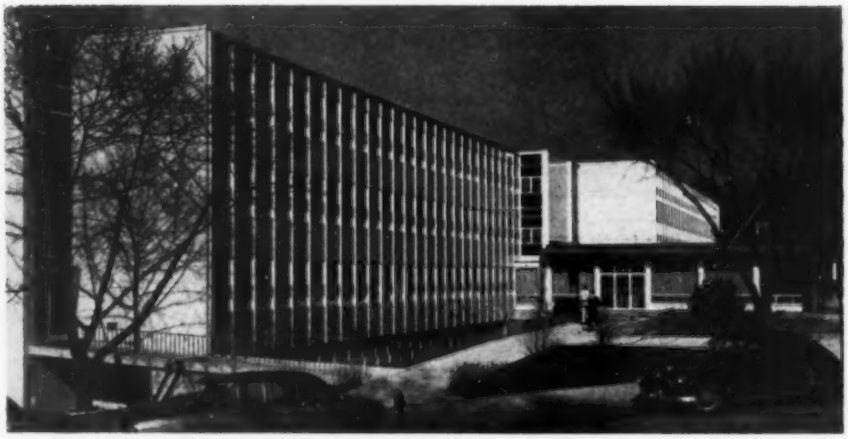
Latest turbine refinements strive for greater versatility and power

Winner of a design competition among 12 aircraft companies, Avco's (Lycoming Division) XT-53 turboprop engine has been selected to power the Army's new utility helicopter, the Bell XH-40.

The XT-53, designed by Dr. Anselm Franz, who developed the world's first mass-produced jet engine for Germany during World War II, incorporates a principle which is of great significance for the future development of propeller turbines. In a turboprop, as explained on page 30, jet gases are utilized by a turbine to drive a propeller—in the helicopter, an overhead rotor. Unlike the Dart engine and any previous turboprop engine in this country, in which the same turbines that drive the propeller also power the compressors, Dr. Franz has designed an 825 h.p. "free turbine engine"; the turbine and the shaft that turn the propeller operate independently of the turbine and shaft that drive the compressors. This provides great versatility for the helicopter and saves fuel; the new engine may also be used for fixed-wing aircraft.

That turboprop power may be augmented by the addition of an afterburner—a device for injecting fuel into the hot exhaust gases to create tremendous bursts of power—is revealed by the successful test flight of the new Republic XF 84-H, an Air Force attack plane. The swept-wing single-engine plane uses the XT-40 Allison engine, has a triangular fin just behind the cockpit to neutralize the powerful twist of the propeller rotation, and a bizarre "flying tail" on top of the rudder for quick maneuverability.

Boeing may be ahead in the race for the first U. S. jet passenger plane. The Air Force has just granted permission for their jet transport, the KC-135, to be produced commercially as the Boeing 707.



Frosted aluminum wall panels used in new dormitory

Donner Hall at Carnegie Institute of Technology, Pittsburgh, incorporates Alcoa's aluminum panelling and finishing in details that may point the way towards more color in architecture. Designed by Mitchell and Ritchey, the face of each sheet panel has a chemically etched frost-white surface which contrasts with the Alumilite finish on the mullions, cover caps and window walls. End walls and entrance trim are in green ceramic tile. The design potential of aluminum finishes will be investigated in ID's October issue.

World Plastics Fair announced

Los Angeles Exposition to feature the work of industrial designers in plastics

This year's World Plastics Fair and Trade Exposition, October 5-9, will be more comprehensive and diversified than ever before, says Philip M. Kent, managing director. The catalogue is impressive: demonstrations of different plastics from raw materials, resins and fibers; processes and their applications, molding, extruding, vacuum forming, etc.; with exhibits of plastic products in 16 categories from Automotive to Optometric.

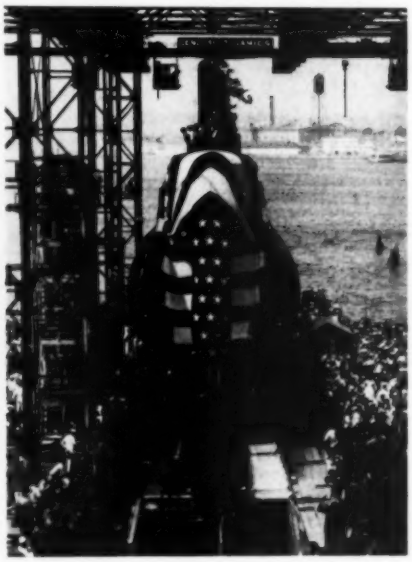
Of special interest is an exhibit of industrial designs in plastics, originals and also changeovers from other materials, sponsored by the Los Angeles Chamber of Commerce Industrial Design Committee, showing the work of 35 West Coast designers. A Modern Home Exhibit will show the latest uses of plastics in building materials, appliances and furnishings.

Two West Coast designers whose work will be shown at the plastics fair: Charles Cruze (left) and James W. Kelso, committee chairman, with Sherry Miller.

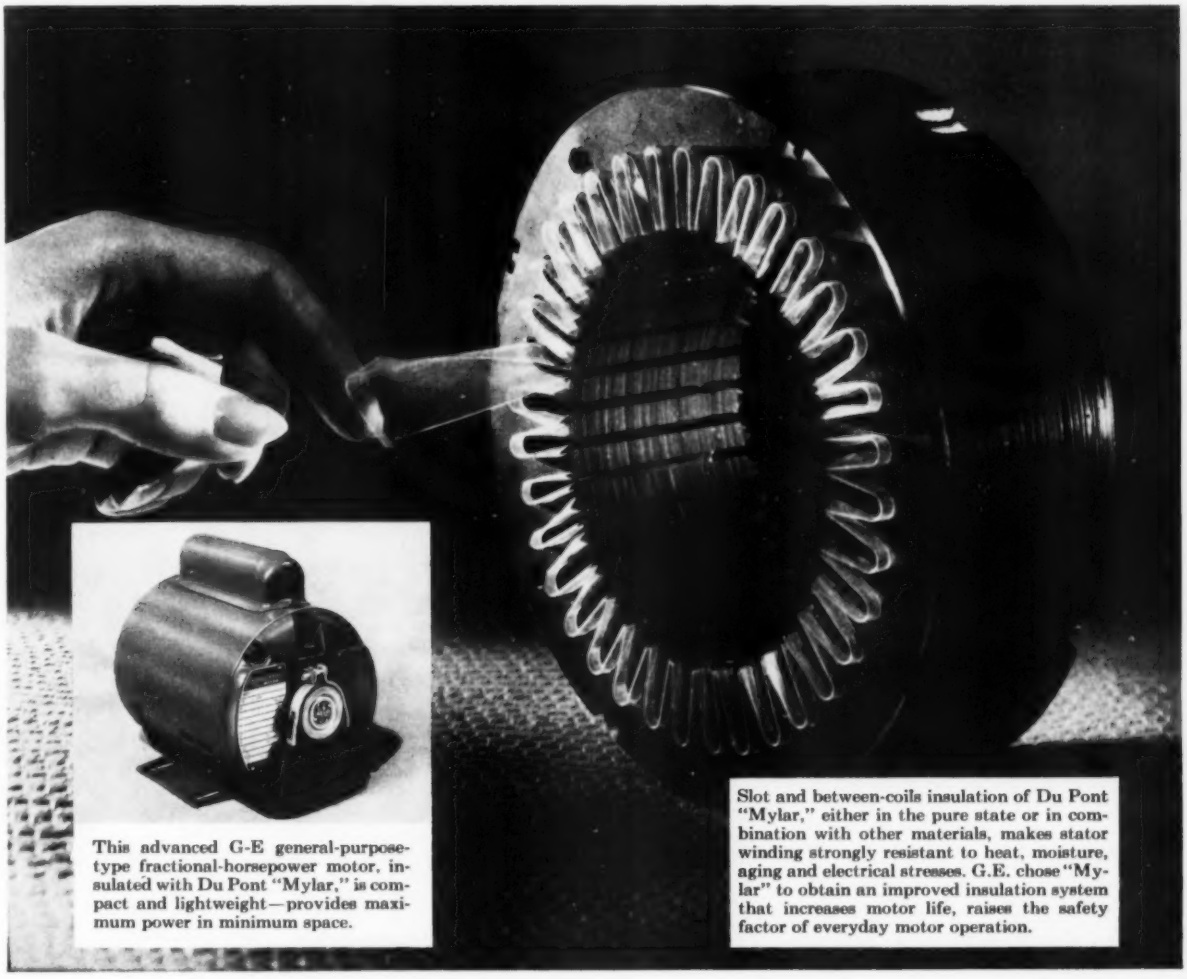
The Seawolf goes into action

25,000 *spectators and high officials attend launching of Navy submarine*

Amid flags and bunting the Seawolf hit the waves on July 21. In the wake of the Nautilus, she is the second nuclear-powered submarine in the U. S. Navy, and Lippincott and Margulies designs are also utilized in the Seawolf's living quarters (ID, August, 1954). On the same day the keel was laid at the shipyard of General Dynamics' Electric Boat Division for a third submarine. The Navy will have eight nuclear-powered submarines according to Secretary of Navy Thomas, and is developing nuclear propulsion for larger ships.



SUPERIOR... Electric Motors Insulated With Du Pont MYLAR*



This advanced G-E general-purpose-type fractional-horsepower motor, insulated with Du Pont "Mylar," is compact and lightweight—provides maximum power in minimum space.

Slot and between-coils insulation of Du Pont "Mylar," either in the pure state or in combination with other materials, makes stator winding strongly resistant to heat, moisture, aging and electrical stresses. G.E. chose "Mylar" to obtain an improved insulation system that increases motor life, raises the safety factor of everyday motor operation.

CHALLENGING to industry: countless opportunities for product improvements with this versatile new film.

Combining high dielectric strength and moisture resistance, Du Pont "Mylar" polyester film helps General Electric obtain a superior insulating system. "Mylar" is now used as slot and between-coils insulation of the G-E advanced motor line—helps make possible a modern, improved type of insulation that increases motor life and insures better motor protection. "Mylar" gives these motors maximum protection against heat, moisture and deteriorants.

These G-E motors are an outstanding example of the way industry is putting versatile "Mylar" to profitable use. "Mylar" is the strongest of all plastic films—has an unusual combination of physical, electrical, chemical, and thermal properties never before available in a plastic film. In a remarkable diversity of fields, Du Pont "Mylar" is making possible better products, lower costs.

It may take only a little creative research to show *you* where you can use Du Pont "Mylar" to develop or improve a product. Mail coupon for free copy of a booklet that gives you the details on this valuable film.

*"Mylar" is the registered Du Pont trade-mark for its brand of polyester film.

DU PONT **MYLAR**® POLYESTER FILM

DU PONT

Better Things for Better Living...*through Chemistry*

E. I. du Pont de Nemours & Co. (Inc.)
Film Department, Room 21, Nemours Bldg.
Wilmington 98, Del.

Please send me sample and further information on "Mylar" polyester film.

Name_____

Firm_____

Street Address_____

City_____ State_____

one of the most significant stories

Design in

coming in the October issue of

ever published about the influence of design on industry

This Major Report Will Put a Magnifying Glass On DETROIT

— one of the country's most active design cities

"Design in Detroit" will give you the behind-the-scenes story of a major manufacturing center and what it is doing to hold its markets. It will be a 50-page illustrated report on the influence of design on Detroit as an industrial center and as a city. It will show how Detroit industries use their designers—probably more than in any other U. S. city—to sell all types of consumer and industrial products.

Detroit

Here is a broad outline of what will be covered:

Design as a sales medium
How it is affecting the competitive position of the automotive companies

The importance of design to related industries
How design affects the selection of components and materials, and influences the production of suppliers

How the design departments work
The largest design departments in the country have developed special working methods to solve their problems

The men behind design
Who makes design policy in billion-dollar industries?

Exclusive: Case studies of two 1956 models
The story behind next year's products reflects new directions in Detroit design and company policy.

The October issue of INDUSTRIAL DESIGN is required reading for designers, executives and consultants in every industry. It will be a permanent reference piece for design and business executives everywhere. Be sure that everyone concerned with product planning and design on your staff is alerted to this valuable issue.

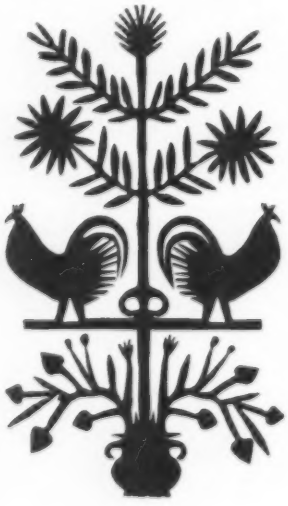
INDUSTRIAL DESIGN

Bettinger makes largest globe

For Babson Institute, Wellesley, Massachusetts, Bettinger Corporation of Waltham has constructed a globe uniquely impressive in scale and in its range of 21 weatherproof colors. Using porcelain enamel on steel, designers Doris Hall and Kalman Kubinyi devised new methods of applying a series of colors. Each one had to be fired separately until 584 different metal grids were finally fitted into position to complete the world's largest globe, 29 feet in diameter.

Poland sends designs in cut-paper

Circulating among department stores in eastern cities beginning in August is an exhibition of a still-active folk art, sponsored by the Polish embassy. Using rough sheep shears, Polish country people have for many years cultivated the art of cutting out paper patterns and pictures to ornament their homes, and each district is known for its style, whether symmetrical and graphic or multi-colored with pieces glued to form pictures like a sampler. Below, one of the simpler forms in one color from Kurpie, northeast of Warsaw.



People

Edmund E. Anderson, chief stylist for the Nash Division since 1950, has been named director of automotive styling for American Motors Corporation. He will direct styling groups working independently on the Nash, Hudson and Rambler. Prior to joining American Motors, Mr. Anderson worked for General Motors; from 1945 to 1950, he was chief designer at Chevrolet.

Smith, Scherr & McDermott, industrial design firm in Akron, Ohio, announces that they have been retained as design consultants by the Tappan Stove Co., to work on the entire Tappan line, including both gas and electric ranges.

Griswold, Heckel & Kelly Associates, Inc., announces their new name and corporation, successors to Griswold-Kostellow Associates. Abe Itkin, Treasurer of Itkin Brothers, Inc., has engaged Marvin B. Affrime as Vice President in charge of sales, and Robert B. Becker as Vice President in charge of architectural design to form another organization, **Itkin Affrime Becker Design Associates** to specialize in office layout and industrial design.

Russell Wright is in the news with two items: Russell Wright Associates have been engaged by the Foreign Operations Administration to provide special technical assistance to small manual industries in the Far East. The aim of the project is to improve products in selected foreign countries and to establish better marketing methods. The Wright office has also been engaged by the National Silver Company to design flatware, cutlery and kitchen tools.

Debell & Richardson, Inc., specialists in the development of plastic products, processes and materials, announces that they have expanded their working area 20,000 square feet adjacent to their present location in Hazardville, Connecticut.

Neal Goldman Associates, Inc., industrial designers, has expanded to larger offices in Manhattan at 34 East 51 Street.

Seminars

Robert I. Goldberg of Robert I. Goldberg Associates will conduct New York University's first seminar in color beginning on September 28. Weekly sessions will include as guests Egmont Arens, Elwood Whitney, O. C. Holland, Dorothy Draper and Tom Lee, leading individual seminars under the general topics: *The Nature of Color, Color to Sell With* and *Color to Live With*, continuing through January 18, 1956.

Mr. Goldberg is also chairman of this year's consumer packaging conference, Wednesday, Sept. 21, at N.Y.U.

Consulting Services Announced

Chicago designer offers design research; advice in ultrasonics is made available

Dave Chapman has formed a new affiliate, Design Research Inc., which will specialize in analyzing factors which may affect buyer motivation in future years. "In this area," says Chapman, "we have found increased interest on the part of those industries requiring substantial tool and equipment investment. We must evaluate this trend as a marked note of maturity on the part of American industry taking action on long-range planning."

Of the new branch, Dave Chapman is president, Kim Yamasaki, Vice President, and Bill Goldsmith, Secretary-Treasurer. They intend to expand the services of the parent firm in offering a long-range study of designs for future markets.

Another specialized service is now being offered by Vibro-Ceramics Corporation, an affiliate of Gulton Industries, Inc. of Metuchen, New Jersey. A staff of theoretical physicists and engineers, headed by Dr. Paul Oncley, offers assistance to industries and designers in the construction of ultrasonic production equipment. The company's BBC-2 analyzer and development laboratories are equipped to measure metal fatigue, to detect flaws, measure gas or fluid velocities, and expand the uses of ultrasonic devices.

Awards

Italy's "La Rinascente Compasso d'Oro," an international design prize, will not be given to product designs this year but rather to an individual or firm whose work will be adjudged most outstanding in the field of industrial design. The Committee will meet on September 1; the announcement will be made several weeks later. ID will report the results in the October issue.

Students at the Art Institute of Chicago who won prizes for dehumidifier designs, awarded by the Mitchell Manufacturing Co. are: left, John Davies, Ash Minassian, Fred Schimmel and Robert Archart.

with COLD HEADED PARTS & FASTENERS

What is COLD HEADING?

Sometimes it's called cold forging. Cold Heading is a method of producing special forms from coiled wire. These forms may be rivets, studs, hinge pins, screw blanks, and other shapes and forms requiring quality, strength and economy.

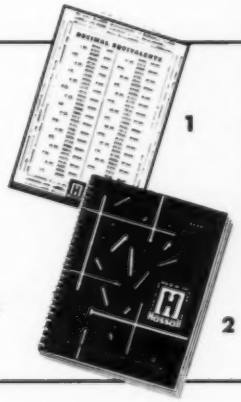
Advantages of COLD HEADING

1. **Lower cost of raw material**
2. **Better structural strength of finished part**
3. **High speed production**
4. **No scrap loss**

HELPFUL INFORMATION

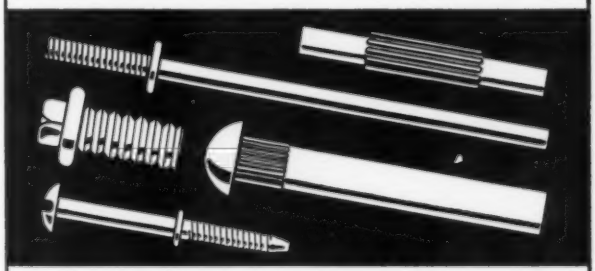
1. Large decimal equivalent wall chart
2. Our big catalog

Either one or both are yours for the asking.



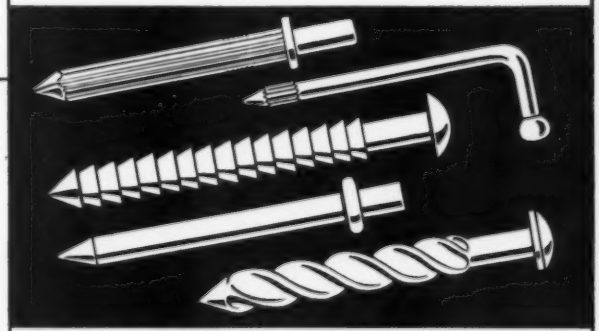
SPECIAL RIVETS

Let us quote you on your special rivet requirements. A special rivet will do a better fastening job on your assembly, possibly improve the quality of the assembly, and lower your parts and assembly cost.



SPECIAL THREADED PARTS

The accompanying illustrations show types of special threaded parts Hassall has made to order. Often new designs or added features are suggested by Hassall to improve the function of threaded parts or to lower cost. We suggest that you write us regarding your particular problem. We may be able to help you.



SPECIAL NAILS

A nail specifically designed for your needs is sound economy if its use improves your product. Special heads, points, collars, diameters, barbing, threading, metals and finishes may make a nail do a better job in your assembly. Send a description or sketch. We will gladly send our quotations or recommendations promptly.

We are, of course, equipped to do all secondary operations such as fluting, knurling, swaging, slotting, reheading, threading, drilling and plating.

We work in any metal and whether your run is large or small, ask for a quotation.

Hassall

ESTABLISHED 1850

JOHN HASSALL, INC.

Cantiague Road

Westbury, Long Island, N. Y.

HASSALL SERVICE

WHITLEY COLLINS

Portrait by Fabian Bachrach

"Over 80% of Northrop personnel buy U.S. Savings Bonds..."

"Our recent Payroll Savings Campaign at Northrop demonstrated the belief of our personnel and our company in the basic fundamentals of American good citizenship—staunch support of our Country and personal thrift.

"At the completion of the campaign we had over 17,000 regular savers—over 80% of all Northrop personnel buying U. S. Savings Bonds regularly on the Payroll Savings Plan. Every employer should stage a similar campaign for the benefit of his personnel and the economic welfare of our Country."

WHITLEY COLLINS, ***President***
Northrop Aircraft Company

If less than 60% of your personnel are Payroll Savers, do something about it. A phone call, telegram or letter to Savings Bonds Division, U. S. Treasury Department, Washington, D. C., will bring prompt assistance from your State Director. He will help you install, or revitalize a Payroll Savings Plan, through a simple, person-to-person canvass which your personnel will be glad to conduct. That's all you have to do—your men and women will do the rest.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

INDUSTRIAL DESIGN

Manufacturers and Designers are invited

to submit entries for

INDUSTRIAL DESIGN's **2***nd*

ANNUAL DESIGN REVIEW

which will appear in the December 1955 *issue*

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

What Will Be Included?

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

Who Is Eligible To Submit Material?

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

How Do You Participate?

From designs placed on the market since September, 1954, choose those which you would like included in this annual review. These designs should represent the most significant work of your firm or design office. Perhaps a design has made a particular contribution in its field, has overcome special practical problems, offered unusual features or merchandising ideas.

How To Prepare Entries?

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

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

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

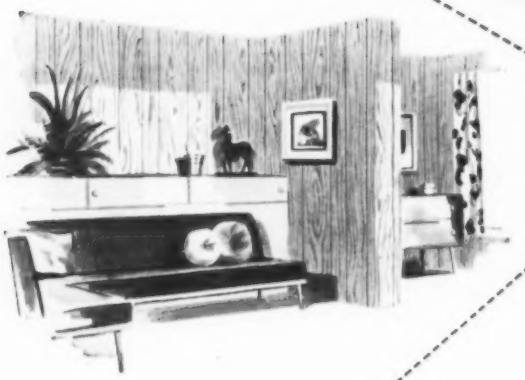
There is no restriction on the number of photographs or designs submitted. Closing date for contributions is October 1, 1955.

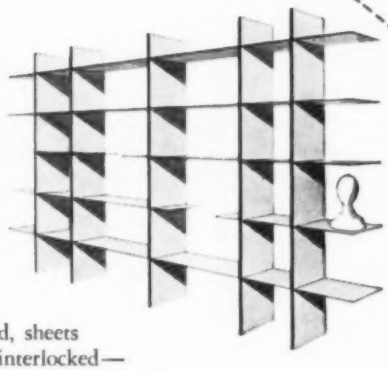
INDUSTRIAL DESIGN

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

THIS
MATERIAL IS

adaptable





A wide range of sizes, surfaces, densities and thicknesses makes Homasote the universal material for both displays and permanent construction of many types

In the egg-crate construction here pictured, sheets of Homasote are cut half-way through and interlocked—without nails. This exhibit has the strength for heavy loads.

If you require a board that really has size, Homasote is available in Big Sheets up to 8′ x 14′—in two different thicknesses. If you have uses for boards with interesting surfaces, Homasote—in all sizes and seven thicknesses—has a fine "linen" surface. In 2′ x 8′ planks, it also has beveled edges. In the 2′ x 8′ size and in other panels—8′ long and 16″, 32″ or 48″ wide—you also have the choice of a *striated*, light- and sound-deflecting surface or a varied width *wood-textured* surface.

If curved surfaces are in your design, Homasote—in any of its three surfaces—can be curved on an 18″ radius—solely by wetting. With steam and molds, it can be curved to a 4″ radius.

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TRENTON 3, NEW JERSEY

Automation, obsolescence, and ownership *How will industry plan the consumer into the well-planned economy that automation demands?*

There's been a lot of talk about automation lately—about the "second industrial revolution" and its effect on the factory—but no one has given it quite such a kicking around as economist Peter Drucker, in his article "Automation: The Promise of the Next Twenty Years," (Harper's Magazine, April.) On first reading, Mr. Drucker's treatise seemed as terrifying as it was edifying; on second reading, it seemed to suggest uncounted revolutions in marketing and design, and we decided to forego a suitably terse August editorial in order to deal with his predictions more fully. Not that Mr. Drucker was talking about design—he lets the word slip only twice in 10 prognosticating pages—but beneath all the concern about employment, GAW and management, he seems, to the editors of a design magazine, to be talking about nothing *but* design, in a new kind of world.

First, a brief review of Drucker's points:

Automation can be simply defined as the use of machines to run machines. This does not mean merely a push-button factory; it means an automated economy, and must be an all-pervading concept of the order and structure of economic life.

Market: Automation requires continuous production at set levels of output for great lengths of time. Thus production can no longer absorb the risk of economic fluctuations; short-term adjustments can no longer follow ups and downs of demand. It is essential, therefore, to establish a stable, predictable and expanding market.

Planning: Automation demands intense study of market demands, excellent product planning, design and service—in fact, complete rethinking of the product, and careful planning for obsolescence and technological change.

Stability: Since the entire plant will be one integrated piece of equipment, piecemeal investment will no longer be possible. Capital projects will have to be carried through on set schedules; as spending goes on independent of the business cycle, it will tend to stabilize the cycle.

Drucker presents these fairly revolutionary notions objectively, but with an overtone of approval for the orderliness of the system. But these basic and inevitable conditions—heavy risk, unfluctuating output and the need for a guaranteed market—raise immediate questions about the desirability of such an ordered system: Will the inexorable production cycle generate unprecedented mediocrity? Will planning result in stifling stability? And how will industry plan the consumer into the perfectly planned economy? By way of exploring some of the possibilities, we offer a few predictions of our own:

Uniformity: As factories spew forth goods in staggering quantities, it is possible that products will be more similar, more stereotyped than they are today. The reason is not the production system, but the risk factor: automated business will have good reason to fear making a sales mistake. It need not follow that all products will be identical, but that they will have a tendency to cling to certain shelter zones of determined marketability.

Planning: Advance planning may, as Drucker says, stabilize the business cycle. But planning on this gargantuan scale has its own risks. A product designed five, ten or fifteen years in advance allows for little response to unseen conditions. It is being born, in a sense, without benefit of its grandparents' wisdom. Unless the designer is clairvoyant, he may miss his best bets. For just as the public makes up its mind on the basis of experience, it changes its mind on the basis of better experience — and such nuances are hard to prejudge. Could tabletop cookers, outdoor grills and wall refrigerators have been put on '55 production schedules in 1945?

One way to peer through the mists of the future, of course, is testing and consumer research. But when planning is done for an invisible tomorrow, there is limited usefulness in testing what the customer wants today. Perhaps research will concern itself, instead, with the possibilities of what might be offered a decade hence; design would become a matter of judgement and intuition based on those possibilities.

Experimentation: One way that business senses what the general public will want tomorrow is by watching what the highbrow buys today. It is the small business, usually, that tries out unique products on this limited but important market. If, under automation, large industry is seriously restricted by fear of losing sales, it seems possible that two distinct entities may emerge: the big production company and the small experimental company. (Not the small supplier, as Drucker says, but the small manufacturer of end products.) Ironically, small business may grow more important because of its *inability* to afford complete automation; its limited production methods will provide the flexibility that makes experimentation an economical possibility. (*Continued overleaf.*)

Innovation: It isn't hard to see that stylistic variety, of the sort industry offers today, will continue to be easy under automation. But will genuine product innovation be an intolerable threat to the new system? It seems likely that new product concepts will be welcomed *as long as they do not outmode any part of the production plant.* This is not a negligible restriction. But it may call forth remarkable ingenuity in developing flexible production methods, and designs which make the most of them. The success of automation, in fact, would seem to depend on the development of basically flexible machines and simple methods of changeover. This would affect industrial design seriously—by making an unsuccessful product capable of quick modification, and by enabling designers to create variety from a basic stock of parts.

Design: Certainly the stable economy of automation will upgrade the designer, the one person with experience in correlating people and products. It will make demands on his ability to advise, his capacity to make long-term decisions. The weight of finality on every product decision will make the design of products a more serious, and more widespread, practice. It will be a big responsibility, and designers *could* hope for a better environment in which to carry it out. Caution does not breed spontaneity; intense risk is more likely to breed conservatism than creativity. This will mean a major decision for industry using designers: Will the designer function merely as an executor of corporate pre-planning, or will he be called in to make a contribution at a creative level, whatever the risks may be?

Ownership and obsolescence: Among Drucker's implications, the most stimulating is the switch from product-marketing to service-marketing. Bizarre as it sounds, the idea of renting products on a service contract is not new. The biggest corporations in the world—IBM and the Bell System—sell a good deal of service. Their success indicates the reason for a similar approach under automation: by assuring production to an exactly calculated demand, service-marketing prevents economic suicide. It is also not far from today's habits of trade—installment buying, for instance. Levittown residents don't own their monthly-payment houses for some 10 years, at which point ownership is more of a bonus than an achievement. The yearly trade-in car buyer has no intention of owning anything except a temporary convenience, which he knows is negotiable for the new models which will be along in a year.

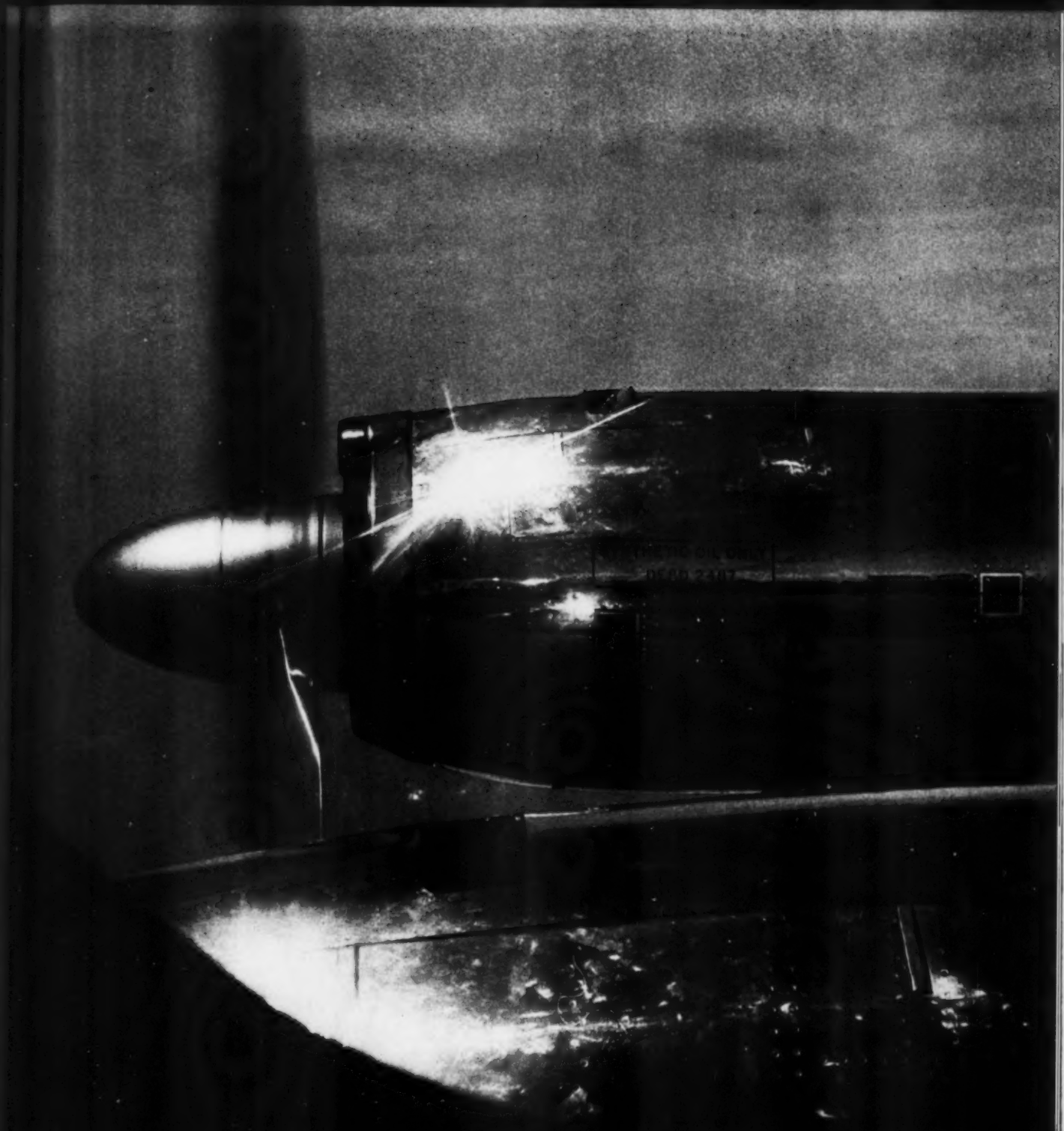
Because automation demands that goods be absorbed in unprecedented quantities, there must be foolproof methods for assuring product replacement. Persuading the customer to kick in a perfectly good car or vacuum cleaner—which is accomplished today by stylistic innovations, new color, new trim—will obviously be a simpler matter on a service-contract basis. The customer may take out a service contract (for a duration, say, of six years) with the understanding that a new model every two years will automatically be her reward. Industry will be able to plan its biennial production, and to organize its market for second-hand products; the customer will know that if she tires of her mauve tank cleaner, a blue upright model will be available the next time around.

This obviously puts a new light on design-for-sales. The consumer's financial involvement will be low; her commitment will be limited, and changing loyalties will be as easy as switching to Luckies. How will business compete for the rental customer's affections? It may, first of all, exaggerate the use of artificial lures, such as color and trim. But at the same time, it may find that genuine product innovation will be more acceptable than ever before, for the simple reason that this lighter commitment will encourage experimentation on the customer's part. Rental competition will also involve new values: better quality and performance, and less servicing. For industry, even more than today, will be designing for itself as much as for the customer. There will be little advantage to building a machine which is calculated to collapse after a brief but brilliant career. If quality is low, the manufacturer will lose profit-time on his second-string rentals. If servicing costs are low, the money he saves will be his own.

Will the new relationship between object and consumer in this strange new world upset one of society's most visible values—possessions? Not necessarily. The fun of possessions need not be spoiled, but merely redefined: *Ownership equals being equipped*—an equation that has many new satisfactions. The customer pays rent for a once-a-year kitchen and an add-a-car policy with the pleasant understanding that they will be around only while they're young and beautiful. This may generate a scorn for belongings, but no loss of interest in the end result, equipment. Freed of the responsibilities of ownership, people will be able to take advantage of the position their service contracts give them. They can indulge in new adventures in taste. They can demand newness, and style, and convenience, and innovation, and industry can satisfy that demand by an endless (but calculated) offering of variety. Where does this apparently inevitable cycle end, and what does it all mean? The end is not yet in sight, and the meaning of life in this product-laden world of automation will, as always, become clear only after we find out for ourselves that technology — even super-technology — is not an end in itself.—*d.a., j.f.m.*

Photo Hugh B. Johnston

Photo Hugh B. Johnston

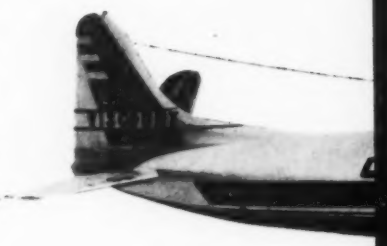


Enter the Viscount

The high whir of these turbine-turned propellers is bringing a quieter, vibration-less ride to U. S. passengers: with the purchase of sixty turbo-prop planes from England, Capital Airlines is revolutionizing its equipment, gambling on a new era in aircraft design.

Capital takes a lead i

July 26, when Capital Airlines' first three Vickers' Viscounts were put on the Washington-Chicago run, marked a radical change in U.S. air travel, and possibly in future U.S. aircraft design. The Viscount, already familiar on Trans-Canada hops, is the first commercial passenger airplane powered by turboprops, which challenge the supremacy of other engines on two counts: the turboprop engine combines the smooth action of a turbine with a propeller drive, giving a quieter, even ride; and it has a high speed potential at distances uneconomical for jets.

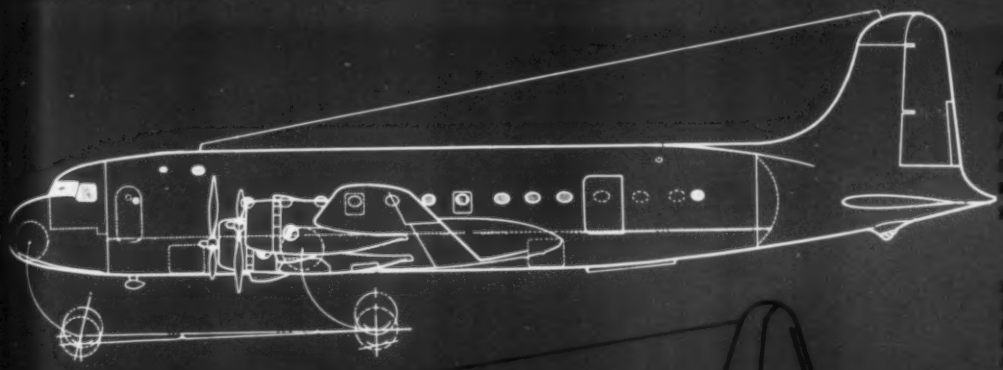


In offering the Viscount's large-plane comfort for short-distance travel, Capital is making a strong bid for passengers who have been lured away from its DC-4's by larger and speedier competitors. The switch represents a $60 million gamble, but Capital's confidence is founded on the Viscount's spectacular gains for foreign airways. British European Airlines inaugurated turboprop service in 1953, earned a net profit of $100,000 per Viscount in 1954. Its minimum vibration, with a cruising speed of 320 mph at 16,000 feet, forced competitors to use their largest piston planes.

Compared to an average piston engine, the Viscount's Rolls-Royce Dart is easier to maintain; fuel costs even out at 500-1000 mile hops and the Viscount arrives 30 minutes faster. Designers are finding that riding comforts which once had to be designed into the cabin are provided by the turboprop engine.

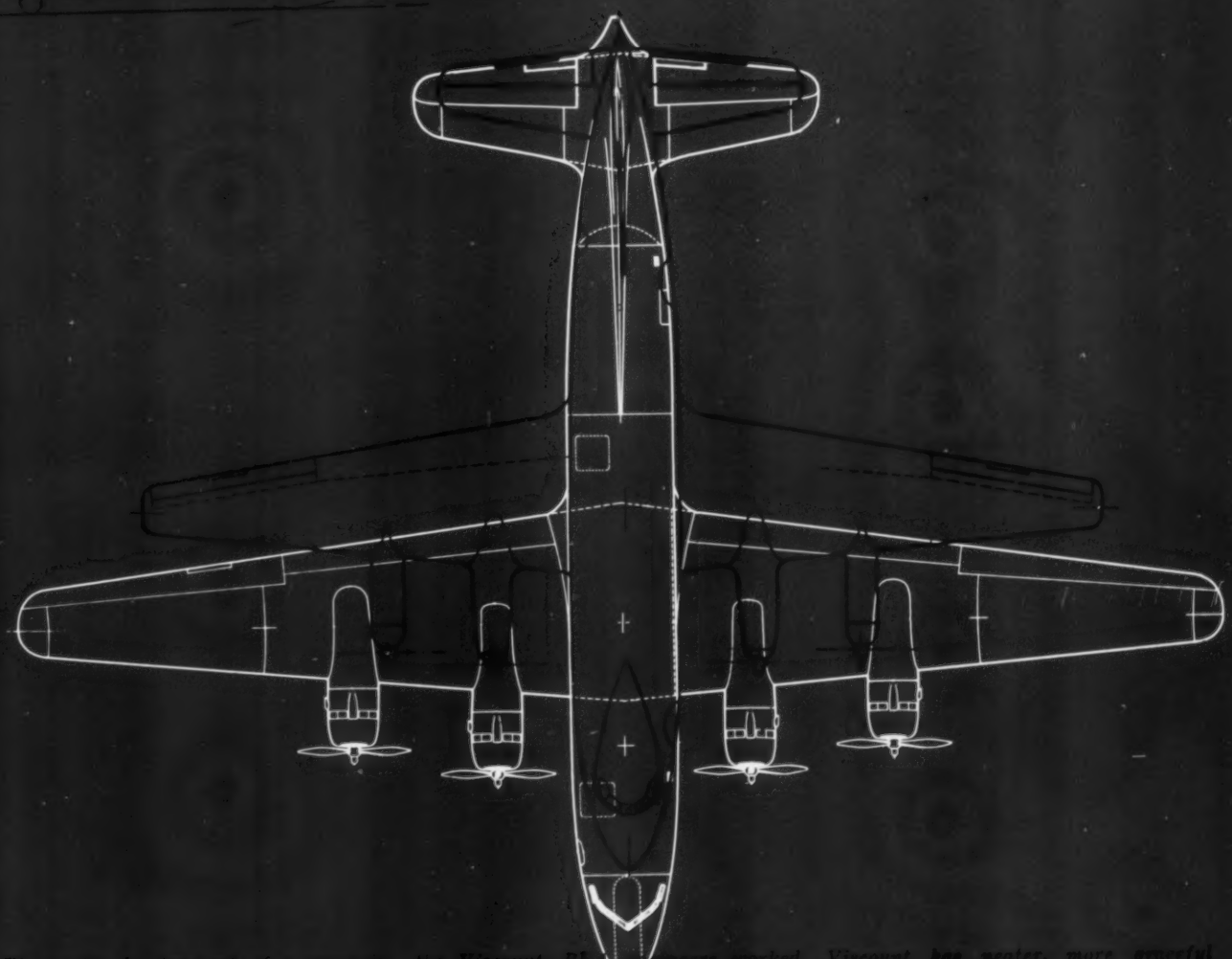
Two who helped to launch the turboprop step out of a BEA Viscount: Capital's president, Slim Carmichael, left, and George R. Edwards, the Viscount's chief designer.

The largest windows in any a visibility, also emergency ex ellipse to be the most practic Pilot's controls are simpler th



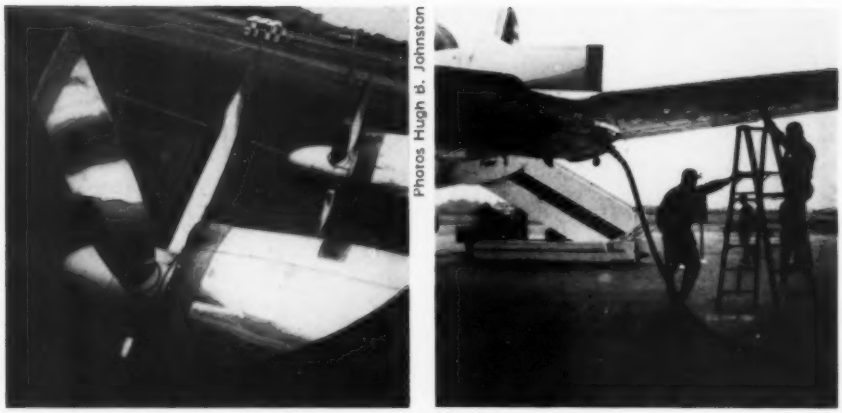
Aerodynamics offers considerable latitude for variety in the shapes of planes. Lines may be chosen for purely esthetic as well as engineering reasons. Compare the shape of the Viscount with the piston-engined DC-4:

	VISCOUNT (700 D)	DC-4
Span:	93' 8½"	117' 6"
Length	81' 2"	93' 5"
Max. Wt.	62,000 lbs.	73,000 lbs.
Capacity	40-48	44-60
Av. Speed	320 m.p.h.	227 m.p.h.



The costly development of a commercial airplane requires cooperative effort on the part of the engine and aircraft manufacturers and the airlines which orders the plane to fill specific needs. The classic Douglas DC-4 (above) is a larger, 4-engine version of the DC-3, which was inspired by American Airlines' request in the early '30's for a 20-passenger plane.

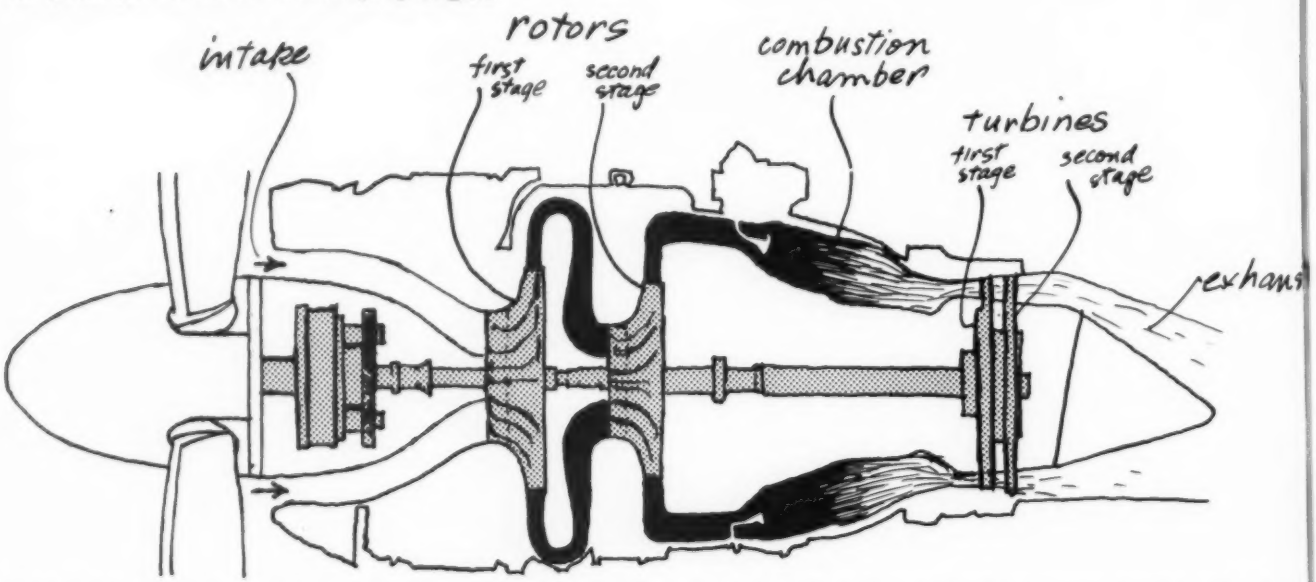
Throughout the six-year development of the Viscount, BEA engineers worked closely with design teams of Vickers-Armstrongs Ltd. on the pioneering venture of testing prototypes for an economical turboprop to carry passengers over short and medium distances. When Rolls-Royce increased the power of the Dart engine, aircraft capacity could be increased to match it. The fuselage, of circular cross section, corresponds to Vickers' Viking transport, though the Viscount has neater, more graceful lines. The wing is the unorthodox but successful Vickers' type with a single spar. As required by the swift action of the turbines, the double-slotted flaps provide a good lift increment and a high drag for landing. An excellent pressurization system (absent in the DC-4) adjusts automatically to the rate of climb, providing a cabin pressure of 5,000 ft. at 25,000 ft.



Photos Hugh B. Johnston

Rotor 4-bladed propellers have a finely adjusted pitch range, are directly connected to the same turbine that drives the compressor, a flowing interaction resulting in much less vibration than with a reciprocating engine. Right, the Dart is fueled with kerosene.

The principle of the Dart turboprop engine

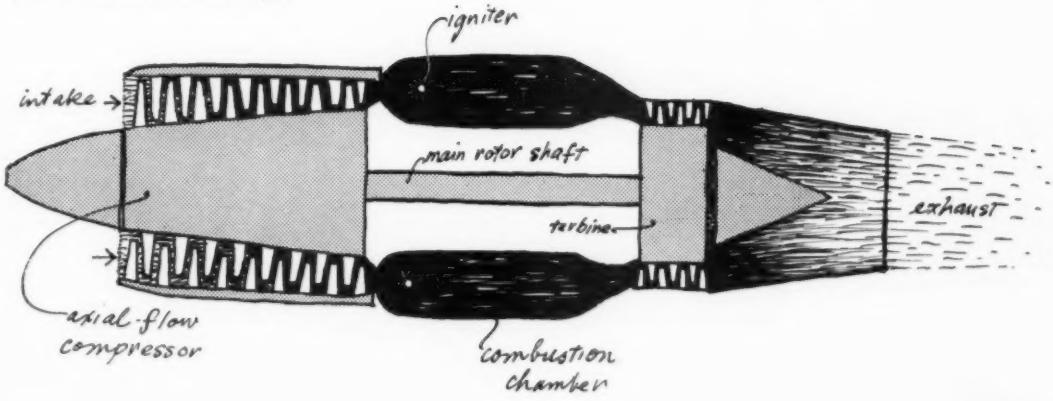


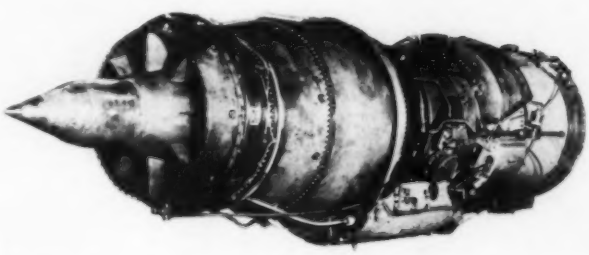
The action of the Dart: air, drawn in through an annular air intake, is directed to a 2-stage centrifugal compressor (see 1st and 2nd stage rotors). This compressed air is forced into 7 straight-flow combustion chambers, mixed with kerosene, and ignited. The resulting energy drives 2-stage axial flow turbine. Turbine power, transmitted by a shaft, drives the engine compressor and then, through a high-ratio reduction gear, drives the propeller. Residual energy passes through an exhaust system in the form of a low-thrust jet.

The heart of an aircraft is its power plant; the designer's problem is to install it in a craft that will utilize a particular engine's power potential most efficiently. Before he can build a new airplane, the manufacturer must choose an engine. It is a difficult commitment these days, with many alternatives, the main ones being turbo-compound, turboprop, turbojet, and by-pass or ducted fan engines utilizing the mixed flow of hot and cool air.

Among three possible turboprop engines available in 1945 when Vickers began design projects on the Viscount, they chose the Dart, which Rolls-Royce had designed as a straight-through-flow jet turbine with a centrifugal compressor. During the first years of the evolution of the Viscount, the power of the Dart was increased from 1000 to 1400 shaft horse power, is now 1550. Proof of the remarkable growth potential of this turboprop engine is that Convair, which had been fighting Vickers' lead with pro-piston-egine propaganda, now proposes a 60-passenger turboprop design using four Dart 7's at 2000 s.h.p. Bristol's Proteus, powering England's next big turboprop, the Britannia, has 3,200 s.h.p. Though Douglas is concentrating on the jet DC-8, Lockheed recently announced plans for the first American turboprop passenger plane, the Electra, on a 39-month "rush" production schedule. While jets are good only for long high-speed travel, the turboprop is fast emerging as a significant power plant in its own right.

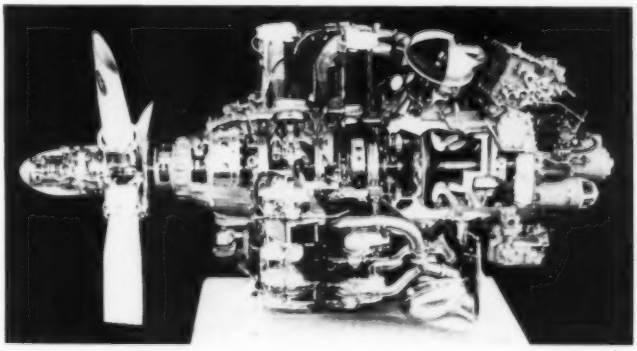
Typical axial-flow turbojet



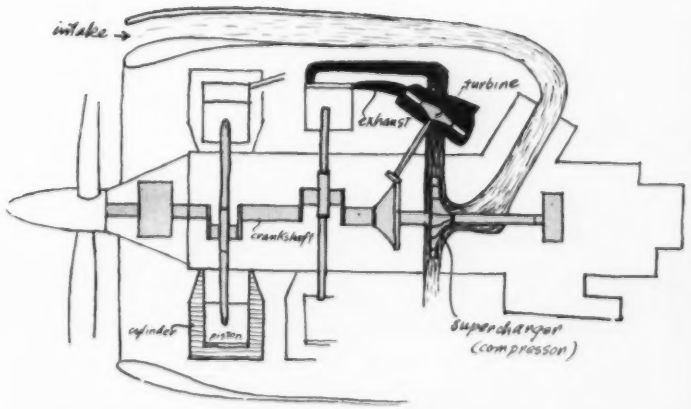


In jet engines, centrifugal compressors (incoming air is flung outward) have been largely superseded by axial-compressors (dual in the Pratt & Whitney J-57, above). The principle: air flows parallel to the axis; compressed through many rotating stages, it is forced into combustion chambers, mixed with fuel, ignited, and converted by the turbines into heat energy. This passes into the atmosphere as a high-pressure jet force, pushing the plane forward. Right, a model of one passenger jet now being built, the Douglas DC-8. *Prototype of the Boeing* 707 *has been flying more than a year* (*see page* 16).

This cutaway of the Curtiss-Wright turbo-compound engine used in the new TWA Super-G Constellation shows a high point in piston-engine design. Extra fuel economy is achieved by using 3 *small turbines to recover power from the engine's* 18 *cylinders. They transform waste exhaust gases into heat energy, which is transmitted to the main shaft by a series of gears and couplings, increasing the power to the propeller. The diagram below shows this supplementary turbine action. Compared to the turbo-compound, the turboprop and turbojet represent basically different concepts.*

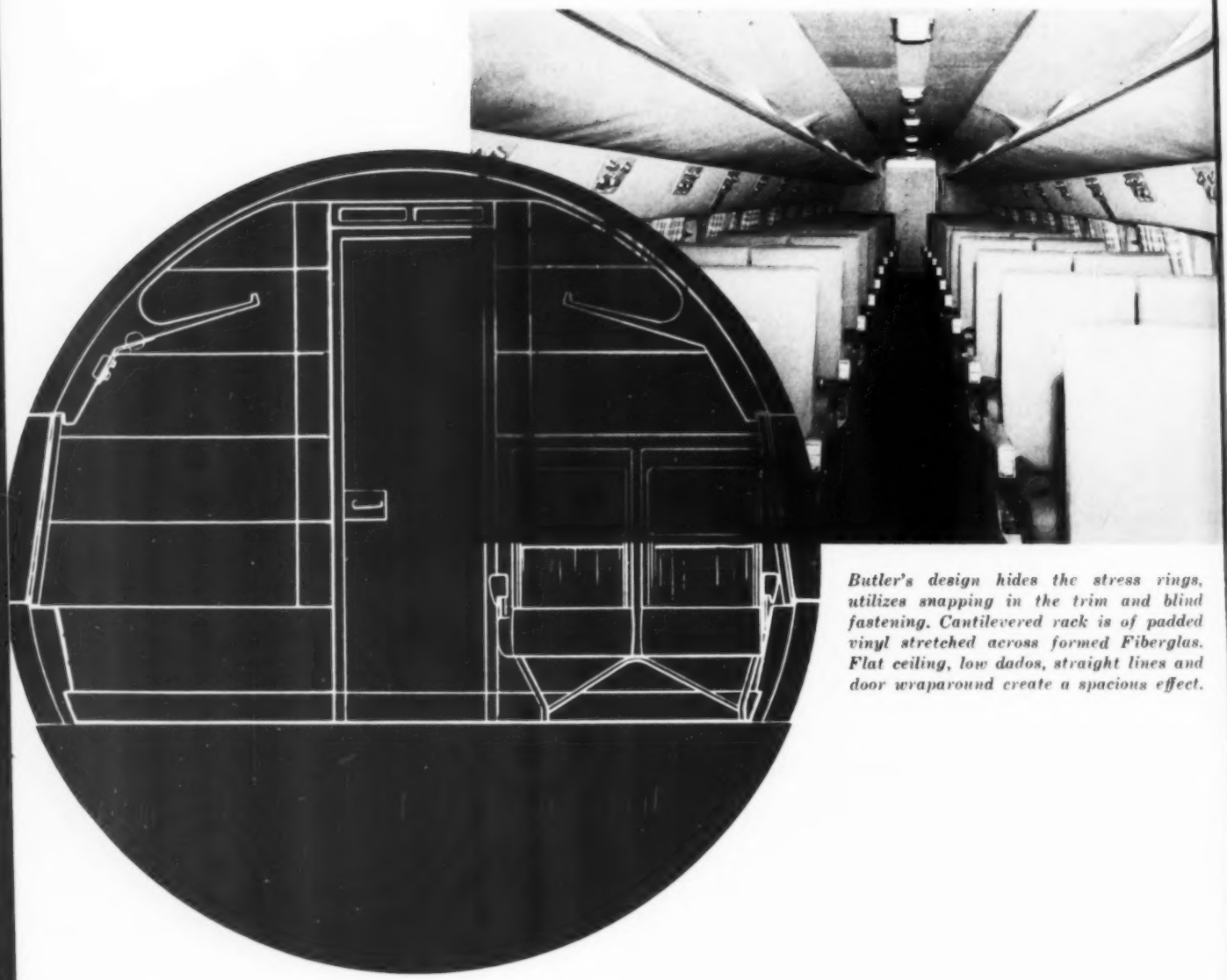


Turbo-compound reciprocating engine



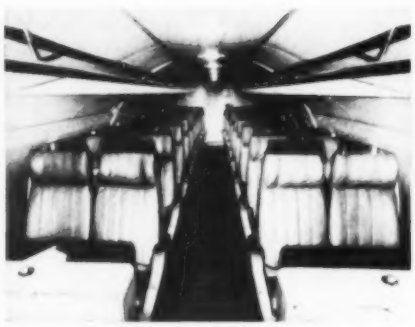
Engine diagrams, courtesy David A. Anderton, Assistant Managing Editor, "Aviation Week"

The Viscount interior varies according to the airlines:



Butler's design hides the stress rings, utilizes snapping in the trim and blind fastening. Cantilevered rack is of padded vinyl stretched across formed Fiberglas. Flat ceiling, low dados, straight lines and door wraparound create a spacious effect.

Interior of an Armstrong Whitworth Argosy, 1927, first London-to-Paris service.



Interior of the standard Viscount which TCA wanted to "Americanize."

The BEA Viscount interior emphasizes the large windows, uses string luggage racks.

one style for BEA, and two North American versions for Trans-Canada and Capital

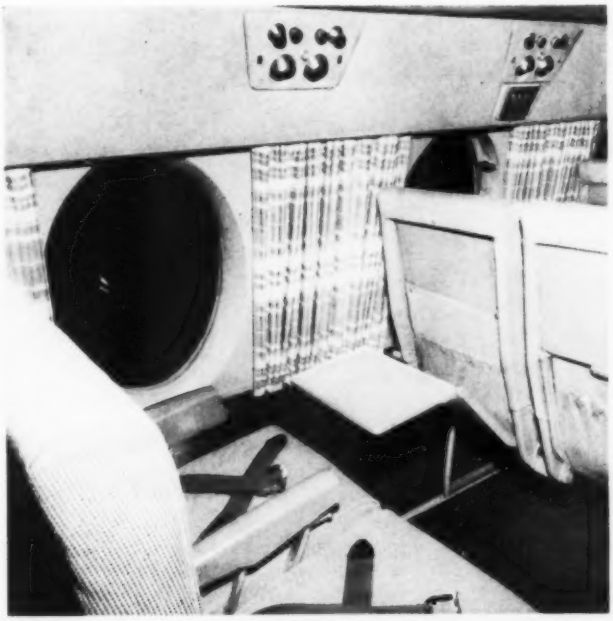


photo: Hugh B. Johnston

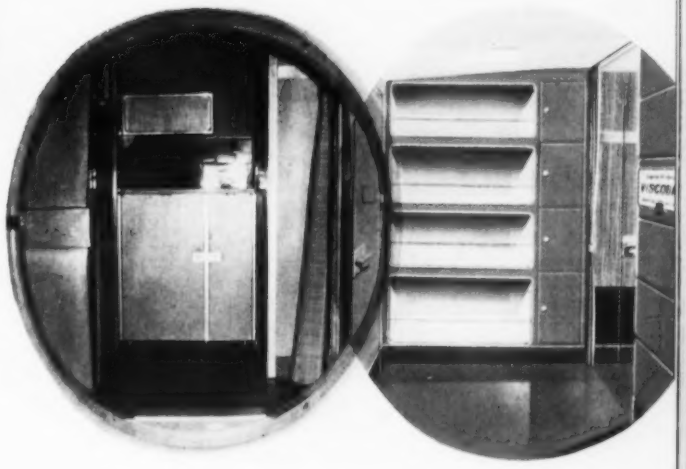
Butler's Viscount seats (top) are collapsible, save 500 lbs. Folding tray was initially BEA's idea; Capital uses Butler's redesign. Trays and seats are being manufactured by Aerotherm Corp. Butler also organized lighting and ventilation fixtures under an aluminum panel, hinged for easy maintenance. Above, passengers circulate easily as the Viscount cruises at 320 mph.

Design features inside the Viscount come from different sources, beginning with the basic cylindrical fuselage by George R. Edwards and his staff. Vickers engineered special equipment with BEA and, with a consultant industrial designer, developed the maroon and grey BEA cabin. In 1953, TCA hired Charles Butler to "Americanize" the interior, and in 1954 Butler began to adapt his TCA scheme to suit Capital's order. In their first three planes, as the photos show, main differences are in colors and fabrics.

Both Butler and BEA designers sought to overcome the tunnel-like effect of the fuselage (see drawing, far left). Cabin layouts are different: BEA has the galley forward and lavatories aft; Butler reversed them for TCA and Capital (below left, view through door aft).

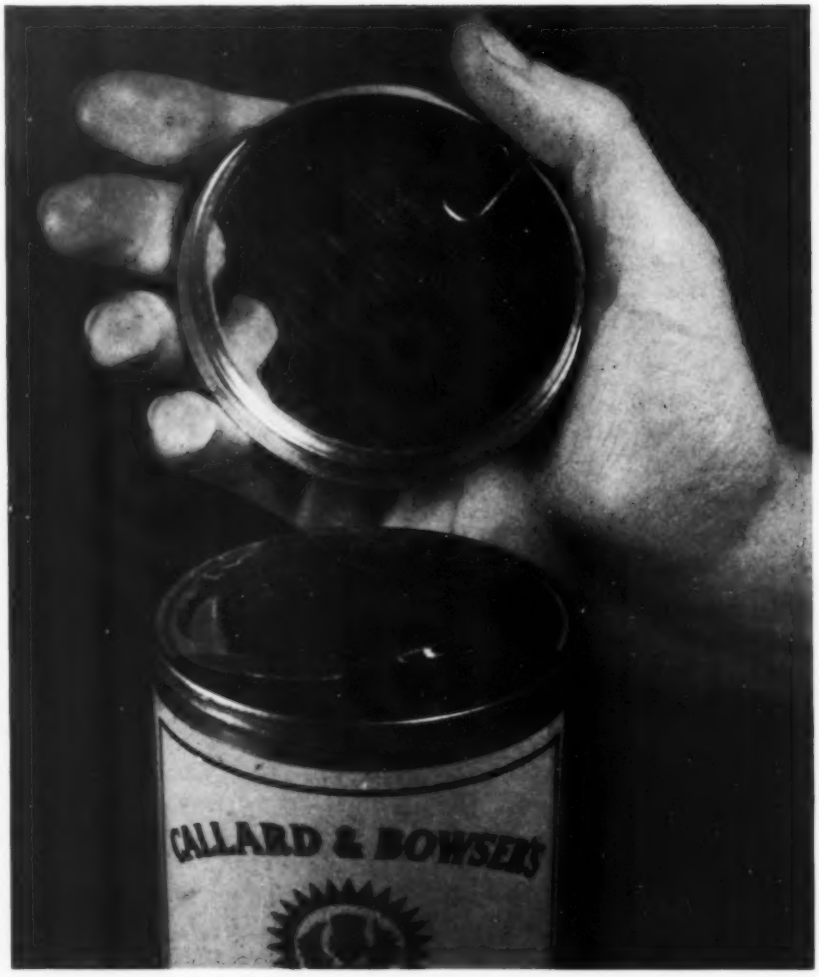
An identifying feature important in the Viscount design are the large elliptical doors and the windows, which give every passenger an excellent view. Fresh air comes through silent "punkah" louvres (specially designed plenum chambers reduce air velocity and sound yet maintain a steady flow). Seating capacity from 40-49 can be increased; the Viscount is a roomy plane, 13 inches wider than a DC-6.

Butler is making further changes on Capital's next 57 planes to use more space in the forward area, where passengers will enter by a mechanically loaded airstair door. The model (below, right) shows the new panelling for radio and safety equipment and a convenient rack for carry-on baggage at the entry, just behind the cockpit.—*s. b.*



SELF-OPENING CAN ELIMINATES KEYS AND OPENERS

The semi-permanent can that can be re-covered after top and body have been stripped apart is a kitchen convenience, but the key opener that cuts fingers in the process is definitely not. Many years ago Callard & Bowser Ltd. of London, who have been making famous confections since time immemorial, developed a unique and sturdy can package to protect their products against tropical climates and long journies to outlying colonies. With the advent of vacuum packing they adapted their filling methods but retained the familiar self-opening can, not so much for its extra protection as for its extra convenience. It is a system which would be equally suitable to coffee, peanuts, and other heavily-packed perishables. The metal can, fabricated with a special heavy-guage aluminum foil cap, is filled from the bottom, evacuated, and sealed. A second top is stamped out with a slit near its edge, and a small cutting device is inserted in it. With the blade positioned forward near the turn-under of the top, both the blade and top fit comfortably over the can. When the time comes to get at the candy, the cap is removed and the cutter pushed back about ¼", just enough to position it above the foil. Closing the top punctures the foil, and a simple counter-twisting action cuts it neatly all the way around. Callard & Bowser report that the half-pound container made of tin-plated iron (which holds 85¢ worth of butterscotch on the American market) costs them about 4d, or roughly a nickel. It may be re-used indefinitely.



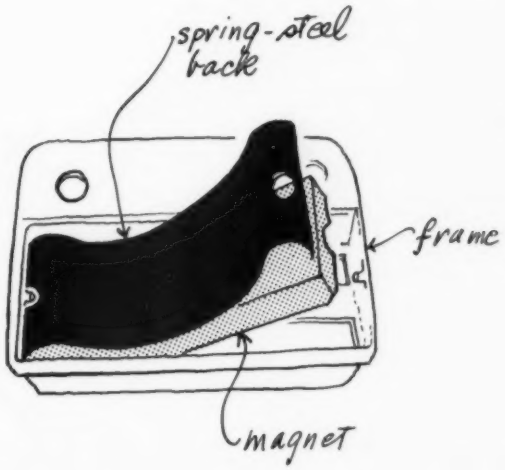
NOISELESS MAGNETIC CATCH HOLDS ITSELF TOGETHER

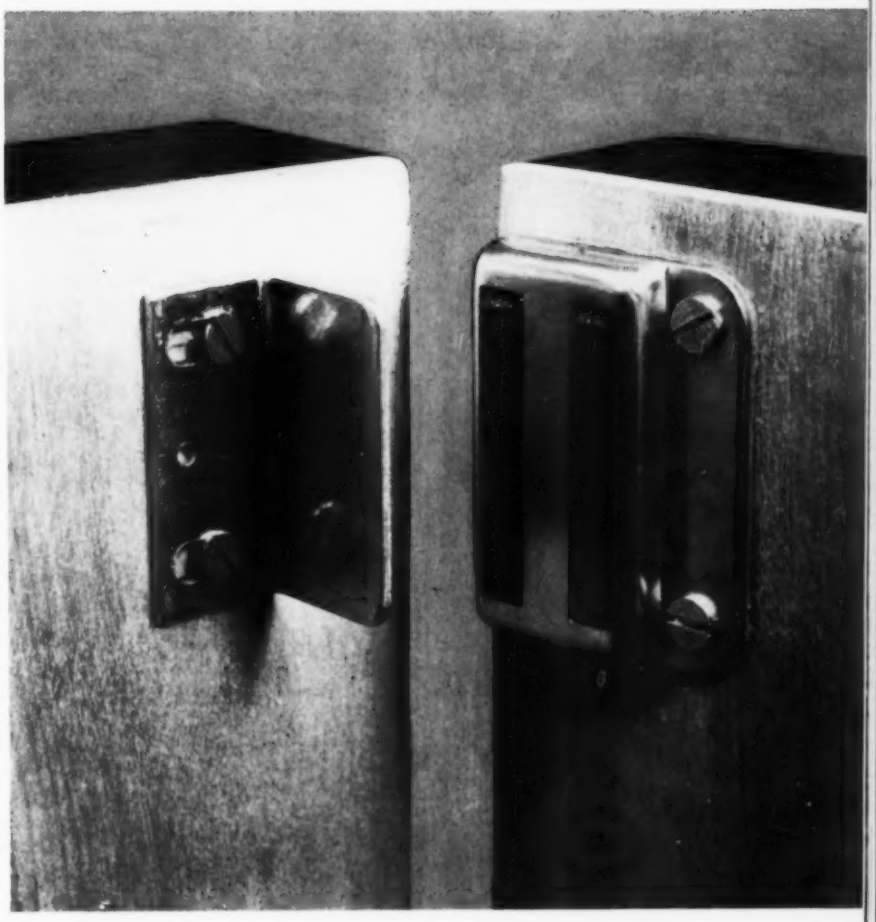
Since the development of the aluminum-nickel alloys which hold magnetism almost indefinitely, a variety of magnetic door catches for all kinds of cabinetry have come on the market. The advantages of these self-closing devices are numerous: since they involve no mechanical action, they are quiet, require no adjustments, and practically never wear out.

The magnetic hardware currently available offers varying degrees of strength and visual refinement. The Stanley 40ALD, shown here, represents one of the more unique designs because Stanley designers have solved its appearance and assembly problems with the same simple means with which they have achieved a neat, noiseless catch. It consists of three pieces: a two-bar magnet, a frame with slots into which the magnet fits, and a thin spring-steel back piece, which is the key to the whole design. Because this spring back is both flexible and magnetically active, it is easy to assemble the catch without fasteners or bending operations. When holes in spring back are snapped over bosses in the frame, the magnet holds the back in place and in turn is held down by the tension of the back.

This spring back serves other purposes in the operation of the catch. Because of the slightly concave center, it works as a cushion which absorbs the shock of the catch hitting the strike. This slight play makes the closure silent; it also cuts down concussion, which might slowly destroy the strength of the magnet.

Manufactured by The Stanley Works, the 40ALD uses Alnico No. 5.



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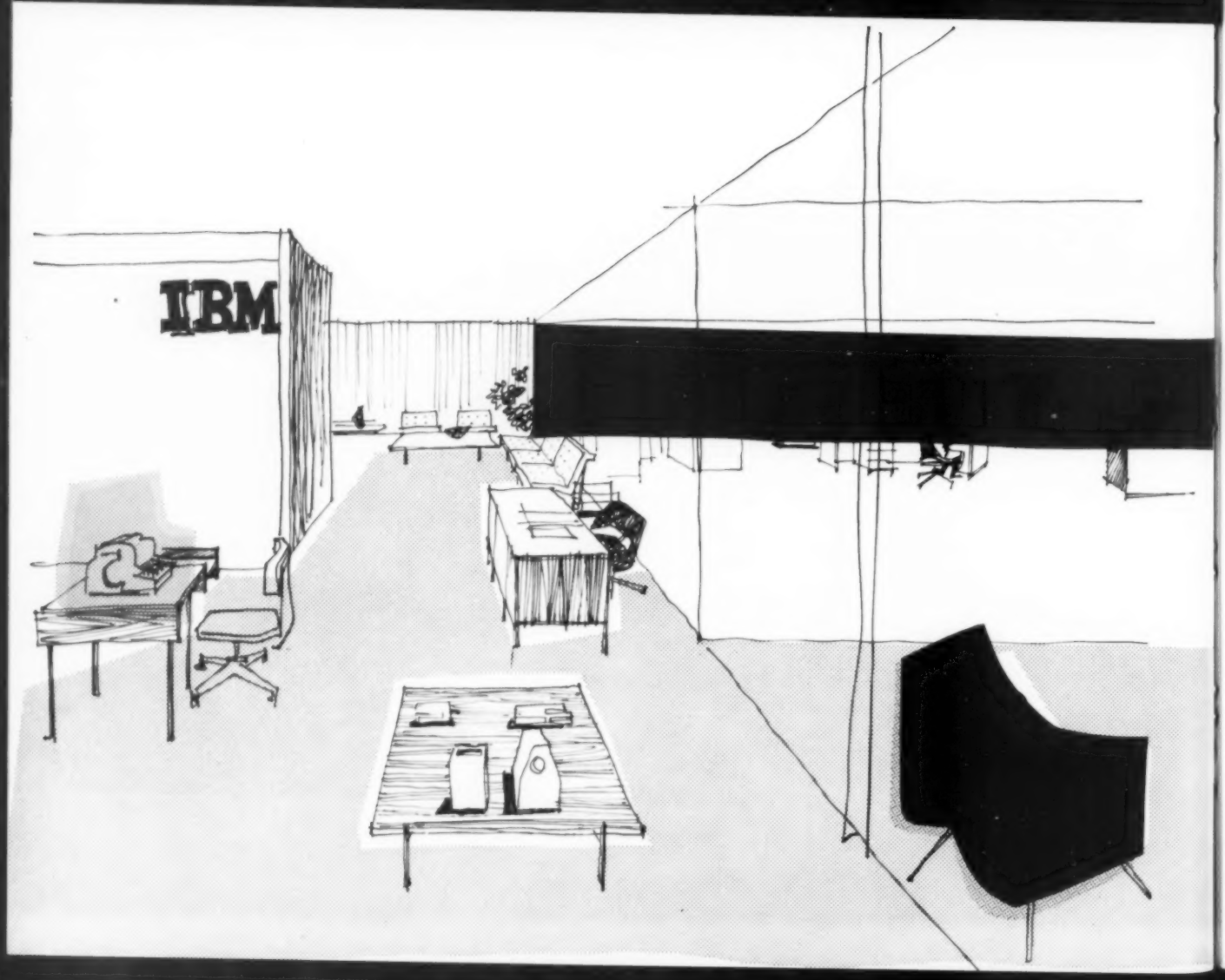

IBM

"In business today, you cannot satisfy your customers just by giving them something that will work. They want something good to look at. You can notice it in all the products in the stores. . . . This is all a part of our American life, and it proves that art is coming into business."

—Thomas J. Watson, Sr., Chairman of the Board, International Business Machines Corporation.

Brain center *a new machine, a new showroom dramatize IBM design policy*

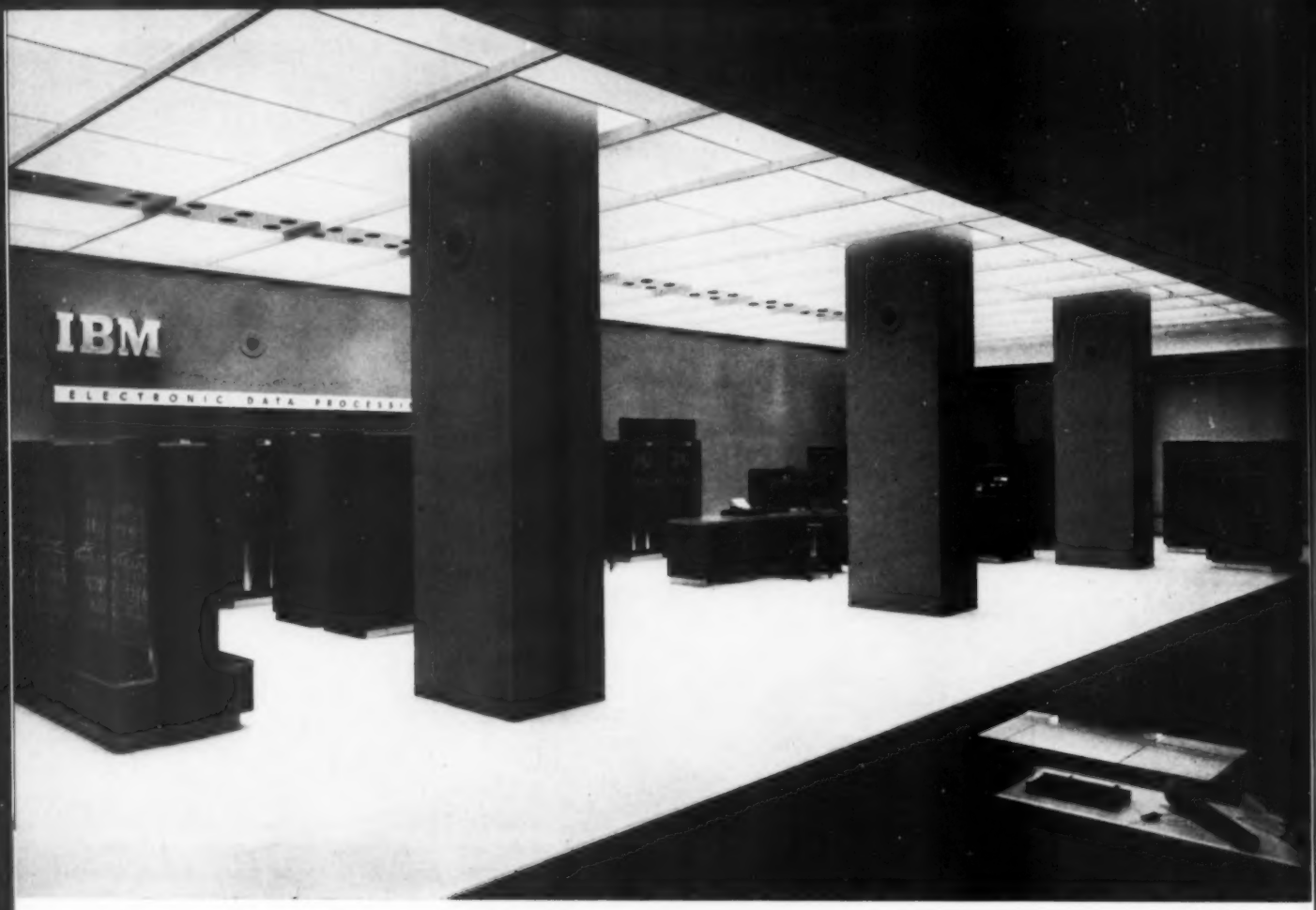
When the blinds were lifted on August 8, IBM's old oak-paneled New York showroom (above) had been transformed into an "Electronic Data Processing Center," with a red wall and a white floor, and the man on Madison Avenue got his first look at a giant new brain, the 702. This electronic data processing machine (EDPM), and a center to house it, had been theatrically installed near the windows for sidewalk inspectors. Together with the elegantly appointed adjoining reception room, they indicate the company's evolving public personality, representing the first graphic statement of IBM's integrated design policy. Staff + consultants is the IBM industrial design equation, evidenced by the fact that the company, while maintaining its own design staff, called on two consultants for this project: Sundberg-Ferar to design the machine, Eliot Noyes to redesign the display room. It is an unusually flexible policy, and the new 702, with its showroom, demonstrates how it works in practice.

Prior to the formation of a permanent design department, IBM consultants found it difficult to correlate their designs with the intricate business-machine mechanisms and special production demands. In 1943 Norman Bel Geddes, Sundberg-Ferar and George H. Kress (then designer of IBM displays) submitted designs for an accounting machine, the 407, and management judged the latter two most satisfactory. To develop a 407 production model, Kress was installed as head of a permanent design staff, and Sundberg-Ferar was called in as consultant and has been retained ever since. The permanent staff, since 1943, has increased from two to 10, with Kress as Industrial Design Director. "Even though the staff has increased substantially, the use of consultants has also increased," Kress points out, "for the very presence and activity of the staff has made management more conscious of the number of areas in which design is important." IBM is currently producing in four main areas: electronic calculators and data processing machines, electric accounting machines, time equipment, and typewriters.

Consultants (at present Sundberg-Ferar and Noyes) are called in by the Industrial Design Director for regular company jobs, such as the 702, and for various temporary assignments. (Kress indicated that one contingent of Sundber-Ferar has been on IBM location for two years with a secret government project.)

Whether staff or consultant—no distinction is made between the types of work done by either—industrial design within IBM is concerned with the development of the fundamental shapes of the machines, with their external appearance, with the mechanical detailing of their exterior members, and with their human engineering, the operator-machine relationship. The EDPM design problem starts when the machine idea is conceived. Technical illustrators work with development engineers to present ideas to management graphically. As the illustrator receives specifications from the engineer and translates them into drawings, he works with an industrial designer. "A satisfactory design solution, with the least amount of extra cost, is achieved only when I.D. works with the other people developing the machine, the engineers and new-product men, *right from the beginning*," Kress emphasized. Completed designs are cleared through him to the sales management department, which reviews them with the President of IBM, Thomas J. Watson, Jr.

The President himself not only OK's designs but frequently initiates them. It was his idea to have the display room redesigned to house the 702. Noyes, who has also designed IBM's typewriter (p. 40), selected a high-key combination: red backing wall and white floor (¼" rubber sheet). "This was done," he asserts, "for a straight-forward, dramatic presentation of the machine to the public, inside and out, and to bind simply the scattered and intricate units." A complex lighting system (designed by Richard Kelly, engineered by Edison Price) enhances Noyes' effect by making the wall radiate and the floor dazzle even when bright outside. At night, when contrast is no problem, the lights can be dimmed down. IBM does not want them turned out, though—the 702 is ready to work around the clock, at an hourly rental of $445.—*h.b.j.*



ezra stoller

702 magnetic tape unit

Designs for the 11 basic units of the new 702 were done almost exclusively by Sundberg-Ferar's New York staff, headed by Richard Figgins, who worked over 18 months on the project. The 702, which is oriented for such commercial functions as large-scale continuous inventory accounting, is characterized by fast input and output, a large-capacity electrostatic memory, and completely automatic control. In this installation, eight magnetic tape units (one at right) are the principal input-output components, permitting data in the form of letters, digits or symbols to enter or leave the central processing unit (far left in photo above) at the rate of 15,000 characters per second per unit. Before the designers were consulted, the tape unit's fundamental shape had evolved, its vertical housing determined by the two tape vacuum tubes, used to control tape slack and prevent breakage. The design job on this unit was largely one of packaging for a precision look and for speed and ease of replacing tapes and servicing. A glass half-door, hinged and provided with a hidden latch, makes the tapes readily accessible, and all of the gray, wrinkle-enameled panels can be removed for servicing.

702 central control center

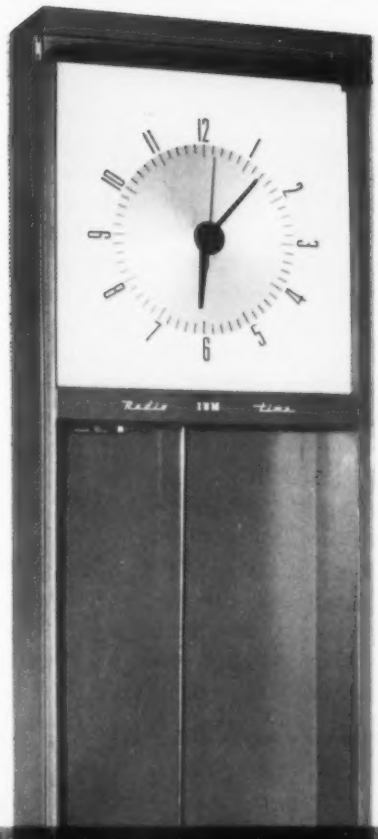
Even an electronic brain requires an operator, and Sundberg-Ferar's aims in designing the 702 console were to help the operator by reducing the operational panel to its essentials, providing ample work space, and clearly articulating the required motions.

On this job, nothing had been previously determined by the engineers except the equipment to go into it, and the designers were involved from the beginning, learning the functions of the various switches and lights before organizing them into a panel of related and strictly operational rectangular sections. Maintenance switches and lights were concealed beneath the brow, and major power switches were grouped in the panel's upper, right-hand corner, where only a deliberate motion can trip them. The keyboard, which can be used for entering instructions and data to supplement or alter the usual automatic programming from tapes or punched cards, was articulated from the main panel to reduce movement and point up its importance. A standard electric typewriter for one-way machine-to-operator communication was installed below table-level, and the designers turned the end of the console for easier access to the typed orders.

IBM

A consultant-designed typewriter

In 1948 Noyes got his first of numerous consultant assignments for IBM: the design of an electric typewriter to replace their early undesigned "Electromatic" model. The monolithic shape that he produced makes the platen, knobs, levers and keys integral to the form, articulated for use but remaining firmly anchored in the sculptured matrix. Its appearance of indestructibility, befitting a high-priced machine, has apparently pleased IBM as well as the market, for the classic casting of the Noyes typewriter has been retained in a variety of subsequent models, offered in six two-tone pastels. Now IBM engages Noyes primarily for architecture. A new plant and the 702 showroom (pp. 36-37) are two of his recent jobs.



ezra stoller

A staff-designed clock

The Radio-Supervised Master Clock (shown below in the Noyes-designed reception room that adjoins the 702 center) is an example of an IBM staff design, out of the office of Charles J. Jaworski, Manager of I.D., Poughkeepsie. The hands, minute markings, numerals and pendulum are meticulously delineated and fitted into a clean version of the traditional wall-clock housing. The result is a clock that is first a precision instrument and is decoratively apt in any office or lobby setting. It contains a short-wave receiver tuned to time signals and automatically corrects its own deviations. The housing is of wood finished in gray enamel. Behind the hands is an aluminum disc, surrounded by a panel which can be removed for servicing without disturbing the hands.

the fifth
international design conference
at

Aspen

found 500 conferees at the
crossroads,
pondering the direction
of the arts,
and, every now and then,
of the American consumer.

"The slow-burn fashion that encourages natural leisure and sharp wit" was the way Cervi's *Rocky Mountain Journal* characterized the five days of intellectual exchange which took place at Aspen this year. For a record attendance of over 500 designers, artists, students, businessmen and curious visitors, Will Burtin's conference committee had set up five broad topics that got a serious kicking around in the interest of determining the direction of the arts. Conference procedure was revamped this year: speeches were distributed to be read in advance; each session could jump right into panel discussions of Communication, Education, Light and Structure, Cityscape and Landscape, and Leisure. One unscheduled topic threatened to dominate the proceedings: Rain. The Buying Public was not invited, but nonetheless managed to make its presence felt.

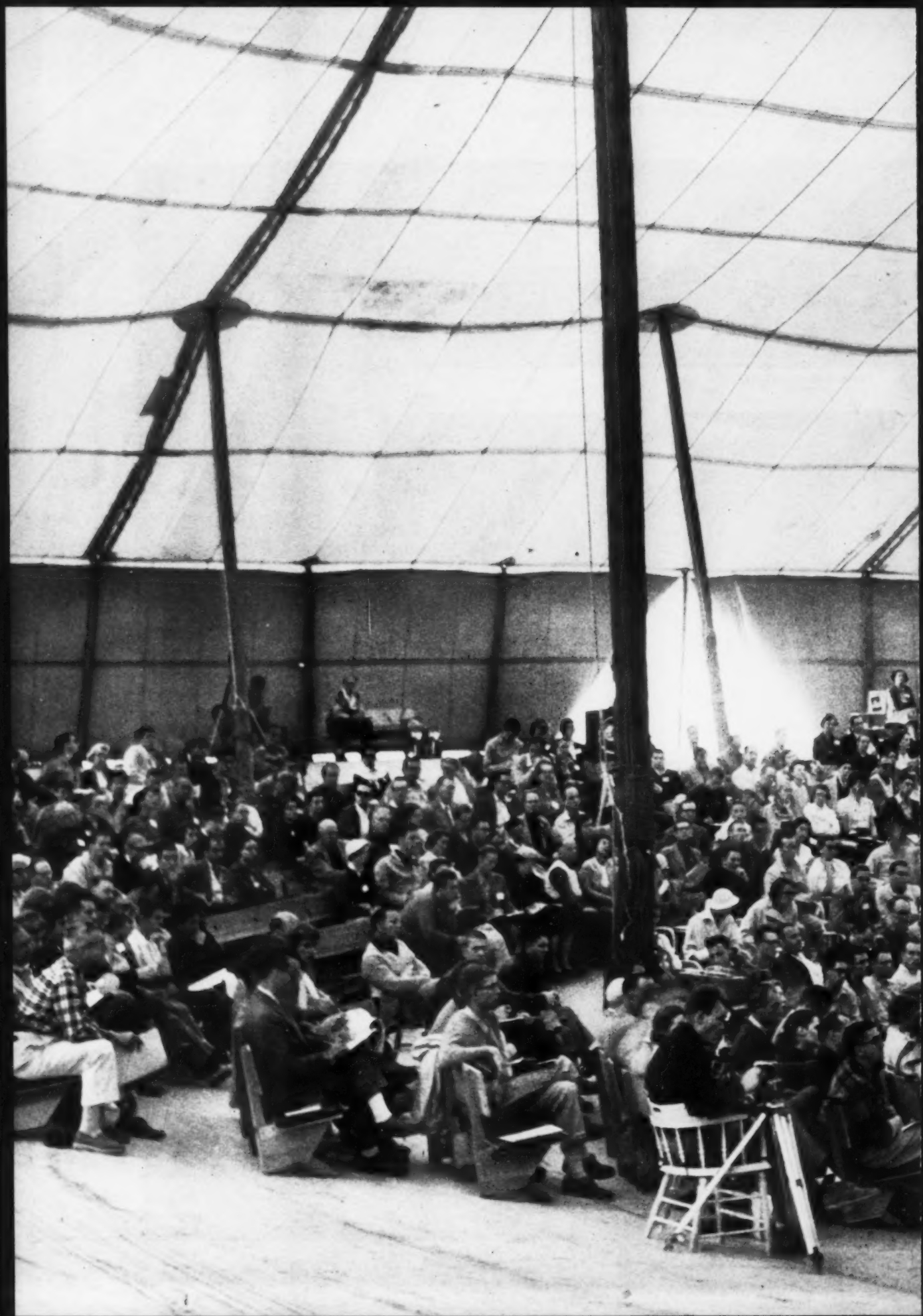
Verifying the fact that this was an international conference devoted not to practical but to theoretical and cultural problems, there were numerous authorities from foreign countries. Two of the visiting designers evaluate their visit to the conference below.

William De Mayo *Great Britain: The most interesting facet of the conference, to me, was the realization that although people from many countries and varied professions were assembled there, there was a basic unity of problems; each problem seemed to support the other and to fit well into the big jigsaw of our daily activities. Design quite clearly has come of age and is no longer a problem of shapes and drawing technique, but is part and parcel of the intricate pattern of 20th-century life.*

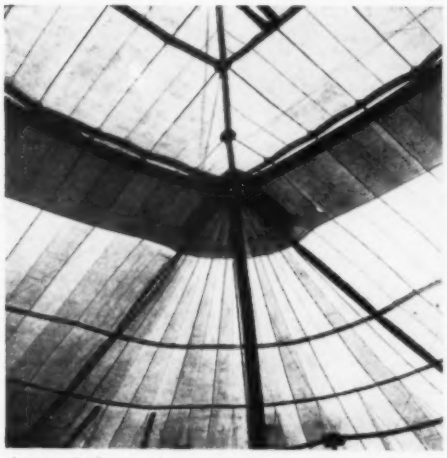
It certainly was one of the few conferences I know at which people were made to feel at ease. The plan of issuing speakers' papers in advance, the presentation of the visual material at the Opera House, and Dr. Hayakawa's lucid introduction, helped immeasurably to create contact between speakers and audience.

Another impressive sight, to the European observer, was the tremendously keen body of students who were anxious to delve into the problems on hand with almost fanatical vigor. The efficiency of their lady chairman leading their sessions was one of the highlights of the conference. . . ."

Kiyoshi Seike *Japan: I come from an island country separated from other lands by large bodies of water; participation in such an international conference is a relatively new experience. I was impressed to find such a large gathering of specialists from many fields, not only men and women, but young and old, from many nations as well. Though the group was heterogeneous, they seemed to be concentrating on one purpose — to study what modern design is. This strong common interest and a common visual language facilitated communication and brought about many lively discussions. It certainly helped me to see how much variation there is in the interpretation and connotation of terms in different countries. . . ."*

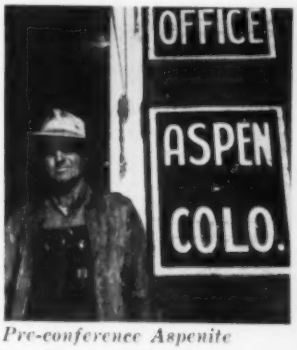


Aspen *was not all intellect: sculpture, domes, exhibitions, kites and um*

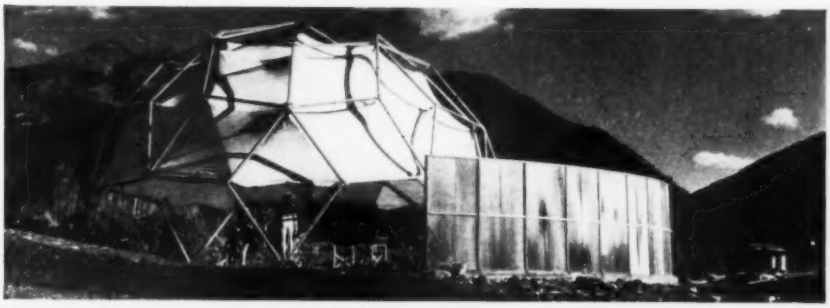


Apex of the conference tent

Aspen bandstand



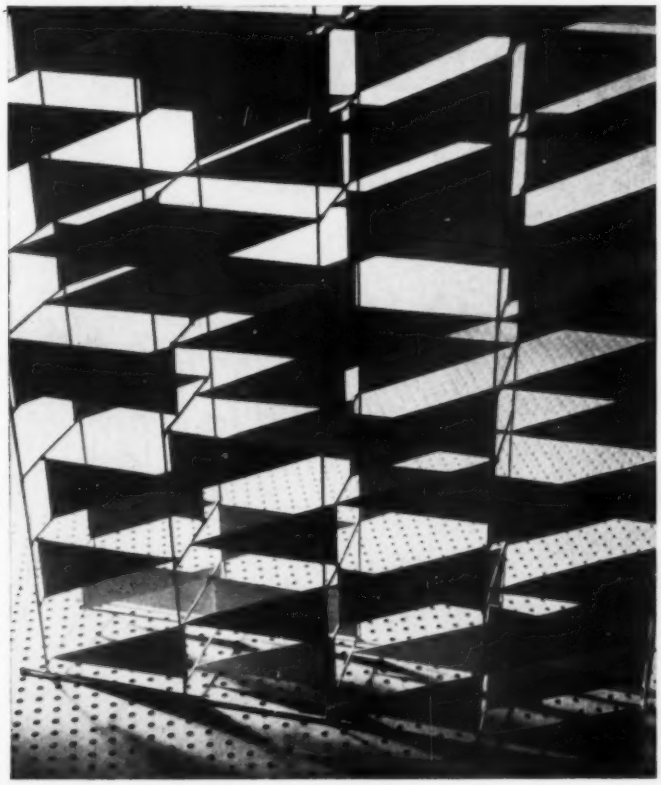
Pre-conference Aspenite



Geodesic shade over a swimming pool

Harry Bertoia's Light Sculpture

Walter Paepcke speaks



Middleton, Burtin

Joseph Koufel surveys e

Harry Bertoia and Kiyoshi Seike, among others

brellas added suitable visual diversion

Kite festival outside conference tent

Photographers with kite

DeMayo, kite and onlooker

Arthur Drexler comments

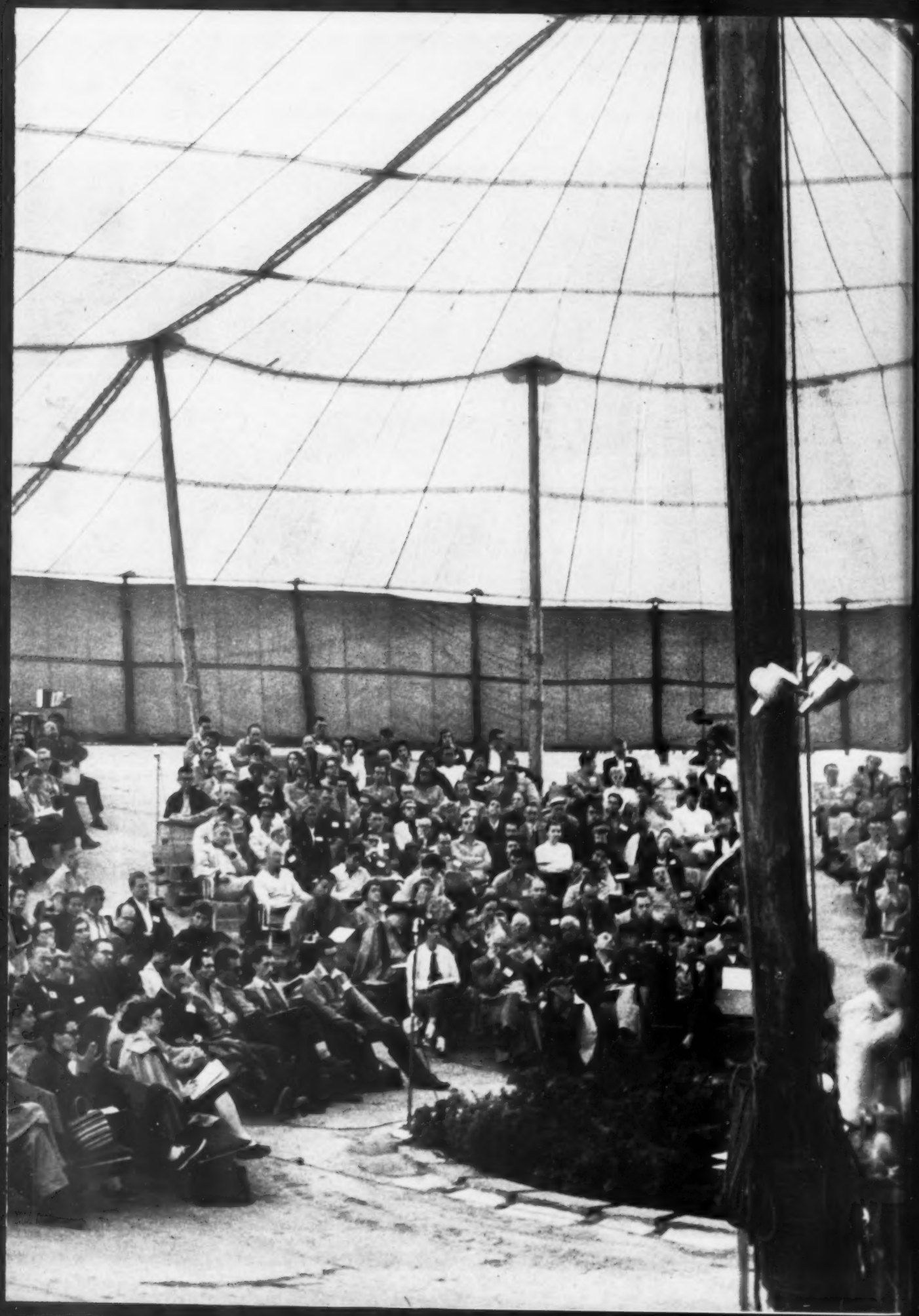
hibit

Samuel Hayakawa and Koichi Ito

Committee volunteers

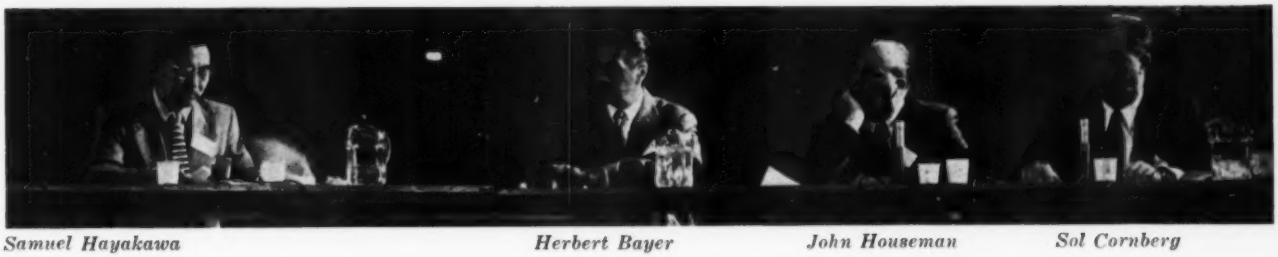
Michael Farr and Will Burtin

A typical day



Each speaker wrote rather than spoke his piece, then waited for questions to roll in

Communication



Samuel Hayakawa *Herbert Bayer* *John Houseman* *Sol Cornberg*

S. I. Hayakawa

"Since the purpose of this conference is to provide opportunity for give and take, it might be wise to adopt one of the conversational traffic rules which ensures the maximum flow of ideas from one person to another: *refrain from agreement or disagreement with a speaker's views until we are sure what those views are.* The best way to discover a speaker's views is to listen to him. But few people, other than psychiatrists and women, have had much training in listening. Most of us are chiefly concerned with getting our own views across, and we tend to find other people's speeches a tedious interruption of the flow of our own ideas. But listening does not mean simply maintaining a polite silence while you are rehearsing in your own mind the speech you are going to make the next time you can grab a conversational opening. Listening means trying to see the problem as the speaker sees it, which is experience with him. It means asking questions which are free of scepticism or hostility."

Sol Cornberg

Director of Studio & Plant Planning, NBC

"With color TV, a miracle is complete—the ability to take a picture and project it through space into the individual environment of millions, now. The message may be no more worthy of giving, nor of receiving, but to the art of communication has been added a plus—speed and saturation. For the designer, it is the all in all. He must take unto his heart the great tools which are available: *cybernetics,* which translates the design into electronic impulses; *automation,* which translates a design into actual product in a minimum amount of time so that *mass communication* may permit testing of the product design before great capital investments are made in tools for a product with questionable saleability. We are not asked to design for the ages, we are asked to communicate now . . ."

John Houseman

Stage and motion picture director

"A few Hollywood movies each year make some effort at vital communication. Whose expression and whose communication is it? Most often it is the director. When you see a picture by Hitchcock or Rene Clair, you know that the movie is *his.* His influence begins before the script is written, and does not stop until the last frame is cut. This is not advocacy of artistic dictatorship, but a sober realization of the absolute necessity for unity in an art form. . . . Making a movie is a collaborative act, but collaboration functions freely only within the matrix of a unified creative whole. Any camera man will tell you that filming a picture with a unified style is preferable to one on which he is left to his own devices. . . . No actor can give a valid performance who has not been made aware of the total form of the work. . . . Certainly the writer cannot alone carry an art form which is primarily visual. . . . It is that unpredictable miracle of individual energy at the core of a movie's communication."

Light and Structure

Harry Bertoia

Sculptor

"One prevailing characteristic of sculpture is the interplay of void and matter, the void being of a value equal with the material. Perhaps it is no exaggeration to say that the reality of sculpture is to be found in the void. The way void and matter are related results in form, which depends on structure.

"What happens when structure and color get together? The exploration of the possibilities of color lead to a new and very significant function. Structure enables color to attain higher intensities. It gives color a chance to receive light from more than one direction. Its reflective possibilities attain an unbelievable degree of intensity.

"The line of demarcation between the plastic arts has vanished. Color, the pictorial essence, an instrument of individual exploration, reaches new levels of expression. Have we the courage and capacity to integrate it properly?

"Light is so ubiquitous, the best we can do is breathe it like fresh air. Because so much of it is given to us free, we should be grateful to have it around us. If we didn't smoke our cities, we really would not need so much air conditioning. Likewise, if we had greater reverence for the primary source of light, the sun, we would build better."

Leisure

Bernard Benson
President, Benson-Lehner Corp.

"There is undoubtedly a path from automation to leisure and a path from leisure to happiness, but it will not be without careful thinking that we will go with assurance from automation to happiness. Let us not be deceived. Automation is not just the advent of more sophisticated gadgetry. It is potentially to the office worker and factory assembler what the steam shovel was to the ditch digger, the foundation for the first major effort to break the direct relationship between productivity and man's time.

"Science is busy designing leisure-producing machines. Now is the opportunity to build leisure-to-happiness converters. It may well turn out that it takes as long to convert leisure to happiness as it does to complete many of the development facets of automation, that is to say about 20 years. If this is so, then the problem is with us today. . . ."

Arnold F. Arnold
Designer

"The 20-hour work week is the result of what we are fond of calling progress. What shall we do with 92 hours of leisure a week? Till now, one of the functions of industrial designers has been making leisure possible. As designers, we must now concern ourselves with an entirely new function, that of permitting leisure to be creatively enjoyable, rather than a burden; We shall have to concentrate more on designing activity-provoking implements, rather than end products, and to concern ourselves more with eliciting participation and less with mere mechanical efficiency and styling. 'Tools made easy' are not enough, for they make it impossible to invent something which no one else might have thought of. The box camera is an ideal tool for leisure use, but its packaging and presentation fail to make its creative possibilities attractive to the consumer. The hammer must be designed so that it must be held in a position that makes it operate infallibly; but along with this foolproof hammer we need packaged projects which make only one demand on the consumer —that he use the tool creatively. . . ."

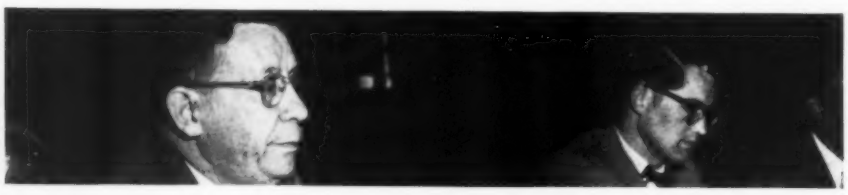
George D. Culler
Director, Akron Art Institute

"I have known artists and designers who had gainful employment in another field so that they could, so to speak, give themselves a fellowship in order to carry on their 'real work' in their 'spare time.' No such person ever felt a sense of guilt about this use of his time off. This leads me to believe that the first step in adjusting our society to meet the challenge of increased leisure time is *to break down the convention which states that a man's gainful employment is his work.* We must begin to see that any activity which leads toward the realization of the human potential is valid and important. As it now stands, a man will work at his business, but will confess that he has been 'playing around with the theory of music.' That playing around, the work he does to make himself a complete human being, must be placed on a par with the work which gives him a living. Creative individuals must lead the way in affirming the importance of developing human capacities. I have never known any real artist who had a leisure-time problem."

Education

Lancelot Law Whyte
Author, philosopher of science

"One of the great needs in education is for a method of approach which brings contemporary knowledge into some kind of order. Particularly, we need a view of the basic design of nature which



Earl C. Kelley
Professor of Education, Wayne Univ.

"Perhaps the most important fact revealed by recent studies in perception is that our perceptions come from us, not from our surroundings. The perceiver decides what an object is, and where it

Michael Farr
Editor, "Design"

"We are indeed at the core of industry, if not of a civilization itself, when we consider design. We live by creating things that are suitable for sale to somebody else, and the design commit-

Whyte

gives the human imagination its proper status, and so promotes its development. Here the concept of a formative process has something to offer. Art and science, philosophy and religion are all based on the ordering of experience and the exploitation of the resulting design. We cannot isolate the cultural activities of 'art' and 'science,' because the esthetic spontaneous components and deliberate systematic components are both present in nearly all human activity.

"It is fifty years since Sullivan wrote 'form follows function.' Perhaps it is now time that designers took a hint from the organism and showed how *function develops form*. What articles can you produce which improve with use, like your own muscles? That would be taking a hint from the design of nature. . . ."

Kelley

is, and makes it what he chooses to make it in the light of his unique experience. Thus he is the center of his own universe, which can share with others through communication, but only in part.

"We have long sought to make people alike by making them learn the same things. We can see now that this has actually succeeded in making them more different, for learning increases dissimilarity and promotes uniqueness. We have long sought to make the learner see something 'exactly as it was,' and if he did not do so, efforts were made to correct him or coerce him. The subjective nature of knowledge calls for a whole new set of educational procedures, in which we would see learning as growth, and knowledge as the outcome of perception. . . ."

Farr

fees in industry are the focal point of this activity. How do they operate? We should not sidetrack the question by stating that ideally the designer guides the team toward a series of 'right' decisions. It is rather the way in which the committee members communicate with each other that matters. Can the designer appreciate the experience that the engineer brings to the table? Can the engineer follow sympathetically the *designer's* views? And can the manufacturer cultivate sufficient impartiality to contribute to their discussion in a way that keeps time, cost and taste factors in perspective? It has been said, 'Extension of communication is often the prelude to entirely new discovery.' The creative element in design teamwork can be expressed in these terms."

Cityscape

Parr *Drexler* *Ito* *Gruen*

A. E. Parr
Trustee, American Museum of Natural History

"I am sure we will all agree that the harmony we seek for our cities should not be dreadful uniformity, but the harmony of diversity. The harmony of uniformity is easy to achieve. It seems more important to give our attention to the methods of creating an abundant diversity: this will lead to a richer harmony on a higher plane.

"Particularly in civic architecture we find a distressing lack of boldness and character, even though none of the valid deterrents to boldness in private construction applies to public buildings. There is no uncertainty about future ownership; permanence of function is assured, and financing does not depend on saleability; competition is excluded. Is there any reason why local pride should have to seek sustenance more from bridges than from buildings, simply because engineers *have* to be bold to accomplish their task, while the creative imagination of architects can be restrained by official timidity? Conservative cautiousness has never produced greatness or enduring beauty. . . ."

Victor Gruen
Architect and planner

"Architecture's most urgent mission today is to convert chaos into order. It must concern itself not only with 'buildings' in the conventional sense, but with all man-made elements in our environment.

"Once upon a time the world was full of wonderful landscapes, and people complained because it was so hard to get to those places. Today we are a nation on wheels. Millions are able to buy cars, have weekends and paid vacations. But the millions are swindled out of their hard-gained advantages. Hours are stolen by traffic jams. Nerves are frayed, and when they finally reach the target of their dreams, the dream looks tainted with beer cans and trash, studded with all the blights of sub-cityscape. We have become a nation all dressed up with no place to go . . ."

Hi fi in a package

Designers and engineers collaborate to equate quality and convenience

Last month Bell & Howell, manufacturer of photographic, optical and electronic equipment, made its debut in the high-fidelity field with a line of six luxuriously housed radio-phono-tape recorder units. It stepped into this ruggedly competitive arena armed with superlatives: not only the highest priced hi-fi combinations on the market ($500-$2000) but units which it felt could be called the highest fi in a package.

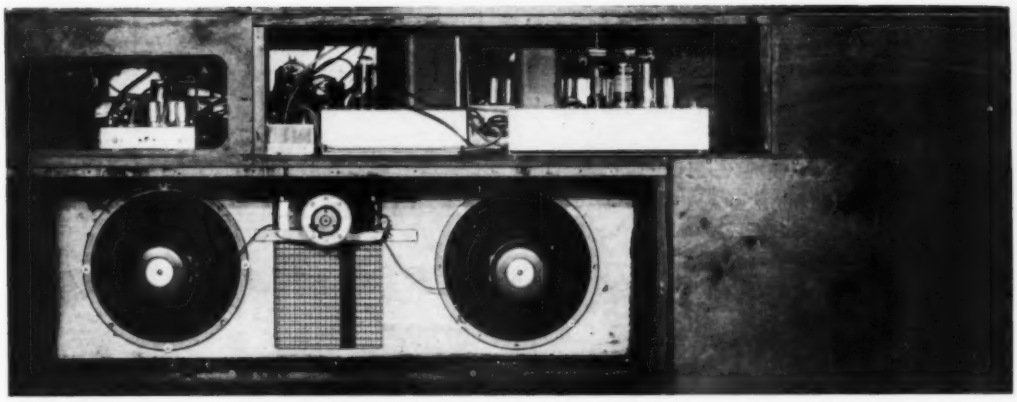
Behind the unveiling was some clear sales strategy: B & H wanted to fill the gap between the tin-eared layman and the audiophile who relishes the struggle of assembling his own set. At a policy level, it was a calculated move to diversification. It was also the result of one engineer's enthusiasm for accurate sound reproduction, and of a unique engineer-designer collaboration. The first is Frank Bennett, Vice-President of Engineering of Bell & Howell's TDC Division, and an audiophile of 20 years standing; the designer is Paul McCobb.

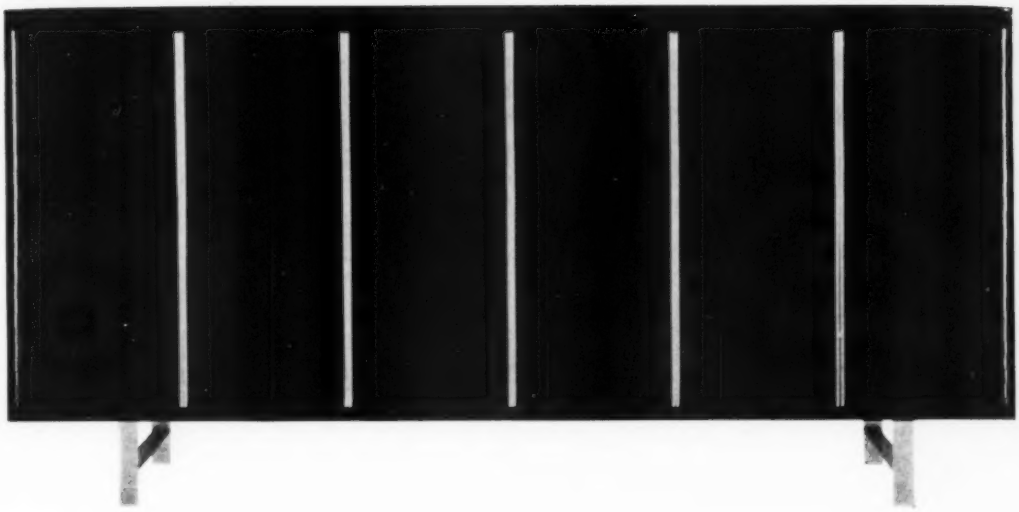
When Bell & Howell purchased the Three Dimension Corporation in January 1954, it was not with any intention of getting into high fidelity. But Bennett, then TDC's VP, had always harbored a desire to make a business of his avocation and wanted to interest B & H president Charles Percy in branching out into hi fi. Specifically, he felt there was room for a technically excellent set which sound-conscious consumers could buy — and stores could sell — with a minimum of technical problems. He called in Paul McCobb, long before engineering was complete, and together they roughed out space requirements for the line. McCobb designed six units, which were presented to Percy and the Board in the spring of this year. As soon as they approved the project, engineer Bennett and designer McCobb settled down to do the real job: developing a line which would look as well as it worked, and would work as well as an audiophile thought it should.

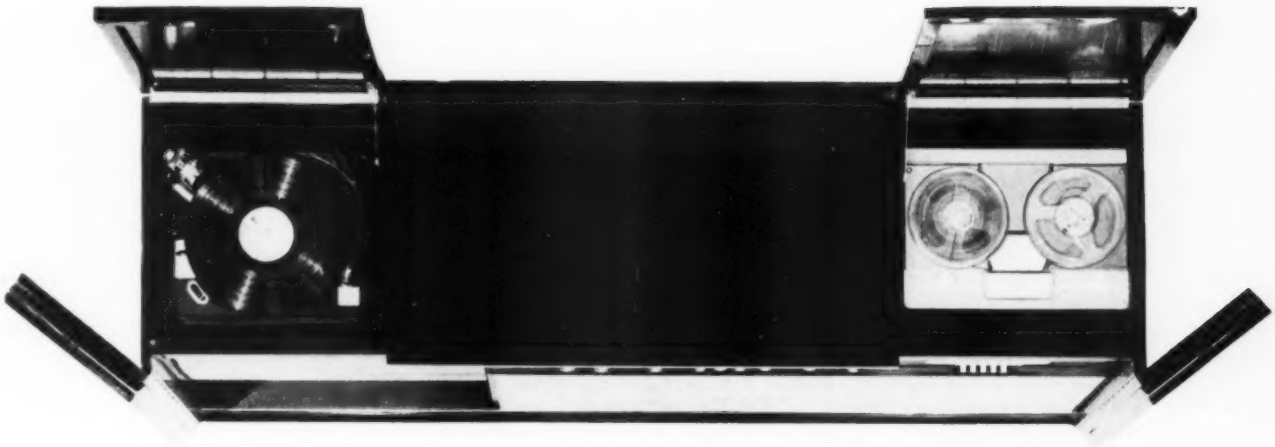
Who can hear it?

When Bennett defines hi fi as "a sound system slightly better than the one you already have," he admits one of the industry's problems: lack of standardization. With no limits on use of the term, it has been lavished on almost everything that makes a noise, to the confusion of the consumer and the distress of those who honor the concept.

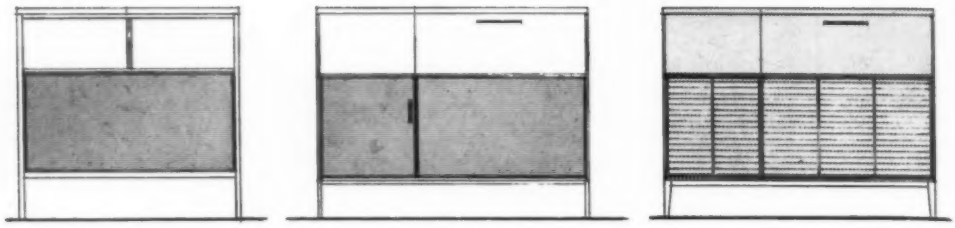
In addition, there is the problem of non-standardization of human auditory equipment. The ability to judge fidelity is a matter of a) the individual ear and b) conditioning. People have been con-



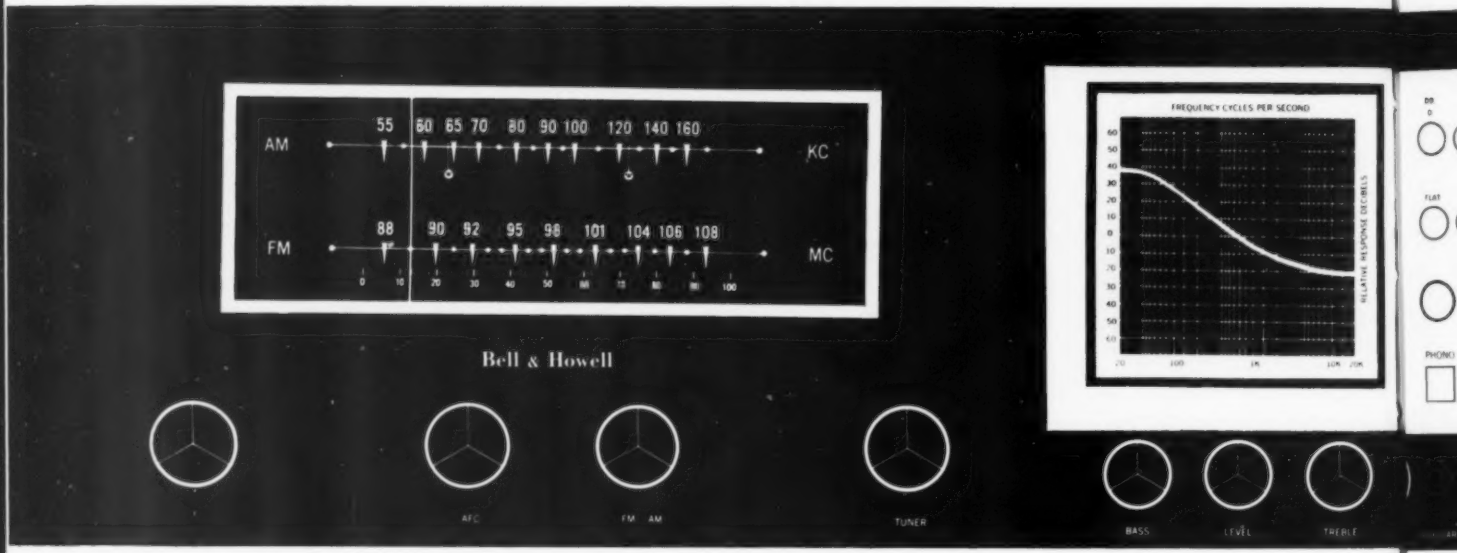




Shown at the top, a rear view of Bell & Howell's 72" single-cabinet hi-fi unit with the speaker enclosure open and the back plate removed. Large units are offered in two cabinet styles: accordion doors (center) or cane front with drop-down panel cover. Units come in five sizes with various component combinations.



The control panel dramatizes B & H's definition of hi fi



AM-FM TUNER
Manufactured to specification by Pilot. 540-1700 KC; 88-108 MC
AM sensitivity: 2 Mv at 20 db S/N ratio; 1.5 Mv for 20 db quieting
Selectivity: AM 6 db at 5 KC; FM: 200 KC at 6 db points
10 KC whistle suppressor: more than 89 db attenuation at 10 KC (AM)
Oscillator drift: negligible with automatic frequency control
AFC: continuously-variable amplified automatic-frequency-control voltage
Audio output: ± 0.05 db from 20 to 20,000 cps. Distortion: 0.2%

B & H PRE-AMPLIFIER
FR: ± 0.5 db 20 to 20,000 cps
Harmonic distortion: 0.2% max.; Intermodulation distortion: 0.1% max.
Hum level: 72-80 db below full output expected rating

VISUAL TONE CONTROL
3 knobs control visual adjustment of level and audio frequency response up to 15 db boost or attenuation at cycle ends. Side-lighted graph calibrated for frequency range (20-20,000 cps) vs. decibel level. (+60 to —60)

LOUDNESS CONTROL
Continuous variable to afford compensation of high and low frequencies in accordance with Fletcher-Munson curve.

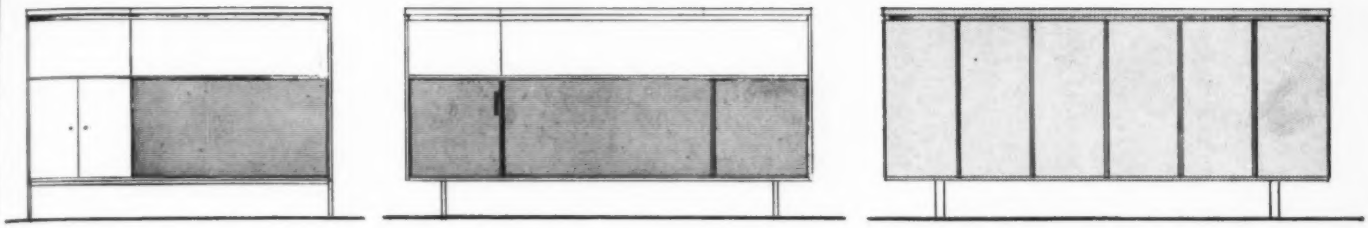
ditioned by the distortions of the victrola, radio and juke box to an excessive regard for low frequencies, and reproduction which is technically accurate often sounds intolerable to any boomy-base addict. Still another variable is the acoustical environment. Whereas a concert hall has many visual distractions, the home offers concentrated listening which may show up acoustical defects.

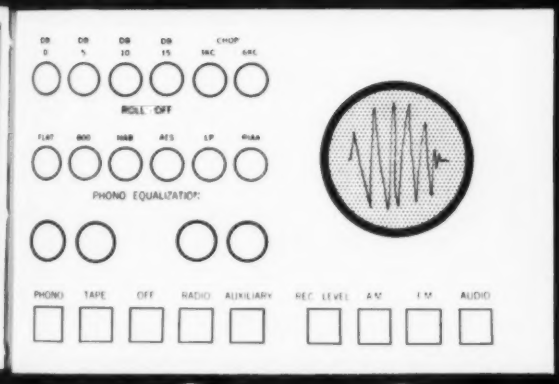
But even without absolute standards, it is possible to *measure* the fidelity of sound reproduction; and, Bennett maintains, most experts will agree within narrow limits on the proper setting for a given recording in a given setting. In other words, true fidelity can be closely circumscribed. The average listener may not want it that way, but a system which calls itself hi fi must be flexible enough to deliver that fidelity when it is called for. Bennett's second definition of hi fi, "a means of transposing the listener to a preferred position in a given acoustical environment," was the starting point for the engineering of the B & H line.

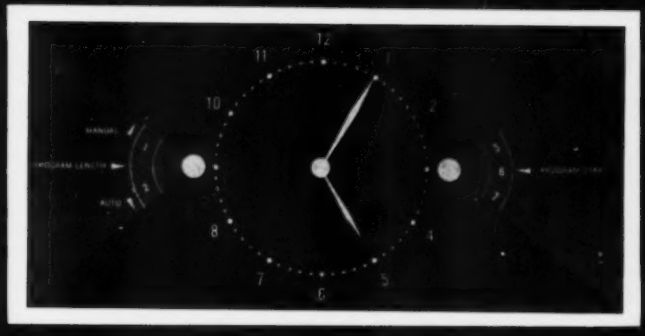
There are no short cuts to hi fi in Bennett's terms. It demands absolute perfection in three areas:

1) Flat Frequency Response (FFR). The pre-amplifier must be able to reproduce high and low tones in the audible range (20-15,000 cycles) without discrimination. Since during recording the lows are reduced and the highs emphasized, all systems have some built-in equalization which emphasizes bass and reduces treble to give an approximately correct balance for all recordings. B & H have a pre-amp equalizer with exact settings for each kind of record.

2) Loudness Control: When tones are reproduced in their original relative strength but at decreasing levels of volume, the listener hears an apparent drop in the strength of highs and lows. To preserve at lower volume the relative







EQUALIZATION NETWORK
4 pushbuttons for treble roll-off, 2 for 6 KC and 3 KC "chop filters." 5 pushbuttons for bass equalization, phono only; 1 for flat response.

OSCILLOSCOPE
On-target tuning, AM and FM. Indicates recording level adjustment for tape recorder. Registers sound wave of phono, radio or tape recorder.

PROGRAM CLOCK turns on desired radio program and records it on tape.

B & H TAPE RECORDER
2 "Brush Redheads" magnetic heads. 1/4 sec. start and stop; electro-dynamic braking; dual tracks with manual turnover; 3¾ and 7½ ips speed; manual reset program indicator. FR: Overall record-to-playback at 7½ isp ± 2 db at 50 to 50,000 cps. Wow-flutter: less than 0.2%

RECORD CHANGER: GARRARD RC 80M
3-speed 3-size capacity. GE variable-reluctance cartridge; turn-over type stylus selector; pick-up muting switch and pick-up protection; platform pusher-type record feed. Heavy drive shaft, 2 belt-driven idlers to filter out small drive variations.

POWER AMPLIFIER
Improved Williamson-type circuit; 15 or 20 watt output. FR: ± 1 db, 15 to 80,000 cps. Intermodulation distortion: less than 1%. Harmonic distortion: less than 2%. Hum level, approx. 85 db down at full output. Special feedback damping network.

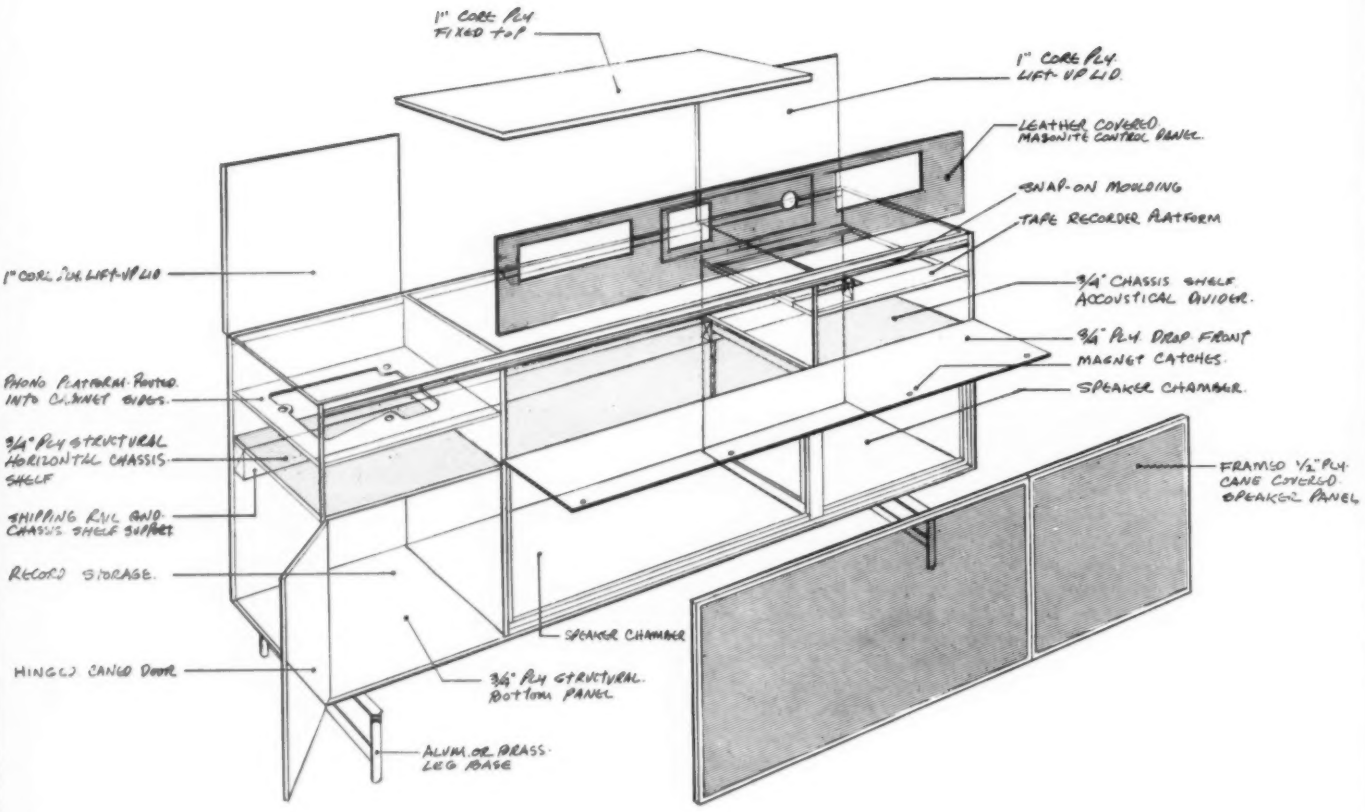
SPEAKER SYSTEM
Loudspeakers to specification by Jensen Mfg. Co.
1 or 2 12" extended-range woofers; 1 horn-type tweeter; speaker cavities from 4¾ to 8 cu. ft. Electrical response, ± 1.5 db from 15 to 50,000 cps; sound pressure response, flat 40 to 15,000 cps.

tone balance which the listener would hear at a "live" volume level, a Loudness Control automatically brings high, low and middle frequencies into a relationship which, though technically distorted, subjectively seems uniform.

Bell & Howell has combined this mechanical compensation with an uncompensated level control and a visual device. The Visual Tone indicator contains a flexible red plastic bar behind an illuminated scale, forming a replica of the engineer's frequency response curve. The treble and bass controls bend the bar to give a visual description of the effect of the listener's adjustments on the frequency response of the unit. The level control raises and lowers the bar to indicate changes in volume level of the entire curve, and may be used independently of the Loudness Control. (As the curve drops below "live" volume, it will continue to show the measurable sound leaving the machine, but not the high and low frequency changes which the listener actually hears.) The adjustments of the Loudness Control remain invisible and do not affect the position or shape of the visual tone indicator bar. But if the Loudness Control is properly used, the listener is able to *see* on the indicator exactly what he *hears*, because the Control maintains the uniformity of his chosen setting.

3) Faithful reproduction: The ability to reproduce sound waves at the same level of intensity as they are received, without intermodulation distortion or other spurious sound, depends on the quality of the pre-amp, and B & H feels it has spared no expense to achieve this quality in manufacturing its own.

Similarly, in selecting components, Bennett, like any audiophile, considered both their individual performances and their combined ability to keep hum, wow and flutter to a minimum. Full specifications are given above.



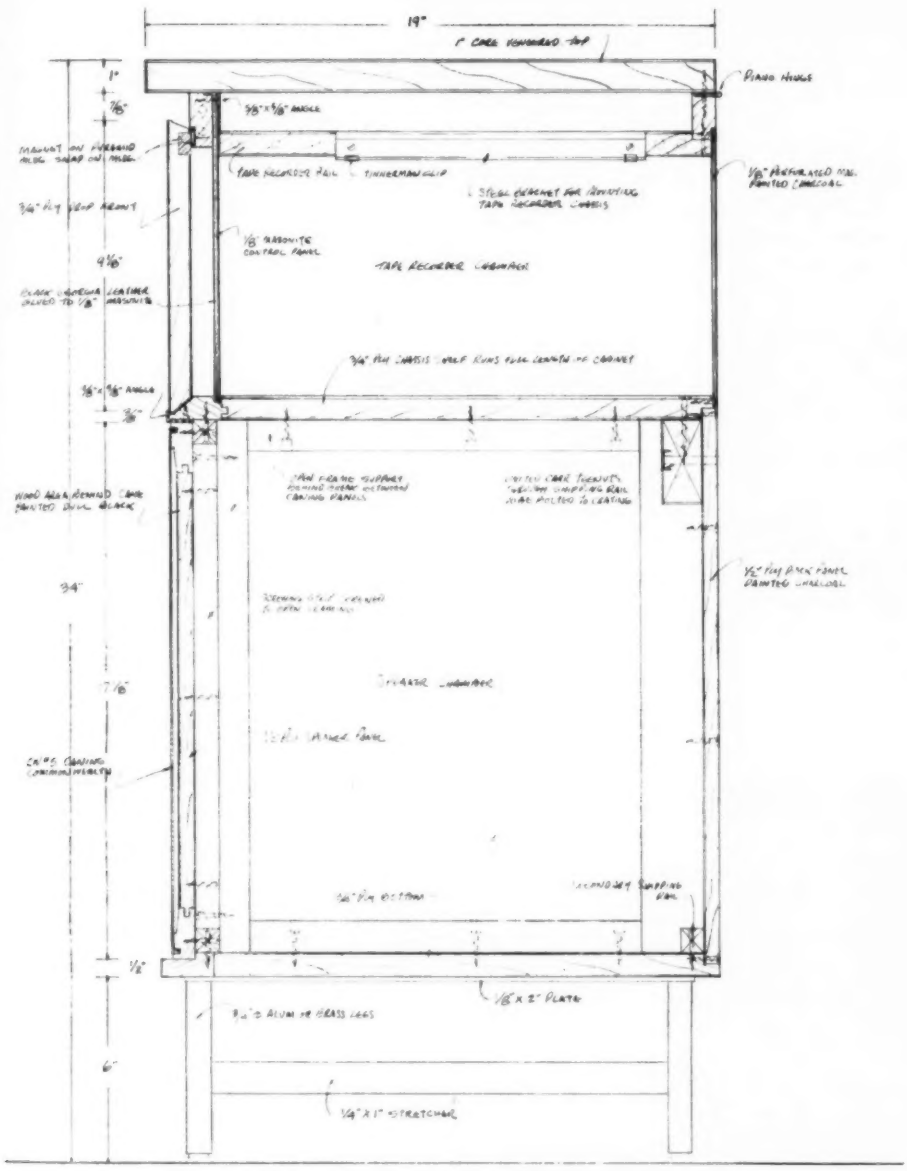
Exploded view of 72" cabinet shows how the speaker chamber at the bottom is isolated from audio equipment above.

Designing a series of hi-fi cabinets became an engineering problem

The design of a series of consoles to house audio equipment could have been a routine housing job, but it didn't work out that way for Paul McCobb Associates. Bennett was not interested in merely building a cabinet and then fitting in the components; he wanted a cabinet which would look and work like a musical instrument — for a good reason. His engineers were convinced that a speaker enclosure capable of handling 15 to 20 watts of audio power need not be separately boxed (as audio gospel would have it.) They decided to develop a single cabinet which would hold not only playing and amplification equipment, but an acoustically isolated speaker system, and McCobb was soon deeply involved in developing this new hi-fi cabinetry with the electronic engineers.

They solved the acoustical problem of feedback, in essence, by a particularly rigid construction which gives each piece of equipment an isolated chamber. A heavy 2x3" horizontal spine dampens the vibration of the 3/4" chassis shelf dividing the speaker chamber from the equipment. Further separated by an air chamber, the record changer is mounted on vibration isolators. The tuner, preamp and tape recorder subchassis are suspended on rubber mounts, and the entire back is enclosed with a 1/2" plate. Even at highest outputs, no mechanical coupling from loudspeaker to electrical circuits or pickup is detected. The design of the control panel also illustrates the interplay of technical and visual considerations. Costwise, it was desirable to have a single basic panel for all the six units. McCobb accomplished this by sectional organization, with the basic controls as the strongest visual element in the center. As components are eliminated in the lower-priced models, the corresponding control segments to the right and left can be dropped without destroying the unity of the panel face.

During early meetings, McCobb and Bennett agreed that the kind of product they had in mind should have "sight as well as sound interest." The ideas which came up eventually devel-



The graduated six-piece line, as the previous page shows, consists of 36", 44", 50", 66" and 72" units in a choice of five finishes. The three larger models offer an oscilloscope for target tuning, and the two largest have as a bonus an automatic program clock.

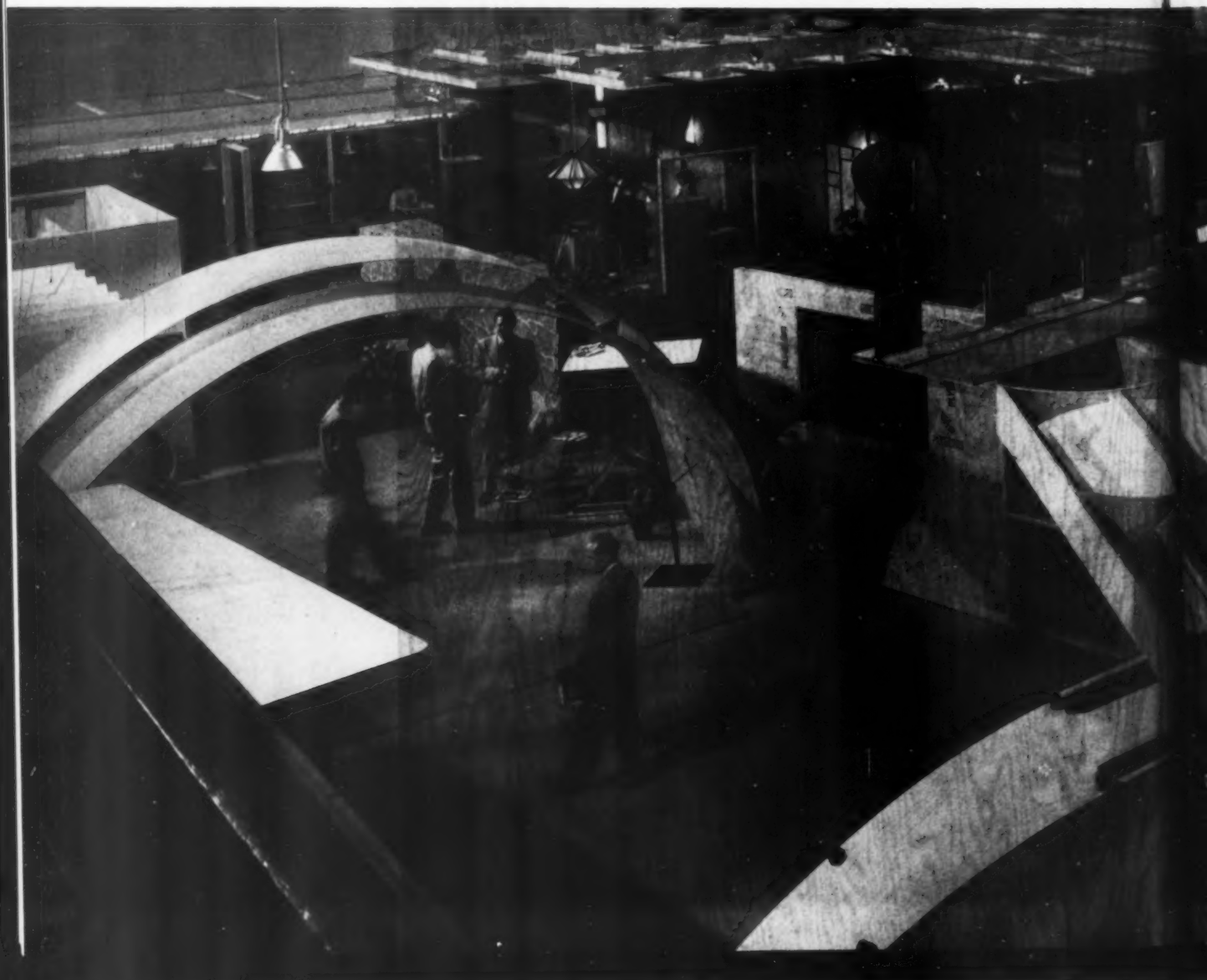
The section at the left shows the heavy framing of the cabinet to achieve acoustical isolation for the loud-speaker chamber. The horizontal framing member also functions as a shipping rail, on which the entire weight of the unit is carried when it is crated for shipment.

oped into the Visual Tone Control and the oscilloscope tuner — devices which might be gilding the lily for an audio purist, but which B & H felt would make hi fi more understandable, and more fun, for its particular market.

In choosing surface and trim materials, McCobb was concerned with both quality and performance. For instance, natural caning was selected for the speaker panel after extensive testing, because of its excellent acoustical performance and luxurious texture. And in the precise detailing and careful proportioning of the series of cabinets, he was expressing Bennett's dual-product objective: an excellent instrument suitable for the contemporary interior.

Development of basic materials through design

case no. 2: # PLYWOOD



The organization — *Douglas Fir Plywood Association*

The problem — *To promote the sale of plywood and allied products*

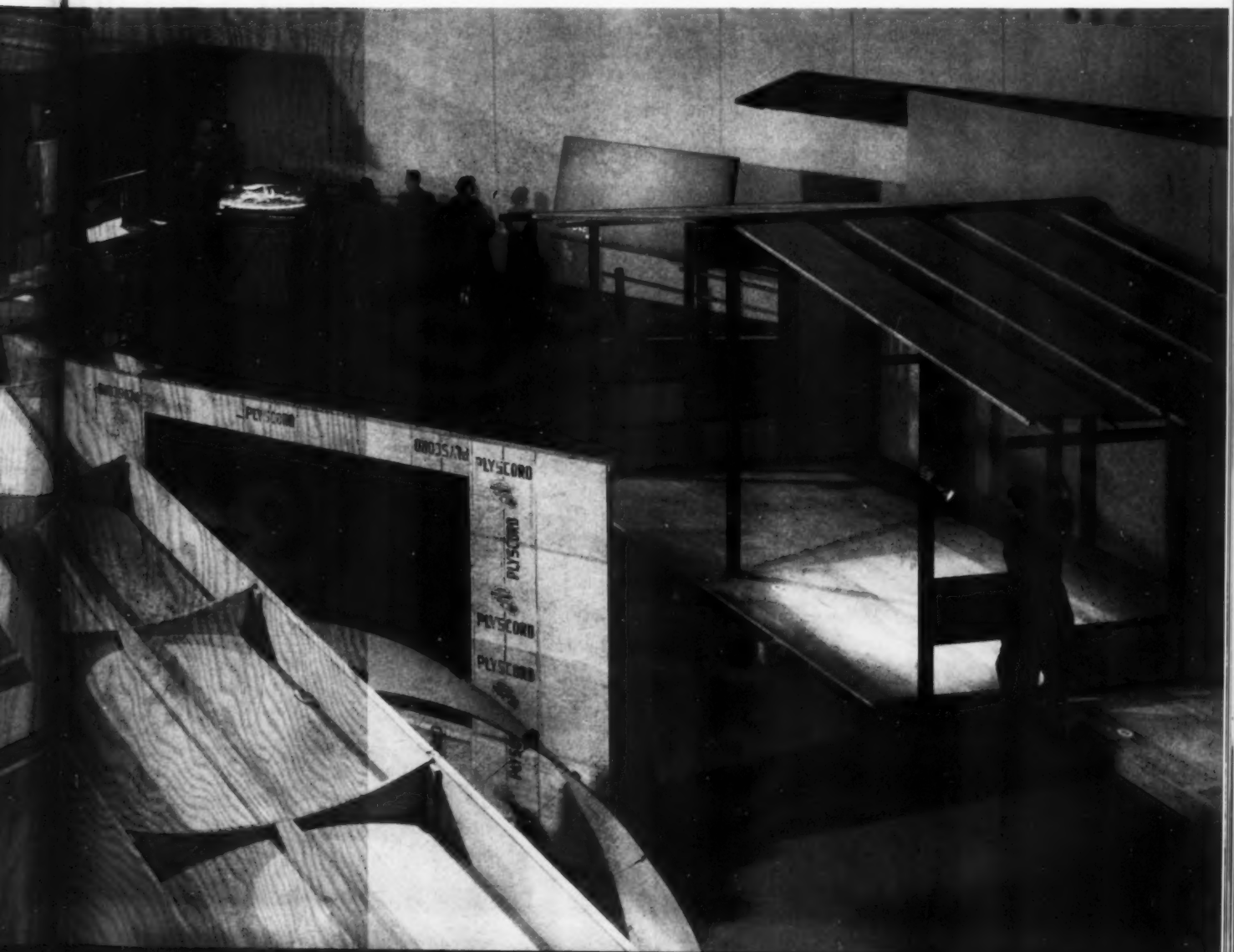
Its objective — *To expand the design possibilities of plywood*

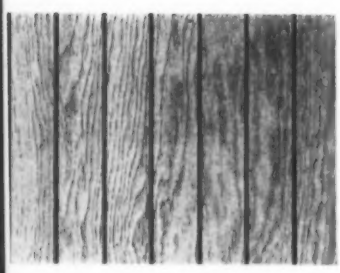
This is the Year of the Golden Jubilee for manufacturers of fir plywood, the 50th anniversary of the development of this basic material, and the Douglas Fir Plywood Association of Tacoma, Washington, commemorated it recently with an Exposition of 50 Golden Ideas—the ideas of five architects to demonstrate to other architects and designers the adaptability of fir plywood to a myriad of problems in design and structure.

The activities of DFPA (a non-profit trade-promotion organization supported by the various fir plywood manufacturers) are of two kinds: technical and promotional. While one hand develops a new surface to meet new design demands or conducts tests on plywood diaphragms for roof decking, the other tries to get window streamers into the 27,000 retail lumber yards or concocts an exposition of ideas for the designers who might specify their product.

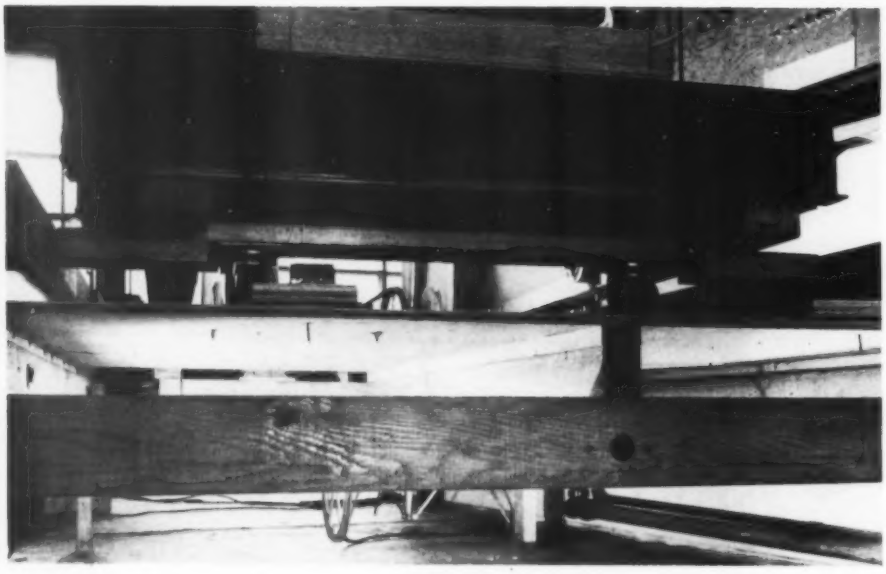
Moldability, flexibility, resistance to warpage and splitting, strength in all directions, light weight—these are the characteristics which make plywood a versatile and widely used product. How DFPA has employed design to find and to suggest not only new applications but new forms for their members' product is shown on the next six pages.

Shown below is a portion of the Portland (Ore.) Armory during the recent DFPA Exposition of 50 Golden Ideas. The plywood arched panels to the left and, in the center, the barrel-vault roof panel, the Plyscord sheathing, the molded structural angles, and the house model are all shown on subsequent pages. Cutaway at right shows subfloor, wall and roof-ceiling systems, the last a two-level arrangement.





Texture One-Eleven (to the left) is a rough-surfaced plywood panel with a vertical accent. The large size of the panels and their easy installation mean cost-savings. The builder whose house is shown below estimates savings of 40% on the in-place cost of the material. Constructions like the vast plywood roof deck (below center) would have been impossible with lightweight panels prior to completion of DFPA's diaphragm research. One phase of this research project was (bottom) determination of the effect on undersides of the roof surfaces of heavy loading on the panel edges. Design methods were developed out of this data.



Texture One-Eleven

At the 1905 Lewis and Clark Exposition, fir plywood had its beginning as a single panel made in a Portland box factory; last year, nearly four billion feet were manufactured. Expansion of this sort is brought about by constant efforts to open new markets. Texture One-Eleven is an instance of a design that opened such a market, done by DFPA itself.

Until recently, fir plywood had been very little used as siding for homes because of two deficiencies: its tendency to check out-of-doors, and the lack of any surface to meet the design trend toward vertical visual patterns. Joseph Weston, DFPA field promotion director, suggested a vertically shadow-lined panel on which checking, if it developed, would not be apparent. A machine for grooving and shiplapping was developed by Harold Evans at the Plywood Research Foundation in Tacoma, and T 1-11 was introduced: a 5/8" fir plywood panel with heavy grooves two or four inches apart. With the surface left rough, checks merely contribute to the rustic veneer, while the grooves, together with shiplapped panel edges, provide an unbroken vertical pattern.

In 1954, 33½ million feet of T 1-11 were sold.

Formulas for roof decking

Developing new techniques for structural utilization of fir plywood is another way in which DFPA has expanded its markets. During the past four years a vast market has been opened in roof decking for schools, supermarkets, warehouses and industrial shop buildings. A research program to determine

Poised below, in various modes of extreme contemplation, are the five architects who were commissioned to have 50 Golden Ideas. Clockwise from the floor, they are: Chris Choate of May & Choate, Los Angeles; S. Robert Anshen of Anshen & Allen, San Francisco; John Campbell of Campbell & Wong, San Francisco; Whitney Smith of Smith & Williams, Pasadena; and A. Quincy Jones of Jones & Emmons, Los Angeles. Left: the exhibition.

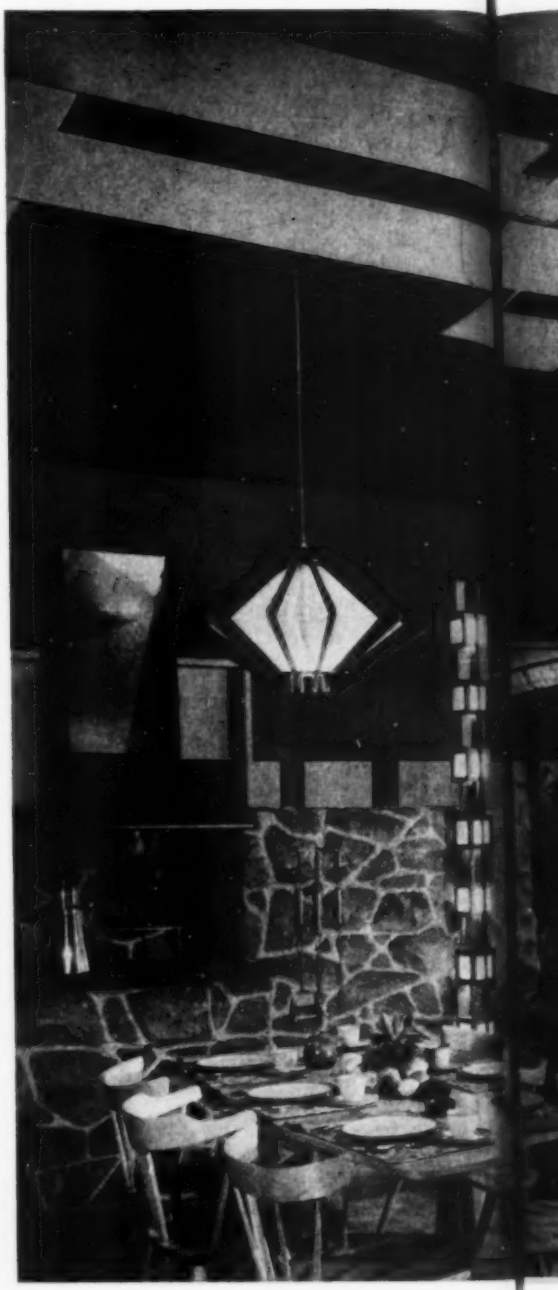
the shear strength of plywood diaphragms was initiated by N. S. Perkins, DFPA technical director, and carried out by David Countryman, civil engineer, at their testing laboratory in Tacoma.

Quarter- and full-scale tests were made to calculate the necessary nail spacing, plywood thickness, and design system for a plywood-sheathed diaphragm that, when in place as a roof, would act as the web of a giant I-beam and brace the walls. Bearing capacities of plywood roof sections under uniform and random loads were measured. With the data accumulated, DFPA found it would be possible to utilize plywood's high horizontal rigidity for safer, lighter roof surfaces and substantial cost-savings.

5 men have 50 ideas

While T 1-11 and the roof-decking research represent realized sales of fir plywood, the recent 50 Golden Ideas Exposition in Portland, Oregon, is a projection of future plywood possibilities. From Plangles to the ply-panelled sink, it was an unusually ambitious undertaking in basic-material promotion.

One way to stimulate the sales of a material which architects and designers use is to consult the designers themselves for suggestions. So an exhibition was planned. Architect Chris Choate of Los Angeles was commissioned to design it, under Mr. Weston's direction; then Choate and four other leading California architects were hired to fill it with ideas. The result was a number of conventional designs, but enough unique ones to make the show an interesting display of plywood possibilities.



Plywood to design with

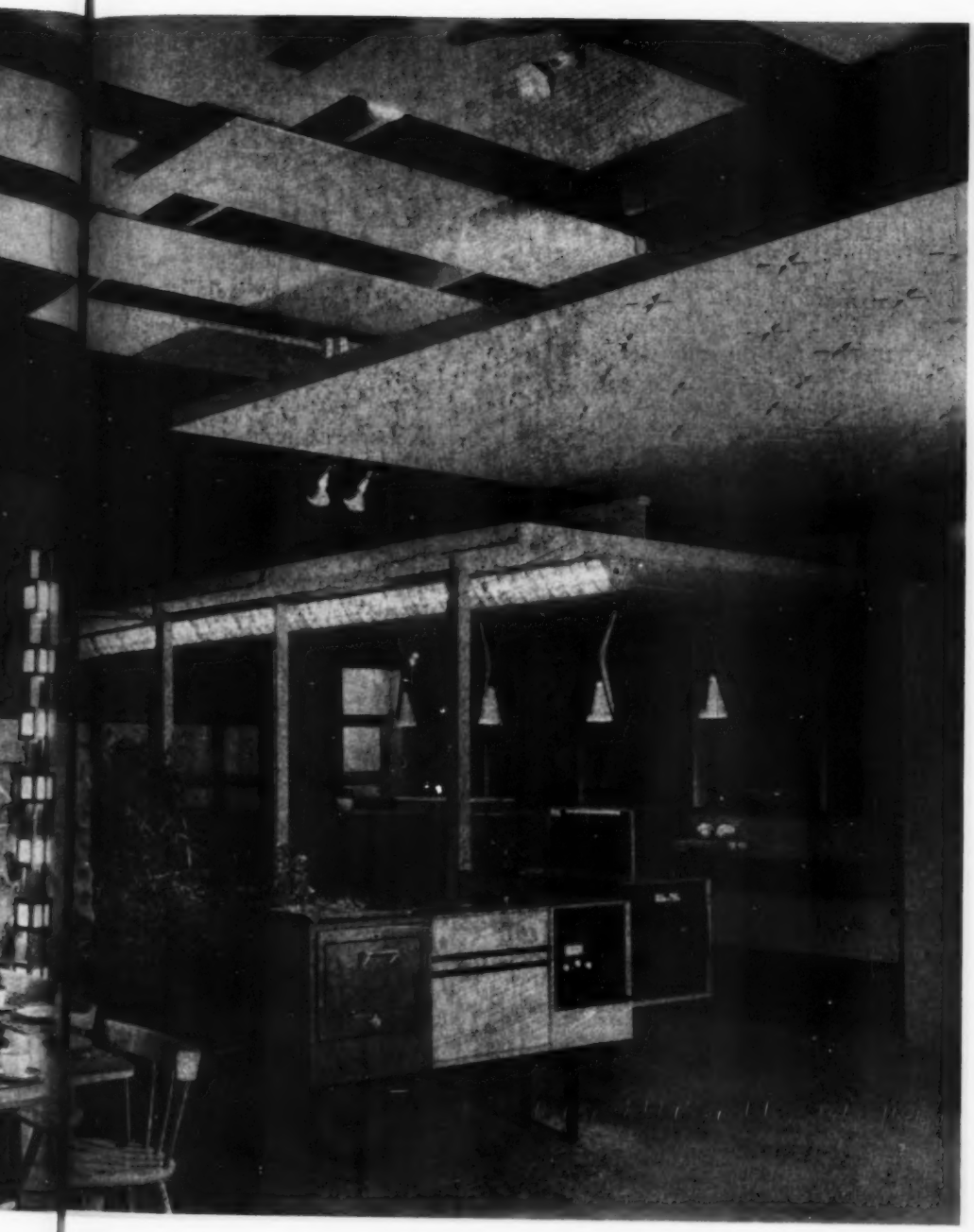
To house the 50 Golden Ideas, an exhibition in three major sections was designed. One reviewed the industry's accomplishments. The central part consisted of stylized architectural settings for the bulk of the Golden Ideas: small-home design (only one example), indoor and outdoor architectural applications, indoor and outdoor furniture, lighting arrangements and fixtures, and purely decorative uses.

Moke (photo above) is an instance of the last, a new decorating concept developed by Smith & Williams that capitalizes on plywood's great flexibility. It involves cutting slits in a plywood panel to form pie shapes, stars, parallel lines and other patterns, then weaving dowels or battens through the perforations or inserting discs, squares or pegs. Moke patterns can be backlighted, and the architects suggests such uses as screens, doors, grilles and fences.

Architectural Golden Ideas centered around a U-shaped barbecue, kitchen and breakfast area (large photo to right), designed by Anshen & Allen. This setting is marked by a series of plywood dining and kitchen units floated in glass panels, which enclose a central patio garden.

"Cubes of Light" (photo near right) is one of the nine lighting ideas. Lighting elements are concealed in 6" plywood boxes with open sides covered by parchment. The boxes alternate with sets of baffles designed to throw the light at varied angles.

This garden reflecting pool (Anshen), all plywood with a bottom of 3' x 12' panels over a web, can be lighted from beneath.



Shown at left is the central indoor-outdoor living area, designed by Anshen & Allen. Kitchen utility and storage units (around "L" to right) are low and floated in glass, providing a clear "view through." Also by Anshen is the bar cabinet (right foreground), which contains the unique combination of a warming oven, refreshment storage, and space for a radio and speaker. The two-level ceiling soffit (top left), by Campbell, lessens room height and provides for indirect illumination. To right is a Moké-patterned ceiling (Williams).

The conversation platform (¾" plywood 6" off the floor) by Choate replaces a furniture group, keeps seating, circulation apart.

This sink counter (Anshen), and all non-copper surfaces in the kitchen units, are finished in two shades of high-density resin-overlaid plywood, which is hard and glass-smooth.

Plywood to build with

The final section of DFPA's Exposition displayed new products and structural systems that exploit plywood's moldability, flexibility, or omni-directional strength. Molded structural angles (tradenamed Plangles and shown at right on facing page) are a formed plywood product of great strength and little weight. Anshen's elegant cantilevered canopy (right) consists of ¼" sheets of fir plywood held in curves by shaped tension members above and nailed to end and middle longitudinal framing members to form hollow stressed-skin beams. Sandbag tests show them able to span 16 feet.

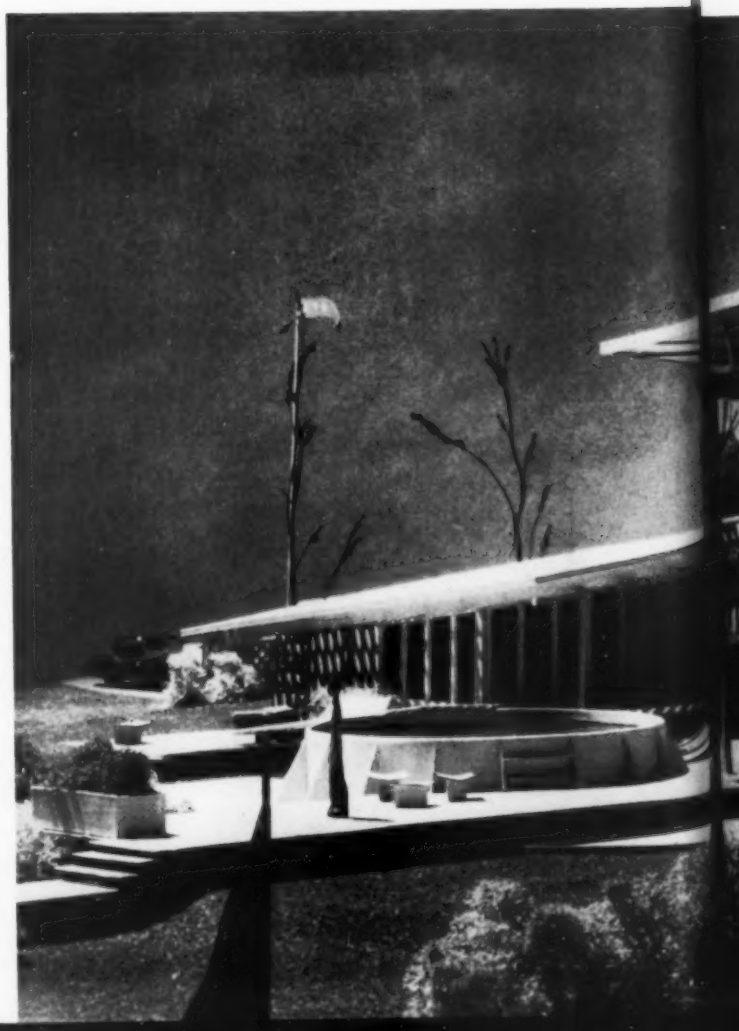
Choate's system for walls and roofs of warm-climate or vacation homes (p. 57) would facilitate prefabrication and quick, low-cost installation. His wall starts with posts on 3 ft. centers. Random rectangles of plywood are rabbeted into the posts and alternated with glass rectangles to create any desired rectilinear pattern. The roof system provides a linear, two-level effect in the ceiling consistent with the pattern formed by the structure of the wall. Two-foot widths of ½" plywood are nailed alternately one down and one up to the parallel spacing members, creating a strong interlocking effect. *h. b. j.*

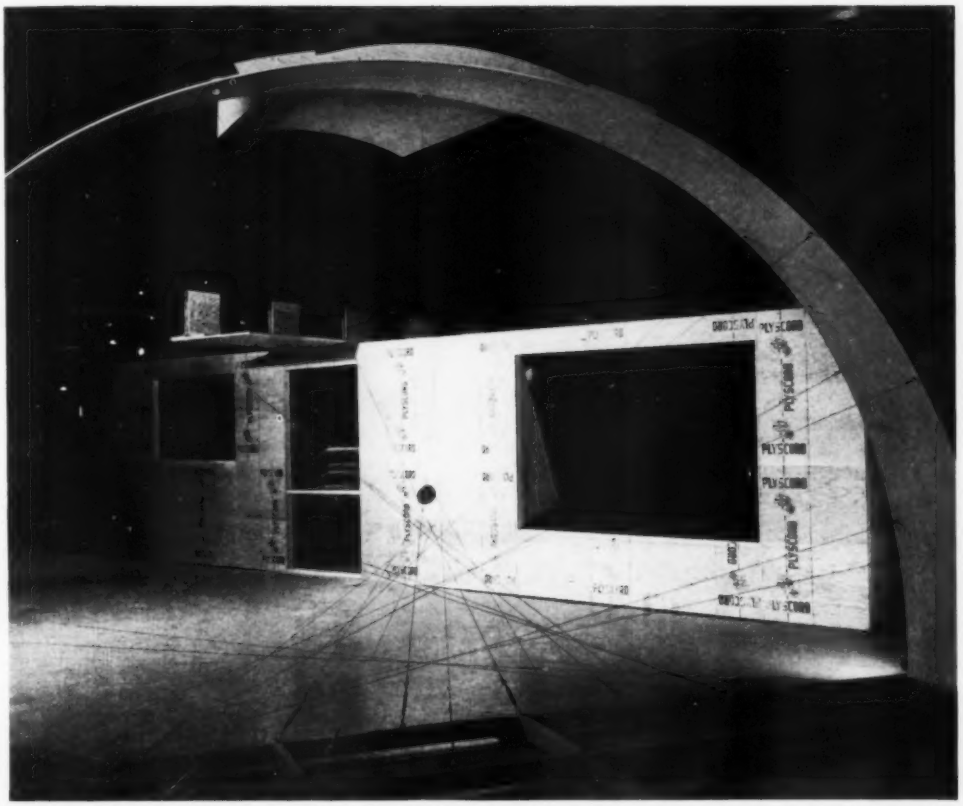
Plywood Leisure House: Campbell & Wong, Architects

". . . It may not appeal to many of you, but the house that we have designed is for a man who has gone back to, well, not nature, but the principles of leisure, which I say is relaxation. . . . It is something you dream about when you are painting the side of the house or mowing the lawn, when you yearn for that nap under a shady tree. . . . This thing is a sort of three-structures-in-one. One structure is very low, almost in the form of a cave, in which there is a fireplace and concrete step, like an amphitheatre, where people can sit around and gaze at the fire. There is a great fascination and magic in watching and listening to a log fire. And then for variation in this lazy living is a great big pavilion, where you could go up to watch the sunset or to watch the moon, a very elegant Japanese pastime. . . . Below this pavilion, which is about twenty feet in the air, there would be quite a shadow in which you could lounge in hammocks, just like the old apple tree. And then there is another structure that is pretty much standard. That is where you have to eat and cook and sleep. . . ."—Worley K. Wong

Anshen's garden storage unit contains four compartments.

Stressed-skin plywood columns (Anshen) support roof.





Trademarkings on Plyscord wall and roof sheathing (through arch) can be used as nailing guide.

One use shown for molded angles.

Plywood leisure house has three units: a windowless fireplace structure (right), a sun-shelf and arbor (middle), and a functional center.

Paul Rand: ideas about ideas

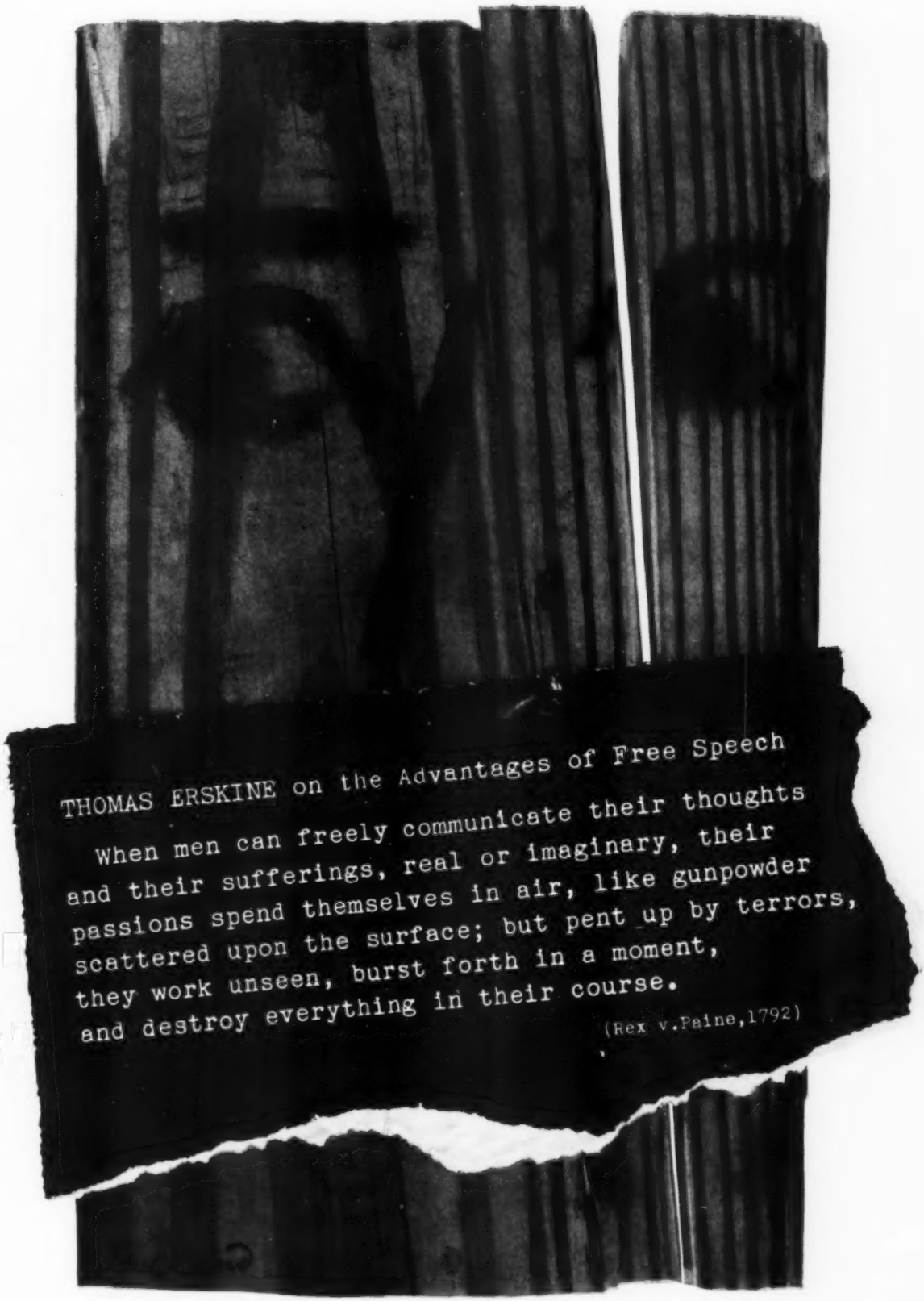
When asked to include my picture, I substituted it for one of some old boards which, with the Etruscan profile, had given me the idea for the Container ad (N. W. Ayer Agency). That it happened to fit shows how flexible a layout is.

In the June issue, ID inaugurated a series of "case histories" of graphic designs: Lester Beall's integrated design program for the Torrington Manufacturing Company was accompanied by his comments on the layout he prepared, offering insight into the approach of a designer working in this important area of designing for industry. In this installment, Paul Rand explains how and why the examples of his work were organized and laid out as we see them on these eight pages.—Ed.

Where do you get your ideas? What inspires you?

Any theory of mine on "inspiration" is offered with reservations, because creativity is almost as mysterious to the artist himself as to the layman. However, I do believe that for the most part inspiration comes from rather unromantic and often unexpected sources.

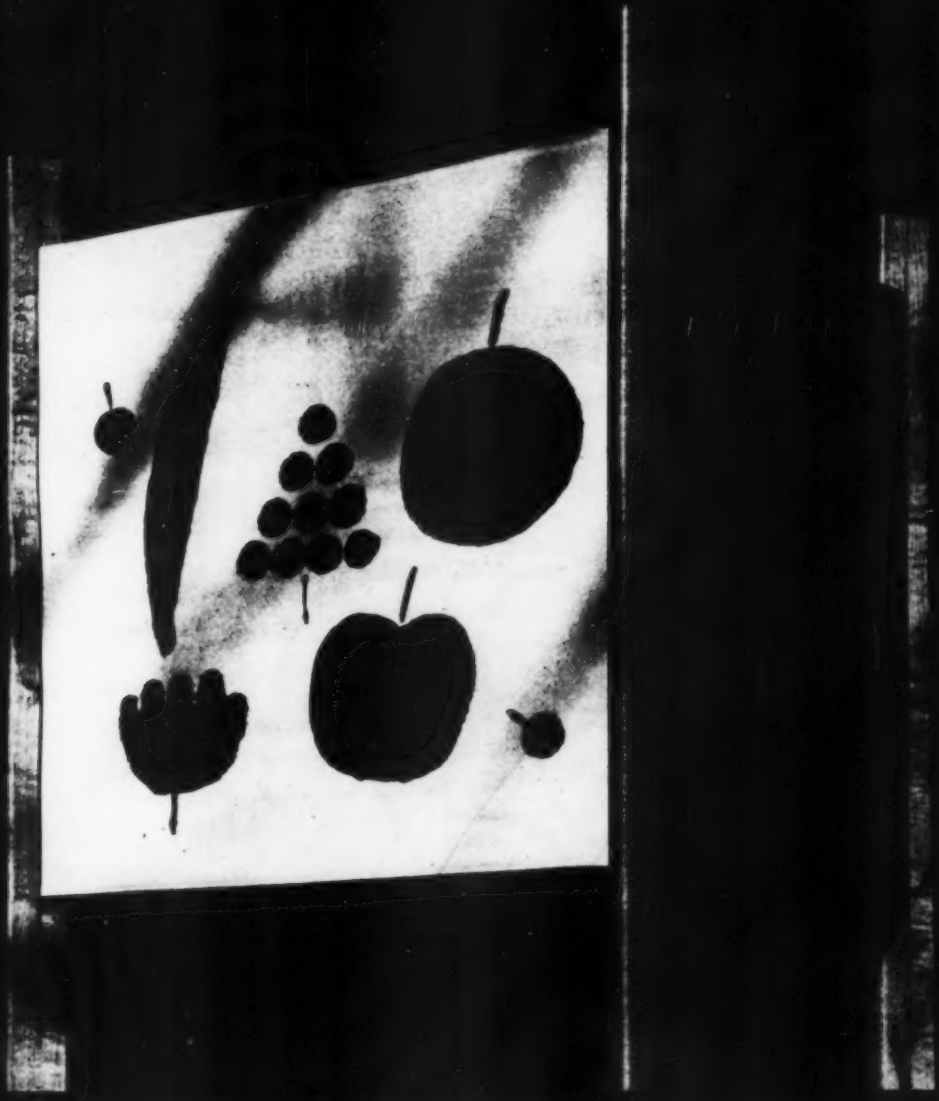
The artist is by necessity a collector; he accumulates things with the same ardor and curiosity that a boy stuffs his pockets. He borrows from the sea and from the scrap heap; he takes snapshots, makes mental notes, and records impressions on tablecloths and newspapers — why one particular thing and not another, he may not know at the time, but he is omniverous. He has a taste for children's wall scrawlings as appreciative as that for prehistoric cave painting. Wildly heterogenous as his inspirational source material appears, there is a common denominator, and that is the satisfaction of his constant search for new forms; he takes note of what jolts him into visual and emotional awareness. Without this harvest of visual experience, he would be unable to cope with the multitude of problems that confront him in his work.

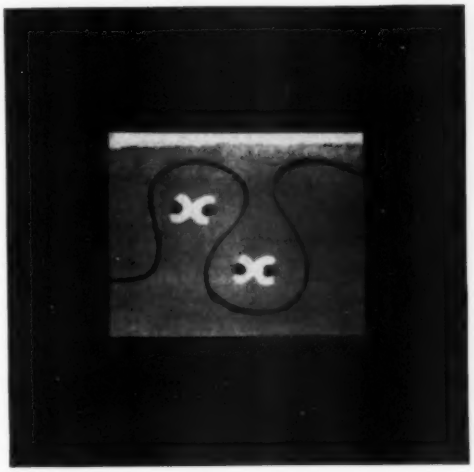


Olivetti Lettera 22

Interfaith Day

The Olivetti advertisement (opposite page) is based on a drawing I did for my own amusement some years before the problem ever came up; I used the typewriter in half-tone to provide exciting contrast to the line drawing. The drawing on the right is by John Corwin, aged 6. Simply for the fun of it, I "adapted" it for the folding lamp below, making some minor alterations, perhaps not for the better. The Interfaith poster is another example of an inspiration from children's art with its incomparable spontaneity.

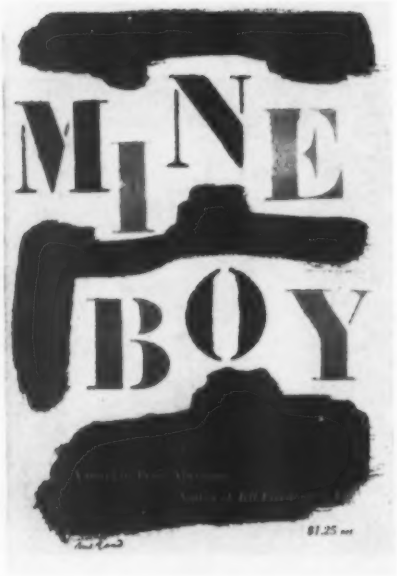




An old Parisian fashion plate from 1896 was the incentive for a series of advertisements, one of which is shown at the left. As a matter of fact, the layout of this double spread was in turn inspired by the Disney advertisement; the heterogeneous assortment of pictures is tied together by the repetition of the black square. The Inter-faith poster and the Japanese magazine cover are both based on paintings I did some years previously. In the case of the poster, only the essence of the idea was used; in the magazine cover, however, the painting was adapted almost literally.

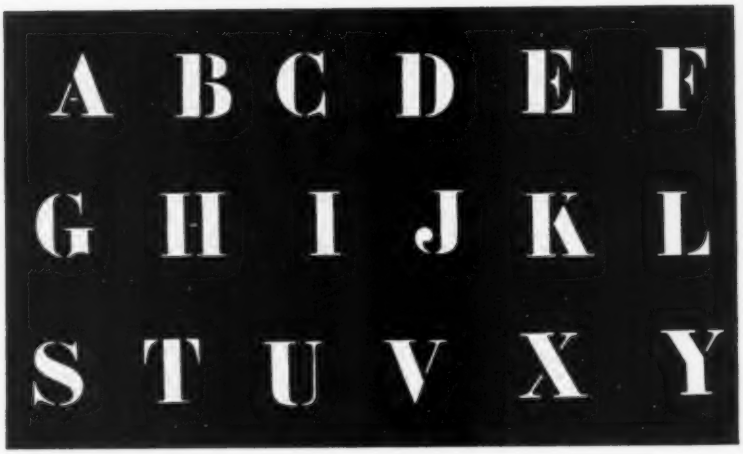
How do you approach a given problem, a product or a layout?

Like any designer, when I have extracted from a mass of complex material the how, the why, the when and the where, I may find there (or in the unconscious storehouse) one or more symbols to convey the significant idea. These must be used suggestively, to engage the imagination. *Contrast* is one of the guiding principles—not only a contrast of symbols, as in the Olivetti ad (previous page), but the contrast in size, color, technique, in a photograph juxtaposed with a line drawing. The effect of startling simultaneity, with two unrelated objects integrated in space, creates a kind of visual test, inviting the spectator to observe and decipher it for himself. Besides the strong contrast in the Disney ad at the left, there is an attracting, rhythmic repetition in the squares and rectangles. This sense of continuity underlies the layout of the whole spread, with the black square from the Disney hat repeated to unite a group of small, unrelated pictures. Four squares in turn make a larger one, clearly organizing the page.

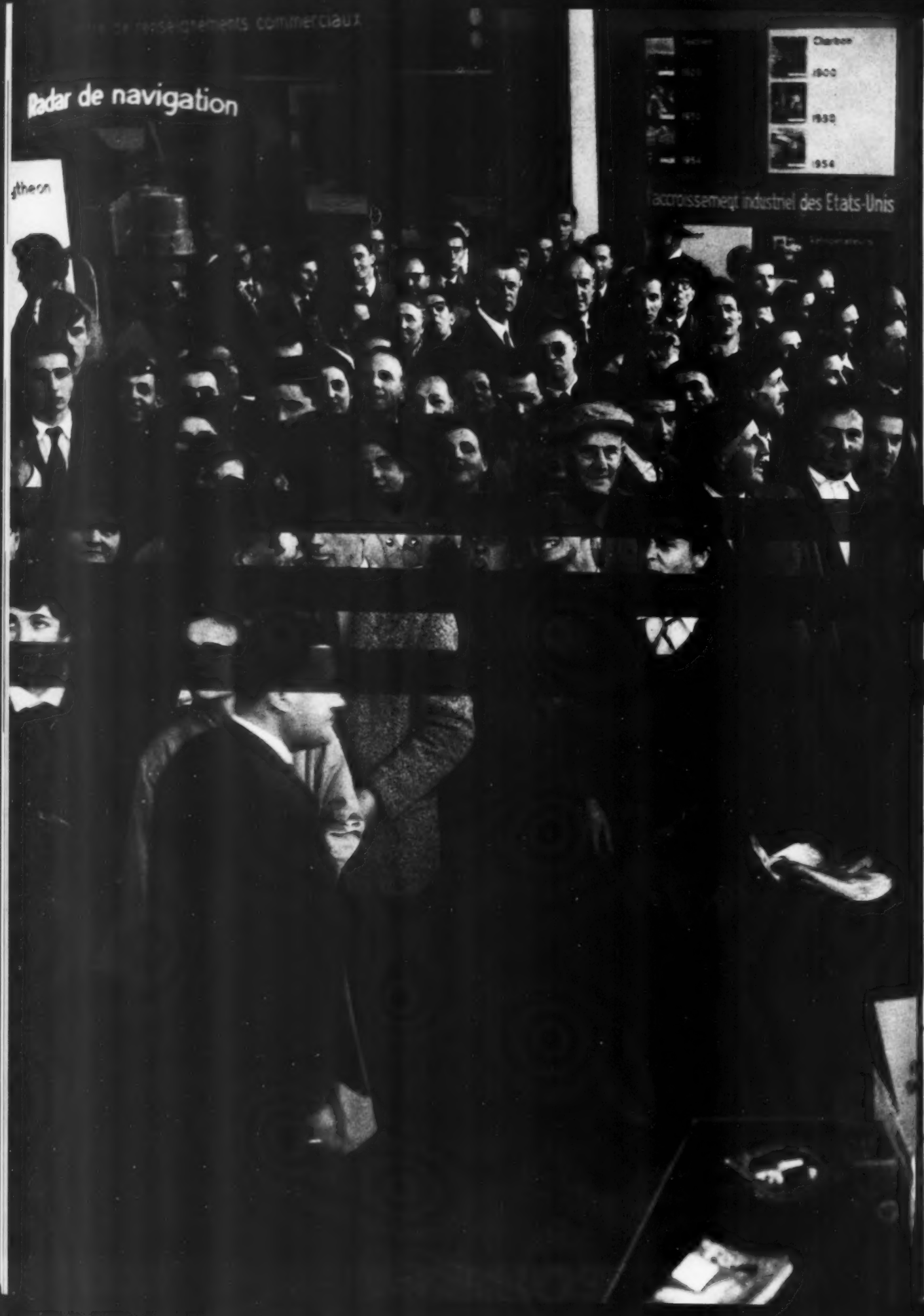


There is a definite emotional force generated by the *repetition* of words or pictures, and there are endless graphic possibilities here. Rhythmic repetition is apparent in all the examples on this spread: in the stencil, in the book jacket where the same typography is used more freely, for "El Producto" to suggest that cigars come from abroad; and it supplies the basic forms for the fabric design.

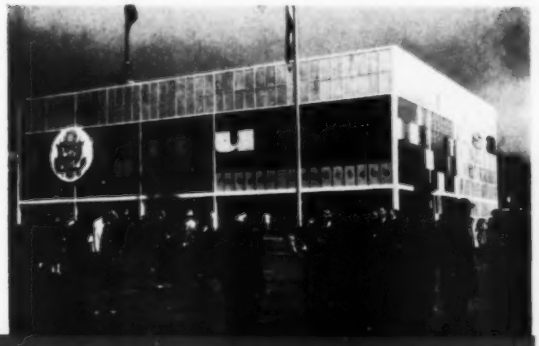
Bleed pages (right) should be used only when they contribute to the total visual effect, when they help to clarify the message, and when they convey the provocative quality of something partly seen. The full page single ads in this article use the bleed simply as an extension of a white or black background; in the fabric, the bleed gives the feeling of the continuity of a bolt of cloth. A rhythm is also created by the alternating bleed pages in the total layout. Since we are in the habit of reading from the left, I started this article with text on the left rather than on the conventional right side. This, I feel, helps the article begin as a spread and not as a single page. I used a full-page photograph to create a visual conclusion to the story.



A type stencil caught my eye in Paris, and it turned out to be the inspiration for all sorts of interpretations, from the book jacket for Alfred A. Knopf to the "Animalphabet" fabric for L. Anton Maix. I decided to animate the cigars with masculine symbols; the ad adapts to any size layout up to full newspaper page, showing any number of figures. (Agency: W. H. Weintraub)


Radar de navigation
Charbon
1800
1930
1954
l'accroissement industriel des Etats-Unis

This newly-built pavilion at the main entrance of the Paris fairgrounds, of glass with colored panels, will remain for future U. S. exhibits. Coulon and Crivelli of Paris designed and constructed it; Peter G. Harndon, the Trade Fair Office's Chief of Design and Production, was in charge of the installations.



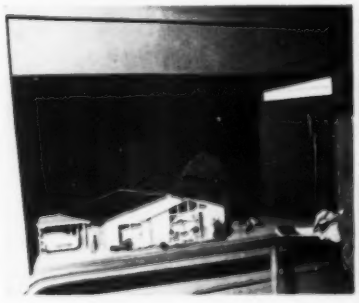
PARIS

MILAN

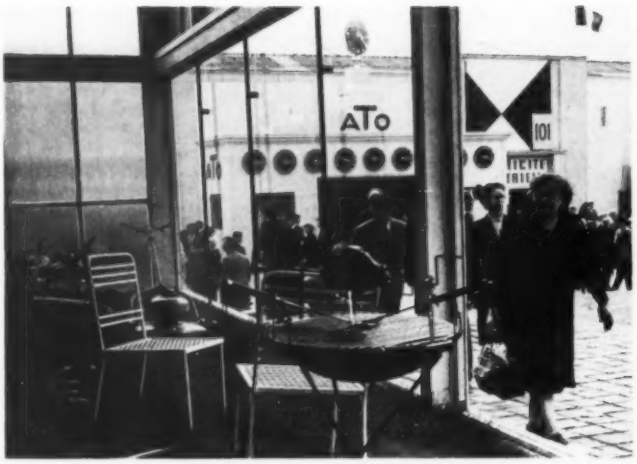
Government leaders made official visits to all the fairs. Left to right: Roy Foster Williams, Director of the Office of International Trade Fairs, Secretary of Commerce Sinclair Weeks, and Ambassador Clare Booth Luce in Milan. Below, one of the model homes in the panorama of the community. Lighting here, with night and day effects, was done by Gerald B. Ewing, consultant for both fairs.

The animated French faces on the left are watching themselves on a closed-circuit television system in the U. S. Pavilion at the Paris Trade Fair, an annual event at the Porte de Versailles in the middle of May. Aware that the big trade fairs are just as much a means of informing the European public about the United States as they are an instrument for marketing, the Department of Commerce set a precedent this year: its Office of International Trade Fairs officially called upon designers to display American goodwill.

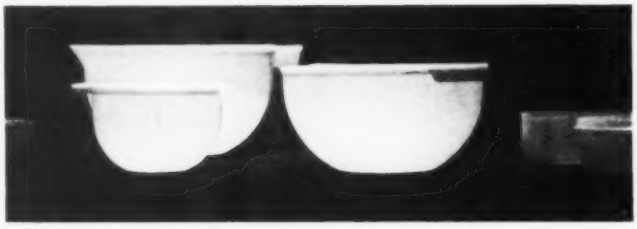
The exhibitions at both the Paris and Milan Fairs, designed by Peter Schladermundt and built by Gardner Displays, dramatized the benefits of mass production for the average American family. In the center, a photographic panorama of a Levittown-type community supplied reference points for individual model houses in special slots. In full size were: a living room furnished by *House Beautiful;* a kitchen equipped with the newest gadgets; a portion of a supermarket (below); a farm program exhibit, transportation and industrial products. 80% of the Milan installations were transferred to Paris, expanded to include TV and a kindergarten furnished with American kids and teachers (above).

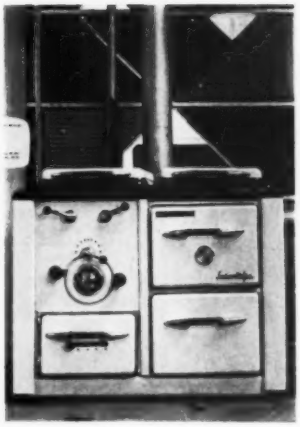


View of an American barbecue grill standing in the garden area of the U. S. pavilion also shows part of a French building with exhibits of industrial electricity. Some examples of American-made plastics are shown below; to the right, a yellow General Electric stove. Above right, one of the many French products at the fair was a low-priced oven of cast aluminum with a glass lid.



Photos Marilyn Silverstone

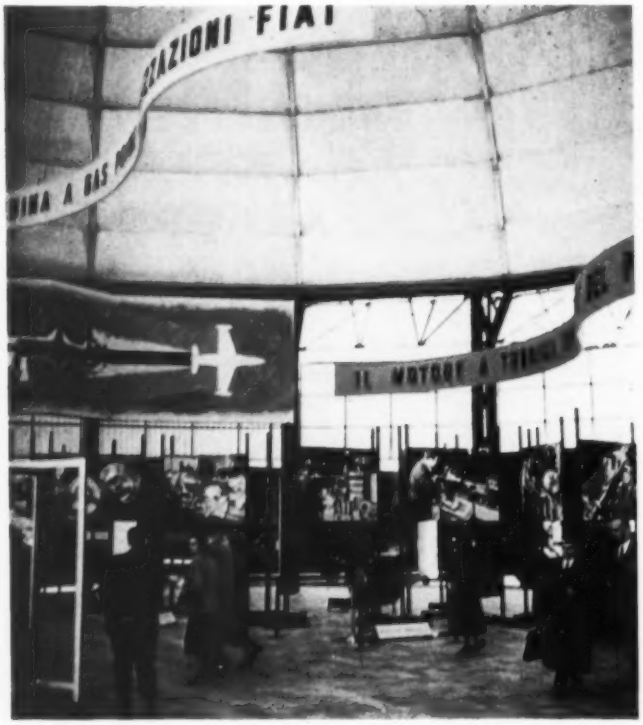




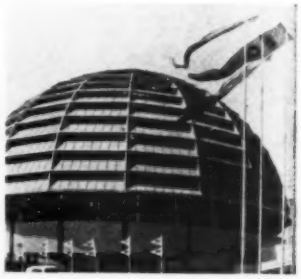
PARIS

MILAN

Italian industries constructed elaborate—and semi-permanent—indoor and outdoor exhibits on the vast Milan fairgrounds. Fiat built a dome of structural metals with cleverly overhanging slabs to let in the light, and Finmare, a poured concrete tower.



Photos Peter Schladermundt



Industrial Design is a feature in itself in an exhibition organized by the Society of Industrial Designers for a Belgian Fair

LIEGE

Another means of presenting life in the United States through design was the exhibit, at the Liege Fair (April 23-May 8), of work by 18 members of the Society of Industrial Designers. Arranged by Peter Muller-Munk and William Winterbottom at the request of the Department of Commerce, the S. I. D. show represented the United States in Belgium's second largest fair, one that is organized with a view to educating Belgian industry in the uses of Industrial Design, Packaging Design, and Advertising and Graphic Arts. The 66 items from the U. S. (not unfamiliar to readers of this magazine) occupied a complete wing in one of the buildings. The display attracted 60,000 visitors. Some of these products were also sent to Paris to round out Peter Schladermundt's "Main Street, U.S.A.," and 44 were displayed in June as a unit in Barcelona's International Samples Fair.

SWEDEN *takes a backward glance in H55 exposition at Halsingborg*

by Frederick Gutheim

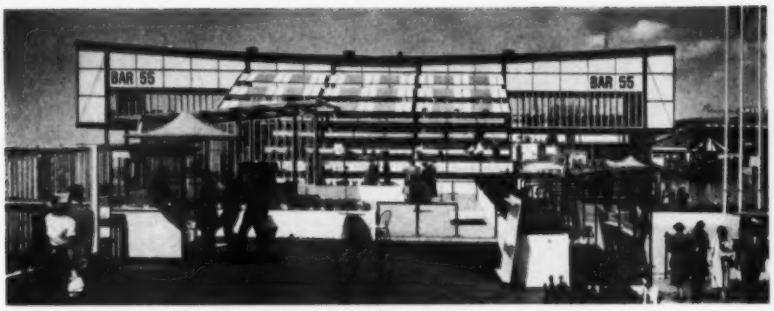
The Scandinavian countries took their stand firmly in favor of established handcrafts at H55 in Halsingborg, their first major exhibition since Stockholm 1930. The fair itself, a work of significance to planners and architects as well as designers, runs through August; it is dramatically situated on a breakwater separating the port of Halsingborg from the Oresund, a 20-minute ferry ride from Hamlet's castle at Elsinore.

Whatever industrial design *is* allowed in H55 is limited to imitating the work of gifted craftsmen of luxury products. The prevailing orientation of Swedish industrial design, with its roots in handcrafts, is that a backward glance at the handcraft tradition will vitalize industrial design as, let us say, the fine arts in Italy vitalize the handcrafts. It leads, on the contrary, to copying; appropriate forms, instead of arising naturally from the interaction of the creative designer with new uses and production methods, are constantly frustrated and confused.

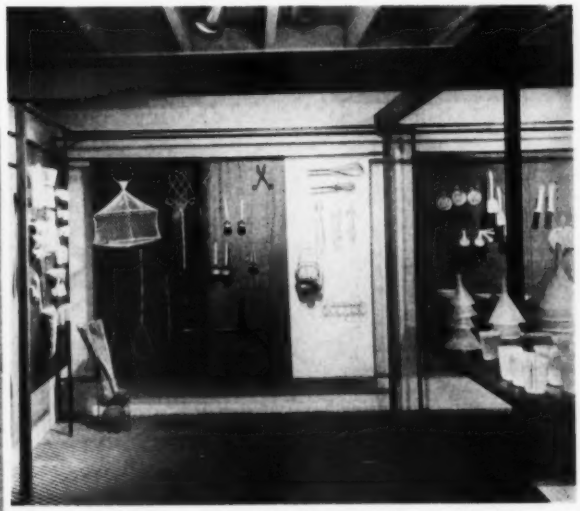
Arne Korsmo, a Norwegian, provides one exception to this discouraging picture in a handsome line of stamped silver tableware, now also produced in stainless steel. There are a number of industrially produced folding chairs, and a canvas laced to metal frame chair designed by Olle Pira and manufactured by Nordiska Kompaniet. Arne Jacobsen, the talented Copenhagen architect, has a splendid series of lightweight stacking tables and 3-legged stools with metal legs and shell plywood tops, now manufactured by Fritz Hansen. But it is significant that the only effort to exhibit "useful objects" as such was undertaken by an American employee of the Nordiska store, Susanne Wasson-Tucker.

As a result of H55's bland "good taste," one cheers for the really original and primitive among the handworkers, or appreciates more fully the forms of an earlier period, like the Thonet chairs, a spirit which Carl-Axel Acking evokes in his splendid Bar 55 interior. The only really original architectural form is a small pavilion to house a model Volkswagen by a very young architect, Bertil Zeinetz, who tensioned a white canvas roof in bold arches like a seagull's wings. The other buildings are designed at a high standard and the exhibition plan is an excellent one, clean and nautical. One regrets that what is in H55 does not quite equal the fair itself.

borg



View of the Bar 55 restaurant, in the center of the exposition.

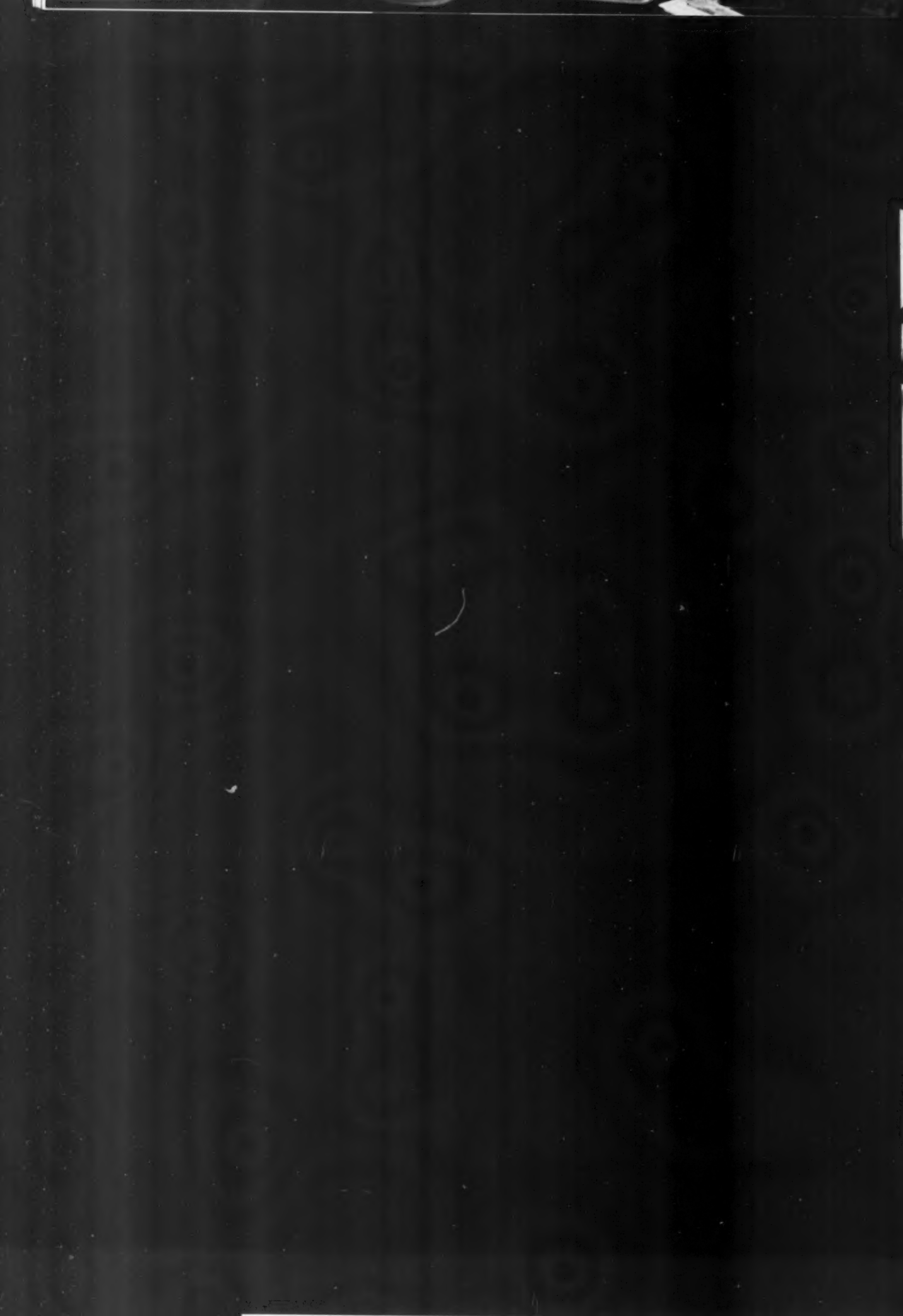


"Useful Objects," arranged by Susanne Wasson-Tucker.

Volkswagen pavilion by Bertil Zeinetz.

Design display, Pira's chairs.

Interior of marine exhibit in third hall.



Vacuum-formed products in the photo at the left, reading from left to right in rows: CLOCK FACE: Dow Styron 475 (extruded by Auburn), vacuum formed by Emet Vacuum Forming, Brooklyn. CRISPER TRAY: Campco S-300, by GE. LAMP DIFFUSER: vinyl copolymer, by Lam Workshop, Cambridge. TRANSPARENT BLISTER PACK STRIP: Celanese acetate, by AutoVac Co., Fairfield, Conn. REFRIGERATOR TRAY: Campco S-300, Gregstrom Co., Cambridge, (VacForm equipment). PICNIC PLATES: Dow Styron 475, by Federal Tool Corp., Chicago. ROUND ORNAMENT: Davis acetate, by Plaxall, Long Island City. TUBE TRAY, AMPULE INSERT: U. S. Rubber Royalite, by Fabri-Cal. SLIDE HOLDERS in long strip: Davis high-impact styrene, by Plaxall. BOTTLE PACKAGE: Celanese clear acetate, by Plaxall. TOTE DRAWER: Campco S-300, by Kingston Products. DEVELOPING PLATEN: Dow Styron 475, by Emet. LID to Millshake Machine: Campco S-300 by Arren Plastic Co., Chicago. HAIRBRUSH PACKAGE: Celanese acetate, by Plaxall. PILLBOX SHEETS: Celanese clear acetate, by Plaxall

Photo: Hank Parker.

an introduction to

Sheet forming techniques

by Edward F. Bachner, Jr.

outlining what can and can't be done in vacuum forming and draw forming, with some pointers for designing products of formed thermoplastic sheet materials.

The following article was written under unusual circumstances: it was originally prepared by Mr. Edward F. Bachner, Jr., Vice President of Chicago Molded Products' and head of its Campco Division, as an educational manual for Campco personnel. Although Campco, unlike its parent company, is not a fabricator but a supplier of plastic sheet, Mr. Bachner felt that its sales and technical staff should understand the design and technical possibilities of sheet-forming methods in current use, "to avoid selling a bad job," among other reasons. Because the manual set forth so clearly a number of points of interest to designers considering these production methods, the author consented to the publication of the abbreviated version in INDUSTRIAL DESIGN.

One of the special advantages of sheet forming with thermoplastic materials, to manufacturers as well as designers, is flexibility. With the various methods—which are discussed below under the general headings of vacuum and draw forming—it is possible to obtain fast economical production with a low tooling investment, and in the process to obtain products with such valuable properties as integral color, toughness, moisture resistance, light weight, and a variety of surface and textural qualities.

While it is not yet possible to obtain the extremely complex contours and wall thicknesses afforded by molding, sheet forming is nonetheless a versatile tool for the designer; notably, it offers a chance to produce interesting and complex shapes with relative freedom from cost worries.

A. MOLDING AND FORMING

It should be pointed out that sheet forming of plastic parts is not, on the whole, competitive with injection and compression molding. Each has its own advantages, and in nearly all cases an analysis of the nature of the job will indicate which method is suitable. The choice between molding and forming generally depends on 1) the design and wall thickness of the part; 2) the economic factors involved. With high production runs, the tool costs of molding can usually be absorbed, and material costs will be lower and finishing operations minimized. But on smaller runs, sheet forming offers many practical advantages.

Here are a few general rules which will help to indicate when forming or fabricating the sheet should be given preference:

1. Where low price and volume make the cost of steel molding dies economically unfeasible. (Vacuum forming, done under low pressure, requires only a one-piece die, which may be made of a softer, more easily shaped material.)
2. When the part cannot be molded economically because a large area is required in a thin-wall design. (Large, thin-walled areas are economical and easy with vacuum forming.)
3. When impact strength of the thin wall section is a deciding factor. (Most thermoplastic sheet materials have excellent impact strength, even in very thin gauges. By vacuum forming it is a simple matter to rib and cross-rib a large area to add rigidity and strength.)
4. When, because of frequent design changes or alterations, the cost of changing or repairing a mold is prohibitive. (A vacuum-forming mold may be changed even during production, sometimes in a matter of minutes.)
5. When short production runs are required. (Often a formed part can be set up and production started in less than an hour, while a large molded part might take a day to set up and cycle out properly.)
6. When a grained or softer finish is called for. (Texture is easily achieved by the die surface.)
7. When certain properties of chemical resistance and strength are demanded.
8. When mechanical assembly calls for riveting, sewing, or cementing.
9. When a minimum of strain is required in any part. The sheet-formed part usually (though not always) has fewer strains than an injection-molded part.
10. When the area of a flat piece is too large to be made on existing injection-molding equipment.

Here are some of the reasons why compression and injection molding will always maintain their advantages in quality of design, finish and production:

1. Molding permits the production of intricate shapes, louvres, side cores, and interior sections in the part. It also permits integral threads and fine line engraving.
2. Molding permits fillets, bosses, ribbing and inserts — for added strength and ease of assembly — to be placed in the parts very simply. Saving of materials and labor in final assembly will always be a prime factor.
3. In molding, wall thicknesses may be kept uniform where needed; or may be varied exactly where it is desired. (Lack of a wide variation in wall thickness is one of the main restrictions of vacuum forming.)
4. In molding, uniformity is possible to a degree not exceeded by any other method, and closer tolerances can be held.
5. The accurate, fast production of molded parts that require little or no finishing means a lower part cost, efficiency, and a minimum of trouble.

Consultation with a reliable supplier or fabricator of sheet materials is essential in making borderline decisions between molding and forming.

B. MATERIALS

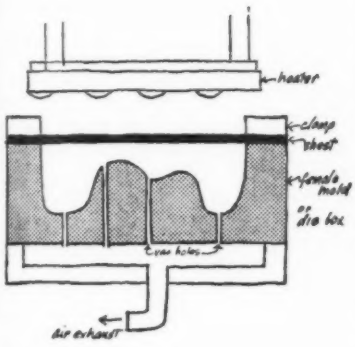
One reason for the recent rise of interest in sheet forming has been the development of the basic ingredient — the

sheet stock itself. In addition to the thermoplastics which have been sheet formed for some years, modified sheet materials have been developed in recent years — notably the plasticized copolymers of styrene and butadiene, and rubber-modified styrenes — which have in turn increased the understanding of the qualities of all thermoplastic sheet materials.

The advantages of each of the major types of materials being sheet formed today, and some suppliers of each type are listed at the end of this article.

C. VACUUM FORMING

Vacuum forming is the simplest and easiest of several ways of forming thermoplastic stock, and the most widely used. It involves a heated sheet and a mold with a controlled air exhaust. The sheet is held firmly in a frame, heated to the proper temperature, and stretched over the mold. When the air is exhausted through evacuation holes in the mold, the sheet is forced into an exact reproduction of the contours of the mold; the part cools, is removed, and the next cycle begins.



Straight vacuum-forming into female mold

Vacuum forming may be used to form an entire part, or may be combined with the other sheet-forming methods to add detail, lines, embossed patterns, ribs.

The equipment needed is relatively simple and inexpensive. Presses are light and use either hydraulic or pneumatic controls. Heating equipment may be either infra-red or Far infra-red, electrical Cal-Rod units, Nichrome wire elements, gas ovens or hot-air guns for spot heating.

Proper heating techniques are important for the accuracy of the final product. To control dimensions, the material must be held firmly in the frame during heating. If the cycle is speeded up by forming sheets below optimum temperatures — usually between 285°F and 325°F — the part will be subjected to strains. For the same reason very even heating is essential. Over-heating of high-gloss materials is detrimental to the finish.

Male and Female molds

Either male or female molds may be used in vacuum forming, the choice depending on design, time and cost. It is generally agreed that parts formed over a male mold are better or stronger than those formed over female molds, because the draping of the heated sheet allows for a heavier wall section at the highest area formed. With the male mold, maximum stretching takes place around the bottom of the part, which can usually be reinforced by a bead-like rim or crimping operation, or some other method.

Here are a few guideposts for choosing between a male and female mold:

When to use a male mold

1. To get sharpness of a design on the inside of the part. (The greatest accuracy of reproduction in vacuum forming is always achieved on the side facing the mold.)
2. To keep mold costs down. Generally a male mold is cheaper to build, since cutting material away makes the work easier; often the forms can be made in sections and assembled later.
3. When a sample is available; when a cast resin mold is to be made; when time is a factor in getting out samples and cost factors are equal.

4. When snap-back forming or drape forming are to be employed to obtain better wall thickness. (See section E.)

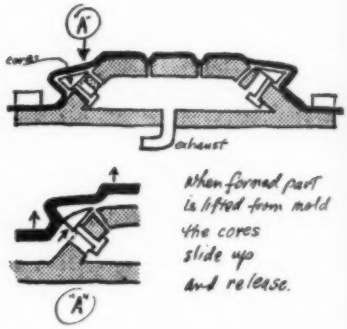
When to use a female mold

1. When sharpness of a design or embossed area is desired on the outside of the part.
2. When a perfect finish and close tolerance are to be obtained on the outer surface of the part.
3. When the cost factors are favorable: when the design of the part allows a low-cost female mold to be made; when an exact model is available and a cast mold can be made; when a multiple-cavity mold is to be made from a master shape or hob.

D. FORMING UNDERCUTS

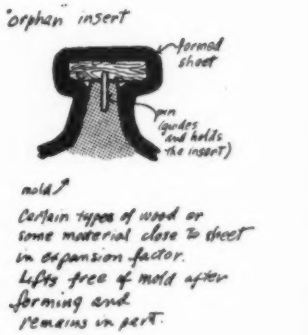
Modern forming methods make it possible to produce parts that could not be made by injection or compression molding, for the simple reason that such parts could not be removed from the mold — if, indeed, the mold could be closed.

In forming very deep undercuts, it is advisable to use side cores actuated by hand or air cylinders. Spring-loaded and hinged or sliding cores may also be used to obtain moderate undercuts. These are designed to move clear of the formed part during removal from the mold; they return automatically to position for the next cycle.



When forming smaller undercuts, such as beads and snap rings, the vacuum will do the forming; upon its release the part can be flexed off the mold while it is still warm and pliable. This is the easiest method of forming such parts as door pockets or trays on refrigerator door liners.

A recent development in vacuum forming involves permanent or "orphan" inserts that are molded into the part. The insert — wood or some material close to the sheet in coefficient of expansion — is placed on the mold and the plastic drawn around it. When the mold is stripped, the insert stays with the part. Not only does the insert add the necessary flange or undercut, but it also adds stiffness to the piece.



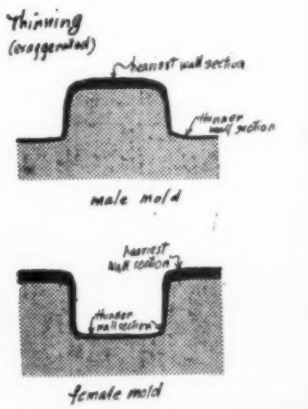
In planning a permanent insert, it is important to remember that the coefficient of expansion of plastic is several times greater than that of metal. A rigidly supported insert may cause flashing of the insert during or after cooling. Thus the design must make allowances for this major difference. In some cases a non-rigid metal insert may be used. In others, the design may permit a certain amount of movement in the insert.

Often the design calls for undercuts or formed-over sections which have to be placed in the part after the first forming. This is done by using a fixture and applying spot heat and pressure to re-form the sections required.

It is also possible to crimp a thin-gauge material back on itself along an entire edge, as on a window frame, by a post-forming operation.

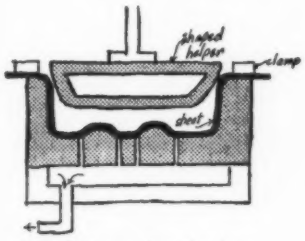
E. WALL THICKNESS

One of the difficulties to be overcome in vacuum forming is irregular wall thickness. The pull of the vacuum usually causes thinning at the point of greatest draw, which is often a point where strength is needed. When formed over a male mold, the sheet tends to thin out at the base. On a female mold, the sheet tends to thin at the bottom of the mold and at the corners. The obvious solution — a heavier sheet — is usually uneconomical, but there are several other ways to control this:



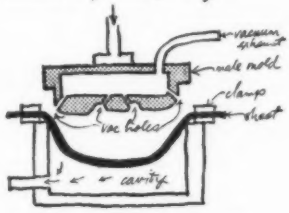
Drape vacuum forming on male mold

Framed sheet is stretched over male plug before vacuum is pulled

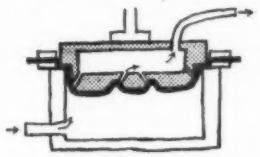


Shaped helper to obtain heavier bottom section.
Helper stretches heated sheet down into mold before vacuum is applied.

Vacuum snap-back forming



As air is exhausted from cavity, preheated sheet is pulled down. Male plug then moves down to predetermined position.



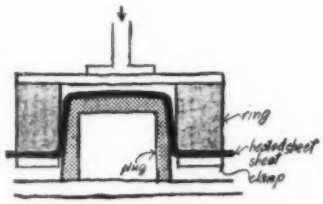
Vacuum is applied to male plug as vacuum in cavity is released. Sheet "snaps back" on plug.

1. **Drape forming.** The sheet is held loosely in the frame and allowed to drape over the male mold or down into the female mold before the vacuum is applied. This tends to give a heavier wall section at the deeper part of the draw.
2. **Shaped helper in a female mold.** The material is stretched as far as possible into the mold with a wooden "helper" before the vacuum completes the forming. The helper is not shaped exactly like the mold, but is designed to give the most advantageous stretching for a more even wall section.
3. **Slip forming with female mold and air pressure.** In this method, air pressure is used to complete the forming action. The unframed material is allowed to drape down into the mold cavity. The plunger descends into the molding, pushing the sheet further into the cavity. When the plunger has dropped to a predetermined point, it seals the sheet against the upper edges of the mold. Air pressure is then introduced between the material and plunger, forcing the sheet into the required shape. Entrapped air escapes through vent holes in the mold.
4. **Snap-back forming.** This is accomplished with a male mold held over the framed sheet, which is in turn held over a box containing an air exhaust. Pulling a partial vacuum within the box sucks the plastic down, and the ballooning action stretches the sheet evenly. The male mold is then moved down to a predetermined position in contact with the sheet, sealing its edges to the box. The vacuum in the box is released simultaneously with the exhausing of air through the male mold. The ballooned sheet then snaps back onto the male mold. The result is a more even wall section.
5. **Pattern heating.** Often wall thickness can be controlled by pattern heating, which means heating a blank in the areas to be formed more than in other areas. The heating cycle, critical in pattern heating, must be well controlled by metal masking or screening to dissipate heat and hold it back from unaffected areas. The cooler areas of the blank naturally resist drawing, so that the wall section there is held to its original gauge. Pattern heating is still in the process of being developed, but some TV masks have been successfully run by this method. The unheated center of such a blank may be saved for another job.

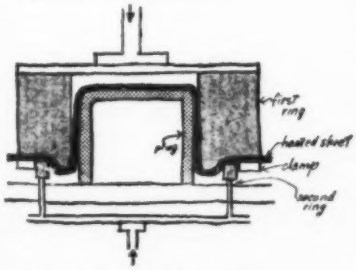
F. DRAW FORMING

Draw forming, like its sister technique in metal fabrication, produces relatively symmetrical cup-shaped or prismatic parts. Pressures are low and obtained from pneumatic or hydraulic cylinders.

At its simplest, draw forming consists of a male plug and a draw ring. The heated material is allowed to drape over the male plug to an extent before the ring descends to draw the wrinkles from the material. The fit of the ring allows only for the gauge of the stock. A second ring is sometimes used to provide an extra operation, such as forming a rolled rim. Here the first ring draws the material down over the male mold to form the body; the second moves upward to turn the rim.



plug and ring forming

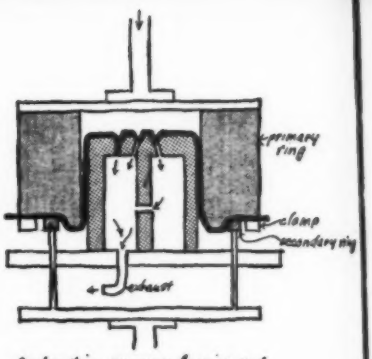


plug and double action rings

Slip forming is sometimes used with the plug and ring method to achieve heavier wall sections at the points of greatest draw. The material is cut slightly larger than the part itself and is held loosely in the frame. During forming the heated sheet drapes down over the top 1/3 of the plug. As the ring descends the material slips up past the ring; the drawing action does not occur until the ring

begins to cover the last 1/3 of the descent. At this point the ring holds the material against a spring-loaded clamp and begins to pull the wrinkles out of the part.

For very complex parts vacuum forming may be combined with plug and ring methods, allowing the advantages of each method to be fully exploited. The plug and ring can accomplish the deep draws and the vacuum method used to add the fine details. Mechanical helpers can be used for undercuts and flanges.

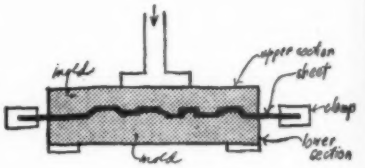


Combination vacuum forming and plug and double action rings. Vacuum used to obtain detail.

G. PRESSURE FORMING FROM MATCHED PLATE MOLDS

In this type of forming, a metal matched plate mold is required to do the work that would be done by vacuum or forming rings in the other types of molds. This method is closest to metal punch press forming. Both the female and corresponding male sections of the mold are made. The heated material is placed between the mold sections and the mold is closed, with only enough clearance for the gauge of the material between the mold parts.

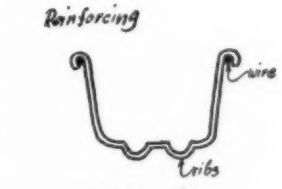
Perhaps the best feature of this type of mold is that heat can be rapidly dissipated in the thicker sections through direct contact with the two metal surfaces. This is especially true if the sections are water-cooled.



matched plate molding

H. POINTERS FOR DESIGNING THE SHEET-FORMED PART

1. **Radii.** Allow liberal radii at the bottom of the draws. The minimum should be about ⅛". Offset sections should be designed with generous radii, not as abrupt changes from the original plane.
2. **Draft.** If a female mold is to be used, ½° of draft is usually very satisfactory since the material will shrink away from the mold. In a male mold, however, drafts should be from 1° to 2°, since the material tends to cling to the male plug.
3. **Depth of Draw.** No general rule can be made for the depth of the draw. It should be helpful, however, to note that in a female mold, the greatest thinning occurs in the lower corners in the bottom of the draw. In a male mold, on the other hand, the greatest thinning normally occurs in the corners at the base of the plug. Mechanical helpers and snap-back techniques are used to correct these conditions when excessive.
4. **Undercuts** can be easily added to the part by the use of a movable insert or by a hinged insert. More complex undercut designs usually require an insert which is permanently locked into the part during forming. (See section D.)
5. **Rigidity.** When added rigidity is required in the part, it is usually a simple matter to add beads, ribbing, and rolled edges, all of which improve the stiffness of the part. When less rigid high-impact modified styrenes are employed, the designer should design stiffness into the product by flutes and ribs rather than specifying extra heavy wall thickness.
6. **Determining Sheet Thickness.** A simple formula makes it possible to determine the approximate thickness of the sheet required to form a given part. Multiply the average thickness desired in the part by the total of all areas in the formed part; divide the result by the area of the flat sheet within the clamp on the vacuum-forming machine. This will indicate the absolute minimum thickness required in the flat sheet. In most cases this should be increased slightly, particularly for long draws and complex parts.



part reinforced with rolled edge, wire insert and ribbing

7. **Mechanical Finishing of Formed Parts.** Formed plastic parts can be cut, sheared, sawed, sanded, or polished in any manner normally used on thermoplastics. They can be easily drilled, punched, or stamped.
8. **Bosses.** When mounting bosses are required, they should generally be cemented into place after the part is formed. Cements now available for leading thermoplastic sheets produce a bond of great strength. Modern cementing processes greatly increase the designer's latitude.
9. **Joining.** Parts may be joined together by bolting, riveting, or Tinnerman fasteners. Certain kinds and grades of thermoplastic sheets are also sewn together like leather. It is quite common to use a plastic or aluminum extrusion to cover the edges of the formed parts. In many parts, stock aluminum extrusions are crimped around the trimmed edges of the formed plastic. Whenever possible, it is better to form the part in one piece than to cement or fabricate sections. If two large sections must be joined, it is better to use bolts than cement or threaded tapped holes.
10. **Lines and details.** Surface lines and details cannot have a minimum width less than the thickness of the material itself, unless mechanical helpers are used to form the details on the outside surface.
11. **Illumination.** When a formed part is illuminated from the back, there is danger that thinning at corners will cause apparent differences in color. It is therefore important that parts to be illuminated in this manner be kept simple in design, with smooth, flowing lines, so that uniform thickness can be held.
12. **Spraying, Hot Stamping, and Finishing.** Nearly all thermoplastic sheets can be painted and finished in the same way a molded part would be. Naturally, a harder sheet would be more difficult to hot stamp than a soft acetate, but this operation is done on all materials. It is reported that the adhesion of the lacquers to a matte-finish material is much better than it would be to a polished molded part.

It is also important to keep in mind that formed parts can be beautifully finished in gold or silver and in bright hammertone finishes.

I. APPENDIX: MATERIALS AND SUPPLIERS

The selection of thermoplastic sheet should be based on its physical properties and cost considerations. Here are the major ones, and typical suppliers:

1. **Cellulose acetate,** one of the first to utilize modern forming methods, has excellent impact strength, good tensile and flexural strength. Its surface finish is excellent, and it comes in a range of colors and in transparent form, which metalizes well. It is the lowest-priced transparent material, which accounts for its widespread use in packaging, advertising and display.

   The principal limitations of acetate are a relatively high coefficient of expansion, moisture absorption, limited dimensional stability, and aging characteristics. (*Celanese Corp., Eastman Kodak; General Plastics.*)
2. **Cellulose butyrate** offers the advantages of acetate plus greater stability and toughness, lower shrinkage and considerably improved moisture resistance, all at only slightly higher cost. (*Auburn Button Works; Joseph Davis Plastics Co.; Kingsbacher-Murphy.*)
3. **Ethylcellulose** sheet and film offer even greater toughness and stability, and are noted for maintaining their characteristics at low temperatures. They are available in a full range of colors and in transparent form; the latter has a slight bluish cast in heavier sections. (*Campco Div., Chicago Molded Products; Dow Chemical.*)

4. **Acrylics** have two valuable characteristics: extreme optical clarity, and the ability to withstand weathering. In addition they boast excellent flexural and tensile strength, and sufficient flexibility to resist shattering, qualities which have made acrylics popular for windows, shields, lighting fixtures, and other transparent enclosures. Vacuum and drape forming permit a range of pleasing forms which are used in outdoor signs; the clarity of the sheet permits the application of color to the back, which may be back-lighted. Vacuum forming is preferred for acrylics when the part is more detailed or complex than can be achieved by so-called "surface tension" shapes. (*Rohm & Hass "Plexiglas"; DuPont "Lucite"; Plastex Corp. "Midlon"; Plax Corp. "Methaflex."*)

5. **Rigid vinyls**, another of the early sheet-formed materials, have fine dimensional stability, a low coefficient of expansion and self-extinguishing properties which make them preferable for lighting fixtures and illuminated displays. They have excellent tensile strength, a high modulus of elasticity, good flexural strength and stability, and come in a range of colors as well as in clear form. In cost the rigid vinyls are only slightly above average. (The elastomeric forms of vinyl are used in a limited way in vacuum and drape forming, principally when great flexibility is called for.) (*Bakelite Co.; Pan Laminates; Nixon, Seiberling Rubber.*)

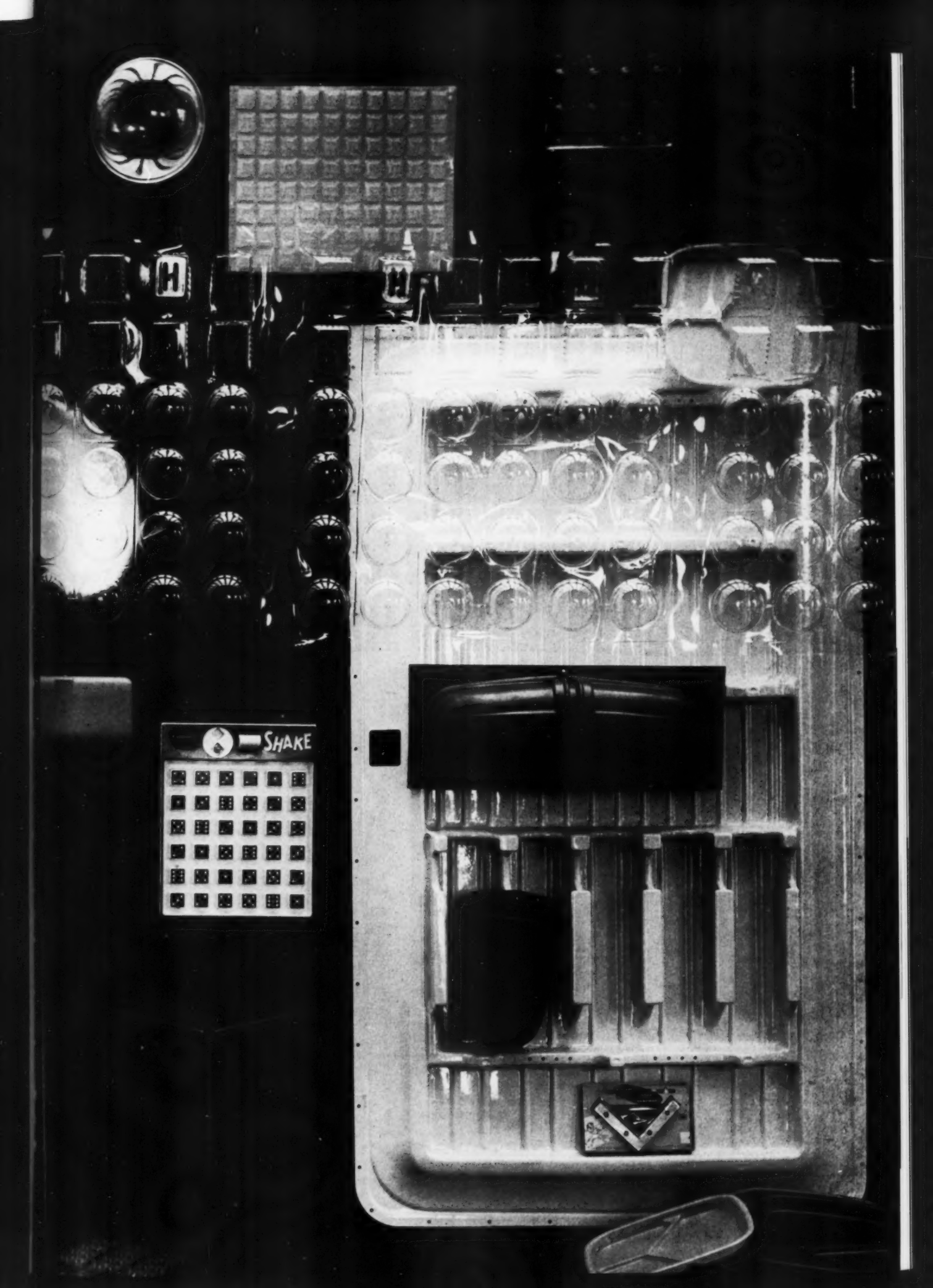
6. **Polystyrene** has a smooth surface, excellent clarity and colorability, as well as high dimensional stability and excellent moisture resistance. However, because of its great rigidity (and the absence of a plasticizer) its impact strength is comparatively low, and the greatest use of styrene for sheet forming has been in rubber-modified forms.

7. **Rubber-modified styrenes** are another recent innovation in commercial sheet materials. Their impact strength, while lower than that of the copolymers, is nonetheless good. They are dimensionally stable and highly resistant to moisture, and come in colored (but not transparent) form.
   The rubber-styrene alloys have the lowest per-foot cost of any thermoplastic sheet. In thinner gauges they are used in displays and toys, and in heavier gauges are being used for equipment housings, which require both strength and attractive appearance. The matte surface of the extruded sheet may be polished, and a brilliant surface may be achieved by adding a thin film of oriented styrene to one surface as it leaves the extruding machine. (*Campco* S-300; *Dow Styron, Sandee Mfg. Co.*)

8. **Plasticized copolymers of styrene and butadiene** started the new developments in modified sheet materials. Copolymers have outstanding impact strength, a relatively high heat-distortion point, good tensile and flexural strength. Their forming characteristics are also outstanding and have led to such applications as machine housings, luggage, boxes, and panels. Forms with high rubber content are good for products which require flexibility. The color range is good, but the copolymers do not come in transparent form. Matte or smooth calandered finishes are available, as well as grain textures. Cost per foot is somewhat higher than that of the cellulosics and rigid vinyls. (*U. S. Rubber "Royalite"; Bolta Products "Boltaron."*)

9. **Polyethelene**, though it is not yet used in sheet forming, will probably be commercially available in sheets before long.

CLEAR ORNAMENT: Davis acetate, by Plaxall, L. I. City, CONFESSIONAL SCREEN: Monsanto Vuepak acetate, by Fabri-Cal, Kalamazoo. EGG CRATE: Monsanto Lustrex styrene; BOX: U. S. Rubber Royalite, by Emet Vacuum Forming, Brooklyn. SHAKE GAME: Campco S-300, by Schaper Mfg. Co. on VacForm equipment. REFRIGERATOR DOOR LINER: Campco S-300, by Regal Plastics. DRIP CONTAINER, uncut and halved: Boltaron, by Imperial Industries, Wayne, Ind. TILE SAMPLE BOOK: Nixon Geon vinyl, by Plaxall. HINGE PACKAGE: Celanese clear acetate, by Valley-National on VacForm equipment.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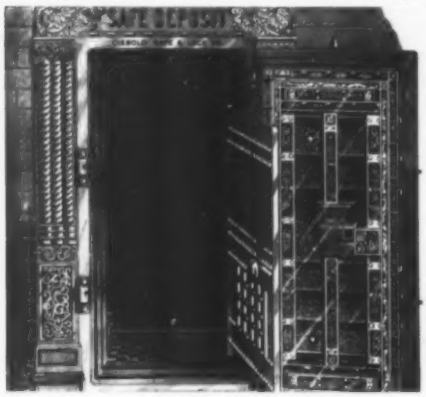
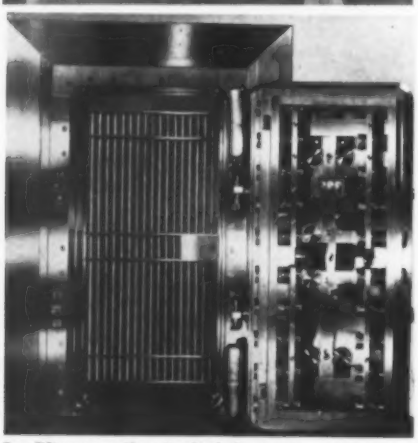
SHAKE

Vaults have always been adornments, but once they hid below stairs; today they are the focus of glass-walled buildings.



Carl Koch, architect
photo: Stone

Big break in vault doors *a tradition-steeped industry learns how*



For fifty years the standard door was an imposing display of crange hinge, gears and bolts.

It's a startling sign of the times when the country's three manufacturers of bank vault doors break out in three directions with brand new designs. The industry has always moved conservatively, out of respect for its conservative customers; its last big step forward was taken half a century ago, when the springs that used to activate the bolting were replaced by a system of gears. After that, a switch from rosettes to fluting on the trim was hailed as a major event.

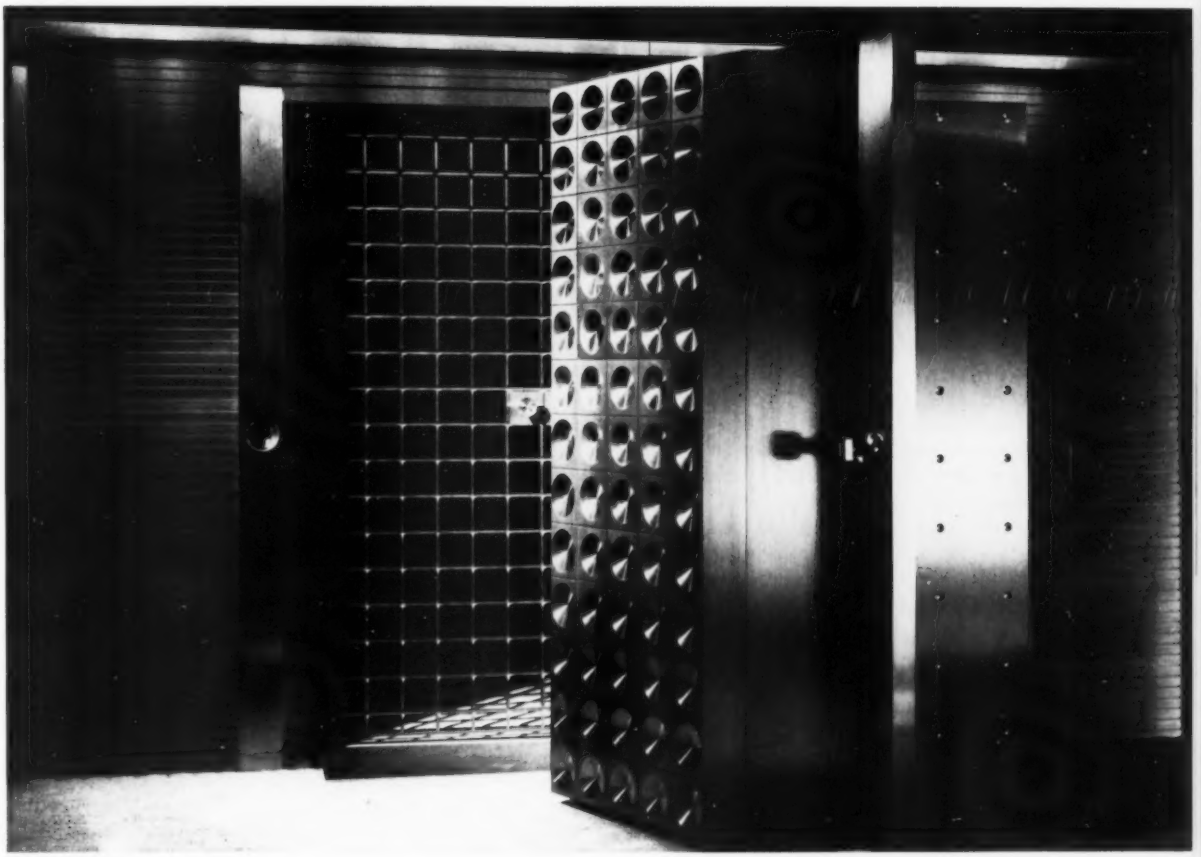
The revolution in vault doors started two years ago as a consequence of a slower revolution in banks themselves. Before it started, vault doors were so standardized that the three manufacturers often competed like contractors, submitting closely figured bids after the building plans were complete. Any ten- or twelve-inch door satisfied the toughest insurance requirements. Mosler says there has not been an attempt to break through one of its doors in twenty years.

When bankers began to shuck off the porticos and pediments that were the very symbol of their integrity, vault makers began to take stock. They had always known that the banker wanted something more than strength. Security comes cheaper in black iron, but the banker always insisted on polished steel or bronze; for one thing, in a modern steel and glass bank the vault is the strongest symbol available, and more and more often has been dragged into the limelight. The banker often bought a heavier door than his assets seemed to require, and occasionally spent thousands for a round door simply because "it looks stronger." If anything stood in the way of change, it was the affectionate conviction of banker and vault man that for psychological effect, nothing could beat the massive functionalism of the standard door with its powerful crange hinge, polished gears and boltwork.

The first company to make the break was Mosler, which introduced a new door by Henry Dreyfuss in September, 1953. The familiar elements—hinge, wheel, and bolt-work—were still there, redisposed in a sleek, strikingly modern arrangement. A few weeks later, Herring-Hall-Marvin unveiled a totally different concept—a robot door completely sheathed in steel, which swings to, seats itself, and throws its bolts at the touch of a button. Some eight months later the third contender, Diebold, hurried into the lists. All three companies report that business is booming, and today the choice of a vault door is often one of the first considerations in the design of a bank.—*d. a.*

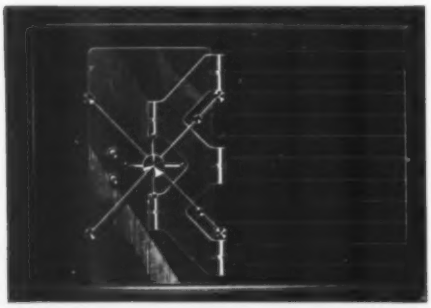
Today's banks have a choice: H-H-M's robot, Mosler's smooth version of the standard door . . .

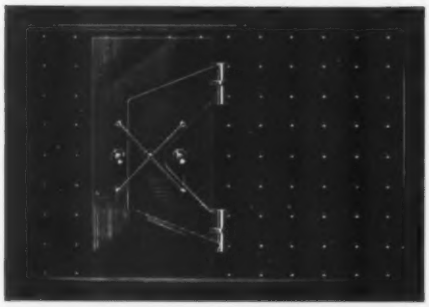
to take the limelight

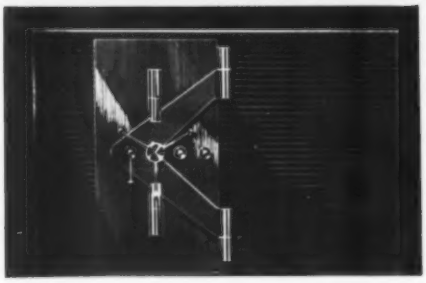


Diebold's decorative departure.

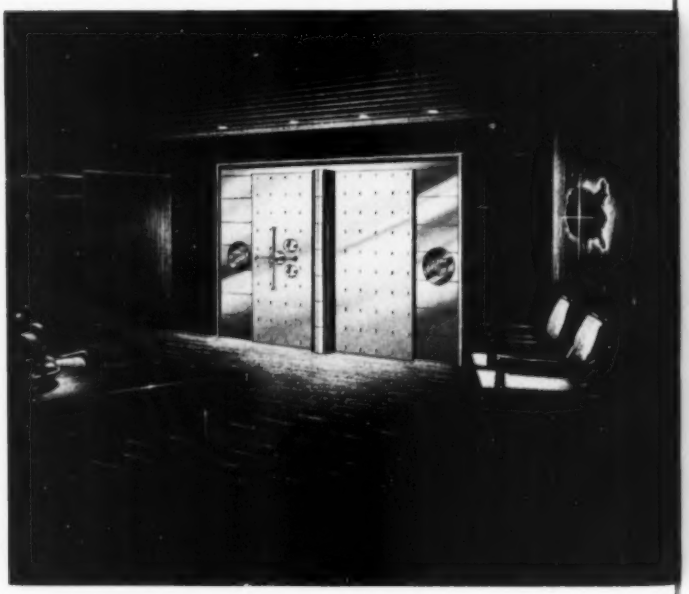
Diebold's door replaces gears and bolts with glittering decoration







The first Diebold-Basic was sold from the sketches shown here. At the time Diebold's salesmen didn't know of its existence, and the prototype was not completed. The sketches at the left were presented as proof that a mere face-lifting would not have been enough of an improvement on the old door. The sketch below shows the final scheme, as it might have looked in the prospective customer's own bank. The customer, US National Bank of Denver, was sold from this rendering.

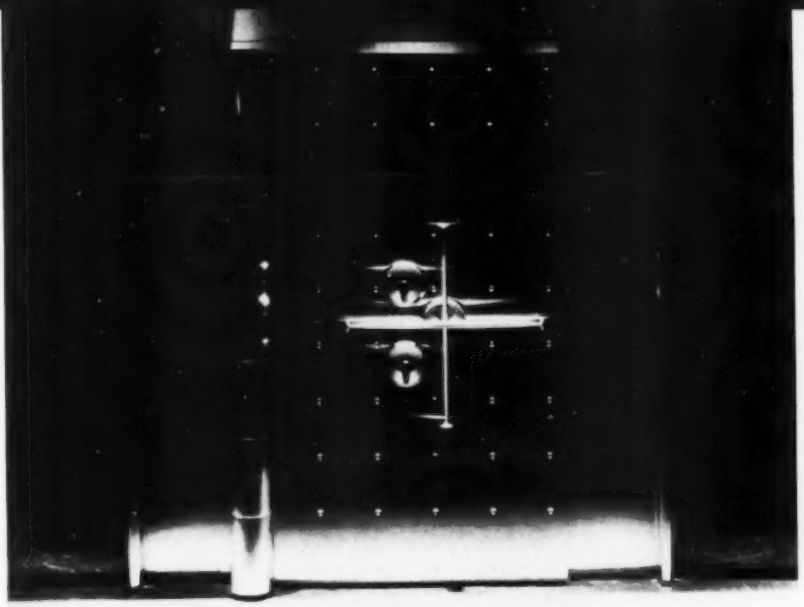


Diebold, Inc., retained Charles Deaton, an independent designer with considerable experience in bank design, in June, 1953. Deaton felt a new door should be based on a new functional concept. He won his point in September, when Mosler unveiled the "Century." Dreyfuss' striking arrangement of the traditional elements made quite a splash: Diebold had no desire to come out with the same thing only different some eight or ten months later.

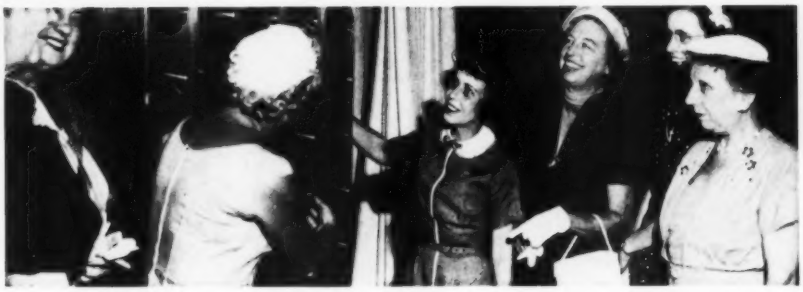
The obvious alternative to Mosler's scheme was something more purely decorative, less boastfully functional, and Diebold believed the banker would actually prefer this in an architectural feature. So Deaton set out with the perverse aim of doing away with the traditional, imposing mechanisms. To free himself of the great crane hinge he invented something that looked like a piano hinge. He hid the seating mechanism inside the door and combined the two major controls in one. When he was through, the door was a sheer slab of steel adorned with nothing more than a wheel and two combinations.

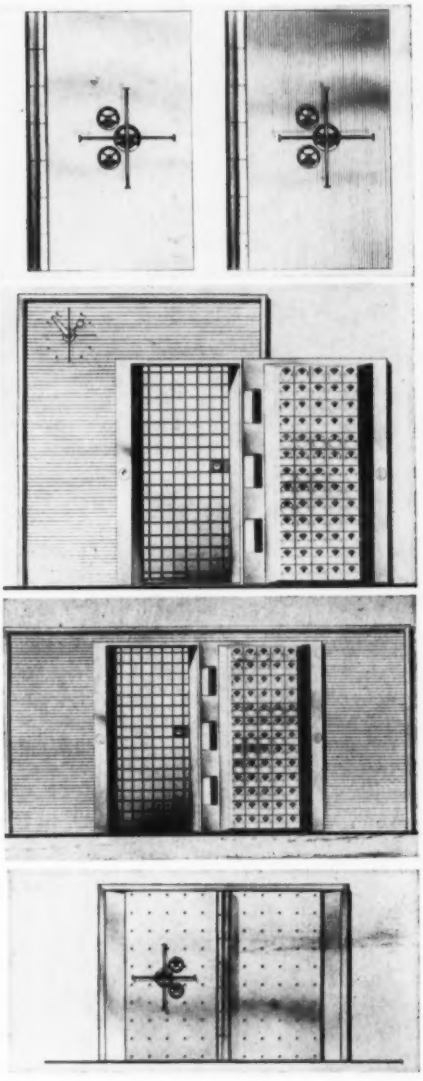
Deaton was even more interested in the back of the door—the "day view," as he calls it. The most precious display of all, the glass-framed bolts and gears, was replaced by a thick slab of stainless steel, whose smooth surface he broke with a glittering pattern of deep conical cuts. It is purest decoration, but it manages to give the same impression of massive material and precision workmanship that the exposed gears once did.

It is no exaggeration to say that Diebold's management staked its reputation on Deaton's design. Already behind their two competitors, they rushed into production of a prototype in November. To avoid trouble with the sales staff, they determined to try the door on the market before introducing it inside the company; the engineers who worked on it in secret were scornful and even rebellious. In February, 1954, a small delegation travelled to Denver to talk with the US National Bank, which was planning new quarters in Zeckendorf's Mile High Center. They had nothing to show but a rendering, but they made the sale, and decided immediately to go into production. Fortunately the prototype, which was completed a month after the first order was taken, worked perfectly, and the sales staff was sold on the innovation.

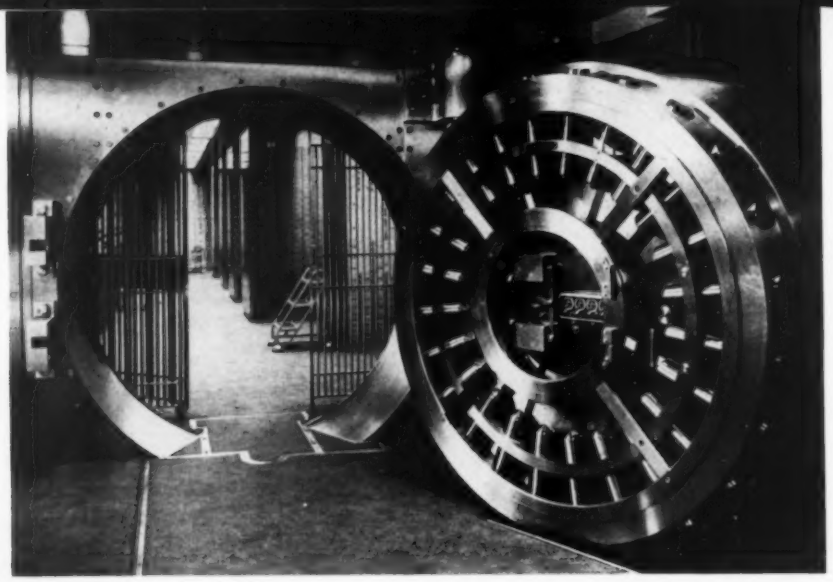


Diebold decided the only way to do the door justice was to show it in the flesh. Instead of carting it around the country, they now fly groups of bankers to Canton, Ohio, for a salon showing and a country-club dinner. Wives are welcomed in the belief that they are especially sensitive to the appearance of the door.

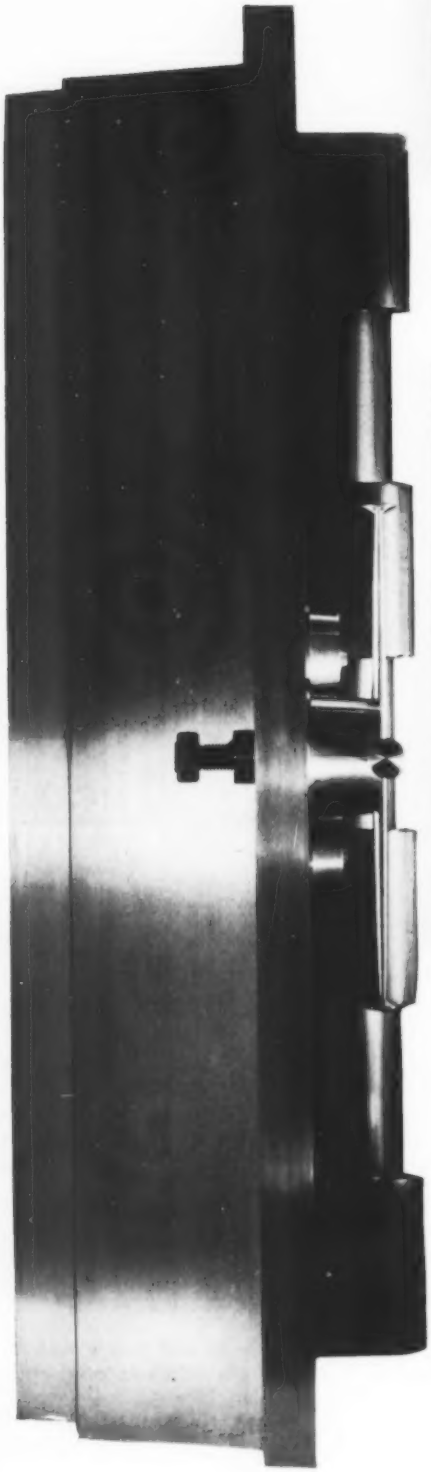


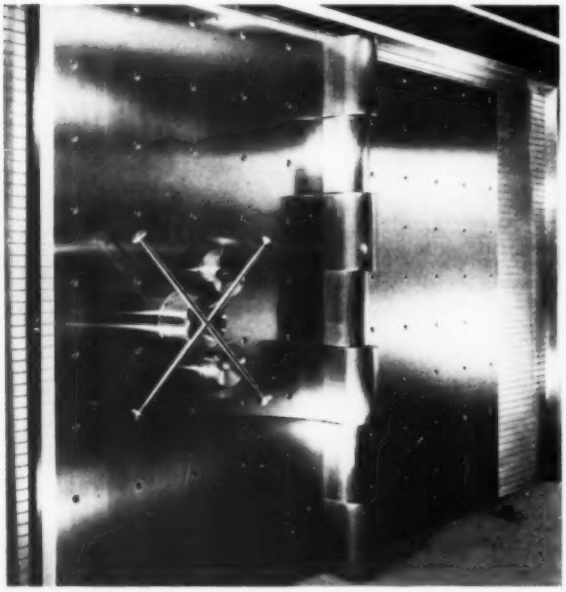


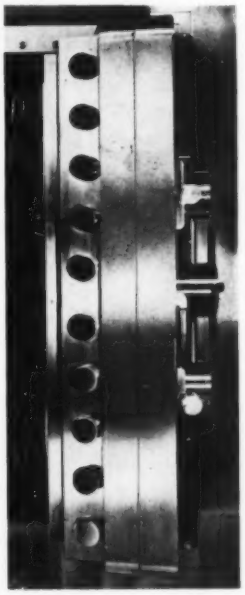
Three door patterns and twelve trim designs give the Diebold-Basic considerable variety. The trim is always designed to frame the door nicely when it is opened.



Circular door looks stronger than a rectangular one to most people, but it is used mainly for decorative reasons. Once it was believed to be economical because it could be milled on a circular milling machine, but today it tends to be far more expensive than a standard door. Since it must be as wide as it is tall it is wasteful of material, and special ramps or a lowering platform are necessary to get trucks over the jamb.

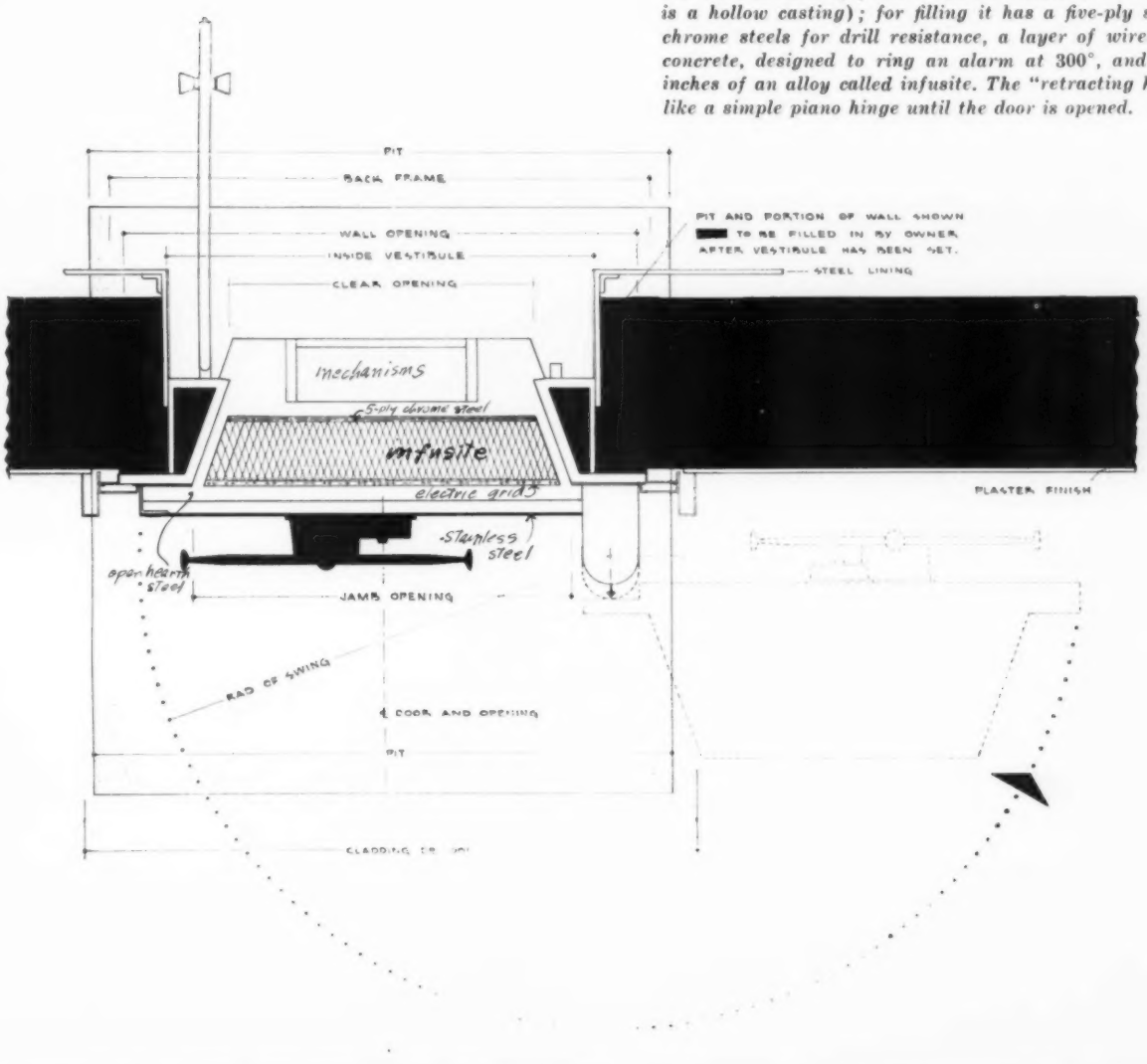


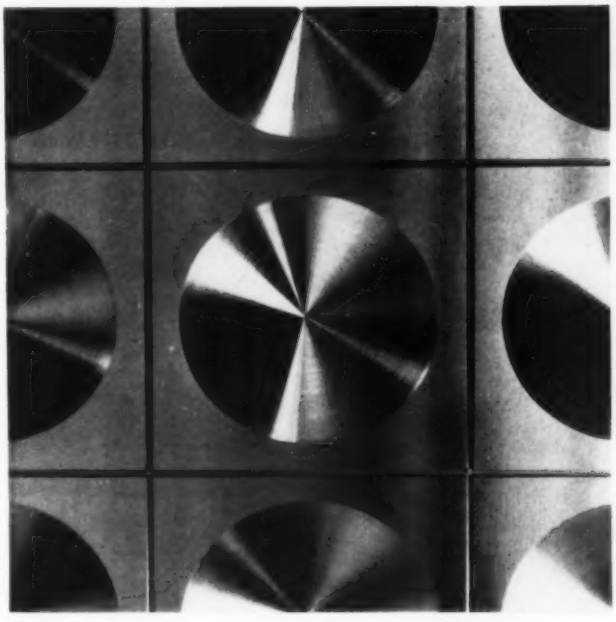




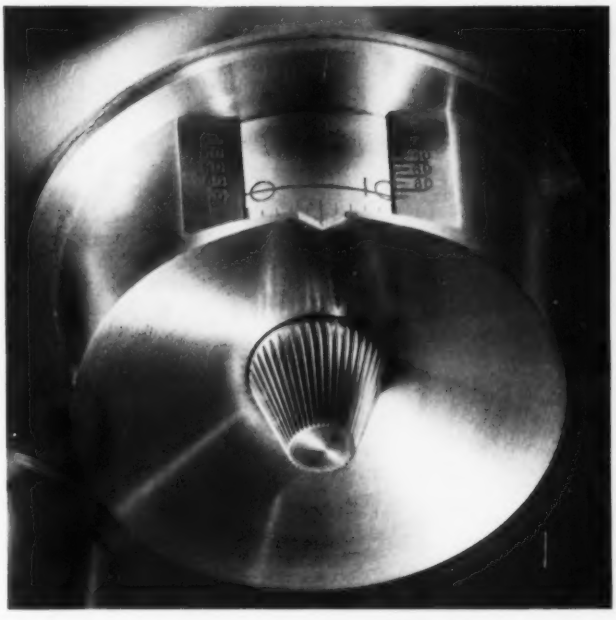
Closing a vault door is a three-part operation. First it is swung to within a few inches of closing. For these last few inches it must move straight in because it is so thick. This is called the seating and is accomplished with the help of a "pressure system" when the pilot wheel is turned. Finally, the bolts are thrown. On the standard door (right), the pressure system consists of eccentrics which force the door in as the pilot wheel is turned. The bolts are thrown with a separate handle. On the new Diebold-Basic three seating screws—two in the hinge and one on the opposite edge—draw the door in. The pilot wheel controls both the seating and locking of the door.

The 10-inch Diebold-Basic is actually about twenty inches thick. The shell is built up from rolled steel slabs (the standard door is a hollow casting); for filling it has a five-ply sandwich of chrome steels for drill resistance, a layer of wires bedded in concrete, designed to ring an alarm at 300°, and eight solid inches of an alloy called infusite. The "retracting hinge" looks like a simple piano hinge until the door is opened.





Diebold door replaces display of gears and bolts with two decorative designs on stainless steel: individually milled conical cuts, and grooved lines, which conceal the parting line of locking bar.



A detail redesigned for banker's convenience is the combination dial. The numbers on the band used to be sideways, but are now read horizontally, with helical line to count the number of turns.

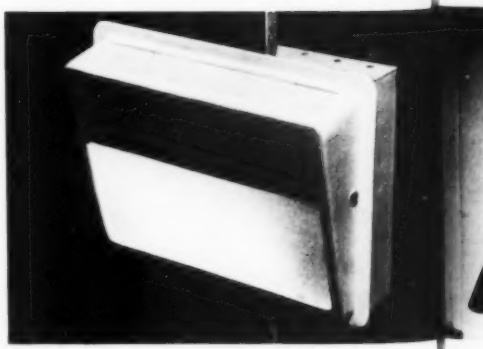
DESIGNS FROM ABROAD

Italian and Swiss

1

2

1. *Cut aluminum lighting fixture designed by Ettore Sottsass, architect, Milan, Italy.*
2. *Outdoor lamp by Baumann, Koelliker, Zurich, Switzerland, in the Kursall garden, Lucerne.*
3. *Wall lamp for hospital beds. The beam can be directed towards the bed or the ceiling; the upper light is fitted with blue for night use. Stilnovo, Milan.* $16.00.
4, 9. *Baumann, Koelliker wall fixtures designed especially for department stores.*
5. *This Stilnovo bubble has a polished brass wall bracket, white plexiglas reflector.* $32.00.
6. *Ceiling projector of aluminum, lacquered yellow and black. Stilnovo.* $15.00
7. *Wall bracket with three articulations (constant friction type, Stilnovo's patent). Lacquered aluminum bonnet-like reflector.* $16.00.
8. *Ceiling lamp with four units in overlapping half-cylinders of white plexiglas and black lacquered aluminum sheet, suspended by white plastic cords. Stilnovo.* $57.00.
10. *Table lamp with lacquered reflector rings, polished brass frame. Stilnovo.* $40.00.



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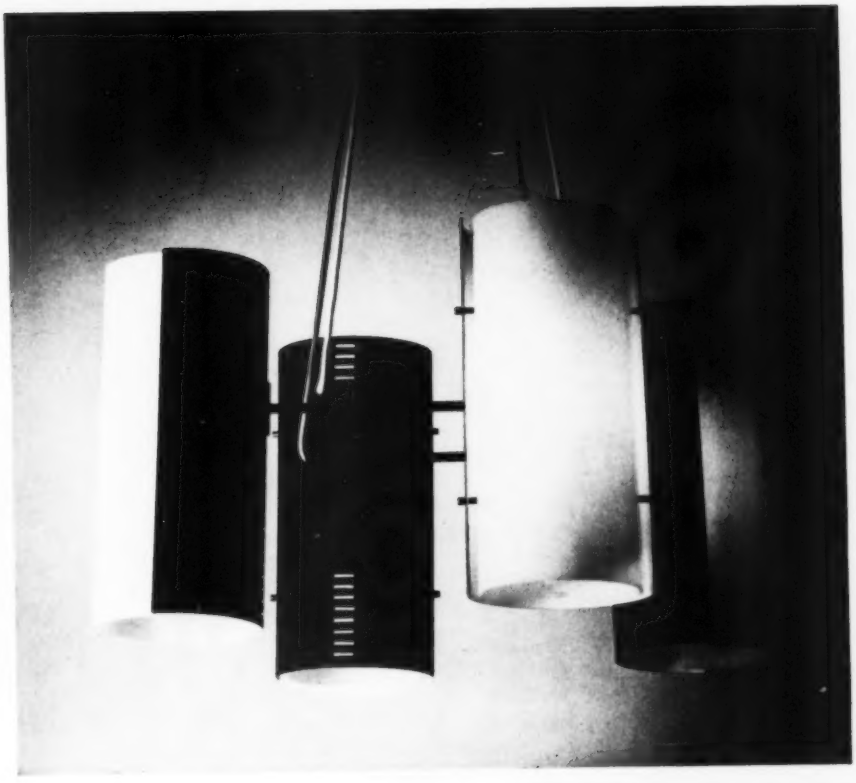

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lamp modes range from feathery to groomed

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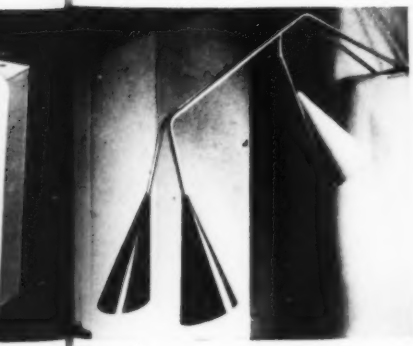

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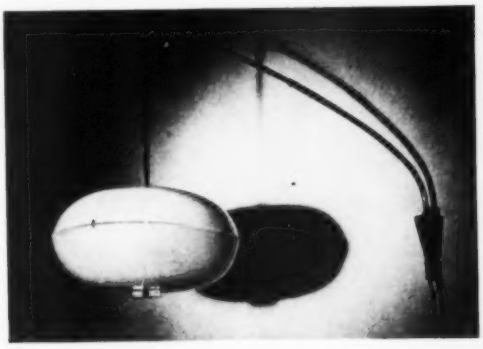

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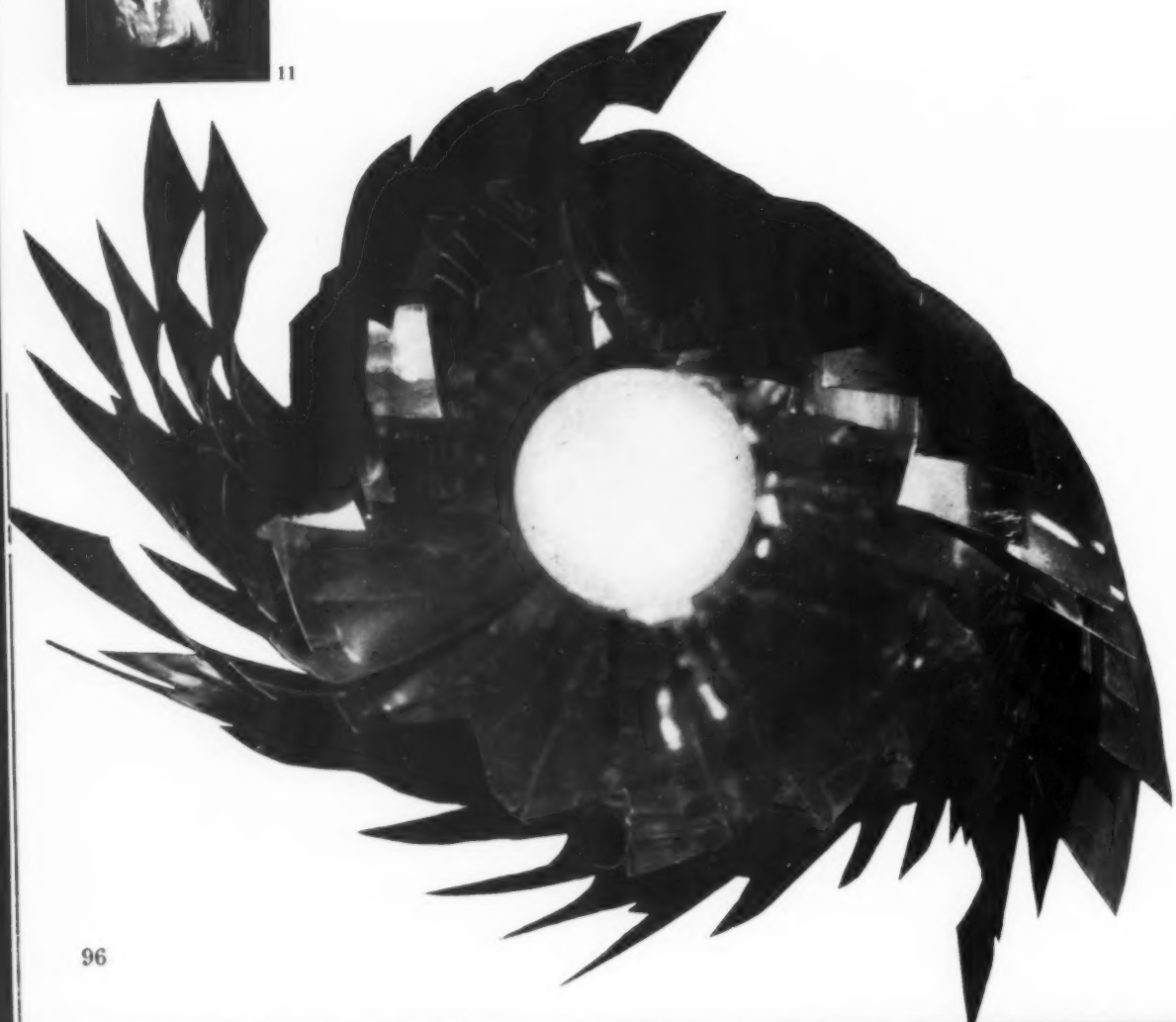
11

Numbers **11-17** *are further examples of Ettore Sottsass' remarkably simple hand-cut lamps. Without fasteners, the flexible, scissored strips of anodized aluminum fold into shapely twists and turns* **(11)**. *Feathered rather like a startled hen, the silhouette below shows the placement of the bulb in a metal shoe.*
Other versions, also cut from one piece of aluminum, are hanging fixtures whose contours change like a piece of sculpture **(14, 15)**. *These models were executed for Raymor; Richards Morgenthau Company plans to distribute them in* **1956**.

12



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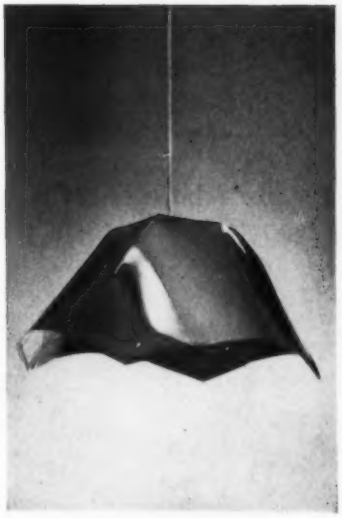

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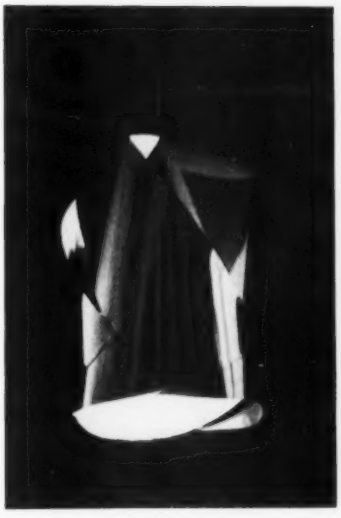

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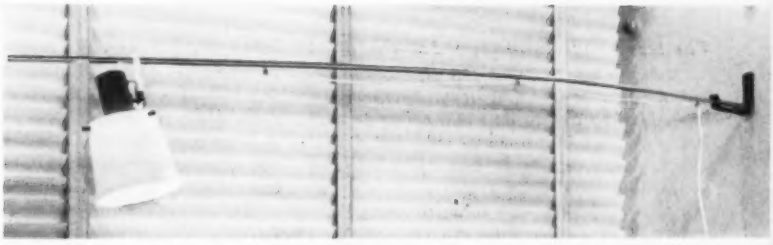
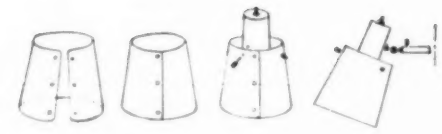
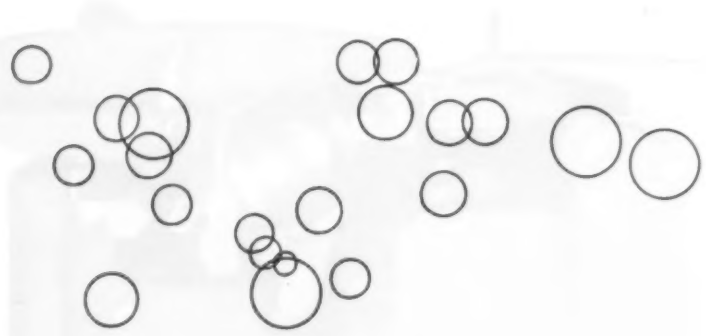


A highly versatile lamp kit, Model 1055, devised by Arteluce of Milan, can be assembled, as the diagrams show, into standing lamp or wall fixture.



Fastening of parts is a never-ending design problem. Most of the products of industry are held together by countless small devices which, despite their diminutive size, can have a visible effect on their quality, performance and safety. The designer is always on the lookout for fasteners that are neater and easier to use, and the exact choice of a fastener will often influence the construction and detailing of his product. Fastening is also an engineer's problem, of course, because assembly may be one of the largest cost factors in production.

The basic fastening device is still the nut and bolt, but such innovations as speed clips, snap rings, and spring pins have become accepted substitutes. At the same time new welding methods have come along, so simple and quick that they can legitimately be called a replacement for fasteners. The following review is not a catalog of all fasteners, but a selection of some of the many devices and methods which can help solve a design problem.



Fastener review

Examples of some standard fasteners and joining methods that help improve design and speed fabrication

The traditional nut, bolt, and washer have always done a satisfactory fastening job, but they present a problem: conspicuousness. If they are to be used, a designer is likely to demand a nut and bolt that are, if not invisible, at least inconspicuous and preferably good looking. These are some of the improvements and substitutions:

1 Improved screws, *like the Phillips head with its cross slot and the flush Allen head with its hexagonal hole, show little roughening when drawn up tightly (A, B). To lock these fasteners in place, teeth, burrs, or knurls can be put under the head, as in the Unbrako set screw (C, Standard Pressed Steel), or in the Spin-Lock series (Russell, Burdsall & Ward). In an offset screw, a deep slit is used to offset the threads so that they will resist loosening (D, Set Screw & Mfg. Co.).*

2 Improved nuts, *like Palnuts and Push-nuts (A, B, Palnut Corporation) or Speed Nuts (C, Tinnerman Products, Inc.), perform as finishing pieces, neatly covering the end of a bolt or shaft. Spring tension locks them in place.*

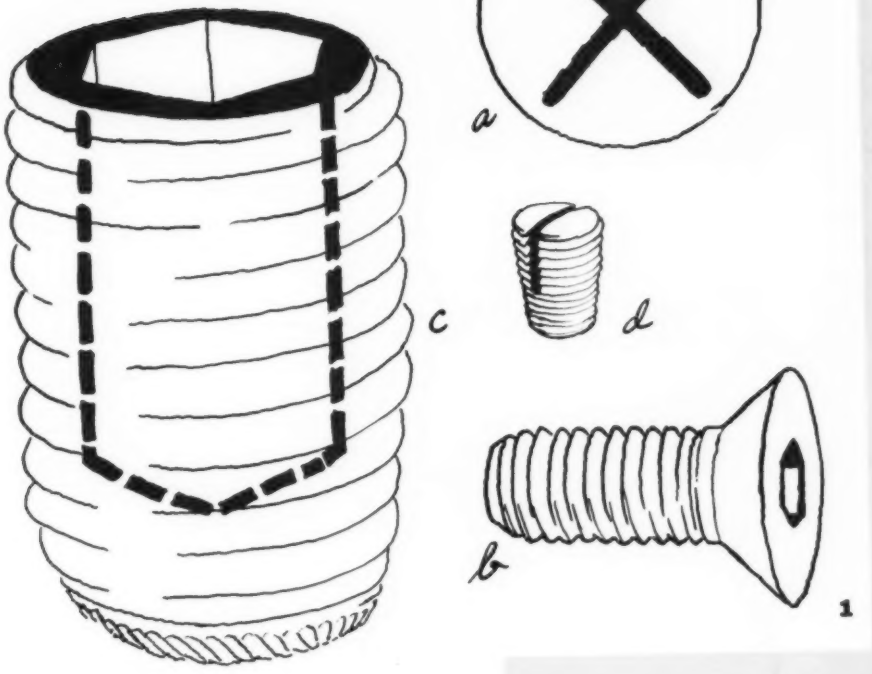
3 Improved washers, *like the integral "O" rib of silicone rubber, neoprene, or plastic incorporated in the Seelscrew, provide neat, tight seals that protect the surfaces and resist vibration (A, Automatic & Precision Mfg. Co.).*

Because of the large integral neoprene washer, the Tuff-Tite screw can be used on curved surfaces (B, Townsend Company). The slightly projecting plug of Nylon in the side of Nylok fasteners wedges the mating threads together, locking and sealing the fastener at the same time (C, Nylok Corporation). Teeth of Everlock washers bite into the face of the work, resisting loosening forces and providing sloping surfaces into which the screw head can be recessed (D, Thompson-Bremer).

4 Improved inserts *provide a seat for flush lock screws used in the lathe attachment, so that stakes and bushings can be eliminated; a brass union is replaced when an insert is used in the air cylinder head (A, B, Heli-Coil Corporation).*

5 Light, *tough nylon fasteners offer chemical and electrical resistance, and because they can be supplied in colors, suggest a new solution to making a fastener decorative (A, Nylogrip Products).*

Spring pins are perhaps the most remarkably simple of the visible fasteners. Spring tension that is set up when the spring pin is pushed into place, permits it to be used as a pin, pivot, key, or axle, and to hold plates together or to hold parts on a shaft. Once they are set in place, they can be cut flush with the surface, leaving only a neat little disk visible (B, Standard Pressed Steel, Elastic Stop Nut).



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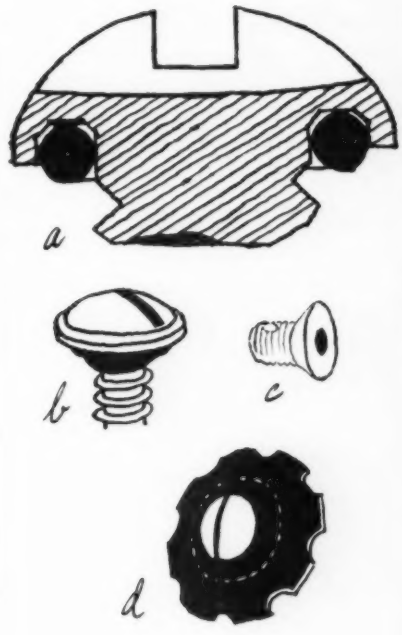

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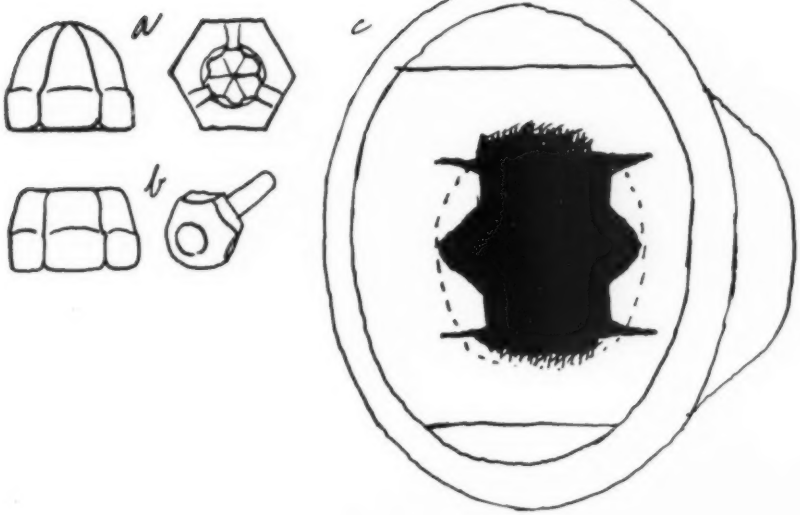

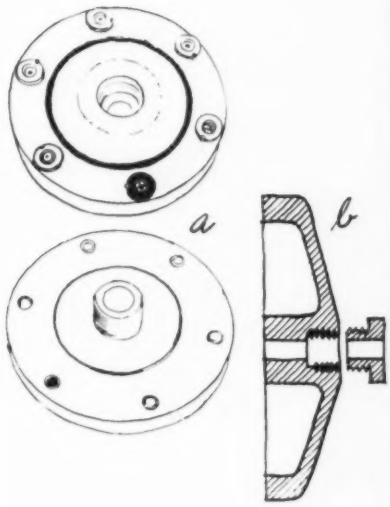

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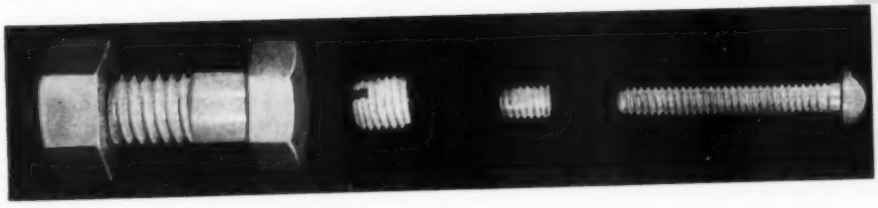

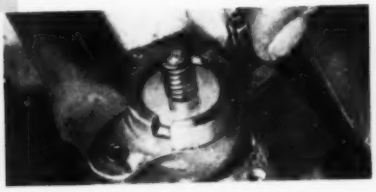

Many fasteners employing new principles are easier to use and harder to see

If what the designer craves are fasteners which are as easy to conceal as they are to install, new ones are springing up all the time. Many of them depend on tension to hold them in place. Fasteners shown here not only simplify assembly, alignment and positioning of parts, but also eliminate such production operations as machining, threading, and drilling.

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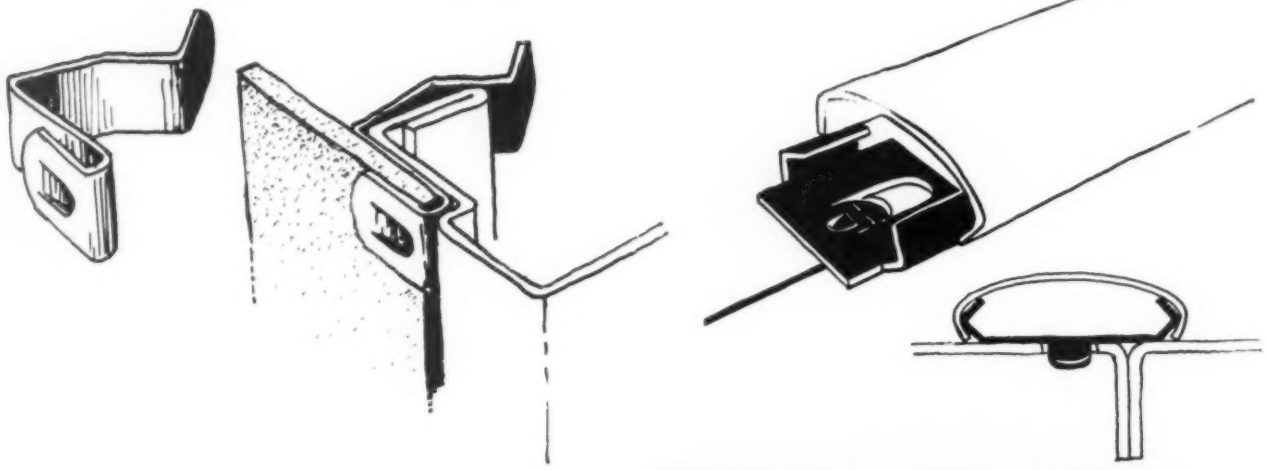

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1. Replaced nut. A shaped hole is the only preparation for attaching one-piece Spring-Lock fasteners, which support shelves. They are pushed through the hole and given a half-twist to provide a secure support, knob, or door strike in sheet materials. The projections can be of wood, metal, or colored plastic, in various shapes and sizes (Simmons).

2. Replaced screw. The only visible part of this speed clip is the retaining tab that locks it to the hardboard access panel. No screws or holes that require careful alignment are needed in the panel or cabinet to keep the panel in place (Tinnerman).

3. Replaced nut and bolt. The invisible molding clip snaps into drilled holes; the trim is then snapped over its spring arms, which hold the attached pieces securely. A simple hand tool is used to attach the clip (Tinnerman).

4. Replaced nut, bolt, and washer. Snap rings of spring steel that are held against a shaft by their own spring tension (right, in photo), or which fit into a groove in the shaft, are simple, neat fasteners that eliminate machining, tapping, and threading operations, as well as such visible devices as nuts, washers, and set screws (left, in photo). The two curved retaining rings replace the washers and nuts to the left, as well as the machining and threading formerly required. All rings on page 101 *are Truare, by Waldes Kohinoor.*

5. Replaced set screw and hub. Two grip

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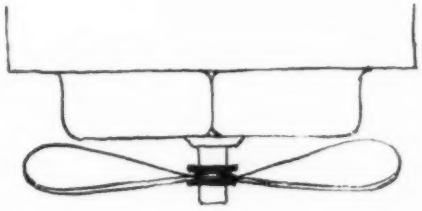

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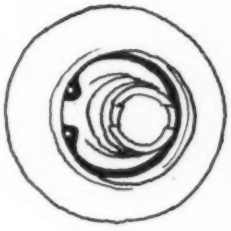

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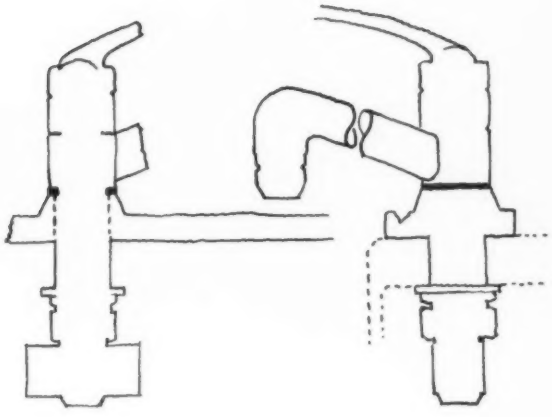

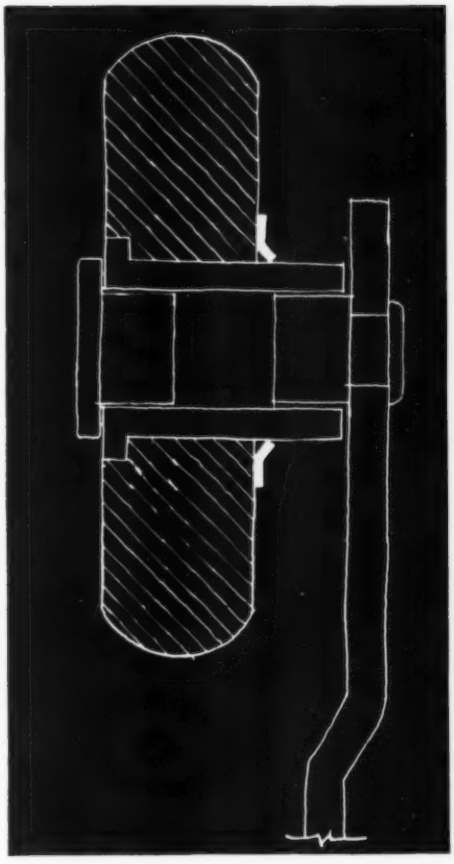

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rings and a bowed ring firmly hold the fan on the Telectro-tape magnetic recorder, but also allow it to slip if it is obstructed. Formerly, fan blades were staked to a hub, which was then secured to the shaft with a set screw; the change resulted in a saving of seven cents per unit.

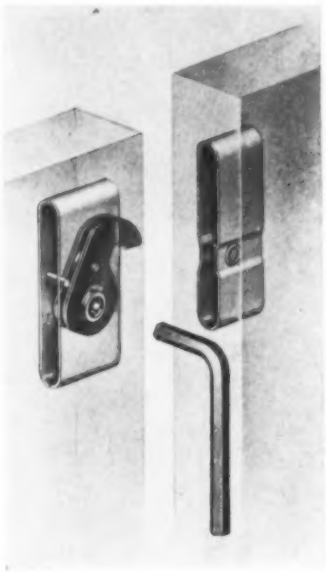
6. *Replaced screws. A doorknob designed by The American Hardware Corporation couples the knob to the knob shank with a beveled ring that presses into a groove. The ring takes up end play, and eliminates two tapped holes and a pair of screws, making a stronger and more precise assembly.*

7. *Replaced shoulder. An aluminum retaining ring which is purposefully visible becomes part of the design of the mixing faucet produced by Gyro Brass Manufacturing. The ring positions the spout and escutcheon; an alternate design could have been made so that the valve body would provide a shoulder for the spout, but this would have required machining and chrome-plating the valve body. By using a ring, the shoulder was eliminated.*

8. *Replaced rivets. Instead of being something to conceal, a self-locking retaining ring contributes to the design on Har-Vey rolling door hardware, produced by Metal Products Corporation. Rivets holding the bushing in the overhead door wheel worked loose in use. These, and a spacer, were replaced by a ring that snaps over the hub, cutting manufacturing time 76% and cutting costs 44%.*

Fasteners for special problems

There are, no doubt, so many fasteners in the world because there are so many special problems. One of the main ones is the joining of dissimilar materials, for which a variety of answers have been worked out. Often, a specially designed fastener is needed, but these are invariably expensive, and it is often possible to adapt to new applications a fastener developed for a particular use.



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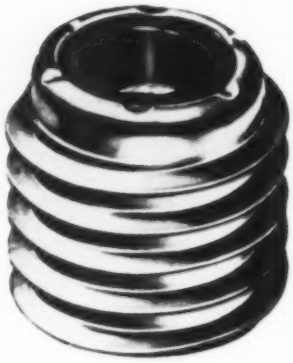

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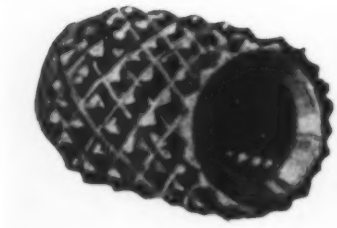

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Panels

1 *Joining panels for portable shelters and knock-down displays, furniture, shipping crates, and even coffins can be accomplished with a series of structural lock fasteners developed by Simmons, of which the newest is the Dual-Lock. A lug pressing against the heel of a trigger locks the rotating claw over the female engaging pin. The butt joint is vibration- and impact-proof, and will withstand 7,000-lb. tensions. The joint will resist water seepage, but other versions are used when absolute water-tightness is required. The fastener is almost invisible when mounted within the panel.*

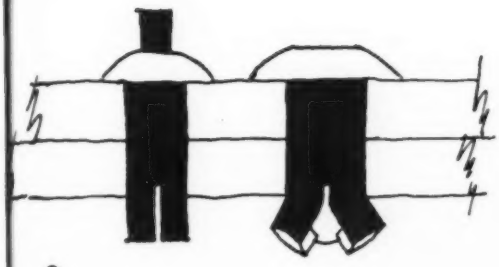
Materials

2 *Fastening soft alloys of aluminum, magnesium, mild steel, and some plastics, particularly soft castings used in engines, is simplified with the self-locking bushing for blind assembly (Elastic Stop Nut Corporation of America). One version uses a metal locking device that will withstand temperatures up to 550° F; a red nylon collar in the bushing shown is used when temperatures run up to 250° F. External threads with a 70% depth provide an interference fit with a softer socket thread, and will develop minimum ultimate loads of 140,000 psi. Socket threads can be reworked with a sizing tool, so that when replacements are needed, bushings of the same size can be used.*

3 *To provide threads in soft plastics, an aluminum insert with a coarse outside knurl has been developed that can be molded into the plastic (Yardley Precision Products).*

4 *Heli-Coil inserts of stainless steel are used to provide threads in a plastic valve.*

5 *When threads are needed in cross-cut ends of wooden boards, Southco tubular inserts can be pushed into a drilled hole and staked with a finishing nail (South Chester Corp.).*



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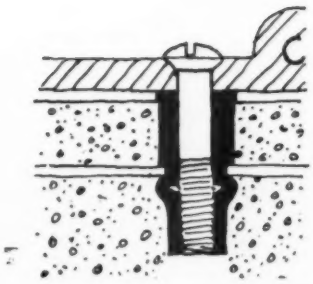

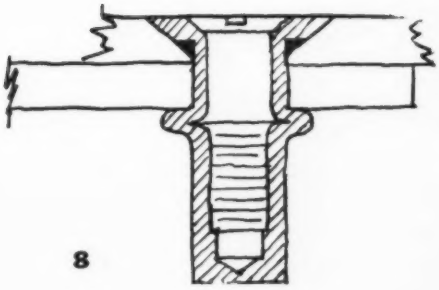

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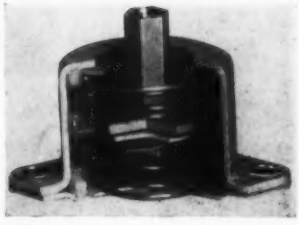

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Blind fastening & sealing

6 Blind rivets for one-side assembly have helped solve some of the slowest and most difficult fabrication problems. Southco has developed a rivet that locks panels together with merely a hammer blow.

7 For assembly of thin sheet materials and attachment of parts and sub-assemblies, blind rivets like B. F. Goodrich's Rivnut are used. The spacer head allows the Rivnut to be set deep in the insulation of the refrigerator door, forming a compression fit that acts as a seal, and providing threads for hinge screws.

8 The company has also developed a Seal-Head Rivnut using a plastic "O" ring to seal integral wing tanks in aircraft which has remarkable resistance to jet fuels and aviation gasoline.

Strength

9 Washers for high-strength structural bolt connections that consist of two concentric steel rings have been developed to provide pre-load indications that permit bolts to be pre-loaded up to 80% of their yield strength (Standard Pressed Steel). The outer washer is thinner than the inner one, which compresses to a pre-determined load; when the outer ring no longer turns freely, the desired pre-load has been reached. A disposable key is inserted in a hole in the outer ring to see if the bolt has been drawn up to the desired load.

10 To isolate machines and parts from vibration and to secure them in position, Barry Controls Inc. has developed the All-Anglmount, which can be mounted at any angle. The load-carrying member, which is supported on two conical springs, carries with it a nylon washer that rubs against the metal casing of the isolator. This friction damping is increased by a damper spring that presses the washer against the case. Molded nylon snubber pieces act as seats for the load-carrying springs to reduce end shock when the carrying member bumps the bottom of the mount.

Wire stitching and stapling are fast and economical for hidden installations

Stapling and wire stitching are quick, efficient methods of joining all sorts of sheet materials. There is a wide range of hand tools, including a stapling hammer, used for attaching shingles and insulation; other hand tools have been developed for clinching to wire or for fastening rods and tubing, including glass thermometers, to sheet materials. Cost ranges from a dollar or so into the neighborhood of $1,000 for heavy-duty metal stitching machines. Stapling and metal stitching are used where appearance doesn't matter, or where the joint can be concealed or inconspicuous.

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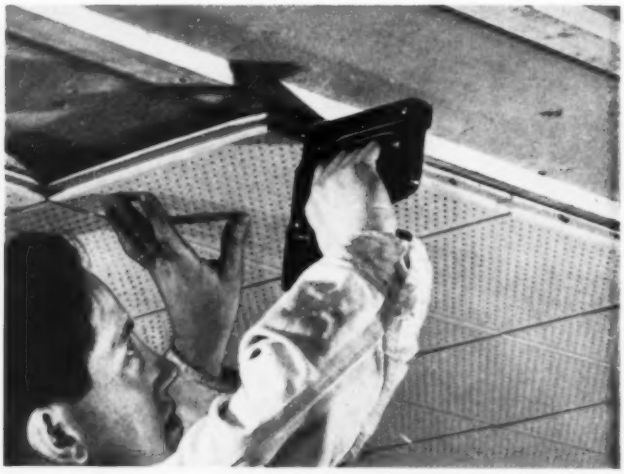

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***1.** Stitching two layers of felt to stainless steel channels in car windows is performed on a standard Bostitch stapling machine, and eliminates drilling and riveting operations. Other plants have used such stitchers to join lengths of metal coil used in continuous strip annealing, which eliminates a spot-welding operation; riveting and crimping was eliminated and fastening time was reduced a third by attaching insulating liners to frozen food and storage cabinets by wire stitching.*

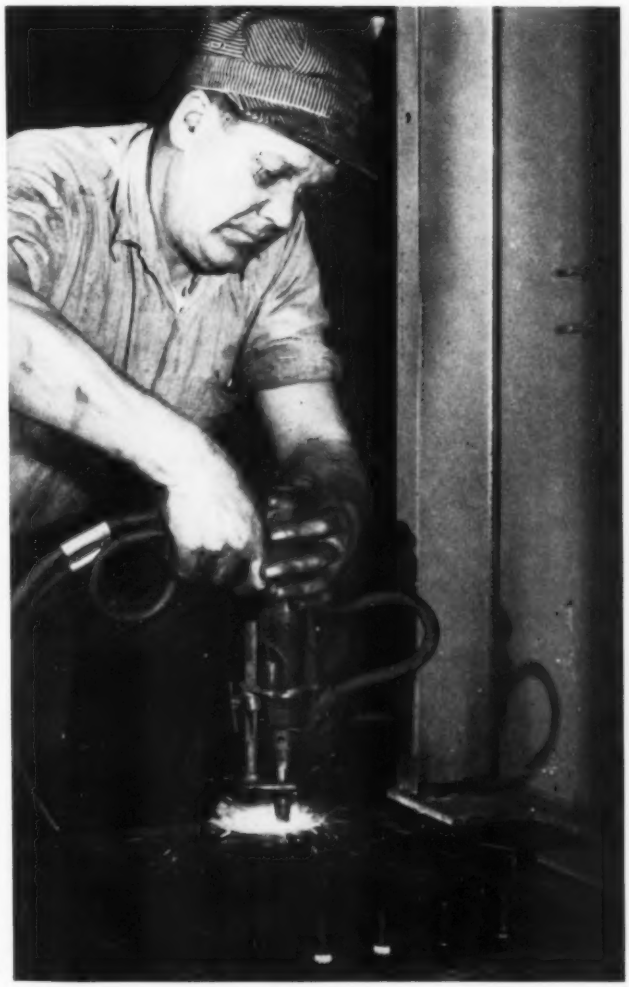
***2.** Rods and tubing can be joined or crimped to sheet materials with hand or power tools, the staple clinching around the tube with no damage to the attached part or marking of the sheet material.*

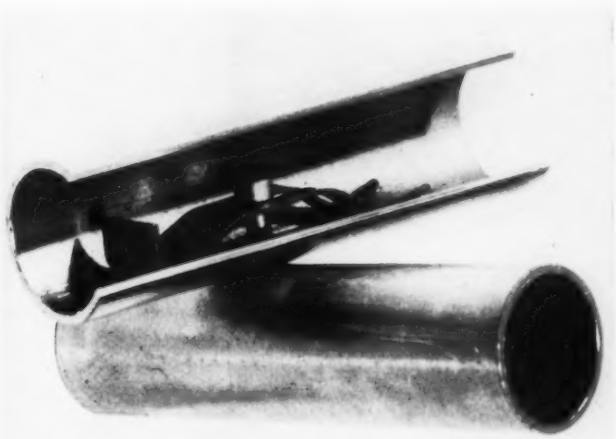
***3.** Insulation and ceiling tile can be held with staples set about 4" apart with a Bostitch tacker, and it is claimed their holding power exceeds that of one-inch flat head brads.*

***4.** Stapling duct work and wire-stitching galvanized sheet speeds up assembly, for curved and bent sections can be rapidly and easily handled. Each stapling action takes only a fraction of a second, eliminating the need for clamping the work. When metal is stitched, however, the staple can rarely be made flush with the surface.*

Stud welding gives a neat one-side assembly

Stud welding, which was developed just before World War II by Theodore Nelson to speed up ship construction, is a method that has been adopted to improve the appearance of housings made of heavy plate and to simplify all kinds of stud-fastening problems. A 5-pound gun that holds a flux-tipped stud just off the work creates an arc between the stud and the plate when its trigger is pressed, and then plunges the stud into the molten pool created in the plate. The weld takes a fraction of a second to complete, and one man can do nearly 200 welds an hour.





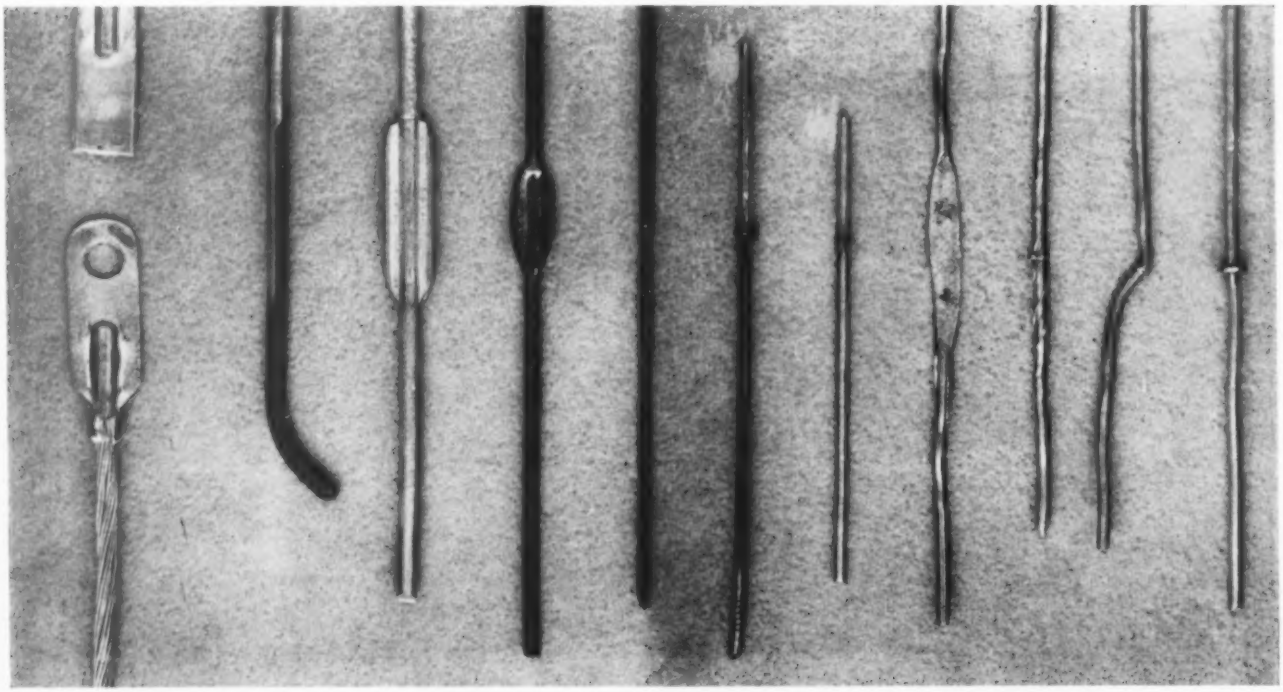
***5.** Smooth walls improve the appearance and the efficiency of a machine for baling waste designed by the American Baler Company. One man, who takes the gun to the work, replaces the two-man team that had formerly been needed to tighten the through bolts. Drilling, countersinking, and punching were eliminated, as were most of the exterior projections.*

***6.** A stud end-welded to the outside of a tube acts as a hidden swivel joint when a second length of tubing with a tapped hole in its side is slipped over the stud and held in place with a spring clip. This application was developed to improve the appearance and operation of a folding chair with a tubular frame.*

***7.** A simpler forging resulted when studs were welded to yokes, rather than forged along with the rest of the piece. A groove in the stud, visible in the smaller yoke, holds a snap ring that retains a swing bolt. The disc and disc nut used in a valve, shown on the left, employed a version of stud welding, called plug welding, to lock the two pieces together. Distortions occurred when hand welding was used. The special studs are pinched off flush with the surface after the weld has been made.*

Cold welding—one of the simplest new fastening methods

Among the newest methods of fastening is one that requires no fasteners at all: cold pressure welding, which can join non-ferrous metals such as aluminum, copper, silver, nickel, zinc, and cadmium at room temperatures. The pressure applied must exceed the flow point of the metal. Nobody knows quite why a permanent bond is formed, but the theory is that the crystals of the two surfaces intermingle and lock together. Because no heat is used, a cast condition is not produced, permitting the face opposite the weld to be anodized or coated.



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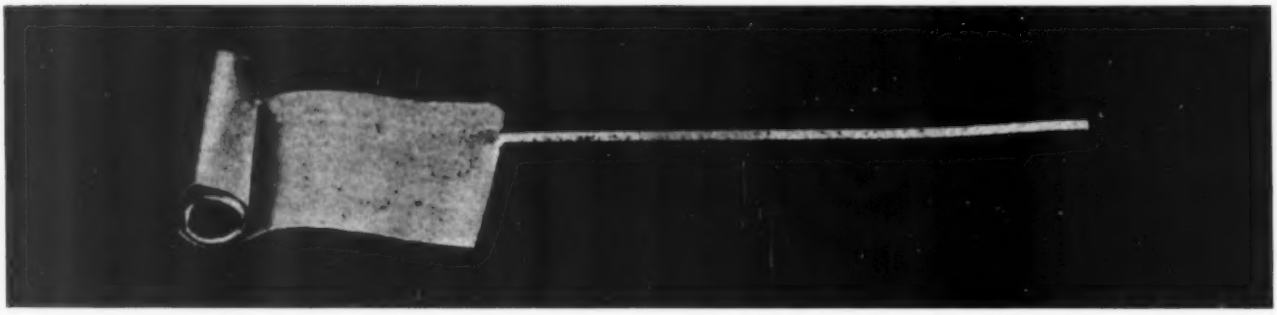

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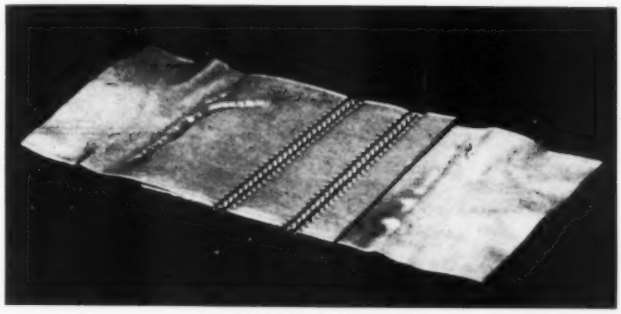
Cold welding wire, sheet, and studs

Cold welding was developed in England in the late Forties by A. B. Sowter of the General Electric Company, Ltd., (no relation to the American firm), and licenses are issued by William Dubilier's Koldweld Corporation, which has an agreement with Utica Drop Forge and Tool Corporation to produce the tools. **1** *Cold welding of wire, rod, and conductors produces a joint that is slightly thicker than the parent metal, even when the flash is removed, but electrical resistance is unaffected. The joint is stronger than the parent metals, because of the cold working during compression. Joined metals can be drawn after the weld is made, and the joint disappears.*

2 *Tabs and foils can be attached with a hand tool, and wire is easily welded to sheet materials. The method is particularly useful in the field because it is faster, simpler, and cleaner than methods employing heat, electric current, or fluxes.*

Several types of cold weld have been developed for joining foil, mesh, and metal sheets up to $\frac{1}{2}$*" thick, but the appearance of some of these welds has not been entirely satisfactory.*

3 *The foil weld presents a neat appearance, although there is a ridge between the two rows of welds, which are carefully spaced*



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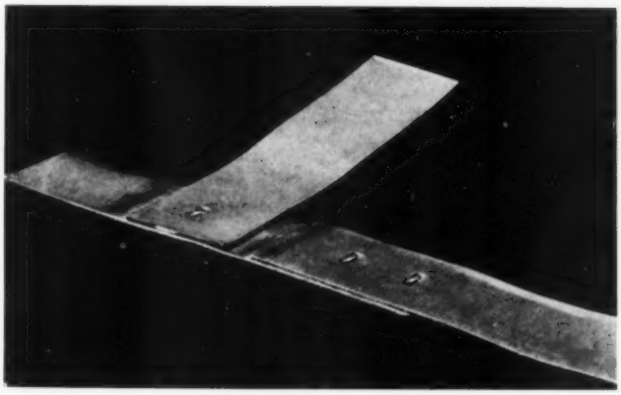

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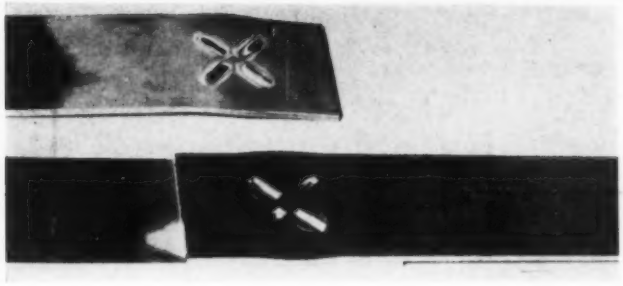

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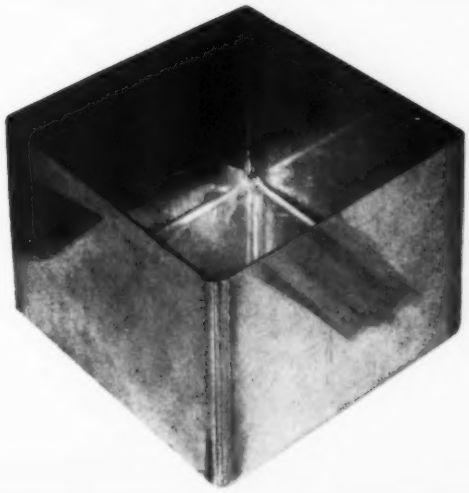

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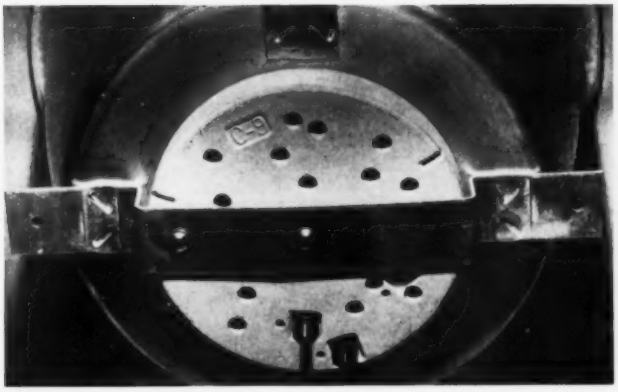

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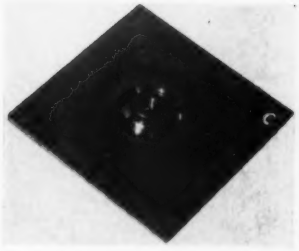

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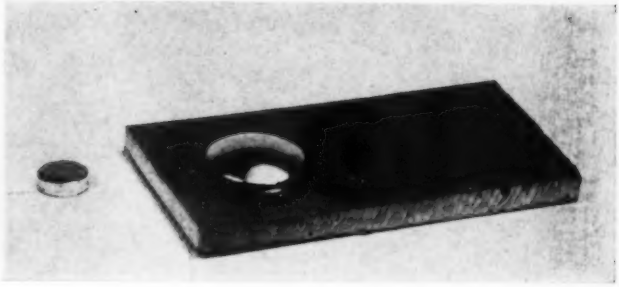

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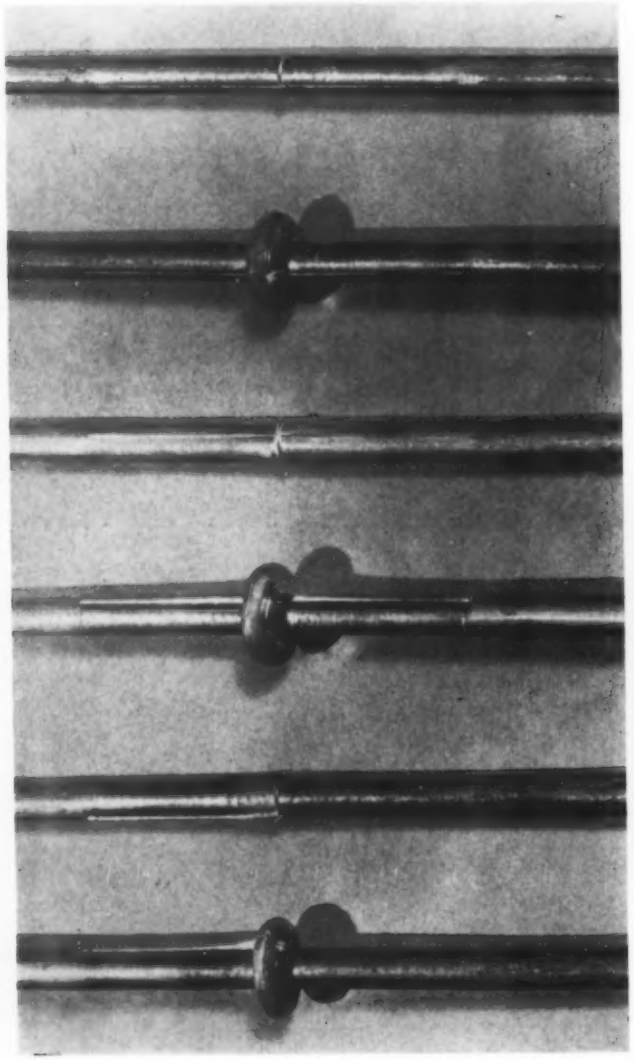
apart to corrugate and stiffen the weld.
4 In thicker materials, a bulge is formed next to the weld, and the wave weld was developed to distribute this bulge.
5 The simplest weld is made with a short, straight die, and looks like a gouge in the metal, but a repetition of these, or a row of dots, presents a fairly neat appearance when carefully spaced. These stagger welds are used to join thin sheets to bar stock or a frame.
6 A cruciform weld arranges the gouges in a symmetrical pattern.
7 The lap weld is invisible, and can be used to form thin-walled seamless metal boxes and air-tight, water-tight cans.
8 Many welds can be formed on the hidden side of the work, as in the case of thick aluminum brackets that were cold welded to the thinner aluminum shell of the Broil-Quick fryer cooker—a reversal of the customary practice of welding thin to thick.
9 A neat trap weld that forces the sheet metal to flow around the base of a stud or insert, holding it firmly during heating and cooling cycles, is used to replace a riveting or soldering operation.
10 Although appearance is not a problem, a neat weld is made when silver electrical contacts are fastened to relay bars.

Cold welding forms as well as fastens

Cold welding can be used for forming a part, as well as for joining wire or sheet to other sheets and for fastening tubing to sheet. The speed and simplicity of the method can be exploited to cut production costs, as well as to free the designer from limitations of other fastening techniques.



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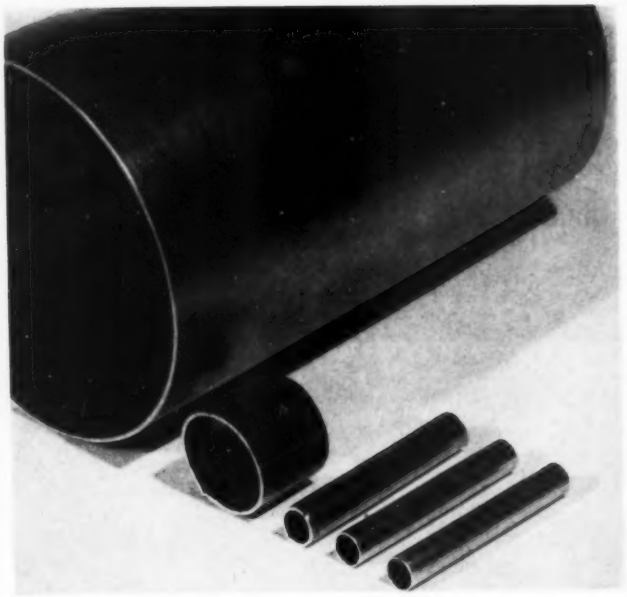


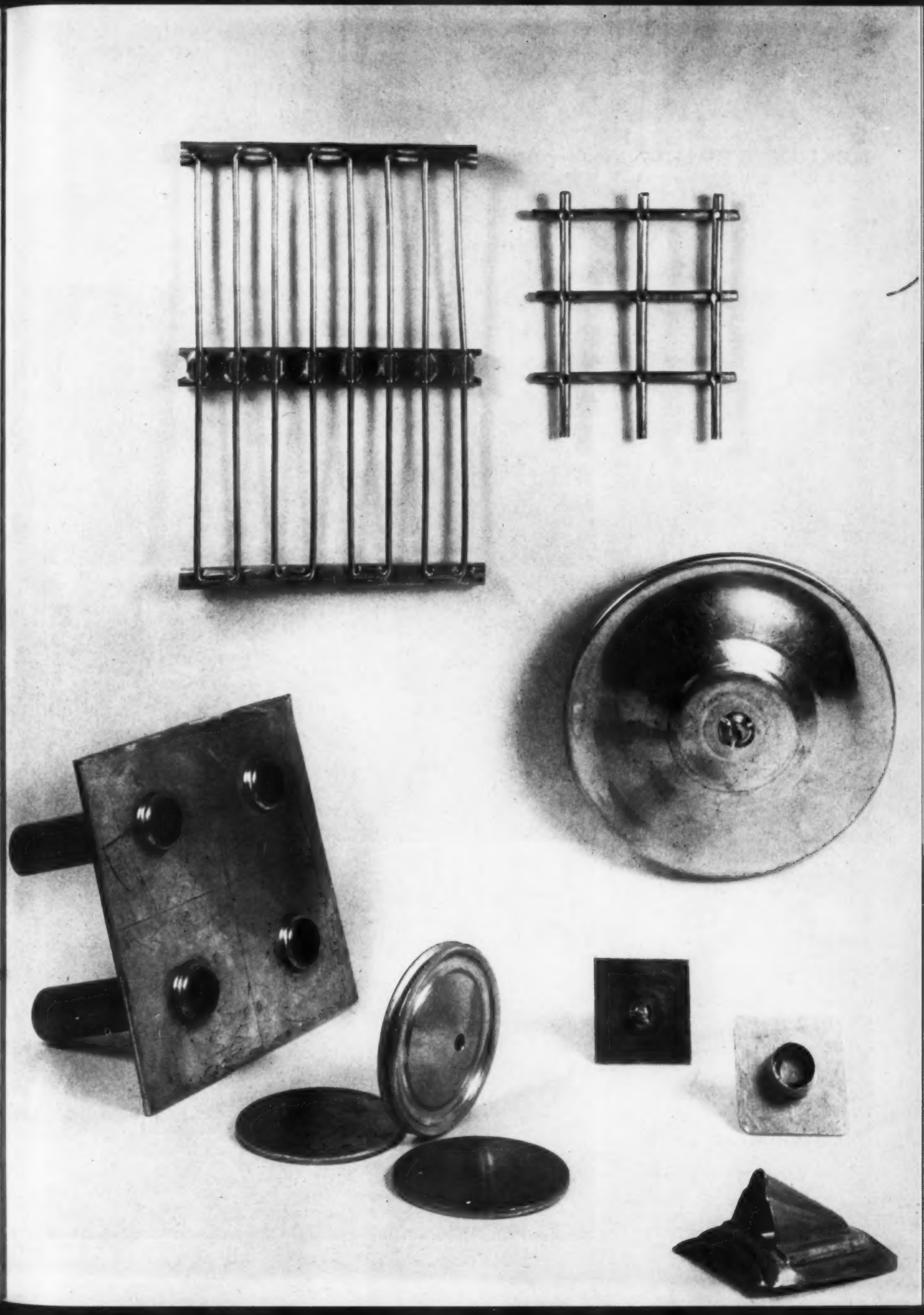
2

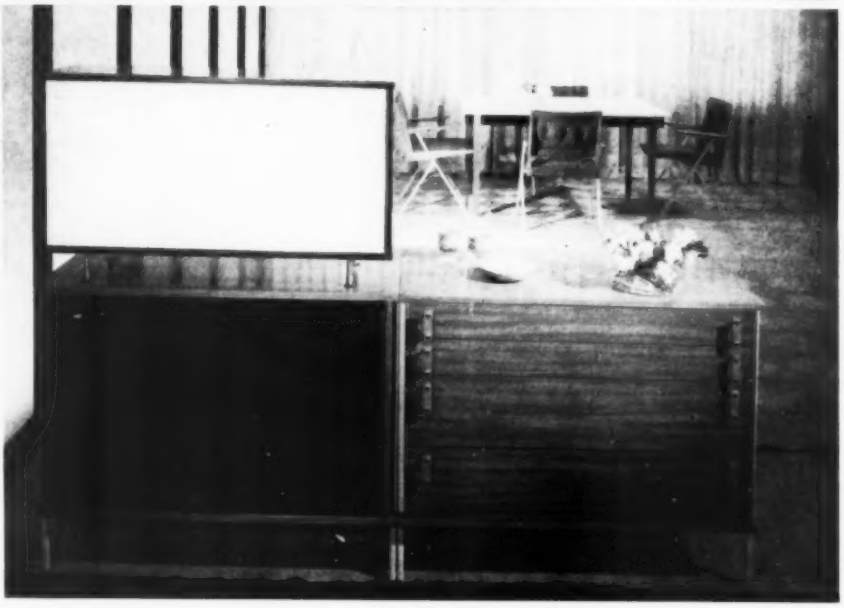
Rods and tubes

1. The direction of future exploitation is suggested by the uses of cold welding shown here. Butt welding of aluminum and copper rods and tubing leaves a flash mark that can be left on for added strength.

2. The rod or tubing can be bent or drawn after the weld is made; tensile failure does not occur at the weld. Tubing can be continuously formed from metal strips.

3. Shown in the large picture, top: grids formed by laying aluminum channels on bent aluminum wire so that the cold weld die forces the channel metal in and around the wire. Circular dies are used on both sides of the crosspoints when aluminum rods are formed into a grid. An iron stud, trap welded into a pot lid, provides threads for a knob that covers the weld indentations, center row right. Just below the pot lid is an aluminum stud welded to an aluminum sheet—a difficult welding problem because of the low melting point of aluminum. Beside it is a cup that is welded to a thin sheet of aluminum. Weld marks are inside the cup, and there is no sign of the weld on the back face of the sheet. When tubes are cold welded to sheet, a projection is formed beyond the sheet; new welding techniques are being developed to do the same job with a butt weld that eliminates the projection. Wheels and pulleys can be formed by squeezing circular disks in a two-part die; the displaced metal forms the groove at the edges, and the center bulges out when pressure is applied. A V-shaped die fastens a stamped spout to the body of a kettle, indicating the various shapes that can be attached to sheet by the cold welding method.





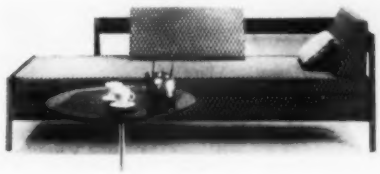
Et tu, Knoll?

Knoll Associates, known for its high quality modern furniture, has finally presented a low-cost line of furniture for department store sale. The pieces will be produced in conjunction with Austin Industries, who will manufacture the line, using Knoll fabrics. The Ladislav Rado designs include some 35 items—all the pieces necessary to furnish an entire house. Case pieces have frames of square steel tubing with gray baked enamel finish and sides of mahogany. Drawers are molded of plastic with fronts of gray enamel or wood. Handles and pulls are leather and brass. Tabletops come in black or white Formica or wood; and one white-topped dining table has black extension leaves. Furniture on this page is all the new Knoll: Chair, above, left $60; desk $150; top sofa $350; lounge chair $155; 3-drawer chest $135.

↓ **Arvin Industries** has introduced a high-style line of dinette furniture to compete with the designed-to-death dinettes of curlicued chrome. Waltman Associates designed this chair with back wires and ferrules of brass; a frame of steel is enameled black. Matching table is also black and brass. Table and 4 chairs, $129.95.

↑ **Raymor Manufacturing Div.** chair is a Fiberglas shell with metal leg fittings molded in. The shell is coated with foam rubber, then sprayed with a tough vinyl covering in color, black, or white. Designer is Guy Rothenstein. $31.

↑ **Avard's** newest chair has an all-steel frame of 1" square tubing lacquered in black, white or beige. Two foam cushions with reversible zippered covers fit into the chair. Design is by Darrell Landrum. $144. At the recent market, easy to clean, comfortable and bulkless chairs like this continue to replace the massive monster that was designed to "look" comfortable.



↑ **Arch Gordon & Co.** sofa comes with a right or left arm. Frame is walnut, and the bumper bar is leather-covered. This elegant design by Milo Baughman typifies the new furniture that appeared at the recent market. $480.

↓ **Bostrom Manufacturing Co.** chair can be folded to less than 6" wide. The frame is tubular steel, seat and back sections are of molded plywood in birch or walnut finish. Design is by Forrest-Syvertsen. $30.

↓ **Thonet Industries, Inc.,** manufacturers of the old bentwood cafe chairs, now propose this chair for hard wear and varied use. The shell is of molded plywood, melamine surfaced, which makes it water-, heat- and acid-proof. Base is wrought iron. $24.

↑ **W. & J. Sloane's** latest line of furniture for non-residential use has been designed by Jens Risom. The series included three sizes of single or double pedestal desks, tables, a storage wall unit and several cabinets. Drawer pulls and trim are brushed aluminum, wood is walnut. Desk above has a 3-drawer pedestal, $634; cabinet $442.

↑ **Herman Miller Furniture Company's** new steel frame desk, designed by George Nelson, is enameled white; matching masonite sliding panels cover storage shelf. Back cabinet and desk top come in grey or walnut Micarta. $200.

↑ **Arch Gordon & Co.** table has base of brass. Top is solid parkay of walnut and cherry wood. The tabletop is 28" square, strips of wood half that long make a checkerboard down the middle. Design by Milo Baughman. $200. This piece, and their table on the next page, typify the use of wood combinations in the new furniture.

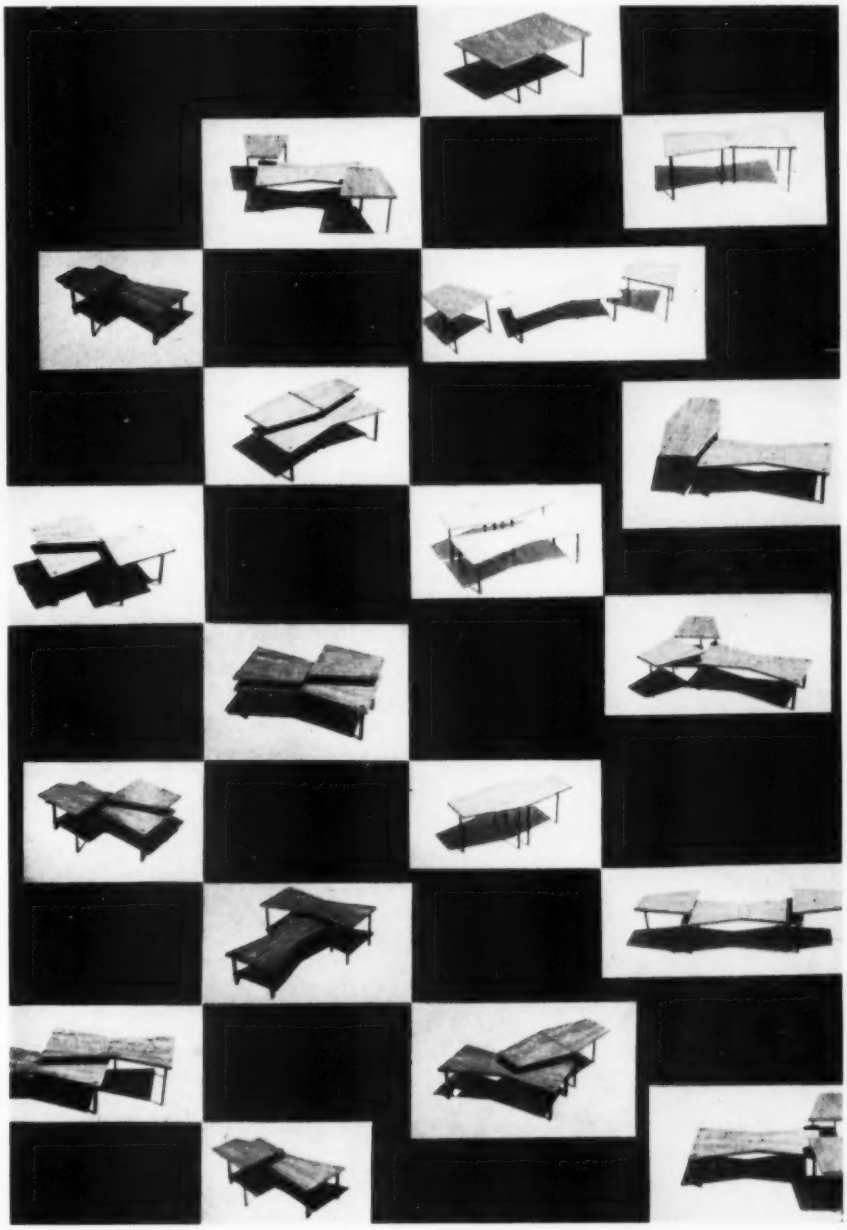
↓ **Urban Furniture Co.** chest-on-chest also illustrates the new handcrafted look in furniture. The walnut here is inlaid with aluminum instead of with a contrasting wood. Design is by William Hinn. $350.

↑ **Altamira** imports these graceful chairs from Italy, where they were designed by Mario Rinaldi. The frame has a chrome finish and the plywood parts are available in "stock" colors such as mauve. $50.

↑ **Arch Gordon & Co.** line also includes this cocktail table of walnut with inlaid ebony splines and two drawers of ebony. Design by Milo Baughman. $279. The trends contributing to the new designs—Japanese simplicity, Italian elegance, and the Scandinavian craftsmanship—all show their influence in this piece.

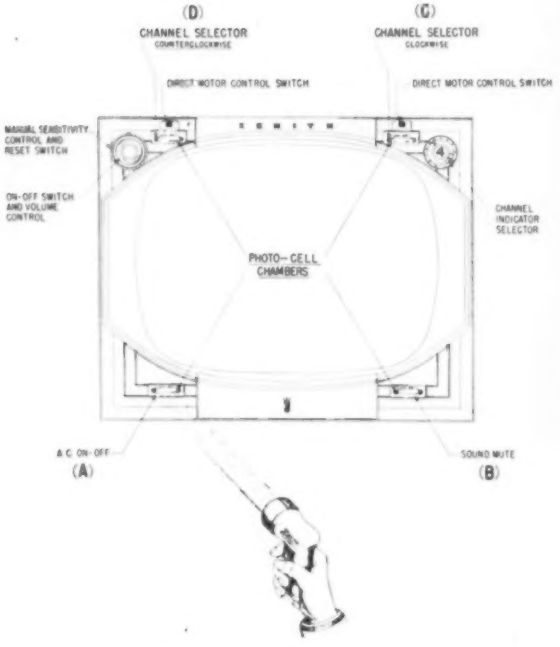
↓ **J. G. Furniture Co.** presents a sturdy chair of molded Fiberglas with polished steel legs. The chair comes in black or white—or if ordered in quantity, in any color. Design is by Kofod Larsen. $60, without available rubber seat cushion.

↓ The butterfly table, below, designed by Theodore Luderowski, is in three pieces—one 4-legged butterfly shape and two 3-legged wing pieces. The three parts can be joined by telescoping the thinner pipe legs of the smaller parts into the larger open legs of the main table, forming a multitude of combinations. Available from the designer (Bloomfield Hills, Mich.) on order.

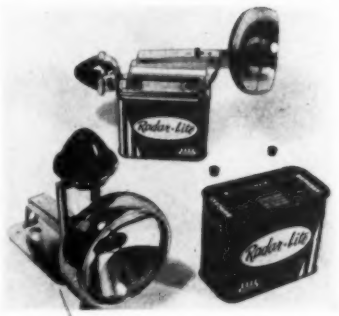


↑ **The Tefifon Company,** a German firm, has developed a clip-in tape magazine that eliminates rewinding of recording tape, and contains a soundband that plays up to 8 hours. The magazines, or "sound books," will cost under $20 and the playback units under $100 when this equipment is available in the U. S.

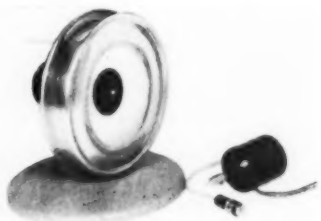
↓ **Zenith's** new line of TV sets includes 9 Flash-Matic models that can be controlled from across the room with a beam from a flash gun. Each corner of these sets has a sensitive window that, when touched by the beam, controls one of the four operations marked A-D in the diagram below. This will doubtlessly save a lot of wear and tear on TV viewers, but the least expensive set is $400.



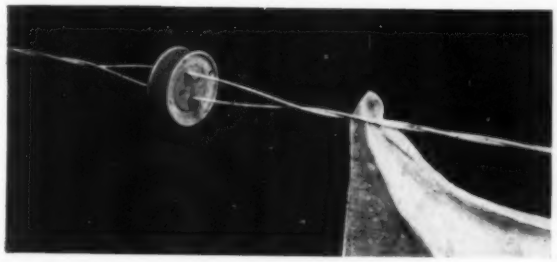
↑ **Stadler - Neuwirth, Inc.** is using General Electric's new electronic switch in their line of table lamps. A touch of the hand to two closely adjacent metal surfaces lights or turns off the lamp. The touch area is not restricted in size; in the lamp above, for example, the metal base is one touch area and the ball is another, so touch control can be achieved from any angle. Illustrated lamp is brass, costs $50.



↑ **Burgess Battery Company's** new utility lantern utilizes a battery which is its own battery case. The 4" x 5" Radar-Lite battery is leakproof and long-lived. Its attachment to a twin light head completes the circuit. $12 with battery.



↑ **Chemex Corporation,** who produce the Chemex coffee maker and other designs by their inventor-President, Dr. Peter Schlumbohm, now offer the Tangentair fan, which collects air in a pressure cowl, then throws it out through a disposable filter. The copper-colored fan, 8½" in diameter, costs $20. This fan is also recommended for automobile use; the necessary exchangable motor costs $8.

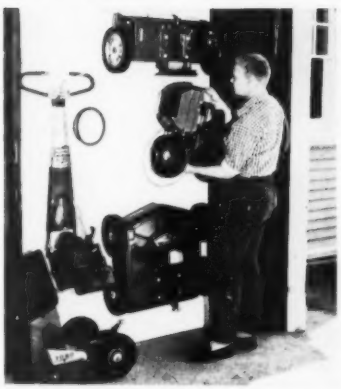


↑ **Dennan Manufacturing Co.** presents a new idea in clotheslines. Tightly twisted twin wires of steel coated with Bakelite vinyl part when passed through a mechanical spreader. Clothes are slipped between the wires — lock in place when the spreader passes along. 30′ walk-along line is $3.98.

↑ **Plastic Age Reinforced Products, Inc.** are manufacturing oars of polyester Plaskon reinforced with fiber glass, which are hollow for storage of fishing rods and floatability. Three models and five colors are available. A heavy-duty pair costs $23.

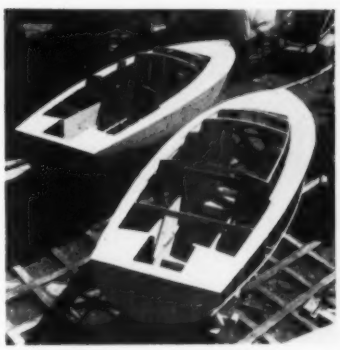
↑ **Ray-O-Lite Corp.** is selling awnings of Fiberglas with an aluminum frame. The awning is shatterproof and provides green, blue, yellow, coral or white filtered light. Design is by Raymond Loewy Associates, and all installations are custom-made.

↓ **Pioneer Equipment Sales Co.** fights 'phone fatigue with a new device which holds the handpiece at head level to leave the user's hands free for typing, writing or lazy listening. Because a goose neck suspends the handpiece, a small spring-operated lever fits over its saddle. Design by Newton S. Leichter. $9.95.

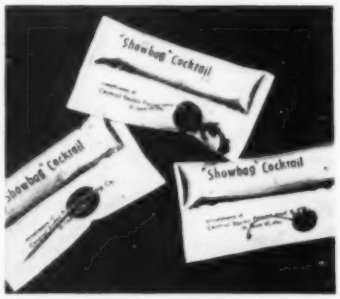


↑ **Toro Manufacturing Corp.** Power Handle is a self-contained detachable unit powered by a 3¾ h.p. motor that can be used with several operating components such as mowers, a tiller, trimmer-edger and a snowplow. Handle (hanging at left) costs $89.95; units cost from $60 to $80. Toro's new line also includes a 10″ deluxe tilting arbor saw that costs $149.50 (below). Designs by Charles Butler Associates.

↓ **Mount Desert Yacht Yard, Inc.** will deliver a 2,000 lb. do-it-yourself kit for building a 25′ sailboat. The Amphibi-Con is actually available in four stages of completion as a "basic kit"; bare hull; semi-finished or completed boat. The basic kit costs $1,390. saves the Sunday shipbuilder about $4,000.



↑ **Industrial Manufacturing Services Corp.** has invented a packaging device called the Pak-Lok, which is a method of clamping units of 4, 6, 8 or 12 cans together. The inexpensive clips are expected to replace paper carrying cartons, in brewery packaging particularly, and save as much as 25 per cent on packaging costs. Pack-Loked "cartons" are easier to handle, stack, cool and count. Easy on the consumer, who doesn't have to learn to identify cartons. **Best Foods Inc.** has recently repackaged Nucoa margarine. The new box features yellow lettering against blue-green —to look cool and contrast strongly with competitors' packages. Design by Lippincott & Margulies. **Ekco Products'** bottle storage rack is an example of well-designed packaging for home storage. The rack holds 12 bottles of wine, or soft drinks in large or small bottles. Chrome-plated, 14" tall. $2.98.

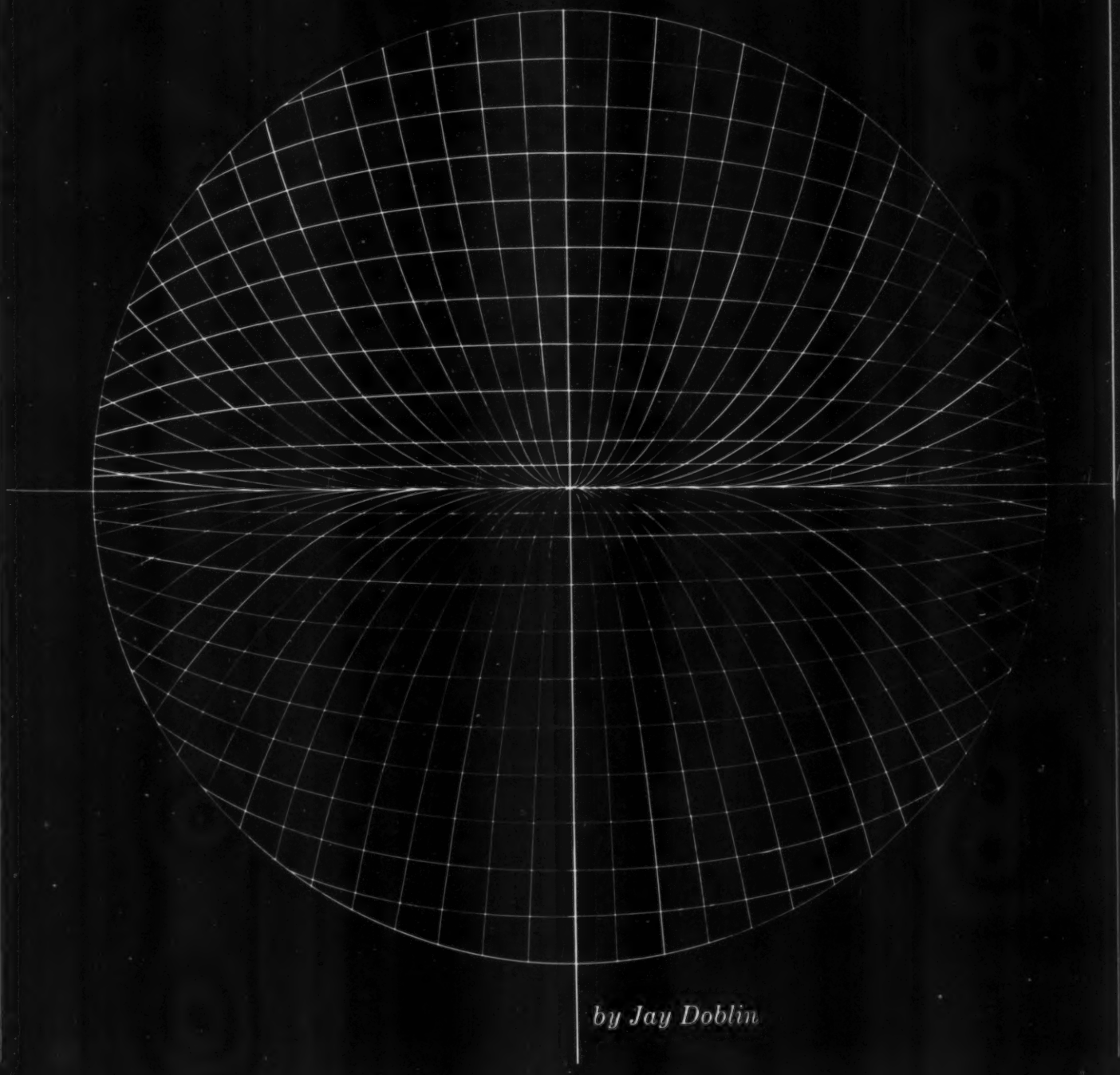


↑ **Frontier Manufacturing Co.** produces a display rack for Fiberglas that makes store storage and dispensing as simple as tearing off a paper towel, while advertising suggested uses for the material. Grey baked enamel finish on steel. Design by D. O. Beren. **Bell & Howell** is packaging matched sets of equipment for shooting and showing 8 mm movies. Camera, projector and lighting equipment are sold in a luggage-type box that has a screen inside its lid. **Wyler Watch** proves its point by packaging their Aquarama waterproof watches in transparent envelopes filled with water. **Central States Paper & Bag Co.** has designed a promotion piece that also has its silly side. Two-compartment polyethylene packages are divided by a center heat seal. Martinis come with an olive, to promote the use of duet packaging for merchandising related items.

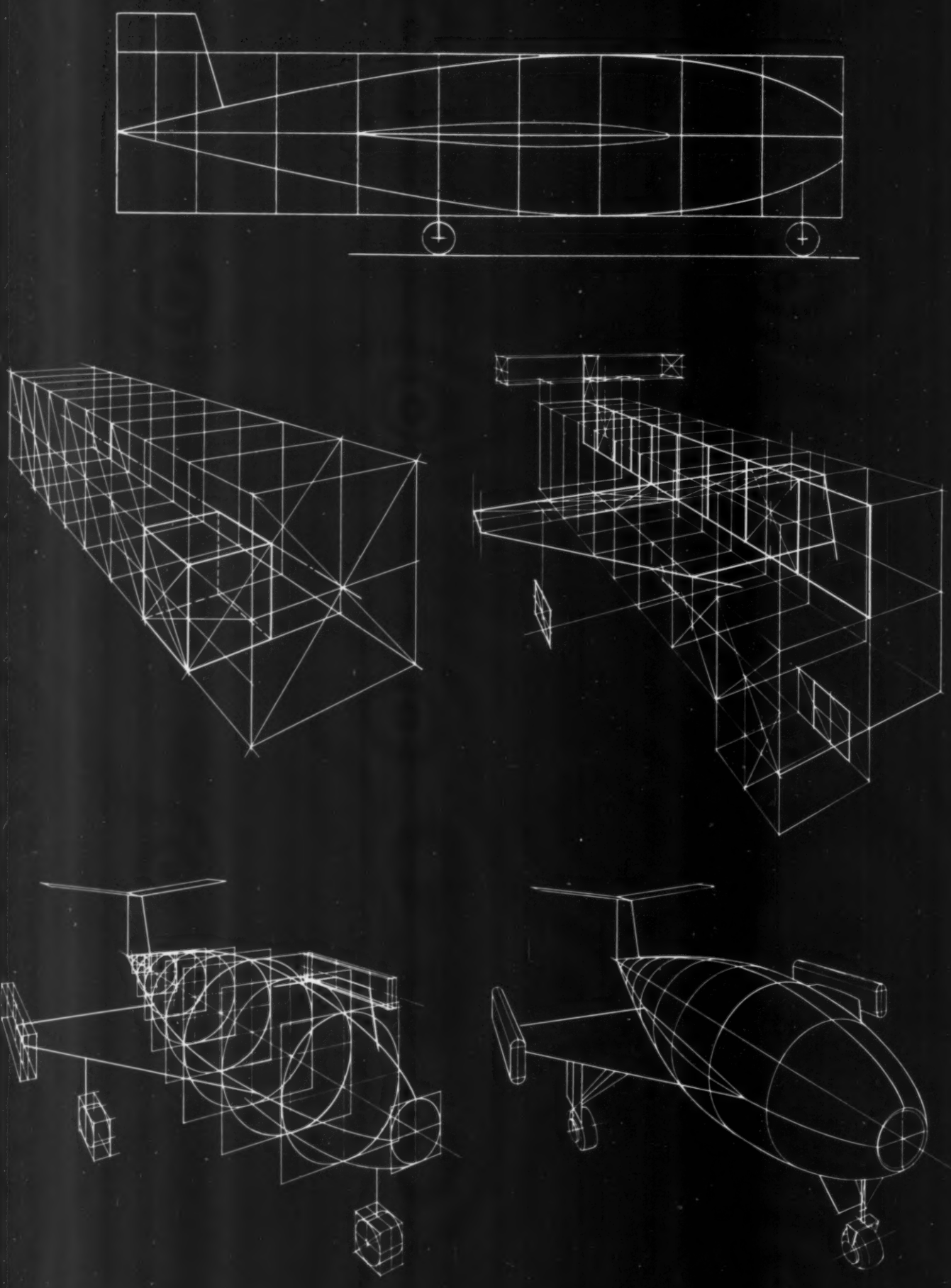
Part 5

PERSPECTIVE

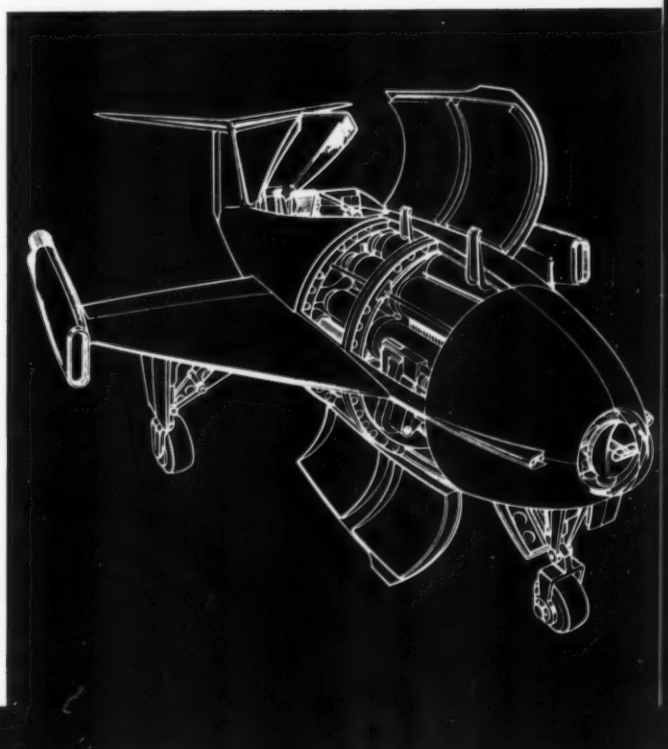
a new system for designers



by Jay Doblin



The best way to draw compound forms like the one below is to develop a perspective grid on which the curves can be plotted from a scale drawing. The example we show is a fairly simple one because the cross section is circular. We start by drawing a longitudinal section showing the free curving side in true scale, and constructing a grid over it. This curve is then translated to a matching perspective grid. The circular cross section does not require a grid; it is only necessary to inscribe ellipses in a series of squares drawn at perspective right angles to the curve with their centers on the main axis of the figure. Usually only a few curves need to be plotted accurately; the rest can be filled in by eye. Some objects — automobiles, for instance — have free curves in more than one plane. For such amorphous forms, complex grids in three dimensions are required. When he is designing directly in perspective, the designer can plot some basic curves on a perspective grid and try out variations on an overlay sheet. The system is invaluable where curved forms must envelope a given mechanism — in an electric shaver, for instance. In such cases, grids are drawn at critical points to make sure the curved form clears the mechanism.



Three-point perspective

In ordinary two-point perspective, only two vanishing points are required. Some of the lines in the cube converge toward one of these vanishing points, some toward the other. A third set of lines — usually the vertical ones — do not converge at all but are parallel to each other. Their vanishing point is assumed to be at an infinite distance from the observer. In three-point perspective, a finite vanishing point is provided for all three sets of lines in the cube.

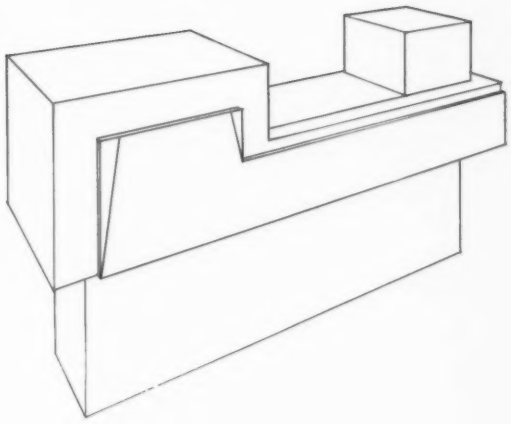
Three-point perspective should be used a good deal more than it is. Parallel lines appear parallel in perspective only if they happen also to be parallel to the picture plane, and in most positions the cube has no edges parallel to the picture plane. In other words, two-point perspective can be regarded as a special case of three-point perspective. It is used more than three-point perspective mainly because the latter is so much more difficult.

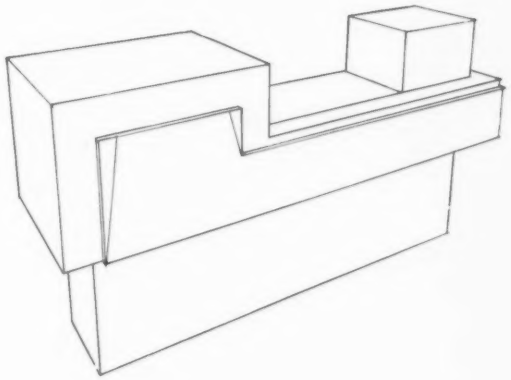
To understand three-point perspective examine this case: We want to draw a group of cubes suspended at various points between eye level and the plan view. Since the observer is looking squarely at the top cube, its verticals are perpendicular to his line of sight and parallel to the picture plane, and they appear parallel in perspective. If these verticals are parallel all the others must be; thus all four cubes are in two-point perspective. If the four cubes are lined up with their nearest edges against the picture plane, all the nearest edges are the same height, regardless of their relation to the observer.

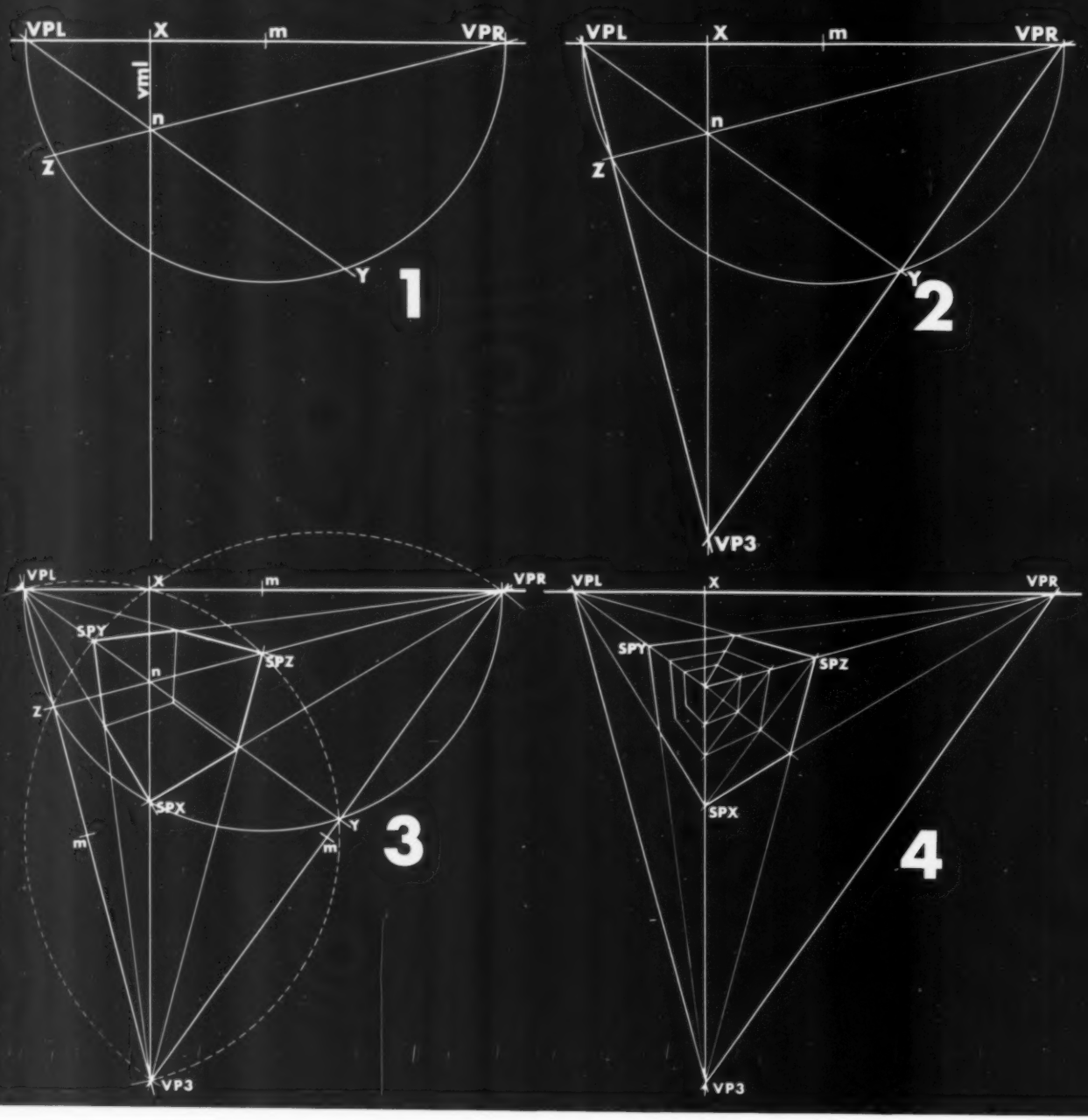
Now suppose we are drawing four separate pictures of these four cubes. In this case the observer doesn't have to maintain a fixed position, and he naturally turns toward each cube as he draws it. Since by definition the picture plane is perpendicular to the observer's line of sight, it rotates to a new position for each cube. The top cube is still in two-point perspective, but the second and third cubes are at random angles to the picture plane; they are in three-point perspective.

The second drawing shows that a cube whose sides are perfectly vertical is in two-point perspective when it is straddling the horizon. If it is below the horizon (as most small objects are) it is seen at an angle and there is convergence in every pair of lines. Returning to the first drawing, we can easily see how the two-point cube grows more and more distorted as it drops away from the observer's line of sight. The draftsman often permits considerable distortion rather than introduce the third vanishing point because three-point perspective is complicated and space-consuming. In addition to a large horizontal area it usually requires tremendous depth for a third vanishing point.

The drawings at the right compare two-point and three-point drawings of one object seen from one angle. Although the second drawing is more dramatic, the convergence is slight in an object so close to eye level, and we are not aware of any distortion in the first drawing. Vertical convergence is more important in objects that are taller than they are wide — buildings, refrigerators, etc. It is imperative in objects so far below eye level that more of the top is seen than the sides.






VPL
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3
VP3
VPL
X
VPR
SPY
SPZ
SPX
4
VP3

A cube in three-point perspective is derived from three horizons. These horizons are the three sides of an acute triangle. The vertices of the triangle are vanishing points. Its altitudes are measuring lines perpendicular to each horizon, and their intersection marks the nearest angle of the cube.

Construction of the cube in three-point perspective

1. Draw a horizon and place two vanishing points *VP-L* and *VP-R* on it.
2. Bisect the distance between *VP-L* and *VP-R* and from midpoint *m* draw a circle through them.
3. At any point *X* between the vanishing points, depending on the view desired, draw a vertical measuring line; its intersection with the circle locates the station point *SP-X*.
4. Draw lines from *VP-L* and *VP-R* to intersect on the vertical measuring line, locating nearest angle *n* at the desired distance below eye level. Continue these lines to the circle, finding points *Y* and *Z*.
5. From *VP-L* draw a line through *Z* to the vertical measuring line. Repeat for *VP-R* and *Y*. The two lines will meet on the vertical measuring line at the third vanishing point *VP*-3.

We now have three horizons, each with its vanishing points and its measuring line (at *X*, *Y*, and *Z*). We found the station point for one horizon on a circle drawn through the vanishing points. To find the other two station points we draw similar circles,

6. Bisect the horizon between *VP-R* and *VP*-3 and draw a circle through them. Station point *SP-Y* will be found where this circle intersects the measuring line through *Y*.
7. Repeat for the horizon between *VP-L* and *VP*-3, locating station point *SP-Z*.
8. Connect all the vanishing points with their station points, enclosing a cube.

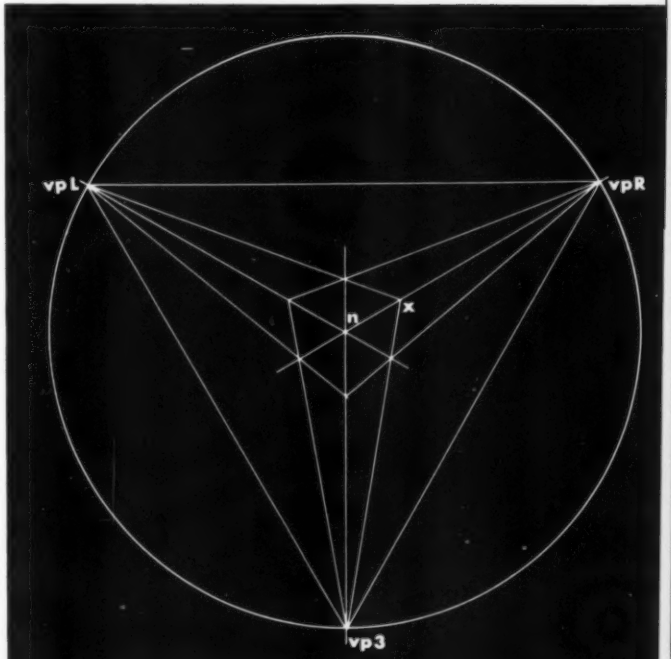
Although this cube is accurate, it cannot be used because the corners at *SP-X*, *SP-Y*, and *SP-Z* are 90° angles and therefore at the limits of true perspective. To make usable cubes or a grid, we must subdivide it.

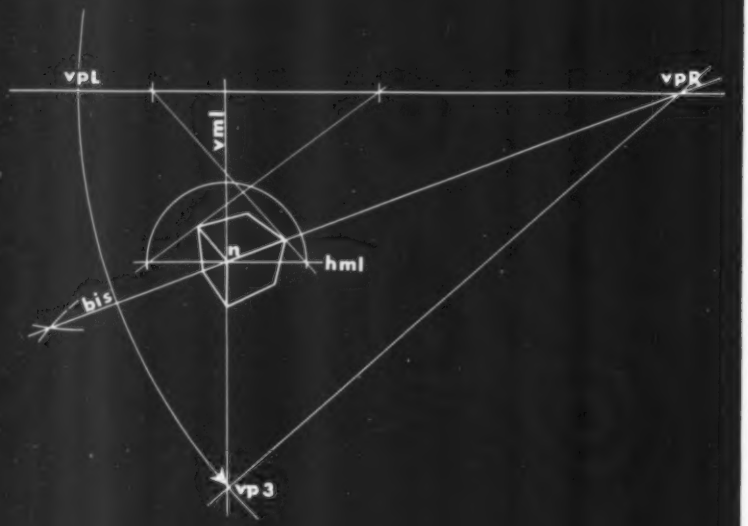
This method is accurate for any view of the cube, but it is cumbersome. Usually the draftsman can save time by using one of several special cases and short cuts.

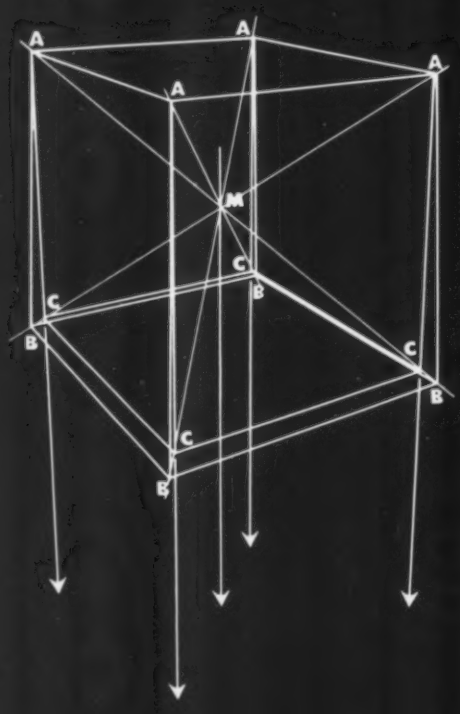
The perfect 45° view

In one case of three-point perspective the cube is perfectly symmetrical. This happens when it is rotated at 45° with respect to each of the three horizons. Then front corner and rear corner coincide on the observer's line of sight; lines converge toward each vanishing point at equal angles; and corresponding corners are at equal distances from the eye. Construction of this cube is quick and accurate.

1. Draw a circle and place the nearest angle *n* of the cube at its center.
2. From *n* draw three measuring lines at 120°, locating the three vanishing points, and coincidentally the three station points, on the circle. The front edges of the cube will lie on these lines.
3. Connect perspective lines at any point *X* on one of the measuring lines. Draw perspective lines to meet at the same angle on the other measuring lines, and the cube is completed.




vpL
vpR
vml
n
hml
bis
vp 3


A
A
A
A
M
C
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B
C
B
C
B

The combination 45° and 30-60° view

A second special case of three-point perspective is the combination of a 45° view toward one horizon and a 30-60° view toward another. This view is less monotonous than the straight 45° view, but somewhat more complicated to draw.

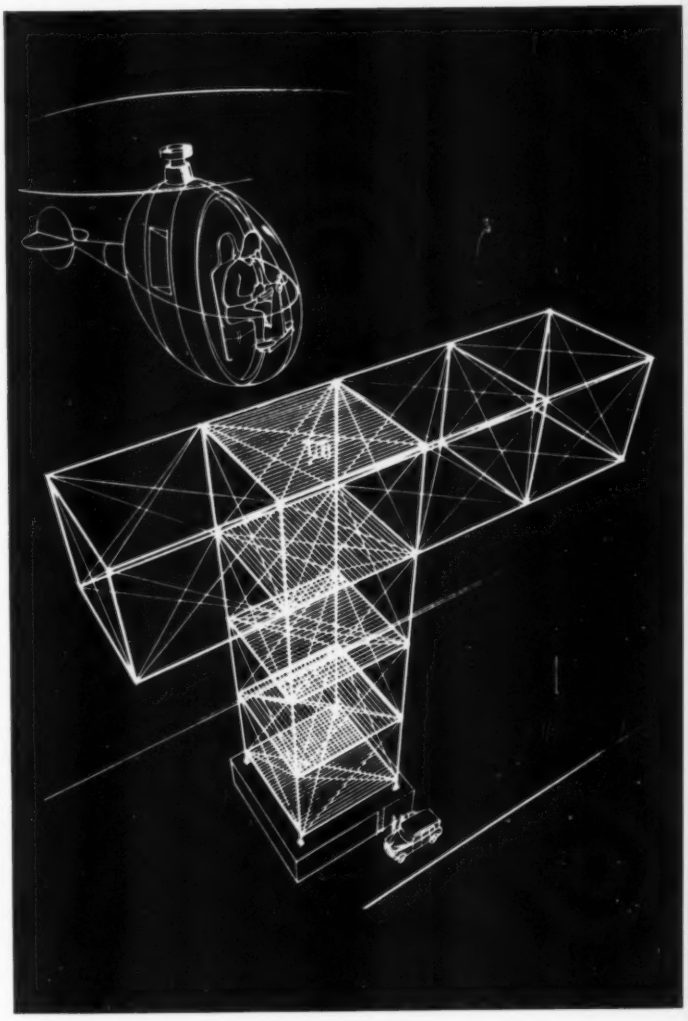
1. Draw a horizon and divide it according to the usual 30-60° method to find the vanishing points, the measuring points, and the vertical measuring line.
2. Rotate the distance between the vanishing points to the vertical measuring line to find *VP*-3.
3. Draw the bisector of this arc. Its intersection with the vertical measuring line places the nearest angle *n*.
4. Draw a horizontal measuring line through *n* and complete the 30-60° horizontal square as usual.
5. Complete another side of the cube by drawing perspective lines to meet on the bisector. The bisector is the diagonal of this side, and since it is half way between two vanishing points, the side is in 45° perspective.
6. Complete the cube.

Three-point perspective by trained eye

The two short-cuts just given are a help in producing two specific views of the cube in three-point perspective. A third short-cut can be used, to draw the cube in a variety of positions. Basically, it is a method for introducing vertical convergence into a cube drawn in two-point perspective. It is not a mathematically accurate method, but depends partly on skillful judgment.

1. Draw a cube *A-B* in two-point perspective at any angle close to eye level.
2. Draw diagonals to find its midpoint *M*.
3. Rotate one vertical edge inward until it looks right for the distance below eye level.
4. Where the new edge intersects its diagonal (*C*) draw a new bottom plane for the cube, using the original vanishing points. Draw all the sides in to it.

This system assures that the vanishing point is directly under the cube, and that the foreshortening of the vertical distance is at least roughly in proportion to the convergence. It is most useful for objects near eye level, where vertical convergence might not be worth the trouble of a more elaborate method. In objects well below eye level, where vertical convergence is essential, the skilled eye is not adequate, and the orthodox method must be followed.



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

Air alone supports huge radome

Design of radar domes makes air-supported buildings a practical possibility

A small amount of air pressure is all that supports the huge radome developed by Cornell Aeronautical Labortory, Inc. for the General Electric Company under a U. S. Air Force contract. Similar domes are springing up throughout the nation, particularly along the frontiers of North America. They enclose and protect the radar antennas that keep constant vigil against an enemy attack.

The air-supported radome was conceived in 1946, when work on the early-warning radar chain was started by the Government. An enclosure had to be developed to protect radar antennas against high winds and iceloads. It had to be constructed of a non-metallic material, thin enough to permit maximum radar transmission. Ribs or stiffeners were out of the question, since they would distort radar signals. Weight had to be kept at a minimum because the radomes were to be transported by air.

Early wind-tunnel tests showed that an air-supported radome was practical and would stand up under winds as high as 100 mph. Using single-ply, neoprene-coated Fiberglas, weighing 2 lbs. a square yard, a prototype was constructed under the direction of Walter Bird, assistant head of the Industrial Division at Cornell Laboratory, Inc. The radome was 36 feet high and had a diameter of 54 feet. It was found that the walls were kept rigid with air pressure of less than one-tenth of a pound per square inch.

Although the choice of suitable materials was seriously limited during early stages of development, new fabrics and coatings are now available to meet almost any commercial requirement. Synthetic yarns have been developed with strength-weight ratios equal to aluminum or structural steel.

Used as radomes for almost all large ground radar installations, air-supported structures have many potential military and civilian applications, including portable hangars or gas-tight enclosures to protect personnel and equipment. They are ideally suited for semi-permanent structures such as fair buildings, industrial or agricultural storage areas, stadiums, and so forth.

There is little danger of collapse, even in the event of a power failure. With blowers inoperative, the roof would settle very slowly. The absence of heavy members makes air supported buildings exceptionally safe in an earthquake, bombing, or other emergency.

Rough estimates indicate that the cost of an air-supported 110 by 225 foot athletic building would be less than half that of a similar building with a conventional roof supported by steel trusses.

Manufacturer: Cornell Aeronautical Laboratory, Inc., Buffalo, New York.

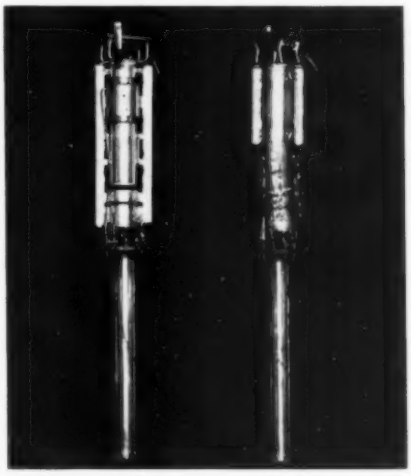
New TV tube is simpler to make

Two developments at General Electric cut down tube production problems

The General Electric Tube Department has designed a new electron gun for large-size television picture tubes which is simpler to produce and easier to install and service in television receivers in the home.

In the past, after a television tube was evacuated, there were enough stray ions left inside to be a serious hazard, since they burn the phosphur on the screen if they strike it. Consequently, electron guns were "bent" so that the electron beam along with the harmful ions did not go directly to the screen. Magnets, affecting only electrons, bent the beam back to the screen, leaving the ions in a trap. This double bending prevented ion burn, but caused distortion and poor focus, and complicated tube production.

The combination of two General Electric developments has overcome this problem. Better evacuation methods get rid of more ions and reduce the danger of phosphur burn. An improved processing technique for controlling the thickness of the aluminum coating inside the tube face gives greater protection against the few ions left inside the tube. This double insurance against ions made possible the "straight" gun which has no external magnets.
Manufacturer: General Electric Tube Department, Schenectady 5, New York.



General Electric's "straight" electron gun (left) will replace the ordinary "bent" gun shown on the right.

Tire is made like glass

Silicone rubber and glass fibers are combined to make a new kind of tire

A new kind of tire which will withstand temperatures of over 500° F. and made of materials new to the tire industry is the result of joint research by United States Rubber Company and Dow Corning Corporation. The raw materials for the tire—quartz and sand derivatives—are similar to those used in glass making. It is the first tire in which silicone rubber and glass fibers have been successfully combined.

The high cost of materials makes commercial application to automotive vehicles unlikely at this time, but tires of this kind may well be suitable for super-sonic aircraft, where tires may be exposed to temperatures as high as 500° F., conditions that would cause ordinary tires to disintegrate.

A pink-orange in color, the glass tire is translucent, with the outer ply visible through the sidewall.

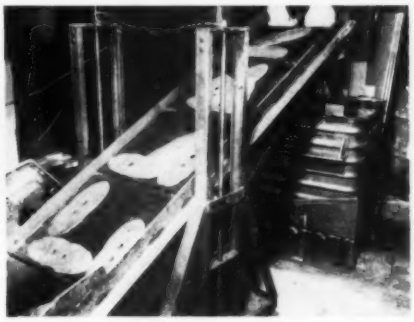
Manufacturer: U. S. Rubber Company, 6600 East Jefferson Avenue, Detroit 32, Michigan.

No slippage with new conveyor

Small parts are carried up hill by Goodyear's novel cleated belt

A cleated conveyor belt which carries loads up grades of 30 per cent or more is in production at Goodyear Tire and Rubber Company. The new conveyor belt is particularly useful to manufacturers of stampings and small machined parts.

The belting is available in a variety of plies, cover thicknesses, widths, and rubber compounds depending on the application. The rubber cleats measure three-eighths inches, one-half inch, one inch, and one-and-one-half inches in height. Widths and base reinforcements are designed to give maximum wear under normal factory use. Manufacturer: Goodyear Tire and Rubber Company, Akron, Ohio.



Electrostatic spraying is fast

Mushroom-shaped spray gives intricate objects a superior coating

Production-line electrostatic spray-coating of vinyl plastisols on fabricated wire products is reported to be more than twice as fast as conventional dip-coating. The process, developed jointly by United Chromium Division of Metal and Thermite Corporation and Scientific Electric, is automatic and conveyorized.

It was found that a mushroom-shaped spray did the best coating job on intricate objects, particularly where reverse angles were involved. Scientific Electric designers developed the "Atomic Nozzle," so named because of the contour of the spray.

The new process eliminates plastisol wastage due to "running," and the ionized "mist" gives a more uniform coating than dip methods.

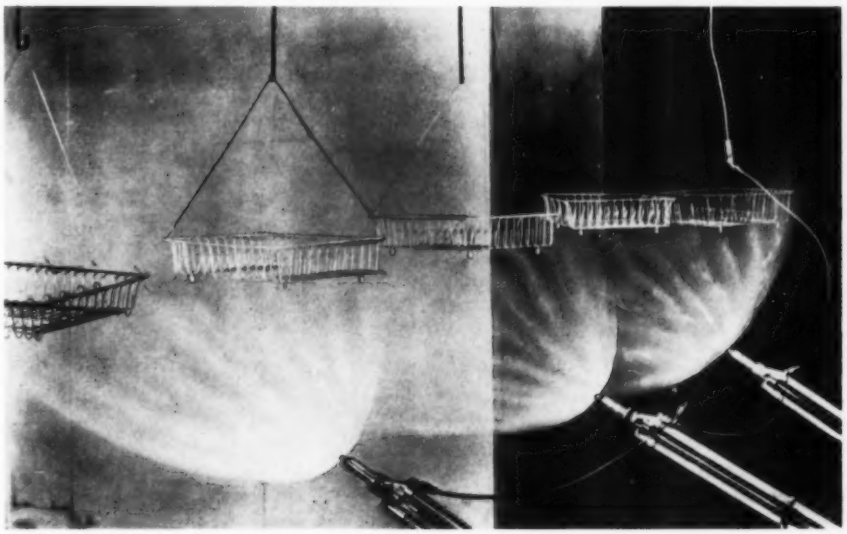
Manufacturer: Scientific Electric, Garfield, N. J. and United Chromium Division, Metal and Thermite Corporation, 100 East 42nd St., New York 17, N. Y.

New adhesive glues chemically

Stik-All gives a bond of 1500 lbs. per square inch on many materials

A new adhesive named Stik-All, that hardens through a chemical reaction rather than by drying out, will glue a variety of materials, porous or non-porous. It comes in a kit ($1.00) that consists of a bottle of glue and a vial of a catalytic agent. When the two are mixed, a chemical reaction begins. The glue is applied and after 24 hours the reaction is completed and the bond is fully hardened. It is not affected by boiling water or organic solvents.

Manufacturer: Stik-All Products, P. O. Box 132, Skokie, Illinois.



Mushroom-shaped spray from "Atomic Nozzles" does a superior coating job on intricate objects. Production rate depends upon the number of guns used on the line.

In flight, hydro-lift landing gear retracts under wing. When lowered, wheels protrude to permit the aircraft to land on hard-surface runways or fields.

Even deep mud is no obstacle

Retractable hydro-lift landing gear gives landplanes great versatility

In recent flight tests, a landplane, equipped with the first retractable hydro-lift landing gear, took off and landed on virtually every kind of surface, including water, snow, mud and ice, as well as conventional runways.

The hydro-lift landing gear, designed by the All American Engineering Company, consists of a pair of short wide skis, through which the wheels protrude. When retracted, they fit snugly under the wing and, being light (100 lbs.), do not reduce the plane's speed appreciably—two knots on the Bellanca Cruisemaster illustrated.

On land, a plane with hydro-lift operates like any other landplane. When landing on water, the plane can skim along the surface at speeds as low as 15 mph without sinking. The pilot maintains this speed until he taxis onto the beach or up a ramp. For takeoff, the procedure is reversed, with the pilot gaining speed along the beach before turning into the water for takeoff.

All American reports that the military is investigating hydro-lift applications. Fighters equipped with hydro-lift would no longer be dependent upon carriers or hard-surface runways. It is conceivable that airliners could operate closer to the center of a city on a river.

The hydro-lift landing gear has been fitted as a fixed landing gear on aircraft for several years. Making it retractable was a great step toward much wider application and, it is reported, application of hydro-lift to larger high-performance aircraft is now merely a matter of design engineering.

Manufacturer: All American Engineering Company, du Pont Airport, Wilmington, Delaware.

Complex insulators molded

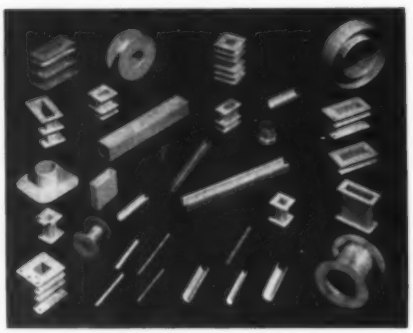
Many shapes and sizes of impregnated glass fabric parts are now available

Complex-shaped, Fiberglas-silicone parts molded to close tolerances and with walls as thin as .005 inch are being produced by Silicone Insulation, Inc. for Class H equipment (180°C). The parts are made of impregnated glass fabrics, which are laid up into shapes or deep drawn into special contours by slippage of the fibers or stretching of the fabric.

These small, three-dimensional parts of high-temperature material introduce new design to insulation by taking the place of many more expensive insulators, such as hand tapings. A molded bobbin, for example, has no joint at the point where the core and flanges meet. The Fiberglas fabric forming the core flares out into the flange and becomes a part of it, making the strongest what is usually the weakest part of the bobbin.

Silicone Insulation's first products were introduced in 1954 and now include end caps, core tubes, and formed insulators of a wide variety of shapes and sizes.

Manufacturer: Silicone Insulation, Inc., 567 Third Ave., New York, N. Y.



Oscilloscope has 40 channels

A new large screen-display oscilloscope is introduced by Electromec

A new large screen multi-channel display oscilloscope that features 40 input channels provides a vertical line graph 9 inches high by 12 inches wide on its 17-inch cathode ray tube. It is designed to give rapid and accurate readability. Each vertical line is terminated in a dot, and a graticule in front of the cathode ray tube simplifies the reading of voltage values and channel identification. The output of each of the 40 amplifiers is scanned each ¼ second, and the vertical length of each line indicates the peak value of the maximum AC input voltage that existed during the previous ¼ second. The unit is 23½ inches wide, 23 inches deep, 68 inches high and weighs 435 lbs. All equipment and power supplies are self-contained and operate from 115-volt, 60-cycle single-phase power.

Manufacturer: Electromec, Inc., 5121 San Fernando Rd., Los Angeles 39, California.

Tying wire is colored

Packages are made more attractive by new tying wire available in 4 colors

Colored tying wire, which makes packages more attractive and can be used for purposes of identification, is now being made by Inland Wire Products Co. The new wire is coated with tough colored vinyl, which has a high resistance to rust. The coating is very elastic, with a smooth surface and may be used in tying machines without danger of chipping, peeling or stripping.

It is available in red, yellow, blue and green and in 17 and 18 gauges.
Manufacturer: Inland Wire Products Co., 3947 South Lowe Avenue, Chicago 9, Ill.

Catalyst cuts refining costs

Cracking plants with catalytic boilers feed on own exhaust

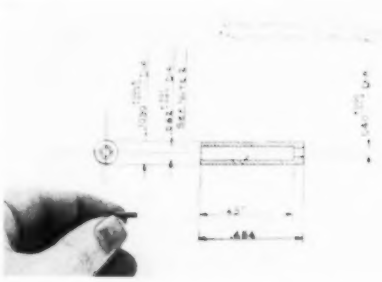
Cheap steam and low-cost air pollution protection are the results of the installation of special catalytic waste-heat boilers at two new Sun Oil Company refineries. They are the first to be built as an integral part of a refining plant.

Using a novel oxidation catalyst, known as the Oxycat, manufactured by Oxy-Catalyst, Inc., fumes and flu gases are consumed ravenously before they reach the atmosphere, generating 100,000 pounds of process steam an hour.

20,000 Oxycats are installed in the two refineries. Each one is brick-size, consisting of 71 slim porcelain rods suspended between two square porcelain and plates. A thin catalytic coating on the rods oxidizes the carbon monoxide and hydrocarbon oil vapors in the cat cracker exhaust to clear carbon dioxide and water vapor. This action is accompanied by a tremendous release of heat energy, totalling 110,000,000 B.T.U. an hour at the two plants, which means a potential $400,000 a year fuel saving for Sun.

Since the waste-heat boilers cost Sun $800,000, they will pay for themselves in fuel savings within two years. After that they will be producing free steam and at the same time will provide continuous insurance against air pollution. Sun oil engineers estimate that $20,000,000 worth of potential heat is being wasted in the exhaust gases of cat crackers in the nation's refineries. This amounts to some 10,000,000 barrels of oil a year.
Manufacturer: Oxy-Catalyst, Inc., Wayne, Pa.

A catalytic maw—part of a bed of 10,000 catalytic elements that digest carbon monoxide and hydrocarbon gases from a petroleum cat cracker.



Precise plastic parts produced

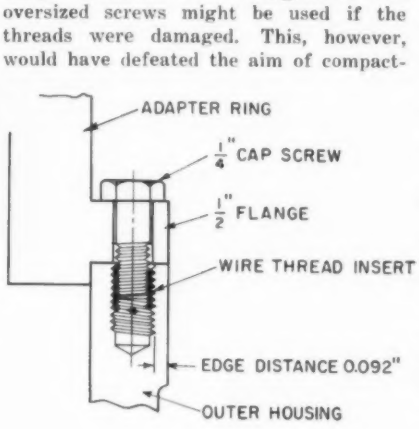
Mass-produced plastic parts require no machining for close tolerances

High-precisioned plastic parts that require no machining are now being mass-produced by Mason, Shaver and Rhoades. The close tolerances attained are exemplified by the alkyd spring holder illustrated above, which is used by the government in a precision instrument. Molded of Plaskon alkyd, a material of good heat resistance and high impact strength and made by the Barrett Division, Allied Chemical and Dye Corporation, the spring holder is .484 in. long, and has an outside diameter of .1090 in. with a positive tolerance of .0005 in. Its inside diameter is .062 in. with a positive tolerance of .001 in. At one end for .047 in. the inside diameter is .040 in. with a minus tolerance of .002 in. Concentricity of the outside diameter and the larger inside diameter is within .0005 in.
Manufacturer: Mason, Shaver and Rhoades, East McKeesport, Pa.

Thread inserts solve problem

Wire thread inserts make small products stronger and more compact

Stainless steel wire thread inserts were the answer to a design problem involving an aerial camera in which low weight and compactness were prime factors. For lightness, aluminum was used for the bearing retainer rings and the adapter ring, connecting the outer shell and the main rotating element of the camera. Because these parts were subjected to constant disassembly, it was essential that thread wear be kept at a minimum. Large bosses or flanges could have been designed so that oversized screws might be used if the threads were damaged. This, however, would have defeated the aim of compactness. By using steel wire thread inserts made by the Heli-Coil Corporation, good thread wear was attained, and it was possible to reduce the size of the flange. Normally, the ¼-inch screw used in the camera (see diagram) called for an edge distance of .125 inches. However, as the major diameter of the threads tapped for the insert was .316 inch and the diameter of the boss was ½ inch, an edge distance of .092 met the requirements.



Wire thread inserts have almost limitless application. Another example is in the casing of a rotor tool which was made in two halves of aluminum. The bosses where steel screws connected the two halves together were given greater strength by wire thread inserts. Also, these bosses could be made smaller, giving the tool a smoother appearance.
Manufacturer: Heli-Coil Corporation, Danbury, Conn.

New insulation is an enamel

Westinghouse development is a step toward smaller electrical equipment

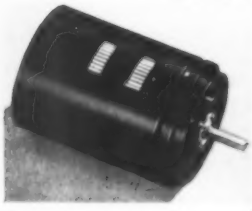
A new insulating enamel for copper wire which is a modified polyester-type resin containing about 20 per cent silicone is reported to be able to withstand higher temperatures for longer periods of time than any wire enamel which does not contain silicones. Known as 1267, the enamel was developed at the Westinghouse Research Laboratories. It may replace the glass insulation normally required for high-temperature motor windings. This would reduce the thickness of insulation by 50 per cent, an important step toward smaller electrical equipment. Laboratory tests show that electric motors insulated with the new enamel can operate continuously for 10 years at a temperature of 325° F. without damage to the insulation. This is equivalent to the normal operation of a refrigerator motor for 30 years, or a washing machine for a century.
Manufacturer: Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Pa.

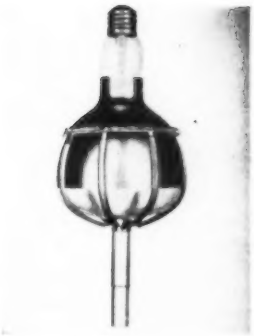
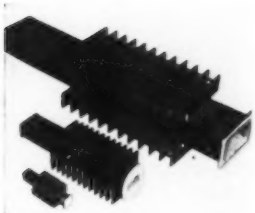
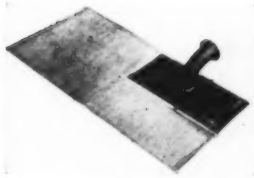
Du Pont makes a new elastomer

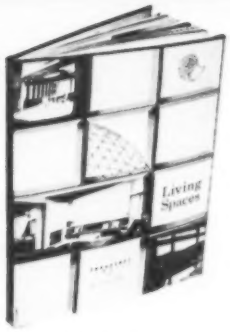
Hypalon—a new engineering material—stands up under severe service conditions

A new elastomer, named Hypalon, is being made by Du Pont. Chemically, it is chlorosulfonated polyethylene. Unlike its parent material, polyethylene, which is a thermoplastic, Hypalon is a thermosetting material. Like other rubbers, the properties of Hypalon products can be varied by compounding. Materials such as softeners, pigments and vulcanizing agents are used to tailor properties to the end use.

Heat has less effect on Hypalon products than those made of natural rubber and most of the synthetic rubbers. Ozone, probably the greatest single cause of failure of rubber products, does not cause Hypalon to crack.
Manufacturer: E. I. Du Pont de Nemours and Company, Wilmington, Delaware.

	Name	Purpose	Manufacturer
	Swagelok tube fittings	Tube fittings made of polyamide resin for plastic tubing where corrosion is a problem. Made in elbows, tees, reducers, adapters, caps, and bulkheads.	Crawford Fitting Co. 884 East 140th Street Cleveland 10, Ohio
	Miniature power resistor	20-watt miniature power resistor, the Ministrip, for use in compact electronic equipment where space is important. Features simplified mounting, oval-shaped ceramic core for strength, and multiple stacking.	Ward Leonard Electric Co. Mount Vernon New York
	Hermetically sealed ceramic capacitor	Capacitance between the capacitor section and the ground is kept at a minimum by using a ceramic instead of metal shell. The "Pacer" capacitor is designed for operation at temperatures up to 125°C.	Sprague Electric Co. Marshall Street North Adams, Mass.
	"Visutac" tachometer	Lightweight visual tachometer which measures rotary or vibratory speeds of machinery or objects from a distance of 50 feet or more. It works on a stroboscopic principle to stop motion. Slightly larger than a baseball, it weighs 11 oz.	Boulin Instrument Corp. 65 Madison Avenue New York, N. Y.
	Gearless differential Model T751	Designed for applications where minimum backlash is required, it makes use of precision balls instead of conventional planetary gears.	Sterling Precision Instrument Corp. 34-17 Lawrence Street Flushing 54, N. Y.
	Tape Rite applicator	For use with masking, sealing or joining tape. Tape pays out of the applicator and is firmly attached to the job surface by a resilient steel "finger." Tape is cut when the applicator is rolled over.	GorDag Industries, Inc. 2215 Foshay Tower Minneapolis 2, Minn.

	Name	Purpose	Manufacturer
	Changer for high-bay reflector lamps	A new lamp changer head built especially for the R52, 500-watt lamp being used extensively in high-bay reflector lighting. It is made of flexible, rubber-covered metallic fingers, held together at the top by a coil spring.	McGill Mfg. Co., Inc. Valparaiso Indiana
	Rotary solenoid for 60-cycle operation	Designed basically for AC use, the solenoid can be operated by standard voltages without the use of rectifiers or transformers. There are eight sizes offering a variety of torque values from fractional inch-pounds to 62.5 inch-pounds.	Lee Spring, Inc. 30 Main Street Brooklyn, N. Y.
	Dialco oil-tight indicator light	Pilot light for severe industrial service. The simplicity of design gives it ruggedness. For mounting in either 1-3/16 inch or 1 inch clearance.	Dialight Corporation 60 Stewart Avenue Brooklyn 37, N. Y.
	High power waveguide terminations	Waveguide terminations of improved design capable of handling extremely high power without deteriorating under high temperature. 7 models cover the frequency range of 1120 to 1700 mc and 2600 to 18,000 mc.	The Narda Corporation Mineola Long Island, N. Y.
	Draftless air conditioning	An air diffuser that employs a perforated ceiling panel to introduce air vertically, and at low velocity, into a room or working area.	Pyle-National Company 1334 N. Kostner Avenue Chicago 51, Illinois
	Gain-standard antennas	Antennas with precision gain calibration to 0.2 db for use in the determination of propogation gain. Parabolas, horns, dipoles, and dipole arrays are available to cover the frequency spectrum from 100 to 50,000 mc.	Color Television Inc. 1057 E. San Carlos Ave. San Carlos, California



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Manufacturers' Literature

Control Systems. Automatic Temperature Control Company, 5200 Pulaski Avenue, Philadelphia, Pa. 16 pp., ill. This firm's services in the phases of design, purchasing, and construction of packaged automatic control systems are described and illustrated with case histories.

Cutting Equipment. The Vern Emery Co., 102 E. Prospect Avenue, Burbank, Calif. 12 pp., ill. Descriptions of standard precision cutting equipment for the plastic extruder.

Die Stamping. M. Swift & Sons, Inc., 10 Love Lane, Hartford, Conn. 14 pp., ill. The hot-die method of product marking for decoration and identification, and use of metallic and pigment colors, is described with lists of applications.

Drafting Equipment. Stacor Equipment, 768-778 East New York Ave., Brooklyn, N. Y. 20 pp. ill. The Stacor line of steel drafting room furniture, tracing, drawing and X-ray equipment is illustrated and described.

Eddy-Current Machinery. Dynamatic Division, Eaton Manufacturing Co., Kenosha, Wis. 16 pp., ill. Information regarding the principles and uses of Dynamatic Eddy-Current adjustable-speed equipment with illustration of typical applications.

Fasteners. Gries Reproducer Corp., 125 Beechwood Ave., New Rochelle, N. Y. 4 pp., ill. GRC's line of zinc alloy industrial fasteners, manufactured by die-casting method at low cost, with illustrations of each type and lists of stock sizes.

Fasteners. Thompson-Bremer & Co., 520 North Dearborn St., Chicago, Ill. 6 pp., ill. Everlock washers, with chisel edges that bite into the face of the work and the screw head or nut, are described and illustrated in their new booklet.

Flooring Materials. Small Homes Council, University of Illinois, Urbana, Ill. 8 pp., ill. Advice on selecting and caring for home floors with a discussion of various materials recommended for subfloors.

High Vacuum Pumps. Kinney Manufacturing Div., New York Air Brake Co., 3640 Washington Street, Boston, Mass. 52 pp., ill. A catalog of its complete line of high vacuum pumps, featuring an engineering section containing formulae and data of value as a reference book on vacuum engineering, has just been published by this firm.

Industrial Gears. Detroit Bevel Gear Co., 8130 Jos. Campau Avenue, Detroit, Mich. 8 pp., ill. A new brochure of detailed information on this company's complete gear and axle shaft lines.

Laminated Plastics and Vulcanized Fiber. Taylor Fibre Co., La Verne, Calif. 4 pp., chart. Engineering data on laminated plastics produced by Taylor is given in comparative chart form; another chart lists information about grades of vulcanized fiber. This firm also offers a listing of government grade designations for these materials.

Metal Boxes. Zero Manufacturing Co., 1121 Chestnut Street, Burbank, Calif. 22 pp., ill. Zero's new catalog lists over 1,000 sizes of drawn metal boxes, all available without tooling charges.

Molding Compound. Barrett Division, Allied Chemical and Dye Corp., 40 Rector Street, New York, N. Y. 8 pp., ill. Molding characteristics and physical properties of Allied Chemical's Plaskon Nylon molding compound are presented in a new booklet of tabular data on this material.

Manufacturers' Literature *(Continued)*

Molybdenum. Climax Molybdenum Co., 500 Fifth Avenue, New York, N. Y. 72 pp., ill. A compilation of all available technical and fabricating data on arc-cast molybdenum and molybdenum-base alloys.

Plastic Pipe. Alpha Plastics, Inc., 14 Northfield Road, West Orange, N. J. 12 pp., ill. How to use and specify rigid plastic pipe and fittings is the subject of this catalog of Alpha's standard line. A corrosion chart, lists of recommended applications, and costs are included.

Polyester Film. E. I. du Pont de Nemours & Co., Wilmington, Delaware. 4 pp., ill. A folder containing sample swatches of metalized, decorative surfacing materials made from Mylar polyester film has just been released by du Pont.

Portable Mixers. Eastern Industries, Inc. Regent St., Norwalk, Conn. 6 pp., ill. Eastern manufactures all types of mixing equipment for heavy-duty industrial use. Engineering suggestions and information to aid in selection of proper units is discussed in their new folder.

Precision Tools and Instruments. The L. S. Starrett Company, Athol, Mass. 464 pp., ill. A complete listing of the many hand tools and instruments manufactured by the company, with detailed pictures and specifications. The catalog is sectionalized, with an index and cross-reference table.

Pressure-Sensitive Tapes for Metalworking. Minnesota Mining and Manufacturing Co., St. Paul, Minn. 56 pp., ill. A representative survey of pressure-sensitive tape applications, with sections on uses for machining and finishing, electroplating, stamping, welding, product assembly, packaging, etc.

Rare Chemicals. City Chemical Corporation, 132 West 22nd St., New York 11, N. Y. 4 pp., ill. A brochure listing the rare chemical compounds produced by this company, now numbering over 300.

Reinforced Plastic Tooling. The Marblette Corporation, 37-21 30th Street, Long Island City 1, N. Y. 20 pp., ill. Technical guide describing the fabrication and uses of various plastic tools made from thermosetting resins strengthened with glass fibers. Based on actual tool and die shop operations. A list of material suppliers is included.

Shaped Tubing. Superior Tube Co., Norristown, Pa. 3 pp., ill. Cross sections of shaped tubing, including squares, hexagons, and ovals are illustrated with information on analyses available in these shapes from the Superior Tube Co.

Sheet Metal Parts. Durabilt Mfg. Co., 668 Arnold Avenue, Aurora, Ill. 6 pp., ill. Durabilt lists their equipment and facilities for producing products or parts of sheet steel or aluminum.

Sicon. Midland Industrial Finishes Co., Waukegan, Illinois. 4 pp., ill. A pamphlet about Midland's silicone-base finish for metal products requiring a highly heat-resistant protective coating.

Silicone Rubber. Dow Corning Corp., Midland, Mich. 4 pp., ill. A folder of information on Silastic, the Dow Corning silicone rubber, with charts, graphs and actual application photographs.

Manufacturers' Literature *(Continued)*

Springs. Hunter Spring Co., Lansdale, Pa. 16 pp., ill. This firm's Neg'ator Springs are highly stressed strips of spring material. Applications and advantages of using these noncumulative-force springs are described in a new technical bulletin.

Stainless Steel Wire. Crucible Steel Co. of America, Pittsburgh 22, Pa. 32 pp., ill., charts. Data to aid users of fine wires in selecting the proper stainless steel wire, featuring numerous tables giving size range, coil data, chemical analysis and characteristics.

Steel Bars. LaSalle Steel Co., Hammond, Indiana. 4 pp., ill. A description of super La-Led cold finished steel bars, the fastest machining steel bar, for use instead of brass.

Synchronous Motors. Electric Indicator Company (Elnico), Springdale, Conn. 24 pp., ill. Theory and characteristics of hysteresis and salient pole induction motors, including specifications and dimensioned drawings of each motor in the company's line.

Synthetic Rubber Products. Acadia Synthetic Products Division, Western Felt Works, 4115 Ogden Avenue, Chicago, Illinois. 18 pp., ill. A presentation of the various types of synthetic rubber shapes manufactured by this firm, the varied uses, and recommended compounds for specific applications. Another booklet, of 30 pages, describes synthetic rubber packings for hydraulic and pneumatic applications; and a third new booklet, "Imagineering with Silicone Rubber," discusses properties and applications of synthetic rubber and is published as an aid to designers and manufacturers.

Test Equipment Kits. Heath Company Div., Daystrom, Inc., Benton Harbor, Mich. 12 pp., ill. The various electronic test equipment kits produced by the company, which include oscilloscopes, checking and generating equipment, and others.

Tube Bending. Parker Appliance Co., 17325 Euclid Ave., Cleveland, Ohio. 8 pp., ill. Parker's bench-mounted manual bender, for use in fabrication of metal tubing for fluid-handling systems, is now available with a new toggle clamp which is fully described in this new booklet.

Utility Fans. Trane Company, La Cross, Wisconsin. 24 pp., charts. A new bulletin describing the expanded line of utility fans available from Trane. The advantages of belt-driven and direct-drive centrifugal fans, their construction features, and applications are discussed.

Valve Regulators. Rockwell Mfg. Co., Pittsburgh, Pa. 36 pp., ill. Its line of high and low pressure balanced valve regulators are outlined in Rockwell's new bulletin on Special Controls.

Vinyl Plastics. Vinyl Plastics Inc., 1825 Erie Ave., Sheboygan, Wis. 8 pp., ill. Sheets and tiles of vinyl for floors, walls and countertops are manufactured by this firm in marbelized and terrazzo patterns, which are illustrated in color in their new booklet.

Waste Treatment Equipment. Graver Water Conditioning Co., 216 West 14th St., New York, N. Y. 4 pp., ill. A discussion of the basic types of equipment available to handle industrial waste and water treatment, with photographs of typical installations.

For Your Calendar

August 15-17. Society of Automotive Engineers' West Coast Meeting. Portland, Oregon.

August 21-26. New York Gift Show. Hotels Statler and New Yorker.

September 6-16. Machine Tool Show. International Amphitheatre, Chicago; Production Engineering Show. Navy Pier, through September 17.

September 12-16. 10th Annual Instrument-Automation Conference and Exhibit, sponsored by the Instrument Society of America. Shrine Exposition Hall and auditorium, Los Angeles.

September 12-16. Boston Gift Show. Hotel Statler.

September 14-16. Annual Meeting of the Association for Computing Machinery. University of Pennsylvania, Philadelphia.

September 16-20. Denver Gift and Jewelry Show. Hotel Albany.

September 20-22. 10th Annual Industrial Packaging and Materials Handling Exposition. Kingsbridge Armory, New York.

September 28-29. Industrial Electronics Conference, sponsored by the American Institute of Electrical Engineers and the Professional Group on Industrial Electronics of the Institute of Radio Engineers. Detroit, Michigan.

September 29-October 1. Standards Engineers Society's 4th Annual Meeting. Hartford, Conn.

October 2-5. Philadelphia Gift Show. Hotel Benjamin Franklin.

October 3-November 11. Second Chicago Area Industrial Design Exhibition. Illinois Institute of Technology, Chicago.

October 5-7. 29th Design Conference. Sponsored by The Institute of Contemporary Art. Arden House, Harriman, New York.

October 5-9. World Plastics Fair and Trade Exposition. National Guard Armory, Los Angeles.

October 6-8. 11th Annual Meeting and Design Conference of the Society of Industrial Designers. The Woodner Hotel, Washington, D. C.

October 9-13. Electrochemical Society's Fall Meeting. Pittsburgh, Pa.

October 11-15. Society of Automotive Engineers' Aeronautic Meeting, Aircraft Production Forum and Aircraft Engineering Display. Los Angeles.

October 13-14. New England Section Meeting of the Society of the Plastics Industry, Inc. Equinox House, Manchester, Vermont.

October 13-16. The Audio Fair. Hotel New Yorker, New York.

October 17-21. Annual New York Market of the National Association of Summer Furniture Manufacturers. New York Furniture Exchange and the various showrooms.

October 17-21. National Metal Exposition and Congress. Philadelphia. (*Continued on Page* 138)

Classified Advertisements

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Index to Advertisers In This Issue

For Your Calendar *(Continued)*

October 24-28. National Business Show. 71st Regiment Armory and 69th Regiment Armory. New York.

October 26-28. 10th Annual Technical Convention of the American Society of Body Engineers. Rackham Memorial Building. Detroit.

October 26-28. Porcelain Enamel Institute's Annual Meeting. White Sulphur Springs, West Virginia.

October 31-November 4. Annual Chicago Market of the National Association of Summer Furniture Manufacturers. American Furniture Mart and the Merchandise Mart.

November 7-9. Eastern Joint Computer Conference and Exhibition. Hotel Statler, Boston.

November 22—. Built in Latin America. Museum of Modern Art, New York.

November 28-December 1. Air Conditioning and Refrigeration Exposition. The Auditorium, Atlantic City, N. J.

December 6-7. Sixth Film, Sheeting and Coated Fabrics Division Conference. Sponsored by the Society of the Plastics Industry, Inc. Hotel Commodore, New York, N. Y.

December 10-16. International Atomic Exposition. Cleveland Public Auditorium, Cleveland, Ohio.

Events Abroad

August 8-20. First International Exposition of the Peaceful Uses of Atomic Energy. Palais des Nations, Geneva, Switzerland.

August 27-September 11. St. Erick's International Fair. Stockholm, Sweden.

September 2-13. First International Trade Fair. Zagreb, Yugoslavia.

September 2-October 2. International Pakistan Industries Fair. Karachi, Pakistan.

September 4-25. International Trade Fair. Salonika, Greece.

September 9-27. International Levant Fair. Bari, Italy.

September 11-18. International Autumn Fair. Vienna, Austria.

September 24-October 9. German Industries Fair. Berlin.

October 5-17. International Plastics Exhibition. Oslo, Norway.

October 8-16. Plastics 1955. Dusseldorf, Germany.

October 29-December 15. India Industrial Fair. New Delhi.

November 3-11. International Packaging Exhibition. Paris.

November 5-December 4. Industrial and Commercial Exhibition. Addis Ababa, Ethiopia.

November 25-December 11. International Industrial Fair. Bogota, Columbia.

December 10-18. Constitution Fair. Bangkok, Thailand.

December 20-February 27. International Fair for Peace and Progress. Ciudad, Trujillo, Dominican Republic.

February 22-March 2. British Industries Fair. Earls Court, London, England. Toys, gifts, jewelry, pottery, etc. will be shown. Heavy industry, including building equipment and machinery, will be shown April 23-May 4.

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