magazine



In the Electronics Limelight

DUPONT

Better Things for Better Living ... through Chemistry

March-April 1965 Vol. 59 No. 2

DU PONT magazine

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THE COVER. This glittery contact for a printed circuit board is called a "dancing man." It's no larger than an ordinary needle and is wearing one of the world's cleanest top hats. The hat's immaculateness is imperative, for an invisible speck of dirt inside its tiny orifice can cause the failure of a highly sensitive computer. The painstaking job of cleaning the toppers once took several hours, but it's now being done by a New Jersey electroplating firm in 12 minutes with the aid of "Freon" T-WD 602 solvent. For more details, see page 2.

Jack D. Hunter, *Editor*
Charles E. Petty, *Associate Editor*

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7,500 times a month the calls come in and, be it turkey eggs or chemica
the subject doesn't faze Du Pont's

SWITC

A phone rang in one of the offices in the big building at Tenth and Market Streets, Wilmington.

"Du Pont Company—Product Information Center," the neat young man said into the mouthpiece. "May I help you?"

There was a pause at the other end of the line, then a voice—hollow with the sound of long distance—asked tentatively: "Are you a recorded message or are you for real?"

Said the Wilmington information expediter later: "I helped the caller find his answers, all right, but all the way through the conversation I had to fight the impulse to go 'beep-beep' every once in a while."

The impulse to do a little kidding is, of course, beyond the capacity of any recorded message. And, among the men and women who staff Du Pont's Product Information Centers in 21 key U.S. locations, such impulses (when they do occur) are rigidly controlled. But the incident does point up two basic Du Pont philosophies: (1) When someone takes the time to contact Du Pont, he should get rapid, personalized help, and (2) from someone interested in Du Pont and its products, there is no such thing as a silly question.

The rationale for this latter is based in the sheer diversity of Du Pont's activities, what with 100,000 employees in 84 plants in 29 states turning out more than 1,300 products and product lines sold through 105 sales offices. In fact, so broad are the company's interests, some inquirers seem to credit Du Pont with omniscience. Example: the lady in Nova Scotia who asked Du Pont where she could order a batch of brown-winged turkey eggs. Admits an information expediter: "Sometimes I myself get the notion that Du Pont busies itself with just about everything—and so I felt serenely confident, when we referred the Nova Scotian inquiry to our Stine Laboratory for answer, there'd be somebody out there who'd have the scoop on brown-winged turkey eggs. And there was, as I recall."

Now well into their fourth year of operation, the Product Information Centers are handling a monthly average of 7,500 inquiries. Based in Wilmington, the major centers are located there and in New York, Chicago, Los Angeles and San Francisco, while subsidiary services are maintained in 16 oth cities. (Baltimore, Philadelphia and Was ington, D.C., are serviced by direct lines the Wilmington center.)

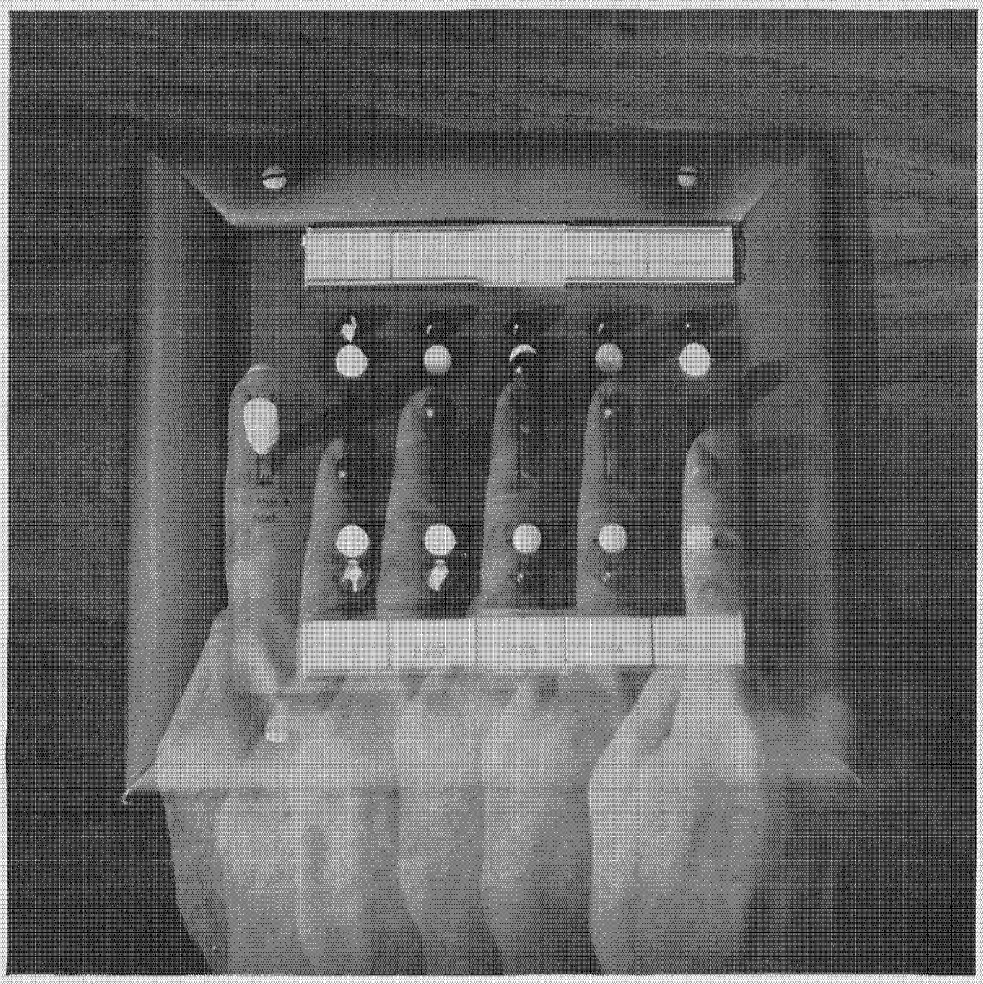
Art Shelley, assistant manager of the ser ice, says: "Nine out of ten of our telepho inquiries are from people who really do know precisely what they're after. It's up us to draw them out, to nail down just wh they have in mind, and then—once the pro uct area is in focus and we determine wheth they want to talk technical data or price a availability—to connect them at once wi the individual in the company who is m likely to have the answers. The watchwo is 'find out what they want, then conn them with the proper Du Pont source as f as possible.' "

Mechanically, this creed is made practi in the principal centers in Wilmington a New York by a sophisticated telephone rangement that was, until recently, the o one of its kind in the nation.

In Wilmington, for instance, each m has telephone equipment with six incomi and six outgoing lines with a "hold a merge" key to control them all. Say a N Orleans customer is interested in "Vex plastic netting and calls "the Du Pont peo in Wilmington" to place an order. His is automatically routed to one of the inf mation expediters who, aware that such ders are taken only in Buffalo, N.Y., p New Orleans on "hold," rings up the pro Buffalo contact man, then merges both c so that the transaction can be made. A although he's talking to Buffalo, the N Orleans man pays only for his initial c

Explains Shelley: "With this system, Product Information Center conti ally controls the call. We could, example, discover that the New Orleans quirer wants not only to place an order 'Vexar', but also to discuss technical data volving, say, one of our paints. We c when he's completed the business in Buff put the caller back on 'hold,' then conn him with the key contact man in our Fab and Finishes Dept. At no time does he h to place a second call or go outside of immediate control. With our teleph switching setup, we can transfer him a where inside Du Pont or anywhere outsi

BOARD MAGICIANS



Flick of finger over keys connects incoming inquiries with Du Pont product specialists.

The Product Information specialist is supported by a reference library of some 9,000 cards and several product directories which provide data he's most likely to need when the phone rings. In a company as vibrant as Du Pont, change is frequent, so to keep the information centers armed with current data, manager Marshall Rogers issues periodic bulletins that list new products, new trademarks, products in development, departments responsible for each, and the individuals within the departments most knowledgeable in each—even a rundown on the articles to appear in upcoming issues of the *Du Pont Magazine*, which usually create a rash of phone calls shortly after publication.

The Wilmington center also keeps a list of key competitors and their products. Says Shelley: "If someone calls Du Pont and we can't satisfy his request, we usually can refer him not only to the proper company but sometimes even to the knowledgeable individual in that firm. The idea here is to make a favorable impression on any potential customer; if he remembers the good service he got from Du Pont when he didn't want to buy, he'll call Du Pont with confidence when he does want to buy."

For the Product Information specialist, the term "regular business hours" is an academic abstraction—he expects to be called at any hour and he has no hesitation to expedite a query regardless of the clock. Shelley recalls the Saturday afternoon when a Norfolk seismograph crew needed a special explosive within hours. The call was relayed to him at his home; he called the home of the Explosives Dept.'s director of sales; the director's wife hailed her husband at the country club, where he was intent on shooting par. Upshot: an abandoned golf game, 15,000 pounds of Du Pont explosives off to Norfolk posthaste, and a satisfied customer.

Such speed is the Information Centers' cup of tea. There came a call from an Air Force base in Massachusetts one evening: a space probe was to be launched the next morning and there was urgent need for a special kind of film to track the rocket. Could Du Pont help? A Wilmington information expediter called the home of the manager of Du Pont's Photo Products Dept. plant in Rochester, N.Y. An order was made up, put on a plane and, as Shelley says, "The rocket was tracked to a fare-thee-well."

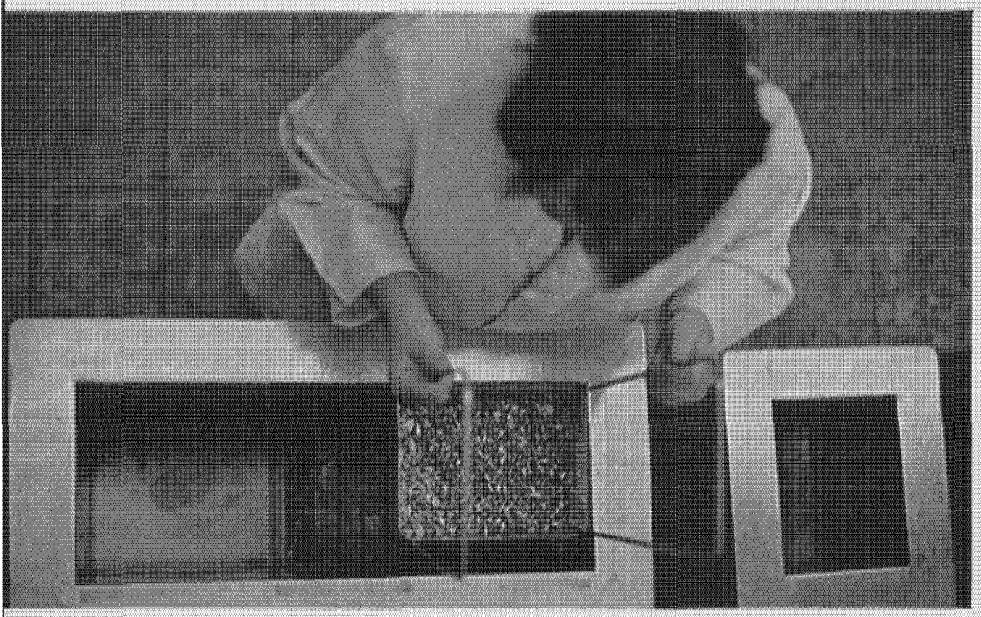
How about the patient questioning of callers who don't know what they want? Has this ever paid off in measurable terms?

"You bet," Shelley says. "A gentleman called one day to locate a special kind of chemical to do a specific job, and he gave the formula. We questioned him sufficiently to decide that our 'Freon' Products Division would likely be working in the area of interest he described. The people in 'Freon' sent him a sample to see if the product could be useful to him. It could, all right: he placed a substantial order."

Then there's the call in which business considerations play no role, yet bring an unexpected reward. Shelley cites the case of a Georgia lady whose bedridden father needed a special-size sponge as a neck support. She called Atlanta and talked to Frank McLeod, a key contact. McLeod called Product Information in Wilmington and was put in touch with Bob Gentile, a sponge specialist. Gentile personally cut and glued a sponge to the size required, sent it off to the lady via McLeod and turned to business as usual. As it happened, the lady is a member of the Governor's staff, and she told her boss of McLeod's and Gentile's services. The Governor thought this "act of kindness" deserved "special appreciation." Result: McLeod and Gentile are now honorary lieutenant colonels, aides-de-camp to Georgia's chief. ■

Makers of intricate mechanisms are calling "Freon" T-WD 602 solvent

A Clean Sweep fo



Platronics technician immerses basket of top hats in "Freon" solvent during 12-minute cleaning cycle; parts emerge clean, cool, dry.

The 24-karat-gold-plated top hats at right, looking like props for a glittery musical revue, are the cleanest toppers in the world.

They have to be, for the fingernail-sized "hats" are semiconductor rectifiers used as airtight seals for wiring products ranging from transistor radios to missiles. That their golden exterior pleases the eye is only a happy by-product; the function of gold-plating is to prevent the formation of tarnish, which can corrode the part and perhaps cause the failure of a highly sensitive computer.

Once applied, the rectifiers' gold must be completely free of invisible soil. Thus the metal has to undergo a painstaking after-gold-plating cleaning process.

Explains Tom Palumbo, quality control manager of Platronics, Inc., Linden, N.J.: "Our technicians must be just as precise in cleaning top hats as they are in plating them to one-millionth-of-an-inch tolerances. Right after plating, for example, corrosive solutions like potassium or sodium cyanide c dry inside a hat's thirty-thousandths-inc diameter orifice or in the pores of the met If such solutions dry, they leave a deposit salt that plugs the opening or so corrodes t finish that the top hat can't be used in a de cate electronic component. Therefore, v not only have to clean each part thoroughl but we have to do the job as fast as possible

Until recently, however, the job was ta ing up to three hours. Water, which is no mally used to rinse away plating salts large pieces, doesn't work well on sm parts; its high surface tension prevents from entering the top hat's tiny orifice pores. "When we added a detergent to t rinse water, we complicated our problem recalls Palumbo. "A detergent lowers wate surface tension and allows it to enter the o fice and rinse out plating salts; unfortunatel it leaves a detergent residue that has to rinsed away with pure water. That took back to our original problem—water's hi surface tension. The only thing to do was bake out the detergent in a high-temperatu oven, a process which ate up about thr hours, all told."

Platronics also tried such cleaning s vents as alcohol. These got into small ope ings and did a good cleaning job witho leaving a residue, but they were highly flam mable and dangerous to use.

"Even cleaning with the standard 'Freo solvents didn't completely do the job," sa Palumbo. "'Freon' solvents got inside t top hat's opening and pores and remove organic materials like grease and oil. B they didn't dissolve the inorganic platin salts that are soluble only in water solutions

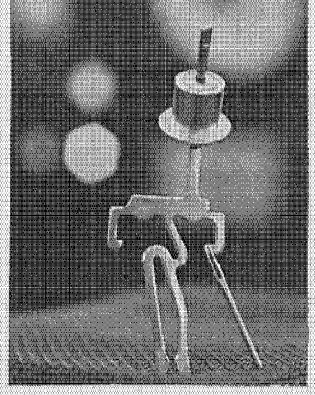
Finally, last year, the answer came in t form of "Freon" T-WD 602, newest me ber of Du Pont's family of "Freon" solvent Like its relatives, T-WD 602 has an organ base; in addition, the formulation includ water and a detergent in a finely divided st ble dispersion to dissolve salts, fingerprin and other inorganic matter.

To remove particulate matter such as san metal chips or human hair, T-WD 602 combined with ultrasonics, a method b which high-frequency sound waves agita

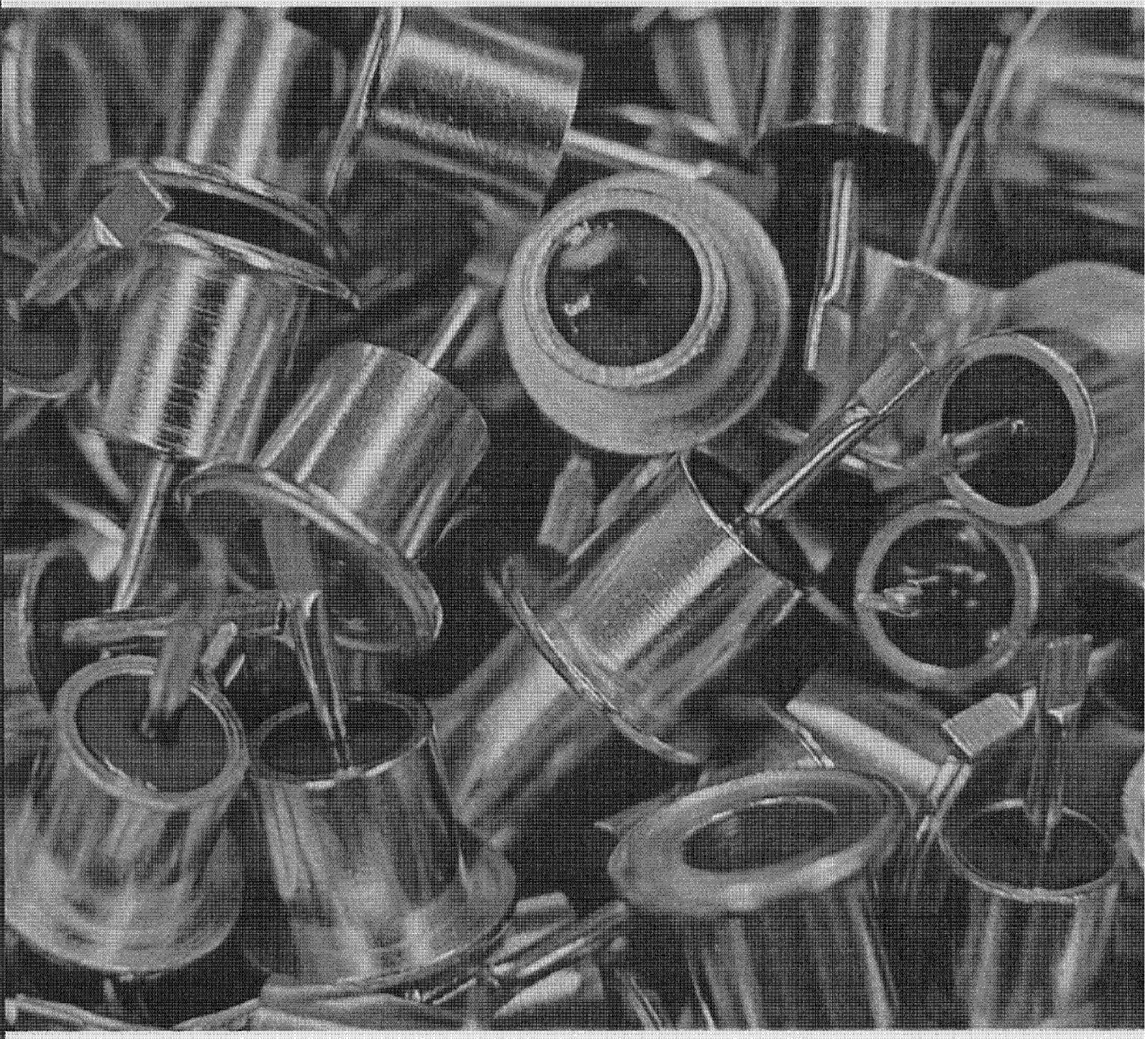
continu

All Soils

By Charles E. Petty

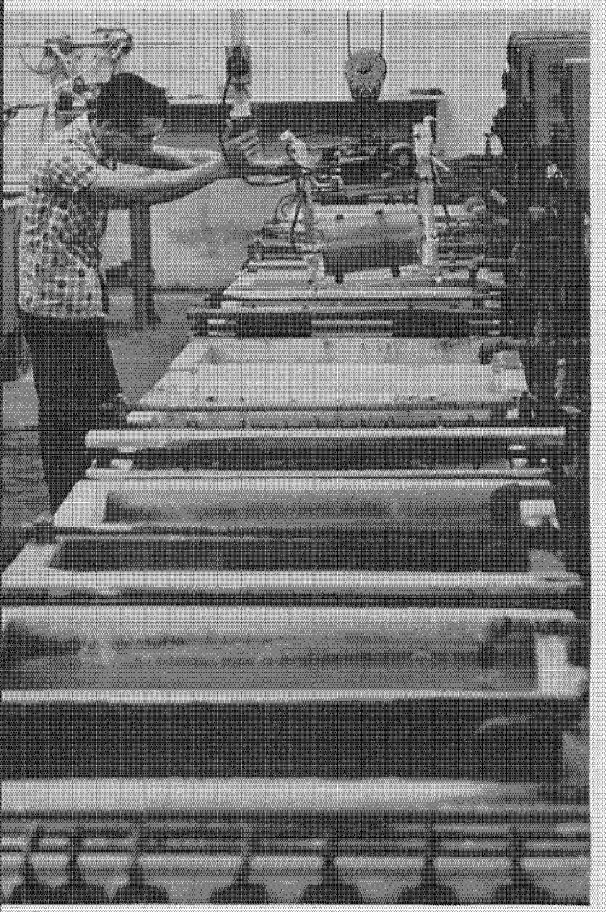


The world's cleanest topper.



Before cleaning, top hats look immaculate, but within metals' pores and tiny orifices lurk corrosive, invisible soils.

A Clean Sweep for All Soils
continued



After gold-plating, top hats are rinsed in series of baths before cleaning with "Freon" solvent.

liquid T-WD 602 to form tiny air bubbles that literally "blast" loose insoluble matter so it can be carried away by the solvent.

In addition to the fact that "Freon" T-WD 602 stays in dispersion and doesn't settle out into two separate layers of liquid, it has the other advantages of "Freon" solvents: it's nonflammable, nonexplosive, almost odorless and relatively nontoxic. It's inert to most chemicals, noncorrosive to metals, harmless to most plastics and elastomers and, with a 117°F. boiling point, the solvent is well below the melting point of temperature-sensitive materials.

Four-Step Cycle

At Platronics, a typical cleaning cycle today is a four-step process that begins when top hats are submerged in an ultrasonic bath of T-WD 602. Here, many of the soils float to the surface as a creamlike layer that can be scooped off.

Then, to remove the residue of detergent left by T-WD 602, Platronics' technicians immerse the top hats in a 117°F. bath of boiling "Freon" TF solvent. Finally, the parts are rinsed in an ultrasonic bath of "Freon" TF and dried in the boiling solvent's vapors.

"The entire cleaning process takes only 12 minutes and the parts emerge clean, cool and dry," says Palumbo. "This means that we can handle the top hats right away and don't have to worry about airborne contaminants sticking to wet surfaces."

Like Platronics, other firms are finding that T-WD 602 offers advantages never before available in a cleaning solvent. For example, one Independence, Ohio, surgical equipment manufacturer uses the solvent to clean glass and metal parts prior to coating them with a silicone resin.

Explains James Ulrich, Pemco, Inc. engineer: "To assist blood circulation in our heart-lung machine, a device that sustains a patient's life during open-heart surgery, we apply a coat of silicone resin to the machine's glass and metal parts. A residue of any kind on glass results in a poor bond which might cause the silicone coating to eventually crack or peel off. So we make sure the surfaces are absolutely clean by bathing them in T-WD 602, then rinsing and drying them in 'Freon' TF solvent."

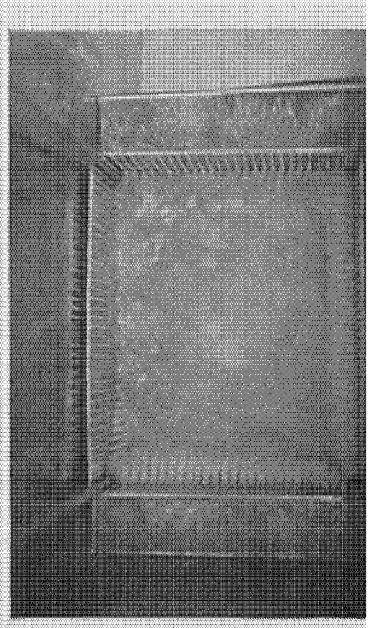
Another firm is using T-WD 602 fortified with ammonia to brighten metal on printed circuit boards that are used in the electronics guidance system for the Navy and Air Forc air-to-surface Bullpup missile.

Says William Buggeln, an engineer fo Maxson Electronics Corp., Great Rive Long Island, N.Y.: "We have to brighte copper wiring diagrams to remove oxide and fingerprints; otherwise, the copper won accept solder properly. T-WD 602 with an monia polishes metal quickly; then we sim ply seal the printed circuit boards in plasti bags and keep them bright and shiny unt they're ready to be used."

Because T-WD 602 doesn't affect mat rials of construction like plastics, metals an elastomers, a New York State gas and elec tric company has had some rather spectacu lar results cleaning watt-hour meters wit the solvent.

Says Anselmo Fini, superintendent of th system meter and test department for Niagar Mohawk Power Corp., Syracuse: "The cos liest problem in cleaning meters is time– time required to disassemble the chrom aluminum, steel and plastic parts, clean eac one separately, then put all the pieces bac together. Heretofore, one man average only five meters a day. With T-WD 60 however, he doesn't have to disassemble an parts and can clean four meters at a time less than five minutes."

Another savings noted by Niagara Ma hawk is the fact that the firm is using le



Ultrasonic bath produces air bubble blast loose insoluble, particulate m

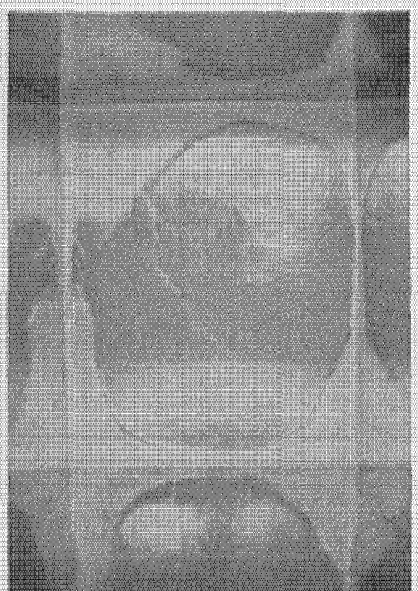
cleaning solvent. For example, the company's former cleaning technique required 350 gallons of solvent; the new method needs only 30 gallons. "While 'Freon' solvents cost more, we save dollars because we use smaller quantities," says Fini.

One longtime user of "Freon" and ultrasonics, Western Electric Co., has recently adopted T-WD 602 to clean telephone coin chutes. "In addition to removing oil and grease, a solvent must clean out dirt carried into the mechanism by coins," says R. R. Herrick, the firm's coin chute department engineer.

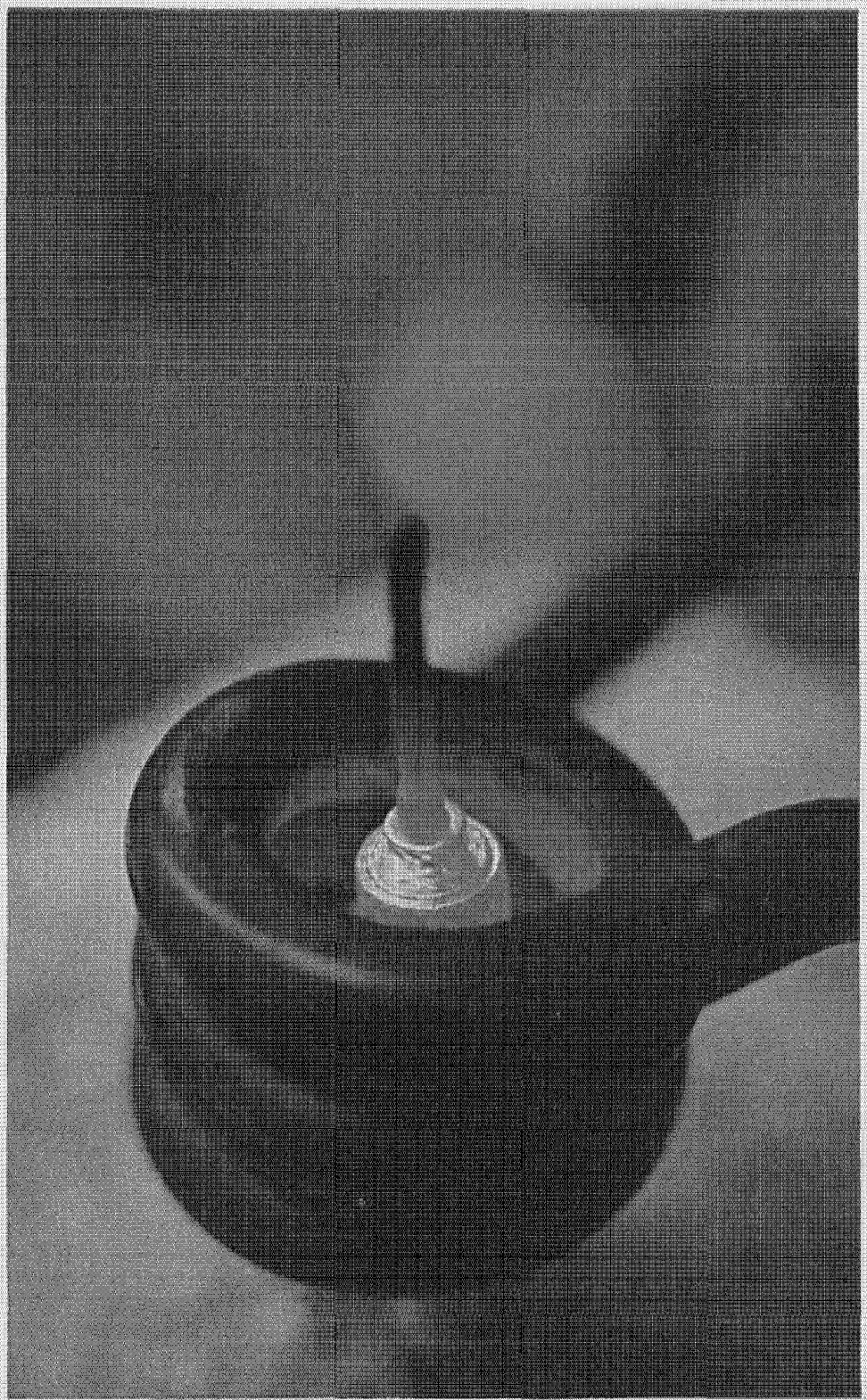
With "Freon", Herrick says his firm saves $100,000 a year in time and labor. "Actually, to clean a coin chute now takes only a half minute of a man's time; he can disassemble fewer parts and can be doing other jobs while the unit is being cleaned."

T-WD 602 has also been winning acceptance in other areas of the electronics, aerospace, plastics and metalworking industries, and one reason, in addition to economy, is the product's safety in use. As one dramatic demonstration, Du Pont solvent experts operate a color television set completely immersed in "Freon" contained in a transparent tank.

Says one: "Not only do we clean all parts of the TV set without hazard; we don't even interrupt the soap commercial." ■



Soils float to surface, form creamy layer that is scooped off "Freon" T-WD 602.



Tiny part glows without blistering in 1600°F. heating coil as Platronics tests quality of metal-plating applied to within one-millionth-of-an-inch tolerance.

A Tulsa-based firm engaged in a unique mining enterprise uses Du Pont explosives in

CARVING CAVERNS FOR BOTTLED GAS

By Walter R. Robinson, Jr.

Tulsa, Okla.

What may be the world's biggest bottles are now being constructed 300 feet underground by Tulsa-based Fenix & Scisson, Inc. The firm's "bottles," huge grottoes engineered in solid rock, are containers for stockpiling as much as 800,000 barrels of liquid petroleum gas (LPG) near major markets all over the country.

These gigantic, readily accessible storage facilities are one reason why consumption of such LPG products as butane and propane last year topped 11 billion gallons, double that of a decade ago.

Another factor in LPG's growing popularity is that it's readily portable in steel cylinders. Transported as a liquid, then returned to a vapor form with 250 times the heating power of natural gas, LPG has become familiarly known as "bottled gas" and has long been the main cooking and heating fuel in rural areas beyond the reach of utility lines.

To traditional markets, LPG producers are now adding industrial and agricultural applications that include flame cultivation for burning out weeds that survive preemergence herbicides; crop drying and curing; fuel for tractors, trucks and in-plant vehicles that must minimize exhaust fumes; supplemental heating fuel for natural gas users; and raw feedstock for manufacturing synthetic rubber and plastics.

Until 1950, most LPG was hauled by rail, truck and barge, then stored in aboveground pressure storage tanks. As markets expanded, underground transmission lines began snaking from southern refineries to northern markets, serving as swift conveyors for bringing the gases into hitherto untapped sales territory. Still the need for larger LPG storage facilities at major distribution centers was critical.

Explains Sidney Scisson, president of Fenix & Scisson: "Industry experts knew that the ideal place for storing LPG in huge quantities was in underground caverns, and in some areas globular cavities had been successfully dissolved out of salt formations. Unfortunately, this technique can be applied only where salt exists. When an Oklahoma petroleum company asked us to build a similar 20,000-barrel-capacity storage cavern in a bed of shale, we had to look for a new design. An unsupported shale structure wouldn't withstand heavy overhead rock pressure."

The solution, says Scisson, was to mine out an underground cavern whose ceiling would be held up by 45-foot-diameter pillars. The firm's crews began by drilling a 42-inch hole straight down to the shale formation 300 feet below. Then they formed the actual storage chambers by fanning out in a series of horizontal, crisscrossing tunnels supported by solid-rock pillars.

The success of Fenix & Scisson's first venture is indicated by the fact that the firm

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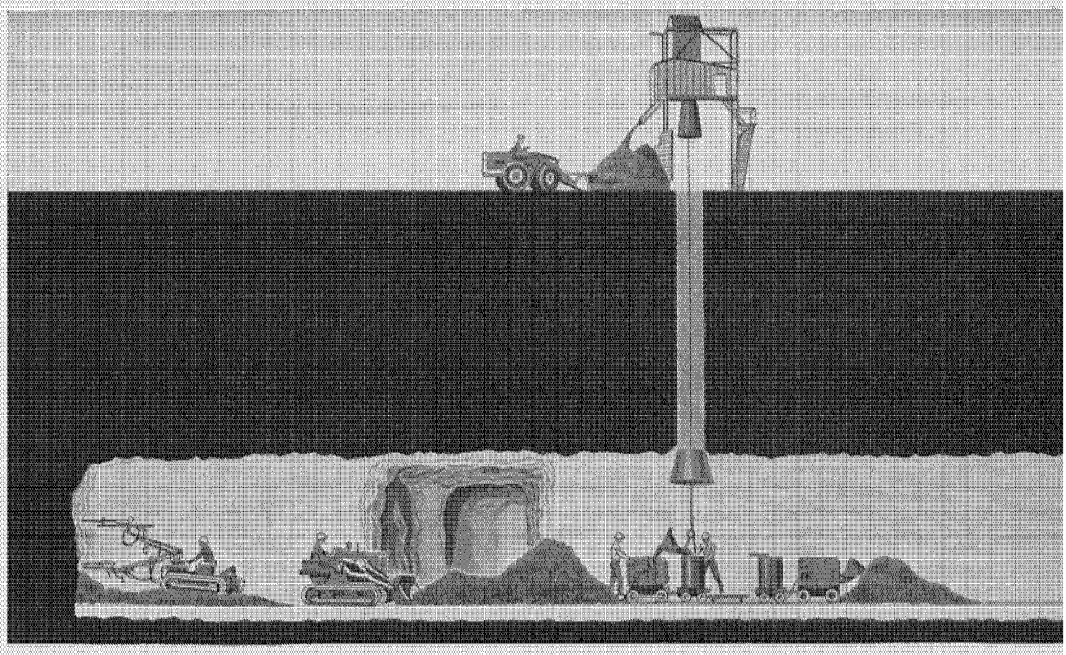


Fenix & Scisson crew carves huge storage vault out of solid rock 300 feet beneath surface. Such caverns provide major market areas with LPG reservoirs holding up to 800,000 barrels.

Diagram shows underground operation that starts with drilling explosives holes, left. After blasting, bulldozer moves rock to cavern entrance where it's loaded in bucket and hoisted via shaft.

Carving Caverns for Bottled Gas

continued

now has completed 54 such caverns, largest of which holds 800,000 barrels.

"The concept's principal advantage is the low cost of constructing an underground cavern," says Scisson. "Building comparable aboveground liquid gas pressure tanks is about four times more expensive."

In addition, because the storage facility is underground, refineries don't have to worry about high maintenance costs, high insurance rates, fires and leaks. And surface space that is often at a premium in industrialized areas is preserved for other uses.

Where can the caverns be built? "Almost anywhere," says Scisson, "so long as the rock formation is impenetrable and inert to butane and propane and sturdy enough to permit excavation."

Wherever the proper rock formation exists, Fenix & Scisson can build a cavern—even under a city. Example: A 200,000-barrel liquid propane storage cavern was built 350 feet under downtown Cincinnati, with the entrance shaft just three miles from Fountain Square in the center of the city.

The most expensive part of any such operation is drilling the 42-inch-diameter vertical shaft. This job takes about four months, and thus represents as much as one-quarter of the total price of the cavern. Earth, rock and mud are gnawed away with a rotating bit; then the long, narrow shaft is lined with concrete and steel casing.

Squeezing heavy bulldozers and tractors through a 42-inch opening is impossible. Thus, Fenix & Scisson crews disassemble the vehicles, lower the parts piece by piece down the shaft, then reassemble underground.

There, blasting and mucking go on round-the-clock until the job is finished. The main explosive charge in all Fenix & Scisson cavern projects is dynamite. "Which type of dynamite we use depends upon the rock," says Scisson. "Shale breaks more easily than most rock, so we needed a low-density explosive to build a 400,000-barrel cavern at Iowa City, Iowa. We chose Du Pont 'Hi-Cap' dynamite, which gave us a smooth-walled cavern at minimum explosives cost."

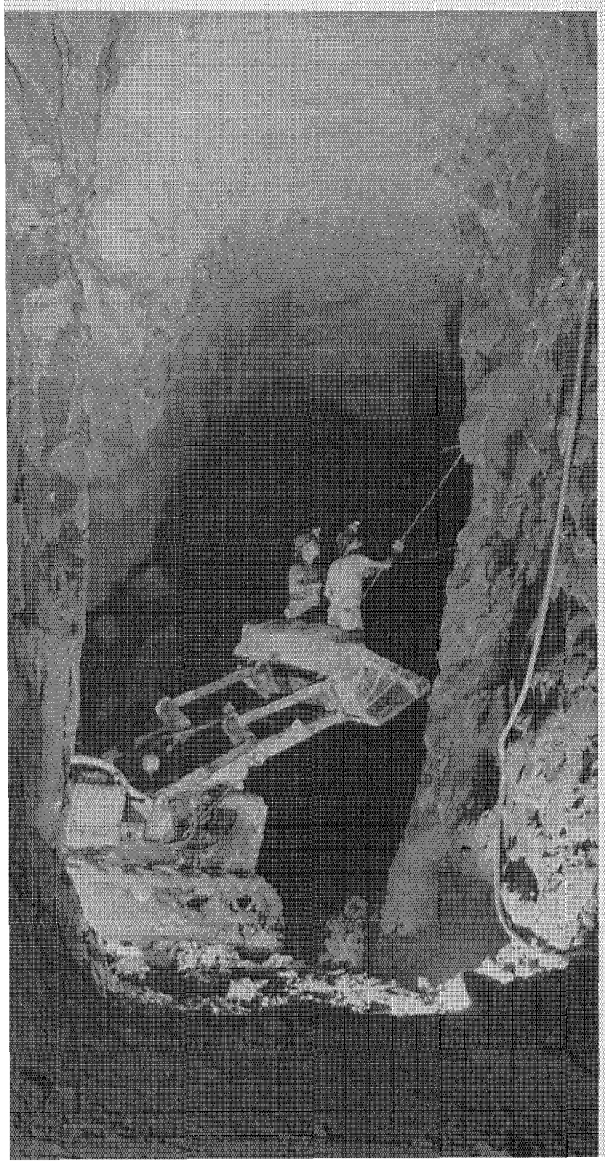
When the firm went to Erskine, Minn., to start what turned out to be its deepest cavern project to date, it faced an entirely different blasting problem: "We expected to build this cavern in a normal granite formation; instead, we had to mine out a rare rock mineral called zoisite that is even harder and more abrasive than granite. In addition, water seepage into the cavern gave us trouble."

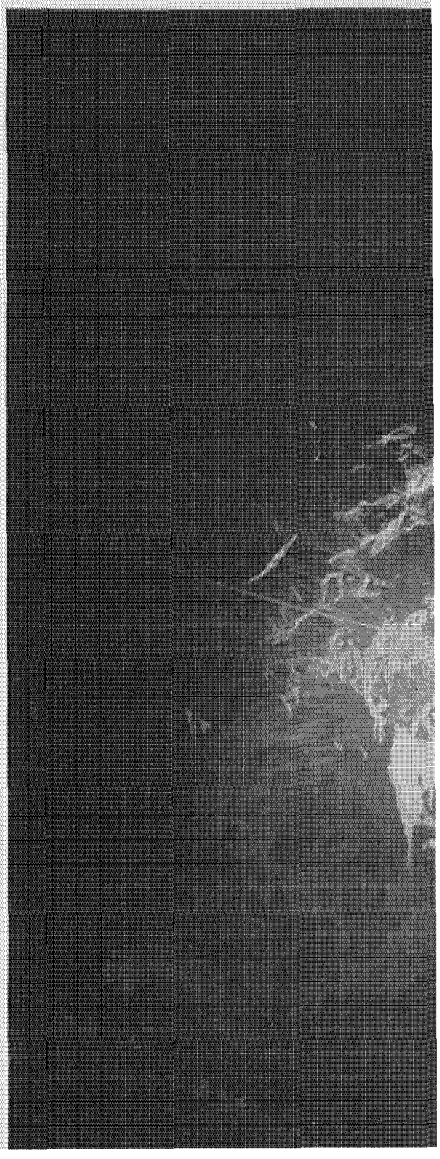
To solve these twin problems, Fenix & Scisson utilized 110,000 pounds of Du Pont water-resistant "Gelex" 1 dynamite, a low-cost, medium-density charge generally used in metallic ore mining and tunneling.

A typical Fenix & Scisson blasting cycle may be seen at a current 200,000-barrel cavern project in Oklahoma. With the vertical shaft completed, crews are carving 8x foot tunnels by drilling a pattern of 28 bo holes, each one 10 feet deep. Into the ho go 16-inch-long cartridges of Du Pont "H Cap" 2 dynamite. So that rock will bre toward the center of the drill pattern, w minimum noise and vibration, each hole set to fire at millisecond intervals: the fi cartridge in each borehole contains o Du Pont "Acudet" Mark V delay elect blasting cap.

Actual blasting is done during lunch ho when crews are on the surface and there sufficient time for exhaust fans to cle smoke, dust and fumes before work resum

The only entrance to the cavern is t





Perched on front-end loader, men at left scale loose rock from section of cavern's hard rock wall. Finished grotto, right, is series of horizontal, crisscrossing tunnels with ceiling supported by 45-foot-diameter solid-rock pillars.

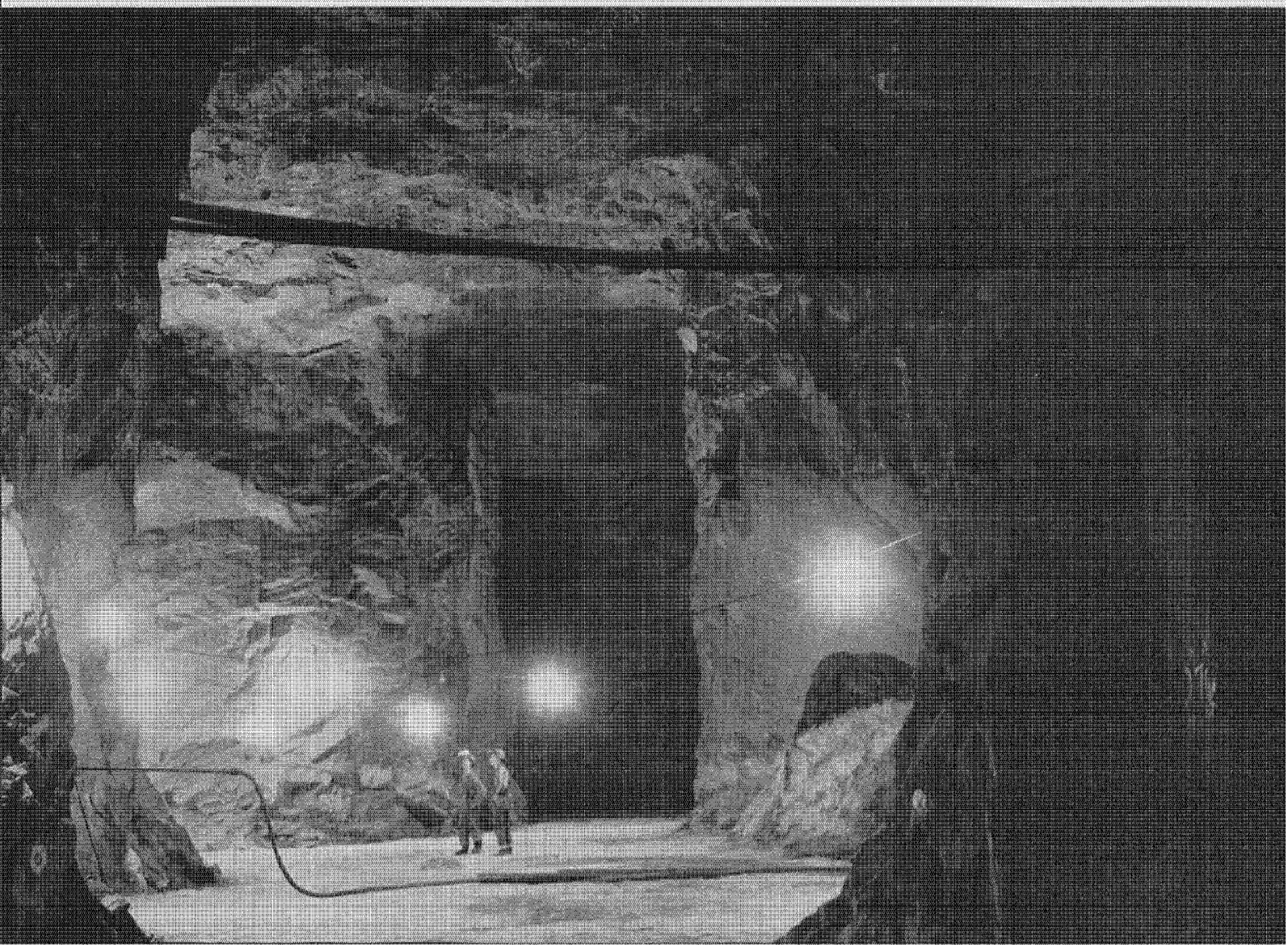
shaft; up and down it speeds a bucket that carries all broken rock to the surface. A round trip topside takes 50 seconds; anything slower than that is too slow. "We can always speed production by putting more men and equipment into the mine, but we can't haul out more than one bucketful of rock at a time," says Scisson. "Thus it's imperative to keep the bucket moving as rapidly and steadily as possible."

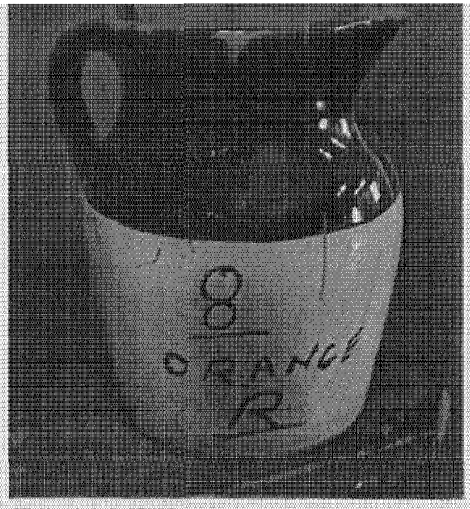
When all rock is removed from the cavern, the LPG injection pipe is inserted into the shaft and the cavern is sealed. Incoming butane and propane are sprayed through a header device and stored in the cavern at a constant temperature and pressure. When needed, the gases will be drawn into tank cars and trucks for delivery to nearby homes and plants.

Looking into the future, Fenix & Scisson foresee other applications for underground storage tanks. "Although they're used primarily today for liquefied petroleum gas, the caverns will soon become storehouses for liquefied natural gas as well," predicts Scisson. "And we expect that they will eventually be used to store such products as anhydrous ammonia, volatile chemicals, and jet and missile fuels. Even atomic reactor wastes could be locked deep in a vault of this type and forgotten. In sum, the trend for down-under storage is definitely up." ■



Welder assembles shovel lowered underground piece by piece through 42-inch-diameter shaft.





Crockery symbolizes past in automated plant.

A New Jersey textile dyer and printer emphasizes new techniques for

Automating an Ancient Art

Washington, N.J.

Motorists admiring the rolling farm and dairy country near this western New Jersey town rarely notice a neat cluster of green-painted, one-story buildings just off Route 24. The pastoral serenity belies the fact that here, 70 miles from New York City's textile trading center, is one of the world's most modern, high-speed textile dyeing and printing facilities.

The structures house the twin companies of Frank Percarpio, long recognized by his contemporaries in the textile industry as a pacesetter and a man with a passion for quality. His highly automated firms, Northern Dyeing Corp. and Castle Creek Prints, Inc., last year transformed 16 million yards of greige (pronounced gray) goods into brightly hued fabrics for the U.S. apparel, drapery and upholstery markets.

Percarpio takes a father's pride in both of his plants' mechanized children, none of which is more than five years old.

Explains Percarpio: "World War II was a boon for dyers and printers; almost anyone with a plant flourished, including those who still did the work by hand or used old-fashioned, worn-out equipment. After the war, however, competition grew rigorous as some firms began dyeing as much as a million yards of fabric a day. The only way for a small firm to stay in the arena was to have the newest and best equipment available."

Thus, in 1946, Percarpio sold his one-third interest in a prosperous tablecloth printing firm, invested $200,000 in screen-

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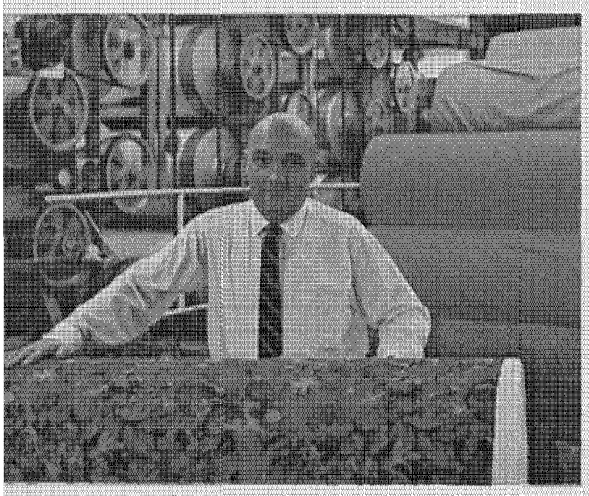
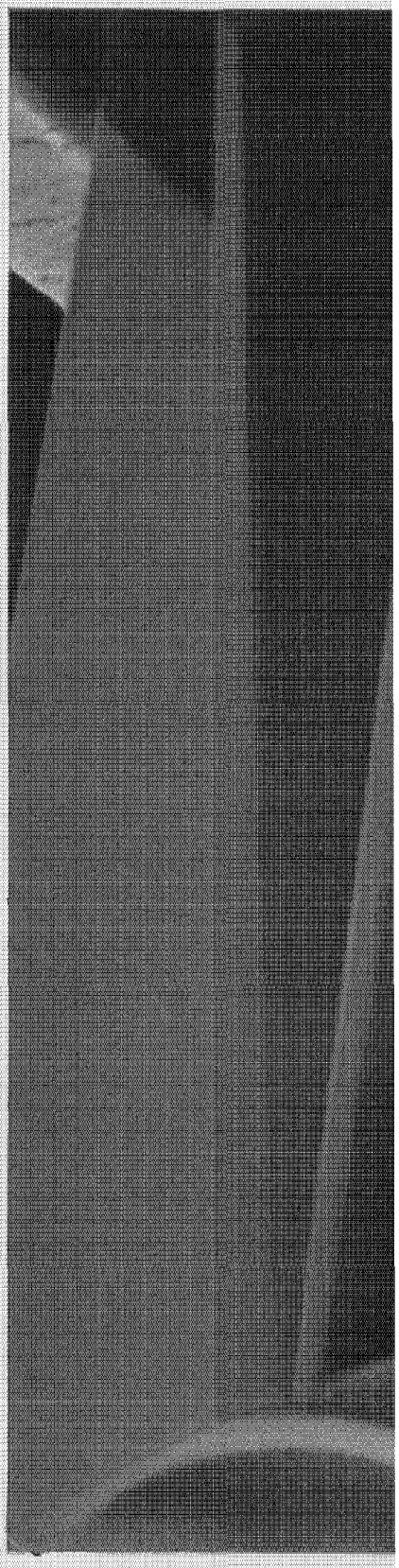
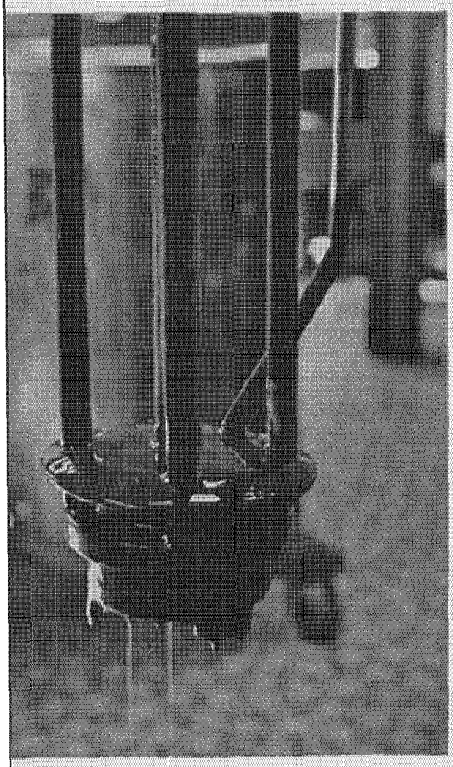
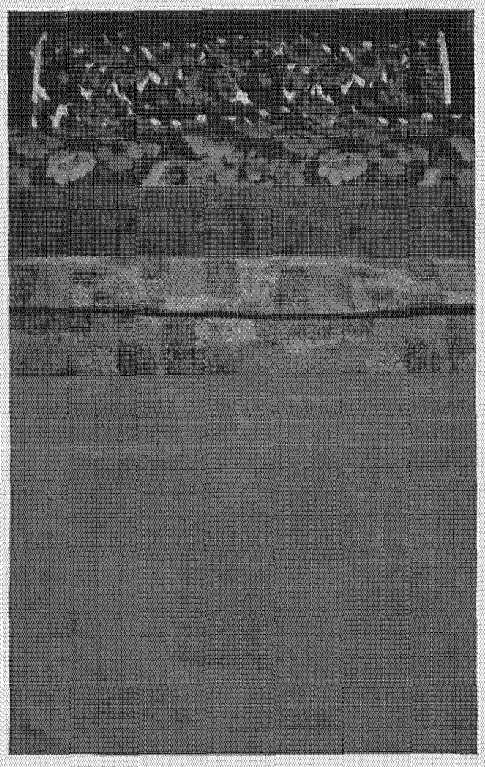
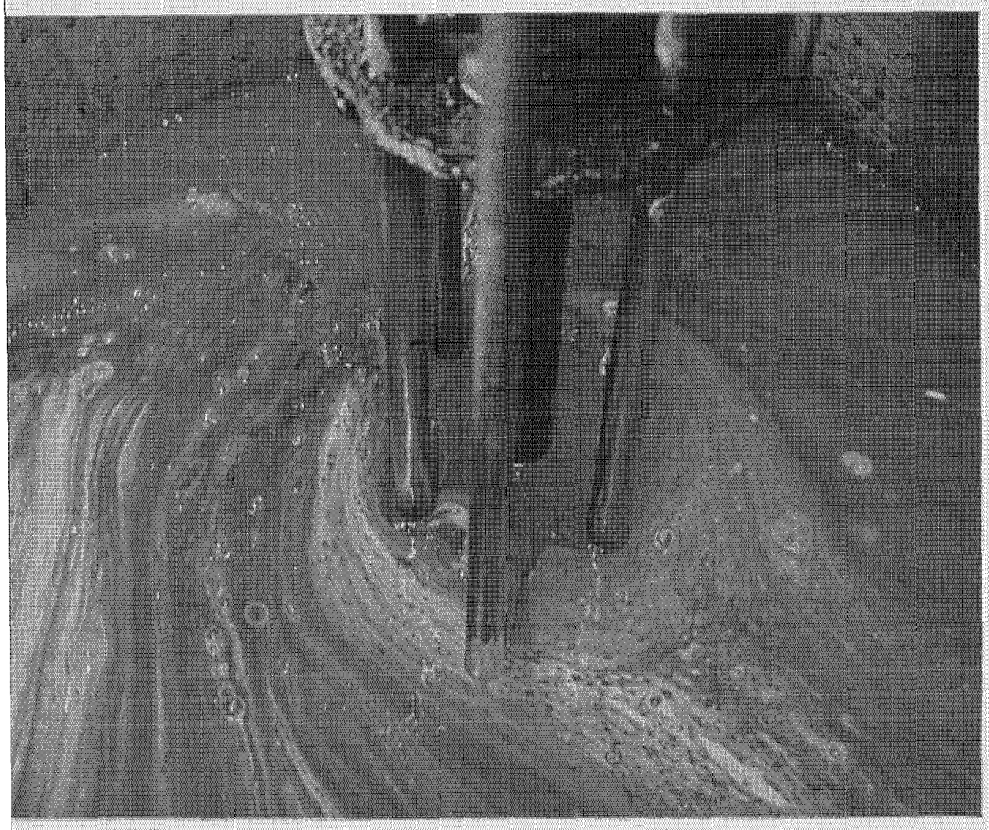


Frank Percarpio's passion for quality and modern machinery makes twin firms pacesetters.









printing and dyeing machines and set out to produce top-quality work as fast and economically as possible. The plan worked, and he now values his two firms' equipment at "over $4 million."

How does he keep his firms up to date? Once a year, Percarpio travels to U.S. and European textile centers and buys at least $250,000 worth of new equipment for his plants. A five-year-old machine is obsolete, in Percarpio's opinion, and it is not unusual for him to replace equipment even before it reaches that ripe old age. Says one employee: "We change equipment so fast here that most of us have been with the company at least three times longer than the oldest machines."

"Most of the new dyeing machinery we've installed is for processing fabrics of 'Dacron' polyester fiber," says Percarpio. "Today, 90 per cent of the fabric we dye is a blend of 'Dacron' and cotton that is ultimately used for dresses, shirts, slacks and raincoats."

To facilitate dyeing such large quantities of the fabric, Percarpio last year installed equipment in his plant for dyeing polyester fibers by Du Pont's Thermosol Dyeing Process. A technique rather than a machine, the Thermosol process is a method for fixing dye on textiles with dry heat in a single, continuous operation.

"The biggest saving is of time because the Thermosol method enables us to do a tedious job in one continuous operation," says Percarpio. "For example, it used to take eight hours to dye and heat-set 2,500 yards of 'Dacron' and cotton, which we now do in just 50 minutes."

First step in dyeing by the Thermosol process is cleaning the fabric. Incoming rolls of fabric are run through Percarpio's new $250,000, 160-foot-long continuous bleaching machine to remove oils and dirt picked up in the weaving process. At the rate of 50 yards per minute, material is singed, desized, washed, bleached, rinsed, neutralized and dried. It's then wound into 1,200-yard rolls ready for dyeing.

Because conventional dyes for cotton won't dye "Dacron", Percarpio uses Du Pont's "Latyl" dyes in both paste and powder form for the polyester fibers. The minute color particles of "Latyl" dyes disperse but do not dissolve in water; thus, the tiny particles cling to the outside of the polyester and cotton fibers. When heat is applied, all the dispersed dye particles migrate to and are absorbed by only the "Dacron" fibers.

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Automating an Ancient Art

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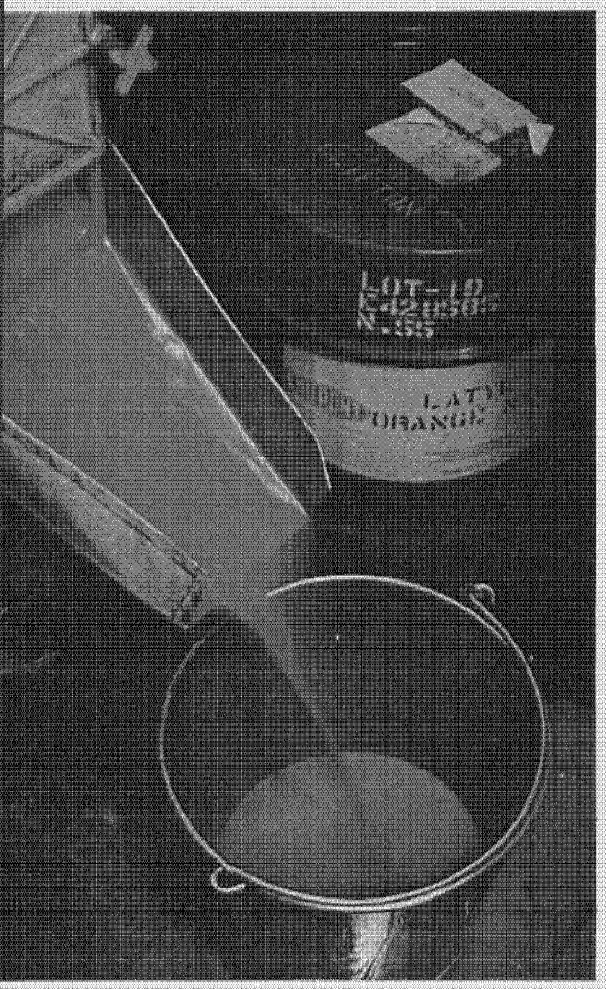


Colloid mill disperses particles of "Latyl" dye in powder form to prevent specking on fabric.

"The principal advantage of 'Latyl' dyes in paste form is that they eliminate the problem of specking," says Percarpio. "For example, it's impossible to completely disperse some dyes even by running them through a colloid mill or removing the large particles by filtering. The dye particles cling together, to leave spots on the fabric and spoil the uniformity of the fabric's color. 'Latyl' dyes in a paste form, however, are already dispersed and don't require special preparation before they're put on the fabric."

In addition, "Latyl" dyes are available in a wide range of shades, give good color value and have exceptionally good colorfastness, says Percarpio. Because these dyes have excellent sublimation properties, dyers don't have to worry about uneven or irregular shades on the fabric as a result of heat-setting processes.

The unique principle of the Thermosol process is the application of dry heat to fix dispersed dye particles in the fibers of "Dacron". Dyed fabric passes through a Thermosol "oven," which is composed of sixteen 20-inch-diameter revolving cylinders, and is exposed to 420°F. temperatures. The intense heat causes dye particles to actually dissolve into the fibers.

Dyeing "Dacron" and cotton fibers separately or simultaneously is a matter of choice, generally determined by the type of dye, depth of shade, and volume of fabric involved. After the "Dacron" has been dyed by the Thermosol process, Percarpio dyes cellulosic fibers either on a jig, pad-roll machine, or continuously by the Du Pont pad-steam process.

In addition to dyeing "Dacron" in volume, Percarpio uses the fiber in his printing plant as screens for printing multicolor patterns on fabric. "We have over 10,000 screens of 'Dacron' and use this material because it's resilient, doesn't tear easily on high-speed machines like silk does, and resists damage from chemicals in the dye better than any other material we've used."

An individual screen is made for each color in a pattern. Fabric of "Dacron" is stretched on a five-foot-square metal frame, coated with a thin layer of paint and etched where the design occurs. In printing, dyes pass through only the etched part of the screen onto the fabric.

Mixing colors for printed fabrics is a meticulous process, but the men who work in Percarpio's "color kitchen" are up to the challenge: last year they prepared 30,0 different shades. To match a designer's la out, Castle Creek Prints converts each col to a chemical formula and obtains preci color tones by blending different combin tions of dyes in a printing gum, i.e., a thic ener that prevents dyes from running on t fabric like an inkblot. When the dye b comes fixed, the gum is washed out.

Printing is performed today in much t same way as the art of silk-screening w done in China centuries ago. Dyes and co ors are first tested by hand as two printe lay material on a 60-foot-long table and a ply each color by squeezing it through t screen of "Dacron" with a rubber squeege

When colors meet the designer's exa specifications, huge rolls of fabric are rea ied for machine printing. In essence, t procedure is the same as hand printing e cept that the work is done automaticall Two of Castle Creek Prints' machines pri up to 10 colors simultaneously, while t firm's newest such machine can print colors. The result last year was six millio yards of printed fabric destined principal for slipcovers, draperies and furniture cove

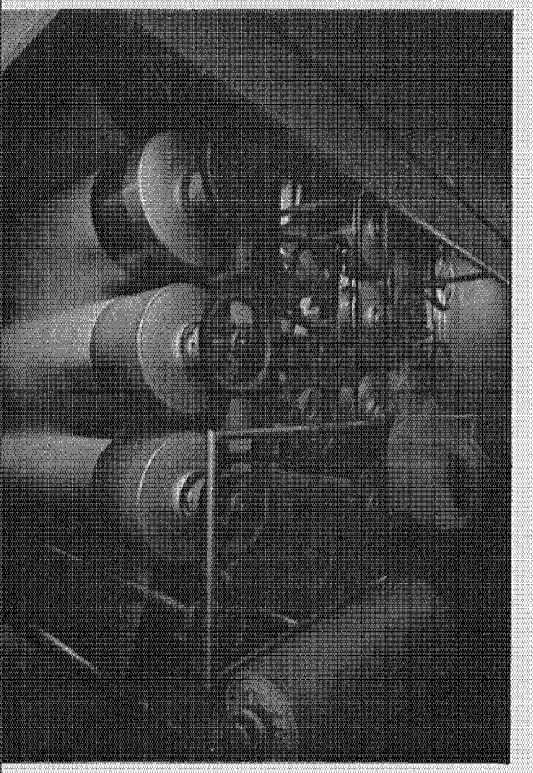
Special attention is given upholstery m terial. To protect it from water- and o borne stains, three-fourths of the upholste fabric now processed in Percarpio's plan is treated with "Zepel" fabric fluoridizer.

Before finished fabric leaves either Nort ern Dyeing or Castle Creek Prints, it carefully inspected to make sure all dyei is uniform and all printed colors are in pe fect register. When Percarpio is satisfied th the material meets his stringent quality r quirements, it's wound into 300-yard-lo bolts and shipped to such firms as Paci Mills Fabrics; Charles Bloom, Inc.; Eve fast Fabrics, Inc.; and Waverly Fabrics.

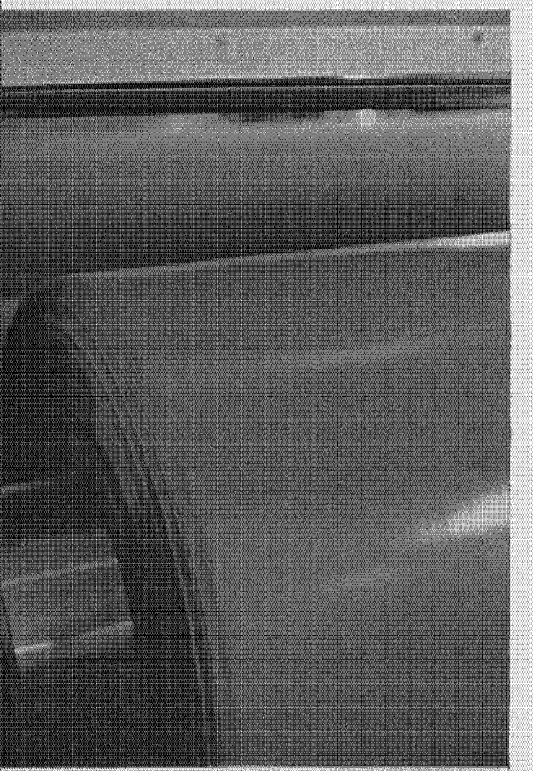
Percarpio himself oversees the smooth o eration of every inch of his two plants, a he and his two sons are the firms' only sale men. "We sell on the basis of quality, n price," says Percarpio. "For this reaso we've never employed a salesman and a ways have orders for a year in advance."

What Percarpio's next machine purcha will be, no one can say. He's already talki about an electrostatic printing machine th is now being developed in Switzerland f applying dry colors to coarse surfaces.

One thing is certain. When the machi is available, Percarpio will be one of t first, if not the first, in the U. S. to have it.



Thermosol oven's revolving cylinders mark the point where dry heat fixes dye into fibers.



Fabric unwinds at constant tension-free speed on jig machine used to bathe material in dye.



Automatic screen-printing machine produces 10 colors on fabric simultaneously by squeezing dyes with squeegee through screens of "Dacron". Resilient screens resist chemical damage.

DOORWAY TO THE MOON

Covering the world's largest windows posed a challenge that "Tedlar" accepted

By Richard J. Woodward

Merritt Island, Fla.

Ever heard of Merritt Island? Probably not. It is mostly swamp and scrub growth, and it's off the beaten track. Bypassed by tourists, it slumbered peacefully while the rest of the Florida east coast hustled and bustled.

It is wide awake now, though, and in five more years it will be the most famous place in America—more famous even than Cape Kennedy, which is three miles to the east.

This sandy, obscure island is home base for Project Apollo. From here, man will go to the moon.

Known as MILA—short for Merritt Island Launch Area—it will soon be a city in itself. A 50-building industrial area will sprawl across its midsection, complete with engineering laboratories, office buildings, a sewage plant and a movie theater. Just north of this will be Complex 39, the lunar launch site, manned by thousands of technicians of the National Aeronautics and Space Administration. It will be a city with a single purpose: to act as a doorway to other worlds.

That moment is perhaps five years distant, but the goings-on at Merritt Island are already out of this world. The first major project, now well advanced, is construction of a Vehicle Assembly Building (VAB) in which the Apollo-Saturn V moon rocket will be put together and checked out for the trip.

The VAB is just a beginning for MILA, but an awesome one. It is the largest structure (in volume) ever built by man.

It is a colossus, almost eight acres big and over 50 stories high, perched on 4,225 steel pilings that are driven 160 feet to bedrock. Its skeleton is 55,000 tons of structural steel, its skin is a million-plus square feet of metal siding, and its doors are big enough to admit a 45-story office building. The giant's total cost: $100,000,000.

In 1966, the Canaveral District of the Army Corps of Engineers, which is supervising construction, will turn the building over to NASA's Kennedy Space Center. After that, the plan reads this way:

The three main stages of the Apollo-Saturn V rocket will be brought to Merritt Island by barge and will enter the VAB through its "small" south door. (It is a mere 10 stories high.) The 360-foot rocket, topped by an Apollo spacecraft and nestled against a 440-foot mobile launcher, will be assembled in its vertical firing position within one of the building's high bay areas.

The huge stages of the lunar rocket will be lifted into place by 250-ton bridge cranes, and fully equipped workshops (three stories high) will telescope out from the surrounding walls to envelop the rocket while it is being prepared for flight. When completed, rocket, spacecraft, gantry and all will leave the building on an immense tractor called a crawler-transporter. (The crawler will weigh 2,750 tons, and its cargo 6,000 tons.)

Poised for flight, the Saturn V will be moved three miles to its oceanfront launch-

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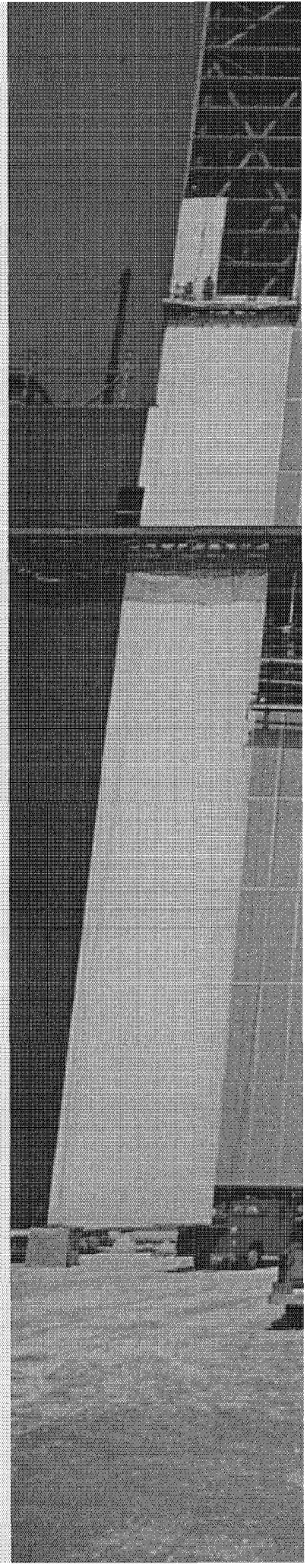
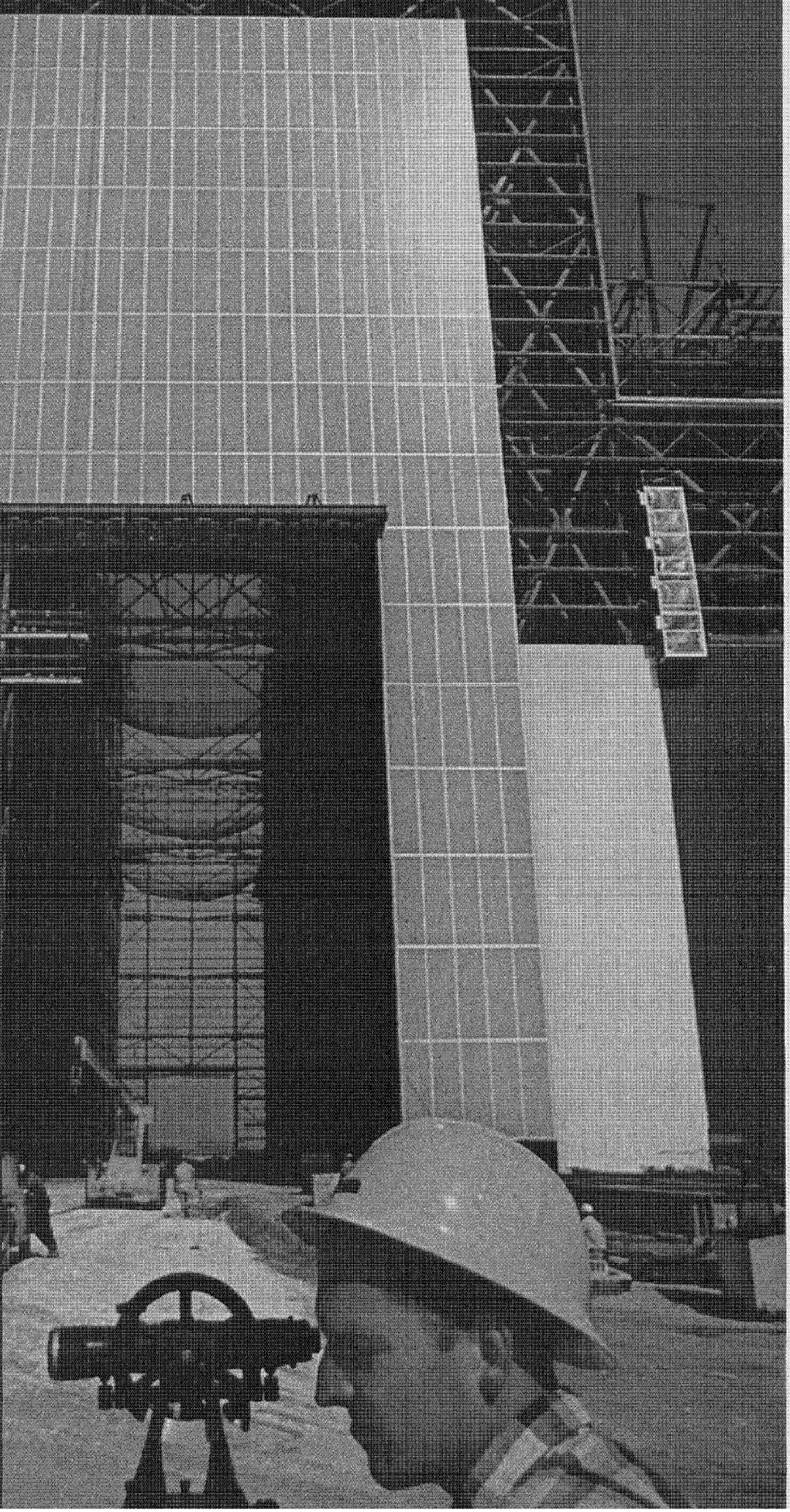




Engineer studies terrain in front of doorway to NASA's Vehicle Assembly Building for Apollo-Saturn V rocket. Translucent plastic panels around doorway are surfaced with "Tedlar" for long-term weatherability, easy maintenance.

Doorway to the Moon

continued

ing pad along a crushed rock crawlerway that is 6½ feet thick.

The trip to the pad will take three hours —from the pad, it is a three-day journey to the moon. Meanwhile, back at the VAB they will be getting another rocket ready. In fact, the building will be able to handle four Saturns at a time.

Not surprisingly, the Vehicle Assembly Building presented some unique engineering problems. For example, weather experts theorized that clouds could form near the 520-foot-high ceiling, causing rain to fall inside the building. The solution was an air exchange system to disperse the clouds, plus an air conditioning system of 10,000-ton capacity—enough for 3,000 homes.

Because the VAB resembles a huge box, its designers speculated that it might blow over in a hurricane. Wind tunnel tests confirmed this. Solution: 30,000 cubic yards of concrete for pile caps and floor slab.

The deafening roar of a Saturn V lift-off posed still another dilemma. Even at the three-mile range, moon launchings will subject the building to hazardous shock waves and acoustical pressures of up to 145 decibels. Solution: metal skin—and no windows.

The "no windows" ruling created a problem of its own, for the huge structure could become a dismal working place. Psychologists felt that technicians in the VAB would need some point of reference to the outdoors —in other words, if NASA's men were to keep their minds on the moon, they needed the sight of some sunshine. Just "some" sunshine, not too much. The idea was to create a sense of airiness without admitting glare or random sunbeams.

It was an uncommon problem, not easily solved. If conventional windows are forbidden, how do you admit natural light to a boxy giant with half again the cubic volume of the Pentagon?

Glass was ruled out, but translucent plastics offered possibilities. Questions piled up: Would plastic panels be strong enough? Would they need excessive maintenance or eventual replacement? Would they withstand hurricanes and shock waves from the launching sites? Would enough be available?

They were all good questions because the world's biggest building would require the world's biggest windows. The VAB contract, if obtained, would consume 10 per cent of the reinforced plastics industry's total 1963 production of translucent sandwich panels. If the panels could do the job, could the industry handle the order?

Several producers were willing and able, including Filon Corporation of California and a New Jersey firm, Panel Structures, Inc. Filon manufactures translucent sheets of fiber glass reinforced polyester resin, and Panel Structures specializes in making "sandwiches" out of them by bonding the thin panels to both sides of a welded aluminum grid. The grid provides great strength without diminishing translucency, and the panels can shrug off winds of hurricane force.

Good Light, Low Cost

The VAB designers drew plans to use over two thousand 4x12-foot panels of this type. Installed in sets of eight within preerected aluminum frames, they would provide a total window area of 70,000 square feet and would do a first-rate job. Strong, rigid and impact-resistant, they would admit an optimum amount of light at relatively low cost.

Of all the initial uncertainties, only one remained: long-term weatherability. The VAB is designed to give many years of service, and its exterior components must withstand long exposure to a subtropical climate. Although Merritt Island is an ideal site for Project Apollo, the intense Florida sun plays havoc with polyester building panels. A southern exposure and salt air make things worse. The VAB is near salt water, and one of its two huge windows faces due south, confronting the sun from dawn to dusk. Would the translucent panels rapidly erode, change color and eventually transmit less light?

The traditional answer would be "yes," particularly here in Florida. A reinforced plastic building panel will retain its structural strength indefinitely, but its initial gloss and light transmittance can be relatively short-lived. If esthetics are important, the panels must be replaced or resurfaced within five years (and sometimes sooner).

But Filon and Panel Structures, who got the contracts for the VAB, could ignore these shortcomings. Panels installed at Merritt Island will continue to look like new f many years, despite the hostile environme Reason: They are surfaced with "Tedla PVF film—one of the most climate-resista products ever developed through chemistr

A Du Pont invention, "Tedlar" was intr duced two years ago as an extremely weat erable exterior finish for building produc Its earliest use was as a factory-applied fi ish for residential siding, and thousands homes now boast a durable surfacing "Tedlar" that is unconditionally guarante not to need painting for as long as 15 yea

In 1964, Du Pont sought a different ki of market for this remarkable film. The co pany developed a modified version call Type 15 "Tedlar", containing ultraviol screening agents that make it an excelle transparent surfacing for reinforced pol ester building panels.

The one-mil (0.001 inch) film is appli to the panels during the manufacturing pr cess, where it serves as the carrier sheet which the fiber glass mat is impregnat with liquid resin and then formed into final shape. Unlike conventional carri sheets of cellophane, which are stripp from the finished panels, the "Tedlar" b comes an integral part of the finished pro uct. No adhesive or special preparation required because the film is specially mod fied to provide good bonding characteristic

Outdoor tests in Florida show that pane surfaced with "Tedlar" will maintain the initial gloss and appearance three to s times longer than conventional products.

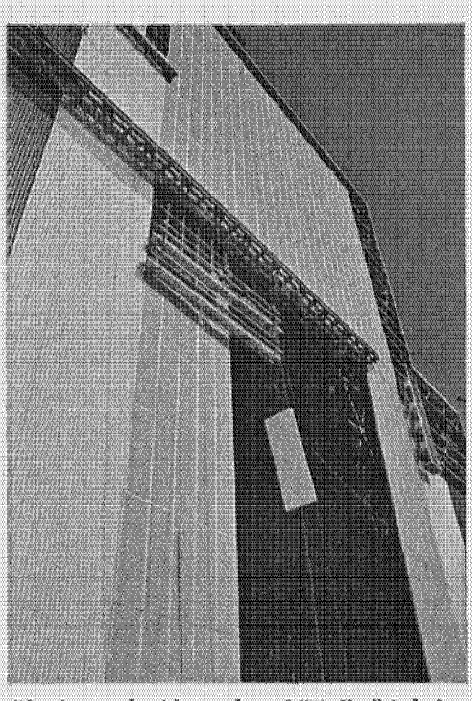
Panels surfaced with "Tedlar" also ter to be self-cleansing because of the low-fri tion characteristics of the protective fil and the elimination of surface fiber exp sure. The film's slick surface aids the clean ing action of normal rainfall and preven exposure of glass fibers that would cat and hold particles of airborne dirt.

It's little wonder that Type 15 "Tedla was considered a natural for the VAB a was used on the exterior surfaces of its tran lucent curtain walls. Because of its presenc the service life of the world's biggest wi dows will be greatly extended. Five years so from now, when the first man meets t moon, these panels should look exactly t same as they do today. In the interim, t

National Aeronautics and Space Administration will save considerable money in routine maintenance costs because of the self-cleansing properties of the overlay of "Tedlar".

By 1970, the Merritt Island spaceport will be the nerve center of man's race for the moon, and the face of Merritt Island will have been totally transformed. What today is a sandpit will have become a mile-long barge canal, with a 1,200-foot-wide turning basin next to the VAB. At the oceanfront, two Saturn launch pads will rise from the flat sands. The $75 million industrial area will be working around-the-clock to provide essential services. This island will be the busiest place in Florida, and technological miracles will take place every day.

Today the VAB stands almost alone. The soaring Saturn umbilical towers, a few yards to the north, are dwarfed by it. The building dominates the area and conveys a feeling that here is man's doorway to the moon. ■



Plastic panel with overlay of "Tedlar" is hoisted to top of 10-story-high doorway for installation. Interior of world's biggest building, right, is brightened by light from translucent windows.

Coating for a King-Size Container

By sealing out moisture, "Elvax" helps keep 10-quart home milk dispensers in shape

Most people call milk nature's most perfect food, but the weary housewife's description is not always so lofty. Reason: She has to lift milk, cart it about the kitchen, make sure the kids don't drop it.

Now there are 10-quart packages that you lift only once—into the refrigerator. Then you simply draw milk from a tap. As for storage: the containers take up no more shelf space than three half-gallon bottles. There's less chance of running out of milk and no need to carry cartons or bottles home from the store.

One such package is called "Liqui-Box", developed by the Liqui-Box Corp., Columbus, Ohio, a subsidiary of The Corrugated Container Co. Its interior is a double-wall polyethylene bag that holds the milk. This bag is tapped by a plastic spigot through a corrugated outer container coated with a blend of "Elvax" vinyl resin and wax. The coating of "Elvax" helps seal out moisture caused by high humidity and condensation and gives the box an attractive, scuff-resistant finish.

One of the pioneers of the bag-in-the-box concept, Corrugated Container entered the bulk milk dispenser business in 1961 by producing five- and six-gallon containers for use in restaurants and institutions. Shortly afterwards, the Liqui-Box Corp. was organized to develop a smaller home milk dispenser. After a year of testing, the new fully disposable units, labeled "Liqui-Box", were ready and are now available from a number of U.S. dairies.

"Housewives like the idea of having plenty of milk at their fingertips," says Robert J. Curie, president of Liqui-Box. "They also like not having to clean bottles or to worry about dropping them."

Curie cites other consumer benefits: "Milk in the dispenser stays fresh because 'Liqui-Box' remains in the refrigerator, sealed off from harmful heat, light and air. And the container's lower distribution costs keep its price competitive with that in the store."

Advantages to the dairies are many. According to the general manager of a Columbus milk company, "These home dispensers practically eliminate breakage—one of our biggest problems with bottles. We've also found that the compact containers store easily and efficiently in both route trucks and dairy coolers. And milkmen can cover a lot more territory because they make fewer stops per week, have no bottles to pick up and do less bookkeeping. In addition, the ease of handling of these dispensers has resulted in significant time and materials savings at our plant."

One problem, however, threatened the success of Liqui-Box's new milk package. The dispensers became limp and soggy after prolonged storage in moist dairy or truck coolers or under hot, humid conditions.

Several new container coatings were therefore tried. Laminates with asphalt, foil and polyethylene were effective but too costly. Heavier corrugation in the boxes added little protection. A wax coating scuffed easily and proved sensitive to temperature.

To help find a solution, specialists from Du Pont's Electrochemicals Dept. suggested using an outer coating based on "Elvax" vinyl resins.

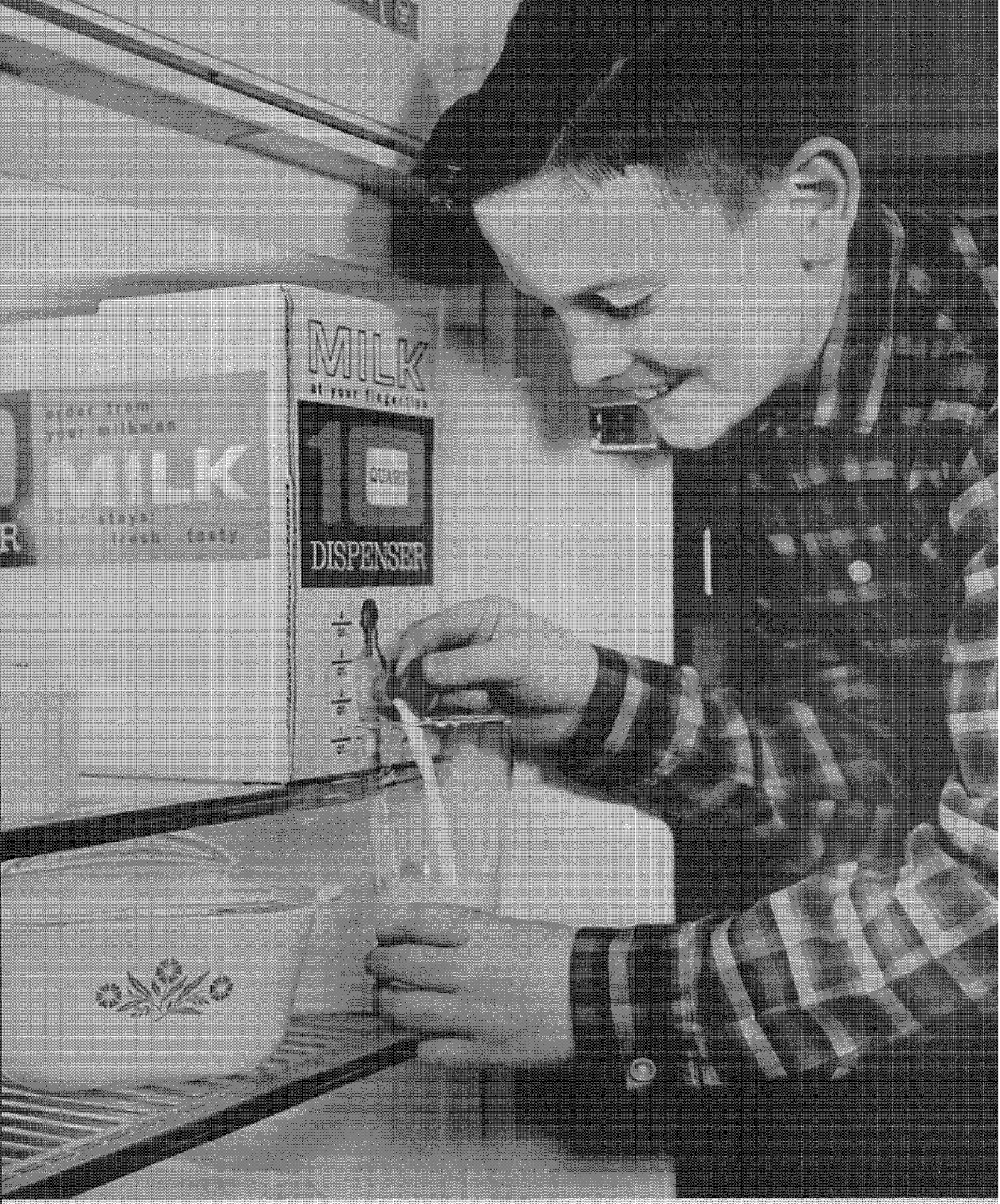
"The results were impressive," says Thomas E. Croley, director of research and development for Corrugated Container. "Boxes treated with a hot-melt blend of 'Elvax' and paraffin wax were impervious to moisture and highly resistant to scuffing and abrasion. The new coating also gave a glossy finish that enhanced the printing on the package."

Liqui-Box adopted the coating. As a result, all containers sold to dairies by Liqui-Box last summer were wearing a protective barrier of "Elvax".

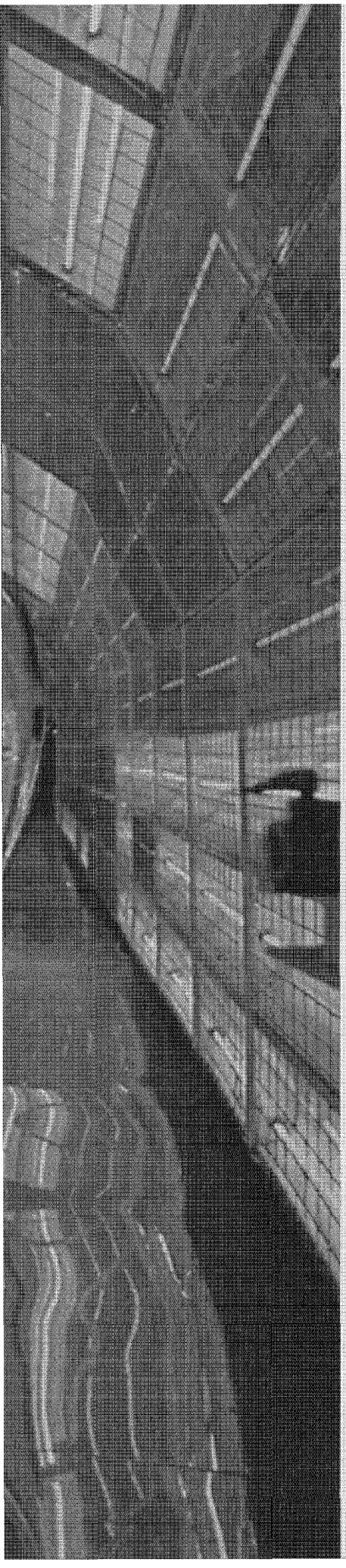
Success of the new coating suggests that it might find use in a wide range of corrugated packages, cartons, boxes and other containers. Reason: It can be applied to either or both sides of a corrugated container.

Explains one Corrugated Container Co. spokesman, "Applied to an inside wall, the blend of 'Elvax' and wax will retain moisture—important in packaging items such as meat, produce and tobacco. Applied to the outside, it eliminates the need for expensive wrappings on products like ice-cream cones and other baked goods.

"When used on both sides," he concludes, "the wax blend with 'Elvax' retains moisture or vapor essential to the life of the product, but fends off excess water or humidity." ■



Ten-quart milk package with built-in tap takes up no more room in refrigerator than three half-gallon bottles.



Detroit's auto makers go all out to break all sales records. For a major ally they look to Du Pont and its

Colors for Colorful Cars

By Jack D. Hunter

Detroit, Mich.

Never before have the American people been more preoccupied with cars, to hear the U.S. Census Bureau tell it. The agency reports that the new car has moved to an all-time high on the list of consumer buying intentions. Highly sensitive to such portents, the nation's 31,040 dealer showrooms are therefore aglow with welcome for 1965's crop of tire-kicking, hood-lifting, door-slamming shoppers.

And never before has the auto manufacturer himself been more intent on turning the shopping public's "we'll think about it" to "it's a deal." The four major auto makers last year spent $1 billion to tool up for the restyling of their 1965 models and—as if sensing that the early bird would dominate the sales *Grand Prix*—rolled off thunderously by introducing 14 makes in only three days of last September. Cheering at the starting line were budgets that amounted to $100 million for initial promotion alone and, in face of the hundreds of millions in ad programs scheduled for the balance of '65, it will be a rare consumer indeed who isn't aware of what car offers what and why he should buy it. And with artillery like this backing them, most Detroit executives expect sales in calendar 1965 to offset labor negotiation setbacks and nudge last year's soaring record.

In his obvious willingness to look and listen, the new car shopper often takes on the look of a kid in a candy store as he considers the colorful alternatives confronting him: compacts, sports types, and intermediate, full-size and luxury cars—each offering a broad range of horsepower and appurtenances, and each competing in price and pomp with counterparts in showrooms across the street. (One car maker offers more than 130 different versions of 26 makes, thereby competing down the line with anything the rest of the industry turns out.)

Ask any auto sales executive what is the single greatest influence on the car-buying public and he'll answer in a word: Styling. "Styling" is the industry's term for an automobile's configuration ("architecture") and decor (colors, textures), and it embraces the whole package—from exterior finish to cigar lighter. So great is the emphasis on styling, one sales vice president estimates that he spends nearly two-thirds of his time weighing new model appearance factors. (His philosophy: "A handsome car is its own best salesman.")

Be it for economy compact or 19-foot-long limousine, the touchstone of modern auto color styling is the exterior finish, since every aspect of the individual car's decor is oriented on this base. Glance around the parking lot and you'll see a rainbow of car colors; look closer and you'll note that the harmonious treatment of tone, shade and materials inside each car has its origin in the paint on the outside.

It hasn't always been this way. In the industry's early days, auto paint technology was not sufficiently advanced to permit more than three or four basic exterior color choices

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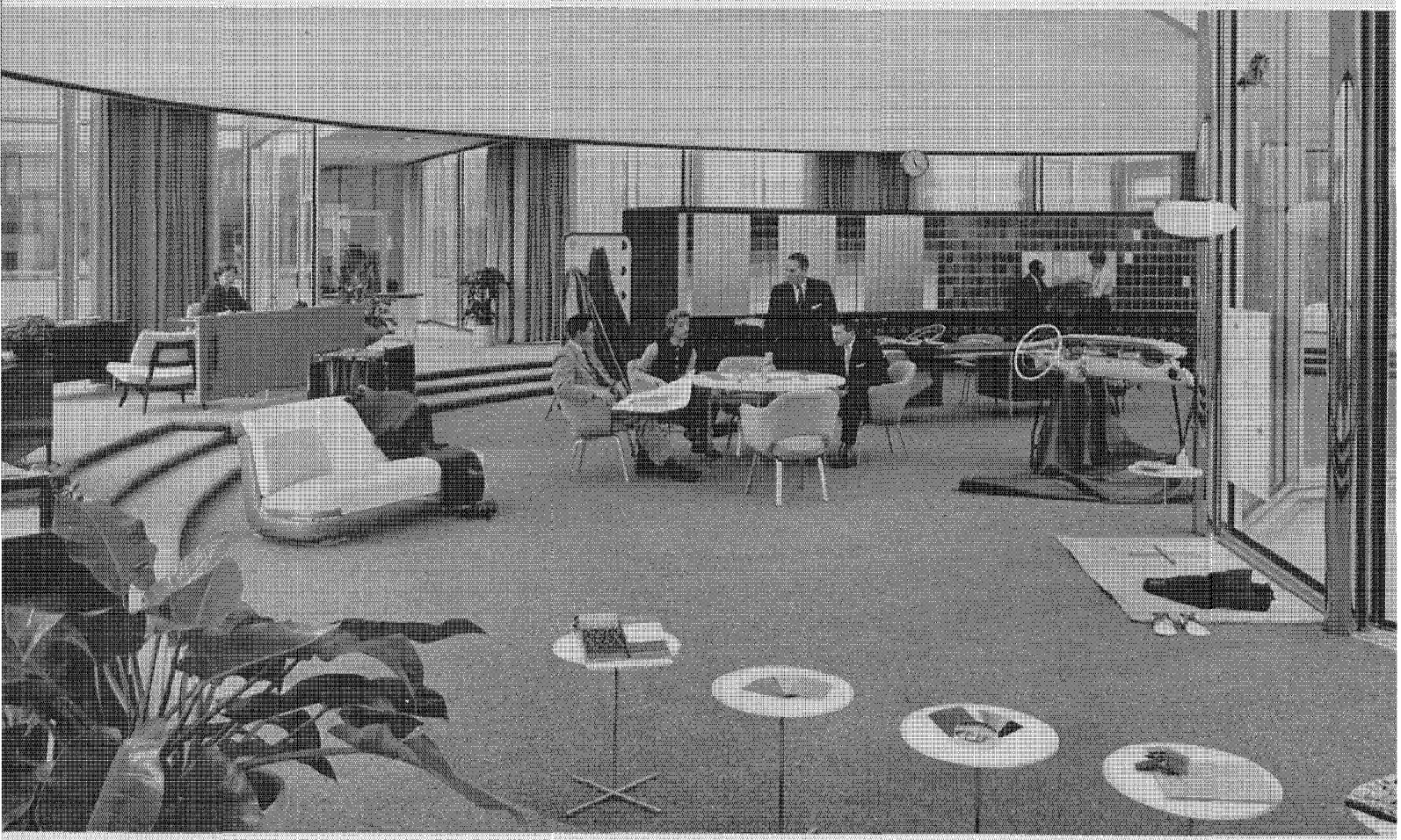
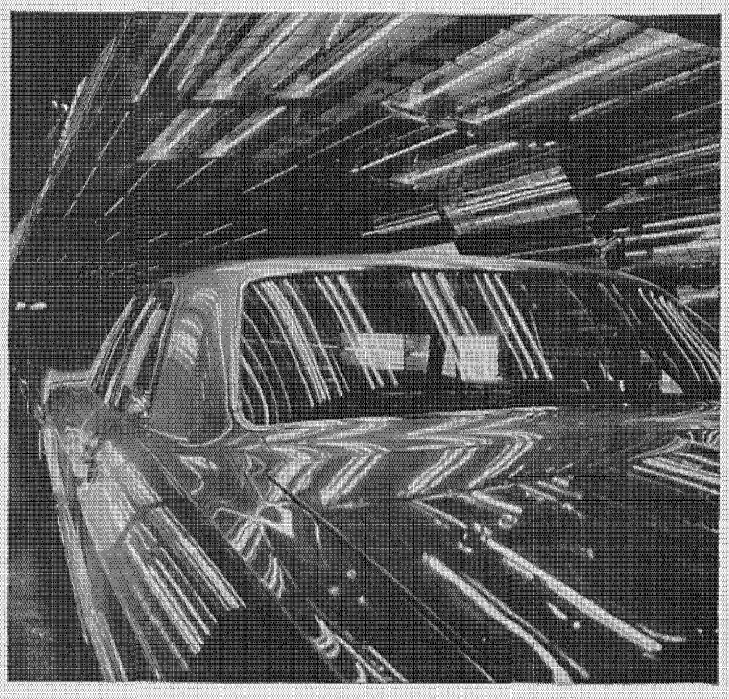
High-temperature ovens, heated by quartz rod lights and reflective floor, cause acrylic lacquer to flow into even, lustrous, hard-finish coat.



Color and Interior Design Studio at GM's Technical Center near Detroit, above, originates hues, textures applied to cars in assembly plant, below.



Colors for Colorful Cars

continued

—invariably somber in themselves and usu
ally accompanied by indifferent interiors.

In the late 1930's, as the U.S. crawled ou
of its Great Depression, General Moto
Corp. dealers seemed to be among the fir
to sense a lifting of consumer spirits. Th
clue: The car shopper was balking at th
same old gloomy colors and was looking fo
something snappy. GM's "Art and Colou
Section"—destined to become the most com
prehensive design organization in the indu
try—discovered to its dismay that ofte
what the shopper wanted the dealer pro
vided: i.e., many dealers were repaintin
the new models in their showrooms wit
bright-hued finishes of dubious origin an
life expectancy.

Meanwhile, though, auto paint manufac
turers were busily making some discoveri

of their own, and Du Pont was busiest of all. Du Pont's introduction of "Duco" nitrocellulose lacquer had long before cleared the logjam in auto production by making it possible to prepare and finish a car in hours instead of months. But Du Pont, unwilling to rest on these laurels, had devoted subsequent millions to the development of better, more durable finishes and, at the time GM was most heavily engaged in its effort to "revolutionize" auto color concepts, these new products proved to be valuable allies.

Color Cornucopia

Says Norman J. Mooney, Du Pont's color advisor in Detroit: "After the introduction of the revolutionary new finish, 'Duco', 'Dulux' high bake enamel was introduced by Du Pont to the automotive industry. This provided a high luster without rubbing, as well as a tough, durable film at relatively low cost which was previously unknown in the automotive field. 'Dulux 100', an improved high bake enamel system, was the next major breakthrough by Du Pont, with 'Lucite' acrylic lacquer being introduced at about the same time (1956) after 10 years and $3 million spent in research. These introductions opened a vast cornucopia of color and quality to the automotive stylist. The subsequent improvements in 'Lucite'—known as 'Lucite' thermo-flow lacquer—offered a sophistication of the original product which eliminated most, and in some cases all, of the polishing operations."

In the post-World War II years, as car production climbed back to normal and new finishes became available, GM pressed its styling gas pedal to the floor. One factor motivating GM's emphasis on color was the woman's increasing influence on the auto market. Engineering progress—power aids to steering, braking and accessories, automatic transmissions—made it easier for women to drive cars, while "architectural" advances made it more comfortable for them as they did.

Says William L. Mitchell, vice president and director of all styling activities for GM: "The ladies' influence, and the psychological uplift of peace and prosperity, created a demand for gay, bright colors. In 1949, the Pontiac Catalina reached the market with the interior fabrics and trim color-keyed to the exterior of the car. This was an industry 'first' and was immediately followed by most other cars. Today we take color-keyed cars for granted."

How does GM select its car colors? Says J. S. McDaniel, head of the Interior Design Studios: "Painstakingly and logically."

He explains that preliminary color selections are made by each of the chief designers of the Chevrolet, Pontiac, Oldsmobile, Buick and Cadillac interior design studios and other members of the interior design section. This group constitutes GM's color committee.

A number of sources are drawn upon in the preliminary selection of exterior colors, including the color reference library in the Styling Color Studio, the Styling paint department (which matches and blends colors), colors previously in production, and colors submitted by paint manufacturers.

At the outset, consideration is given to (1) appropriateness of hue, chroma and value with exterior car designs; (2) the degree of modification desired in basic colors offered year after year; (3) colors that indicate a rise in popularity; (4) colors that can be attained through new manufacturing techniques and pigmentation; (5) previous color preferences and regional variations resulting from climatic differences; and (6) colors reflecting public taste changes.

Once the initial colors are selected, the color committee screens them and reduces the number of color categories into a workable program, as there may be as many as 60 colors under consideration at this stage. From the total colors proposed, the committee adopts a range to "sponsor" for the model year's exterior color program. These surviving colors are then turned over to the paint manufacturers for development into finishes of automotive quality that meet established GM paint standards. Each manufacturer (source) is asked to formulate all of the proposed colors.

When samples of the complete line of color proposals are received from the sources, Styling reviews each development against the Styling master sample. If the color varies from the master, the source is asked to submit a closer color match. After all sources have completed their formulations and submitted samples, Styling then decides which source will produce the master standards.

At this point, Styling has a complete range of color proposals that are practical production automotive finishes. These colors are then painted on production cars for a review with divisional managements. (Styling prefers to paint full-size cars because esthetics are better evaluated this way; moreover, painting cars on a production assembly line helps the Fisher Body and car divisions to assess a paint's working properties.)

continued



Library of fabric samples, with hinged leaves showing swatches from many mills, aids stylists.

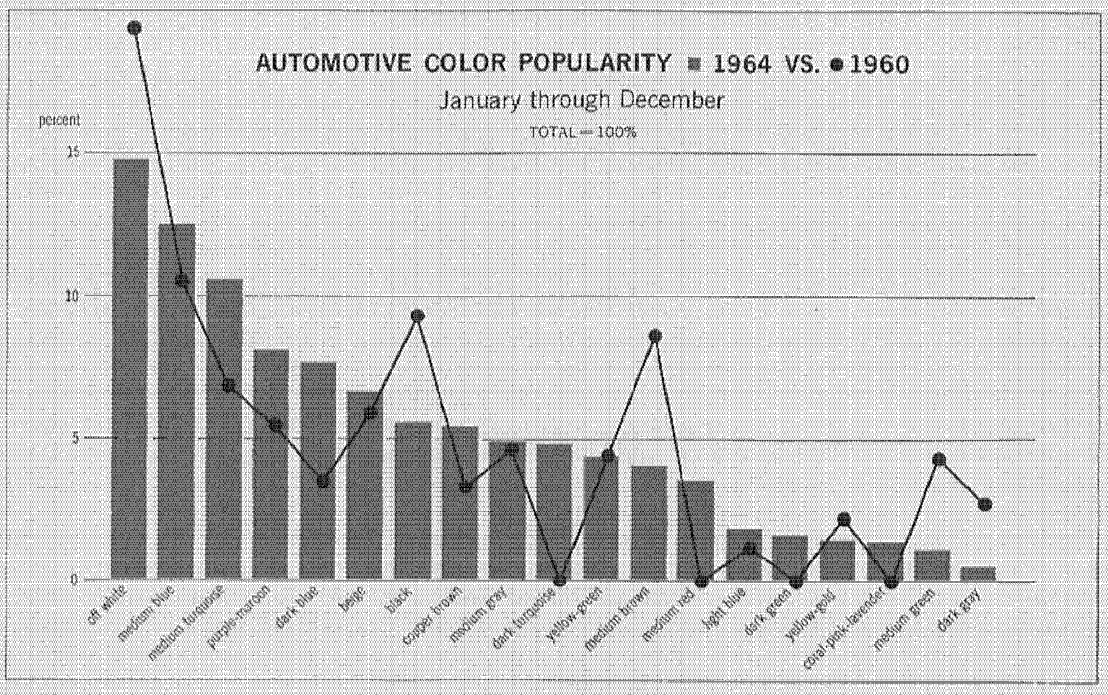
At Styling's initial color showings, the divisions review the painted cars in both a static and moving display—the latter on a landscaped circuit of roadways overlooked by a reviewing stand occupied by key management men. From these displays, each division selects as many as 15 colors for its exterior color program.

The decisions made at all color meetings are published by Styling in a release to paint sources and to GM manufacturing divisions. This release designates the color category name, the approved paint source number identification, and the divisional color usage. Fisher Body Division's Paint Standards and Trim and Hardware Depts. then assign identification codes for their purchasing requirements, and color selection is complete.

This is an annual procedure, repeated as each new model year's cars are designed.

As for Norman Mooney, he rarely hesitates to point up the role Du Pont has assumed in Detroit's search for more and better colors. For more than three decades, he has been serving in the color development area and as a key liaison man between the industry and Du Pont, and he unabashedly claims that Du Pont has "mastered" more automotive colors than any other vendor in the industry. (The huge color selector at GM, for instance, which holds 3,800 metal color samples and provides an absolute color scale by which all tints, shades and chromatic colors can be identified and graded, would seem to bear him out. It was developed by Du Pont for GM and, since Du Pont is still a principal paint supplier for GM and GM manufactures more than half of the cars sold each year, Mooney's point can hardly be shrugged off as sales enthusiasm.) Moreover, he says, Du Pont's automotive finishes today are much more durable, more attractive and are not very much higher in price than they were 20 years ago for comparable type colors.

Mooney keeps a year-by-year scorecard to establish trends in automotive color popularity. Among the recipients of these annual analyses are more than 1,200 of the world's car manufacturers, fashion organizations, pigment manufacturers and consumer goods manufacturers, as well as Du Pont sales and paint development laboratories. Says he: "The present trend appears to be definitely in the direction of dark green, blue, gray, maroon and turquoise, and there is no current evidence of a revival of the many pastels of the early '50's —some of which would be esthetically unacceptable today. But whatever tomorrow's colors will be, Du Pont will more than likely be their primary source." ■



Four years can make marked difference in consumer color preferences, chart by Du Pont's Mooney shows.



Dad's beachwear is bicycle pullover of 100 per cent "Orlon" with matching blue walk shorts of "Dacron" and flax.

Wardrobe for Warm Weather

From office to beach to cocktail party, the well-dressed man stays neat and comfortable in apparel fashioned of Du Pont fibers

Any day now the cold winds will turn balmy, the last of the snows will melt, overcoats will go into mothballs and fashionable men's thoughts will turn to what's new in apparel for spring-summer '65.

And, according to the fashion trade, this year's warm-weather wear will be highlighted by lighter colors, fabrics with textured effects and subtle styling refinements.

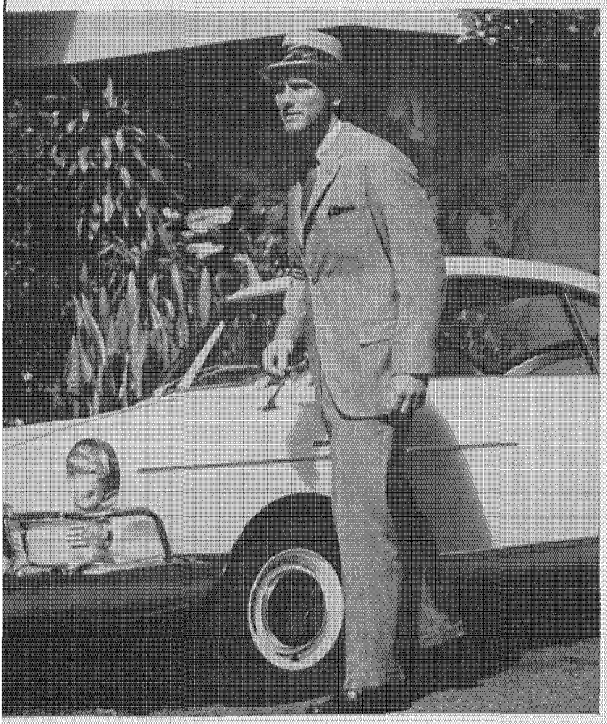
For example, lighter, brighter suits (especially mid-blues and silver-grays) will compete with traditional olive, clay and putty shades for a place in the gentleman's summer wardrobe. Even darker suits will have undertones of lively color. Fabrics will range from iridescents, slub weaves, cords and seersuckers to coarse homespuns and those with the luster of mohair or the look of silk. Most suits will be cut in either new body-tracing lines (slightly nipped at the waist) or in the traditional natural shoulder style.

Slacks will be slim, pleatless and tapered. There'll be beltless, self-belt and belted models in basket weaves, iridescents and linen

continued

Wardrobe for Warm Weather

continued



Businessman's glen plaid suit blends "Dacron" and "Orlon", his striped shirt "Dacron" and cotton. Total effect: tidiness, comfort, elegance.

and silk looks. The preference in walk shorts is for patterns: stripes, checks, plaids, madras types and seersuckers are expected to outnumber solid-color models this year.

The three-button sport coat remains the favorite and will be seen in new plaid, striped and madras ideas. High-fashion, two-button jackets with side vents and hacking pockets will be available in textured, solid-color fabrics, fashion authorities say.

Stripes, Plaids, Solids

Sport shirts you'll soon be seeing include shirt jackets and sweater shirts with striped front paneling, button-down, button-front models in oversized plaids and stripes, and collarless knits in solid colors. Button-down remains the prominent dress shirt style for the summer months with bold stripes and soft, solid shades most popular.

While color, fabric interest and cut have become increasingly important factors in determining what men will buy, the prudent male still wants facts about how the garment will perform. "Will it hold a crease? Can I wash it? Will it resist wrinkles?"

Helping to meet these requirements are fabrics and yarns fashioned of Du Pont fibers. Whether he's wearing a business suit or dinner jacket, sport shirt or walk shorts, the well-dressed man will stay cool, neat and comfortable in apparel made with Du Pont nylon, "Dacron" polyester, "Orlon" acrylic, "Lycra" spandex and "Antron" nylon fibers.

This season's fashions are the summit of a 75-year evolution. The notion that men could be both fashionably attired *and* cool is a relatively recent one.

Back in the blue serge days of the Nineties, one fashion magazine advised men to cast aside their starched collars, cuffs and patent leather shoes "whenever the temperature rises above 90°F." Other suggestions: avoid tight-fitting clothes; wear a gray suit; switch to narrower neckties.

Even though men's wear of that era was not geared for warm-weather comfort, colors were varied. Pastels were considered very fashionable. All shades of purple enjoyed a fling in both shirts and neckwear. And solid pink was so popular that one retailer devoted an entire window display to his "supreme and fancy blouses for the discriminating gentleman."

Although sportswear *per se* did not b
come popular until years later, the need f
leisure apparel was already apparent. O
fashion observer of the Nineties report
that cycling and golf were beginning to "r
tionalize the male's dress habits. Even ba
presidents may be seen—though not in bu
ness hours—in breeches and long stockin
The reign of the trousers is already unde
mined."

While some stores were valiantly attemp
ing to sell garments for leisure (a few d
played lines of no less than 30 differe
bicycle suits), others saw a ready market
gym ensembles. One thoughtful retailer
the day included free bandages with the pu
chase of every gym suit.

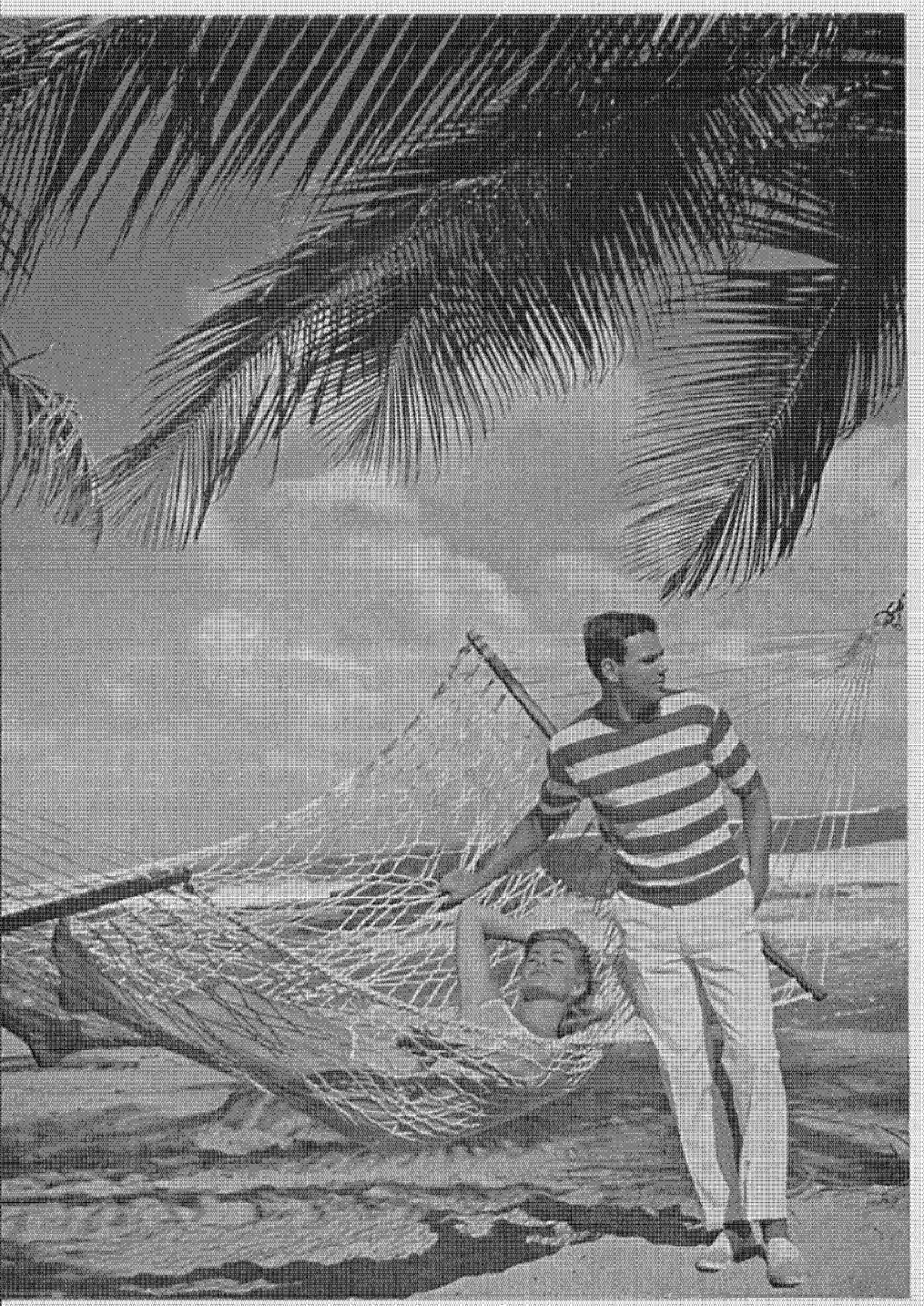
By the turn of the century, men we
promenading the boards at Coney Island
suits with baggy, peg-top pants, cut short
show colorful socks. Jackets were lo
loose-fitting and heavily padded at t
shoulders. Blue serge was still the top fab
and, as one veteran writer put it, "was pro
ably the nearest thing to a civilian unifo
the country will ever see."

Enter Slimness

For weekend picnic excursions to t
country around 1910, white, ankle-leng
automobile dusters were the rage. Suits h
tapered trousers, fitted waists, wider lap
and less shoulder padding. By the ti
America entered the Great War, the masc
line silhouette was slim and trim. (T
slenderized look is thought to have inf
enced the snug styling characteristic of U
military uniforms.)

Following the war, the country went w
and so did men's fashions. Suit jackets we
vest-tight and flared at the bottom; th
hung inches below the fingertips and we
decorated with belts, rows of buttons a
angular pockets. The trousers often rese
bled stovepipes, a style shunned by mo
decorous men.

In the late Twenties, men's summer
parel took on a decidedly British look d
mainly to the influence of the Duke
Windsor. Resort wear included brightly c
ored linen slacks and brown buckskin sho
tab and widespread collar shirts were wo
with Windsor knots; double-breasted jack
had long, rolled lapels; sweaters were col



Pullover of "Antron" and "Orlon" and slacks of "Dacron" and cotton mark beachcomber style.



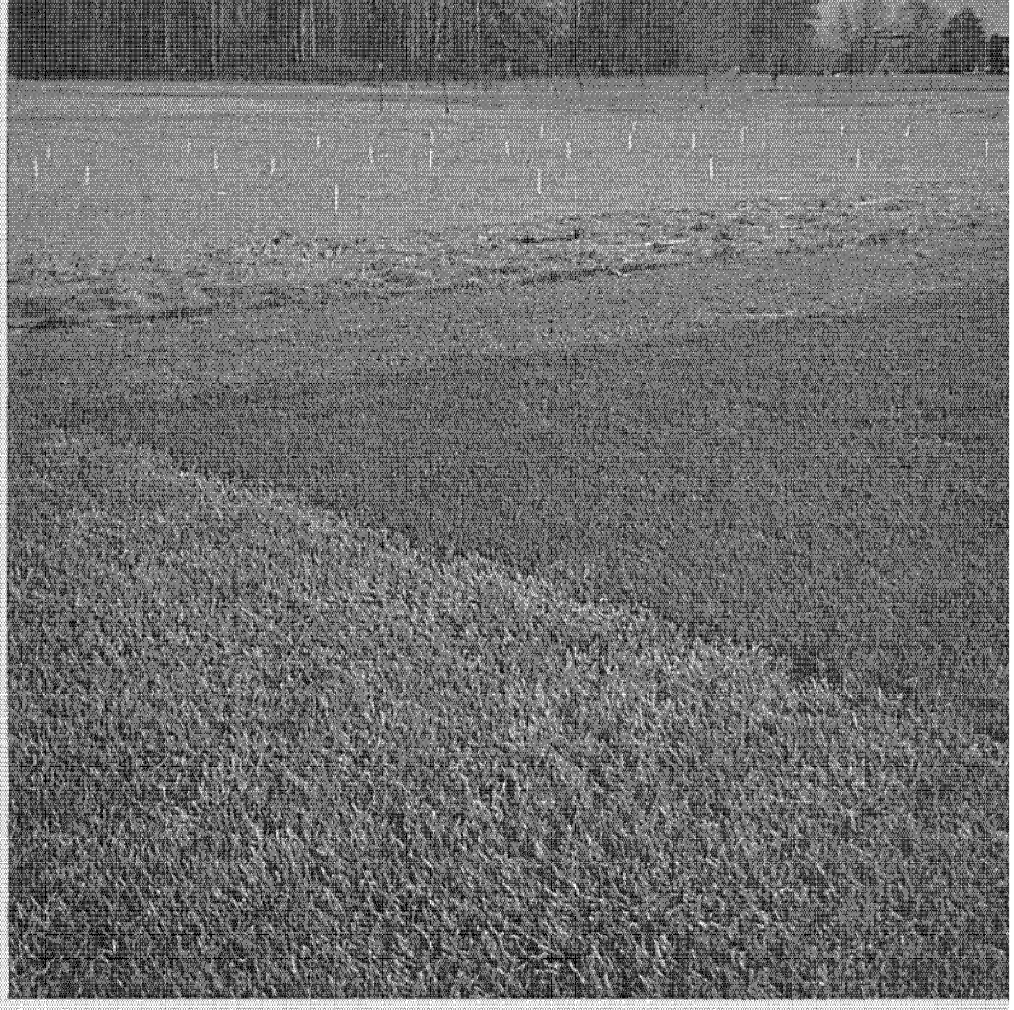
Burgundy seersucker, gray-and-white cord dinner jackets, both featuring blends of "Dacron" and cotton, make for cool cocktail hour.

fully decorated with horizontal patterns, and white waistcoats were a must with black dinner jackets.

By the mid-Thirties, while suits were being further refined for warm-weather wear, the knit polo shirt was at the peak of its popularity. Bathing suits still had tops and flannel slacks were considered mandatory for leisure hours. Prevailing style for the first half of the Forties was the Eisenhower jacket. The fabric: khaki.

Wash and wear was the big news in men's apparel during the Fifties. Suits made with fabrics containing "Dacron" and "Orlon" were not only washable but they also retained creases remarkably well and resisted wrinkling.

According to one fashion critic, the wide range of good-looking, easy-care clothing now available reflects men's growing desire to be well dressed. "Today, men are particular about what they wear; they take time to coordinate the right shirt and shoes with a specific suit. And when they buy, they want to know a lot more than just whether the garment will wear well." ■



Dark green portion of this lawn test plot was treated with "Tupersan"; frost left it undamaged. treated surrounding area had been overrun by crabgrass, thus browned when cold weather str

This spring, with "Tupersan", man has an opening move that puts an instant

Checkmate on Crabgrass

Digitaria, says the *Britannica*, is a native of Europe "naturalized" in eastern North America. But to homeowners and golf course superintendents, crabgrass remains an undesirable alien.

In family lawn and fairway alike, it invades before turf grasses have a fair chance to flourish; it multiplies all summer; and finally, in the fall, when one's zest for gardening dies, so does crabgrass, leaving a winter-long gift of brown lawns and golf courses.

But when man meets crabgrass this spring, the odds will be tipped in man's favor. Reason: A remarkable new weapon, called "Tupersan" weed killer, that's truly selective. "Tupersan" kills crabgrass, foxtail and some odious friends, but is completely harmless to the desirable turf covers such as Kentucky and Merion bluegrasses, bent grass, redtop and fescue. This means you can put "Tupersan" right down on top of seed you've just sown. Up come the desirable grasses; the crabgrass never shows.

An herbicide that can distinguish fri from foe is a substantial advance. Prior "p emergent" herbicides, of which Du Pont marketed its share, have indeed preven the germination of crabgrass—but they killed desirable seedlings. After a treatm a waiting period of 60 to 90 days was quired before planting desirable grass.

It's for such reasons that fall has tra tionally been recommended as the best t to seed turf. Explains Harold C. Ols product manager for "Tupersan", "The i has been that you could tack several we of weed-free growing in the fall to anot three in the spring. Hopefully, in that ti you'd have developed vigorous turf that itself could fight off crabgrass."

But there have been a couple of ru "For one thing, the homeowner is pr weary of gardening by fall; he prefers work in the yard in the spring, as indica by the fact that most seed and lawn c products are sold in that season.

"Second, it takes about a year to develop a hardy stand of bluegrass with rhizomes or roots capable of sending up new shoots. And if good turf lacks a heavy root system, crabgrass invades with a rush as soon as the moisture, temperature and light are right."

Golf courses, as might be expected, get the homeowner's problems in spades. The game encourages crabgrass; fairways, for example, have to be mowed short—normally not more than one inch high. This admits light to ungerminated crabgrass seeds, and up they come. Traditional herbicides kill the weed but thereby leave unsightly patches and bald spots that raise the ire of golfers.

With "Tupersan", the course superintendent's crabgrass problems should be sharply decreased, according to Robert T. Miller, Du Pont's turf specialist. "One spring treatment on newly seeded or established turf will keep out crabgrass the whole growing season," says Miller. "And because the product doesn't harm desirable grasses at any stage of growth, crews can work all summer at patching or building new turf."

One turf grass for which "Tupersan" is not recommended is Bermuda grass, frequently used for lawns in the South. "However, with bluegrass," recalls Miller, "Du Pont scientists actually mixed the compound with the seeds; they germinated normally. And we've raised many of the temperate region turf grasses in soil containing eight times as much 'Tupersan' as is needed to control unwanted annual grasses."

As for safety to adjacent plants: on plots with trees, Industrial and Biochemicals Dept. scientists applied 10 times the normal amount of "Tupersan" for two consecutive years and found no evidence of injury; on plots with representative ornamental shrubs and vines, they've applied 4 times the normal amount without damage.

"Tupersan" is an odorless, white crystalline compound known chemically as 1-(2-methylcyclohexyl)-3-phenylurea. The original sample of 10 grams performed so strikingly in the greenhouse that a pound was made and tried out on a company research plot near Newark, Del. This was followed by 200 pounds for expanded testing on Du Pont's experimental farms both in Delaware and North Carolina.

So promising were the results that Du Pont scientists really became enthusiastic and made the material available to state and Federal investigators across the country, as well as abroad. More than 100 college and university investigators, for example, received samples of the product.

An example of the meticulous experiments that followed was that conducted last summer by Dr. J. M. Duich, agronomist at the Pennsylvania State University.

In three sets of six strips, Dr. Duich sowed plots of crabgrass, bent grass, Kentucky and Merion bluegrass, redtop and red fescue. Then, at right angles across the strips, he applied "Tupersan" at varying rates.

Six days later, germination began. In the untreated control plots, crabgrass flourished. "However," Dr. Duich reported to the Northeastern Weed Control Conference in January, "the crabgrass seedlings in treated plots turned bluish in two days and reddened after seven. With few exceptions, their leaves never exceeded one-half inch in length... The stunted seedlings then browned and withered and nearly all disappeared by July 1 (a month after seeding).

"Based on the mean control stand of 2,808 crabgrass seedlings per nine-square-foot plot, all treatments were found to be 99+ to 100 per cent effective. Most important, the herbicide did not appear to affect the germination or emergence of the five turf grass species."

Equally successful results with "Tupersan" also were reported at the Northeastern Weed Control Conference by Dr. C. R. Skogley and J. A. Jagschitz, agronomists at the University of Rhode Island.

I&B Dept. will market "Tupersan" for the professionals — golf courses, landscapers, parks, highways and cemeteries. A 50 per cent wettable powder, the product is sprayed on freshly seeded turf areas in the spring at rates of 4 to 12 pounds per acre. On established turf, "Tupersan" is applied at rates of 16 to 24 pounds. It's important to provide plenty of water—about one-half inch within the first three days after treatment—so that the chemical gets into the soil.

The homeowner, however, isn't forgotten. Several companies expect to use "Tupersan" as an ingredient in their crabgrass control products. To make "Tupersan" as easy as possible to use, the Du Pont Lawn and Garden Products Division is introducing "Trey" Triple Action Lawn Aid 10-5-5. Packaged in a granular form that may be applied over fresh seed by an ordinary lawn spreader, "Trey" is three products in one. Besides "Tupersan" weed killer, which will prevent crabgrass with up to 99 per cent efficiency, "Trey" also includes a 10-5-5 lawn food containing ureaform nitrogen that does the spring fertilizing job, and chlordane to control ants, grubs and other soil insects. The product is sold in 22-pound bags, a quantity sufficient to cover 5,000 square feet of newly seeded lawn area, or 2,500 square feet of established turf.

Both "Tupersan" and "Trey" have been registered by the U.S. Department of Agriculture for use on home and commercial turf areas. With "Tupersan" for the professional and "Trey" for the amateur, Du Pont men predict that, this spring, crabgrass is in for the surprise of what will probably be a very short life. ■



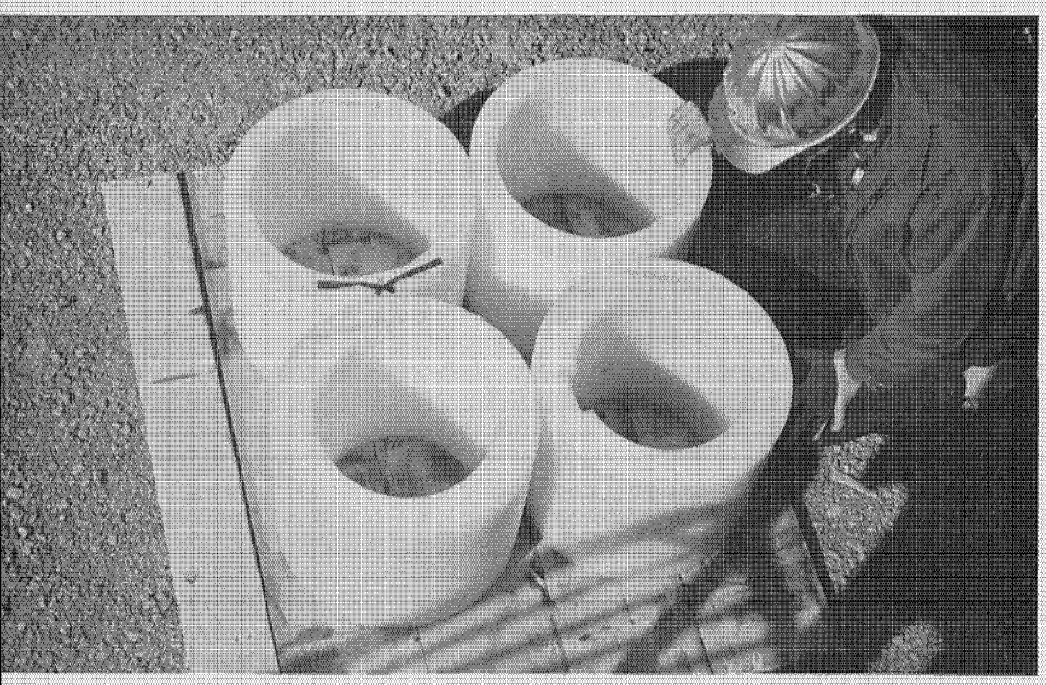
Homeowner can beat crabgrass to the punch this spring with "Trey" Triple Action Lawn Aid 10-5-5. Product is applied over new seed with ordinary spreader.

WHAT'S NEW

● **Primrose-lined awnings** that enhance outdoor decor resist mildew, fire, water and dirt. Translucent, colorfast awnings of "Dacron" polyester fiber by J. P. Stevens & Co., Inc. are vinyl-laminated by Weblon, Inc. and distributed by The Astrup Company. Awnings are also available in stripes and solid colors.

● **Printed sleeve of "Mylar"** polyester film provides long-lasting, protective jacket for slide-type insurance payment charts. "Slidamatic" charts, made by American Charts Company of Atlanta, Ga., have transparent window to protect data which salesmen use to calculate payments, premiums and refunds. Sleeve of "Mylar" resists tearing and cracking; soils are easily removed with a damp cloth.

● **A boon for bicyclists** are tires made of "Nordel" hydrocarbon rubber that resist cracking and damage from high and low temperatures, abrasion, wear, ozone, weather and sunlight. Tires are made by Carlisle Tire and Rubber Division of the Carlisle Corporation, Carlisle, Pa., and are available in standard sizes for all bicycles.



Cylindrical castings of "Alathon" polyethylene resin are one-piece, void-free shields that absorb neutrons and reduce radiation from atomic reactors. White, translucent shields have high density and are made by Boonton Molding Company, Inc., Boonton, N.J., in 15-inch-long, 17-inch-diameter castings that weigh 90 to 100 pounds.

● **Cooks cut cooking time** by 50 cent with pins containing liquid "Freon- refrigerant that carries oven heat inside m and fowl to cook both inside and outside multaneously. Faster cooking reduces m shrinkage and keeps natural juices in m Pins are also used to thaw or freeze m "Thermo Pins", made by Thermo Pin C poration of America, Mineola, N.Y., distributed by American International M keting Co., Floral Park, N.Y.

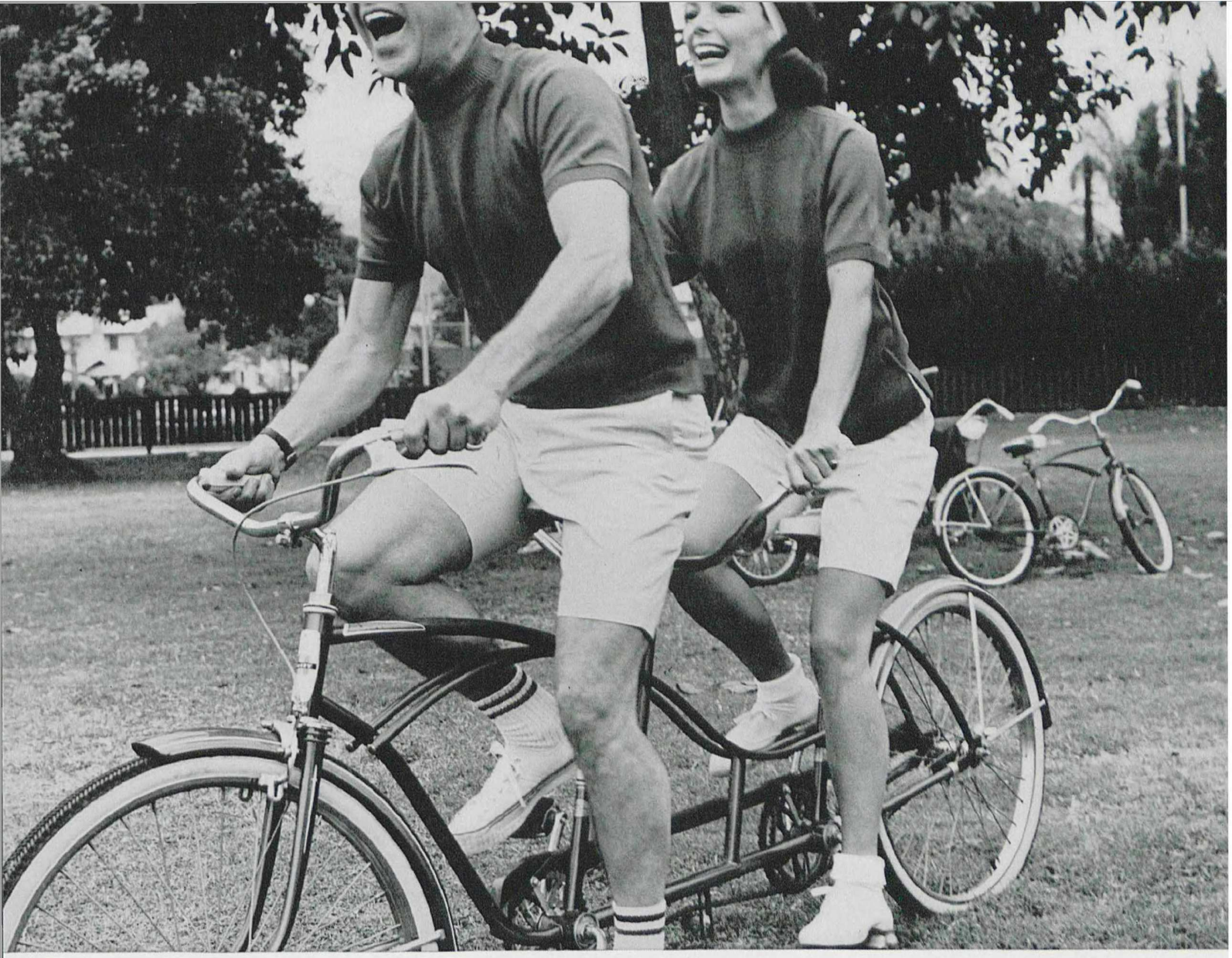
● **"Magic Cleaning Rose"** is a colo cluster of Du Pont nylon used for househ scouring without scratching on dishes, flo woodwork and autos. "Roses" are made Jamco Company, a Junior Achievem company, Wichita, Kans., and are availa in red, white, pink, green, aqua or combi tions of colors.

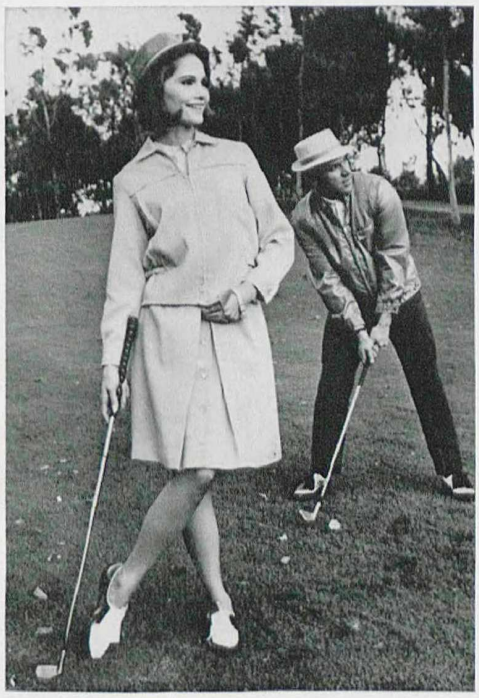
● **Crack-resistant football helmet** "Adiprene" urethane rubber is hard and silient and protects player's head by abs ing shock from blows. Helmet resists a sion and won't become brittle in cold we er. Helmet is guaranteed for five y against cracking by Ivory System, Inc., P body, Mass.

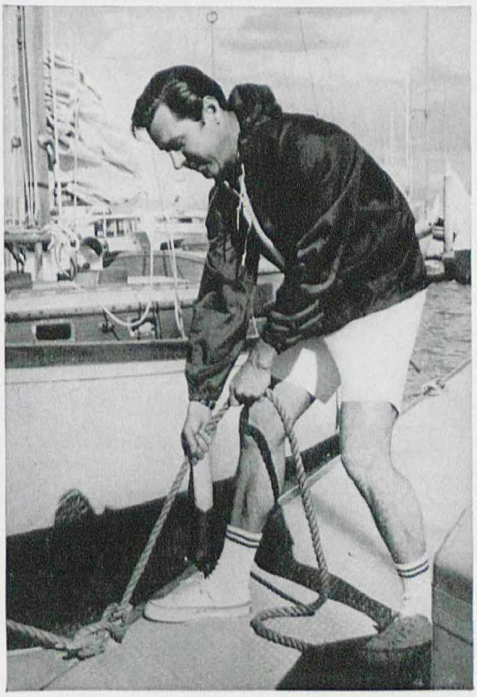
● **New additive for automatic tra missions** does two jobs: stops leaks and proves transmission fluid efficiency. "T-S transmission sealer and tune-up reco tions hardened or cracked seals and, u every 10,000 miles, replenishes worn-out ditives in transmission fluid to assure qu smooth shifting. Newest Du Pont No. Product, "T-Seal" is available in 15-ou cans at service stations and automotive s ply stores.

● **Damask look for stage curtain** newest addition to Du Pont's family flame-resistant, washable "Tontine" fabr Vinyl-coated fabric has gold, green, b and red colors and blends with Du Po 13 matching or complementary colors "Queen Anne" pattern of vinyl upholst fabric for auditorium seating. Curtains maintenance-free, have solid-color lining

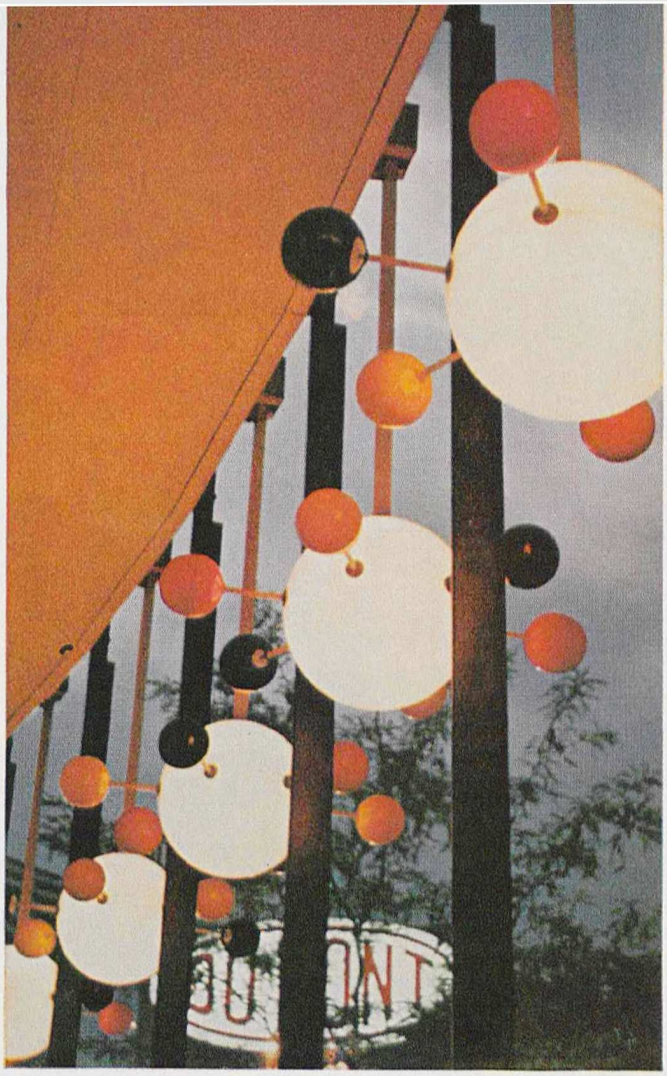
● **Slim, flexible clasp** of "Zytel" ny resin is making possible comfortable fr closing bras that won't pinch or gouge wearer. Trademarked "Bonnie Clasp" by developer, Bonnie Enterprises, New Yo clasp is also available in an adjustable sure for swimwear or loungewear.







Sportswear treated with "Zepel" fabric fluoridizer has long-lasting protection against stains borne by oil and water. Bicyclists' matching walk shorts of "Dacron" polyester fiber and cotton are by Austin-Hill, Ltd. Boating jacket of nylon is by Stahl-Urban Co., and swim shorts of "Dacron" and cotton are by Jefferson Mfg. Co. Girl golfer's zip-front jacket and twill skirt of "Dacron" and cotton are by Sacony; man's nylon jacket is by William Barry and slacks are by Esquire Sportswear, Inc. Golfers' hats of "Dacron", cotton and "Lycra" spandex fiber are protected with "Zepel" by producers, the Hat Corporation of America.



"LIGHTS...ACTION...CHEMISTRY"

These glowing globes of "Lucite" acrylic resin—part of a great ring encircling the Du Pont Pavilion at the New York World's Fair—are once again to be radiant with welcome on April 21 when the Fair launches its 180-day season.

Last year more than two million men, women and children from points around the earth were Du Pont's guests for the two-part, 45-minute show entitled, "The Wonderful World of Chemistry." However, due to new equipment and techniques adopted during the past winter recess, this year's presentation is planned so as to accommodate nearly a quarter of a million additional fairgoers between opening date and the October 17 closing. The show itself has been further polished, too, with some new music and lyrics and dance numbers. The Pavilion's Red Room will again be the site of some of chemistry's most intriguing demonstrations.

Many critics have cited last year's Du Pont show as among the Fair's best. It'll be even better this year.

Come out and see why. The show's on us.

DU PONT

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

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
WILMINGTON, DELAWARE 19898

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