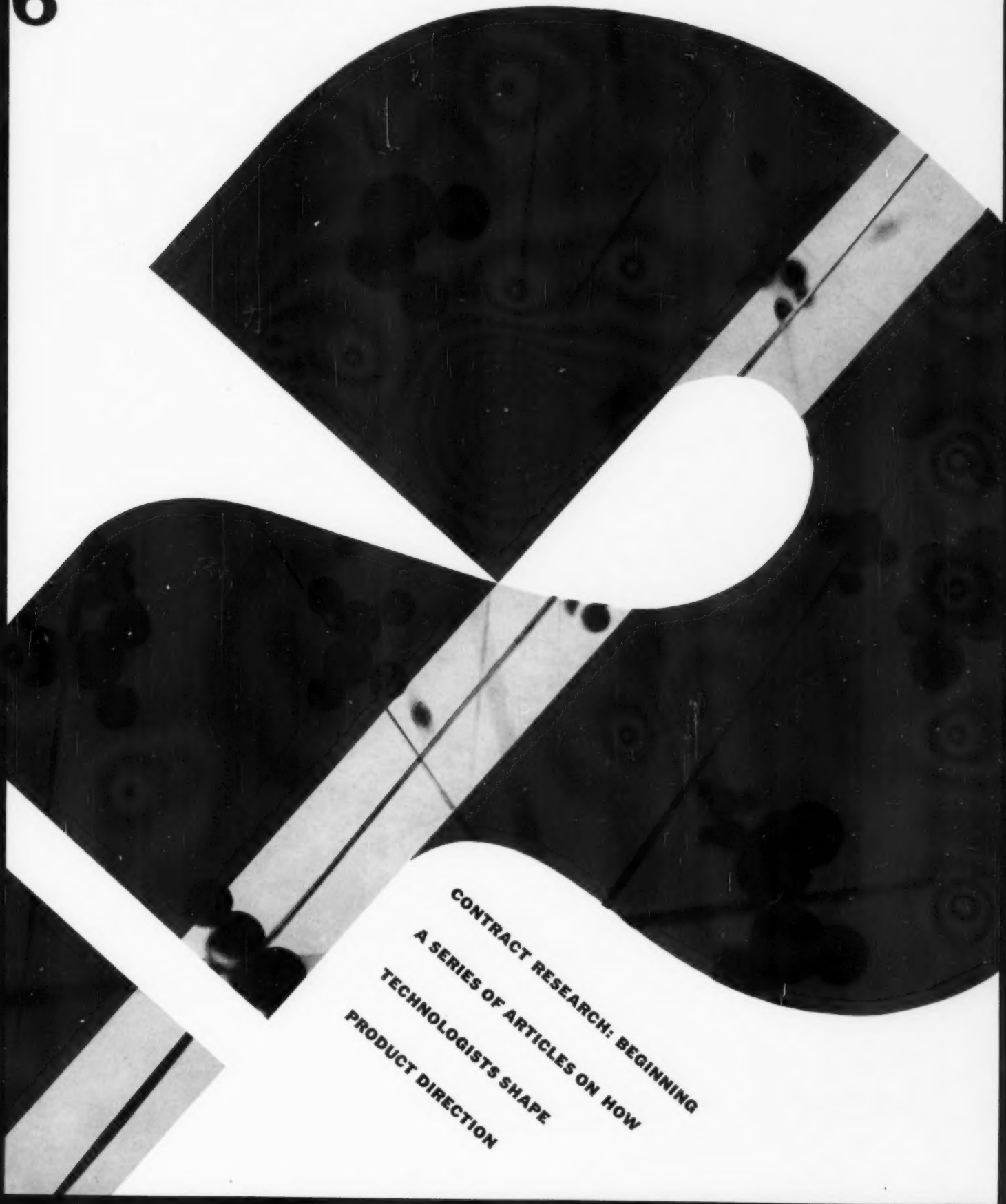
INDUSTRIAL DESIGN

6 *June 1960* *$1.50 per copy*



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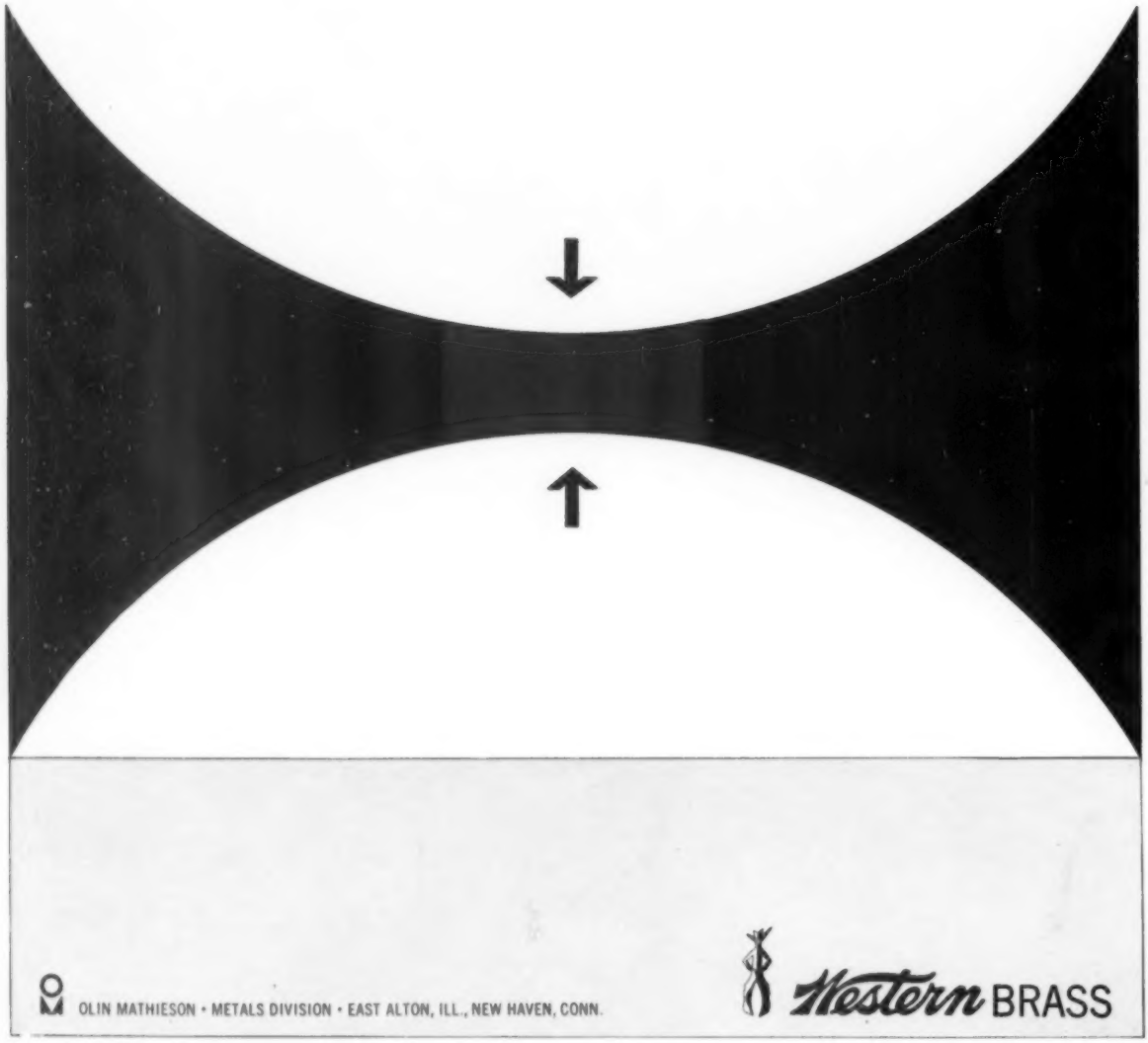

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ID

MEMO TO ADVERTISERS

INDUSTRIAL DESIGN

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

June, 1960

We are understandably happy to report that at the June mid-year point our advertising is up 50% over the first six months of 1959.

We attribute this gratifying gain to the rapidly increasing recognition of . . .

1. The obviously strong voice industrial designers have in determining what goes into the products they design

2. INDUSTRIAL DESIGN as the favorite professional publication of industrial designers (at $10.00 yearly) and of at least one top ad man who writes...

   "Your article on industrial films was superb, a beautiful job. Everything I.D. does is exceedingly good in my opinion -- including especially your provocative editorials."
   Warren R. Dix, Account Supervisor, Fuller & Smith & Ross, Inc.

Some recent assignments of industrial designers include

Donald Deskey Associates retained by The Waldorf Astoria;
Design Analysts retained by Midland-Ross Corporation;
Peter Quay Yang Associates retained by Power Sources, Inc.;
Carreiro Design Associates retained by Black & Decker Company;
Robert John, Inc.; and Computer Controls, Inc.

These recent INDUSTRIAL DESIGN advertisements point up designer selection of specific products

Bakelite hi-density polyethelene in the Eveready "Shop Lite"
(Union Carbide Corporation)
Kralastic for tool parts, camera cases, sports equipment
(U.S. Rubber Company)
Prepainted aluminum strips for Flexalum venetian blinds and awnings
(Bridgeport Brass Company)
Rigid-Tex metal for Pelton & Crane surgical instrument scrubber
(Rigidized Metals Corporation)
Campco butyrate for Tailor Garage Doors, Inc. (Chicago Molded Products Company)
Poly-Plates for Lady Schick electric shavers (W. H. Brady Company)

We will appreciate the opportunity of discussing with you the importance of the industrial designer as a buying influence.

Cordially yours,

Paul R. Kane

Paul R. Kane
Vice-President, Advertising

JUNE, 1960 VOLUME 7 NUMBER 6

INDUSTRIAL DESIGN

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

CONTENTS

Coming

IN JULY—R & D, Part II: An R & D firm run by industrial designers; Dialog in Graphic Design: Norman Ives; "Classic" packages.

IN AUGUST— R & D, Part III: In-company R & D department; Felt as an industrial material.

COVER: Unlike most cover designs, which start as a question, Art Director Jim Ward's June cover ends as one and symbolizes the interrogative attitudes of Research & Development. The atoms inside the question mark symbolize the scientific approach.

FRONTISPIECE: A photomicrograph, magnified 200 times, compares the mottled crystal pattern of ordinary graphite, on left, with the orderly stacks of crystals in pyrolitic graphite, a material used for the heat shields of missile nose cones.

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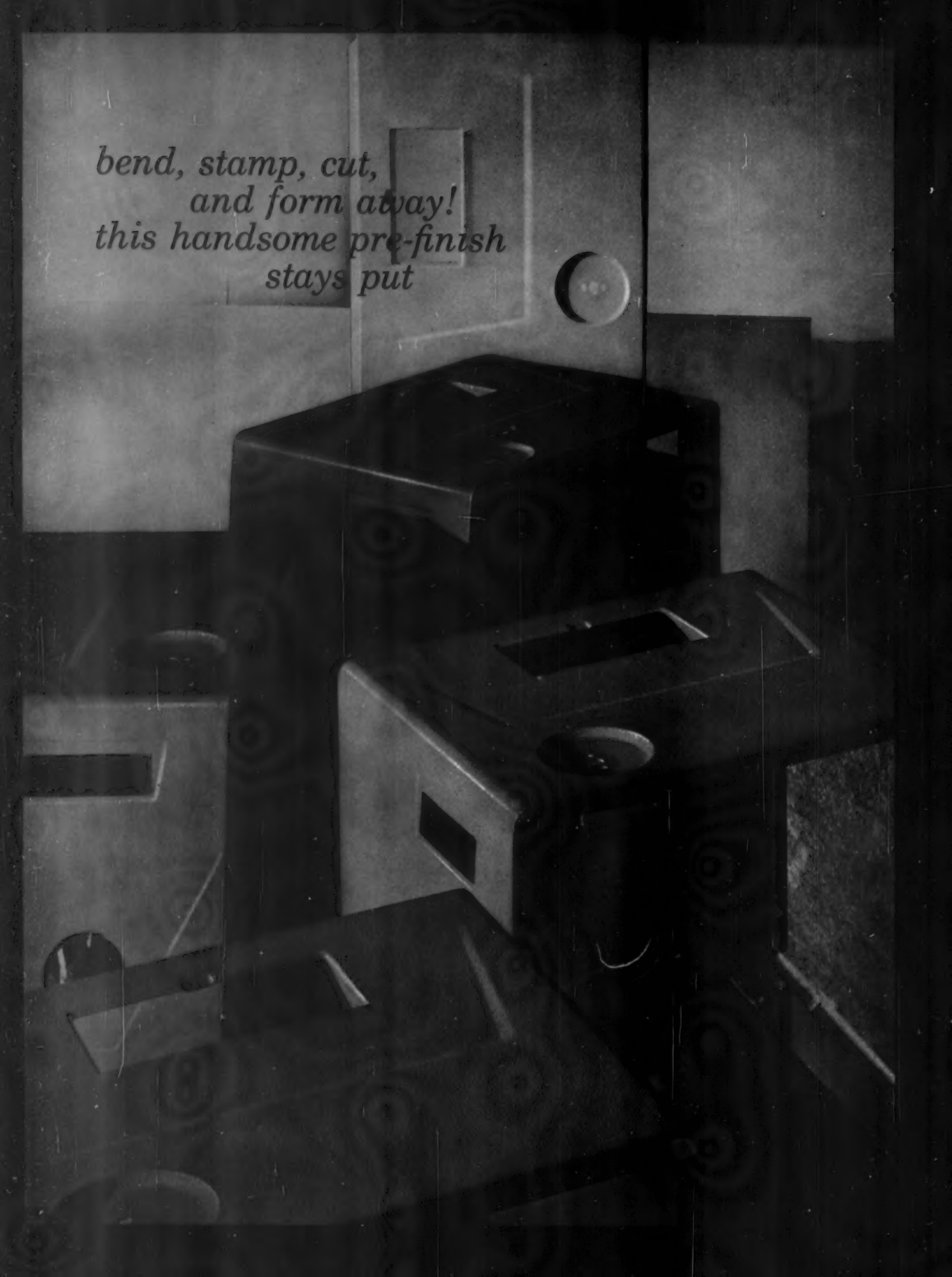
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and form atvay!
this handsome pre-finish
stays put

VINYL-ON-METAL is cooperative. Stamp it out. Punch it out. Even weld it! Form it the same ways you form unfinished sheets. The unique colors, textures and patterns of Vinyl-on-Metal sheeting or coils remain unaffected. The tough resilient surface stays—won't chip or peel in use. It protects against tearing or wrinkling—minimizes surface damage during fabrication and assembly. Vinyl-on-Metal is already widely and successfully used for furniture appliances, transportation interiors, building construction, and in many other fields. For a highly informative booklet, "Vinyl-on-Metal," write to Monsanto Chemical Company, Plastics Division, Room 753, Springfield 2, Mass.

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in this issue...

Dreyfuss

Henry Dreyfuss, whose famous "Joe and Josephine" have acquired new or revised dimensions (see page 68), has made physical convenience and comfort his first principle of design. To quote from his creed, ". . . the object being worked on is going to be ridden in, sat upon, looked at, talked into, activated, operated, or in some other way used by people." Currently the principle is being applied to such things as thermostats, turret lathes and telephones.

Dave Chapman and staff members **Frank Carioti** and **Kim Yamasaki** were the principals in an unusual assignment for a design firm (page 82): a study for the Ford Foundation on the use of tv in schools. The Chapman office has been involved in school design before, notably in its school furniture for Brunswick-Balke-Collender, a project which Yamasaki supervised. Yamasaki is executive vice-president and director of design; an architect by training (University of Southern California), he has been with Chapman since 1943. Carioti, who joined the firm in 1953, is an ex-journalist (*Chicago Daily News*); he is vice president and director of marketing and merchandising research, and also serves as public relations counselor.

Carioti, Chapman, Yamasaki

Snead

Stella Snead, author and photographer of the story on Indian observatories (page 56), is a London-born world traveler. For a number of years she lived in the U. S. (in Taos, New Mexico) and also investigated Central and South America, but more recently her theatre of operations has been the Near and Far East. She has recently built a home in India—a "little bungalow" at Juhu Beach, Bombay—and she says that the surrealistic observatories have inspired her to return to the avocation of her Taos days: painting.

Saporito

Dominic Saporito, job captain on the Harley Earl Associates project for Wear-Ever (page 62) is a graduate of Pratt Institute and a specialist in product design. He has headed design programs for such Earl clients as U. S. Rubber, Clark Equipment, and Alcoa. Last year his design team's movie camera for Argus, the Cinetronic, won an IDI annual design award.

Stern

Walter Stern, who annually serves as our guide through the AMA's packaging show (page 86), is Technical Director of Packaging and Graphics at Raymond Loewy Associates. During the past year his work has included the development of new packaging and dispensing techniques for eye lotion, experimentation in the use of plastic mesh for gift packaging, and participation in the development of flexible containers for liquid food products.

Reclining lounge chair
and ottoman
from the Eames
Aluminum Group.

An innovation
in upholstery technique
makes possible
the flexible support
in this chair
of exceptional comfort
from Herman Miller.

LETTERS

Designer as integrator

Sirs:
I enjoyed very much your provocative March issue. As a German designer, I would like to add a few words.

Both motivations for a designer's activity—"I am styling for better sales" and "I am relying on 'objective facts only' "—resemble each other in their strong emphasis on the more materialistic facets of industrial design. This "loud denunciation" of the esthetic factors in industrial design has its roots in something common to both: a sense of inferiority to either the business man or the engineer. Trace back the history of many successful designers of today and you will find an art background. This, for instance, is as true for Loewy as for most of his protagonists at Ulm. Two years ago, when I gave a guest course in industrial design at Ulm, I was amazed to learn that "we are not interested in esthetics" because "what is right is also good." (Incidentally, the "distinctive and personal form, unusual for Ulm," of the calipers on page 95 was done by a student during this course.)

Well—what is "right" for a designer? Certainly economics (sales), technology and human engineering (objective facts), are prime considerations in modern industry. No need to discuss this. No designer could ever do a thorough job without being constantly aware of these factors and without a profound knowledge of the problems involved. But personally I feel these are only the "sounds and grammar that are to be learned" before the designer broaches his main task. This task is to integrate economics, technology, human engineering and esthetics into a form having an inner logic and esthetic satisfaction (for I firmly believe—with no excuse for doing so—that beauty in machine-made products is an important factor to human beings).

Such integration needs the designer's constant control of the growing three-dimensional concept (in the round, not only on the board), and it needs imagination as well as intellectual ability.

So the designer in my opinion is an *integrator*. This is quite different from being a *coordinator* or even the person responsible for achieving maximum productivity in manufacture. If the latter becomes the role of the designer, as Maldonado predicts it will, then we might as well dismiss the product planner and fire the boss.

If a product is good to use, if it expresses an inherent logic of order (grouping of units, etc.) and of technological processes (flow of cast material, precision of machined parts, accentuation of partitions either between molds or mounted parts, etc.) and if it pleases your eyes, it might be worthwhile to discuss the degree of integration that has been achieved. Frank criticism often would be useful to the designer. He does not need, however, Weltanschauung.

DIETER OESTREICH
Germany

Cult of the juke box

Sirs:
The devotion of the entire March issue of ID to critical writing is a noteworthy event, even if the writing comes from abroad.

I was particularly fascinated by Reyner Banham's essay "Popular Art and Industrial Design." It is one of several British articles I have seen recently which reflect a similar outlook. Some of our British friends, it seems, having belatedly embraced the techniques of mass marketing, are not content to merely enjoy its economic benefits, but are impelled to idealize and institutionalize its esthetic consequences. It is particularly intriguing that these views should be emanating from England at a time when many thoughtful Americans such as John Galbraith, Walter Lippman and C. Wright Mills are questioning the economic and social premises of the Big Sell that underlie Mr. Banham's "throwaway esthetic."

Mr. Banham's reasoning eluded me. I do not understand why it follows, from the relatively short life of some modern products, that these should be more blatant in their visual impact and less enduring in esthetic value. Many cultures, including the Japanese, have produced artifacts of the most impermanent materials and short life without loss of enduring esthetic qualities. An automobile may have a useful life of 6 or 8 years, but the visual impact of millions of similar or identical models even during this short period accelerates and compresses our experience of their forms. This might well call for a more understated rather than overstated esthetic. I think the problem of a modern esthetic should be seen in the context of a total environment rather than the longevity of the individual objects that make up that environment.

This is not to deny that Mr. Banham's "popular esthetic" does have a vital and important place in our diverse culture. It is understandable that many aspects of our visual environment reflect the qualities of jazz and the frantic pace of modern life. But I think there is also a countervailing need for serenity and stability. At any rate, I see no reason why an esthetic which derives from the imperatives of mass marketing should become an idealized cult. The human organism has its own imperatives. We may accept the values of juke box designs that projected these values with creative imagination, but it does not follow that the criteria of juke box design should be applied to everything else, including automobiles.

DON WALLANCE
Croton-on-Hudson, New York

PR on PR

Sirs:
I want to compliment you warmly and highly for your feature on public relations in the May issue. Obviously, you spoke with several hundreds of people prior to its preparation. I also suspect you had a lot of fun doing the piece as I thought I detected a note of sly humor from place to place. If I might add one thought to the myriad in the article it would be that we pr men (or better yet, "press agents") take ourselves and our function much, much too seriously. "Good" companies or "good" professionals will get into print and have "good" public relations without us as long as there are editors and reporters who are performing their function properly.

ARTHUR URROWS
New York

Film reference

Sirs:
Of the many articles that have been written on the subject, your "Industry on the Screen" (April, ID), is the most objective and carefully prepared that we have seen. Your research on the subject was monumental and makes your story a reference work for our industry.

JAM HANDY ORGANIZATION
Detroit

BOOKS

Dymaxion car was one of the early Fuller projects.

The Integrity of Buckminster Fuller

THE DYMAXION WORLD OF BUCKMINSTER FULLER. *By Robert W. Marks. Reinhold Publishing Corporation, New York.* 1960. 232 *pp. Illustrated.* $12.50.

This is a well-formed book about an important subject. Important because Mr. Fuller's work has always shown an extraordinary number of profound characteristics. First among these is his early and continuing commitment to the tool function of the mind. What an amazing instrument it has proved to be, providing us not only with a remarkable data storage system for information but also a model environment, or stage, where we can rehearse an action before we engage. In this model environment we are able to cut and try relationships in an economical exploratory way. Think of the time which would be required to investigate all the possible solutions to a particular problem by actually trying each of them in the real world!

In surveying the record of man, it is difficult to escape the evolutionary pattern of growing inclusiveness or expanding allegiance. At first the self, in a blind instinctive way, contained the largest horizon of interest and value—then the succeeding steps of family, clan village, etc. In our time the locus is one of almost total interest in the nation-state accompanied by a component of one-world thought which is 99 per cent vocal and one per cent real. The entire Fuller concept of production and distribution has constituted an import part of this real one per cent which consistently recognizes the necessity of predicating in terms of the entire man-group. Additionally, his Dymaxion cartography, in the flat two-dimensional arrangements, has made possible instantaneous, mobile graphic representations of the geographic flux images which have accompanied man's expanding allegiance.

The two foregoing components — conscious utilization of the tool function of the mind and expanding allegiance—have not enjoyed constant rate acceptance. Despite the dangers of "now-centricity" I must observe that the last few years in America have been consciously negative toward these trends. Lost in the horror of war past and war to come, having left the Great Depression with no real resolution of the deep problems broached in the 1930's, we negotiated the 1950's armed only with the time-payment plan and a national purpose which aspired no higher than the puerile application of a fifty year backlog of technology to "problems" which were never really problems at all. It is not surprising that this situation produced large numbers of people possessing the mentality and values of tough chorus girls.

That Fuller's work has continued and prospered even in the grip of the grim matrix of our time can only be a tribute to his intense integrity. I think that his present force is directly traceable to the application of 100 per cent integrity to every situation he encountered. This transcendent result is a little like that in the virginity equation — 99 per cent is not nearly enough.

It is just a little embarrassing to refer to "design" here. "Design" too often means that wonderful bubble that expanded so excitingly in the 1920's only to be perforated by the golf shoes of the corporate image boys in the middle 1950's. Let me instead refer to that body of ideas and projections having to do with the environment of man. The result of Fuller's work has illustrated the absolute necessity which dictates that these ideas and projections can only be effective if based on a worldview.

A last quality exhibited by Mr. Fuller is perhaps even more rare than any of the others—the virility of putting the thought into action. He was not satisfied to just invent a system of force geometry—the implications of it had to be eventuated in the physical by the geodesic dome used across the world. And his idea of the patronless, self-starting artist is worth noting.

In this book the Fuller activity is assembled in a coherent package. The record is total and fascinating, from the 4-D apartments (zeppelin-delivered) of the late 1920's to the latest geodesic structures utilizing the discontinuous compression principle. Included, of course, is the story of the development of Dymaxion transport and especially important sections on cartography and energetic geometry. The illustrations are excellent and Robert W. Marks, the author, has proved himself to be a fine and understanding friend.

—*Kenneth Isaacs*

Plumbing through the ages

CLEAN AND DECENT. *By Lawrence Wright. The Viking Press, New York,* 264 *pp. Illustrated.* $4.95.

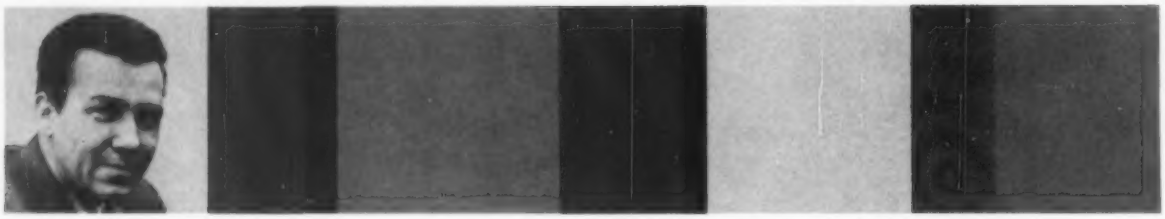
This book is not, as its jacket suggests, "a serious architect's distinctive contribution to his profession" since it is only minimally concerned with technical problems of the plumber's art through history. And the amusing illustrations are sometimes merely fillers to the narrative. But its wry reflections on the triumphs and disasters of man's changing hygenic aspirations, make *Clean and Decent* both entertaining and enlightening. From it the designer can learn much about man's social history as well as bathroom design.—*Evelyn Meincke*

The "Pedestal Lion" closet

DESIGNED BY JAMES VALKUS

aluminum is color alcoa is aluminum

S. L. Fahnestock, Manager of Design, Aluminum Company of America



ALUMINUM IS COLOR e.g., NEW ALCOA SHEET WITH TONE-COTE FINISH COMES IN 20 BAKED COLORS READY FOR FABRICATING

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Fahnestock—Correct. Roller-coating puts on a very even coating, much more so than spraying. This permits forming. Tone-Cote finished sheet can be brake formed, roll formed, blanked, crimped—and lends itself to many drawing operations.

You—What kind of paint do you use?

Fahnestock—This would depend on the application. You tell us the forming and service requirements and we recommend the proper paint formulation—vinyl, acrylic, alkyd or alkyd-vinyl.

You—How about colors?

Fahnestock—We make Tone-Cote finish in 20 standard colors plus special colors if you need them. You can even have a different color on each side at no extra charge.

You—Is Tone-Cote finish available only on nonpatterned sheet?

Fahnestock—No. We make it in various patterns . . . we emboss the pattern after roller-coating and baking.

You—That's good, but tell me . . . if the metal is painted anyway, why should I specify aluminum instead of a cheaper metal?

Fahnestock—First, paint adheres much better to aluminum because it can be given a chemical conversion coating to provide "tooth." Paint doesn't peel or blister. Any exposed edges resulting from fabrication will "heal" themselves due to natural oxide formation.

You—How about sizes, thicknesses, colors, etc., etc.?

Fahnestock—All the specs are in our free Tone-Cote finish brochure. Write Aluminum Company of America, 1971-F Alcoa Building, Pittsburgh 19, Pennsylvania.

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For more information on COLOVIN VINYL METAL LAMINATE, write for your copy of "Colovin Meets Metal."

COLUMBUS COATED FABRICS • COLUMBUS 16, OHIO

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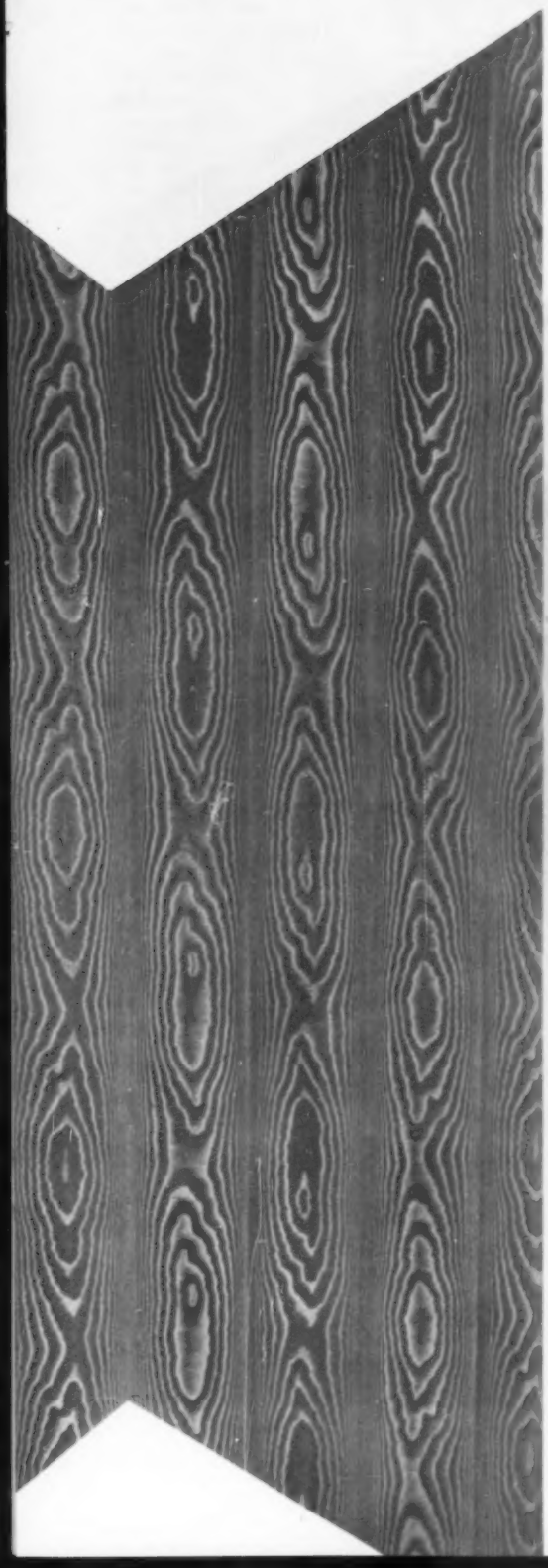
vinyl metal laminates



NEWS

At workshop session, members discuss qualifications for industrial design graduates.

IDEA in OHIO

Fifty teachers of industrial design held their third annual meeting April 8th and 9th in Cincinnati, in an effort to clarify the shape of IDEA—the Industrial Design Education Association. In the debates which preceded ratification of the constitution, in the panel discussions, and in the conversations over coffee cups, the educators found that they were examining more than the education of a designer; they were examining the designer himself.

James Alexander, head of the department of industrial design at the University of Cincinnati, acted as coordinator and host at the meetings. Much of the meeting time was devoted to the business of approving the membership list and the reworded constitution; and in the process of formulating the requirements for membership, comments from the floor suggested a general feeling that the association should be as strict as possible in its admission policy.

The first break in the business session consisted of a symposium on "Technics and Values," in which a philosopher, a sociologist, a psychiatrist, and a graphic designer commented on C. Wright Mills's article "The Man in the Middle" (ID, November 1958). The philosopher, Campbell Crockett, expressed the view with which all the panelists concurred: that the integration of conflicting motivations is a problem for everyone and not just for the industrial designer. The psychiatrist, James L. Titchener, interpreted it as the choice between "making" (creating something for others' approval) and "producing" (creating the thing for itself). The sociologist, Richard M. Emerson, said that designers are uneasy because they are too often enticed into the role of salesmen and have no durable values of their own to sell—and it is for groups like the IDEA to formulate these values for the profession. Noel Martin, the graphic designer, disagreed sharply with the idea that values could be formulated by "groups with initials"; the individual designer, he said, must create his own values and persist in them despite all the distractions of his society.

A later panel was made up of four industrial designers: Arthur Pulos, Jay Doblin, Richard Latham and Richard Montmeat, whose discussion centered loosely on the topic: "Minimum Acceptable Qualifications for Industrial Design Graduates"—also the topic of the subsequent workshop sessions in which all the members participated. If the sessions did not succeed in defining qualifications for industrial design students, they did show that industrial design teachers were divided on the question of what sort of world and work they were qualifying their students for.

The meeting recovered its spirits during Mr. and Mrs. Alexander's cocktail party and later at dinner, where 15 schools showed slides of student work, ranging from a construction of cornstalks held together with thorns — illustrative of the University of Southern Illinois' work with primary materials—to a plan for the rebirth of civilization following a nuclear war, hypothesized by industrial design students at the University of Southern California.

The second day's sessions started with an industrial design film made by students at the State University of Iowa under John Schulze's supervision. Among the committee chairman who read their reports was Joseph Carreiro, of the Industry Liaison Committee, who pointed out that his efforts in obtaining material from industry for student work had been directed toward establishing a format and not toward fulfilling the role of procurement officer. Aare Lahti presented the results of the 1960 Industrial Design Education Survey, which tabulated the results of a questionnaire completed by 22 schools of industrial design.

Samuel Fahnestock, Manager of Industrial Design for Alcoa, gave the concluding speech, on "Alcoa and Industrial Design Education." At the invitation of Alcoa, Pittsburgh was selected for the next national meeting, which will be held in the spring of 1961.

New officers elected at the close of the meeting were: James Shipley, re-elected president; Arthur Pulos, vice-president; Edward Zagorski, secretary-treasurer. Regional chairmen are: Robert Redmann (Eastern); John Schulze (Midwest); Austin Baer (Southeast); and Wayne Champion (West).

Panel members Latham, Pulos, and Doblin hear comments from the floor.

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No other metal has the strength, beauty and versatile qualities that serve you so well today and promise so much for tomorrow.

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McLouth Steel Corporation,
Detroit 17, Michigan

Manufacturers of high quality Stainless and Carbon Steels

Look for the **STEELMARK** on the products you buy.

McLOUTH STAINLESS STEEL

ASID student awards

Winners of the ASID's Annual Student Awards, presented April 29th at simultaneous dinners held by the various ASID chapters, were: William J. Frcka (IIT), Ralph A. Hertle (IIT), John Simmons (UCLA), William Hine (Art Center School), Richard Culbertson (Illinois) and Roger H. Sweet, who is a graduate student at IIT.

Among the award-winning designs were Frcka's urban mail truck (above), a chain-saw jacketing (Hertle), a rural vehicle for an oriental community (Simmons), a garden tractor (Hine), a letter-scale (Culbertson) and a food mixer (Sweet).

Over 60 students representing 18 different schools submitted projects for consideration, and jury chairman Hunt Lewis reports that all submissions were "extra choice." "The winners were finally picked because they showed intelligence in overall design thinking rather than for any one single talent." Each student was required to submit three projects for judgment.

The panel of judges included, besides Lewis, designers Richard S. Latham, Henry Dreyfuss, Jean Reinecke and Harry Greene. William E. Cranston, president of Norris-Thermador Corporation, and Brian Harvey, creative director of the Hixson-Jorgensen advertising agency, also judged. It was the first time the jury included members not in the design field.

RISD European study center

A "senior year abroad" study program for honors students in the visual arts is currently being set up by the Rhode Island School of Design. A permanent RISD European center will be established either in Perugia or Siena and will receive its first group of about 20 select seniors and graduate students next September.

First-semester studies in Italy will include courses in Italian language and culture, studio courses or seminars with RISD professors Frank J. Deignan and Samuel F. Hershey, and a three-week "home visit" with Italian families to be arranged through the Experiment in International Living.

During the spring semester, students will scatter throughout Italy for senior-thesis work, on a tutorial basis, with a recognized Italian designer in the student's special area of design. One week-end each month the students will re-assemble at the RISD center for group criticism and discussion.

At the end of the academic year, students will have the choice of returning to Providence or of receiving their degrees overseas in order to remain in Europe for further study or travel.

The European honors program has been under consideration at RISD since 1955 and is now made possible by a grant of $75,000 from the Carnegie Corporation.

"Typography Everywhere"

If typography can be intoxicating (and the character of mid-century graphic design suggests that it certainly is), the men who judged and mounted this year's "Typography Everywhere" show — the sixth annual awards exhibit of the New York Type Directors Club — must have enjoyed a bacchanalian feast. From over 2,500 original submissions, judges Lester Beall, Joseph Weiler, William Buckley, Otto Storch and Oscar Ogg picked out 220 examples of excited and exciting

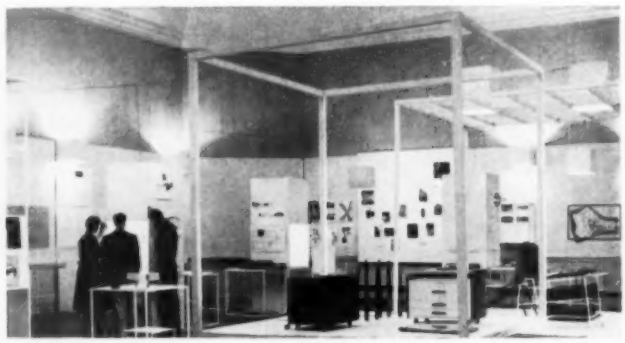
graphic designs in everything from personal Christmas cards, letterheads and catalogs, to advertisements, record-covers, brochures and packages (above).

Robert Sutter was chairman of the show, which was on view last month at Mead Paper's Library of Ideas in N. Y.

Packaging clinics

Package designers and marketing men meted out sharp criticism as well as praise to a number of packages selected for comment at concurrent New York and Chicago packaging seminars sponsored by the PDC last month. The seminars, held on location at the Grand Union in Paramus, N. J., and at the Jewel Tea Supermarket in Chicago, were the second in a series of "clinics" begun last year.

Participating in the New York seminar were: designers Russell Dixon, Francis Blod, Frank Gianninoto and Walter Stern (RLA), plus Leroy M. King (*Food Topics-Food Field Reporter*), Mrs. Jean Wade Rindlaub (BBD&O), Thomas Prioleau (General Foods) and Fred J. Haberle (H. C. Bohack). Panelists at the Chicago meeting included designers Lawrence Meusing, Robert Sidney Dickens, William Goldsmith (Dave Chapman), plus Ernest W. Turner (Campbell-Mithun Advertising), Don Grimes (Independent Grocers Alliance), Robert Foster (John Morrell & Co.) and Mrs. Betty Mudge (Hamilton Beach).



Two recent college shows: Carnegie Tech's Class of 1960 *industrial design exhibition (left); and Iowa's* 1960 *Design Exhibition (right), which included the work of both students and faculty.*

Plaskon NYLON FILMS ARE TOUGH RESIST OIL AND GREASE

Plaskon Nylon Films protect a wide variety of hard-to-hold packaged goods with a combination of top-grade properties . . . **High strength:** Over 10,000 psi tensile; 2 to 4 times stronger than conventional films. **Abrasion resistance:** Tabor tests show 4 to 6 times more wear resistance. **Transparency:** Excellent — variable as desired. **Oil and chemical resistance:** Outstanding . . . outperforms all other films. **Odor barrier properties:** Outstanding. Tests show superiority over other commercial films. **Printing and dyeing properties:** Good, without special treating . . . flexo and roto. **Heat sealing:** Seals well at 420 to 500°F, 0.5 seconds dwell; impulse seals, too. More complete Nylon Film information is yours for the asking.

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Profitable idea from **Plaskon** ...

FOILS PUT ON UREA CLOSURES

The use of foils can provide a fresh new way to decorate your urea closures and containers. Your old molds are candidates in many instances for a whole new line of gaily decorated closures and containers — at savings not to be overlooked!

Now that it is possible to combine the high quality of urea closures with permanently molded-in decorations, the design possibilities are intriguing — cosmetic caps that add another touch of glamour; pancake makeup boxes with bright, wear-resisting

COLORFUL, LASTING PATTERNS AND CONTAINERS

patterns; dusting powder boxes with sparkling floral designs! In other areas — pharmaceutical closures with molded-in product identification and trademark; brand-name-identified jiggers and secondary closures for liquors.

Foils can now be obtained to brighten alpha cellulose urea and melamine parts . . . including curved surfaces. We'll be happy to work with you to adapt the use of foils to your application.

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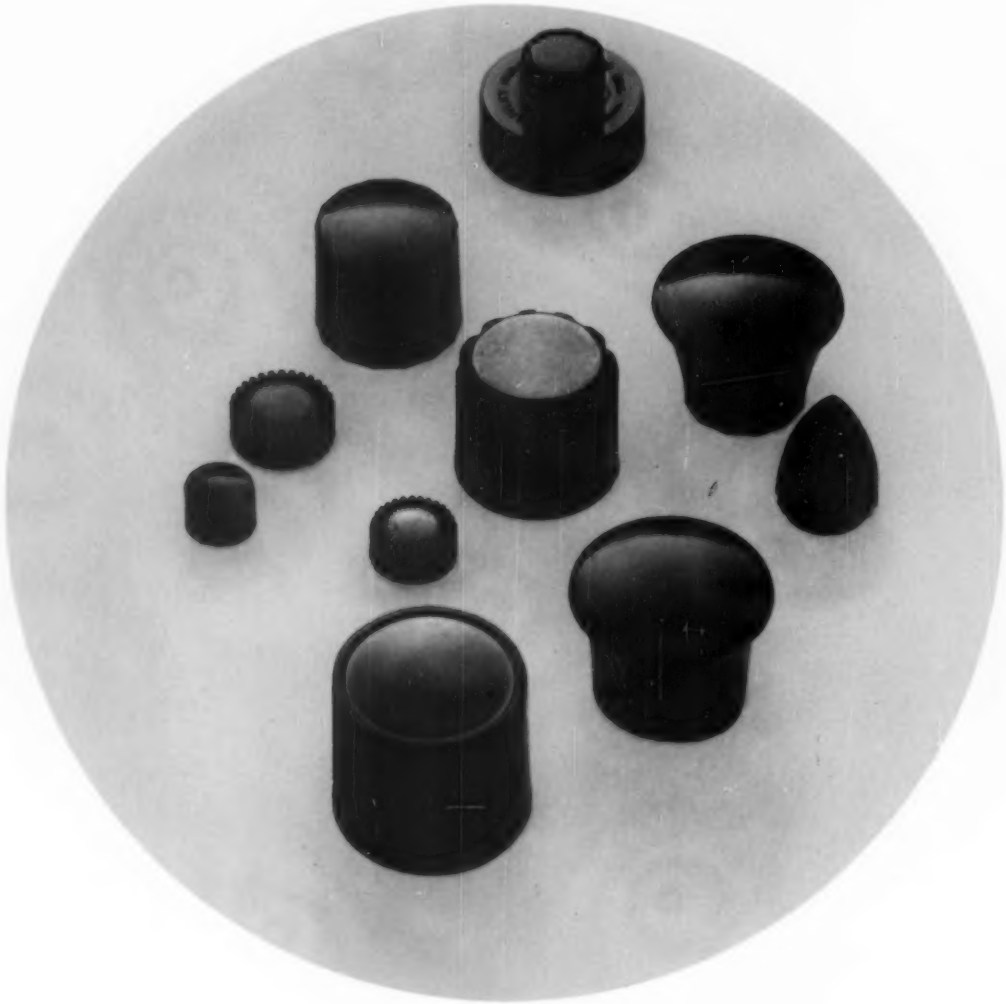
Plaskon WOOD-FLOUR UREA CAPS IT WELL...FOR LESS



Plaskon Wood-Flour Filled Urea beats the closure properties of the older general-purpose plastics — but matches them in cost!

See if your present closure material matches these advantages: Bleed proof and color-fast • Scratch-resistant, non-electrostatic surfaces • Unaffected by ordinary solvents, impermeable to volatiles • High torque strength • Odor-free • Excellent for high-speed automatic production.

Plaskon Wood-Flour Filled Urea, available in closure brown and standard black, is thoroughly checked out and proven in lab and field. It's ready to top your closure savings—and profits. Contact us for more information, and for molded samples.

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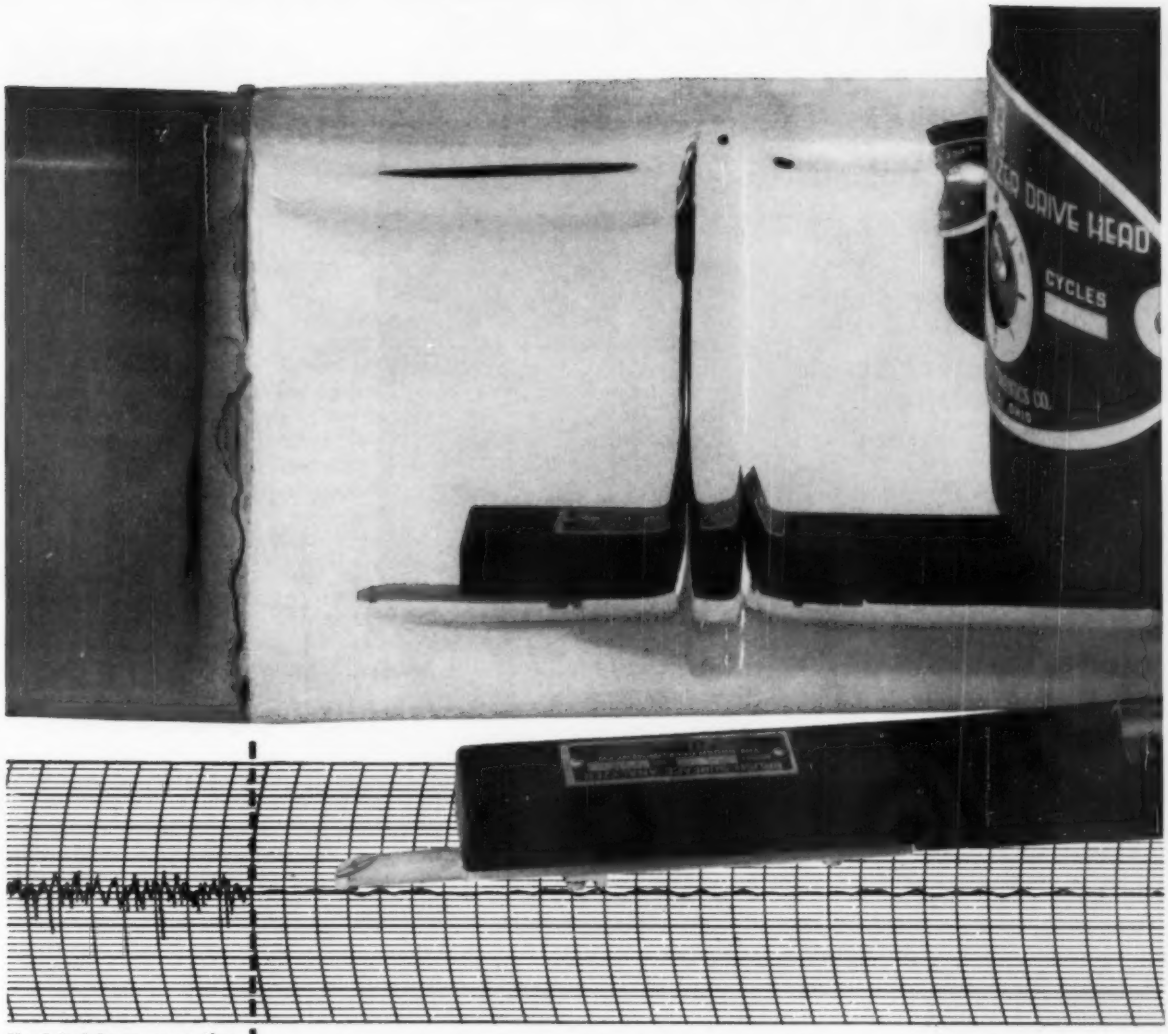


Unplated bumper section shows surface variations averaging 40 micro-inches.

Same bumper section plated with 2 mils of leveling Nickel and 0.01 mils of chrome shows an average variation from level reading of no more than 5 to 6 micro-inches.

See how a layer of leveling Nickel takes polishing-buffing costs out of plating

Above, you see how a layer of leveling Nickel can be used on bare steel to even out surface imperfections, reducing the need for polishing and buffing before and after plating.

The leveling Nickel, however, could have been applied to a zinc, brass or aluminum part or product with equally good results

Special Nickel baths have been developed to coat and smooth the rough surfaces of a wide range of basis metals. By employing these baths, engineers and designers can reduce, in many cases *eliminate* high polishing and buffing costs.

You get higher quality, too. Leveling Nickels, when plated semi-bright, are often coated with bright Nickel before chrome plating. The thick, double-layer Nickel coating that results assures high brightness and lasting beauty. It provides a mirror-smooth, white-metal foundation for a brilliant blue-white finish. It backs up the chrome and cushions it against cracking—protects basis metals from rust and corrosion.

So with Nickel in ample supply as far into the future as any man can foresee, you can now plan to use leveling Nickel Plating to cut your production costs and enhance plating quality.

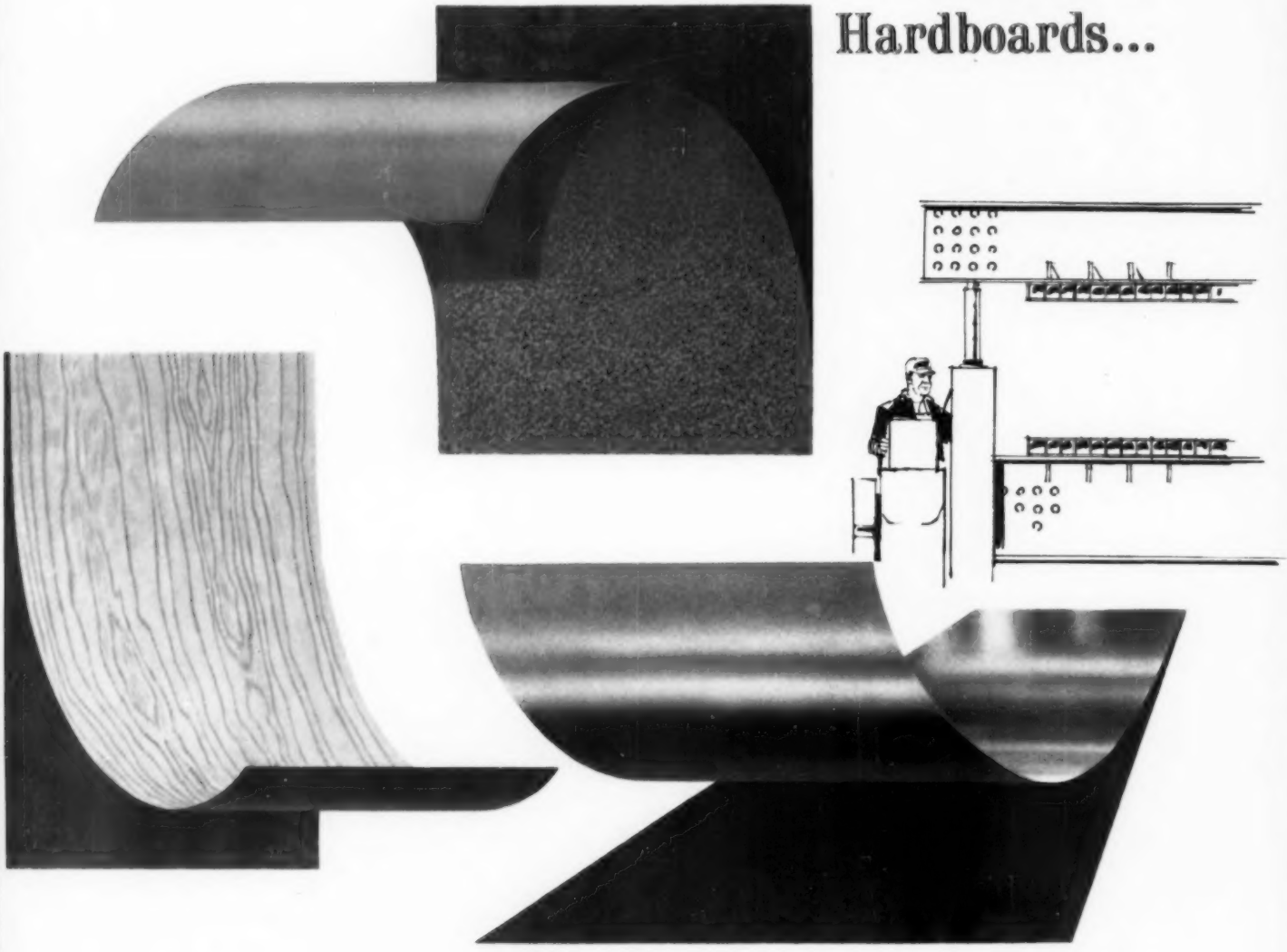
For more information about versatile Nickel coatings, write us for our informative booklet, "PRACTICAL ANSWERS TO 40 PRACTICAL QUESTIONS ABOUT NICKEL PLATING."

The International Nickel Company, Inc.
67 Wall Street INCO **New York 5, N.Y.**

Inco Nickel

Nickel makes plating perform better longer

you can do just about anything with Masonite® Hardboards...



for example The uniform surface of Masonite hardboard makes it ideal for laminating—as the outer material, or a core between layers—bonding beautifully with wood, metal, foils, plastic, leathers, fabrics. Its consistently smooth surface, dimensional stability and hardness—from piece to piece, carload to carload—make Masonite hardboards reliable from one job to another.

in fact Masonite offers you a complete choice of thicknesses, densities, textures and patterns. Wonderful workability. Extreme resistance to impact, moisture, abrasion. Whatever your design or production need, Masonite has the hardboard to do the job.

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BCID announces annual awards

The British Council of Industrial Design selected 18 products, ranging from lamposts to saucepans, for its 1960 Design Center Awards. A majority of the items, however, are in the classification of furnishings. The awards were highlighted by the 1960 Duke of Edinburgh Prize for Elegant Design, won by a Spode dinnerware set designed by Neal Franch and David White, and manufactured by W. T. Copeland & Sons Ltd. All the items will be on display at the British Exhibition in the New York Coliseum, June 10-26. Following is a list of the award-winning products.

Street lighting columns and lanterns designed by Richard Stevens and made by Abacus Engineering Ltd. Also by Richard Stevens, a spotlight with a narrow high-intensity beam with no glare, made by the Atlas Lighting Ltd.

Decorative light fittings designed by Peter Rodd and Richard Stevens, made by the Atlas Lighting Ltd.

Office desk units designed by Yorke, Rosenberg and Mardall and made by Bath Cabinet Makers Ltd.

Melamine plate designed by Ronald E. Brookes and manufactured by Brookes and Adams Ltd.

Drip-dry furnishing lace made by Clyde Manufacturing Co. Ltd. from designs by F. G. Hobden.

Lemington glass vases, designed by R. Stennett-Willson, made by General Electric Co. Ltd.

Oval casseroles, entree dishes and tricorn stand of "Anniversary Ware," designed by John and Sylvia Reid and manufactured by Izons and Co. Ltd.

Brownie 44A-Camera made by Kodak Ltd., and designed by the firm's development in consultation with Kenneth Grange.

Irish linen glass cloth designed by Lucienne Day and made by Thomas Somerset and Co. Ltd.

Stainless steel saucepans designed by Design Research Unit and made by Ernest Stevens Ltd.

"Royal Bobelin" Axminster carpet designed by Graham Tutton and made by Tomkinsons Ltd.

"Pannus" wallpaper designed by Humphrey Spender and manufactured by the Wall Paper Manufacturers Ltd.

"Queensberry Ware" nursery china made by Crown Staffordshire China Co. Ltd. The shape was designed by David Queensberry and pattern was created by Bernard Blatch.

"Orlando" furnishing fabric made by Donald Brothers Ltd. and staff designed under the direction of Peter Simpson.

"Le Bosquet" printed cotton satin designed by Shirley Craven for Hull Traders Ltd.

"Vynide" coated fabric for wall covering designed by staff of Imperial Chemical Industries under F. J. Hoswell.

Pratt show at IBM gallery

"Education of a Designer," an exhibition by Pratt Institute's Industrial Design department, was on view during May at IBM's Gallery of Arts and Sciences. The show (above) was set up to demonstrate the philosophy of teaching, and the practice of learning, at Pratt, through an exhibit of student work in all classes. The show included examples of underclass exercises in form development, sculpture, experimentation in materials, and study of natural phenomena, as well as the work of upperclassmen in product and transportation design (including some radical treatments of automobile and subway-car design) and the organization of interior spaces.

Designer-management conference

Management's use of designers in connection with corporate-image programs was the subject of a conference of designers and management personnel sponsored by the Design Division of Boston's Institute of Contemporary Art on April 25th. A dozen speakers addressed the subject from different points of view, perhaps the most interesting of which was Theodore Holmgren's; he was formerly with Donald Deskey Associates and is now design director for General Foods. Holmgren told his audience of designers and businessmen (there were too few businessmen, everyone agreed) that management generally doesn't know how to employ the special talents of designers. "What shows this," he said, "is management's tendency to use several designers on the same project. Designers' services are too often bought as a commodity; management looks at design mostly as an art service. But if designers want to change this situation," Holmgren concluded, "they have to stop acting like a commodity and look a little more professional. Professional freedom depends on professional competence."

In the afternoon session, designer Philip Stevens (of Stevens-Chase Design Associates) declared with considerable conviction that a corporate image is "not a symbol, or a package, or a promotion stunt, but is something that grows out of product design itself." It was a remark echoed at several other points in the day's talks.

Featured speaker of the conference was William Capitman, president of the Center for Research in Marketing, whose blunt irreverence for the shibboleths of both designers and businessmen is currently in heavy demand at design conferences. The burden of his argument was that a corporate image is not what most people think it is (it is a "complex of real experiences" of the consumer with the corporation); that the results of some corporate image programs are remarkably different from their objectives ("designers do an abominable job in creating an image"); and that the design of a corporate image involves a number of variables (e.g., "the dynamics of social change") which are frequently neglected.

Other speakers at the conference were: designers Samuel Ayres Jr., Frank Giannoto, Joseph L. Nelson (Motorola staff), Philip George (George Nelson) and businessmen H. R. Ohleyer (product manager for Crown-Zellerbach), William G. Reynolds (attorney for Du Pont), Daniel Cronin (vice president, the Macbick Company), and Philip B. Toole (assistant advertising director for Sheraton Corporation).

More cars

Although cars are getting smaller, the shows are getting larger, and the Fourth International Automobile Show, put on in the New York Coliseum in April, was the largest to date. All told, over 300 models of cars made by 86 manufacturers were on view, including a few items, most of them from overseas, never seen before in this country. Among these were: Renault's new light truck (top, right), called the "Petit Panel"; the tiny new Austin 850, which

will sell for about $1,300; an amphibious car made in Germany, and the Plymouth "XNR"—an "idea" car-of-the-future designed by and named for Chrysler styling director Virgil M. Exner. This car does not have fins, but its profile (as described by Chrysler) *is* one.

Milan samples fair

A young New York design firm, Labalme and Chang, coordinated the American exhibits at this year's Milan International Trade Fair, and turned in what the Government considers a particularly neat job of giving design unity to thirteen corporation displays whose diversity ran the gamut from soup (Campbell's) to knots (Scott outboards).

Spectators (and there were 660,000 of them in two weeks) entered the U. S. exhibit through a hall in which the theme of the show, "Testing and Quality Control of Consumer Products," was stated and explained in visual symbols.

The exhibits that followed (Westinghouse display is shown above), were given unity by similarities in the treatment of platform, ceiling, lighting and explanatory graphics design, relieved by variations in arrangements, color-motifs and display-background materials.

Native market in Manhattan

Sixty-five countries were represented by exhibits at this year's U.S. World Trade Fair, held at the New York Coliseum last month, but the increased participation did not really result in a sharper focus on its theme. As in past years, it resembled a native bazaar more than serious exhibit of business and commerce.

"Foster Grant has a new, low price for Nylon-6, and here's why," *says Joe Foster*

WE DIDN'T WAIT for Nylon-6 to become a large volume molding resin before we reduced the price. We simply did what we believed in—lowered the price of our 60 series of Fosta® Nylon resins from $1.18 per pound to as low as *$.98 per pound*. Now, no one responsible for the design, development and manufacture of molded products can afford not to consider Nylon-6 as a basic, efficient and profitable fabricating material.

Experience both as raw material suppliers and proprietary molders tells us that Nylon-6 has a wonderfully promising future. For example: Housings for portable electric radios, for home electric appliances, for hand power tools and important components such as gears, rods, tubes and plates and countless other molding applications haven't even been tapped yet.

Nylon-6 is one of the *great* molding resins. It provides toughness, non-flammability, superb molding

ease, abrasion-resistance and colorability by pigmenting or dyeing. It also possesses good electrical properties, is impact-resistant, light-stable, self-lubricating, flexible and has excellent heat stability. In short, Nylon-6 can do almost anything a molded product might require.

Our confidence in Nylon-6 is supported further by what certainly is a trend toward still lower material prices. One obvious indication is that within the last three years, caprolactam monomer—the basic ingredient of Nylon-6—has come down more than 20%. The next two or three years should bring even lower caprolactam prices and wider and more varied use of Nylon-6 in end product applications everywhere.

Faith in the future of Nylon-6 prompts us to take this major step in making this great molding resin more available than ever before to the plastics industry. We would like to make Fosta Nylon more familiar to you by sending you our completely new price list and brochure and by discussing your molding operation and Nylon-6 requirements with you. Just call or write Foster Grant, Leominster, Mass., KEystone 4-6511. We're ready to work with you and your staff right now!

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Aspen conference speakers

Speakers at the Aspen International Design Conference, which will open on June 19th for a week's discussion of "The Corporation and the Designer," will be: Arrigo Castellani (designer for Pirelli), Olle Eksell (Swedish graphic designer), Paul A. Fine (vice president, Center for Research in Marketing), Leslie Julius (director of Hille & Co., London), Joseph McGarry (vice president, International Mineral & Chemical Co.), Dr. Traugott Malzan (designer for Max Braun, Frankfurt), designer Eliot Noyes, author C. Northcote Parkinson, British CID director Paul Reilly (above) and Spencer Stuart (management consultant).

Events

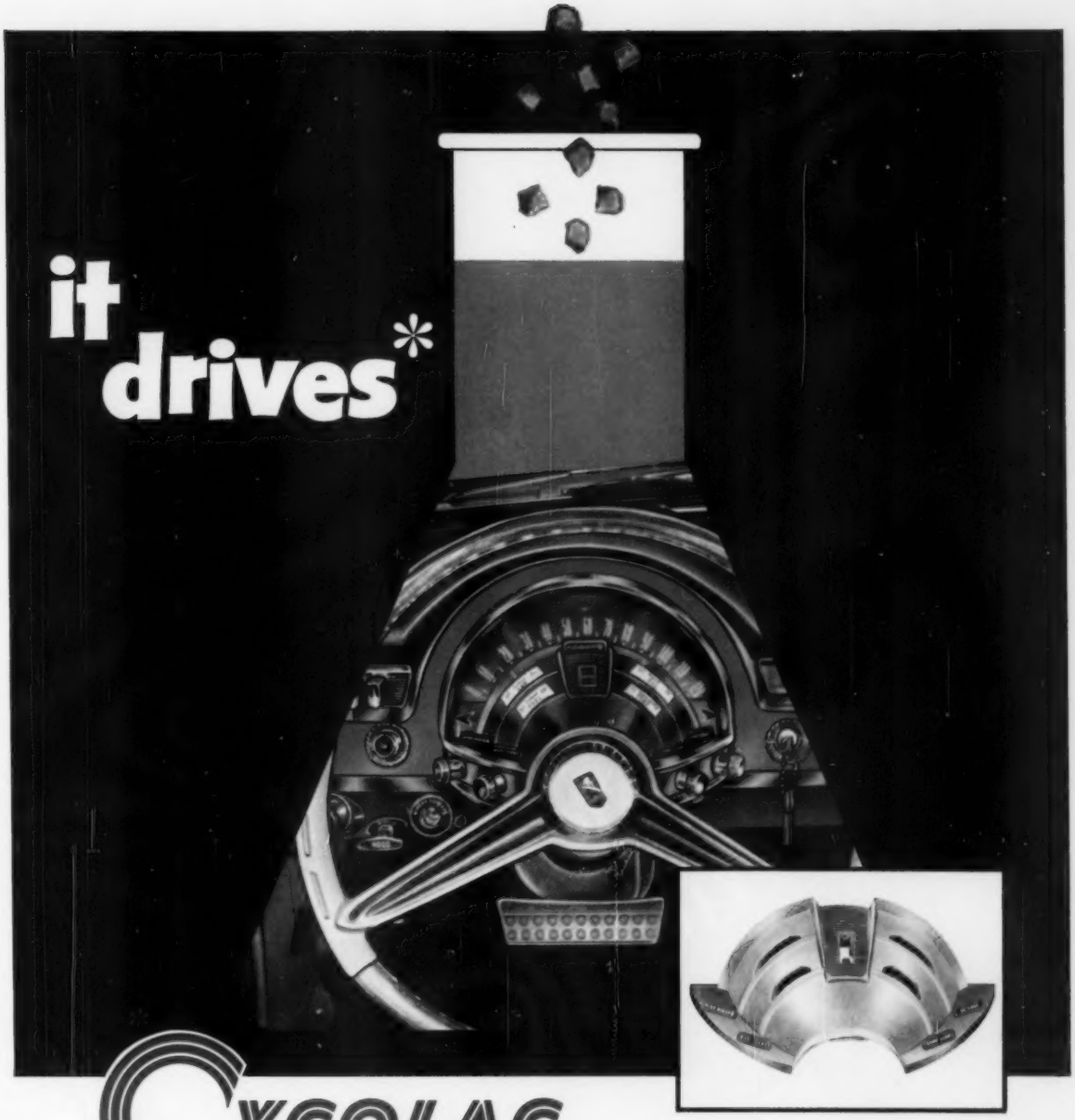
A Design Film Festival is planned for the **ASID N. Y. Chapter spring meeting** at the Motel on the Mountain in Suffern June 3-4.
IDI N. Y. Chapter meeting is being held June 3 at the Sheraton Inn in Binghamton. Eliot Noyes is guest speaker, and his subject is "IBM Corporate Design Program." A tour and exhibit of the IBM facilities in Endicott is scheduled for June 4.
David R. Campbell, president of the **American Craftsmen's Council**, has announced a $101,000 grant from the Rockefeller Foundation. The grant will be used to augment the Council's Craft Research Service which provides information on all aspects of American crafts. The ACC will hold its Northeast Regional Conference at the State Teachers College, New Paltz, N. Y., June 10-12. The keynote address by David Campbell will be: "Basic Principles of Marketing Crafts." Lectures and discussions during the remainder of the conference will cover design, production and marketing.
An exhibition of photographs and models of the work of **Buckminster Fuller** will be on view at the Walker Art Center through June 21.
Garden furniture by Kagan-Dreyfuss has been selected for the honor of exhibition at the first United States Exhibit in an international horticultural exposition at the 1960 Dutch Floriade, world's fair of gardening in Rotterdam.
Pratt Institute is offering an eight-year program for evening study leading to the Bachelor of Fine Arts degree with majors in Advertising, Illustration, Interior Design and Product Design.
A special summer program, **Theory and Criticism in Architecture and City Planning**, will be held at MIT from July 11-15. Intended for practicing architects and city planners, as well as for critics, historians and teachers, the seminar will explore the formal, social and technological objectives of modern design.
The **Michigan State University School of Packaging Foundation** has received a $10,000 contribution from the Packaging Machinery Manufacturers Institute to be used to purchase research and development equipment for the Michigan State University School of Packaging.
On view at Georg Jensen Inc. during May was **"Vision,"** an exhibition of contemporary American crafts by the Designer-Craftsmen of New York and San Francisco. Over 100 artists were represented in the categories of woods, metals, glass, ceramics, rugs, enamels, silver, wall hangings, and jewelry.

People

APPOINTMENTS: **Samuel L. Fahnestock** (above) as manager of design for Alcoa. . . . **Don McFarland**, formerly manager of Industrial Design Operation, Housewares Division, General Electric, as a member of the Latham-Tyler-Jensen staff. . . . **Ralph Holker** and **James Fulton** as staff members of Raymond Loewy Associates. . . . **Soloman J. Lim** as architectural associate for Good Design Associates. . . . **Juel Stern** as projects director for Warren Furlonge Associates. . . . **Wesly M. Dixon** (above), as president of Container Corp. of America, succeeding the late Walter P. Paepcke, founder of the company; **John V. Massey** as manager, Department of Design, for Container Corp. of America. . . . **Eugene Feldman** as graphic arts director, a newly created position, for Schaevitz Engineering. . . . **Oren G. Sherman Jr.** (above) as manager of product development for Masonite Corp. . . . **Thomas S. Buechner** (above), director of the Corning Museum of Glass, as director of the Brooklyn Museum, effective August 1. . . . **Charles Le Brun** as designer for Emery Roth & Sons.
ELECTED: **Nettie Hart** (above), director of decorative design for Raymond Loewy Associates, as vice president of the Loewy industrial design organization.
AWARDS: The late **William Golden**, creator of the CBS "eye," was honored as "Art Director of the Year" by the National Society of Art Directors at its 13th annual awards meeting in May.

Company News

RETAINED: **Jaap Penraat Associates** by General Automation Corp. to redesign control devices and develop a complete corporate identity program. . . . **Raymond Loewy Associates** by Trans World Airlines and California Packing Corp. . . . **Lippincott & Margulies, Inc.**, by B. F. Goodrich Co. . . . **Fred M. Gore** (above) of Fred Gore and Associates by Mooney Aircraft Co. as consultant. . . . **Leon Wirch Associates** by Rona Plastics Corp. to design a series of items for their Ronaware line. . . . **John Balazs** by Office Equipment Co. to design identifying symbol and logotype. . . . **Goertz Industrial Design, Inc.**, by Acco Products and Storecast Corp. of America. . . . **M. Barnett & Associates** by Malsbary Mfg. Co. to establish a color coordination program for their line of industrial steam cleaners. . . . **Good Design Associates** by Speakman Co. as packaging and industrial design consultants. . . . **Ehrman & Reiner, Inc.**, by Ralf Shockey & Associates, Inc., to design packages and identifying trademark for "Fairchild Cinephonic Eight" products. . . . **Bruce Kamp Associates** by Bowser, Inc., as consultants.
ESTABLISHED: **Sage, Bukar & Larisch Sales Promotion Organization, Inc.**, at 10 East 49th St., N. Y. . . . **The International Research Service of Faber Birren & Co. and American Color Trends**, at 500 Fifth Ave., N. Y.
EXPANDING: **George Nelson and Co., Inc.**, to include representation on the West Coast by Mitchell A. Wilder, 2334 Kenilworth Ave., Los Angeles.
GOING PLACES: **Creative Playthings, Inc.**, to Princeton, N. J. (P. O. Box 1100). . . . **Consultants for Product Design** to 1850 Westwood Boulevard, Los Angeles 25. . . . **Osborne: Tuttle, Inc.**, to 200 East Ohio St., Chicago 11, Ill. . . . **Thomas Laufer & Associates** to 164 Spencer Ave., Sausalito, Calif. . . . **Tomi Ungerer** to 17 Commerce St., N. Y.
RESIGNED: **Gene Smith** of Smith, Scherr & McDermott, to establish his own office.



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THE BORG-WARNER PLASTIC THAT'S TOUGH, HARD, AND RIGID

Every year, the auto industry finds new applications for CYCOLAC—to the tune of important savings and an improved appearance for many products. The 1960 Chrysler instrument panel you see above is a typical example.

This unique panel, molded of Borg-Warner CYCOLAC, cuts production costs because it replaces expensive die-cast metal with economical molded plastic. It also replaces chrome plating with vacuum plating . . . another cost-economy. Product-appearance is improved because the toughness, hardness and rigidity of CYCOLAC enable it to keep its "like new" look for many years.

CYCOLAC *Better in more ways than any other plastic*

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CHECKS PERSPIRATION TOO!
BY MENNEN
THREE
Bakelite
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. . . because this cab is

MOLDED FIBER GLASS

This is one of the revolutionary new White "5000" Truck Cabs . . . damaged when it hit an unlighted flat truck parked on a highway.

It is made of MOLDED FIBER GLASS, which is very tough and highly resistant to impacts. That's why **damage was confined to the point of impact.**

Headlight and fender were removed, but adjacent parts were not damaged or distorted. Door frame and body frame were not bent, either. In fact, the door did not even need refitting.

As a result, down-time for the cab, from start of repair job until parts were ready for painting, was a **cost-saving four hours.** This is another major advantage which MOLDED FIBER GLASS offers your products . . . besides light weight, high strength, no rust, corrosion resistance, easy moldability to modern designs, beauty and economy.

Write today for descriptive brochure and for detailed information on molding *your* designs of MOLDED FIBER GLASS.

GREATEST NAME MOLDED FIBER GLASS IN REINFORCED PLASTICS

MOLDED FIBER GLASS BODY COMPANY
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Coatings of TENITE POLYETHYLENE mean tight, heat-sealable closures

And here is a good case in point... French's Instant Mashed Potatoes.

All the original goodness of this food product is preserved in new packages made of paper, plus metal foil coated on both sides with Tenite Polyethylene. One coating of polyethylene serves to bond the paper to the foil. The other, on the inner foil surface, makes it possible for the pouch to be tightly heat-sealed —protecting the sensitive contents against loss of flavor and quality.

In addition to being heat-sealable for quick and easy closing, this versatile plastic has many other properties useful in packaging. It is chemically inert to most materials...doesn't puncture or tear easily...remains flexible at low temperature. And its resistance to water and water vapor helps prevent loss or gain of moisture.

Tenite Polyethylene is being used in a wide variety of packaging applications. It is extrusion coated on paper, boxboard, film and foil...extruded into tough, waterproof film...blown into bottles that are practically unbreakable...and injection molded into containers of all shapes and sizes.

For more information on the packaging usefulness of Tenite Polyethylene, or for help in using this versatile plastic in any application, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

TENITE®
POLYETHYLENE
an Eastman plastic

Package designed by R. T. French, Rochester, N. Y. Pouch packages manufactured by Thilmany Pulp & Paper Co., Kaukauna, Wisc., using Tenite Polyethylene.

imagination
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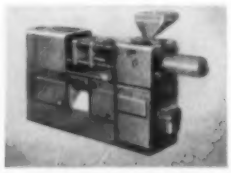
DELRIN®
acetal resin

Du Pont "Delrin" acetal resin is a completely new material that offers designers distinct performance and cost advantages in many applications once reserved for metals. Today, "Delrin" is being used in hundreds of products where die-cast zinc and aluminum, cast and machined brass, stainless steel and cast iron were once considered "standard". Imaginative and cost-conscious designers have taken advantage of the unique properties offered by "Delrin" to make such products better and at lower cost. Household items, sporting equipment, telephone components, gears, housings, plumbing fixtures, valve parts, clothing fitments are examples.

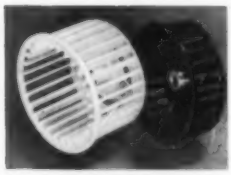
On these pages you will find some of the good reasons why "Delrin" opens the door to improved designs and examples of how industrial designers have profited from these new opportunities.

What DELRIN offers to designers

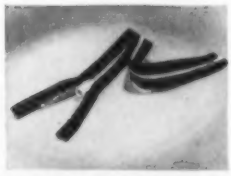


rapid, economical fabrication: Parts of "Delrin" are rapidly mass-produced via conventional injection molding or extrusion. There is usually no need for finishing operations. Assembly is simplified by a variety of fastening and joining methods. Complex parts can often be molded in integral units, thus making possible savings in costs and simplifications in design. Models and prototypes can be machined easily from stock shapes, which are readily available.

attractive appearance: "Delrin" is available in a variety of colors. In addition, varied surface effects can be achieved by texturing, vacuum metalizing or painting. "Delrin" offers designers new latitudes in décor, in such applications as the integrally colored instrument cluster (left), in bathroom fixtures, in automotive and appliance handles and in clothing fitments.



strength, toughness, dimensional stability: Outstandingly strong, rigid yet resilient, "Delrin" retains its desirable properties over a wide range of temperatures and under exposure to water, solvents, oils and greases and stress and strain. The "squirrel-cage" blower (left) is an example of many of these properties at work. A variety of gears and hardware fixtures takes advantage of the dimensional stability and toughness of "Delrin".

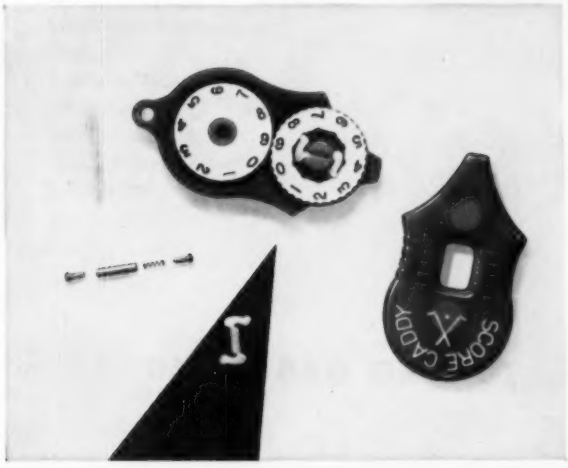


resistance to stains, rust: "Delrin" is unaffected by long exposure at room temperatures to a wide variety of common and usually troublesome substances—among them tea, catsup, vinegar, greases and oils and lemon juice. It cannot rust. The resistance of "Delrin" to body oils and perspiration, as well as its toughness and good frictional properties, makes it a logical choice for zippers (left) and other fitments.

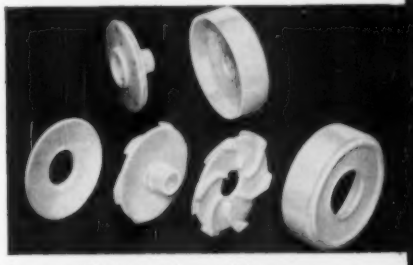
cost savings: Because one part of "Delrin" can frequently replace several parts of another material, because costly finishing operations are usually eliminated, and because assembly is simplified, "Delrin" often permits dramatic cost savings. The textile solution pan (left) costs $25 in stainless steel; injection-molded of "Delrin", it requires no finishing, and costs approximately $3, with a weight saving of 75%.

New designs made possible by DELRIN

In the housing of this bilge pump, the use of "Delrin" permits 30 to 40% longer impeller life because of the low friction between the walls of "Delrin" and the moving part. There is also a weight saving of 1 lb. 4 oz. The manufacturer—Wilcox-Crittenden, Division of North & Judd Mfg. Co., Middletown, Conn.—reports that cost savings permit a lower competitive price.



In this golf-score counter, an indexing spring of "Delrin" replaces a metal spring, two pistons and a tube. This simplified design, made possible by the resilience and strength of "Delrin", solves a difficult assembly problem. Added advantages: the new "Score Caddy" lasts far longer and is completely corrosion-proof. (By CMS Enterprises Co., Flint, Mich.)



In a multi-stage submersible pump, precision-molded parts of "Delrin" replace brass components. Flint and Walling Mfg. Co., Kendallville, Ind., selected "Delrin" for this design because of its high strength and stiffness, dimensional stability, low moisture absorption and fatigue endurance. The company reports that "Delrin" has performed better than brass in abrasion and corrosion resistance, and permits a 75% cost saving in the parts involved.

What problems can DELRIN help you solve?

The applications shown on these pages are only a few of the hundreds of remarkable design improvements already made possible by "Delrin" acetal resin. We suggest that you investigate further the many ways in which this versatile new material may help you solve some of your design problems. Du Pont technical personnel are ready to assist you in your evaluation of "Delrin" as well as the other high-quality plastic materials offered by Du Pont, such as ALATHON® polyethylene resins, ZYTEL® nylon resins, LUCITE® acrylic resins. For more information on any of these materials, write us. Address: E. I. du Pont de Nemours & Co. (Inc.), Department T-6, Room 2507D, Nemours Building, Wilmington 98, Delaware.

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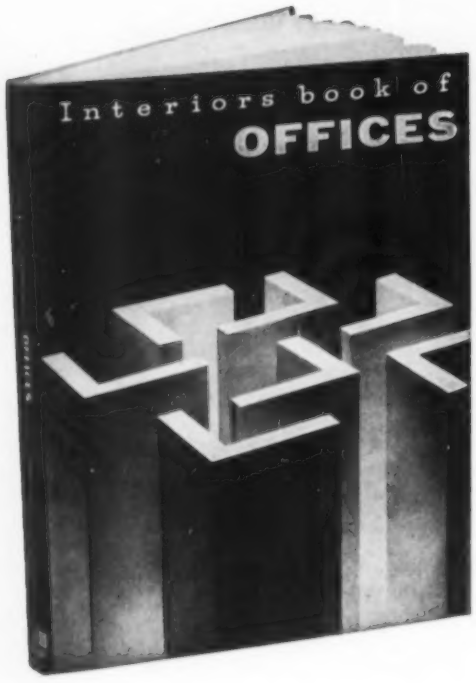

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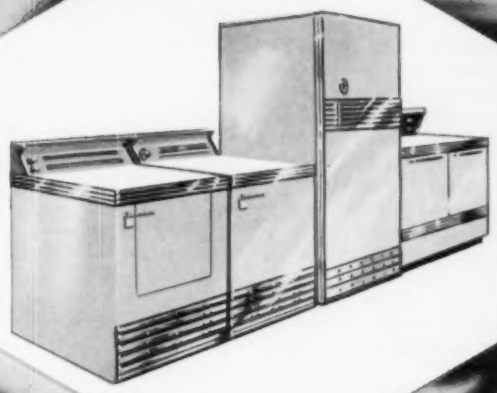

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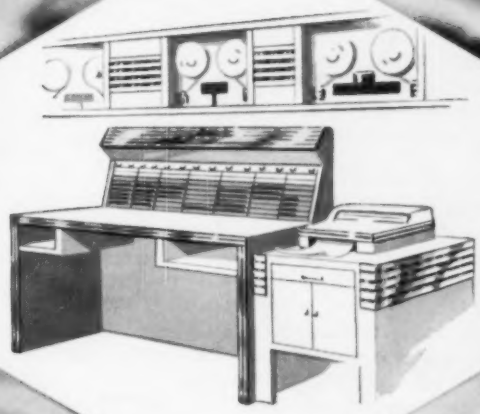

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CLIPS AND QUOTES

Consumer Reports, *March, 1960, page 108.*

"As any supermarket shopper knows, the need for protection against deceptive packaging has become ever more urgent as, in recent years, packagers have openly boasted of packaging—size, shape, color, etc.—as point-of-sale advertising and a means of influencing the consumer to impulse buying . . . Judging from the number of letters CU has received, readers are growing increasingly incensed over what they consider to be instances of deceptive packaging."

Elisha Gray II, *chairman of the board of Whirlpool Corporation, in a speech to the technical conference of the American Home Laundry Manufacturers Association, March 24, 1960.*

"Let's agree to the perfectly obvious fact that an engineer's principal purpose, as an engineer, is to create obsolescence. Any attempts by various people to toady up to the public by saying they are against planned obsolescence is so much commercial demagogy. To pose as a protector of the public has become a fashionable pastime. If engineers and other professional people had not been creating obsolescence at a tremendous rate, this nation of ours would still be two-thirds undernourished, the average life span would be 37 years instead of 75 years, and the average person's life would include tremendous measures of hardship and sadness, and unnecessary toil to a degree that is hard for us to recall."

Richard Latham, *in a speech to the IDEA conference at the University of Cincinnati, April 8, 1960.*

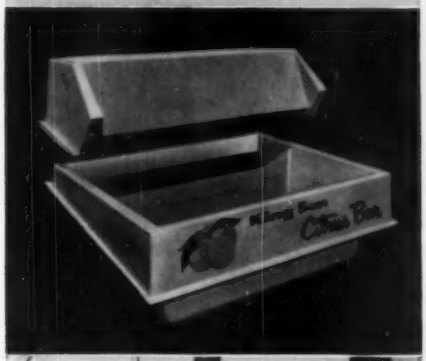
"Everybody can see the stars, but unless you know how to *read,* in order to acquire the platform of previous learning and so be able to short-circuit a life-time of discovering what men before you have already found out—unless you can learn to build a telescope and use it—you can never come to understand what the stars really are; and unless you acquire the language of mathematics so you can come to conceive in the abstract, you will never come to know what the stars do. And so these simple things — understanding, disciplines, and imagination — separate the star gazer from the astronomer.

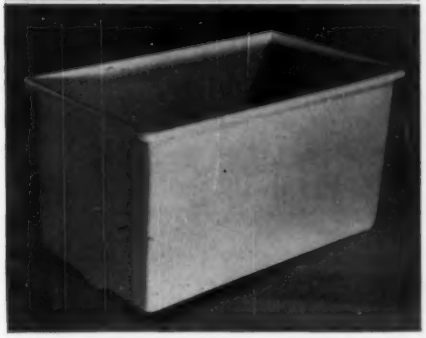
The same simple things separate people from designers, and so what I think is that no educational process, good or bad, trade school or university can create a designer, rather they can show people how to become designers if theyre willing—and *able.*"

Virgil M. Exner, *Director of Styling, Chrysler Corporation, in a speech on "The Role of Art and Style in Human Relations" at the "Design in Industry" show in Columbus, Ohio, February 10, 1960.*

"Briefly, our styling philosophy at Chrysler begins with the premise that an object's design should describe its function—that an object's shape should tell you in pleasing and graceful form what it is made to do. In essence, the really modern automobile should convey an eager, poised-for-action look.

The wedge, or dart, shape certainly expresses the function of automobiles because it imparts a sense of direction. Also, it has the fresh, youthful appeal we are striving for. We want our cars to give owners of any age that wonderful young-in-heart feeling. This buoyancy is reflected in their relations with other people and tends to create a friendlier, livelier atmosphere conducive to good fellowship."





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S-300 Styrene—Similar to S-540 but with greater rigidity. Good impact strength.

S-1029 Tripolymer Styrene—High impact, tensile and flexural strength at extreme temperatures. Excellent chemical resistance and dimensional stability, low moisture absorption. Forms easily, machines readily. In smooth or Haircell grain finish, gauges .020″ to .125″, many colors. For luggage, housings, chairs, ducts, exhaust hoods, clock cases.

ACETATE

A-130 Cellulose Acetate—Strong and tough. Vacuum or pressure form. Machines well. In gauges .003″ to .060″ transparent, translucent, opaque, clear and colors. For blister packs, wraps, displays, toys, novelties, indoor signs.

POLYETHYLENE

PE-200 Linear Polyethylene—Rigid, tough, heat and chemical resistant with good dielectric properties. Forms, machines, welds. Gauges .020″ to .125″ custom sheets and rolls. For housewares, containers, vessels, electrical products, toys, housing, packaging.

PE-100 Low Density Polyethylene—Low melt viscosity, excellent chemical and heat resistance. Stable under humidity changes. Vacuum form. Processes rapidly. In gauges .015″ to .125″ gloss finish custom sheets and rolls. For housewares, packaging, toys, containers, form liners, electronic applications.

POLYPROPYLENE

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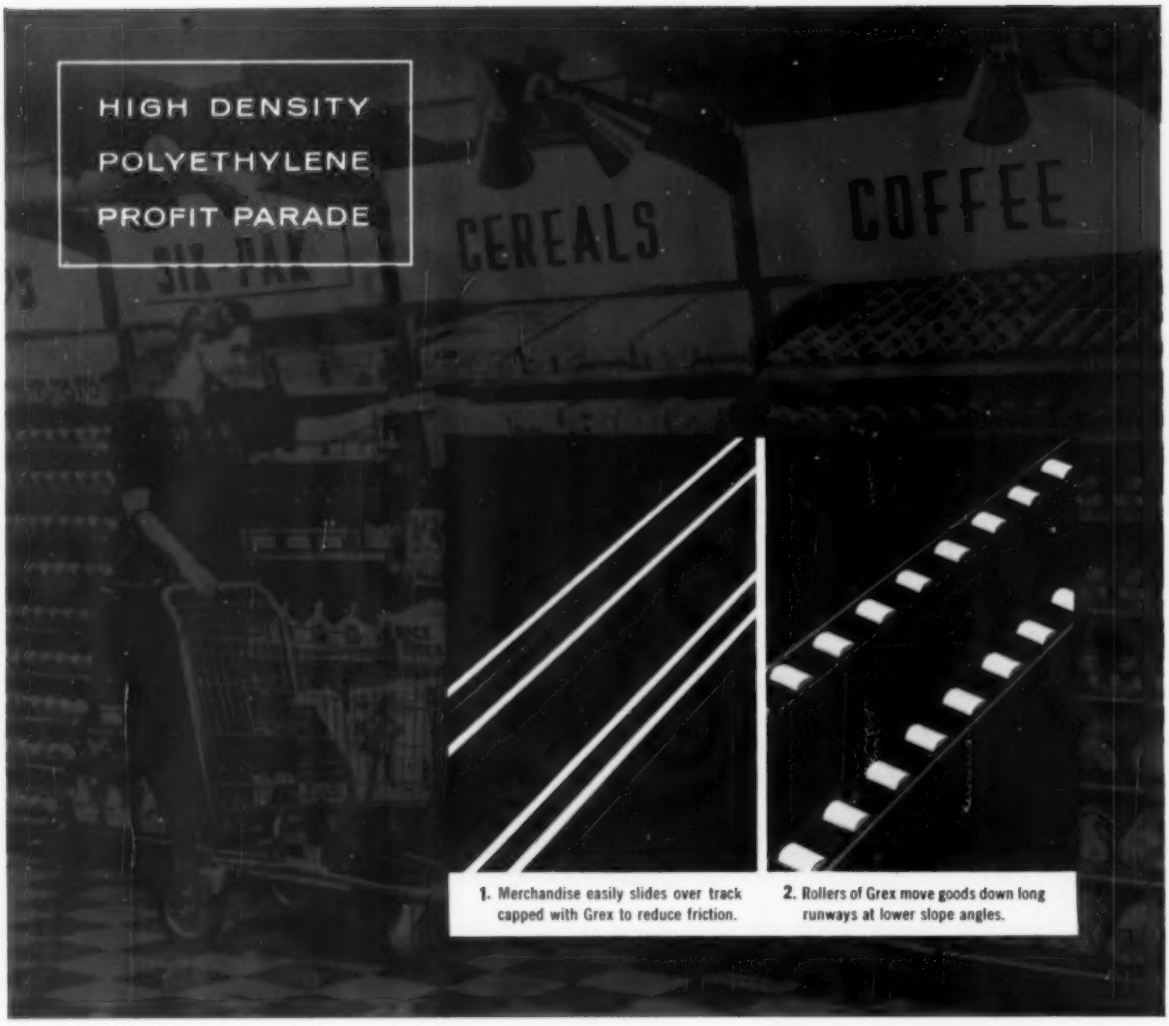

Grace Plastic Solves Friction Problem 2 Ways

North American Equipment Company finds that Grex high density polyethylene is the most practical material available for reducing friction in two types of gravity storage installations. These are utilized in both "Food-O-Mat" for supermarket merchandising and "Quik-Pik" for industrial order picking.

"Quik-Pik" units hold stock which automatically slides down a runway as items are picked from the front. The problem is friction. This friction is overcome in one type of installation by using runways capped with an extruded Grex tubing made by Action Plastics, Inc. Stock slides smoothly over Grex at a slope angle of 12°-14°. The other type of installation moves merchandise at an even lower angle (4°-6°) by utilizing tracks with Grex rollers that never require lubrication and never freeze up. Rollers are made by Gar-Mold, Sefton Div. of Container Corp. of America.

The manufacturer of "Quik-Pik" and "Food-O-Mat" is building a profitable business with superior products that exploit the remarkable properties of Grex. Perhaps you can do the same.

The best way to find out is by calling in the high density polyethylene experts. Grace has the production facilities, technical service and experience to help put your product in the Grex profit parade. Everyone says we're easy to do business with.

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Off the subject?

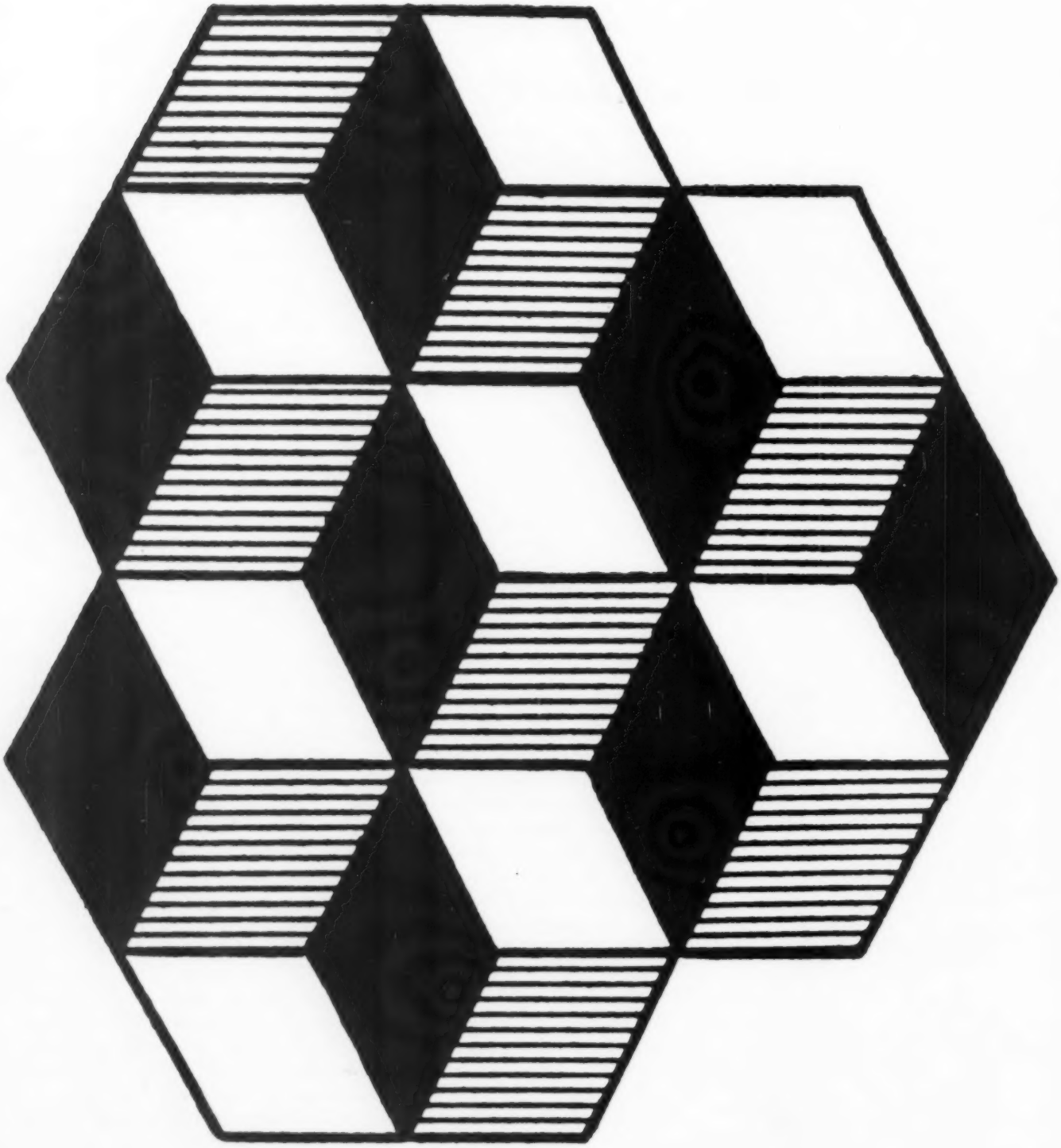
The editorials on this page ordinarily fall into two classes: those that deal with industrial design, and those that only pretend to. This month, however, circumstances direct our attention to a matter that has nothing to do with design, and that concerns designers only to the extent that they are men. Marianne Moore, one of America's most dedicated poets, once said of her art, "There is something important beyond all this fiddle." This was not disparagement, it was perspective. And now — only a few weeks after Man's most recent Fall, this time from a summit that never even promised to be Eden — who with any sense of perspective can help thinking of what it is important beyond his particular fiddle?

Something important is happening in the South. This was inevitable, and both its inevitability and the quality of its importance are obscured by the emotions with which we non-participants view it. The inevitability of the sit-in movement is muddied by those Southern whites who strain to find its origins in Communism. (The cynical implication here is that the struggle to achieve decency is so alien to us that no Americans would ever think of it by themselves.) The importance of the sit-ins is distorted by the tendency of the Northern press to treat them as sensationalism on days when nothing much is going on with Dr. Finch or Mr. Armstrong-Jones. In fact the sit-in movement *is* sensational, but in the lasting way that, say, Ghandi was sensational. Courage, as Candide found out, is sometimes a mistake; but it is never a fad.

This time it is not a mistake either. The campaign of young negro Southerners, impressive at first because of its dignity, has become even more impressive because of its effectivness. It works. And it is worth asking why it works when so many equally well-meant efforts have failed. Certainly timing, and a generally more favorable social and legal climate, have had a lot to do with it; even more significant is the emergence of morally and intellectually brilliant leaders. But the strength of this dramatic movement lies largely in the insight and care with which it was fashioned, the realization that spontaneity as an impulse is not inconsistent with intelligent planning as a means. The urge to hold sit-ins was spontaneous: the technique for holding them were carefully wrought. When law student Donald Moss was expelled, with 17 other sit-in leaders, from Southern University in Baton Rouge, his wife consoled him with the words, "Perhaps you should stop preparing yourself for the world and start preparing the world for you." Moss and his friends did more: they prepared themselves to prepare the world — and this is what makes the sit-in movement unique. An hysterical mob can beat a brave man. But they cannot ultimately defeat a brave man who has anticipated their hysteria, compassionately understood it, and planned a strategy around it. This is what some younger men are doing in the South today.

Several weeks ago, at a conference on industrial design, William Snaith described the shift of emphasis in his office from product design exclusively to "programming," and designer Brooks Stevens observed, "Bill, you have become a situation planner."

Well, so has Martin Luther King. And maybe this is an editorial about design, after all. — *R.S.C.*



What a product is made of and how it works are often the result of creative thinking in Research and Development; and its performance is verified by Testing. The first in a series of articles on R, D & T takes up one type of service available to industry as a problem solving agent — contract research.

Objectivity at Work

by Arthur Gregor and Richard Moss

The optical illusion at left suggests a problem inherent in the dynamic nature of industry — the difficulty of distinguishing between what is and what appears to be. Resistance to change is an obviously damaging attitude for any company. Whether an enterprise finds itself stymied in the development of a new product or production process, or whether the company's health is being drained by some hidden ill, the way out of the trouble is to transcend illusion. Like a person, a project or a company can be sick; and, as with a person, sickness calls for therapy through understanding. F. Scott Fitzgerald once said that the sign of creative genius was the ability to hold several different ideas in the mind at the same time. Creative genius is hard to come by. But there is in technology a breed of immensely alert and thoroughly trained men who — if they cannot all hold different ideas in the mind at once — have learned techniques for seeing a thing as it is. They are the industrial researchers.

Research as an organized means for combating ignorance was projected in the 17th century by Francis Bacon. In the utopia of his famous book *The New Atlantis*, he describes a research foundation whose object would be "the knowledge of causes and of the unexplained behavior of things; and the enlarging of the boundaries of human ability, to make all things possible."

It is illusory to think that this objective is being realized as the national standard anywhere today, but it is the ideal toward which the dedicated technologist strives, and in the realm of *research and development* it is the underlying principle which directs the investigation and action.

United States industry and government combined are expected to spend a staggering twelve billion dollars this year to maintain R & D as the inner core of technology and to apply its findings to the needs of industry, space exploration, and defense. Research and development is not only the storehouse of ideas, the laboratory where industrial ills are examined and the boundaries of darkness are pushed further back. It is also the originating source of many components and materials eventually incorporated in marketed products. "The development of new or better products and processes" says Dr. W. C. Lothrop of the research firm of Arthur D. Little, Inc. "is the true research task."

Scientific and technological research

At the outset, we can distinguish between two fundamental research endeavors: *scientific research* and *technological research*. The difference between them has been sharply stated by the philosopher Charles Peirce. He speaks of the scientist as the man who makes inquiries into nature without caring about the usefulness of the answer. The technologist, on the other hand, does it in order to make a better lipstick. Scientific research, often referred to as basic or pure research, has no other goal than to explore a given field and to translate behavior into theory. The function of technological research, or *applied industrial research*, is primarily that of a *problem-solving* agent.

Research is "out for the new." Because it is concerned

with growth, with a continued unfolding of a given direction, technological research helps to avoid — as far as this is consistent with discovery — the emergence of new problems, and seeks out the applications of known products and materials. Under a contract from the Signal Corps, the Battelle Memorial Institute, for example, opened up a new area in the field of high-current, refractory cathodes by the developments of cathodes made from the oxides of the rare earths metals (which hitherto had not been used in this way). When a food warehouse came to Arthur D. Little about a decade ago for advice on policy shaping, the researchers recommended that the firm set itself up in the then young frozen food field, and the company has since become a leading firm in this product category.

What has R & D to do with ID?

In a pamphlet entitled *Problem Solving* ("The Businessman's Guide To Seeing Alternatives") Arthur D. Little states that "successful problem-solving does not begin with a search for answers; it begins with the flexibility of your perceptions. . . . Imposing an ideal solution may be a substitution for examining a problem. . . . Don't be suspicious of vague ideas. See what you can get out of them." It states that the task of the research team in solving a problem, after it has been defined, is "to place it in the right perspective, and to see it against the background of the practical business or industrial situation in which it originated."

The similarities between a research team and an industrial design group are fairly obvious. The position of each is predicated on independence, and an original conclusion to a problem is expected of each. They are related in various ways, and the contribution of the researcher is often absorbed into the product execution of the designer. Both researcher and designer are working toward the same thing: to shape the product direction and look of a company in particular, and even, to some extent, the character of industry on the whole. The innards of the product given form by the designer — the operating principle, the material, the finish, the components — have in most cases been through the research mill. Both researcher and designer operate as generalists qualified to solve specific problems in many product areas. And like the designer, the researcher brings his own fresh view to bear upon the often stale and outmoded attitudes of a client company. But designers have been known to yield to the wishes of a client and to give him what he *wants*, which is not always what he *needs*. This is a departure from principle which neither designer nor researcher can afford; the temptation is not as likely to arise in research, since the researcher is more likely to present findings than interpretation. The integrity of the research technologist's position depends upon a conviction of, and an adherence to, his objective attitude and the validity of his findings.

What enables teams to cast a critical eye on a company's ailment and successfully come up with some magic that works? To say that their answers are nothing but a way of seeing, would be replying to a riddle with a riddle. This much is certain however: from the start, a staunch, an uncompromising objectivity is a research team's basic manipulating element. And it is this which puts them in a very favorable position to solve problems in the total industrial scene, be it in technology, business management, or the invention and production development of new products.

In-company vs. contract R & D

Industry has recognized research as a life-giving element and has paid handsomely for its upkeep almost from the very beginning, and in recent years the willingness to do so has increased. The United States spent nearly 40 billion dollars on research until 1954, with half that sum being spent since 1948. By 1954 this figure was about five billion per annum (these amounts include expenditures for the R & D field on the whole — comprising basic research, applied research, product development, management services).

The R & D activity in industry today exists in two different camps: the in-company (sometimes called captive) scientists and engineers who work within a single manufacturing company whose problems and product-needs they serve; the technologists operating within independent groups available for client-work on a contract basis. Within the latter there are two further main divisions: the non-profit research institutes, and the profit organizations. The former is usually made up of organizations either endowed or sponsored by universities but substantially independent of them (nine of these — Battelle Memorial Institute, Stanford Research Institute, Armour Research Foundation, Mellon Institute among them — had a combined volume in 1958 of about 85 million dollars). The profit-making organizations are independent groups who are equipped with facilities and technical background to engage on full-time client projects which must pay off for them.

From physical to social science

The majority of funds allotted R & D is spent by industry. During 1957-1958 (the last period accurately surveyed by The National Science Foundation) industry spent 7.73 billion dollars, 1.45 billion were spent by Federal Government agencies; the rest, making up the total of 10.05 billion, was research carried out for colleges, universities and other non-profit institutions. The bulk of these sums generally goes to industry-owned and government research engaged on long-range projects in specific technical areas. As part of this research activity, outside organizations like Arthur D. Little whose company and laboratory headquarters are in Cambridge, Massachusetts, are often brought in to serve business or government on a contract basis.

Arthur D. Little is the oldest and the largest commercial

research organization. Contrary to the non-profit institutes, ADL is as keen on profit and success as the clients they serve; it has been in the contract-research field since 1886. ADL's founder, whose name the organization now bears, has been called "a missionary of applied science to industry." He believed that man's improved conditions — moral as well as spiritual — must be based on increased productivity, based in turn on the application of science to industry. Himself a student at the Massachusetts Institute of Technology, which eventually gave him an honorary doctor's degree (he actually never graduated, but left to earn his living), he contributed to the development of MIT's system of education in that field of engineering in which he and his new company were active in the beginning, namely chemical engineering. In its early history the company provided the sugar industry and later the paper industry with a chemical analysis service. Since 1945, ADL has extended its research from the chemical industries into nearly all phases of science. In its capacity to solve problems in all technological areas, as well as in city and regional planning, and in the application of social sciences to industry problems in management areas, ADL has been engaged on a contract basis by many major companies —IBM, Tidewater Oil Company, Owens-Illinois Glass, Bell Telephone, Republic Steel, du Pont, Minneapolis-Honeywell, General Electric, Bristol-Myers, Sears Roebuck, among them. ADL's business volume last year was about 20 million dollars.

The Arthur D. Little organization is examined on the following pages to show how a private research organization operates as an independent agency, how it keeps itself in business, how an industrial problem becomes a project and how a team goes about solving it.

Antagonists of unproved assumptions

About thirty years ago, when a good deal of ADL's work was in the chemical industries, its scientists took exception to a proverb which had been bothering them. They did not see why "you can't make a silk purse from a sow's ear" and, after some thorough searching, proved that you could. For first-hand instruction, the ADL group turned to a study of how silk is produced naturally. Investigating the habits of the silkworm, they discovered that the liquid which eventually becomes silk is at one point in the process very much like a glue. A sow's ear, being mostly gristle and skin, is a natural raw material for glue. The discovery of this similarity was the beginning of a chemical process by which they transformed the glue made from a sow's ear into silk. The purse (page 55) which they made from the silk of the sow's ear, and which is now on display at ADL's chemical museum in Cambridge, was of course nothing more than chemistry at play. But it does express Little's research philosophy: in their dedication to pure rational inquiry, ADL technologists take nothing on faith. And it shows ADL clients that prejudiced assumptions, traditional proverbs, and attitudes such as "What's the use?" and "It can't be done," are regarded as challenges rather than foregone conclusions.

Little's personnel

ADL has the largest staff of any independent research firm working on a profit basis. In addition to their main offices — the original "research-palace" on Memorial Drive in Cambridge and their newer complex of buildings in West Cambridge's Acorn Park — they have eight others in key cities throughout the U. S. and Europe. Since its inception in 1886, the company has grossed 100 million dollars, making it the biggest such operation in history. And it is growing rapidly. Since the war, the firm has increased at a rate of about 15 per cent annually, and in addition to its professional staff of 600—of which one in every eight has a Ph.D.,—ADL employs 600 more for sales, secretarial and other business duties. Together they make up an organization prepared to deal with all aspects of industrial technology. There is hardly a field in science and engineering or a branch within a field which is not represented on the Little staff.

For industry the company represents a pool of technological knowledge available for hire. For Little, its eminently

Lt. General James M. Gavin, *president of ADL since last March, came to the firm two years ago (as executive vice-president) after a controversial tour of duty as chief of the Army's own research and development department.*

knowledgeable personnel is the equipment with which the firm operates. And just as a manufacturing plant's facilities are all available for a given production problem, so all of ADL's intellectual resources are available for solving any problem that comes in. Most of the professional staff is made up of men who have had a good deal of industrial experience, but some members have come directly from the universities. The screening process for new personnel is rigorous. A prospective senior staff member is likely to have to go through sixteen interviews before any decision can be made. There is good reason for this high degree of selectivity. In addition to his knowledge in his field, any newcomer to ADL must be capable of flourishing under one important condition: he must be able to stand on his own, must be fervently independent: he must enjoy being his own boss.

Why everyone is his own boss

Contrary to their anti-traditional attitude toward so-called proverbial truths, ADL researchers are quite traditional in the figure they represent. They are inventor-entrepreneurs and, in their approach to applied science and method of operation, resemble the famed industrial pioneers of the late eighteenth and nineteenth century who turned their discoveries into useful objects and, in many cases, produced them. They view a business operation as an entity. And they are quick to observe that the separation that so often exists between invention and production may threaten a company's health. When, not long ago, one of ADL's divisions was called upon to look into the technical arm of a corporation which was not functioning adequately, they came up with the rather ironic finding that it was, in fact, the head of the complaining body — the chairman of the board — who was stifling the freedom of the technical division. And ADL had to tell him, it was he himself who was the cause of the trouble.

It is part of the researcher's dedication to his work to be fearless in the face of facts and to present the picture regardless of how seriously it may challenge and upset the client. To have fundamentals questioned comes as a terrific shock to most people. Yet this is precisely what the researcher — like the designer — must be willing to do. The atmosphere in an organization in which this attitude is an implied dictum differs markedly from that of the large corporations in which most staff members operate as organization men. It is an atmosphere of freedom, informality and change because these are necessary to reach the researcher's goal: objective truth. As a consequence, research teams can have an unsettling effect upon a company whose status quo they will constantly challenge, and, in the end, may upset.

To arrive at new knowledge, two or more pieces of information must be put together in a way that they never have been before; thus a new idea results. A manufacturer of towel dispensers faced this problem: how do you prevent the supply of roller towels from running out? The answer: make dispensers that hold two roller towels instead of one. When a team of ADL researchers was busy surveying a plant as part of a problem they were on, they noticed that a lift truck run by gas would waste five minutes each time the tank containing the gas was empty and a new one had to be brought. "Why not carry two tanks instead of one?" asked a Little man out of habit. "That's right, why not? I just never thought of it" said the operator of the truck. According to ADL, many a company executive has similarily failed to see the obvious solution to their problems.

In addition to assuming the independence of "bosshood" in their own projects, Little staff members have another "boss" incentive. They are the sole beneficiaries of the trust which owns the organization. (The board of trustees have no financial interest in the trust). Consequently everyone is keen on keeping the overhead down as far as possible. "You will notice we all turn the lights out when we leave an office" said one of Little's employees—a part owner. The attitude of "freedom, informality and change," by which ADL teams preach to business for the furtherance of a client-company's own business potential, is eminently demonstrated by the Little organization itself.

Who goes to Little, and why

As pointed out earlier, Arthur D. Little's clients range over the entire spectrum of American industry. Aside from the U. S. government (ADL's chief customer, accounting for about one-fourth of its gross earnings), the people for whom Little has worked include a long list of the major U. S. corporations as well as a number of small and even obscure firms. With the fame and esteem it enjoys in the world of industrial research, Little has less of a problem acquiring clients than running the vast, amorphous organization needed to handle the demands which industry is increasingly making on its services. Consequently, although ADL's Business Development Section (its promotion group) numbers "salesmen" among its personnel, most clients come to ADL on their own initiative. And Little scientists prefer it that way: a client who brings his problem to Acorn Park is more likely to be receptive to Little's special brand of problem-solving.

The major corporations, of course, have their own often immense technical facilities, but a variety of reasons prompts them to seek Little's research assistance. Their own R & D departments may be already overloaded; or they may want two approaches to an urgent and critical problem; or they know that Little offers specialized talent in an area for which no one on home grounds qualifies; or the problem may be essentially extra-curricular to the company's regular work (i.e., it may be a problem that would probably not furnish subject-matter for a continuing research program in the home R & D department).

Many of the smaller clients, on the other hand, have no research facilities of their own, and they adopt Little as

Three research groups and the men who head them

Dr. Howard O. McMahon

The advanced research division at ADL, headed by Dr. Howard O. McMahon, senior vice president, engages in work which is exploratory rather than applied. Its criteria for deciding to investigate a given problem are the problem's relevance to technology, its topical interest to the world of science, or its compatibility with ADL's special kind of thinking and doing. At the moment, the division is active in the fields of low-temperature physics, low-temperature refrigeration, quantum electronics, exploratory research on materials, and physical meteorology. But although its approach is the most pure-science of all the ADL divisions, it does contend with one special philosophical hazard—a sort of Janus-complex arising from the conflict of interest in the ultimate objectives of science and industry. The scientist regards his work as an intellectual activity, and this is its value, but its value to a businessman is the profitability of the inquiry's result. Two ideas may be equally interesting to a scientist, but the businessman, using the yardstick of commercial success, may find one priceless and the other worthless. Dr. McMahon feels that these dual objectives of science and business continue to be a serious dilemma for the scientist. Dr. McMahon received his Ph.D. in physics and physical chemistry from MIT in 1941, and has been with ADL since 1943.

Dr. Joseph Harrington, Jr.

The type of knot his group—like others at ADL—likes to untie, says Dr. Joseph Harrington, Jr. (left), head of the mechanical engineering section of ADL's engineering division, is one for which there is no precedent. "That is the kind of situation in which we at ADL feel we can make our best contribution. We enjoy tackling a problem that has a research component to it, a component of novelty." Although there is no strict separation of the individual's responsibilities at ADL, group distinctions are made. Dr. Harrington describes the engineering division as a convenient grouping of people who most frequently find themselves involved in the development of processes, systems, machinery and manufacturing problems. The division is further broken up into five sections: chemical engineering, thermodynamics, cryogenics, mechanical engineering and engineering physics. In addition to their own projects, any one of these sections will work with ADL's R & D section in solving material and product problems. The group has set up plants for highly mechanized assembly systems, and has solved production problems for intricate computer components. Dr. Harrington has been with ADL since 1955. Before that he was with the research division of United Shoe Machinery Corporation, which he joined upon receiving his Ph.D. from MIT in 1932.

William J. J. Gordon

With the vogue which "creativity" enjoys today, it is logical that Little should have its own slant on the subject. Of course, everything ADL does exemplifies a fairly advanced stage of creativity. In addition, however, it has given shelter to two invention groups who are preoccupied not only with the results of creativity, but with the process itself. Donald Schon (a young doctor of philosophy *in* philosophy) and William J. J. Gordon (left, a wandering scholar educated in several places, but mostly by himself) are the talented leaders of two groups of talented men who produce inventions-to-order (new products, new processes, new applications) and spend a lot of time thinking, talking, and writing about how they do it. Gordon's group—more swashbucklingly nonconformist than Schon's, which grew out of Gordon's—refuses to work at Acorn Park, has established its headquarters in an industrial garret not far from ADL's original "palace of research" on Memorial Drive, and spends its summers cogitating somewhere in the New Hampshire woods. In addition to inventing new products (see space-suit "zipper," page 54), Gordon's group is active in setting up "synectics" groups in the product-planning sections of such companies as Kimberly-Clark and RCA-Whirlpool. A basic condition of these groups is that, like Gordon's they operate in relative autonomy.

Typical of ADL procedure is task force meeting at which members present and discuss findings for client approval.

their only technical arm. This is a situation which ADL scientists deplore, since they feel they could best serve the company's ultimate objectives if they could work with a research man inside the company itself.

Commencing a project

But whoever comes to Little, and for whatever reasons, comes with a problem — and it is usually pressing. It may be as specific and delimited as IBM's urgent need to reduce the excessive man-hour time originally required to manufacture the memory-cores of the 704 and 705 computers. Or it can be as ill-defined and "fuzzy" as the client's simply having, in the patois of Acorn Park, a "hurt" somewhere. In this case, the client has felt the symptoms of an ailment — declining or stagnating sales figures, inefficient manufacturing processes or operating procedures, the need for a new product or for improvements in the present line, and so on—and he comes to Little not just because he cannot solve the problem but because he can't even pin it down.

Pinning the problem down is one of the tasks of ADL's Business Development Section, with whom a prospective client is likely to have his first contact. Although this group does nose out and follow up "leads," it is not staffed chiefly by men trained in sales techniques. "We don't have a bagful of samples," explains one member of the team. The men in Business Development are primarily technologists, and they have already spent a good deal of applied time on research and engineering projects in the labs. Thus, they are usually able to define the client's problem for him (if he hasn't been able to himself), or to re-define it (in case he has, but unsatisfactorily). When, for example, a middle-sized firm in North Carolina recently called Little in — the firm's sales had levelled off and they had heard, "vaguely", of Arthur D. Little — the man who went down from Cambridge was Dr. Frank W. Maurer. Maurer's primary duties now are with client contact, but his education and experience have been chiefly technological, and he continues to keep one sleeve rolled up by working part-time on current ADR research projects. In a day's session with the firm's top brass, Maurer was able to locate the problem in the operating structure of management (rather than in the need for additional products, as the company's executives had been thinking), and to propose a method by which ADL might attack and solve the problem. Back next day in Cambridge with a bagful of facts on the firm, Maurer got up a task force out of ADL's Management Services division and provided them with enough essential data to start the project.

A Little task force

Depending on the nature of the task, a new research project will fall under the operational supervision of a "case leader" selected from the appropriate one of ADL's six divisions. Research and Development (oldest), Engineering (largest in manpower), and Management Services (newest) are Little's three principal divisions. Advanced Research (whose studies nudge such distant frontiers as those of outer space and absolute zero temperatures), Special Staff (which works in such unrelated fields as process metallurgy and radiation chemistry), and Food & Biology are three much smaller and more specialized divisions of the ADL organization.

But although any particular project will be administered through only one of these divisions, the make-up of project task forces commonly cuts the strict divisional structure to shreds. In keeping with ADL's policy of making its tremendous variety of technological skills available to the solution of any problem — a policy of fundamental importance to what Little uniquely offers its clients — a case leader will pick on any one in the organization who offers any special talents in the area of his project.

A classic ADL project — the development of the original hot-and-cold paper drinking cup — furnishes an example of what might be called Little's cross-sectional method of composing a project task force. The case fell into Research and Development, but included a number of Engineering personnel (equipment designers, mechanical engineers) and Management Services experts (market researchers and specialists in "company evaluations" and diversification).

Applying all the necessary skills to a particular problem also includes cutting through the vertical personnel hierarchy. ADL executives all have solid groundings in one field of technology or another, and a case leader who stands somewhere in the middle of the hierarchy can, and often does, call on them for help in his projects.

The technology of management counsel

Although comparatively new to the field of management counsel, ADL's Management Services group offers its clients a stock-in-trade that few other professional management consultants possess: nuts-and-bolts experience with the industrial problems that business managements and government planners commonly face. Most Management Services personnel, like almost everyone else at ADL, are basically

technologists, although many have added Business Administration degrees to their diplomas in science.

People as knowledgeable in affairs of finance and investment as the Bank of America and Chase-Manhattan have called on Little for financial and investment advice. Governments in such places as Puerto Rico and Manitoba and New England have asked Management Services' area-development group for help in setting up industrial-growth plans. "Operation Bootstrap," the result of a study ADL began for Puerto Rico in 1942, is the most celebrated of these plans. And the recent and widely-publicized "upheaval at Philco" was the product of a management re-organization plan worked out at Acorn Park.

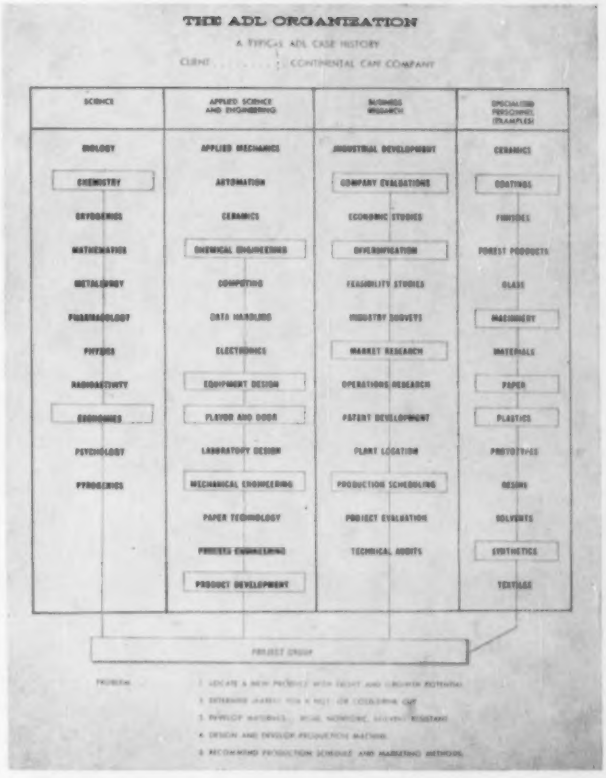
Management Services has recently expanded its work into consumer research, and now claims the skill of the largest staff of marketing experts in the field. This group includes the one industrial designer on Little's staff: Paul Warner, a recent graduate of RISD. However, Warner's work is chiefly in consumer research, and he does almost no industrial designing to speak of—certainly no product design in the generally accepted definition of the term.

In fact, as far as industrial design goes, it has no place as yet in Little's work. Yet, ADL is curious enough about the field to have invited Henry Dreyfuss to lecture to the Engineering Division last April (the audience reacted with some unfamiliarity and lively interest, says Dreyfuss). But, Warner says, "although we have [here at ADL] a great feeling for products as evolved through research, we have no feeling for form as an esthetic expression." (It is an indication of the ruggedly individualistic spirit that ADL cultivates in its staff that so junior a man as Warner can so deliberately and with such candor bite the hand that feeds him.)

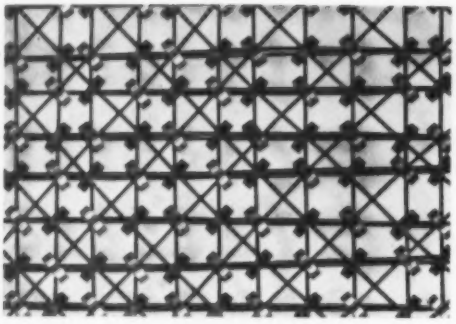
Problem-solving through R & D

The term "research and development" refers to more than simply a division of ADL's organization. "Everything we do here at ADL is research and development," says one senior member of the firm. Moreover, the difference between research on the one hand and development on the other is more semantic than real. The solution of the problems that ADL scientists habitually confront requires "research" in the beginning (the discovery of alternatives, and then a choice), and "development" at the end (reduction-to-practice of an idea). But no one at ADL is able to put his finger on the point in this process where discovery ends and practical application begins.

In any case, the sort of research which Arthur Little himself originally did to help establish such "synthetic staples" industries as rayon and fiberglass (and which, in turn, helped establish his reputation), is still the firm's primary capital. It is now invested in a priceless stock of technical skill and experience that covers the index from A (abrasives and acoustics) almost to Z (wood technology and x-ray diffraction). And ADL's R & D and Engineering divisions (in

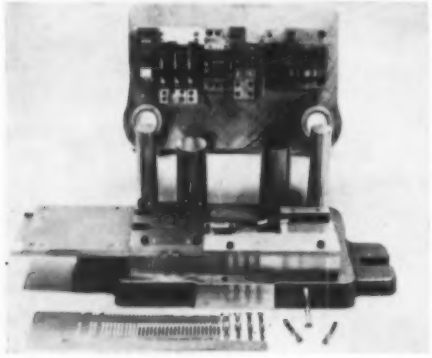


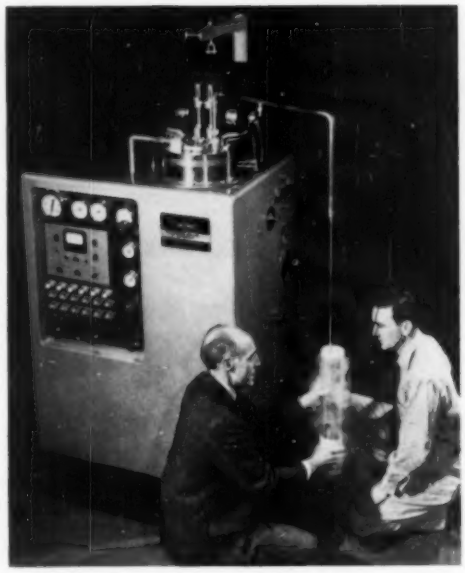
Organization chart for project group which developed universal hot-and-cold drinking cup shows how Little concentrates a wide diversity of technical skills on the solution of client's problems.



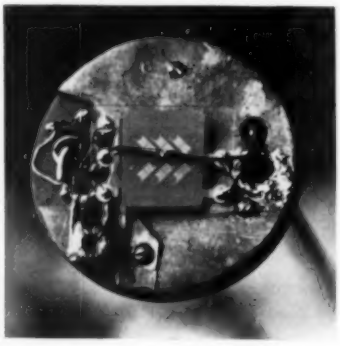
Memory-core sub-assemblies *for IBM 704 and 705 computers contain frames of wires and tiny ferrite magnetic rings "woven" tennis-racket style. Original manufacture required 15 hours to hand-thread wires and rings. ADL's mechanical engineers, collaborating with IBM's research group, mechanized the process by stringing short segments of the wires on fine hypodermic needles, and then passing these through the rings held in a matrix. IBM built the ADL-designed machine. New process cuts time to 15 minutes.*

"Wing-Ding," *a hollow-wall anchor developed for Diamond Expansion Bolt Co. is an example of Little's concept-to-production R & D activities. Unit allows the manufacturer to compete in a field that was once almost a monopoly by right of patent protection of the "Molly" bolt. ADL designed entire bolt to be made from single strip of sheet metal, also designed machinery to produce 50,000 "Wing-Dings" daily.*





Cryogenics: *the generation of extremely low temperatures, is one of the principal fields of ADL's "pure" (or what it calls "exploratory") research. The Advanced Research division, whose work is not expected to bring immediate profits to the company, and whose discoveries have only distant (but far-reaching) applications, is presently studying the characteristics of cryotron circuitry. A cryotron in a superconductive switching element which operates only at temperatures approaching absolute zero (about 450° below zero). Its possible uses in digital computers include greater miniaturization, increased reliability, and, in theory at least, unimaginable speeds. For these studies, ADL has developed a cryotron ring oscillator (below) and uses the ADL-Collins Helium Cryostat (above) designed 15 years ago by MIT professor S. C. Collins. This instrument maintains temperatures close to absolute zero by liquefying helium and other gases. It is, incidentally, one of few "products" ADL itself manufactures for sale.*



which most of what is commonly called research and development is done) work on everything from single-shot equipment- and process-design to long-range product evolution from invention to pilot production.

However, the bulk of Little's work in "research & development" is short-run. Discounting a great many exceptions-to-the-rule (all strict rules at ADL are hypothetical and looked on with suspicion), the average project is in and out of Acorn Park in about four months. An example of these single-shot tasks was Little's contribution to the mechanization of a sub-assembly of the IBM 704 and 705 computers. Memory-cores for these computers are composed, tennis-racket style, of 64 wires running north and south, 64 east and west, and passing through literally thousands of infinitesimal ferrite ring-shaped magnets (see photo, page 52). Original manufacture of this unit was by a kind of hand-weaving, and it took 15 hours, plus an average of three hours for corrections, to finish each frame of cores. IBM asked ADL to collaborate with its own research group in an attempt to mechanize the process. Leader of the ADL team was automation expert Dr. Joseph Harrington, Jr., who heads up Little's mechanical engineering section. Harrington's group conceived the idea of threading the wires through hypodermic needles fine enough themselves to be passed through the centers of the magnetic rings. Reduction-to-practice was accomplished by designing a machine (ADL built the prototype, IBM the final model) that gang-feeds these needles, each holding short segments of the wires, through the rings held in a matrix. The frame of cores is then completed by joining the loose ends of the wire segments with a static-free bond developed by IBM. Result of this mechanization: a reduction in assembly time from 15 hours (plus re-work) to 15 snare-free minutes.

In contrast to specific tasks like the IBM job, Little often gets into programs whose objectives, at least at the start, are far less clear-cut. One such R & D project finally ended in the production of the hot-and-cold drinking cup mentioned earlier. But it had begun, in 1953, when the then newly-installed president of the American Paper Goods Company, Albert S. Redway, came to Little for some advice on where and how to spend the few million dollars he had for capital development. Little got up a task force out of Business Research (ancestor of Management Services) headed up by Richard J. Coveney, who is now ADL's vice-president in charge of New York operations.

Coveney's project group included a marketing expert and some junior researchers, a paper chemist, and an engineer whose specialty was production machinery. This group made a preliminary study of American Paper's entire organization and operations, and, in four months, presented Redway with a long list of findings. Among these was the discovery of a strong market demand for vendor-cups and hot-drink cups. American was already producing vendor-cups, but not enough of them. It already had a hot-cup, but it could not also be used for cold drinks.

One of the 26 recommendations made in Little's final report called for the development and marketing of a universal cup to fill these separate needs of the market. Redway accepted the proposal and asked Little to work it out. ADL modified the composition of the project group to fit the new objective. Chemists with specialties in paper, plastics, coatings, and finishes were added, along with a mechanical engineer who would later design the machinery needed to produce the cup.

First thing this group did on this three-year project was to set some standards (e.g., cup rigidity) that had never existed before. Then the chemists developed a plastic coating that would accommodate both hot and cold liquids, would impart sufficient rigidity to allow the use of very thin paper, and would be non-toxic, odorless, and tasteless.

With the materials of the cup developed, Little's engineers built some pilot production equipment, from which a prototype model of the production machinery was built and sent to American Paper's factory.

A little creativity

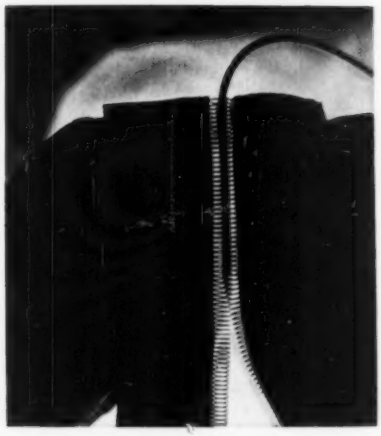
Underlying all of Little's research work, and doubtless responsible for much of its success, is a rare attitude towards creativity. What makes it rare is that it cultivates, rather than suppresses, the often very unconventional means by which creativity operates. The architecture of Acorn Park (deadly-dull 1930's factory-style), or the bearing of Little technologists (solid businessmen in dress, speech, and manner), do not suggest the value Little places on original (sometimes called "screwball") thinking. ADL's open hostility to the Organization Man is summed up in the autonomy it gives to some disorganization men at ADL who earn their living by challenging every received notion within slaying distance.

Two invention groups within the R & D division produce inventions-to-order (new products, new processes, new applications) by a method of "operational creativity" that only superficially resembles groupthink or brainstorming and more closely resembles the way paintings and poems are made. They make a business of arriving at rational objectives (see space-suit "zipper," page 54) by irrational means.

One of these groups, established ten years ago under the direction of inventor W. J. J. Gordon, works in the seclusion of its own loft away from any of ADL's official buildings. The other, a two-year old off-shoot of Gordon's group and headed by philosopher Donald A. Schon, occupies offices in ADL's R & D labs at Acorn Park and works both on its own independent projects and in collaboration with other R & D groups. Both groups work on essentially similar types of projects: inventing new products to order, and finding new uses for old products. In addition, Gordon's group teaches clients' product-planners how to create and develop fruitful

Classic example *of Little's research and development work was universal hot-and-cold drinking cup for American Paper Goods Company (now part of Continental Can). Project began when Little, working on another project for American Paper, discovered strong market for a universal cup. ADL chemists researched a plastic coating that would accept both hot and cold liquids, impart rigidity to cup, be tasteless and odorless. Then Little's engineers designed prototype production machinery for making the cup.*

Space sphere, *nine feet in diameter and made of Dacron®-reinforced Mylar, was developed by ADL for the Air Forces Cambridge Research Center. It was developed for use in relaying information about the density of the atmosphere 300 miles above the earth. The ballon is designed to be ejected at that altitude from a two-stage rocket propulsion system, inflate itself, and then transmit information on the amount of drag induced on its surface by upper atmospheric gases. The Air Force tried unsuccessfully to launch it last fall.*



Bill Gordon's "Synectics" Group, *one of ADL's inventions-to-order departments, produced this "zipper" in answer to a government request for a space-suit closure of maximum strength and endurance.*

Closure is achieved by meshing two springs together vertically and then inserting a flexible steel rod up through the center shaft created by the overlap of the two springs. Unusual, yet simple why-didn't-I-think-of-that solutions, arrived at by looking at analogies in nature and using commonplace materials in the environment, are typical results of ADL's "operational creativity."

ideas. Both Gordon and Schon are intensely concerned with discovering the "laws of the creative process," and both are writing books on the subject.

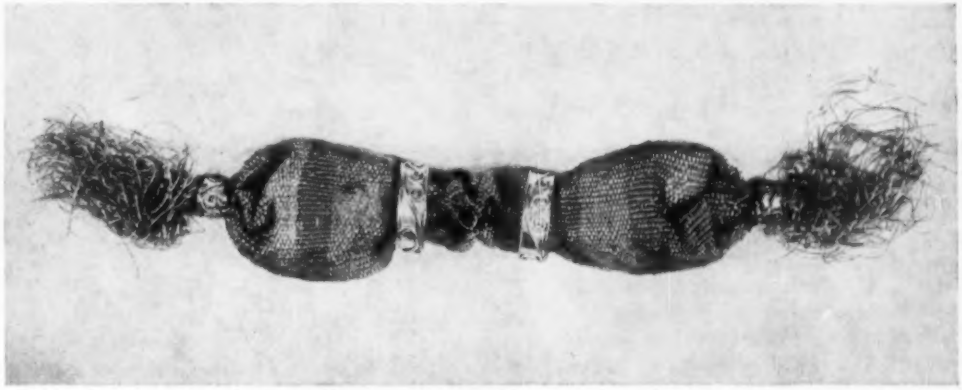
One of the fundamental assumptions in their approach to the problem of innovation-by-order is that, whether the result be a poem, a painting, a mathematical theory, or a new product, the process in each case is essentially the same. Another assumption is that the creative process, heretofore considered the unique property of individual artists and scientists, can be developed and put to effective use by groups of talented people bringing fertile imaginations to bear on the same problem. Would they like to make a commodity of the creative process? "I'd love to," Gordon declares, with considerable relish.

Both Schon and Gordon vigorously disclaim any resemblances between their creativity groups and the methods of brainstorming and groupthink popular among management men today. And they have been successful in convincing some very big, old, and conservative companies that inviting junior executives to dis-inhibit themselves in the presence of their seniors (on those irregular occasions when brainstorming is on the plan of the day) is not the way to overcome the inertia of the Organization Man.

Such companies as Kimberly-Clark and Whirlpool Corporation have asked Gordon's Synectics Group (from the Greek "synektikos" meaning "fit to hold together") to set up similar groups within their own product-planning departments. Kimberly-Clark's group was set up a few years ago under the direction of William Wilson, who characterizes his firm, the fourth largest manufacturer of pulp and paper products in U. S., as "an extremely conservative company."

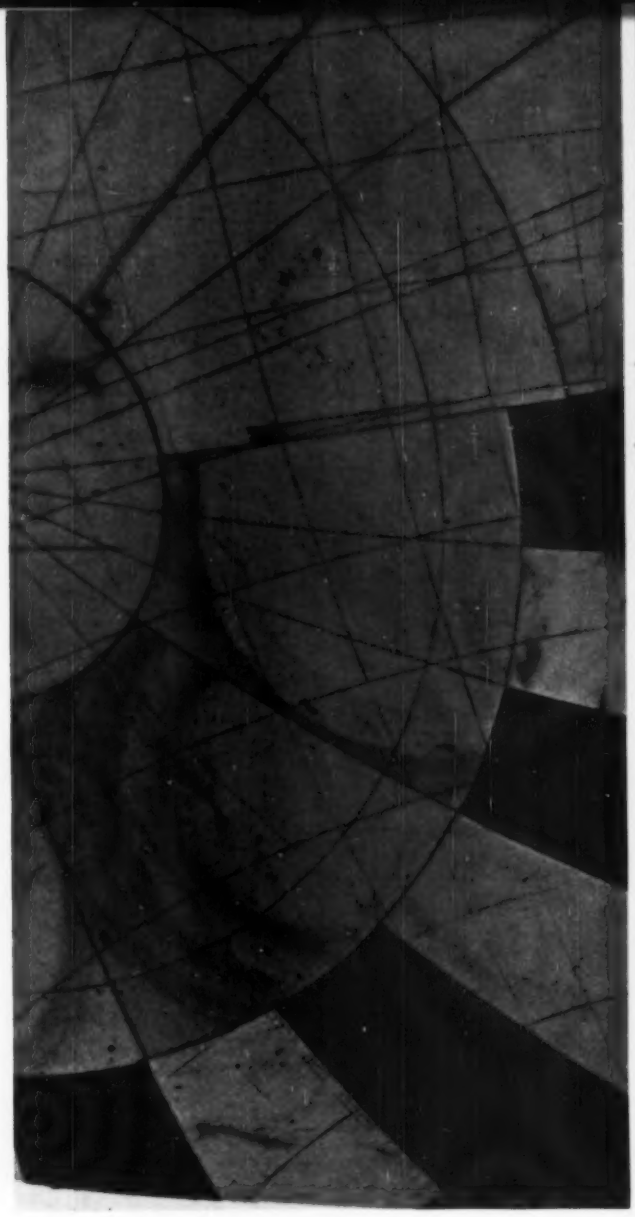
Despite its conservatism, K-C allowed Wilson to duplicate in his own group the fairly radical working conditions of Gordon's own Synetics Group. Wilson's team, made up of two chemical engineers (one of them a West Point graduate), an architect, a lawyer, a physicist, and a salesman, has no defined or routine responsibility for any particular area of the company's activity. "We can work," says Wilson, "on new products, personnel problems, financial problems, marketing problems—anything. We have the right to pick and choose what we will work on. We have our own bank account. We have our own laboratories and machine shop where we can build what we wish. We are not subject to the normal regulations of the rest of the company." Wilson's group has naturally encountered a great many problems working with the more rigid structures of the rest of the company, but being professional problem-solvers, they take these in stride. And while the company is understandably secretive about the specific results of its investment in synectics, it is evidently paying off.

Although ADL's own creativity groups constitute only a small field of Little's varied activities, they epitomize Little's entire business. They engineer the innovations that are the life-blood of industry by bringing a wide diversity of talents together in an atmosphere of perfect, if applied, freedom. It was by such means that Little produced a silk purse from sows' ears (below), and it is how, untooted by Madison Avenue, Arthur D. Little is quietly helping to give concrete form to that ultimate material comfort which was once part, and is now almost all, of the "American dream."

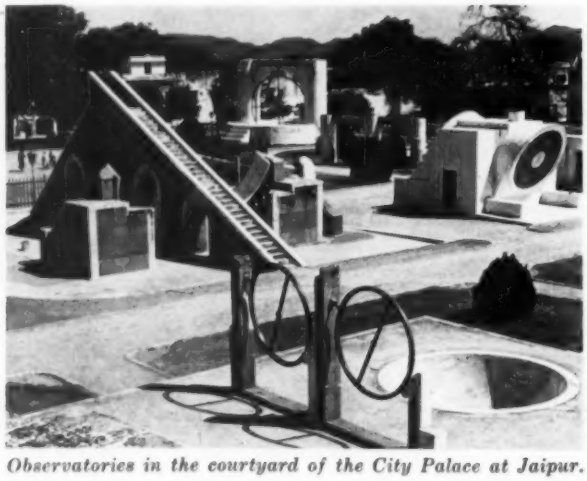


Silk purse made from sow's ears was ADL's proof that popular proverbs — "you can't make silk from a sow's ear" — are often based on ignorance. It illustrates the researcher's habit of questioning untried maxims. ADL produced it more than 30 years ago by analyzing the silk of a silkworm, discovering that at one point it is glue. They converted a sow's ear into glue, then into purse which is now at chemical museum in Cambridge.

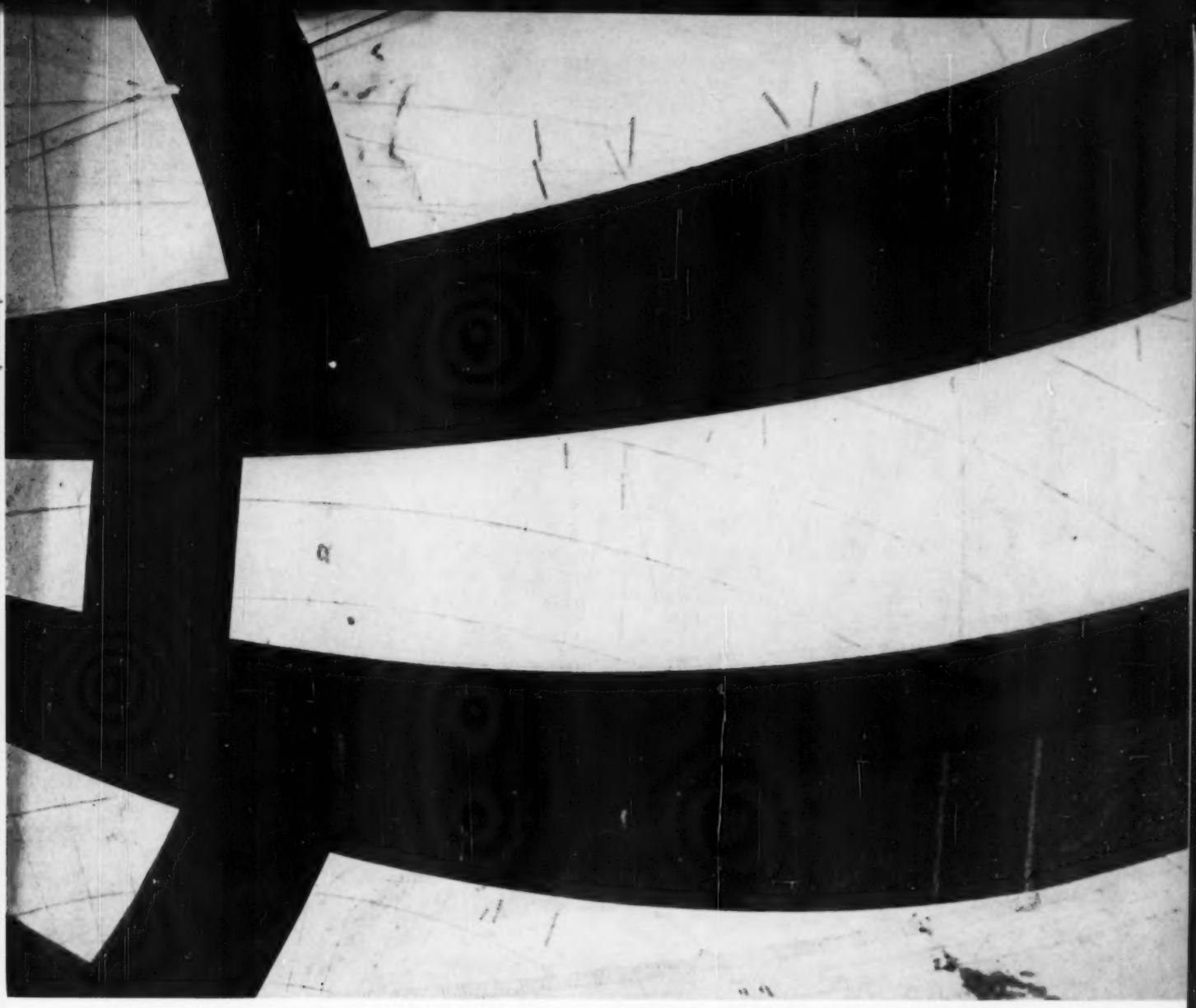
The modernity of the ancients is expressed in these famous 18th century structures, newly photographed and interpreted by Stella Snead.



OBSERVATORIES REVEAL THE IMAGINATION OF INDIA AND THE MIND OF A MAHARAJAH



Observatories in the courtyard of the City Palace at Jaipur.



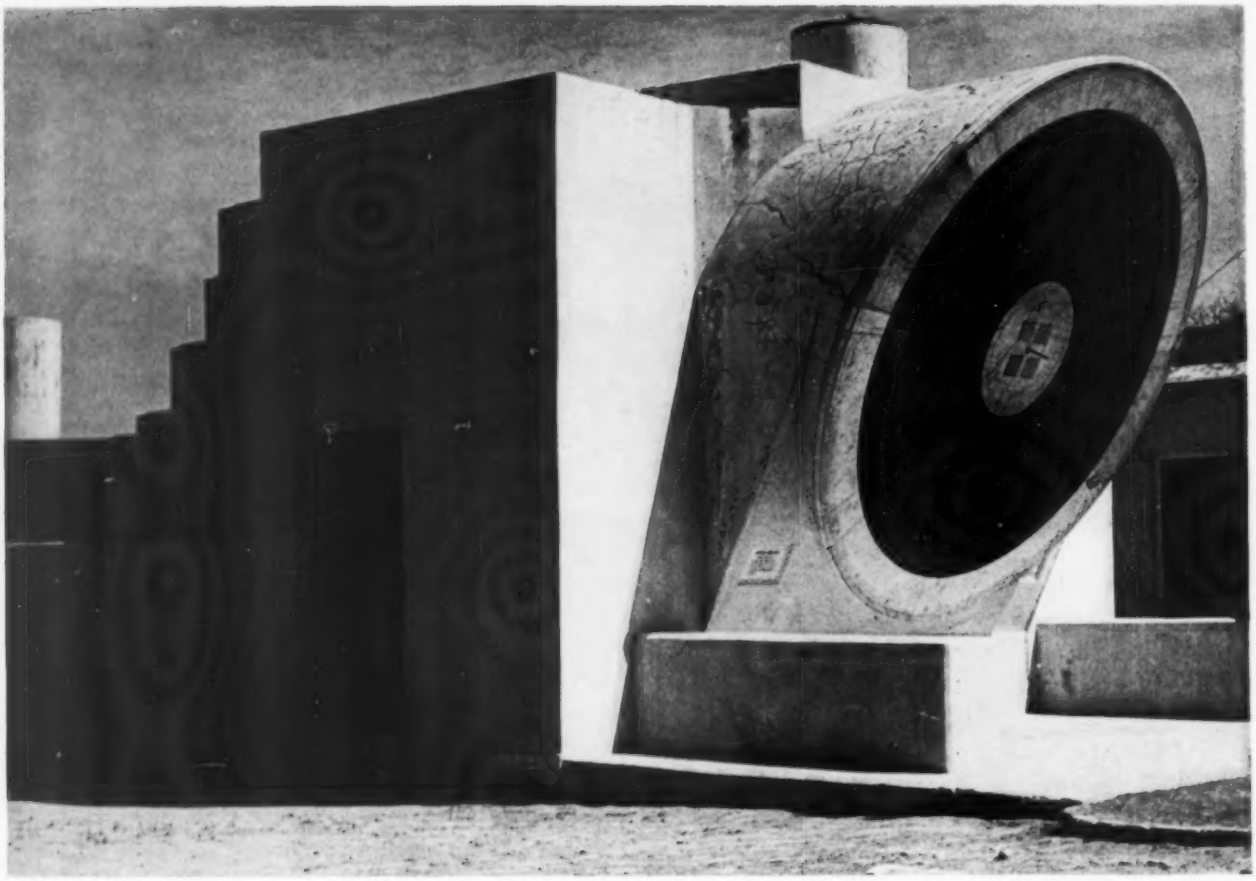
Jai Prakas Yanta, Delhi. Wires stretch N-S and E-W in concave hemisphere, and shadow of their intersection shows sun's position.

The buildings shown here — built in India in the 18th century by the Maharajah Jai Singh—are spectacular not only in how they look but in what they are. Ultra-modern in appearance, they have a strong surrealist quality — an air of unreason. Yet they are scientific instruments, most of which are said to be precise even by our present standards. Their *raison d'être* was functional —they are astronomical observatories— and they are beautiful as the best airplanes are beautiful, or our finest bridges and dams: their appeal is direct and uncontrived.

The functions of the principal structures are various and overlapping. Broadly speaking, and in the language of a layman, they were designed to measure the altitudes of the heavenly bodies, to take the azimuth of the sun, to find positions and declinations, to trace the courses of the planets, to observe celestial latitudes and longitudes, and quite simply to tell the time. They are all concerned, as contemporary astrophysics is concerned, with space, time and motion.

The largest of the observatories is in Jaipur, Jai Singh's capital city in northern Rajasthan. Rugged mountains surround the city, and rose-pink walls surround it even more closely. There are eight splendid portals, and within them the pink continues on the main thoroughfares. It is a deep, warm pink worked with curling white designs; there are small latticed windows, and sometimes green shutters. The structures are all a little the worse for wear at present, but still the streets are a pageant. Against the pink glow pass camels, and sometimes elephants, and men with bulging turbans of magenta, orange, saffron yellow. The yellow is repeated in the mounds of marigolds for sale and in the clothes of the women, who are perhaps the most colorfully dressed in all India. Red and yellow predominate in their half saris draped over swinging skirts; and their silver jewelry is nearly always heavy and finely worked. Orange-clad holymen pass, a snake charmer performs on a street corner, cloth is hand-printed in open-fronted shops and the dyers hang their work out to dry on the housetops, or walk back and forth with it across the pavements. There are a few cars, many bullock carts and pony carts, myriads of cyclists, rick-

The Narivalaya at Jaipur is a cylindrical dial, with axis of cylinder pointing N and S, northern and southern faces parallel to plane of the equator. At center is an iron style surrounded by graduated circles. Shadow of style marks time of day, and shows sun's passage across equator.



shaws and pedestrians. Early mornings are busy, but the traffic is thickest in the evening when people return from work and the pink of the buildings is deepened and strikingly dramatized by the setting sun.

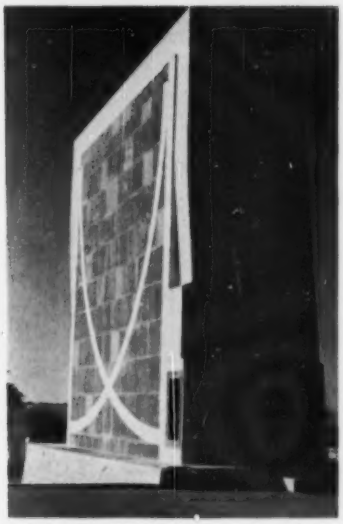
Right in the center of the city, in the courtyard of the City Palace, stands the group of buildings on page 56, probably the most cherished possession of a monarch of unusual taste and vigor.

Jai Singh (1686-1743) was, besides an able ruler, a scholar who knew Sanskrit and Persian, a mathematician, and an astronomer. It was said of him when he died, that "his wives, concubines and Science expired with him on the funeral pyre." But the science survived.

Jaipur, Jai Singh's capital city, is a testament to his intellectual vitality. With its wide and parallel streets, it was an unusual place for those days, and this was no accident. Before building it Jai Singh studied the plans of several European cities, and consulted architects and astronomers, as well as the Shilpa Shastras, the ancient Hindu treatises on town planning. But astronomy was his greatest interest. Avid for further knowledge of the heavens, he sent frequent emissaries to Europe and the Muslim countries to learn what they knew. He consulted both early and contemporary works including European works and Ulugh Beg's Catalog (which he later brought up to date). But in his research he followed Ulugh Beg more closely than the Europeans—and conceived his observatories after the style of Ulugh Beg's fifteenth century constructions at Samarkand. Because Jai Singh was convinced that size and immobility furthered accuracy, his instruments were solidly and massively built. The largest of them—the Samrat Yantra at Jaipur (see page 60)——is 90 feet high and 147 feet long.

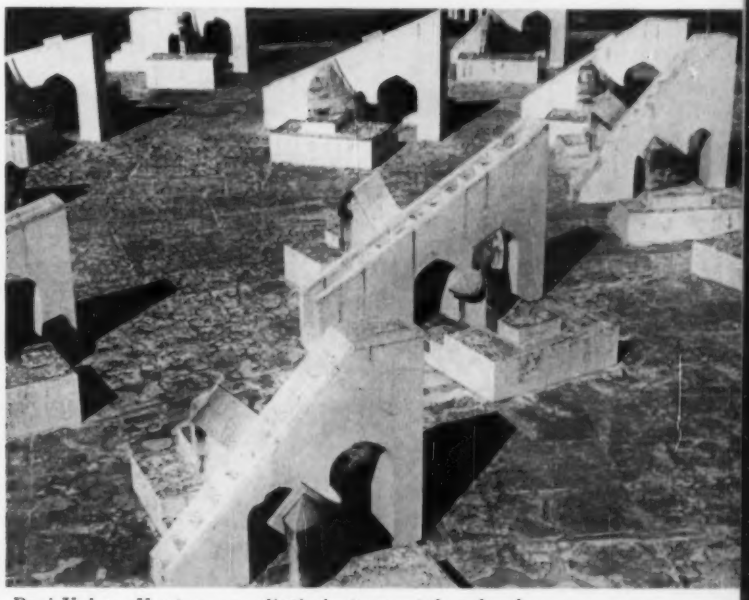
The first of the observatories was built at Delhi in 1724. During the next decade the four others were built—one at Ujjain, which had long been a center of astronomical learning; one in Benares, on the roof of a building overlooking the Ganges; one in Jaipur; and one on top of a fort in Mathura. This last has completely disappeared, while the rest are at present in fair shape. There are ten principal astronomical instruments, although not all of them are found at each of the five observatories.

Samrat Yantra, or "Supreme Instrument," has triangular gnomon (diagonal shaft with steps). On either side of gnomon is a quadrant of a circle parallel to plane of the equator. In principle a simple sundial, it indicates the sun's angular distance from the equator.

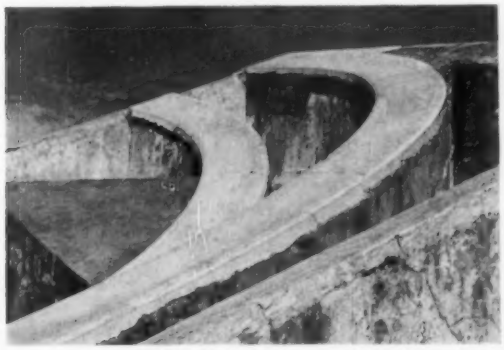


Dakshinovritti Yantra (meridian circle) is similar to mural quadrants found in most medieval observatories, corresponds to modern transit circle. It is used to observe altitudes of heavenly bodies as they are passing meridian.

Misra Yantra (mixed instrument) shown above and below, is in Delhi. Four instruments are combined in one building. Detail below shows graduated semi-circles at either side of gnomon. Caption material for all instruments is based on notes taken from The Astronomical Observations of Jai Singh, *written by G. R. Kaye.*

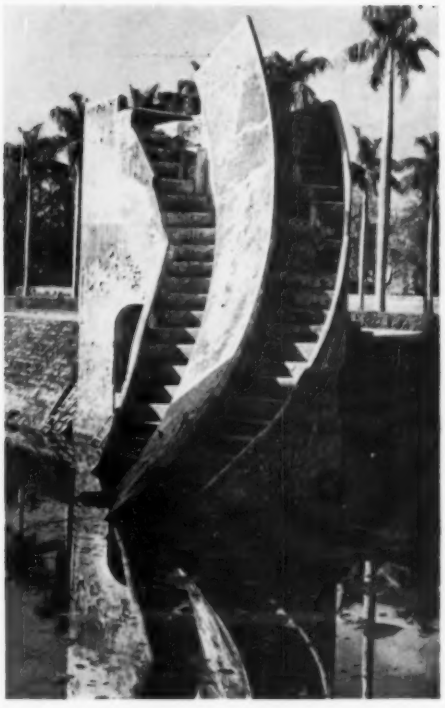


Rasi Valaya Yantra, an ecliptic instrument found only at Jaipur, is a collection of 12 dials, one for each sign of the zodiac. Quadrants lie not on the plane of the equator but in the plane of the ecliptic when the appropriate sign is on the horizon; edge of the gnomon points to the pole of the ecliptic, shows sun's latitude and longitude.

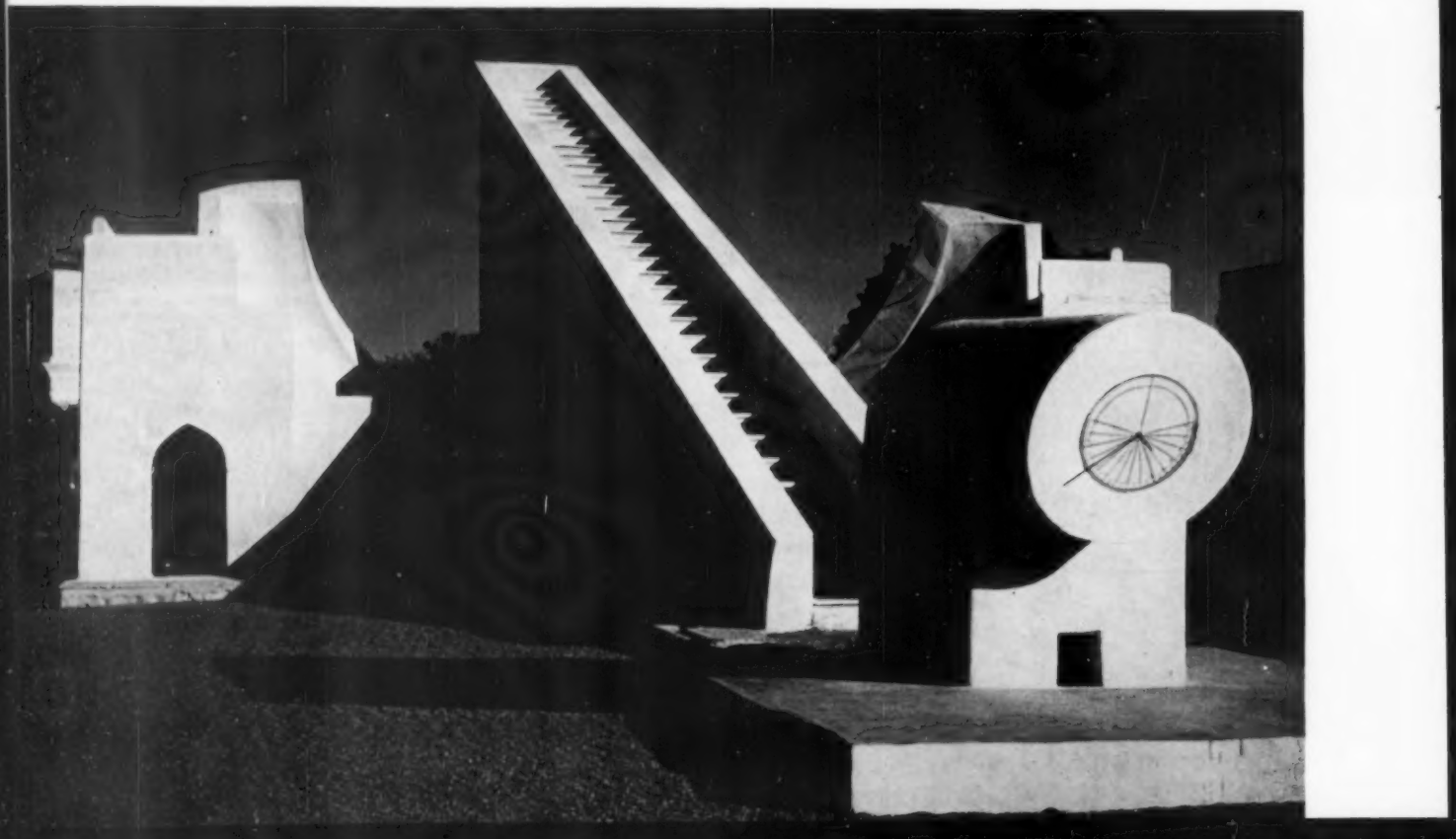


Quadrant of the Samrat Yantra in Jaipur. The legend on the "supreme instrument" itself reads: "for finding time, declination and hour angle of heavenly bodies." The edges of the quadrants are graduated in hours and minutes, as well as degrees. The surface of the quadrants at Jaipur is of marble.

Quadrant of the Samrat Yantra at Delhi.



The Samrat Yantra and the Nari Valaya shown below are found at Ujjain, which was, at the time of their construction, one of the most important centers of astronomical learning.



In Stella Snead's photograph the bird-studded gnomon at Jaipur rises to the serene skies, and looks as if it will never stop.

New and old versions of saucepans. Both do the same job, but the new one adds an extra dimension to the art of cooking.

NEW CLASS FOR A CLASSIC

Wear-Ever's top quality line of aluminum cookware gets a major redesign to please the tastes of a special market: young, modern-minded business girls

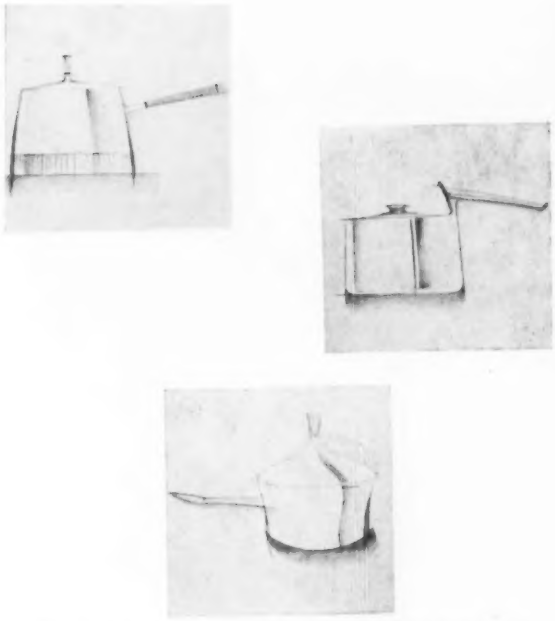
It is an odd fact of contemporary life that the more meal preparation becomes a matter of sinking a plastic pouch in a pot of boiling water, the more handsome becomes the pot in which the water is boiled. Why this should be we do not know, but at any rate there have probably never been quite so many elegant variations of what grandma considered a strictly utiltarian object. One of the newest is a line of Wear-Ever aluminum cookware designed by Harley Earl Associates—although in one sense it is not new at all.

Way back when "waterless cooking" caused a major revolution in the kitchen (fomented by nutritionists and the discovery of vitamins) Wear-Ever introduced a line of heavy-gage aluminum cookware designed for this culinary concept and intended to last a lifetime. Like several similar lines which appeared at about the same time, it was sold door-to-door so that the new method of cooking—and its virtues—could be demonstrated. These were the quality cookware of the day, and they were expensive. Because it was a "classic," and because of the uncompetitive selling situation, the Wear-Ever line remained unchanged—except for minor variations in the trim of lids and shapes of knobs and handles—for 25 years.

But in recent years there have been

radical changes in the kitchen itself, as well as in the culinary arts. Design has moved in among the pots and pans, and the eminence of the Wear-Ever line has been challenged by utensils of stainless steel and two much older materials, copper and enameled iron, brought up to date by improvements in appearance and performance. The challenge could hardly go unanswered since more than three-quarters of Wear-Ever's customers for the door-to-door line come from a particularly looks-conscious segment of the public: young, unmarried business girls who buy the line for their hope chests.

The Earl team, composed of Dominic Saporita, Sam Highberger, and Frank Moelich, was instructed—first and foremost—to please this public. At the same time, however, the new design was to perpetuate the line's reputation for quality and longevity. In short, it was to be a "new classic." To implement this large order, Wear-Ever agreed to retool completely if necessary, with the only proviso that the forms of the new pots and pans be appropriate to the firm's manufacturing process: sheet metal drawing. Beyond this, plus the

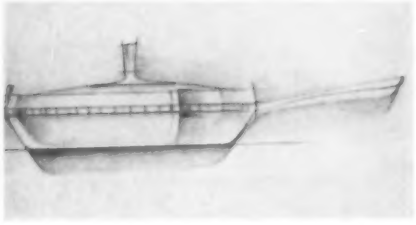


Blue-sky progenitors were voted down by designers' own self-criticism, but tapered silhouette, smooth, straight handle, and high-rising knob of final version derive from these free-wheeling early studies.

Girls from an office secretarial pool check out prototypes of the new line in ex post facto *market research to determine their reaction to lid colors as well as overall design.*

Lids and handles establish a family resemblance between pots of varied shapes

More studies: at one point the saucepan flared out at the bottom; then at the top; and a frypan carried a decorative trim around top.



After the basic shapes were determined, various versions of handles and lids were "tried on for size." Ultimately, the decorative trim of the latter was discarded, and the handle became one long, smooth curve with a set-in hanger that is an integral part of the silhouette.

stipulation that units in the new line be as interchangeable as they were in the old, and a few specifications about the function of the handles (they were to withstand the heat of a 450 degree oven and incorporate some sort of hanging device), the designers were given free rein. In fact, they were not even required to submit studies.

This gave the Earl office plenty of latitude, but it also made them responsible for pulling their blue-sky ideas down to earth without outside help. Actually, it was not too difficult, for the desire to design a dream pot had already been satisfied in several experimental projects for Alcoa (and since these had been made in the Wear-Ever shop, the designers were familiar with what their client's process could and could not do). The studies for the production design began where the experiments left off, and gradually evolved into a series of svelte forms (for sauce pans, fry pans, Dutch oven, and percolator) whose family resemblances include slightly tapered sides, smooth handles minus contoured grips, and flush lids with high, flared knobs. All the bodies are natural aluminum; the lids, however, come in a choice of natural or black.

Originally the designers conceived of many more lid choices than this, and theoretically the lid could still be the variable element if Wear-Ever should need to revitalize its new "classic." But the reason it is offered now in only black and silver is neither Wear-Ever's nor Earl's. These are the customers' preferences. To discover them, Earl's market planning department, under William Blau, went out and surveyed prospective customers for their reactions, using prototype models of the four basic pieces and seven different lids: five were in color (black, gold, charcoal, bronze, blue), the sixth and seventh were plain and embossed aluminum. Except for a few samplings from other groups, most of the respondents in the survey were young working girls interviewed at their places of business.

If their preferences seem surprisingly conservative, considering the tastes normally associated with this age-group (most of them are barely out of bobby-socks), their reasons are surprisingly practical, considering their relative in-

experience at housekeeping. The favored lid, by an overwhelming majority, was the natural aluminum because "it matches the pots, looks more uniform, looks easier to keep clean, will go with any color scheme." Black was the second choice because it matches the knobs and handles; charcoal was third. Gold was attractive to so few that it was scarcely in the running, and the embossed lid, most decorative of all, got almost no votes because, said the girls, its "fanciness" conflicted with the simple lines of the pots themselves.

Besides giving Harley Earl the final word on lid preferences, the survey will also give Wear-Ever's salesmen some first words to use in approaching their customers, which they have just begun to do. The response is gratifying to both client and designer for the new line is not only selling well, it is also outselling the old line which, for the time being, will continue to be on the market. The full line is as complete a cooking kit as its predecessor although it does not duplicate it unit for unit, since not all the double-function elements are exactly the same. And Wear-Ever, as it promised, has re-tooled completely—at a cost of one-quarter million dollars.

New handle not only looks simpler, but is simpler to assemble. It has fewer parts, can be mounted in fewer steps, requires no final brazing to mask joint.

Basic pieces with natural aluminum lids; alternate choice is high-gloss black anodized lid. Lids are lighter gage than bodies; handles and knobs are black Bakelite; hanger is aluminum alloy. Price of the starter set in the new line will be $39.95.

DESIGNS FROM ABROAD

A selection of new business machines and audio-visual equipment

Hi fi unit *from Sweden includes both speaker and amplifier.*

Manual calculator *designed by Sigvard Bernadotte for Facit.*

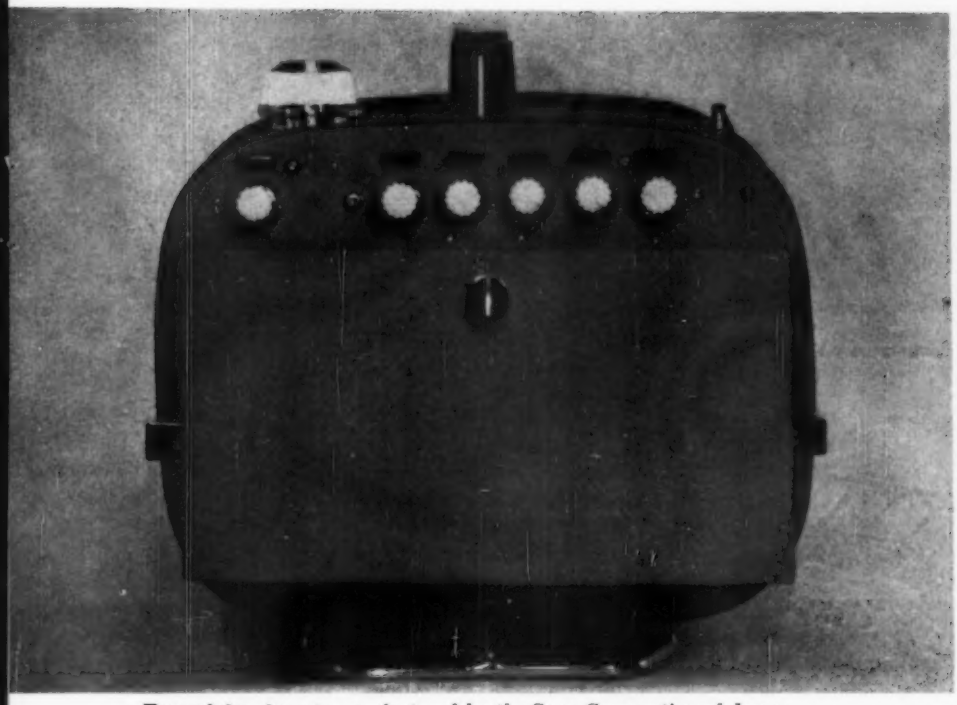
The militant looking piece of hi fi equipment at the left, from the Swedish firm of Elektron Lund, was engineered by Stig Carlsson and designed by Sigvard Bernadotte. Although the shape is startling—and this is somewhat modified by the traditional Scandinavian teak finish—the conical unit combines both speaker and amplifier and serves to achieve a radiating sound effect. The tweeter apertures surround the mouth of the cannon-like structure, the middle tones shoot out the top, and the woofer and amplifier lie at the bottom of the barrel. The direction of the sound for the high and medium tones can be altered simply by aiming the cannon, and an adjustment at the base of the unit directs the low tones to best suit the surrounding surfaces, depending upon the unit's position in the room.

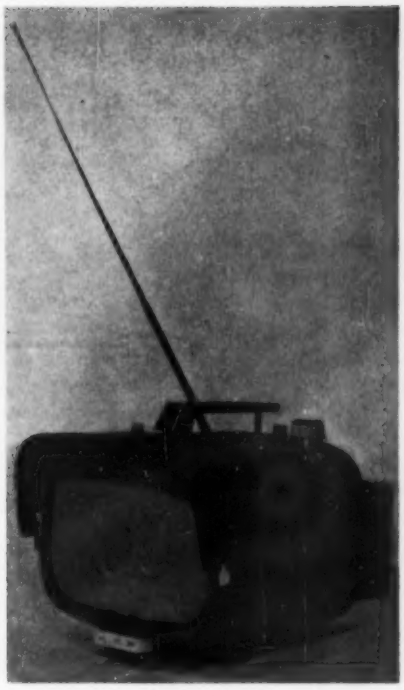
By contrast, the new Facit calculator, also designed by Bernadotte, is neat and conventional. The steel case is in two-tone office gray with red and black keys.

From France come two data processing machines designed by T. Meunier for Cie. des Machines Bull. The fast printer completes 300 lines of 120 figures per minute, and the reader and puncher handles 300 cards per minute. The machines are cased in sheet metal and finished in light and dark gray.

The Sony Corporation of Japan has developed two portable miniatures in the field of audio-visual equipment. The first on the market is a transistor tv set which has an 8-inch screen, weighs about 13 pounds and is fully equipped to operate independently with an expandable antenna and rechargeable batteries. If used indoors, it can be plugged into ac current. The set is staff designed.

The other Sony product, a portable tape recorder, recently won the first prize in the Mainichi Industrial Design Competition sponsored by the Mainichi Press of Japan. Designed by T. Saito, the model was made specifically for the contest and will be modified before going into production. When open, the tape recorder lies flat on a table or sits upright, supported by the lid; closed, it becomes a small, thin package.—*M. D.*

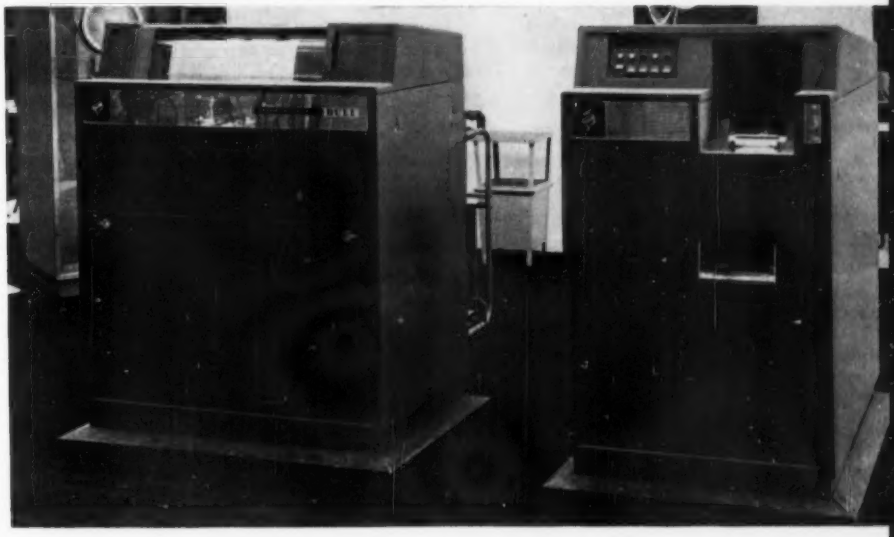




Transistor tv *set manufactured by the Sony Corporation of Japan.*

Tape recorder *by T. Saito for Sony.*

Data recording *machines designed by T. Meunier.*



TAILORING THE PRODUCT TO FIT

Dreyfuss Office Compiles Available Human Factors Data for Use by Designers

—with a word of introduction (and of caution) by Henry Dreyfuss

During the past fifteen years, the words "human engineering" and "human factors" have loomed larger and larger in the designer's vocabulary. There has been so much human engineering talk that we are sometimes in danger of forgetting that the industrial designer is still an artist. From a mere tool—just one vital part of the designer's stock-in-trade —human engineering has been exaggerated into a cure-all for the designer's problems. In reality, it is no cure-all, but simply a valuable technique, one of many techniques that should be standard in any good design office. Human engineering is no substitute for esthetic judgment. It is not technique but *imagination* for which the designer is hired.

This emphasis on human factors comes as a surprise to many of us who remember the early days of industrial design. One of the remarkable things about this infant profession, thirty years ago, was how little we really knew about human dimensions. We had some traditional rules-of-thumb, of course, when it came to things like chair heights. Certain industries had rules-of-thumb we could borrow: ship-builders, for example, had some data and some unwritten laws about clearances. And there was always the empirical method of building a model or mock-up and inviting all our friends over to play guinea pig. Not a very sound method, statistically, but our batting average turned out to be fairly high.

The problem was that we had no single body of knowledge we could turn to for all the odd facts we might need. Here and there we found a book or an article with some data we could use. Often this was no more than a statistical footnote or a chart on a back page. We bought these publications when we could—though many were old, out-of-print and probably inaccurate—borrowed the ones we couldn't buy and scribbled the data on index cards.

Over the years, our pile of books, pamphlets, clippings and dog-eared index cards grew higher and more jumbled. When World War II came, the pile grew even faster. The armed forces and their suppliers undertook some very ambitious human engineering and published their findings. But still no one assembled this data into a single package that a designer could refer to, without spending days wading through his library and his files.

Shortly after the war, our office was working on the interior of a heavy tank for the army. We had tacked a huge, life-size drawing of the tank-driver's compartment on the wall. The driver's figure had been indicated with a thick, black pencil line and we had been jotting odds-and-ends of dimensional data on him as we dug the data out of our files. Surrounded by arcs and rectangles, he looked something like one of the famous dimensional studies of Leonardo. Suddenly it dawned on us that the drawing on the wall was more than a study of the tank-driver's compartment: without being aware of it, we had really been putting together a dimensional chart of the average adult American male.

We called our average man "Joe" and we asked Al Tilley —who has since become the self-made human factors specialist on our staff—to make more drawings of this theoretical figure. We drew "Joe" standing, sitting, crawling, peddling a bike. Our charts showed him head-on, in profile and above. We drew his wife "Josephine" and his children just as carefully. Al Tilley methodically transferred hundreds of statistics from our library and files and plastered them over the first rough charts. Particularly important, these dimensions included not only "Joe and Josephine"—the theoretically average man and woman—but the largest and smallest people likely to use the products we designed.

The charts were really put together for our own use: they probably would have baffled an outsider. But in 1955, we cleaned them up, organized them more carefully and allowed some of them to be published. They were far from perfect, but they were almost the only thing available and were quickly put to use by designers and engineers.

Within a year or two, however, it was obvious that the published charts had two important flaws. First of all, new data kept coming in. We marked this data on our office copies of the diagrams, but who was going to mark them on all the published diagrams? Second, the published drawings included the *dimensions* of the small, average and large men, but only the average man was *drawn*. We found that people referred to the charts as "Dreyfuss' average man," which indicated that many people had misunderstood the diagrams and probably misused them. A good design must "fit" not only the theoretical average, but his large and small brothers. We had thought this was obvious in the charts, but we seemed to be wrong. By 1959, we found that we had an enormous variety of new data. Our old "Joe and Josephine" charts were no longer adequate. The quantity and scope of our new data demanded a different format, more complex and more encyclopedic. We were in sight of something we had dreamt of for years: a miniature "encyclopedia" of human factors data for the industrial designer, presented in graphic form. This is the set of charts that appears on the following pages.

What data do the charts include? Four of the charts are simply human measurements — what human engineering specialists call "anthropometric data"—of the adult American male and female. Note that the charts now carry individual drawings of the small, average and large figures. The large male figure even includes data on the thickest winter clothing issued by the air force: a good design should "fit" the biggest man in the *heaviest clothes*.

Five new charts deal with an area that was not really covered in the earlier charts: applications. These are workplace diagrams. The male and female figures are shown standing and seated in standardized work areas. Data is

given for such things as reach, sight lines, placement of common objects for maximum convenience and scores of other factors too numerous to list here. Only the average figure is drawn in these diagrams, but data is included for the small and large figures.

Grouped on a tenth chart—and distributed among the nine charts of measurements and applications—is an enormous amount of useful data that defies classification. This chart deals with environmental stimuli like heat, light, noise and acceleration. Notations on the other nine charts range from lung capacity to light reflections on eyeglasses.

How much of the population is covered? Human factors researchers have adopted a system of "percentiles" as a simple way of dividing the adult population into groups for study. As you might expect, the researchers take the entire adult population—that is, 100 percent—and simply break them down into 100 percentage groups, called percentiles. Percentile 1 is the smallest possible physique. Percentile 100 is the largest.

However, for the designer's purposes, it is not really necessary to work with data on all 100 percentiles. To begin with, the top and bottom few percentiles represent people who are extremely rare. Normally, collections of human engineering data skip the first five and last five percentiles. This leaves us with data on percentiles 5 through 95, or 90 percent of the adult population. In the charts that follow, we have kept this practice of lopping off the extreme percentiles, though we have been a bit more cautious: our data covers percentiles 2.5 through 97.5 or 95 per cent of the adult population.

In theory, this would mean that each of our charts should carry 95 human figures, one for each percentile covered. Actually, our charts carry just three figures. Our experience —plus the experience of human factors researchers who have gone into the subject more deeply—has convinced us that these three human figures are enough for the designer's purposes. They represent the mean, percentile 50, plus the two extremes, percentile 2.5 and 97.5. If a design "fits" these three theoretical physiques within reason, it should be adequate for the other percentiles.

Limitations of these diagrams: Like the earlier "Joe and Josephine" drawings, the present charts are far from perfect. They have limitations which are important to remember.

First of all, working with percentiles involves some obvious compromises. A design that "fits" our three basic percentiles cannot "fit" each of them perfectly. The design must strike a balance that provides all three with a reasonable "fit." The same would be true if we checked our designs against all 95 percentiles. For each percentile is in itself an average. In reality, no two members of a percentile are exactly alike. They are all put into the adding machine and come out as a theoretical group based on *average* dimensions.

A second limitation of these diagrams is that they are based on rather limited data. No one has done a really complete survey of the dimensions of the American population, accounting for all geographical areas, all ages, all racial and occupational groups. The surveys from which our information is drawn have been based on fairly narrow statistical samples. Much of it, for example, is taken from studies of armed forces personnel; since the selection of military personnel is based on criteria that automatically excludes extreme physical types, these types are also automatically excluded from the range covered in our diagrams. Further, most of the available studies have insufficient data on minority groups like negroes, orientals, and the foreign-born.

Like most designers, we are not equipped to undertake these global studies on our own. So we have no choice: we must depend upon the findings of other researchers. The data on our charts is derived from sources generally recognized as the most reliable—a bibliography is included on page 110—but we must recognize that this data is far from complete. We can only hope for more ambitious research projects in the coming years.

This implies a third important limitation of our charts. As new studies are done and new information is recorded, the data on our charts must be updated. Like all good research material, our charts are *provisional;* they should be used with the reservation that better data may come along. Admittedly, when we update our charts with data gleaned from new sources, the changes are usually fractional. But nevertheless, they *are* important. We have no illusions that our charts are the last word.

New data: If new information keeps coming in, what can you do to keep up? Obviously, these charts cannot be re-published every six months with a handful of fractional alterations in data. The only suggestion I can make is that you begin reading up on human factors research, put yourself on the right mailing lists and subscribe to the right publications. Our own bibliography, later in this article, may be a good place to begin. In this way, if you keep up, you should know about new research as it is published.

Suggestions about how to use these charts: No two designers are likely to use these diagrams in exactly the same way. Not only do designers' work methods differ, but each design job involves different human engineering considerations. Nevertheless, there are several recommendations that need to be made.

One good way to exploit this checklist function is to photostat the charts to a scale that corresponds to the scale of your drawings, then cut out the human figures to make templates. These templates can be mounted on stiff board and even hinged. This gives you small (2.5 percentile), average (50 percentile), and large (97.5 percentile) figures that actually fit over your drawings. The templates can even be used to

trace figures, where these are helpful.

This is like building a mock-up for testing in two dimensions. Needless to say, this paper mock-up is not enough. It does not replace the three-dimensional models and mock-ups that *must* be built for testing in depth. Though we feel that our charts—our check-lists—are as accurate as we can make them, we ultimately check out every dimension, every movement in a life-like situation. For years, we have employed a leading medical authority, Dr. Janet Travell of Cornell Medical College, to ride on our tractors and "fly" in our airplane interior mock-ups.

Human factors are less predictable than our statistic-worshipping society likes to think. A chart is a static thing. But products and the human beings who use them are not static: they are dynamic. It is these dynamics that must be explored with three-dimensional tools like models, mock-ups and *real* people, not just anthropometric abstractions.

At times, we have even considered hiring three men and three women whose dimensions correspond to the figures on our charts. But finding designers with good *portfolios* is hard enough; we might never hire anyone if we insisted that employees look like walking charts. On the other hand, if your staff does happen to include someone who fits one of the three basic percentiles, make use of him.

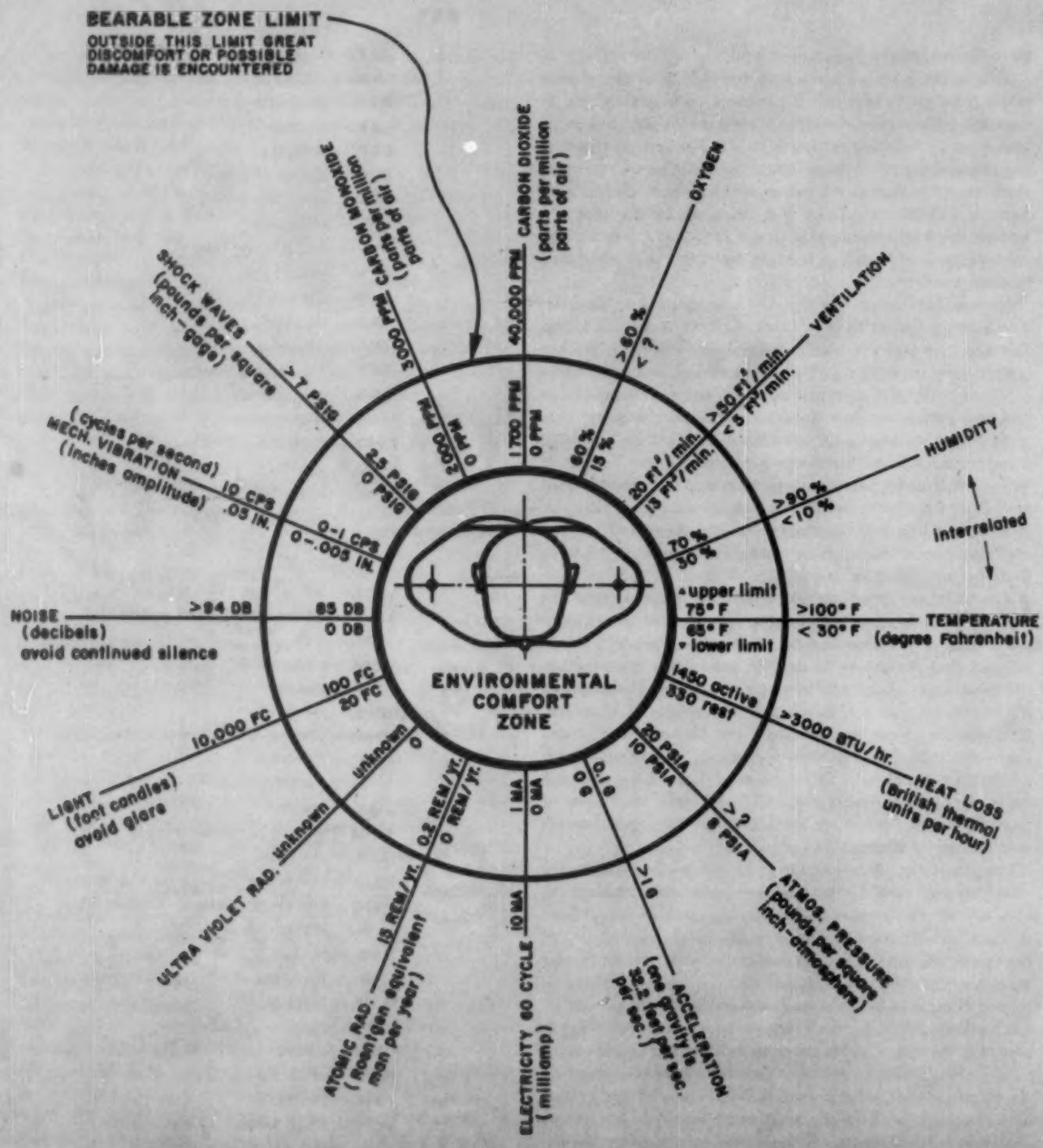
You may ask whether the diagrams go back into the drawer when the model or mock-up is built. Are these charts useful only at the drawing stage? On the contrary, I would suggest that the charts be kept on hand while checking out the model or mock-up with human guinea pigs. At this point, the charts become a somewhat different kind of checklist. Initially, they were used to check the dimensions of drawings. Now the charts become a checklist of subject-matter for further examination. Each piece of data on the charts is likely to suggest related data to investigate via model or mock-up tests. The charts are meant to raise questions as well as answer them.

Our diagrams, then, are meant as points-of-departure for your own thinking. Unless they are used with imagination, they are all but worthless. The charts cannot be used "raw" without serious trouble. For example, nowhere does any of the charts explain when a 2.5 percentile measurement is relevant and when the measurement that counts is the 97.5 percentile dimension. When you are designing a cylindrical grip, for instance, it takes a small leap of the imagination to recognize that the space inside the grip must be big enough for a 97.5 percentile hand, yet the diameter of the bar must be slight enough for a 2.5 percentile hand. Beyond their value as a checklist, perhaps the most important function of our drawings is to stimulate you to do your own problem-solving. A key to the abbreviations used in diagrams follows. A bibliography of sources appears on page 110.

KEY

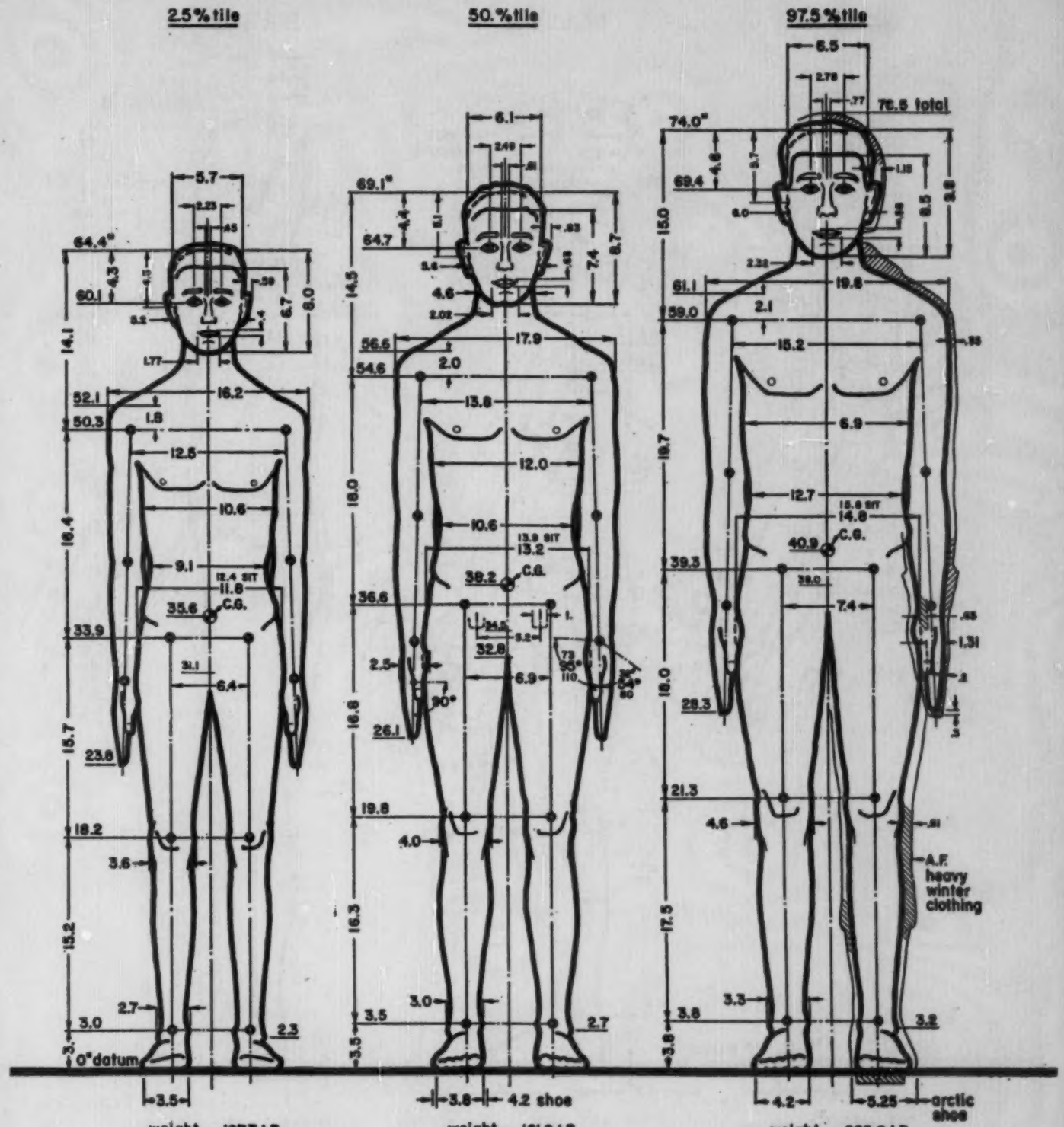
A. F.— U. S. Air Force
ALLOW.— allowable
ALT.— alternate
AV.— average
CAP.— capacity
C. G.— center of gravity
CIRC.— circumference
CLEAR.— clearance
C. R. T.— cathode ray tube
CYL.— cylindrical
D.— diameter
D.C.— decibels
DIA.— diameter
EFF.— efficient, efficiency
ENG.— engineering
FC.— foot candles
FWD.— forward
G.— gravity
H.— high, height
L.— left, long. length
LG.— length
L.H.— left hand
L. M.— large man (97.5 percentile)
L. W.— large woman (97.5 percentile)
M.— men
MA— milliamp
MID— middle
MOVE.— movement
0" DATUM— vertical measurements start here
OPT.— optimum
P.— pressure
POS.— position
PPM— pounds per million parts of air
PRESS.— pressure
PSIA— pounds per square inch atmosphere
PSIG— pounds per square inch-gage
R.— right, radius
RAD.— radius
REM./yr.— Roentgen equivalent man per year
R. H.— right hand
RT.— right
SIT— sitting
S. M.— small man (2.5 percentile)
SW.— switch
S. W.— small woman (2.5 percentile)
W.— woman, wide, width
W. C.— water closet
% TILE— percentile

HUMAN FACTORS IN DESIGN

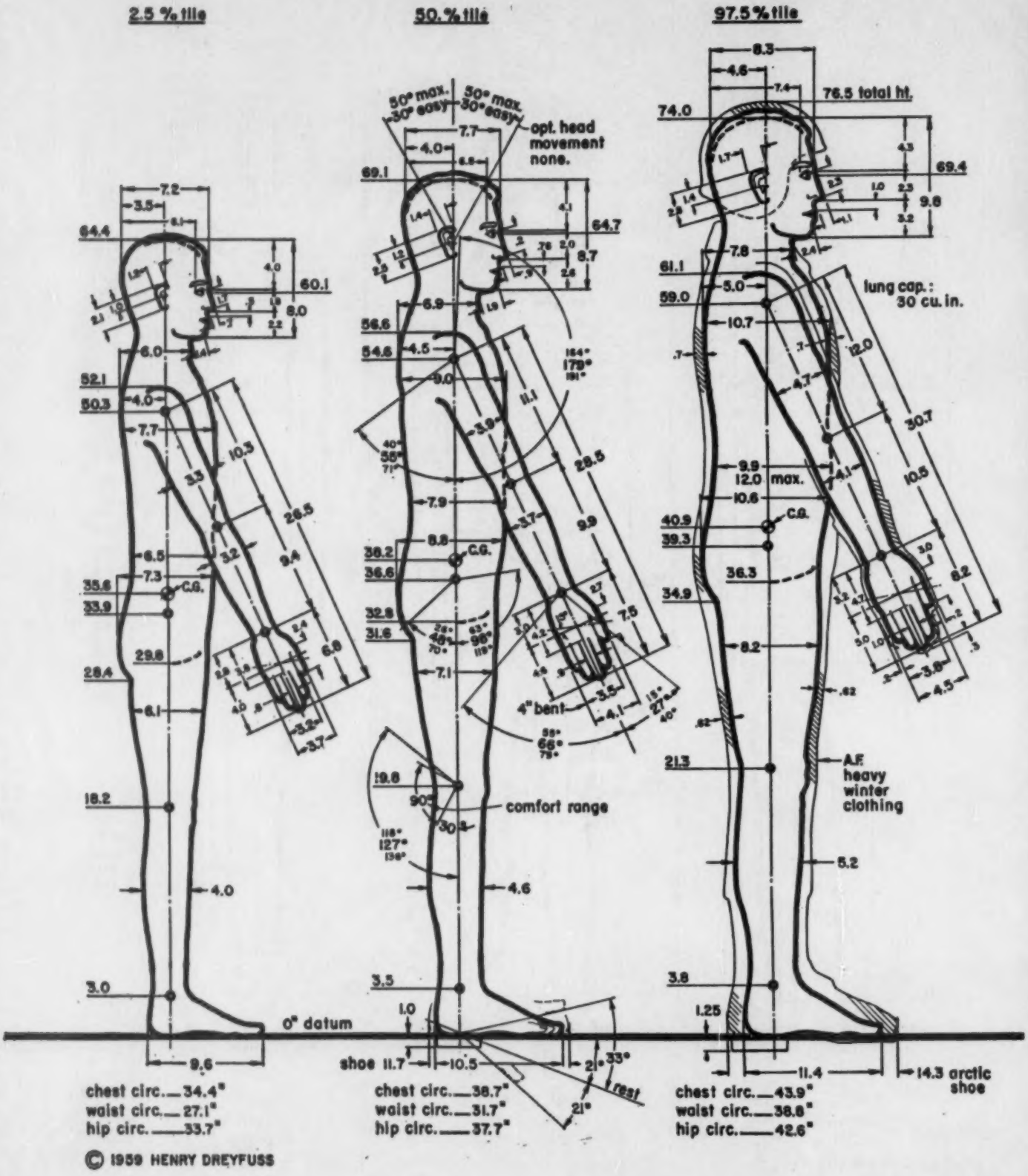


also consider : infra-red radiation, ultra sonic vibration, noxious gases, dust, pollen, and heat exchange with liquids and solids.

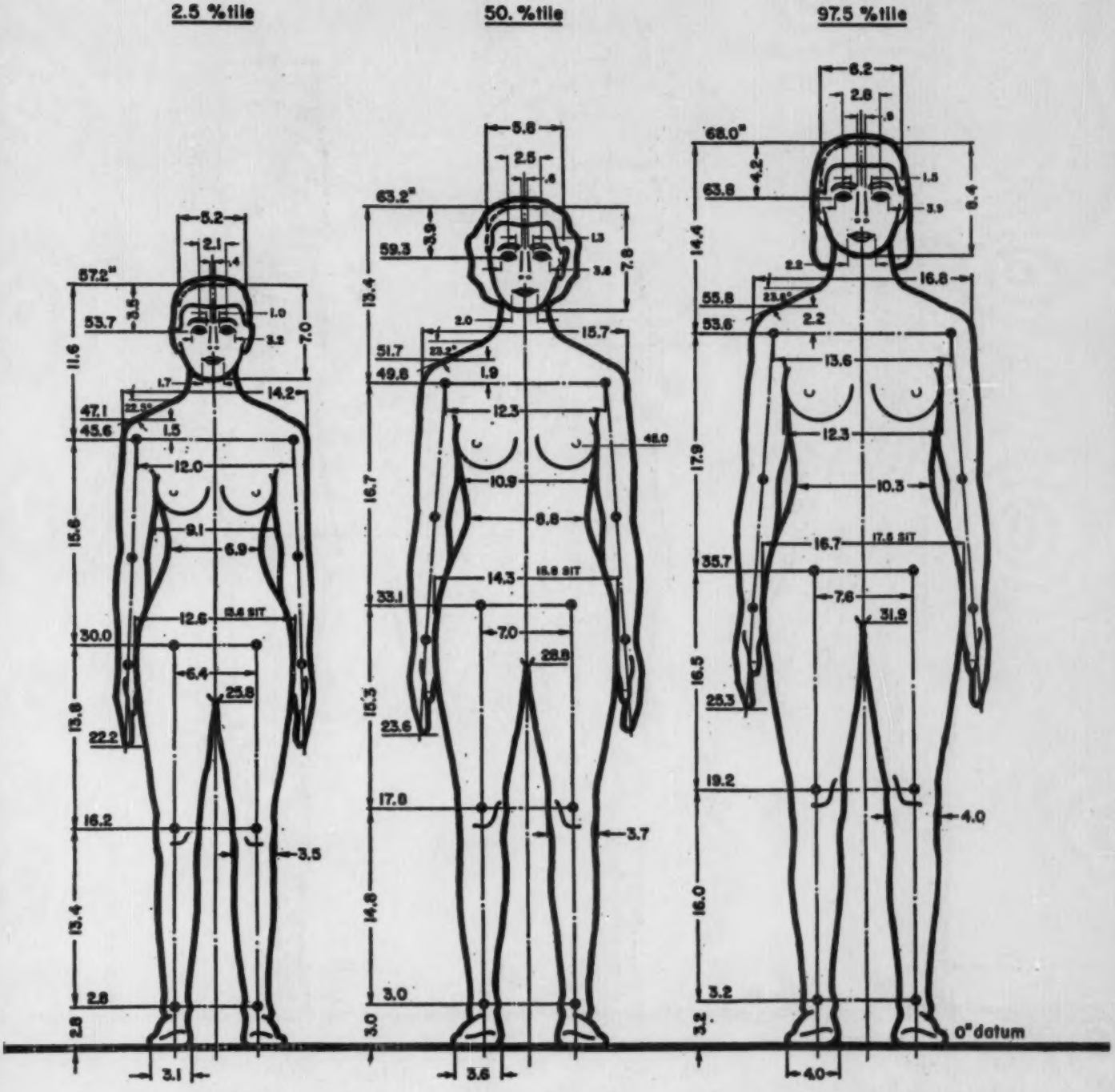
ANTHROPOMETRIC DATA — STANDING ADULT MALE



ANTHROPOMETRIC DATA – STANDING ADULT MALE

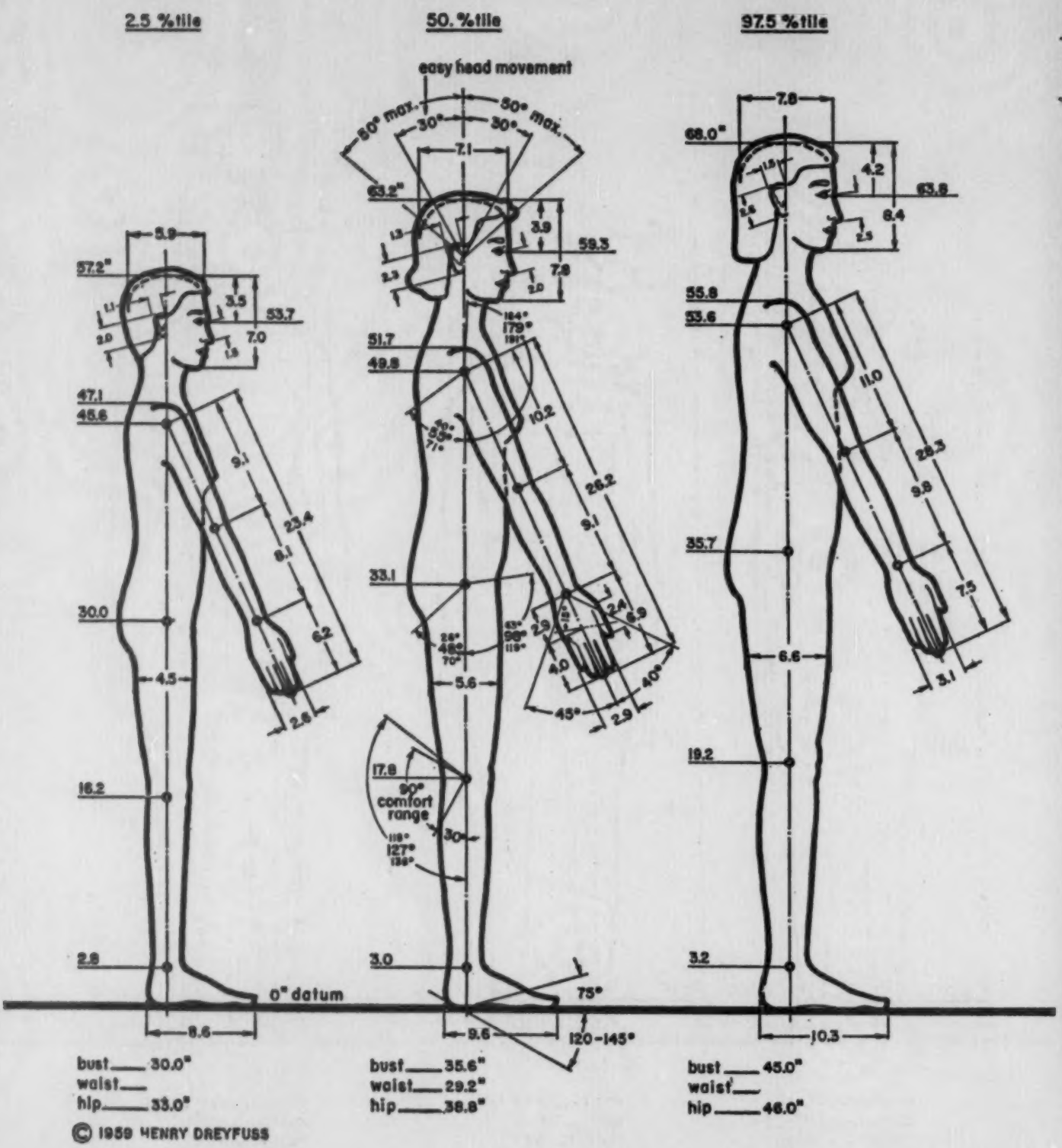


ANTHROPOMETRIC DATA — STANDING ADULT FEMALE

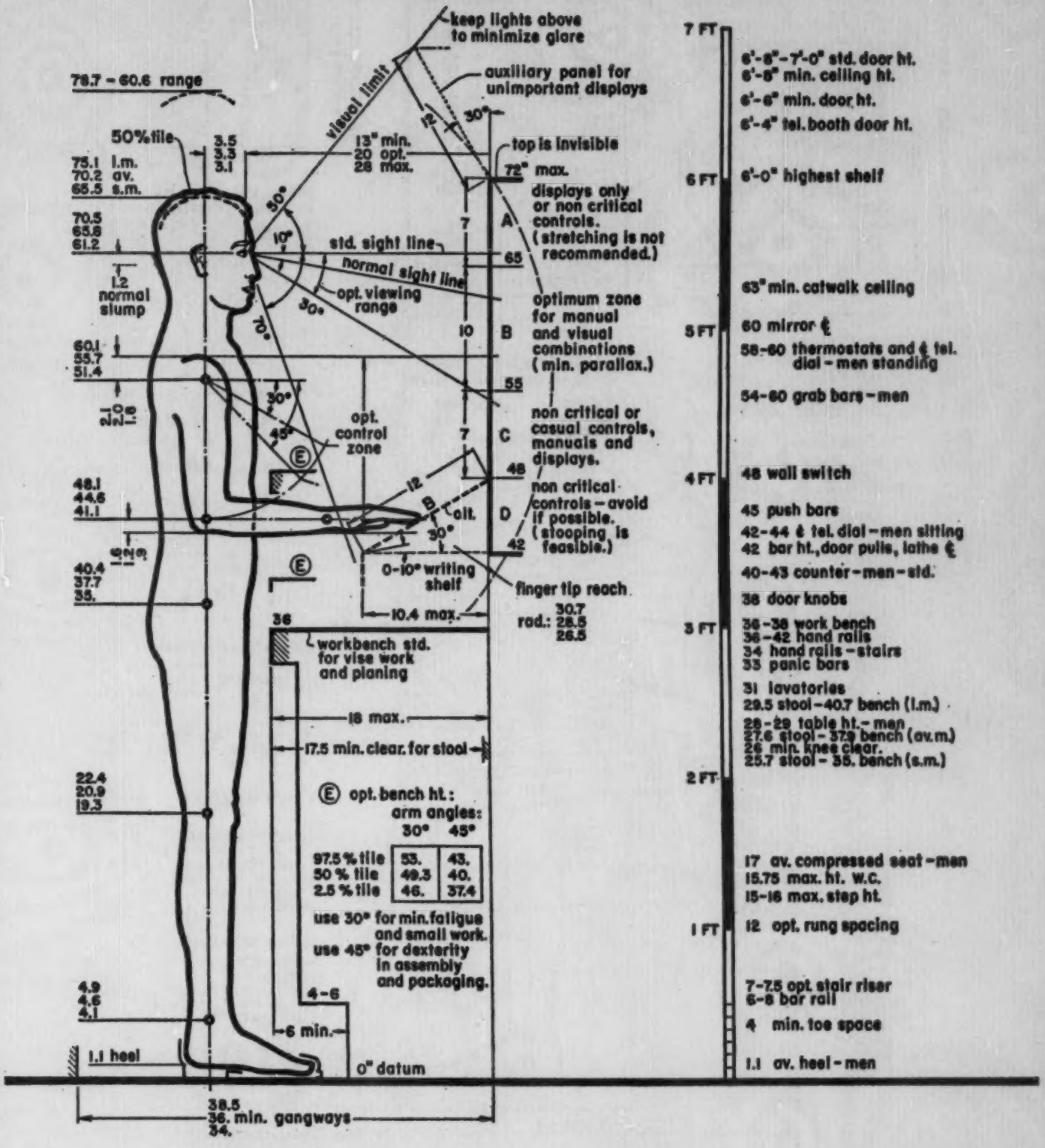


2.5 %tile	50. %tile	97.5 %tile
weight — 95.0 LB.	weight — 134.6 LB.	weight — 195.0 LB.
span — 58.6"	span — 64.7"	span — 70.2"
akimbo — 31.8"	akimbo — 34.7"	akimbo — 38.0"

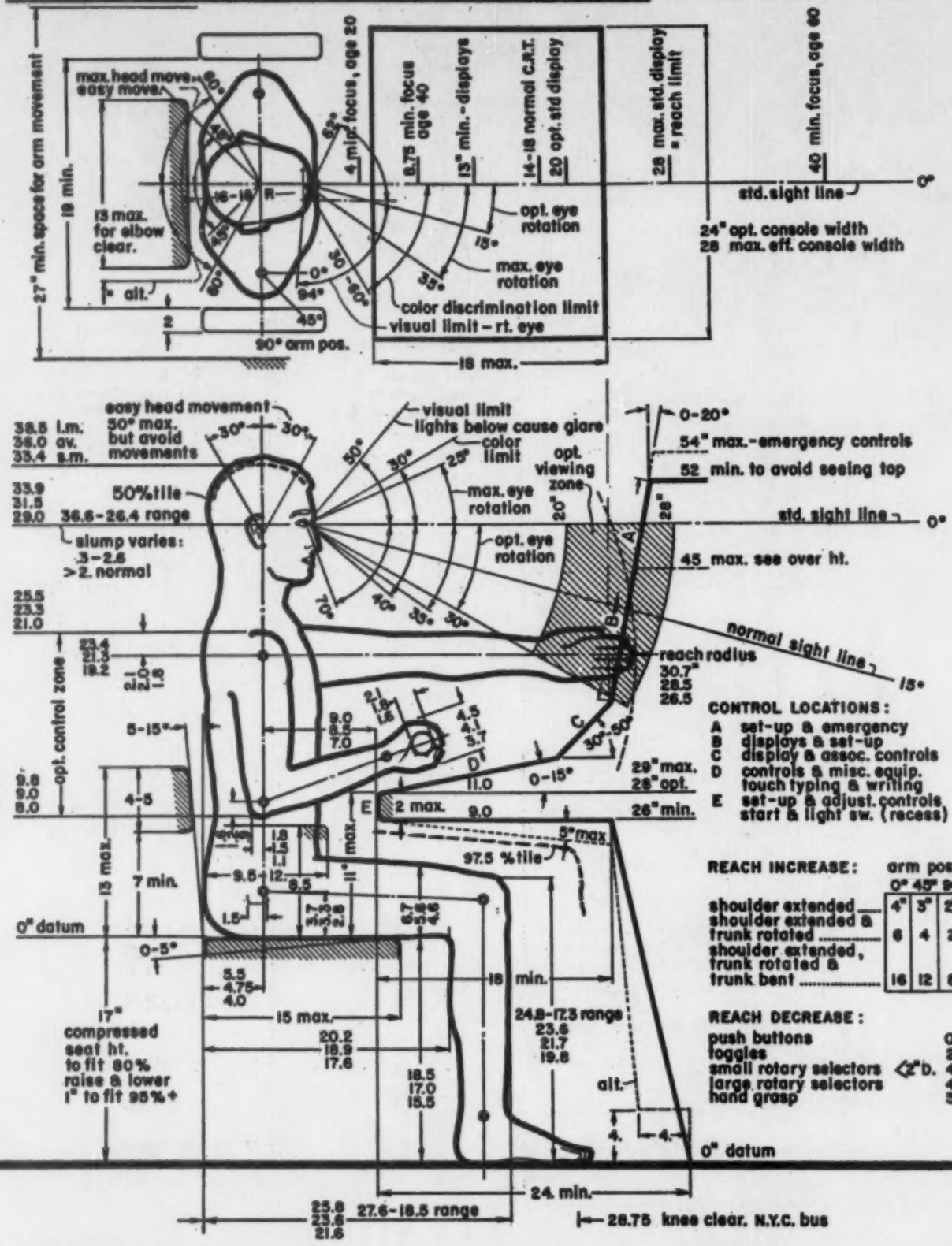
ANTHROPOMETRIC DATA — STANDING ADULT FEMALE



ANTHROPOMETRIC DATA — ADULT MALE STANDING AT CONTROL BOARD

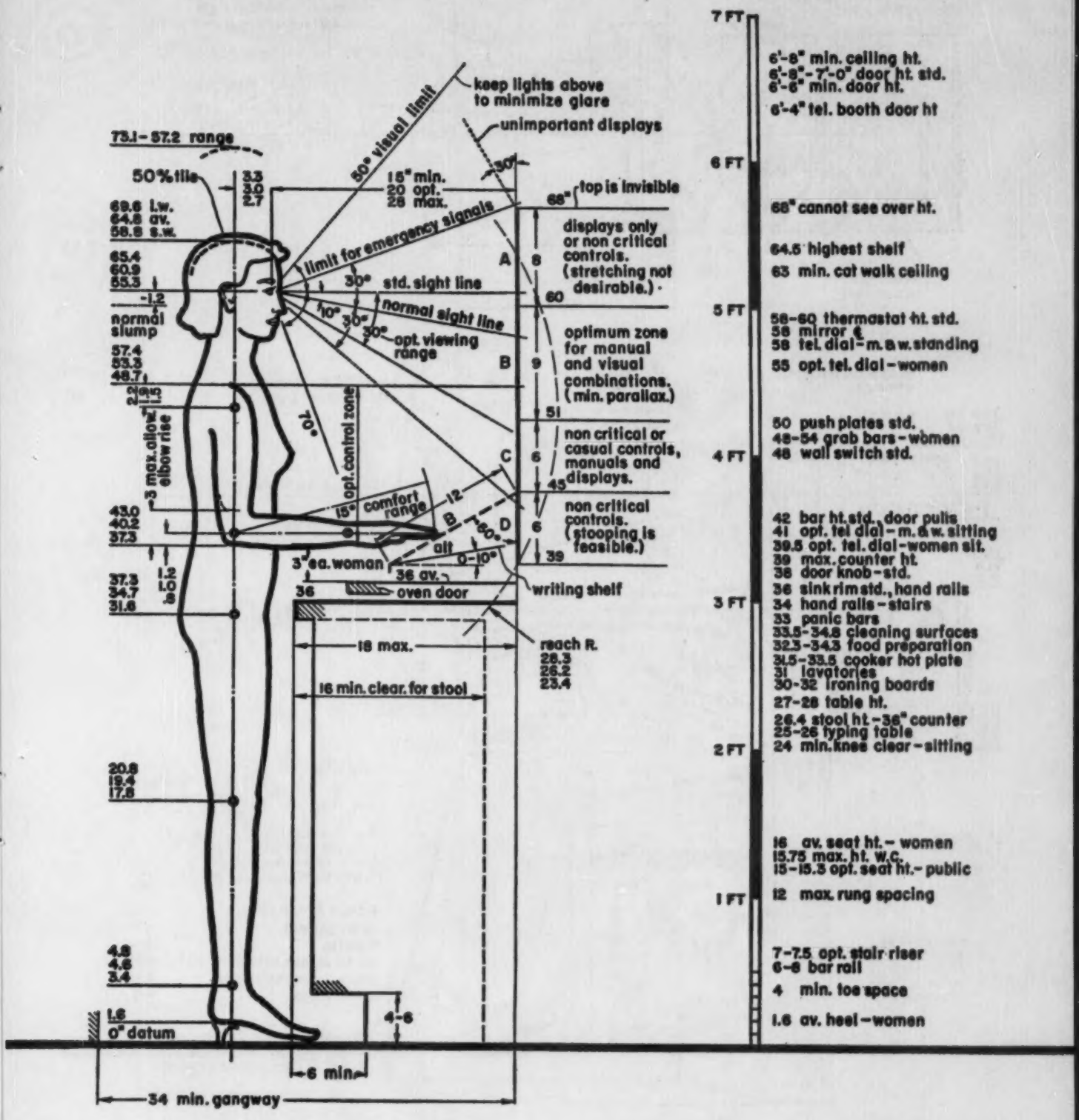


ANTHROPOMETRIC DATA — ADULT MALE SEATED AT CONSOLE

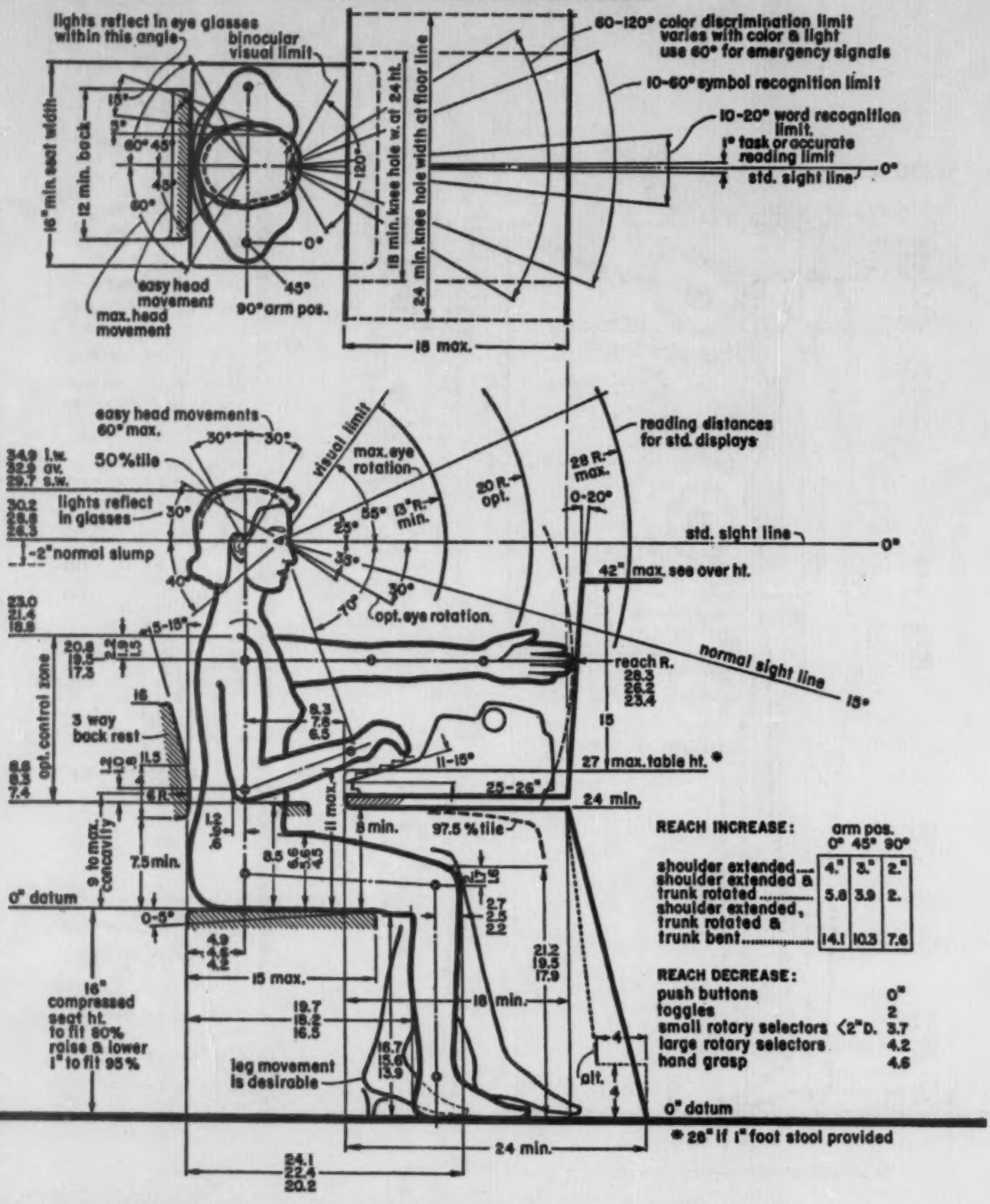


6.6-9.% left handed, 3.5-6.% color blind, 4.5% hard of hearing, 29.3% wear glasses

ANTHROPOMETRIC DATA — ADULT FEMALE STANDING AT CONTROL BOARD



ANTHROPOMETRIC DATA — ADULT FEMALE SEATED AT CONSOLE



REACH INCREASE:

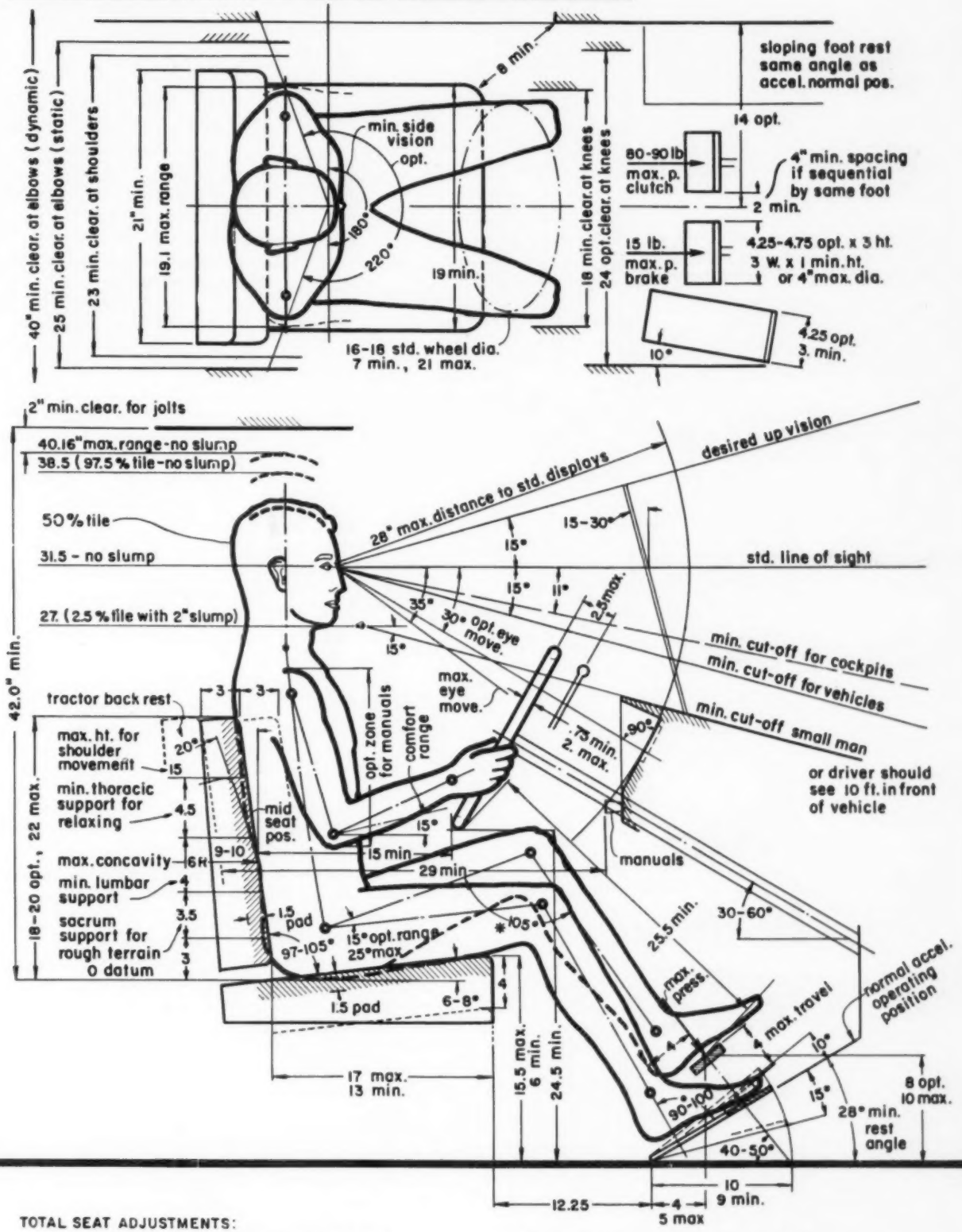
	arm pos. 0°	45°	90°
shoulder extended	4."	3."	2."
shoulder extended & trunk rotated	5.8	3.9	2.
shoulder extended, trunk rotated & trunk bent	14.1	10.3	7.6

REACH DECREASE:

push buttons	0"
toggles	2
small rotary selectors <2"D.	3.7
large rotary selectors	4.2
hand grasp	4.6

6.6-7.% left handed, 3.5-6.% color blind, 4.5% hard of hearing, 37.9% wear glasses

ANTHROPOMETRIC DATA — ADULT MALE SEATED IN VEHICLE

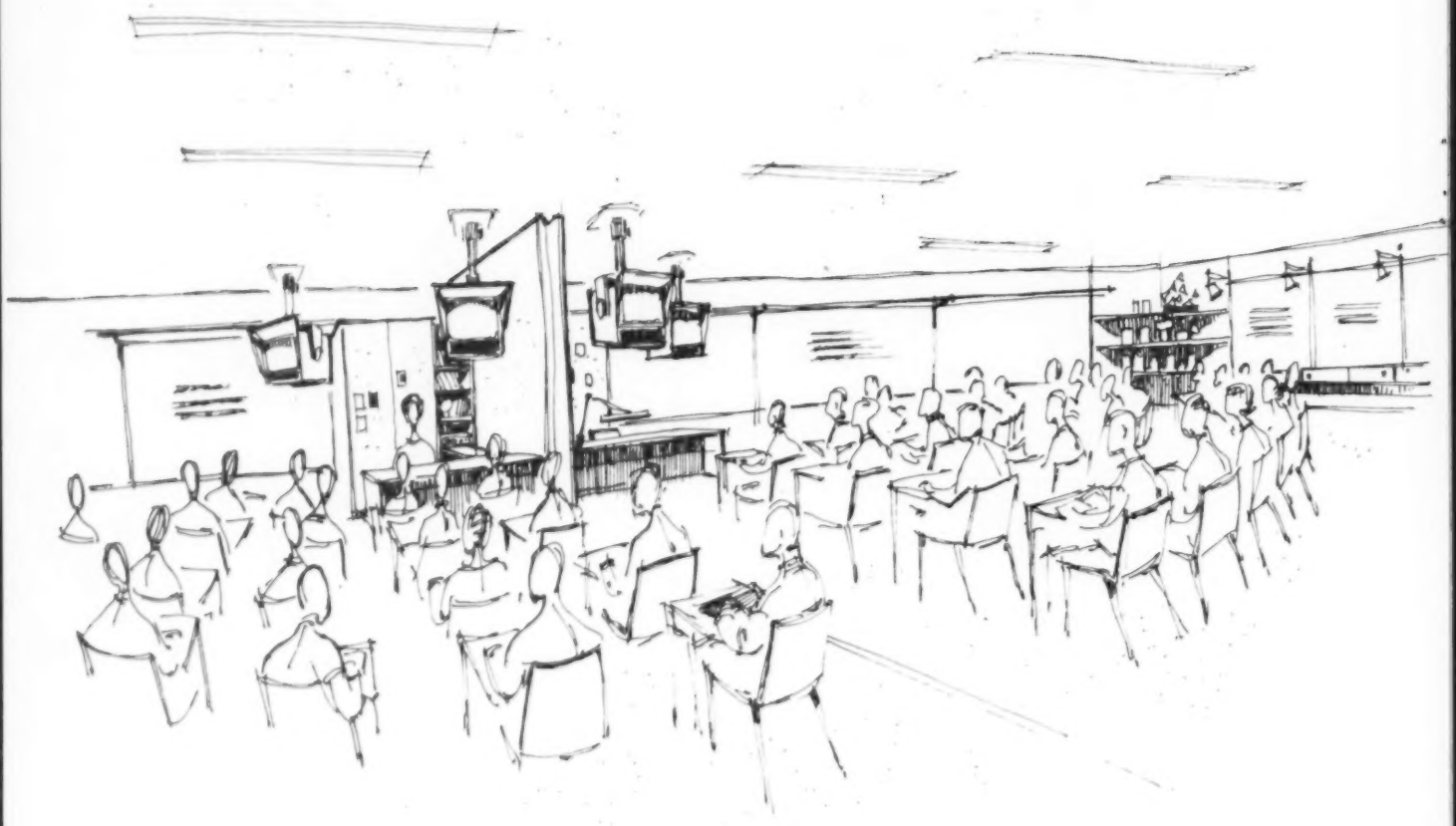


TOTAL SEAT ADJUSTMENTS:

horizontal: 6" min. in max. increments of 1"

vertical: 4" min. in max. increments of 1"

* leg angle 105-110° for max. pedal pressure 0-50 lb.
120° min. " " " " 50-100 lb.



Why Johnny can't see

Designing television into classrooms means another look at education and a different look for the school

The Ford Foundation has always been concerned with programs of education. But since often it has found the facilities getting in the way of the programs, in 1958 it set up the Educational Facilities Laboratories to study the *things* of education: the schoolhouse and what goes into it. Since its foundation, EFL has published a series of profiles of significant schools and has sponsored a number of experimental studies of school equipment. Last year it distributed a quarter of a million free copies of a booklet called *Ring the Alarm!*, subtitled "A memo to the schools on fire and human beings."

Last year also, in response to the clamor of teachers and school superintendents, Jonathan King, EFL's secretary, prepared a four-page memo outlining "a general study of what goes on in a room which is to be used for teaching by television and, possibly more important, what would go on in such rooms if the present activities were not dictated by the existing walls, equipment, acoustics, furnishings, etc." An educational group bent on a general study normally sets up a committee composed of other educators, but in this case, EFL felt, a committee of educators could pool nothing but ignorance. And since, as EFL's own foreword to the report says, "it was a question of arranging people and things," they decided that what they needed was an expert in

this kind of arranging: an industrial designer.

But the half dozen industrial design firms to whom EFL showed the memo were appalled by both the breadth and the ambiguity of the problem. Even the office which EFL finally chose — Dave Chapman, Inc. — was alternately delighted by the freedom their client allowed them and disturbed by the lack of guideposts and even of goals. Trying to fit this unconventional client into a manageable pattern, Frank Carioti, who coordinated research for the office, asked finally, "Look, what are you selling?" and was told by the non-profit EFL, "That's for you to find out."

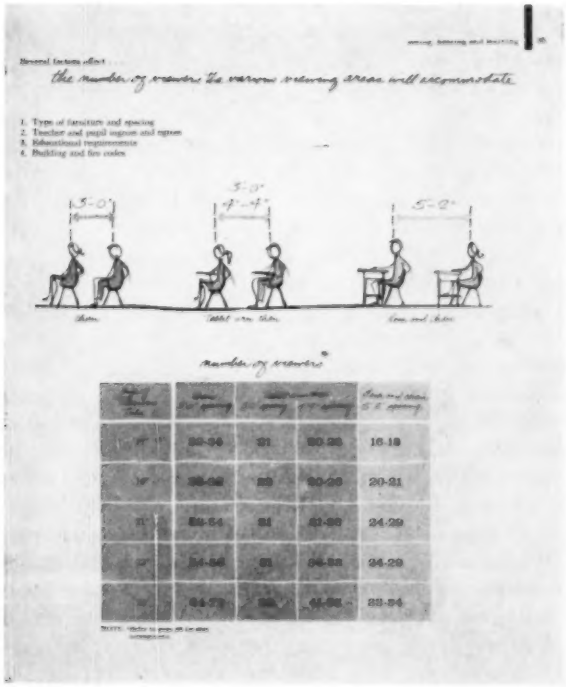
The designers set about finding out in June of last year. The regular Chapman staff was assisted by Joseph Carreiro, of the Philadelphia Museum School, who spent the summer on the road, visiting schools and offices across the country. Altogether, Carioti and Carreiro turned in reports of more than a hundred and fifty interviews with teachers, administrators, suppliers, manufacturers, architects—anyone who had anything relevant to say about education and television. Carioti prepared digests of what written material existed in the field; for help with the technical reading, he turned to members of the design staff. (A bibliography in the report lists about a quarter of the sources consulted.)

Research proved in some ways to emphasize the vagueness of the problem rather than to help define it. Since there is no central authority for education in the United States, and no one set of rules for record-keeping, there are no reliable statistics on which to base present evaluations and future calculations.

The Chapman office presented its solutions this April in a book, which they tried to make look as little like a book as possible. They wanted a form which would express the urgency of the problems it described, and a book, they felt, is something that is put away in a drawer or on a shelf to be read "later." The format they chose, 10 x 13 inches, with a soft cover, wide margins, and short blocks of text liberally interspersed with line drawings, was, apparently, selected in the belief that, unlike the U. S. Commissioner of Education — who recently reported that he had never heard of some famous books—school superintendents and college presidents have heard of books and don't like them.

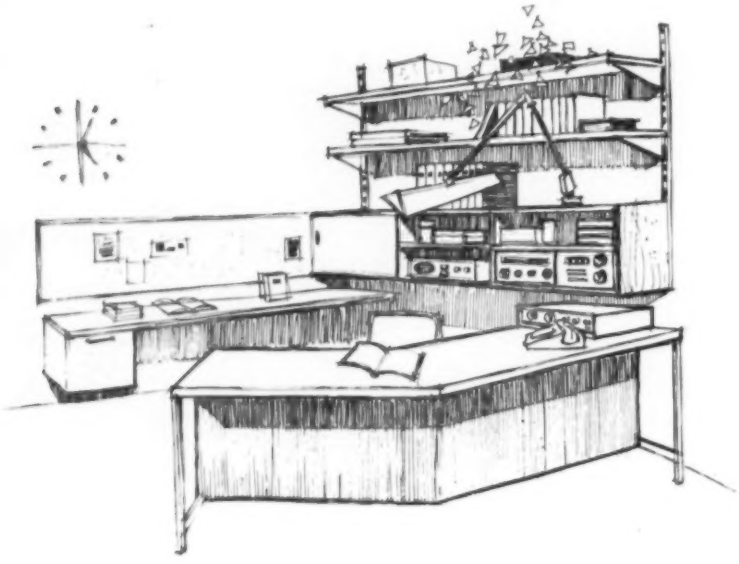
The first twenty pages of the presentation hardly mention television: they are concerned with the function of the schoolroom now and in the years to come. In the next five years, it is estimated that the public school population will grow by five million. There will be more students, they will stay in school longer, and they will be expected to learn more while they are there. The number of teachers has not grown

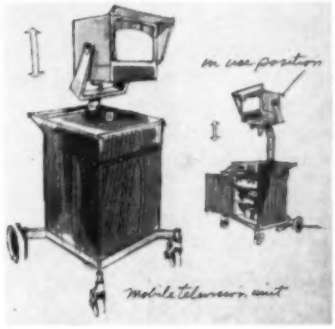
Chapman report to the client and to the public fills a book that is both presentation and product



Research for the book took the form of interviews, reading, and experiments like the one below, where a member of the Chapman staff tests the visibility of a television screen at various heights. Presentation of the findings was made as lively as possible, with color overlays, drawings, copy in script, as in the page at left.

Suggestions for school equipment range from fairly simple methods of mounting standard television receivers to "teacher's control center" below. Designers say that both the pole mounting for the television set and the teacher's desk and cabinets could be fabricated inexpensively in the school shop.





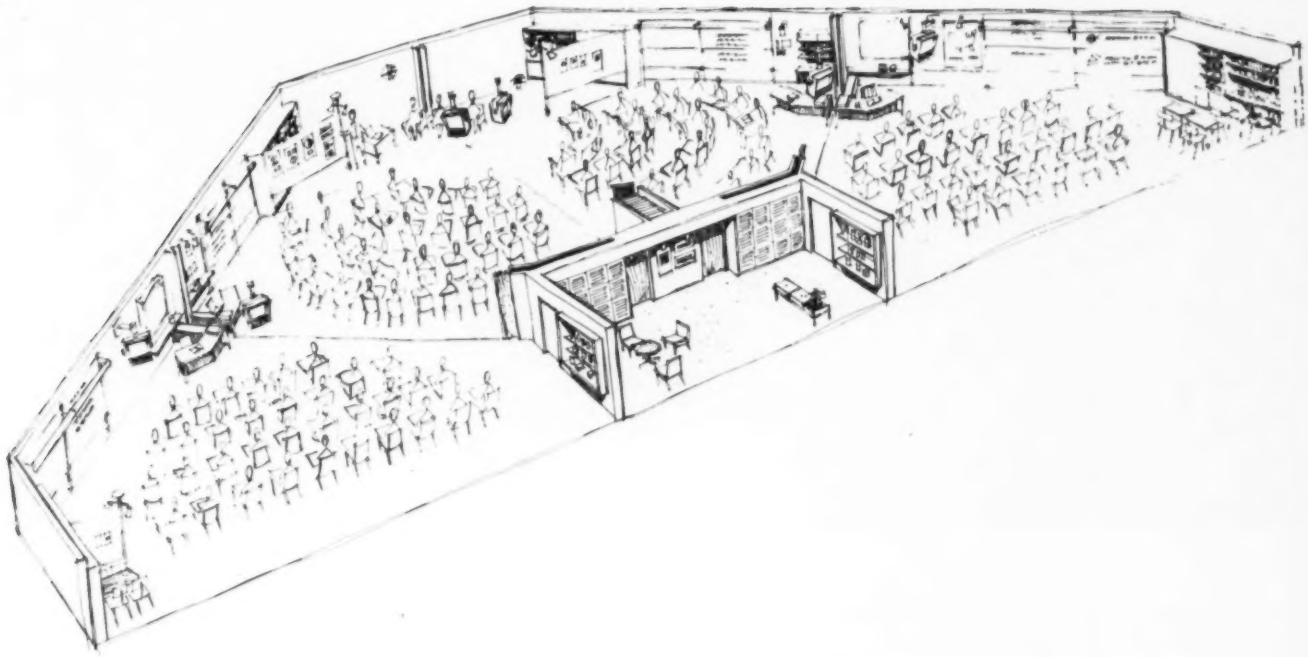
at a similar pace; one guess puts the current shortage at 195,000; and the shortage is expected to grow rapidly. The number of schools, on the other hand, is declining, as more of the smaller ones are consolidated. One consequence of all this is that there is more need for large rooms in which students can meet for instruction or special programs. There is also an equal need for small rooms for individual study, for conferences between teacher and student, and for seminars. In response to the increasing need for a variety of classroom sizes and shapes, school planners today invariably tell the architect they want flexibility but can seldom specify the degree or the purpose of this flexibility.

One new reason for flexibility is, of course, the introduction of television into the school day. This often demands a regrouping of classes as well as new equipment, and the report examines the kinds of instruction most suited to television, as well as the kinds of origination, transmission, and reception suited to schools of various sizes and needs. Here as elsewhere the report emphasizes the necessity of expert advice, for the designers were conscious of the danger they ran of appearing to usurp the proper duties of engineers or architects.

But if the shape of the schoolroom can be changed, the shape of the student cannot, and there are certain rigid considerations that planning for television — or even just planning for teaching—must take into account. The Chapman office's research included a determination of the proper distance of the viewer from the screen, of the distance between seats for children of various ages, of the maximum viewing angle, and of the proper image size. Their research in acoustics resulted in the single product (apart from the book itself) of the project: a curtain woven of a metal-core nylon-sheathed fabric, which serves as a barrier against sound. The fabric will be tested this fall at the experimental high school of the University of Chicago.

The "design" section of the report deals first with the furnishings of the schoolroom: various kinds of television receivers and other audio-visual equipment, space dividers, and desks and chairs for teachers and students. But most of the design section is devoted not to things but to spaces: the spaces which will best accommodate groups of various sizes and ages, and not only while they are watching television. For the designers came to a perhaps unexpected conclusion: the use of television will not impose special design requirements on classrooms. But intelligent use of this report will result in changes in classroom design. For example, television receivers are most effectively seen if they are placed in a corner; *ipso facto*, the teacher is best seen if

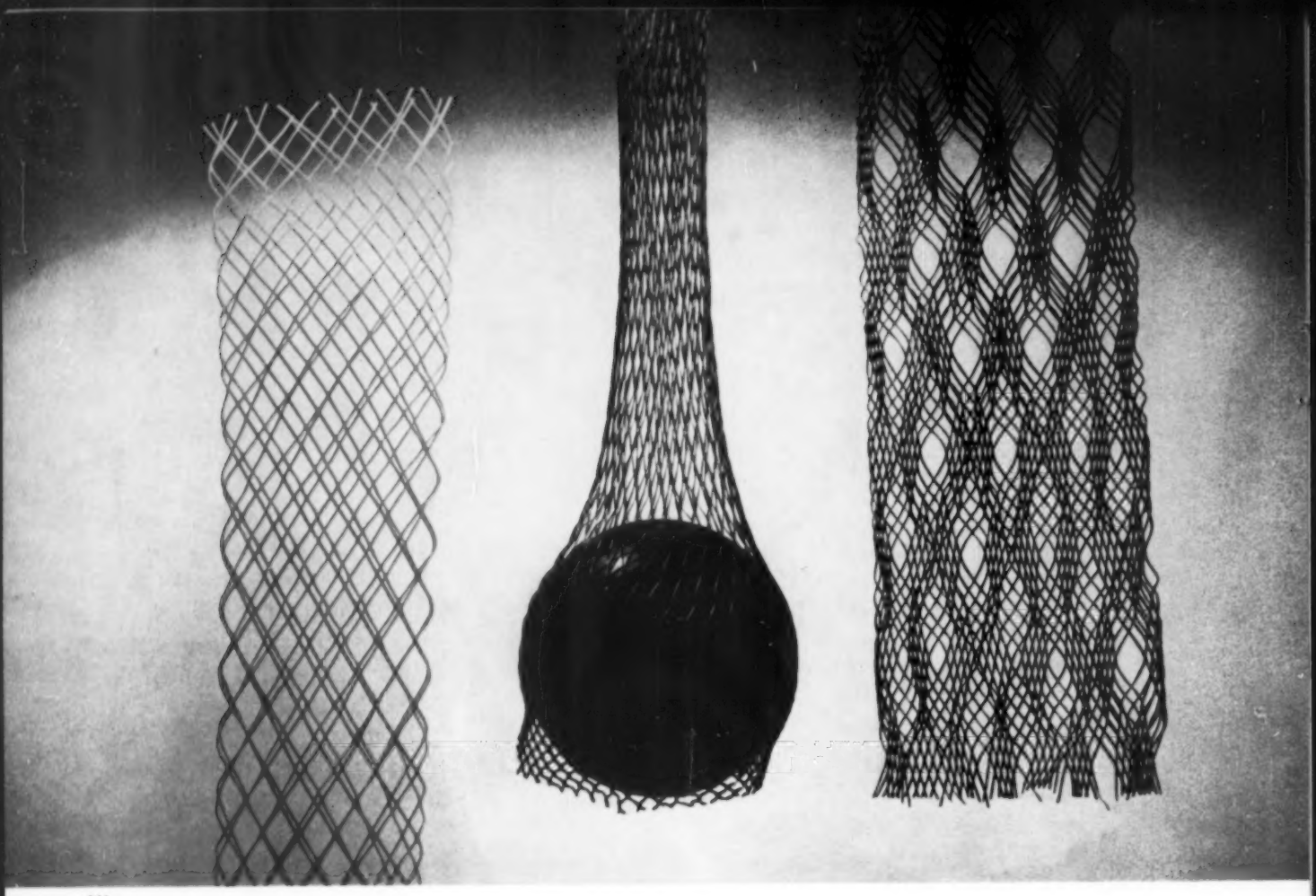
Class space for a group of 100 to 200 can be sub-divided by retractable partitions into four irregularly-shaped rooms clustered around a central audio-visual and resources core.



Project director Kim Yamasaki inspects test installation of curtain space divider developed by the Chapman office in the course of the project. Fabric, of metal-core, nylon-sheathed fibers laid in one direction only, was prepared on a handloom. Its great density and lack of porosity make it an effective sound block, while the flexibility and vertical character of the texture mean it can be drawn easily along the runners. It is not yet on the market.

she is placed in a corner. Classrooms that are not of the traditional box shape can be more easily combined for television viewing by a large group; by the same token, they can be more easily combined for other activities, or subdivided for individual study space.

The whole design section is intentionally presented in rough sketch form; suggestive rather than explicit, since EFL wanted the book to serve as the beginning of planning, rather than the end. A section at the conclusion answers specific questions about adapting present facilities to television, but for the most part the book aims to *provoke* questions—and action. The report has gone out to the superintendents of the larger school systems, all directors of audio-visual programs, and all college presidents. The first printing of 30,000 copies is nearly exhausted, and a second printing is in the offing. EFL judges it one of the most successful projects it has ever undertaken: a study significant, not just for educational television, but for education. Here, they feel, television acted like a catalyst, making everyone take a new look at factors that had been there all along. Jonathan King said recently that the most important result of the project is that "no one who reads the report can ever again think of a schoolhouse as a series of boxes strung along a corridor to *contain* education."—*U. McH.*



(1)

AMERICAN MANAGEMENT ASSOCIATION PACKAGING EXHIBITION UNDERLINES:

Intriguing tetrahedron-shaped single-portion units and the bag-in-box

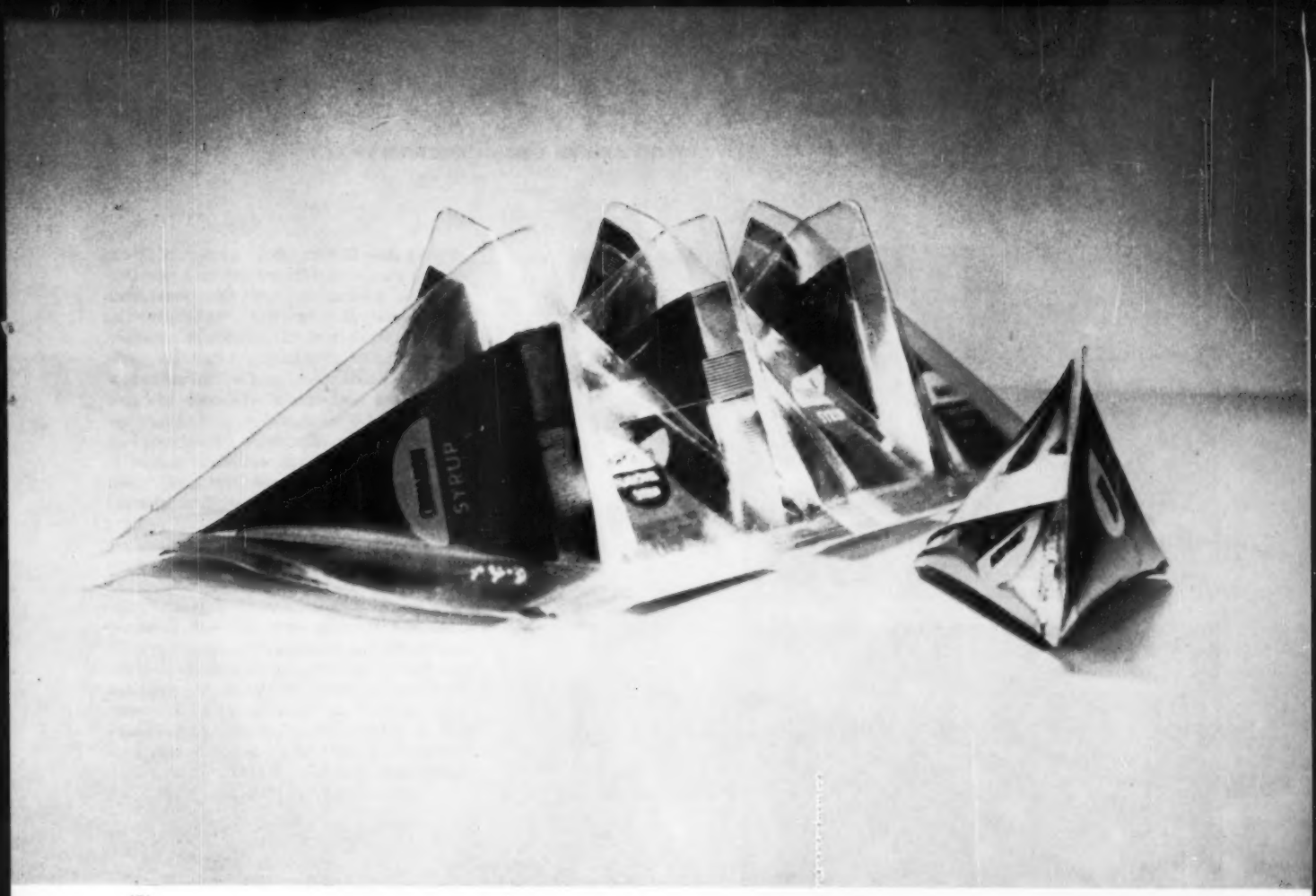
Dramatic strides of research and development in plastic films

Exciting but uncertain packaging future of glamorous polypropylene, "most versatile plastic in the world"

New form and new qualities for polyethylene

Availability of colored glass in small, custom quantities

Revolutionary lightweight and low-cost shipping system made of metal slotted-angle frames



(2)

(1) Du Pont's Vexar, a new extruded polyethylene netting, may be marketed as a decorative sleeve for wine bottles or as a shopping bag, among many other ideas.

(2) Ultra Pak, a tetrahedron-shaped single portion film package, offers exciting possibilities for packaging juices and syrups.

by Walter Stern

The 29th AMA Packaging Exhibition was a tremendously stimulating show — 365 exhibits spread over seven acres of Atlantic City's rain-shrouded Convention Hall. Which ones are truly significant to package designers has been far from easy to decide, and the 27,000 visitors pouring over 142,000 square feet of exhibition space did not make the task any easier. Another obstacle to picking out important packaging trends was a tendency among exhibitors to dramatize the obvious. While lavish space assignments were often given to firmly established materials and techniques, new developments were frequently hidden. The first commercially printed bottle label on vacuum metallized paper stock, for instance, was so completely disguised by a row of metal foil labeled bottles that even the attendants did not recognize it as significantly different from its surroundings.

Ultra Pak offers a new shape for containers

The same company, Leedpak, Inc. of New York, which last year showed an integrated manufacturing and packaging technique called All Pac (ID, April, 1959), this year has brought out machines to create an entirely new package—one of the most exciting at the show. The new package, Ultra Pak (above) is a tetrahedron-shaped single portion package produced on machines designed and manufactured by the Williams Stevens Corporation of Los Angeles. Leedpak's Ultra Pak Division will distribute it. Similar to Crown-Zellerbach's Tetrapak, it is a laminated film package created by sealing a tube at both ends with fins positioned at 90 degrees to each other. It offers entrancing visual possibilities.

VERSATILITY OF POLYESTER FILM OPENS WAY FOR BROAD USE IN SUPERMARKET

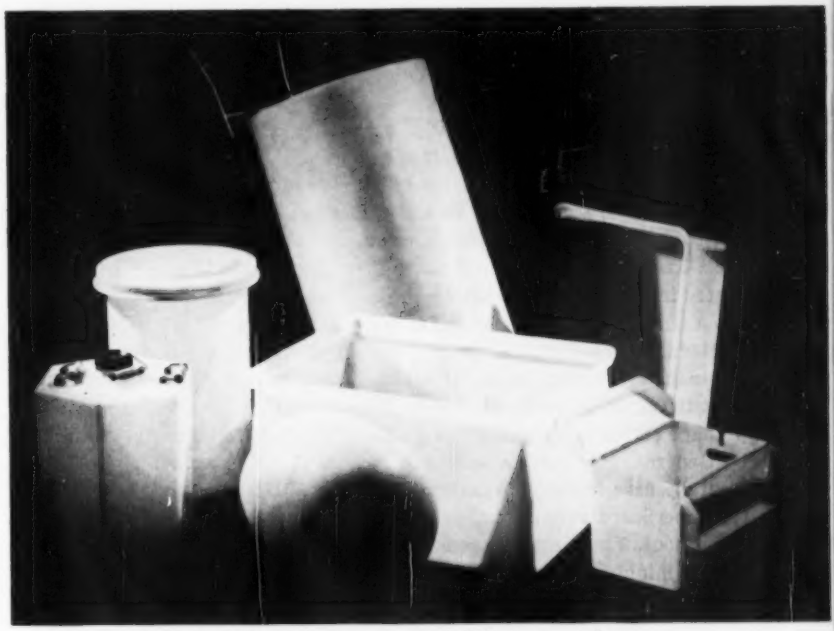
(3) Single-use nail polish package spurs impulse buying.

(4)Resealable nozzle unit among Minnesota Mining packs.

Polyester films: One group of films which should rapidly become part of supermarket packaging are the polyesters. Minnesota Mining and Manufacturing Company showed 21 different entrees, from chop suey to turkey à la king, packaged in polyester films for boiling-in-the-bag. Food processors who will use this film for boil-in-the-bag packaging are Armour, Libby, Excelsior Foods and Fox Deluxe Foods. Other applications for it include a single-use applicator for nail polish (3) and boil-in-the-bag frankfurters produced in endless strip form (5). Perforated score lines between individual packages eliminate the consumer complaint that pre-packaged items are either "too much" or "too little." Polyester film may soon turn up on trains and planes as well as in the supermarket. Investigations are now under way to package individual portions of liquor in polyester pouches with tear-off corners. Another polyester film package with a handle and a nozzle which seals itself after each use was also demonstrated (4).

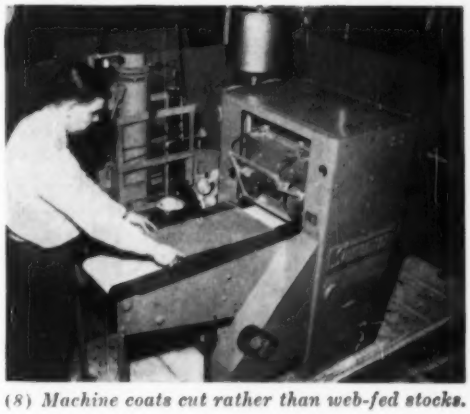
(5) Perforated score lines on boil-in-bag frank package allow consumer to select exact number.

Polyethylene films: Among the new applications for polyethylene is a shrinkable overwrap by du Pont used to bundle group-purchase items (7). Spencer Chemical demonstrated a series of containers (6) for industrial packaging and materials handling which were made from polyethylene by a unique fabrication process. The process, Thermofusion, heats powdered thermoplastic to the fusion point inside an inexpensive mold. The relatively simple nature of the process eliminates expensive tooling and allows thermoplastics to be formed into objects of almost unlimited size. Invented in Europe by Thomas Engel, the process is used there to fabricate articles as large as 10-foot boats and 500-gallon tanks. The Steinemann curtain coating machine (8) employs a unique method of coating paper with polyethylene by placing the paper stock on a continuous moving belt, assuring an even flow of the stock through the coater. As the stock passes through, a uniformly thin curtain of polyethylene is deposited on it. The advantage of this process is greater grease and scuff resistance and non-flaking.



(6) Unique thermofusion process fabricates containers.

(7) Shrinkable overwrap marks new use for polyethylene.



(8) Machine coats cut rather than web-fed stocks.

Helene Curtiss, who previously used the famous pillow pack or Nelipak (this is the same package which, as a colorful curtain of continuous strips of single-use pillow packs, contributed so successfully to the exhibition design of the Museum of Modern Art's recent packaging show), will now try Ultra Pak for single-use portions of egg shampoo presented in a carded six-pack. Reese Finer Foods is using it for a colorful assortment of six different flavor syrups (1), and National Dairy Corporation will test-market orange juice and non-carbonated drinks in a similar package, adding a built-in polyethylene drink "straw" which pops up when the package corner is opened. Ultra Pak is also being considered by General Mills and General Foods, and has been experimentally used in the distribution of Boraxo in a foil laminated paperboard version, which has an interesting reclosable pour-spout. The machine produces 160 eight ounce containers per minute, and points a dramatic finger towards greater use of plastics at the expense of metal and glass.

Because the package shape is based on an equilateral triangle, it poses entirely different distribution problems than does a rectangular package. The two methods so far tried are an octagonal box or wire rack, and a rectangular box with see-through window and triangular air space at each end.

There were a number of other packages for liquids which looked to be keen rivals to the glass and can market. Most of them followed the bag-in-box principle. Alcoa and Pneumatic Scale, for example, showed a bag-in-box for fresh frozen strawberries — which Crown-Zellerbach says will carry about 15 per cent of this year's western strawberry crop to the market. A related construction by Interstate Folding Box has an ingenious opening and pour-spout which cuts into the heat-sealed bag. Extensive investigation is now directed toward the packaging of true liquid products in this package. The bag-in-a-box should also be excellent for packaging gelatins, pudding desserts, dehydrated soups, dry cereals, pie crust mixes, dehydrated milk, and instant coffee.

Kaiser Aluminum Company has been working on an all-foil pouch with welded closure. Instead of double folds and adhesives, the pouches are joined entirely by pressure, which causes a molecular flow that welds the seams of the bag. This is particularly important considering that liquids under stress automatically exert the greatest pressure towards the weakest point in a seal. Another package for liquids, which made its debut last year under the name, "Solo Wrap," has made impressive inroads on the liquid container field. The "Expresso" system, handled in the U.S.A. by the Mead Corporation, offers the entire packaging process from accepting the collapsed container, to filling, sealing and closing the package in a single line process. This eliminates overwrap materials and liner bags. In all these cases, including Ultra Pak and the bag-in-box packages, the containers are formed at the filling site from flat sheet or roll stock. They are much lighter than glass and easily disposable without requiring the cumbersome machinery of handling the return of empties.

Cubitainer also has made impressive progress since its inception two years ago. For the first time, it is being tested in materials other than polyethylene. This should open the way for its use in the packaging of liquid food products, particularly if it can be successfully produced in polypropylene.

It seems obvious from these comments that the show once more demonstrated that plastic films furnish by far the most dramatic examples of aggressive exploration and solidification of research. According to one recent writer, "plastic resin manufacturers will be taking a closer look at the industrial packaging market's need and use of film during the next few years. This segment of the market looms as the next big area for the industry."

Polypropylene looks to a glamorous future

The most exciting film on today's packaging horizon is polypropylene. As glamorously described by the Sun Oil Company, "an inexpensive, flammable gas produced in petroleum refining has been transformed by science into the newest, lightest and very possibly the most versatile plastic in the world." The term "very possibly" is well used. At present there is little factual information to indicate what the future of polypropylene will be. But its truly remarkable qualities, as demonstrated at the show, may make this the most important plastic resin of the future. It has high tensile strength, high heat resistance, excellent electrical properties and chemical resistance, together with clarity, high gloss and good vapor barrier properties. At the show, the Enjay Company's exhibit illustrated many of the things to be expected of polypropylene. For instance, the possibility of heat-sealing two, four and six folds simultaneously and its imperviousness to boiling water (it does not noticeably soften below 280 degrees and does not melt below 350 degrees). Its considerable stiffness makes it ideal for high-speed automatic wrapping.

The exhibits of many resin producers and converters concentrated on the use of nylon in film form and in paper laminations, particularly in the packaging of bakery products. Advantages of nylon are its excellent gas and grease resistance.

Typical of the significant package news, which was almost impossible to uncover by casually scanning the teeming exhibits, was a technical development by du Pont that enables cellophane to seal at lower temperatures, providing faster overwrapping speeds. A bevy of smiling models completely obscured the fact that this new type of cellophane, New MSD-60, has been engineered to provide strong heat seals at temperatures at least 50 degrees lower than have been possible with other cellophanes. The film retains its good appearance, protection, and non-blocking properties, and the

Polystyrene film: An important use of this film, which many designers know only superficially, is in pressure sensitive tape. Considering that there are more than 300 varieties today and that many can be adhered at rates of 300 to 2,500 per minute, it is an important material to keep in mind whenever an otherwise insoluble packaging problem arises. The delicate labeling of tiny bottles as well as the reinforcement of large containers filled with iron and steel has been achieved with these versatile tapes at split-second speeds. Minnesota Mining, for instance, used a tear strip tape in the breaking of a whiskey bottle seal (9). In this case the 4½-inch tape eliminates the need for parting the plastic wax seal with a knife. (Obviously, such an expensive tear strip would be practical only on premium brands.) During the last year foamed polystyrene has been used in unique containers, considerably lighter than glass, extremely strong, inexpensive and practically unbreakable, with smooth, polished finishes (10). This material has rapidly gained in importance and is now used widely in the industrial packaging of everything from electronic components to typewriters. Sheffield Plastics, Inc. of Sheffield, Massachusetts, showed a whole range of new jars with unique insulating qualities caused by the cellular structure of the foamed plastic (10). Because of their texture, feel, and sheen, the appeal of these containers is extremely pleasant, soft and warm. One of the most ingenious applications for Dyna-Foam, an expanded polystyrene foam film, was displayed by the Dixie Cup Division of American Can, who used a band of it on a polyethylene lined paperboard cup to provide insulation and reduce outside cup temperatures (11).

(9) Pressure-sensitive tape is used for seal break.

(10) Foamed polystyrene makes lightweight inexpensive containers.

(11) Dyna-foam band acts as insulator for handleless paperboard cup.

lower temperature seal means that the film needs less dwell time in contact with heater plates. This development has meant improved machine efficiency, more trouble-free production and lower packaging costs. Du Pont indicates that tests with New MSD-60 show speed increases of as much as 10 per cent on bread wrapping machines.

Polyethylene shown in many new applications

Important developments in polyethylene films were shown by several producers. Dr. George Ham of the Spencer Chemical Company, Kansas City, demonstrated a new "polymorphous resin." The polyethylene film produced from this resin has unique clarity and toughness due to a singular structural balance of long, relatively unbranched molecular chains of high weight, coupled with highly branched chains of lower molecular weight. Upon extrusion the long chains crystallize into a network of "ordered" regions. However, the growth of these "crystallites" is confined by the presence of the highly branched chains. The significance of this situation is that it gives polymorphous film a low percentage of crystallinity (about 50 per cent) which means good impact strength. Unlike previous resins, it also has the small crystallite size which creates good clarity. According to Dr. Ham, the new material may be likened to polyethylene coated glass scrim (glass-fibre webbing). When this material is subject to impact, the polyethylene coating distributes the stress and the glass scrim absorbs the impact. This development again expands the range of properties that the polyethylenes offer and, at the same time, the range of possible applications.

Another new development in polyethylene is the Steinemann curtain coating machine (8) which is capable of coating cut sheets of paper and paperboard with low-molecular weight polyethylenes. Until now, the application of polyethylene to paper has been entirely limited to continuous or web-fed stocks. The coater was exhibited by Eastern Chemical Products, Inc., a subsidiary of Eastman Kodak.

The Print-A-Tube Company of Paterson, New Jersey showed a new combination of polyethylene on Mylar, particularly advantageous in skin packaging. Skin packaging is still relatively new, and machinery available to produce it has certain limitations. Heretofore, films have usually been of heavy gage. The average film today ranges from 5 to 7½ mils in thickness. These films require a dwell time of 15 to 40 seconds under the heater. Also, since such film is wound on a 9½ inch diameter roll, it is almost time to change the roll just when the packaging operation has started. That is why most of today's films are in sheet form. But even sheet film has to remain under the heater for up to 30 seconds, and the vacuum has to be pulled for 10 to 20 seconds. This makes for fairly slow production rates in most skin packaging operations. A comparison made by Print-A-Tube on the very thin polyethylene-on-Mylar film showed that "several thousand feet" could be wound on a roll, thus making frequent changes unnecessary. The dwell time under the heater for this combination is only about 2 to 6 seconds, and the time for pulling the vacuum about 3 to 6 seconds.

Since polyethylene resin-coating over a specially treated sheet of Mylar polyester film can be wound in rolls of great length — requiring only a few seconds for heating and drawing the vacuum — equipment could conceivably be built to speed up skin packaging operations considerably. Print-A-Tube says that this combination is stronger than currently used materials, yet costs less than most of them. It has greater shelf life, longer lasting sealing qualities, and, most important, eliminates the need for coating and perforating boards. Theoretically, it could double production on existing equipment, and, through the use of automatic controls, make possible greater efficiency and even automation in skin packaging.

A particularly fascinating polyethylene film development, though of limited application, was the scented polyethylene film demonstrated by United States Industrial Chemicals Company. The four scents demonstrated were unquestionably clear and powerful, and might be used in textiles, gift items, clothing and some food products.

Du Pont offers Vexar polyethylene netting

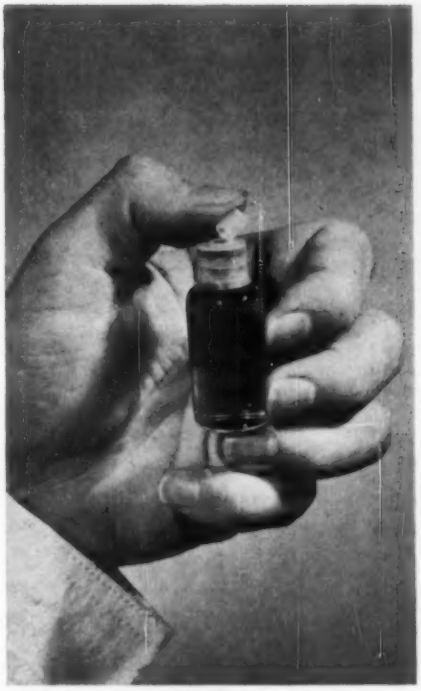
An exciting and extremely versatile material shown for the first time is Du Pont's Vexar, a polyethylene netting (2) manufactured by a new process in which the polyethylene polymer is extruded directly into net form by means of a series of revolving, reciprocating nozzles. The process allows great latitude in mesh size, filament diameter, design, pattern, and color, and the tubular netting shows outstanding flexibility, chemical inertia and resistance to moisture, rot and mildew. The production of this material has progressed beyond the exploratory stage, and marketing plans include presenting it as a decorative sleeve for wine bottles, as a substitute for shopping bags in supermarkets, and for bulk packaging of produce now enclosed in the rather unsightly semi-opaque polyethylene bags.

Polystyrene has bright future in supermarket

Polystyrene film has also entered its adolescence if not maturity. Its sparkling clarity and superb transparency, combined with an unusual degree of stiffness, make it an ideal automatic overwrap and packaging medium. Its use on bakery goods and supermarket prepacked produce and meat cuts has been limited, but should increase greatly in the near future. Plax Corporation's "Polyflex" and other heavy-gage styrene films were also demonstrated in many different applications for thermoformed containers, or as transparent formed domes for foil trays used in the packaging of ice creams, fruit, produce, sea foods, fowl, and unit portions for jams and jellies.

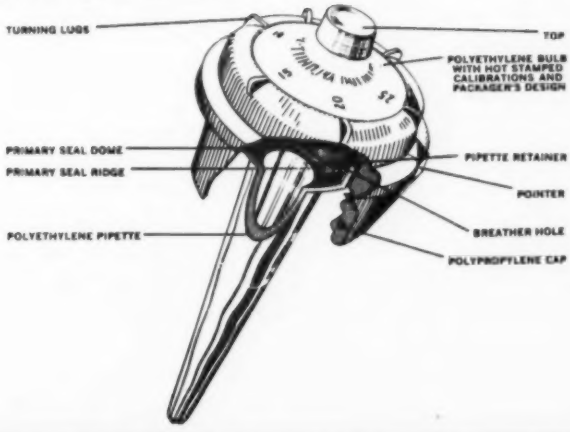
Last year's packaging show included an extruded, low-density, expanded polystyrene foam film, called Dyna-Foam, although examples of applications for it were limited. Now a distributor and converter licensed by the International Research and Development Company (Dyna-Foam Corporation of Ellenville, New York) has taken over its production and presented it at the show in various colors and embossings,

Closures and dispensers: Owens-Illinois' Kimble Glass Division has solved the problem of tamper-proof protection for parenterals with a pre-scored polyethylene snap-off top (12). At the same time, Alcoa has developed a radically new aluminum closure for injectables called the Push-button Stericap (13), which also combines instant opening with complete product protection. This one-piece aluminum cap, formed in a single operation, features a small button in the center. To expose the sealing medium (usually rubber or neoprene), the button is pressed with the thumb and breaks loose from the cap. Thus the sealing medium is kept completely free from superficial contamination, and the closure allows for one-hand opening. Another interesting cap-dispenser combination, which can be set to eject any desired dose, is the Dosamatic dropper (14), manufactured by the Dosamatic Dropper Corporation of Valley Stream, New York. Here a positive primary seal is automatically formed when the polyethylene pipette and screw cap are screwed down on the bottle. Because the primary seal is combined with the dropper, considerable expense can be saved over the present system of side-by-side packaging. Dose calibrations are hot-stamped on the polyethylene bulb prior to assembly. The user need only rotate the bulb to set the desired dose and then dispense metered quantities.

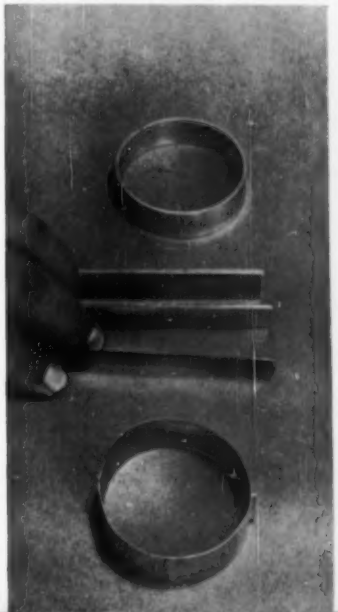


Plastic snap-off top (12) eliminates contamination; metal top (13) uses similar idea.

(14) User rotates bulb to set dose.

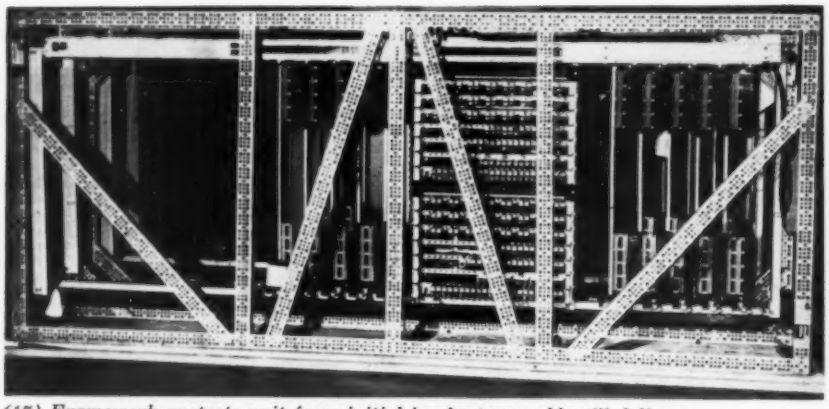


Strubing: This light-wall, seamless metal tubing (15) can be shipped in ribbon form and then inflated at point of use by hydraulic or air pressure or by mechanical expansion. It may be cut in either flat or inflated form, and comes in sizes as small as a lead pencil.

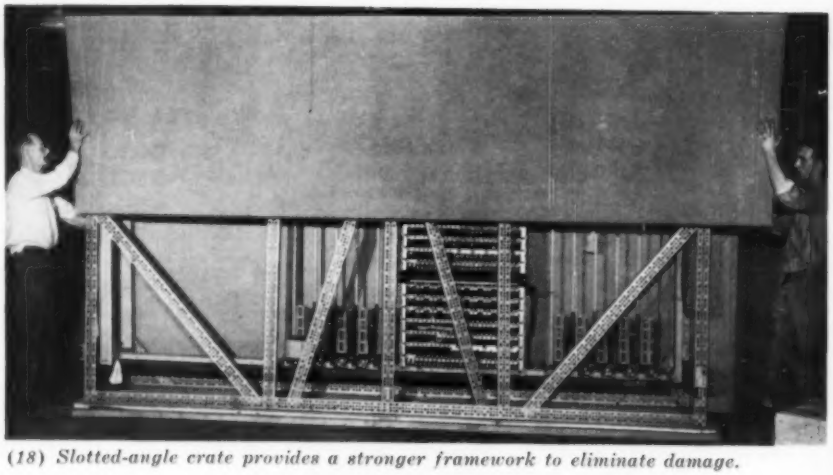


METAL SLOTTED-ANGLE SHIPPING SYSTEM RADICALLY CUTS COSTS AND WEIGHT

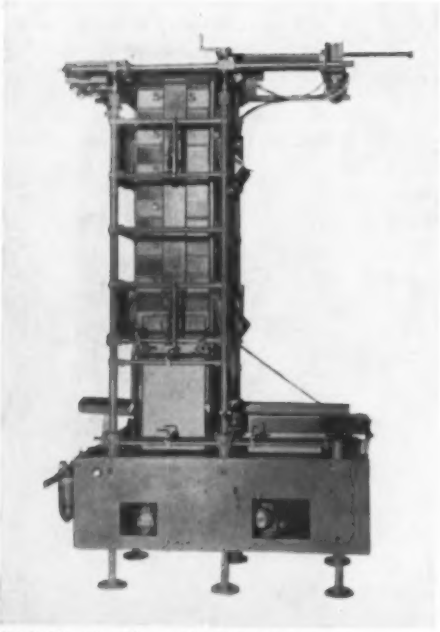
Heavy consumer and industrial packaging. Two developments most significant in this area are the Standard-Knapp Vertiseal compression unit (16) and the Acme Steel Aim Brand slotted-angle frame shipping system (17-19). Vertiseal is an air operated unit with an eight-foot lift. Its primary purpose is to seal corrugated cases on a vertical, rather than horizontal, plane for considerable space savings. The unit also serves as an elevator for sealed cartons to a second story. The Acme Aim Brand system represents a revolutionary replacement of wood with metal as the framing material for the shipment of heavy items. Typical savings which the new system offers are seen in the crating of a C-47 aileron. Here it reduced shipping costs from $267 to $179 and tare weight from 408 pounds to 285 pounds, resulting in a yearly savings (in spite of double material cost) of $135,250 on this single item alone. Another advantage of the system is that it can make innumerable round trips, since it may be unbolted and shipped back flat. And it is conveniently assembled with standard ⅝-inch structural bolts.



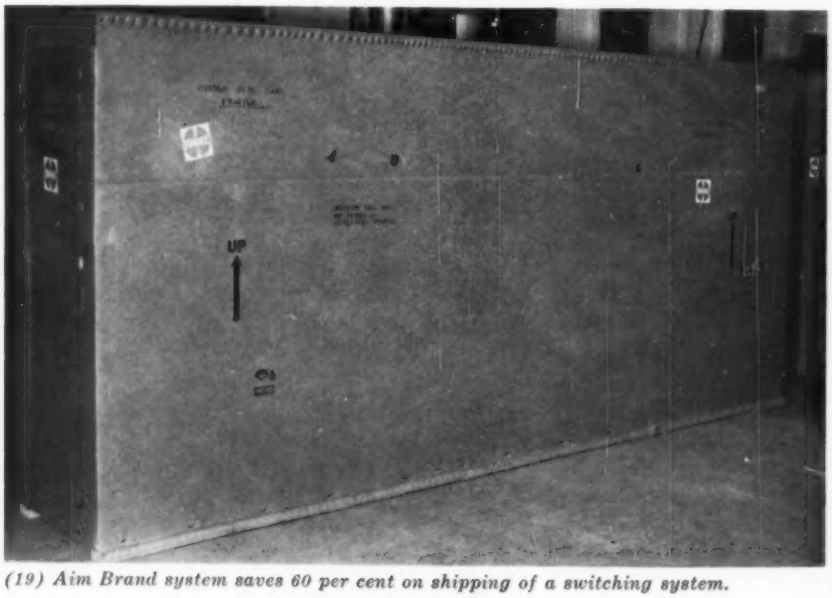
(17) Framework protects unit from initial in-plant assembly till delivery.



(18) Slotted-angle crate provides a stronger framework to eliminate damage.



(16) Vertiseal's vertical system saves space.



(19) Aim Brand system saves 60 per cent on shipping of a switching system.

and as an insulated bag said to keep ice cream firm at 90 degrees for two hours. The intriguing sheen of the satin finish is tremendously appealing; it is an effective insulator with a low transmission factor even in thin sections, an excellent shock absorber, and completely waterproof. It may be printed on by means of either silk screen or flexography. It heat-seals well, die cuts easily and can be embossed or thermoformed without difficulty. Its weight of 4 to 10 pounds per cubic foot is extremely low and at present it is available in film, sheet, lay-flat tubing, pipe, rod and other special shapes.

In the field of expandable polystyrene, both Sheffield and Hermsdorf Industries (Manchester, N. H.) showed perfected semi-automatic machines for producing articles molded of this material (11).

Colored glass available in custom quantities

So much for films and plastics. The glass people have not been asleep either. Now they are offering an entire range of new transparent colors in comparatively low runs. While the concept of colored glass in packaging is far from new, it has only been practicable for large-quantity production. The W. Braun Company has made facilities to produce glass bottles in specified colors in much smaller quantities. What makes the development particularly interesting to the industrial designer is that Braun has sample colors ranging from a deep purplish magenta to a pale wintry yellow, and has set up a small test furnace for producing special colors to the designer's specifications in small test batches of a few hundred pounds at a commensurately modest price. This enables the client to see how his product appears in the actual colored glass, instead of having to resort to the inadequate artificially stained lucite models normally used, or the even less attractive method of thermo-forming and heat-sealing two colored sheets of styrene.

There is an interesting sidelight to these unique facilities. In order to check the glass from the test furnace, Braun had to set up two single-section machines and the glass had to be hand-gathered in the machine to sample with greatest facility. Braun was able to do this because their Hartford City, Indiana plant was until recently entirely devoted to hand blowing and pressing by the hand-gather process. Now they have found that, in addition to sampling colored glass, these single-section I.S. machines can be automatically run to produce a few thousand pieces of "giant" display bottles at a most reasonable mold cost and still more modest quantity of clear flint and color. Interesting too is the plant's versatility in being able to press as well as blow, by hand as well as machine. Questioned as to relative costs and quantity requirements, Braun could not describe a definite price formula because they must consider at least three variables: total quantity, the size of the product, and the color itself. We understand, however, that since the colored bottles can be run on the same high-speed, automatic bottle-blowing machine on which Braun blows flint glass, the color differential can be held to as little as one and a fraction per cent over clear glass under the most ideal combination of these three variables.

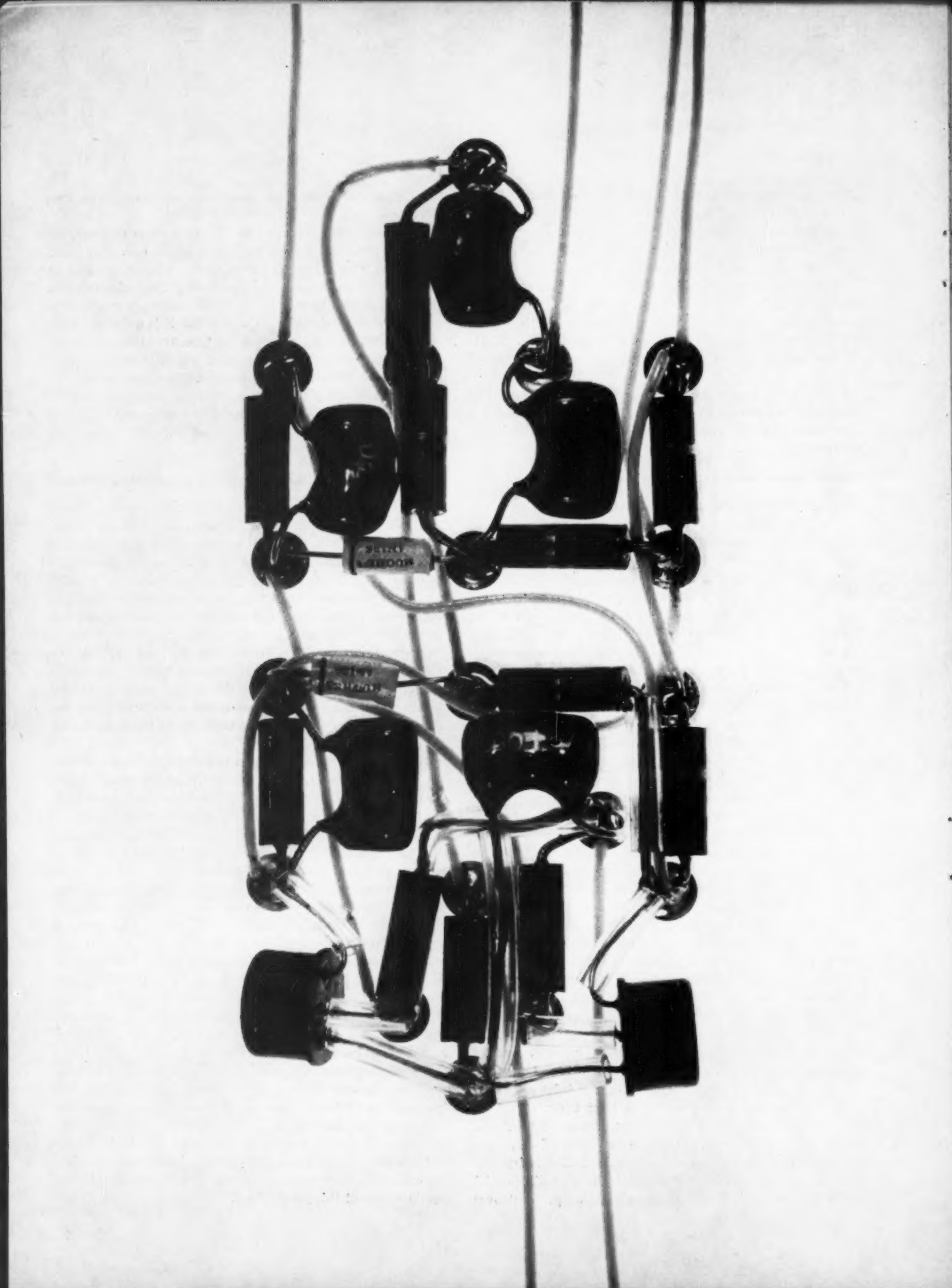
The glass-making process at Wheaton Glass Company of Millville, New Jersey is an entirely different one. Here glass is covered with a low heat-fired acrylic lacquer, sprayed in transparent or opaque colors, and fired at approximately 300 degrees. Liquor-and-washproof, the Wheaton spray probably will not withstand severe handling, but it is quite economical. The coating is a thermosetting type. It resists the attack of most commercial chemicals, and will withstand most of the standard methods of sterilization. The containers can be silk screened and will easily accept most commercial labels. Both Braun's and Wheaton's methods are considerably less expensive than Owens-Illinois fired ceramic spray, but Wheaton's is obviously less durable.

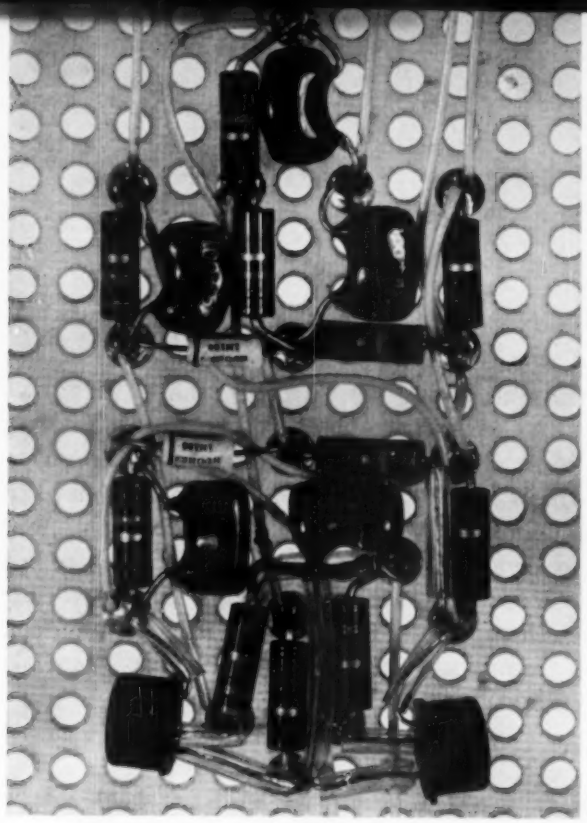
Metalized paper shows versatility in printing methods

In the vacuum metalized paper field, the Champion Paper and Fibre Company exhibited Vaculite, an unusual material with a highly reflective metal surface which prints like any other paper (ID, November, 1958). The Brown-Bridge Mills of Troy, Ohio exhibited Vaculite printed both in offset and letter press, and Champion demonstrated samples in full color letter press, offset, and gravure with varying degrees of success. Vaculite is actually a base paper to which a mono-molecular coating of aluminum has been applied. The metal is vaporized in an almost complete vacuum, and emits clouds of gas very similar to steam. The paper is passed through this cloud and because it has a cooler surface, the molecules condense and adhere naturally to the paper's surface.

Another exciting development in the metals field is Strubing (15) — or strip tubing — the inflatable metal tubing (ID, August, 1958) produced by the Wolverine Tube Division of Calumet and Hecla Inc. of Allen Park, Michigan. It will enter commercial production sometime this summer. Strubing is a light-wall, seamless metal tubing that can be shipped in ribbon form and inflated at the point of use. Used as a packaging medium, Strubing might make an excellent foil pouch for liquids. Its rolled rather than heat-sealed edges would make an especially reliable bond for a liquid-carrying package. And Strubing's field inflatability may make it possible, for instance, to ship the entire duct work for the heating system of a seven room house in a box the size of an orange crate, instead of in trailer truck loads. A Strubing ribbon might be strung through the house and then inflated right in place — for a major saving in time and effort over conventional installation of duct work.

The number of professional designers intensely searching the AMA show, and the unusual number of manufacturers interested in their requirements and aware that a successful package is produced by aiding the designer, give a strong indication of greater mutual understanding. This, in a year of increasingly complex and highly specialized technological developments, impresses us as one of the most significant developments at this year's show.



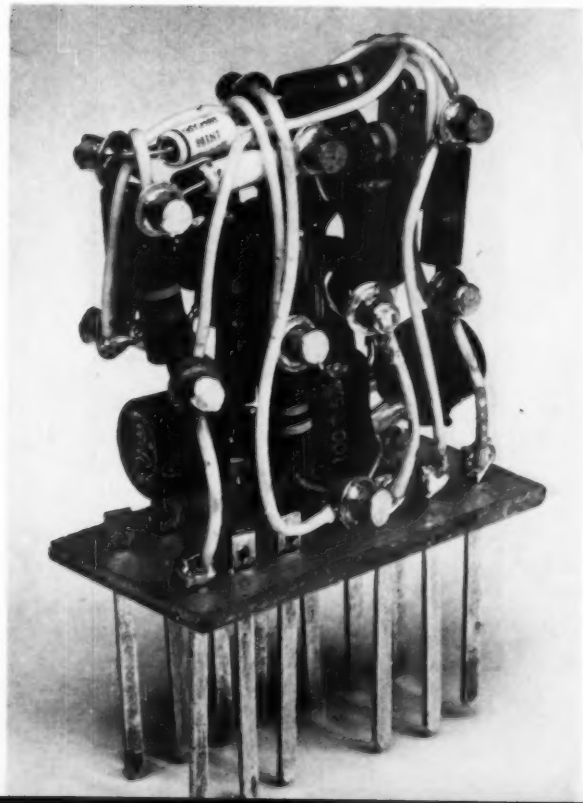


1.

Surprising structures

The configurations on this spread were not intended to be visually striking or to convey a sense of artistic order. They simply emerged as part of a process that General Electric's Heavy Military Electronics Department devised for the assembly of tiny electronic parts. Previously the joints that link such miniaturized parts as resistors, condensors, and transistors had to be hand-soldered—a tedious, difficult, and dangerous problem, even for production workers skilled in miniaturization. GE's new process—which uses eyelets, a glass-base epoxy pegboard, and a machine that can inundate a surface with flowing solder—is as safe for the hands as the new detergents claim to be. The leads to be connected are brought together in eyelets that have been inserted in pre-designated pegholes of the glass base board. When the board is flow-soldered in a special machine, the eyelets fill with solder and all connections are made. In addition to safety and convenience, the process brings beauty in its wake: when the assembled horizontal circuit **(1)** is lifted from the board—later it will be folded in two, attached to a terminal strip **(3)** and, encapsulated, used as a circuit module **(4)** — the result is a striking, accidental pattern like **(2)** on the left.

2. 3.



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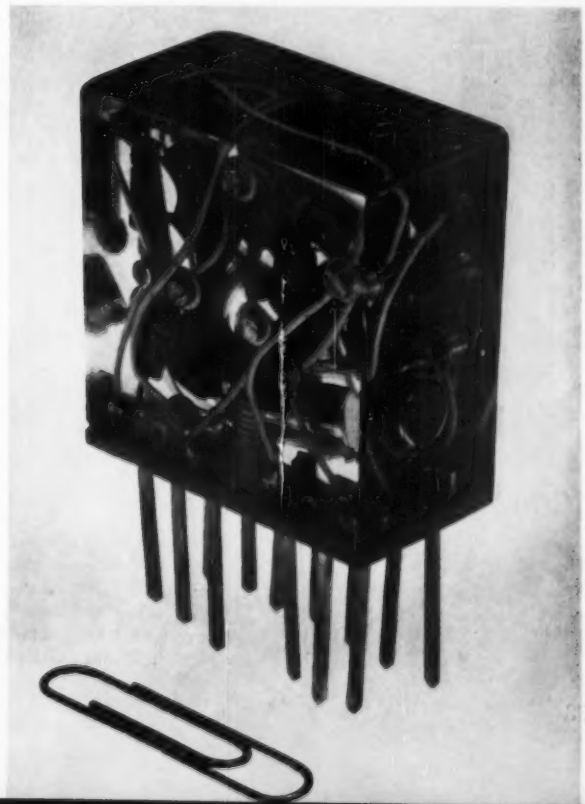
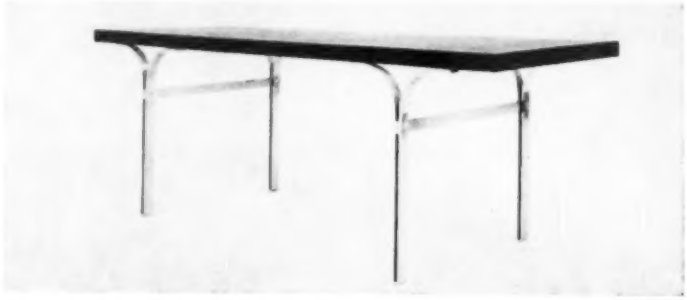
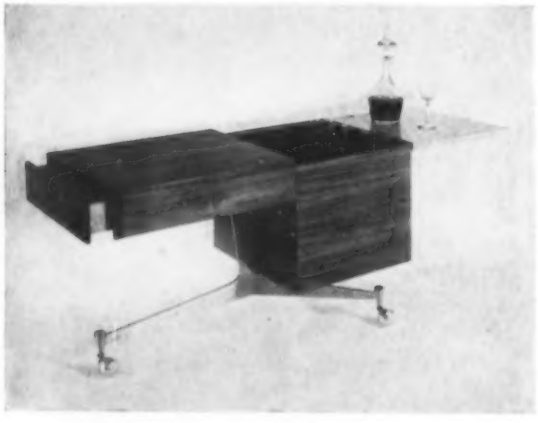


Home and Office scarcely mean anything as furniture categories now that the same couch can add status to the vice-president's office and distinction to his home. The constant element in much of this double-duty furniture is the use of metal for the base in the form of bracketing straps or pedestals and tripods. This eliminates the elaborate joinery of wood and simplifies assembly, but creates new problems in joining and combining. For one thing, the sleekness of metal seems to require luxurious accompanying materials — like glove-soft leather—but it does not always get them. When it doesn't, the result may look more like an arbitrary departure from wood than a logical new direction.

Avard dining table or drawerless desk has black leather-wrapped top on a base of continuous satin-finish stainless steel bands. Dimensions, 28" by 78" by 28" high. Designer: Darrell Landrum.

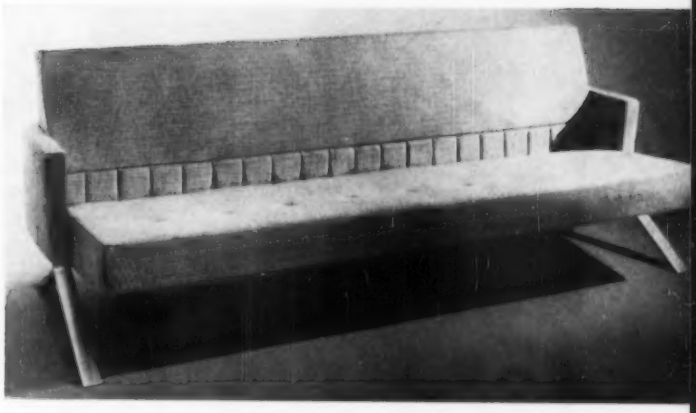


Grosfeld House bar cart of walnut veneer with flip-top Formica counter is supported by polished steel tripod base on Shepherd casters. Designer: Vladimir Kagan.



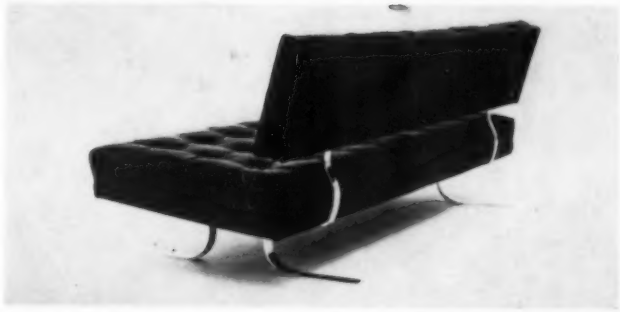
Knoll Associates petal table and center-vent stacking chair (pedestal of stacked chair slides into vent) have plastic-coated metal bases. Designer: Richard Schultz.

Lehigh stools with tufted, pleated, or plain seats are part of Column-X line; cast aluminum bases derive from Mies van der Rohe principle. Designer: Ward Bennett.



Helikon foam rubber sofa is suspended from, rather than supported by, splayed-leg steel base which is akin to structural steel trusswork. Designer: Robert Becker.

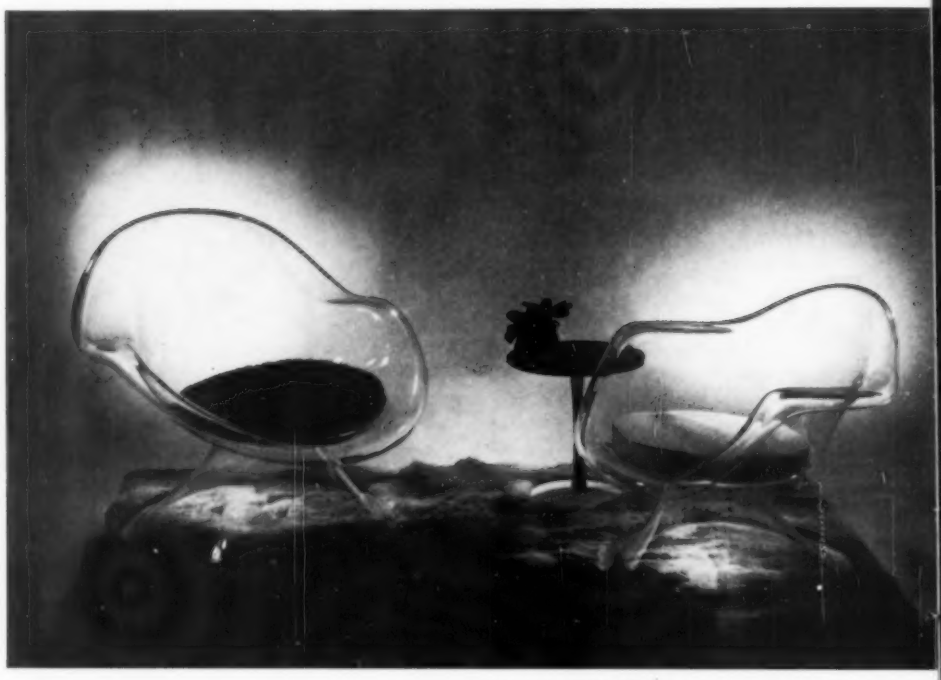
Albano lounge chair of handsewn leather cantilevered from column formed by high-polish stainless steel bands. All three dimensions are 28". Designer: Nicos Zographos.



Avard sofa of button-tufted glove leather has base and back-connection of mirror-finish steel bands whose curves supply resilience. Designer: Darrell Landrum.

Sitting Down, which is supposed to take a load off one's feet, actually seems directed, in the design of current seating, more toward the mind. Some chairs are intended to lull the sitter into a semi-comatose condition, even to put him to sleep. At the opposite pole, others seem intended to keep him perpetually alert by continuously challenging his sense of equilibrium. Office seating, however, strikes a balance between the two, and, in the bargain, reassures the sitter that eight hours in a bent position will not leave him permanently so.

Georg Jensen armchair is cozily affectionate, puts the sitter in the lap of a teddy bear. Tweed with leather headrest and paws. Designer: Hans Wegner.

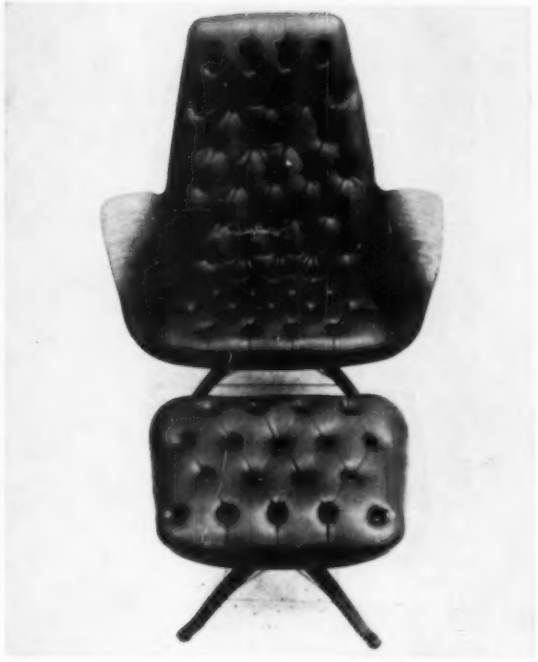


Laverne invisible armchairs molded of clear plastic are for people who like unobstructed views. In two versions. Designers: Estelle and Erwine Laverne.

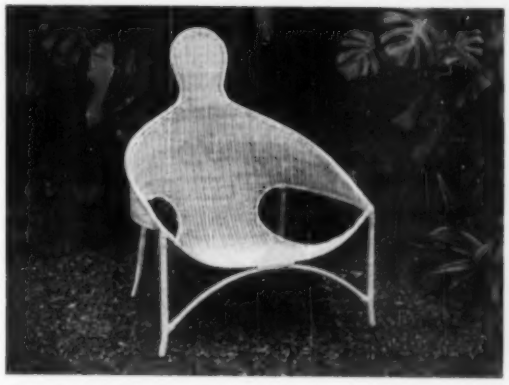
Thonet sidechair for office and institutional use has chrome-plated base; seat and back are of wood, Formica, or fabric upholstery. Designer: H. von Gustedt.

Taylor Chair office seating is of lacquered or oiled walnut plywood with foam rubber cushioning covered in leather or fabric. Designer: Leon Gordon Miller.

Troy Sunshade chair with removable canopy top has aluminum frame with baked-enamel finish in choice of five colors; fabric is Saran. Designer: Herbert Saiger.



B. G. Mesberg "Mr. Chair," with swivel base, and matching ottoman have laminated walnut shells, upholstery of vinyl over foam rubber. Designer: George Mulhauser.

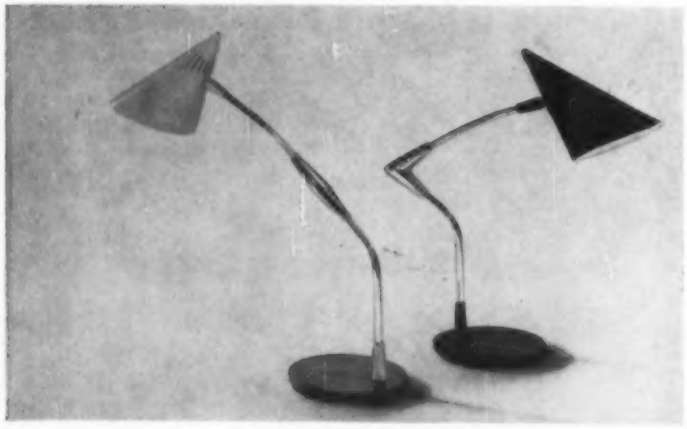


Decorative Imports lounge chair is rattan with clear vinyl finish on galvanized frame. Made in Hong Kong; designed by an American: Francis Mair.

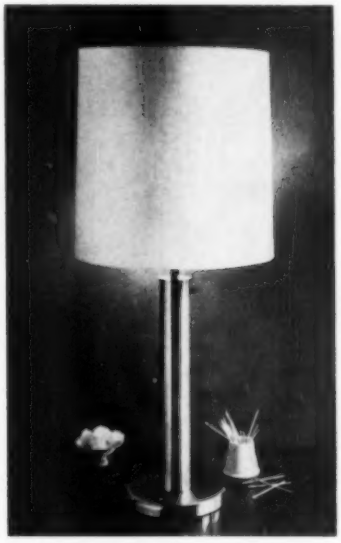
MB Designs executive chair has walnut-clad steel pedestal base, vinyl upholstery over lamination of polyfoam in varying densities. Designer: Martin Borenstein.

Plycraft molded plywood chair has seat and back that tapers from 15 ply down to 5 ply; arm is based on George Nelson's pretzel chair. Designer: Norman Cherner.

The Source of Light, as a visible interior design element, has lost none of its popularity even though built-in area lighting—in the form of downlights, valance lighting, and luminous ceilings—has taken over much of the job of general illumination. A number of new fixtures are designed, in one way or another, to focus light on a specific object or surface. Sometimes the purpose is to dramatize, but just as often it is intended simply to put the nimbus where it is needed.



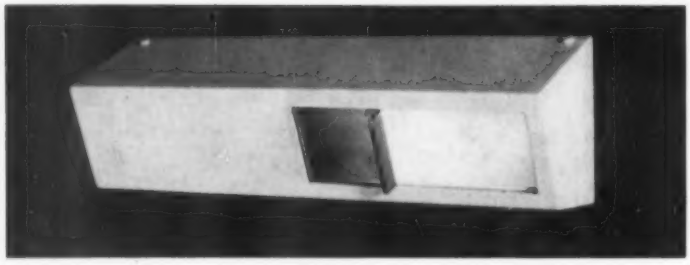
Lightolier take-off on the gooseneck desk light swivels at base and head and has a double-jointed elbow for wide-area or close work. Designer: Maurice Tempestini.

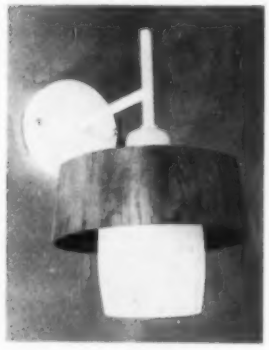


Nessen table lamp is a simple brass cylinder on an 8-inch brass base; available in brushed, polished, or satin-chrome finish. Staff design.

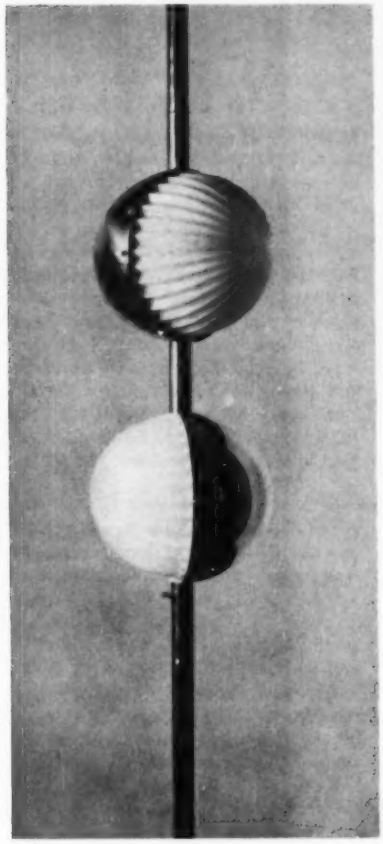
Koch & Lowy wall light combines hand-blown Swedish glass diffuser with a canopy of oiled teak. Metal mount is enameled, brass, or satin-chrome finish. Staff design.

George Tanier bed light is white-enameled steel with brass slide opening that adjusts light and also functions as on-off switch. Designer: Pierre Disderot.

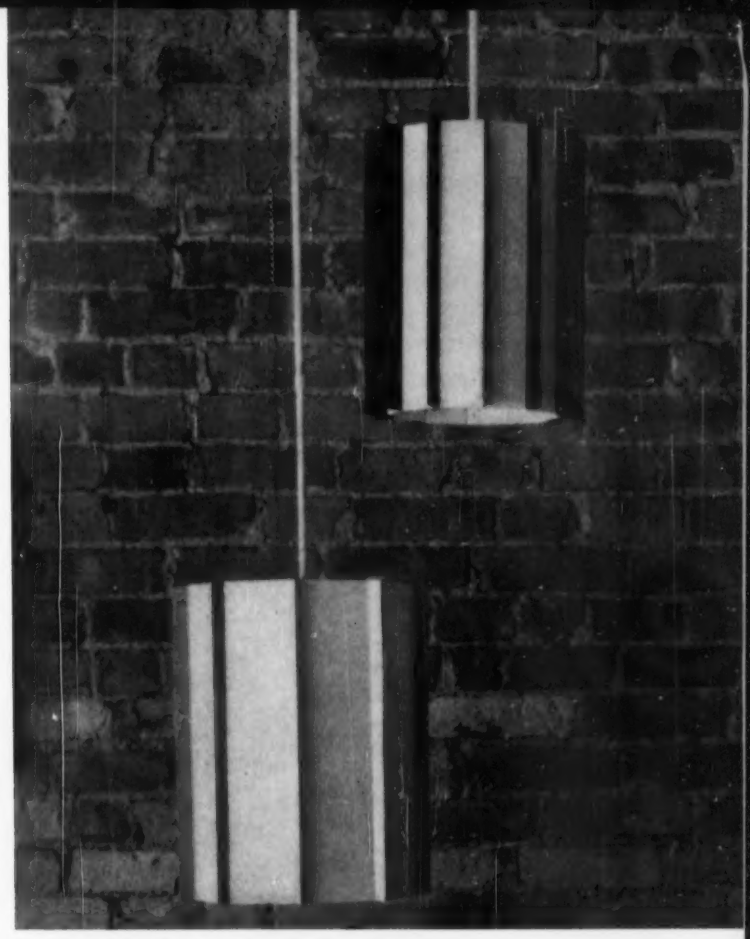




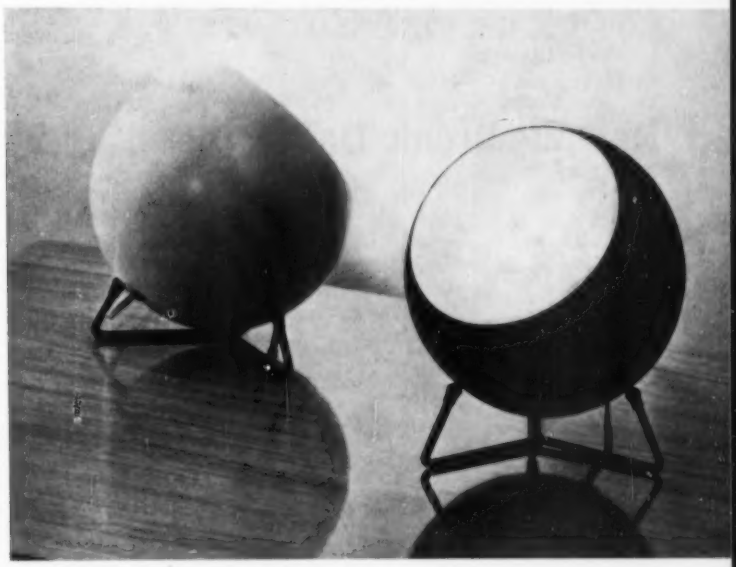
Horizon pole light is strung with spheres that revolve independently, a full 360 degrees. One half of sphere is vacuum-formed styrene, other half is brass-plated or enameled steel. Designer: Michael Lax.



Harry Gitlin floor light illuminates plants, paintings, ceilings, draperies, from below. White cannister with black interior; takes a "reflector-type" bulb. Staff design.



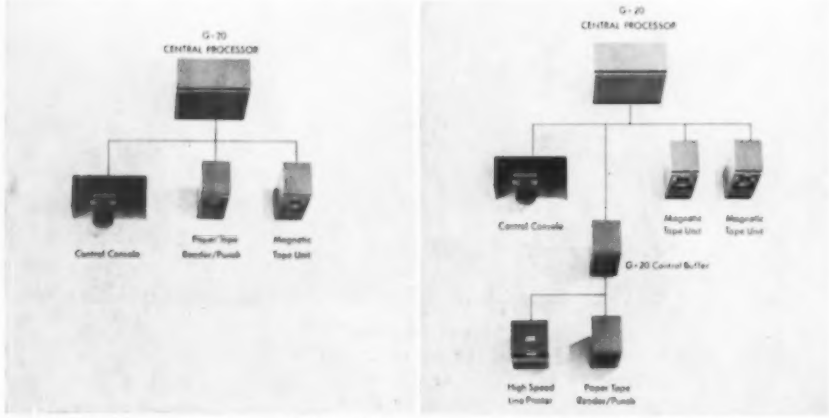
Harry Gitlin hanging fixture is made of three-sided metal pans spot-welded together to form finned cylinder. White with white or colored fins in varying depths, depending on depth of pans. Staff design.



Harry Gitlin re-designed "eye-ball" light is now meant for use as floor fixture. It takes 75- or 150-watt PAR 38 lamp with spot or floor beam. Staff design.

Highly simplified control console of the new Bendix G-20 system.

New Electronic Data Processing Systems



Model of basic G-20 system. Right, addition of control buffer illustrates modular expansion and versatility of system.

Several years ago the arrival of a single new electronic data processing (EDP) system was heralded as an event; today it is simply an installment in a serial story. In recent months, a number of manufacturers of EDP systems have announced new and improved designs of their present models. In general, the new versions are cheaper, more compact, easier to operate and program, and faster and more capable. All of them are transistorized, and they range in price from the small and comparatively inexpensive models ($25,000 to $30,000), designed to attract new business, to the huge $10 million systems that will be used to solve the problems that have occurred in new areas of research such as outer space calculations and world-wide weather forecasting. In many cases individual manufacturers are marketing systems in several price ranges in order to satisfy the different requirements of the small, medium, and large corporations.

The new systems' simplified programming results from their ability to accept information in ordinary English and mathematical terms instead of the specialized computer language which was previously necessary. Many of their operations can be programmed automatically, and they can use shorter programs because a number of commonly used arithmetical and logical results are stored within their circuitry, and therefore need not be repeated for each individual program.

The largest and most expensive of the new computers is able to perform over a million logical operations per second; the speeds of the smaller units are also higher than those of their parent generation. Parallel to the increase in speed has been the increase in memory capacity. This has been achieved partly through the use of external memory storage units in addition to the primary internal ones.

Most of the new systems have a multiple input and output set-up so that they can accept information from paper tape, punched cards, magnetic tape, and an electric typewriter, and deliver information on output versions of these units.

A brief examination of some of the new EDP systems follows.

Bendix G-20

The Bendix Aviation Corporation's new EDP system, the G-20, will serve a wholly

different segment of industry from its G-15 system which is presently on the market. The G-20 is a high-speed, solid-state, general purpose system that sells for $300,000. It will be suitable for both commercial and scientific applications. It is capable of 45,000 operations per second, and has a flexible, random-access (accepts data in any order) magnetic core memory storage system that is capable of being expanded into 8 modules, each with a memory storage of 4,096 words. The use of a magnetic core allows a much higher speed of operation than the magnetic drum of the G-15 because the time required to locate and use particular bits of information is greatly lessened.

The G-20 is provided with a simplified and fast method for programming. Both fixed point (operation with a specific number of digits wherein the position of the decimal point is constant) and floating point (permits varying positions of the decimal point) operations are available. The commands may be written in variable length, and in algebraic or symbolic form. This latter feature permits the program to be written in a language familiar to the programmer.

The significant degree of simplification of the new G-20 system is reflected in the control console, which no longer contains the masses of lights and switches that are commonly associated with such units. This is made possible by a special internal supervisory program located in the central processor and known as the Executive Routine. It schedules the assignment of problems to various accessories, and is able to move programs and data around in the central processor's memory, and keep track of which accessories may be temporarily out of service. It will also provide a record of the operation of the computer, and if there is a failure somewhere in the circuitry, the Executive Routine will localize it, sound an alarm, and instruct the typewriter on the control console to identify the faulty part. At the same time it automatically reschedules the program and the processing continues without interruption or time lost. As a result of this refinement, most of the operator's duties consist of loading and unloading the input and output equipment.

Another design feature of the G-20 is the use of "control buffers" as subordinate, small-size computing sections which are able to execute complex programs on their own. Under the supervisory direction of the central processor, the control buffer, which can be located as much as 1,000 feet away, is able to accept information from its own input unit, use its own storage and logic sections to solve the problem, and present the answers on its own output equipment. This permits the central processor to solve other problems, or to instruct other subordinates. Further, the utilization of control buffers allows the system to be expanded whenever necessary.

Compared to the size of other systems in its class that are presently being used, the G-20 is small; the central processor, for example, is 66 inches wide, 28 inches deep, and 64 inches high.

RCA 301 and 601

RCA has recently announced two new EDP systems that, together with the RCA 501 (see ID, November 1959, pages 52-55) with which they are fully compatible, will provide a complete range of computer service. The new 301 is a completely transistorized, general purpose system for medium and small business firms. Like its big brothers, it is designed on a building block concept so that it can be expanded to meet varying user requirements. A new feature of the 301 is the use of a magnetic disc memory system, similar in appearance to 45 rpm records, for its memory storage. Up to five disc files, each holding 128 discs with magnetic recordings on both sides for a capacity of 4½ million characters, may be incorporated in one 301 system.

The other new RCA system is extremely fast (it can make ⅔ million decisions per second), and has a very high memory capacity (it can be expanded up to 262,000 characters in a basic unit, and up to 64 additional tape stations can be added, each with a capacity of 20 million characters). It can recall a fact from its memory in 1.5 microseconds. The modular design of the system will permit it to handle 20 independently written programs simultaneously. The 601, which will rent for over $20,000 monthly, will be suitable for the largest and most complex business and scientific applications.

IBM Stretch

IBM has recently announced that it is building what it considers the fastest and most powerful EDP system in the world.

Magnetic memory discs for RCA 301.

The 10 million dollar system, known as Stretch, will have a speed of a million operations per second. And, although it is 75 times more powerful than the IBM 704, it will be installed in the same floor space. The Stretch system will be applied to the solving of space research problems that involve trillions of calculations, and to long-range forecasting of weather on a worldwide basis. It will also be used to mathematically simulate the operations of very large corporations in order to permit long-range planning on a faster and more accurate basis. The great speed of Stretch is made possible by an assembly line organization in which all sections of the central processor operate simultaneously, as well as by multi-programming techniques. In order to make this great speed usable, the memory capacity must also be enormous. In a typical system, with six magnetic core storage units, the capacity is 1.5 million decimal digits; data can be retrieved in 2.18 microseconds.

A special Exchange computer is used as a switching center for the multiple input and output units. It routes information between the internal system and as many as 32 channels, each of which handles the many input-output devices. Stretch also incorporates a "Look Ahead" device that automatically anticipates instructions and data requirements and prepares the system for tasks to come. Another design

Monrobot Mark XI system.

Packard Bell PB 250 system.

feature is an "Interrupt" section that enables the system to put aside what it is doing and turn to special tasks requiring immediate attention. Programming of the system is also simplified because it organizes itself automatically for the most efficient use of its components.

IBM has also announced a computer tape system, known as Tractor, that will read and write information at a speed of 1.5 million characters per second. This is the equivalent of almost four full-length books in one second. It will store 60 billion characters. Tractor employs magnetic tapes that are wider and have a greater density of information per inch length than conventional tapes. At the present time, its application is classified.

Honeywell 400

The new Honeywell 400, manufactured by the Minneapolis-Honeywell Regulator Company, embodies many features of the high-speed, high-priced (one million dollars) Honeywell 800, but it is a substantially cheaper system applicable to medium-size businesses. It uses the same magnetic tape units, the same high-speed printer, and card readers and punches.

However, the less sophisticated 400 has a much smaller memory, and lower speed —6,000 operations per second as compared to 30,000 for the 800. And, as is usual when one company manufactures more than one EDP system, the 400 is also compatible with the 800 in its programming methods, so that it will be easily expandable when conditions require. The magnetic tape unit has a transfer rate of 96,000 decimal digits per second. It employs air pressure and vacuum to transport and stop the tape instead of the conventional mechanical methods. This is said to reduce the stresses in the tape during acceleration and deceleration, and to eliminate skewing of the tape. Cost of maintenance is also reduced. The basic 400 unit, which includes the central processor, four magnetic tape units, the printer, and the card reader, rents for $8,660 per month.

Monrobot Mark XI

One of the smallest of the new systems is the Monrobot Mark XI, manufactured by the Monroe Calculating Machine Company. Selling for under $25,000, it is within reach of small business firms, yet it offers speeds and capacities of operation that are said to compare favorably with machines costing much more. Its magnetic drum memory holds 1,024 words, and it is capable of 5,000 computations per minute. When programmed for a payroll operation, it will compute the payrolls and print the checks of 800 people in an eight hour day. It has flexible input and output units that may be operated simultaneously or separately, and a self-checking device that rejects improper data as soon as it is entered. The system weighs 375 pounds and requires less space than an office desk.

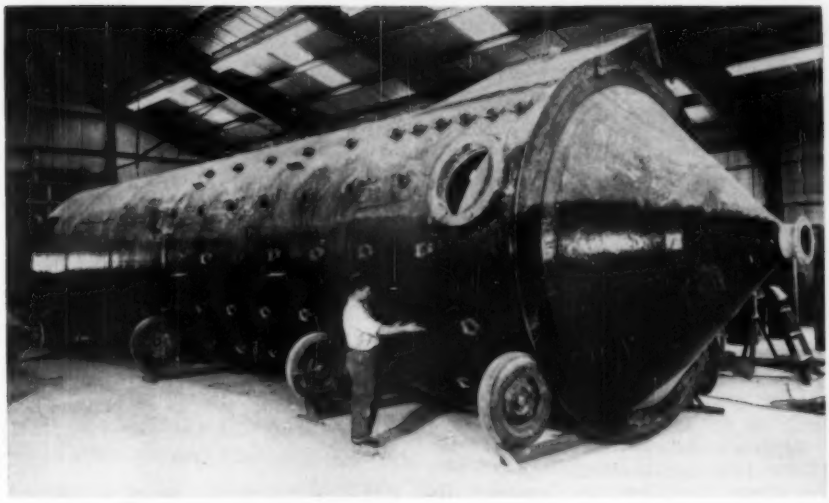
Royal Precision 9000

The new Royal Precision 9000 EDP system, manufactured by Royal Precision Corporation, a subsidiary of Royal McBee Corporation, has several features which distinguish it from the 4000 which is presently on the market. (However, it should be noted that the two are companion models, and both may be considered as second generation of the LGP-30 which is a vacuum tube system.) Both systems are in the medium to low price range: the 9000 rents for $2,450 per month as compared to $1,750 for the 4000. The 9000 is particularly designed for the business needs of payroll, inventory control, account handling, and sales analysis because it features random access records processing which automatically up-dates all relevant records. Also it has a magnetic tape storage system that uses endless loops of tape rather than tape reels; the 4000 employs a magnetic drum memory. The 9000 also has multiple input and output, and is equipped to operate up to 30 such units simultaneously. It also features a larger range of programming aids than the 4000.

Packard Bell PB 250

Another computer in the low-price range (cost $30,000), and one that includes features usually found only in the higher priced systems, is the PB 250, manufactured by the Packard Bell Computer Corporation. The system has an operating speed in microseconds, and a memory of 1,808 words that is expandable internally to 16,000 words. Like other EDP systems, its programming has been simplified, and it can use multiple input and output equipment. The PB 250 is well suited for integration into existing systems. Because it can be modified to operate with various kinds of inputs, it can be used to convert any particular format of input information into any format of output. Another application results when the volume of input-output information that must be processed exceeds the capacity of a single PB 250. When this occurs, two or more units can be employed as a single instrument with one computer serving as a central processor and the others used to collect, edit, and assign information for the central processor. This separation of input and output processing from central computing offers a powerful system at a comparatively inexpensive price. The PB 250 computer is completely modularized, is 30 inches high, 19 inches wide, and 24 inches deep, and weighs 110 pounds.

end/computers



Giant plastic equipment

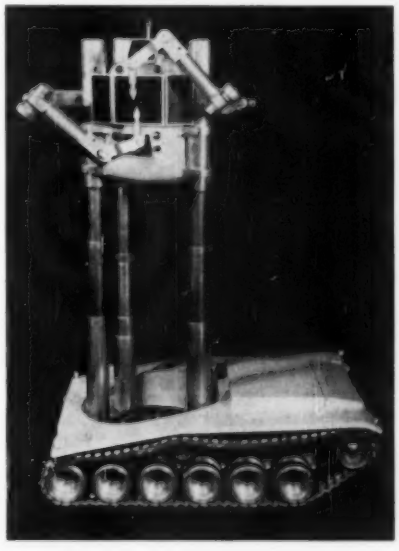
A gigantic chemical fume scrubber (above), believed to be the largest single unit of industrial equipment ever fabricated from reinforced plastic, will soon be installed in a metallurgical processing company. The scrubber, over 47 feet high and 10 feet in diameter, is made from a fiberglass-reinforced polyester plastic known as Hetron 92. The only metal used is for supports and external fasteners. The plastic was selected because of its light weight, structural strength, flame and corrosion resistance, and ease of maintenance. The apparatus, which will handle effectively 42,000 cubic feet per minute of severely corrosive fumes, mists, and dusts of fluoride compounds, was designed by the Buffalo Forge Company. The plastic was produced by the Durez Plastics Division of the Hooker Chemical Corporation. Du Verre, Inc. of Arcade, New York, was responsible for the fabrication. Source: Buffalo Forge Company, Buffalo, New York.

Wallcovering in stone patterns

A new vinyl wallcovering material that duplicates the distinctive tone and textural appearance of marble has been announced. Known as Travatex, the wallcovering will not stain, chip, fade, or crack, and is said to be unaffected by atmospheric conditions. It is wiped clean with a damp cloth. Travatex, available in 14 different hues, is one of a number of textured, three-dimensional patterns. Manufacturer: L. E. Carpenter & Company, New York 1, New York.

Mechanical arms

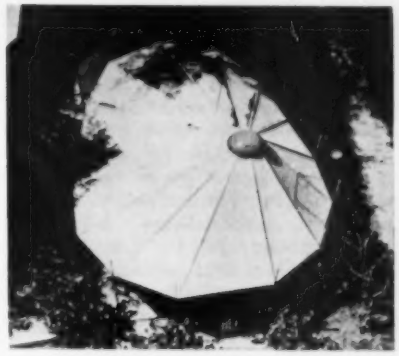
A new mechanical arm for remote handling of atomic materials has recently been introduced. Designed to work in radioactive atmospheres, the arm can hold more than 100 pounds at the end of its 18-foot length. It has eight separate motions, all of which are controlled by a human operator at a small portable control box. The arm can both flex and rotate at the shoulder, telescope its upper arm, bend its elbow, rotate at the elbow, bend its wrist, spin its wrist, and close its fingers with either a light touch or crushing force. A pair of the arms will be mounted on a tank-like mobile vehicle which is being constructed by General Electric Company. As illustrated in the picture below, which is of a 1/10 scale model of the complete vehicle, the body to which the arms are connected can be raised and lowered. The vehicle will be used in the development of aircraft nuclear engines and will be placed in service at the National Reacter Testing Station in Idaho. Manufacturer: General Mills Inc., Minneapolis.



Old roofing material with new life

Architects have been showing renewed interest in Terne metal, a century old roofing material that may be seen, for example, on Andrew Jackson's Hermitage. One of the latest applications has been on an unusual "circus-tent" two-building residence in Sarasota, Florida. Designed by Sarasota architect Ralph Twitchell, the roof presented a difficult construction problem because of its varying levels.

Terne is an alloy of lead and tin on a base of sheet steel. One of its major advantages is that it is supplied in seamless



50 foot lengths in widths up to 28 inches. This permits the architect to specify many possible combinations of seam constructions. Further advantages are said to be that it forms a perfect soldered joint because of the lead already in the alloy; it takes paint well; it needs no expansion joints in shorter lengths because it has a low coefficient of expansion; it has the high structural strength of steel; and it is light weight and anti-corrosive.

In the residence shown in the pictures above, the roof was tied to a series of three-inch steel pipes anchored in concrete, and spaced three feet apart around the building perimeter. Free-standing concrete block walls were then added, with glass reaching upwards from their tops to the roofs. Down through the center of the roof is a 12 inch hollow steel column which is the central support and also serves as a chimney for a fireplace. Manufacturer: Follansbee Steel Corp., Follansbee, W. Va.

Ultrasonic cleaning

A more efficient ultrasonic cleaning system has been made possible through the introduction of a new type of transducer (used to convert electrical power into sound energy). The method of cleaning depends on cavitation—the rapid generation and violent collapse of countless small bubbles within a fluid—which is produced in the presence of ultra-high-frequency sound. When these bubbles "implode" at the surface of a solid material immersed in the cleaning fluid they actually blast away any dirt particles that are present. The basic ultrasonic unit consists of a tank which contains the cleaning fluid, a bank of vibrating transducers, and a generator which energizes the transducers.

The new transducer (above), which employs a different ceramic from the traditional barium titanate, is able to convert larger amounts of power, and thus is able to deliver more effective power per unit area. Other advantages of the new transducer are that it has an extremely high efficiency, it can operate at a higher temperature, and it may be easily replaced.

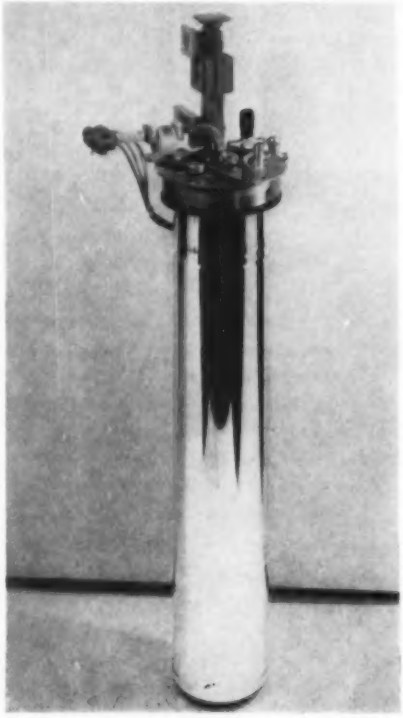
The transducer has a sandwich-type construction that utilizes thin sections of ceramic and sections of aluminum. Because of this design, the elements of the transducer, known as Sonogen Z, may be completely reclaimed from their housing (when it eventually erodes due to cavitation on the radiating face of the transducer) and replaced in a new housing. Such replacement, with its substantial cost savings, is not possible with the conventional transducer because the barium titanate elements are bonded directly to the radiating face, making it difficult to remove them without damage. Manufacturer: Branson Ultrasonic Corporation, Stamford, Conn.

Listening to outer space

An "electronic ear," described as being "pound for pound the most sensitive listening device in the history of science," has recently been announced by the Hughes Aircraft Company and the Army. The detector will extend by tenfold the range of many Army electronic listening systems. It will also detect radio beeps from space vehicles millions of miles away, enable military defense systems to detect ICBM's far earlier than can presently be done, receive radio signals from distant stars, and, in the future, facilitate communication between space vehicles.

The "ear" (below) is a ruby maser amplifier that is used in a microwave receiver. The device employs an inexpensive synthetic ruby that is cooled to 452 degrees below zero F. In this ultra-cold temperature, which is maintained by liquid helium, the atoms and electrons in the ruby move in slow motion; this reduces the natural collisions of the atomic particles to a minimum, and consequently reduces the "noise" resulting from the collisions. Thus, the almost static-free ruby is able to detect and amplify extremely faint radio signals in the high-frequency range. In a conventional amplifier, the hot radio tubes or transistors create their own noise which often overrides and obscures faint signals.

In operation, the ruby is placed within the field of a small, twelve-ounce magnet which acts to tune the ruby so that it will operate at the correct frequency. Previously, masers have required large vacuum pumps for cooling as well as a magnet weighing up to 500 pounds. The complete new maser weighs only 25 pounds, and is housed in a double vacuum glass tube. Manufacturer: Hughes Aircraft Company, Culver City, California.



Extensible kraft paper

A tough kraft paper has been introduced to prevent bag breakage during packaging, shipping, and storing operations. It is expected that its principal use will be for multiwall bags for such items as grains, feeds, cement, and other granular and powdery materials. Known as Expanda-Kraft, the paper satisfies two requirements for bags: the need for stretchability and toughness to prevent breakage under impact; and the need for rigidity, flexibility, uniformity, printability, and moisture resistance to simplify production and handling problems.

In the picture below, the properties of the new paper are demonstrated. The bag on the left, which is made of regular kraft paper, broke when it collided with a bag made of the new extensible paper. Each

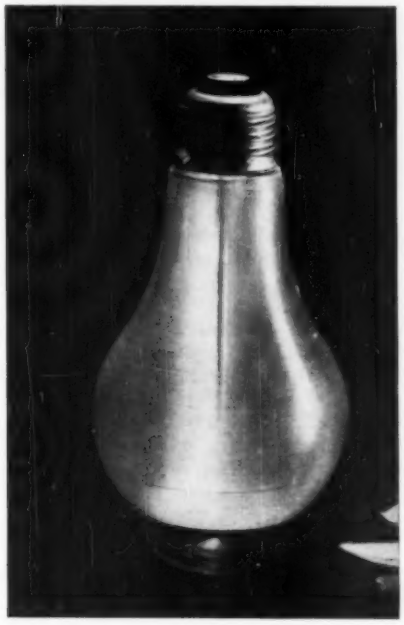
bag had three plies and was loaded with 90 pounds of sand. They were swung together from a distance of 15 feet. Manufacturer: Hollingsworth & Whitney Div., Scott Paper Company, Chester, Pa.

Stainless steel in colors

An economical method of color-coating stainless steel so that it maintains its natural metallic finish has been announced. It is believed that the first commercial application will be in the architectural fields where it might be used for exterior panels for curtain-wall buildings. Other applications will be for consumer products, furniture, and decorative materials. The color is applied by spraying, brushing, or rolling onto the metal a chromate-base coating that contains the pigment. The metal is then cured at temperatures of about 350 degrees F. The process does not require special pretreating or primer undercoat. The result is said to be an evenly-colored surface that is durable, and abrasion- and corrosion-resistant. The steel will be available in shades of brown, black, blue, green, red, and grey. The coating material is supplied by the Kelsey-Hayes Company, and the steel by Allegheny Ludlum Steel Company.

Shatter-proof light bulb

A new electric light bulb has been produced that offers shatter-proof construction and a lamp of higher lumen output than any other type of processed bulb. Besides finding wide consumer use, it is expected that the lamp will have industrial uses such as in drop-cord lamps for work under trucks. The bulb is made from Fiberglas supplied by Owens-Corning Fiberglas Corporation: the fiberglass yarn produces a light source with a flame effect. This gives the lamp its name—Flamescent. A cooling crown on the bulb serves to lower the filament operating temperature. This is important because it eliminates the brittleness and fragility commonly associated with filament-type lamp bulbs, and also assures long burning life. The Flamescent bulb is impervious to thermal shock; a hot lamp when dunked into cold water will not crack. Manufacturer: Duro-Test Corporation, North Bergen, New Jersey.



Rugged, closed-circuit tv camera

A single-unit, transistorized, closed-circuit tv camera has been developed that is designed to function at top efficiency even under extreme conditions of vibration and noise. Because of its ruggedness, it is expected that the camera, known as the TE-9-A, will have wide application in the military, industrial, and educational fields. The unit, which is mounted in a dust-tight aluminum housing and weighs nine pounds, went through several performance tests including one in which it was mounted close to a rocket engine. During the test, the camera is said to have performed continuously without loss of its high picture quality (650 line horizontal resolution).

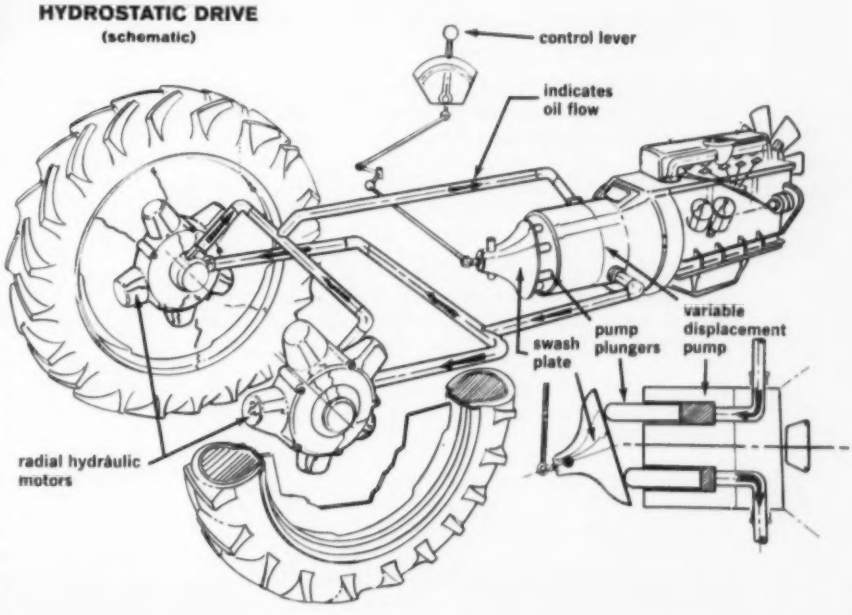
The camera uses a 16 mm lens, and comes equipped with a remote turret for mounting four lenses at one time. It operates on a power input of 18 watts. Manufacturer: Communication Products Department, General Electric Company, Lynchburg, Virginia.

New tractor transmission

Down on the farm these days a research tractor is going through its paces with a conspicuous lack of many familiar parts that have been thought to be essential. The tractor has what is known as hydrostatic transmission, which depends on oil at high pressure to transmit power by acting on a moving piston. The transmission, which has been developed largely in Great Britain, does away with the clutch, brakes, gear shift lever, rear axle, all gears, shafts and splines, and the hollow, main frame casting that houses the transmission and differential in conventional tractors.

The transmission has three major parts: a pair of radial, hydraulic motors — one in each driving wheel — and a variable displacement pump which is coupled directly to the engine, and which furnishes pressure energy to the system. The pistons in the motors act on an eccentric gear which serves as a crankshaft, converting hydraulic pressure to torque(the twisting force that turns the wheels). Key to the system is the variable displacement pump in which the slightest plunger stroke is instantly converted by the motors to torque. The operator, using a single control lever, controls the plunger stroke by changing the angle of a swashplate in the pump. The tractor's response to the control lever is immediate and solid. With the control lever in the vertical position, the swashplate stops action of the plunger, which deprives the system of pressure energy, thus braking it. By using the lever to lengthen or shorten the stroke of the plungers the speed of the tractor is increased or decreased. Reverse movement is produced by reversing the flow of oil (which is the driving medium) in the system.

Over and above the obvious advantages of simplification and ease of maintenance, direct advantages to the driver are that he can control forward and reverse direction and speed with one lever without having to contend with clutching, braking, or shifting. However, before the transmission can be marketed, several important problems must be solved: the need to improve fuel economy, and the high cost of pumps and hydraulic motors. Manufacturer: International Harvester Company, Chicago, Illinois.



(*See article on page* 68)

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Manufacturers' Literature Supplement

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

Materials—Metals

1. **Metal Production Facilities.** Dow Metal Products Company, Division of Dow Chemical Company. 12 pp. Ill. Brochure describes facilities for producing products of magnesium, aluminum and other metals. The facilities include a foundry, die casting plant, rolling and extruding plant, and a metal fabricating plant for machining, forming, joining and finishing operations.

2. **Welding of New Metals.** Air Reduction Company. 5 pp. Ill. Article discusses the problems involved in joining the new metals and alloys used in aircraft and missile design such as PH stainless steels, rene 41, beryllium, zirconium, molybdenum, tantalum, and columbium.

3. **Anodes and Plating Chemicals.** Hanson-Van Winkle-Munning Company. 8 pp. Ill. Bulletin describes company's line of anodes, anode accessories, and chemicals for electroplating and metal finishing. Anodes described include nickel, cadmium, brass and bronze, copper, lead, and zinc.

4. **Extruded Stainless Steel Shapes.** H. M. Harper Company. 16 pp. Ill. Booklet contains information, photographs, and schematic drawings of 38 different extruded shapes. Also included is a standard design guide and a glossary of terms.

5. **Selection of Heat-Resistant High-Alloy Castings.** Alloy Casting Institute. 12 pp. Charts. Article discusses five major considerations in selecting a heat-resistant cast alloy: surface stability, structural stability, mechanical properties, physical properties, and design considerations. The metals treated are divided into three grades depending on their chromium and nickel content.

6. **Rare Earths.** Vitro Chemical Company. 8 pp. Brochure contains complete technical information about various chemicals, metals and alloys of the rare earth group of elements. In addition to potential uses, it describes manufacture and lists detailed properties of more than 50 products.

7. **Bushings, Bearings, Bar Stock, and Babbitt Metal.** American Crucible Products Company. 16 pp. Ill. Brochure offers technical data and information on company's Promet (processed metals) alloys, and also lists specifications and properties of brass and bronze casting alloys, and manganese and aluminum bronze alloys. The company's facilities are also described.

8. **Hot-Work Tool Steel.** Uddeholm Company of America, Inc. 4 pp. Ill. Pamphlet describes characteristics and uses of UHB Calmax, a chromium-tungsten-cobalt steel recommended for hot pressing dies, mandrels, extrusion dies, and die casting dies for copper, brass and similar alloys. The new steel is said to maintain great toughness at high temperatures.

9. **Aluminum Primary and Mill Products.** Harvey Aluminum. 12 pp. Technical booklet reviews the full range of shapes, sizes, and alloys available in primary aluminum pig, ingot, and billet, and in wrought aluminum mill products. Product applications, alloy characteristics, and production facilities are also included.

10. **Molybdenum Products.** Climax Molybdenum Company, Division of American Metal Climax, Inc. 24 pp. Nontechnical brochure describes molybdenum and molybdenum-base alloys, offering full details on sizes, forms, tolerances, weights, methods of identification, and applications.

Materials—Plastics

11. **Epoxy Pellets for Electronic Components.** Epoxy Products. 4 pp. Bulletin discusses E-Form epoxy pellets, which are dry, one-component, pre-measured epoxy resins that are available in a variety of sizes, shapes, and volumes. The pellets were developed to overcome the disadvantages of liquid resins which had to be mixed in small quantities at the time of application. They are liquefied by heating, and are used for encapsulating, sealing, impregnating, strengthening, potting, end sealing, embedding, and bonding.

12. **Powered Polyethylene.** U. S. Industrial Chemicals Company. 8 pp. Ill. Bulletin describes Microthene, a powdered polyethylene that may be used for coatings on metal, glass, textiles, and paper, and also for molding.

13. **Stock Nylon Parts.** Nylomatic Corporation. 6 pp. Ill. Catalog contains information on stock nylon parts such as bushings, washers, rollers, gears, bearings, etc.

14. **Laminated Plastics.** Taylor Fibre Company, 12 pp. Manual and wall charts include information for specifying and ordering 21 commonly used laminated plastics. Composite laminates, which are made by bonding a compatible material to a laminated plastic, are also described.

15. **Insulating Resins.** Marblette Corporation. Illustrated chart serves as an introduction to resins available to the electrical industries. For each resin system, information offered includes physical, mechanical, thermal, and electrical properties, type and proportion of hardener and curing method, potential life, and characteristics and uses.

16. **Molded Products.** Formica Corporation. 8 pp. Ill. Booklet outlines company's molded products service, which includes design of part, design and fabrication of mold, and molding of the part. Properties of 25 laminates are also listed.

17. **New High Impact Resin.** Naugatuck Chemical Division, U. S. Rubber Company. Folder describes Kralastic MH, a new high impact resin that is said to have excellent engineering properties and durability. It may be fabricated by injection molding, vacuum forming, profile and sheet extrusion, and lends itself to various machining operations. Its suggested uses range from housing panels to cameras, wheels, knobs, and automative hardware and trim.

18. **Molded Polyester for Speed-Sensing Switch Housings.** Chemicals Division, Atlas Powder Company. 4 pp. Ill. Case history reports on how switch housings made of Thermaflow, a reinforced polyester molding compound, provided a 4-month saving in development work and $15,000 in model and die costs. A cost comparison between Thermaflow and die-cast aluminum is included.

Methods

19. **Mesh-Belt Furnaces.** General Electric Company. 4 pp. Ill. Bulletin describes mesh-belt furnaces that are especially designed for use where low cost, high volume production is required. They can be installed in a continuous production line and can be used for copper and silver brazing, sintering, and bright annealing.

20. **Gaging Shortcuts.** Deltronic. 4 pp. Folder describes gaging methods that are said to shortcut many tedious production and inspection jobs. The new system provides one gage of nominal size and 12 gages increasingly larger in .0001 increments and 12 gages decreasingly smaller in .0001 decrements.

21. **Blow Molding.** Phillips Chemical Company. Bulletin discusses blow molding with Marlex resins. Information is presented on equipment designs, mold construction and design, and on the molding process itself.

22. **Explosive Forming.** Propellex Chemical Division, Chromalloy Corporation. 4 pp. Ill. Bulletin describes advantages of the Explosiform process, which is a method of shaping metal parts by means of explosive energy. According to the developer, it will reduce tooling costs, hold tight tolerances, increase yield strength, and reduce scrap losses. In addition, it will form complex shapes, which ordinarily would require several steps, in one operation.

23. **Printed Circuit Drafting Aids.** By-Buk Company. 6 pp. Ill. Table lists and has actual-size illustrations of pre-cut shapes and sizes of pressure sensitive drafting aids used to make paste-up printed circuit drawings.

24. **Chemical Coatings.** Industrial Coatings Division, National Glaco Chemical Corporation. 12 pp. Ill. Brochure describes the properties and applications of various materials such as silicones, epoxy resins, and fluorocarbons when they are applied as thin film coatings. Among the properties discussed are chemical and corrosion resistance, wide-range temperature stability, dry lubrication, and antistick characteristics.

25. **Modular Building Panels.** Plastics Division, Koppers Company, Inc. 33 pp. Ill. Brochure describes various Dylite building panels which have an inner core made from expandable polystyrene. The panels may be used as basic building units for exterior and interior walls and roofs. Included are diagrams of study houses in varying styles that are adaptable to construction with the panels.

26. **Insulation of Electrically-Heated Houses.** Forty-Eight Insulations, Inc. 8 pp. Booklet covers insulation of electrically-heated houses that present problems lying outside the scope of the standard codes. It provides minimum specifications for various types of insulation to meet the demands of more extreme winter and summer climatic conditions.

Miscellaneous

27. **Silicones.** Dow Corning Corporation. 16 pp. Ill. Brochure contains a summary of the forms, properties and applications of various silicone products ranging from adhesives to laminating resins to electrical insulation.

28. **Tubes and Transistors.** Electron Tube Information Council. 64 pp. A comparative study, prepared by the leading tube manufacturers, that discusses the characteristics and capabilities of vacuum and solid-state devices.

29. **Electronic Meters.** Empire Devices Products Corporation. 48 pp. Ill. Catalog describes company's line of noise and field intensity meters, impulse generators, power density meters, modulation meters, and other types of equipment.

30. **Tube Fittings.** The Lenz Company. 118 pp. Comprehensive, indexed catalog of original equipment and replacement tube fittings.

31. **Air and Electric Signal Systems.** Sperti Faraday, Inc. 88 pp. Ill. Manual describes signal systems and lists specifications of horns, bells, buzzers, chimes, and sirens. Also included are sections on various types of annunciators and accessory equipment.

32. **Load-Center Unit Substations.** General Electric Company. 32 pp. Ill. Bulletin describes features, operation, and applications of GE's new coordinated load-center unit substations that provide continuous power for ac distribution systems.

33. **Porcelain.** Process Equipment Division, Lamp Insulator Company. 26 pp. Ill. Catalog describes how chemical porcelain is manufactured and explains its properties and applications. Several new products, including valves, strainers, and piping, are introduced in the catalog.

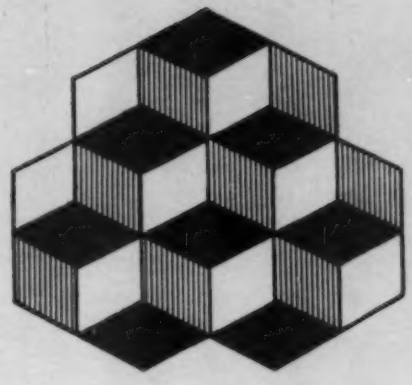
34. **Inks for Cellophanes.** Claremont Pigment Dispersion Corporation. 2 pp. Fact sheets describe Thermagloss inks, which are said to have excellent heat and smear resistance. The inks may be used with both moisture-proof and semi-moisture-proof cellophanes as well as with treated aluminum foils.

35. **Photovoltaic Cells.** General Electric Company. 8 pp. Ill. Bulletin describes photovoltaic cells which are used for the precise measurement of light. Such a cell requires no external source of power supply; it converts light energy directly into electric energy. They have been found well suited to applications where light is utilized to perform a control function.

36. **Hydraulic Presses.** St. Lawrence Hydraulic Company. 8 pp. Ill. Brochure describes 14 specially designed hydraulic presses of all types, including a 150-ton forming press, used to form abrasive cut-off wheels, that may be operated from any one of its four sides.

37. **Electrostatic Projector-Printer.** Keuffel & Esser Company. 4 pp. Ill. Bulletin describes the new Kecofax projector-printer that is the first electrostatic system capable of making prints from 8½ by 11 to 34 by 48 inches from miniature negatives. Previously, the largest print produced by this method could have only a 24-inch side.

38. **Market and Sign Catalog.** North Shore Nameplate Division, Anodyne Inc. 24 pp. Ill. Catalog provides complete information on pipe markers, electrical markers, numerals, letters, safety signs, and identification signs. All items are printed on waterproof vinyl backed with an instant-stick adhesive.



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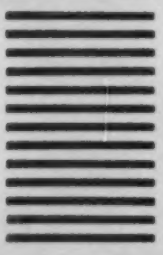

39. **Strainer Guide.** Tate Engineering, Inc. 88 pp. Ill. Engineering handbook contains a compilation of reference data for the layout of fluid flow systems and sizing of strainers as well as information on valve and pipe selection. The complete line of Tate strainers, which are used to eliminate solid particles from fluid flow lines in order to prevent damage and contamination during manufacturing processes, are also illustrated.

40. **Bonding of Tile and Insulation Materials.** Miracle Adhesives Corporation. Charts present detailed information and specifications on the proper types of adhesives to be used in varying applications involving ceramic tile work and insulation projects.

41. **Fluorescent Enamel.** E. I. DuPont De Nemours & Company. Folder describes high-visibility Pyralux, a fluorescent enamel for safety and decorative painting of vehicles, aircraft and signs.

42. **Steel Strapping Machines.** U. S. Steel Corp. 20 pp. Ill. Brochure describes operation and applications of round and flat steel strapping machines which are used for industrial packaging operations.

43. **Corrosion Resistance Rating Guide.** Hydromatics, Inc. 8 pp. Guide lists relative ability of metals, plastics, and synthetic rubbers used in Flo-Ball valves to resist the corrosive effects of 390 different fluids.

44. **Industrial Socket Screws.** Standard Pressed Steel Company. 82 pp. Ill. Booklet describes basic information on size, material, and availability of industrial screws, including head cap screws, set screws, shoulder screws, etc. Also included is a section on basic design and performance, and a section on the technology of fasteners.

45. **Hand Grinder.** Dumore Company. Bulletin offers information on a new high-speed hand grinder known as the Dumore Series 40. The grinder features a motor design that reduces no-load speed and increases full-load speed for maximum production and faster metal remover.

46. **Power Transmission Belting.** Maurey Manufacturing Corp. 24 pp. Ill. Catalog discusses various types of belts and offers design, construction, and application data.

47. **Teletype Equipment.** Teletype Corp. 20 pp. Ill. Brochure describes operation and applications of the new Teletype Model 28 equipment, which utilizes a "Stunt Box" to automatically control local and remote operations in response to keyboard and line signals. The equipment has a mechanism for translating electrical pulses into mechanical motion to operate a typing unit of a page printer for communication networks. The most popular application of the stunt box is as a sequential selector for message directing.

48. **Buying and Selling in an Industrial Market.** General Electric Company. 36 pp. Bulletin discusses value, price-volume-cost relations and other topics that affect buying and selling.

49. **Solid Lubricant.** Poly Chem, Inc. 4 pp. Ill. Bulletin describes Poxylube, a solid-film lubricant formulated from molybdenum disulphide with an epoxy binder, which does not require any expensive surface pretreatment prior to application. Once applied, this hard, dry resin separates surfaces and is said to be a permanent lubricant.

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For Your Calendar

Through June 6. Graphic Arts and Illustration Department show. Pratt Institute, Brooklyn, New York.

Through June 15. "Three Danish Printmakers." Smithsonian Institution traveling exhibition. George Thomas Hunter Gallery of Art, Chattanooga, Tennessee.

Through June 26. "Art Education for Every Child." Exhibition of basic methods for creative teaching with special apparatus, films, sound effects, and models for visitors' use. Prepared by the National Committee on Art Education with the Museum of Modern Art's Department of Education. Museum of Modern Art, New York.

Through June 30. Annual Exhibition of the Society of Typographic Arts. The Art Institute of Chicago, Chicago.

Through July 15. Exhibition of Gandhara sculpture from Pakistan. Asia House Gallery, New York City.

June 5-9. Annual summer meeting and aviation conference of the American Society of Mechanical Engineers. Statler Hilton Hotel, Dallas, Texas.

June 8-Sept. 6. "Art Nouveau." Exhibition of art from 1890-1905 including paintings, sculptures, prints, books, posters, design objects and furniture from fourteen countries. Museum of Modern Art, New York.

June 10-12. Northeast regional conference of the American Craftsmen's Council. Program will cover design, production and marketing of craft products. State Teachers College, New Paltz, New York.

June 10-26. British exhibition sponsored by the Federation of British Industries. Exhibits range from tea to heavy machinery, an English inn with British barmaids, and shopping arcade. New York Coliseum, New York.

June 13-17. Thirty-sixth Norelco X-ray school sponsored by Philips Electronic Instruments. Course will cover X-ray diffractions, diffractometry and spectrography. North Park Hotel, Chicago.

June 19-21. Annual meeting of the Alloy Casting Institute, Homestead, Hot Springs, Virginia.

June 19-25. International Design Conference in Aspen: "The Corporation and the Designer, an inquiry into the opportunities and the limits of action for innovators in our 20th Century technological society." Aspen, Colorado.

June 20-24. National inventions exhibition and creativity conference sponsored by the Cleveland Engineering and Scientific Center, Cleveland, Ohio.

June 20-July 5. Chicago international trade fair sponsored by the Chicago Association of Commerce and Industry. June 20-24, trade only; June 25-July 5, public. The Navy Pier, Chicago.

June 20-July 24. "The Strength of Plastics and Glass." Special summer program at the Massachusetts Institute of Technology. Tuition $200.00. Boston.

June 24-29. Summer program-planning session sponsored by the Building Research Institute. Wianno Club, Wianno, Massachusetts.

June 27-29. National convention on military electronics sponsored by the Professional Group on Military Electronics of the Institute of Radio Engineers. Sheraton Park Hotel, Washington, D. C.

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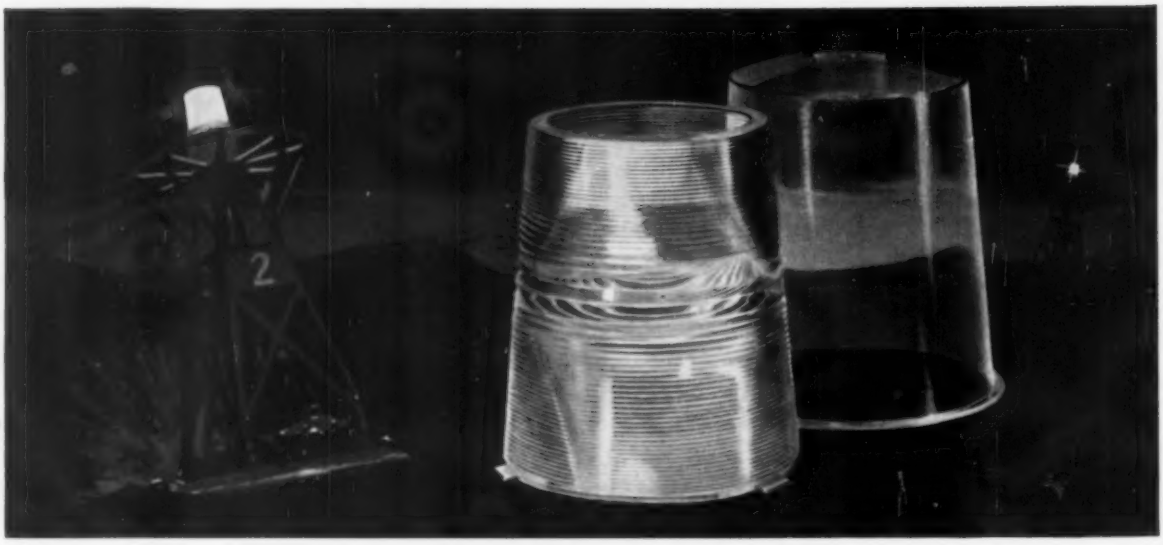

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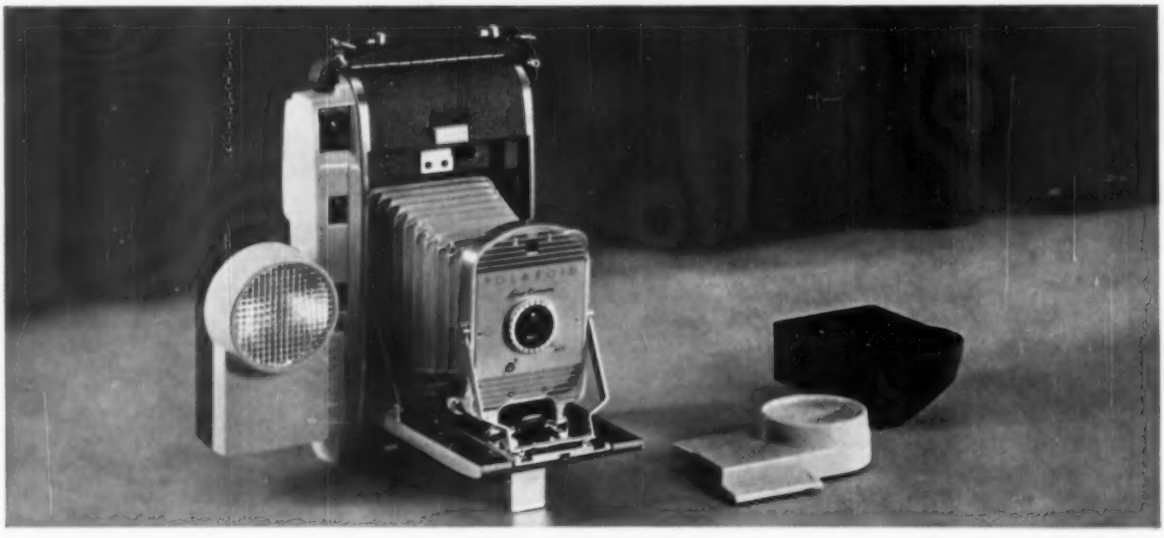

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