

THE DYNAMITE MAGAZINE

BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

APRIL - MAY 1942



Dynamite ... SEE PAGE ONE

HOW DU PONT CELLOPHANE HELPS CONSERVE THE NATION'S FOOD

... as told in *LIFE* and *THE SATURDAY EVENING POST*

**PROTECTION YOU
CAN SEE ... AND
SEE THROUGH ...**

How Cellophane gives you 2 big helps
in getting the most for your money...



1 In the old days people could see nearly all the food they bought. There it was, open to the dusty air in barrels and boxes, handled by almost everyone, exposed to dirt and germs. Freshness quickly vanished—flavor, too. Be thankful you don't have to shop in those old-fashioned, unsanitary stores. That was B. C. (Before Cellophane).



2 When higher standards of cleanliness and quality arrived, most foods went into packages—but the packages *hid* the contents. Finally came transparent, protective Du Pont Cellophane. Not only did it guard foods against dirt and handling, and protect quality and freshness—but it also let shoppers *see through* the package for wise buying.



3 When food in Cellophane arrives in your kitchen, you are surer of getting the quality put there by the manufacturer. Thus Cellophane helps you get your money's worth in two ways: It *protects* what you buy—and it lets you *see* just what you buy. Today, Du Pont Cellophane is doing a vital job conserving the nation's food and health.



PREVENTION OF WASTE IS A NATIONAL NEED

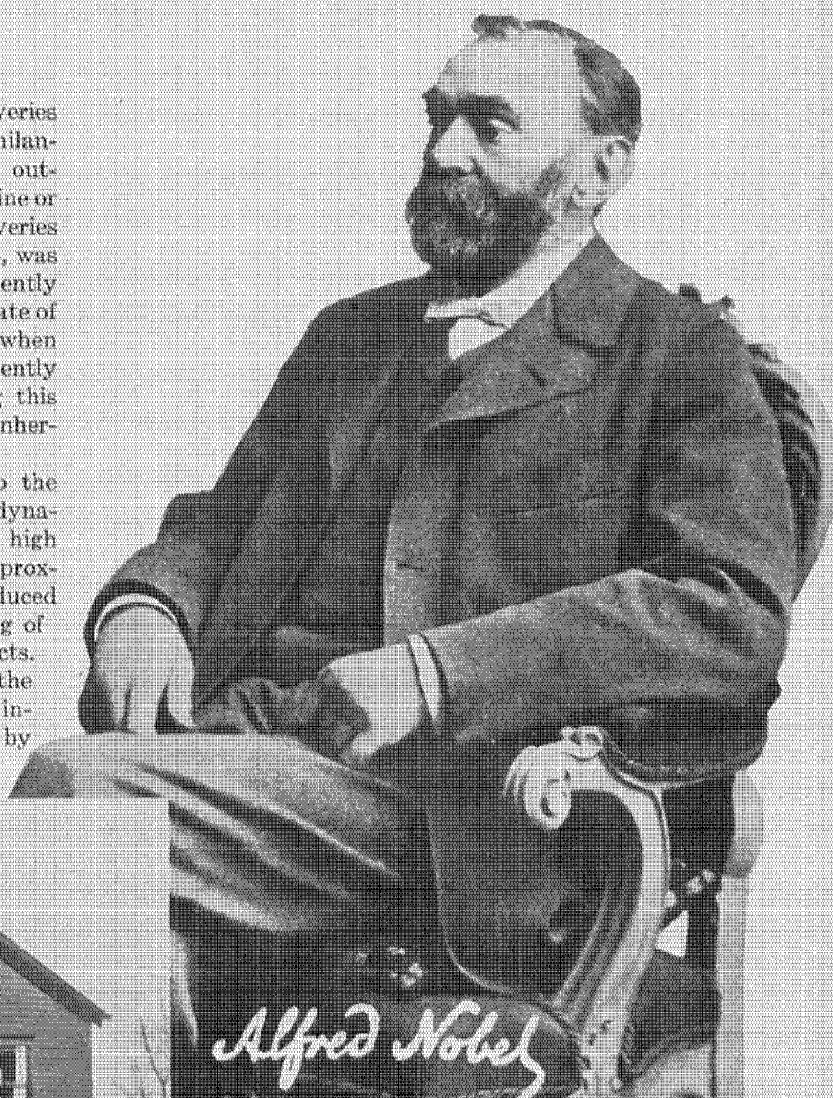
Research in the Dynamite Industry

By C. A. WOODBURY, *Director Chemical Division, Explosives Department*

THE dynamite industry dates from the discoveries of Alfred Nobel, Swedish inventor and philanthropist, who established annual prizes for outstanding contributions to physics, chemistry, medicine or physiology, literature and peace. Two of his discoveries were of major importance. The first, made in 1865, was that nitroglycerin could be made to detonate violently by the explosion of a very small quantity of fulminate of mercury. The second was that liquid nitroglycerin, when absorbed in kieselguhr, could be packed conveniently and safely into paper cartridges, thus rendering this explosive reasonably free from the undue hazards inherent in its transportation and use.

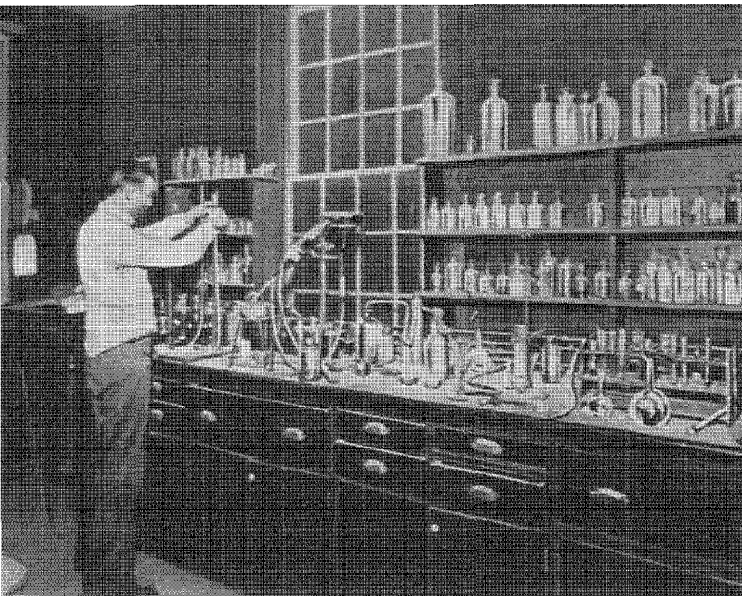
This latter invention, made in 1866, led to the manufacture of the commercial product known as dynamite and to the development of the world-wide high explosives industry. In the United States alone, approximately 350,000,000 pounds of dynamite are produced and used annually for such purposes as the mining of ore, rock and coal, and for various construction projects.

The dynamite of today is quite different from the product formulated by Nobel. Thanks to numerous inventions since his time and to the results of research by



Thanks to his research and inventions, dynamite came into use about seventy-five years ago. Alfred Nobel founded the industry that has served mankind ever since that time.

LEFT: Du Pont explosives chemists first tested high explosives in this small frame building. When organized research was undertaken in 1902, the Eastern Laboratory was built.



An interior view of the old laboratory where the Du Pont Company's first dynamite was formulated for plant production. This photograph, showing a chemist at work, was made in 1895.

industrial chemists, the art of high explosives manufacture has continually advanced.

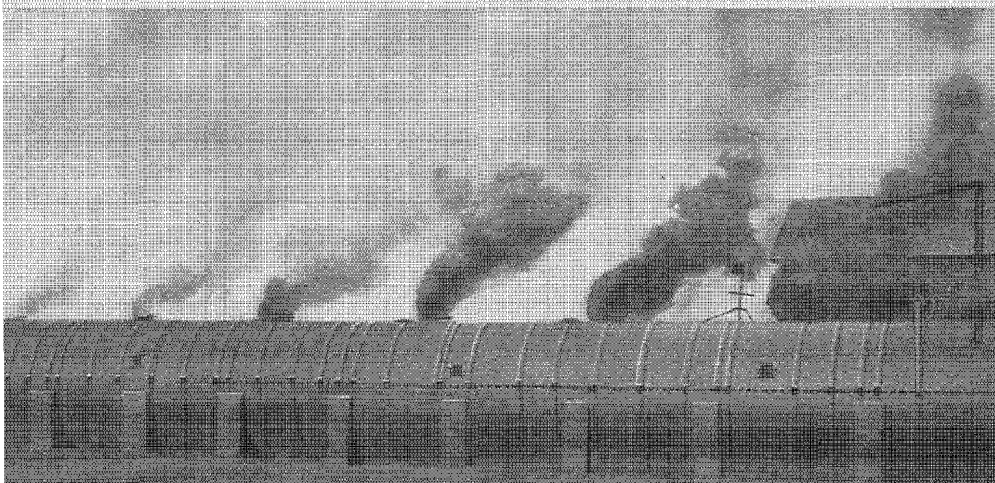
Prior to forty years ago, the development of new and improved dynamites was more or less of a "hit-or-miss" proposition, depending on the initiative and ingenuity of individuals. No group of technical men had been brought together and told that it was their job to improve the processes of manufacture.

In 1902, the Du Pont Company decided it was time organized research should be applied to the dynamite industry, and established the first Du Pont research laboratory. It was designated as the Eastern Laboratory, because of its connection with the Eastern Dynamite Company, and was one of the first industrial laboratories for chemical research in the United States.

The first annual report of this laboratory, dated December, 1903, listed the following objectives:

1. "To improve as far as possible the chemical operation now employed.
2. "To investigate the explosives now being manufactured, to revise their formulas, and to put them on a scientific basis.
3. "To devise or discover new explosives for general and specific purposes."

The old testing gallery, first one of its kind established by an explosives manufacturer. Here dynamite was tested under conditions approximating those found in gaseous coal mines.



There has been no departure from fundamental objectives, although other responsibilities have been added from time to time as the organization has grown in size and experience.

The new research venture started with six chemists working in three small buildings. Today, forty chemists are kept busy in the Eastern Laboratory with its more than fifty buildings spread over an area of about sixty-five acres.

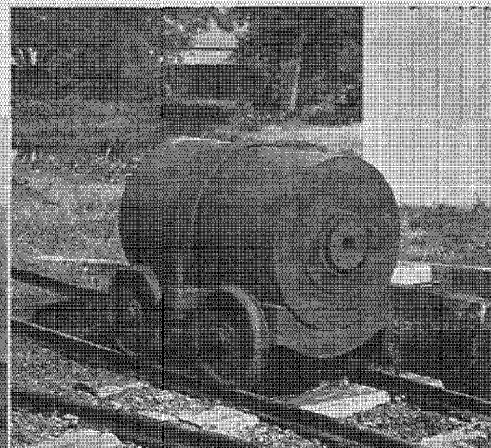
"Why so many buildings?" you may ask. The answer is that when dealing with high explosives, one does not build a single large brick laboratory, several stories high, then fill it with explosives and chemists, for an accidental explosion might be disastrous. A number of small buildings, with only a few men in each, is a much safer arrangement. It is not intended to convey the impression that explosives research is unduly hazardous, but common-sense precautions must be taken. While one always hesitates to emphasize safety records, particularly in the explosives field, this laboratory has operated thirty-nine years without a fatal accident.

FIELD OF ACTIVITIES

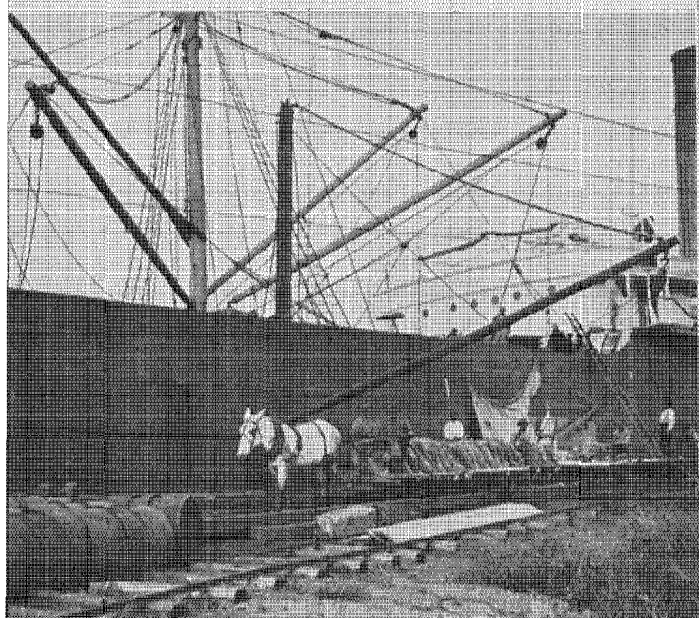
What has the Eastern Laboratory been doing of interest to laymen? How has it served explosives consumers and made possible those "Better Things for Better Living . . . Through Chemistry" in its particular field?

Fundamentally, dynamite serves only one purpose, namely, to blast loose fragments of Mother Earth. However, the nature of the material to be blasted, its location or environment varies greatly. Coal is obviously softer than granite. An open, exposed quarry face presents an entirely different situation from the heading of a tunnel a thousand or more feet underground.

Research workers have studied these varied needs and have provided a multiplicity of types and grades of dynamite to satisfy them. In order to do this, they have had to develop methods for measuring the power of an explosive; methods for determining quickly and accurately its shattering or pulverizing power, its water resistance, its safety characteristics when exposed to shock and flame, the composition of the gases produced on explosion and so on.

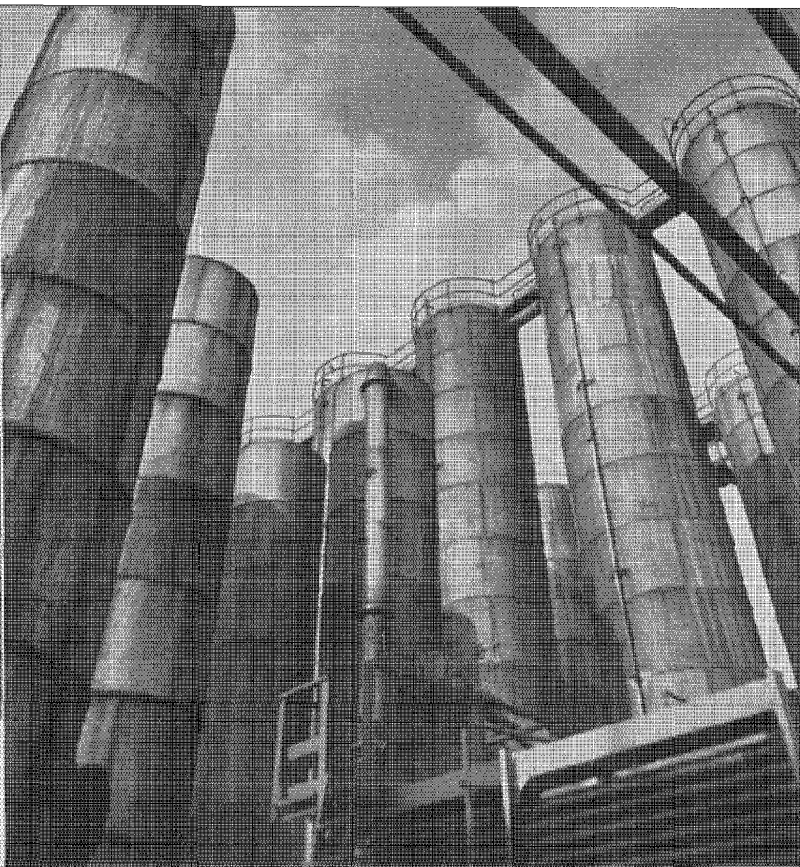


The steel mortar on wheels. When loaded with a test charge, it was fired inside the gallery.



Transferring imported sodium nitrate to the storage house in the days before Du Pont developed a process for oxidizing synthetic ammonia for making nitric acid.

RIGHT: The towers built for the ammonia oxidation process. When erected in the '20s, they marked the first large-scale use of stainless steel in plant construction.



With the methods which have been developed, and as the result of prolonged study of the influence of various factors on the properties of dynamite, it has become possible on short notice to design a dynamite combining the properties best suited for practically any blasting or mining condition. The following are illustrative of some of the more interesting types of dynamites which have been made available by research:

1. Dynamites for mining salt; these explosives produce a clean, unstained salt.
2. Physically-rugged gelatin dynamites used in prospecting for petroleum where the cartridge must hold together when forced through heavy muck in the borehole and, at the same time, function satisfactorily under high fluid pressure.
3. A blasting agent that is insensitive to shock, friction, flame and rifle bullets for use in geophysical prospecting for oils. It is packaged in tin cans so designed that they can be readily joined together in a long continuous column and forced through muck in the borehole.
4. Free-running dynamites that can be freely poured into boreholes and at the same time cannot be ignited by sparks or flame.
5. Low-density dynamites, with low power per unit of volume, low velocity of detonation, and as free as possible from any tendency on explosion to ignite inflammable gases or dust in the mining of coal. Such dynamites have contributed greatly to increased safety in the mining of coal, their extremely slow action having made possible a continued decrease in the use of black powder.

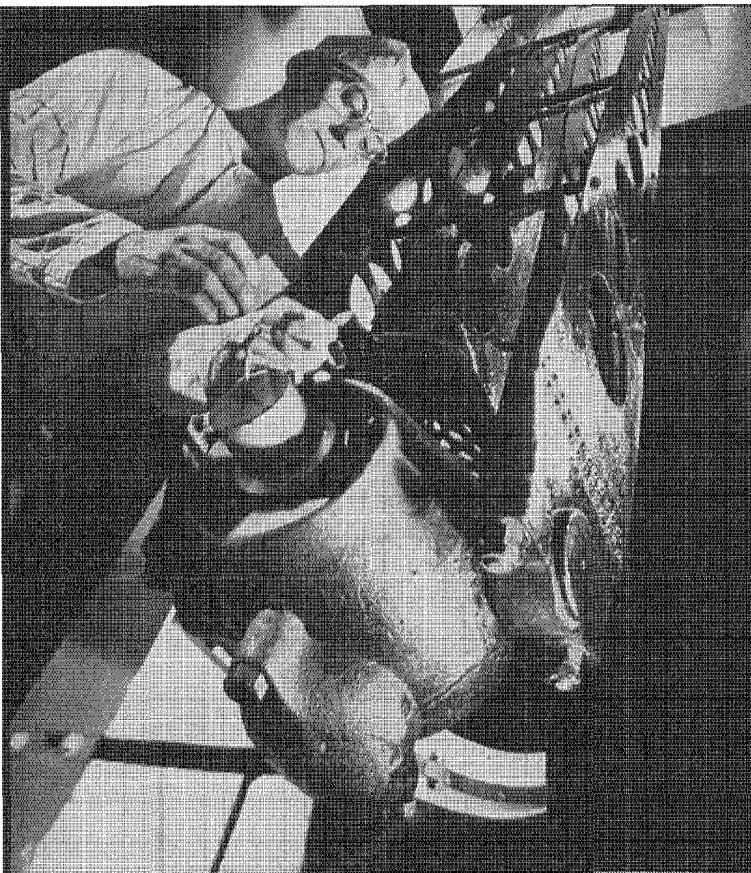
Many other dynamites for special uses could be mentioned. In blasting, it is not enough simply to use dynamite. The right kind must be used, as determined after careful development research.

FUNDAMENTAL IMPROVEMENTS

In reviewing the varied activities of this research laboratory for nearly forty years, certain lines of work are seen to have led to fundamental advances.

One serious problem that confronted the explosives industry in the early days was that of frozen dynamite. Nitroglycerin, the liquid ingredient of most dynamites, has a relatively high freezing point, around 52° F. Since many blasters have to work in wintry weather at temperatures far below that freezing point, it was not uncommon for them to encounter frozen dynamite, which was not only unsatisfactory, but also hazardous to use. It could be thawed safely by careful, trained workers, but the miners and quarrymen often used short-cut methods, with fatal consequences.

How to solve this problem was not an easy task, although it was known that the freezing points of liquids could be lowered by dissolving other materials in them. The chief difficulty was in finding a compound that could be added in a relatively high percentage without seriously affecting other essential properties of the dynamite, particularly its propagating power at low temperatures. Research and experimental work was carried on for a number of years, and many diverse freezing-point depressants, such as TNT, nitrated sugars and nitrated polymerized glycerin, were used with some success. Although reasonably satisfactory low-freezing dynamites were developed in the laboratory as early as 1912, the



Loading the ballistic mortar for a test shot to measure the strength of an explosive. Recoil from the blast causes the pendulum to swing along the graduated scale at the bottom.

most satisfactory solution of the problem came in 1925 with the use of ethylene glycol dinitrate as an anti-freeze. This material is not added to nitroglycerin, but when a solution of ethylene glycol and glycerin is nitrated, the resulting product has a very low freezing point. Frozen dynamites have ceased to be a problem to explosives users even in locations where temperatures range as low as 40° to 50° below zero. Anti-freeze protection for dynamite—and for automobile radiators, too—is achieved with ethylene glycol, although it is applied in different ways. The two innovations came practically in the same year.

Next to nitroglycerin, the most important explosive ingredient of dynamite is ammonium nitrate. Certain types of dynamite—many of them used in coal mining—contain up to eighty per cent of this ingredient. It was discovered at the Eastern Laboratory that, by varying the size of the grains of ammonium nitrate, the velocity of detonation of the dynamite can be controlled. In other words, by using fine particles, very fast explosives of high shattering power are obtained; conversely, by using coarse grains, the dynamite is much slower and of low shattering power. This was a discovery of great practical significance since it allowed the production of low-velocity permissibles to bring down coal in large lumps, and high-velocity dynamites for use in hard rock where fine fragmentation is desired.

During the period under review, nitroglycerin has

declined in importance as an ingredient of dynamites. It has gradually been replaced by ammonium nitrate, even though, on a weight-for-weight basis, the replacement material has only about seventy per cent of the blasting energy of nitroglycerin. But ammonium nitrate is less expensive and much less sensitive. Its use has made possible dynamites that are less hazardous to manufacture, handle and use; moreover, consumers have the benefit of lower cost per unit of energy.

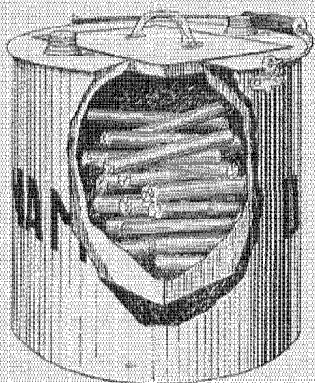
Research development reached a new high point in 1935 with the introduction of "Nitramon" blasting agent, which contains a high percentage of ammonium nitrate; no ingredient of this product is explosive by itself. "Nitramon" is insensitive to the action of a commercial blasting cap, to shock, friction or the impact of a rifle bullet. To explode it one must employ a booster charge of a more sensitive material. Actually, it is the safest blasting agent available, although it is equal in strength to the most powerful dynamites. It is particularly suited for use in large-scale quarry operations, and a special type, "Nitramon" S, has been introduced successfully for seismic exploration work.

Another problem of long standing concerns the manufacture of dynamites that will produce a minimum of noxious fumes on explosion. The explosive power of dynamites comes from their almost instantaneous expansion from a solid mass to a very large volume of gases, conceivably a ten-thousand-fold expansion. When charges of dynamite are exploded in confined spaces underground, as in mines or tunnels, it is important that the fumes resulting from the blast shall be as free as possible from poisonous effects on the men as they return to the working faces.

The major portions of dynamite compositions consist of carbon, nitrogen and oxygen containing com-



RIGHT: A moisture cabinet. Explosives are tested under varying conditions of temperature and humidity to simulate exposures that may be encountered in shipment and storage.



Another relic of the past—the throwing kettle. Research opened the way for the manufacture of low-freezing dynamites. These explosives can be used in locations where temperatures range as low as 40° to 50° below zero.

pounds in properly-balanced proportions. Years of research were spent in the laboratory and in mines and tunnels before properly-balanced explosives for underground use were designed and produced commercially. But the results are exemplified by the fact that improved dynamites are being used to drive big-bore tunnels through which water will someday flow from far-distant reservoirs to supply the vital needs of our large cities. It would have been impractical and unduly hazardous to construct such tunnels, if chemical research had not made possible more suitable dynamites for the purpose.

PROCESS IMPROVEMENTS

Although the manufacture of dynamite involves a number of mechanical operations, such as mixing the ingredients and cartridging them, the basic materials are the result of chemical processes; and, as stated before, one of the most important functions of the Eastern Laboratory has been to improve these processes, particularly from the viewpoint of costs.

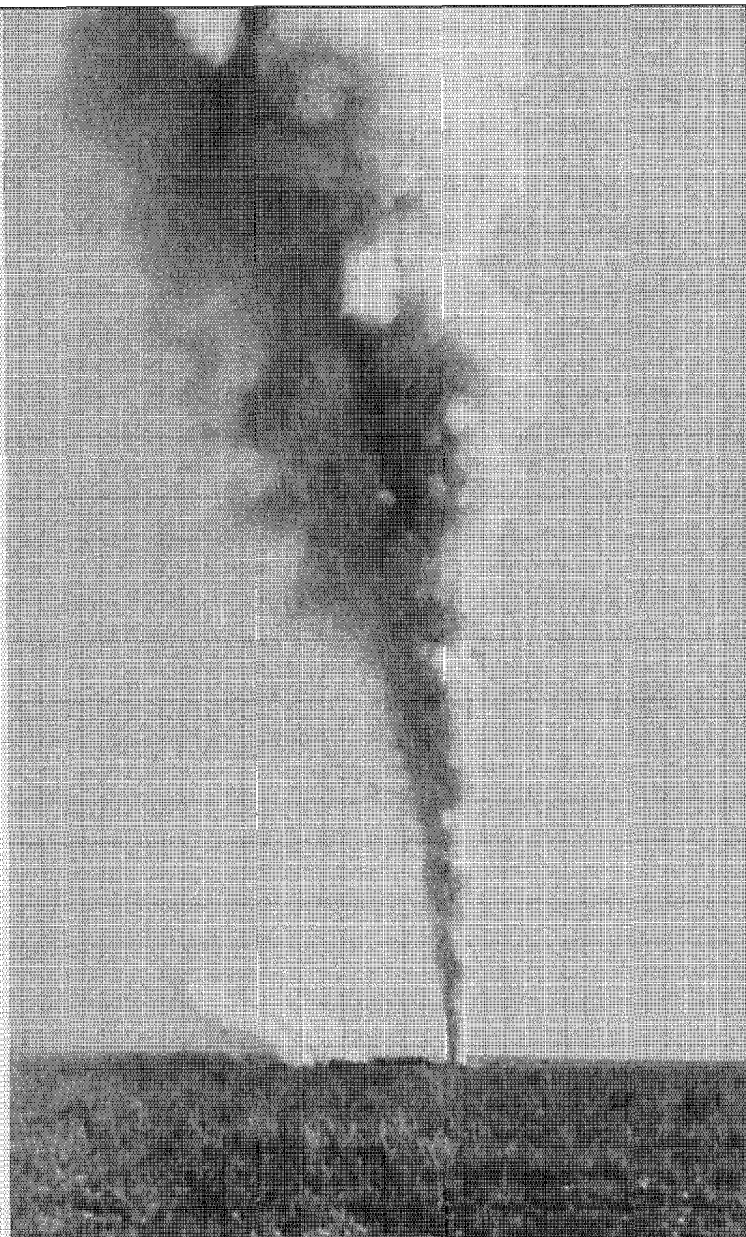
Consider nitric acid, for example. It is a basic raw material in the manufacture of both nitroglycerin and ammonium nitrate—the two ingredients that constitute about sixty per cent of all the materials entering into dynamite compositions. Forty years ago nitric acid was produced by the reaction of sulfuric acid with sodium nitrate; in fact, less than twenty years ago it was standard practice in the industry to obtain nitric acid from this salt which is dug out of the ground.

About 1920 the Du Pont Company initiated a research program with the object of obtaining nitric acid from ammonia, and the Eastern Laboratory staff played an important part in this work. Using ammonia synthesized from such basic raw materials as coal, water and air, Du Pont chemists and engineers developed the ammonia oxidation process which yielded acid of increased strength at a lower cost than was possible before. This process has been employed extensively in the explosives industry, and, incidentally it created the first large-scale use of stainless steel.

Among the fruits of research activities at this laboratory may also be mentioned the development of the most economical processes for the concentration of nitric acid and for the manufacture of ammonium nitrate, diphenylamine and TNT, all of which may be considered of major importance.

The foregoing paragraphs present only a few highlights to show that the activities started at the Eastern

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Du Pont blasting agents have been developed for use in geophysical prospecting work. This view shows a heavy blast in the oil fields.

"Nitramon" S blasting agent is packed in waterproof containers that can be screwed together, an advantage in loading boreholes in wet ground.



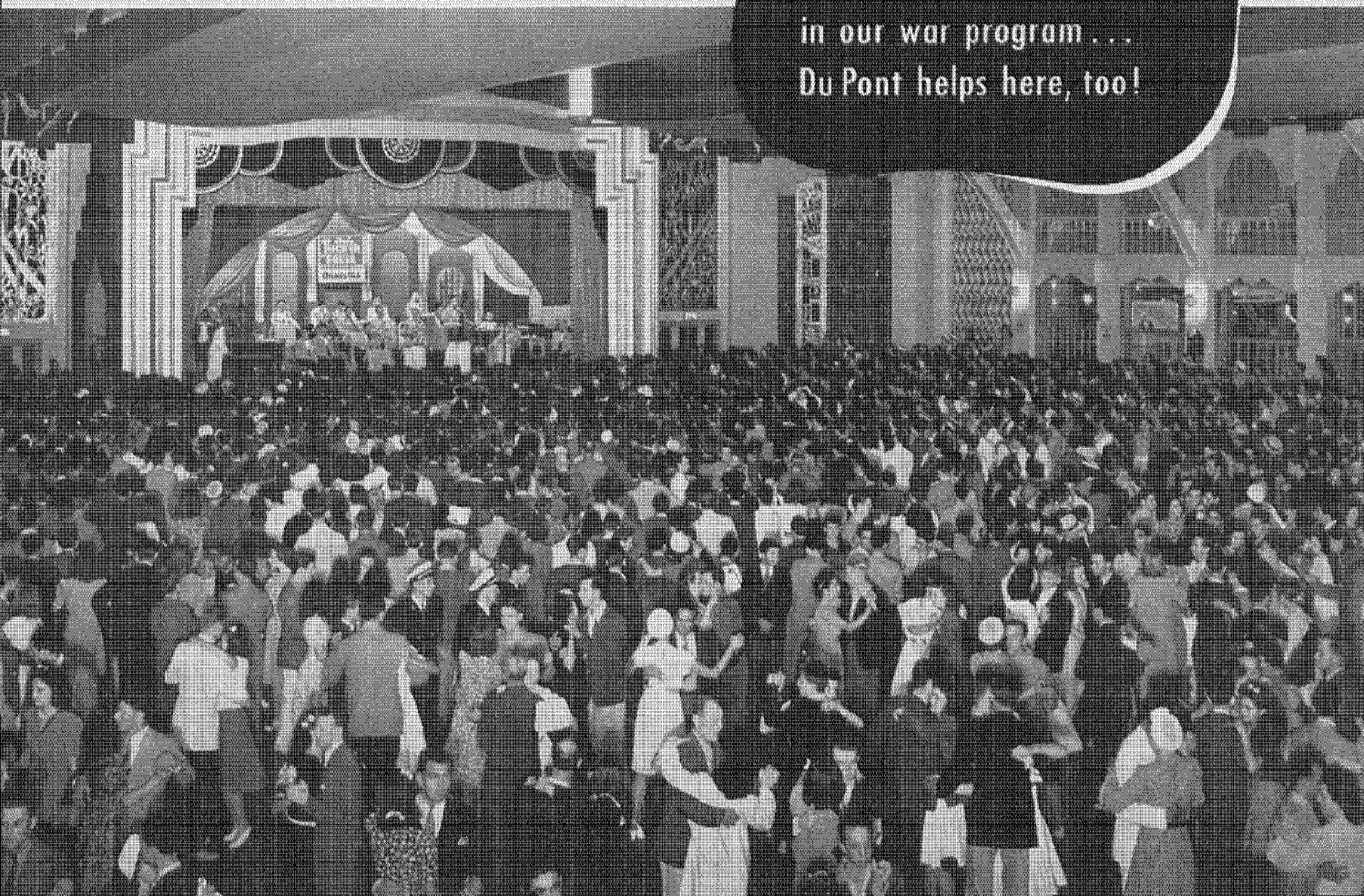


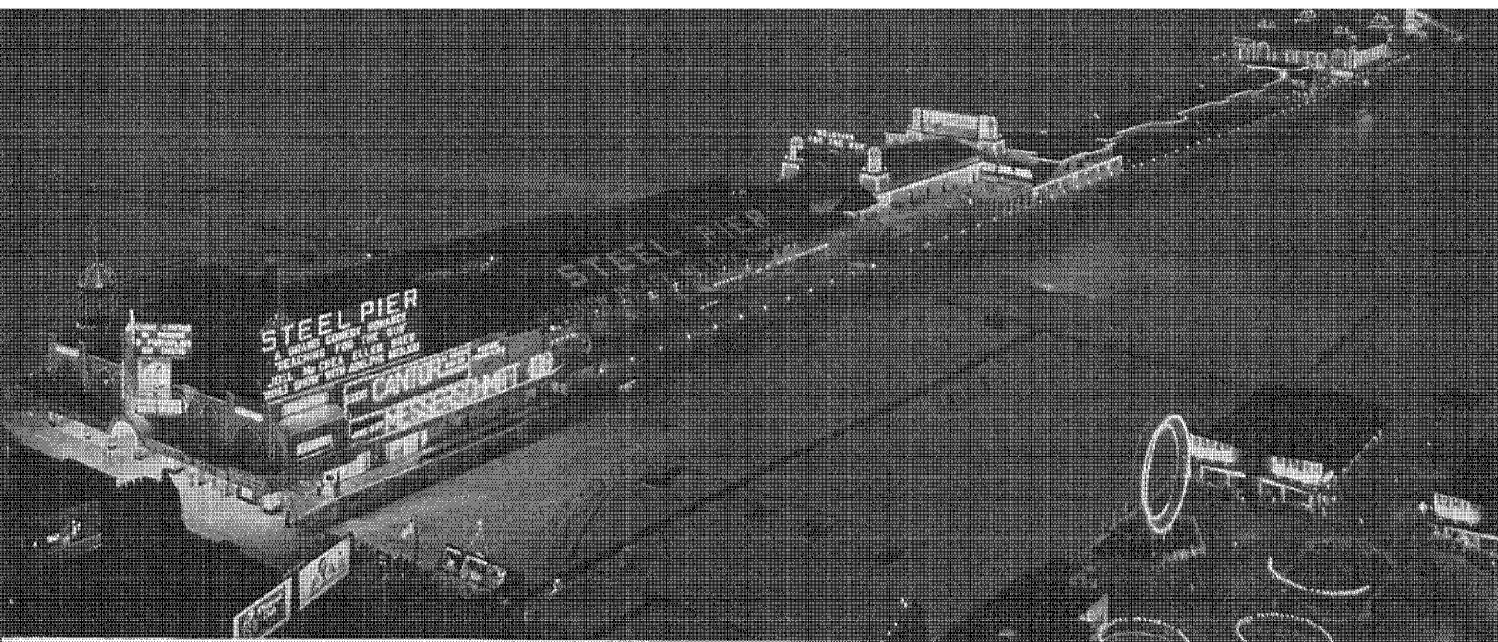
Between the acts, theater patrons stroll out on the promenade deck to fill their lungs with fresh air and watch the ocean waves rolling in on the beach.

Du Pont finishes are used to keep the floor of this dance hall in condition for the thousands of people who dance to the music of well-known orchestras.

PROTECTION FOR FUN

There's room for relaxation
in our war program...
Du Pont helps here, too!





In pre-war days, night-time illumination of the Pier was one of its attractions. Now, fewer lights glow, and everyone knows why.

By BERT POLLOCK

WHILE smoke pours from the stacks of plants making implements and materials of war, and Mr. Citizen continues to worry about new tires for his car and increasing demands upon his purse, the Steel Pier at Atlantic City busies itself with recreation. While Boeing announces new bombers, at Steel Pier it is bands and stage, radio, screen and circus stars.

No one takes the Steel Pier to task for its fun-making enterprise, for it is acknowledged that some form of wholesome entertainment is needed to maintain morale and momentarily provide relaxation from taut war work and worries. The Steel Pier is admirably fitted to handle this task. Stretching out into the Atlantic nearly a half mile, this play center of the famous resort known as the "World's Playground" offers such a variety of entertainment that a visitor cannot absorb it all in a single day.

Doors open in the morning and patrons troop in, box lunches under their arms, prepared to watch or participate in a hundred forms of entertainment until closing time in the wee sma' hours of the next morning—all for a single small admission fee.

There are five theaters with a seating capacity of 12,000 people where motion pictures are shown continuously. There are three large stages echoing the voices of minstrel artists, opera singers, vaudeville performers, with radio and screen stars appearing in person. The circus stadium—capacity 5,000—overlooks an immense stage where acrobats cavort and diving horses and humans perform. There are exhibitions . . . fun houses . . . Hawaiian and Filipino orchestras . . . and even a zoo; in short, there are so many, many interesting things to do and see that the visitor is more than grateful for the many restful steamer and promenade decks where one may relax in comfortable steamer chairs and quietly partake of the healthful salt-laden sea air.

Considering the many forms of entertainment provided—each complete in itself—you will understand why

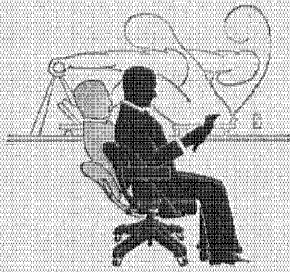
we class the Steel Pier as a major business enterprise. Think of the maintenance problems and you'll wonder, as we did, how the management keeps the property in such fine condition, despite the severe exposures. Good paint has a real job to do on this Pier, and Du Pont takes a bow for its contributions in easing the many maintenance "headaches."

Take, for instance, the Marine Ballroom with its more than 23,000 square feet of floor space over the ocean. It is one of the finest on the East Coast. Here, the music of our country's leading bands draws capacity crowds night after night—and capacity means 4,000 dance patrons plus 1,000 "wallflowers" in the permanent seats around the dance floor. When Kay Kyser lifts his baton and shouts, "Let's dance, kids!" 4,000 pairs of feet begin to scuff, scrape and glide over the mirror-like floor. A short distance below, waves slam and batter at rugged steel and concrete pilings, filling the air with salt spray and an all-pervading dampness. Yet, the floor must always be kept in perfect condition. See what we mean by maintenance headaches? Here, they are alleviated with Du Pont Penetrating Wood Finish and Liquid Wax.

Or take the more than 300 park benches and 600 steamer and rocking chairs which line the steamer, sun and promenade decks. Day after day they are subjected to burning sun, salt fogs or beating rain. They must always appear bright and gay and must not soil or stick to vacationers' light clothing; hence the use of orange, green, red and blue "Duco" finish.

On your first or next visit to Atlantic City, take a look at the Steel Pier. Notice how gleaming white are some of the Pier buildings; they're painted with Du Pont No. 40 Outside White. Inside, too, you will not fail to notice how well Du Pont finishes are sturdily resisting exposures far more severe than any paint would have to cope with in your home environment. There's the place to preview the results you may expect the next time you pry off the lid of a Du Pont paint can.

POSTURE



A FACTOR IN FATIGUE

WHEN women were replacing men in British munitions factories during World War I, a study was conducted to determine the causes of fatigue, and one of them was found to be inadequate seating facilities. As a result, F. H. Headley, an English inventor, did some experimenting and developed a new type of chair that could be adapted to the physique of the individual who used it. Not only was the seat height adjustable, but the back rest as well could be raised or lowered and moved forward or backward at will. This made possible anatomical fitting, which encouraged the occupant to maintain a correct sitting posture and work longer without fatigue.

After the war, in the early '20s, Mr. Headley brought a sample of his chair to America; he thought his associate, W. S. Ferris, a mid-western businessman, might be interested. He was, and before long Mr. Ferris had made samples and placed them on trial in a number of industrial organizations. Workers liked these new chairs.

Management, efficiency-conscious, saw they had real merit, and soon there was an active demand. The Domore Chair Company, Inc., was organized, manufacturing facilities were acquired, specialty salesmen went out into the field, and Dr. J. L. Garner, company physician, began his work on posture research, the starting point of what is now a separate departmental activity.

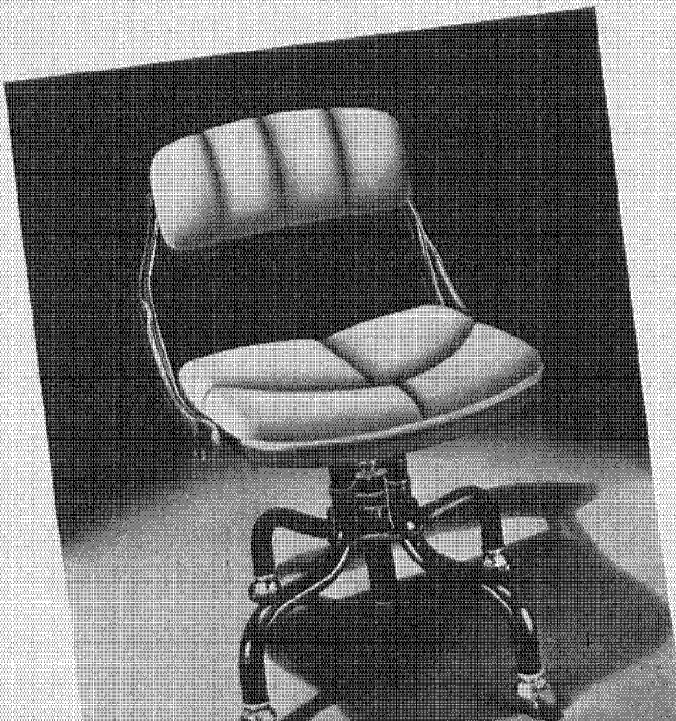
At the outset, the new chairs were so different in construction and appearance from the conventional types that they aroused considerable comment. Reasons for the change of design were not as well understood as they are today. Many people at first were reluctant to purchase chairs that were manifestly a radical departure from what they had been accustomed to use. They had never thought much about postural influence. The idea was new; it had to be explained and demonstrated before seating habits of chair users could be changed. Clearly an educational program was needed to point out all the whys and wherefores of properly-designed and fitted chairs.

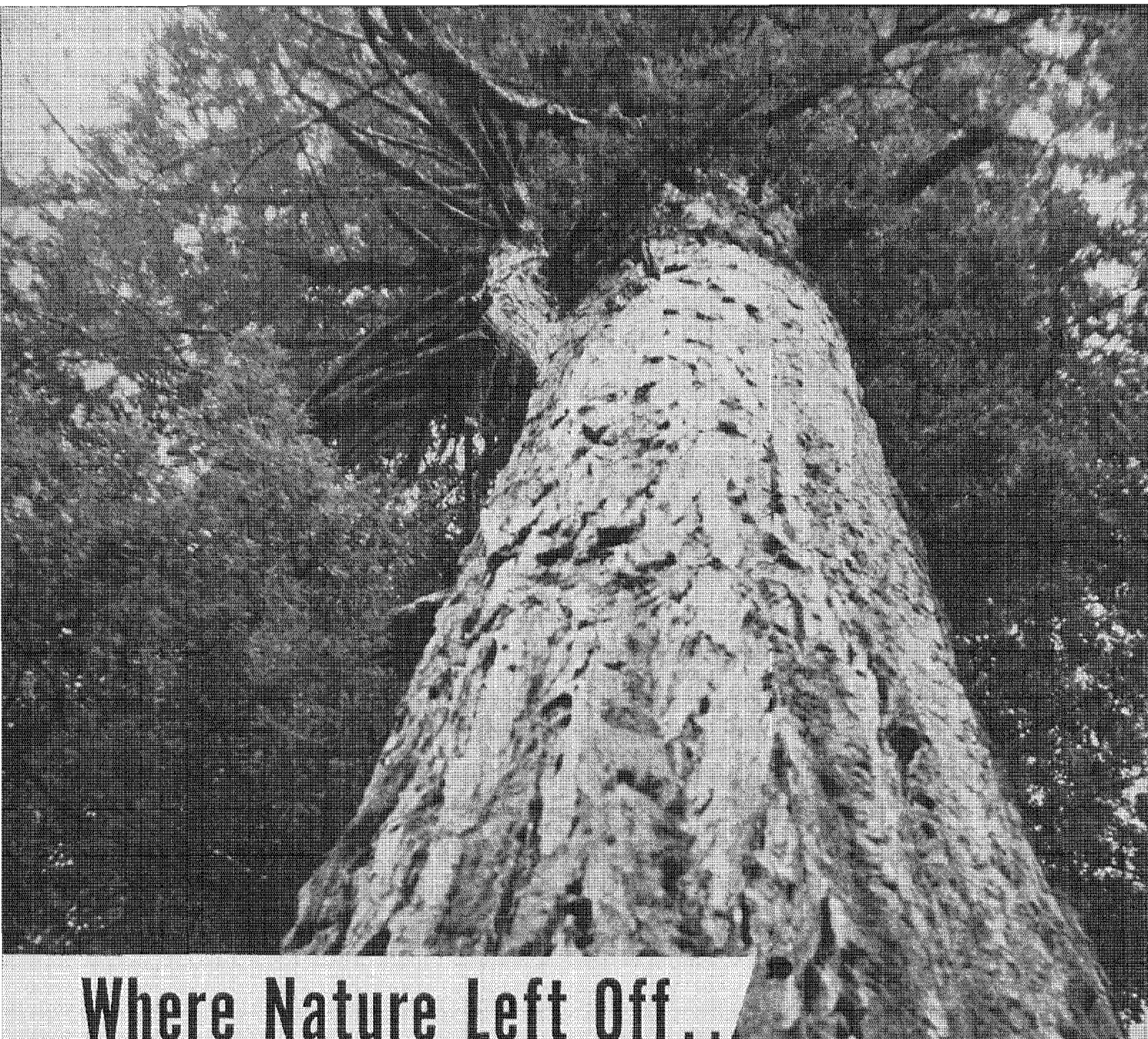
Good posture is attained when a worker can be seated so as to insure a normal trunk alignment, with body erect and properly supported in a comfortable position. When one's body weight is supported by the bony structure that does not tire, all is well; but when the weight is shifted to one's muscles, which do tire, this bad posture eventually results in fatigue. One who habitually sits in a slumped position may not be conscious of its bad effect upon his or her health.

Representatives of the company pointed out these facts to thousands of people who never before had realized that it was important to sit correctly in chairs designed for their physical needs as well as their occupational requirements.

The idea behind the first Domore chairs, as expressed in the slogan, "Build your body as you sit," was sound. Originally, these chairs were made only for clerical and

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Where Nature Left Off...

CHEMISTS TAKE OVER AND MAKE WOOD A MORE DURABLE CONSTRUCTION MATERIAL

THERE is an urgent demand for lumber today. Reserve stocks are rapidly diminishing. We are consuming timber faster than it is grown. Fortunately, aided by modern preservative treatments and improved forestry practices, growth and consumption are rapidly approaching equilibrium.

The scope and progress of the wood-preservation industry are revealed by recent statistics of the United States Forest Service, Department of Agriculture which show that more than three billion board-feet of wood each year receive preservative treatment.

Wood improved by chemistry is an ideal construc-

tion material. In addition to durability, it possesses strength, resiliency, low heat conductivity, ease of fabrication and low initial cost. When treated by the chemist, it is not essentially a substitute for metal or other permanent structural materials, but is a modified product with all the advantages of ordinary lumber, plus valuable new properties of its own.

The present war has emphasized how much more useful wood has become. Proof of this comes from Canada where a huge aircraft plant was recently built, and in a severe fire came through little scathed. To conserve structural steel, relieve transportation facilities through

use of local material and speed construction, this plant was built with trusses and columns of timber treated with chromated zinc chloride. An unfortunate "test" proved the fire-retarding qualities of the treated wood when the plant was nearing completion. A serious fire broke out in a structure only ten yards away from the plant. Control depended upon extinguishers at hand and the municipal service. Before fire-fighting apparatus arrived, the plant had been exposed to a fiercely-burning fire for three-quarters of an hour. When the fire was extinguished, the treated structural timbers were relatively undamaged; those in the few areas affected were charred no deeper than three-eighths of an inch at the worst points. Repairs were insignificant and construction proceeded with little interruption. The incident reported is an example of how far science has progressed in improving the fire-retardant properties of wood.

The technique of making lumber resistant to fire is only part of the chemists' effort to overcome other and more important shortcomings, such as vulnerability to decay and insect attack.

OTHER CHEMICAL CONTROLS

Hardly a species of wood resists decay. Few resist termites. Damage done by the latter is conservatively estimated at \$40,000,000 annually. Rot-producing fungi are even more destructive. Both losses can be greatly reduced with modern wood preservatives.

Application of preservative treatments is not new. It dates back to ancient times. However, the true cause of decay and other forms of degradation is a relatively recent finding. For many years it was believed that decay was caused by fermentation of the natural saps and wood acids stored in the tree. But recent scientific studies have proved otherwise, and the decay-producing organisms or fungi have been identified as low forms of plant life. Under proper conditions of temperature and humidity, fungi propagate rapidly, depending upon the wood cellulose for their food supply. Chemicals poisonous to them, when impregnated in the wood, render it uninhabitable and unfit as a source of food for wood-destroying organisms.

The task of developing effective wood preservatives has not been an easy one for the chemist. It has required long, tedious study. For effectiveness can be determined only by the test of time. Sometimes this required exposures of twenty, thirty or more years before degradation occurred. This was impractical for commercial research. As a result, it was necessary to develop accelerated tests through which similar conditions could be duplicated within much shorter periods of time. Du Pont chemists now maintain seven outdoor accelerated test gardens in widely-separated sections of the country in which more than 10,000 specimens representing scores of treatments are under observation. These accelerated tests are augmented with a complex series of laboratory tests in which the permanency and toxicity of the treatments under investigation are carefully checked in laboratory cultures of many species of fungi. Other related aspects are also investigated, such as freedom from health hazards, workability of the treated wood, paintability and other important attributes.

One of the most important developments resulting from these studies is chromated zinc chloride, a treatment that now enjoys recognition as the established standard in a majority of the commercial wood-preserving plants equipped to do "salt" treating. It has also been accepted as a standard preservative treatment by the Federal Government for all purposes where specifications call for a "salt" treatment.

Lumber treated with chromated zinc chloride does not differ in many essentials from ordinary wood, for it is clean, odorless and possesses the inherent properties of ordinary wood with the added quality of durability introduced through science. In processing lumber to impart this added durability, the wood to be treated is placed in huge, hermetically-sealed cylinders, whereupon the preservative is introduced in liquid form and pressure is applied until the wood is completely penetrated. As opposed to merely brushing, spraying or dipping, complete penetration of the chemical is necessary to achieve adequate protection. This is particularly true where protection against termites is desired, for these insects shun light and attack the core of the wood, frequently causing considerable damage before their presence is suspected. Unless the wood is treated through and through, they are still able to gain entrance and eventually destroy it.

THE OILS AND SALTS

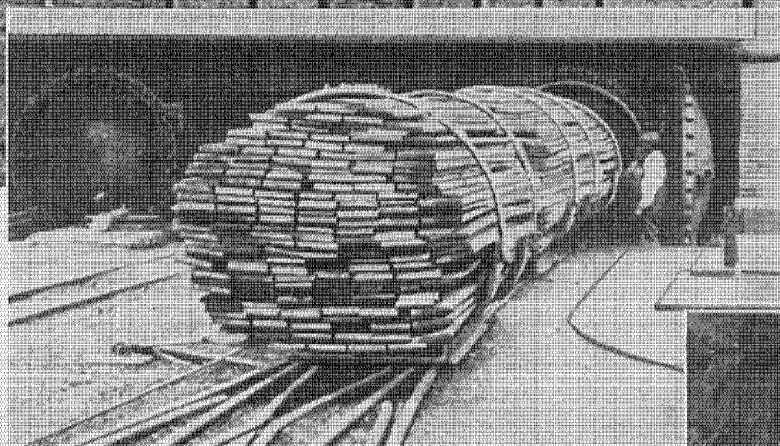
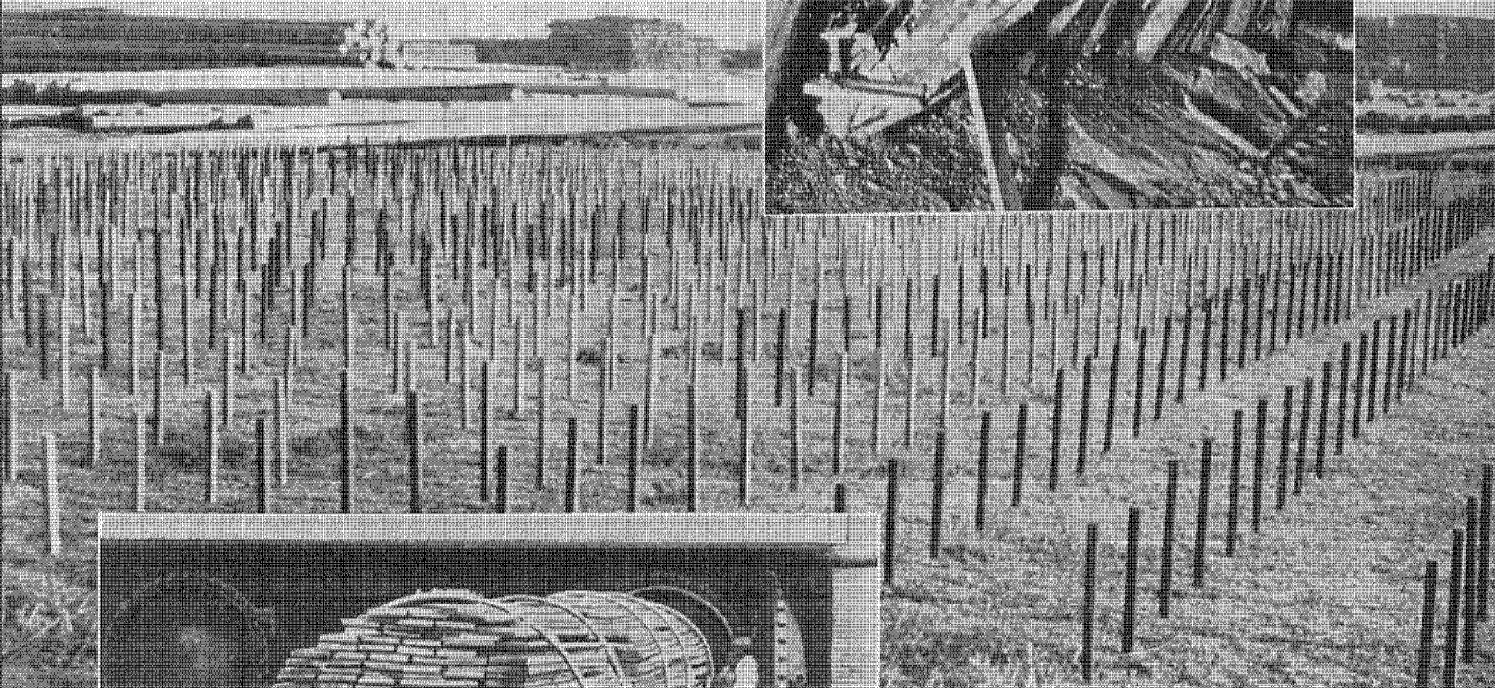
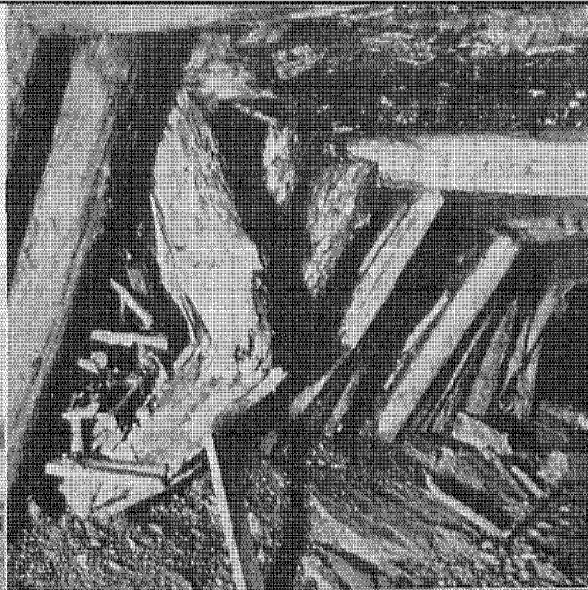
Wood preservatives may be said to fall into two general classes—the oils and the toxic salts. Both serve the purposes for which they are adapted. Creosote oil, best known among the oil-type preservatives, is used chiefly by the railroad companies for the treatment of cross-ties, piling and other structural parts where discoloration of the wood or the odor from the oil is not objectionable. Utilities are also large consumers of creosote oil for poles. And wood for dock structures standing in water is also treated with this oil.

The salt-type preservatives, represented predominantly by chromated zinc chloride, are better suited for lumber that is required to be clean, odorless and paintable. Wood, thus treated, is well adapted for industrial constructions such as mill roofs and floors, structural members, platform decking and other uses in which these specific properties are desirable. Coal mines are another excellent example, for here atmospheric conditions are ideal for rapid decay, and safety requires the protection provided through the use of treated props, ties and other timbering. The odorless and fire-retarding characteristics of chromated zinc chloride are ideal under these conditions. Builders of new homes are also using such "clean" treated lumber in increasing quantities.

Since 1885 with the erection of the first zinc chloride producing unit in the United States, Grasselli, now a department of Du Pont, pioneered in research and service to the wood-preserving industry. Meanwhile, preservatives have been improved and better treating practices initiated during the continued growth of this huge and vital industry. Chemistry continues to contribute to the progress of the lumber industry by opening new fields for wood through treatments that make wood decay-resisting, termite-repelling and fire-retarding.

The story of two mine props after one year's service. One, extreme left, was treated with chromated zinc chloride; the other was not.

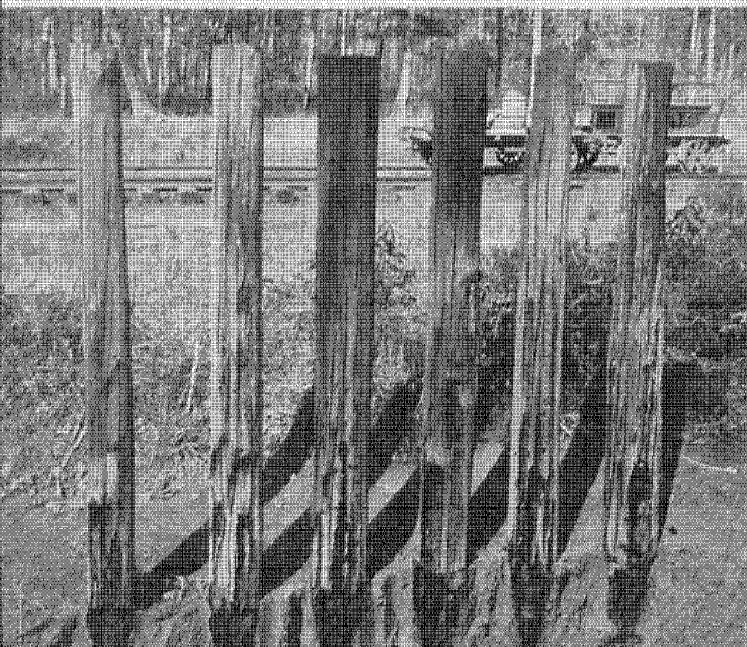
BELOW: A test garden where wood preservatives applied to sapling stakes are evaluated under field-exposure conditions. These stakes decay more rapidly than large posts, thus tests can be completed in months, not years.



LEFT: More lumber enters a steel cylinder of a wood-treating plant. When the doors are sealed, the chromated zinc chloride is applied to the wood with heat and pressure.



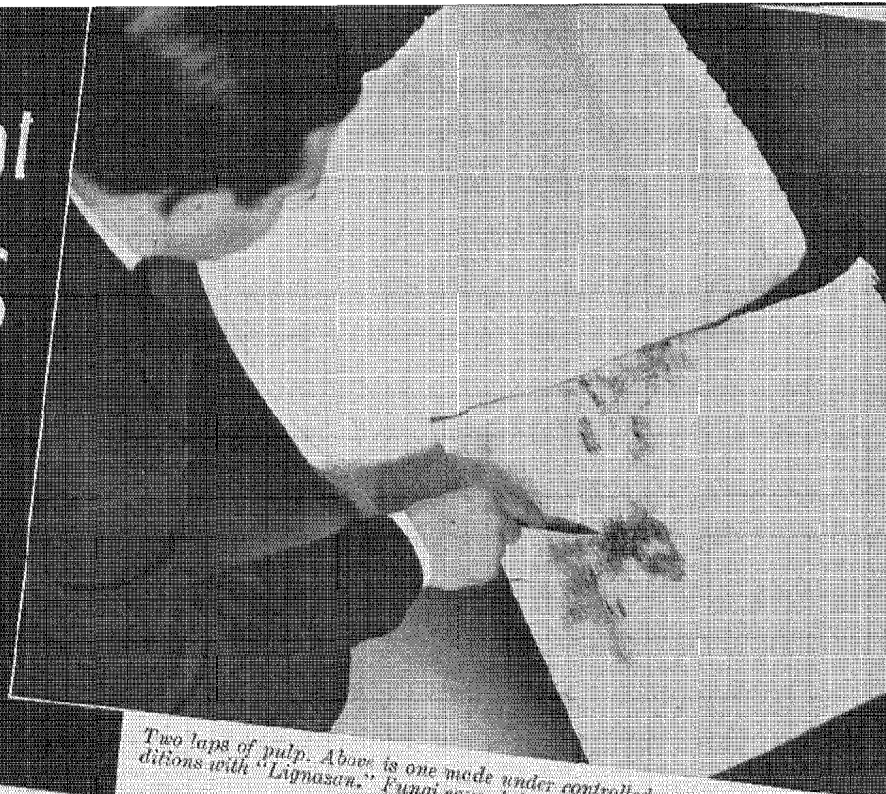
ABOVE: A typical example of fungus growing on untreated timbers in a coal mine. Atmospheric conditions here favor the development of spores that cause wood to decay rapidly.



LEFT: Untreated fence posts after a "fifth column" attack by termites. Such damage is now preventable by pre-treating the wood thoroughly with chromated zinc chloride.

Chemical Control SAVES PAPER

Du Pont "Lignasan" fungicide
is cast for a new service rôle
in preventing slime formations
in pulp and paper mills



Two laps of pulp. Above is one made under controlled conditions with "Lignasan." Fungi caused the other to discolor.

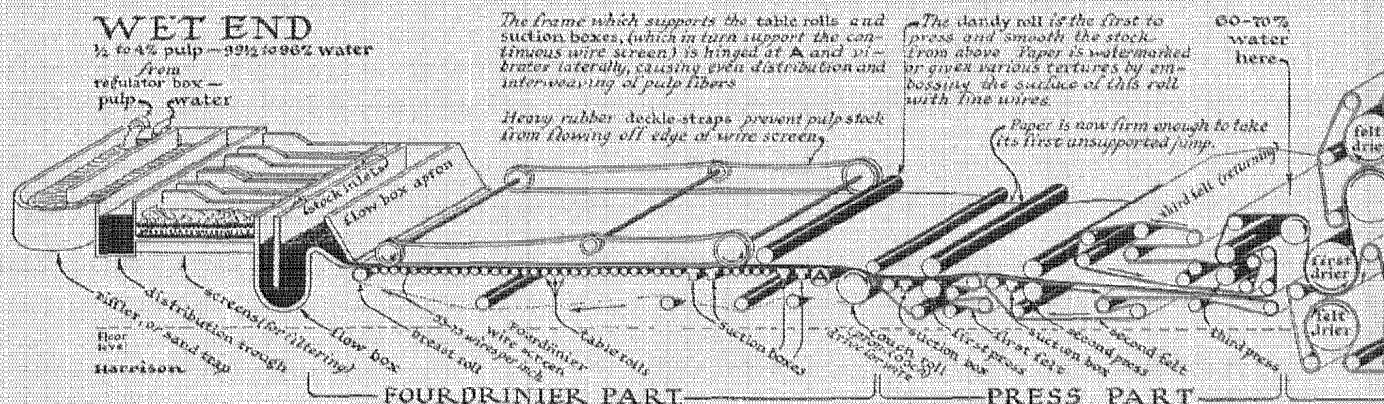
By C. E. GRAVES

"SAVE WASTE PAPER!" You have heard this appeal over the radio many times of late. It has been strongly emphasized by the press. And everybody knows why. Enormous quantities of food, clothing, ammunition and other products must be shipped to destinations on the home front and overseas, which means that paperboard manufacturers must procure all the scrap paper that can be collected for conversion into waterproof containers.

Manufacturers of pulp and paper are doing their best to meet the abnormal demand for more and more white paper products, despite the handicap of not having enough raw materials with which to work. Especially acute is the scarcity of chlorine which is needed to bleach pulp and to purify the water used at various stages in the paper-making process. Although more chlorine is being produced than ever before, a large part of the output is required for war uses, and supplies for the paper industry have been sharply curtailed.

That is unfortunate for paper makers in these days when every minute of machine-operating time is so valuable. Clogged screens and torn sheets, due to slime, are often the cause of shut-downs and costly time losses when it becomes necessary to clean the equipment. Slime, produced by bacteria, fungi and algae in the water and fiber, is responsible for these troublesome conditions that are usually preventable by a simple treatment with chlorine, if the mill men could obtain enough of it.

Not long ago Du Pont chemists tackled the problem of finding some other material with fungicidal and bactericidal properties to take the place of chlorine, at least in part. The good news is that they have found it—a Du Pont-made product lumbermen have been using for more than ten years to prevent the development of blue stain in air-dried lumber. Tests have disclosed that "Lignasan" fungicide works as well for certain purposes in pulp and paper mills as it does in the lumber yards.



A little of it goes a long way. Only a few ounces are required to protect a ton of paper.

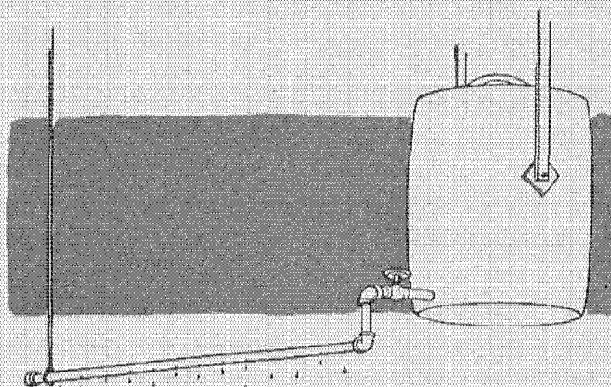
The quantity to be added, of course, depends upon the severity of the infection, composition of the pulp, character of the equipment in use and the local operating conditions. In some plants, to cope with an acute slime problem, it may be necessary for a time to bleed the chemical into the system continuously. When control is established, intermittent feeding usually suffices, and this is considered to be the more economical method.

To control slime all the way from the beaters through the paper machine and to the driers, some operators apply the fungicide to the pulp in the beaters. If trouble develops only on the machine, it is corrected by bleeding the "Lignasan" solution directly into the head box which contains the pulp stock or slurry.

In mills equipped to produce both the pulp and the finished paper in a continuous production line, bacterial infections generally can be kept under control with "Lignasan" wherever slime forms. Many pulp-mill operators do not manufacture paper. Conversely, many paper manufacturers do not produce pulp; they buy it for delivery in such forms as slush pulp, rolls, or laps, which are folded sheets of partially-dried pulp somewhat resembling a very thick blotting paper. And these laps must also be protected in transit or in storage against bacteria; otherwise, slime spots will cause unsightly discolorations as shown in the accompanying illustration. Whence, it is a recommended practice in pulp mills to apply "Lignasan" in small quantities as a preservative. Eight ounces per ton of dry fiber usually afford good protection to laps in storage for more than a year.

The applicator used for this purpose usually consists of a perforated pipe suspended over the pulp sheet as it passes over the wet machine that forms the laps. Above is a tank containing a supply of the chemical solution, and the assembly is completed with a valve to control the rate of flow.

It may be noted in passing that "Lignasan" may be applied in solution, in paste form, or as a powder. Mill men know which form is best for each operating requirement. To describe the recommended dosages in detail would make dull reading for readers of this publication. This information may be obtained from the Wilmington office of the Grasselli Chemicals Department.



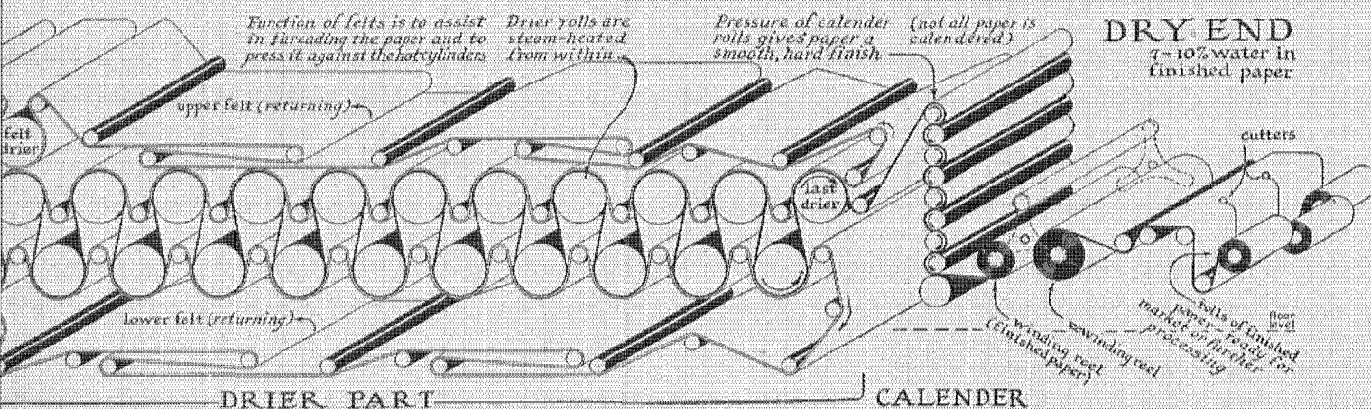
"Lignasan" is usually applied over the wet machine with this simple device—a tank, a control valve and a perforated pipe.

But this much may be said: According to reports received so far from mill operators, slime control through the use of "Lignasan" can be credited with a substantial saving. Few operators who give it a trial discontinue its use, and it has already been adopted as a standard treatment in a number of paper mills for these purposes:

1. As a slime control in the white-water system, in the beaters and/or in the head box of the paper machine.
2. For the preservation of laps, rolls and slush pulp during storage or transit.
3. As a disinfectant on felts and other equipment during shut-down periods.
4. To prevent clogging in the alum lines, when obstructions are caused by biological organisms.
5. To prevent deterioration of invert sugars, starch sizes and adhesives due to bacterial or fungous infections.

In these days when it is so necessary to save paper and to produce more and more of it for military and civilian needs, any product that helps to keep pulp and paper mills operating at high efficiency is important. "Lignasan," designed for the lumber industry, is now serving equally well in its new, broader field, saving time, labor and paper-making materials by fighting off the enemies that lurk along the production line.

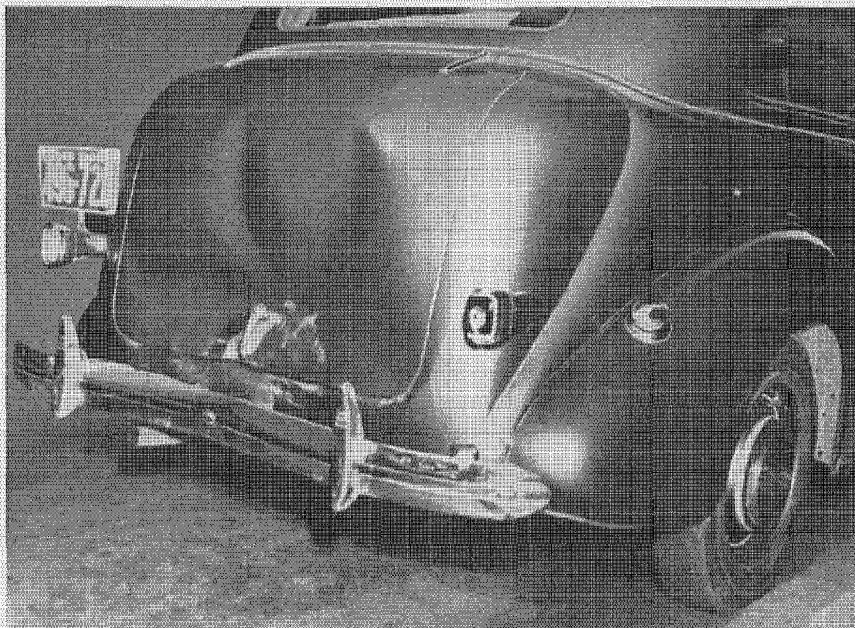
NOTE: Because one of its important ingredients is required for war uses, "Lignasan" will be available only in limited quantities.



MAKING THE OLD CAR DO . . .

**Authorized Du Pont Refinishers
can render a real service
during the emergency**

By GORDON WARD



Another traffic victim needs the attentions of the repairman and the refinisher.

AFTER a hectic day in the office, Joe Smith went down to the parking lot to get his car. . . found it closely wedged between two others, and with the door-panel badly dented.

Matt Shaw, hurriedly trying to back into a parking space on Main Street, misjudged the distance slightly. Scru-runch! The bumper of the car in back had crumpled his fender.

At 327 Maple Avenue, Mrs. D — had a similarly-distressing experience backing her automobile out of the garage at home. The nearby retaining wall was undamaged, but the back of her car was bashed in; it looked as though a vandal had performed his masterpiece with a sledge-hammer.

Almost every minute of every day fenders are dented, doors scratched, car bodies scored and scarred as a result of accidents of this kind. Motorists who take pride in the appearance of their cars are annoyed when such mishaps occur. They involve trouble and expense, and if the repair and refinishing work is not done promptly, deterioration from rust and corrosion is certain to follow, which is a real cause for alarm in 1942 and no one knows how much longer.

With new-car production halted and the automotive industry fully engaged on war projects, every automobile now in use must be kept in serviceable condition at least for the duration of the war. As long as one could trade in a battered car for a new one, it was not of such great concern. But that possibility has gone. Motorists now must guard their cars well against every agency of destruction or else—and the alternative is not pleasant to contemplate. With steel and other metals earmarked for war uses, replacements for doors, fenders, hoods and the like will be difficult to obtain. Old-car conservation is a "must."

Fortunately, that is easy to do, for the metal surfaces of our cars, if properly painted, can be made to last almost indefinitely. As long as there is a protective film of paint, rust and corrosion cannot get a foothold.

From Du Pont laboratories have come not only the automobile finishes that have heretofore been applied by mass-production methods, but also the refinishing materials for touching up or completely repainting damaged cars with a minimum of delay and expense. You will be interested to know how these materials are used.

Every car that rolls off the production line at the factory has affixed to it a metal plate inscribed with a code number designating the particular color in which it was finished. Each year, too, Du Pont provides materials for the automobile refinisher's use so that he can match all of the "production colors" currently used by automotive manufacturers. Consequently, regardless of make or model, any Du Pont refinisher can make repairs to any damaged part and apply the same color with which it was originally finished.

Since few people have an opportunity to watch one of these craftsmen at work, it may be interesting to review briefly what happens when a car rolls into the shop for a "touch-up" job. Let's assume it is your car—a 1940 gray Oldsmobile. You have driven it to an Authorized Du Pont Refinisher's establishment to have a scratched and dented fender repaired.

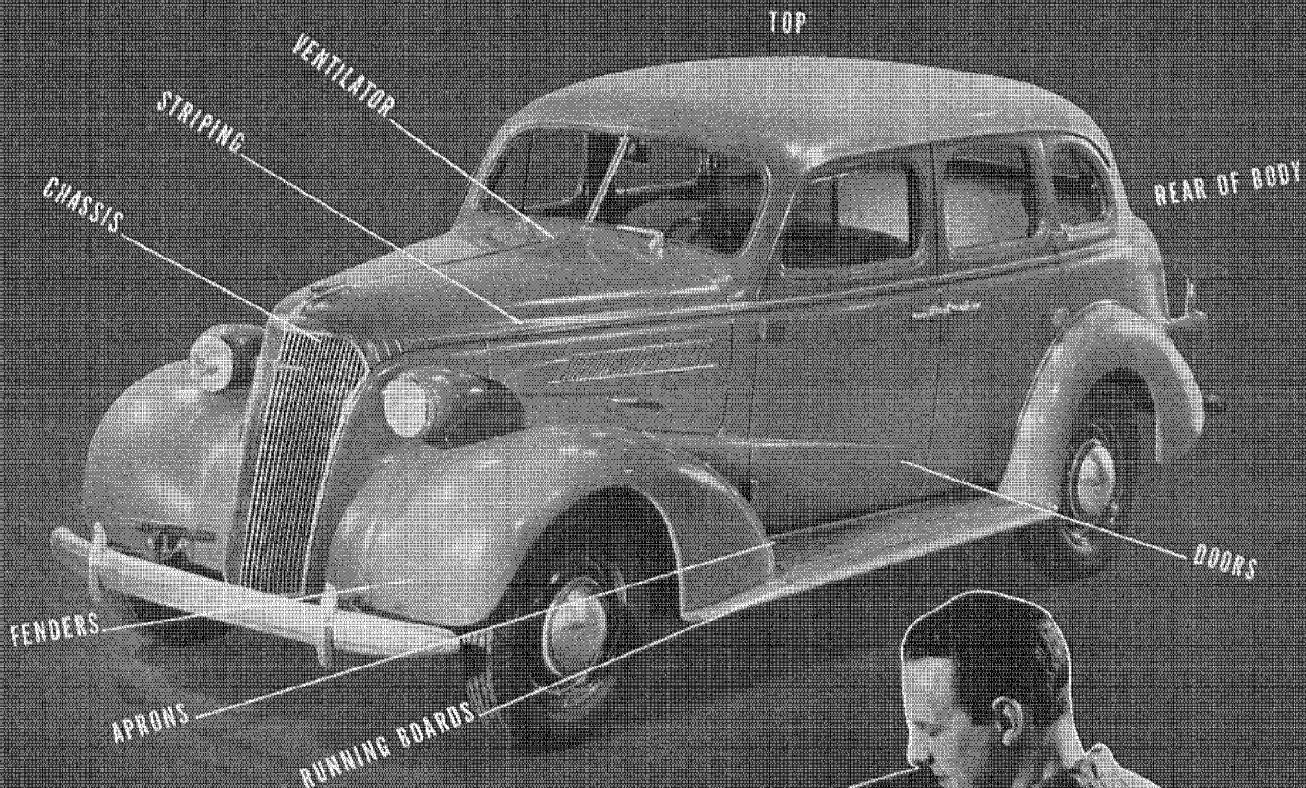
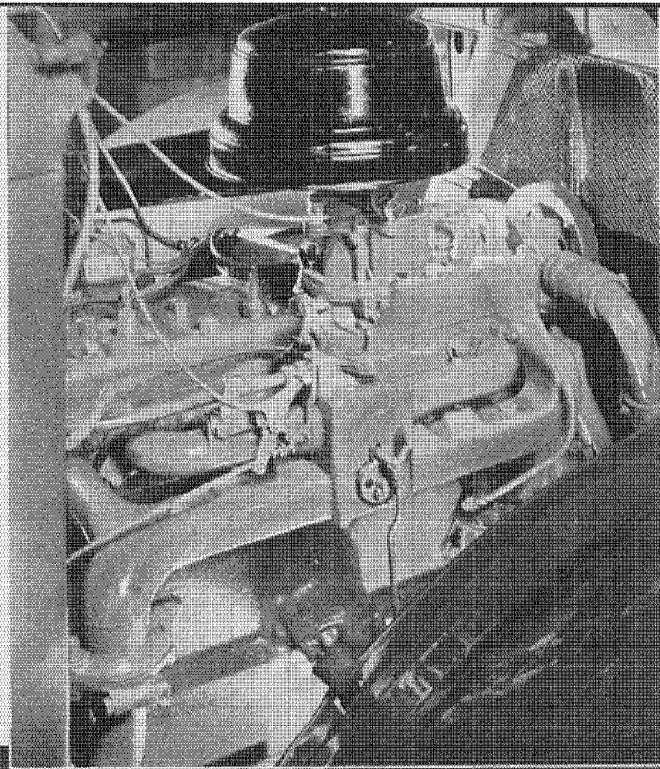
First, with a pneumatic vibrator, he straightens out the dent, making the fender as shapely as it was when new. This done, he carefully wipes the area to be painted with Du Pont "Prep-Sol" Cleaner, which removes all traces of wax, polish, grease, tar or weathered film. This insures a clean surface that is essential to a good refinish job. Then he sands the surface and wipes it with a rust-removing agent until not even the tiniest spot of rust remains. He washes the fender, dries it carefully and next applies Du Pont Pyroxylin Primer-Surfacer, which will serve as a bond between the metal and the finish coat, and also provide a smooth surface. Another sanding follows, after which he works around the patch with "Duco" Rubbing Compound to remove any scratches in the old finish before spraying the entire patched area with a coat of Du Pont "Pyra-Prep." This prevents any

sandpaper scratches from showing through the finish to be applied.

Now he is ready to spray on the required color finish. What color? He locates the plate previously mentioned and reads the legend: "Combination 47." By referring to the 1940 Oldsmobile Color Bulletin, supplied by Du Pont, he finds that the matching color is "Duco" No. 246-53631. Then he goes to a nearby stock shelf and procures a can, loads his gun and applies several spray coats to the fender.

Four hours later, when the finish is dry, he completes the job with "Duco" Rubbing Compound and "No. 7 Duco" Polish, which gives the surface a high luster—and the restored, refinished fender looks as well as it did when the car was new. That service, rendered at small cost and quickly, we repeat, is more essential today than ever before, for automobiles are and will be for some time to come irreplaceable assets. If you keep your car refinished for protection alone, you may not have to walk to work so soon.

(Continued on Page Twenty-Four)



TOP: Lift the hood of your car and see if rust is collecting on the motor. If so, give it another paint coat.

ABOVE: The danger points where scratches and dents most often occur, and where bare metal exposed to the air opens the way for corrosion to start its destructive work.

RIGHT: Authorized Du Pont Refinishers will help you keep the old car in condition. Here's one consulting his color bulletin before undertaking a touch-up job to match a particular finish.

THE DU PONT MAGAZINE

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E. R. MANCHESTER, EDITOR

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Vol. XXXVI APRIL-MAY, 1942 Nos. 4-5

Bonds or Bondage

MILITARY developments overseas of late have shocked the American people into a belated realization that nothing less than an all-out, sustained war effort will win the war. Further territorial aggressions by the Axis powers, and our shipping losses on the high seas, make it clear that we can no longer carry on a defensive war. If Germany, Japan and Italy are to be stopped before it is too late, the United Nations must attack with all the power and resources that can be brought to bear—and quickly.

After Pearl Harbor, the President outlined some of the equipment required for an all-out war effort as follows:

Sixty thousand planes in 1942!

Forty-five thousand tanks!

Twenty thousand anti-aircraft guns!

Eight million tons of ships!

These are staggering totals, but they represent only a part of the material that must be financed, fabricated and delivered. It is an unparalleled undertaking to supply all the accoutrements of modern warfare. America cannot, must not, fail to meet its ever-increasing responsibility as "the arsenal of democracy."

To do this job, to win this war, will draw heavily upon all our national resources of men, money and materials, perhaps to the very limit. It must not be said of Americans that they supplied "too little, too late." That has been the epitaph of too many nations now under bondage.

Cost what it may in blood and treasure, World War II must continue until our enemies are over-

whelmingly defeated. War is never cheap, but it is a thousand times cheaper to win than to lose, which is reason enough for urging all citizens to buy United States Defense Savings Bonds regularly out of current earnings. Our nation needs—and will need—every dollar that can be spared. To quote one official:

"We realize that should this nation fall short one ship, one plane, one tank, one gun, one bullet of the number needed to make us victorious, no business will now survive in the hands of those who now direct it. . . our freedom as individuals will be ended . . . our hopes for the future will turn to ashes."

Aside from the fact that United States Government Bonds and Stamps are the safest securities one can hold, purchasing them now is well advised, whether one be prompted by self interest or by patriotism.

That is why arrangements for purchasing Defense Bonds and Stamps through pay-roll deductions have been made in our nation's industrial plants, including those of the Du Pont organization, and why all Americans are urged to subscribe regularly and to the limit of their ability to help finance the war program. The need for cooperation was never greater than now. It's bonds or bondage. There can be no compromise. There must be no delay.

Important to Explosives Users

FEDERAL regulations for the control of explosives and their ingredients in time of war or national emergency became effective March 16, 1942, following the enactment and approval of the Federal Explosives Act on December 26, 1941. These regulations, which have the force and effect of law, require, with few exceptions, all persons who manufacture, purchase, sell or use materials of the classifications designated to obtain federal licenses. It is important for those who have not yet secured licenses to do so promptly, for violation of the laws and regulations are punishable by heavy fines and penalties. Copies of the regulations may be obtained from the Government Printing Office, Washington, D. C.

Just Off Press . . .

FOR twenty-four years the *Blasters' Handbook* by Du Pont has been recognized as the one authoritative manual of information about explosives and how to use them. No other book of the kind is published in the United States, and it is also unique in another way. This handbook, prepared for explosives users, serves as a textbook in some of our nation's leading engineering and mining schools and colleges.

The eleventh edition, like all the others preceding it, was prepared by the technical staff of the Du Pont Explosives Department. The information, completely revised and expanded to 340 pages, contains up-to-the-minute facts about all types of explosives, blasting agents, supplies and accessories. A limited number of copies, bound in "Fabrikoid" coated fabric, is available for sale at one dollar each. Orders should be addressed to the Advertising Department of the Du Pont Company, Wilmington, Delaware.

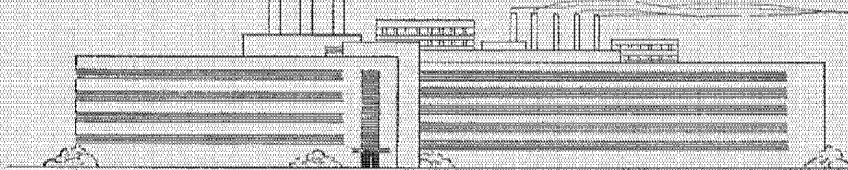
The Cover Picture

ELSEWHERE in this number is presented a review of research activities in the dynamite industry during the past forty years. With that background, it seemed appropriate to portray on the cover page a subject keyed to some phase of the work at the Eastern Laboratory. So we take you inside one of the buildings where dynamite ingredients are brought together under the chaser wheels of a small mixing unit which is used for experimental production.

"The value of freedom is that it never dies. We have seen great military machines built up on despotism. We have seen them achieve temporary success, and they may have further temporary success. But we know that they are headed for disaster. This war is a war of peoples who insist on their freedom—not only freedom as nations, but also freedom as men—freedom in spirit, freedom in economic life. The time to make those freedoms real is now, and not later."

A. A. BERLE, JR.,
Assistant Secretary of State

TO SPEED INDUSTRY



AND CONSERVE ESSENTIAL MATERIALS

WITH prospect of shortages in even the poorer grades of leather, shoe manufacturers are turning to "Fabrikoid" pyroxylin-coated fabric for bindings, heel covers, ankle straps, quarters and stripping. They are using "Texon" latex-impregnated fiber stock for mid-soles, insoles and sock linings of footwear.

AN "ELECTRIC NOSE" invented in a Du Pont laboratory provides a rapid and reliable means of determining the concentrations of certain solvents and chemicals in the air of work-rooms. This device detects the presence of as little as two drops in a room of average size. Thanks to its use, excessive losses, usually due to faulty operation or defective equipment, can now be reduced.

"SAFETY MICROCOPY" film for documentary reproduction purposes, since the war, is being fast adopted by many industries. This 35 mm. film, until recently was used chiefly by libraries and newspapers. Now it is being used for reproducing documents and drawings in manufacturing plants and business houses with limited facilities for safe storage.

A "STREAMLINED" process of bleaching textiles with hydrogen peroxide makes cloth snow white in two hours, as compared with fifteen to twenty-four hours under former methods.

POLYVINYL alcohol resins are now being extruded in the form of a tubing which is resistant to all common oils, fats, greases and solvents. This tubing is replacing rubber hose in refrigerator applications and many other installations where oil resistance is important.

A RECENT development offers considerable time-saving possibilities in distinguishing between compounds that have many chemical features in common. Similar to microscopes used in studying the structure of rocks, a petrographic microscope is used for precise identification of all organic compounds—even gases or liquids—provided they can be converted to crystalline derivatives. The actual identification is achieved by transmitting polarized light through the crystal.

THE Du Pont Company has recently prepared and placed on the market a line of blackout paints.

THE permissible amount of tin for plating metals and containers has been reduced drastically. Tin plating generally has been done by hot dipping. Thinner but satisfactory coatings of tin can now be obtained by electroplating with a saving, in some instances, of up to seventy-five per cent of this vital material.

AMMONIA, cracked by heat and catalysts to its constituent gases—nitrogen and hydrogen—is now used as furnace atmosphere in many heat-treating operations. It not only gives a superior product, but also saves time and metal formerly lost in pickling and cleaning operations. The metal leaves the furnace in a bright condition and needs no further processing. When heat-treated in the usual manner, oxidation forms a scale that must be removed.

TO RELIEVE the shortage of plastics and lacquered metals, many manufacturers are making certain parts of wood and covering them with "Fabrikoid" pyroxylin-coated fabric.

SERVICE life of rubber products exposed to sunlight can be materially extended by adding "Heliozone" rubber chemical to the compound before its vulcanization. The use of this chemical also improves the appearance of products containing reclaimed rubber.

IN THE leather tanning industry it has been found that skins processed with sulfamic acid have a finer and silkier grain than those prepared with sulfuric acid, the reagent commonly used in pre-war days.

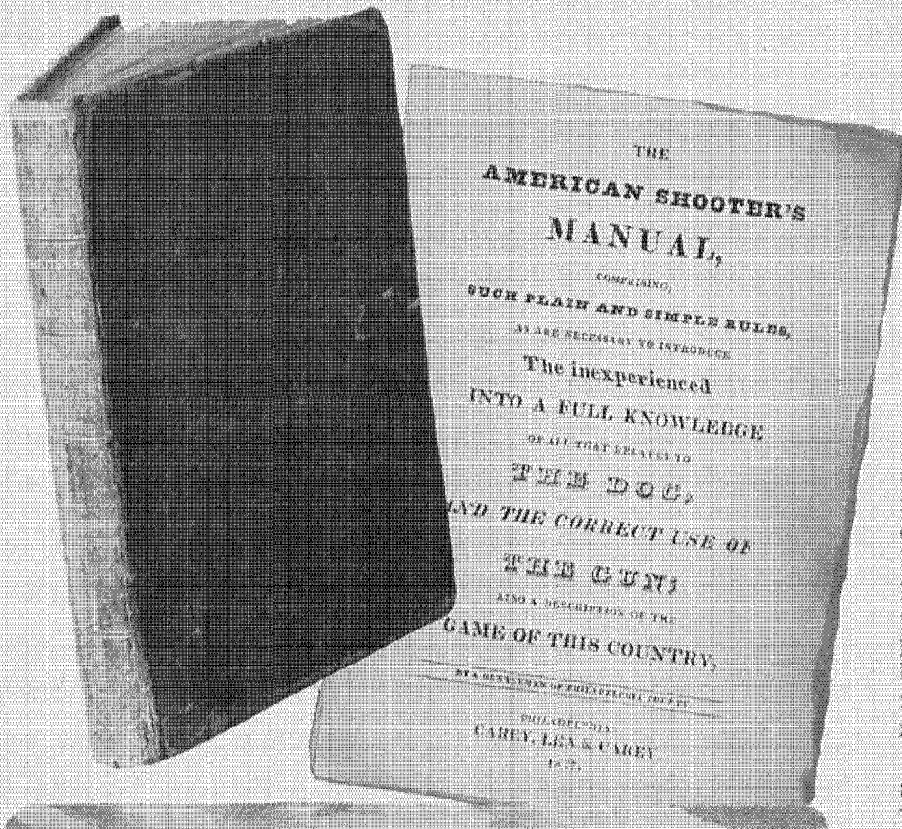
MANY manufacturers now provide their employees with "Pro-Tek" protective cream. Workers apply it to their hands before starting to handle dirty or greasy materials. It acts like an invisible glove and prevents grime and stains from adhering to the skin. After work, only a wash-up, with running water, is needed to dissolve the film and any dirt accumulated on it. As a time-saver there is much to recommend "Pro-Tek."

IN THE manufacture of radio tubes, certain heat-treating operations must take place in a vacuum to avoid a destructive reaction between air and the delicate tube parts. Cracked ammonia, we are informed, is now being used as a furnace atmosphere by many manufacturers.

DUPONT cellophane is now starting to play a new part in packaging—one that may develop into importance from the standpoint of conserving materials essential to the war effort. The container industry, in cooperation with DuPont technicians, has found ways to use moisture-proof cellophane laminated to paperboard to replace the metal bodies of cans and also to form entire containers that provide adequate protection for certain types of food, drug and chemical products. Some of these new packages are already in successful commercial use. Another direction in which DuPont cellophane is helping to conserve metals is in the replacement of foil as a wrapping material on products requiring protection against moisture-vapor transmission.

SHOOTER'S MANUAL

1827



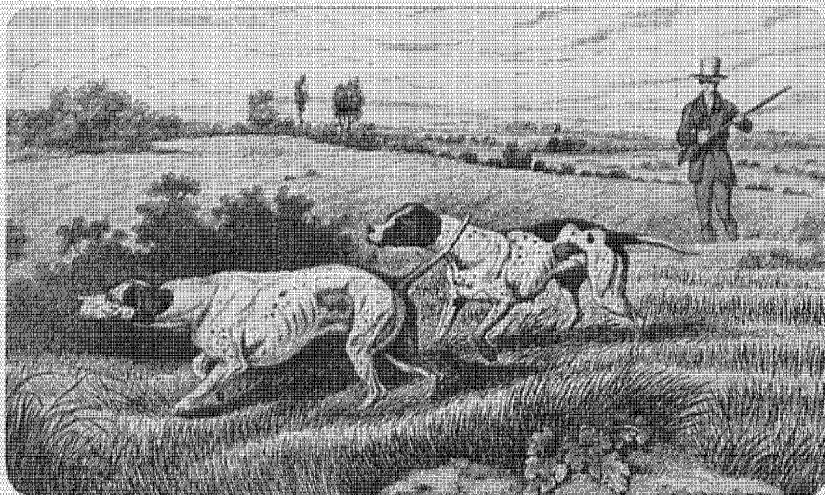
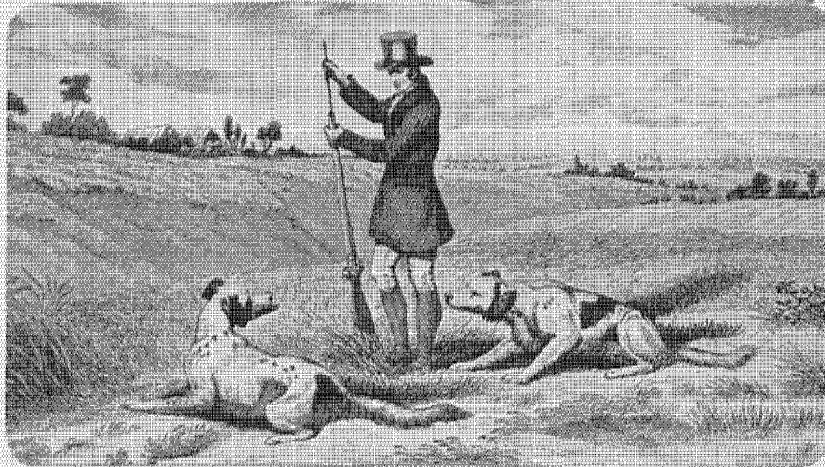
MANY sportsmen will be interested in hunting conditions as reported in a 115-year-old volume recently loaned to us by a member of the Du Pont Company's Legal Department. The author, it seems, preferred to be known only as "A Gentleman of Philadelphia County," perhaps because he thought it might be best to remain anonymous when making critical comments about his fellow gunners.

In the preface he states: "One great object of the present undertaking is . . . to diffuse throughout the community a taste for genteel and sportsmanlike shooting, and to abolish that abominable poaching, game-destroying habit of ground shooting, trapping and snaring which prevails throughout our country in the neighbourhood of all cities and large towns."

He outlines the ethics of sportsmanship, first setting forth in detail what an inexperienced shooter needs to know about hunting dogs and how to train and care for them. Next, he discusses game birds found in the tidewater and upland districts, the mechanics of rifles and fowling pieces, and then comes a very enlightening chapter about the merits of gunpowder made in this country and overseas as disclosed by comparative tests. To quote from the text:

"Several methods of proving or trying the strength of powder have been adopted, but with the exception, perhaps, of Mr. Dupont's Eprovette, none of them can be relied on for much accuracy, when used for fine powder. The mortar is very uncertain, and the spring eprovette is worse than useless, and should be abolished.

"I shall conclude this subject by inserting a communication made by Captain Thomas J. Baird, of the United States Army, on ordnance



**How were hunting dogs broken more than a century ago?
What game birds inhabited the Delaware River valley and
the Pennsylvania uplands? What about the guns, and was
American-made powder better than Europe's best?**

duty, in which a detail of a number of experiments, on powder from different manufactories, were kindly made by him, at my request. I was well aware that many partialities existed in favour of foreign powder, and prejudice was against our own; it was therefore considered advisable to have a fair and impartial trial given to both by some person whose profession and character would silence every suspicion of unfairness or partiality; and the public may rest assured that the following is a true and honest report of every result.

'Arsenal, Frankford, April 24, 1827.

'To the author of
The American Shooter's Manual.

'MY DEAR SIR—

'It is with much pride and satisfaction I communicate to you the result of a series of experiments made upon several samples of powder which you furnished me for that purpose, together with that manufactured by Messrs. Dupont de Nemours & Co. of Frandywine.

'I say that I am proud to communicate these results, not only because they fully prove that *our* powder is the best in the world, but they enable me to do justice to the manufacturers who, from their care and enterprise, have not only been able to compete with, but have actually in a few years outdone all Europe in this important article. This is a

pretty bold assertion, but it is nevertheless true.

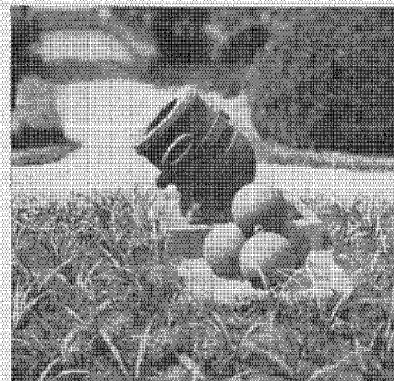
'There is certainly no nation in the world whose manufacturers, in general, have so justly become celebrated as Great Britain, and in no article, perhaps, more than in gunpowder. The French powder has been highly spoken of, but by experiments made upon what is called *King's powder*, made expressly for the King of France and his court, and which is doubtless the best made in France, it has been found not to bear comparison with Pegou, Andrews & Wilke's, which is no doubt the best foreign powder ever introduced into this country.

'The annexed table will shew the result of the experiments, which were made upon an improved eprovette, for the proof of fine sporting powder. This eprovette is nothing more than a small chamber capable of containing about the charge for a patent breech fowling piece, placed in a vertical position, so that the action of the powder is upwards: when loaded, a weight of about four pounds, attached to a lever, is let down so as to cover the chamber. To the moveable end of the lever, a graduated ribbon is so attached that when explosion takes place, the weight is thrown up, taking with it the ribbon, which passes through a small slide; the weight, of course, again falls to its place, but the ribbon is held by the slide, at the point to which the force of the powder carried the weight.



'By this it will be seen that Dupont's powder is eight degrees stronger than the best sample of foreign, namely, Pegou, Andrews and Wilke's.

'Having tested the strength, I shall now proceed to shew the quickness of the different samples, as proved by a machine invented by Mr. A. Dupont. The manner of testing quickness upon this machine is both simple and satisfactory. It is nothing more than burning a train of twelve feet, or 144 inches, of each of the two samples to be tried; these trains are laid parallel to each other; and the board being graduated, you see plainly the comparative quickness of each sample. The following is the result of these experiments; Dupont taken as the standard, one hundred and forty-four'. (Continued on Page Twenty-Four)



"Mr. Dupont's Eprovette," mentioned in the text, is now on display in the Company's Museum. Captain Baird used another type.

Description of Powder	1st Range in Degrees	2nd Range in Degrees	3rd Range in Degrees	Mean Range in Degrees	Remarks
Pegou, Andrews & Wilke's single seal	82	81	82	82	} Being 8 degrees stronger than Pegou, Andrews & Wilke's Can- ister.
do. do. double seal	95	84	95	91	
do. do. Canister	110	105	105	107	
Edinburgh	93	93	93	93	
London*	78	82	82	81	
Dupont de Nemours & Co.	112	115	119	115†	

*The London powder is said to be of an inferior quality to the Edinburgh.

Birthday Greetings



THE STORY OF THE FIRST WASHABLE WINDOW SHADE CLOTH WITH PICTURES SHOWING HOW IT IS MADE

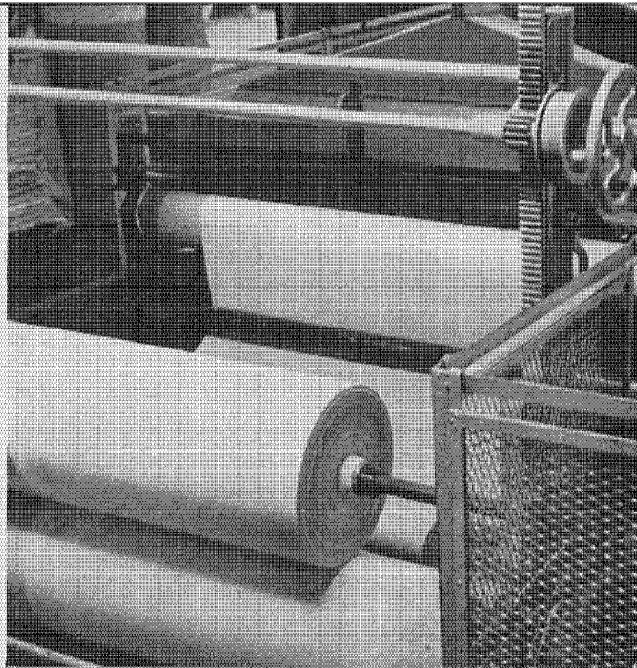
By K. S. DAVIS

When silver anniversaries occur, it is customary to make note of them in some way. Glowing candles—twenty-five of them—should decorate a cake with red candies spelling the name of a well-known member in the family of Du Pont cellulose products—"Tontine" washable window shade cloth. It is one of the "Better Things for Better Living... Through Chemistry" that has won its place of respect in millions of American homes.

This product was developed because there was a real need for it. Middle-aged people will recall the troubles experienced with window shades before 1917, when Du Pont chemists first set out to improve them. Even the best ones on the market at that time were not satisfactory. The filled fabrics—a makeshift at best—faded, cracked, gathered dirt, sagged, curled, ripped and tore in the wind and could not stand water; they simply did not last.

What was needed was a really durable window shade cloth, and the chemists went to work on the problem of finding some tough substance that could be anchored to a cotton fabric so tightly that it would not flake off. They found it in pyroxylin, which is chemically-treated cotton cellulose in a liquid form. Then followed a long series of other researches, experiments and tests to develop a properly-balanced formulation of pyroxylin, pigments, softeners and other ingredients. How best to impregnate the fabric so as to insure maximum washability and wearability of the finished product was another problem requiring still more research and development work. This activity has continued through the years with the result that today's "Tontine" is considered to be the finest shade cloth in the field.

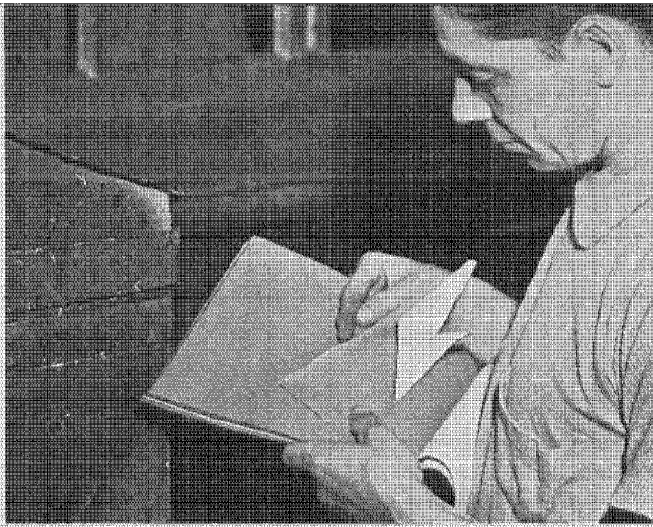
How it is now made is a story better told in pictures than by text, so here are a few pictures from the album:



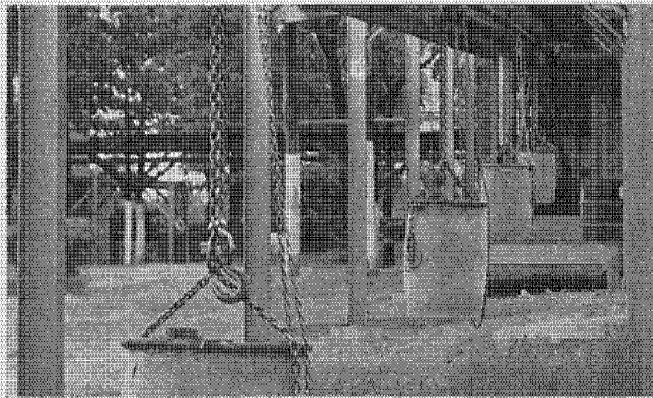
This machine prepares the cloth for impregnating, and removes lint, knots, dirt and loose threads from the surface of the goods through a shearing operation. This preparation is necessary for the production of translucent-type "Tontine."



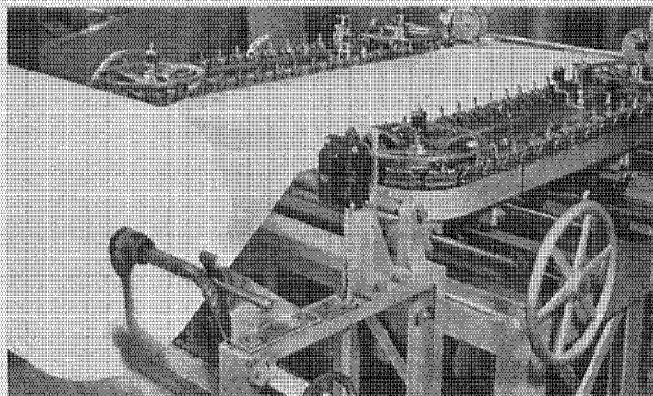
Before gray goods are released for processing on their long and carefully-checked run through the plant, they are inspected for adherence to a standard, and for any moles, misweaves and blemishes that might show up later in impregnating operations.



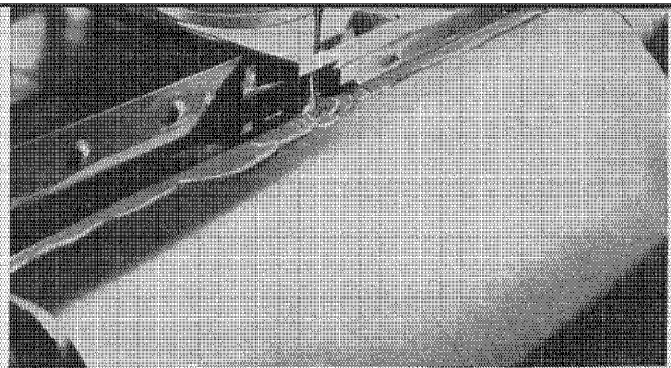
Matching hand sample against standard before color is approved for mixing. This color control check is one of the most important in the plant; it assures absolute uniformity of color from one shipment to the next.



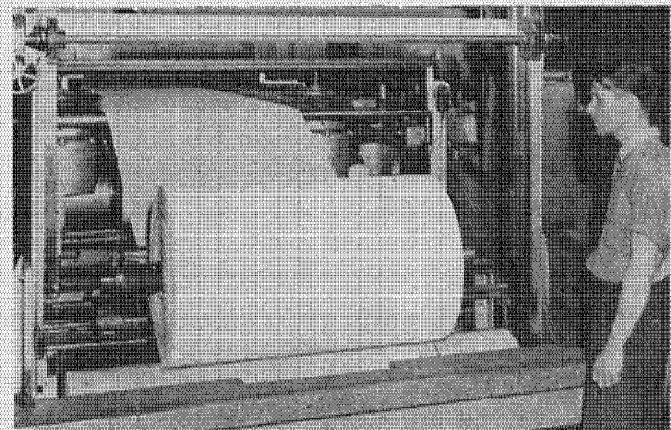
After the pyroxylin has been thoroughly mixed with pigments, softeners, etc., in the color room, it is moved by overhead conveyor system to the impregnating room.



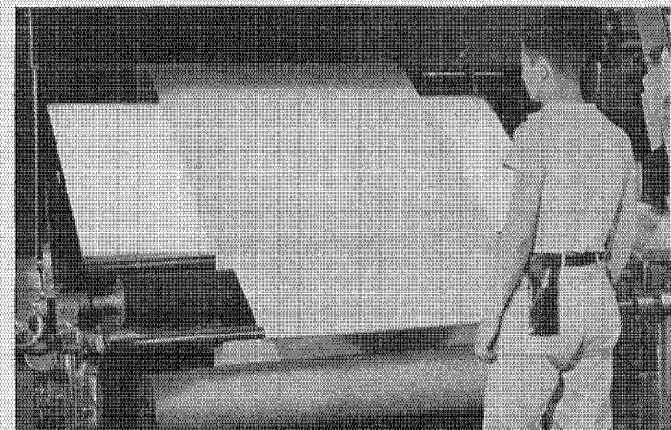
This ingenious machine is an automatic tenter-frame which is used in straightening the cloth for the impregnating machine. By automatic control, the tenter clips pull the cotton fabric into shape so that an absolutely uniform roll is obtained.



This is the working head of one of the new machines. Here, high-grade pyroxylin compound is driven into the weave of the cotton base fabric, making for thorough impregnation. The cotton fabric is carried through the machine in tenter clips, thus eliminating any strain or distortion of the cloth.



This is the rear end of one of the new machines. The goods are examined under a strong light by the operator, who not only services this end of the machine, but also carries on continuous inspection during the time the pyroxylin compound is applied to the base goods.



A careful final inspection is made of all finished goods before shipping, and trained operators check on color and uniformity of appearance and weight.



MAKING WATER WETTER

.... a fascinating group of organic chemicals helps speed production of better textiles and other materials

By R. J. WOODRUFF

THIS scientist was quite blunt about it. "I'm going to sink this duck," he said. Sink it he did. It went down like a freighter with its seacocks open. So doing, he assured the desirable characteristics of your fine fabrics.

Scuttling ducks and processing fabrics have plenty in common, surprisingly enough. What he had done was to demonstrate the effectiveness of a relatively new and valuable group of chemical compounds called "wetting agents." Valuable? Inability to get these compounds now could hamstring the huge textile industry.

Back to the scene of the scuttling: It wasn't done by any laboratory hocus-pocus or witch's brew. A wetting agent gave the water a penetrative power even the duck's oily feathers couldn't withstand. So, the duck crash-dived in the interests of science.

The "why" of wetting agents entails an explanation of the eccentricities of our almost universal solvent—water. A big bracket of industry makes demands on water which can't possibly be fulfilled by water alone. In the textile industry, where a series of soaking operations are essential, water alone falls down miserably, perhaps because water's arch enemy, oil, is present in the fiber, or because of peculiarities in a weave.

The surface of any liquid, chemists tell us, behaves in quite a different manner from the layer underneath. They call it "surface tension." A good physical test of surface tension is to experience a fall from a high bridge into a body of water. Floating a steel needle on the surface of a pan of water is a simpler test. Should one end of the needle become ever so slightly submerged, the

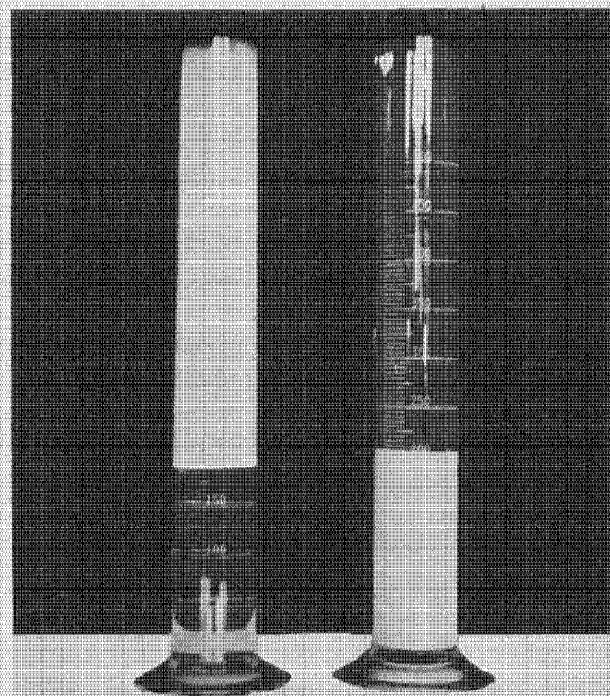
needle up-ends and sinks, as if it had fallen through a hole in the surface.

Stripped of laboratory technicalia, usually the greater the surface tension of a liquid, the smaller its power to wet anything. It follows that any reagent holding whip hand enough over water to lower its surface tension is a welcome guest in any sphere where water is useful. Looking at it in this light, the development of wetting agents is—in the cautious language of the scientist—"of some moment."

The modern synthetic wetting agents—such as "Duponol," "Gardinol" and the "M.P." compounds—in microportrait look like nothing more imposing than a string of freight cars. The molecules are hitched together, end to end, and to carry the analogy still farther, the terminals, or ends, are unlike the molecules in the center of the chain. These terminals explain the action of wetting agents. One end of the chain has an affinity for oil; the opposing terminal's affinity is water. Thus, one end loves water, the other hates it. The converse is true with oil. When water, plus a wetting agent together with suitable alkali, is poured into a greasy frying-pan, the millions of tiny molecular chains anchor their corresponding terminals firmly in the oil and water. The result is a clean frying-pan.

There is another group of synthetics, the alkyl naphthalene sulfonates, where the molecular structure is in the form of polygons, and other geometric shapes. Du Pont's "Alkanol" B is an example of this family.

Then comes ordinary soap, which was a daily partner of man long before anyone began worrying about synthetic wetting agents. Despite its limitations, soap is still the top rung in the seniority ladder when you



Illustrating comparatively the sudsing properties of "Gardinol" sulfated higher alcohol, left, with those of soap in hard water. Contrast the clear solution and foamy suds in the flask, left, with the curded soap solution, right, over which no foam appears.

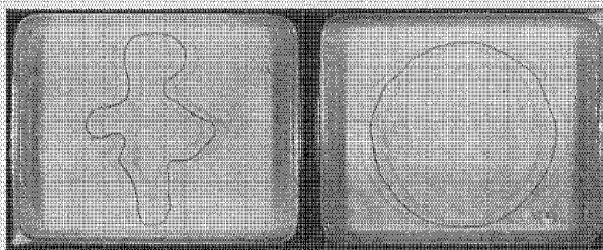
speak of surface-active agents as a broad over-all group.

Back to fundamentals, the primary duty of soap and the more efficient surface-active agents in the "wet-processing" of textiles is to make the process water "wetter" by doing away with its inherent stubbornness to penetrate and spread where oil is present. Scouring, bleaching, dyeing and finishing would be well-nigh impossible without them. It isn't only a question of the end result—an attractive fabric—but time enters into it as well. In mercerizing cotton, wetting agents help alkali solutions penetrate cotton fibers in a few seconds, instead of minutes. In other applications—under good conditions—where the water is soft, the fiber or fabric not too repellent to the solution, and enough time used, ordinary soap will do all the penetrating and spreading necessary. But this ideal set-up—like holding thirteen spades in a bridge hand—doesn't always occur. More often than not the water is hard, contains mineral salts, and the fabric or fiber is greasy and full of natural oils. It is here that the textile man must rush up his shock troops in the form of wetting agents.

When a certain fabric strikes you as one of the best things you have ever seen, you would probably be stumped if asked to define its charm. By analysis, though, you discover that the over-all effect is a certain blend of design, color and finish. No one of these is more important than the other. The fabric isn't worth much, either decoratively or from a utility standpoint, unless its finish jibes with the intended use. Lacy organdy would not be much good as a tent material. In much the same way color and design have their own orbits of importance.

But finishing has certainly been the laggard when it comes to keeping up to date. The art of dyeing has been revolutionized within the past 100 years; design has raced ahead to catch a functional and streamlined style of living, while finishing has only just begun to pick up speed. As late as two decades ago little had been done to fit the new alphabet of organic chemicals into the textile jigsaw of finishing. Came the chemical revolution and the first forays into the unblazed fields of organics. Until then, "modern" finishing methods could have been called archaic without anyone getting mad.

Till World War I, sulfated and sulfonated oils and fats were the only known wetting agents—in addition to soap. The war economy in Europe—and here to some extent—sent scientists afield in the search for natural and synthetic fats. "Soapless" soaps made their bow. In this country a whole industry was slowly being throttled for lack of suitable dyestuffs. Dyes were synthesized in comparatively short order, after tremendous expenditures in money and frantic scrambling in the laboratories. But wetting agents were slower in coming of age. The first synthetics prepared from non-fatty intermediates were the alkylated naphthalene sulfonic acids, and their salts. And these were the first of the new family to be found useful in products other than textiles. Because the call was for shells, powder, and the guns to burn them, these synthetics only slowly infiltrated the fields formerly staked out as the property of soaps and sulfonated oils. With the Armistice, some of the wartime users of the synthetic penetrants went back to soaps,



At the left, just a loop of thread in a pan of water. Add a drop of a wetting agent inside the loop. What happens? The picture at the right shows the result, as the greater surface tension outside causes the loop to form a circle.

while others, perceiving that the synthetics were a cut above the old stand-bys, remained faithful, and began studying their processes to ferret out new applications. Soon, those who still doggedly stood by the older methods found themselves in a definite minority.

By the end of the 1920s, the long-chain alcohols had been perfected in the laboratory and tried in the field. They clicked—overwhelmingly. So, if the pre-1914 period can be called the Dyeing Age, the post-1914 period can be justifiably called the Finishing Age.

Today—1942—it's almost impossible to lay your finger figuratively on a manufacturing process whose product has not been aided or abetted somewhere along its formative span by the synthetics. Paying no attention to the textile industry—which would receive a decided set-back if the synthetics were suddenly consigned to limbo—the broad field of their applications reads like a muster of all industry. In leather, fur and paper, synthetics are extremely helpful. The multi-million dollar cosmetic industry and allied manufacturers whose bread and butter depend on the call for feminine war paint need the extra benefits synthetics offer. Because of synthetics, petroleum is extracted from the earth's crust the easier; metal processing and electroplating are faster and better; rubber is reclaimed faster. Dairies use them to clean their milk cans; they expedite processing of critical metal ores, and the foam-type fire-extinguishers are more effective for their presence. On the other side of the ledger, you sleep better at night because wetting agents have whisked the rancid, smelly natural oils from the feathers that fill your pillow. These are a few industrial applications. The list of miscellaneous uses is as long as your arm. As one chemist puts it: "They (the synthetics) add that final filip, the 'extra something,' that makes the difference between a mediocre product or process and a good one."

Like many other chemicals, wetting agents are now in overalls, plugging away for our war effort. Here, for the most part, the spotlight has been on wetting agents as they work with water. There are other fields, some already touched, and others still on the shelf, that promise exciting and brilliant futures. It has taken only twenty years for this new group of chemicals to come into its own. If you ask a chemist what kind of a future this youngster has, he will say "fruitful." This is lavish praise from a chemist.

And I'm sure you'll concede that from scratch to maturity in this short period is a whacking good record, even in our streamlined perspective.

Research in the Dynamite Industry

(Continued from Page Five)

Laboratory in 1902 have produced good results. New and improved products have been created in great number. New processes have resulted in increased manufacturing efficiency, and this has been accomplished without any increase in costs to explosives consumers in spite of the fact that wage rates in the industry are now five to six times higher than they were in the early 1900s. Research has been a very important factor in making such a situation as that possible.

Posture...a Factor in Fatigue

(Continued from Page Eight)

factory workers, but the time was to come when business executives and professional men wanted chairs of the improved type. As a result, the Domore Chair Company has broadened its field and has provided chairs for more than 30,000 people in this group alone, among them many of our nation's top-flight executives.

During the past eighteen years, this company has kept abreast with new developments in the factory and office equipment field, always striving to improve its products in details of design and construction. Exerciser backs, seats and arm rests cushioned for comfort; Du Pont "Cavalon" rubberized upholstery fabrics for enduring service and fine appearance—these are a few among the many refinements added to good posture chairs for executives and other office workers.

Subject to limitations imposed by the war, the Domore Chair Company is not only supplying a complete line of posture chairs through office equipment dealers and by direct mail, but it also maintains seating service representatives in nearly 200 American cities. Thanks to their efforts, more than a million workers are enjoying the benefits of good posture from the use of these chairs. In short, Domore has lived up to the implications of its name by developing what was only an idea in World War I into a full-fledged successful industry that can render even a greater service in World War II.

Making the Old Car Do...

(Continued from Page Fifteen)

There is another way, too, in which the refinisher can help. Before that fateful Sunday at Pearl Harbor, many a motorist in this country had planned to trade in his old car for a new one finished in a different color. That plan has gone glimmering, but it is still possible to refinish the old car in any color desired. There are literally hundreds of colors available in "Duco," "Dulux" or "Pyralux" finishes—the three types produced with Du Pont refinishing materials. Each is designed to do a specific job, and any Authorized Du Pont Refinisher can be depended upon to handle the work creditably.

Broadly, the car-refinishing service extends far beyond the needs of individuals. It has an important bearing on the national war effort. The point was stressed in Washington, not long ago, by a member of the United States House Committee of Public Roads in discussing the importance of maintaining full efficiency of highway transport facilities. In part, he said:

"Many defense production plants and Army cantonments and other military and naval establishments are located beyond reach of other public transportation, and this makes necessary a greatly multiplied use of highways for movement of employees, Army and Navy personnel, and materials. Actually, hundreds of thousands of workers at defense plants and projects daily drive their automobiles millions of miles to and from their jobs to arm America. Approximately 32,000,000 civilian motor vehicles, operating daily over the highways of this country, are vital to defense either in serving the civilian population or military forces."

It is the responsibility of each one of us, quite apart from considerations of appearance and pride, to keep our cars rolling. Mechanical repairs will improve their performance; careful driving will conserve gasoline and rubber, and proper painting will protect them from deterioration until the time comes when the automotive industry can resume normal factory operations.

Shooter's Manual—1827

(Continued from Page Nineteen)

Description of Powder	Inches	Description of Powder	Inches	Difference in Favour of Dupont's, Inches
Dupont's	144	Pegou, Andrews & Wilke's double seal	96	48
Dupont's	144	do. do. Canister	103	41
Dupont's	144	Edinburgh	128	16
Dupont's	144	London	102	42

"By this it will be seen that there exists a still greater difference in favour of Dupont's powder over the foreign in point of quickness than in that of strength. When we consider the difference between 144 and 103, we will perceive that Dupont's powder burns nearly one-third faster than Pegou, Andrews & Wilke's justly celebrated Canister. The Edinburgh powder comes nearest Dupont's in point of quickness burning as 128 to 144, making a difference of one-ninth in favour of Dupont's, although it falls far short of Pegou, Andrews & Wilke's in strength.

"I must also remark that the residium, in burning all these powders, is much greater than in Dupont's; consequently, the latter also possesses the quality of cleanliness in a greater degree than the others.

"Having now given you the result of those experiments, without favour or prejudice, and merely that your book might contain such information as would put it in the power of any one to select the best powder, I will only add that I hope and trust every sportsman, who believing in the authority of this statement, and who purchases foreign powder, will at least have the candour to acknowledge that it is from prejudice and not from judgment that he prefers it.

"With much esteem, I am your obedient servant,
"T. J. B."

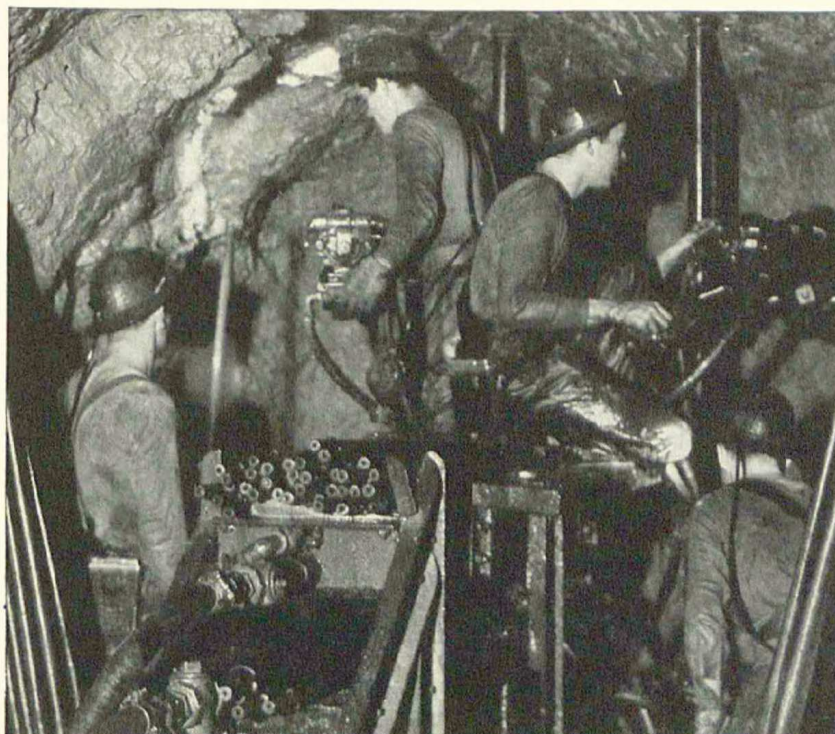
This letter, at face value, is a striking testimonial to the quality of American-made gunpowder. We may suppose that E. I. du Pont de Nemours read the test results with real satisfaction; he aimed to make a better product and as the record shows, did so. From that day to this the organization he founded has sustained the reputation he earned for his first high-quality product.

THESE DU PONT PRODUCTS

Speed PRODUCTION AND *Lower Costs*

HERE are three du Pont products that can help you meet today's huge demand for ore — through increased efficiency, effectiveness and safety in underground operations. What's more, in many mines these products will contribute important savings.

FOR LOWER BLASTING COSTS, along with the other important properties needed for underground shooting, du Pont offers "Gelex,"* an outstanding semi-gelatin dynamite. "Gelex" cuts blasting costs at many mines because its good water resistance often permits it to be substituted for the more expensive gelatin grades. "Gelex" is plastic and cohesive — hence well adapted to loading, even in uppers. "Gelex" detonates with high velocity assuring excellent fragmentation, and it produces a minimum of noxious fumes, thus saving time at the face. With all of these advantages, it's not hard to understand why "Gelex" means greater speed, higher efficiency and lower costs in blasting.



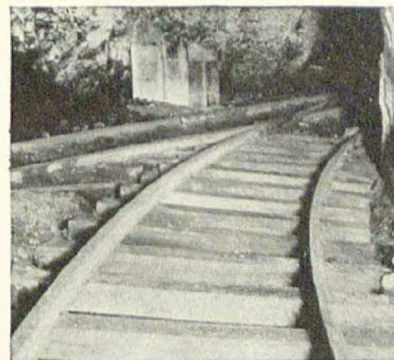
GELEX semi gelatin dynamite



VENTUBE ventilating duct

BY KEEPING THE ATMOSPHERE CLEAN with "Ventube",* you speed up work, and make it easier and safer. All you need is a suitable fan and tubing to reach workings. This flexible tubing is easy to hang — one man can install an entire system in a few hours. It takes little room, and goes around corners without appreciable loss of air.

"Ventube" is made of special impregnated cloth that resists acid water, damp and dry rot. Write for complete information.



CZC treated ties

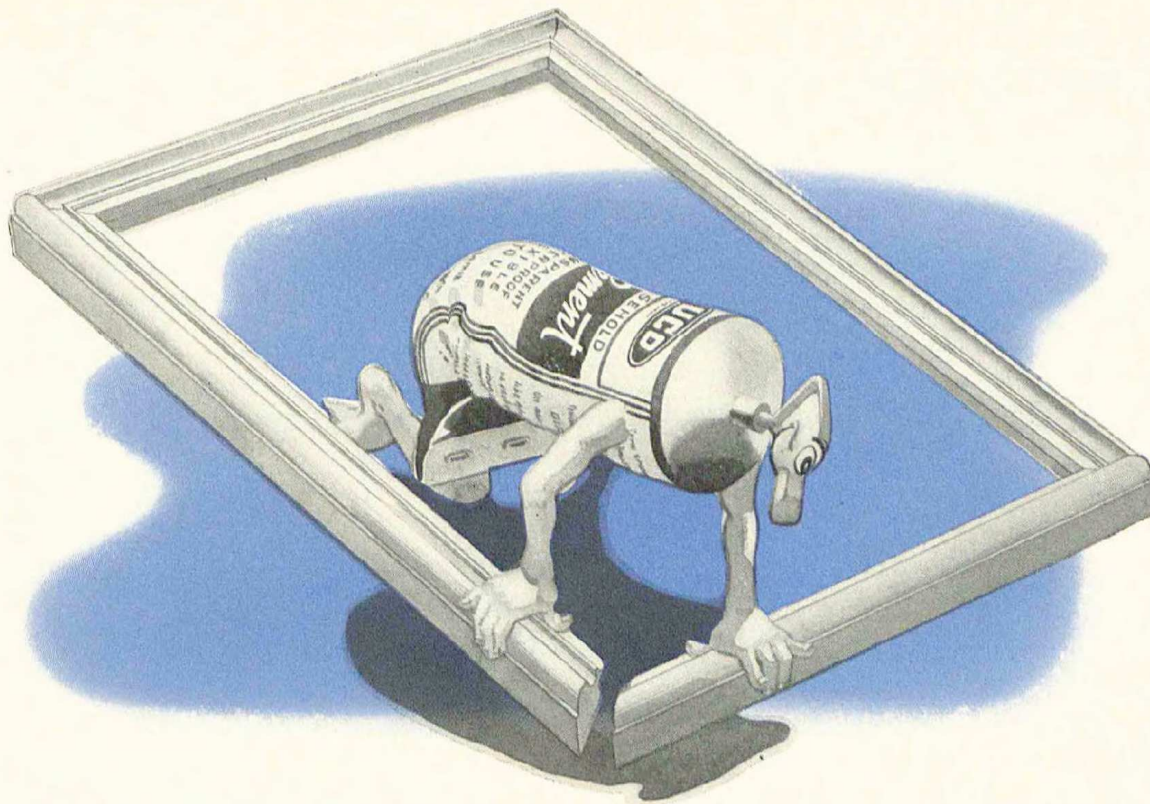
TIES AND TIMBER LAST MANY TIMES LONGER when treated with Chromated Zinc Chloride. This longer life in mines is due to CZC's decay resistance. This treated timber is also fire retardant, clean, odorless and safe to handle.

You'll find CZC treatment a wise investment for cribbing, shaft timbers, air course timbers, haulage way ties — all timber above and under ground. Write for locations of the nearest treating plants.

*Trade Mark



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



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... by helping make your old things do!

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And they know too, how handy it can be around the house... for mending broken dishes, for repairing furniture, for building models, for rebinding

old books... and for a hundred other purposes.

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