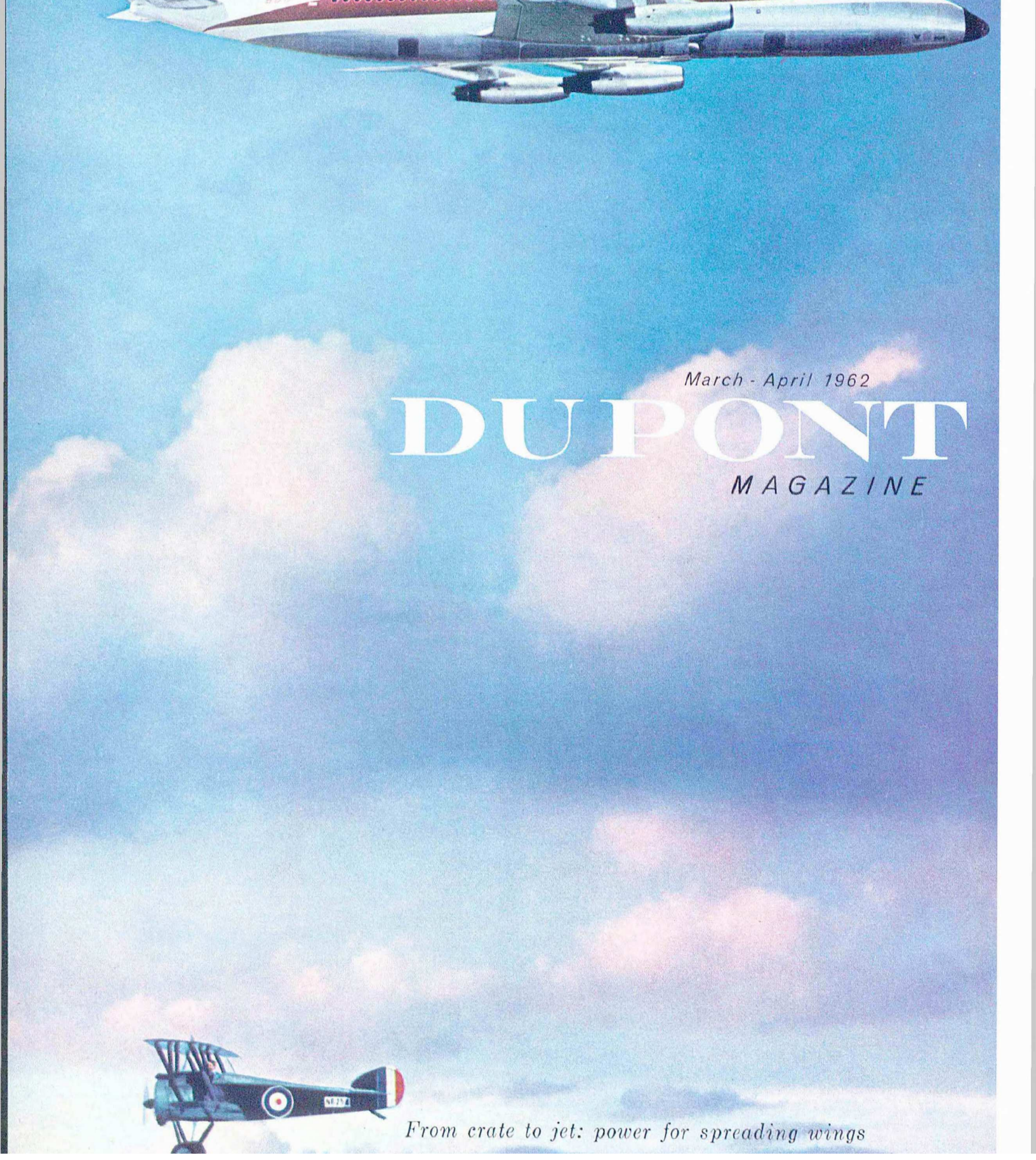




March - April 1962

DUPONT

MAGAZINE



From crate to jet: power for spreading wings

1961:

A Year for the New

"The past year has been a fruitful one both from the standpoint of scientific discoveries and of new products emerging from pioneering research." So says Du Pont President Crawford H. Greenewalt in his 1961 annual report sent this month to the company's more than 226,000 stockholders.

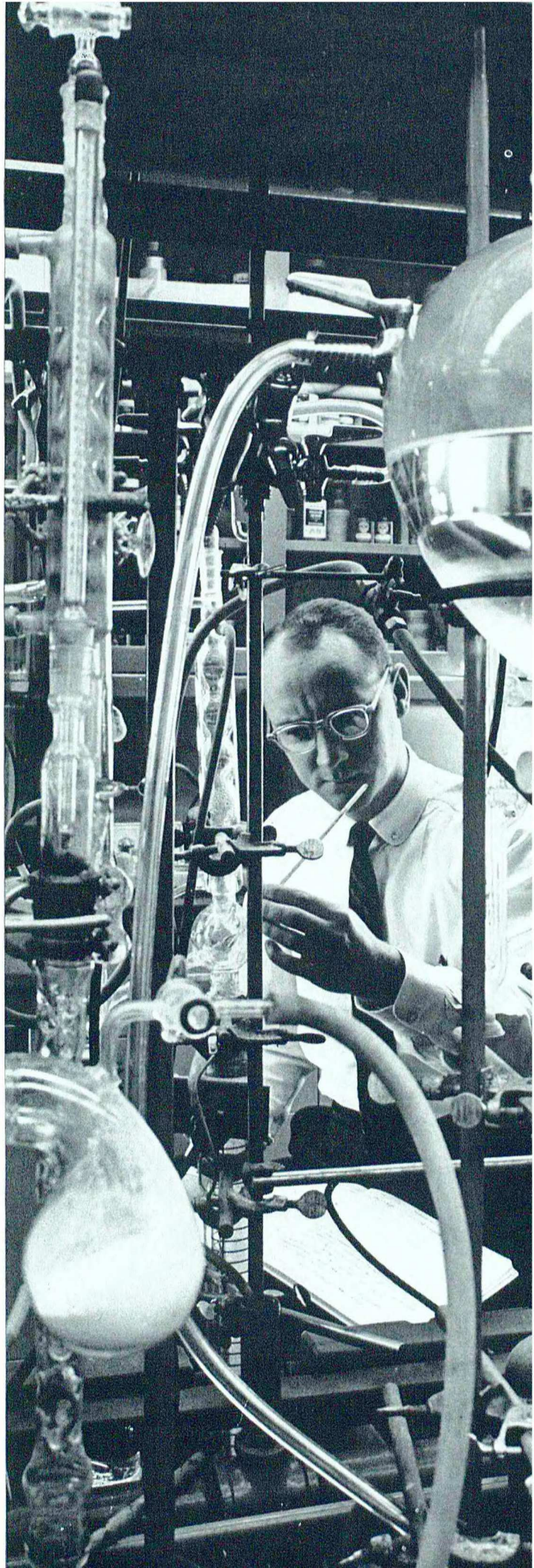
Throughout his year-end review of Du Pont's wide-ranging activities, Greenewalt sounded this emphasis on the new. The year just past saw a new sales peak of \$2,191 million, with earnings, aided by higher income from the General Motors investment, moving upward to \$8.88 per share of common stock; a new high of \$7.50 per share in dividends paid on common stock; continuing efforts toward cost reductions that helped counter the combined pressures of rising costs and the intensely competitive economy; new efforts to keep pace with the vigorous expansion of foreign markets, either by setting up on-the-spot marketing organizations to increase export sales of U.S.-made products or, when necessary, by building plants in foreign trade localities; and new domestic plant facilities to produce promising new products and improved existing ones.

But as detailed as his account for 1961 was, Greenewalt's eye also trained hard on developments that show promise for the years to come. Wrote he: "At the foundation of Du Pont's record of innovation is a program of fundamental research which extends beyond the scope of present commercial activities." As examples he cited some fruits of pioneering research that are already in the early stages of commercialization:

New organic compositions, aloof to temperatures thought of as destructive to organic matter, that serve as the basis for heat-resistant fabrics, coating compositions and plastics (example: a tough, transparent film that remains intact at the melting point of aluminum); a new kind of synthetic rubber of unusual durability which can be shaped and vulcanized by techniques used in the rubber industry; a colloidal fibrous alumina with wide potential in many uses, from fibers to glass; a new composition that promises to provide means for extruding and shaping very refractory metals and alloys at high temperatures; a flake pigment that gives an unusual iridescent effect to paints and lacquers; a graphic arts film which is clarified by pressure and simplifies lithographic printing operations.

How important does Du Pont deem its search for the new? The company's president made this clear when he reported: "Approximately 1,300 scientists were engaged in pioneering research activities in 1961 with an expenditure of about \$59 million, excluding the cost of laboratories and equipment."

New heat-resistant polymer studied by Du Pont chemist has potential applications ranging from films to enamels.

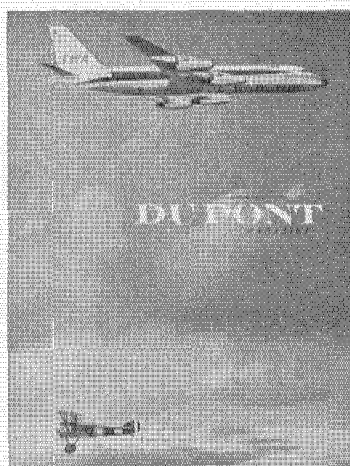


DUPONT

MAGAZINE

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THE COVER. Presenting, in the lower corner and weighing in at 1,422 pounds: World War I's Sopwith Camel, acidly recalled by its pilots as "a fierce little rasper" that "terrorized the enemy because he could never be certain it wouldn't fall on his head." In the opposite corner and tipping the scales at 184,500 pounds: today's Convair 880 Superjet, universally admired by crews and passengers alike for its eagerness to go from here to there with minimum delay and max-

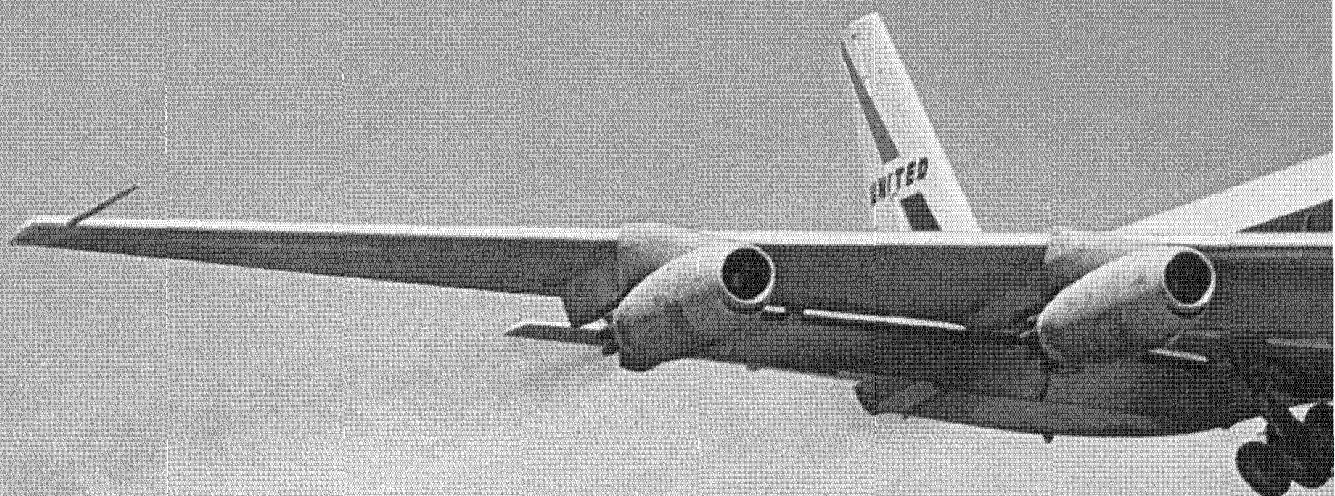
imum reliability. The Camel, with its 110 horsepower Le Rhone rotary engine, could be coaxed to a top speed of 118 mph; the 880, with its four GE CJ-805-3 jet engines, loafs into a landing at 130. The Camel's fuel tank held 31.5 gallons; the 880 burns nearly that much in each minute's cruising at 615 mph. By any measure, comparison between the machines is awe-inspiring, and for a report on how petroleum chemistry helped the aviation industry create the difference, see page 2.

EDITOR WILLIAM C. HALLEY • ASSOCIATE EDITOR EMILY HEINE • ASSOCIATE EDITOR JACK D. HUNTER

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Full rich mixture of fuel, air and water fed to four engines of DC-8 provides maximum power output for huge transport's quick lift-off from runway.

GIVING THE BIG



Three-man ground crew, clasp hands and running full tilt, was required to crank up engine of World War I Bristol F2-B Fighter.

Planes go higher, farther, faster with every improvement in engines and fuels. Unsung hero in the saga: the chemical additive

In the seventeenth century, Mother Shipton—a legendary English seeress—is said to have predicted:

*"Under water men shall walk,
Shall ride, shall sleep and talk;
In the air men shall be seen,
In white, in black and in green . . ."*

Mother Shipton didn't set a fixed schedule, and it took 200 years for men to get off the ground. But even so, the big DC-8 above, lifting from the runway in a racketing compound of shrieks and whines, would seem to exceed even her fertile imagination. The machine, despite its 140 tons, soars easily to 30,000 feet in a few minutes, covers 2,700 miles in a little more than four hours, and carries 126 persons—not only men "in white and black and green," but also whole families in every fashionable hue.



BIRDS A LIFT

By JACK D. HUNTER

No sleight-of-hand, the jet airliner is an ingenious amalgamation of applied scientific principles. Still, the enormous machine would remain a fairground curiosity if it weren't for a series of quiet triumphs in the research laboratories of the nation's petroleum industry over the past 50 years. In that span, intense collaboration among engine designers and petroleum scientists has developed engines like the four J-75's on the DC-8, each of which delivers, smoothly and reliably, a maximum thrust of 15,900 pounds—power sufficient to operate 120 fighter planes (or nearly seven squadrons) of 1918 vintage.

Fuel technology has been a ladder for man's climb to the doorway to space, not only by matching aircraft and engine developments but also by frequently pacing them. But it took man a while to appreciate the fact that unless fuel is precision-tailored to perform perfectly under an awesome range of extremes in altitude, temperatures and pressures, the airplane remains no more than a toy for adventurers.

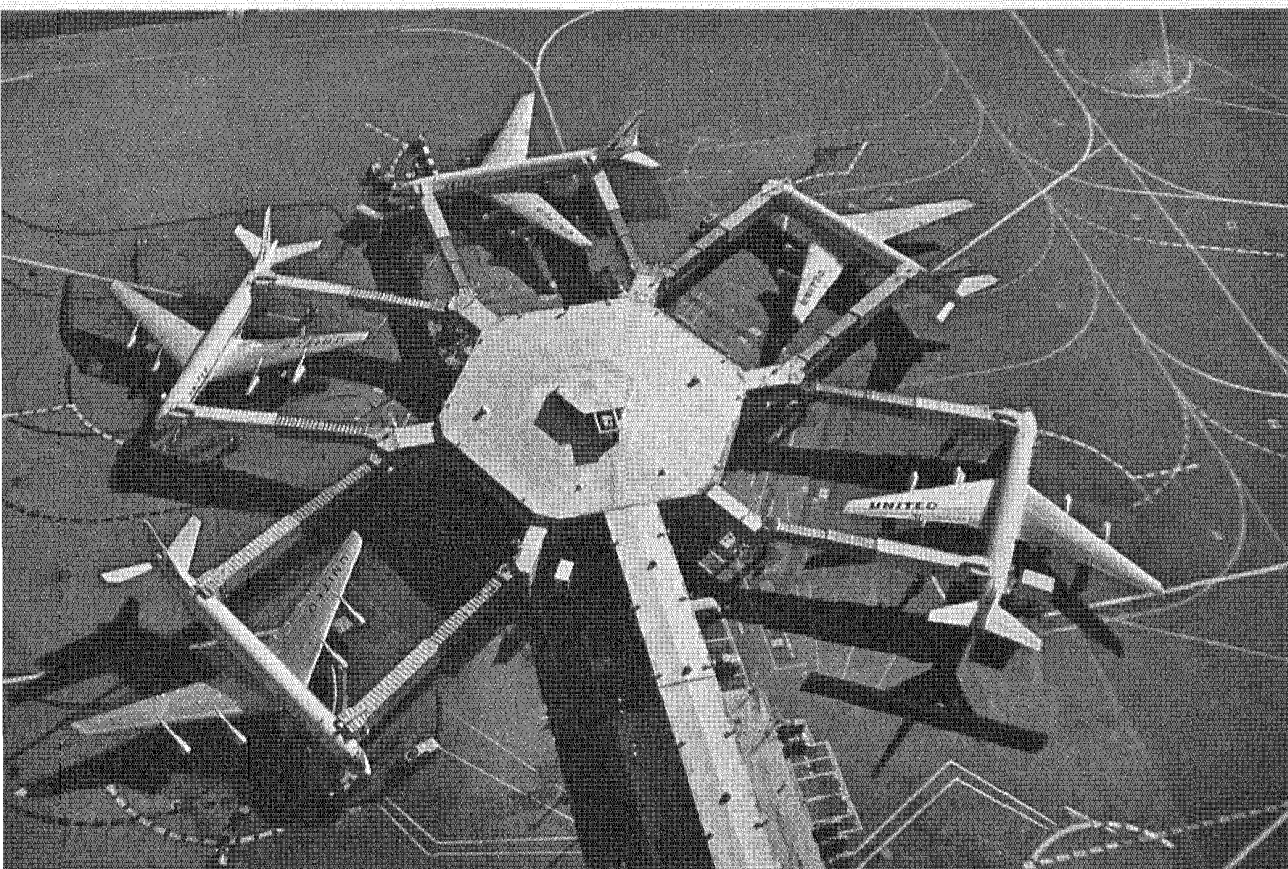
At the dawn of aviation history, fuel was one of the

last considerations in the effort to build and operate flying machines. With his creation finally assembled, the airman, almost as an afterthought, would fill the tank by tapping a few tins of kerosine and take off—frequently with disastrous results. Later, flying even the most advanced machines was a touch-and-go proposition, thanks in great measure to this casual attitude toward fuels.

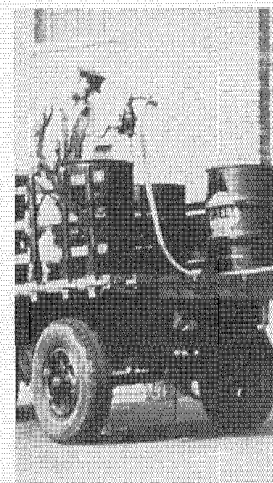
For example, the rotary engines powering first-class fighter planes of World War I were fed a diet of the highly volatile motor fuel used in Tin Lizzies of the era. (An apocryphal story has it that the fuel vaporized so rapidly a bucketful could be tossed into the air and nary a drop would return to earth.) These engines routinely burst into flames at start-up, and pilot and ground crew would wait tentatively a few moments to see (1) if the engine would continue running; (2) if the propeller wash would blow out the blaze; or (3) if they should all run for their lives.

In water-cooled engines of those times, vapor-locked fuel systems and destructive knocking—similar to the “ping” in your car engine when the fuel burns improperly

continued



Fuel must be pumped quickly and safely to handle heavy traffic volume at busy air terminals like that at San Francisco.



—brought down more planes than enemy gunfire.

Goaded by such ironies, aeronautical engineers began to look for safer, more reliable engines. They quickly found, however, that engine and fuel are Siamese twins: the better the power plant, the better the fuel needed to run it; the better the fuel, the better the engine required. Gradually, they established certain qualities that must be common to all aviation fuels:

They must not freeze in the airplane's tanks at high altitudes; must not be so volatile as to cause vapor lock in the fuel system, yet be volatile enough to insure good combustion and quick starts; must not break down into gummy sludge during storage or transport; must flow well enough to permit transferral and metering under all conditions; and must prevent rust and resist other engine system contaminants.

These and other sometimes contradictory demands have left the nation's oil companies unabashed. By broadening their petroleum technology, they have met each problem as it's come—first with piston engine fuels, then with the jets. And over the years they've received important help from companies like Du Pont, producers of chemical additives that permit increased fuel efficiency.

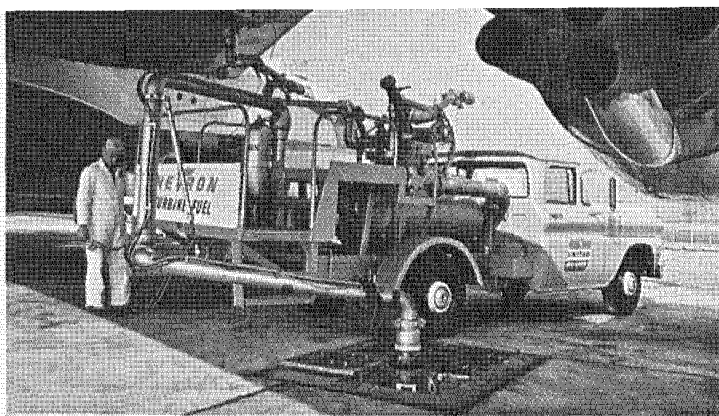
Take the knock problem caused by improper fuel combustion, which, if serious enough, can wreck an engine. It was found in the 1920's that the addition of tetraethyl lead permits aviation gas to burn better without knocking. This revealed that an engine of given size using fuel of high antiknock (octane) value can produce as much power as

a larger engine burning fuel of lower octane. In other words, the better the fuel, the *smaller* the engine.

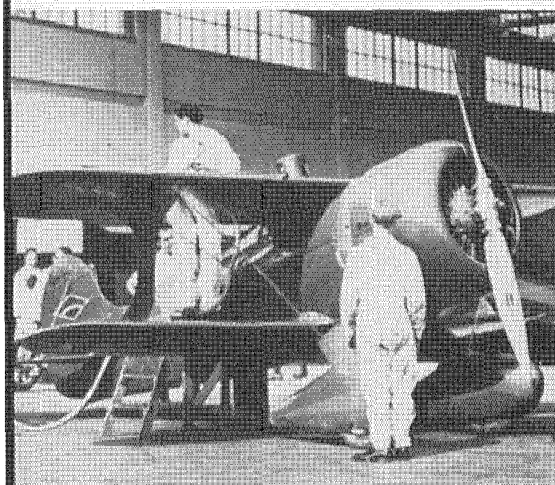
Refiners turned to TEL, which at that time was manufactured solely by Du Pont, and with the help of this additive they developed improved fuels which permitted engine manufacturers to make dramatic power plant advances. Example: both the Liberty engine of World War I and the Rolls Royce Merlin of World War II were liquid-cooled and had exactly the same cylinder displacement. Yet the Merlin produced more than four times the power of the Liberty with less than half the weight per horse power. Almost half this gain can be traced to the improvement in fuel antiknock quality.

Along with the seesaw climb in engine and fuel improvements, the search for chemical additives broadened. For one thing, dyes were developed to provide visual identification of the growing number of fuel grades. For another, antioxidants were found to assure stability in storage so that sticky, engine-fouling gums wouldn't form while the fuel awaited use. Also devised: corrosion inhibitors to maintain engine-and-fuel-system integrity.

Says John Rogers, aviation technologist at Du Pont's Deepwater, N.J., Petroleum Laboratory: "Whatever the additive and its function, it must be trouble-free from the time the fuel containing it leaves the refinery until the burnt gas passes out the aircraft's exhaust pipe. It should not influence fuel properties other than the particular quality item for which it is chosen; it should have no detrimental effect on engine deposits; it must be miscible and



Underground fuel reservoirs are newest device to facilitate aircraft servicing. Pilot pulls plane up to pump like a motorist in a gas station.



Refueling in 1930's was by hand pump from back of truck, left. Underwing loading, right, came later, greatly reduced costly on-ground time.

soluble at the required concentration, and should not be extracted by water; it must be realistic from a cost standpoint. Finally, it must be compatible with other additives present."

As for jet fuels, the antioxidants, corrosion inhibitors and metal deactivators are becoming more important as an integral part of their manufacture. Anti-icing additives are also being developed to serve critical functions required for safety under all flight conditions. Also achieved: additives to disperse insoluble fuel residues that tend to form in the high temperatures of jet operation.

The sky-wide future of the jet is underscored by the fact that in 1960 annual consumption of commercial jet fuel surpassed that of aviation gas and is expected to reach a total of over seven million gallons a day this year. "Avgas" is far from obsolete, though: it's the primary fuel for 80,000 private and business planes in the U.S.

John Rogers, in a talk before the International Air Transport Association in London recently, said: "The use of gasoline and jet fuel has increased significantly since World War II, and while prices of other commodities have risen in the period, there has been no increase in fuel prices. Additives help provide fuel at minimum cost, and it's well recognized that the saving of even a tenth of a cent per gallon in fuel price means several thousand dollars per year in operating a single international jet."

Added he in quiet understatement: "Production of aviation fuels satisfactory in this and all other respects is an exacting business."

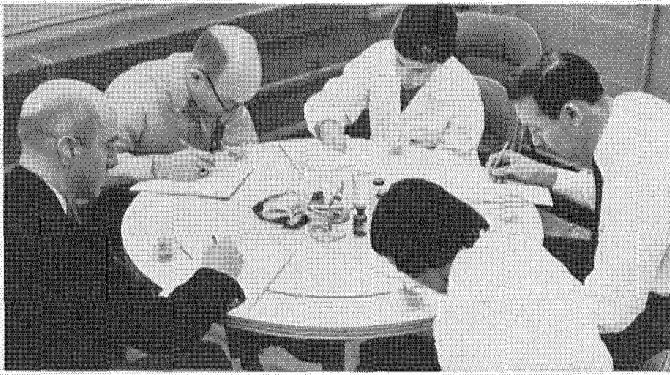


Fuel residues that form at high temperatures are studied by Du Pont aviation fuel specialists John Rogers, right, and Charles Pusey.

*Food scientists
put
last things first
to find
this product*

chip-O's: not off the old block





Food experts of Arthur D. Little, Inc., used Flavor Profile technique to devise an "ideal" corn chip.

By FRANK GUENTHER

Which comes first, a food or its flavor?

Most people answer "food." After all, doesn't a chicken precede an egg?

Not necessarily, say officials at Morton Foods of Dallas; what's more, they can prove it. When this large manufacturer and processor set out five years ago to develop a unique corn chip, it ignored the obvious logic that a food should exist before you begin to modify its flavor. Instead it called in Arthur D. Little, Inc., consulting research company of Cambridge, Mass. A joint Morton-ADL research team decided that to succeed, the as-yet-unborn food had to start life as a unique flavor. Ergo, they set out scientifically to devise a taste with sure-fire consumer appeal; the food could follow.

Last summer, after five years' work that progressed from flavor to processes, product design and packaging, the food arrived: a wafer-thin, silver-dollar-sized corn product called "chip-O's." Morton sold 100,000 pounds, all it had, the first week. In a short time, the product became so popular, one newspaper reported, that if you telephoned a Dallas teen-ager, he was apt to answer "chip-O" instead of "hello."

"Development of the flavor of chip-O's was a prerequisite to successful development of the food itself," says Jack D. Brown, Morton vice president of production. "With the flavor profile developed by Arthur D. Little, Inc., we were able to set up an ideal flavor model; then we could work backward to a corn chip possessing these ideal flavor characteristics."

Flavor is at once the most elusive, important and complex quality of food. The flavor you savor comes from chemical stimuli emitted by foods and other materials to the end organs of taste, smell and feeling in both mouth and nose. The tongue can detect characteristics like sweet, sour, salty and bitter in a wide variety of materials; the olfactory system can recognize tens of thousands of odors, some of them at surprisingly low concentrations.

To help define what you like and why you like it, the Flavor Laboratory of Arthur D. Little ten years ago developed its "Flavor Profile." By this analytical technique, food scientists can break down the elements of flavor in detail, and trace the effect of even small changes in food tastes and odors.

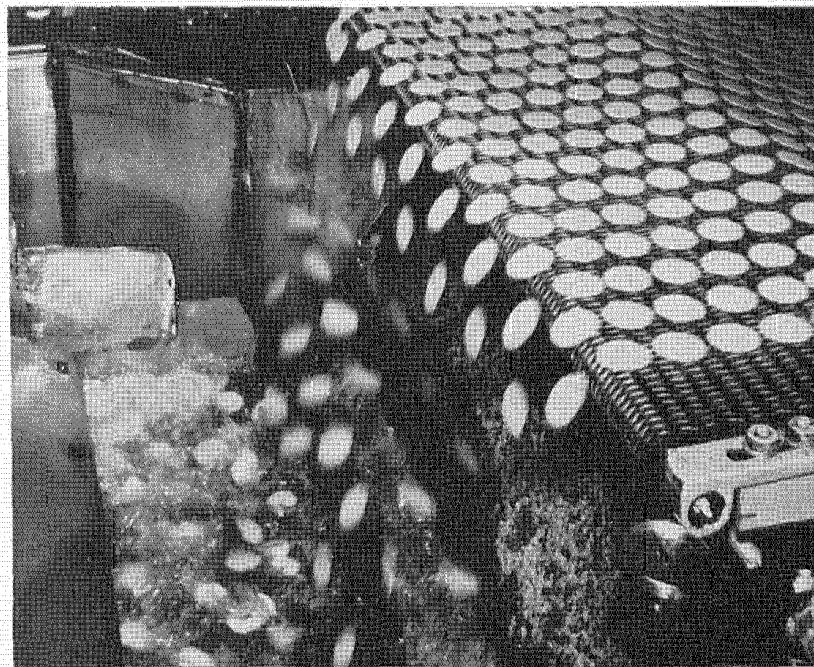
Thus, when Morton charged ADL with developing "a unique corn chip," the first step was a flavor profile of existing corn products. Panels of trained ADL tasters

probed foods for sweetness, sourness, and similar "perceptible factors"; sought to associate flavor elements with definite chemicals where possible; analyzed "feeling factors," such as astringency, labeling flavors as "dry mouth," or "cheek puckering," or "tongue or tooth coating." Also studied: intensity of individual taste and odor sensations; their order of appearance; aftertaste; and what ADL calls "amplitude" or over-all effect of a flavor.

"From our early work, we concluded there was a place for a distinctly new type of corn chip possessing greater individuality," recalls Dr. Edward Anderson, ADL's senior food technologist. "Nevertheless, we felt the product should retain the true Mexican identity—the traditional limed corn flavor associated with Mexican foods."

Though they hadn't yet captured the flavor, engineers drew pictures of it: two-dimensional graphic visualizations telling them that to appeal, the new food must have an early flavor impact; create a pleasant mouth sensation; rapidly develop a full-bodied flavor that would also rapid-

continued



Uniform circles of dough drop into fryer at rate of 800,000 per hour; then automated line salts, prepares product for packaging.

ly disappear when food was swallowed; and that there must be no unpleasant aftertaste.

Then began a series of formulation tests, using different varieties of corn kernels, in different proportions, cooked with various amounts and grades of chemical alkalies.

"Even at this early stage, we had our eyes on possible new cooking methods and processes we might translate into modern automated production equipment," Dr. Anderson recalls. "Sometimes researchers can spend months developing a good formulation only to find it can't economically be made into a product."

So the scope of the project enlarged from a search for new flavors and formulations to include new machines and methods to cook, soak, grind, form, fry, salt and package chips. A new mode of pressure cooking was evolved, eliminating irregular and uneven cooking. Soaking time was reduced from the usual 18 hours to one hour. The first production unit of a newly developed Urschel cutting mill was installed to supply the forming equipment turning out 300 square feet per minute of dough with improved texture. A continuous deep fat frying system was born to cook 800,000 chip-O's an hour, salt them on both sides, and move them by vibrating conveyor to automated packaging equipment.

A Different Look

Even the different look of chip-O's was slow going, Jack Brown recalls. "We tried many shapes, finally choosing a round one because this shape, when fried, produces many interesting variations in third dimension—variations in curling and waviness that add substantially to eye appeal. Then we tried different dimensions in round chips, eventually settling on the silver dollar because it was bite size, and lent itself naturally to dips and canapés."

For an easily identified and flavor-retaining pack-

age, the team decided on a double-wall bag of two moistureproof, heat-sealing Du Pont cellophane films. The liner, MSD-54, maintains the best appearance of all nitrocellulose films in contact with such snack foods. MSD-53, the outer wall, supplies the extra durability needed for a bag construction. Nine automated machines make bags and fill them in one operation.

Focus on Consumers

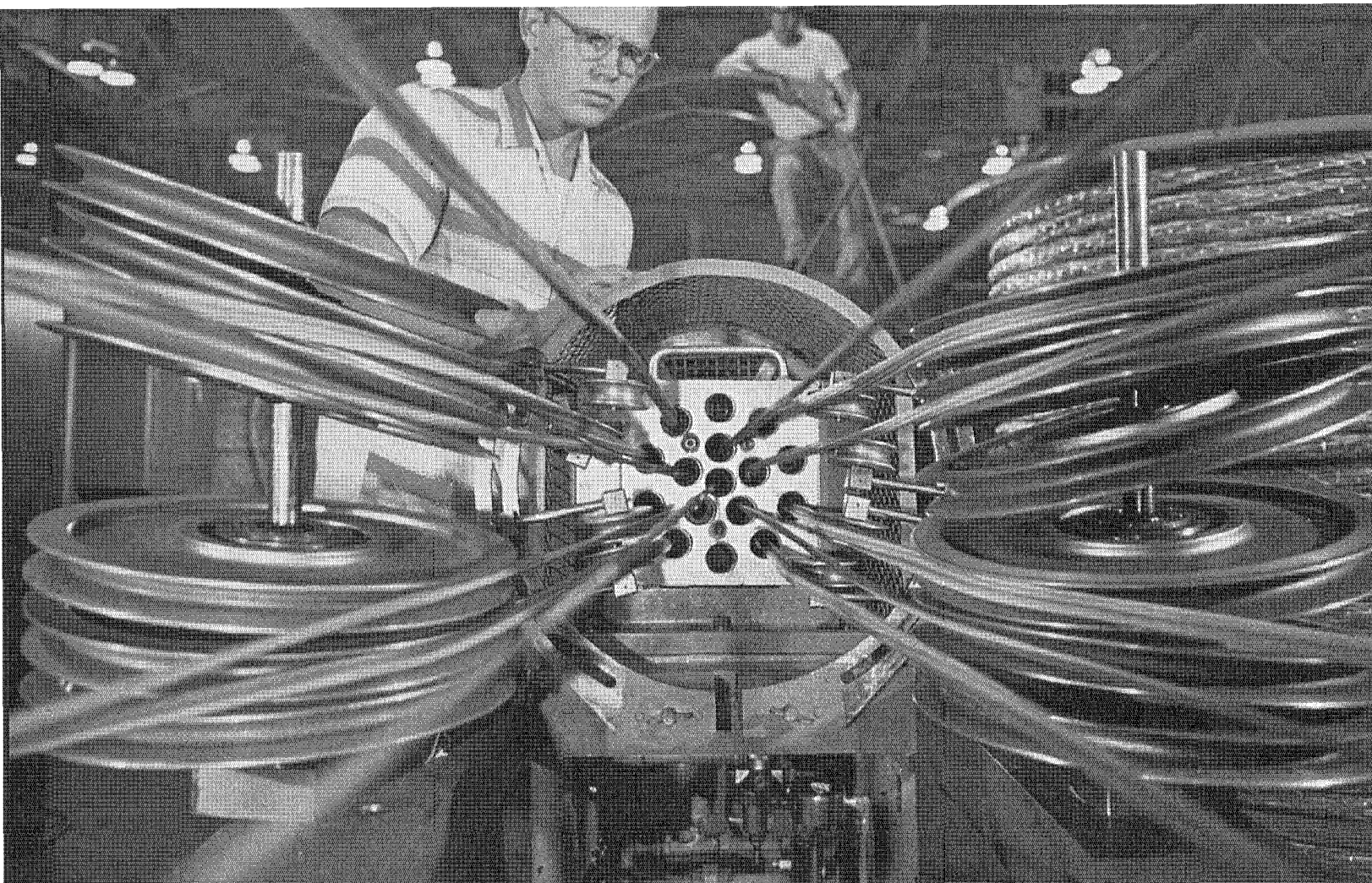
Packaging, the final step, had both to sell and protect; consumer satisfaction is a rule of life with President G. C. Morton, who 30 years ago printed "You Must Be Pleased" on the firm's first sales slips. Founder Morton was so sure people would respect and buy quality that he sold a successful sandwich shop in the depths of the Depression. Then he risked the \$15,000 he had realized on a small plant to make potato chips at a time when his competitors were practically giving the product away. Still Morton bought best quality potatoes and shortening, experimented, and started picking up and replacing bags that didn't leave the grocer's shelf in a given period. Gradually, people discovered that Morton's product was always fresh; they bought and Morton expanded, adding pickles, mustard and ready-folded napkins to his line. Today, Morton products range from black pepper and soda straws to salad dressing and tea; the company has expanded 13 times, reared plants in four Texas cities, built a fleet of over 400 route trucks and 41 large road transports.

Looking up from drawings of a 35,000-square-foot expansion prompted by chip-O's, production chief Brown gazes down his revolutionary processing line, and sums up the firm's newest venture in paradoxical terms. "This seeming to work backward is a real step forward. It's not a matter of putting first things last, so much as deciding which thing is really first.

"We agree with the consumer: the first test is taste."



Nine form-and-fill packaging machines turn out 18,000 cellophane bags of chip-O's per hour.



Colorful polyethylene-insulated conductors speed on way to become telephone exchange area cable.

WHAT'S CURRENT IN CABLES

By EMILY HEINE

It used to be said facetiously that the medical profession buried its mistakes, noted a British engineer in a history of power cables. The opposite, he observed, is the case with cable makers. Their successes lie quietly interred while their mistakes are dug up and analyzed.

Never have cable makers made greater efforts to predict—and so prevent—cable failures than they are doing today. It's well known that the stakes in the reliability game are high. A faulty control cable can cause a \$1 million missile to misfire. It costs several thousand dollars a day just to rent a specially equipped ship to raise a submarine cable for repair. A comparatively simple underground residential cable can bring home a design problem literally—and maddeningly—by

New materials add to the complexity of an already complex industry. But they also lead to significant improvements

making it necessary to dig up a prized back yard.

The photograph above might stand as a symbol of the dramatic improvements that have been made in cable in the last 20 years. It shows how telephone exchange area cable grows from twisted pairs of wire (any of which might connect your telephone with a central office). The colorful insulation is polyethylene, likely from a Du Pont "Alathon" polyethylene resin.

Polyethylene began to replace pulp as telephone conductor insulation in 1950. Today about 85 per cent of all exchange cable that Western Electric Co. produces for members of the Bell System contains polyethylene-insulated conductors. The thermoplastic is economically more attractive than pulp, although its

continued



Complex missile cable may have nylon-armored polyethylene insulation on conductors; a binder of "Mylar"; an outer jacket of neoprene.

price is much higher. Savings are accomplished because polyethylene has high dielectric strength and is unaffected by moisture. A system doesn't have to be hermetically sealed as older ones did. Sheath has changed, too. Until 1945 most Bell System cable had lead sheath; 98 per cent of the cable made today has polyethylene. Manufacturing savings are several million dollars a year, Western says.

Examples paralleling this might easily be found in the area of power cable, where lead, natural rubber, paper and paper impregnated with oil have largely yielded to newer materials. The parade of new insulations that began 25 years ago is still marching and the job of choosing the best ones for a given design gets more complex all the time.

Of the more than 600 companies serving the wire and cable industry, Du Pont probably supplies the broadest range of materials. Among the principal categories are elastomers, plastics, films, coated fabrics, textile fibers, insulating varnishes and wire enamels. Recognizing the problem of choosing the best material for a given application, Du Pont recently formed an interdepartmental Wire and Cable Council. It will evaluate future needs of the industry and serve as a clearinghouse for information about the various Du Pont products.

The first Du Pont elastomer to gain favor in the cable industry was neoprene synthetic rubber. Nevertheless, its history is short enough to lie within the working life of one man. Peter P. Murawski, now the Elastomer Chemicals Dept.'s representative to power companies, vividly recalls neoprene's early years.

"In a day when natural rubber sold for four or five cents a pound, we were offering something that cost \$1.05 a pound. To make matters worse, we couldn't even claim that our material was a good insulator. But we knew that it had a number of properties that would be attractive to cable makers. Properly compounded, it was far more resistant to weather and ozone than natural rubber; it was tough, pliant, abrasion resistant; it could withstand chemicals and extreme temperatures and deformation from cable clamps.

"It wasn't until after World War II that neoprene really started to have its day. By then, of course, it was much less costly. This trade report, written in 1945, is history. We had called on a manufacturer, in the cause of neoprene, as usual. The research director there told us about an idea for a one-shot cover of neoprene to replace the cotton braid that then protected weatherproof wire. That development opened a whole new area for neoprene."

Weatherproof wire—a category covering both line wire and service drop wire used by utilities—became, in fact, one of its major end uses. Another large application is in telephone drop wire. Neoprene holds a 20-year record, too, as jacketing on lighting and power cable in Pennsylvania Turnpike tunnels. Multiconductor cable covered with the synthetic rubber controls the signal system in the Lincoln Tunnel. From all of these places, the simple, important report is the same: neoprene has a job to do and it does it.

A newer Elastomers Dept. material is "Hypalon" synthetic rubber, a chlorosulfonated polyethylene. Aerial

An easily memorized code system using colored polyethylene has simplified telephone work.

cable is covered with it for resistance to corrosive fumes, air-borne chemicals, ozone and corona discharge. It can be colored readily for easy phase identification. The department also is developing "Hypalon" in a new form that doesn't require vulcanizing. This makes possible its use over such materials as polyethylene that would melt during vulcanization.

Polyethylene, Du Pont's first plastic to serve the cable industry, made its debut about the time neoprene was getting established. A cable insulated with it has been in service since 1939. Since then the Polychemicals Dept. has tailored a whole line of "Alathon" polyethylene resins for insulating and jacketing assignments. "'Alathon'," says M. A. Kubico, the department's wire and cable industry manager, succinctly, "keeps getting better."

"Environmental stress cracking was a problem with polyethylene in the early days," he explains. "The weakness stemmed largely from its low molecular weight tail. We got busy and came up with a succession of higher molecular weight polymers. 'Alathon' 1000, which we offer as a jacketing material today, is a many-fold improvement over the polyethylene we supplied in the 1940's and substantially better than our improved product of 1956."

Companion to "Alathon" 1000, Kubico says, is a high molecular weight insulation, "Alathon" 3530. Other newcomers to the line-up are high density resins that inherently are more resistant to mechanical damage and elevated temperatures than earlier types.

Polychem also markets these cable materials:

"Rulan" flame retardant plastic, which is based on polyethylene. It's the choice of International Business Machines as insulation for its new 7090 data processing system, and this use aptly points up its advantages.

"Zytel" nylon resin. Used primarily as an extra-tough armor for missile and aircraft wire, it also is attracting attention as a jacket over polyvinyl-chloride-insulated building wire. "The mechanical properties of the nylon permit a construction much smaller and tougher than conventional ones," Kubico explains. "Although it's somewhat more expensive to make, the installed cost is less than for commonly used building wires because the smaller diameter and smooth, tough surface allow longer and faster pulls through conduit. Installation damage is practically eliminated."

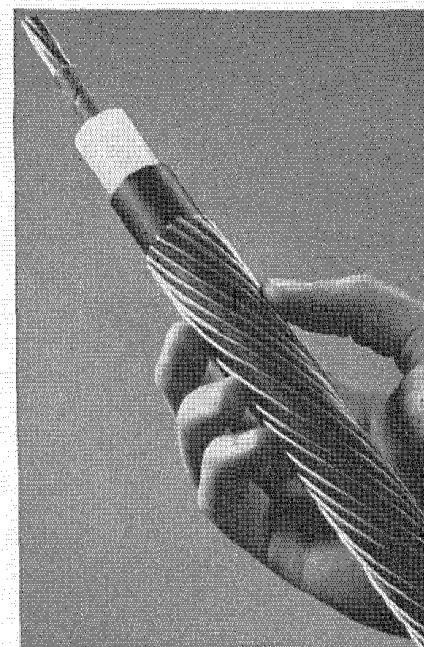
"Teflon" TFE and FEP fluorocarbon resins. Well established insulating and jacketing materials, they offer an extremely high degree of reliability. Although they have their greatest use in military applications, they are rapidly becoming economically attractive for a wide variety of industrial uses including computer wire, thermocouple wire and industrial control cable.

There are certain jobs for which elastomers seem clearly indicated (secondary network cable, appliance wire and ignition wire, for instance); there are others where plastics are generally used (communications cable and street lighting, to name two).

There are certain types of cables where either plastics or elastomers perform satisfactorily. Service drop wire, which carries power from the pole to the house, is a good example. Neoprene, "Hypalon" and "Alathon" all are capable performers and each has its staunch backers.

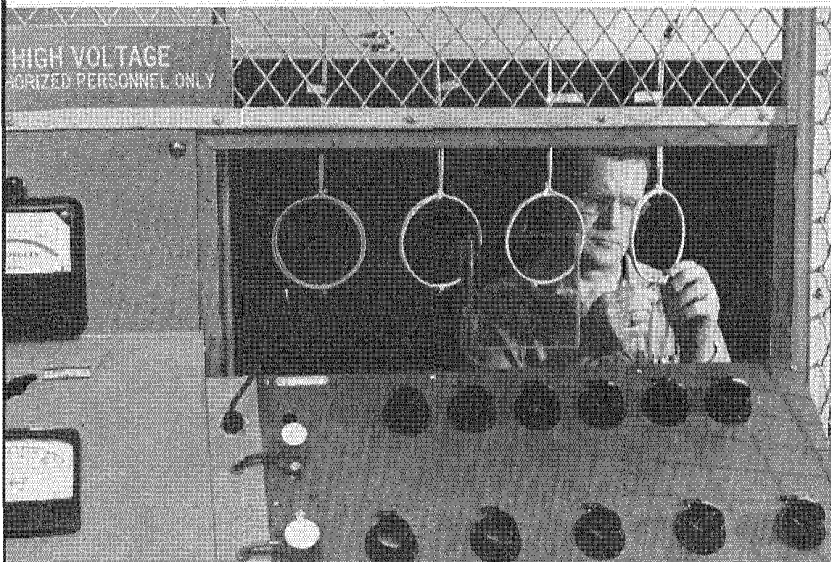
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Underground residential power cable made by Okonite Co. has nylon-taped conductor; insulation of "Alathon"; semiconducting jacket of "Hypalon".



An increasing number of designs capitalize on the best properties of both. A good example is missile cable made to MIL-C-13777, which may use "Zytel" nylon-jacketed polyethylene over individual conductors and neoprene outer jacketing over the completed cable.

Another example is the new underground residential power cable from Okonite Co., Passaic, N.J. Advantages of such cable, used instead of overhead wires, include improved appearance and fewer repairs.



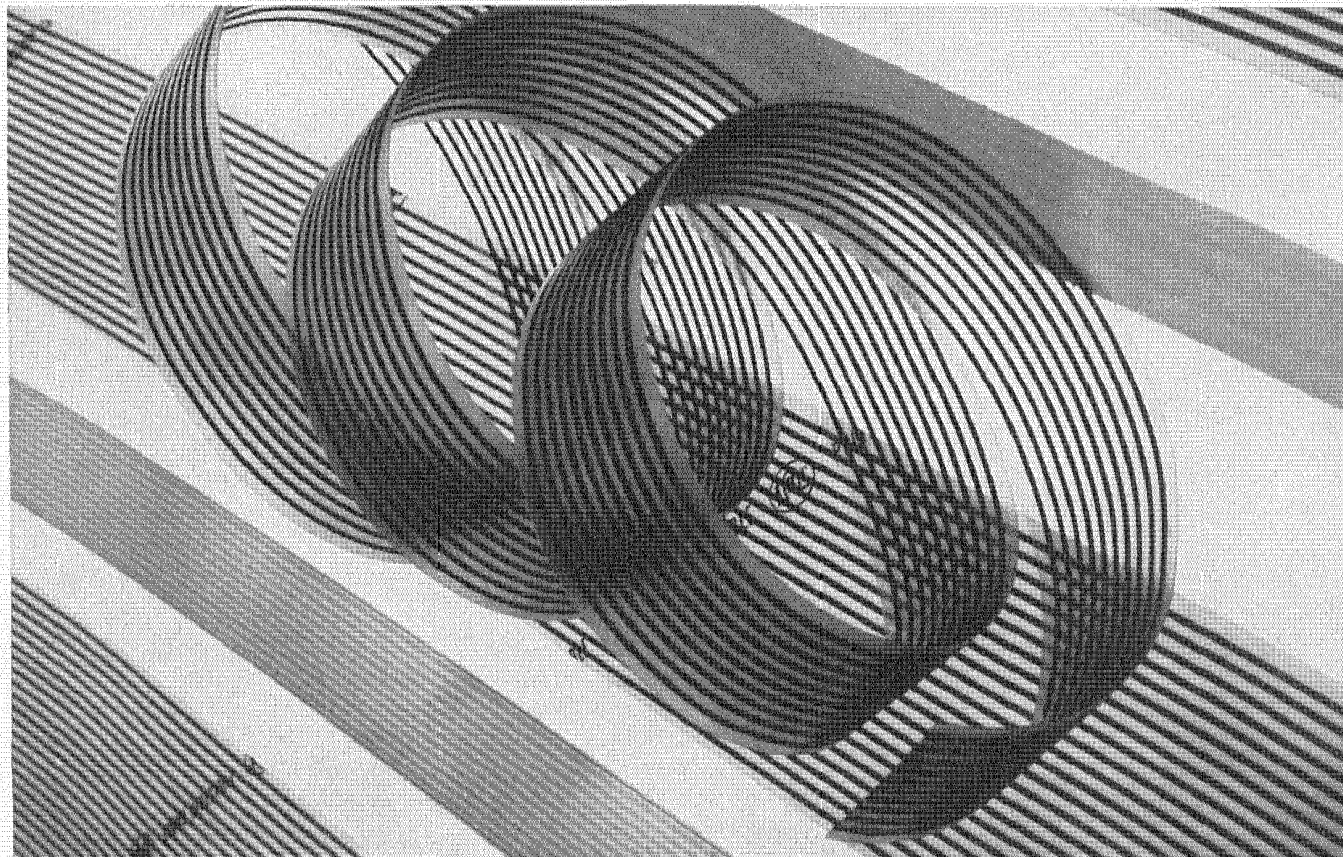
Dielectric strength of a promising new copolymer is measured by subjecting insulation to high voltage at Du Pont Elastomers Lab.

"We've been offering various types of UR cable since 1936 or 1937," says R. S. Hayes, Okonite's director of public relations. "For at least ten years we've known that a sound and economical design would utilize 'Alathon' and something else. Now we've come up with the right 'something else.' The new form of 'Hypalon' answers our need for an elastomeric jacket that doesn't have to be vulcanized. This has simplified the design and kept the cost down. We think we have a reasonably priced alternative to overhead wire."

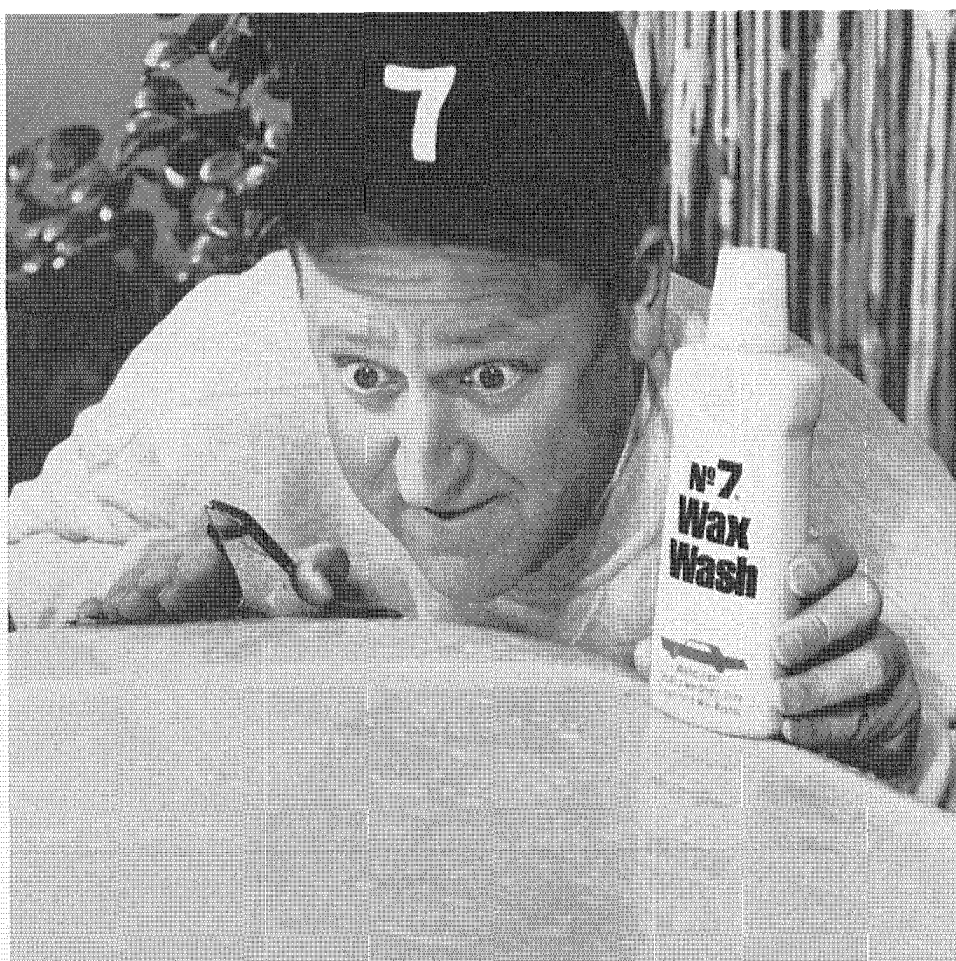
No single Du Pont material has a wider range of cable industry applications than "Mylar" polyester film, a product of the Film Dept. It serves as insulation, plasticizer barrier, separator and binder tape, moisture-proofing and identification tape; it also offers abrasion and mechanical protection. Laminated to metallic foils, it serves as electrostatic shielding. A new Film Dept. cable material, polyethylene-coated "Mylar", is fast finding use as shield isolation.

Du Pont films play a prominent part in the important new field of flat cables. Typically, these cables range from one to five inches wide and consist of flat conductors sandwiched between such materials as "Teflon" FEP, "Mylar", or combinations of "Mylar" and vinyl or of "Mylar" and polyethylene. A telephone company is testing flat cable for use inside homes. It has a pressure-sensitive backing that reportedly saves 50 per cent on installation labor; householders are pleased because it's inconspicuous.

What's current in cables? The answer has changed greatly in the last 20 years and will continue to change as new materials, now being designed, enter the field.



Flat cable, first adopted in missiles, has many potential uses. Conductors are sandwiched between such films as "Mylar" or "Teflon".



Water beads on car hood reveal to TV's Eddie Mayehoff the wax left by new Du Pont car wash.

Wax Wash's Wag

This month an important addition was made to Du Pont's No. "7" line of automotive specialties—a liquid car wash that contains a self-polishing wax. For consumers, this was news enough; for Du Pont's customers in the trade, though, the product signaled something extra.

The product is called No. "7" Wax Wash, and it's described as a true wash-and-wax material that deposits the wax during a normal washing operation. The concentrate's chemical ingredients remove surface dirt and provide a bright shine with no rubbing or other special afterwash procedures required. When used on modern car finishes in relatively good condition, subsequent applications (average cost to consumer: 20 cents each) bring steady improvement in gloss, since previously applied wax is not removed.

No. "7" Wax Wash can be applied to all parts of the car—wheels, chrome, trim and windows included—yet no wax residue remains on glass. The new liquid's ability to deposit firmly adhering wax on a painted surface but not on glass is due to an electrochemical phenomenon which prevents the material from smearing windshield and windows. This eliminates the annoyance of trying to avoid glass while washing a car with a cleaner containing wax.

In San Francisco recently, the owner of an automotive wholesale establishment signed a truckload order

for the new product. And it was here that the something extra cropped up. The caller from Du Pont—a new man participating in his first sale—took the customer's hand, pumped it vigorously, and with expansive pride in his remarkably mobile face, beamed: "That's my boy!"

Ordinarily, Du Pont representatives are not so ebullient, even when closing a large transaction. But for Eddie Mayehoff, TV, film and stage comedian, it was his first face-to-face experience with a customer in his new role as the most unorthodox product promotion man in Du Pont's No. "7" organization.

Mayehoff, whose portrayals of the winsome stuffed shirt have inspired critics to unaccustomed effusiveness (*Cue* calls him "comic of the century"), will serve as the unifying element in a series of television commercials Du Pont has scheduled this year—initially for the No. "7" Wax Wash, then later for other products in the line. He'll also contribute to point-of-sale promotions and take part in trade gatherings attended by Du Pont's wholesalers, jobbers and retailers.

Although entertainment is his forte (he has co-starred in movies with Bob Hope, Dean Martin and Jerry Lewis and won raves for his interpretation of the pompous general in the stage version of "Visit to a Small Planet") Mayehoff still cherishes memories of his pre-theatrical days as a salesman. Says he of his new role, therefore: "It's not exactly new to me, my boy."

Deep in the still-sultry gloom of the idle carpeting dryer Charles Andrews sweeps his flashlight beam over the clumps of snarled lint that have collected on the face of the unit's big air filter.

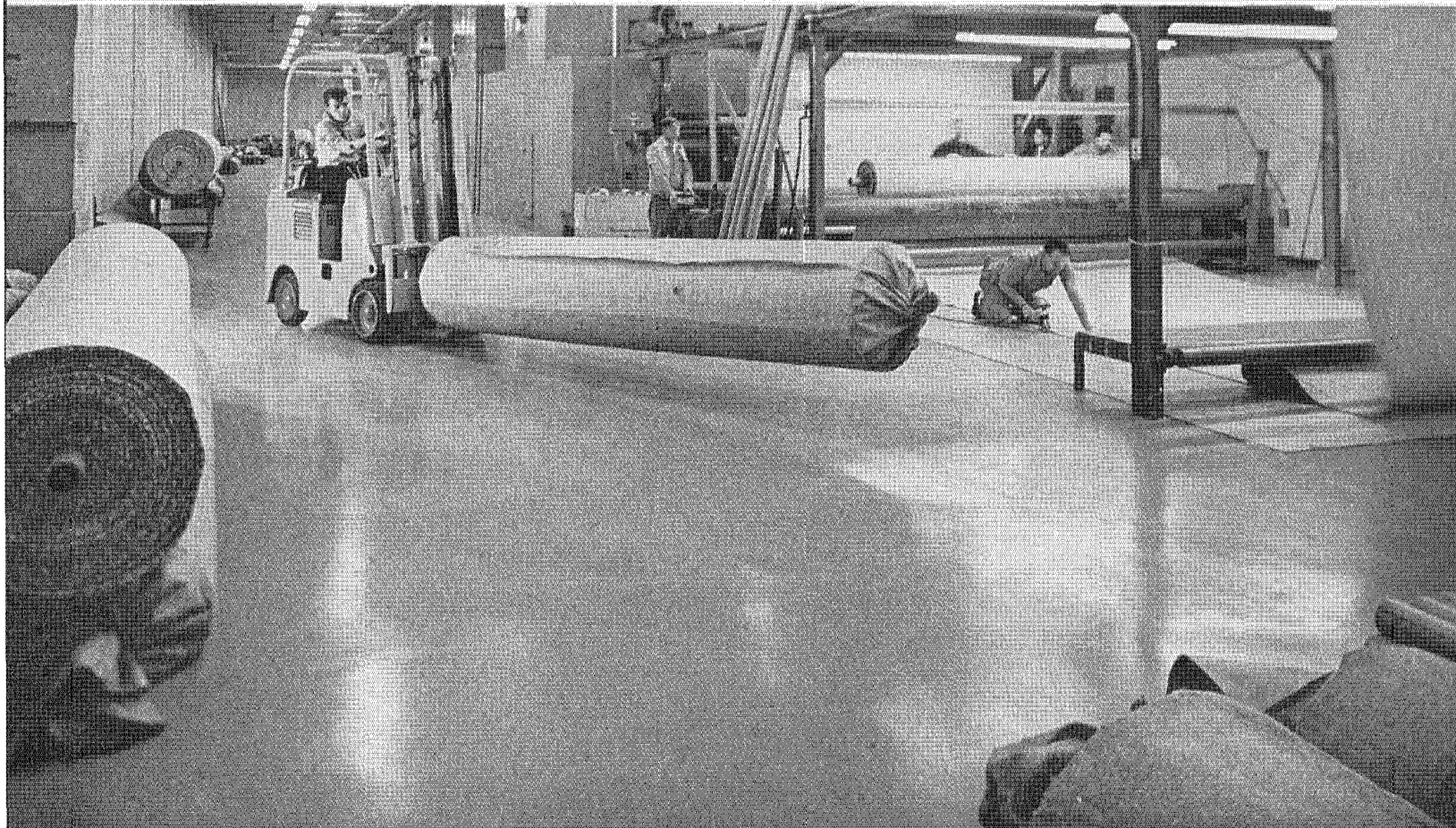
"See that lint?" he asks. "Well, it's nothing to what it could be if we didn't take special measures."

Andrews is supervisor of the finishing area at Beattie Manufacturing Co.'s plant in Little Falls, N. J., where up to 2,000 running yards of carpeting are dried and readied for shipment each eight-hour shift. He'll tell you that lint-picking is literally a major preoccupation of the textile industry. Says he:

"Whenever you work with large amounts of yarn like we do—even the high-quality synthetics such as 'Orlon' acrylic and nylon—tiny fibers separate themselves from the product. These cause two problems. First, they cling to floors or collect in nooks and crannies, complicating plant housekeeping. Second, they build up in these gas-fueled dryers, where too much lint can drastically reduce efficiency and create a considerable fire hazard. So, both for tidiness and safety, we make a big effort to keep lint to a minimum."

From textile mills to schools, maintenance men using a new urethane enamel are

Finishing Up Floor Problems



High gloss, soft hue of concrete floor treated with "Imron" urethane enamel enhance looks and practicality of Beattie's finishing area.

Today, one of the principal allies in this effort at Beattie and elsewhere is a new floor finish by Du Pont: "Imron" urethane enamel. The coating provides an exceptionally hard, elastic, high-gloss surface that prevents the accumulation of lint, oil and other foreign matter and makes it easy to clean once-stubborn areas.

Beattie applied the pigmented urethane to the floor of its finishing area last June. Since then, lint cleanup has been greatly eased, according to Gerard Bush, maintenance supervisor; moreover, he points out, the floor still looks like it has been freshly painted — despite the pounding of rubber-tired lift trucks and the shifting of stock.

The finish — available in horizon gray, light green, ivory, yellow and black — will protect not only heavily traveled floors and stairways but also dry cargo bins, holds and structures or equipment that take frequent abuse from abrasions, fumes or spills of alkalis, dilute acids and industrial solvents. And, although it has a slick appearance, "Imron" provides a surface that resists slipping hazards.

The new finish is essentially the same as the clear "Imron" textile floor finish, an oil-free urethane coating used successfully in more than 300 southeastern textile mills over the past four years.

For instance, more than a million square feet of hard maple and concrete floors in 11 mills of Fieldcrest Mills, Inc., have been coated with the clear finish since 1957. Some of these floors are more than 30 years old, yet "Imron" has given them a look of new freshness.

H. E. Williams, director of safety at Fieldcrest and coordinator of its floor refinishing program, cites four key advantages offered by the clear "Imron": (1) it cures rapidly, even in conditions of high humidity; (2) it is extremely resistant to abrasion where floors are belabored by employee traffic, hand trucks and bobbin boxes; (3) it is easily cleaned; and (4) it retains its clear sparkle without the yellowing, or darkening, that occurs with other floor finishes.

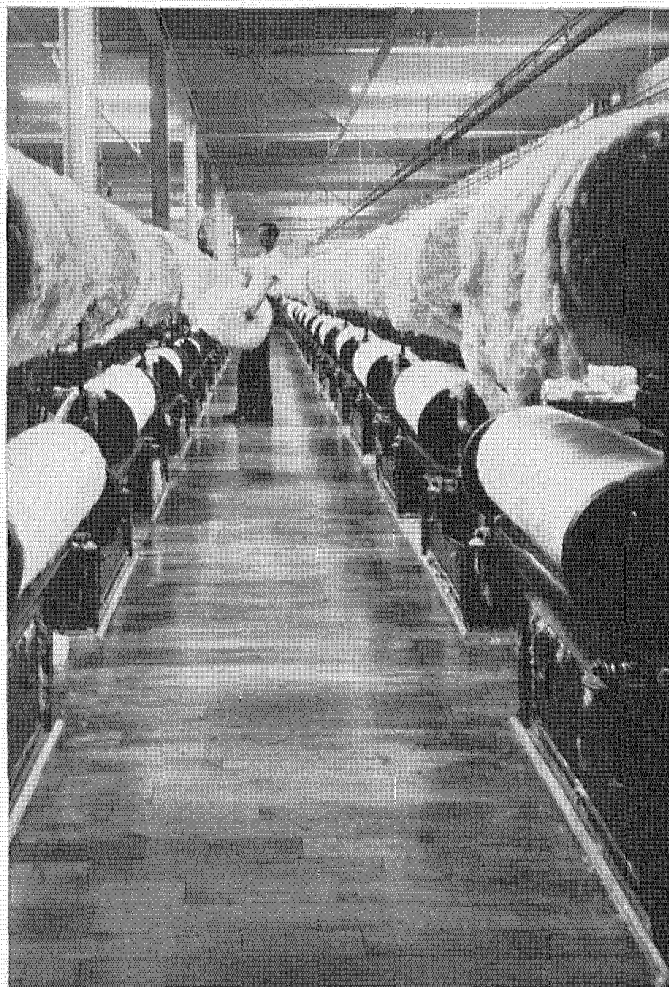
Minimizes Interruptions

Williams points to the fast-curing property of "Imron" as being particularly significant to textile mill operators. "In high humidity conditions," he says, "the moisture in the air actually helps by serving as a catalyst. The higher the humidity and temperature, the faster the dry. In 50 per cent humidity or higher, floors are tack-free in one to two hours and can be buffed and recoated in three to four hours — a factor of some importance in keeping operations interruptions to a minimum."

As a result of these and other field uses, "Imron" has attracted the attention of maintenance people from paper mills, pharmaceutical plants, public utilities, chemical laboratories, machine tool plants, chain stores, schools and office buildings.

"Imron" enamel can be applied to wood, masonry, metal and concrete with equally good results if surfaces are properly prepared. (At Beattie, for example, the concrete floor was washed with clear water, etched with a five per cent solution of muriatic acid, flushed with water, thoroughly dried, then given two coats of horizon gray.) Assistance in initial applications is available through Du Pont's Industrial Maintenance Finishes Division.

The enamel is packaged in one-gallon and five-gallon



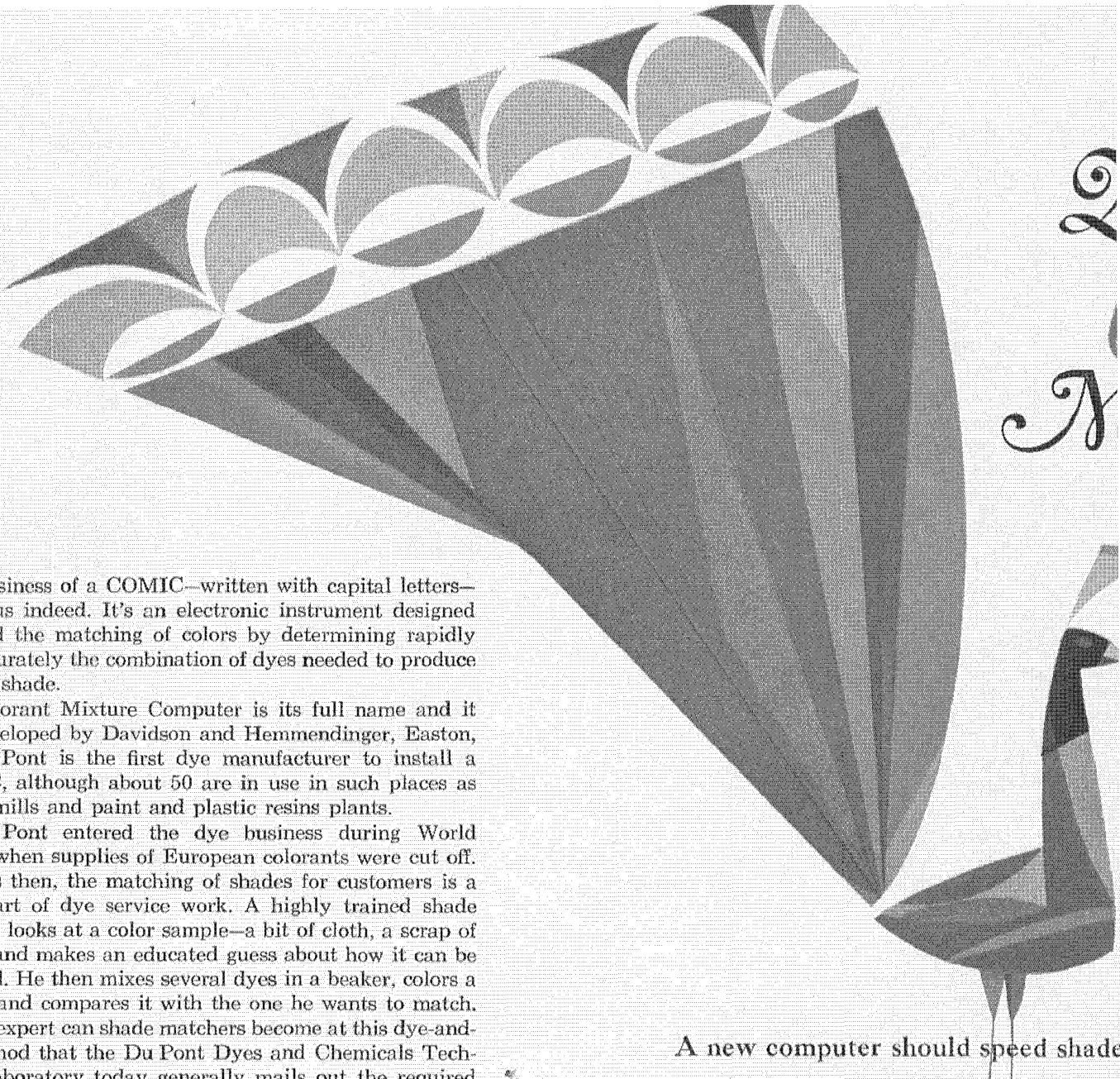
Abrasion resistance, easy housekeeping are noted in Fieldcrest mill where maple floors are coated with "Imron" textile floor finish.

two-compartment containers. In one compartment is the vehicle, similar to the clear "Imron" textile floor finish, and the other contains the pigment paste. They can be mixed as received, and the finish is applied by either brush or spray. It covers 410 to 435 square feet per gallon and forms a film about two mils thick.

The enamel is tack-free in four to six hours after application in a temperature of 77°F. with 50 per cent relative humidity. In these same conditions, a second coat can be applied after 16 hours.

Although "Imron" floor finishes involve slightly higher initial expense, users report that increased service life and reduced maintenance costs more than offset the difference. Field tests show that for wooden floors the average cost of preparation, application and materials in applying two coats of clear is 12 cents per square foot, compared to ten cents per square foot with conventional varnishes of good quality. However, service life for "Imron" is found to be two to three times that of the other finishes.

Beattie's Gerard Bush is as pleased with the pigmented "Imron" as he has been with the clear variety that's been used on the wooden floor sections of his plant. He applauds the ease with which lint comes up from the enamel, the rapidity with which truck tire skid marks wash away, and he says with an air of esthetic appreciation: "Sure looks pretty, too, doesn't it?"



The business of a COMIC—written with capital letters—is serious indeed. It's an electronic instrument designed to speed the matching of colors by determining rapidly and accurately the combination of dyes needed to produce a given shade.

Colorant Mixture Computer is its full name and it was developed by Davidson and Hemmendinger, Easton, Pa. Du Pont is the first dye manufacturer to install a COMIC, although about 50 are in use in such places as textile mills and paint and plastic resins plants.

Du Pont entered the dye business during World War I, when supplies of European colorants were cut off. Now, as then, the matching of shades for customers is a large part of dye service work. A highly trained shade matcher looks at a color sample—a bit of cloth, a scrap of paper—and makes an educated guess about how it can be matched. He then mixes several dyes in a beaker, colors a sample and compares it with the one he wants to match.

So expert can shade matchers become at this dye-and-try method that the Du Pont Dyes and Chemicals Technical Laboratory today generally mails out the required dye formula within 48 hours after a query is received.

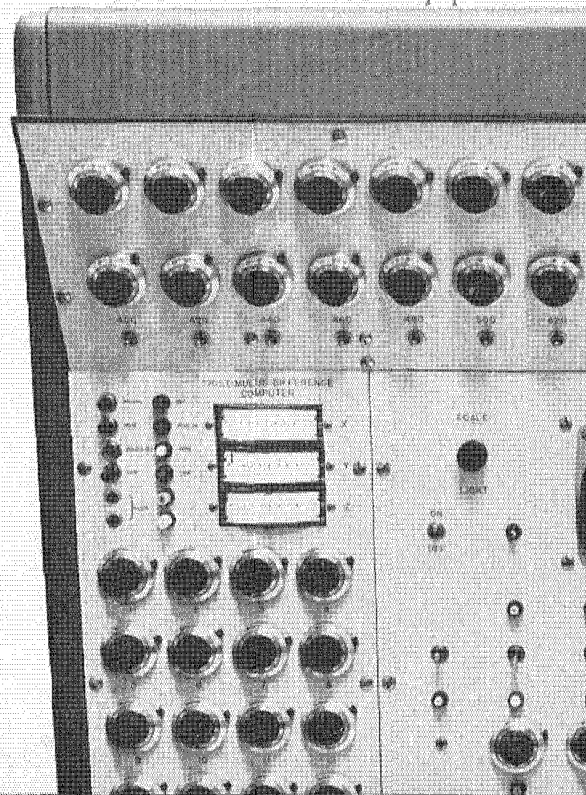
But mailed samples take time to reach the laboratory and then get back to the customer. A paper mill, say, that needs to know a dye formula to bid for an order wants answers fast. Moreover, there always are stubborn samples that might require several days or a week to duplicate. Here, especially, is where the COMIC fits in.

It usually can find suitable formulas in one-half to one-quarter as many trials as purely visual methods commonly require. Du Pont dye specialists emphasize, however, that it is not a cure-all for shade matching problems. Certain dyes that fluoresce, for example, present particular difficulties.

Color can be analyzed by an instrument called a spectrophotometer, which measures the fraction of light reflected at each wave length of the visible spectrum. Each shade, then, has its peculiar profile, called a "spectrophotometric curve."

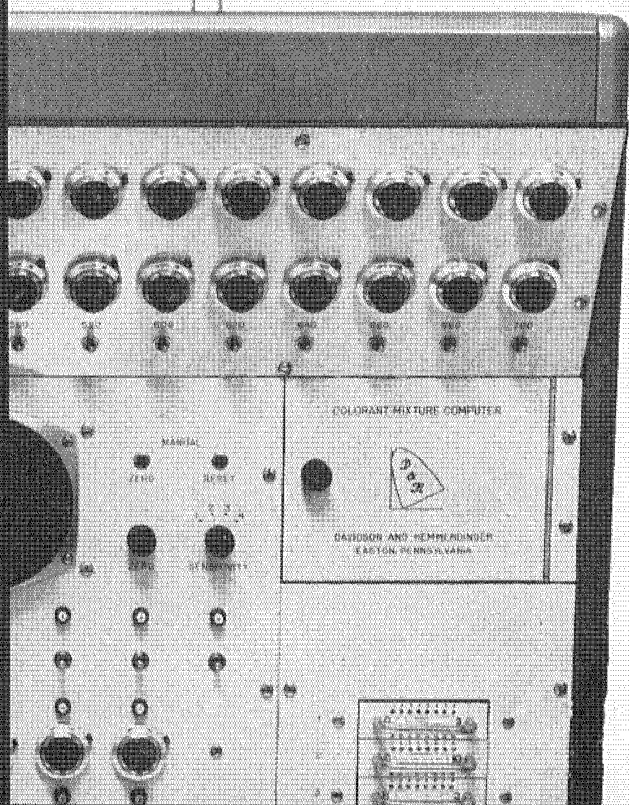
Before it can function, the COMIC needs values derived from these curves, not only for the shade it seeks to match but also for several dyes that, it seems likely,

A new computer should speed shade



cker
lor
atches

ing service to Du Pont dyes customers



would combine to produce it. This information is fed through "plug-in" boxes, one for each colorant.

It takes an operator with both ability and experience at shade matching to select the right plug-in boxes. He must choose dyes that not only match the shade but also meet the customer's requirements in such properties as bleed- and light-fastness and that are in an acceptable price range.

When measured values for both the sample and the trial match are placed in the computer, their differences appear as a curve of dots on the oscilloscope. The operator then adjusts concentration dials to make his trial formula match the straight zero line. If no combination of dial settings will do this, he switches to other dyes by replacing one or more of his plug-in boxes and tries again. His goal is to achieve a match that is spectrophotometric—that is, one that looks the same as the sample under all lights.

This COMIC model is equipped with a Tristimulus Difference Computer (TDC) for use when such a perfect match is impossible. With it, an operator can quickly obtain the best metamerism match—a shade that looks the same as the sample in some lights although not in all.

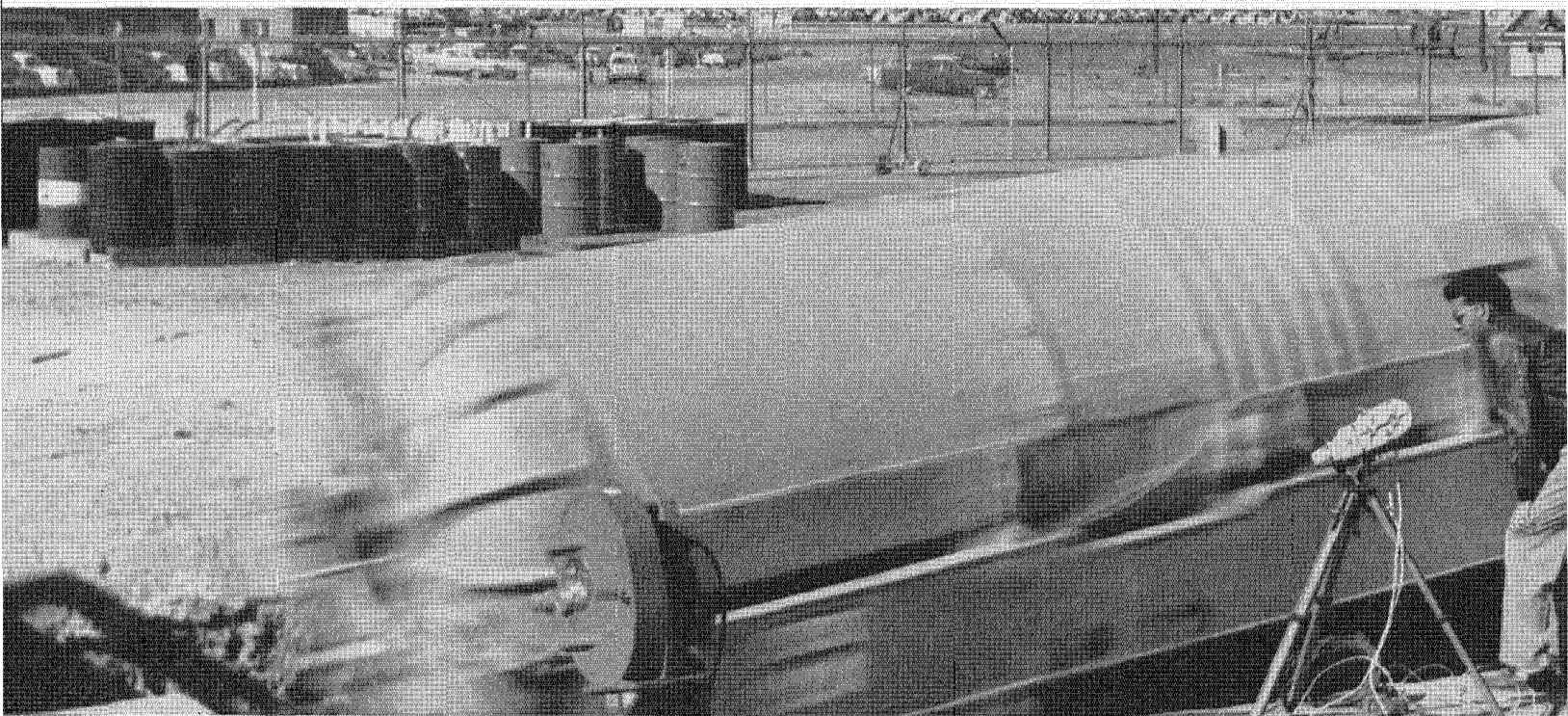
Generally, Tech Lab makes a test dyeing to compare the COMIC's first approximation with the given sample. In some cases, the match is acceptable; more often, however, adjustments are necessary. Experience to date suggests that most COMIC matches are successful on the second or third try.

Precious time is lost—and the value of the COMIC lessened—if Tech Lab must prepare the spectrophotometric profile of the sample it seeks to match. Ideally, a customer would plot this curve on his own equipment—a recording spectrophotometer or equivalent instrument equipped to make reflectance measurements. He could then relay the spectrophotometric points to the lab and quickly get back the formula for a match.

Such an ideal system is on the horizon. Du Pont dye specialists want to be certain first, though, that they have as thorough an understanding as possible of how the COMIC can perform. Applications that will develop with experience, they say, will make it an even more valuable tool in handling color problems.

BOTTLE FO

Polaris missiles are containerized for train trips from plant to port. Neopren



Shock absorbing capacity of missile container is tested by slamming extensively instrumented prototype against a concrete wall

By E. F. T. RICE

Sunnydale, Calif., is the tranquil-sounding origin of one of the most imposing weapons in the U.S. arsenal, the nuclear-armed, submarine based Polaris rocket. As the embryo "birds" come off the assembly lines at this West Coast manufacturing site of Lockheed Aircraft Corp.'s Missile and Space Division, they are quickly distributed to sub bases on both the Pacific and Atlantic. Each member of the globe-girdling Polaris sub fleet carries a full complement of sixteen missiles.

In their journey from plant to port, Polaris missiles go first class, stowed in very special containers designed to protect both missiles and their solid fuel rocket engines from harmful environmental exposure or damaging shock conditions. Looking something like huge thermos bottles, the ribbed steel containers are pressurized to 20 psi at 70°F. and dehydrated to a humidity range of 5-300 grains H₂O/lb. air at 100°F.; they're air conditioned because of the 50-110°F. temperature limitations on the solid rocket propellant. Within the strong outer shell the missile is sheathed in a close fitting inner cylinder. A series of air springs, attached to the inner surface of the steel shell, isolate the missile tube from external shock.

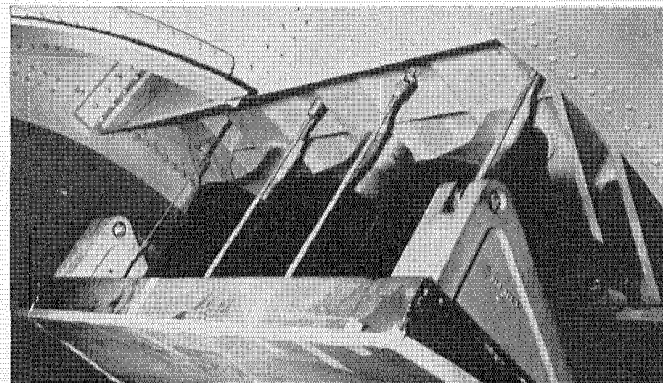
Design and manufacture of the air springs was an extensive technical project carried out by The Goodyear Tire & Rubber Company, Akron, Ohio. Out of a series of experimental constructions emerged the "rolling lobe" type of spring, which is essentially a fabric-reinforced neoprene synthetic rubber sleeve attached to an internal piston. When the piston thrusts against a preset internal air pressure, the sleeve turns inside out and a bulge is

created where the infolding occurs. This is the lobe. As the piston moves, the lobe ripples along the exterior—hence "rolling lobe."

Type 714 Du Pont nylon tire cord is used in the carcass of the neoprene spring. It is pretreated for minimum stretch and shrinkage and is not woven, but laid in parallel strands (with a few transverse "pick cords" to hold it together). Two plies are laid up, similar to the way a tire is built. These intersecting cord plies increase strength; rather than rupturing when subjected to extreme inversion, a cord-reinforced sleeve actually tightens its grip on the end connections.

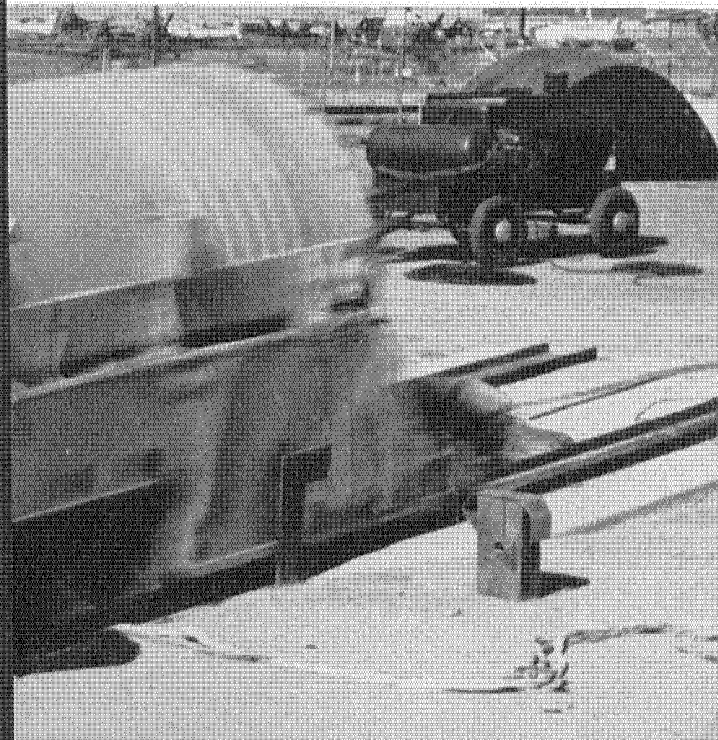
Photos, right, of a typical rolling lobe air spring under test illustrate how it looks when loaded. Precisely how well the spring performs depends upon many factors Goodyear found, including the shape and dimensions of the lobe which, in turn, is modified by the shape of the piston and the length of its stroke. Load-stroke curves were plotted for a variety of spring designs, operated un

Eight sets of three neoprene air springs, attached to inner walls of containers, cushion Polaris during shipment.



A ROCKET

springs absorb transportation shocks



der various inflations, speeds and temperatures.

The final stage of development included studies of spring characteristics on a full-size Polaris container. This work was conducted at Goodyear Aircraft Corporation's plant in Litchfield Park, Ariz., where the containers were built for Lockheed after the joint development work by GAC and Goodyear Tire engineers.

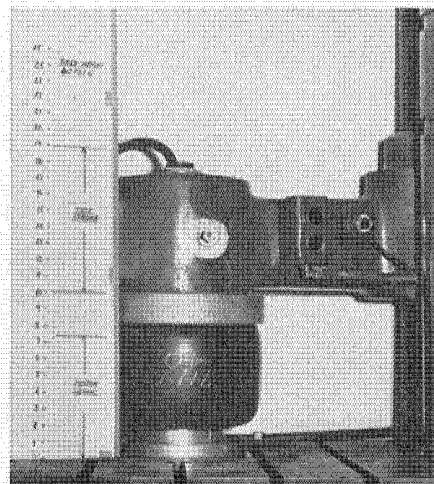
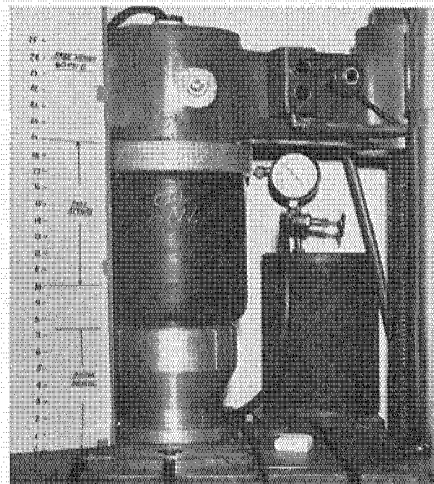
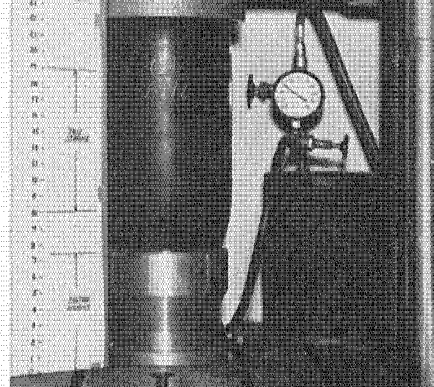
In the present design, eight spring assemblies, each using three air springs, are mounted in forward and aft positions in each quadrant around the cylindrical portion of the missile container. Additional air spring mountings in the two dished end sections complete the system.

Cushioning specifications call for reduction of longitudinal shocks from 22 G's down to 6 G's and of transverse shocks from 7 down to 4 G's. That the springs readily attain this performance was graphically proved in one instance when a missile-carrying train was involved in an accident. Longitudinal forces of 32-33 G's were experienced (recordings were made by an accelerometer that had been installed to measure normal shocks via rail) and the suspension system dampened this extraordinary shock to a mild 3.5 G's.

Spectacular confirmation of Goodyear's sound engineering design gratified but didn't particularly surprise A. B. Hirtreiter, chief engineer, air suspensions, who showed us through their mechanical testing labs at Akron. Goodyear has been in the air springs business for over six years and has furnished many thousands for automobile, bus and truck service. More recently, Goodyear rolling lobe air springs have been specified for cushioning

Appearance of a rolling lobe air spring as it yields to a loading force is seen in these three photos taken in Goodyear's mechanical testing laboratories.

The neoprene sleeve actually turns inside out as the spring is progressively compressed.



equipment aboard the newest naval vessels, the *Forrestal*, *Enterprise*, *Constellation* and *Kitty Hawk*.

Hirtreiter recalls that natural rubber and a variety of synthetics had been considered for these air springs, but a neoprene compound was ultimately selected. "Neoprene has good dynamic properties, approaching those of natural rubber; good abrasion resistance, compared to other oil and age-resistant rubbers; and good resistance to atmospheric ozone, oil and aging."

The missile containers are reusable and all materials used in their construction must have a minimum service life of three years. They are normally transported on railroad flatcars but may be air lifted, trucked, water borne, and, according to Hirtreiter, "are rugged enough to be drawn by oxcart." Whether carried by car, cart, or cargo plane, the Polaris missiles are cradled — as carefully as any glass bottled ship model — in their custom-fitted, air spring-cushioned "rocket bottles."

Whipped Cream of the Crop

The snowy mound that graces the dessert at the left is more than whipped cream to men of the Du Pont "Freon" Products Division. For them, it's a giant step toward a faster-growing aerosol-dispensed food industry, which till now has lagged far behind nonfood aerosols.

The cream was discharged by a new food propellant blend featuring "Freon" C-318, which has just been accepted by the U.S. Food and Drug Administration as a food additive. Chemically octafluorocyclobutane, the compound is nontoxic, colorless, odorless and tasteless; it doesn't modify the flavor of even the blandest cream.

"This is the first time the advantages of liquefied gas have been available to food processors," explains Larry Hall, "Freon" marketing associate. "Now they can get both higher quality products and a wider choice of propellents. Foods that before now couldn't be dispensed with aerosols are now possible."

To start, though, whipped toppings is the market. First to adopt the product is Golden Guernsey Dairy Co-operative, which is using C-318 in a blend with nitrous oxide supplied by Ohio Chemical & Surgical Equipment Co., of Madison. One result: Wisconsin housewives using "Reddi-Wip" and "Top-Wip"—and institutions using "Font-Wip"—will shortly notice that the creams stand up both longer and higher.

Tests show that "Freon" turns out ultrastiff, unusually white topping that doesn't yellow. Many an aerosol-using hostess is all too familiar with cream that soon loses texture and collapses to a draining ooze. The new propellant turns out tiny, tightly knit bubbles that keep the foam standing firm and tempting for an hour on cool desserts. Thus the hostess doesn't become a ghostess; she can top desserts at leisure before dinner instead of rushing later, after guests arrive. In cafeterias, where desserts wait in display cases, stable foam is even more essential.

Heat is ordinarily the ruin of whipped cream, Hall explains. "The new stiff toppings, however, hold up 15-20 minutes on hot gingerbread and the like, compared to five minutes at best for current products. Even in vegetable toppings, creams propelled by 'Freon' stay suitably firm. In fact," he adds, "the lower the fat content of cream or topping, the more dramatic the improvement. It's even

possible to make toppings with very little fat—a new opportunity for marketers in a calorie-counting country."

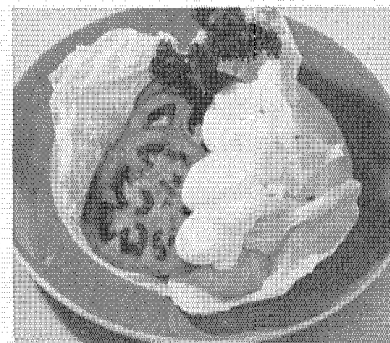
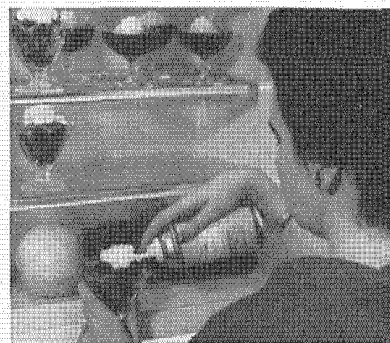
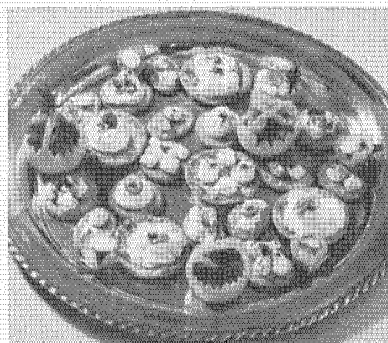
One notable feature of C-318, when used as the only propellant, is that it doesn't lose its push before the food is gone. Until now, compressed gases like nitrous oxide, nitrogen or carbon dioxide have been used. But each squirt of food has meant reduced pressure, for as product is dispensed, compressed gases expand to fill the emptying can, and a lower quality product ensues. With C-318, however, there's a reservoir of power that keeps vapor pressure uniform so long as liquid propellant remains. Not only is the last serving of food the same frothy quality as the first, but there is no "fizzed out" can—still sloshing with food in the bottom—to alienate housewives.

C-318 is not a panacea, of course. Initially, the product is expensive, and Hall points out that such factors as solubility or compatibility of the propellant with each food have to be checked. But with a fully accepted liquefied gas available, companies can now spend research monies with some assurance of a return. There's room for growth; for while Americans are using 700-800 million nonfood aerosols a year, food units are running only 65 million, almost all of which are whipped toppings.

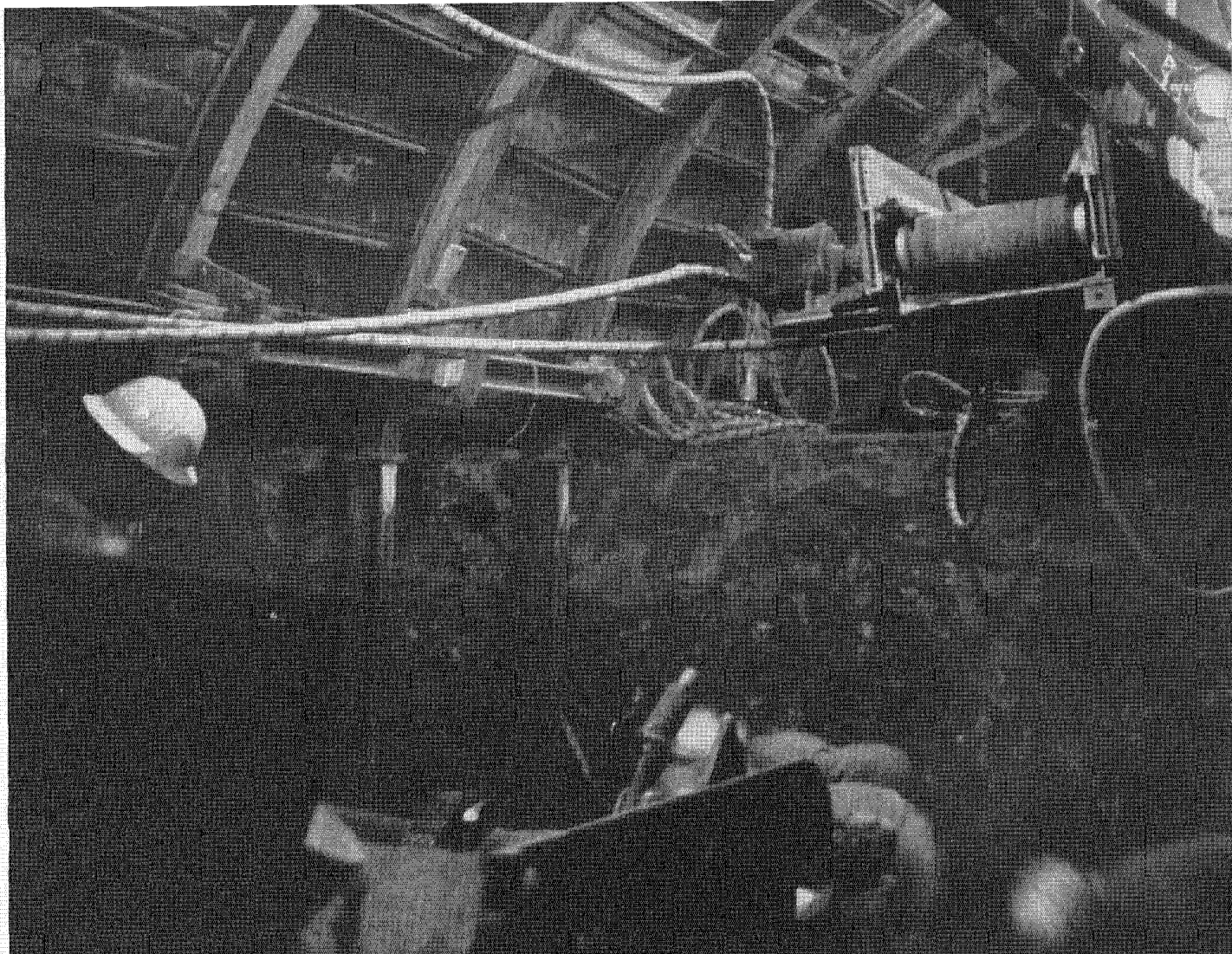
"Our development studies suggest this may only be the beginning," says Hall. The compound shows promise for pushbutton foods such as cheese and canapé spreads; mayonnaise; spice extracts and flavorings; salad dressings; and even butter for cornbread and other crumbly edibles. Chocolate and strawberry flavored toppings can be made with whipped cream or vegetable emulsion bases. Pancake mix and peanut butter are not impossible.

"Besides giving a stable, uniform product whose flavor is locked in a sealed container, aerosols can bring real conveniences. Consider cake frostings: just as cake baking has been simplified, so the job of beating icing and messing bowls and mixers can be eliminated by C-318. A housewife could apply frosting by pressing a button."

Much useful information regarding compatibility of C-318 with many types of food ingredients has been developed in the course of testing and experimentation, and is available to food packagers as part of "Freon" Products Division's regular technical service.



You may see: cheese and canapé spreads . . . long-lasting dessert toppings . . . mayonnaise and specialty salad dressings.



In huge storm drain, clay layer atop rock bench is mined out with air spades, dumped by conveyor.

THE WORLD UNDER CH

By S. S. JENKINS, JR.

Sixty feet below what will soon be a model city highway, construction men and explosives experts are burrowing a 15-mile-long tunnel that few Chicagoans will even know exists.

The \$15 million project is the huge main storm drain of the South Route Expressway, a soon-to-be completed, eight-lane addition to more than 100 miles of high-speed highway Chicago has built in the past 15 years. Traveling the entire length of the expressway, the underground drain varies in size from 4x4½ feet to 13x14. Its sole function: to carry away the heaviest rainfalls without flooding.

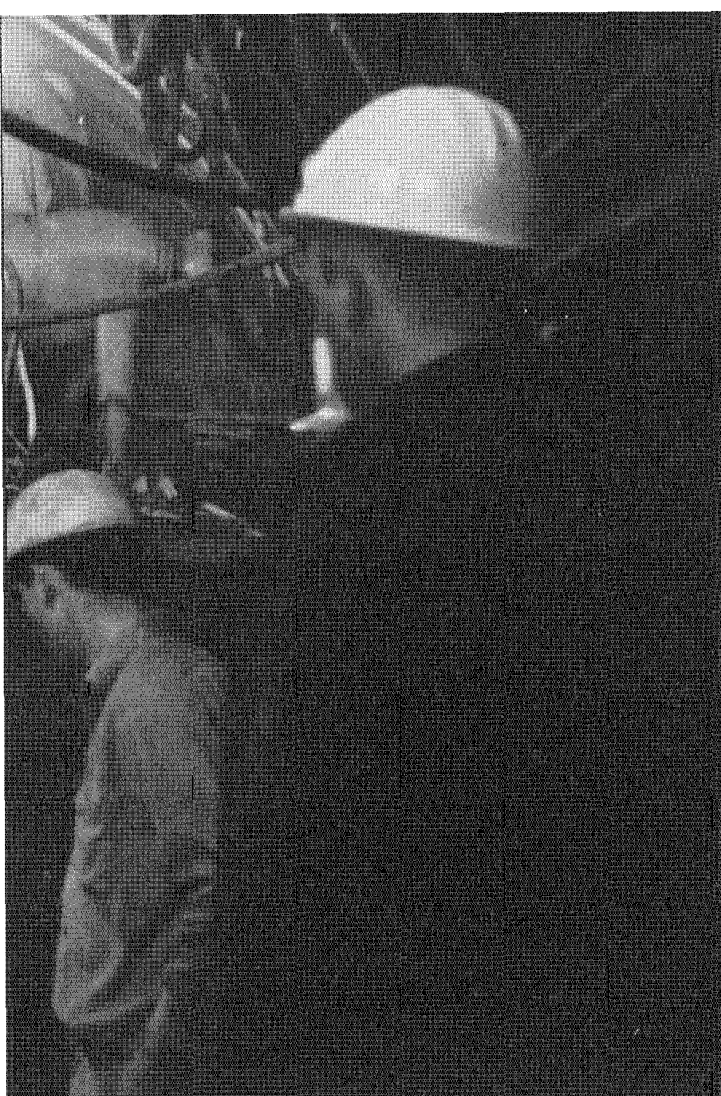
In Chicago, it takes a lot of cooks to follow the Army Engineers' classic road-building recipe, "Get the water off and the rock on." This entire region is a broad, very flat plain interrupted only by barely discernible ridges and divides, and it contains very few natural watercourses. In addition, since August 1922, when the Calumet-Sag Canal was opened, Chicago has kept all drainage out of Lake Michigan, the source of its water supply. Result is that the city depends upon a huge artificial drainage system

in which the bulk of unwanted water is carried off by three streams, the Chicago, Des Plaines and Calumet Rivers.

Ordinary road drainage ditches wouldn't work with the South Route Expressway, southward spoke of a wheel whose hub is downtown Chicago. Volume of water to be removed was too great, and the expressway goes through residential and manufacturing areas. Only answer was an enormous storm drain, sunk not only below the road but also below the river levels. Because water must be hoisted 50 feet into run-off streams, pumping stations were needed.

At 24th Street and the Chicago River, W. E. O'Neil Construction Co. is putting in a facility to handle 108,000 gallons of water per minute, with additional storage being available in the tunnel itself. A similar station is going up at the Calumet River, and several smaller booster stations are installed along the route.

The tunnel has been planned in sections, each worked by individual contractors, including Kenny Construction Co. of Illinois, Inc.; John C. Tully Co.; Michael Pontarelli Inc.; S. A. Healy Co.; and John Doherty Co., Inc.



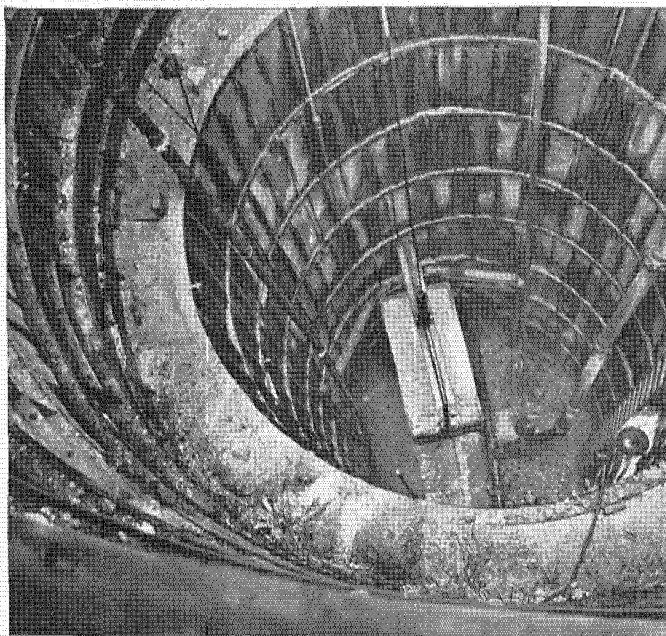
...ove, into mine cars for removal. Then explosives crews blast out rock.

CAGO

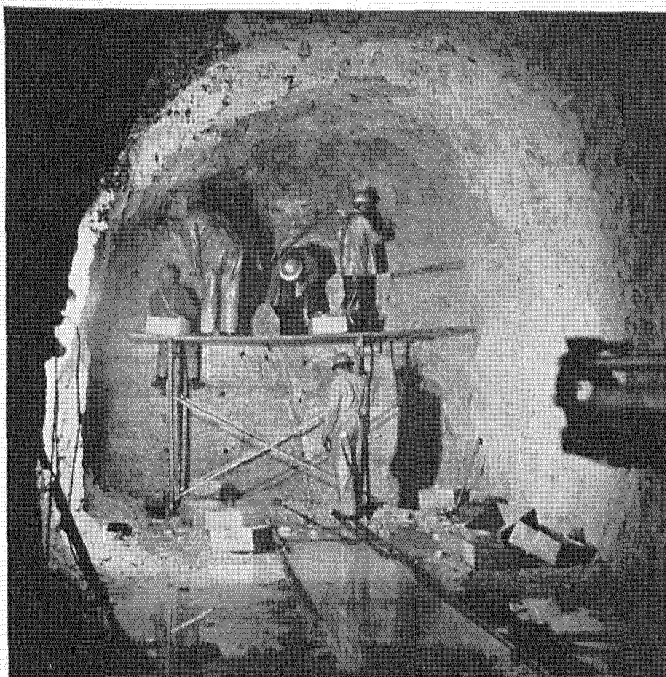
In the 15-mile stretch, these tunnel men have found that Chicago rests upon every kind of foundation: sand, hardpan, clay and rock, and at times, mixtures of all. Only one contractor, Kenny, has encountered solid rock from floor to ceiling; the others are dealing with "partial rock headings," sandwichlike faces with clay tops and rock bottoms. "These slow the job," explains a foreman, "because we have to delay using explosives until we mine out the clay with air spades. Then, when we blast the bared rock, we have to be careful that we don't knock out roof supports. If the clay is hard or when the layer on top of the rock is hardpan, we can blast out the full face, and get a faster advance."

By the time the job winds up, nearly a half-million pounds of explosives will have helped carve the route. To meet wet underground conditions, all contractors have used Du Pont Special Gelatin 40%, a highly water-resistant, dense explosive, and "Gelex" 1 or "Gelex" 2, semi-gelatinous water resistant dynamites.

Another Du Pont product gives special aid with the



Broken rock from blasting is removed by bucket from large shafts. When tunnel is completed, shafts will be converted to manholes.



Facing a full rock heading, explosives crew loads "Gelex" 2 into drill holes, readying a blast that will advance tunnel ten feet.

rock encountered. Niagaran limestone is a semihard dolomitic limestone that miners' language calls "dead"—i.e., it's not brittle like granite. "To pull a good round," Chicago's tunnel men have used "Acudet" Delay Electric Blasting Caps, which fire a succession of shots with accurately timed intervals between, allowing better rock movement, better fragmentation and more advance per round.

The tunnel, like the expressway overhead, will be finished this year. "It won't be the first tunnel that cost \$1 million a mile," observed one muddy-booted wag. "But it may be the first time people will be happy because so much money is just water down the drain."



Dutch elm disease flies its "flag."

NEW HOPE FOR THE DYING ELM

Methoxychlor makes a strong ally for towns anxious to save this noble tree at the least expense to taxpayers and wildlife.

By DR. DEANE W. FINNERTY

In 1930, plant pathologists examined a sample of wood taken from a wilting tree near Cleveland and made a grim diagnosis: the brown dots in a ring just under the bark were *Ceratocystis ulmi*, a beetle-borne fungus known as Dutch elm disease. Prognosis: the stately elm—delight of poets and pride of cities—could ultimately vanish from the U.S. unless means were found to control the malady's carriers.

From that alert came a bitter running skirmish between man and insect, which, in subsequent decades, has developed into a full-blown battle raging in more than 20 states. And today, although hundreds of thousands of cherished trees have fallen to his attacks, the tide is turning significantly against the elm bark beetle. Reason: Du Pont methoxychlor.

Dutch elm disease is a vascular wilt caused by a fungus carried from diseased to healthy trees by the smaller European bark beetle and sometimes by the native bark beetle. (One insect alone can carry enough fungus spores to infect and kill an 80-foot elm.) The disease first becomes apparent with wilting or discoloration of leaves on one or more branches—a condition known as "flagging," because wilted branches show like flags in healthy foliage.

The beetles spend the winter in the larval and pupal stages under elm bark in weak, dead or dying elm trees, elm logs and firewood, and the fungus commonly grows in the galleries they occupy. With spring, tiny brown adult beetles emerge to fly to nearby healthy elms and feed in the crotches of younger twigs. Disease spores carried on their bodies contaminate the chewed areas. There's no saving such an elm, since the fungus inexorably throttles the tree's water-conducting and sapwood functions.

Two-way Control

After protracted investigation of these facts, state and federal entomologists established a two-phase program of control: sanitation, or thorough cleanup of dead elm wood, and spraying of healthy trees with insecticide. The first measure destroys fungus that continues to thrive in dead wood; the second prevents infected beetles from feeding on still-uncontaminated elms.

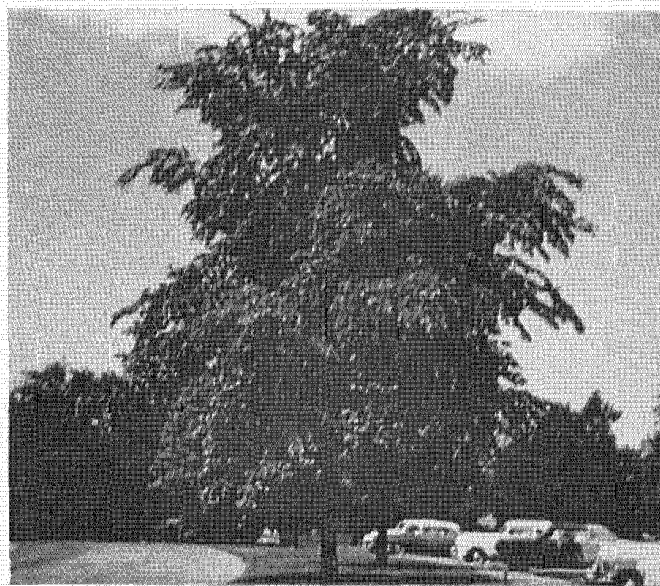
Until the late 1950's, the recommended insecticide was DDT, sprayed on trees when dormant in late fall or early spring. From the first, DDT proved effective, but as spirits rose among tree lovers and conservationists, there came another setback. Songbird mortalities had begun to climb, and there was evidence of DDT's complicity in the deaths.

Facing up to this irony four years ago, University of Wisconsin staffers such as Dr. Dale Norris, entomologist and Dr. J. J. Hickey, wildlife management specialist, began to look for an alternative insecticide. Their attention ultimately centered on methoxychlor.

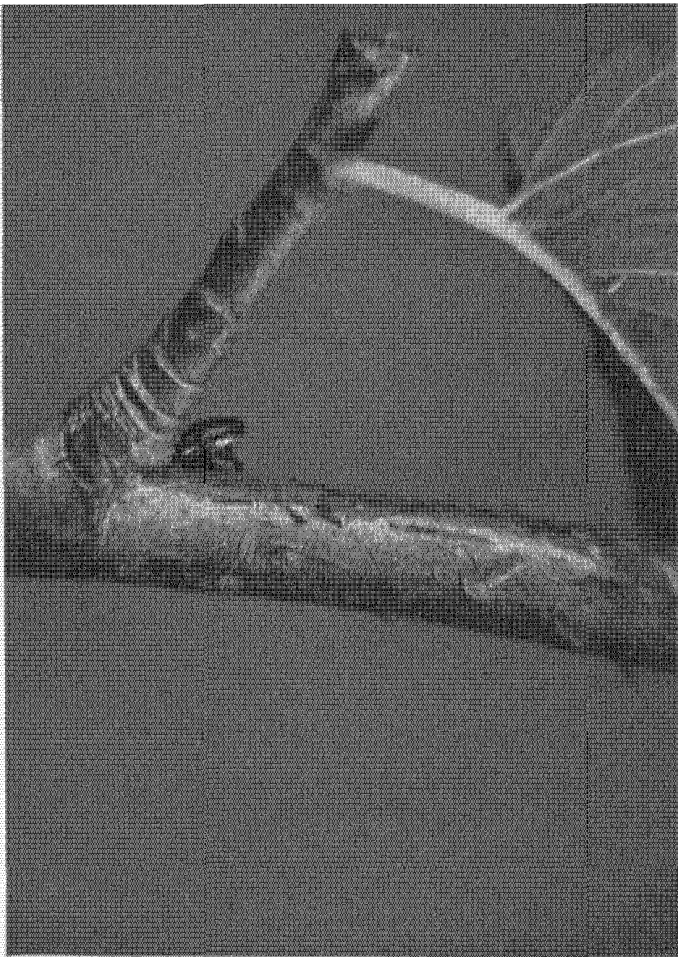
They ran comparative field tests which showed that methoxychlor to be as effective as DDT when applied as a 12 per cent emulsion spray during the spring dormant season. Moreover, these and other tests revealed that methoxychlor is from 12 to 34 times less toxic to robin and other songbirds than DDT. (Nor does the chemical adversely affect animals. It's widely recommended by state and federal authorities for direct dusting onto live stock, including dairy cows, to control flies, mosquitoes and other pests.)

On the basis of these studies and the considerable biological information gathered since then, methoxychlor provides a very effective elm bark beetle control when applied in the spring or fall, and its efficient use is found to cause no significant loss of wildlife.

Taking the cue, a number of communities have recorded dramatic results in their efforts to save elms while breathing easier over the bird mortality question. For example, Western Springs, Ill., has kept annual elm tree



Healthy ornamental elms have good chance to survive disease



Killer at work: twig-chewing bark beetle spells doom for the elm.

losses traceable to Dutch elm disease to less than two per cent by pursuing a careful sanitation program along with the use of methoxychlor. In cities without similar programs, losses may be 20 per cent annually. One large Illinois community discovered Dutch elm disease in 1947, but because it waited until 1949 to initiate a program, has had to remove 15,000 dead elms from city property. Another late starter in Illinois reports it doesn't expect

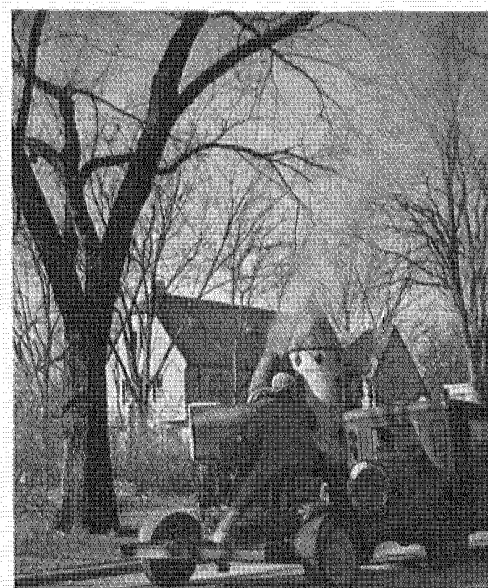
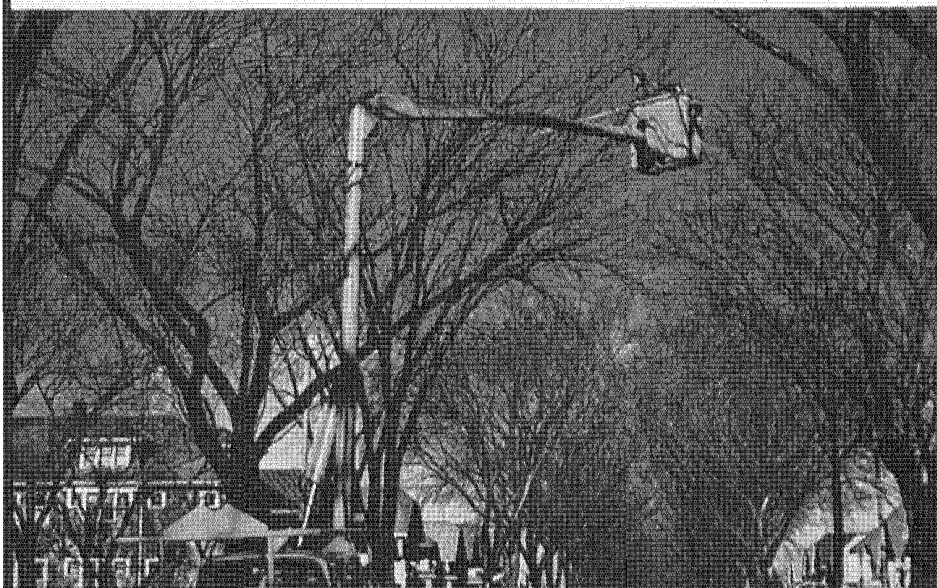
to save one elm. A third lost 6,000 elms in 1960 alone.

In southern Wisconsin, where about 75 per cent of urban ornamental trees are of the elm variety subject to the Dutch elm disease, extensive methoxychlor spraying programs are under way. A typical program is that of Milwaukee, where the use of methoxychlor was begun during the spring of 1961 on about half of the city's 150,000 elm trees.

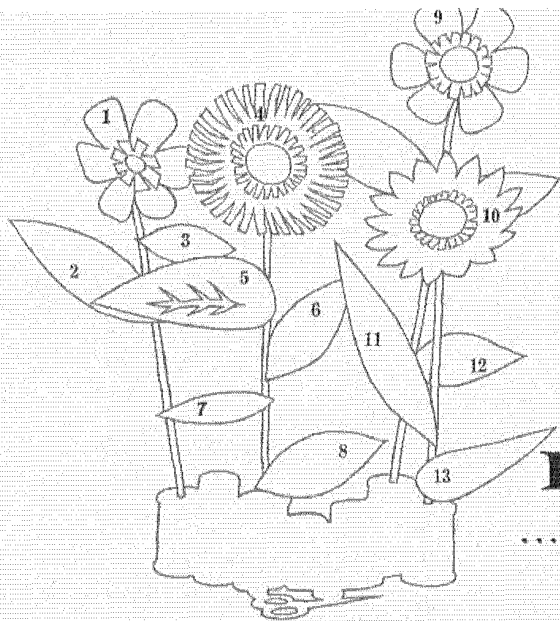
Tree sanitation and insecticide applications to city-owned elm trees cost money, of course. But in answer to queries from taxpayers who wonder if the expense is worthwhile, Dr. Norris wrote in the publication, *The American City*, recently:

"Successful disease control costs money, and few people voluntarily seek higher taxes. However, the taxes required to support a good control program are generally no more than a sudden tax bill required to pay for compulsory removal of the thousands of elms in your city when the disease gets into high gear.

"The average price of effective tree protection for 40 to 50 years will not exceed the average cost of required dead tree removal; thus, control is a highly practical measure that actually spreads out the tax bill over years and retains most elms for enjoyment during your life span."



communities conduct vigilant sanitation programs to destroy fungus-infected wood, and if . . . there's an annual application of methoxychlor.



FABRICS THAT BLOOM

...beg to be picked for home sewing

"I've heard that synthetic fabrics are hard to sew. If this is true, can't something be done to overcome the problem? Man-made fibers are so wonderful in other ways that it seems a shame if they can't be handled readily by women who like to make their own clothes."

The words vary from letter to letter, but the question is familiar to sewing experts in Du Pont's Textile Fibers Dept. An estimated 35 million American women sew these days, more often for pleasure than from necessity. They find fabrics of Du Pont fibers—"Dacron" polyester, nylon and "Orlon" acrylic—and blends of these with natural fibers widely offered in piece goods departments. If they have questions about how to sew with such fabrics, Du Pont is understandably eager to answer them.

Company specialists point out that sewing synthetic fabrics, like washing or ironing them, is most successful when some special techniques are followed:

Shears should be sharp. Needles should be both sharp and fine. To help prevent seam pucker, sewing machine thread tension should be set lower than for fabrics of natural fibers. Fewer stitches should be used with fabrics of the man-made fibers; normally ten to 12 stitches per inch are satisfactory. To prevent raveling, seams should be finished.

One reason some women have found synthetic fabrics hard to sew is that they have used the wrong sort of thread. Du Pont technicians say firmly that only thread made from such synthetic fibers as nylon or "Dacron" has the necessary stability, strength and durability to be compatible with synthetic fabrics. Obviously, any contraction of the thread in a sewn seam will pucker the fabric. This shrinkage may be caused by water or heat during laundering, or by the recovery of thread that has been stretched by sewing under too much tension.

Thread manufacturers have been active in their efforts to use synthetic fibers to best advantage. Coats & Clark, Inc., New York City, offers "Taslan" textured nylon thread; texturing gives it a soft surface that reduces tangling and breaking. Nylex Co., Hackensack, N.J., applies a special bonding agent that imparts a slight stiffness to its "Nylex" thread, making it easier to thread and less likely to slip on the spool. Designed for heavy-duty sewing, "Nylex" is so strong that it defies breaking by hand. It's available in many variety stores across the country. Non-

tarnishing metallic thread made of nylon and "Mylar" polyester film is offered by Gylock Corp., Philadelphia. The manufacturer recommends it for adding decorator touches to draperies, curtains and bedspreads as well as pockets and lapels of garments. Its uniformity and roundness make for easier sewing.

Representative 1962 piece goods made with Du Pont fibers are pictured at right. Particularly newsworthy are fabrics of 100 per cent "Dacron", ranging from batistes (Rosewood Fabrics, Inc., and Belding Heminway Co., Inc.) to the crepey "Whipped Cream" of Fabrex Corp. and silk-like floral prints by Cohama Fabrics, Fabrex Corp. and A. P. Silk Co. "Torga", a crepe of 55 per cent "Dacron" and 45 per cent rayon by J. P. Stevens & Co., Inc., is available in a wide variety of solid colors.

Travis Fabrics offers a blend of 65 per cent "Dacron" and 35 per cent imported flax that looks and feels like fine linen with the added advantage of superior wrinkle resistance. The ever-popular blend of 65 per cent "Dacron" and 35 per cent cotton is plentiful in poplins and broadcloths, in solids, plaids and checks. It's also the choice of Reliable Textile Co., Inc., for "Relshan", a new shantung weave available in 11 solid colors.

For those who want a heavier fabric for early spring, "Lorette", a blend of 55 per cent "Orlon" and 45 per cent wool that's by now a classic, is offered in checks, yarn dyes and solid colors. Milliken Woolens, Inc., markets it.

Move in the opposite direction and you find a number of very sheer fabrics. "Faconné" by Bazaar Fabrics is of acetate and nylon in a very open design. "Sheerfast", an organdy of new 280 Du Pont nylon by Durelle Fabrics, is recommended for curtains and bedspreads as well as apparel. Harvey Mills offers dress lace of "Acele" acetate yarn and nylon.

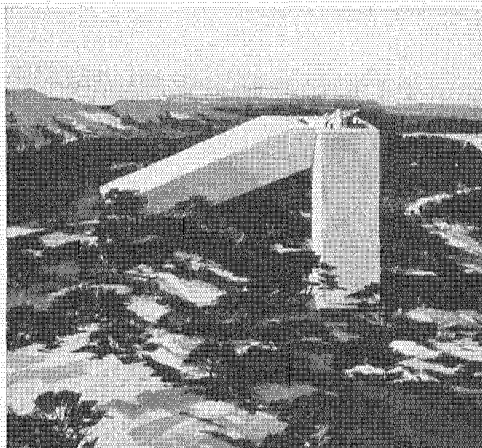
1. 100% "Dacron", Cohama Fabrics 2. 65% "Dacron"/35% cotton, J. P. Stevens & Co., Inc. 3. and 4. 65% "Dacron"/35% imported flax, Travis Fabrics 5. 100% "Dacron", Fabrex Corp. 6. and 7. 65% "Dacron"/35% cotton, Travis Fabrics 8. 100% "Dacron", Rosewood Fabrics 9. 65% "Dacron"/35% cotton, J. P. Stevens & Co., Inc. 10. 60% acetate and 40% nylon, Bazaar Fabrics 11. 100% "Dacron", Cohama Fabrics 12. 100% "Dacron", Fabrex Corp. 13. 55% "Dacron", 45% rayon, J. P. Stevens & Co., Inc. All of these converters have offices in New York City.

IN THE SPRING



Largest Solar Telescope

...but not too cool. Astronomers keep a new telescope's temperature normal by piping water all around



Finished solar telescope looks like this drawing.

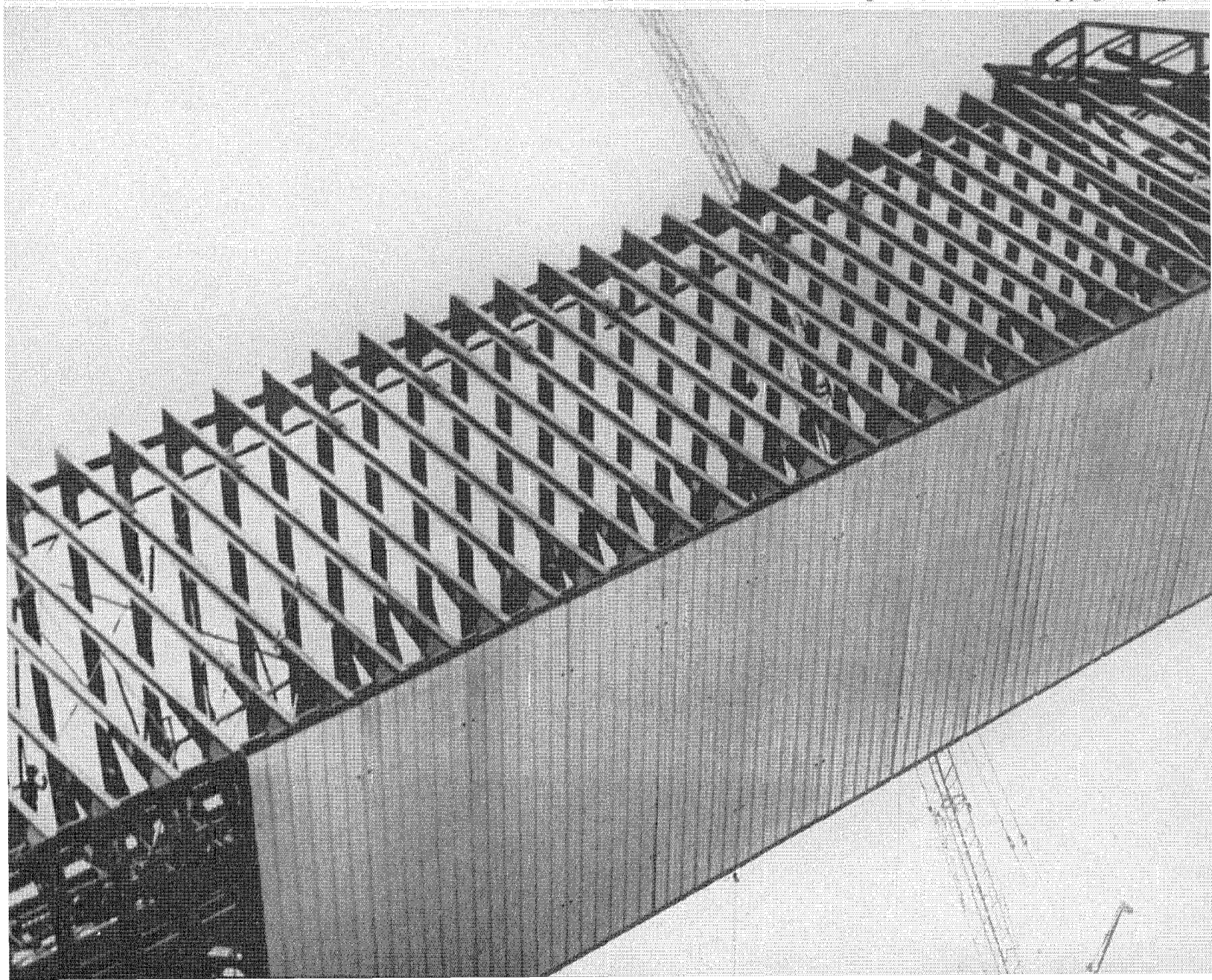
By JOHN L. PARKER
Photographs by the author

At Kitt Peak National Observatory, 45 miles southwest of Tucson, Ariz., astronomers have gone underground to get a better look at the sun. To build the world's largest solar telescope, they have bored 300 feet into a mountain.

The telescope is designed especially to study solar storms that rage across the face of the sun, affecting the earth's atmosphere by their violent eruptions. The observatory, a joint undertaking of nine universities and the National Science Foundation, is the first completely new astronomical complex in the U.S. in 25 years. It's located on Kitt Peak, a flat-topped mountain that abruptly rises some 7,000 feet above the Arizona-Sonora desert plain.

Unlike a swinging stellar telescope, a solar telescope is mounted in a fixed position; in many respects it's like a bellows-type camera. The "bellows" in the Kitt Peak instrument is a huge concrete-and-steel tube 500 feet long.

Telescope is sheathed in panels containing nine miles of half-inch piping. Through this



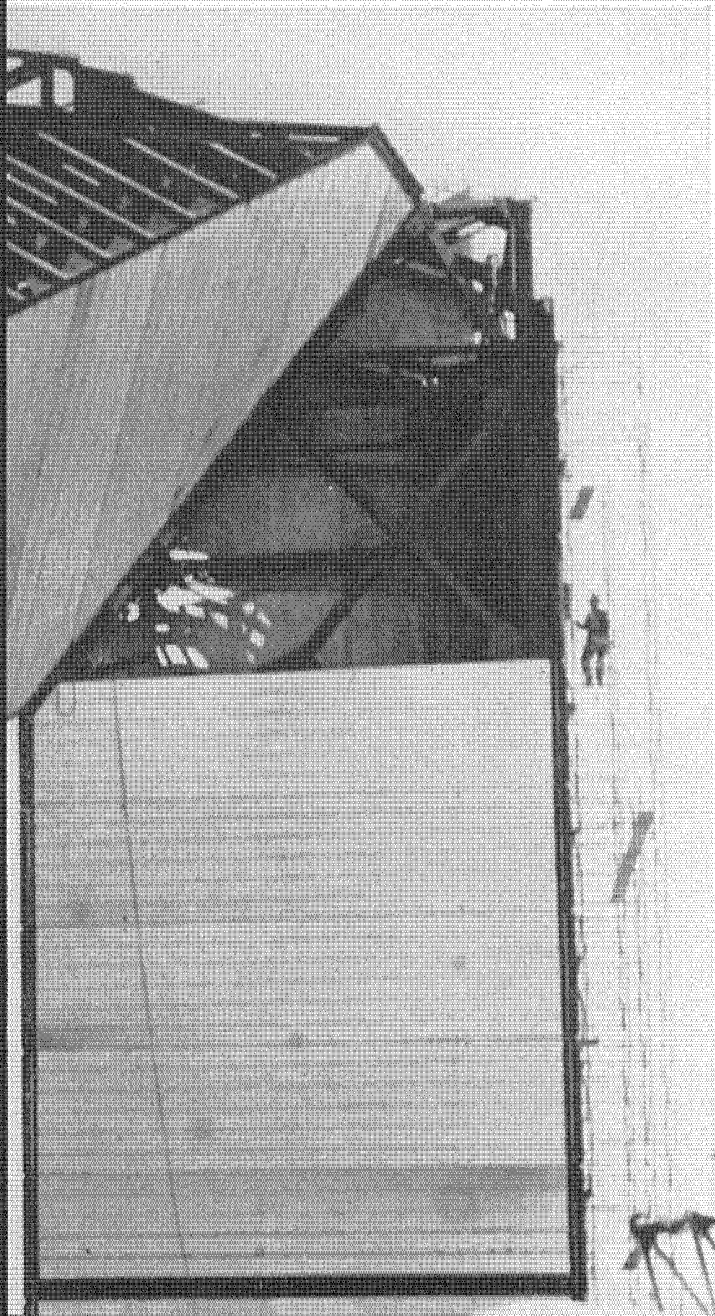
Plays it Cool

Du Pont ethylene glycol prevents freezing

Some 300 feet are below ground. The remaining 200 feet jut out from the surface at a 32 degree angle; the tube is supported at its upper end by a steel-reinforced concrete pillar 100 feet high.

At the top of the pillar, an 80-inch flat mirror called a heliostat is mounted in a control yoke. When the telescope starts working, a precision clock drive will rotate the mirror once every 24 hours to track the motion of the sun across the sky. From this mirror, a beam of sunlight will be reflected to a 60-inch concave mirror at the bottom of the tube. Then it will be reflected to still another mirror, which will project it to an underground observing room. There the image—up to 34 inches in diameter—may be photographed or analyzed directly by means of a powerful spectrograph. The images formed by this telescope will be larger and more brilliantly illuminated than those ob-

vs a solution of water and Du Pont ethylene glycol antifreeze.



tained with other such instruments.

Despite its great size, the Kitt Peak solar telescope is extremely delicate. To eliminate vibrations that could spoil its focus, the supporting pillar has walls five feet thick sunk 30 feet into bedrock. The astronomers also have planned carefully to guard against another possible cause of distortion—warm air currents rising from the ground or reflected from surrounding objects. The entire tube, from the top of the supporting pillar to the bottom of the tunnel, is sheathed with copper panels that contain about nine miles of half-inch piping.

Circulating through this network of piping is a mixture of 6,000 gallons of water and 4,000 gallons of Du Pont ethylene glycol antifreeze. Cooled by radiators near the tower base, the water keeps the instrument's temperature normal despite outside temperature variations of as much as 72°F. between night and day. The inside temperature is automatically controlled by a series of thermostats that regulate the rate of coolant circulation.

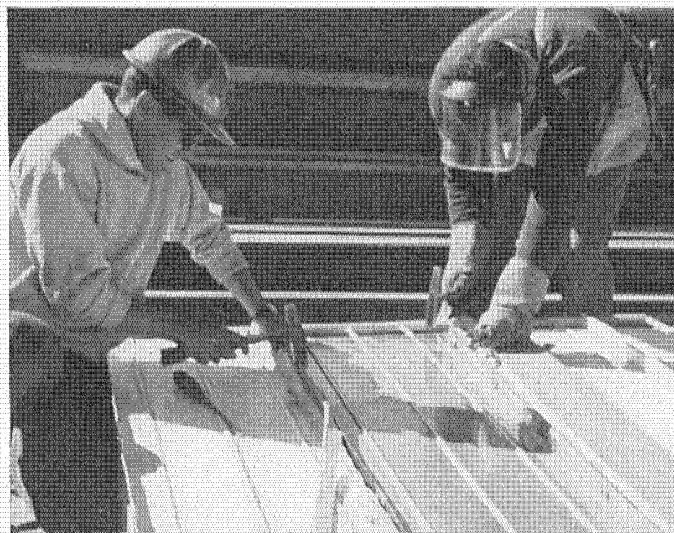
"Cool but not too cool" is the watchword, and that's where the Du Pont antifreeze comes in. Its service to the telescope is much the same as it is to family cars: it keeps the pipes from freezing. At Kitt Peak it will stay on the job in summer, too, since the solution will circulate over refrigeration coils part of the time and freezing again will be a problem to be prevented by Du Pont antifreeze.

With this advanced environmental control—the first system of its kind to be installed on a solar instrument—it is expected that maximum use can be gained from the telescope. In older installations, perfect viewing is obtained only 30 per cent of the time.

Dr. Nicholas U. Mayall, director of the Kitt Peak Observatory, believes the highly magnified solar studies will give astronomers greater knowledge of the magnetic field structures created around sun spots. These are the fields that exert an adverse effect on radio and television wave bands and more especially on space telemetry.

With the new telescope in use, he says, it eventually may be possible to predict magnetic storms in the earth's atmosphere just as the weather is predicted now.

The observatory also has five stellar telescopes—one 80-inch, two 36-inch and two 16-inch—that greatly expand the research facilities available to U.S. astronomers.



Workers wedge neoprene sponge between panels to form a weather seal. The Du Pont synthetic rubber withstands climate extremes.

Printed Textiles: **Livelier and Longer-Lived**

Du Pont's new line of "Savalux" fast colors and a special process for applying them combine to improve Riverdale drapery and slip-cover fabrics

Printed drapery and slip-cover fabrics that meet new standards for both color brilliance and colorfastness are in stores across the country this spring.

Standing squarely behind this flat statement are Du Pont, which developed a new line of colors and a special process for printing the fabrics, and Riverdale Drapery Fabrics, New York City, which markets them. The two companies have gone to unprecedented lengths to make sure that consumers can buy these fabrics with confidence that their colors are truly fast.

Many women have had bad experiences with fabric colors. Some fade in sunlight. Others run in the wash. There are some that lose color from rubbing and still others that aren't safe at the cleaners.

Studying home furnishings fabrics some years ago, Du Pont dyes specialists decided that improvement was possible. They began what eventually developed into a two-part program.

Part one led to a new line of some 25 dyes, which make up a rich palette and are now trademarked "Savalux"



Rudy Alperin, a Riverdale vice president, shows cotton fabrics colored with Du Pont "Savalux" fast colors to a department store buyer.



Bold, colorfast prints from Riverdale's new line lend themselves to imaginatively decorated rooms like these.

fast colors. Some of these are standard vat dyes and others are new. All have passed the most stringent laboratory tests for fastness in four areas.

How fast is fast? A candidate for the name "Savalux" is checked for sunfastness in a Fade Ometer, which exposes fabric swatches to the harsh light of a carbon arc, simulating direct exposure to the Florida midday sun. The test for washfastness is equal to five home washings in hot water with detergent and chlorine bleach. Fastness to dry cleaning is checked by agitating swatches in a Launder-Ometer containing full-strength commercial dry cleaning solvent. Many colors that are otherwise fast can still be removed by abrasion. They will transfer and stain another fabric, such as a white dress or a wet swimsuit, that rubs against them. Tests for rub-off, or "crocking," consist of rubbing swatches vigorously with both dry and wet cloths mounted on a mechanical finger.

Many of the dyes that passed muster have been used for years to color cotton fabrics in solid shades, but at least a dozen could not be used in printing by conventional means. Part two of the Du Pont research, then, became an effort to develop a new textile printing method. The process that resulted is a refinement of the Du Pont pad-steam process, a standard way of dyeing solid-colored cottons economically and rapidly.

Water-in-Oil Emulsions, Flash Steaming

Key to the effectiveness of the new printing process is the mixing of dye pastes into unique water-in-oil emulsions and flash steaming to develop the colors. Printing is done in a conventional manner on standard equipment. The emulsions, however, make it possible to run machines faster than in ordinary printing. The process also is of value in screen printing when soluble gums are used.

Even more important, the new process permits the use of many fast colors that can't be printed satisfactorily by conventional methods; it also yields prints with a more solid, dyed appearance.

Yellow, for example, long has been a problem to fabric designers. A yellow dye used for years in printing degrades cotton fabric so badly after sunlight exposure that the cloth disintegrates during washing or dry cleaning. The irate customer usually blames the commercial launderer or dry cleaner rather than the culprit dye. The new



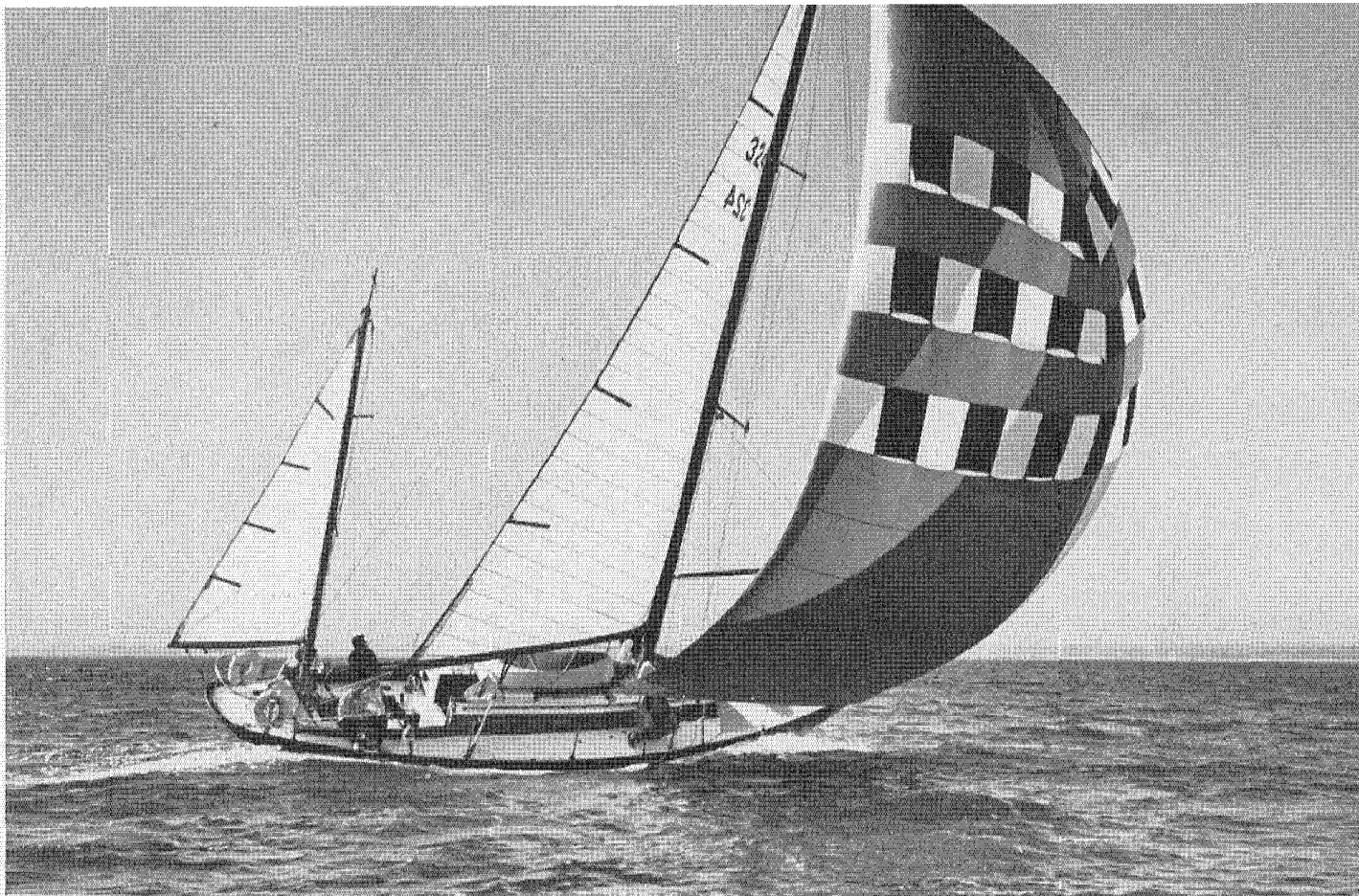
printing process now makes it possible to use a well-behaved "Savalux" yellow instead.

The better selection of colors also produces noticeable improvements in the lightfastness of pinks, reds and oranges. Violets have better resistance to water spotting. Blues are more brilliant and are affected less by chlorine. Browns are nonflaring—that is, they keep the same color in either daylight or artificial light.

Riverdale's entire 1962 line of cotton and cotton-rayon drapery and slip-cover materials is offered in the new colors. The fabrics carry a legend, "Color Styled With Du Pont 'Savalux' Fast Colors," on the selvage or on tags, showing consumers that quality requirements have been met. Coordinated solid shades also are available in the fast colors. So are the ready-made bedroom draperies and spreads marketed by Riverdale's Scroll Products Division.

"Savalux" colors are available only to mills that agree to dye and print with them in ways that will achieve specified fastness standards. Mills also must submit finished fabrics for critical testing by Du Pont technicians.

The clarity and richness of the new prints are readily apparent, but a consumer must take their colorfastness on faith. Du Pont's rigorous test program is her assurance that the colors will be long-lived as well as lively.

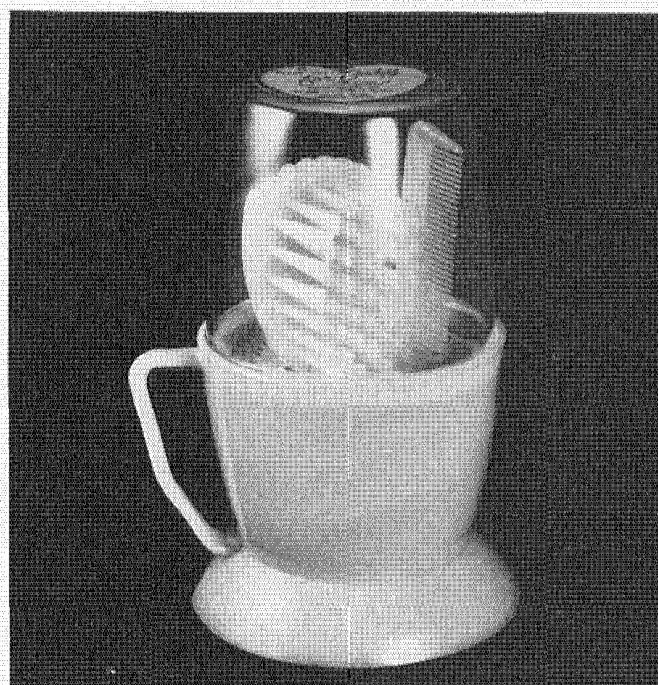


Sailboating with an extra lift: New spinnaker with directed vents providing downward jet thrust for increased lifting and driving power has been introduced by Ratsey & Lapthorn, Inc., sailmakers, City Island, N.Y. Made of Du Pont's Type 300 nylon supplied by the

Lamport Sail Fabric Co., New York City, Ratsey's "Venturi" has more lift, is stable on close reaches, and considerably lessens knock-down effect. Sail is available for all boats, from smallest spinnaker-use to big ocean racers.

WHAT'S NEW

For care and feeding of baby: Four-piece infant set has been introduced by Du Pont's Polychemicals Plastics Products Division. Set features drinking cup of linear "Alathon" polyethylene resin in pink and blue, a utility container made from clear plastic, and a brush and comb in pink and blue regular "Alathon". Product is available at most department stores, variety stores and many other retail outlets.



► **Liquid spray for quick engine starts:** "Moisture Guard", a liquid spray that displaces moisture upon contact, has been added to the Du Pont No. "7" line of automotive specialties. The product is found to be particularly useful in starting wet automobile and power mower engines. A liberal spraying of the ignition system makes engine operable in seconds, without taking anything apart. "Moisture Guard" also provides excellent metal surface protection against rust and corrosion, and serves as a penetrating lubricant that loosens corroded nuts and bolts.

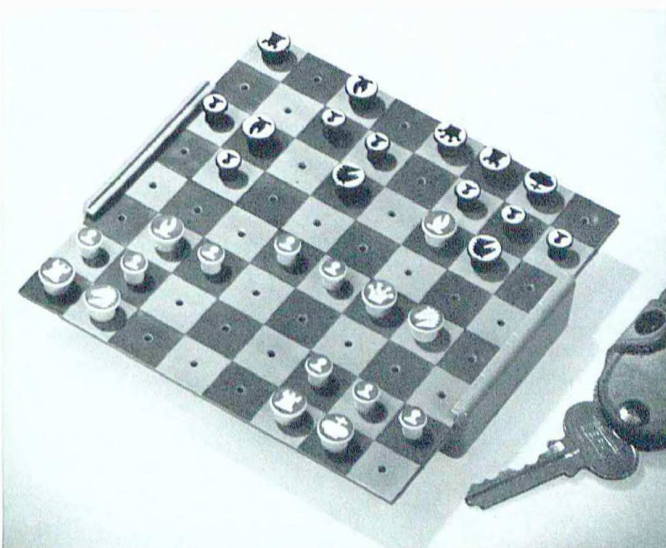
► **Coin-operated clay target shooting:** A coin in a slot and a push of a button starts "Auto-Trap-Shoot", a new indoor shooting game. Featuring special choke-bored Remington 22 caliber pump guns, standard rim fire shot cartridges, fully automatic traps, and miniature clay targets thrown at varying angles against a realistic outdoor mural, the game offers extra attraction for bowling alleys or other indoor game centers. Manufacturers are Auto-Trap-Shoot, Inc., Champaign, Ill.

► **Handy handbook:** An engineering reproduction handbook, published by the Du Pont Photo Products Dept., is being sold through dealers handling "Cronaflex" engineering reproduction and drafting film. Designed as a working tool for the reproduction engineer, the handbook features application and technical bulletins plus information on the wide range of films of "Cronaflex".

► **Long-life electronic equipment safety device:** Tests show new actuating rod of "Delrin" acetal resin in door interlock switch operates more than a million consecutive times without failure. Device, made by Micro Switch, a division of Honeywell, is for use on door frames of cabinets or consoles containing hazardous electronic equipment and cuts off the power when door is opened for servicing or checking. Power resumes when door is closed.

► **Ice water on tap:** Automatic water cooler small enough to fit under the kitchen sink uses "Freon" refrigerant as cooling agent, permits drawing of 40°F. drinking water from push-down spigot mounted beside regular cold water faucet. The cooler, merchandised as the "Sunroc Tiny Titan", is made by Sunroc Corp., Glen Riddle, Pa., and retails for about \$150.

► **Release agent for moldings:** Du Pont has developed a product said to solve many mold release problems plaguing molding firms. Virtually nothing sticks to "Vydax" AR fluorocarbon telomer, which is available either as a dispersion or in aerosol cans. It dries fast, leaving a slick coating that repels dirt, oil and water; withstands molding temperatures to 500°F.; won't stain, become gummy or build up on molds. Paint dries smoothly, without "orange peel" effect, on plastics shaped by molds treated with "Vydax". Molders can obtain samples for study from Du Pont's Organic Chemicals Dept., Wilmington 98, Del.



Pocket-size chessboard: "Symbolic Chess", marketed by Arthur R. Braun Co., Cary, Ill., features pieces that stay in place even if board is inverted, snap-in storage area for captured men, compact size and durability suited to use by servicemen, students, travelers. Set is molded entirely of "Zytel" nylon resin.



Leading horses to water—with nylon: Lead line made of Du Pont 707 nylon has been introduced by Alexander Industries, rope manufacturers, Lawrence, Mass., to replace less durable materials currently used by horsemen. Fiber provides lines that offer ease of cleaning, strength, light weight and resistance to mildew.

GET UNSURPASSED ACCURACY WITH NEW REMINGTON NYLON 66

AUTOLOADING 22

OTHER NEW NYLON 22's

Send for free literature describing other all-new 1962 nylon bolt and lever action 22's.

Remington

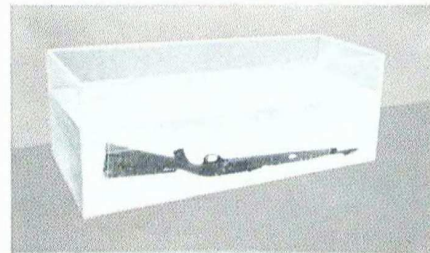


"Kleanbore" is Reg. U. S. Pat. Off. and "Hi-Speed" is a trademark of Remington Arms Company, Inc., Bridgeport 2, Conn. In Canada: Remington Arms of Canada Limited, 36 Queen Elizabeth Blvd., Toronto, Ont.

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
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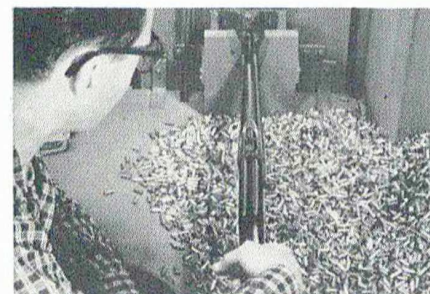


THE ACCURACY SECRET of the Remington Nylon 66 lies in its structural-nylon stock and fore-end. This super-strong material allows the same 3-point barrel bedding principle used on the most expensive target rifles. To fully utilize this pinpoint precision, the Nylon 66 receiver is grooved for 'scope sights. Rear sight is fully adjustable with thumb screws.

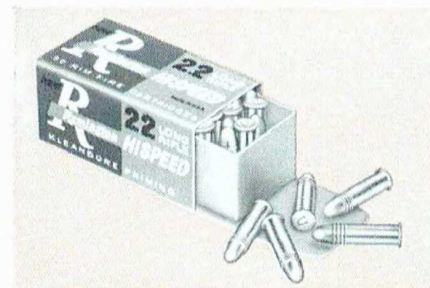


EVEN SOAKING CAN'T HURT THE STOCK.

Stable structural-nylon is made to stay handsome. The stock in Mohawk Brown or Apache Black with inlays and spacers will look as good as the day you bought the gun even after years of use. The grip and fore-end feature sharp checkering... attractive and important for sure holding. Convenient top-of-grip thumb-type safety.



REVOLUTIONARY DESIGN. Receiver parts, stock and barrel are a strong interlocking of steel and structural-nylon. Friction-free parts glide on 'greaseless bearings' of nylon, no lubrication needed. This creates the most trouble-free autoloading action known. The test engineer above put the gun through 5 hours of rapid fire without a jam. Weighing only four pounds, Nylon 66 has a capacity of fifteen long rifle cartridges.



NEW "HI-SPEED" 22's with "golden" bullets and "Kleanbore" priming feature pile-driving power and amazing accuracy. At 50 yards out the bright, extra-clean bullet packs more punch than a standard 22 does at the muzzle. Bullets come in solid and hollow-point types.

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