INDUSTRIAL DESIGN

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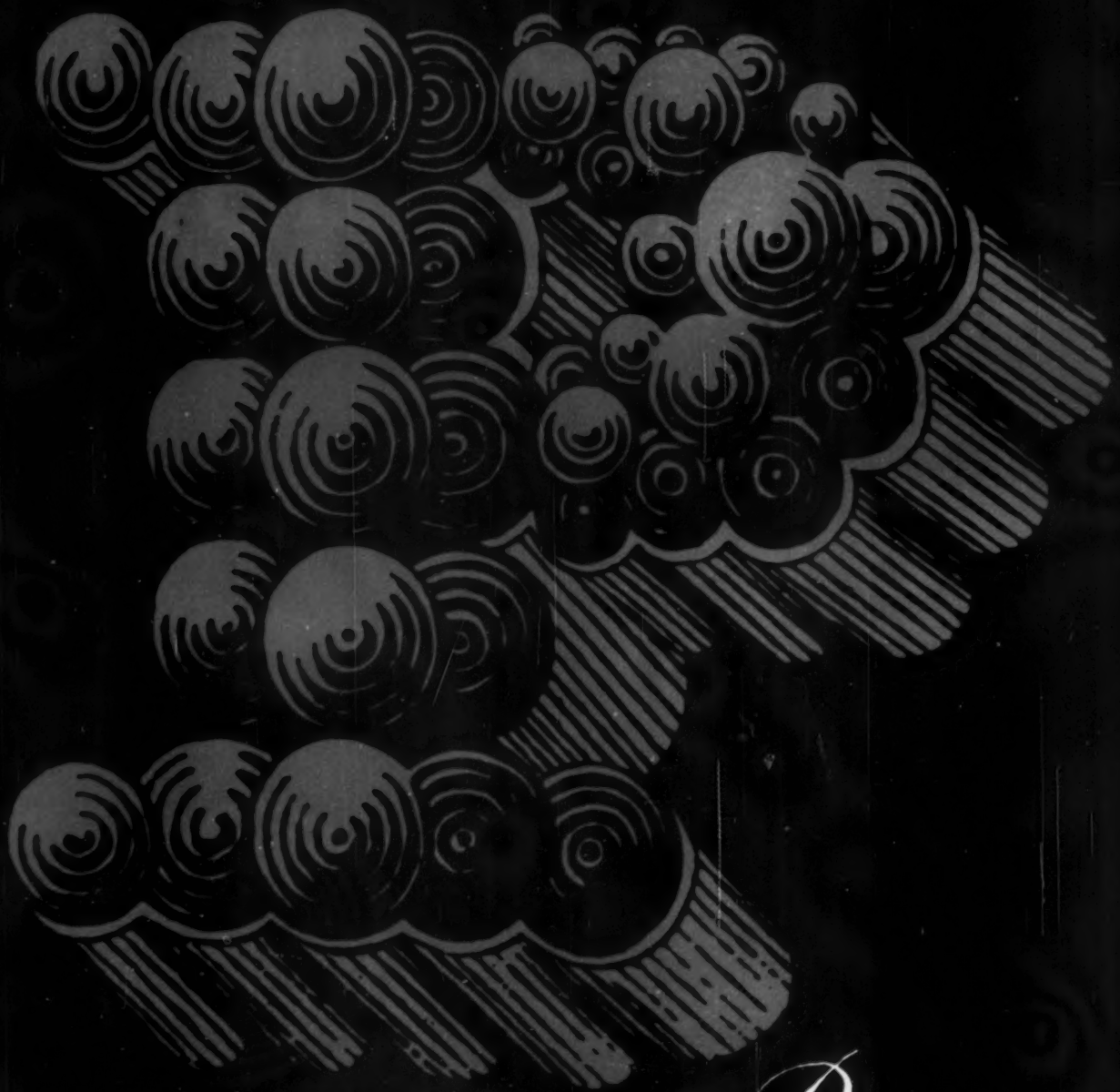

Paper

A history of paper, and a report on new developments

Revolutionary machines by LeTourneau

Hors d'oeuvre tree with arrangeable components, salad service and electric casseroles, all of aluminum, designed for the Alcoa collection by Don Wallance. Photographed by Becker-Horowitz.

FORECAST: THERE'S A WORLD OF ALUMINUM IN THE WONDERFUL WORLD OF TOMORROW . . . where the loveliest pieces on your festive table will be aluminum . . . gay and colorful aluminum . . . anodized, or porcelainized, or brushed to satiny richness . . . aluminum tableware so versatile you will cook in it, serve in it, and create table arrangements as original as a Gauguin canvas. Aluminum Company of America, Pittsburgh.

ALCOA ALUMINUM

NOVEMBER, 1958 VOLUME 5 NUMBER

11

INDUSTRIAL DESIGN

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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 DECEMBER—ID's Annual Design Review of the year's innovations in design.
IN JANUARY—A review of new developments in photographic equipment.

COVER: An ornamented letter "P," taken from a 19th Century Italian alphabet, is enlarged to serve as a cover element for this month's feature article on handmade paper, page 32.

FRONTISPIECE: Picasso, whose restless imagination has at one time or another become occupied with every graphic medium, has recently designed this watermark of a bull's head. (This is its first reproduction in an American publication.) It is interesting to compare his bull's head with that of a 16th Century artist on page 38 in Mr. Quentin Fiore's article on handmade paper.

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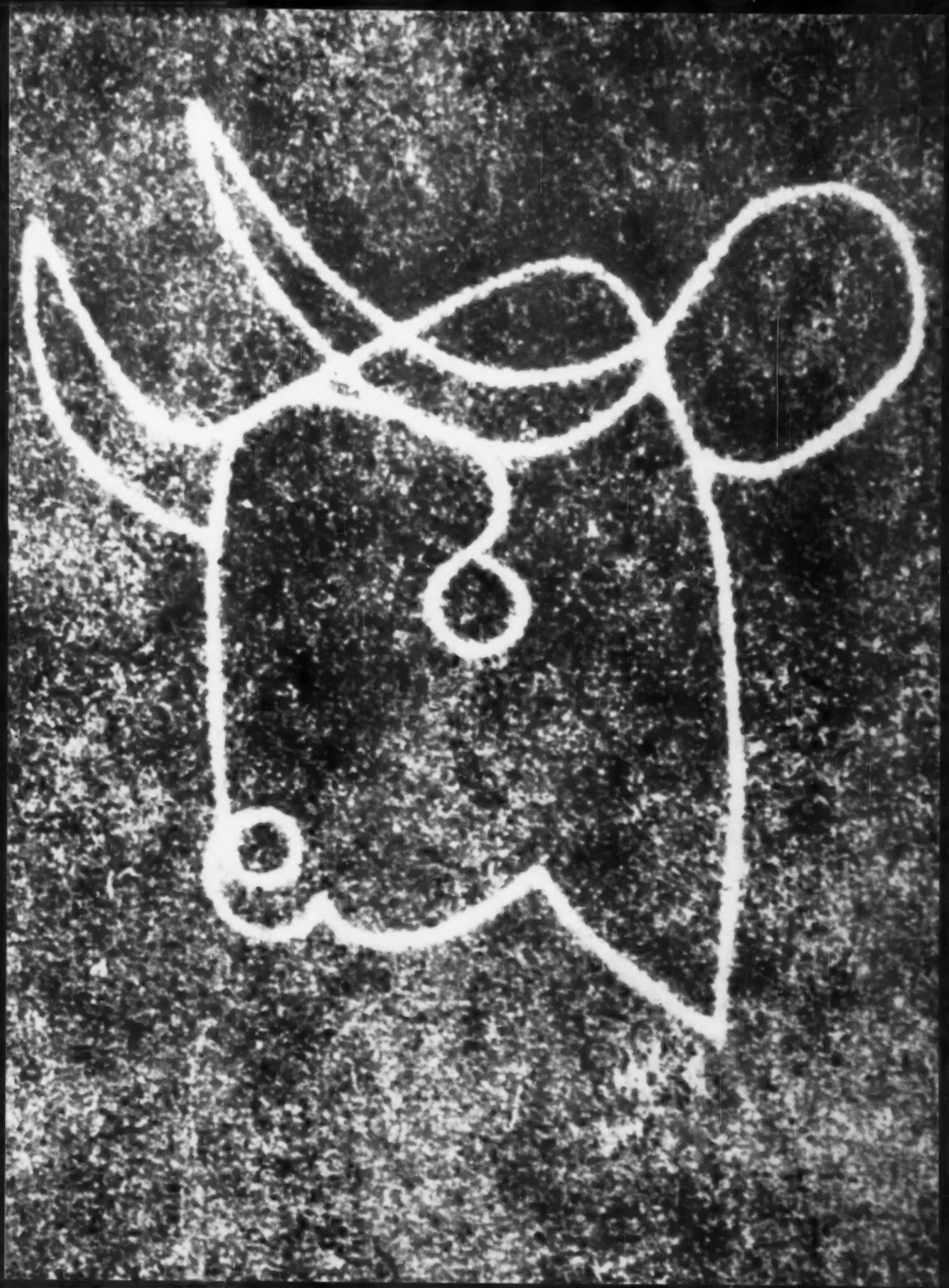

LETTERS

Posters from Poland

Sirs:
I find your article on Polish posters very interesting and I appreciate very much your interest in the subject as well as the work you have done in writing this article.
Jerzy Michalowski
Permanent Representative of Poland to the United Nations
New York

Sirs:
Your review of Polish Posters in the September issue of ID has fired my enthusiasm again to have just such an exhibition in our new gallery . . . blow-ups of parts of posters, full size actual sheets, and if possible, photographs of the posters as they are seen in actual situations.
H. Douglas Pickering
Associate Professor of Art
Allegheny College
Meadville, Pennsylvania

In defense of Dollikin

Sirs:
I am the designer of Dollikin, a fully articulated doll made by Uneeda Doll Company for whom I work on a contract basis.

In a recent issue of your publication (ID, August) this doll was illustrated along with a few sage and stilted remarks which have caused me no little sadness. As a picture is worth 10,000 words it might have been better to leave out all copy than to publish such a weak and dreary description. Assuming that INDUSTRIAL DESIGN is a so-called Bible for designers, the following might have been of interest:

1. Dollikin *is* the first of the modern dolls combining beauty and good shape with full articulation. To compare it to ancient dolls is no fairer than to slap at the similarity of today's furniture and autos with those of the '90s.

2. Dollikin took two years of hard work in the development of shape and mechanical joints including the hand carving of the first model by the writer.

3. The Dollikin package is also original as it is the first to display a doll in a pose indicating its flexibility.

4. Dollikin starts out as 32 cellanese acetate parts from 5 injection molds and is assembled into 17 moving sections or 16 joints.

5. Dollikin represents a financial investment of over $200,000 before the first doll was shipped.

6. Dollikin was the first doll designed to appeal to the young teenager in which market it received a large acceptance.

As a designer, I am proud of Dollikin and some ten other dolls I have invented for Uneeda in the last seven years.

In the light of the foregoing I am sure you will understand my feelings and allow me this small display of my artistic temperament.
Robert K. Ostrander
Maplewood, New Jersey

The evolution of design

Sirs:
With reference to the letter written by Mr. Joseph Palma, Jr. in your September issue I should like to make my comment on the method of design education as practised at our college.

It is absolutely essential that the graduating student is able to carry out the most meticulous rendering and model of any product design. However, this skill is by no means the decisive point of sale.

My students in Industrial Design are asked to keep all their rough sketches, from the very first to the final on which the actual design has been based. Nothing conveys more clearly his way of thinking. In showing the various stages in the development of a design combined in a portfolio that contains also the final rendering, or, photos of mockups and prototypes, he has a much better chance to secure the job he wants than he would by showing the slickly rendered finished design alone.
Eric Stearne
Associate Professor of Design
California College of Arts and Crafts
Oakland, California

Exhibit designers neglected

Sirs:
I am writing in reference to the October issue, and the letter by Gerald Waxman that you reprinted in your Letters column.

It has been eight years since I was last associated with Mr. Waxman. I was an industrial design student at the Cleveland Institute of Art, working part time for an exhibit company, in which Gerry was a designer. At the time, with little professional experience and education behind me, I thought the responsibilities and practices of the exhibit designer lacked the challenge and interest the industrial design offices had to offer.

Having been associated with advertising agencies, industrial design offices, and finally exhibit companies, of one of which I am at present design director, I sympathize with Mr. Waxman's view in regards to the lack of acknowledgment given to exhibit designers in local and national trade shows.

I am sure that when you review the strict regulations we must adhere to in designing an exhibit, along with the confusion associated with budgets, approach, and shortage of time, you may appreciate that writeup or pat on the back we look for in a job well done. If possible, let's see some local publicity for a very unpublicized group of designers.
Edwin Axel
Philadelphia

U. S. Steel

Sirs:
Let me compliment you on an excellent job of pulling together into one coherent whole all the complex facets of a highly complex design program. (ID, October: *The new image of United States Steel.*) I don't think you missed a single important point. And your presentation is as interesting as it is lucid.

Frankly, we were a bit worried whether this far-reaching story could be told in anything less than a volume the size of *War and Peace.* I can see now that our fears were groundless.
J. Gordon Lippincott
New York

Erratum

The Mattel Fanner 50 cap pistol shown on page 71 of the August issue of ID was incorrectly credited. The toy pistol is a Mattel staff design.

Trans-Flo hose nozzle molded of Tenite Butyrate by The Vichek Tool Company, Cleveland 4, Ohio.

Four parts of **TENITE BUTYRATE** form this tough, lightweight nozzle

Here's a good example of how a switch to Butyrate plastic can mean an improved product, with savings in both material and manufacturing costs.

Four parts of transparent green Tenite Butyrate make up this product. Assembled in an adjustable, leakproof fit, they form an attractive and durable hose nozzle which sells at a popular price.

These four plastic parts, including the threads, were injection molded in one quick operation. The "manufacturing" process consisted only of molding and assembly. By avoiding use of metallic parts, there was no casting, no forging, and no machining, even for the threads.

And look how well Tenite Butyrate meets the performance needs: It is a tough plastic, virtually shatterproof and ready to take a good measure of abuse; yet, it's light in weight. It resists corrosion and endures outdoor exposure over broad variations in temperature and humidity. Color is an integral part of the product and will not chip off or wear away. Tests show the assembled nozzle has withstood water pressures up to 500 psi.

Remember this use of Butyrate whenever you need a tough, outdoor plastic, readily adaptable to design. Tenite Butyrate is available in a wide range of flows and colors for injection molding or continuous extrusion. Look into the design and economy possibilities offered by this versatile plastic. For more information on Tenite Butyrate or any other Eastman plastic, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

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BOOKS

In Praise Of Creativity

SCIENCE AND HUMAN VALUES. *By J. Bronowski. Julian Messner, Inc., New York*: 1958. 94 *pp. Illustrated*, $3.00.

Jacob Bronowski has written a provocative book in praise of science, which he views as the contemporary phase of man's quest to know himself, and analyzes as a branch of inquiry and a field of creation. Designers will not find here investigations into the discoveries of science. The book is not a manual of what science has achieved but an interpretation of what it is, and what the author has to say can clarify a good deal about creativity, regardless of one's field. He evaluates science in terms of three general concepts: the creative mind, the habit of truth, the sense of human dignity; these, of course, apply as well to all types of creative expression. It is Bronowski's basic premise that the creative process is as intrinsic to science as it is to poetry, painting and philosophy.

The book begins with a reference to that ominous day in 1945 when the first atomic bomb exploded over Nagasaki. Late that year Bronowski was sent on an assignment which took him across the desolate landscape of the Japanese harbor. As his jeep drove past the ruins, the sounds of a dance tune came from the waterfront . "Is you is, or is you ain't ma baby?"—the name of the tune—seemed to express the mood of the moment. A streak had been cast across man's conscience; mankind had been plunged into a new era of concepts and attitudes. The question posed by the tune seemed to Bronowski to suggest the question civilization—"face to face with its own implications"—had every right to ask of science. And what he has done in this slim volume is to present one interpretation of the answer.

Bronowski's answer—or attempt at it—is a fine statement which he, as a believer in science's ability to explore the human potential, apparently felt called upon to make to clear science of unjust charges and restate its intrinsically noble purpose. He has done this on an evocative rather than logical basis, by aiming to capture the inexplicable that has stirred and promoted all creative processes. He has attempted, and no doubt correctly so, to reach the intuitive intuitively. The result is not only evocative, but (since the topic is obviously close to the author's heart) inspiring and convincing as a personal statement. Reading its passages of high praise and inspiration, one responds as always to any inspired expression: subjectively to a burst of subjective lyricism. But the expression of the subjectivity in this instance, though adding to praise and affirmation of the subject, is not sound enough to secure the argument against assailment. Nor does it succeed in clearing science of the serious charges resulting from that dent in history, in Japan in 1945—if indeed this is possible without the least trace of guilt, as the author's "song" implies.

An avowed humanist, Mr. Bronowski places man at the center of his own world, at the center of what he knows. Man creates what he knows, the evidence of objective cognition is his alone; consequently he controls what he knows. He can explore his knowledge, which is a collection of experienced data, and he is free to postulate the behavior of objects, of any sensory manifestation, not on the basis of faith or any handed-down theory, but on the evidence of his own experience. All he knows is part of his experience, and the realm of logic forms part of his larger content. Bronowski does well, no doubt, to reestablish man as the possessor of this logic and not to leave it centered in the mind as a separate entity removed from man. All that man knows are facets of the same thing: namely himself. All exploration therefore is part of a common aim. It is a single stream that underlies creativity; it is continuous, and stemming from the same source and aiming toward the same overall expression, everything created contains what has been done before. All variety, he asserts, is part of the same unity. Science, therefore, is part of the essential stream toward self-exploration. This is basic and beyond effacement, however grievously misused and misinterpretated have been the goods the search has yielded.

Taking the traditional view of the humanist, Mr. Bronowski's stand as such is clear and sound. But it is clouded in many of his interpretations of this view. He writes of his subject with a constant sense of marvel, and his explanation is often so highly subjective that it is not always testproof. He is, it appears, still struggling for an infallible system of thought which could support his thesis firmly. What, for example, is that toward which man continues to strive, that elusive something which has an ennobling influence on his search? Mr. Bronowski is, of course, in awe of it, but it is here, in attempting definitions of that high point of endeavor, that his reasoning often falls short. He is of course, correct in saying that it is a "hidden likeness" that science, as well as other creative processes, attempts to reveal. But he speaks of this as "unity in variety." Unity *in* variety, the timeless *in* time; how is that possible? Is that not contradictory? These are the concepts that are not probed here sufficiently. There is no suggestion here anywhere that this seeming contradiction could be resolved on the basis of a *difference* in planes, for example, which could admit to the concept of unity *behind* variety—the timeless, or, more correctly, the time*free*, freed of the bonds of time on a plane distinct and separate from that where change occurs. Mr. Bronowski dismisses all too easily the testimony left by what are now called "the mystics" of the Middle Ages or the great philosophers of India and China, in whom much preoccupation with this difference in planes which are part of the One, the Whole, the Unity—and this with reference to man as the center—is found.

The final part of the book deals with "the sense of human dignty." Directing one's attention and activity toward the greater comprehension of man carries with it the sense of dedicated service which naturally results in a sense of dignity in man. Those not only charged with this responsibility, but fulfilling it selflessly to the best of their abilities, are the natural possessors of this lofty privilege. No doubt many men of science have earned this, and proper recognition cannot be denied them. But the question that remains finally unanswered is the one raised in the opening pages. Mr. Bronowski certainly has succeeded in restating the meaning of science in terms of man's highest values, but he has made no convincing attempt in dealing with this curious turn: that selfless, noble endeavor has been misused to bring not dignity but destruction to many thousands. But one can hardly put any blame on the author for this. Can any man be called upon to explain this paradox? *A.G.*

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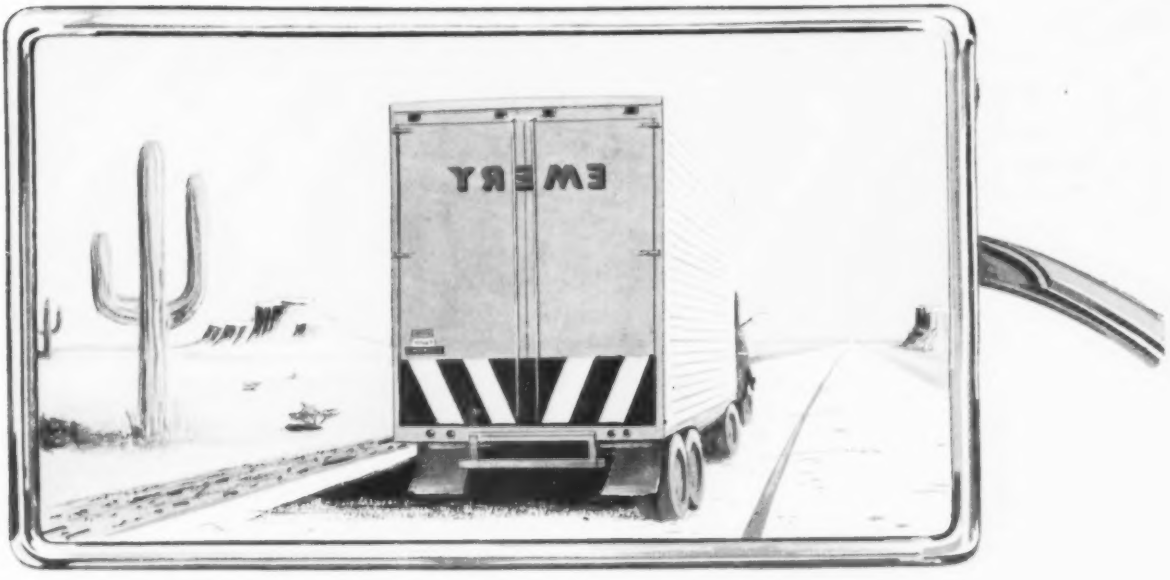

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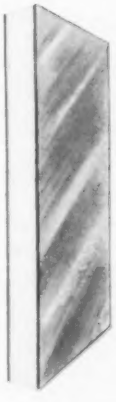

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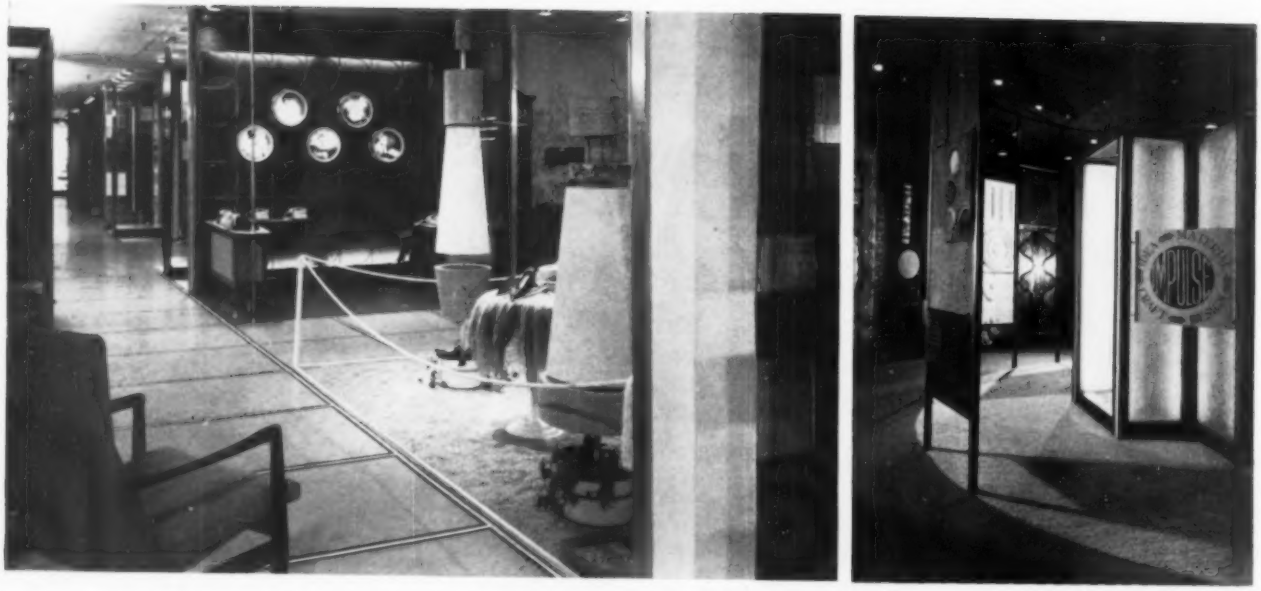

Design Center for Interiors opens

The Design Center for Interiors, which opened last month in New York City, offers a permanent exhibition center for the latest furnishings and a complete storehouse of design information for consumers as well as decorators. The center is an unusual blend of museum, showroom, and up-to-date design library. For the first time, the Center will give Americans services similar to those found at Den Permanente in Copenhagen and the Design Center in London.

The Center gives the consumer access to decorator showrooms usually closed to the general public, and, while nothing is sold at the Center, its staff furnishes complete information about the items on display.

The consumer may also use the information center (right), which contains a complete library of design information, including details about the various materials on display, catalogs from hundreds of manufacturers, and a complete list of the country's designers, decorators, and architects. A self-service filing system, set up on eye-level rotators, contains information about product availability. It was developed by Remington Rand. Another feature, the Kard-Veyer, is a mechanized cross-reference index which answers questions on furniture and accessories, fabrics, floor coverings, lighting and wall coverings. Adjoining the information center is a lounge with desks and easy chairs which gives the visitor a pleasant place to read. Another area of the information center is reserved especially for professional decorators and designers. Here there are conference rooms, desk space, and telephones (a roof garden restaurant will be added soon).

Top left: Exhibit area for Bell Telephone is one of 150. Top right: The Panorama. Bottom left: Tom Lee, designer for the Center. Bottom right: The Information Bureau.

Panorama, the central exhibit area in the Design Center, is devoted to non-commercial shows which change every six weeks. The shows are devoted to new trends in interior design and will revolve around such themes as color, lighting and fabrics. Foreign governments will be invited to display their products in Panorama too.

Norman Ginsberg, who previously opened the adjoining Decorators' Mart, is president of the Design Center. Tom Lee (above) designed the interiors for the Center and acts as a permanent consultant on all new exhibits. To maintain high exhibit standards the Center has established an advisory council headed by Lee and including Pierre Bedard, president of Parsons School of Design; Robert Carson, architect; John Gerald, president of the New York Chapter of AID; Dorothy Liebes, textile designer; George Nelson, industrial designer; and Meyric Rogers, curator of decorative and industrial arts at the Art Institute of Chicago.

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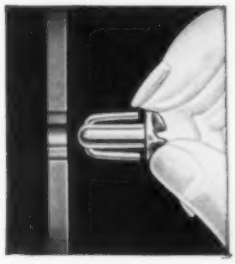

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Forticel... a Celanese plastic

Aluminum buffet group by Wallance

A six-piece aluminum buffet cook-and-serve set (right) has been designed for Aluminum Company of America's Forecast collection by Don Wallance. (Forecast is Alcoa's program to commission imaginative and "predictive" design in aluminum.) The cooking ware includes two electric casseroles, a salad bowl, an hors d'oeuvre tree, and two salad serving spoons which have been designed to combine the lightness and rapid heat transfer properties of aluminum with the colorfulness and "cleanability" of porcelain enamel. In the various pieces, Wallance has presented a variety of finishes for aluminum cooking and serving elements. The casseroles are porcelain enamel on both inner and outer surface, the salad bowl has a porcelain enamel interior and a polished aluminum outer surface, the tree is finished with a color-dyed anodic coating, and the spoons are of polished natural aluminum.

The casseroles include as an integral feature a heating element protected so that the entire piece may be immersed in water for cleaning. The flexibility of the heating element permits change to other heating methods, such as ultrasonic heat, as they become practical.

In his Forecast project, Wallance sought to develop "a group of cooking and serving pieces that would express the American way of living which fuses efficiency with gracious informality." The buffet group can be produced commercially as soon as the problem of finding a porcelain enamel finish suitable for surfaces in contact with food has been resolved.

Aluminum hors d'oeuvre tree, spoons, porcelain finished aluminum bowl and casseroles

Japan comes to Fifth Avenue

Offering sake and fish delicacies to celebrate the event, Takashimaya, one of Japan's largest department stores, opened its first American branch last month with traditional Japanese courtesy and pomp. The store, on New York's Fifth Avenue at 47 Street, offers a broad selection of Japanese goods amid a genuine Japanese atmosphere.

Tokyo's Junzo Yoshimura, whose work in this country includes the Japanese house in the garden of the Museum of Modern Art and the Motel on the Mountain, designed the store's three-floor interior. Yoshimura worked in association with Steinhardt and Thompson. To achieve authenticity, the architects had all the interior decorations, show cases and fixtures especially made in Japan. Even large rocks and hundreds of pounds of pebbles for the two interior gardens were brought in from Japan. Especially attractive elements in the Japanese decor are a mural in antique bronze (on right wall in photo below) by Inokuma, well known painter who studied with Matisse, and flower arrangements by Ikebana, the world-wide organization which teaches this art. Over a dozen Japanese salesgirls, wearing the traditional kimono, have been especially trained to serve American customers in the prescribed Japanese manner.

A large selection of products—draperies, textiles, home furnishings, garden supplies, china, lacquer, dolls and toys, books and decorative papers, and food stuffs—have been selected to meet American tastes. But the emphasis on gift and luxury items make it a specialty rather than department store.

Architect David Engel designed garden

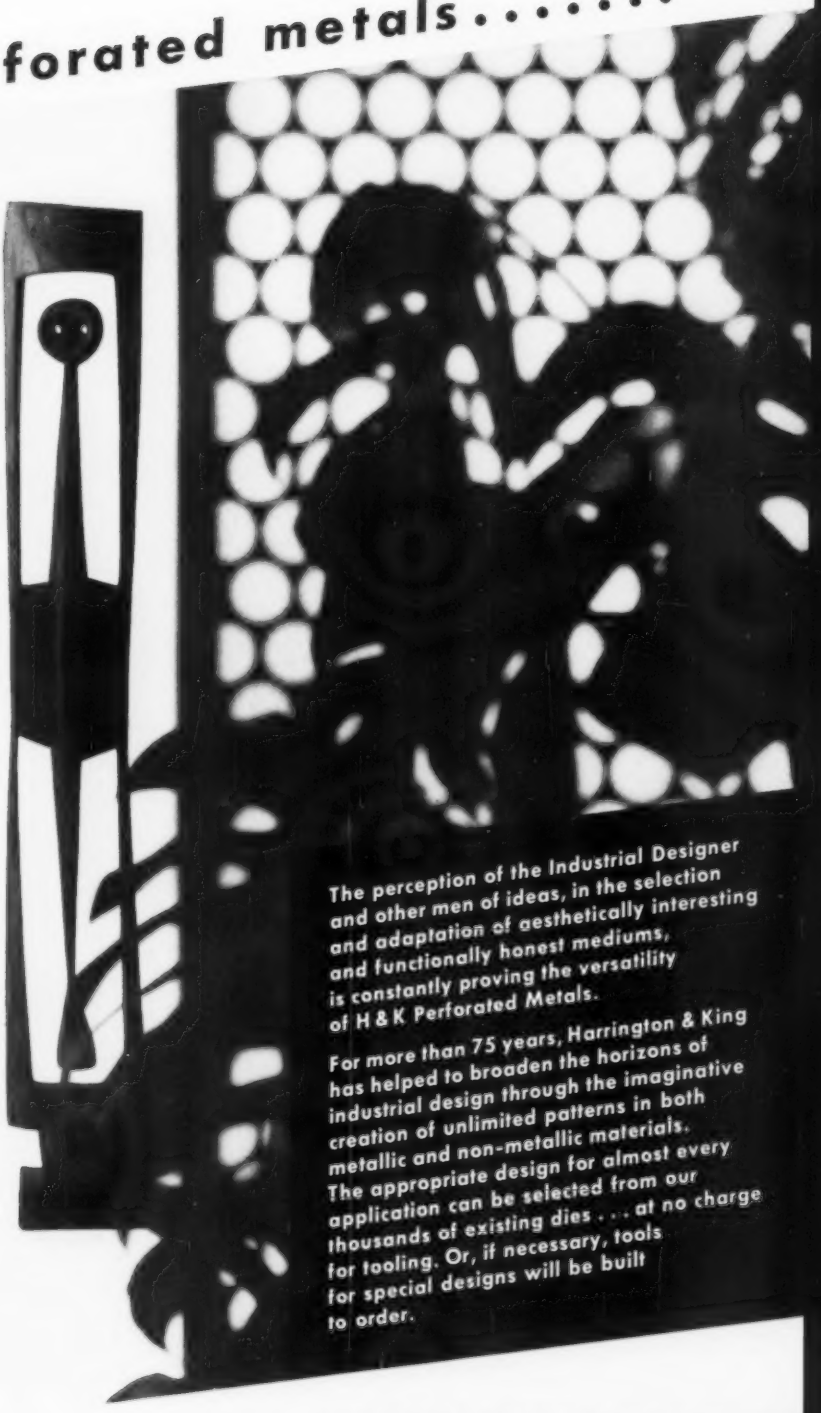
Symbol used on all Takashimaya packaging

All fixtures and fittings, as well as all products, are truly Japanese at Takashimaya

Idea!

. . . aesthetic functionalism

with H&K perforated metals . . . . . .



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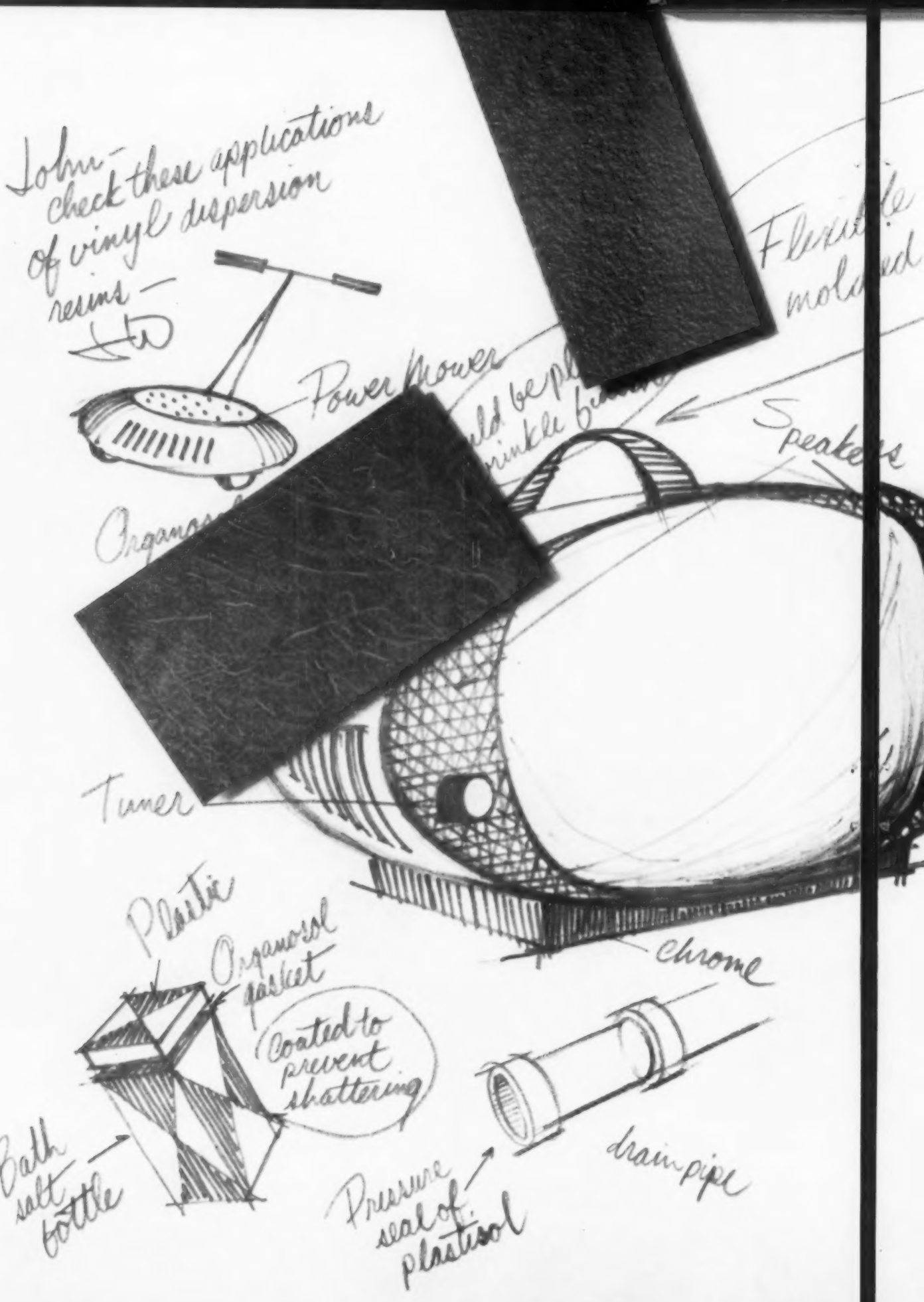
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New beauty and serviceability can be designed into appliances, furnishings, and even utensils – when you know the properties of these unusual coatings. Organosols and plastisols can be formulated for finishes ranging from glossy to textured, hard to resilient. One type, for example, outlasted other coatings tenfold in abrasion tests. Another, applied in quarter-inch thicknesses, forms a resilient cushion-coat and even a "poured" electrical insulation. Still another is used as a corrosion-resistant liner for chemical drums. Metal coated with these materials can be postformed—they won't crack, chip, or lose adhesion. Some types can be molded, apart from their use as coatings.

In fact, you can use them for roller coating, spraying, knife coating, dip coating, slush molding, rotational molding, casting, and extrusion...

Learn how they can help with design problems. Write Bakelite Company for the names of coating formulators who work with them, or for technical information on specific uses. Address Dept. KV44L, Bakelite Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Toronto 7.

It pays to design with coatings based on **BAKELITE** BRAND **PLASTICS**

UNION CARBIDE

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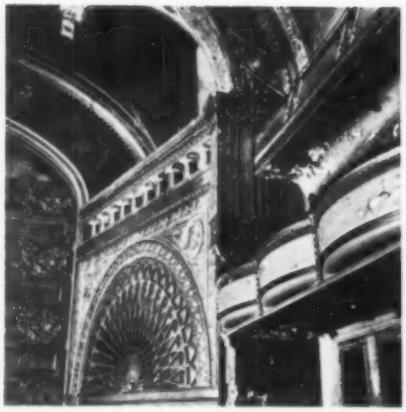
FOUR EXHIBITS in NEW YORK

"Architecture Worth Saving" will be on view until December 15, at the Museum of Modern Art, closed this past season because of a fire. The exhibition, photographs of important buildings in various parts of the country which have been recently "destroyed, doomed or delivered," is intended to demonstrate the rapidity with which America is losing much of its architectural heritage in a rapidly changing landscape.

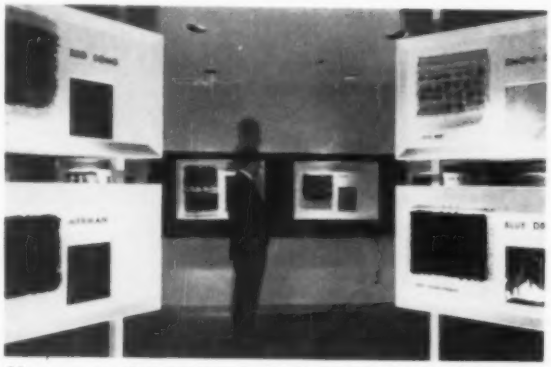


Sullivan's Chicago Auditorium

Wright's Larkin Building

Both photos Museum Modern Art

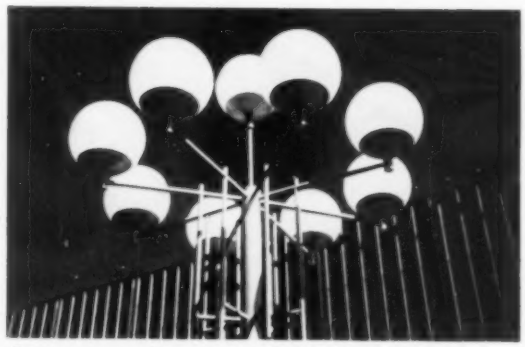
Forty-one Finnish rug designs, part of a competition conducted in Finland by the Bigelow-Sanford Carpet Company, are on display at the Museum of Contemporary Crafts until November 30. The winning entries are shown in full-scale rugs made by the designers themselves. First prize in the competition went to "Blush," an all-over design by Liisa Suvanto. Other winners were Sirrka Autio-Polkkynen, Eva Brummer, and Greta Skogster-Lehtinen.



Museum of Contemporary Crafts shows Finnish rugs

Street furniture—mail boxes, street lamps, litter boxes, benches and fountains—was shown in a photographic exhibit at the Architectural League last month. According to League president Morris Ketchum, who spoke at the opening of the show, "Street furniture can endow its surroundings with meaningful character. The handling of street furniture therefore greatly affects the characters of both the cities and suburbs of our country."

N. Y. street lamp, 1892



Denver street lamp for Zeckendorf Plaza, 1958

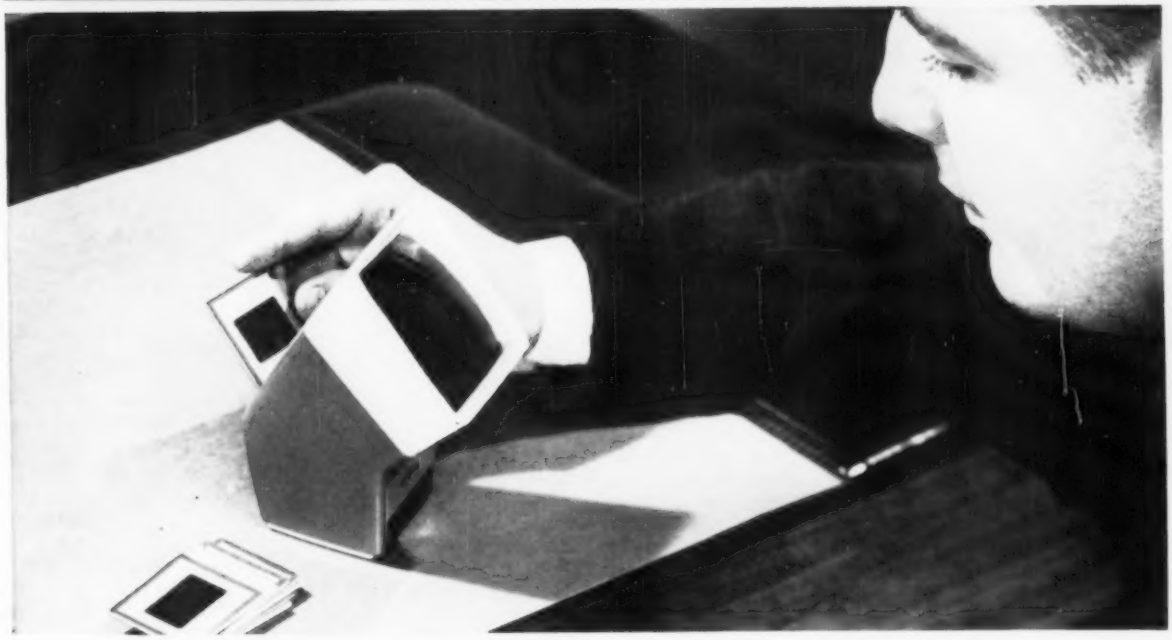
"The Diamond Jubilee of Halftone" at the Cooper Union illustrated the development of the photoengraving process. The pictures ranged in date from the 1950s back to 1880 when the first halftone made from a photograph appeared in the *New York Daily Graphic*. Oldest halftone in the collection (right) was made by Nicephore Niepce in 1826. The show, which closed in New York last month, is available for exhibit in other cities across the country.

Earliest photoengraving

First newspaper halftone

CYANAMID

PLASTICS NEWSFRONT



ARGUS SLIDE VIEWER focuses on CYMAC® 400

A number of advantages made CYMAC 400 polymethylstyrene plastic ideal for the smartly designed case of the new Argus PreViewer II color slide viewer. CYMAC 400 resists heat and will not warp when the bulb is lighted for an extended period, or when the viewer is exposed to the hot sun in store windows. It resists stains and may be wiped clean. And it lends itself to attractive design in two tones of blue—color that won't chip off. CYMAC 400 is economically injection-molded for Argus by the Parts Division of Sylvania Electric Products, Inc.

POLAROID PICKS BEETLE® PLASTICS PARTS

Eleven parts, including the handsome pale gray and charcoal case of the new Polaroid Print Copier, are molded of BEETLE urea plastic. Selected for its hard, lustrous finish, durability and range of colors, BEETLE resists staining from oils, greases and common chemicals. Parts are compression-molded by G. M. Laboratories for the Polaroid Corporation. Used in conjunction with the Polaroid Land Camera, the Copier delivers finished prints in 60 seconds.

For the plastic that will best meet the requirements of your particular application, call or write the Cyanamid representative nearest you.

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CYANAMID Plastics and Resins Division

National Plastics Exposition, Chicago, Nov. 17-21. See us at Booth 540.

First-prize winner in Bachner competition

Three products cited for honorable mention

Bachner awards for plastics

The Bachner awards "for outstanding contributions to the practical application of molded and formed plastics to the products of industry" were presented by John Bachner, president of the Chicago Molded Products Corporation, at a dinner in Chicago on November 18.

First prize ($1000 and an all-plastic plaque designed by Jean Reinecke) went to the Shampoo Master (top), an applicator for liquid rug cleaner made by the Bissell Carpet Sweeper Company and designed by Robert Yonkers and Richard Herring.

Three other entries (above) received honorable mention citations. Nylon roller skates by Manning Manufacturing Company were designed by William C. Crowle and Charles E. Jones. Thermokups, lightweight, smooth-surface drinking cups, were produced by Crown Machine and Tool Company and designed by James M. Harrison. Bathroom scales of injection molded cycolac were manufactured by the Brearley Company and designed by Palma-Knapp Associates.

All-aluminum homes on the market

Prefabricated houses with aluminum walls and roofs will be manufactured this year by National Homes Corporation of Lafayette, Indiana. According to James R. Price, National Homes board chairman, prices will start at $8750, and the homes, to be known as the Viking line, will be on the market by the first of the year.

The new building technique has been under development by National Homes for several years, with the cooperation of Alcoa, Reynolds Metals, and Kaiser. Each house will contain from 1300 to 2300 pounds of aluminum, used for roofing, siding, windows, doors, and trim.

Electronic restaurant planned

The restaurant industry will soon have caught up with the electronic age, when plans for a fully electronic restaurant which automatically cooks, serves, and cleans are completed by Designers for Industry in Cleveland, Ohio. The new kitchen, now in the engineering stage, will be especially designed for use in such centers as airline, bus, and railroad terminals, according to Guilbert Hunt, director of industrial design at the firm.

According to plans, individual place settings will be mounted on round tables which revolve through the side walls of the restaurant. Above each table an electronic menu will list the various items available and the price. When the customer has pushed the button next to the items he wants, a selector arm on the far side of the wall deposits food, utensils, and napkin on the table, the table revolves 180 degrees, and the customer's meal appears.

IDI election results announced

At its annual national conference October 8 through 10 in New York, the IDI reelected all its present officers to serve for the coming term, with the exception of Carl Bjorncrantz, who resigned as executive vice president because of the pressure of other IDI duties. Robert E. Redmann continues as president, H. Creston Doner as secretary, Leon Gordon Miller as treasurer, and George A. Beck as chairman of the board. The new executive vice president is John S. Griswold.

ASID presents 1958-1959 officers

New officers and directors of the ASID were formally presented to the Society's members on October 18, at the first evening session of the 14th Annual Design Conference and Meeting at Bedford Springs. President of the ASID for 1958-1959 is Donald L. McFarland, Manager of Industrial Design, Housewares and Radio Receiver Division, General Electric Company. Richard S. Latham, of Latham, Tyler and Jensen, is executive vice-president. Secretary is William C. Renwick, of William Renwick and Company; and Kenneth Van Dyck, of Van Dyck Associates, is treasurer.

Dave Chapman, Henry Dreyfuss, and Jay Doblin were elected directors to serve three-year terms. New chapter chairmen and regional vice-presidents are Reid Viemeister, Allegheny; John Sherrer, Midwest; John Bruce, New York; and Peter Augusztiny, Pacific.

The annual meetings of both the ASID and the IDI will be fully covered in the December issue of ID.

PDC elects new officers

Karl Fink (below) was elected the new president of the Package Designers Council at the Council's Sixth Annual Meeting last month in New York. Other new officers are George Reiner, executive vice-president; Margery Markley, secretary; and Harry S. Lapow, treasurer. Francis E. Blod, Donald Deskey, and Walter Landor were elected to three-year terms as members of the Board of Directors.

The PDC's program for the coming year, as outlined at the meeting, includes a comprehensive conference during which educators and professional package designers will discuss the question of package design curricula and what they should offer; the initiation of a series of Industry Awards to the head of a company "which has made outstandingly effective use of the professional package design consultant in its marketing program;" and a series of conferences, at the monthly Council meetings, with representatives of various industries and retail fields.

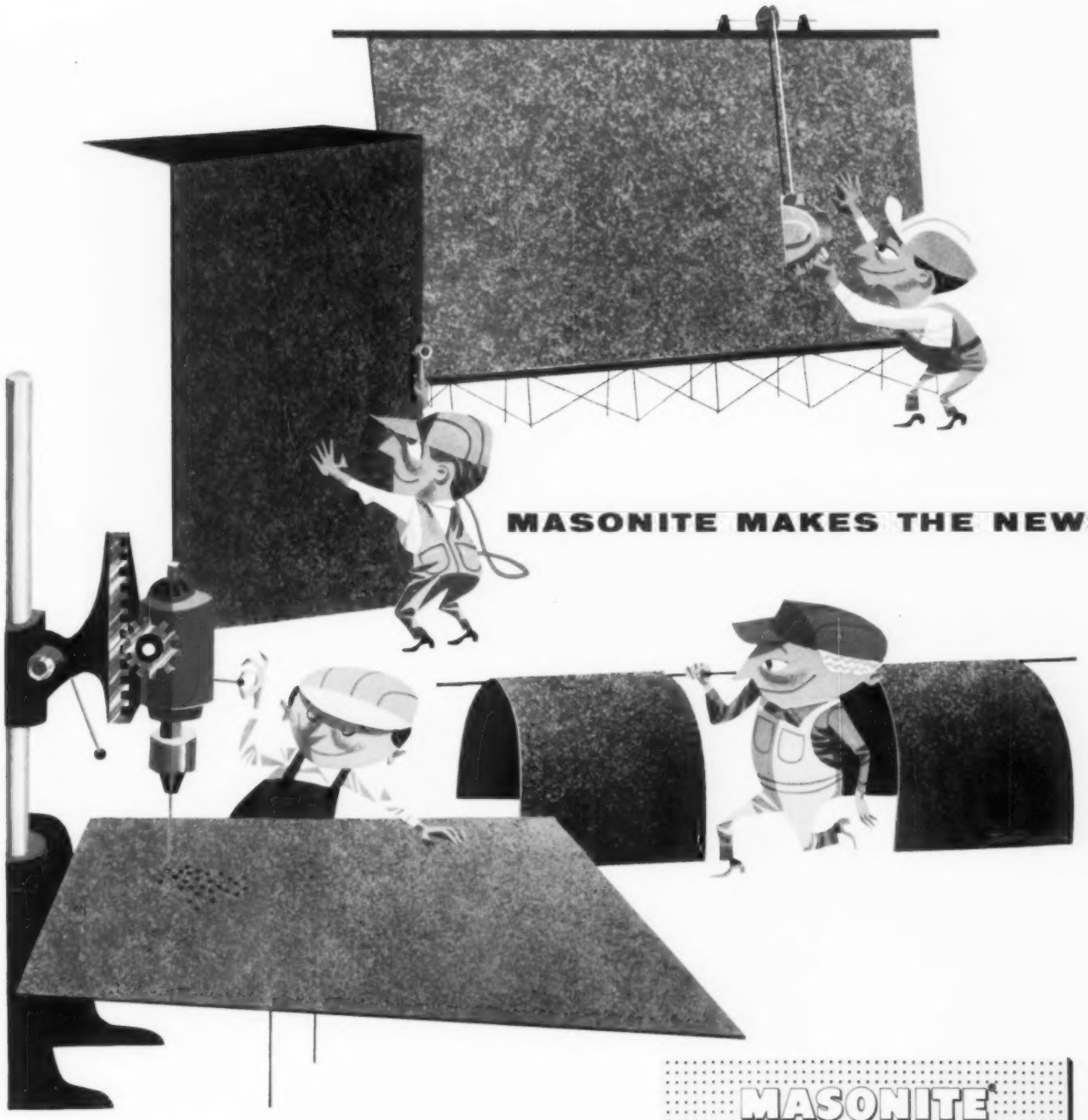
Karl Fink

Mail order decorating introduced

International Studio of Interiors, a new decorating firm with a new idea, has announced "complete interior decorating services" on a mail order basis. The consumer may obtain this service for $30 either directly or through a chain of dealers across the country. For dealers, membership fee in the plan is $150 per year, with each job placed at a flat $30 which they may either absorb themselves or pass on to the customer.

After the consumer has outlined to I.S.I. detailed information on the size of her home and the personal tastes of her family, I.S.I. sends her a complete decorating plan, including information on where suggested furnishings may be purchased, photographs of each item selected, a list of dealers where goods may be purchased, and their price.

Headquarters for International Studio are 18450 Livernois Avenue, Detroit; 516 Fifth Avenue, New York; and 6000 Sunset Boulevard, Hollywood.



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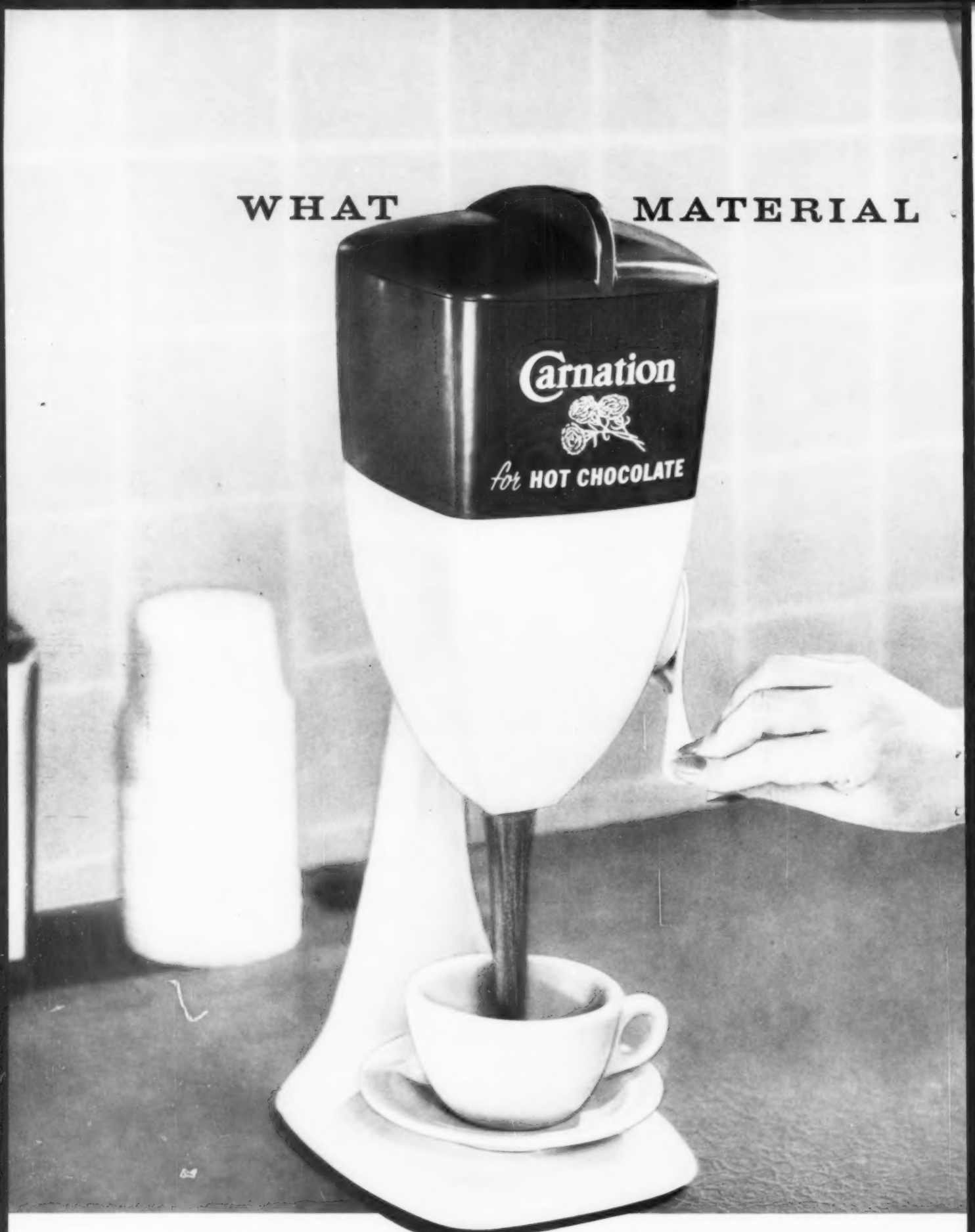
WHAT MATERIAL



DRY CHOCOLATE DISPENSER. To meet special qualities in esthetics and strength, BAKELITE TMDB-5161 is used in molding the precision main parts of the new "Carnation" hot cocoa mix dispensers for use in the restaurant field. The high heat- and-impact resistance of this styrene material makes it completely washable, and insures accurate, trouble-free service.

Molded by Field Manufacturing Corp., Santa Monica, Calif.

IS ALWAYS NEW?

BAKELITE BRAND PLASTICS

. . . offering new freedom in design . . . and cost . . . and functional advantages!

It continually appears in *new* compounds and forms to meet new specifications.

It encourages the creative talents of design engineers, architects and interior and industrial designers.

You *know* the answer—*BAKELITE* Brand *Plastics.*

From the coatings on TV towers atop New York's Empire State Building to undersea oil rigs . . . from the packages on supermarket shelves to molded appliance parts . . . from Cup challenger yacht hull sealers to jet plane controls . . . *BAKELITE* Brand *Plastics* are solving new design problems.

And *BAKELITE* Brand *Plastics* almost invariably offer cost, production and functional advantages *as a plus!*

BAKELITE COMPANY WILL HELP YOU: Whatever your design area, no matter how unusual the qualities you require for forming, strength, rigidity, flexibility, insulation, corrosion resistance—explore the proven advantages of *BAKELITE* Brand *Plastics* and *Resins.* The material that's new all the time!

Technical representatives with years of training and field experience are available to discuss your special design problems. Write Dept. KF-51D.

THIS NEW AND DIFFERENT BLENDER, with separate compartments from which liquids are automatically mixed when poured, is easy to clean and hard to break. BAKELITE C-11 acrylonitrile-styrene-copolymer is used for the outer container, for strength, chemical resistance and low cost. The lid is BAKELITE Brand Styrene Plastic. Molded by Avsco, Inc., Excelsior Springs, Missouri.

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BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.

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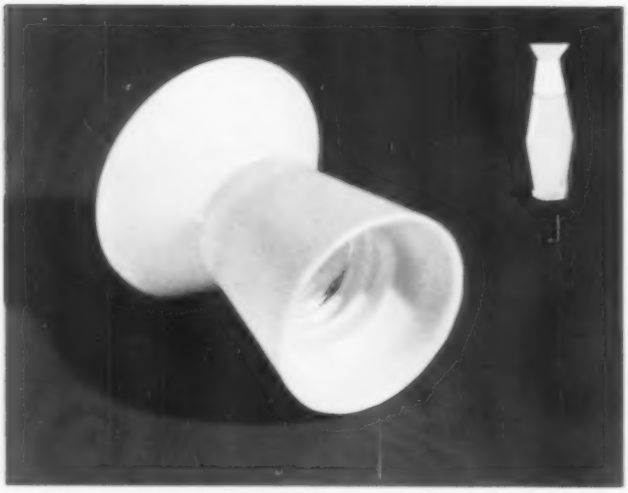
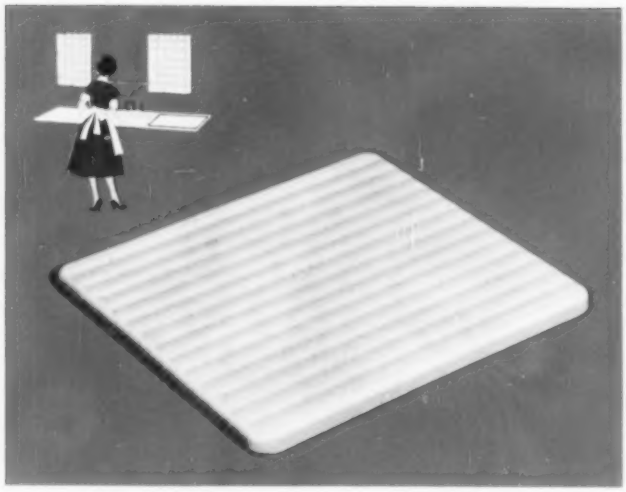
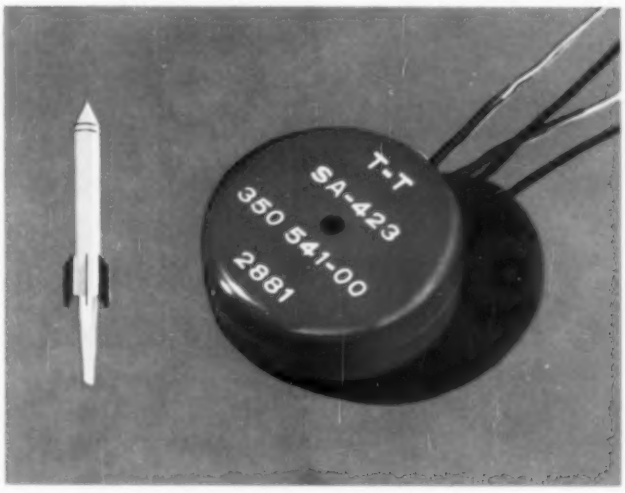


CLOSURE MOLDED OF UREA. This is a double reverse taper closure for Max Factor's Hypnotique Parfum-Cologne. Urea's smooth, hard surfaces add eye- and sales-appeal and have a resistance to chemicals.

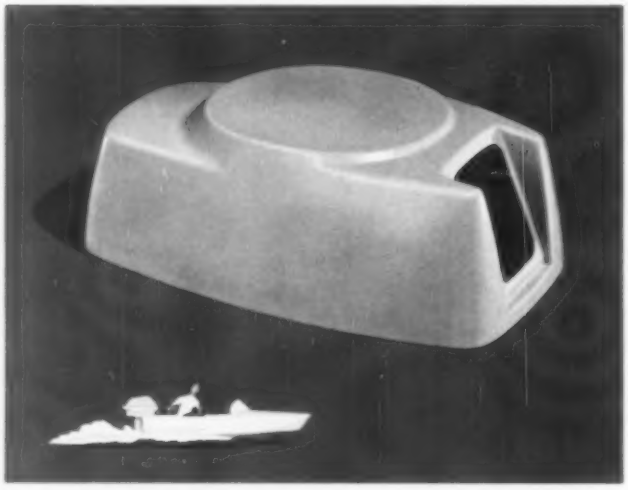


SINK DRAIN TRAY MOLDED OF MELAMINE. Kohler's movable Melamine sink drain tray is rigid, chip-proof and rust-proof. Melamine provides smooth, extremely hard surfaces that resist scratching and household chemicals . . . and wipe clean easily.

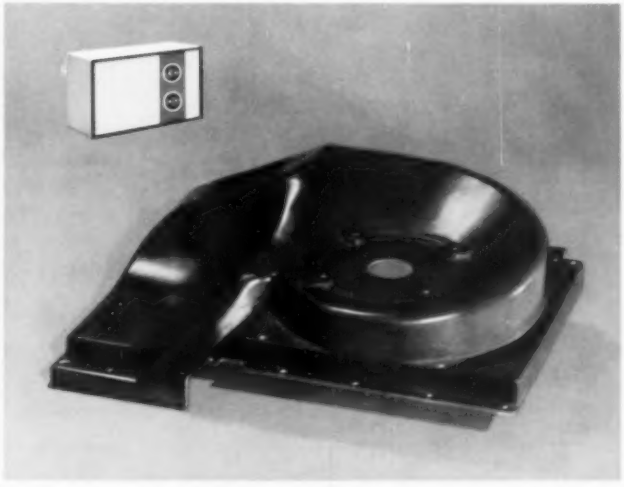
HEEL LIFTS MOLDED OF NYLON. Nylon's outstanding resistance to abrasion gives these lifts several times the life of ordinary lifts. Lifts can be molded quickly, efficiently and economically.



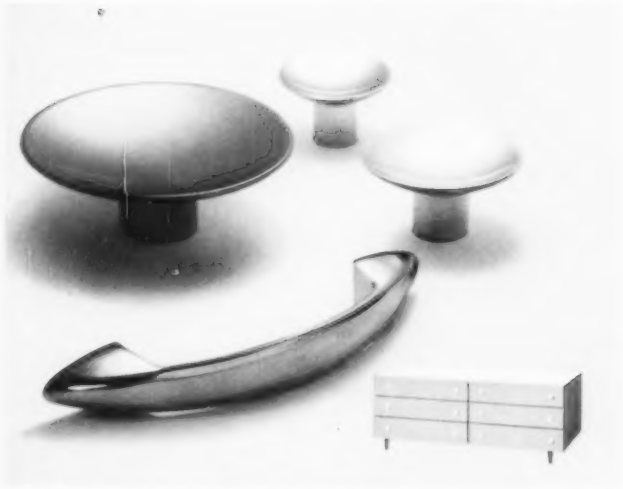
TORROID COIL MOLDED OF ALKYD. Outstanding electrical properties plus resistance to moisture and heat—make Alkyd the ideal material for encapsulation of electronic components. Alkyd is the fastest curing thermoset and can be molded in a few seconds.



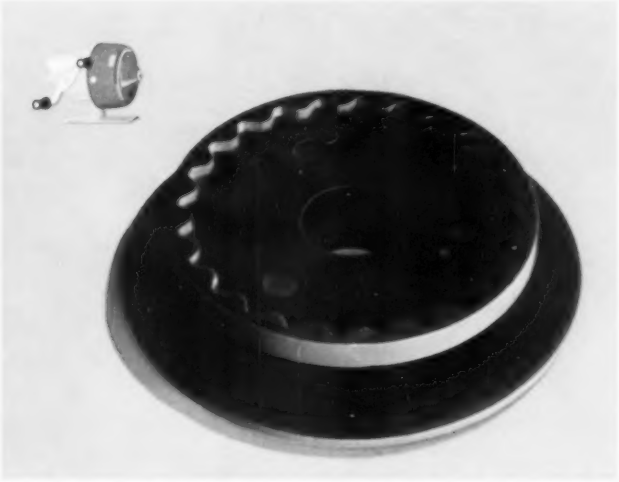
MOTOR COVER MOLDED OF POLYESTER LAMINATE. On Johnson Sea-Horse Outboard Motors—Polyester reinforced with glass fibers, provides a motor shroud that is lighter than metal, corrosion-proof . . . offers greater impact resistance than metal and lower fabrication costs.



AIR-CONDITIONER PARTITION MOLDED OF PRE-MIX POLYESTER. Pre-Mix can be molded in varying contours of an Archimedes spiral—all in one piece construction. Partition is corrosion-proof and acts as a thermal barrier.



DRAW PULLS MOLDED OF NYLON. Knobs and handles, by Mirra-Cote, are injection molded, and then metalized. Unlike metal . . . these draw pulls cannot rust or corrode. They retain their color brilliance almost indefinitely.



REEL SPOOL MOLDED OF ALKYD. Alkyd is strong—it withstands the pressure of a wound nylon line as it contracts during drying. In this reel by Bronson Reel Co., Alkyd is also impervious to salt water corrosion and moisture . . . and it retains precise dimensions.

SLEEVE INSULATOR FABRICATED WITH PHENOLIC VARNISH. Designed by Allis-Chalmers Manufacturing Co., part utilizes flame-retardant PLASKON Varnish V-236. Burns only when exposed to very high temperatures (gas flame or electric arc) and extinguishes immediately upon removal of ignition source. V-236 laminates meet NEMA Grade XX.

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new products

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Company News

At a dress rehearsal for the American Gas Association's recent convention in Atlantic City, designers **Carl Sundberg**, **Elisha Gray II** (Whirlpool Corp. Chairman) and designer **Montgomery Ferar**, left to right above, displayed the new **RCA Whirlpool** Miracle Gas Kitchen. After the convention, the new kitchen, intended to illustrate the progress of gas appliance research, began a demonstration tour across the country.

The Color Styling Service of **Monsanto** is distributing a brochure by **Faber Birren** which plots graphically the varying popularity of 22 colors used in home furnishings and related products since World War II. Currently, the graph indicates, consumers are choosing pale and muted colors.

The **H. J. Heinz Company** has opened the Heinz Research Center in Pittsburgh, an eight-story building designed by **Skidmore, Owings and Merrill**, with interior decoration by **Florence Knoll**. In addition to seven research laboratories, the new building contains a small-scale factory for the test-production of new products under laboratory conditions.

The **Jim Nash** office in New York and the **Walter Landor** office in San Francisco were hosts last month to groups of European management executives visiting the United States under the auspices of the ICA and the U. S. Department of Commerce. The design offices presented a survey of American package design, emphasizing the particular marketing characteristics responsible for the dynamics of packaging.

Competitions and awards

The **National Society of Interior Designers** has announced its 1958 awards. The **Bell Telephone System** received the award for the outstanding contribution of the year to the field of interior design, for the establishment of color telephones as a part of interior decoration. **Philip Johnson**, the designer of New York's Seagram Building, received honorary membership in the society. In addition, citations for distinguished service to the organization were presented to **Yale R. Burge** and **Dora Brahms**, former president and vice-president of the NSID. **Charles E. Whitney**, publisher of *Interiors* and INDUSTRIAL DESIGN, received the 1958 award for "distinguished practice of professional journalism."

The **James F. Lincoln Arc Welding Foundation** is offering 54 awards (first prize: $10,000) for papers describing the uses and advantages of arc welding in the design and construction of machines or machine components. The rules booklet is available from the Foundation, Cleveland 17, Ohio.

The **Franklin Institute**, Philadelphia's 134-year-old scientific and educational organization, last month in its annual Medal Day ceremonies honored 17 men whose varied accomplishments ranged from the development of plastic bottles to the production of the first synthetic rubber. Winner of the Franklin Medal, the Institute's highest honor, was **Donald W. Douglas**, founder of Douglas Aircraft, for his contribution to aeronautical design.

The **American Society of Mechanical Engineers** has presented its Timoshenko Medal, for outstanding work in the field of applied mechanics, to **Theodore von Karman**, chairman of NATO's Advisory Group for Aeronautical Research and Development; **Arpad L. Nadlai**, former consulting mechanical engineer for the Westinghouse Research Laboratories; and **Sir Geoffrey Ingram Taylor**, former Yarrow Research Professor of the British Royal Society. The ASME also awarded honorary membership to **John Blizard**, director of research for the Foster Wheeler Corporation; **Howard Coonley**, professional engineer; **James Gleason**, chairman of the board of Gleason Works; and **Ernest L. Robinson**, former structural engineer for the General Electric Company.

Fetzer

Portanova

Wever

The **California College of Arts and Crafts** has been awarded a first prize for its 1958-1959 catalogue by the **American College Public Relations Association**. The catalogue was cited for the "excellence of its design, the clarity of its text, and its fine typography."

People

APPOINTED: **Tadao Takano** to the staff of Benolken-Douglas-Minnick, Inc., Chicago . . . **Howard Wever** (above) to the staff of J. M. Little and Associates, Maumee, Ohio . . . **Morrison Fetzer** (below) as associate director of Cornelius Sampson and Associates, San Francisco . . . **Lee Winslow Court** as special consultant to the Commerce Department's Office of International Trade Fairs . . . **Charles E. Finsilver** as vice-president of Lippincott and Margulies, New York . . . **Peter Heller** and **John Kishler** as, respectively, Director of International Operations and Director of Research Development at the Institute for Motivational Research, Croton, New York . . . **Thomas A. Woods** to the staff of Inspire Design Studios, New York . . . **Wayne R. Wagner** to the staff of Niko Arvon and Associates, Milwaukee.

ELECTED: **Joseph D. Portanova** (below) as chairman of the Southern California Chapter of IDI.

Exhibits

The French industrial design association, *Formes Utiles*, has notified the ASID and the IDI of its desire to obtain American designs for display at the 1959 Paris Housewares Show. The themes chosen for presentation are three: chairs, clocks, and kitchen cutlery. More information can be obtained from J. Poirier, *Formes Utiles*, Grand Palais, Cours de la Reine, Paris 8.

The Museum of Modern Art, New York, will exhibit a selection of "the best and most significant design of the 20th century" from December 17 through February 23. The objects shown will be chosen from the Museum's permanent collection.

Going Places

CHANGE OF ADDRESS: **Herbert Pinzke** to 175 North Michigan Avenue, Chicago 1 . . . **Lubar Asociates** to 6 East 39th Street, New York 16 . . . **Henry Keck Associates** to 245 Fair Oaks Avenue, South Pasadena, California . . . **Hoyt Howard, Inc.** to 210 East 39th Street, New York 16.

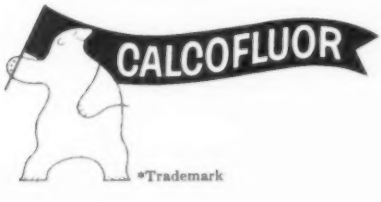
NEW FIRMS: **Campbell Packaging Company**, 52 East 19th Street, New York . . . **M. Barnett and Associates**, 545 Sutter Street, San Francisco.

NEW BRANCH: **Smith, Scherr and McDermott**, at 10 West 56th Street, New York.

CHANGE OF NAME: Dckovic- Smith Design Organization, Chicago, to **DesignComm.**

EVEN **BLACK**-*AND-* WHITE *HAS MORE "COLOR"...*

when you specify papers treated with CALCOFLUOR* white!



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If you want lifelike reproduction and greatly enhanced visual appeal in catalogs, letterheads, posters, magazines and other printed matter, make sure you specify "CALCOFLUOR-treated" papers. They're available in a broad range of grades and types—including coated stock, offset, vellum and bond—from America's leading papermakers! Ask your supplier for samples—today!

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put
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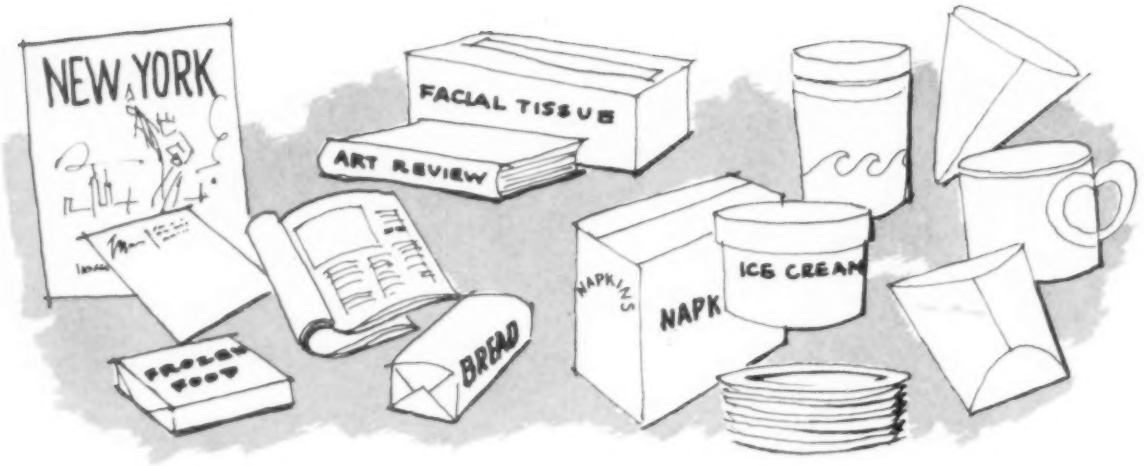
printing to *paper cups!*



It's not only the printed page that benefits from CALCOFLUOR White!

Art directors, package designers and smart merchandisers are all discovering that people just naturally respond to the more beautiful, more brilliant CALCOFLUOR White papers at the *point of sale*. This added whiteness is truly like another dimension—a *marketing* dimension!

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BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Are designers undemocratic?

Too much has been written about Detroit this year, and too much has been written about the kind of research that aims to flush wild birds from the most tangled jungles of the popular heart. There have been books and articles by those who are enraged by the new cars and those who are stuck with them, those who have been saved by evangelical psychology and those who have been scared by Vance Packard. Yet it is still hard to keep off these subjects, for what is said about them is often disturbingly relevant to design.

For example, a prominent executive recently posed to a group of designers the following thoughtful question: "Why has the big overblown monster been such a success, despite your practically unanimous criticism of its design?"

Many were surprised to hear that it *had* been such a success, but that is beside the point. The point is the executive's answer. He said that automobile design today was "admirably suited to its true underlying function," which was not to provide transportation at all, but to demonstrate social status, give a feeling of mastery and power, and magnify the driver's personality. It was suggested that although the designer may consider these to be "*unworthy* desires," it would be undemocratic of him to judge.

We have heard this before. It seems to us, however, less a question of democratic behavior than of an older, less public virtue that every designer must name for himself. If a man really believes that what he is creating is a monster, then he had better stop creating it. Otherwise *he* is a monster. Any good designer may be responsible for design he finally decides is bad, but he does not do it deliberately.

This is a dilemma for a professional who is, after all, retained not to express his integrity but to enhance his client's products. Since he is designing for people, isn't he obligated to design what people want?

As with most hard questions, the answer is: "Yes and no." For people want lots of things. We want security and we want adventure; we want sensible, safe products and we want products that tickle our egos. To the extent that seemingly opposed desires are compatible in form, both may be satisfied by design; in fact, to discover and express this compatibility is one of the designer's roles, and it is not a new one. (Even the surrey had non-functional fringe on top.) The problem is to distinguish between what is basic to a product's conception and what is incidental to it. An automobile is a device for getting people from place to place, just as a razor is a device for shaving. Both instruments offer a number of additional satisfactions. But if these extra functions are interpreted as the main thing, it would be more efficient to make a product honestly designed to perform them, and do away with the extravagance of engines and blades. It is only when a product's incidental value seems to be distorted out of all proportion to its basic value that the designer may consider the desire "unworthy." And we do not think it is undemocratic for him to exercise his judgment about this.

Such distortion has very often come about desperately as an artificial selling tool; but even if the distortion were spontaneous, the designer could not really help. If a man is indeed so insecure that a product has to be misleadingly designed in order to make him feel virile and socially acceptable, then what he needs is not motivational styling, but psychiatry. He may as well take his Freud straight. Except for resale value, the cost is probably about the same. (We refuse to believe, however, that many consumers are in this fix.)

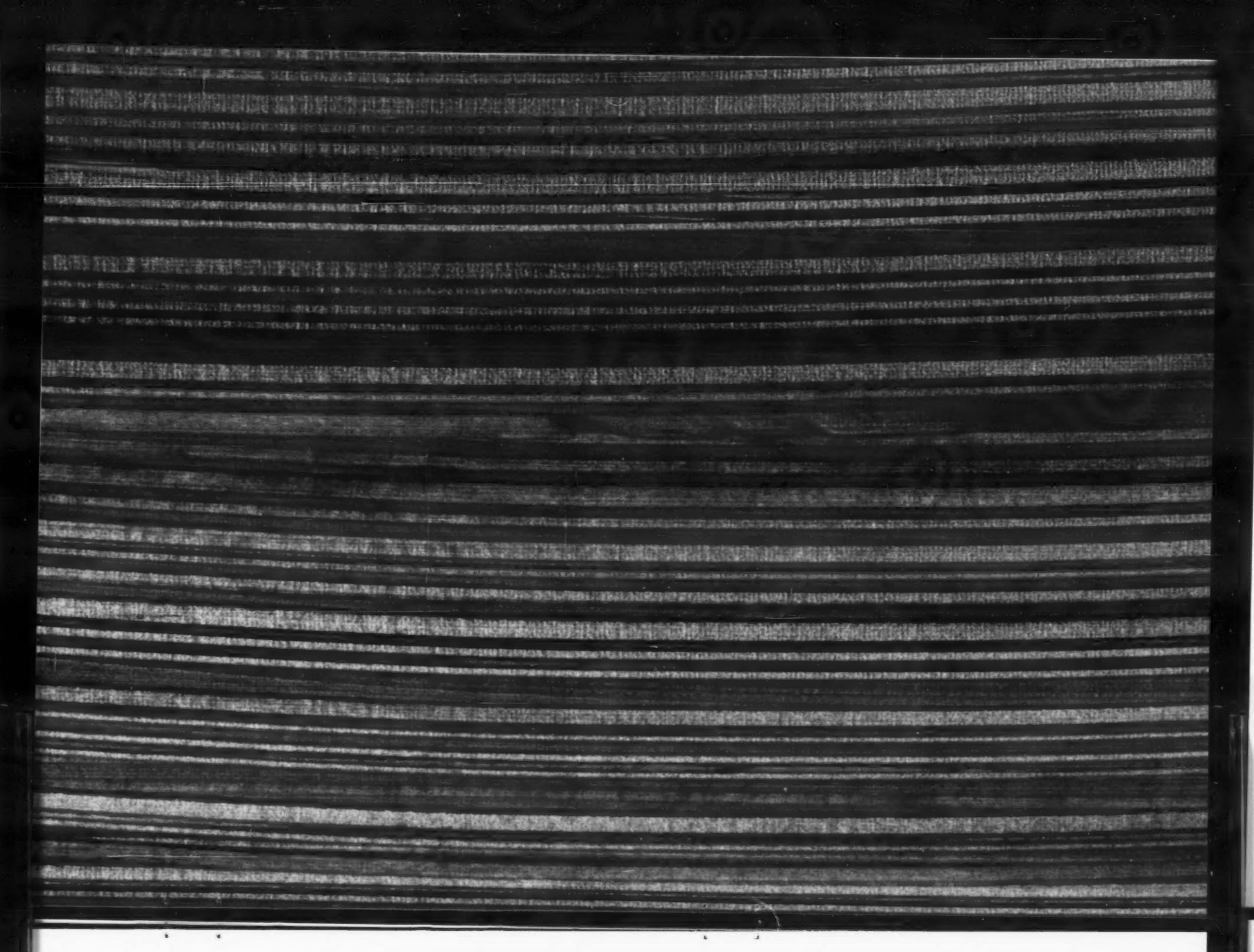
Design is not a democratic process, but a creative one. Democracy makes the designer responsible for appealing to people at their best with his best. It does not relieve him of the right to have ideas about what is worthy, nor does it ever absolve him from his duty to implement them by design.—*R.S.C.*

Paper

The manufacture of paper by hand enjoys a long and fascinating history — the unbroken tradition of an esthetic craft and a practical art. The art of papermaking gives us our most basic material for written communication: the silent tongue frequently more eloquent than our speaking tongue. In the papered world in which we live, a world of bank notes, billboards, and belles lettres, we tend to forget the tool which first made possible this handsome material: the paper mold — simple and ingenious — which is the central figure of this article.

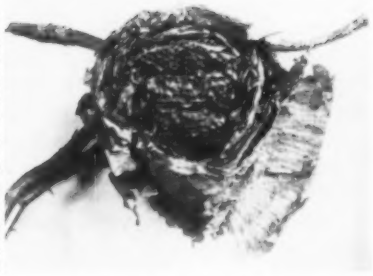
by Quentin Fiore

Quentin Fiore, graphic designer, calligrapher, typographer, and paper enthusiast, became interested in the neglected study of handmade paper some years ago. Mr. Fiore regards paper as not merely a surface but an integral part of any graphic presentation. The hand-decorated paste-paper at right was made under his direct supervision.



This sheet is Fabriano mold-made paper. It was decorated, under the direct supervision of the author, by the most ancient of all methods— hand. Each insert in this edition of Industrial Design is unique (as a comparison between any two copies will show) — the distinguishing trait of a hand-made object.

In dedication to the late Harrison Elliott, friend and paper scholar — a modest tribute to his kind encouragement and expert guidance in the study of the "white art."



Courtesy of the Museum of Natural History

Handmade paper is a jewel, sought after by those whose tastes crave something that has been touched by human hands; something nurtured by tradition and with a personality all its own. Paper as we know it today is far removed from the delicate craft of the papermaker whose traditions stretch back nearly two thousand years and across the world. It took handmade paper a millenium (105 A.D. to 1151 A.D.) to make its remarkable journey from China, through the Middle East and Africa, and then to Europe through Spain, where the Pillars of Hercules were just an invasion away from Moorish Africa.

But eons before man produced paper, it was being made in the great coal forests of the carboniferous era, when among the lords of the earth were some of the insects of today. Among these was the *Hymenopterous* of the family of *Vespidae*, known simply as the "paper wasp." Millions of years ago, this lowly insect, which we have good reason to shy away from, developed the first true paper. We have had to learn to imitate the natural process of this winged papermaker who, without benefit of vats, molds, beaters and all the other appointments of the papermaker's trade, nibbles away at any source of dry wood, masticates it, and then exudes a paste-like substance which serves as a binder for her miraculous product. With this paper, she constructs a form of habitation that is, apart from the material used, a marvel of technology to which architects are returning as a source for creative inspiration.

Many materials were used for the purpose of communication before man learned to imitate this first papermaker. Thoughts, in the form of words and images, were *carved* upon stone; *scratched* into clay tablets; *cut* into brass, copper, bronze, lead, and wood; *painted* upon the walls of caves, leaves, and barks of trees, upon laminated surfaces such as Amatl, Huun, Tapa, and Papyrus, on cloth such as silk, and also upon animal skins—vellum and parchment. Before speaking of paper, it might not be amiss to clear away two common misconceptions of paper on the part of some. One of the materials used as a writing surface before the development of paper is particularly important because it has mistakenly come down to the present day as the first form of paper. The word for it, familiar to every schoolboy, is "papyrus." The mistaken notion is perhaps due to the etymology of "paper": the Latin word "papyrus," from which our word "paper" derives. Thus papyrus is often confused with paper, or at best, thought of as its earliest form. It is in no sense either of these things, for papyrus was made from the pith of a tall sedge found in great quantities along the banks of the Nile and was used as a writing substance in Egypt and by the neighboring Mediterranean people. The basic difference between paper and papyrus lies in their manufacture: papyrus is a *laminated* surface of strips of the sedge pith while paper is made by *macerating* fibers to produce an aqueous solution of pulp.

Another substance which is often confused with paper is so-called "rice paper." Much prized by some as the most typical product of oriental papermakers, this elegant, very white thin substance is not paper at all. In reality, it is the pith of a plant that grows in Formosa, which is cut spirally into strips, and is usually used to make charming artificial flowers. Unfortunately, and inaccurately, the term "rice paper" has come to mean *all* oriental papers. Although rice is the universal staple of the Orient, it cannot be used to make paper.

Before the advent of paper, and for several hundreds of years after its appearance in Spain, Europeans derived an exquisite writing surface from the prepared skins of lambs and calves. These skins were made into vellum and parchment and were used by the scribes and illuminators of medieval Europe in place of papyrus, since the papyrus sedge could not be practically raised on the continent. Man's ability to "make do" with the materials available to him accounts for the many differences in paper throughout the world. For instance, the Arabs of Samarkand (751 A.D.), although they had probably come into contact with oriental papermaking through wars, had no mulberry tree from which to form paper; linen rags, plentiful in the land at the time, were therefore used as a substitute pulp material. Apart from various substitutes proposed from time to time, there are, broadly speaking, two basic categories in which hand papermaking materials fall: vegetable fibers in their natural state, and cotton and/or linen rags. Vegetable fibers are used in the Orient, while rags form the basis from which pulp is made in the West.

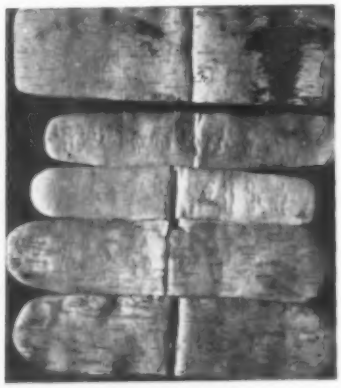
Post-horn—French, 16th Century watermark

The Pierpont Morgan Library

The Egyptian Book of the Dead *on papyrus — a laminated substance made from the inner bark of a tall sedge found along banks of Nile.*

The Pierpont Morgan Library

The Berthold manuscript (German) written and illuminated on vellum, an exquisite medieval writing material from skins of calves.



Courtesy American Museum of Natural History

Writing on birch bark. An example of primitive man (in this case the American Indian) writing on a surface most available to him.

If there is one man in all history who deserves credit for conceiving the process by which handmade paper is made, he is a Chinese eunuch named Ts'ai Lun, a privy councilor to the Royal Court of Ho Ti. An ancient Chinese scholar wrote: "Under the reign of Ho Ti (89-105 A.D.), Ts'ai Lun, of Lei-yang, conceived the idea of making paper from the bark of trees, discarded cloth, and hemp well-prepared; the paper was then in use in the entire universe." Perhaps Ts'ai Lun, denied the pleasurable pursuits that often distract other men, found time to gaze at the paper wasp and wonder why man too could not make paper. But Ts'ai Lun did find time to become involved in a court intrigue as an inventor of slanders against a member of the Imperial family and his end was worthy of the most confirmed stoics of another culture: having given himself up to the minister of Justice, Ts'ai Lun experienced such deep feelings of remorse and shame that he ended his life by bathing and dressing himself in his most elaborate robes and quaffing poison. Ts'ai Lun left behind him a legacy far greater and of far more import than that of many a conqueror. History, full of Tamerlanes and Caesars, records only one Ts'ai Lun.

Ts'ai Lun saw, with unusual insight, the possibilities of manufacturing a writing substance from strips of silk which remained after newly mounted scroll manuscripts had been trimmed. Waste of this sort would naturally concern a man with the type of mind with which Ts'ai Lun was endowed. It was clear to him that after beating these silk left-overs until they were reduced to a fibrous pulp, some contrivance was needed upon which this aqueous substance could be poured and, after drying, formed into a writing material of very economical manufacture. What was required was a screen which would retain the matted fibers on its surface and at the same time allow the excess water to drain through. Thus was born the paper mold, and it is to this simple device that this article pays homage.

The paper mold—simplicity and ingenuity

This tool, the paper mold, is profoundly important to mankind. It was created in response to a particular need and, because of its basic design, has not changed appreciably in nearly twenty centuries. There have, of course, been a number of innovations, the most interesting of which was —in answer to the nineteenth century's demand for more and more paper—the Fourdrinier, or continuous web, papermaking machine. But it is the story of hand papermaking —the tool and the process—that concerns us here.

Before describing the paper mold in detail, it may interest the student of etymology that some paper scholars claim that a term widely used today had its origin in the paper mold; namely, that "format," so bandied about these days in fields as far removed from papermaking as television and advertising, is derived from the French name for the tool—*forme*. *Format*, in the sense in which it was first used and is still used in France, refers to the size of a sheet of paper as formed in the paper mold.

PAPER'S LONG JOURNEY FROM CHINA IN 105 A.D. TO THE AMERICAN COLONIES—1690

1 105 A.D.—Paper invented by Ts'ai Lun in Lei-yang. 610—Paper introduced into Japan via Korea. 770—The Million Prayers of Empress Shótoku, first text printing on paper. **2** 751—Paper made in Samarkand, presumed to have been learned from Chinese prisoners of war. **3** 793—Baghdad: paper introduced by Harun-al-Rashid, learned from Chinese in Samarkand. **4** 900—Paper made in Egypt, employing Chinese methods of manufacture. **5** 1100—First papermaking in Morocco—from Egypt. **6** 1151—World's first stamping mill at Xátiva, Spain; motivated by water power until invention of "Hollander." **7** 1276—establishment of paper mill at Fabriano (oldest continuously operating paper mill). 1282—First known watermark of Europe, at Fabriano. **8** 1348—First paper mill in France, at Troyes. 1719—René Antoine Ferchault de Réaumur suggests use of wood for pulp. 1777—"Wove" (papier vélin) exhibited in Paris by Benj. Franklin. 1798—Nicholas-Louis Robert invents continuous web papermaking machine. Called to this day the Fourdrinier because it was developed in England by two brothers of that name. **9** 1390—Mill established at Nurnberg by Ulman Stromer (famous "S" watermark); first known papermaker's strike at this mill. 1450-5—Gutenberg's 42-line Bible published. 1540—Glazing hammer, supplanting hand burnishing of paper, invented. 1595—First "paste-papers." **10** 1322—First *use* of paper in Holland. 1680—invention of the "Hollander," a machine supplanting primitive beaters motivated by wind or water. **11** English mill established in Hertfordshire by John Tate. 1757—Introduction of "wove" paper, made by Turkey Mill for John Baskerville. 1848—Chiaroscuro watermarks invented by Wm. Henry Smith. **12** 1690—Founding of first American mill in Germantown, Pa.

Bull's head—French, 16th Century watermark

Mitsumata

Kozo

Gampi

Tororo-aoi

Handmade paper is formed in two ways. In the primitive manner, which is still practiced in some of the remote areas of the Orient, the pulp is *poured* upon a cloth of woven grass stretched taut by a frame of bamboo. This grass cloth is firmly affixed to its frame. The wet sheet of paper thus formed remains on the surface of the mold and is left to dry. The second and more highly developed manner of forming paper is as disarmingly simple as the first process. In this, the *mold* is *dipped* into a vat filled with pulp, lifted, and rhythmically shaken to ensure even distribution of the pulp. The sheet is then dried.

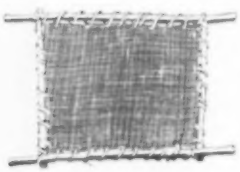
However, because the newly formed sheet of paper remained in the mold until dried, a mold was needed for each sheet. For a thousand sheets a thousand molds were required. As a result, a flexible, removable bamboo covering, *which could be rolled off its frame*, was developed. This simple, ingenious device enabled the early oriental papermakers to simply roll off the mold covering upon which lay the newly-formed sheet of paper, place the sheet in the sun to dry, return the mold covering to the frame, and repeat the process. The simple beauty of this tool, sometimes referred to as the "transfer" mold, is an excellent example of technology in its simplest form.

The split bamboo covering of the transfer mold was held in place during the dipping process by loose sticks the same length as the short ends of the rectangular frame. These were grasped by the right and left hands of the papermaker, completing the right and left side of the deckle. The early Chinese papermakers followed a policy of using readily available material to make paper, and therefore used silk in both its raw or woven state before discovering the use of mulberry bark, bamboo hemp, and a wide variety of materials for the basic ingredient—pulp. It should not be surprising, then, that the Chinese character for silk forms part of their character for paper. 糸 紙

It should be mentioned here that we owe a very great debt to the Chinese for their contributions to the art of papermaking. Unfortunately, present strained relations do not permit correspondence with these people and make it difficult, if not impossible, to procure illustrative material and specimens from China. Since the variations between papermaking in Japan and China are slight, we take Japanese processes and tools as our model.

The love of the craft in Japan

Japanese papermaking represents to the highest degree the oriental attitude towards this ancient craft. The very choice of ingredients for pulp takes on something more than the mere raw materials required to make a sheet of paper. Soetu Yanagi, the eminent Japanese folkcraft scholar, in speaking of the three major sources for pulp in Japan, says: "*Gampi*, *Kozo*, and *Mitsumata*—these build a triad of



A sketch of the most primitive type of mold of the Orient. The surface of the mold is made of grass, giving it a "wove" formation. The four edges of the mold are constructed of the handiest material available: bamboo. In this mold, pulp is poured *upon the surface.*

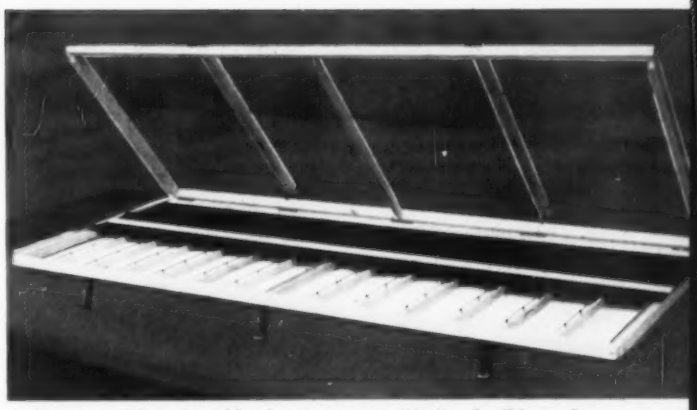
A Japanese papermaker removing wet sheet from flexible bamboo mold covering. The wet sheet is simply pulled off *the covering and neatly stacked. Use of* Tororo-aoi *mucilage prevents sticking.*

papermaking materials, with the various kinds of Japanese papers taking their seats somewhere in this triad; *Gampi*-paper sitting at the top, *Kozo-paper* on the right, and *Mitsumata-paper* on the left. In its dignity and lustrousness the beauty of *Gampi* is peerless, and its life endless. No paper under the sun can be nobler than this. Soft and hard, negative and active, go hand-in-hand herein. *Kozo* is the sterner sex who keeps guard over the land of paper. Its sinewy, tough fibers can bear any rough work. To this does Japanese paper owe its strength even now. Were it not for *Kozo*, how effeminate the world of paper would be! Beside *Kozo*, *Mitsumata* is the gentle sex which softens the realm of paper. No paper can be more graceful than this. It is of fine texture, smooth skin, and sweet temper. Without *Mitsumata*, paper would decrease in tasteful delicacy. In concert with *Kozo*, it has kept on protecting the life of Japanese paper...."

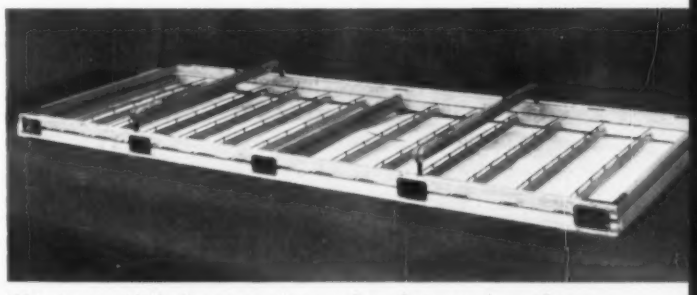
These three—*Kozo*, *Gampi*, and *Mitsumata*—are the deciduous plants which are used in Japan for papermaking more than any other vegetable fibers. The best of the three variants of *Kozo* is scientifically called *Broussonetia Kazinoki*, popularly known as the "paper mulberry." Before the advent of paper into Japan, the people were said to have woven cloth from its bark and offered the cloth to the gods during festivals. Paper made from *Kozo* is resistant to water and is used in the manufacture of *Shoji* and *Kappa* (paper raincoat). *Mitsumata* (belonging to the *Daphne Odora* family) is so named because of its distinctive appearance—three branches issuing from an upright stem. Hence its name, "three forks." *Gampi*, referred to as the "king of papers," is a plant which resists cultivation and as a consequence is scarce. This naturally increases the cost of manufacturing *Gampi*-paper above the others.

The invention of the hinged mold

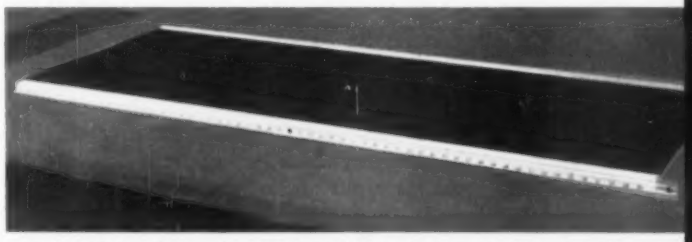
The earlier transfer mold which originated in China and came to Japan by way of Korea was improved upon by simply hinging the deckle to the frame at one end and providing clasps at the other, so that when the papermaker wished to remove a newly-formed wet sheet of paper from the flexible bamboo covering, he undid the clasps and opened the deckle. This improvement gave the papermaker greater freedom. He no longer needed to be concerned with keeping the deckle firmly in place while dipping. Also, as can be seen in the illustration, two handles, considerately oval-shaped for the user, were provided. The entire tool is of very light construction, a fact greatly appreciated when we realize the enormous weight of pulp. It is usually made of unpainted cypress and reinforced at important structural points by copper strips. The flexible, movable mold covering consists of finely split, rounded bamboo splints. These form the "laid" lines and are spaced about 28 to the inch. In turn, these are chain-stitched together in the opposite direction by silk thread and are called "chain lines." These chain lines are approximately one inch apart.



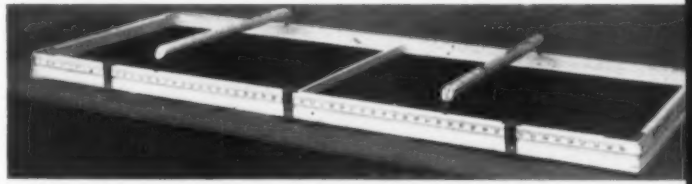
A Japanese hinged mold, shown open, with its flexible and removable bamboo covering rolled back. Note the three clamps hanging down in front. The upper part of the mold, which constitutes the deckle, is hinged to the frame in the back — as seen below.



This is essentially the same view as above but seen from the rear, with the mold closed and its bamboo covering removed. When the covering is in its place in the mold and ready to form a sheet, it rests on copper wires running along top edge of the elevated ribs.



The flexible bamboo mold covering without the frame. All oriental molds are made by placing finely split bamboo splints that form the "laid" lines (app. 24-28 per inch) which are sewn perpendicularly together by silk, thus forming "chain" lines (app. 1" apart).



The complete mold — closed and ready for the process of forming a sheet of paper. Clamps are locked. The handles are oval-shaped to fit more comfortably in hands in the shaking process. The central divider makes it possible to form two sheets simultaneously.

Cluster of grapes—German, 15th Century watermark

Basically, the steps taken to prepare papermaking material in Japan consist first of cutting into equal lengths shoots of either *Kozo, Mitsumata* or *Gampi* and tying them into faggots which are placed upright above a boiling cauldron and steamed. (The bark of *Gampi* is stripped without being steamed, and for this reason the shoots of this plant are cut in early summer when its sap is running.) After the steaming process, the outer bark is removed and is ready for the next step–*beating*. Many peasants and Buddhist monks are engaged solely in this work and sell their produce to papermakers in their vicinity. These fibers are called *kuro-kawa* (black bark) by the Japanese. *Kuro-kawa*, to be useful as papermaking material, is further treated by long immersion in running streams to remove all imperfections, such as knots, etc. The Japanese call the product of this process the *siro-kawa* (white bark). The white bark is then stored in great quantities and further boiled. This boiling is done in a lye solution made from wood ashes, buckwheat ashes, or slaked lime. The lime is removed from the *siro-kawa* by immersing it in water for as long as three days. This bast is then beaten on oak boards or granite slabs, depending on the papermaking district.

Apart from the occasional employment of the water buffalo to stamp the prepared inner bark of plants in a circular potching trough, or the use of an animal to motivate a stone roll, the mortar and pestle and the mallet provide the two main means for macerating vegetable fibers for papermaking in the Orient. The obvious advantage of the trip-hammer as a labor-saving device is still resisted by a great number of these craftsmen, for they believe that hand beating, which seems so primitive to us, assures them a material whose fibers are the correct length. It is difficult for Westerners to comprehend the importance assigned to this stage of papermaking by his oriental brother. The preparation of vegetable fibers to form pulp is the *mystique* of all oriental papermaking. Time and again these craftsmen refer to the ancient and time-honored manner as the *best*.

The beating of fibers is usually performed by village girls and at times extends far into the night in order to provide the vatman with a full vat the following morning. Most of this activity takes place during the winter months to supplement the income from a usually meager harvest. The following lines beautifully illustrate the sensitivity combined with stark realism of the type of ballad sung by the paper beaters in Japan:

"At Simo-gyo the winter seems to have come
With the dreary sound of pulp beating . . ."

Reproduced at right are eight pages of the more important steps in the oriental papermaking process. The illustrations are taken from the first book to be published on the subject in Japan, "Kamisuki Chohoki" by Kunisaki Jihei, 1798. These beautiful drawings graphically explain an oriental method of making paper by hand. It is interesting to compare this technique, which is one of the oldest in the world, with the photographs on the following spread showing hand paper-making in a typical English mill today.

The first step in papermaking process is getting the raw material. Here branches of plants suitable for paper are being cut evenly in middle, cinched tightly in large bundles and are then sold to papermakers.

The outer (black) bark is completely removed. What remains after this step is allowed to rot. Afterwards, it is mixed together with a mucilaginous plant (Tororo-aoi), which acts as a very strong binder.

Eight major steps in the papermaking process in Japan as practiced since 610 A.D.

Bundles are placed upright over boiling cauldrons in order to separate the outer bark from the inner. The presence of the baby shows how much a part of a peasant's domestic life the art of papermaking is!

The bark, which is now separated from the core, is peeled off in preparation for the following step. The core is not used in this Japanese papermaking process: it is usually sold in the market as firewood.

The bark is then immersed in a running stream for a period of time in order to remove all imperfections, such as knots. The Japanese call the product at this stage of the process Siro-Kawa *(white bark).*

The papermaking bark is shown here being beaten. (A typical beating stick can be seen at upper left-hand corner.) This work, which is near the end of the process, takes much time and patience to perform.

The beating of the fibers is usually done by village girls. The sound of the beating was described by a Japanese poet as "touching to the heart," and forms distinctive aspect of the Japanese craft.

A woman forming Hanshi *paper, dipping mold into vat. In background are neat piles of newly-formed stock. The paper is then dried and packed. The text says woman complains of the coldness of her hand.*

Esso Petroleum, Ltd.

Vatman forming sheet of paper. The surplus pulp runs over far side of mold. Mold is of light construction because weight of pulp and suction is great, as can be seen by tenseness in muscles. Experienced vatman forms many sheets, all "uncannily" of same weight.

The Western method of papermaking photographed in a

The London Times

1 *Worker stirring rags in beater. Rags have already been* sorted, cut, *and* boiled. *This step is the final one in the complete disintegration of rag in order to form pulp.*

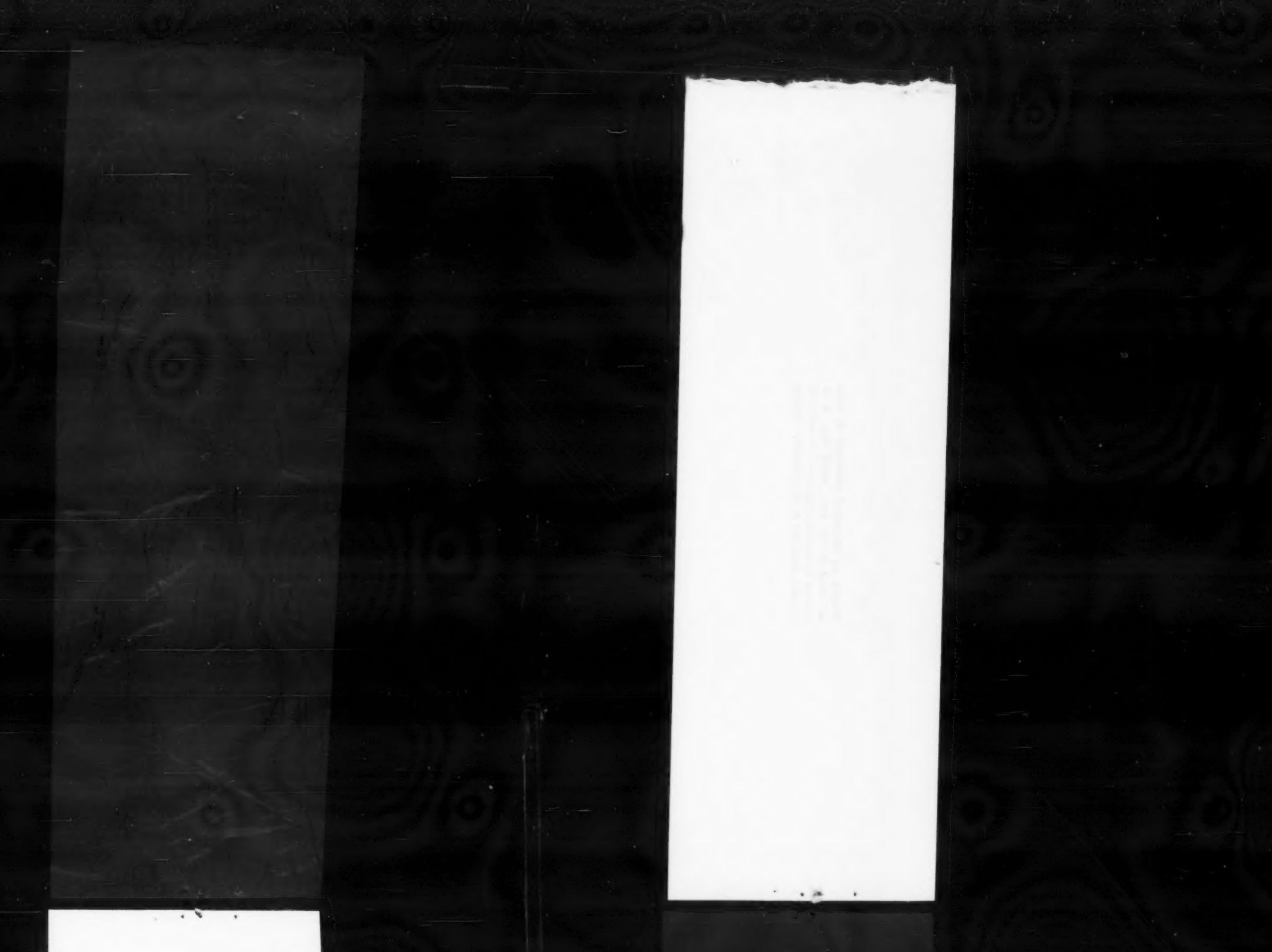
2 *Vatman forming sheet. Note the wave of pulp traveling towards him. Pulp is evenly distributed over surface of mold; deckle is in position. Note draining.*

3 *Coucher laying newly formed sheet of paper from mold given him by vatman. The mold upside down, the paper is placed between sheets of felt. This is called the "post."*

4 *The post is put into hydraulic press to squeeze out excess water. Water dripping from sheets is called "sweat." Pressure applied varies according to the type of paper.*

FABRIANO BOOK—Italian: this sheet is typical of the finest book paper. The "wove" formation gives a granular surface, sound color, and body strength highly receptive to type.

MAIDSTONE — English: everyman's idea of "handmade." Laid, it has strong body, hard sizing, and the "snap" so characteristic of the many fine English handmade papers.



HOSHO—Japanese: one of the many examples of Japanese paper often mistakenly referred to as "rice paper." This type of paper has been in continuous production for millenia.

Mr. George Nelson, Jr. of the Nelson-Whitehead Paper Company of New York has kindly contributed the stock for four handmade paper inserts. The Nelson-Whitehead Company, dealers in handmade European and Oriental papers, plays a unique role in American graphic arts in their importation of fine quality stocks.

typical English mill—J. Barcham Green, Ltd.'s Hayle Mill, Maidstone, Kent, England

5 *The "layman" piles neatly pressed sheet of paper on his inclined table. He removes the felts and returns them to the coucher. Vatman, coucher, layman form "trinity."*

6 *A "dry worker" hangs spurs (about 4 sheets) of paper on cow-hair ropes to dry in loft. Middle left, paper dries flat on canvas. Hayle Mill now uses this method only.*

7 *A familiar sight in the old handmade paper mills. This final drying is done in the loft, whose walls are made of slats to allow free flow of air. Next: glazing, sizing.*

All photos, unless otherwise noted, courtesy of Melvin Loos, Columbia University.

Fleur-de-lys — German, 16th Century watermark

Stamping mills used for preparing rags for papermaking—from Cartiere Miliani, at Fabriano, Italy (a mill in continuous operation since the 13th Century). The stamping machines shown above are very similar to those first used in Xátiva, Spain in 1151. It was said of the loud sound of these stampers: "God would thunder in vain to make Himself heard."

In Japan, the actual process of making paper by hand can be roughly divided into four phases; the first is the preparation of the vegetable fibers, the second consists of forming the sheet of paper, the third, removing the newly formed sheet of paper from the mold and placing it in a neat pile, and the fourth, the actual drying of the wet sheet of paper.

Balls of pulpy vegetable fibers that have been treated are placed in wooden tubs or vats, (hune—"boat") into which water is added. Usually there is a seventy to thirty per cent water to pulp ratio. This is thoroughly mixed by means of a huge comb-shaped agitator. In the various papermaking districts of Japan, these wooden tubs are as common as sewing machines are in American farmhouses, and the very thin, elegant papers of Japan, which possess such remarkable tensile strength, are made by peasant women.

Tame-zuki, the first and oldest of the two methods used to form paper in Japan, and which is believed to have come from China, is quite similar to the European method. The mold is *dipped* into a vat filled with pulp, lifted and shaken in two directions. This action allows the pulp to be distributed evenly over the surface of the mold and permits the excess water to drain through the sieve-like surface of the mold. The wet, newly formed sheet is removed from the mold covering. In the Orient, sheets of newly formed paper are simply piled one upon the other without the use of interleaving layers of felt as in the West. Great weights are placed upon these piles of wet sheets. This removes about eighty per cent of the water. Finally, in the last stage of the drying process, these damp sheets are usually brushed onto long boards and permitted to dry in the sun. This is the most ancient manner of drying and is completely dependent upon the caprices of the weather. Another way of drying paper is by steam-heaters, but this method does not produce the finest papers. As in China, the damp sheets are sometimes placed on the ground (uncultivated burial grounds are choice spots), or simply brushed onto the walls of a cottage.

Nagasi-zuki, the second and relatively newer method of Japanese papermaking, is most often distinguished by the fact that the mold is not dipped into the vat, but instead the pulp is *poured* upon the surface of the mold to make a sheet of paper. A type of mucilaginous substance is added to the pulp. This "paste" is derived from the *tororo-aoi* (*Hibiscus Manihot*) and the *nori-utugi* (*Hydrangea Paniculata*), which is popularly referred to as the "paste tree." This manner of forming paper is in reality the more ancient of the two since it was used in China long before the introduction of paper into Japan. The mold in this method is also shaken and the wet sheet laid. The Japanese papermaking processes described above are the same used today as they were almost two thousand years ago, and in all probability will continue to be used for years to come.

Waterpower and wind mills in Europe

As paper found its way into Europe through North Africa, the distinguishing characteristics of the oriental method of macerating fibers changed from manpower to the use of water power and windmills, which are typical of the paper mills of Europe. It is generally thought that the early papermakers of Europe used for a brief time the same method of beating fibers as their oriental counterparts. But this changed rapidly. The first stamping mill operated by water power in Europe was erected in Xátiva, Spain, about 1151.

Instead of vegetable fiber, the basic raw material for the manufacture of paper was linen and/or cotton rags. These were soaked and made into balls which were permitted to remain in this state for as long as two months at a time. The ball of rags in this state slowly fermented as its temperature increased. Only one third of this ball was actually suitable for papermaking. The appearance of fungi on this huge ball was considered a sign that the material was ready for beating in the stamping mill. (It is now thought that the "*foxing*" found on pages of many books printed between the sixteenth and the early nineteenth centuries was the result of the rags' being subjected to the extreme processes and fermentation.) The use of lime to speed the disintegration was occasionally resorted to, but was eventually prohibited by government fiat. With the advent of the invention of movable type in the middle of the fifteenth century and the consequent demand for a greater supply of paper, these stamping mills became larger and more complex.

The large stamping mills of the continent, which used the superior force of water power, were formidable competition for the Dutch papermakers who were obliged to supply huge quantities of paper to their expanding nation. These Dutch mills were constrained to employ wind as

power to motivate their stampers. An ingenious device for the beating and macerating cotton and linen rags was invented sometime during the last quarter of the seventeenth century. Although the name of its inventor is lost to history, this type of beater, which supplanted the earlier stamping-mill, is referred to as a "Hollander", after the country of its origin. Its appearance is distinctive and has changed but slightly these past centuries. It is an oblong vat with rounded ends, having, at one side, a solid wooden roller equipped with a number of knives upon its surface. The use of this beater greatly increased the output of pulp for papermaking. It now became possible for the Dutch papermakers to meet the greatly increased demand for paper. It was thought by many that rags so macerated would not possess fibers long enough for the proper preparation of pulp. In fact, many mills in Europe hesitated using this "new-fangled" gadget for some time, but the pressure of the "immutable laws of economics" won out. It is now in universal use throughout Europe.

New materials sought

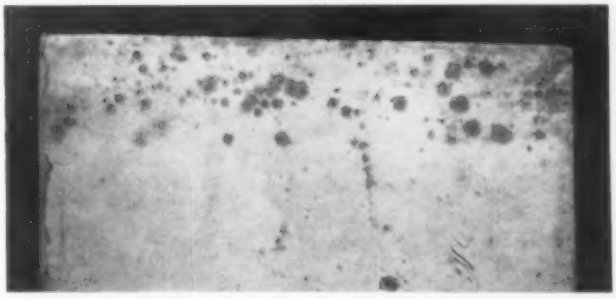
With the introduction of papermaking on a large scale, a shortage of rags developed. All manner of government edicts were enacted to encourage the populace of Europe and America to conserve these materials. In England, at one time, a law was passed forbidding anyone to be buried in clothing other than wool, a material which is not suitable for papermaking. A French scientist, René Antoine Ferchault de Réaumur (1683-1757) turned once more to the paper wasp and, by observing the almost continuous labors of this insect, came to realize that wood could be used to replace cotton and linen fibers in the fabrication of paper. Réaumur's proposal was a revolutionary one, since the growing lack of cotton and linen had become a source of great concern to the papermakers and legislatures of his day. A state of emergency existed at that time not unlike the one during the recent war, and severe penalties were meted out to anyone found guilty of wasting these precious materials. A new material had to be found and again the paper wasp led man to a solution! Practically all machine-made paper is made from pulp which is formed in great part by wood. It must be stressed, however, that cotton and linen rags are still used today by *hand paper mills* in Europe. (There are no known commercial manufacturers of handmade paper in existence in the United States.)

Jacob Christian Schäffer (1718-1790), in a now extremely rare work of six volumes, proposed the use of, and successfully made paper from, the following: wasps nests, moss, various vines, hemp, straw, cabbage stalks, thistles, turf, marsh-mallow, asbestos cattail, burdock stalks, Indian corn husks, genista, pine cones, potatoes, old shingles, reeds, beans, horse chestnut, walnut, tulip, and brazil-wood.

In the history of papermaking, as in the history of other fields of human endeavor, certain men are known to us almost only by name and what they contributed to the particular field of their calling. Matthias Koops, a Dutchman residing in London during the nineteenth century, is one such man. If Jacob Christian Schäffer gained his recognition for the discovery of new, and sometimes surprising, sources of papermaking materials, credit should be given to Matthias Koops for having created public interest in England's biggest paper mill and for having been the first man to produce commercially, and in large quantities, paper made from a material other than the extremely scarce rags–wood. In 1800, his greatest work, "Historical Account of the Substances Which Have Been Used to Describe Events and Convey Ideas, from the Earliest Date to the Invention of Paper", appeared–printed on paper made entirely from straw, with an appendix printed on paper made from wood alone.

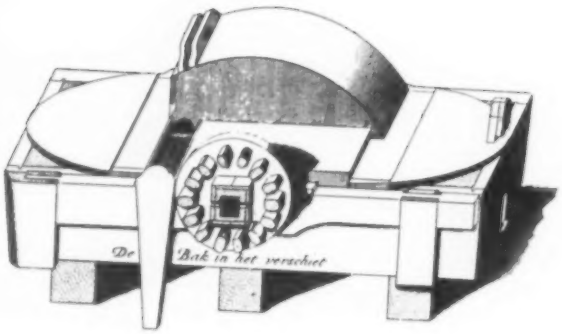
Introduction of the rigid wire mold

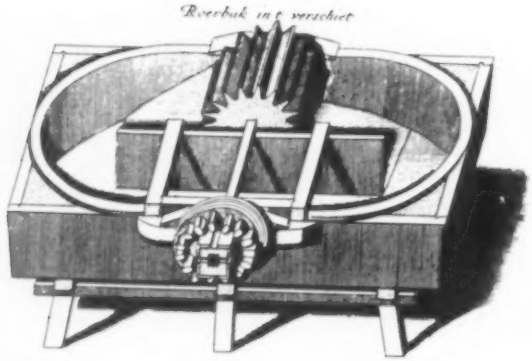
In its westward course, other changes in this ancient craft took place. For example, by the time the Arabs had become familiar with paper, they had developed the art of wire-drawing to a very high degree. It was this invention that permitted Europeans of the twelfth century to perfect the art of papermaking much earlier than would otherwise have been possible, for Europe lacked that pliant, strong, and highly practical material–bamboo. An adaptation of the remarkable tool, the mold, was now made feasible by the existence of this new material—brass wire. The European "rigid" wire mold consists of two main parts: the deckle and the mold. The deckle is actually a removable wooden frame of exact fit for the mold. It forms a raised edge which serves as a barrier to prevent the thin layer of fibrous pulp from running over. The depth of the deckle is determined by the substance of the sheet to be formed. Also, the size the sheet is determined by the dimensions of the deckle. Because of the inevitable shrinkage of the sheet of paper after drying, allowances of one-quarter to one-half inch are usually made. The term "deckle-edge" refers to the distinctive irregular edges of a sheet of handmade paper. These edges are the result of the liquid pulp creeping under the



The spots on the paper are called "foxing." It is believed that these spots (brownish in color) which appeared on the paper of books printed between the sixteenth and nineteenth centuries were caused by the excessive fermentation of the papermaking rags. Although the theory is not proved, it seems plausible.

Pilgrim—Italian, 16th Century watermark





One of the earliest engravings show the new device, the Hollander, which superseded the earlier stamping mills for the beating of rags for papermaking. Upper view shows the machine closed, the lower, open. Wheel has knives for macerating rags. From Groot Volkomen Moolenboek, 1734.

deckle. Originally these crude edges, considered merely an unesthetic result of the papermaking process, were sheared off by bookbinders to prevent dust from settling upon books. It is only in comparatively recent times that the retention of "deckle-edges" in book work has come to signify a sure sign of craftsmanship, found only in deluxe editions.

The tyro, elated by his new discovery regarding chain and laid lines as characteristic of handmade paper, would be denied the satisfaction of his knowledge were he to hold a sheet of "wove" handmade paper to the light. He would see nothing but the slightly mottled fibers found in *all* paper. This type of paper is made from a mold covered by a finely woven mesh of wire cloth instead of the "laid" and "chain" wires used in the fabrication of "laid paper."

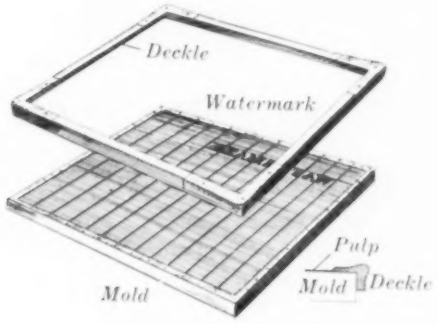
Wove paper is basically as old as the art of making paper, but it did not appear in the Western world until the eighteenth century, when John Baskerville (1705-75), famed Birmingham printer and type founder, whose eccentricities passed from life into death by his wish to be interred in the "mill" in an upright position, required a smooth sheet with a calendered surface which would do justice to his types with their finely modeled serifs. Baskerville is often mistakenly credited with having originated the mold for "wove papers." It has recently been proven that this new type of paper was supplied to Baskerville by the Turkey Mill (Whatman-Balston) of Maidstone. The first book to be printed on wove paper was Baskerville's edition of Virgil's Georgics.

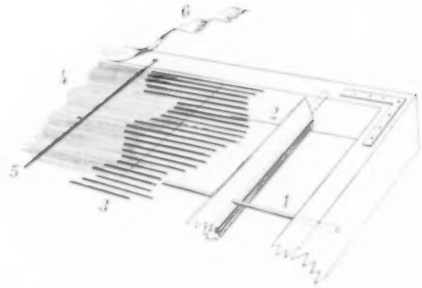
Before John Baskerville insisted on wove paper, all handmade paper in Western Europe was of the "laid type," whose process of manufacture has not altered to any great degree to the present time. Hans Sachs, the cobbler-poet of Nurnberg (1539-01) who was immortalized not so much by his own poetry as by Wagner's opera *Die Meistersinger*, wrote the following description of a papermaking mill as it existed in his time: "Rags are brought into my mill/ Where much water turns the wheel/ They are cut and torn and shredded,/ To the pulp is water added;/ Then the sheets 'twixt felts must lie/ While I wring them in my press./ Lastly, hang them up to dry/ Snow-White in glossy loveliness." A bit of poetry, a few words in a diary, something mentioned in a will—these are our only sources for study of the art as it existed in its early days in Europe. The secrets of this craft were jealously guarded by workers and their masters, and since intercourse between the various mills was infrequent, papermakers developed methods and tools peculiar to their localtities.

Paper, in the early years, was distrusted in medieval Europe as the product of foreigners and infidels. Another deterrent to the acceptance of paper in Europe was that rags used in papermaking were oftentimes the clothing of those who died in the plagues which periodically decimated great segments of the population. The following amusing observation was written in the early eighteenth century: RAGS make paper,/ PAPER makes money,/ MONEY makes banks, BANKS make loans,/ LOANS make beggars,/ BEGGARS make RAGS.

The paper mold

The rectangular frame of the mold is made of mahogany or white wood and sometimes oak. It is reinforced by heavy gage wires inserted into the short sides of the frame (1) *and passed through the ribs. The position of these wires can be changed according to the size of the mold. The ribs* (2) *are wedge-shaped and spaced approximately* 1⅛ *inches apart parallel to the shortest sides of the frame. Their wedge-shape makes it easier for the vatman to lift his tool than it would be if they were flat.*





Paper made before the latter part of the eighteenth century had a shadow-like effect along the "chain lines." This was the result of the pulp lying heavier on each side of the chain lines and was traced to the practice of lacing or sewing the "chain" wires directly to the ribs. Mold-makers in the late seventeen hundreds eliminated these lines by adding backing wires (3) *that would raise the "chain wires" away from the ribs.*

The bottom layer of wires, spaced about 9 to the inch, support the "chain" and "laid" wires, and adds rigidity. The brass laid wires (4) *are spaced 24 to the inch and crossed perpendicularly by the heavier gage chain wires* (5). *The term "chain wires" is used because of the way they are attached to the ribs. Finally, this complex of wires is secured by copper stripping around the frame* (6). *The effect of laid and chain lines in handmade paper is duplicated in machine-made paper by a device known as the "dandy roll." A wire, twisted into any shape and sewn onto the laid wires, is responsible for the watermark.*

Glossary

CHAIN AND LAID LINES: held to be the light, "laid" handmade paper has thin narrowly spaced "laid" lines crossed perpendicularly by heavier, more widely spaced "chain" lines. Lines can be simulated in the machine-made product with "Dandy-roll."

DECKLE: removable wooden frame that fits the mold exactly, forming a raised edge. Serves as a tray which prevents the thin layer of fibrous material from running over the edges.

DECKLE-EDGE: irregular edges on handmade paper that result from liquid pulp creeping under the edges of the deckle. These edges can be simulated in machine-made paper.

COUCHER: workman who piles newly formed wet sheets of paper between alternate felts. From the French *coucher*, to lay down and from the Latin *collocare*, to place.

MOLD-MADE PAPER: a misnomer, for paper so-called is in reality a machine-made product. Usually, pulp used in this form of manufacture is superior to that used for machine-made papers.

MOLD: a rectangular wooden frame upon which brass wires or wire cloth are stretched, thus permitting water to drain through, leaving a thin layer of fibrous material. Two main types of construction—the "laid" and the "wove."

PARCHMENT: writing material used, along with Vellum, before the advent of paper. Made by separating the inner side of sheepskin from the outer (wool) side. Peeled skin is treated to make it suitable for writing.

POST: a quantity of wet sheets of paper, freshly "couched," and ready for pressing. Also, a size of paper and its multiples.

SHAKE OR STROKE: peculiar motion given to mold by vatman to insure even distribution of pulp over mold surface.

VELLUM: the whole skin of a calf treated with lime. Term "vellum" loosely used today to denote paper that resembles parchment.

WOVE PAPER: type of paper made in a mold covered by a finely woven mesh of wire cloth instead of "laid" and "chain" wires. Slightly mottled fibers seen when held to the light.

Bibliography

A great debt is owned to Dr. Dard Hunter by paper lovers the world over for his pioneering efforts in the field. He is the author of many highly authoritative books on the subject and curator of the Paper Museum of the Institute of Paper Chemistry, Appleton, Wisconsin, which contains the most extraordinary collection of paperiana in the world.

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Acknowledgment is also given to: Col. John Cummings, Curator Bucks County Historical Museum; Rémy Green, J. Barcham Green, Ltd., Maidstone, Kent, England; Dott. Enrico Tonalini, Cartiere Miliani, Fabriano, Italy; Melvin Loos, Columbia University Press, New York; K. Sugikado and I. Koji, Tokyo, Japan; J. W. Zanders, Bergisch Gladbach, Germany.

Snail—French, 15th Century watermark

If ever a trinity existed, that of vatman, coucher and layman has been one for centuries. The vatman can be considered as being at the apex, while the other two play supporting roles, for it is the vatman who initiates the forming of a new sheet of paper. The vatman is the personification of the human-turned-machine. With the deckle in place over the mold, the vatman extends the mold vertically into the vat, lifting it filled with pulp; and then, with that motion described as the "vatman's shake," distributes the pulp, first in one direction to level it and then in the other to cause the fibers to set in a cross direction. The entire operation is begun and completed in a matter of seconds. The vatman removes the deckle and passes the wet sheet, still on the mold, to the coucher and is now ready to take another mold and repeat the process. The coucher then couches the newly formed sheet of paper by placing the mold over a sheet of felt. By skillfully applying the right amount of pressure, the coucher causes the sheet of paper to detach itself from the mold and adhere to the felt. He then places another piece of felt on top of the wet sheet of paper, and repeats this process with each sheet given him by the vatman.

The third member of this highly coordinated operation, the layman, is in charge of pressing and separating the felts from the newly formed sheets of paper. Paper is usually pressed a number of times. In the early days of papermaking, pressing was accomplished by means of a windlass, a huge device affectionately called the "Sampson." About 1800, this crude press was replaced by the hydraulic press. Each kind of paper requires different treatment, depending on the intended use of the paper. If the amount of pressure applied is too great, the packs of paper become solid blocks. The water dripping out is referred to as "sweat."

Drying, sizing, and glazing

Once paper has been pressed to remove great quantities of water, it is ready for drying. This is accomplished by hanging the damp new sheets of paper on cords, usually in groups of four or five ("spurs"). As these sheets dry, they become separated. The drying room of a paper mill is usually on the upper floor, having loose slats for walls, thus allowing free movement of air through the room.

To give paper a surface suitable for writing or printing, it is sized. The section of the mill set aside for this process is colloquially referred to as the "slaughter house" because a great deal of paper is wasted in this process. Size is prepared from the hides, hoofs and bones of animals. In the Orient, however, starch and gypsum are usually used.

Lastly, paper is sent to the finishing room for "glazing." This room is called the "salle," a term introduced by John Spilman, a German papermaker who resided in England in the 16th century. This great papermaker, incidentally, also introduced the term "deckle" into the English language.

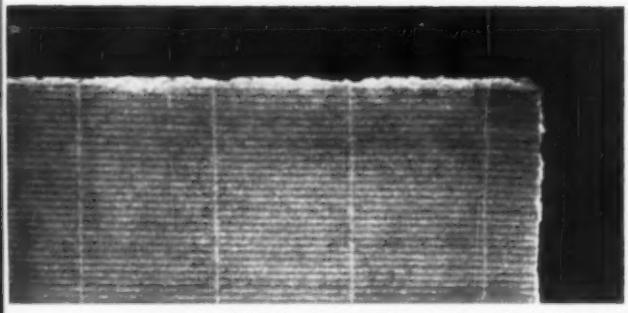
Glazing was once accomplished by the use of a pressing hammer, but since 1720 rollers have been used. The use of these rollers originated in Holland, and they were first cut from trunks of trees. The paper was passed between these revolving rollers. The finish imparted to paper by this device was superior to the one produced by the pressing hammer, as it, in its turn, had been superior to the burnishing process—rubbing paper by hand with a smooth stone. Once paper is "finished," it is ready for packing.

This then is the basic papermaking process as it is, and has been, practiced in a typical European mill for centuries. As can be seen, great coordination is required between the vatman, coucher and layman if this operation is to be a success. One motion out of sequence will upset the rhythmic pattern so important to the smooth functioning of this unique trinity. Among the few changes in the papermaker's tool, three of them concern the vat in which the pulp is prepared for making paper. Sometime during the 17th century, a charcoal heater, known as the "Pistolet," was attached to the vat in order to keep the pulp mixture warm. The 18th century saw the addition of a platform across one side of the vat. The "bridge" enabled the vatman to rest his newly formed sheet of paper in a position to facilitate the drainage of excess water from the mold. The third improvement, and one that America contributed to the art of handmade paper, was the "knotter." The knotter enabled papermakers to remove impurities from the pulp before they became part of a newly formed sheet. This device was first used around 1819.

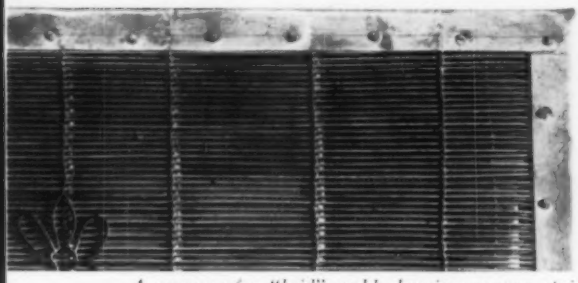
A mill worker affixes a watermark to a Dandy Roll. The Dandy Roll is a cylindrical roll which is used in the manufacture of machine-made paper to impart to its surface the "chain" and "laid" lines. Another instance of the machine imitating the hand.

"Designs-in-wire"—the first use of watermarks

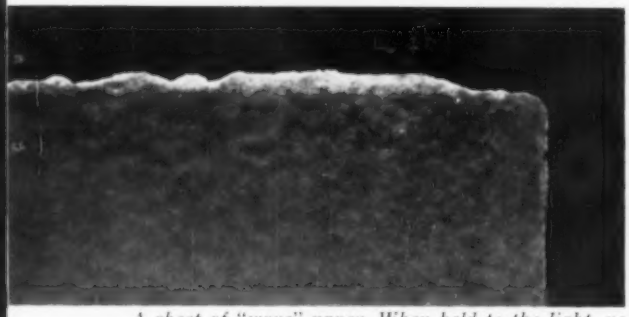
The study of one field of human endeavor almost always leads to byways, often as interesting as the original course. This is the case with watermarks, so closely bound with papermaking. The origin of these designs-in-wire is obscured by the mists of history, but the first known watermark was used in Italy about 1282 (at Fabriano). Almost all theories with regard to their signification are met with rebuttals. We can only surmise and construct at best a patchwork-quilt of isolated facts. It was only very recently, for instance, that these marks began to be used to denote sizes of paper. This study presents a great challenge to anyone wishing to pursue it further. He must love riddles



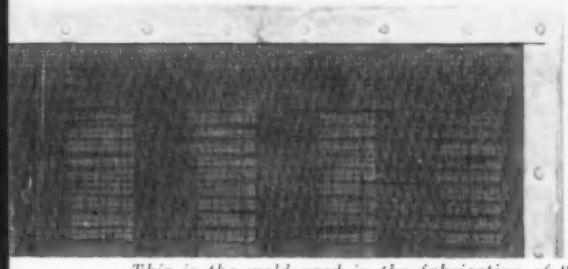
A sheet of "laid" paper with deckle edge. The thin horizontal lines ("laid") are spaced approximately 24 to the inch, vertical ("chain") lines, 1¼" apart.



A corner of a "laid" mold showing copper stripping holding down complex of wires. It is this criss-cross of "laid" and "chain" lines that makes ribbed appearance.



A sheet of "wove" paper. When held to the light, no lines can be seen since this type of paper is formed on a fine mesh of wire cloth. Note the deckle edge.



This is the mold used in the fabrication of "wove" paper. The frame is the same as the one used in "laid," but except for the difference in mold-covering.

and be equipped with a thorough knowledge of papermaking, bookbinding, and general history, and must be well-versed in the principles of bibliography, for he is certain to find rebuttals to his cherished theories at every point.

In his highly provocative book, "The Lost Language of Symbolism," Harold Bayley makes the following statement with regard to the *mystical* significance of watermarks: "Independent researches upon which for many years I have been engaged enable me to say with certainty that behind the obvious trade purpose served by watermarks there lies buried one of the most extraordinary romances ever suspected by bibliography. In brief, watermarks are emblems, imperishable thought-crystals in which lie enshrined the traditions and aspirations of many generations of papermakers. It further follows that a correct reading of these emblems throws an unexpected light on the hitherto obscure history of early papermaking, and incidentally, upon many of the dark pages of medieval history..."

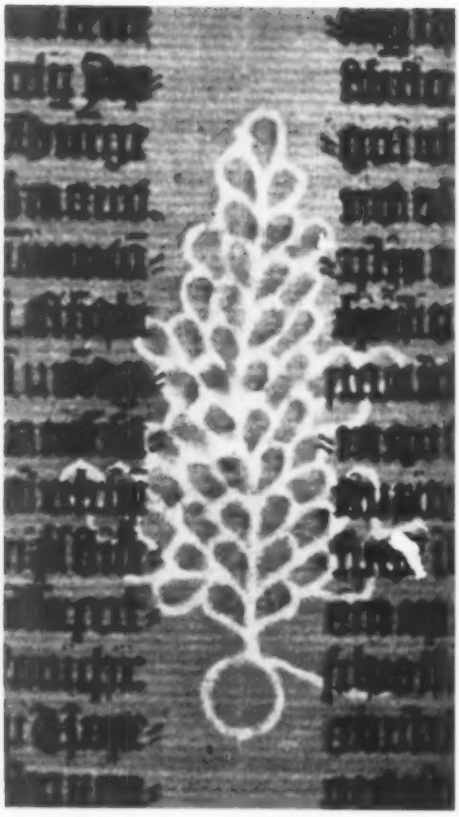
This bold history goes on to state that these marks were the cryptographic messages used by pre-Reformation Protestants when they wished to communicate between towns. Naturally, for fear of reprisals, all correspondence or communication between these heretical sects was conducted in great secrecy. What better form of communicaton could there be than innocent-looking marks on a sheet of paper? It should be noted that many papermakers were members of these heretical sects. Auvergne, Albi and many papermaking villages were referred to by ecclesiastical authorities as "the workshops of innovators," "asylums and arsenals of new ideas," etc.

The chiaroscuro watermark and counterfeiting

In the middle of the nineteenth century, the *chiaroscuro*, or light-and-shade, watermark came into use. This beautiful method of watermarking was invented by an Englishman, William Henry Smith, who conceived the idea of making a wax model of a design, covering its surface with graphite or plumbago, and then making an electrotype from it. This "electro" was then backed with a thin coating of lead—enough to render it rigid. The electrotype was then embossed into the finely woven screen which would eventually serve as the "covering" for the "wove" mold. (This type of watermark cannot be successfully embossed upon the coarse surface of a "laid" mold.) With the *chiaroscuro* watermark great fidelity of reproduction can be achieved, and it is often used on "security" papers. Counterfeiting this watermark requires great experience and many years of highly specialized training.

Counterfeiting is usually considered to lie (in its gentler forms) just on the other side of the law. Though this may be true, it takes an uncommon, albeit perverse, ability to be able to reproduce a signature—entire letters in the handwriting of another human being. Perhaps one of the greatest literary hoaxes ever perpetrated on the public concerned the activities of a young Englishman—William Henry Ire-

Bow and Arrow—Italian, 15th Century watermark



An infra-red photo, greatly enlarged, from the Pierpont Morgan Library, showing a cluster of grapes watermark in Gutenberg's Bible of 1455.

PUBLII VIRGILII

MARONIS

BUCOLICA,

GEORGICA,

E T

AENEIS.

BIRMINGHAMIAE

Typis JOHANNIS BASKERVILLE.

MDCCLVII.

Title page of Baskerville's Virgil, the first book printed on "wove" paper. This paper proved to be especially good for his finely modeled types.

land. This eighteen-year-old had the temerity to forge Shakespeare's name to several documents, and succeeded in duping even the illustrious Samuel Johnson. Ireland (1777-1835) continued to forge Shakespearean documents, crowning his efforts with the writing of a play "Vortigern and Rowena" purported to be a long lost play by the Bard of Avon. In 1805 he blithely published his "confessions" which detailed the techniques used to fool everyone—notably the "experts" of his day.

"But they were so beautiful."

One day during the recent war, The Bank of England's headquarters on Threadneedle Street received news of a bold enemy plan to sabotage its currency. This plan, masterminded by a Major Bernhard Krueger, was so successful that the venerable Bank was forced to withdraw from circulation all £5 notes and substitute new ones of different design. It is reported that the Nazis were able to print and successfully distribute 140,000,000 pounds sterling (then roughly the equivalent of $564,000,000)! When the tide was beginning to turn for the Germans, Heinrich Himmler gave orders to place these notes in large caches at the bottom of Lake Toplitz, near the village of Redl Zipf, Austria. The craftsmen used in this nefarious scheme were recruited from everywhere, even concentration camps; the best craftsmen in Germany were called upon to "cooperate." When the plan was exposed, one of these craftsmen was quoted as saying: "But they were so beautiful." Eliaza Bazna, the celebrated "Cicero" of the last war, was reported to have been paid £3,000,000 in bogus notes. It is said he committed suicide when he learned that he too had been duped.

Philatelic connoisseurs all over the world have been duped by a tall, gaunt French engraver named Jean de Sperati, who refers to himself as the "philatelic atom bomb." De Sperati is no ordinary forger of rare stamps; he has spent no time in prison, for his aim in life is quite simple, and innocent of wrongdoing. He simply loathes the experts! One "expert," after having been told the stamps he had been very anxious to buy were forgeries, replied "They're so good they make me ill." This engraver with so strong a satirical bent summed up his modus operandi in the following words (*Saturday Evening Post* 4/30/49) "... I have opened the eyes of the blind—the so-called experts. In the history of philately there has never been a man like me. I baffle everybody. Counterfeiter I may be, but I am an artistic counterfeiter." He delights in writing open letters to Parisian dailies exposing the experts as *bêtes* and buffoons. Some day the general public will be given an opportunity to learn his technique and great store of technical knowledge, for de Sperati is planning to issue a huge and expensive tome "exposing all."

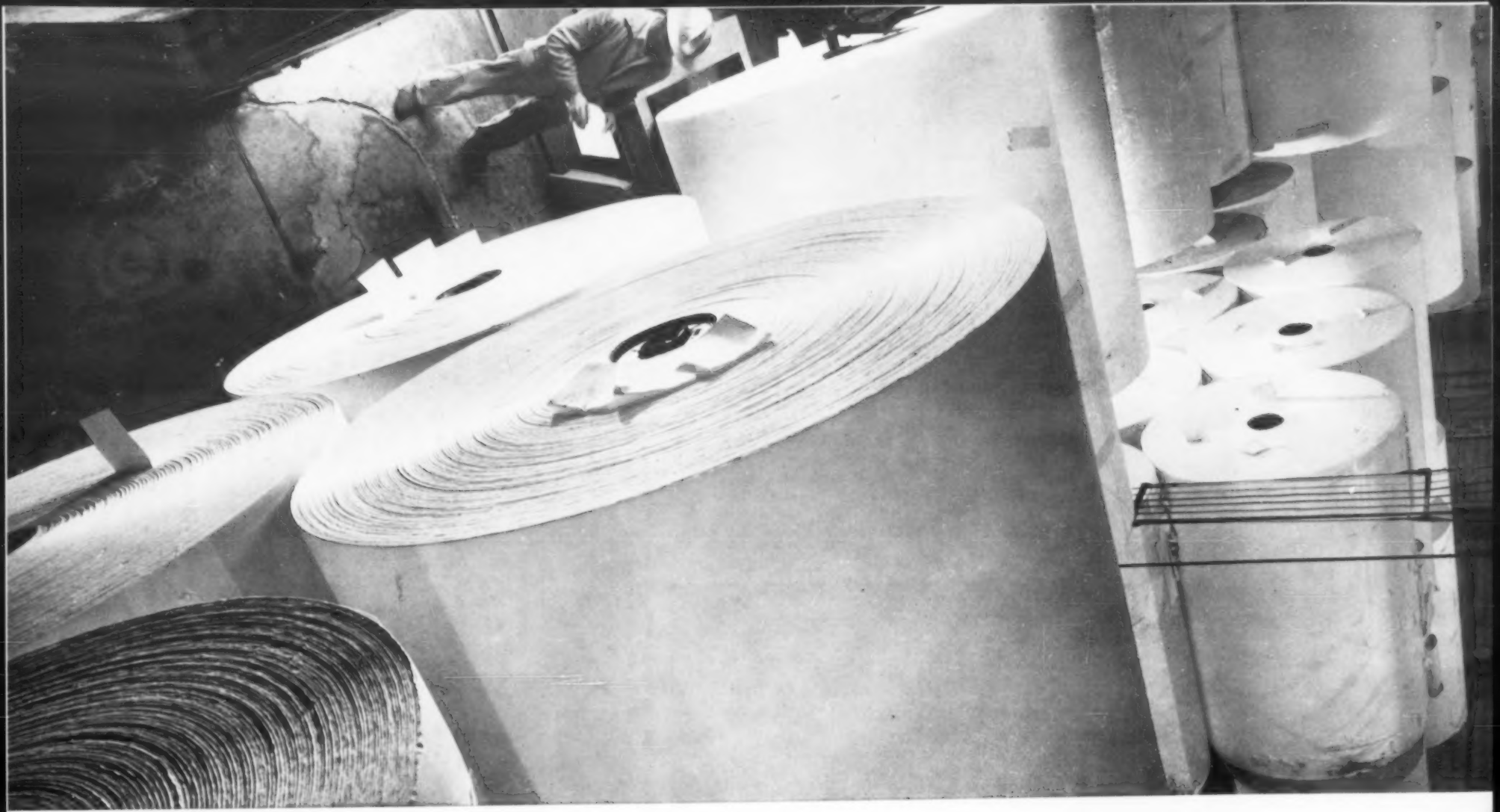
The last of this queer "trinity" is an American forger—Martin Coneely, *alias* "Joseph Cosey." The life and works of this master archeological forger were thoroughly dealt with in a *Profile* appearing in the 2/25/56 issue of the *New*

Five hundred years after the invention of line watermarks came "chiaroscuro." These remarkable sheets of paper show this watermarking technique carried to its highest degree of perfection. On the left, a portrait from the J. W. Zanders (Bergisch Gladbach, Germany) collection, and on the right, a view of St. Peter's in Rome. Latter is from the mill of E. Miliani of Fabriano, Italy. Wm. H. Smith, an Englishman, invented this process of embossing *a bas-relief on a wove covering. The Zanders watermark measures* 8" *x* 11½", *the Fabriano,* 14⅝" *x* 17⅛". *Use of this kind of watermark is sadly unexploited today as a part of letterhead design.*

Yorker. Alcoholic and drug addict, "Cosey" was so skilled in the art of producing bogus Civil War documents and letters, that G. W. Bergquist, then working for the New York Public Library decided to start the "Cosey Collection" in order to remove these amazing documents from general circulation and thus protect the public from an unscrupulous dealer planning to sell Cosey's work to unsuspecting buyers. The expert's great respect for the efforts of a skilled forger is ably summed up in an address by G. W. Bergquist to the Grolier Club in New York. Speaking of Joseph Cosey and those shadowy figures engaged in this perverse art, so much a part of the lore of papermaking, Mr. Bergquist said: "... Decidedly, there is something intriguing in the idea of a person sitting down and deliberately forging the handwriting of some well-known person. Obviously, this is not the work of any ordinary criminal. I am convinced that the person who does this is hardly ever motivated by the sole hope of monetary reward... Rarely do these forgers sell their goods to the unwary. No doubt, hunger or some other unsatisfied want forces them at times into the displeasing practice of selling a forgery to the ignorant, but certainly they get no pleasure in doing so and must feel that they are prostituing their art, for it is an art, rather than a profession. It is understandable how a man might learn to forge one hand, but marvellous to switch to others at will."

* * *

On September 21, 1958, an article appeared in the New York Times in which Dr. William F. Libby, a member of the Atomic Energy Commission, spoke of a new technique of paper manufacture which would give paper a life span of 20,000 years—longer than all of recorded human history. If this miracle product could be made, what a record future generations will have of primitive man traversing the earth in the twentieth century, learning of our aspirations, our fears and our delusions. They will be so much the wiser—perhaps.



"Paper is a cellulose clothesline designed to hang chemicals on."

Paper

the sophistication of a simple tool

Once familiar only as an end product, paper reaches out for new commercial applications, and joins with other materials as an inexpensive, respected, and versatile vehicle.

Once upon a time, just a few short years ago, machine-made paper was a simple, unassuming, cheap, disposable product made in a few varieties for relatively few uses. Today, paper is still simple, unassuming, cheap and disposable, but its varieties include a noiseless paper for eating popcorn in the movies, string ham bags, phonograph records, mail sacks, wallpaper that kills flies and pastes itself up without wetting or gluing, snow fences for controlling winter snow drifts, and that's not all: the pulp and paper industry speaks casually of disposable pots and pans for use on electronic ranges in the not-too-distant future.

What makes these applications possible is the use of paper in combination with other materials, where the paper acts as a vehicle. A common form of combination is the use of clay or resin coatings. In this way, a manufacturer can use a low-grade, inexpensive stock and still produce a paper with a quality look. Another and a more important use of paper as a vehicle occurs in the case of those materials which by themselves would be either too costly or show an undesirable characteristic, say poor printability. Polyethylene is one of the materials most commonly used in this manner. The plastic alone is relatively expensive and its printability relatively poor, but when it is applied to printing paper in a thin lamination the resultant material has the strength of polyethylene and costs only slightly more than the plain paper by itself.

Materials often exploit their inherent potentialities so far that division lines became blurred. The most familiar, and possibly one of the most successful, examples of this is Alcoa's and Reynolds' aluminum foil with paper backing. Here the aluminum seems to be passing itself off as paper, and doing it quite handsomely. Nevertheless, it is only a foil with a paper base – not a paper, properly speaking. However, the Stokes Company of Philadelphia and the Vaculite Corporation of Cambridge are at present engaged in joining paper with metals (aluminum, copper, silver, gold), not in their foil form but directly *as* metals. The method is vacuum metalization, and the process is an incredibly simple one. In a chamber of high vacuum, the metal is converted into gas. Paper is exposed to the metal in its gaseous state, and because it is cooler than the gas, it causes the cloud of metal to condense on its surface. The resultant coating of metal is extraordinarily thin, with possible thinnesses ranging from 4 to 20 micro inches. Its advantages are considerable: it has a new quality of brilliance; an evenness of coating from edge to edge; freedom from surface streak marks, imperfections, and wrinkles; and poses no problems in printing runs at normal speeds.

The stock of this and the preceding sheet (pp. 59-62) is coated with Galaxy Radiant White Dull Enamel, a Calcofluor White of the American Cyanamid Corporation. The paper is produced by Martin Cantine Paper Company of Saugerties, N. Y. ID, as an experiment, is running this stock—which has never been used before—at normal printing speeds and conditions. Calcofluor Whites are compounds which have blue or blue-white fluorescence when applied to cellulose materials; and viewed in any light containing ultraviolet (daylight, for example), the resulting fluorescence enhances the whiteness of white. These fluorescent papers exhibit a brilliance in printing and reproduction, both in offset and letterpress.

But possibly its greatest advantage is that unlike foil, which crinkles and dents, the metalized product looks like paper, feels like paper, and behaves like paper—simply because it is paper.

Another "borderline" paper is Texoprint, a printing paper passed through a saturating bath of latex and opacifying fillers. It feels like a soft, flexible plastic and has good printability. The paper is said to resist both fresh and salt water; it will not soak oil, and permits easy washing off of grease. According to the manufacturer, Kimberley-Clark: "It can be sewed, grommeted, and stapled."

But aside from the increasingly frequent use of paper as a vehicle for another material, there appears to be another trend in paper-making, and that is towards thinness. This is partly due to the recent increases in United States postal rates. The rates will go up in three annual steps, the first being effective January 1, 1959, with second-class increases for reading matter at 30% and for advertising 60%. In a country where mailed publications and advertisements run to 1.3 million tons a year, it is obvious that publishers will either have to use thinner stocks or face an increase in costs which in the aggregate will run into seven figures per annum. And it is easy to guess which step the publishers will take. But the use of thinner stock as a solution to this weight problem is not as simple as it sounds because one of the primary requisites of printing paper is opacity. The desirable thinnesses of papers are therefore, at least in theory, limited. Several companies are at work on the problem, and one of them, the American Cyanamid Corporation, has tested a titanium dioxide coating which shows excellent promise. Called UNITANE Titanium Dioxide, it has a high opacity factor, and shows good results.

Another new development in printing paper is Keuffel & Esser's (Hoboken, N. J.) innovation in diazo sensitized papers which make possible a faster output from diazo machines with no sacrifice of print density. The new paper, Helios Blue 11, which requires less light, finds its most important application in the reproduction of old, worn original drawings, more especially on small diazo equipment, which, because of lower light intensity, must be run at relatively slow speeds – usually below the capacity of the machine – whereas this paper permits runs at Speed 11.

It is curious to note that very often developments–usually by coincidence–occur in complementary pairs. For example, a few years back Union Bag-Camp introduced a non-skid paper which found good use in the piling high of cement bags on fork-lift trucks. A similar development has been made more recently by the Interchemical Corporation with its IC Non-Slip Emulsion. As the name implies, the paper is treated with a resin which gives it a grip. Now, as a kind of complement to this paper with a sticking characteristic, there is a new lightweight paper coating invented by the Dow Corning Corporation, called "Syl-off." "Syl-off" has a strong *anti*-adhesive characteristic so that stock coated with it will not stick to anything –asphalt, candy, unvulcanized rubber, even glue. Another complementary pair is a crepe paper produced by Dennison which is non-inflammable, and a paper of another company which burns so thoroughly that it leaves no ash. The latter is said to be especially useful to embassies and consulates.

Aside from the spectacular new kinds of paper and new uses for it (such as wet-strength paper sails for sail boats) other, more sober ones have appeared recently. These include a "diffusion board" impregnated with chemicals (as yet undisclosed) which screens out deadly gases while allowing oxygen to pass in and carbon dioxide to pass out –for use in special construction; Calcofluor, on which this and the preceding three pages are printed–American Cyanamid's fluorescent white dye which absorbs ultraviolet rays and then emits them as visible light, thus making white paper whiter; and, as might be expected, still newer kinds of kraft.

Kraft paper is the workhorse of the industry. The Dictionary of Paper (of the American Pulp and Paper Association) lists 65 properties that paper may have, ranging from absorbency, gloss, and stretch, to hygroscopicity, initial tearing strength, and thermal conductivity. With additives and coatings, and with laminations of film and foils, and by other converting operations, kraft can be turned out with a combination of physical properties (though not quite all 65) to meet virtually every wrapping or packaging requirement and some construction requirements, too. To name only a few, it can be made waterproof, grease proof, scuff proof, fungus proof, flame-, acid-, and vapor-resistant, insect and rodent repellent–and all this in a full range of colors. There is a kraft that withstands pressure and heat, which is used as a protective liner while welding inert gas pipes. And of course there is the now familiar kraft-and-foil in insulated packaging, but its use has been extended to disposable fire-fighting equipment and garments.

But, "the more it changes, the more it remains the same," and paper is still what it has always been: paper. If the industry occasionally reaches out for a new and unusual application for it, it deals with a constant – and amazingly simple–material. Possibly the most ubiquitous manufactured material in the world, paper is almost as cheap as water and more plentiful than the leaves of those trees from which it is made. Indeed, aside from its varying content of chemicals, paper is water and wood, the usual ratio in its manufacture being 99% of the former to 1% of the latter. It is the 1% wood, in the form of pulp, that is the important element–the water is largely only a means of production–for it is from the cellulose fibers in wood that paper is made. In fact, expressed simply, paper is cellulose.

It seems inevitable then that the pulp and paper industry should work closely with the chemical industry. From one point of view, paper is only a chemical formula capable of infinite variation. The chemical industry's principal area of interest in paper is in new coatings for it or in endowing it with special new properties. The more basic chemical work, though, is done by the pulp and paper industry itself, and the center of this research is the primary raw material, cellulose. Organically, cellulose is a complex carbohydrate occurring in all vegetable matter. It is composed of long chain molecules built up through the union of glucose molecules. The formula of ideal cellulose is represented by $(C_6H_{10}O_5)x$, where x indicates the number of glucose residues in the chain. Wood cellulose, which never reaches the ideal, is the material remaining after a

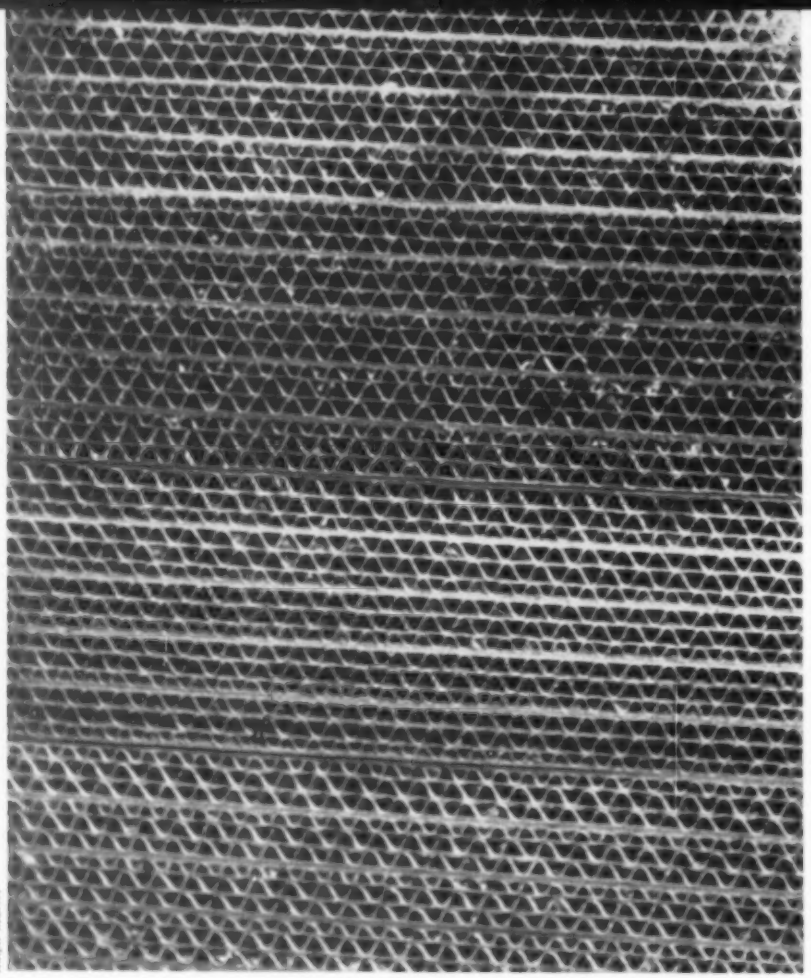
COMBINING

St. Regis' *"Fome-Cor" is a sandwich-like lamination of kraft paper and polystyrene foam plastic which retains high compression strength under severe humidity conditions, has good insulation properties, is lightweight but strong, and is easily fabricated into many shapes. From this list of characteristics it is easy to see that in the carton field alone its applications are many. "Fome-Cor" has already been used to package flowers, plant cuttings, ice-packed poultry, fruit, photo film, and a variety of items, including acid.*

Du Pont's *synthetic fiber papers, using nylon, polyester, and acrylic fibers, although they will not compete with existing papers, do promise to satisfy a growing demand for specialty papers and will conceivably replace non-woven fabrics for some purposes. Fold endurance is an outstanding property of paper made of nylon and "Dacron." With the addition of these fibers in 50/50 blends with wood pulp, the fold endurance is increased hundreds of times. Tear strength increases in direct proportion to the amount of "Dacron" or nylon present. Research in Du Pont's laboratories has resulted in new techniques for cutting these fibers into short lengths, previously impossible without fiber fusion. Synthetic paper is ideal for maps, charts, and most book covers.*

	Cellulose: Alpha %	*Beta %*	*Gamma %*	*10% KOH Solubility %*	*Ash %*	*Calcium %*	*Iron %*	*Copper %*	*Manganese %*	*Ether Extract %*	*G.E. Brightness %*	*Oven Dry %*	*Intrinsic Viscosity %*
RAYOCORD—X (G)	*96.0*	*1.4*	*2.6*	*6.3*	*.06*	*.016*	*.0005*	*.0004*	*.00001*	*.13*			
ALPHANIER	*90.3*	*2.1*	*7.6*	*16.6*	*.11*	*.0002*	*.0005*			*.12*	*91.5*	*93.0*	*8.2*
RAYBOND	*88.5*	*2.0*	*9.5*	*16.2*	*.12*	*.075*	*.0003*	*.0005*	*.00001*	*.23*	*87.5*		

Rayonier's *recipes for papermaking. A quick glance at these typical analyses of the chemical characteristics shows that the essential elements in three different formulas are quite similar, thus demonstrating that although most papers have the same basic ingredients in very similar proportions, a slight change in percentage of elements determines a different property in the paper. RAYOCORD X-(G) has been developed specifically for use in the manufacture of high tenacity rayon yarn. ALPHANIER is a bleached sulfite wood cellulose, with high absorbency, bulk, and freeness, while RAYBOND is expressly intended for bond paper.*



Ralph Mariel

large portion of the lignin and certain carbohydrates – other than cellulose – have been removed by pulping and bleaching operations. (Little is known about lignin other than that it has a strong adhesive characteristic.) The proportion of the chemist's cellulose in the wood cellulose depends upon the extent to which the delignification and further purification by bleaching are carried. With too much purification, the transformation of wood cellulose to chemical cellulose results in the loss of desirable papermaking characteristics.

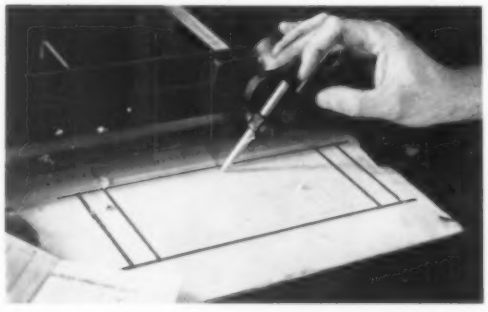
But the production of paper simply as paper would be a futile operation: almost all paper is used only after it has been converted to various forms for various uses. There are five basic operations in the process of paper and board conversion:

*1–*Mechanical*–in which paper and board are cut into various sizes and

**Stillwell, Chas. W.–"Paper Converting", University of Maine Lectures on Pulp and Paper Manufacture, Series II, *Lockwood Trade Journal Co., Inc., N. Y., 1953.*

MECHANICAL

Tri-Wall Containers' *new Tri-Wall King-Pak. Ordinary corrugated board often did not give satisfactory strength (it usually needed product rigidity to help sustain the package), and in most crating applications expensive – and heavy – wood or plywood was used. New methods in the combining machine make it possible to pass sufficient heat through seven thicknesses of paperboard for adhesion on the inside sheets without scorching outside ones. Tri-Wall Paks find excellent use in crating heavy equipment, such as engines, cabs of trucks.*



Remington Rand's *tabulating cards and tapes employ paper as a precision tool. Shown here is wax engraving of card for electrotype from which cards are printed. The paper, made of northern spruce, must have dimensional and thermal stability. The card is .00067 inches thick, with variance limited to .0005 inches either way. The lengthwise "curl" should not be more than .0093 inches.*

shapes, as in the manufacture of boxes, containers, bags or sacks.

2 – *Coating* – decorative coating to change the appearance, or functional coating as in the manufacture of waterproof, greaseproof, and waxed papers, or photographic, blueprint, and carbon papers.

3–*Combining*–in which a sheet of paper is "combined" to another sheet or another material for decorative effect or for the same functional effects sought in coating.

4–*Saturating*–impregnating paper, usually for functional effects; for example, to impart flame resistance, wet strength, or softness.

5–*Creping*–creping paper for decorative uses, and, more recently, for functional purposes as in the case of roofing and building papers, bags.

The paper industry today enjoys a seller's market instead of having to face the sterner reality of a consumer's market, and as a consequence of this, competition between paper companies is at the moment not very intense and radical new developments are slow in coming. Very often it is due to the more aggressive efforts of chemical companies that new developments occur in the pulp and paper industry. But if the industry has lately appeared sluggish, it should in all fairness be said that it is partly because the last decade has been one so rich in innovation that the industry has yet to catch up with itself. One such innovation was extensible paper, invented by Sanford Cluett several years ago. The paper has not yet been broadly marketed (although we shall be seeing it soon) because of the tremen-

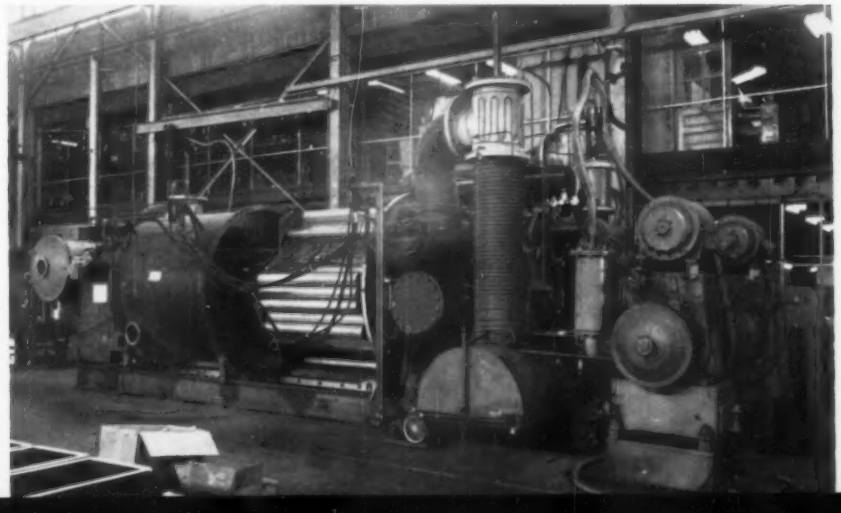
COATING

Dixie Cup's *new development in drinking cups is lamination before forming. Glue is not used. Heat-sealed, the polyethylene itself is the "glue" for the seam and bottom: tearing shows that the plastic coating binds so well that paper rips before the plastic. New drinking cups withstand high temperatures.*

Dow Corning's *silicone coating, "Syl-off", gives remarkable release or parting characteristics to papers such as kraft, glassine, parchment, corrugated boxboard and even cellophane. "Syl-off" will not migrate, or contaminate other materials, weighs less than other anti-adhesives. Promises many applications.*

J. S. Ward

Lily-Tulip's *combination holder and plastic-coated paper cup. "China-Cote" cup has 7-oz. fluid capacity with rounded reinforced bottom for easy stirring. Fits snugly into holder, made of cycolac.*



F. J. Stokes Corporation, *Philadelphia, and Vaculite Corporation of Cambridge are two companies now making vacuum metalized papers. Shown here is Stokes' continuous vacuum metalizer for Mylar in 54" widths, but machine for metalization of paper (photos not yet released) is similar. The metal is converted into gas, continuous roll of paper is exposed to it, and metal condenses on its surface. Possible thinnesses range from 4 to 20 micro inches.*

dous expense entailed in making it commercially available in sufficient quantity. It is only this year, with the West Virginia Pulp and Paper Company's $25,000,000 machine at its Charleston, S. C. mill, that the paper will be produced at an appreciable rate, namely 225 tons per day. And the story is similar with regard to wet strength papers (combined, often, with extensible). Although South Sea islanders have for centuries been making paper clothing, they have not yet tried swimming in them. Imagination leaps to the prospect of a one-swim bathing suit, and at least one company tried it. While still in its experimental stage, a paper bathing suit demonstrated in a New York pool as a special preview to the press became front-page news when a piece of the suit ripped away from the pretty model swimming in it. The accident is said to have done little harm in the way of publicity. But, that early failure notwithstanding, one-time disposable clothing is becoming a reality, with some of its foreseeable uses including surgeons' gowns, impregnated garments that can be worn in radioactively contaminated areas, garments for industrial laboratories, and last, but not the least interesting, ladies' underwear.

The pulp and paper industry is a stable and healthy one with great steady growth, and if advances manifest themselves slowly in their broadest commercial use, the wide profit margins enjoyed by the industry are being put to constructive purposes. There is in progress a research program that will in a very short time cost $50 million a year, and the range of its research reflects the entire spectrum of papermaking, from forest genetics to finished product. Here are only a few of the projects and experiments:

—Injecting trees, and in some cases seeds, with various chemicals to arrive at different pulp properties as well as to extract more pulp from a given quantity of wood.

—Injecting trees with radioactive carbon 17—so far for use in the manufacture of rayon, but also for possible later use in paper.

—Reinforcing paper with glass fibers for use in concrete form molds and heat channels in concrete slabs.

—Treating paper with fungicide for use in construction.

—Making pollen-tight bags for the control of plant pollination.

—Experimenting with new sources for pulp, including hardwoods, gumwoods, oaks, cotton stalks, bagasse.

In a world in which one can neither be born nor die without a piece of paper to prove it, this uncommonly common material is the omnipresent witness to all official enterprise and transaction. And there is none cheaper. What makes it cheap is that 90% of our paper today comes from wood, which is the only natural raw material renewable on a large scale; and, cellulose fibers do not die: they can be re-used again and again, until they are destroyed. And what makes it omnipresent is an industry which is as surprisingly large as it is incredibly prolific. The pulp and paper industry is the nation's fifth largest corporate income producer, its annual sales in the vicinity of $9 billion; the industry owns almost 26 million acres of forest land, and to insure its source of raw material, it plants millions of seedlings a year; the United States consumes 35.1 million tons of paper and board in a year, a weight exceeding that of all automobiles made in the same period.

Compared with the 35.1 million tons consumed this year, in 1938 there were only 13.5 million. If per capita consumption should continue its ascending trend, and taking into consideration normal population growth, the predicted gross consumption of paper and board will be over 57 million tons by 1975. A brochure of the American Pulp and Paper Association ("An Everyday Wonder... Paper") speaks of the "Paper Law: the higher the standard of living and the greater the national wealth, the greater the volume of paper consumed." One could add to that: and the greater the uses for, and the more new kinds of, paper. *HIAG AKMAKJIAN*

West Virginia Pulp and Paper Company's *Kraftsman Clupak. Invented several years ago, the introduction of extensible paper on a broad commercial basis demonstrates the typical difficulties involved in the manufacture of paper. The difficulties are twofold: cost and time—the cost and time of research, the cost and time of tooling, and the cost and time of production. It took over three years and a capital investment of more than $2,500,000 in research to get Clupak from the laboratory to the production line. The experimental paper went from a 2-inch table model to a 15-inch lab paper machine, to a 60-inch pilot model, and was finally brought to commercial production on a 264-inch paper machine at Westvaco's Charleston, S. C. plant, a machine recently installed at a cost of $25,000,000. The new monster is capable of producing 225 tons of extensible paper daily at speeds ranging as high as 30 miles an hour. Kraftsman Clupak's toughness can be measured as the force (inch-pounds of tensile strength) multiplied by the distance (the distance the paper is stretched under constant strain to the breaking point). If a 100-lb. bag of grain is dropped from a height of 5 feet on to a concrete floor, from the above formula, 5 x 100, or 500 foot-pounds, must be absorbed. Some of the energy will be absorbed by friction between kernels of grain; the rest must be absorbed by the bag. Where kraft bags fail on the first or second drop, Clupak bags perform satisfactorily as high as 20 times before failure. Possible uses include disposable clothing (aprons, coveralls, house slippers, brassieres), disposable undersheeting for hospital beds, fender pads for the auto industry, shotgun shells, and even disposable blankets for race horses.*


REGULAR
X 10
X 10

ICE CUBISM

As the *New Yorker* has observed for years, there will always be an adman. Lest this phenomenon seem provincially American, René Lherbet, advertising manager of General Motors in France, provided ten prominent painters with special cellulose paint and invited them to apply their fine art to Frigidaire cabinets. GM plans to auction off the cabinets and divide the proceeds between the artists and the French Center for the Protection of Children. Shown above in what looks like a cemetery endowed by Sherwin-Williams are the artists and their works. Jean-Michel Atlan and Francis Bott lean on theirs; Jean Carzou sits beside his; Constantin Terechkovitch poses behind his like a friendly bartender; Félix Labisse stands paternally beside his; and Jean Mathieu rides his refrigerator side-saddle. In the foreground at right, José-Manuel Capuletti and his versatile wife (she modeled both the upstairs and down-

stairs girls) embrace a box that looks like a Mielziner stage set. Not present, but represented by their art, are Jean Cocteau and Bernard Buffet, whose refrigerators stand unprotected in left field, and Leonor Fini, whose feline nursery room design stands between Terechkovitch and Mathieu.

The Frigidaires were shown last month at New York's Wildenstein Gallery under the imposing title "Beauty in Everyday Objects." But the beauty—if such it is—was *on* the objects, not in them or even related to them. To many amused spectators, Beauty was the beast in this sponsored fairytale.

At a moment in cultural history when yesterday's dada is today's gum advertisement, the exhibit can be seen for what it is: good, clean, promotional fun. Yet designers may find that the joke is on them. For unfortunately the show is publicized with sober statements about how important it is "for the creative artist to bring his inspiration to bear on the product of the machine." Although nothing is closer to the designer's heart than this sentiment, nothing is further from what it means than this stunt. Designers probably will go on stubbornly believing that the beauty of the everyday object is more likely to come from an expression of the object itself than from the post-design application of paint—even when applied by a member of the Académie Française.

THE MAN IN THE MIDDLE

by C. WRIGHT MILLS

What shall the designer be—a commercial star? a commercial hack? or a modern

The American designer is at once a central figure in what I am going to call the cultural apparatus and an important adjunct of a very peculiar kind of economy. His art is a business, but his business is art and curious things have been happening both to the art and to the business—and so to him. He is caught up in two great developments of 20th-century America: One is the shift in economic emphasis from production to distribution, and along with it, the joining of the struggle for existence with the panic for status. The other is the bringing of art, science and learning into subordinate relation with the dominant institutions of the capitalist economy and the nationalist state.

Designers work at the intersection of these trends; their problems are among the key problems of the overdeveloped society. It is their dual involvement in them that explains the big split among designers and their frequent guilt; the enriched muddle of ideals they variously profess and the insecurity they often feel about the practice of their craft; their often great disgust and their crippling frustration. They cannot consider well their position or formulate their credo without considering both cultural and economic trends, and the shaping of the total society in which these are occurring.

I want briefly (1) to define certain meanings and functions of the cultural apparatus, and (2) to indicate the economic context in which the designer now does his work. It may then be useful (3) to invite you to reconsider certain ideals for which the designer might stand in the kind of world in which Americans are coming to live.

Our worlds are second-hand

Our images of this world and of ourselves are given to us by crowds of witnesses we have never met and never shall meet. Yet for each of us these images—provided by strangers and dead men—are the very basis of our life as a human being. None of us stands alone directly confronting a world of solid fact. No such world is available: the closest we come to it is when we are infants or when we become insane: then, in a terrifying scene of meaningless events and senseless confusion, we are often seized with the panic of near-total insecurity. But in our everyday life we experience not solid and immediate facts but stereotypes of meaning. We are aware of much more than what we have ourselves experienced, and our experience itself is always indirect and always guided. The first rule for understanding the human condition is that men live in second-hand worlds.

The consciousness of men does not determine their existence; nor does their existence determine their consciousness. Between the human consciousness and material existence stand communications and designs, patterns and values which influence decisively such consciousness as they have.

The mass arts, the public arts, the design arts are major vehicles of this consciousness. Between these arts and the everyday life, between their symbols and the level of human

Generally when a speaker addresses members of a profession not his own, he tells them what they want to hear. He can do it obviously, by telling them how good they are; or subtly, by telling them how bad they are, then making it all right at the end by exhorting them to be better. In either case, since he tells them only what they tell each other, he contributes only the illusion of a fresh perspective. An exception is this paper read to the Design Conference in Aspen this summer by sociologist and author (The Power Elite) *C. Wright Mills. Neither lullaby nor mock attack, it is a hard analysis of the designer in our society.*

craftsman in a world that needs craftsmanship as an ethos?

sensibility, there is now continual and persistent interplay. So closely do they reflect one another that it is often impossible to distinguish the image from its source. Visions whispered long before the age of consent, images received in the relaxation of darkness, slogans reiterated in home and in classroom, determine the perspective in which we see and fail to see the worlds in which we live; meanings about which we have never thought explicitly determine our judgments of how well and of how badly we are living in these worlds. So decisive to experience itself are the results of these communications that often men do not really believe what they "see before their very eyes" until they have been "informed" about it by the official announcement, the radio, the camera, the hand-out. Communications not only limit experience; often they expropriate the chances to have experience that can rightly be called "our own." For our standards of credibility, and of reality itself, as well as our judgments and discernments, are determined much less by any pristine experience we may have than by our exposure to the output of the cultural apparatus.

For most of what we call solid fact, sound interpretation, suitable presentation, we are increasingly dependent upon the observation posts, the interpretation centers, the presentation depots of the cultural apparatus. In this apparatus, standing between men and events, the meanings and images, the values and slogans that define all the worlds men know are organized and compared, maintained and revised, lost and found, celebrated and debunked.

By the cultural apparatus I mean all those organizations and milieux in which artistic, intellectual and scientific work goes on. I also mean all the means by which such work is made available to small circles, wider publics, and to great masses.

The most embracive and the most specialized domain of modern society, the cultural apparatus of art, science and learning fulfills the most functions: it conquers nature and remakes the environment; it defines the changing nature of man, and grasps the drift of world affairs; it revivifies old aspirations and shapes new ones. It creates models of character and styles of feeling, nuances of mood and vocabularies of motive. It serves decision-makers, revealing and obscuring the consequences of their decisions. It turns power into authority and debunks authority as mere coercion. It modifies the work men do and provides the tools with which they do it; it fills up their leisure, with nonsense and with pleasure. It changes the nature of war; it amuses and persuades and manipulates; it orders and forbids; it frightens and reassures; it makes men weep and it makes men laugh, go numb all over, then become altogether alive. It prolongs the life-span and provides the violent means to bend it suddenly. It predicts what is going to happen and it explains what has occurred; it helps to shape and to pace an epoch, and without it there would be no consciousness of any epoch.

The world men are going to believe they understand is

now, in this cultural apparatus, being defined and built, made into a slogan, a story, a diagram, a release, a dream, a fact, a blue-print, a tune, a sketch, a formula; and presented to them. Such part as reason may have in human affairs, this apparatus, this put-together contraption, fulfills; such role as sensibility may play in the human drama, it enacts; such use as technique may have in history and in biography, it provides. It is the sect of civilization, which—in Matthew Arnold's phrase—is "the humanization of man in society." The only truths are the truths defined by the cultural apparatus. The only beauty is experiences and objects created and indicated by cultural workmen. The only goods are the cultural values with which men are made morally comfortable or morally uneasy.

From production to distribution to "merchandising"

As an institutional fact, the cultural apparatus has assumed many forms. In some societies—notably that of Russia—it is established by an authority that post-dates capitalism: it is thus part of an official apparatus of psychic domination. In some—notably the nations of Western Europe—it is established out of a tradition that pre-dates capitalism; it is thus part of an Establishment in which social authority and cultural prestige overlap. Both cultural tradition and political authority are involved in any cultural Establishment, but in the USA the cultural apparatus is established commercially: it is part of an ascendant capitalist economy. This fact is the major key to understanding both the quality of everyday life and the situation of culture in America today.

The virtual dominance of commercial culture is the key to America's cultural scope, confusion, banalization, excitement, sterility. To understand the case of America today, one must understand the economic trends and the selling mechanics of a capitalist world in which the mass production and the mass sale of goods has become The Fetish of human life, the pivot both of work and of leisure. One must understand how the pervasive mechanisms of the market have penetrated every feature of life—including art, science and learning—and made them subject to the pecuniary evaluation. One must understand that what has happened to work in general in the last two centuries has in the 20th century been happening to the sphere of artistic and intellectual endeavor; these too have now become part of society as a salesroom. To understand the ambiguous position of the cultural workman in America one must see how he stands in the overlap of these two worlds: the world of such an overdeveloped society with its ethos of advertisement, and the world of culture as men have known it and as they might know it.

However harsh its effects upon the nature of work, the industrialization of underdeveloped countries must be seen as an enormous blessing: it is man conquering nature, and so freeing himself from dire want. But as the social and physical machineries of industrialization develop, new purposes and interests come into play. The economic emphasis moves from production to distribution and, in the overdeveloped society, to what is called "merchandising." The pivotal decade for this shift in the USA was the Twenties, but it is in the era since the ending of World War II that the new economy has flowered like a noxious weed. In this phase of capitalism, the distributor becomes ascendant over both the consumer and the producer.

As the capacity to produce goes far beyond existing demand, as monopoly replaces competition, as surpluses accumulate, the need is for the creation and maintenance of the national market and for its monopolistic closure. Then the salesman becomes paramount. Instead of cultivating and servicing a variety of publics, the distributor's aim is to create a mass volume of continuing sales. Continuous and expanding production requires continuous and expanding consumption, so consumption must be speeded up by all the techniques and frauds of marketing. Moreover, existing commodities must be worn out more quickly for as the market is saturated, the economy becomes increasingly dependent upon what is called replacement. It is then that obsolescence comes to be planned and its cycle deliberately shortened.

Silly designs for silly needs

There are, I suppose, three kinds of obsolescence: (1) technological, as when something wears out or something better is produced; (2) artificial, as when something is deliberately designed so that it *will* wear out; and (3) status obsolescence, as when fashions are created in such ways that consumption brings disgrace or prestige in accordance with last year's or with this year's model, and alongside the old struggle for existence, there is added the panic for status.

It is in this economic situation that the designer gets his Main Chance. Whatever his esthetic pretension and his engineering ability, his economic task is to sell. In this he joins the advertising fraternity, the public relations counsel, and the market researcher. These types have developed their skills and pretensions in order to serve men whose God is the Big Sell. And now the designer joins them.

To the firm and to its products he adds the magical gloss and dazzle of prestige. He plans the appearance of things and

their often fraudulent packaging. He lays out the interiors and decorates the exteriors of corporate businesses as monuments to advertising. And then, along with his colleagues, he takes the history of commercial fraud one step further. With him, advertising is not one specialized activity, however central; with his capitalist advent, the arts and skills and crafts of the cultural apparatus itself become not only adjuncts of advertising but in due course themselves advertisements. He designs the product itself as if it were an advertisement, for his aim and his task—acknowledged by the more forthright—is less to make better products than to make products sell better. By brand and trademark, by slogan and package, by color and form, he gives the commodity a fictitious individuality, turning a little lanolin and water into an emulsified way to become erotically blessed; concealing the weight and quality of what is for sale; confusing the consumer's choice and banalizing her sensibilities.

The silly needs of salesmanship are thus met by the silly designing and redesigning of things. The waste of human labor and material become irrationally central to the performance of the capitalist mechanism. Society itself becomes a great sales room, a network of public rackets, and a continuous fashion show. The gimmick of success becomes the yearly change of model as fashion is made universal. And in the mass society, the image of beauty itself becomes identified with the designer's speed-up and debasement of imagination, taste and sensibility.

The growth of the star system

The cultural workman himself, in particular the designer, tends to become part of the means of distribution, over which he tends to lose control. Having "established a market," and monopolized access to it, the distributor—along with his market researcher—claims to "know what they want." So his orders—even to the free-lance—become more explicit and detailed. The price he offers may be quite high; perhaps too high, he comes to think, and perhaps he is right. So he begins to hire and to manage in varying degree a stable of cultural workmen. Those who allow themselves to be managed by the mass distributor are selected and in time formed in such a way as to be altogether proficient, but perhaps not quite first-rate. So the search goes on for "fresh ideas," for exciting notions, for more alluring models; in brief, for the innovator. But in the meantime, back at the studio, the laboratory, the research bureau, the writers' factory—the distributor is ascendant over many producers who become the rank-and-file workmen of the commercially established cultural apparatus.

In this situation of increasing bureaucratization and yet of the continual need for innovation, the cultural workman tends to become a commercial hack or a commercial star. By a star, I mean a producer whose productions are so much in demand that he is able, to some extent at least, to make distributors serve as *his* adjuncts. This role has its own conditions and its own perils: The star tends to be trapped by his own success. He has painted this sort of thing and he gets $20,000 a throw for it. This man, however affluent, may become culturally bored by this style and wants to explore another. But often he cannot: he is used to the $20,000 a throw and there is demand for it. As a leader of fashions, accordingly, he is himself subject to fashion. Moreover, his success as a star depends upon his playing the market: he is not in educative interplay with a public that supports him as he develops and which he in turn develops. He too, by virtue of his success, becomes a marketeer.

The star system of American culture—along with the commercial hacks—tend to kill off the chance of the cultural workman to be a worthy craftsman. One is a smash hit *or* one is among the failures who are not produced; one is a best seller *or* one is among the hacks and failures; one is either absolutely tops *or* one is just nothing at all.

As an entrepreneur, you may value as you wish these several developments; but as a member of the cultural apparatus, you surely must realize that whatever else you may be doing, you are also creating and shaping the cultural sensibilities of men and women, and indeed the very quality of their everyday lives.

The Big Lie: "We only give them what they want"

The mere prevalence of the advertiser's skills and the designer's craft makes evident the falseness of the major dogma of the distributor's culture. That dogma is that "we only give them what they want." This is the Big Lie of mass culture and of debased art, and also it is the weak excuse for the cultural default of many designers.

The determination of "consumer wants and tastes" is one characterizing mark of the current phase of capitalism in America—and as well as what is called mass culture. And it is precisely in the areas in which wants *are* determined and changed that designers tend to do their work.

The merchandising apparatus, of which many designers are now members, operates more to create wants than to satisfy wants that are already active. Consumers are trained to "want" that to which they are most continually exposed. Wants do not originate in some vague realms of the consumer's personality; they are formed by an elaborate apparatus of jingle and fashion, of persuasion and fraud.

They are shaped by the cultural apparatus and the society of which it is a part. They do not grow and change as the consumer's sensibilities are enlarged; they are created and they are changed by the process by which they are satisfied and by which old satisfactions are made unsatisfactory. Moreover, the very canons of taste and judgment are also managed by status obsolescence and by contrived fashion. The formula is: to make people ashamed of last year's model; to hook up self-esteem itself with the purchasing of this year's; to create a panic for status, and hence a panic of self-evaluation, and to connect its relief with the consumption of specified commodities.

In this vast merchandising mechanism of advertisement and design, there is no inherent social purpose to balance its great social power; there is no built-in responsibility to anybody except to the man who makes the profit. Yet there is little doubt that this mechanism is now a leading fixer of the values and standards of American society, the foremost carrier of cultural sensibility, and quite comparable in influence to school, to church, to home.

This apparatus is now an adjunct of commercial establishments which use "culture" for their own non-cultural—indeed anti-cultural—ends, and so debase its very meaning. These uses of culture are being shaped by men who would turn all objects and qualities, indeed human sensibility itself, into a flow of transient commodities, and these types have now gotten the designer to help them; they have gotten him to turn himself into the ultimate advertising man. When you think about it—if you do—it really is amazing: the old helpmate of the salesman, the Air Brush Boy, the corporal of retailing—has become the generalissimo of anxious obsolescence as the American way of life.

Craftsmanship as a value

I have of course been describing the role of the designer at what I hope is its worst. And I am aware that it is not only in the field of design that the American ambiguity of cultural endeavor is revealed, that it is not only the designer who commits the cultural default. In varying degrees all cultural workmen are part of a world dominated by the pecuniary ethos of the crackpot business man and also of a world unified only vaguely by the ideals of cultural sensibilility and human reason. The autonomy of all types of cultural workmen has in our time been declining. I also want to make it clear that I am aware of the great diversity among designers and the enormous difficulty any designer now faces in trying to escape the trap of the maniacs of production and distribution.

The problem of the designer can be solved only by radical consideration of fundamental values. But like most fundamental considerations his can begin very simply.

The idea of the cultural apparatus is an attempt to understand human affairs from the standpoint of the role within them of reason, technique and sensibility. As members of this cultural apparatus, it is important that designers realize fully what their membership means. It means, in brief, that you represent the sensibilities of man as a maker of material objects, of man as a creature related to nature itself and to changing it by humanly considered plan. The designer is a creator and a critic of the physical frame of private and public life. He represents man as a maker of his own milieu. He stands for the kind of sensibility which enables men to contrive a world of objects before which they stand delighted and which they are delighted to use. The designer is part of the unity of art, science and learning. That, in turn, means that he shares one cardinal value, that is the common denominator of art, science and learning and also the very root of human development. That value, I believe, is craftsmanship.

From craftsmanship, as ideal and as practice, it is possible to derive all that the designer ought to represent as an individual and all that he ought to stand for socially and politically and economically. As ideal, craftsmanship stands for the creative nature of work, and for the central place of such work in human development as a whole. As practice, craftsmanship stands for the classic role of the independent artisan who does his work in close interplay with the public, which in turn participates in it.

The most fundamental splits in contemporary life occur because of the break-up of the old unity of design, production and enjoyment. Between the image and the object, between the design and the work, between production and consumption, between work and leisure, there is a great cultural vacuum, and it is this vacuum that the mass distributor, and his artistic and intellectual satraps, have filled up with frenzy and trash and fraud. In one sentence, what has been lost is the fact and the ethos of man as craftsman.

By craftsmanship I refer to a style of work and a way of life having the following characteristics:

(1) In craftsmanship there is no ulterior motive for work other than the product being made and the processes of its creation. The craftsman imagines the completed product, often even as he creates it; and even if he does not make it, he sees and understands the meaning of his own exertion in terms of the total process of its production. Accordingly, the details of the craftsman's daily work are meaningful because they are not detached in his mind from the product of the work. The satisfaction he has in the results infuses the means of achieving it.

This is the root connection between work and art: as esthetic experiences, both involve the power "to catch the enjoyment that belongs to the consummation, the outcome, of an undertaking and to give to the implements, the objects that are instrumental' in the undertaking, and to the acts that compose it something of the joy and satisfaction that suffuse its successful accomplishment."*

To quite small circles the appeal of modern art—notably painting and sculpture, but also of the crafts—lies in the fact that in an impersonal, a scheduled, a machined world, they represent the personal and the spontaneous. They are the opposite of the stereotyped and the banalized.

(2) In craftsmanship, plan and performance are unified, and in both, the craftsman is master of the activity and of himself in the process. The craftsman is free to begin his work according to his own plan, and during the work he is free to modify its shape and the manner of its shaping. The continual joining of plan and performance brings even more firmly together the consummation of work and its instrumental activities, infusing the latter with the joy of the former. Work is a rational sphere of independent action.

(3) Since he works freely, the craftsman is able to learn from his work, to develop as well as use his capacities. His work is thus a means of developing himself as a man as well as developing his skill. This self-development is not an ulterior goal, but a cumulative result of devotion to and practice of his craft. As he gives to work the quality of his own mind and skill, he is also further developing his own nature; in this simple sense, he lives in and through his work, which confesses and reveals him to the world.

(4) The craftsman's way of livelihood determines and infuses his entire mode of living. For him there is no split of work and play, of work and culture. His work is the mainspring of his life; he does not flee from work into a separate sphere of leisure; he brings to his non-working hours the values and qualities developed and employed in his working time. He expresses himself in the very act of creating economic value; he is at work and at play in the same act; his work is a poem in action. In order to give his work the freshness of creativity, he must at times open himself to those influences that only affect us when our attentions are relaxed. Thus for the craftsman, apart from mere animal rest, leisure may occur in such intermittent periods as are necessary for individuality in his work.

(5) Such an independent stratum of craftsman cannot flourish unless there are publics who support individuals who may not turn out to be first-rate. Craftsmanship requires that such cultural workmen and such publics define what is first-rate. In the Communist bloc because of official bureaucracies, and in the capitalist because of the commercial ethos, standards are now not in the hands of such cultural producers and cultural publics. In both the mere distributor is the key to both consumption and production.

Some cultural workmen in America do of course remain independent. Perhaps three or four men actually earn a living here just by composing serious music; perhaps fifty or so by the writing of serious novels. But I am concerned now less with economic than with cultural requirements. The role of the serious craftsman requires that the cultural workman remain a cultural workman, and that he produce for other cultural producers and for circles and publics composed of people who have some grasp of what is involved in his production. For you cannot "possess" art merely by buying it; you cannot support art merely by feeding artists —although that does help. To possess it you must earn it by participating to some extent in what it takes to design it and to create it. To support it you must catch in your consumption of it something of what is involved in the production of it.

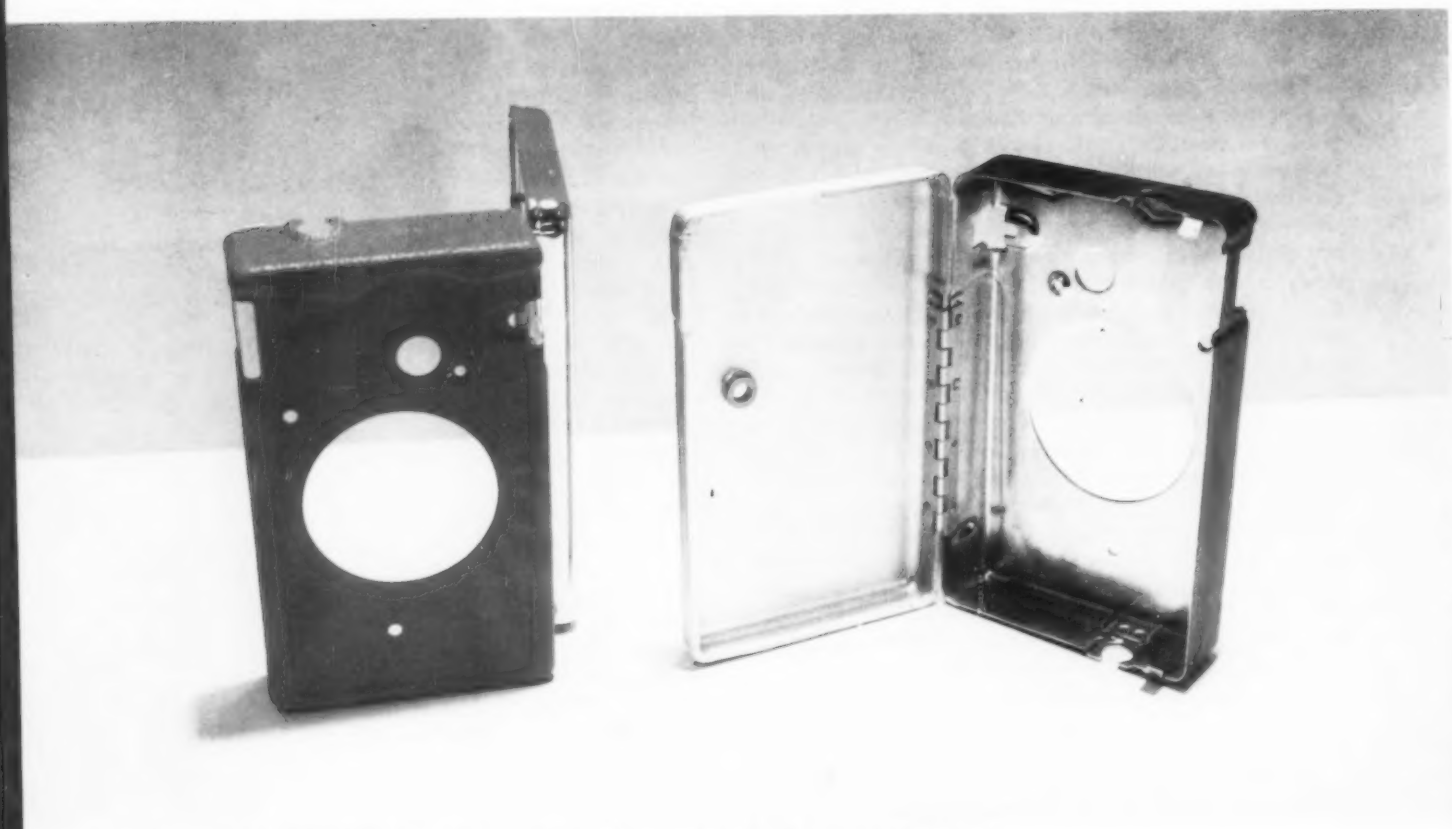
It is, I think, the absence of such a stratum of cultural workmen, in close interplay with such a participating public, that is the signal fault of the American cultural scene today. So long as it does not develop, the position of the designer will contain all the ambiguities and invite all the defaults I have indicated. Designers will tend to be commercial stars or commercial hacks. And human development will continue to be trivialized, human sensibilities blunted, and the quality of life distorted and impoverished.

As practice, craftsmanship in America has largely been trivialized into pitiful hobbies: it is part of leisure, not of work. As ethic, it is largely confined to small groups of privileged professionals and intellectuals. What I am suggesting to you is that designers ought to take the value of craftsmanship as the central value for which they stand; that in accordance with it they ought to do their work; and that they ought to use its norms in their social and economic and political visions of what society ought to become.

Craftsmanship cannot prevail without a properly developing society; such a society I believe would be one in which the fact and the ethos of craftsmanship would be pervasive. In terms of its norms, men and women ought to be formed and selected as ascendant models of character. In terms of its ethos, institutions ought to be constructed and judged. Human society, in brief, ought to be built around craftsmanship as the central experience of the unalienated human being and the very root of free human development. The most fruitful way to define the social problem is to ask how such a society can be built. For the highest human ideal is: to become a good craftsman.

* *G. H. Mead, "The Philosophy of the Act," (Chicago, '38) P. 454.*

VINYL LAMINATES *color, strength and texture in one material*



Motorola's pocket portable radio case was made of metal covered with vinyl by Arvin Industries. Inside of case was plated and brackets were welded to case after vinyl had been applied.

Easily decorated, self-protecting against corrosion and abrasion, calendered vinyl sheets laminated to base materials — metals, plywood, paper, cloth and plastics — contribute important product characteristics; the combination constitutes a new materials group. Recent advances in workability have broadened the application range of the laminates.

The product in which the qualities of a new material are fully utilized is, of course, the best symbol for indicating the appearance and workability of the material. The housing for Motorola's transistor portable radio (at left) serves to illustrate what can now be done with vinyl-clad materials, and in a more general sense, shows clearly the strides made by the vinyl-laminates industry in recent years. Early in 1957, when Motorola approached the Arvin Industries, Columbus, Indiana, to develop the plastic covered metal case for their new portable radio, they challenged Arvin engineers with some stiff and (in the field of vinyl-clad materials) unprecedented specifications. In earlier models Motorola had used a metal radio case covered with a plastic-covered fabric cloth. What they wanted now was to achieve the same effect by using a material in which the coating was an integral part of the material: a vinyl-metal laminate. But the material had to be properly developed to withstand these stringent tests: to resist a temperature of 195° for four hours; to permit welding spring clips and hinges to the unit, and plating the inside of the laminate. Above all, what confronted Arvin was the problem of finding proper bonding methods so that the laminated material would not break down under the prescribed heat conditions after having been shaped, drawn, stamped, etc. After some research the proper techniques were found (page 79) and Arvin was able to produce a laminate bonded strongly enough to impose no limitations on its workability, and generally to permit treating it as though it were a *single* material.

Vinyl-clad materials — vinyl on metals, plywood, paperboard — have two strong attributes which promoted their use from the start: protection against abrasion and corrosion, and decorative effects. In recent years cost reduction and, as of late, improved workability have made them very popular materials. Strong (if the base is metal), self-protecting by virtue of the coating's chemical ingredients, easily decorated in a vast variety of designs, vinyl laminates have been applied in a wide range of products. Among its present users are fabricators of luggage, furniture tops, housings, doors, shelving, automobile interior trim parts. But, with the recent advances in machinability, the application potential of this material category will no doubt be explored in other areas where the material can bring added structural and design features: advertising signs and displays, boat decks, automobile panels and fenders, trailer bodies, aircraft interiors, etc.

The history of vinyl-clad materials began in the early 1930s when vinyl solutions were first used as a replacement for the standard coatings applied to metal surfaces to protect them from destructive external influences. It was the high chemical resistance of vinyls that made some manufacturers turn to them in place of the conventional oil paints, alkyd finishes, lacquers, enamels and porcelain. But decoration could not be added to the protecting features of the coating until the development of calendered vinyl sheets introduced about ten years ago.

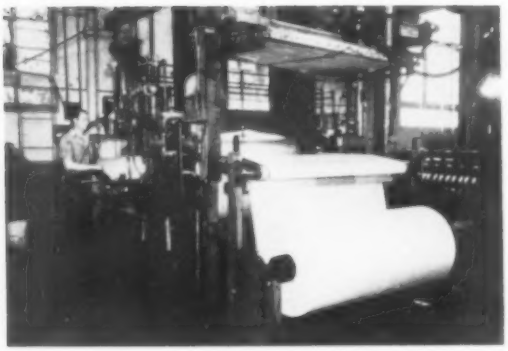
Today, the manufacture of the plastic coated materials is divided among the suppliers of the vinyl sheet and the laminators who combine the vinyl coating and the base materials into the laminated product.

One of the most active suppliers of the decorated vinyl is the Columbus Coated Fabrics Corporation (Columbus, Ohio) which supplies a good percentage of the country's laminators with rolls of colored, textured vinyl. Columbus Coated Fabrics started about fifty years ago as a manufacturer of coated fabrics. The first coatings they used were oil; these were replaced by various other protecting agents over the years until the development of special calendering equipment after World War II, when the company began fabricating calendered vinyl sheets.

Colovin, the tradename of the latest polyvinyl chloride sheeting put out by Columbus Coated, is generally made in thicknesses ranging from 4 to 25 mils, and can be sufficiently controlled by the company's special printing and embossing equipment to achieve a wide range of decorative properties. The company has also developed multicolor printing methods by which accurate registration can be maintained when printing as many as five color design patterns; these can be embossed in any desired texture. There is virtually no limitation in the surface effect that can be achieved by the supplier's decorating methods. The supplier follows the directions of the laminators or designers in the type of surface wanted. The finished vinyl rolls are shipped to the laminators, where they are bonded to the base material which gives structure and strength, and a new, single material is the result.

The flexibility in color patterns coupled with the ease of texturing the surface has meant broader design possibilities; and the combination of a decorative and protecting surface with the structural and functional properties of the base materials has helped incorporate essential characteristics within the structural make-up of the total product design. How the vinyl is prepared and laminated, some new design features, and some applications of the laminated materials are described on the next four pages. *ARTHUR GREGOR*

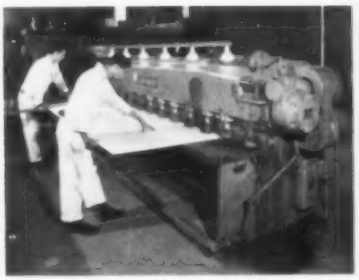
Vinyl is supplied in rolls to laminators who combine them with base and shape them.



Vinyl is prepared according to the specifications of the laminators by the vinyl suppliers whose plants are set up to apply multicolor coatings and to emboss textures in a vast range of design patterns. Most standard decoration of the vinyl is a wood, leather or marble grain, cloth and basketweave texture, metallized print. At Columbus Coated Fabrics, Columbus, Ohio, the calendered vinyl rolls are embossed on equipment shown at left.

First step in laminating the vinyl coating to the base material, is preparing the surface of the base so that a strong bond with the adhesive will be achieved. Before the adhesive is applied, the base material is processed through a cleaning operation. At the Clad-Rex Corporation plant in Denver, at right, sheets of metal are rid of grease, rust and chemicals to ensure strong, laminated structure.

After the metal has been prepared, the adhesive is applied and processed through ovens until it is properly activated and ready for vinyl lamination. In a continuous process the metal moves through these steps until the vinyl "meets" it and the structure is formed. The close-up at right shows this meeting point on equipment at the Clad-Rex plant. After lamination, the finished sheets are cut to size in a final shearing operation, extreme right.



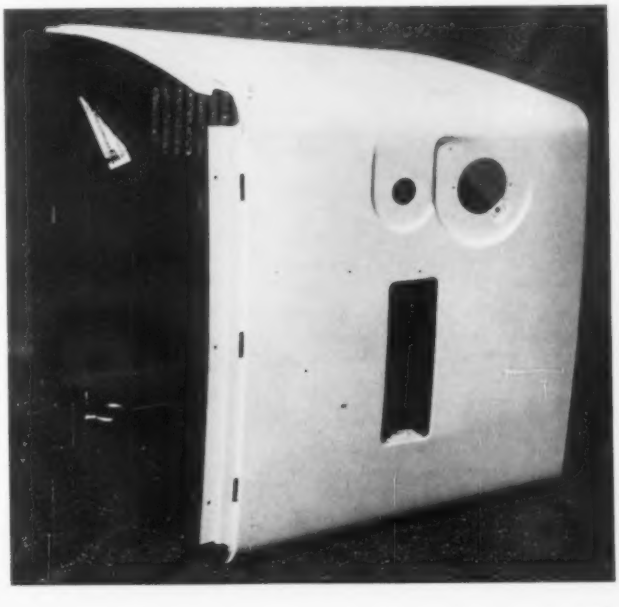
The application of vinyl-clad materials to mass-produced products became economically feasible when the various steps involved in laminating a vinyl coating to a base material were combined into a continuous flow process. This is simple and straightforward and consists of three basic steps: a) preparing the backing for the adhesive; b) applying the adhesive; c) applying the vinyl. Within each of these a number of other preparatory operations are necessary. The adhesive is, of course, the laminating agent that "welds" the two halves (vinyl and metal) into a single product. The bond between the adhesive and both materials must therefore be very strong so that the finished laminate can be shaped by the usual metal forming techniques. For a strong bond between the adhesive and the metal, the metal surface is made porous by etching. The incoming metal sheets (18 to 48 inches wide, 55 to 144 inches long) are passed along various stages where they are given an alkaline hot spray and a hot spray rinse, are phosphatized, rinsed again and passed through an oven where the remaining moisture evaporates. From here the sheets are conveyed to the laminating line where the bonding surface is roller-coated with a 0.0025 to 0.005 thick plastic adhesive. The sheets are then heated again to remove any solvents in the adhesive and, in another oven, at a temperature of about 385° F., the adhesive is activated and prepared for the vinyl application. The vinyl rolls are generally supplied in 250-yard lengths, from 18 to 48 inches wide. As each sheet comes out of the oven, it meets the vinyl as both move forward between two rubber rolls (see lower picture, middle column, opposite page); the lower roll drives the material while the upper one supplies the pressure needed for bonding (about 60 psi). To let the bond set and to dry the laminate, the by-now unified "halves" are finally treated with a cold water spray and an air blast. The sheets follow each other along this process with practically no space between them.

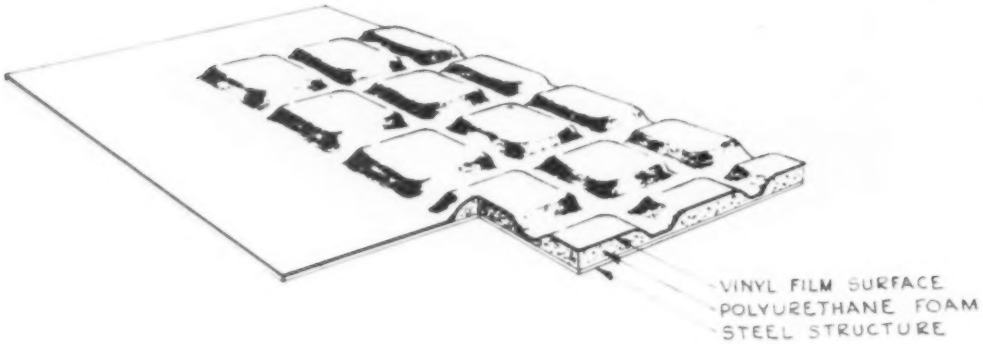
The procedure described here is the step-by-step process used at Arvin Industries, but it is pretty standard throughout the industry and will vary only with different base materials, and then only slightly. The most popular are metals — aluminum, steel, magnesium — but paperboard, plywood and cloth are also used for the base. The process is the same for these materials except for preparations, temperatures.

Variations of this process are of course possible when special products are intended. Both sides of the base material can be covered with the vinyl, or the inside of the laminate can be covered with a variety of other coatings. Most standard decoration of the vinyl is a wood, leather or marble print; cloth and basketweave textures; metallized prints. These need not be uniform, different patterns can be applied where an inner covering is also desired.

Although the finished laminate can be shaped into products using ordinary forming methods, welding onto the laminate was not possible until recently (see Arvin's portable radio case for Motorola, page 76). The difficulty lay in the fact that with ordinary welding the metal must be heated to the melting point, a temperature far above the endurance of plastic. This was overcome by Arvin in developing a projection-welding technique using magnetic force. In this method, heat is not applied directly but is projected by means of magnetic forces which do not affect the vinyl — clips, brackets, hinges can be welded to the metal without ruining the covering.

Great advantage of the vinyl laminate is in its ability to be treated as though it were a single material — stamping, bending, crimping, shearing, punching present no problems; the vinyl laminate can be shaped into products by ordinary metal fabricating techniques. The portable television cabinet at right, was stamped, punched, sheared by Clad-Rex for R.C.A. Victor.





A new vinyl laminate just developed is the vinyl-to-metal product with encapsulated foam, above. Manufactured by Arvin Industries, Columbus, Indiana, the product (particularly useful with car interiors, case coverings) contains foam sandwiched between the vinyl and the metal.

Vinyl laminates take many varied forms for new and different uses

Highly decorative vinyl laminates are put on the market by Polyplastex United, Inc., Union, N. J. Decorated with actual leaves, fibers, fabrics, sequins, etc. sandwiched between two sheets of vinyl, the products lend themselves to use in screens, room dividers, furniture tops, fixtures.

Since the main attribute of the plastic covered materials is in the combination of the structural properties of the base material with the decorative surface and corrosion resistance of the vinyl, they are best applied in products requiring a strong material for a decorative application. The products fall into three major areas: office and home interiors; appliance cases and furniture coverings; transportation.

In office and home interiors the laminate has been used for room dividers and for those wall areas where a decorated surface is wanted. The laminates used most widely are metal laminates, but in the field of interiors another type—vinyl on hardboard or plywood sheets—has found extensive application. One such product, Vin-L-Bord, is marketed by the Met-L-Wood Corporation of Chicago for heavy traffic applications in hotels, motels, and homes. The product is supplied with divider mouldings and is used to cover flat wall surfaces in recreation rooms, kitchens, bathrooms. The plywood or hardboard laminates offer sufficient surface strength for these uses and the vinyl covering permits washing of the surfaces. The product can also be used for containers, cabinets, furniture, etc.

Another laminate used mostly for interior applications is a vinyl-to-vinyl product. Available in translucent form as well as opaque, the translucent product has found use in lighting fixture panels, room dividers, screens and lampshades; in opaque form the plastic laminate has been incorporated in airline interiors and furniture.

A highly decorative product in this category is manufactured by Polyplastex United, Inc. Union, N. J. The company does not imitate textures, it incorporates them (see picture at left). Leaves, fibers, fabrics, sequins, seahorses and starfish are laminated between two sheets of vinyl into a rigid panel in thicknesses up to ¼ inch. These lend themselves very well to use in screens and room dividers, and the company is also producing some of the panel designs in a flex-

Magnesium is the base material used in Shwayder Brothers' new Samsonite luggage covered with textured vinyl. The suitcases consist of two vinyl-laminate shells punched for riveting.

This Argus slide projector case is made of vinyl covered aluminum by Arvin Industries. Metal is shaped over extrusions.

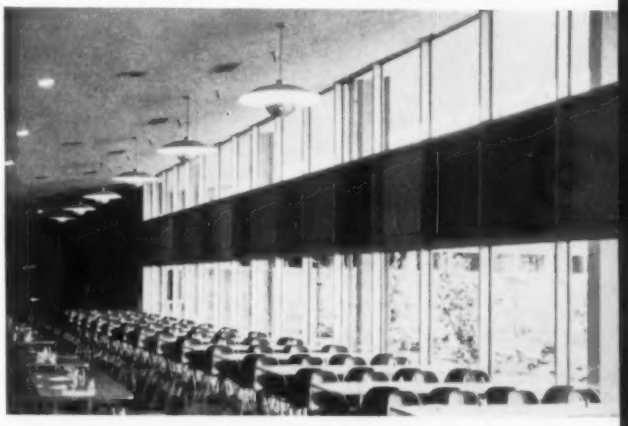
Strength and textures of the materials lend themselves to housings, interiors.

ible vinyl for use with luggage, handbags and shoes.

In the field of appliances—television cabinets, radios, etc. —vinyl-to-metal laminates have an added advantage. The vinyl covering has a high degree of electrical resistance, which is especially important with portable television sets where poor resistance can be a serious shock hazard. But regardless of specific use, the metal laminate can withstand rough handling, can be immersed in boiling water and can take an exposure to dry oven heats up to 200° F. For these reasons it is being used widely for a variety of case coverings, camera and movie projectors, air conditioners; furniture accessories, card table tops and folding chair assemblies. In these latter applications, the washability of the vinyl is again especially advantageous.

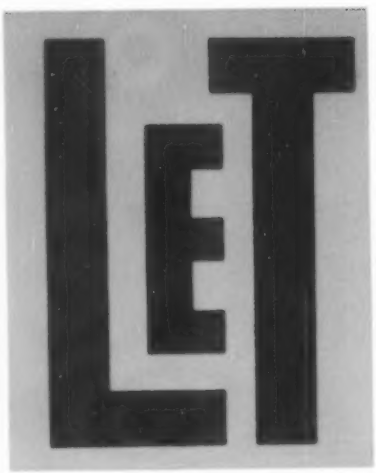
The type of base material used for laminates in these as well as structural applications in car and airplane installations, depends largely upon the strength and weight factors. Steel is used for the school chairs made by Shwayder Brothers of Detroit, where it is imperative that the chairs be stain-proof and scratch-proof and can take all the rough handling of children without having to be replaced each year. For structural installations steel can be used where strength is required and weight is not important. But where weight is a factor and where the highest corrosion resistance is needed, aluminum or even magnesium, bases are best used.

Much has been said about the advantages of this material group, and little about its limitations. These are not easily defined since the materials are able to withstand the usual weather and handling conditions to which decorative products are generally exposed. It is, of course, not a material that lend itself to industrial, aviation and military applications, where excessive strength and very high temperature conditions must be met. But since in those applications the decorative aspects of this materials group are not useful, vinyl laminates would hardly be the right materials choice.



The strength and decorative properties of vinyl-clad materials are especially meaningful in interiors such as the cafeteria window area at IBM's San Jose, Calif. plant.

In heavy traffic applications the washability of vinyl covered metals is important. The laminates are used to decorate car and airplane interiors. Top and bottom, Clad Rex products.



ROBERT LETOURNEAU'S EARTH-SHAKING MACHINES

by ANN FEREBEE

Looking like a paleolithic monster about to seize its prey, this mighty log stacker bites 22 ton loads of timber at a time, yet its sensitive jointed tusks can also pick up a single log and deftly deposit it in its appointed place. This machine is only one of a gargantuan family developed by inventor R. G. LeTourneau (below) in the short space of five years. The family includes an enormous scraper more than twice the size of any yet produced; a steamrolling jungle destroyer which, like a tornado, cuts through four acres of forest growth an hour; a brutal tree crasher, resembling a fantastically magnified beetle, which approaches trees of all sizes and knocks them to the ground; a mobile tree stinger whose telescope boom pushes down trees with a quarter million pound thrust; a bug-eyed leviathan which rolls out into the ocean surf to pick up and retrieve 70-ton landing craft; a cross-country train which can cover dense jungle or arctic tundra without tracks; a massive floating island which drills oil in the ocean floor. Remarkable for their size alone, these machines are uninhibited solutions to unique design problems, and get their power from a new application of electric energy.

"I'm of a daring nature," says Robert LeTourneau, the inventive genius who, before creating this new family, pioneered many of the advances now standard in earth moving equipment, to build a multimillion dollar manufacturing business from a one-man garage operation back in 1919. "I can make more money designing conventional machines," he says, "but I always want a better one, and I'm continually looking for new ways to do it." The story of how he does it, and a photographic inventory of the results, is presented on the following pages.

Last month the nation's 200 big earthmoving equipment manufacturers got news which interested all, challenged many, and was downright frightening to some. The giant had come back. Robert LeTourneau, earthmoving's grand old man (now a robust 70) came roaring onto the earthmoving scene after an absence of five years. At the American Mining Congress in San Francisco last month, he unveiled a new scraper, the Goliath (above), which puts in the shade by 42 tons any scraper now on the market. If Alexander Botts, William Upson's fictional tractor-salesman hero, looked in on the Congress—and he probably did—he must have eyed the new Goliath as the materialization of a salesman's greatest challenge and worst fears. For the LeTourneau competition there was more of the same news ahead: the Goliath, a 70-ton capacity machine which sells for about $100,000, will soon be joined by another scraper *twice* its size! According to company officials, LeTourneau will offer buyers more than just grand scale. The new monsters will be moved by a revolutionary principle, involving the application of electric power directly to each wheel. As LeTourneau describes his modular power system, "you can start adding or multiplying wheels, until you get a tractor working with any number of independently powered wheels. That way you can get almost unlimited traction to move the heaviest loads." Recalling the extent to which the diesel engine replaced steam, LeTourneau believes that his new system of electric power will have a revolutionary effect on the earthmoving industry. And with production in the industry now ahead of sales, LeTourneau's new scraper will certainly have an unsettling influence on the market.

The Goliath made especially exciting news last month because it is the first LeTourneau earth-moving equipment to appear since 1953, when Robert LeTourneau sold three of his five plants for $31 million to Westinghouse Air Brake Company. As part of the deal he agreed not to produce earthmovers for five years, thus taking a kind of sportsman's handicap. This year, when the time limit expired, LeTourneau lost no time getting back on the job. In the meantime, the company had not been idle. "With only two plants on my hands and the cash in my pocket, I bought myself time to sit down and think," he says. "I've put about $12 million into developing the ideas that came to me, and now they've begun to pay off in fields other than earthmoving, too."

Apart from their size, Le Tourneau's new brood of gigantic machines are remarkable for their astonishingly direct and pragmatic design. For the most part they offer original solutions to new problems: when off-shore oil was found—a device for getting to it; when the problem of foundering landing craft became pressing—a device for retrieving them. That their design represents free-wheeling inventiveness simply confirms a company pattern which has developed over more than 37 years. For during its decades in the earthmoving industry, R. G. LeTourneau, Inc. has been responsible for most of the major breakthroughs that have made it possible to build modern super-highways with pres-

The Goliath, *largest and most powerful scraper ever produced — more than triple the capacity of the average scraper—picks up 70 tons of earth in one load. Power for this 62-foot machine comes from a 600 h.p. diesel engine coupled to ac and dc generators under the hood. First of a new line of LeTourneau earthmoving equipment, it was unveiled only last month. The self-propelled Goliath, which will sell for about $100,000, will soon be followed by another scraper twice its size.*

The Jungle Destroyer *tears its way through jungle growth like a tornado. It rips up huge trees by the roots, slaps them to the ground, and smashes them into splinters. With its two big (each 20 feet long), welded-steel, cleated rollers, it clears up to four acres an hour. Power for this 150-ton juggernaut comes from specially designed LeTourneau electric motors which are controlled by finger switches to make land clearing by a single operator fast, simple, and economical.*

The Tree Crasher, *similar in purpose to the Jungle Destroyer, travels on six of the largest tires ever produced. The low pressure design of these 10-foot tires allows the Crasher to travel over lowlands or sand where most equipment could not go.*

ent efficiency and speed, at costs no greater than ten years ago. Among the "firsts" which the company claims are:

1. First to build a tractor-drawn scraper with a bottom in it. (1922).
2. First to build welded earthmovers, making them less destructible than bolted and riveted units (1922).
3. First to use electric motors on earthmoving equipment (1923).
4. First to discard cumbersome steel wheels and crawler tracks in favor of versatile and fast-traveling rubber tires (1932).
5. First to develop a two-wheel prime mover (1938).

The big job shop

At present this trend-setting company actually operates as a big (about 1,000 employees) job shop, with many of the machines custom made, but the line of products broad enough to prevent dependence on any one industry. "We are the only company of this kind in the U. S.," says LeTourneau, "but it's custom and not mass-produced work. We build by the dozens instead of by the hundreds. That's the curse in making this type of machinery. But the electric wheel—since we build it in only two sizes—can be used on almost any machine, so that we do save by mass producing the most expensive items needed for this type of equipment."

The company's operations are now split between plants at Longview (page 91) and Vicksburg. The Longview plant is dominated by two LeTourneau-designed Semispheres — frameless aluminum buildings 94 feet high and covering more than 70,000 square feet. One Semisphere is used for assembly purposes, the other as a warehouse for machine parts. A mill with three 25-ton electric furnaces turns out 300 tons of steel daily, mainly a low-alloy, high-tensile variety. (LeTourneau makes not only his own steel but his oxygen as well). Manufacturing equipment includes complete facilities for cutting, forming, forging and machining heavy steel, and there are numerous sub-assembly areas which produce small parts for the electrical components needed to power the machines.

Man behind the machines

Both the "firsts" which the company claims in earthmoving and the inventiveness of the later developments in heavy machinery reflect the remarkable personality behind this remarkable equipment. Robert LeTourneau, with over 250 patents to his credit, personally sparked most of the ideas behind them. In fact, the story of his life reads like a whole series of Tom Swift adventures, with each stage of development marked by a new invention. Having inherited the independence of his Huguenot ancestors, LeTourneau at the age of 14 went to work in an iron foundry, saying, "I would rather pound iron twelve hours a day than go to school." Not long after that, around 1905, he discovered the versatility of the welding torch, and quickly came to believe that the welding torch could do anything—even tack the buttons on his trousers. He soon branched into his own free-lance welding service and when calls began to mount, the "one-tool mechanic" decided to mobilize. He devised a strange contraption—an automobile rigged as a welding shop. (One farmer found this machine so useful in repairing equipment that he had LeTourneau make one for him.) He next embarked on a partnership in an automotive repair shop in Stockton, California. Here he progressed to more ambitious projects for his welding torch, and, from joining broken parts of cars and pieces of steel, he began to weld together his own equipment. This experience proved useful when, in 1922—on his own again after working in a California Navy Yard during World War I—he developed his first scraper. Using electricity rather than compressed air, it required only one man to operate (on earlier models one man controlled the scraper, another drove the tractor) and, because it was welded throughout, was lighter than the then standard riveted models. The "Mountain Mover" which he designed the following year was a real departure. It carried two four-foot buckets, the first telescoping into the second, and moved about 16 yards of earth at a scoop, a record for the time. One design feature which LeTourneau incorporated into these early scrapers was a bottom which not only picked up earth and dumped it, but also spread it in smooth even layers to a precise depth of from one to 20 inches.

In May, 1921, after operating for a year in an open field beside his Stockton home, LeTourneau built his first manufacturing plant. At the same time he was building a reputation as a man who designed machinery that could move dirt faster than any other. The reputation brought orders which soon taxed the capacity of the shop, and another open-air annex was added. After nine years, LeTourneau opened a second plant in Stockton. This plant, a LeTourneau design built entirely of structural steel with corrugated iron welded to its sides, was one of the first all-welded buildings. Again, orders outstripped capacity: the size of the plant had to be doubled even before it was completed! By 1930 sales totalled nearly $111,000 with a net profit of $34,474. And in the next five years sales and profits multiplied ten times. In 1935 LeTourneau found that he was ready to open another plant—this time at Peoria in the industrial East. The Caterpillar Tractor Company was already established there, and at that time they were pairing LeTourneau scrapers with Cat equipment. In the following years Le

The Electric Logging Arch *(above) skids up to 28 tons of heavy timber along even rough jungle trails. Tires with deep-cut treads churn through mud, easily negotiate the steep grades and sharp turns.*

The Log Hauler *has been especially designed to move heavy timber over rough, unimproved logging roads. One of a family of LeTourneau logging machines, this mammoth also is powered by electricity.*

Tourneau established plants in Toccoa, Georgia and in Vicksburg, Mississippi. Meanwhile, sales and profits climbed until in the war year of 1944 (the company furnished 70 per cent of the earthmoving equipment used by the Allies during the war) sales topped $42 million.

Faith to move mountains

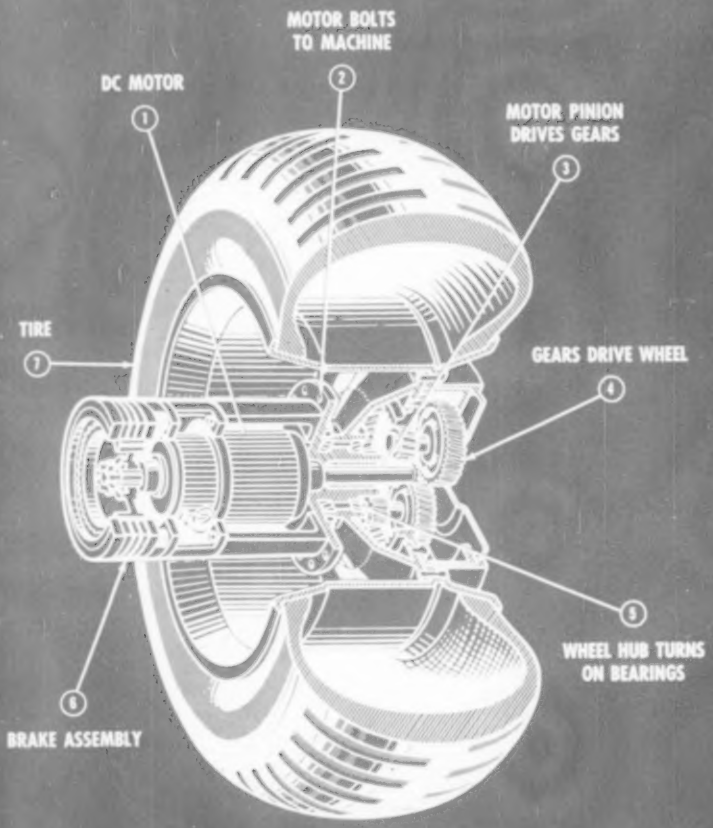
A deeply religious man, LeTourneau credits his success as an inventor and manufacturer to his belief in God. His attitude toward religion is as pragmatic as his attitude toward machine design: "If I had a religion that didn't work better than some, I'd throw it away. But I'm a mechanic; I like powerful machinery and I like a powerful Gospel." At 32, after first accepting evangelical Christianity at 16, LeTourneau felt that he really had come to terms with his faith (he is a member of the Christian Missionary Alliance, a non-denominational group devoted to missionary endeavor), and believing that "God needs business men as well as missionaries," he announced that he would do his best to be "God's business man." From the minute I made God my business partner, things started to go," he says. Convinced that whatever gains accrue from his business belong not to him but to the Lord, he established in 1935 the LeTourneau Foundation, a non-profit corporation "whose income and capital can be used only for the Cause of Christ." Reversing the Biblical exhortation to tithe, LeTourneau gives a prodigious 90 per cent of his income to the foundation, keeps only ten per cent for himself. This unusual foundation —largest shareholder in R. G. LeTourneau, Inc., among the largest trusts in the U. S., and largest evangelical foundation in the country—has been hard at the Lord's work since its inception. It maintains the LeTourneau Technical Institute, a junior college which carries out Robert LeTourneau's educational philosophy by combining theory with actual job experience; the Gospel Radio Station at Toccoa; and the Missionary Flying School there. Most ambitious are its two overseas projects. In Liberia it maintains—until recently under the supervision of LeTourneau's daughter, Louise, and her husband—a 600,000 acre experiment in combining Christian missionary endeavor with economic development. Another LeTourneau offspring, Roy, runs a similar experiment on a million-acre tract at the headwaters of the Amazon in Peru. On both scenes to help the natives with modern farming and manufacturing methods are, of course, LeTourneau machines of the most varied nature.

The way of the bumble bee

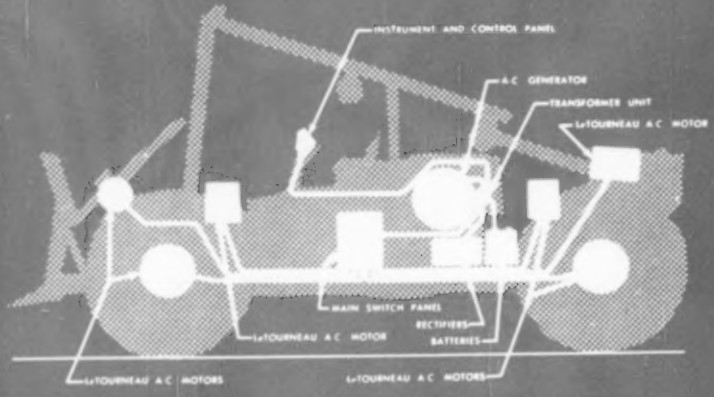
Faith, according to LeTourneau, operates in his inventions too. "According to the theory of aerodynamics, and as may be readily demonstrated through laboratory tests and wind-tunnel experiments, the bumblebee is unable to fly. This is because the size, weight, and shape of his body, in relation to the total wingspread, makes flying impossible. But the bumblebee, being ignorant of these profound scientific truths goes ahead and flies anyway—and manages to make a little honey every day." This inscription, which used to hang on the factory wall in Peoria, LeTourneau enjoys applying to himself—he claims to be ignorant of many engineering truths, but goes right ahead inventing anyway. Like the designer, who does things which afterwards he learns "cannot be done," LeTourneau has often been forced to try the unorthodox in order to achieve the "impossible." (Yet he says he wouldn't know what to do with an industrial designer on his staff.) His machines—born of necessity (and

The Tree Stinger *exerts a quarter million pounds of pressure literally to push trees out by the roots — leaves no stumps for later removal. Needing less than a minute to uproot even the biggest trees in one operation, its speed makes it highly economical for landclearing projects, and brings a new system to the usually slow and expensive job of removing big trees. Powerful electric motors raise and lower, extend and retract the pusher boom. The blade, also electrically controlled, at the end of the boom anchors the thrust, and powerful electric wheels take the tree stinger over terrain where less hardy machines can't travel. Each movement of the big machine may be delicately controlled by finger switches located at the simply planned control panel. There are no foot pedals.*

The Tree Saw, *unlike the Tree Stinger which uproots trees, cuts large-size timber at ground level. Giant circular saw projecting on boom at base of the machine cuts through big trees in seconds. A second pusher boom at the top part of this powerful machine directs tree fall as the saw cuts.*



THE LeTOURNEAU ELECTRICAL POWER SYSTEM



LeTourneau's electric power system, *now used on every piece of mobile equipment which the company produces, makes possible the two most outstanding characteristics of LeTourneau machinery: prodigious power and extraordinary mobility. "I started to work on this idea about seven years ago," says LeTourneau. "And I'm now convinced that electric power in each wheel has many advantages over conventional power systems—ease of steering, dc motors for the most efficient operating ratios, and easy maintenance (there's practically nothing to wear out)."*

The electric wheel (left) is the heart of the LeTourneau power system. Inside its broad rim a high-torque motor is geared to deliver immediate power in either forward or reverse direction. Each wheel has regenerative brakes—motor functions as generator when given speed is exceeded. A dc generator delivers power to the wheels, and each wheel unit then becomes a prime mover which produces power without transmissions, torque converters, final drives, clutches, or other power-loss assemblies. On the cutaway at left pointers 1 to 5 show the positive channel of power as it is transmitted from the electric motor to the rim of the wheel.

Power for the auxiliary functions such as steering and operating winches, blades, and hoists is supplied by an ac generator. This means that a "power package"—consisting of motor and gear box—focuses the precise amount of power required for any given job directly on the point of work (see diagram below). The simplest linkage possible, a flexible electric cable, transmits power to where it is needed. The operator's control panel which governs the power as well as all operations of the machine — steering, braking, accelerating — is unusually simple; it consists mainly of small buttons and easy-to-read gages. There are no foot pedals or gear shifts.

Mobility, the second important characteristic of LeTourneau equipment, comes from specially-designed giant rubber tires. These wide-base, low-pressure, tubeless tires are as large as ten feet in diameter with 48-inch treads. Low ground pressure —sometimes down to 10 pounds—plus the high center of rotation and the favorable angle of approach allow these tires to roll LeTourneau machines into areas where angels—not to mention competitive machines—fear to tread. Yet the tread of even the largest tire is, like an angel's, so light that it can roll over a pocket watch without breaking its crystal.

sired by unpredictable imagination)—have not always been elegant, but LeTourneau places solid performance before appearance. Almost embarrassed that some people have been impressed with the way his machines look, he says, "When I have a successful machine, we'll put the looks—if any—on it afterwards. However, appearance, I do believe, is a matter of the education of the eye. If you have a machine that works good, it will look good—at least to me."

LeTourneau and his "chess matches"

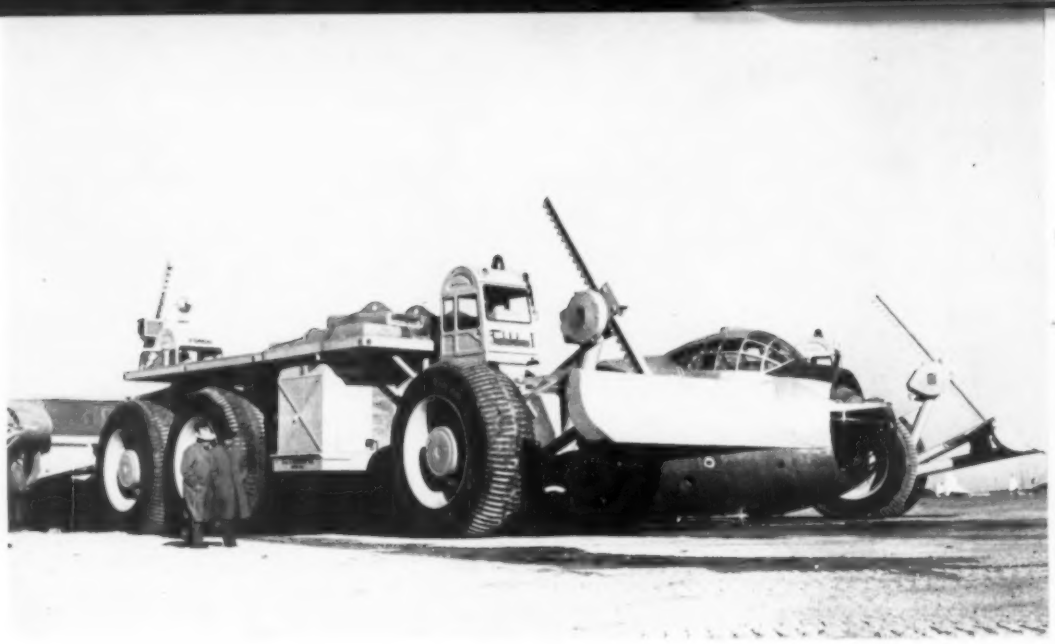
In operating his engineering department, LeTourneau compares himself to a chess master who keeps half a dozen games going at once. Thus he hops from plant to plant, from drawing board to drawing board (he also hops an average of 5,000 miles a week in one of his ten planes to keep business and religious engagements) as he "plays against" his engineers. LeTourneau has developed a virtual "steel plate technology" which ignores the standard engineering handbook in favor of a set of principles based almost exclusively on the use of two-dimensional steel plate rather than on the usual die-forming methods. Because all his products are based on this "steel plate technology" there is excellent communication of ideas within the engineering department and a remarkable cohesion to everything they turn out.

The company's reputation for getting jobs done with dispatch is based in part on Robert LeTourneau's personal working method. He uses a number of short-cut rules for rapidly solving in his head engineering problems involving such things as stress or horsepower; only when he feels he's nearing the solution to a problem does he begin to put it down on paper. Actual production is speedy, since making a new machine means simply designing and welding a different frame; already tested standard components will be used to power the machine. Finally, as a former employee says admiringly, "R.G.'s own drive transmits itself to the entire organization. He has the engineers so excited they sharpen the ends of pencils with their teeth in order to rush ahead with their drawings."

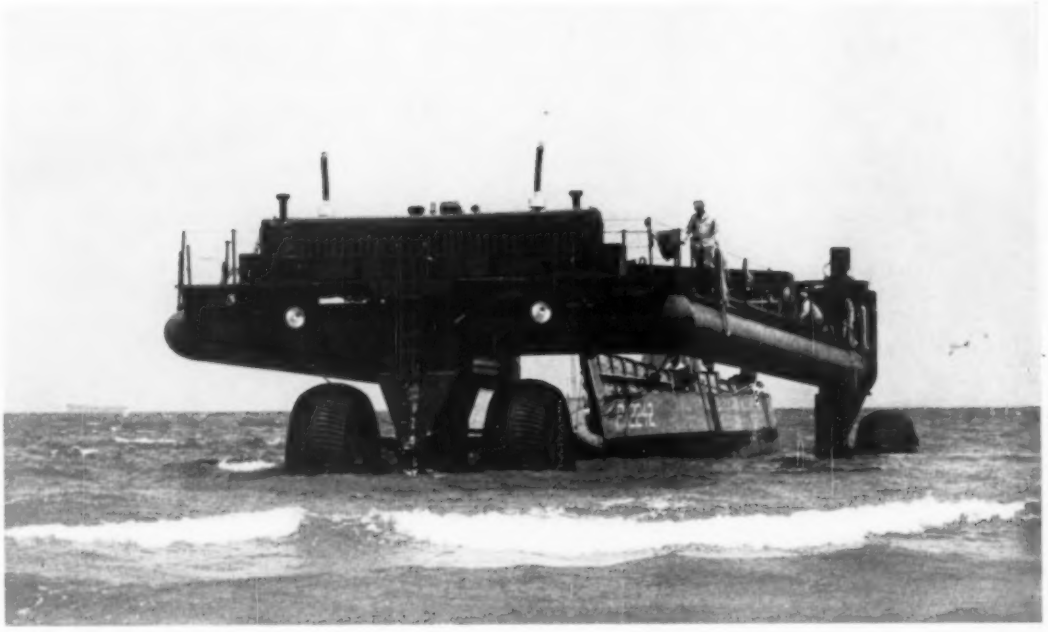
Patriarch of this far-flung empire of machines and men—he even designs and builds many of the houses in which his workers live—LeTourneau makes the company very much a family affair. His son Ben runs the Vicksburg plant, Richard the steel mill, Ted Longview production, and his nephew, R.L., the sales department. In earlier days, even Mrs. LeTourneau helped haul from the railway siding the steel with which the machines were made. But as in any family, there is only one Papa, and in this case he runs the show. In running it, however, LeTourneau—proud of his "Chief Engineer" title—leaves administrative work to others, and spends most of his time—a long 12-hour day—in the engineering department.

While LeTourneau has been responsible for the major ideas which his company has developed, he stoutly asserts that "the really hard job is to pick the good ideas out of the many that exist. The electric wheel," he says "is an example

Two huge aluminum Semispheres dominate the LeTourneau plant at Longview. LeTourneau-designed building stand at the left.



The Crash Pusher, *one of the most powerful bulldozer-like machines ever designed, completely removes a 400,000 pound plane from a runway in 20 minutes, a task which formerly took five to 15 hours. These mammoth machines, weighing 151,000 pounds each, work in pairs and, placing scoops against the crashed plane, literally shovel it from the runway (the final condition of the plane is disregarded). Blades and operator's cabs are located at both ends of the machines.*



The Landing Craft Retriever, *like a bug-eyed leviathan, plunges into the water, raises sunken or capsized craft, and either sets them afloat or tows them into shore. Its sprawling mass of olive drab beams is actually a highly intricate arrangement of hoists and wheels which allow it to straddle a 67-ton vessel and literally lift it from the water. Of U-shape design, this 101-ton machine may be operated by one man. The U-shaped Tournalayer (below), which lays concrete houses, suggests how LeTourneau can adapt design features of one machine to another vehicle with a completely different function, though similar form.*

Cross-Country Train *moves across the arctic snow-fields on the "world's largest tires" — ten feet tall and four feet wide. The train, which has an electric motor in each wheel, runs on a high powered diesel engine. The train also has complete steering controls at both ends, and an oscillating suspension system provides a smooth ride for the 100,000 pound payload. A similar train was designed and built in a record six weeks.*

of a good idea that others knew about. I have a whole crew that have ideas. If I can get a lot of ideas, I can usually come up with a honey."

The machine that walked to work

The company's recent venture into the complex business of off-shore oil platforms (page 94) illustrates how much the organization revolves around Robert LeTourneau's particular inventive genius. While this represents only one of the company's operations, it is characteristic because:

1. Each of the ten rigs which the company has built so far has been a custom-designed job.

2. Each rig is giant size—the largest about eight million pounds and covering half the area of a football field.

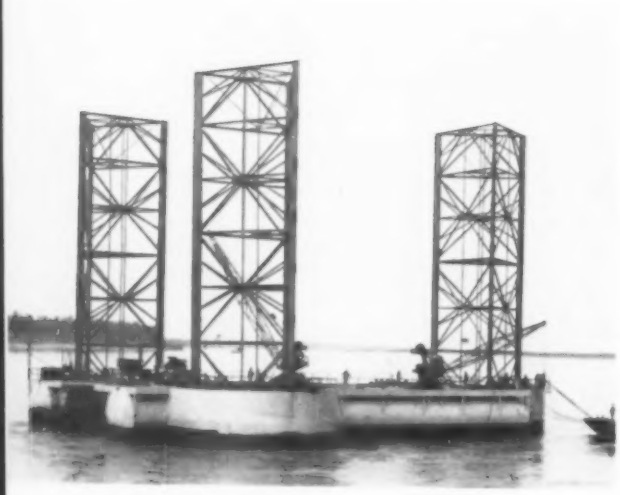
3. All are powered by electricity.

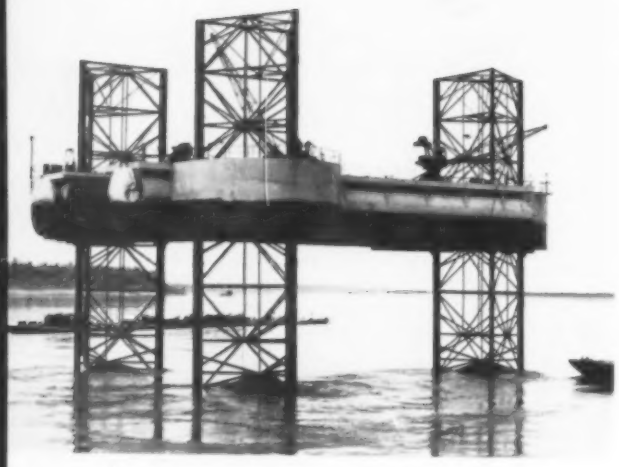
4. Every design has been personally developed by Le Tourneau.

LeTourneau's idea for these three-legged islands dates back to the period before he sold his earthmoving business in 1953. He had seen articles on the cumbersome methods then being used to raise the big and heavy platforms out of the water, and was convinced that hydraulic or air jacks were not the efficient way of operating these rigs. He had already used electric motors for localized power on a number of other machines, and reasoned that electric power might work on offshore oil rigs also. The problem was how to create a practical, moveable man-made island in the sea. The platform had to be able to move to the open water, then stand still—in calm seas or storms—to drill under the ocean floor, and move again to another spot.

LeTourneau's answer to the problem was a sort of three-legged triangular barge. Operating in water up to 100 feet deep and drilling to 20,000 feet, the platform uses electric motors to run its legs, or spuds, to the ocean bottom and elevate its deck to the desired height (see page 94). When ready to move on, it lowers itself back to the water, retracts its 175-foot spuds and gets towed to the next location. A set of gearmotors in each spud powers the rack and pinion drive for this lowering and raising action. The platform itself holds all the machinery for drilling an oil well—tanks for fresh water, drilling water, fuel, drilling mud, and storage for dry mud. Almost like a city, the platform has an electric generating plant, air conditioned living quarters for 45 men, and atop the Vinegarroon (page 95), even a heliport. In fact, the quarters are almost plush: oversize bunks, foam-rubber mattresses, and an all-electric galley.

The basic idea of powering the platforms by electric motors had, of course, first been tested on other types of equipment. Land clearing is about as tough a job as a machine can do, and equipment for this field was the first to test LeTourneau's electric motor system. In the logging equipment which he designed next, there were surprisingly few complications to be worked out, and as these new lines of electrically powered equipment began to sell, LeTourneau started to put his ideas for a mobile, offshore platform down on paper. In spite of his own belief in the design, it was hard to find a customer for it—the idea was too new even for the progressive and youthful offshore oil industry. But in 1955 he convinced the Zapata Petroleum Corporation to buy the first platform for $2 million while it was still on paper—with the understanding that they would not be obligated to pay if it were not successful. This platform,

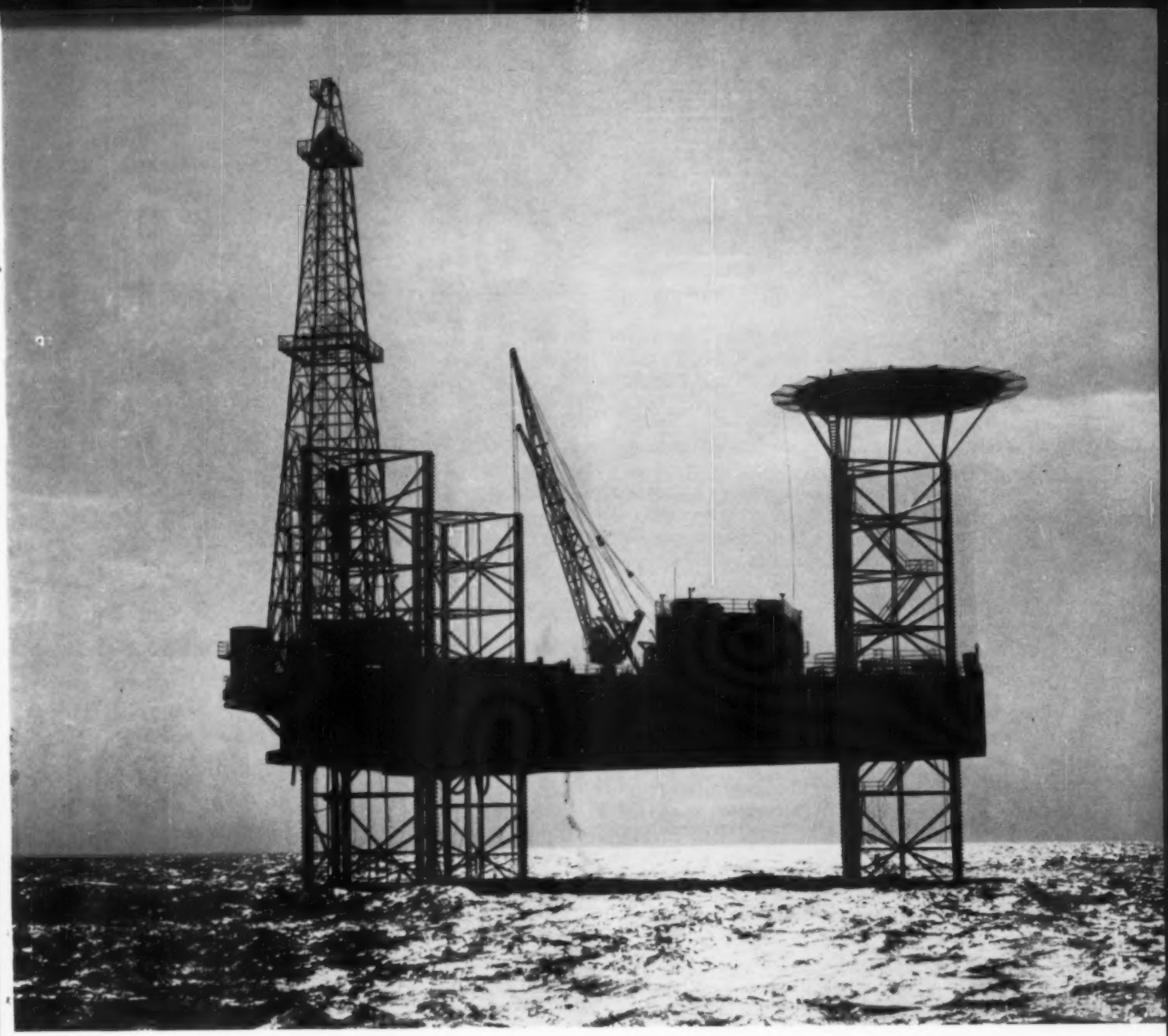




the Scorpion (at left), went into operation in March, 1956, and Zapata was able to say in its annual report for that year, "We are well pleased with the Scorpion's performance." Since then Zapata has bought the Vinegarroon, and close to a dozen other platforms have been sold to such companies as Arabian American Oil, Dixilyn Drilling Corporation, and Reading and Bates Drilling Company. After he had built several large-size platforms in the $2 to $2½ million category, LeTourneau designed some smaller, "economy-size" platforms which sell for about half the price of the large ones and operate with a tender, or supply boat, alongside. LeTourneau platforms operate from the Persian Gulf to the Bahamas, and the Italian government was even willing to pay an extra $125,000 trans-Atlantic towing bill to get one this month. Although each one has been a custom job, they all follow the basic design of the Scorpion.

In working out the design of that first platform, Le Tourneau's biggest problem was to create a highly complex but compact unit, yet avoid the expense of actually building a test platform. This meant that the most intricate problems had to be solved on paper. LeTourneau also used cutouts and simulated some problems with already existing machinery. With all steel produced in his own plant, there were few fabrication difficulties. Critics posed a final question to LeTourneau before the first platform was launched: how did he plan to move a 4,000-ton, land-built barge into the water? They were astonished on the final day to see the platform, through its elevating mechanism, actually walk itself into the water! Bulldozers built a mound of dirt between the two rear legs; when the front leg was elevated above the rear legs, the platform slipped forward. This action was repeated many times until the ponderous platform had finally edged itself into the water—a further vindication of the direct, practical and uninhibited approach which has become the hallmark of LeTourneau's work.

The Scorpion's *electric motors raise it from water level to any point on its 140-foot steel spuds. Photographs were made at one-hour intervals when the platform was tested in the Mississippi River near its launching site at LeTourneau's Vicksburg plant.*



What remarkable machines will spring next from the drawing board of Robert LeTourneau? Whether they will excavate new canals in the earth's surface, remove mountains from the path of expressways, or cross great distances in record time, this much seems certain: they will be grand in scale and they will be powerful. As for the man behind them, there seems no reason to doubt the words of his last annual report to his stockholders: "I expect to keep right on going, giving my personal testimony of God's power in man's life, and at the same time to put as many hours into the business as any other man in this hard-working organization." Characteristically, he closed his report with these words from Isaiah: "They that wait upon the Lord shall renew their strength; they shall mount up with wings as eagles..."

Student Project

Tea for two thousand: a study in shapes

School: *Institute of Design of the Illinois Institute of Technology*

Instructor: *Jay Doblin*

Student: *Mitchitaka Yoshioka*

Problem: *to design a basic set of plastic dinnerware for institutional use*

As his thesis project for the Master of Science degree at the University of Illinois' Institute of Design, Fulbright exchange student Mitchitaka Yoshioka undertook the design of a basic set of plastic dinnerware for institutional use. His own design work was preceded by a considerable amount of research into the development of dinnerware in general and plastic dinnerware in particular, into the differences between Japanese and Western methods of eating (and consequently into the differences between Japanese and Western eating utensils) and into the present standards set for contemporary plastic dinnerware by the government and other institutions which must engage in mass feeding. His research is handsomely and very fully illustrated, and adorned with all the footnotes, tables, and bibliographies that are the required costume of the academic paper.

The Master's thesis, possessing, as it does, the sophistication that comes with some experience and the freshness that can disappear with too much experience, can be an especially rewarding kind of student project: an example of serious and sustained experimentation with solutions to a basic problem. This project involved the redesign of some of the oldest implements of human use; and it dealt with problems that the most experienced contemporary designers have not yet solved: problems presented by new material — plastics; and by a new function—mass feeding, with its many automatic processes.

Scholarly graduate work in design is rare; the nature of the field and the goals of most of the students do not lend themselves easily to scholarship. This, then, was not a conventional student project in the depth and the extent of its research; although the problem itself was not beyond the scope of undergraduate students, the present solution probably was. It has, however, many of the characteristics of student work—or, at least, of the best student work: it is tentative, it is in many ways radical. However, it is not responsible to the limitations of actual production, and in some respects it raises more problems than it solves.

The hardest thing in the world to design is something that, because of the simplicity and logic of the relation between function and form, can be said to design itself. (Raymond Loewy once remarked that he would redesign a tractor for very little but that he would have to charge $100,000 to redesign a needle.) An object like a cup, which is one of the first essentials of domesticity, and which is used by almost everyone several times a day, has been so logically shaped by custom to its form that refinements on this form must usually be extraneous and therefore illogical. The project which Yoshioka chose for his student project was, in this light, rash: the first man who used a fired clay bowl to drink from instead of his hands—in fact, the man who first picked up a shell to drink from—solved the basic design problem. But classical objects like the cup, which time has rendered apparently impervious to change, can be fruitful problems for the student; it is their approach to the universal in human experience that makes some objects classical, and it is in part the ability to perceive human experience clearly that makes a good designer.

In this case, the student was perhaps particularly fortunate in the background he brought to the study. Moving from one culture to another as he did, he was in a position to observe what was universal and what was convention. Because the manner of eating in this country is different from that of Japan, he was led to observe more closely just how people do eat, and how their eating utensils are adapted to their needs. From this observation he evolved dinnerware he felt was more closely related to universal requirements as well as to the immediate requirements of the production line, the cafeteria, and the automatic dishwasher.

The basic problem in design, as Yoshioka says, is human behavior. In the case of a dish or cup, the pertinent behavioral elements are three: what people put into it, how they hold it, and how they take food from it. There is, for example, a basic difference between Eastern and Western ways of drinking, as illustrated opposite. Westerners hold their cup with a lever or a pinching action. In both cases the efficiency of the action is dependent on the form of the handle and its position in relation to the rest of the cup. Because the Japanese cup is supported by the palm of the hand, its contours must be adapted to the hand and its walls must be thick enough to prevent it from becoming too hot to handle.

In the West, much of the food, meat in particular, must be cut in the plate. This means that while both hands are occupied with cutting, and are in the process exerting considerable pressure on the bottom surface of the plate, the plate must rest securely on the table. On the other hand, meat is not a large part of the staple Eastern diet, and when it is served it has been previously cut into small pieces, so that it need only be lifted out by the chopsticks, which are held in one hand. No pressure is exerted on the surface of the dish, which is held in the other hand, so that in this case the manner of eating demands that the dish have a rounded surface to fit comfortably into the hand.

A preliminary chapter of Yoshioka's project uses slight variations among traditional Japanese bowls to illustrate the evolutionary method of design: the long process by which a form, first chosen for its esthetic content, is adapted to the various functions which it must perform. Of the two very similar bowls shown at the top of this page, the bowl on the left is used as a serving dish and rests on the table.

Two forms of traditional Kashiwa-Mon bowl; thinner wall, shallow base, flared rim of the right-hand bowl are functional adaptations.

The bowl on the right is used to eat from and is therefore held in the hand and comes into direct contact with the lips. The differences between the bowls are almost imperceptible; their development is the result of centuries of behavior imposing themselves upon a given form.

The conscious design process does not, however, permit the evolutionary approach, and the presence of a new material, in this case a plastic, and a comparatively new function, the mass feeding demanded by the institutional organization of much of contemporary society, introduced two new factors to a problem that the industrial designer must solve by the analytical approach. For example, dinnerware for mass use must be easy to handle and store in large quantities and should lend itself to washing and drying by machine.

Yoshioka's analysis of the manufacturing process for plastics is prefaced by a brief history of the development of plastic dinnerware from its earliest use by the United States Navy during the second World War. The Navy had found that the dinnerware it was using was too heavy, noisy, and fragile, and commissioned the Watertown Plastic Tableware Company to produce a set of dinnerware from a Melamine molding compound containing formaldehyde and cellulose filler. Hospitals, and then university dining halls, were next to recognize the advantages of plastic dinnerware.

As this new dinnerware grew increasingly popular, the National Bureau of Standards, in cooperation with the United States Department of Commerce, drew up a list of specifications for Melamine tableware, which was issued in December of 1950. Yoshioka, who adopted these standards for his own project, quotes them at length as evidence of the limitations within which he chose to work: standards for size, weight, thickness, capacity, and surface quality. One reason for the imposition of these standards on the industry was the brisk fight put up by chinaware manufacturers to prevent their market from being cut away from under them. Their fight, incidentally, was notably unsuccessful, according to Yoshioka: 50 per cent of all dinnerware sold in this country, to be used in both institutions and homes, is made of plastic. This figure is even more striking in view of the much higher replacement rate for chinaware. A further section of the thesis is devoted to production information: the content of Melamine, its physical properties, the kinds of molds used to form it, and the advantages and disadvantages of each.

Yoshioka began the actual design work with the cup, because, he felt, "it has the closest connection in its function with the human being. Whether the cup has handles or not, it is touched by the human hand and lips. The determination of the cup form, therefore, sets the beginning form of the whole set of dinnerware." For this beginning form, he decided to consider three basic shapes: the oval, square, and triangle. This choice, he says, was motivated not so much by any relation of these shapes to the form of the human hand and lips, but by his own rather arbitrary ideas of esthetic desirabilities. On the basis of his study of behavior patterns in eating, he would then modify these shapes to fit the function they had to serve. In other words, he intended, by analysis, to accomplish the same modifications that had, in the case of the Japanese bowl above, taken centuries of evolution.

He begins his sketch studies of the three basic shapes with the flat statement that "the ideal curve for drinking is between 1" and 1¾"." Since there is no support for this figure, the student apparently arrived at it by simply experi-

Early plastic dinnerware, used at the United States Military Academy, showing some modifications necessary for institutional use.

menting until he found the most comfortable curve to drink from. This ideal curve is the reason he did not choose to work with the conventional circular cup (a convention, he says, which in chinaware resulted primarily from the method of manufacture: the potter's wheel—a method, which, of course bears no relevance to plastics). But, to quote him: "It is difficult to design a circular cup with an appropriate curve for drinking, and still maintain a large enough liquid capacity, unless a part of the cup is deformed with a spout shape. It is obvious that to deform the cup in this way will create a loss of balance especially when trying to drink from it."

All of the shapes he selected to work with combine a curve small enough to drink from with a large capacity. They raise their own problems, however, with the handle, since the drinking curve must be in the proper position to drink from whether the cup is held in the right or in the left hand. There are, he notes, a number of square cups now on the market, but in each case the handle is placed in the center of one of the sides. The user either holds the cup normally, and is compelled to drink from one of the flat sides, or twists his wrist uncomfortably trying to drink from one of the corners.

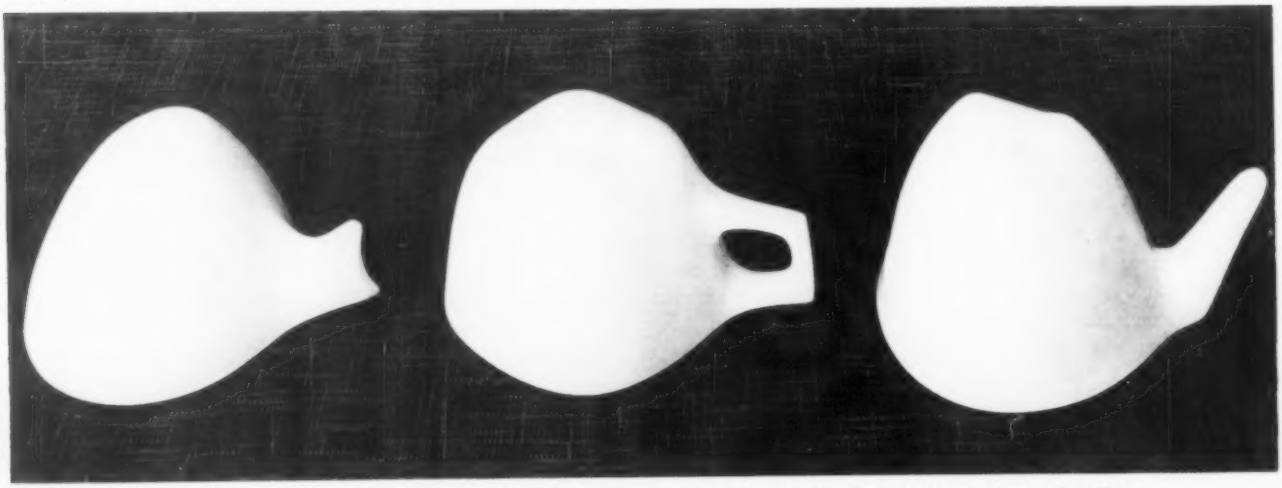
This initial stage of the design process is in sketch form—innumerable drawings combining and recombining various solutions to the different parts of the problem a cup presents. There is not only the basic shape of the cup and the position of the handle, there is also the problem of the thickness of the walls: how to obtain a wall agreeable to drink from but thick enough to retain the heat of the contents and to support the handle satisfactorily. This is a problem recognized and considered in traditional Japanese bowls, which contain very subtle variations in thickness. There is the problem of the shape of the handle: it should maintain an esthetically pleasing unity with the body of the cup; it ought, being of plastic, to be the result of a simple molding process; it should, being intended for institutional use, permit the cup to be easily stacked; and it must, above all, being intended for use by people, be easy to hold.

Then there is the problem of the bottom. It should, naturally, give stability to the cup. (One of the earliest of Yoshioka's sketches shows a lever-shaped handle extending downward to touch the table, forming a kind of foot, thus making the cup steadier, especially while being carried on a tray.) No amount of evolution seems to have solved the problem of the dripping cup bottom. A number of the sketch solutions show serrated bottoms, convex bottoms, and pointed legs (with placement holes in the saucer) in an attempt to eliminate dripping. One of the sketches below shows a cup and saucer so formed that the spilled liquid will drain away to the edge of the saucer.

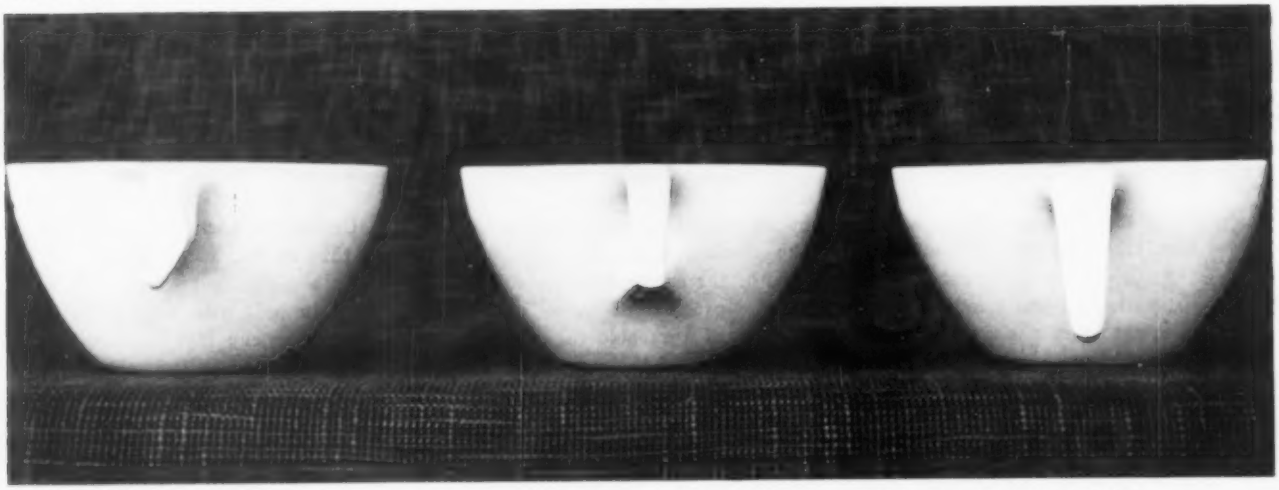
The next design step is the mockup. Yoshioka chose to make three cups, each a combination of ideas first developed in the sketches. The handle was the element which apparently gave him the most trouble and to which he devoted the most thought and effort. Esthetically, the handle shown on the oval cup, the first in each series shown overleaf, was his favorite, but this, he decides regretfully, is impractical. Although it forms a pleasing visual unity with the rest of the cup, it must be held with a pinching action that is uncomfortable when the cup is full. Also, because of its asymmetry, it cannot be held indiscriminately in either the left or the right hand. The handle on the square cup is placed on the corner, as Yoshioka has shown it must be.

Early "foot handle" shows faintly in upper left corner of sketch.

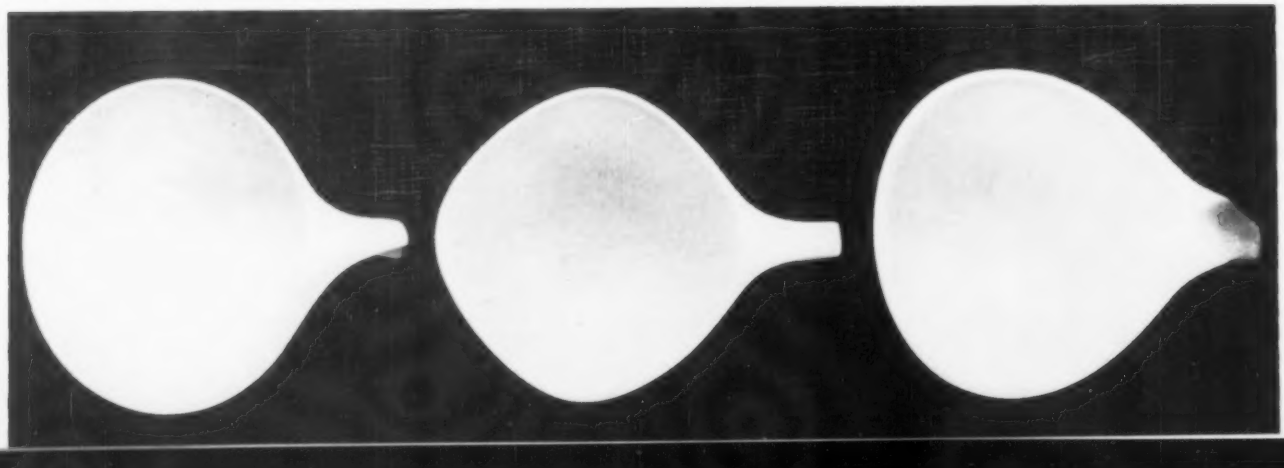
Mockups show three solutions to the handle problem; student found first hard to hold, second hard to stack, chose the third.



Above: bottoms, the first slightly concave, others with bumps, in attempt to end dripping. Below: front view of handles.



Below: three basic cup shapes: oval, soften square and triangle, have their smaller curves in best position for drinking.



It is comfortable to hold and is, he believes, visually satisfactory. In production, however, it would demand two extra metal insertions, and it would also make stacking impossible.

The triangular cup with the lever handle, furthest right in all the photographs, is the model finally chosen as the solution. The handle operates with a lever action, fundamentally more comfortable than the pinching action. This is also the easiest kind of handle to stack. A groove in the top surface of the handle and a small notch on the opposite side of the cup are further helps in stacking. (The effort required to align the grooves and notches might slow down the stacking process, however.) The area of the wall from which the handle is developed is the thickest part; the thickness diminishes at the top where the lips touch it. The rim has a slight "morning glory" flare to flow more easily into the handle, to conform to the lips, and, supposedly, to reduce dripping. The three bumps on the bottom are also intended to reduce dripping (there is less surface to drip from) and also to eliminate the suction problem which arises in the conventional cup when a vacuum is formed between the bottom of the cup and the saucer.

Yoshioka conscientiously points out the disadvantages of his cup: the small pointed legs which are not in proportion with the cup body and handle, and which make the cup unstable when it is used without the saucer. The saucer, derived, as is the rest of the basic set, from the design of the cup, has three depressions to receive the three legs of the cup. (But if the cup isn't put in exactly the right place on the saucer, so that the legs fit into the holes, this arrangement seems to lose its stability.)

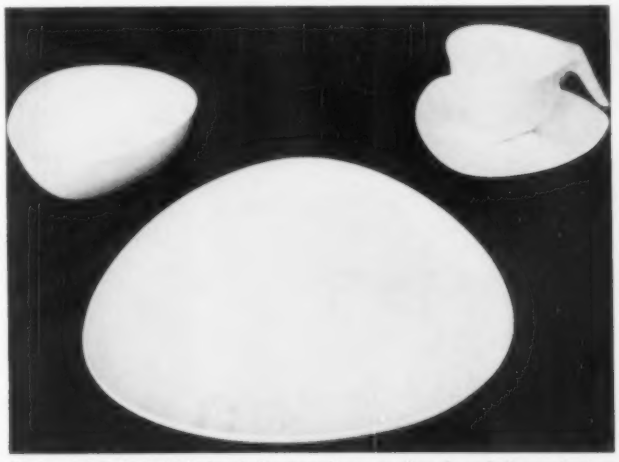
The plate is slightly concave, with three soft bumps at the bottom to make it stable. The rim is high, to permit soft foods to be easily scooped up. The slightly raised center keeps food and gravy from mixing. In a rack for washing and drying, the triangular bowl and plate maintain their position. The rounded edges and corners of all the parts of the unit expedite washing and drying.

Considered as a design project in itself, the dinnerware unit is a thoughtful and original answer to a number of problems. The fact that it does not answer all of the problems means only that the experiment needs to be carried further, not that it is valueless. As a step in the education of a designer, the project is even more impressive.

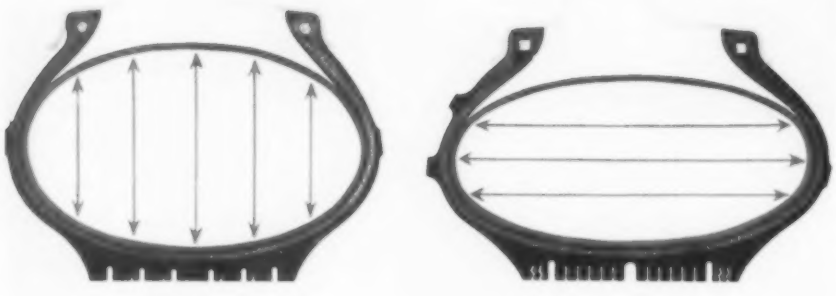
Some of the academic paraphernalia, however, indicates that the nature of the industrial design thesis needs to be defined more clearly and that research in its relation to the design process needs to be distinguished from research in, say, chemistry. One of Yoshioka's introductory chapters, for example, contains miscellaneous figures on plasticware sales and replacement rates. What is the place of statistics in a project of this nature? In most such cases, complete statistics are not available; and even when they are, the student is not qualified to evaluate them. So that while figures on, for example, comparative replacement rates of chinaware and plasticware in two pantries of the Ohio University Hospital are interesting as illustrations, they are only that, and are in no sense definitive. Nor is it quite clear what—in terms of the project—they illustrate. Should the design graduate student devote much time or space to the accumulation of statistics simply because they are a traditional part of scholarly research?

The section on production processes is extraneous for a different reason. The point in including this kind of information seems to be more to prove that the student knows what he is talking about than to contribute toward human knowledge. This is, naturally, important, but, again, its significance should not be over-emphasized. It is, in a sense, the presentation of credentials and is therefore preliminary to the real order of business.

However, whether or not these appurtenances make a significant contribution to the design itself, they do contribute something to a fuller and more appreciative understanding of the factors which controlled it and of design process—unconscious in the case of evolutionary design, and conscious as here in the case of a design based on the analysis of human behavior.



Saucer, bowl and dish of final unit were developed from design of cup, the element most closely related to eating behavior.



Nylon cord tubeless tire

United States Rubber Company has announced a new nylon cord tubeless tire which combines a recently perfected low profile design, a marked change in tread pattern, and improved rubber compounds into a tire which company officials claim to be the safest on the road. The new tire, called the Low Profile U.S. Royal Master, is oval in cross section — wider than it is high. Company engineers say that it is capable of sustained operation at the maximum performance limits of any American passenger car now in production.

According to G. R. Cuthbertson, vice president and general manager of U.S. Rubber's tire division, "This tire could not have been built a year ago. It was made possible by four engineering achievements." He listed the achievements as: 1) the development of a deep intricate mold design—the most expensive ever used; 2) a pressure tempering process which strengthens the tire by taking the stretch out of nylon cord, and removes the strains from tread and rubber carcass compounds; 3) a new homogenized synthetic rubber compound in which the reinforcing carbon black is finely and evenly distributed throughout the rubber to give it greater strength and wear resistance; 4) the recent wide-scale conversion to automatic Bag-O-Matic tire curing equipment with its high steam pressure which is needed to shape and cure the wide, low profile tire.

The low profile tire flexes less as it rolls than conventional tires, making it smoother-riding and cooler-running, especially at higher speeds. Its oval shape and long, low angled nylon cord construction give it greater stability, much as a wide stance gives a man more resistance to a sidewise push. This results in faster response to steering and safer travel around curves.

The tire combines maximum rim diameter with minimum tire height. It offers the automotive engineer a means of lowering the car without reducing the wheel or brake diameter, an important safety factor. On a 15-inch wheel, the tire—which is only 86 per cent as high as it is in cross section—lowers the height and center of gravity of a car as much as a conventional tire on a 14-inch wheel.

Original tread mileage of the new tire is 36 per cent more than the average of present first line tires. When the tread of the Royal Master is 75 per cent worn, there is still enough rubber left to allow its traction and skid efficiency to be renewed. This extends the life of the tire up to 60 per cent more than that of competitive tires. In recent road tests against other premium tires, the new nylon cord tire showed over a third more mileage over all types of roads in every section of the country, the company states.

The tread of the new tire is a complete departure from conventional tread design. Instead of a series of ribs separated by grooves, the tire's tread is made up of thousands of cylindrically shaped elements. These traction "shoes" present biting edges in all directions. The tread has a center groove providing flexibility. Three flexible ribs are at the shoulders of the tire to maintain uniform wear and to prevent squealing and scuffing on turns.

The new tire is made in tubeless form only. Extra thickness of the thread and the heavy nylon cord prevent punctures by small objects. A special inner wall compound grips larger nails that might penetrate, preventing sudden loss of air; this allows cars to be driven for miles until repairs can be made.

Although the new tire is 80 per cent more expensive than other tires, U.S. Rubber feels that its basic principles can be applied to lower priced tires. They predict that because of the increased safety factors, the new type of tire will be standard equipment on the 1960 automobiles.

Source: U. S. Rubber Co., New York, N. Y.

Cercor process

A new process for forming extremely thin-walled ceramics into lightweight honeycomb structures capable of operating at high temperatures has been introduced by Corning Glass Works, Corning, N. Y. Materials made by this process—which is known as the Cercor process—can withstand over eight times the heat necessary to boil water. At these high temperatures, they are, unlike metals, resistant to oxidation and corrosion. Furthermore, another unique characteristic of the materials is their low rate of expansion under heat,

enabling them to withstand extreme thermal shock.

Corning executives indicate that the low expansion at high temperatures and the high surface area of Cercor process materials give evidence that their future uses will be in such applications as gaseous heat exchangers, as catalyst supports, and as structural materials for use at elevated temperatures. They further claim that it is possible to build Cercor structures having a wide range of shapes and physical properties with base materials of a large number of ceramic compositions.

Large disks, up to 20" in diameter, have been made by the Cercor process. A protective rim for the disk is formed by a tough coating of special material with matching expansion and equally high resistance to temperatures.

Portable power density meter

A portable power density meter to be used for survey of high-energy fields near powerful microwave devices has been developed by Sperry Microwave Electronics Company, division of Sperry Rand Corporation. The new device, now in production, is a simplified search meter which directly measures power density of high-level microwave fields. It answers the long-standing needs of military radar operations for a compact, lightweight instrument to replace involved bench-type power meter setups that heretofore were carried about on test carts.

The new unit is specifically designed for detecting hot spots and leakage areas around antennas, transmitter tubes, and plumbing in order to establish comfortable working conditions for operating personnel. It can be operated by either technical or non-technical personnel. The power meter measures microwave power density within the frequency band of the instrument while detecting reflections, antenna side lobes, and other strong microwave fields around the base of operating radar stations at military and test installations.

The meter is completely portable and weighs between four and six pounds. Operating power is supplied by an internal mercury battery, while a single-knob operating control combines both zero adjustment and the on/off switch. Manufacturer: Sperry Microwave Electronics Co., Clearwater, Florida.

Aluminum fin automobile radiator

Alcoa has announced that a lightweight aluminum fin automobile radiator can be produced today at raw material costs averaging 20 per cent less than conventional copper-brass units. The saving is based on current copper prices.

Achieved after more than twelve years of research and development effort, the composite aluminum-fin, brass tube heat exchangers also weigh 20 per cent less than normal assemblies and require only minor changes in manufacturing procedures. The fins—whose purpose is to dissipate heat—give the radiator its honeycomb appearance.

Tests over the past five years on thousands of late-model automobiles all over the country give the radiator high ratings in corrosion resistance. Laboratory tests have also been conducted under a variety of conditions approximating exposure to salt spray, high humidity, and other varied atmospheric conditions.

According to Alcoa officials, heat transfer studies indicate that these radiators can be engineered for adequate cooling capacity with very little modification in conventional design. Because of this adaptability, several radiator manufacturers have already evidenced interest in producing the lightweight unit. Production is anticipated in the near future for automobiles to come off the assembly lines in the early 1960's. Source: Aluminum Company of America, Pittsburgh, Pa.

Flame-retardant polyethylene

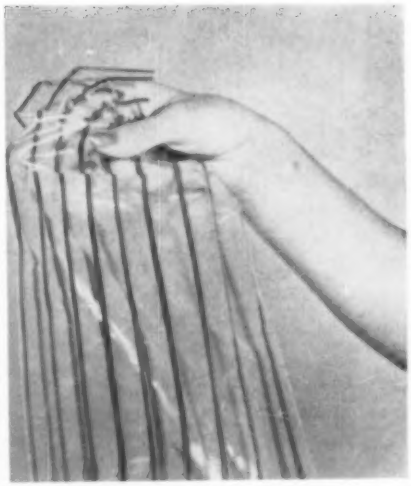
New flame-retardant compounds of high-density polyethylene are now commercially available in a variety of colors, opening the way, it is claimed, for new or improved products never before possible with polyethylene. These compounds of Grex high-density polyethylene were developed at the Technical Service Laboratories of W. R. Grace & Co.'s Polymer Chemicals Division. Available colors include white, black, grey, blue, green, pink, orange, yellow, and scarlet.

Grace officials suggest that among the first applications for the material will be television yokes (housings for electrical components of television tubes), baby-bottle warmers, and cylinder heads for tanks containing nitrogen, oxygen, or acetylene. While many of the applications will be in the electrical and electronics field because of the polyethylene's particularly good

electrical properties, many other uses such as safety goggles, fire extinguisher cones, and water tower cooling grills are anticipated.

The first two of the new flame-retardant series of Grex high-density compounds are known as C-1007 and C-1008. Colors are differentiated by name and number following either of the numbers. C-1007 is particularly suited for products requiring higher impact strength, while C-1008 is a freer flowing compound making it suitable for larger moldings.

In the picture above, the flame-retardant sample (left) is immediately self-extinguishing, while the untreated polyethylene continues to burn. Manufacturer: W. R. Grace & Co., Clifton, New Jersey.



Striped polyethylene film

Polyethylene film with extruded-in colored stripes which form a permanent design is now available to the packaging industry. The new type of film is produced by Borden Hively, Columbus, Ohio, from U. S. Industrial Chemicals Company's Petrothene resin. The new material is competitively priced with other polyethylenes, and its stripes will not rub or wear off.

The striped polyethylene is produced generally as a clear film with stripes of any single color. It is possible, however, to construct a die to produce stripes of two alternating colors or even to obtain a three-color effect. With a wide variety of colors to select from, packagers can color-code different product grades. Translucency or transparency of the stripes can be varied as desired, as can the width. A raised or embossed effect is possible, imparting a high quality feel to the film.

Custom built extruders are employed in the process, although considerably modified basic standard extruders have been used. Two or three color streams of material are fused within the die and brought out as a homogeneous unit. Produced in thicknesses ranging from 1¼ mils to 10 mils, the new film is available in widths up to 15 inches.

According to the manufacturer, the film opens the door to some unique packaging innovations. One company is using the striped film to form a bag in which shoes or slippers are housed. Both hard and soft goods manufacturers dealing in cosmetics, drug products, candy, and toys have expressed interest in the striped material. The development of the new material opens up the possibility of packaging innovations with multi-colored netting effects, marbleized and zigzag stripes, and bands that can be snapped onto the film and used as handles. Source: Borden Hively, Columbus, Ohio, and U. S. Industrial Chemicals Company, Division of National Distillers and Chemical Corporation, 99 Park Avenue, New York 16, New York.

Acrylic push-button selector

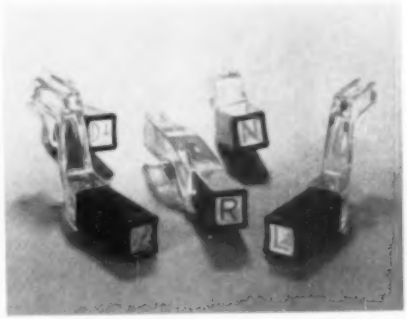
A two-piece assembly of both opaque and transparent acrylic produces an interesting and utilitarian effect in the push-button selector of the automatic transmission of Rambler automobiles. The selector buttons consist of a clear transparent core and a black sleeve which is force-fit around the forward end of the button that projects through the front panel of the selector unit.

The assembly arms, which vary from three to four inches in length, are molded from clear plexiglass, enabling them to act as light pipes. By internal reflectance they transmit light from a bulb in the selector box to the satin finished faces of the buttons, a distance of five inches. The even diffusion of light on the frosted surface provides a soft glowing background that accentuates the pigmented hot stamped letter on the face of each button.

The opaque sleeves, molded from Implex A, a modified acrylic powder recently developed by Rohm & Haas, fill both practical and decorative functions. Being opaque, they prevent any light loss through the sides of the push buttons, and concentrate the illumination at the frosted end facing the driver This produces better contrast, improves visibility at night, and eliminates the possibility of extraneous light leakng through the sides of the button.

Besides enhancing appearance and illumination, the Implex sleeves contribute physically to the button assembly. The excellent scratch resistance of the material prevents marring from abrasion, and other surface scratches. The material's superior strength is needed because during manufacture, the sleeves are force-fit over the end of the button. This is done while the sleeves are hot (and thus have not developed maximum strength) in order to obtain a shrink fit around the button and provide permanent gripping without mechanical fastenings or adhesives.

The sleeves are molded in the form of ½" square tubes, having an 0.070-inch



wall. They are molded on a 35 second molding cycle at 450°F in a four ounce injection molding press. Source: Rohm & Haas, Philadelphia, Pa., and American Motors Plastic Division, Milwaukee, Wisconsin.

Manufacturers' Literature

Adjustable Speed Drives. Bulletin GEA-6234B, General Electric Company, Schenectady 5, N. Y., 8 pp., ill. Describes General Electric's general-purpose Thymotrol adjustable speed drives. The bulletin fully explains standard and optional features, electrical and performance characteristics, application advantages, and key construction features of the controller, dc motor, and operator's control station of the drives.

Annunciator. Panelit, Incorporated, 7401 North Hamlin Ave., Skokie, Illinois. 4 pp., ill. Folder describes a new type of ultra-reliable annunciator. It contains information on the system recently developed for monitoring complex automatic machine and continuous process operations. The annunciator uses static magnetic controls in place of conventional relays.

Ardmore Textured Metals. Ardmore Products, Inc., 190 Atlas Road, Kenilworth, New Jersey, 6 pp., ill. Case history of how textured metal saved a manufacturer over one third in cost, cut down on installation time, labor, materials, and reduced field maintenance to a minimum.

Bishop Tubular Products. Bulletin #12. J. Bishop & Co., Malvern, Pa. 16 pp., ill. Catalog contains information on types, grades, lengths, finishes, and general characteristics of small diameter stainless steel, nickel, and nickel alloy tubing, glass to metal sealing alloys, super and precipitation hardening alloys, and fabricated tubular parts.

Cemented Carbide Cutting Tool Materials. General Electric Company, Metallurgical Products Department, 11177 East Eight Mile Road, Detroit, Michigan. Catalog lists both positive and negative rake tool holders, Carboloy cemented carbide tools, tool bits and inserts. Also a new technical and application data section on Carboloy cemented carbides.

Central Station Air Conditioning Units. Carrier Corporation, Syracuse 1, N. Y. 72 pp., ill. Catalog for the selection of central station air conditioning units from two new Weathermaker lines for conventional and multi-zone applications.

Chemical Processing. Graver Water Conditioning Company, Division of Union Tank Car Company, 216 West 14th Street, New York 11, N. Y. 6 pp., ill. The bulletin details the equipment and services available from Graver in the field of chemical processing. Among the processes explained are ion exchange, sedimentation, filtration, and flotation.

Dupli-Mill Tracer Controlled Milling Units. Colonial-Romulus Division, Colonial Broach and Machine Company, Parkgrove Station, Detroit 5, Michigan. Bulletin CRD-58, 6 pp., ill. Bulletin gives specifications and features of the basic building-block machines that can be mounted, fixtured and operated on any plane.

Ferrocarbo® Briquettes. The Carborundum Company, Niagara Falls, New York. 16 pp., ill. Booklet was designed for metallurgists in the gray iron casting field. It contains detailed information about Ferrocarbo on cupola melting practice, machinability, graphite, sulphur, iron carbide, iron phosphate, structure, and segregation. Actual case histories are contained showing the effect of Ferrocarbo on machining.

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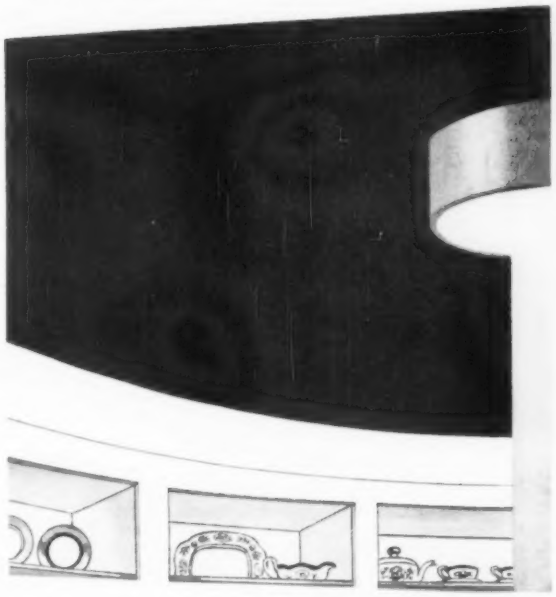

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Napco turbo-tug

Napco Industries has announced the development of an aircraft towing vehicle, the Napco Turbo-Tug, capable of towing planes as large as the Boeing 707 quickly and easily around an airfield. The Turbo-Tug, which weighs 9,000 lbs. and is 49 inches high, has been test-proven by towing giant jet aircraft weighing up to half a million pounds. The satisfactory results obtained on these tests have attracted both Air Force and civilian airline officials who have been urgently seeking a towing vehicle capable of high speed airfield clearance—a major objective in times of large planes and split-second scheduling.

The Turbo-Tug employs drive rollers, located in the rear of the machine, that are hydraulically pressed against the aircraft tires. Motive force is provided through the roller to tire friction drive by the Tug's power plant, a Boeing 502 series gas turbine engine. The basic weight of the aircraft is utilized to help create the tremendous traction that the tug needs. Thus the weight of the plane becomes an advantage. A second gas turbine engine used to supply air gives the Turbo-Tug the ability to start jet aircraft engines. Manufacturer: Napco Industries, Incorporated, Minneapolis 11, Minnesota.

Nylon-metal pulley slide

A new nylon-metal pulley slide for Westinghouse Corporation's latest line of washing machines has been developed by Chicago Molded Products Corporation. The new slide replaces a costly all-metal one. Engineers from Westinghouse Chicago Molded were faced with the problem of designing and developing both the piece itself and a flash-free mold. The slide had to be mass produced to meet close tolerances on both the internal diameter of the shaft and the two different types of helical slots, and at the same time eliminate the expensive machining operations formerly necessary with the all-metal part. Nylon was chosen to be used with a stamped sheet-steel insert (copper plated) because of its toughness and abrasion resistance, and because it can be injection molded in mass production units. Since the operation required little or no lubrication and since no costly machining was necessary because the slots are molded into the part, an appreciable saving was realized. Source: Custom Molding Division, Chicago Molded Products Corp., Chicago 6, Illinois.

Styrene textile bobbins

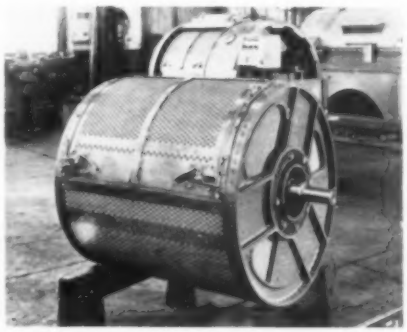
Lightweight, one-piece textile bobbins made from high-impact styrene are now being molded by Worcester Moulded Plastic Company to save shipping and original production costs. The one-piece design of the bobbins is primarily responsible for their low cost. Integrally molded spokes in the end piece impart greater rigidity than was possible with wood or glass fibers and, it is claimed, permit the bobbins to be used many more times than was previously possible.

Glass fibers wound on the styrene bobbins will not snag as readily as on the old style bobbins. The styrene will not impart its color to the fibers wound around the device, an important advantage to users of light colored material. The new bobbins are moisture resistant and have greater dimensional stability than conventional bobbins. Source: Bakelite Division, Union Carbide Corporation, New York, N. Y., and Worcester Moulded Plastic Company, Worcester, Massachusetts.

Ductile iron washer cylinder heads

A threefold advantage in ductile iron has caused W. H. Nicholson & Company, a manufacturer of laundry and dry cleaning equipment, to switch from the malleable iron cylinder heads which are riveted to the stainless steel drums of laundry washers. According to Nicholson executives, it was extremely difficult to keep a malleable iron casting from warping or cracking in the annealing furnace. Stresses were sometimes locked into the larger malleable iron castings, which caused them to crack as soon as machining started. Furthermore, the malleable castings required three to four weeks for delivery because of the extremely slow annealing process necessary to create the malleable iron cylinder head.

These difficulties are not encountered



with ductile iron, which requires no annealing period. Nicholson points out that a ductile casting is serviceable as soon as it is taken out of the flask. Therefore, delivery schedules can be speeded up, and emergencies may be met much more quickly.

Nicholson has also switched to ductile iron from cast steel in the trunnions of its washers. These new trunnions, it is claimed, are tough, rigid, and shock resistant, and will meet approximately the same specifications as steel with regard to tensile strength and elasticity. This resistance to shock is important, because the drums make three reversals a minute, and are thus subjected to the same fatigue stress that a wire gets when it is bent back and forth. The trunnions must support the weight of the cylinder plus the weight of the clothes and the water in the wet load. Since the trunnions are rigidly bolted to the cylinder heads, the latter must also carry loads; they may in fact be considered as extensions of the trunnions. Rough castings of both cylinder heads and trunnions are made by T. B. Wood's Sons Co.; machining is done by Nicholson. Source: W. H. Nicholson & Co., Wilkes Barre, and T. B. Wood's Sons Co., Chambersburg, Pa.

Manufacturers' Literature

Fiberglass Reinforced Plastic Moldings for the Product Designer. Winner Manufacturing Company, Trenton, N. J., Dept. D. 4 pp., ill. Brochure designed as a succinct summary of various points product designers should consider when using reinforced plastics. It describes the wide variety of physical properties available and provides brief outlines of different methods of molding these materials.

Hollow Metal Doors. Ceco Steel Products Corporation, 5601 West 26th Street, Chicago 50, Ill. 28 pp., ill. This catalog makes available all the necessary data for selecting doors, frames, and hardware with all units completely engineered to complement each other. Various types of hollow metal doors in flush and panel styles are described and detailed, as are jalousie and louver doors.

Hydraulic Tank Weighing Systems. A. H. Emery Company, New Canaan, Connecticut. Bulletin 581. This catalog shows in detail the equipment available to team up with Emery Load Cells in providing indication, recording, printing, and controlling in tank weighing installations. Complete with application drawings, the bulletin describes in detail the operation of the load cells and the transducing elements used with the various cells.

Miniature Transformers. Microtan Company, Inc., Valley Stream, N. Y. 24 pp., ill. Catalog describes the complete line of miniature, subminiature, transistor, and industrial transformers.

Overhead Door Operator. Barber-Colman Company, Dept. SG, Rockford, Illinois. An illustrated bulletin which announces several features with no increase in price for the Barcol Model L Electric Operator for commercial and industrial overhead doors.

Package Liquid Coolers. Bell & Gossett Company, 8200 North Austin Avenue, Morton Grove, Illinois. Bulletin HB-258, 16 pp., ill. Bulletin gives design features, typical installations, and a detailed description of the components of these outstanding units.

Polyethylene Technology. U. S. Industrial Chemical Company, Division of National Distillers and Chemical Corporation, 99 Park Avenue, New York 16, N. Y. 100 pp., ill. The technology of polyethylene plastic—from basic chemistry of the resins to fabrication of end-products.

Terminals and Electronic Hardware. Lerco Electronics, 501 South Varney Street, Burbank, California. 24 pp., ill. Catalog No. 30 features complete lines of molded and standard terminals, diode clips, taper pins, plugs and receptacles, handles, quintlock nuts, terminal boards, and swaging tools.

Tumbling Media for Barrel Finishing. The Carborundum Company, Niagara Falls, N. Y. 20 pp., ill. A complete study of tumbling media, functions and applications, and analyses of typical tumbling jobs.

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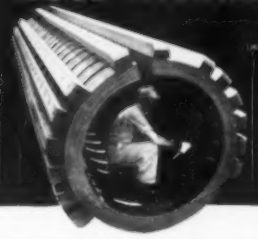

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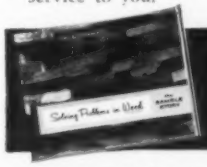

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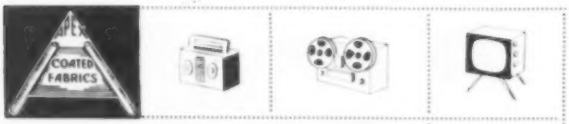

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For Your Calendar

Through November 30. Exhibit of the work of Louis Sullivan, University of Illinois, Urbana.

Through November 30. Four exhibitions at the Museum of Contemporary Crafts, New York: craft objects lent by various art museums, Finnish rug designs, tiles by David Weinrib, wall hangings by Jettie Penraat.

Through December 3. "Creativity at Work", an exhibition sponsored by the Art Directors Club of New York, Time and Life Building, New York.

Through December 7. International Ceramic Exhibition presented by the Syracuse Museum of Fine Arts to celebrate the 20th anniversary of the Ceramic National. Syracuse Museum of Fine Arts, Syracuse, New York.

Through December 15. "Architecture Worth Saving" at the Museum of Modern Art, New York.

Through January 4. "New York from 1890 to 1910," as photographed by Byron. Museum of the City of New York.

November 17-21. The 8th National Plastics Exposition. International Amphitheatre, Chicago.

November 19. Last session of National Home Fashions League's Home Furnishings Forum. Speaker: James Fitch. Cooper Union Museum, New York.

November 21-December 18. "Good Design for Christmas." Contemporary Arts Center, Cincinnati. Well-designed objects suitable for Christmas gifts.

December 2. The 2nd Annual National Food Packaging Symposium, sponsored by the Food Packaging Council, Chicago. Subject: "Merchandising the Package—A Road to Profits." Palmer House, Chicago.

December 3-4. Building Research Institute Conference on field applied paints and protective coatings. Shoreham Hotel, Washington, D. C.

December 10-11. The 4th National Construction Industry Conference. Subject: "Creative Trends in Urban Building." Hotel Sherman, Chicago.

December 12. Talk by Buckminster Fuller on "Comprehensive Designing." Sponsored by The Architectural Panel. Hollywood High School, Los Angeles.

December 12-February 15. A retrospective exhibition of the work of Wharton Exherick in wood, furniture and design. Museum of Contemporary Crafts, New York.

December 15-16. National Institute of Management seminar on production control. Roosevelt Hotel, New York.

December 17-February 23. Exhibition of the Design Collection of the Museum of Modern Art, New York.

January 5-9. Product engineering seminar sponsored by the American Management Association. Subject: "Managing and Measuring Engineering Effort." Hotel Astor, New York.

January 5-16. International Home Furnishings Market and Decorative Accessories Show at the American Furniture Mart and Merchandise Mart, Chicago.

January 9. Four films on contemporary design at the Long Beach Museum of Art, Long Beach, California.

January 10-February 1. "British Artist-Craftsmen," a Smithsonian Institution Traveling Exhibition at the National Collection of Fine Arts, Washington, D. C.

January 26-29. The 65th Annual Meeting of the American Society of Heating and Air-Conditioning Engineers, Bellevue-Stratford Hotel, Philadelphia. The 14th International Heating and Air-Conditioning Exposition, Convention Hall, Philadelphia.

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