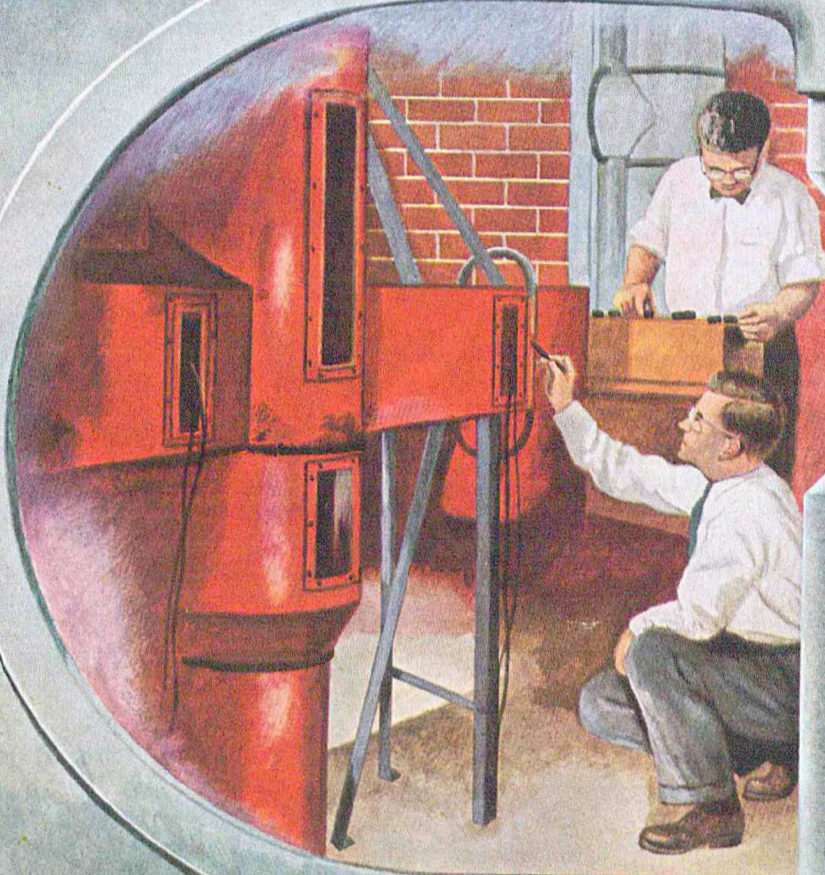
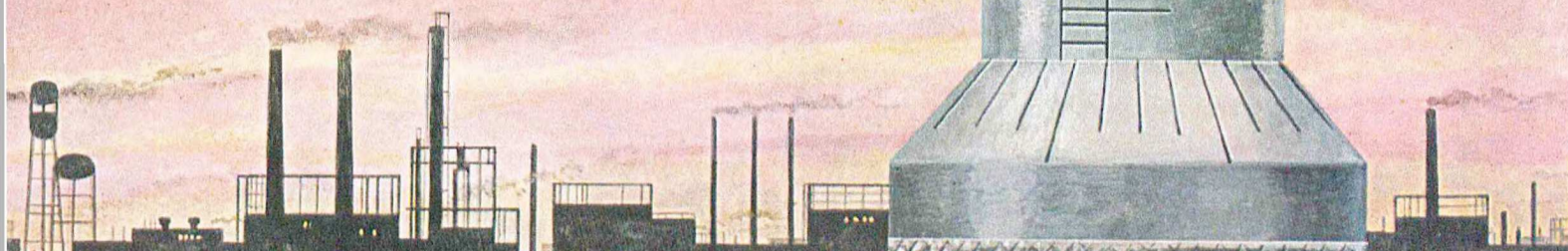


August • September 1953



Better Things for Better Living...through Chemistry



LOOK AT ACETATE NOW...

Luxurious acetate, long the glamour girl of the fibers, once was found almost exclusively in apparel fabrics. Like many glamour girls, it may have been *too* clothes-conscious. But now the fiber has broader interests, and its unique combination of softness and sheen is winning new friends. Illustrated here are some up-to-date uses for Du Pont acetate—in draperies, auto and furniture upholstery, and in non-woven ribbon for colorful packages.



BETTER THINGS FOR BETTER LIVING... THROUGH CHEMISTRY

ACETATE one of Du Pont's MODERN-LIVING fibers



DU PONT MAGAZINE

Vol. 47 No. 4

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DU PONT

M A G A Z I N E

AUGUST • SEPTEMBER 1953

The third in our series of cover illustrations and lead articles concerns engineering research at Du Pont. It is another major research activity that helps the Company provide Better Things for Better Living . . . Through Chemistry.

It's not dream-stuff today

By WILLIAM S. DUTTON

The other day I saw a Du Pont engineer put a sliver of stainless steel into a glass apparatus. The bit of metal was no bigger than a paper match. Using a solution that ate under what had been the sliver's exposed surface, he floated off an invisible film onto a tiny plastic tray.

"You can't see it, but it's there," he said.

He burned his prize in a furnace the size of a shoebox, using a platinum crucible the size of a thimble. Still as invisible as Harvey the rabbit, the contents of the crucible, nestled in its precious thimble, were taken to the vacuum chamber next door to be weighed.

The scales were so delicate that a human breath would wreck them. I was seated behind a toy-size telescope which was aimed at the scales on the other side of a glass window in the vacuum chamber. I saw an event that not long ago would have thrilled an Einstein. The scales' hairlike balance arm tipped, showing a weight of a few millionths of a gram. A tiny pencil mark would weigh much more.

A second sample of this invisible film was placed

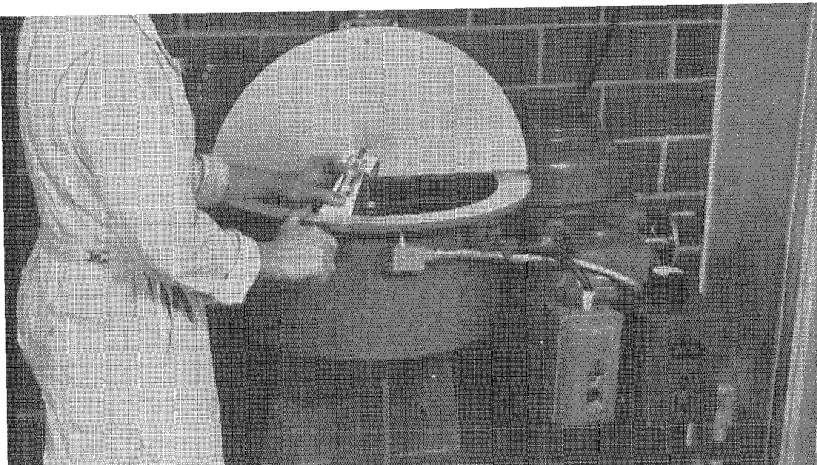
under an electron microscope. Another engineer invited me to look. Now I saw what, yesterday, metallurgists had only guessed at. Even magnified 20,000 times all that could be seen was an unbroken film as continuous as cellophane. This, then, was the transparent coating that had protected the metal from which it had been formed.

"You are seeing what makes stainless steel stainless," said the engineer.

A generation of great brains had theorized on the presence of such a film. They reasoned that upon contact with moist air, stainless steel must form a protective armorlike coating of oxide that resists further corrosion. But nobody could isolate or analyze the film. When it came to proof it was as if it didn't exist.

Today, the research engineers of Du Pont's Engineering Dept. are both isolating and analyzing the self-forming protective films that check corrosion in stainless steels, aluminum, titanium and other resistant metals or alloys. They are learning which film protects against what, a knowledge that is rewriting material specifications. Work-

Protective film, 500 magnification,
taken from piece of stainless steel.



Measuring the size of particles as small as $1/250,000$ th of an inch. Such studies improve quality of dyes, pigments.

ing from *what* and *why* toward the *how* of creating oxide films to order, they foresee potential savings to America that could dwarf the national debt in time, for corrosion is no minor destroyer. It costs Du Pont millions and industry billions of dollars yearly.

New research tools, largely the developments of the past ten years, are a major reason for the mounting accomplishments of today's engineering research. The new tools are turning the can'ts of only a decade ago into routine procedures in Du Pont laboratories. Problems are being solved in weeks or a few months that, until recently, would have taken decades or lifetimes if attempted with tools then at hand.

"We'll advance a century in the next ten years or so in terms of prewar standards," a director of engineering research told me. His field happened to be plastics. He saw them just emerging from relative infancy.

Almost equally responsible is a new vision—one that sees it as the first duty of the research engineer to bridge the gap between pure science and the builder. There is a

new emphasis on the *why* of all processes irrespective of how long they have been in vogue.

A chemical plant is like a barrel with a bung hole from which the product emerges, a prober into what-and-why told me. The old rule for increasing output was to build more and bigger barrels, to put more push behind the bung hole. The trend was toward the extremes of temperature, added pressures, more of everything.

"That rule is as out of date," he said, "as the old notion that more heat under a boiling liquid will make it boil faster. One of our earliest discoveries was that too much heat will actually make your liquid boil less or even stop completely."

The research that turned up that paradox—a basic addition to knowledge—was begun in 1929. But it was the postwar period that brought the real change. Then the Development Engineering Division was established to consolidate and augment research in the Engineering Dept. Its former Technical Division became the Engineering Research Laboratory, with its own \$4,250,000 plant. Research was begun in fields of applied physics, and in others only sketchily explored. A separate \$1,000,000 laboratory was devoted solely to mechanical engineering. All ten manufacturing departments of Du Pont have used these expanded facilities.

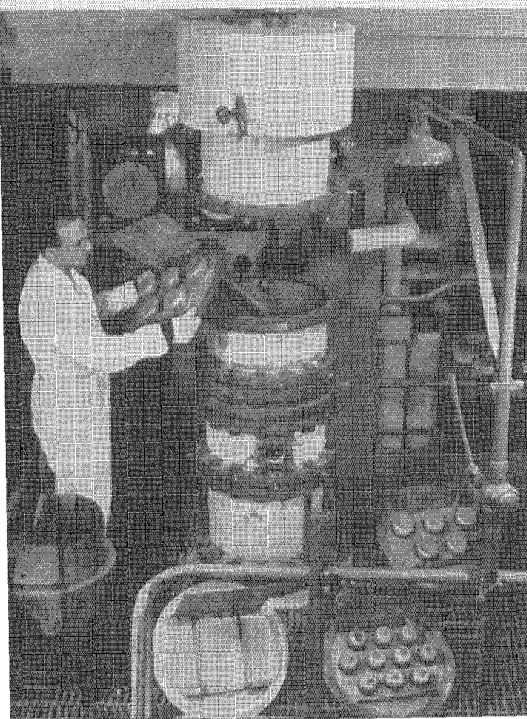
ENGINEERING . . . AND HOLLYWOOD STARS

Today, the study of corrosion is but one sector of a new engineering research front that extends from such basic processes as distillation to the making of better x-ray pictures—and prettier pictures of Hollywood stars.

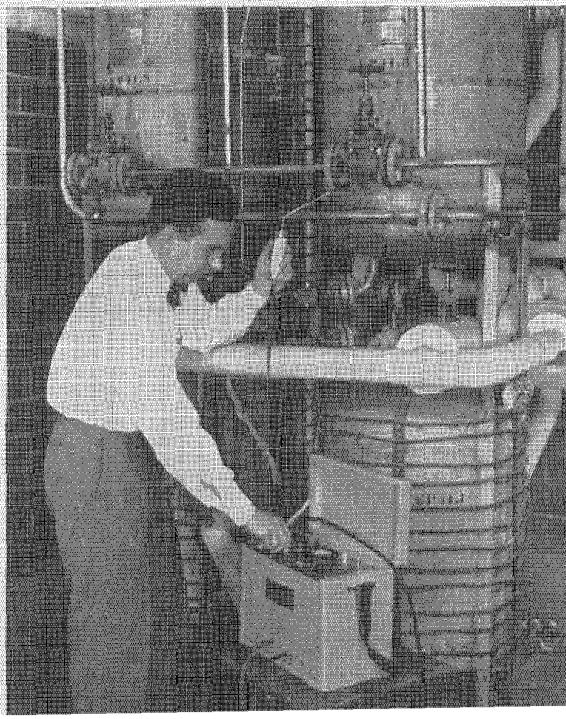
The Mechanical Development Laboratory is exploring metal surfaces with its own particular goal. It is no less than creation of the world's most perfect metal finish. Light beams, diamonds and Hollywood stars intermingle in the difficult and unusual task.

Photographic films are no more perfect than is the polished surface of the roll or huge wheel on which they are cast. A flaw in the film invisible to the eye becomes

Evaluating the efficiency of various distillation plate designs in semi-works equipment. Knowledge gained will help plant operations.



Testing for leaks with a portable gas analyzer. Apparatus was developed by Du Pont to insure the safest possible plant operating conditions.



Measuring the vapor rate that required to get uniform bubble through model distillation pl



glaringly visible when magnified on a motion picture screen. Films such as acetate also demand a high degree of perfection in the finish of their casting rolls.

What is the perfect metal surface?

A contraption not much bigger than a portable typewriter, bearing the ponderous name of multiple-beam interferometer, was the engineers' tool for finding out. By bouncing light rays off a surface, the interferometer magnifies its imperfections 300,000 times. That would raise a postage stamp, pasted flat, to the height of a full nine-story building.

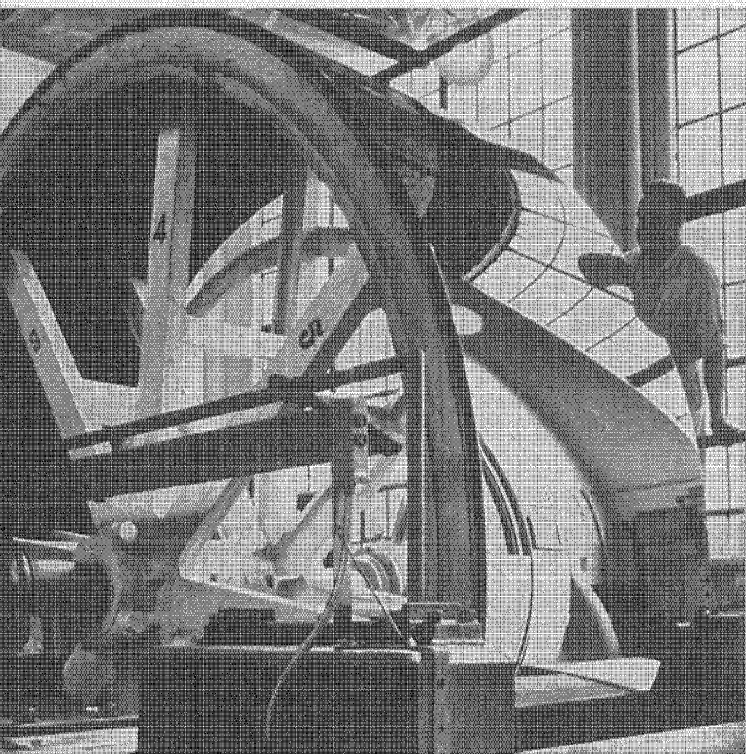
You may think that the finish of a chromium-plated coffee urn is perfection. To your eye and touch it seems to be the last word. The interferometer makes the urn's finish look as rough as saw teeth. Films cast on such a surface would make Marilyn Monroe look like one of Macbeth's witches.

It follows that the people at Parlin, N. J. where

even treble the size of theater screens, Parlin is ready for the advance.

Now a still more versatile repolishing process is in the offing. Diamonds—many carats of diamonds—are ground into an abrasive powder so fine that by comparison baby powder would be as sand. A newer polishing rig, racing along at 120 miles an hour, polishes with a mixture of this powder and olive oil. The diamond-polished surfaces produced on harder metals, the engineers anticipate, will keep their finish three or four times longer than before.

Whats, whys and new hows are being probed wherever engineering touches Du Pont operations. What filter cloth or medium is best for what process? The old range of choice was some 500 filter media; studies have narrowed the choice for any one process to half a dozen. No instrument could equal the eye in matching all colors; the engineering researchers devised a colorimeter that is more sensitive than the eye. With it you can make color meas-



Engineers developed better polishing methods to put about the smoothest working surface known on this casting wheel.

Du Pont photographic films are cast, were doing fairly well at the job, for nobody had yet mistaken Marilyn for anyone else. However, the interferometer demonstrated that the very finest of existing metal surfaces were still far from what they might be. The engineers got busy and first developed a method that obsoleted older ways of repolishing. They built a precision machine by which the abrasive, suspended in oil, could be rubbed with the right force across the metal surface of the slowly revolving film-casting wheel. Although each wheel is 15 feet in diameter and at least four feet wide, the job could now be done in a reasonable time. By former hand methods, the operation was as slow as the painstaking creation of a work of art.

Today, those wheels boast about the finest working surface ever put on metal. Even the highly critical interferometer registers its pride. Let Hollywood double or



Measuring variations in yarn so slight that conventional equipment can't detect them. More uniform yarn is goal.

urements in seconds, pick up a telephone, and order matching colors by number.

The greatest revolution under way makes it appear that the advances of science and technology until now were at a snail's pace, compared to what they will be.

Not long ago, young Du Pont engineers of the Polychemicals Dept. quietly began studying their new plant at Victoria, Tex. Their concern was to find the best way to operate their processes. Assembling an array of facts having to do with temperatures, pressures, rate of flow and the like, they presently departed.

Back at Du Pont's Experimental Station at Wilmington, the facts were given mathematical symbols. Working with specialists from the Engineering Dept., these engineers began playing with these values, adding to some, subtracting from others. Purpose guided the play, how-

ever. They were *assuming* that the changes on paper were being made in the controls of the plant itself.

Next they asked: "What would happen in the plant if the changes we've assumed were actually made?"

For the answer they turned to electronic computers, which in lay language are robot brains that can tell you if your thinking is on the right or the wrong track.

Du Pont's researchers have desk-size robots which solve equations in minutes or hours that would take days or weeks to solve by the old classroom methods. The Engineering Dept. has a room-size robot that tackles yet more complex equations. Finally, at Massachusetts Institute of Technology, is the great Whirlwind Computer, partly government-owned but shared with industry. It can do a lifetime's figuring in hours.

YOU OPERATE A "PAPER" PLANT

The engineers work from small assumptions to greater ones, from their desk computers up to the Whirlwind. Its answers come out in picturegraphs that show, if it's more output you are seeking, rising or declining lines. Then you readjust your aim and try again, like an artilleryman searching for an unseen target with an aerial observer calling his shots. You change no machinery, tamper with no controls, build nothing but equations on paper. The robot calculator feeds back advice: "You're using too much heat; taper off on your pressure." You operate a "paper" chemical plant.

Once a higher pressure was assumed for a process at Victoria. The robot's response was a line that shot skyward. It warned: "Try that and you'll blow up the place."

After asking a hundred times, "What will happen if—?"

the engineers went back to Victoria with knowledge. In a few months, with the aid of the computers, they had done the equivalent of 20 years of work by old methods, much of it work that otherwise couldn't have been done. They now had a simple set of instructions: to readjust this set of valves, to ease up a bit here, to bear down more there. No money had to be spent on alterations to equipment; the plant's controls were simply set to a new manufacturing efficiency.

The result? *Output at Victoria increased by one-fourth!*

You can try the never-before-dared in this new-day research; the risk is on paper. You can tear down and rebuild, spend millions—on paper. Of course, dreaming on paper is as old as science, but yesterday's dreamers all too often reached a point where the complexity of their dreams left them groping in a void. There is no such point today, not with the tools at hand.

To help me grasp the timesavings that these new research tools make possible, an engineer scrawled a figure on a laboratory blackboard. The figure was 100,000,000,000,000. That, he said, is the number of possible combinations involved in the creation of a new synthetic material that Du Pont would like to introduce to the world. Ten years ago, he went on, those 14 ciphers would have barred any consideration of the project. By methods then in use, the work was beyond comprehension.

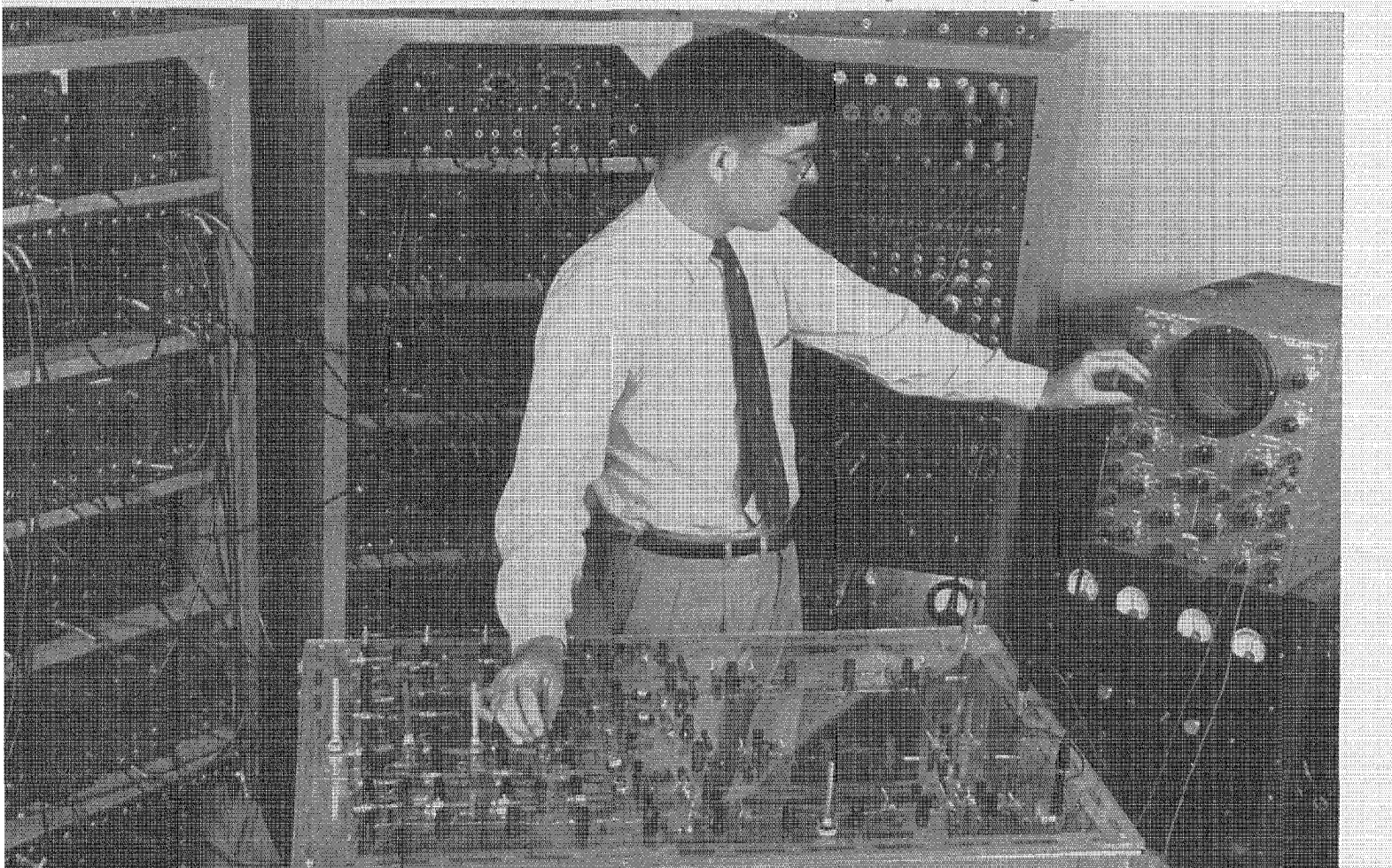
Then he erased nine ciphers from the blackboard. The new figure was 100,000.

"We can now reduce the possible combinations to that by mathematics alone," he said.

"It's still a large number," I said.

"Not today," he replied. "The Company is going ahead with the research."

Electrical and analog computers aid in solving problems too time-consuming even to attempt by older calculation methods.



MAN VERSUS RIVER

Army engineers battle the Big Muddy to a draw

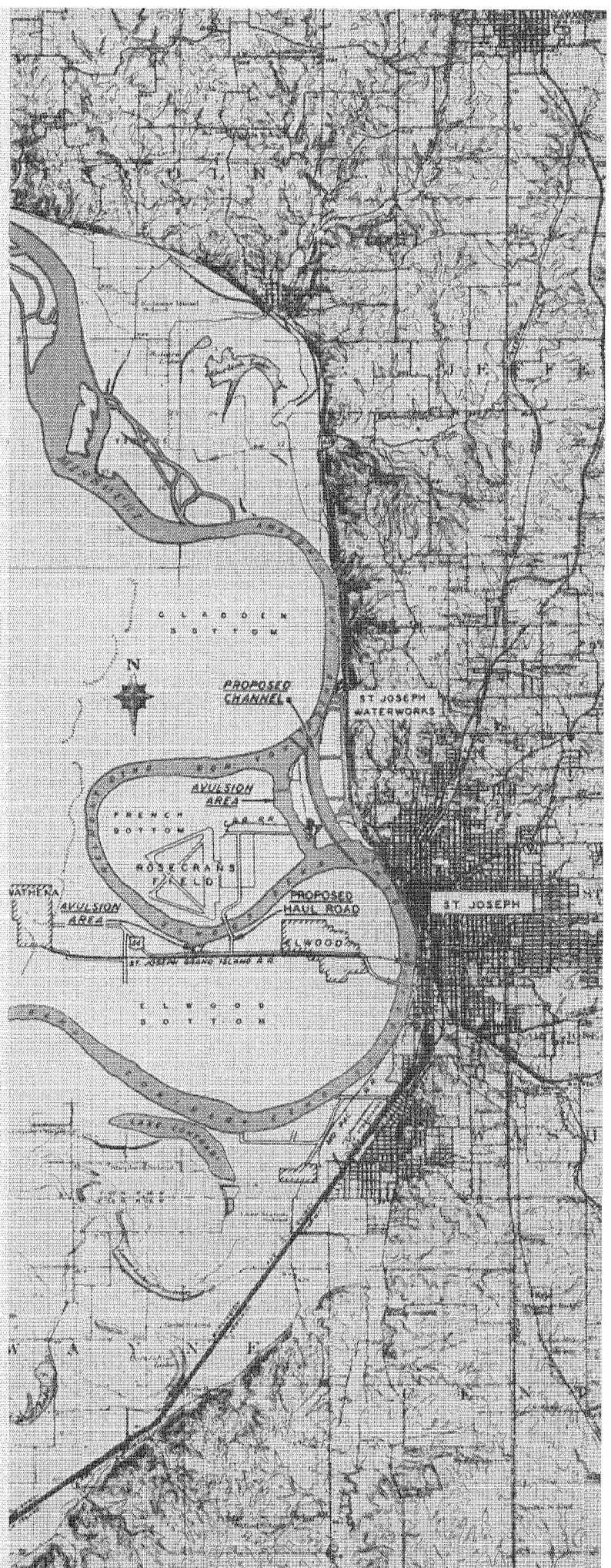
By T. F. R. DUNGAN

On the morning of April 23, 1952, citizens of St. Joseph, Mo. looked from their bluff city across six miles of angry flood waters. Their airport had disappeared under eight feet of rampaging Missouri River, at its highest since Joseph Robidoux set up his fur-trading post there in 1826. The town of Wathena, Kans., six miles by car from St. Joseph a few days before, was now 150 miles distant via Kansas City.

To top off the disaster, the river current had taken the line of least resistance and had broken across the peninsulas of its giant S-curve near the city. Up until this morning, the Missouri had hugged the bluffs north of St. Joseph, veered west sharply near the city waterworks for some three miles, then back east to form big Belmont Bend. Inside this peninsula was Rosecrans Field, St. Joseph's airport.

After making this capricious meander, the Big Muddy flowed back under the bluffs close to St. Joseph, only to swing to the west again. This large bend enclosed the towns of Elwood and Wathena, Kans., south and west of the city. Now record high waters had converted the S-design of the river into a crude dollar sign.

As the water went down, geographical and political problems arose. Rosecrans Field and its housing development were thrown on the west side of the river and therefore into the State of Kansas. Elwood was now on the east side of the river, which appeared involuntarily to convert more than 1,000 Jayhawkers



into natives of Missouri.

The lawyers had an answer to this dilemma. They had previously enacted laws in Jefferson City, Topeka and Washington providing that while the mid-channel of the Missouri River was the boundary between Missouri and Kansas from Kansas City to the Nebraska line, boundary changes caused by floods should not be considered as affecting existing political lines.

But no one had an answer to the essential fact that the river had been taken from St. Joseph. The Missouri was the source of water for industrial purposes and a convenient sewage disposal outlet. It furnished the cooling water for the power plant that produced the city's electric power. This was a clear case of desertion, and St. Joseph determined to bring the recreant back, by the scruff of the neck if necessary.

NOT SO DEEP AS A WELL...

The U. S. Army Corps of Engineers was the constable to serve the papers. Its experts found the lower loop cutoff to be "not so deep as a well, nor so wide as a church door." There was still time to drive some 33,000 feet of piling at that point and shore up 20,000 tons of rock to force back the west-east current of the stream. So they restored the bottom loop of the S-curve, and St. Joseph had its river once more.

But the upper loop cutoff through the French Bottoms was something else again. Here the water was running rampant in the line of least resistance. The judgment of the engineers was that the river could not be forced to go back to its leisurely but twisting course around Rosecrans Field. Engineering logic was plainly on the side of the river.

Then someone came up with the idea that the

channel cut during the flood was likely to be unstable. Two sharp left curves remained where the stream left the old channel and where it rejoined its original course. Here the engineers thought nature's work could be improved upon. If only the newly cut channel could be moved a short distance to the east, the flood's reconstruction job might be consolidated and made reasonably permanent.

Some recalled stories of General Grant's attempt to shorten Vicksburg Bend in the Mississippi in 1863. Army engineers had been unsuccessful in digging a canal across the neck of the bend. Obviously, even engineers do not dictate to big rivers.

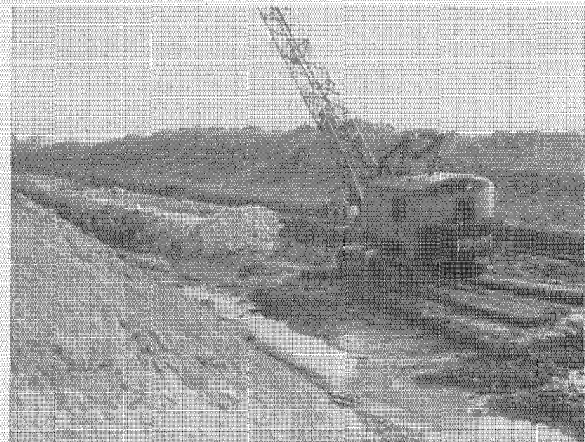
The engineers of 1952 decided to persuade the Missouri by dredging a pilot channel 250 feet wide and one and one-half miles long at the site where the center of the river *should* be. Then the water could complete the job.

Canal dredging was the first of three phases of the persuasion job undertaken by the engineers. Next, they had to build up a barrier to discourage the water from flowing back into the original S-curve channel and to guide it into the desired course. This was the task of about a mile and a third of dikes and rock

Powderman makes up his primer cartridge. DuPont dynamites were picked to blast rock.



This dragline is painstakingly excavating toe trench to anchor the side of the new channel.



Dredge (left) is slowly sucking and chewing out a new pilot channel to control Missouri River in vicinity of St. Joseph.

slopes anchored by piling at the bottom.

The third step was to strengthen and stabilize the bank on the west or concave side of the newly dredged canal. A rock-covered slope, a mile and a quarter long, was constructed and anchored at a location that was expected to form the west bank when the river had widened the pilot channel to around 800 feet.

Condon-Cunningham Co. of Omaha, Neb. and Massman Construction Co. of Kansas City, Mo. were given the contracts for this work. Subcontracts for rock production for the west bank revetment and for the guiding structure above the cutoff were let to the Tobin Quarries and J. E. Vandiver Construction Co., both of Kansas City.

A terrific amount of rock was required, and it had to be quarried from a limestone rock outcropping on the bluffs several miles upstream. After stripping off the dirt overburden, the contractors found a ledge about 50 feet wide and 9 to 12 feet thick. To keep a steady flow of rock to the job, they both chose a system of buffer shooting, using Du Pont millisecond delay electric blasting caps. The buffer was a pile of broken rock left from the preceding shot. By spacing their holes wide apart and using millisecond delays,

they broke the rock to size without throwing it and without breaking back behind the shot.

Owing to slight variations in the rock structure and different sizes of equipment, Tobin Quarries elected to use DuPont "Gelex" No. 2 dynamite, while DuPont 40 per cent "Red Cross" "Extra" dynamite suited the Vandiver Construction Co. better. Within two weeks, 5,000 tons per day of quarry-run stone was being delivered. Almost a quarter-million tons of rock was placed in the effort to control Big Muddy.

In late summer, a dredge started excavating at the lower end of the pilot channel. Soon only a narrow plug remained. A load of 3,000 pounds of explosives blasted it sky high.

Muddy waters rushed through the opening at such a rate that the water level above the cutoff was quickly drawn down. Six months later, the old channel of the north loop was only a sluggish drainage ditch that left "Rosecrans Island" as a large patch of Missouri sod west of the Missouri River.

Disputing the will of the Big Muddy had been a gamble, but in their victory the Army engineers of 1952 had exacted some compensation for Grant's defeat of 1863.

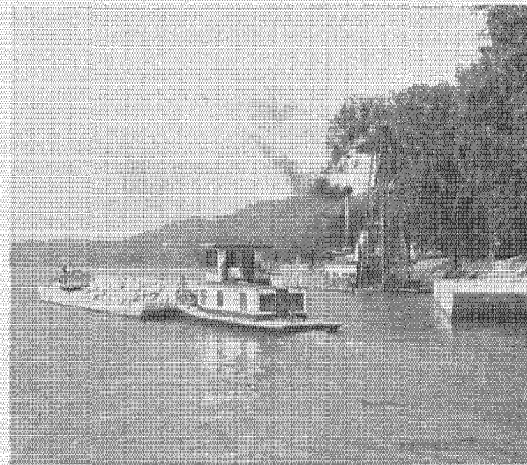
Powderman loads row of holes in outcropping of limestone.



Quarrymen appreciate this kind of fragmentation. Rock can be handled easier and faster.



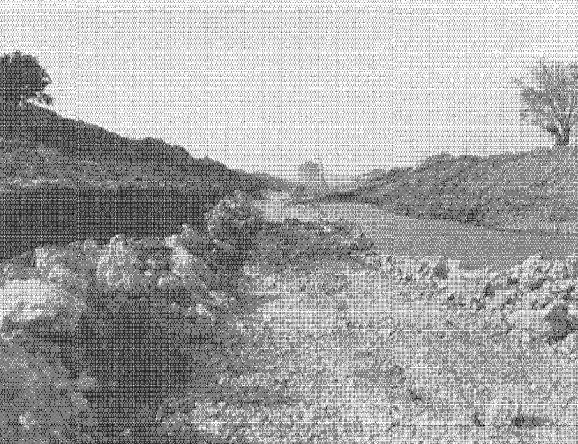
Barges carried rock from quarry downstream to stabilize west bank of newly dredged canal.



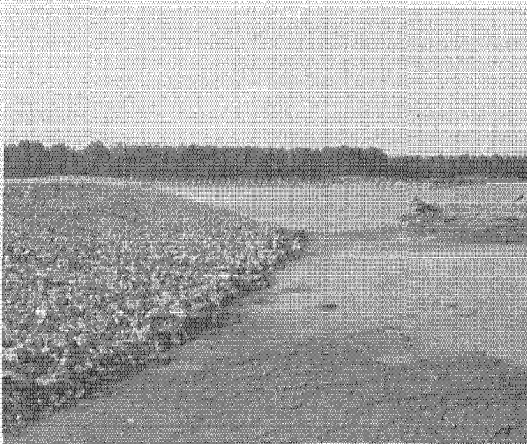
Bulldozer pushes stone in place to protect toe of the revetment.

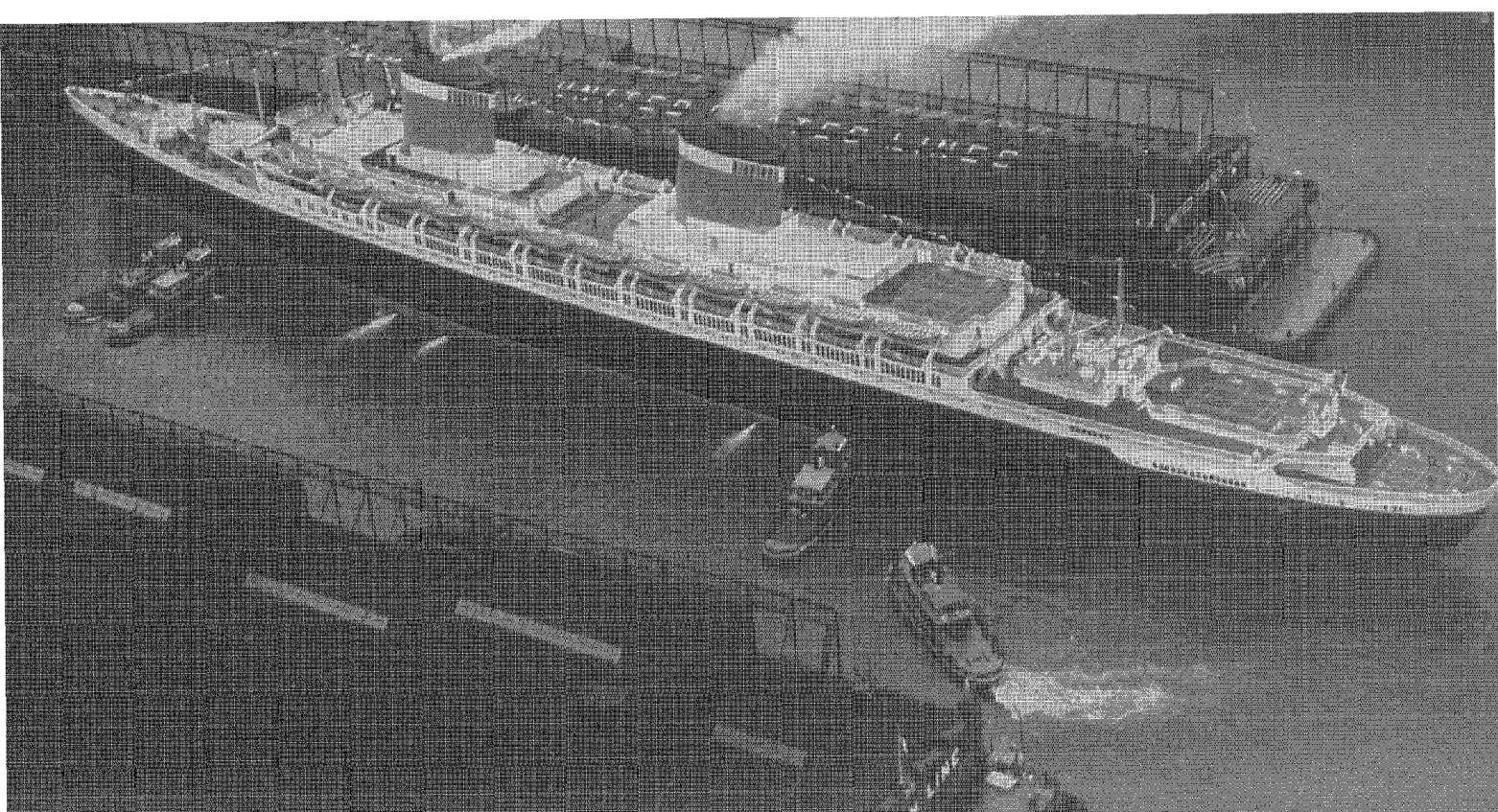


Revetment job nearing completion. All told, almost 250,000 tons of rock was put in place.



Cut off point. Pile dike in background will force water into new channel at the right.





Lightweight aluminum is used extensively on *United States*. Now the Navy's interest is in enameled aluminum.

Aluminum's all-weather topcoat

A progress report on Du Pont vitreous enamel for aluminum. Newly adopted by the Navy for shipboard use, it's winning favor among landlubbers, too

By GORDON H. KESTER

At a state banquet in the 1850s, so the story goes, Napoleon III of France and his guests of honor ate with forks and spoons of aluminum, while lesser guests at the imperial board had to be content with ordinary gold. Aluminum has been democratized since then, losing ground with royalty but more than making up for it with us commoners.

Helping to make the former court favorite even more useful today is a porcelain coating for aluminum, developed by Du Pont's Electrochemicals Dept. The Company supplies the porcelain to enamellers in rice-size particles which are mixed with pigment and heat fused on the metal. First reported in the *Du Pont Magazine* four years ago, vitreous enamel for aluminum has been making important progress ever since.

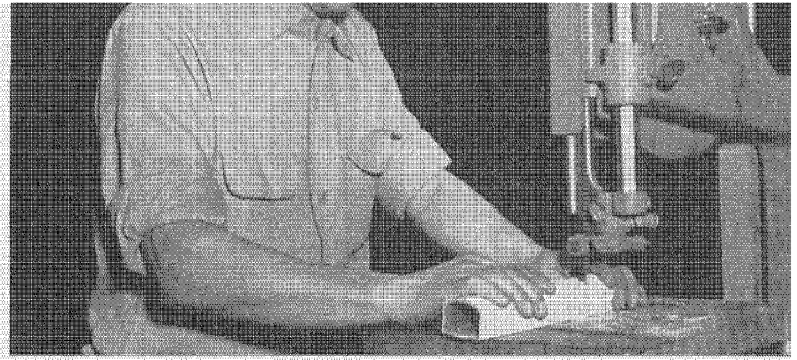
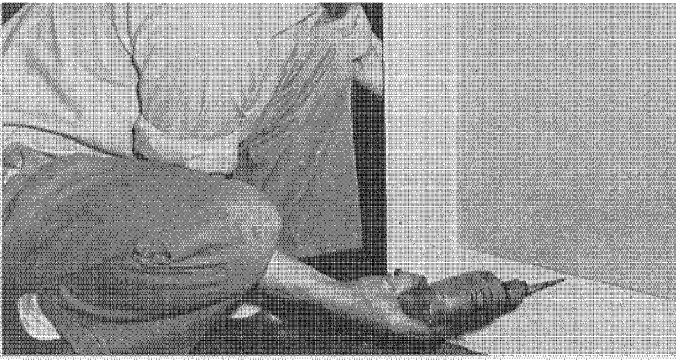
A few weeks ago, for instance, we stopped at the Navy's Bureau of Ships to talk with the men who have been sizing up the material for use aboard ship. Everan C. Woodland, naval architect at the Bureau, told us the Navy had been experimenting with the material since 1950. And he named some reasons why nonstructural bulkheads of ceramic-coated aluminum will be used in the

Navy's two new supercarriers, the *Saratoga* and the *Forrestal*, and in a number of smaller ships.

Aluminum saves weight in shipboard partitions—about half a pound a square foot over steel. The liner *United States*, for example, weighs thousands of tons less than conventional ships of the same type because its deckhouses, superstructure decks, ramps, funnels, lockers and furniture are made of the lightweight metal.

On a Navy ship, Woodland said, every pound of weight saved means an extra pound of armor or armament added to the ship's fighting ability. Weight, however, is only one leg of the tripod on which naval architecture rests. Space and flexural strength are the other two, and ceramic-coated aluminum has twin advantages here. In thin sections the coated metal is considerably stronger than an uncoated sheet of the same total thickness. The ceramic increases the metal's rigidity up to 60 per cent.

"Ever been inside a tin-roofed barn when the wind was blowing hard?" Woodland wanted to know. "Well, the rumble you hear there is something like you get in a heavy sea when every thin metal partition aboard shrieks



Enameled aluminum can be drilled, punched and cut without flaking off the porcelain coating. It is economical in upkeep as it does not require repainting. It washes easily and resists fire and rust.

in protest. Bulkheads should resist this vibration, and aluminum does, thanks to the very real strength of the ceramic coating."

Porcelain on aluminum also has what the Navy calls good optical properties—that is, it retains its color and gloss indefinitely. Color, gloss and illumination in a ship-board compartment have a psychological effect on the crew, Woodland explained. Tests conducted at the New London Submarine Base have shown that proper visual surroundings inside a sub can even lessen claustrophobia among crewmen.

He went on to list other advantages of the material: fire resistance, economy of maintenance—since it can be washed easily and doesn't need repainting—stain resistance, and ease of fabrication. Workmen can handle coated aluminum with no more care than they would give to galvanized sheet. It can be sheared, punched and drilled without flaking off the porcelain coating.

But what happens if shell fragments rip through a bulkhead during combat, the Navy wondered? Will the ceramic fly off in jagged particles? If so, the shattered coating might do more damage than the shelling.

A highly informal test provided the answer. Some Bureau of Ships men took a sheet of the material to a firing range, where a Washington police sergeant let fly at it with a service .38. The bullet plunked through the metal, and only fine, dustlike particles of porcelain came off. They would have been harmless to anyone in their

path. In a more recent formal test .20 and .40mm. shells were fired at the panels. The results were the same.

The Navy at present is ordering chiefly light green and white porcelain on its sheeting, but to civilian users less limited in their choice, the selection of colors is practically without a limit. The ceramic can also be put on with varying degrees of gloss.

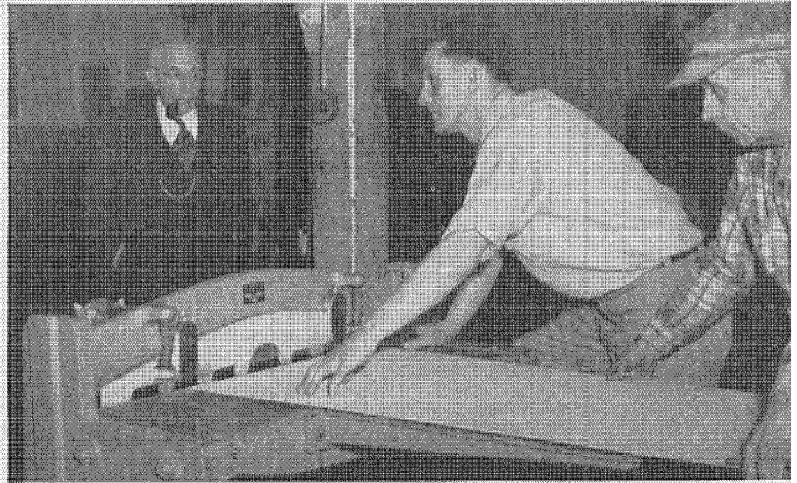
HOW YOU'RE CONCERNED

Enameled aluminum is used now for store-front panels and signs that are strong and weather-resistant. In various stages of development are products like these made with ceramic-coated aluminum: stoves, washers, vacuum cleaners, wall tile, pipes, tanks, furniture, and roofing. Imagine a kitchen range you could lift with ease—yet one that was stout and durable. It's likely that one will be available fairly soon.

Take a honeycomb of paper or some other material, sandwich it between two thin sheets of ceramic-coated aluminum, and you have a lightweight, durable building material. It's being used in thin sections for interior walls and in thicker sections for exterior sheeting. This is an outlet of immense potential.

So far no one has suggested enameled aluminum for body armor, which was one of Napoleon III's pet schemes for the metal. But the Emperor's erstwhile tableware has come a long way nevertheless, and in its new ceramic topcoat is slated to go even farther.

Workmen can handle enameled aluminum with no more care than they would give a galvanized sheet.



Fast friend for wool

"Capracyl" dyes, originally created for nylon, are now being introduced for wool. These soft-hued colors will soon appear in textiles to be used for men's suitings, shirtings, uniforms, automotive fabrics and upholstery materials.

Although they were developed specifically for nylon, "Capracyl" dyes possess equally good affinity for wool. This was established during the development stage when, like all new products, the "Capracyl" dyes were tested on practically every fiber to determine their dyeing characteristics. Likewise, the "Capracyl" group of dyes were subjected to a series of basic tests for color fastness by chemists at the Technical Laboratory in Deepwater, N. J. to provide prospective purchasers with complete data on each color.

"These tests must duplicate color-destroying influences that are likely to occur to fabrics," says Charles Sylvester, head of the dye properties division at the laboratory. "For example, the color of men's clothing must withstand sunlight, perspiration, dry-cleaning fluids, soaps

or detergents, pressing, rubbing, and a variety of finishing agents used by the textile processor before the garment is made up."

For light fastness, chemists at our Technical Laboratory placed swatches of material dyed with each "Capracyl" color in the Fade-Ometer, an apparatus that speeds up fastness tests by providing constant, uniform simulated sunlight. Out of doors, other swatches were exposed to natural sunlight.

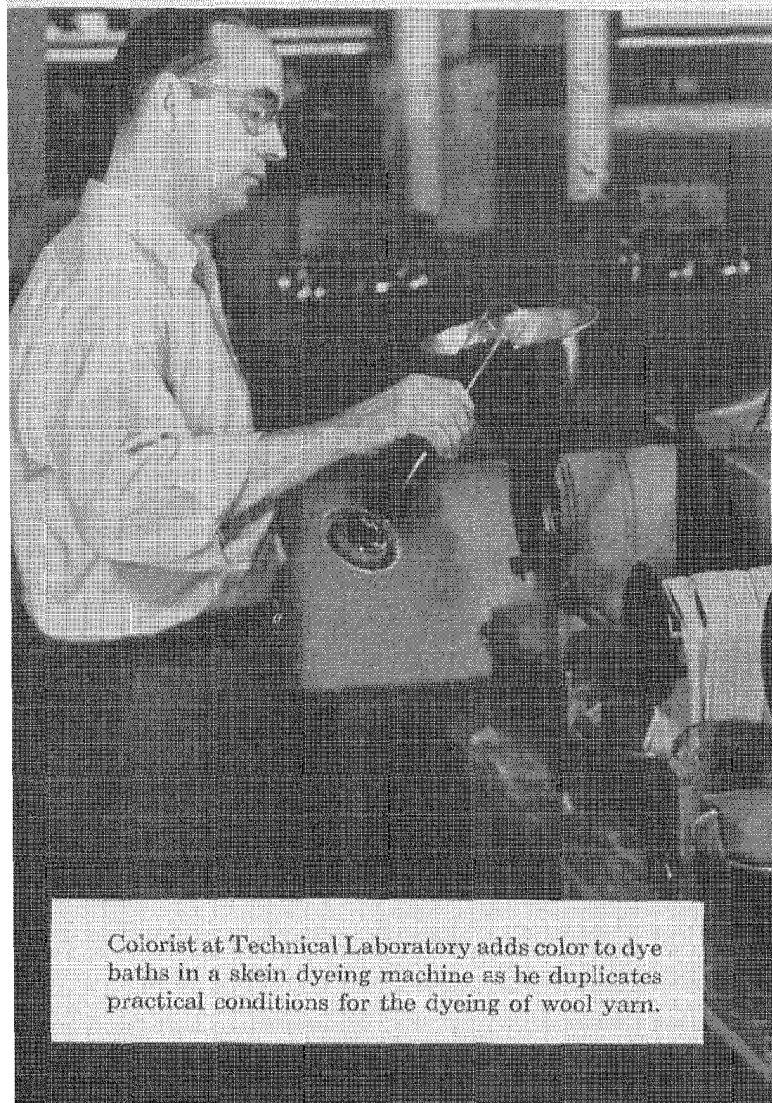
DYES TAKE OBSTACLE COURSE

Pieces of material were laundered, dry and wet cleaned, and given hot moist pressing and other treatments. Technicians gave them a workout in chemically duplicated perspiration. They saturated the wool and "baked" it in an oven for six hours at the temperature at which a person starts to perspire freely. This was done to determine whether or not the colors would bleed and stain other material. Special tests were also made with salt water, resin treatments and water repellents.

The dyed woolen pieces that had been through these obstacles were then attached to a fastness blanket, a long strip of wool flannel that had been dyed the color being tested. Each test swatch was carefully studied by the laboratory's chemists and colorists, and compared with the color of the blanket. Their conclusions: "Capracyl" dyes for wool show excellent all-around fastness properties, especially to light. For this reason, they are recommended for dyeing textiles that must withstand sunlight.

The neutral-dyeing "Capracyl" colors are kind to wool, colorists say, because no sulfuric acid is needed in the dyeing operation. Since they do not color acetate, rayon or cotton, the "Capracyl" colors are ideal for dyeing wool in blends with these fibers for cross-dye effects.

The future of the "Capracyl" dyes appears bright—they will add to wool both color and beauty that will last as long as the fabric.



Colorist at Technical Laboratory adds color to dye baths in a skein dyeing machine as he duplicates practical conditions for the dyeing of wool yarn.



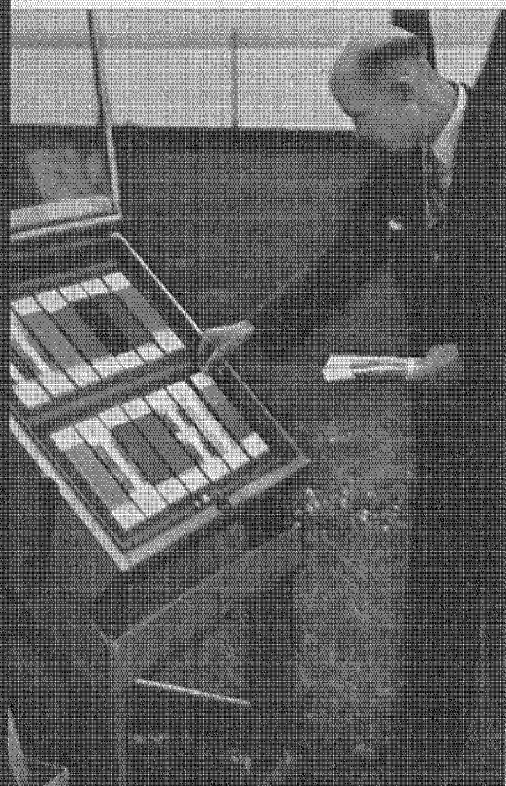
Simulated sunlight at constant, uniform rate provided by Fade-Ometer in Technical Laboratory speeds up tests on fastness properties of Du Pont "Capracyl" dyes on wool fabrics.



Cloth dyed with "Capracyl" is tested for perspiration staining by saturating fabric in synthetic perspiration and baking the wool in a special oven at 100 degrees about six hours.



Results of 18 basic fastness tests are compared with fabric that has been dyed with "Capracyl" color but not subjected to fading tests. The dyes proved extremely fast.



Fastness to sunlight was tested in outdoor boxes. This method, dependent on weather, is slower than tests in the Fade-Ometer but is preferred by a number of customers.



Colorist dyes wool cloth on small-scale dye jig for future tests. The Technical Laboratory staff performs hundreds of tests to assist customers who have special dye problems.



A technician compares the color of dyed yarn with a standard sample from the laboratory to be sure each batch of dye made at Charrers Works meets all rigid specifications.

Chemicals against fire

A report on new Du Pont flame retardants for protecting cloth and paper

"The newly developed composition is outstanding in overall performance based on flame retardancy, afterglow resistance, soft hand, freedom from efflorescence, and heat stability. Mill tests are now in progress and all tests to

date have been outstandingly successful."

Thus Du Pont technical report GCD-52-47 tallied the score on a new, renewable flame retardant temporarily labeled X-12. Reports on "Erifon" flame retardant, the



Applying Grasselli's new X-12 renewable-type flame retardant to rayon. Paper and cotton products are also treated.

durable type manufactured by the Company's Pigments Dept., had been equally as favorable—and case histories have now backed up the test findings.

Newspaper headlines all too frequently tell us why cloth and paper should be flameproofed. Not a season passes without its record of death or injury from flaming cloth or paper. Fortunately, Du Pont and other chemical manufacturers were able to come up with chemicals for treating paper and fabrics. Today upholstery and curtains for our homes, clothing for work, decorations and draperies in clubs and theaters, and even the tents sheltering our GI's are protected from fire by chemicals.

Technically speaking, there's nothing in the books that will make paper, cotton, and rayon as fireproof as asbestos. Nor is there likely to be. But both "Erifon" and X-12 can make fibers flame resistant by retarding the rate of combustion so that these flammable materials, if ignited, won't continue to burn and spread fire. The afterglow exhibited by fibers treated with these chemicals is of short duration and is usually confined to the charred areas.

The Grasselli Chemicals Dept., which is now beginning commercial production of X-12, has marketed ammonium sulfamate-based renewable flame retardants for 12 years. In the continual search for a better product, however, new formulations were explored and new chemicals tested. X-12 is the result.

DYE FASTNESS IMPROVED

The new flame retardant is miles ahead of earlier types that weakened textiles, turned them brown from heat, or dulled colors. As a matter of fact, in 23 of 45 cases where the new compound was applied to cloth, dye fastness was actually improved.

While this compatibility with dyes will win friends and influence sales, X-12 will probably owe its selection over other renewable-type flame retardants to its versatility. It can be applied to finished goods—or to unfinished cloth or paper. Important from the paper and textile finisher's point of view, water solutions of the crystalline solid can be applied in one quick step without fear of processing temperatures of 275°F. and without special equipment.

X-12 can be applied by commercial laundries and cleaning establishments such as those now treating clothing worn by workers in chemical plants and government arsenals. Paper mills, textile finishers, and custom processors also treat material with the Du Pont chemical.

To tell the story of "Erifon" flame retardant you could repeat many of the advantages of X-12 and add a few extra ones—such as its durability and its tremendous sales record since 1949. Cotton and rayon fabrics treated with "Erifon", for example, have weathered as many as 50 dry cleanings or launderings, and the solution has been applied to many millions of yards of tent fabric for the armed forces.

"Erifon" has recently moved into the civilian market and established itself for decorative fabrics such as draperies and for pile fabrics used on dress decorations, toys and the like. Now tests are showing that it can be recommended for flame-proofing curtain goods, tarpaulin, sheeting, life jacket fabric, and mattress ticking.

"Erifon" is applied to cloth in a continuous process only, and is not suitable for treating finished articles. Within the past few months, the method for applying the solution has been improved and simplified, resulting in better looking fabric and lower treating costs.

Two kinds of establishments are applying the durable product. The big mills do volume work, and the small custom treating plant such as Perma Dry Co. of New York will apply "Erifon" or X-12 to even a single yard of cloth.

We asked President Sam Esserman of Perma Dry what flame retardants he recommended for his customers. "I consider the end use first," he said. "Banners for trade shows and political rallies, for instance, would call for X-12. For draperies and sheeting, or for cloth exposed to the weather like awnings or tarpaulins, the logical recommendation would be 'Erifon'. The choice depends on the end use."

Treating cotton cloth with durable "Erifon" flame retardant. Cloth so treated can be washed, dry cleaned.



The color guard

...that's the accident-reducing

Du Pont safety color code

By JAY H. MACKEY

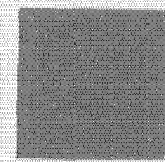
Improved housekeeping. Better employee morale. Better impression on customers and the public. Fewer accidents.

That's the prospect for businessmen who adopt the safety color code developed by Du Pont and color expert Faber Birren. "Our accident rate dropped 75 per cent after using it," said the superintendent of a steel company. "It has been one of the contributing factors serving to reduce the Navy's industrial accident frequency rate from 6.4 in 1948 to 4.6 for 1951," added a Navy spokesman.

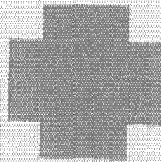
The Du Pont safety color code, announced at the 1944 annual safety convention of the Greater New York Safety Council, was reported to you in the April-May 1944 issue of this *Magazine*. The plan was simple: Make scientific use of colors and colored symbols to warn of danger, but even more important, standardize safety colors so that they'll always mean the same thing—so that red, for example, will always point out the location of fire-fighting equipment. The National Safety Council promptly approved the plan, and engineers and safety-minded persons in a dozen walks of life as promptly began studying it.

The actual painting is also remarkably simple, and experts agree a little safety color, like a little saccharin, goes a long way. Five colors are involved. Birren and Du Pont picked them, insofar as possible, to conform to their traditional meaning. The use of fire-protection red we've noted already. Safety green would continue to identify and locate first aid equipment. Blue, long used by railroads as a symbol of caution, would warn against potential hazards ranging from electric switch boxes to machinery that's down for repair and shouldn't be started. Alert orange, psychologically the most stimulating and attention-getting of all hues, would mark portions of machines or equipment that might cut, crush, mangle or electrocute. Bright bars of yellow and black would highlight places where you could fall or bump into something.

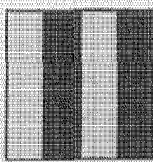
In addition, white, gray or black were suggested for aisle markings and facilities for such housekeeping equip-



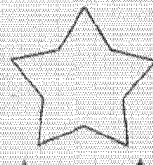
FIRE PROTECTION
RED



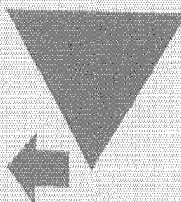
SAFETY GREEN



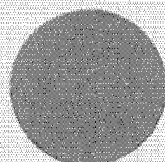
HIGH-VISIBILITY
YELLOW



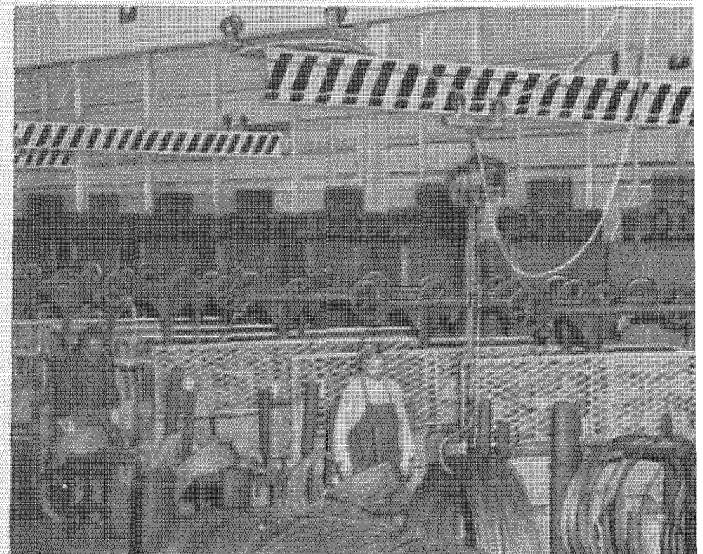
TRAFFIC WHITE



ALERT ORANGE



PRECAUTION
BLUE



ment as trash cans. Standardized use of these colors, Birren pointed out, "will automatically eliminate hundreds of conflicting color standards maintained in the past by different bureaus and establishments."

The *New York Herald-Tribune* reported that the Army's use of the Du Pont safety color code "resulted in substantial reduction of accidents in 26 quartermaster and Army service depots. One depot reported during the first year after adoption of the code that disabling injuries were cut from 13.3 to 7.0 per million man-hours worked."

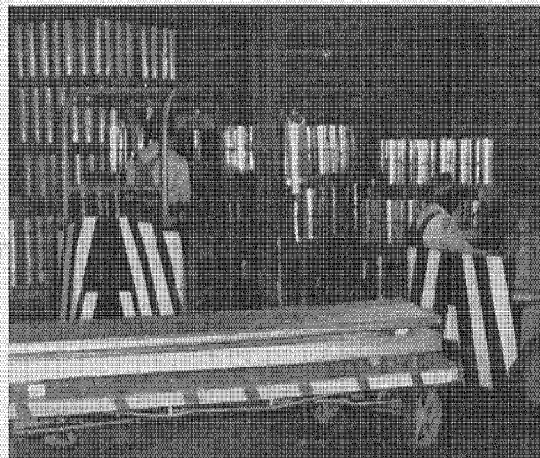
The plan was adopted broadly by the Navy, and became mandatory for all shore establishments. Today the Navy's savings in compensation and medical care run to about \$1,400,000 a year—not to mention even more important humanitarian benefits. A few months ago, the United States Coast Guard joined this military parade.

The program began paying off for the New York City Board of Transportation more than six years ago. While an intensive safety training program was under way, the Du Pont safety color code was installed throughout the shops. Eighteen months later, accidents had dropped 42.3 per cent. Total savings, according to insurance statistics, ran about \$500,000 a year.

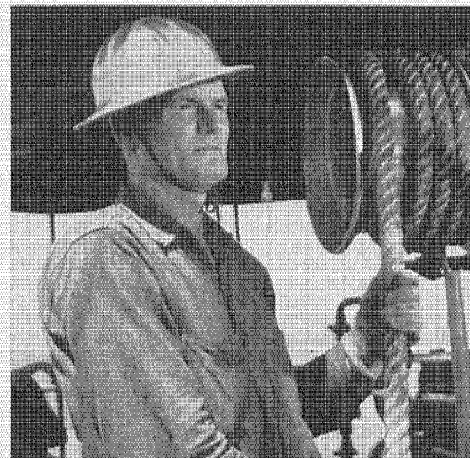
Another transit company recently investigated safety colors. "What can you do to make people watch their feet



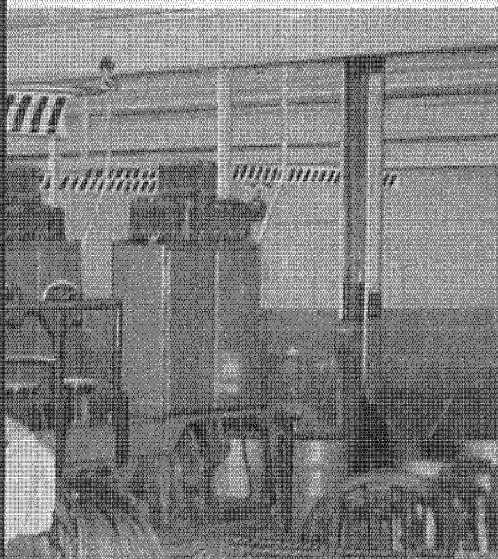
Says Topeka bus line of safety markings: "Over 90% of boarding accidents prevented."



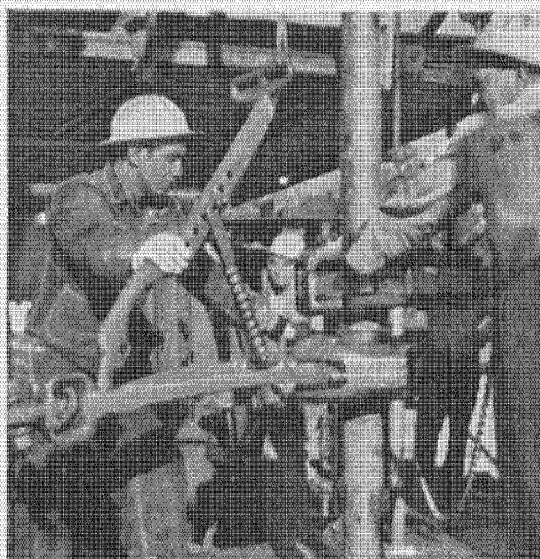
Says Houston metal fabricator: "Safety colors, good housekeeping and safety go hand in hand."



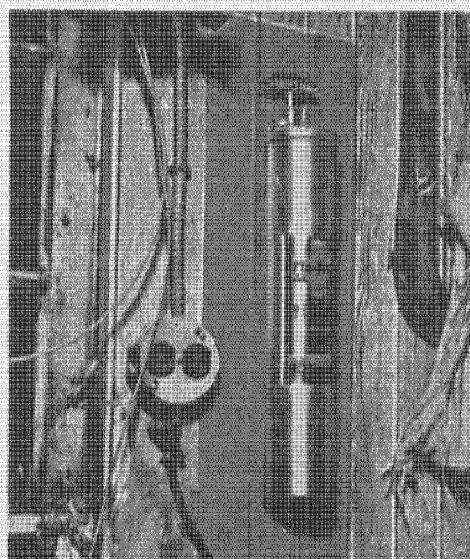
Says Southwestern oil firm: "Crew members were soon sold on the safety paint idea."



Du Pont safety color code saves N.Y. City Board of Transportation \$500,000 yearly.



Stimulating "alert orange" warns against equipment that can cut, crush, mangle, electrocute.



Agriculture is newest field for program. Planners are studying likely applications.

when getting on a bus?" Claim Manager F. J. Templeton, of the Topeka Transportation Co., asked Du Pont. The safety color code supplied the answer: diagonal stripes of black and high-visibility yellow.

After a year's experience, Templeton says, "It's safe to state that over 90 per cent of the boarding accidents have been prevented. Only a 15-minute refresher job once every six or eight months is needed to keep safety markings in top shape."

No group has benefited more from the plan than manufacturers. Du Pont's own record of ten consecutive National Safety Council "Highest Safety Awards" is due in part to the use of the code. In Houston, Chief Inspector B. J. Butler of the Kelley Manufacturing Co. said, "Our accident rate dropped well over 65 per cent in the year we've pushed safety and painted our machinery and moving and hauling equipment according to Du Pont's recommendations. We firmly believe safety colors, good housekeeping, and safety go hand in hand." The American Car and Foundry Co., when they received "Pennsylvania's Special Award for Safety," gave safety painting major credit for earning the award.

In few occupations is an instantaneous response to color more important than around oil wells. Because drillers frequently move from job to job, uniformity of markings is especially important.

"The tool pusher, drillers and crew members were soon sold on the safety paint idea. It kept their rig looking nicer and was easy to apply and maintain," said Safety Supervisor W. B. Cox of Stanolind Oil and Gas Co. Within a year after its first oil-field use, the American Association of Oilwell Drilling Contractors had approved and recommended colors for safety.

W. F. Rickards of Shell Oil in Houston explained their program this way: "A man driving a new auto takes care of his car. The same is true of a drilling rig. Our object at Shell in adopting the code was to improve housekeeping, believing it would also improve our safety record. We've won on both counts."

Agriculture is the newest field for the program. Now the National Safety Council is seeing how the plan can be applied to farms and agricultural operations. Here, as elsewhere, the installation of the color code and good safety practices is a team that's paying off wherever it's invited.



Instructions for lashing drums of tetraethyl lead on deck of freighter **Albany** are given to stevedores and first mate of ship by Du Pont's John Heesters.

I travel with problem children

By JOHN N. HEESTERS

Let me tell you about my job—playing nursemaid to a bunch of drums. Not ordinary drums such as Gene Krupa uses but special steel containers, neatly painted light gray and bearing bright yellow and green labels that identify their contents as Du Pont tetraethyl lead compound.

Right there you have the reason for my rather unusual work. Tetraethyl lead, TEL, or lead, as it is sometimes called, is very useful. Almost everyone benefits from tetraethyl lead because it is the additive that gives gasoline its antiknock quality and makes engines run more smoothly. In gasoline, TEL is easy to live with, but in concentrated form it must be handled like a baby.

That's where my nursemaid angle comes in. I run around following TEL drums in transit like a young mother following her frisky offspring. And my kids really travel. My chase starts at the Du Pont Chambers Works at Carneys Point, N. J. and usually winds up on board an ocean-going ship lying in port anywhere between Boston and Norfolk, Va. Every inch of the way, every time the drums are loaded or unloaded to trucks, boxcars, docks or decks, I'm hovering near to see they don't get dropped or roughly treated.

If you think that's no problem, listen to this. First I get a copy of a printed order for, say, 600 drums of TEL to be shipped to Japan or South America on a ship to be in Brooklyn in a few days.

I head for the New York office of the shipping line and find they know about the cargo. All is fine until I start explaining just how the drums should be loaded and secured aboard ship.

I tell them TEL is extremely poisonous in its concentrated form, that any leak caused by damage to a drum may have serious results. These facts don't bother a steamship line too much. They're used to shipping anything from live snakes and Bengal tigers to high explosives. The difference, I explain, is that while TEL doesn't look dangerous it is a quick-acting poison if it gets on the skin or its vapors are breathed.

So I must explain that no hooks, chains, forklift trucks or anything else should be used that might drop, crush or perforate the drums. They should be rolled by hand, placed in a special rope sling, and hoisted to the deck two at a time (it isn't safe to put them in the hold). They must be neatly placed on end upon lengths of raised boards, so that if a leak should occur the TEL can be safely hosed off the deck. Then heavy lumber sides are to be built around the drums, and an equally heavy top built over them. All this must be securely lashed with cables around

and over the wooden enclosure. After this job is done, the drums can be considered reasonably safe against the heaviest seas and gales.

Next I make a visit to the pier where I go through the story again with the man in charge. The pier boss is quite a fellow. He heads a beehive of activity in a rugged world. Into such a world I go with a photo album in one hand and a rope sling in the other. The album contains pictures of how the drums should be handled and secured. The sling is a sample of how to make the ones to be used on our drums.

The pier boss tells me the exact time he wants my drums to arrive and where he wants them unloaded. Let's say he specifies 8 a.m. the next day. I now rush a phone call to our plant in South Jersey. The carrier's trucks must be loaded this afternoon ready for departure in the early morning hours.

When the trucks arrive, I am already on hand. Once the trucks are in place, the stevedores and longshoremen take over. The drums are carefully rolled from the trucks onto the pier, and loading usually begins at once. If the ship's arrival has been delayed, I stay with my babies until it does arrive. On occasions I have sat up all night waiting for my ship to come in.

I PICK A DECK SITE

Hoisting of the drums to the deck starts as soon as the rope slings have been inspected. Then up the gangplank I go. Deck locations must be chosen to allow construction of the wood enclosures and provide anchorages for the lashings that follow. The board strips are put down in orderly fashion, and our drums begin to line up in even rows.

Once I'm satisfied that all phases of the ship loading are progressing well, I look up the chief officer or mate, usually the man in charge of the ship's cargo.

I explain the toxic nature of his deck cargo and advise him to check it periodically during the voyage. A booklet I give him contains information on TEL and tells him what to do should a leak occur en route. When he reaches his port of destination, an experienced refinery representative will be on hand to take charge.

It takes about 13 hours to load and secure 600 drums, although I've sent off loads as big as 1,200,000 pounds and for destinations as far away as 12,000 miles. This time is not as dull as you might think; first, because of friendships I make with the officers and crew, and second, because of the delicious meals they invariably serve on board ship.

Well, that's my job. You can call it anything you like, but you can't have it. You see, I like it!

Forecast for fall

Designers of men's sportswear have turned to fabrics of "Orlon" acrylic fiber and blends of this yarn for casual but smart comfort this fall.

Manufacturers are offering sports coats, slacks, suits, shirts and topcoats in a variety of fabrics, patterns and colors. Sweaters, socks and raincoats are made entirely of "Orlon". Flannel suits and slacks, once considered impractical by the budget minded because they did not hold their press or give sturdy service, now come in a blend of "Orlon" and wool that provides a completely new standard of shape and crease retention. Tweeds, chevots and other suitings are similarly improved. "Orlon" in the fabric means less time and money spent on upkeep. Blends of "Orlon" and wool offer the advantages of the best qualities in both fibers.

Sportsmen like "Orlon" because it provides comfort on cold, windy days and yet is lightweight.

Forecast for fall is lightweight warmth for the inner man and smart appearance for the outer man — with "Orlon".

Tweed topcoat in comfortable weight blend of 55 per cent "Orlon" and 45 per cent wool is made by Edward Makransky in variety of colors. About \$55. ▶

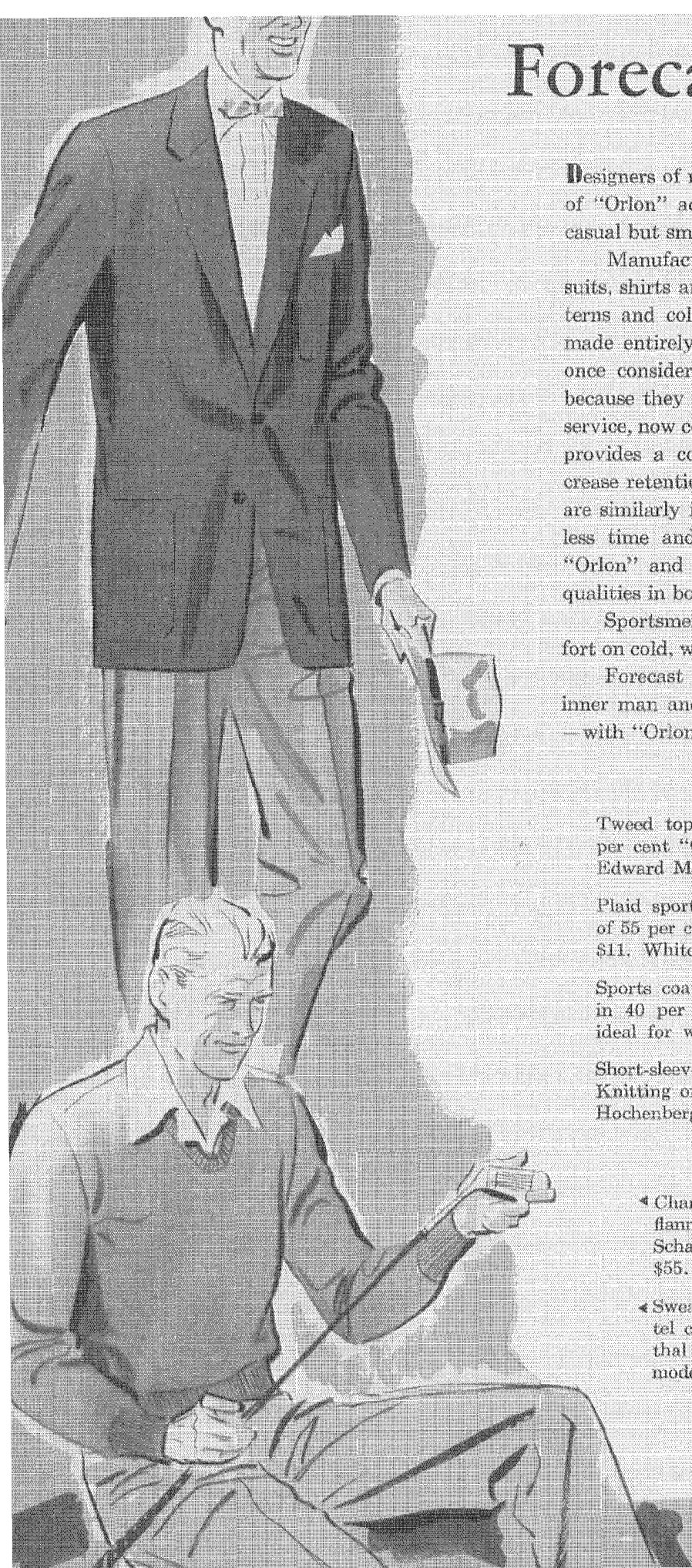
Plaid sports shirt by Van Heusen in blend woven of 55 per cent "Orlon" and 45 per cent wool. About \$11. White dress shirts in "Orlon" also available. ▶

Sports coat in cheviot weave by Phoenix Clothing in 40 per cent "Orlon" and 60 per cent wool is ideal for wear with contrasting slacks. About \$35. ▶

Short-sleeved knit shirt of "Thalspun" by Alamac Knitting of 80 per cent "Orlon", 20 per cent wool. Hochenberg and Gelb slacks in blend are \$14.50 up. ▶

◀ Charcoal gray, featured fall color, in flannel jacket from a suit by Hart Schaffner & Marx and L. Greif. About \$55. Shown with light gray slacks.

◀ Sweater in "Orlon", available in pastel colors, made by Bamberger-Reinthal to sell for about \$10. Sleeveless model in "Orlon" retails at about \$7.50.

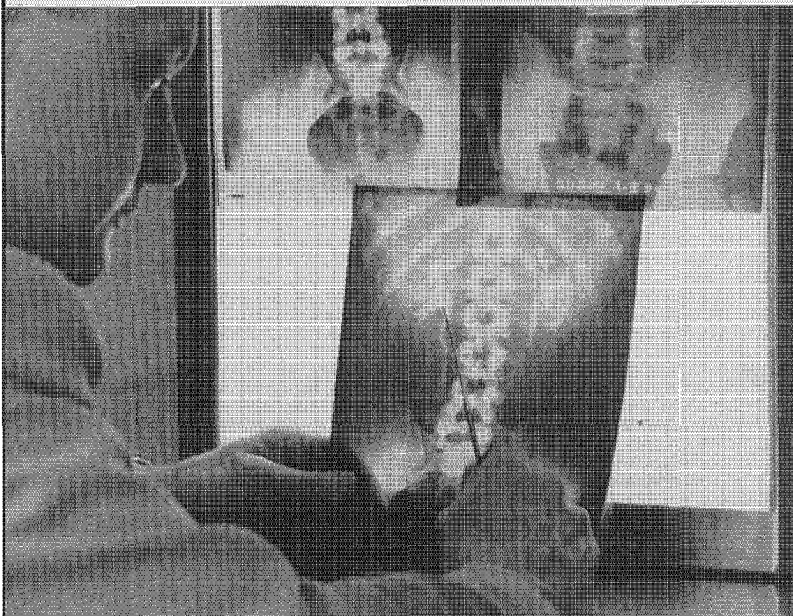




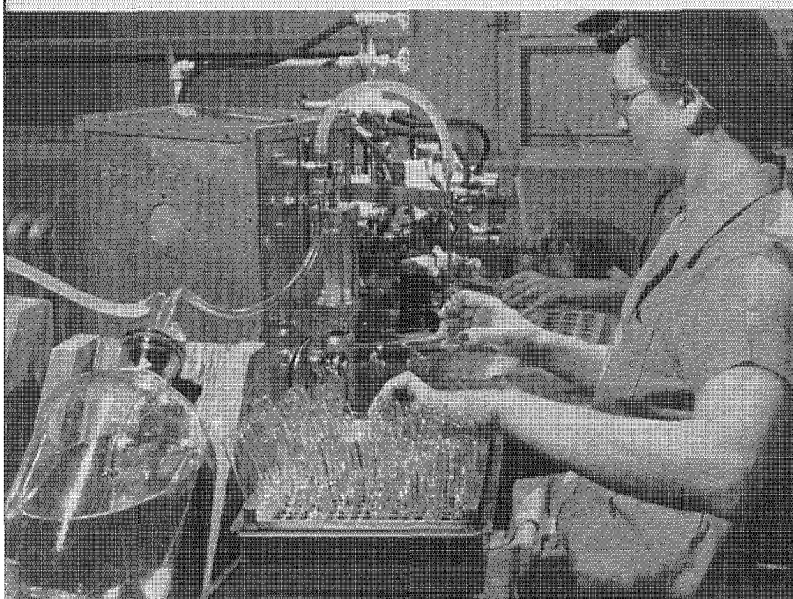
The drug that hunts for trouble

"Neo-Iopax", made with Du Pont's dimethyl sulfate, helps doctors see inside their patients

Proper diagnosis by the physician, like the right clue to a detective, often spells the difference between life and death. But how can the doctor be sure his diagnosis is correct when the patient complains of vague abdominal pains?



Physician examines a pyelogram showing sharp outline of child's urinary tract after intravenous injection of "Neo-Iopax" in arm.



Filling ampules with clear liquid "Neo-Iopax" requires extreme care. Each ampule is then rigidly inspected prior to shipment.

Bones show up clearly on his x-ray film, but a kidney, bladder or other soft tissue can be a confusing mass of shadows, signifying little. He must dye the suspect organ with a solution that will be opaque to x-rays and result in a sharp outline on the film.

So when the physician finds evidence of possible kidney or bladder disease, he usually calls for a pyelogram—an x-ray of the patient's urinary system made after an intravenous injection of "Neo-Iopax" sodium iodomethamate, a stable, clear radiopaque solution made by Schering Corp. of Bloomfield, N. J.

Two to five minutes after the injection of "Neo-Iopax" in the patient's arm, the physician can make an x-ray that will show a sharp picture of the kidneys, ureters and bladder. Physicians like "Neo-Iopax" because of the speed with which it works, its high iodine content which gives it maximum radiopacity, its rapid excretion from the body, and its long record of safety and comfort for the patient.

Although 90 per cent of "Neo-Iopax" is used in urinary diagnosis, it is becoming increasingly important in diagnosing heart disease. A child with suspected heart trouble may, for example, have the blood of the heart replaced by "Neo-Iopax" in split seconds as a simultaneous x-ray is made. The resulting picture will help in diagnosis and treatment. This drug is also being used in examinations of the ducts of the liver and gall bladder during surgery.

Any solution injected into the human blood stream must meet the highest possible standards of manufacture. The record of clinical safety of "Neo-Iopax" is due largely to Schering's care in preparation, constant supervision of all stages of manufacture, and rigorous inspection of the ampules filled with the solution.

Schering chose Du Pont's dimethyl sulfate as a methylating agent for "Neo-Iopax" because it is effective yet economical. Dimethyl sulfate is reactive at low temperatures. Its boiling point, 188.8°C., permits its use at atmospheric pressure and thereby saves the cost of expensive pressure vessels required by some methylating agents.

Dimethyl sulfate also serves the pharmaceutical industry in the production of synthetic caffeine, codeine and other essential drugs. It is used in dyes, perfumes, insecticides and a photographic developer as well.

Perhaps not as well known as some Du Pont chemical compounds, dimethyl sulfate is quietly winning its own laurels by helping create useful products for the health and welfare of people everywhere.



Rupture test is one of numerous checks given tires built with cord of "Super Cordura".

New sinews for industry

*A quick glance at "Super Cordura" high tenacity rayon
and some of the jobs it will soon be performing*

Continuing Du Pont research on rayon has produced a new type of high tenacity yarn, especially developed to meet the requirements of tires and belts for today's fast, higher powered cars, trucks and industrial machines. Trade-marked "Super Cordura" high tenacity rayon, the new yarn fills a need for an economical fiber stronger than today's high tenacity rayon.

Extensive laboratory and field tests indicate that "Super Cordura" has about 20 per cent more strength, and has substantially greater resistance to the damaging effects of moisture and flexing than current grades.

Rubber companies tested tires built with "Super Cordura" on buses, on a fleet of taxis, and on trucks hauling ready-mixed concrete. Cords removed from tires after 40,000 miles showed little loss in strength.

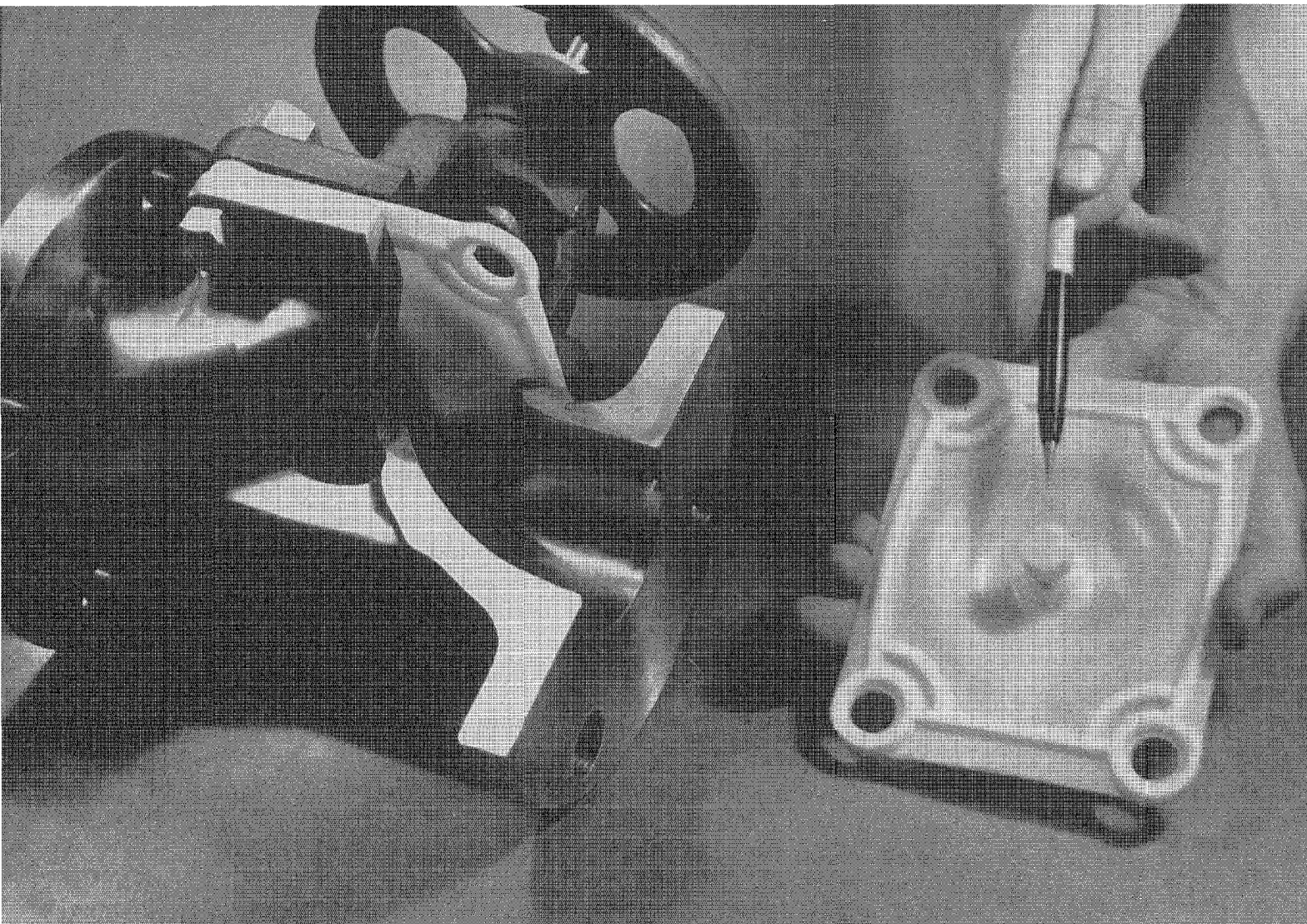
Tire cords must be able to withstand complex flexing every time the wheel turns. Under heavy loads, "Super Cordura" showed up to 25 per cent

increase in flex resistance. This means fewer blowouts, greater safety on the road. Tire cord of "Super Cordura" reduces damage from all kinds of impacts and bruises, and leaves better carcasses for recapping.

ADDS TO BELT LIFE

V-belts have also been improved by the new yarn. Laboratory tests proved that they had a substantially longer life than similar V-belts made with current grades of high tenacity rayon. Field tests on oil well slush ^{PUMP} drives, where service conditions for belts are extremely severe, brought quick response for "extraordinary performance."

Manufactured at Du Pont's Richmond, Va. plant, "Super Cordura" high tenacity rayon will be available in limited quantities this fall. We will give you a progress report on this new yarn in an early issue.



Valve diaphragm of "Teflon" shrugs off heat and corrosive chemicals.

The valve that forgot to corrode

... owes its extra life to a diaphragm made from "Teflon" resin

By FAUNEIL J. RINN

When they started pressing gold into coins for easier handling, one metallurgical problem was how to coax the yellow dust into sticking together without mixing in so much adhesive that the coin would be more stickum than gold.

Somewhat the same difficulty faced the men who discovered that "Teflon" tetrafluoroethylene resin, which compares with platinum in repelling chemical attack and is without rival among plastics in withstanding heat, just couldn't be economically molded like other plastics. They had a product with a host of

uses that would become even more numerous if they could lick the molding problem. But adding a plasticizing material probably would change the nature of the resin and lessen its unique physical toughness.

Du Pont scientists who had developed "Teflon" found an answer, and, in keeping with our analogy, they took a cue from the coiners. They borrowed techniques of powder metallurgy. By pressing Du Pont "Teflon" molding powder into forms and putting it under controlled high heat, out came the parts they wanted.

When the developers got through, they had molded "Teflon" so that the resin's mechanical uses were

increased while preserving the catalog of properties that have given "Teflon" the name of tough guy among plastics. It still wouldn't absorb any water. Its resistance to temperatures as high as 500°F. continued. And still nothing would really stick to it. Raybestos-Manhattan, Inc., adapting and expanding these techniques, became an outstanding molder of parts made of "Teflon".

All this was good news to a company like Hills-McCanna, Chicago founders and manufacturers who buy their valve diaphragms of "Teflon" from Raybestos-Manhattan. Hills-McCanna have been in the valve-making business 22 years. And within the past year, they have found that equipping their Saunders patent valve with diaphragms of "Teflon" is a natural for firms that deal with extremely corrosive chemicals at high temperatures.

Makers of antibiotic drugs, for example, process at extreme heat to insure complete sterilization. So do canners of foods and beverages. They need a valve diaphragm that will stand up against chemical attack as well as top temperatures. Reports from users have been so favorable that by this fall Hills-McCanna will market valves with diaphragms of "Teflon" for valve sizes from one-half through four inches.

A diaphragm of "Teflon", customers report to Hills-McCanna, offers a cushioned and leak-tight seal. Chemicals can't get through to corrode the valve's working mechanism, nor can grease from the bonnet seep down to contaminate the chemicals. The diaphragm flexes enough to allow easy turning of the handwheel in shutting the valve, and closes around minor surface irregularities in the body. "Teflon" makes the diaphragm self-cleansing, for other matter can't stick tightly to it.

"The striking feature about our valve diaphragms of 'Teflon'," says V. M. Barber, a Hills-McCanna executive, "is their amazing resistance to chemicals. You can give a fairly long list of chemicals that conventional diaphragm materials will handle. But with 'Teflon', all you have to say is it will resist every industrial chemical we know of except chlorine trifluoride, molten alkali metals and hot fluorine."

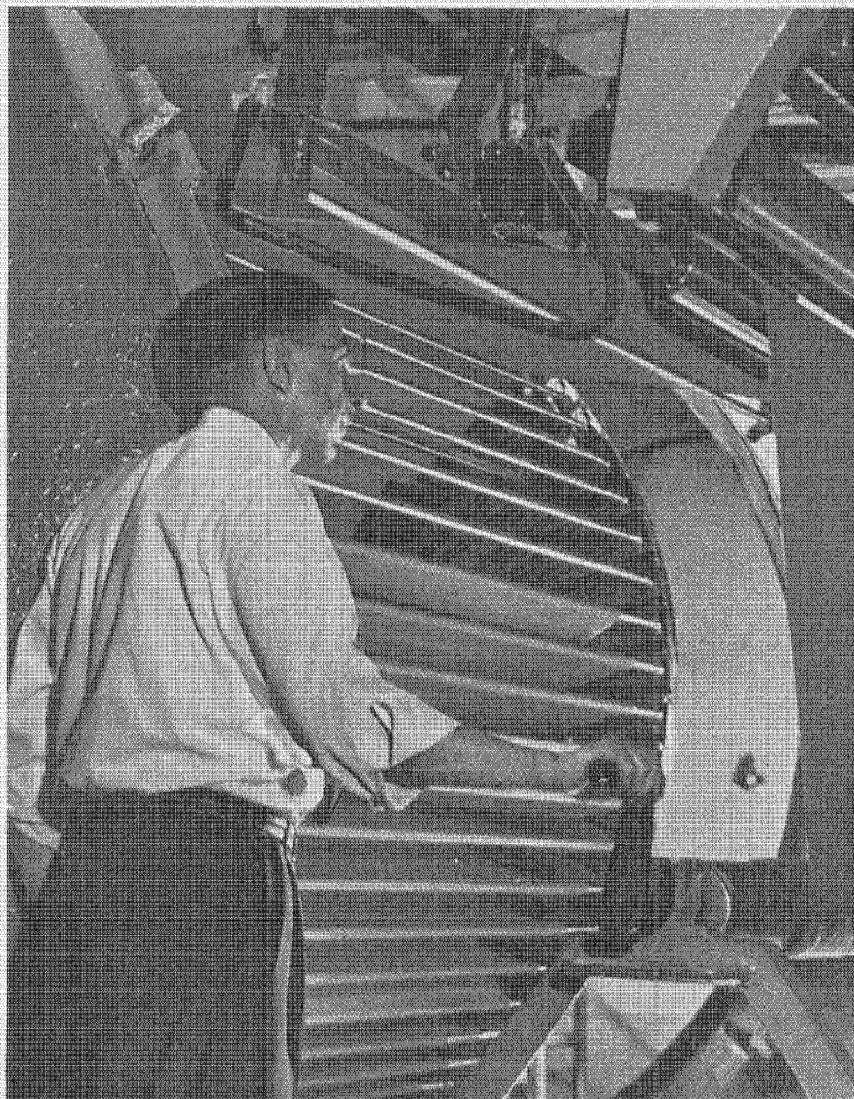
A Wisconsin company, served by Hills-McCanna, processed such highly corrosive material that their valve diaphragms had to be continually replaced. Hot weather meant daily changes. According to Barber: "After a month's use of our new valve, they took out the diaphragm to inspect it. It had forgotten to corrode. Looked like new, they told me."

Squeeze play for dyes

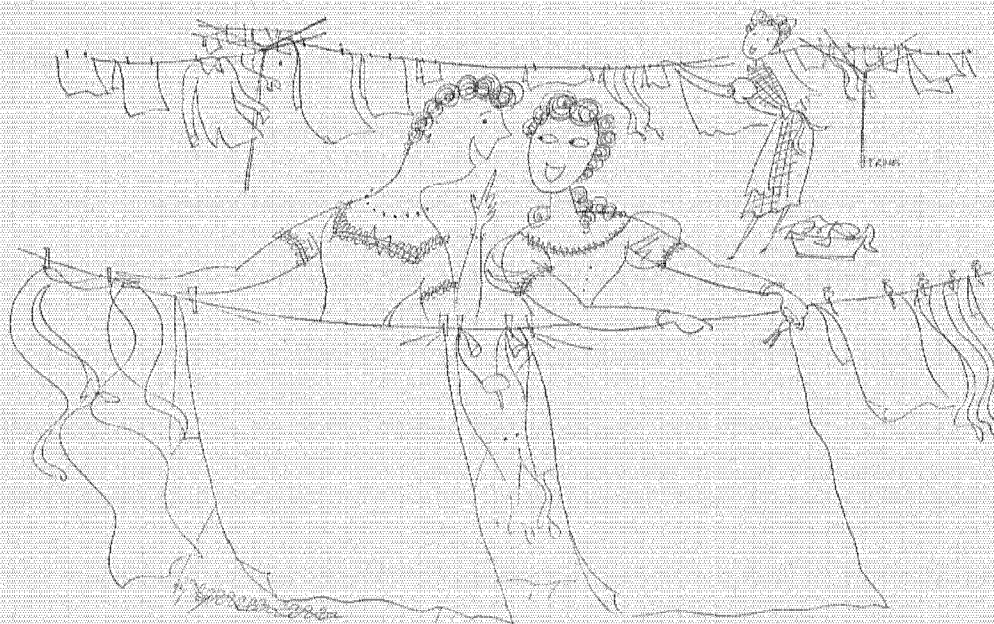
Food cooks faster in a pressure cooker because the water gets hotter than it would at atmospheric pressure. A similar principle applies in the pressurized fabric dyeing machine shown here with its inventor, Paul L. Cole of Du Pont's Textile Research Laboratory. Introduced a year ago, the machine has since been simplified and improved.

The newer man-made fibers absorb only small amounts of water, the traditional medium for applying dyes. At ordinary temperatures these newer fibers take up colors reluctantly. But at the higher temperatures achieved with pressure, fabric is dyed more rapidly, more uniformly and with better fastness properties. The pressurized machine also may have advantages in the dyeing of rayon and acetate as well as natural fibers.

Cole calls his brain child the barotor—from the Greek *baros*, for weight or pressure, plus the English word *rotor*. Fabric to be dyed is looped over the stainless steel rods and swished repeatedly through the dye bath. Firms licensed by Du Pont will manufacture the machine for dyers.







These clotheslines sell bleaches

By LOUISE J. GRUBER

Never underestimate the power of women . . .

"The facts are that in the first quarter of 1953 we found our powdered bleach sales up 23 per cent over the last quarter of 1952." Why? Women like the stuff.

"Our sales in 1952 increased 62 per cent over 1951 and 164 per cent over 1950." Again, the homemakers are responsible.

These impressive statistics are quoted by two companies that make and sell powdered bleaches containing Du Pont sodium perborate. The first is a newcomer to the field, and the second, Tidy House Products Co., has been a pioneer with "Dexol". Both concerns have records indicating a steady increase, largely attributable to widespread home use of this type of bleach.

In the fall of 1951, through these pages, we introduced you to powdered bleaches, the newest friend of the family wash. The chief ingredient, sodium perborate manufactured by our Electrochemicals Dept., is a thorough but gentle bleach. Since then the story is one of beanstalk growth—the number of packages sold each month has risen from 650,000 to 2,000,000. Homemakers have tried it, liked it and gone back for more. They've told their neighbors about it and written to friends across the country.

More than 20 companies are now manufacturing sodium perborate bleaches, and three of these have their products on shelves throughout the nation. At least one firm markets a regular ten-ounce package plus a 29-ounce size.

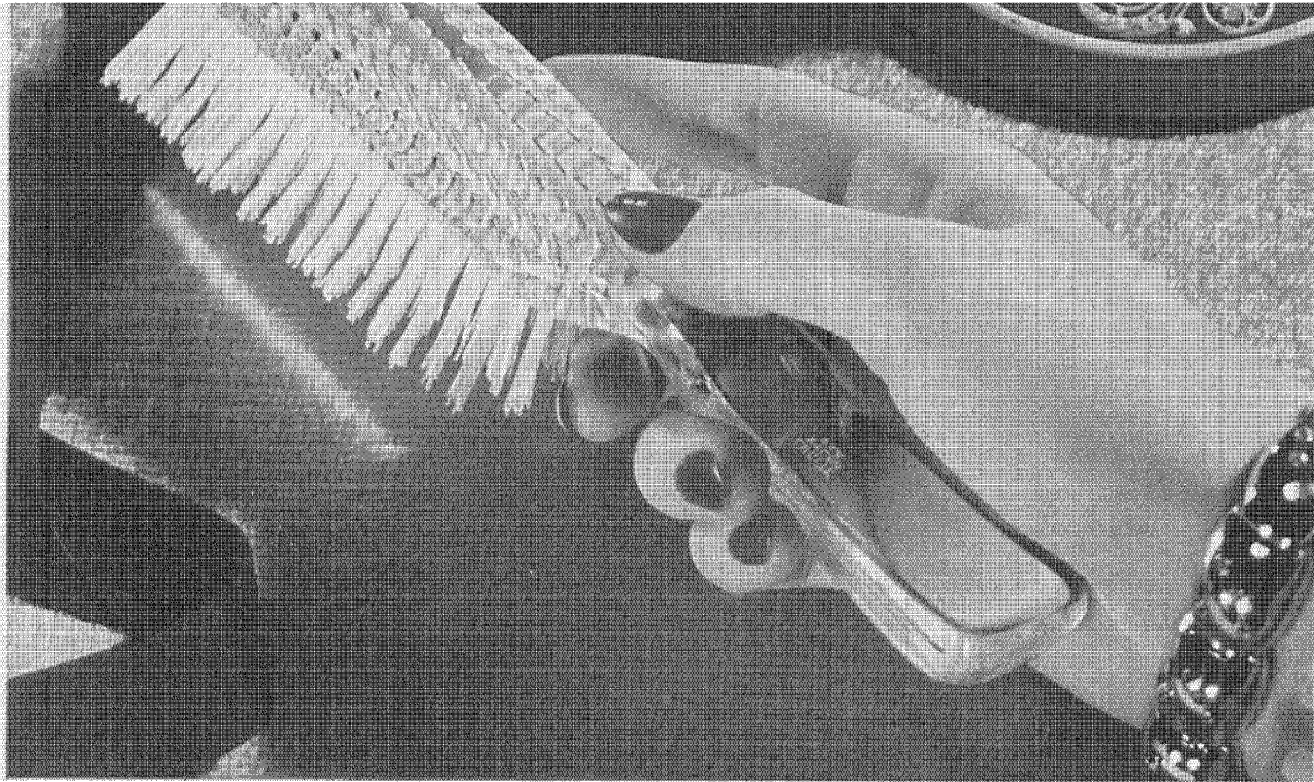
Why do powdered bleaches have such a feminine following? Let the homemakers tell you. "I hated to hang out my wash; it was muddy gray. My husband even hated to see it on the line. Then I bought and tried powdered bleach and now the laundry is bright and clean. I'm really proud to have washday come." That was a New Orleans housewife.

From New York: "It is one bleach that is safe for the *entire* wash, and it is so light in weight and easy to use." An Indiana mother says: "Powdered bleach is safer to have around when there are children who are apt to spill it. I also like the fact that there is no odor to stay on the hands."

All washable fabrics—whether of silk, cotton, wool, rayon, nylon, "Orlon" acrylic fiber, or "Dacron" polyester fiber, and whether white, colored or printed—are safe in perborate bleaches. They do not impair fabric strength and, furthermore, the perborate bleaches are safe for textiles that are crease-resistant or shrinkage controlled.

Perborate bleaches are most efficient when used in hot water, and when lower temperatures are required a longer bleaching period is recommended. Overnight soaking at room temperatures has proved effective for the newer synthetics.

The active ingredient in the gentle powdered bleaches is sodium perborate. It is, in effect, a solid and convenient form of hydrogen peroxide that DuPont has long supplied many textile mills to achieve long-lasting whiteness in sheets and towels. Now it's the housewife's turn to cash in on the useful chemical.



The brush came first

Eighteen months before nylon stockings appeared, nylon-bristled toothbrushes were cleaning teeth. The story of the filament is even broader than that of its textile cousin

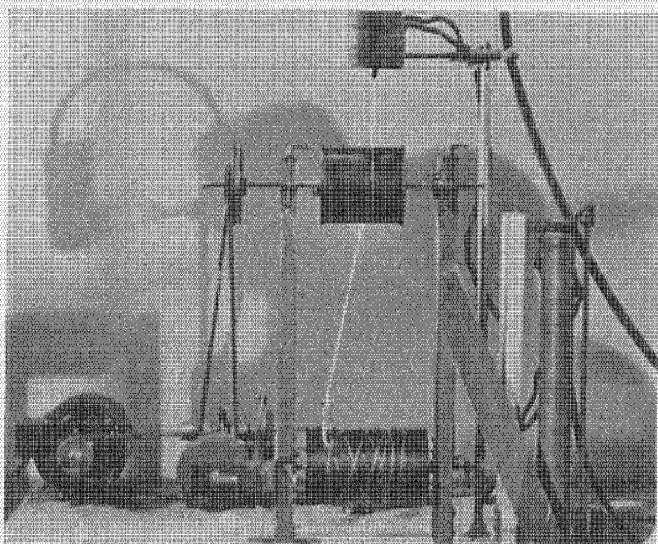
Nylon monofilament brushes performing about 3,100 different industrial tasks. Nylon monofilament tufts in more than 100,000,000 toothbrushes last year. A new eight-pound test monofilament spin fishing line landing a 78-pound tarpon. Surprising facts? Surprising in their

scope, perhaps, but nothing more than expected by some of the Du Pont pioneers who first marketed products of nylon plastic filament as early as 1938. That was some year and a half before nylon hosiery appeared to capture the fancy of women and the imagination of the press.

Du Pont recognized from the first that long-wearing, fast-drying nylon should make a superior bristle. The Company was familiar with the brush industry's needs, since it had been in the business for years. The Arlington Co., purchased by Du Pont in 1915, began making toothbrushes in 1910, when relatively few Americans brushed their teeth.

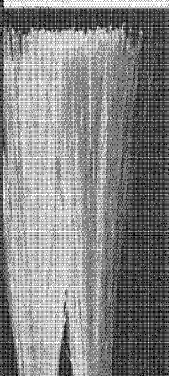
Early research on nylon bristle was done at the Experimental Station near Wilmington. Later, in 1936, two men from the plastics laboratory at Arlington, N. J. were assigned to help steer the product from the laboratory to the plant stage.

The following year the first spinning unit for Du Pont nylon monofilament began operation at Arlington. The gleaming filament was squeezed out at the unimpressive rate of four pounds an hour, but already better and faster models were on the way. From there the continuous filament was sent to the Du Pont plastics products plant at Leominster, Mass. where

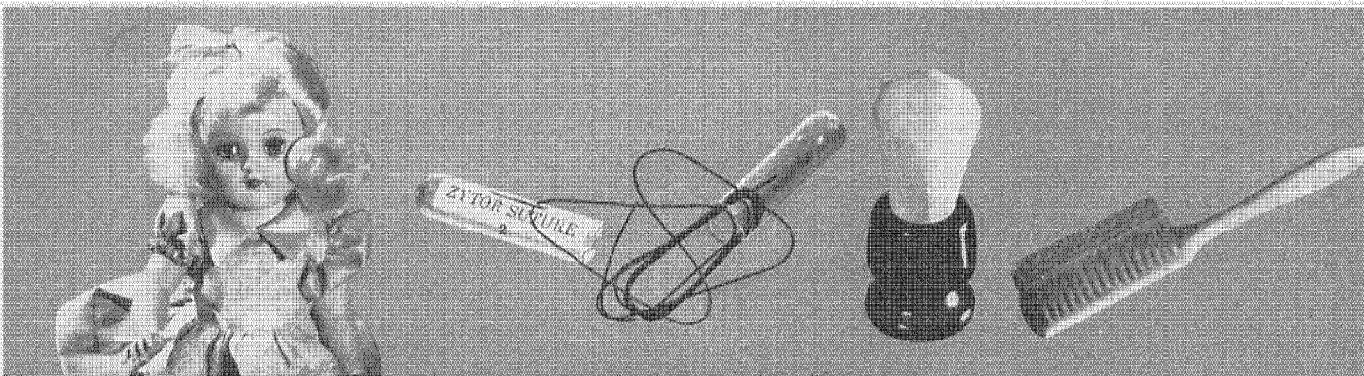


First nylon filament was spun on this tiny lab machine. New polymer made its commercial bow in nylon-tufted toothbrush.

Typical Products of Nylon Monofilament



Extra fine—
4 mils diam.

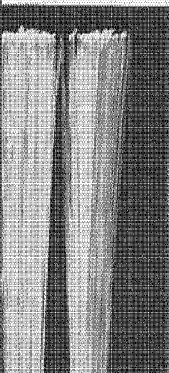


Doll wig

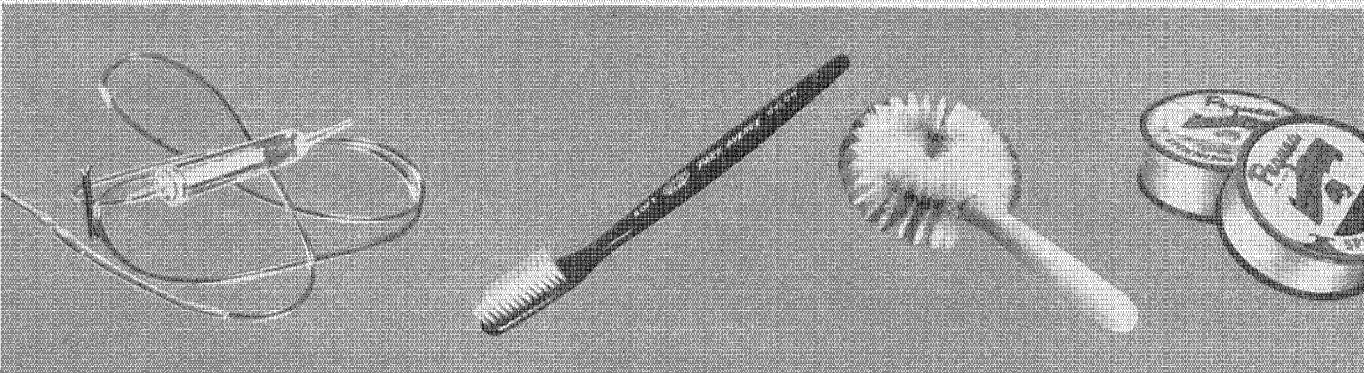
Surgical suture

Shaving brush

Baby hairbrush



Fine—
10 mils diam.

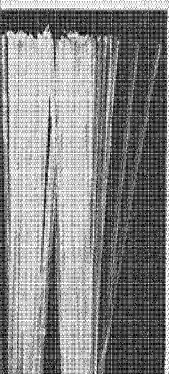


Plasma filter

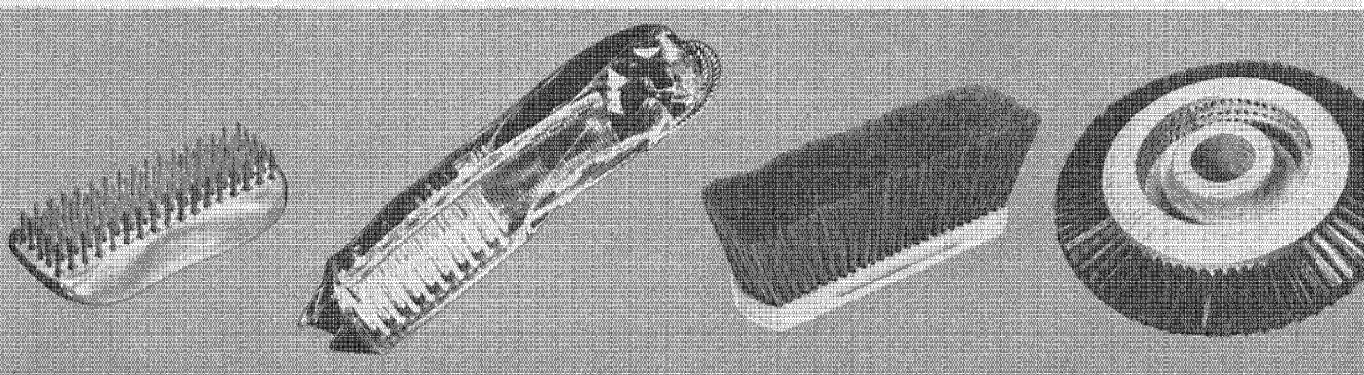
Soft toothbrush

Powderpuff brush

Spin fishing line



Medium—
23 mils diam.



Hand brush

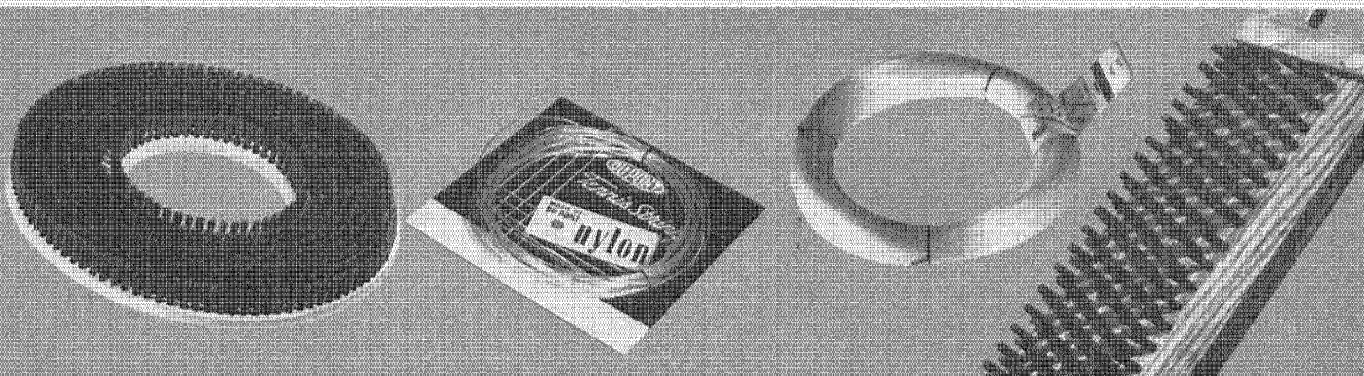
Purse hairbrush

Stippling brush

Tenter brush



Heavy—
50 mils diam.



Rug-scrubbing brush

Tennis string

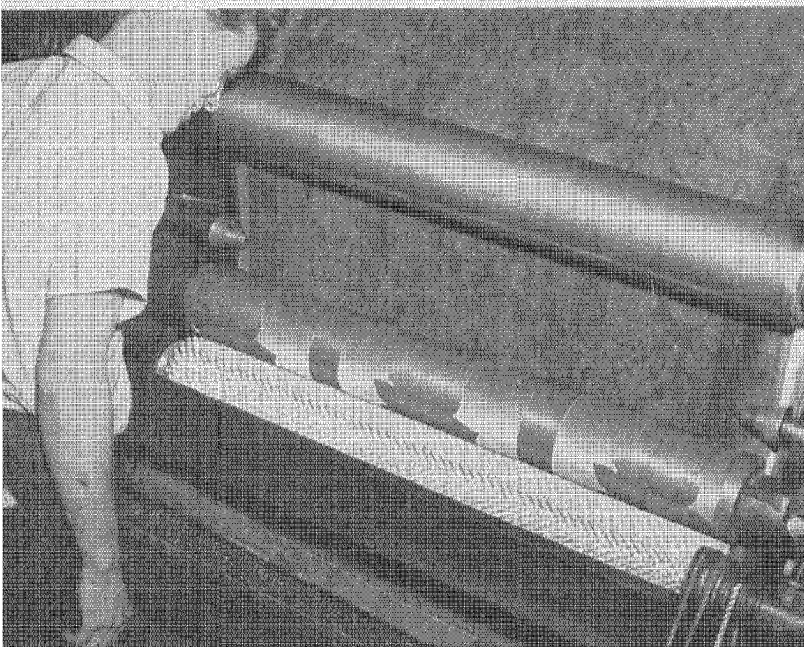
Fishing leader

Teasel brush

the first nylon-bristled toothbrushes were produced.

As production increased, nylon monofilament was available to other manufacturers. They used it in hairbrushes, cleaning brushes, fishing leaders and, in 1942, in the first of dozens of successful industrial brushes. In a high-speed bottle washing machine, for example, nylon brushes outlasted their predecessors from 3 to 20 times. And a nylon-bristled furnisher brush for textile printing lasted so much longer than vegetable bristle that the manufacturer decided to make the brush body of steel instead of wood. He ended up with a much more expensive brush, but his customers were glad to pay for the added quality.

The problem of adapting nylon for paintbrushes was one of the first tackled at Du Pont, and was the knottiest connected with the program. Researchers were slowly making headway when a phone call was received. "This is Lt. Berentsen of the Navy," said the voice. "I'd like to talk with you people about nylon filaments for tufting paintbrushes."



Furnisher brush on textile printer was first of a long line of industrial brushes to be made with durable Du Pont nylon.

The call came to Du Pont's Wilmington headquarters on Feb. 24, 1941. Pearl Harbor was ten months in the future, but the Navy, which prides itself on forehandedness, knew that a war would shut off the supply of Chinese hog bristles for brushes. Some other material had to be found.

Painting is surely as typical of the Navy as swabbing decks. There's a saying in the fleet: "If it moves, salute it; if it doesn't move, pick it up; if you can't pick it up, paint it." Salty humor, yes—but without paint a ship would soon rust into uselessness.

Lt. Berentsen phoned several more times on the same subject, and the upshot was a conference at the Navy's Bureau of Ships, attended by a Du Pont representative. Research already begun was stepped up, and

by midsummer sample brushes bristled with nylon were submitted to the bureau. They were approved. As it happened, the first of several Navy contracts for nylon bristle was accepted by Du Pont one month before Japan's surprise attack. When war did come, the Navy's paintbrush supply was secure.

Assuring the Navy a supply of bristles for brushes still left a lot of work to be done. A bristle of uniform diameter, like that used in other brushes, made a paintbrush that performed like a mop. A bristle that tapered from the butt to the tip was needed.

The engineers designed a spinning machine to turn out continuous filament of alternately large and small diameter. Chopped in the right places, these filaments became tapered bristles. But before being cut, the filaments had to be drawn to four times their length to develop maximum strength.

For smooth painting, the tips of the bristles also had to be ground to a long fine point. At first this was done after the brush was made; now, following a postwar study of the problem, the bristle is ground first, a better method.

This postwar study, described in one of our 1951 issues, was conducted for Du Pont by the Battelle Memorial Institute. It covered the entire design and manufacture of paintbrushes tufted with Du Pont nylon, and resulted in techniques that have improved paintbrushes significantly in the last few years.

FILAMENTS FROM W. VA.

Since 1948, nylon monofilament has been manufactured at the Polychemicals Dept.'s plant in Parkersburg, W. Va. From there it is shipped in wrapped bundles to brush manufacturers and to makers of tennis racket strings, fishing lines and leaders, and doll wigs. In industry, nylon-bristled brushes are smoothing on labels, polishing metal, scrubbing leather, coating paper, and cleaning candy and fruit, to name only a few of its more than 3,000 different industrial jobs.

One of Parkersburg's new products is limp nylon monofilament line for spin fishing. The line is made of a new type nylon, which is limper and higher in tensile strength than the type used for brushes. Fishermen like it as much as the fish must despise it.

A good Parkersburg customer, of course, is our Leominster plant, which last year helped contribute to the flood of more than 100,000,000 toothbrushes manufactured in the United States. The plant now makes some brushes with tough nylon plastic handles as well as nylon tufts. Newest in the line is a toothbrush with soft nylon bristles—tufts of more than 1,500 filaments, each only eight-thousandths of an inch in diameter. Other Leominster products made with nylon filaments are ultra-soft hairbrushes for babies, a one-piece brush and comb, purse brushes for the hair, and hand and complexion brushes.

Since that first toothbrush sale in the fall of 1938, the Du Pont plastic has been working a profound revolution. Today nylon monofilament has become the generally accepted standard in a dozen different fields.



Wash-up without water

A waterless hand cleaner which removes grease, paint, oils, carbon, tar—just about anything that soils the hands of the mechanic, painter, motorist or handyman—is the newest addition to Du Pont's No. "7" line of chemical specialties.

Cleaning largely by solvent action, this hand cream liquefies on contact with the skin. The liquid reaches crevices and fingernails, rapidly dissolving grease and grime. A teaspoonful or so is enough for one washing. The hands are rubbed together briskly and wiped clean with a paper towel or cloth. No water is required, although it may be used since the cream is soluble in water. Customers say its composition is less irritating than abrasive cleaners; its lanolin content aids in softening the skin.

Said one painter who had used turpentine to clean his hands for years: "Amazing cleaner. I could use a case right now in my business."

A printer was pleased to find it removes printer's ink. He provides the waterless cleaner for all of the pressmen at his plant.

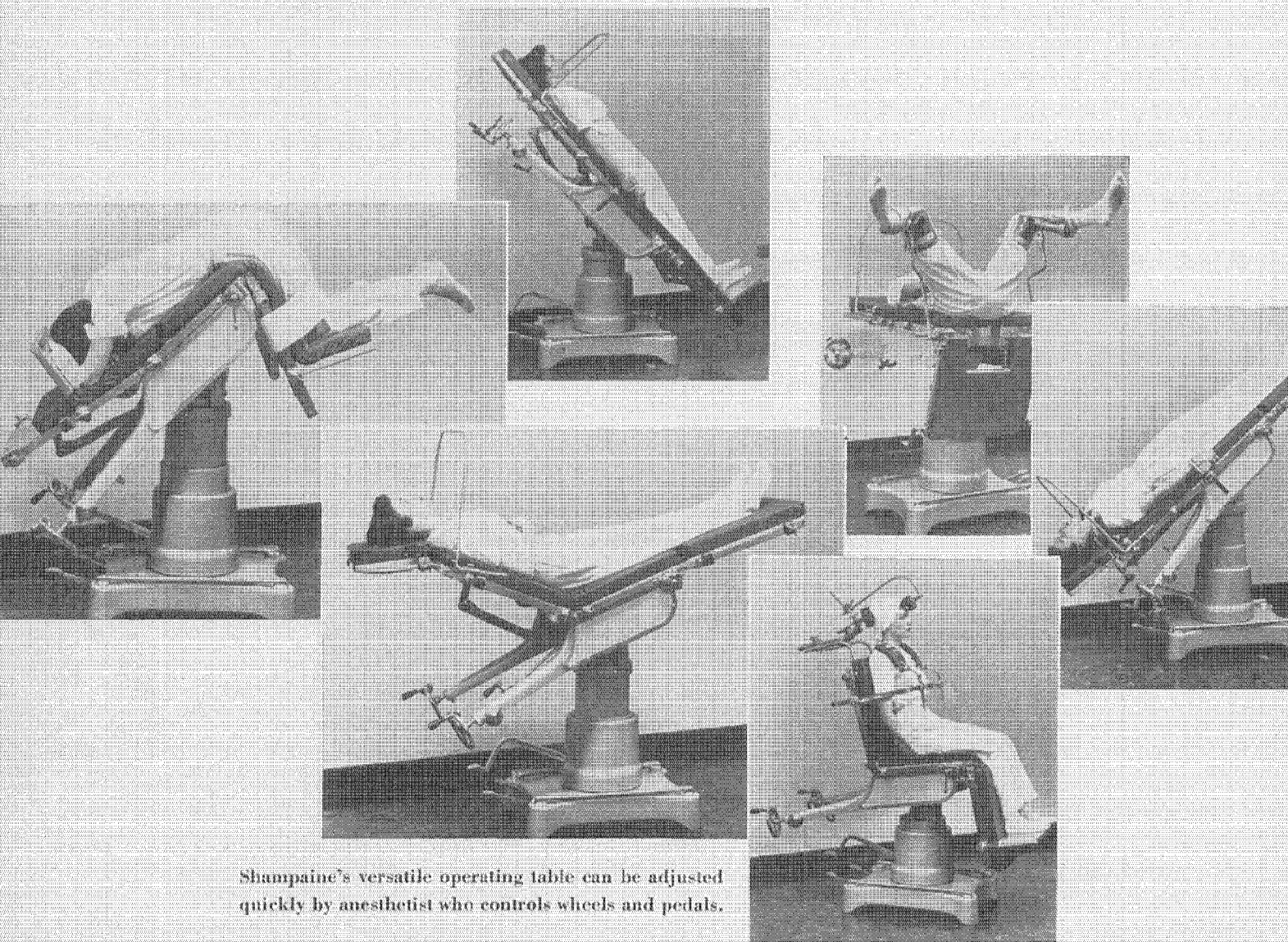
A farmer, whose hands had been well coated with creosote from fence posts he was setting, found Du Pont's hand cleaner removed every trace of creosote.

Many motorists say the waterless hand cleaner in the eight-ounce metal container is now a standard item for the glove compartment or trunk of their car. They say it can't be beat for a wash-up after changing a tire or tinkering with a motor.

Mechanics and service station attendants, who must clean grease and oil from their hands many times a day, find the new cleaner fast acting, effective, yet economical in the 28-ounce size. The cream remains stable in the container—ready for a quick wash-up without water.

Just what the doctor ordered

*Du Pont finishes in 19 colors help sell hospital
equipment made by Shampaine Company of St. Louis*



Shampaine's versatile operating table can be adjusted quickly by anesthetist who controls wheels and pedals.

By MARY ELLEN EVANS

Trips to the hospital, while not as frequent as visits to the dentist, are now accepted as a necessary aid to our good health. Not that more people are ill. The health of our nation has never been better. The answer lies in the attempt to stop diseases before they get a head start and in the greater availability of hospital services, from big cities to remote communities.

Surgeons in these hospitals are demanding equip-

ment to meet every requirement of modern operating techniques. Their demands keep designers and engineers busy at such surgical innovations as the new table for major operations made by the Shampaine Co. of St. Louis. The table, complex yet easy to adjust, can do almost anything but remove an appendix.

Surgeons like its control wheels and pedals, easily adjusted by the slightest touch of the anesthetist at

the head end of the table. Each section of the table is independently adjustable to positions that meet the needs of present-day surgical technique. For greater speed, the anesthetist may lower the patient's head, raise the kidney section and turn him on his left side—all simultaneously. Hydraulic units in the base of the table adjust the height from 31 inches to 46 inches to suit the surgeon.

TWO SCORE TABLES

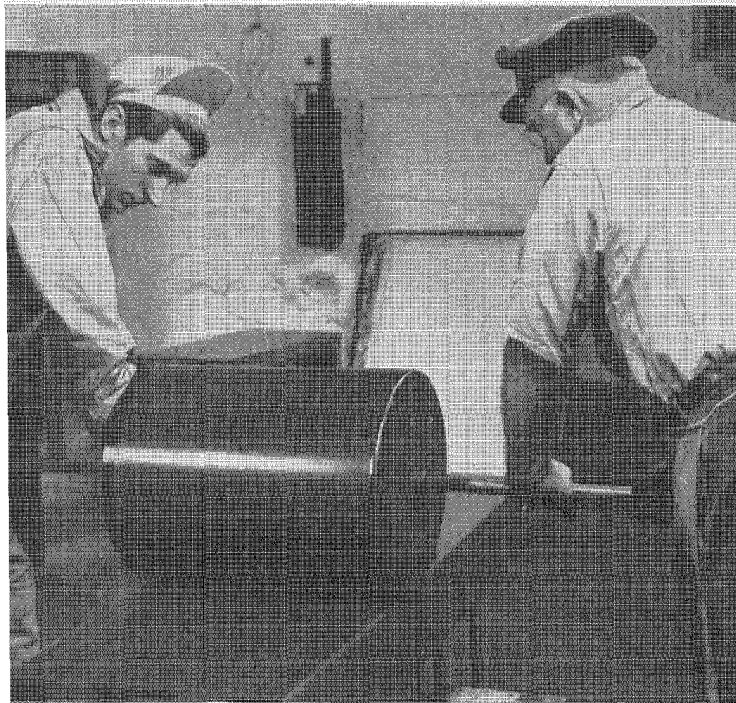
Developed and manufactured by Shampaine, this table is one of 21 hydraulically operated tables and 20 tubular examining tables made by the company. Shampaine, in fact, manufactures everything for the hospital operating and physicians' examining rooms from instrument tables to kick buckets.

All their equipment, made to meet the high

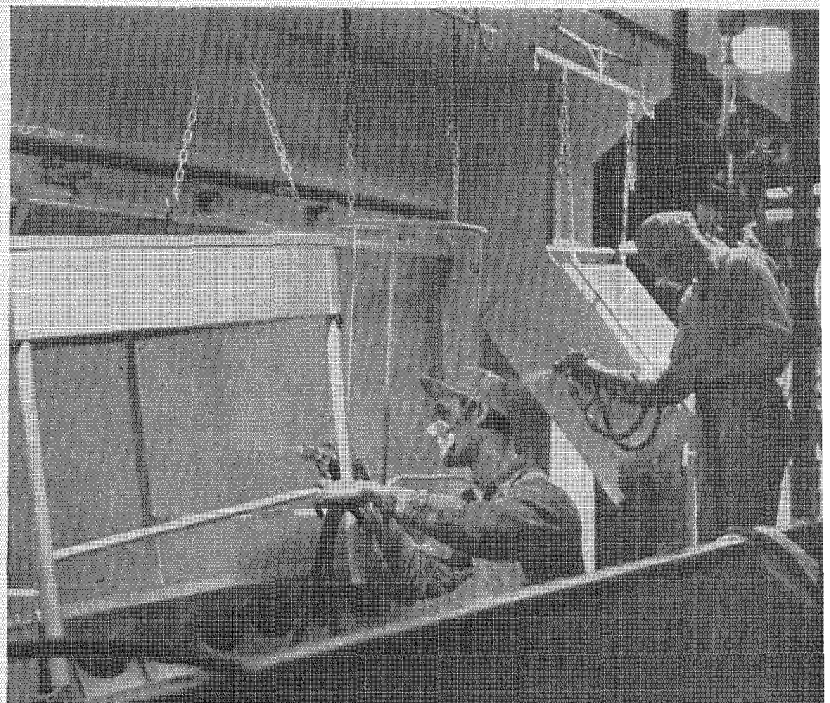
won't scratch or chip. 'Dulux' finish stands up under a constant barrage of medicaments, cleaning compounds, sterilizing solutions and anesthetics. Our equipment is in use in almost every climate in the world, and our sales are pretty conclusive proof of its high quality."

A good customer for Du Pont finishes since 1934, the Shampaine Co. now also uses Du Pont strippable coating to protect the glistening stainless steel as it passes from the polishing wheel down the assembly line. After the danger of scratching is over, the non-adhering coating is simply peeled off.

Founded by Abe Shampaine, a metal craftsman who came to this country from Russia in 1905, the Shampaine Co. has expanded from a small workshop making hospital furniture for another company to a four-acre plant that is the largest single source of hospital and surgical equipment in the world.



Grain pattern is rolled on cabinet to give an appearance of wood before the application of the "Dulux" clear finish.



Final coat of "Dulux" enamel is sprayed on as conveyor takes hospital equipment to the oven for the final baking.

standards of doctors and hospital administrators, is constructed of stainless steel or of stainless and carbon steel combined. The carbon steel parts are finished with Du Pont "Dulux" enamel for durability and lasting beauty. Nineteen colors, plus numberless color combinations, were selected after a nationwide survey of preferences of doctors and hospital administrators. While personal tastes differ, Nile green and plantation green lead the list for hospitals, and cream white is the favorite of physicians. In its large orders for hospital equipment, the Army asks for blue spruce.

"We chose Du Pont enamels for the multi-coat, baked-on finishes," General Sales Manager Frank Martin says, "because the surface is hard, durable and

In the early '30s, ingenious Abe gambled on a company of his own. He and his chief mechanic made working models of operating tables and tested them in hospitals. His son Bob, now president of the company, cut classes at Washington University to help sell the products. With the war years and a sharp rise in sales, their early struggles began to pay off. Research and development of the finest products possible for the hospital and physician, and the phenomenal growth in the use of hydraulic equipment sent their sales skyrocketing.

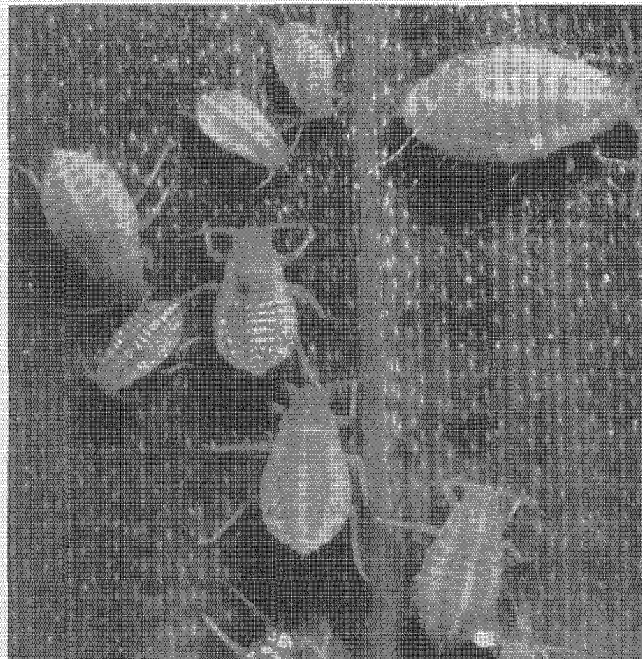
Such quality equipment, coupled with new drugs and near-miracle operations, helps make a visit to a modern hospital a day of hope instead of despair.

What's New

• **LIGHTWEIGHT PLASTIC ROPE** is being made from Du Pont polyethylene film by Plastic Rope Co., Inc., Redwood City, Calif. So buoyant that it floats, the rope is being used for heaving, anchor and life lines for boats. Its non-absorbency and acid resistance also qualify it for other uses where rope or heavy cord may come in contact with water or chemicals.



• **\$430 A POUND.** That's the price tag on these shiny crystals, now being supplied to electronics researchers by the Du Pont Pigments Dept. The material is the element silicon, which shows promise for use in transistors, rectifiers and other electronic parts. The price isn't as steep as it sounds, because the tiny silicon wafer in a transistor costs only a few cents. A Du Pont-developed manufacturing process opens up a virtually limitless source of the element.



• **THE BUSY APHIDS** shown here, red spiders, and many other insects are killed by new Du Pont Aphid & Mite Spray, recommended for flowers, ornamentals, evergreens, fruits and vegetables. The insecticide is sold in liquid form for mixing with water. A four-ounce bottle makes 16 to 24 gallons of spray.

• **COCKPIT COVERS** for the protection of transparent enclosures are now being made for the civilian aircraft industry by Du Pont. V-Cockpit Cover #3, part of the Company's "Fabrilit" vinyl-coated fabric line, has a soft fabric base and an aluminum top coating to reflect sunlight. The material is already being supplied to the Air Force.

• **BUG SPLATTER** is removed quickly, before it can mar car finish or chromium, by a new cleaning powder in the Du Pont No. "7" line. Also good for cleaning windshields and headlights, the powder rinses off with water and is designed for use with Du Pont car wash.

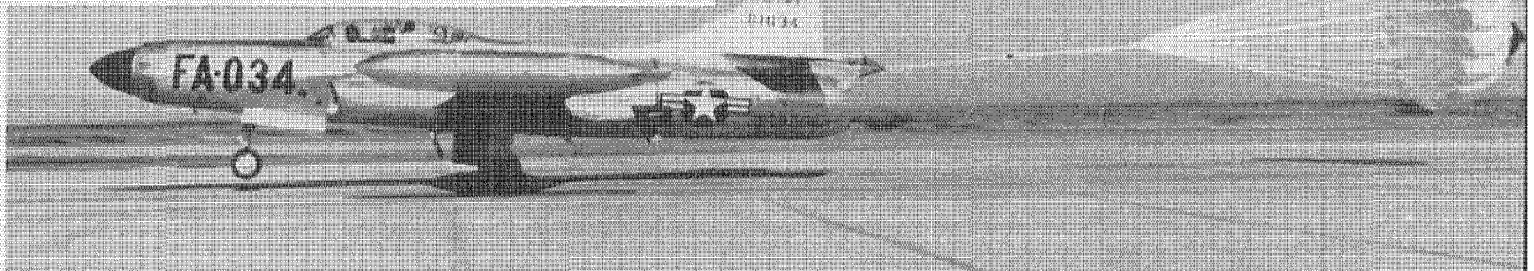
• **"MYLAR" POLYESTER FILM**, one of the newest products of Du Pont research, is the subject of a technical bulletin containing information on the physical, electrical and chemical properties of the film, and suggested applications. For a copy, write Du Pont Film Dept. ML, Wilmington 98, Del.



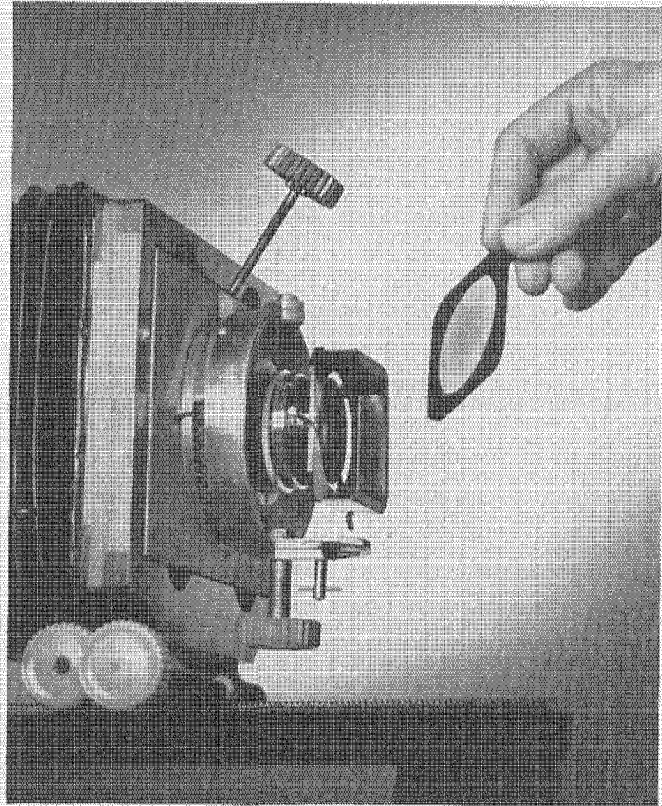
• **STYLISH STOLES** may now be hand-knitted from "Kitten Soft" yarn made of "Dacron" polyester fiber by Zelta Yarn Corp., 2 East 23rd St., New York 10, N.Y. These soft stoles of "Dacron" swish through suds, won't stretch or lose shape. "Kitten Soft" yarn is available in white and eight colors.

• **MEDICAL X-RAY FILM** is now being packaged by Du Pont without paper interleaves, because today's super-hardened emulsions make them unnecessary. Advantages: film handling is easier and faster; the static problem is reduced; more film can be stored in the same space.

• **WHOA!** This F-94C Starfire, 600 mph-plus jet interceptor, is equipped with a newly developed drag parachute of Du Pont nylon that stops the 10-ton ship in 60 per cent of the distance normally required. The chute, stored in the tailpipe, is released on landing. The Starfire is the first U.S. fighter to be so equipped.



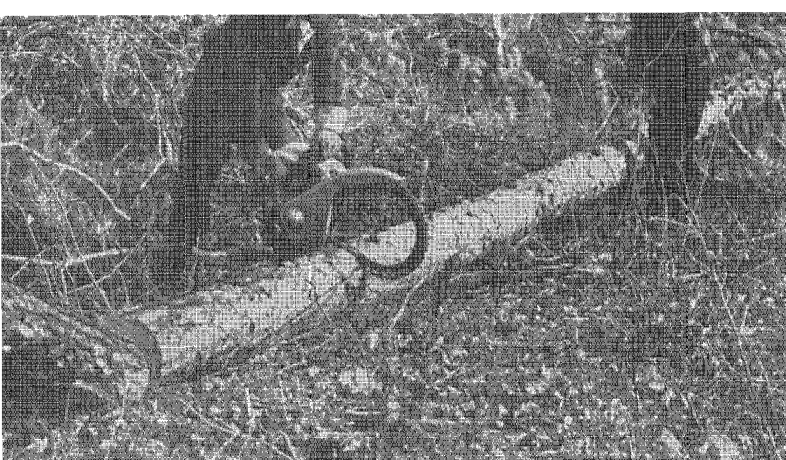
• **TWO NEW DYES** are being marketed by Du Pont — "Leucosol" Yellow LN Paste and "Latyl" Violet B. The first, a vat dye especially suited for textile printing, produces bright greenish-yellow shades of superior light fastness on cotton and rayon. The second is a dispersed type, blue-violet dye for use on "Dacron" polyester fiber.



• **NEW PLASTIC FILTERS** for use with Du Pont "Varigam" variable contrast photographic paper, made of optical-quality plastic, are now available at photographic dealers. The filters can be cleaned with soap and water, are highly resistant to heat and abrasion. Sets of five or ten are packaged complete with plastic filter holder and instructions.

PHOTO CREDITS: Page 5: Courtesy U. S. Geological Survey; Page 6, left: Courtesy U. S. Army; Page 8: United Press; Page 13, top right and bottom center: Courtesy Stanolind Oil and Gas Co.; Page 15,

bottom right: Courtesy *Country Gentleman*; Pages 30 and 31: Courtesy Champagne Co.; Page 32, right: Courtesy USDA; Page 33, bottom: Courtesy U. S. Air Force.



S&R sells pulpwood from 2,000-acre Du Pont explosives test site near Millville, N.J. Selective cutting keeps the forest healthy.



Steel coil from an acid warming tank is cut up for scrap. S&R collected 26,500 gross tons of iron and steel scrap last year.



Repairing safety glasses and goggles at a nylon plant. This and similar economies can save a single plant up to \$4,000 monthly.

The penny

S&R's saving ways help cut cost.

By GERALD KING

"There's a market for everything if you can find it."

That's Luther Broadway talking. He heads Du Pont's Salvage and Reclamation Division, which hunts markets inside and outside the Company for the leftovers and by-products of chemical manufacturing. Last year the division sold \$4,353,000 worth of salvaged, reclaimed and surplus materials, thus cutting production costs and the price you pay for Du Pont's finished goods.

In one category—scrap metal—finding a market has been no problem. The defense program has seen to that. It's estimated that S&R's 1952 collection of 26,500 gross tons of iron and steel scrap was enough to forge, with hot-melt steel from ore, all the steel for 2,000 Sherman tanks or more than a million five-inch shells.

In addition to iron and steel, S&R's salvage program rounded up 2,250,000 pounds of copper and copper alloys, 2,440,000 pounds of lead, 594,000 pounds of aluminum, 104,520 pounds of nickel, and 18,300 pounds of zinc.

Not all salvaged material ends up as scrap, of course. More than a million dollars' worth of machinery was sold to outside buyers or transferred within the Company last year. Included were still usable chemical manufacturing equipment, motors, pumps and the like.

Offhand, you might think used filter cloths would be discarded. Not so. Cotton cloth used to filter viscose at Du Pont rayon and cellophane plants is sold for manufacture into dish towels, and salvaged cloth as a whole accounted for \$338,000 of S&R's sales last year. Scrap paper brought in another \$150,000, and used containers—mostly steel drums—about \$300,000.

Not reflected in these sales figures are the many items reclaimed for further use at Du Pont plants and offices. Pushbrooms are ready for more mileage after their worn wooden handles have been cut off and re-threaded. Filter press frames, safety glasses and goggles, leather gloves and wiping cloths go back into service after being cleaned and patched up. Salvaged pipe and valves are put aside for future use. Even used stationery is chopped into scratch pads. This sort of scrimping can save up to \$4,000 a month at a single Du Pont plant.

Reclamation can be overdone though, according

pinchers

and conserve important materials

to Broadway. "If you're not careful, you can spend \$5 to save \$2. You have to watch that. Some people become overzealous and turn into string-savers."

Dismantling of old or outmoded Du Pont manufacturing facilities is also an S&R responsibility. Last year the division handled 84 such projects. On new plants, S&R arranges for the sale of any excess construction materials.

Know anyone who can use sodium sulfate by the tank car? They can buy it either as a slurry or a salt from S&R. How about acrylic waste, possibly for conversion to soil conditioners? Or a mixed brew of organic acids and aldehydes, available in ton-a-day quantities? As a suggestion, the acids might be extracted and the balance used in plastics manufacture.

CHEMICALS ON SALES BLOCK

These and some 40 other chemical by-products and residues from Du Pont plants are among the materials S&R is attempting to market in its newest campaign. Any reasonable offer will be considered.

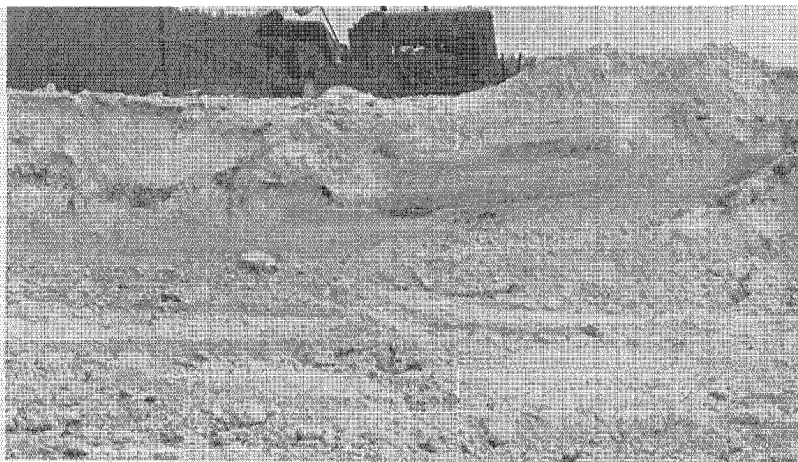
Customers for many chemicals and residues have already been found. Lime, for example, is being hauled from Du Pont's Waynesboro, Va. acetate plant at the rate of 50,000 tons a year for farm use. And aniline sludge, a mud-like soup of finely ground iron oxide discharged at two plants, is sold to a dealer who resells it as a raw material in steelmaking.

Both the lime and the aniline sludge were liabilities before S&R found outlets for them. Waynesboro, with a 20-year accumulation of lime, had been forced to buy a nearby farm as a storage yard. About 500,000 tons of the stuff had piled up by the time S&R rang up the sale.

Another marketable residue of rayon manufacture is caustic soda solution. A rubber reclaiming company and a paper mill buy it from the Yerkes rayon plant in Buffalo. They pay less than they would for new caustic, and Du Pont is saved a costly disposal problem.

S&R has come a long way, philosophically as well as financially, since making its first \$150 sale of a sulfuric acid by-product in 1907. Today it sees itself as a creative selling agency, particularly for chemicals and residues that have been considered unsalable up to now.

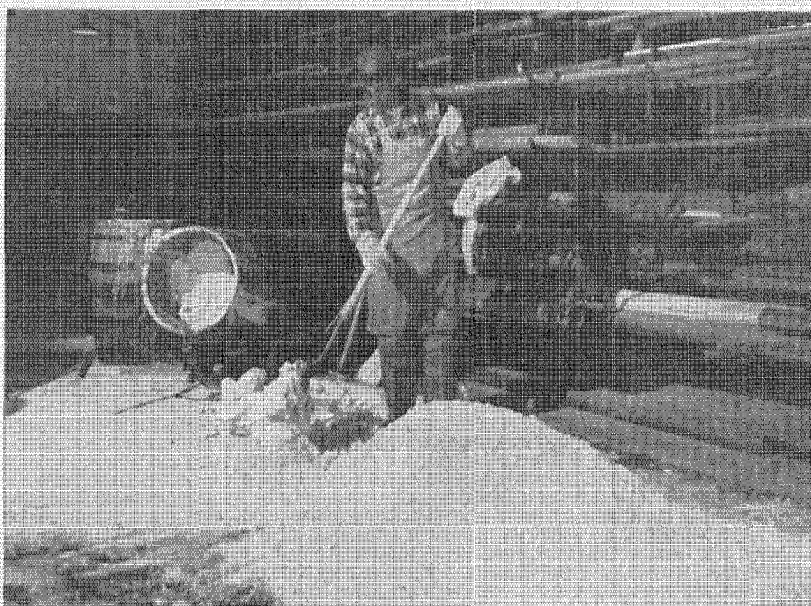
"Our Du Pont plants used to come to us," says Broadway, "but now we go to them. We ask them what they have running in the ditch, and then see if we can sell it."



Waynesboro acetate plant, which once bought a farm for storing lime waste, now sells it through S&R for agricultural purposes.



Steel drums no longer usable for shipping end up as scrap metal. Other metals salvaged: copper, lead, aluminum, nickel, zinc.



Titanium dioxide is used to deluster nylon yarn. Residue shown here at Chattanooga isn't thrown out, but is salvaged for reuse.

Du Pont Notes

NOT MONEY ALONE

Something besides dollars must be offered business leaders if industry's need for skilled managers is to be met, the Du Pont Company's president declared in a recent address.

That something, said Crawford H. Greenewalt, is added prestige and more recognition for the business executive. He said this is so because high personal income taxes are making money incentives less attractive.

Unlike the older professions, business has "no patron saint and no oath hallowed by centuries of devotion," he said. "Yet the America we know today—its high living standard, its strength, its position as a world power—would have literally been impossible without the executive function... The fact is that the business executive's part in our national development has been as profound as, and far more lasting than, the exploits of the warriors and the makers of the laws."



THE TOO-TIRED FEELING

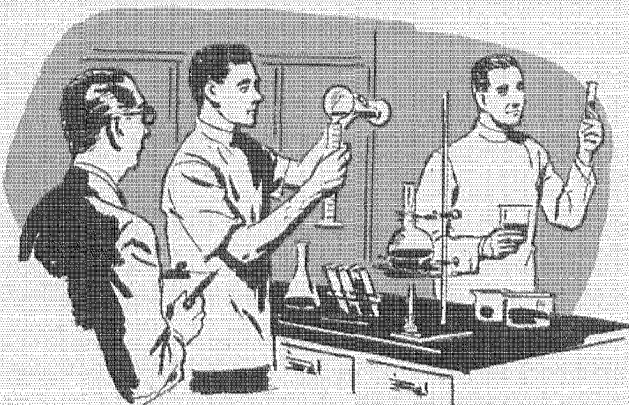
... that sometimes comes at the end of the day can be measured with a stop watch and a thermometer, Dr. Lucien Brouha of Du Pont's Haskell Laboratory of Industrial Toxicology told an industrial conference recently.

Increases in a worker's pulse rate and temperature after muscular exertion, and the time it takes for them to start back toward normal levels, are reliable measures of how strenuous a job is, he explained.

In some plants, fatigue has been reduced by lowering heat and humidity, improving ventilation, and rescheduling rest periods, the doctor said. His research has also confirmed that drinking plenty of cool water

in hot weather, whether you feel thirsty or not, is one way to avoid undue fatigue.

It isn't always easy to make a job simpler and less tiring without disrupting production schedules, Dr. Brouha admitted. "It has to be done patiently, by trial and error, and with the close collaboration of the physiologist and industrial engineer."



COLLEGE AID

For almost a year Du Pont representatives conferred with educators, other companies, foundations, and government agencies concerned with education and research. The purpose: to determine how the Company could most effectively improve its program of aid to higher education. For years the Company has maintained many postgraduate fellowships and grants-in-aid in support of fundamental research.

As a result of the study, Du Pont has announced two new plans aimed at advancing the teaching of chemistry at the undergraduate level. In one, grants have been made to 19 private colleges to help them maintain their present high level of training in chemistry. In the other, postgraduate fellowships have been awarded to 13 universities to improve the teaching of undergraduate chemistry.

"The maintenance and encouragement of high-quality teaching are vital to the future supply and quality of scientists... and consequently research," said President Greenewalt.



54 different parts of Du Pont nylon plastic used in this new fare collector

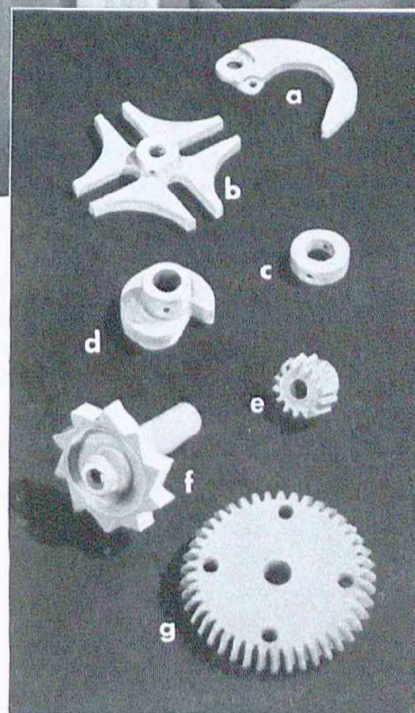
It took Grant Money Meters Company 13 years to develop this new fare collector that gives drivers an audible count of deposits as well as a visual check. The design incorporates 54 different parts of Du Pont nylon plastic. Included are gears, ratchets, bearings, cams, geneva motions, linkages, couplings, screws, impact parts, spacer plates and other components. They illustrate the variety of functions that nylon parts can perform.

The device—the Grant Electrofarrer—is completely automatic. It can be set to receive a single or multiple-coin fare deposited in pennies, nickels, dimes, quarters, and tokens . . . audibly record it . . . then separate and drop each coin into a nylon change carrier. It eliminates all driver fare-handling except making change . . . contributes to safer, faster service.

Seven representative nylon parts are illustrated. The shaft lock (a) simplifies design and as-

sembly. Geneva cams (b) have the resiliency to resist shock . . . add to smooth operation. Wheels of Du Pont nylon (c) are strong, tough, dimensionally stable. Cams (d) resist wear, corrosion and breakage. Molded gears (e & g) need no oiling or greasing. Lightweight ratchets (f) are molded in one piece. Du Pont nylon acts as an electrical insulator, too. And it damps vibration . . . parts operate quietly. The nylon parts afford production and operating advantages . . . help assure an expected 30 years' service life at lowest maintenance cost.

Parts of Du Pont nylon can be economically mass-produced by injection molding . . . cut production steps and costs. For full information on nylon and other Du Pont plastics, write: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 2502, Nemours Bldg., Wilmington 98, Delaware.





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