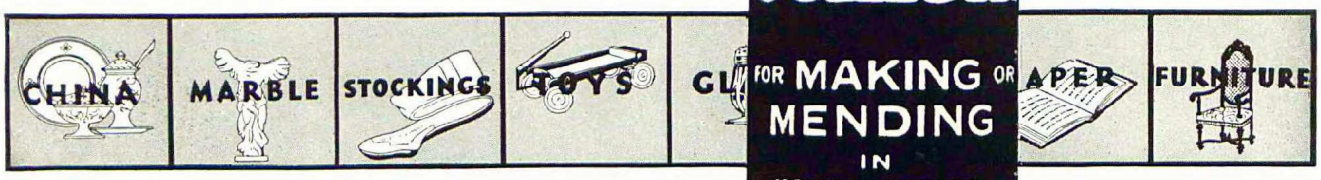
THE DU PONT MAGAZINE FEBRUARY 1933



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. . "Am lost without it for household mending."

. . "As general mending cement, none seems superior to Duco Household Cement. It mends anything."

. . "A much used article in my home. . . . Its uses are legion."

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COTTON, AND THE DYE CHEMIST

A résumé of some remarkable developments directly or indirectly concerned with the staple product of the Sunny Southland

By W. S. CALCOTT
Director, Jackson Laboratory

AMONG the natural textile fibers, cotton is by far the youngest. Early European travelers returning from Asia brought back word of a curious wool that grew on trees, and their fellow citizens, familiar with travelers' tales, were rather skeptical about it. However, samples were soon displayed and cotton at once came into favor. At first it was even more expensive than silk, but this merely stimulated the demand. It remained a fairly high-priced product until the English colonists were established in the Western Hemisphere; then, with cheap land and cheap labor available, more cotton was grown and it became the leading fiber. The invention of the cotton-gin completed the work of enthroning cotton as the king of textiles, a position from which it has not yet been displaced, although in these days thrones are less comfortable and secure than in the past.

Cotton is unique in one respect. Unlike other fibers which are used entirely or almost entirely as such, it serves both as a fiber for the textile industry and as cellulose, a raw material for several other industries of importance.

The chemist works with cotton in two ways: first, he treats it for use as a textile fiber and manufactures dyes for the purpose; second, he uses it as a raw material to produce other substances, such as "Pyralin," "Cellophane," lacquer, rayon, and the like. Both are fields of considerable magnitude.

Probably his first problem in treating cotton as a textile material comes about in this way. In order to bleach or dye the product, it must first be wet—and natural raw cotton is almost waterproof. How to overcome this difficulty? Well, since the water won't wet the cotton, he can do two things: change the cotton, or change the water. Ordinary absorbent cotton has been chemically treated; it sinks rapidly when placed on water. And raw cotton will sink, too, if there is added to the water a small amount of the so-called "wetting agents." These, incidentally, can be made from such diverse materials as vegetable oils, animal oils or fats, mineral oils, or coal-tar derivatives, including the humble "moth-ball."

The problem of removing the slight natural color of cotton hardly needs discussion. In fact, bleaching powder gets its name from its use for this purpose, although other bleaches are now available. But the coloring of cotton and other textiles has given rise to one of the most important of all chemical developments — the organic chemical industry.

Natural dyes have been used for centuries. The blue dye found in Egyptian tombs 3,000 to 5,000 years old is the same as that used largely on modern overalls, indigo. The only difference is that the Egyptian obtained his from a vegetable; we make ours from coal tar. For the most part, however, the natural dyes left much to be desired, for they were either not uniform, expensive, dull, or not fast enough. They are still used, but most colors are now chemically made.

The synthetic dye industry really began with a piece of bad judgment and good luck on the part of a young English chemist, W. H. Perkin. In 1856 he was trying to synthesize

Some time ago the Engineers' Club of Charlotte, North Carolina, joined with others in sponsoring a series of educational talks to be given in the local technical high school.

Mr. Calcott was asked to discuss cotton and its uses. He did so, at the same time demonstrating, with laboratory equipment, many facts about the product that are not commonly known.

The accompanying article is an adaptation of his manuscript which presents a story that will be illuminating to many readers of this publication.—Editor.



EWING GALLOWAY, N. Y.

Cotton-picking time in the South is a busy season when all hands turn out to gather the crop. The scene is reminiscent of ante-bellum days, and was photographed near Williston, South Carolina

quinine by oxidizing aniline, a process now known to be impossible. He obtained no quinine, but did produce a beautiful color, Mauveine, which he started to manufacture. The good luck part of the experiment was that his aniline was impure. Had it been pure, he would have obtained a greenish-black color instead of pink.

Germany quickly saw the possibilities of Perkin's work and, with governmental encouragement, dye production there advanced rapidly, soon swamping the English plants. The manufacture of synthetic dyes prior to the World War was predominately a German industry.

Outside of Germany and Switzerland only minor factories were established and, with the Germany monopoly founded on superior technical knowledge and skill, it was almost impossible to break it down. To Perkin's one pink dye others were rapidly added until a wide range of synthetic colors was available. The Germans then sought to duplicate the more important natural colors, such as indigo and Turkey red. The struggle for supremacy between natural and synthetic indigo was bitter and lasted for years, but in the end the triumph of the man-made product was complete, owing to its higher quality and lower cost. Hundreds of thousands of acres of land in India were released for food cultivation and natural indigo became almost a chemical curiosity.

With synthetic dyes solidly entrenched, new colors and even new kinds of dyes were developed rapidly. They were applied to all kinds of fibers and uses, and the methods were correspondingly changed and improved. Now there are available products which will dye wool or silk, but will not affect cottons. Others will dye cotton, but not wool or silk. Still others will dye both simultaneously. The technique of application has advanced steadily since Perkin's day.

Dyes have been developed that will change color readily, although the color change is used only for chemical work. Among them are phenolphthalein, Congo Red, Clayton Yellow and Brilliant Yellow. In this connection an amusing episode may be cited. During the late war, when indigo was scarce, some overalls were dyed with Congo Red, and a number of ammonia plant operators surprised themselves and their families one day by going to work in blue overalls and coming home in red ones.

Today, dyestuffs cover a very wide range of colors, applications and properties. While imperfections still exist in all lines, work is being carried on constantly to remove the flaws, so that improvements are still taking place and will probably continue.

Organic chemistry is so closely associated with textiles that we may well consider other developments in this field. For many years a standard criticism of cotton was that the fiber was not sufficiently glossy. The first solution of this problem was mercerizing, a treatment with strong lye, to render the surface of the thread glossy. Later, it was found that cellulose can be dissolved and reprecipitated by the use of suitable chemicals. By squirting the solution through very small holes, the material coagulates as fine threads, and gives an entirely new textile, rayon. Among the methods used commercially, the "viscose" process produces the greater part of all the rayon made. Its composition is so similar to the original cellulose, that it is called regenerated cellulose.

If it is coagulated in sheets instead of threads, we have a valuable product, Cellophane, which is chemically the same as rayon; the difference is merely in form.

Both Cellophane and rayon originally had the objectionable characteristic of being affected by water. However, means were found to remedy this trouble, and Moistureproof Cellophane is now produced on a large scale. While marked improvements have been made in rayon also, chemists have developed another new fiber, known as Acele. This product is not regenerated cellulose, but a chemical derivative, cellulose acetate, which is soluble in lacquer solvents,

but not in water. Both threads and sheets can be made from it.

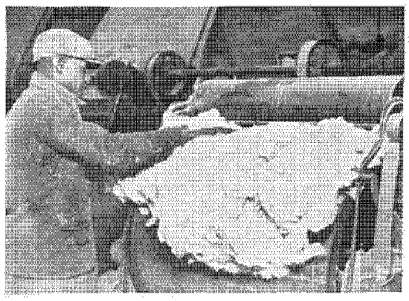
Acele, chemically speaking, is a combination of cellulose with acetic acid. By combining the cellulose with varying amounts of nitric acid instead of acetic acid, nitrocellulose compounds are obtained, among them Pyralin, certain lacquers, Duco, motion picture film and others.

Pyralin is essentially nitrocellulose that has been treated with camphor and then shaped. Incidentally, the camphor itself — formerly imported from the Orient — is now synthetically made in this country from turpentine. Camphor causes the material to soften on heating, so that the plastic can be molded into articles under heat and pressure. This cannot be done with nitrocellulose alone.

If more nitric acid is used in making nitrocellulose, another product results. Sportsmen know it as smokeless powder.

Again, by altering the composition of the nitrocellulose, it becomes adhesive to glass, and is used for making safety glass.

And Fabrikoid is substantially an all-cotton product. Its base is a cotton cloth, probably dyed, and it is coated with nitrocellulose, colored with pigments or dyes, and the coating is chemically produced from cotton linters. Millions of yards of cloth and large quantities of pyroxylin are thus combined each year in the manufacture of Fabrikoid.



In cotton seed oil mills, machines of this type are used to remove the short fibers adhering to the seeds. Cellulose, in the form of cotton linters, is an important raw material in many du Pont plants

EWING GALLOWAY, N. Y.

An essentially similar nitrocellulose, when liquefied in a suitable solvent, such as amyl acetate or banana oil, forms a very thick solution which was the basis of the old-style lacquers. If properly treated chemically, however, the solution becomes quite thin, and may be used to make lacquer products, such as Duco, for example. The former type is used to prevent metal from tarnishing; the latter is familiar as an automobile finish.

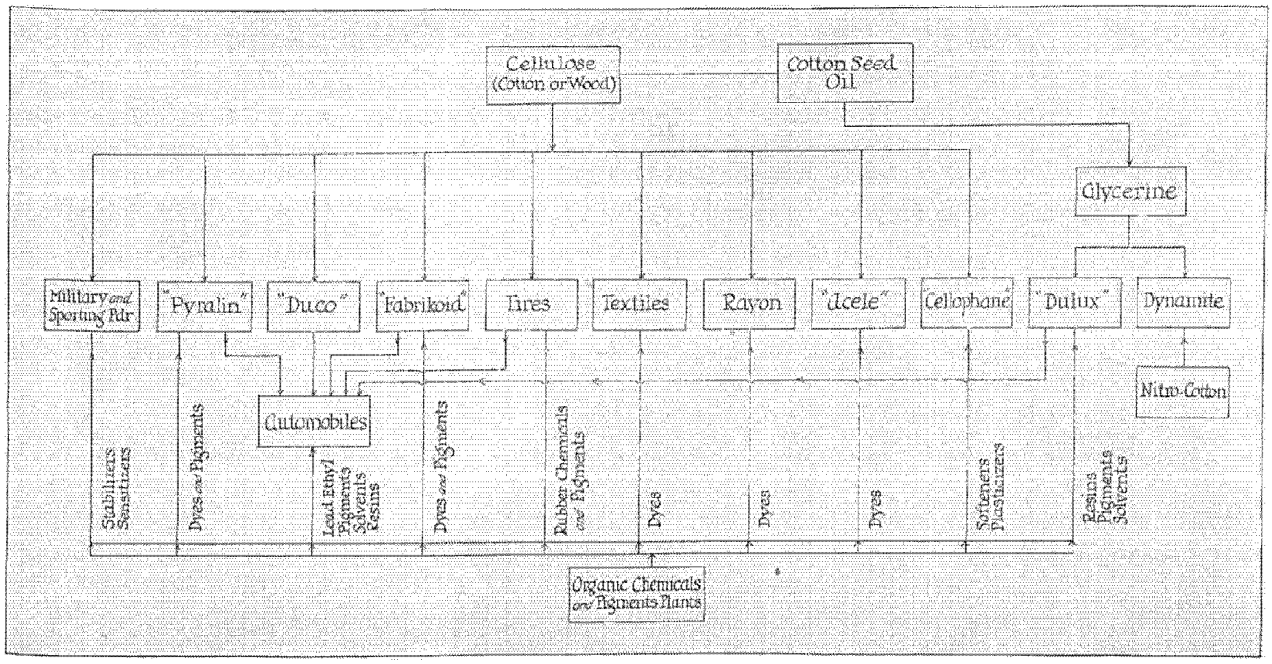
By suitable chemical treatment, other cellulose derivatives can be made, such as ethyl cellulose, which is soluble in plain water; cellulose glycolate, soluble in alkali, but not in acid, and so on. Also, simpler compounds can be made from cellulose, such as oxalic acid, glucose, dextrin, alcohol, acetic acid, and the like. These, however, are made from wood cellulose, although they could be made from cotton, if desired.

In producing the derivatives mentioned, it will be noted that an appreciable number of other chemicals are used, such as nitric, acetic and sulfuric acid. Their manufacture, partly for the textile trade, constitutes in itself an industry of no mean magnitude.

Cotton can be considered as the main support of the dye industry, which long ago ceased to confine itself to the production of colors only. The dyestuff business is today one important branch of the larger organic chemical industry which

In the chart below the trade names of certain du Pont products are shown. Those quoted are briefly described here, so that the reader may identify them as to type:

"Pyralin" . . . . . pyroxylin plastic
"Duco" . . . . . lacquer
"Fabrikoid" . . . . . pyroxylin-coated fabric
"Acele" . . . . . cellulose-acetate rayon
"Cellophane" . . . . . cellulose film
"Dulux" . . . . . a paint product



produces an enormous range of substances and may even be considered as one of the most important safeguards of any nation in time of war.

In discussing the derivatives of cotton it was pointed out that there is a basic chemical relationship between smokeless powder and other cellulose products serving entirely different uses. The initial processes of manufacture are essentially the same, so that any country which is equipped to manufacture moving picture films or pyroxylin compounds can, to a certain extent, utilize the same equipment and technical knowledge in producing smokeless powder.

This is, however, only the beginning of what we may term the interlock between the organic chemical industry and war materials. For instance, consider the important dye called sulfur black. It is made from dinitrophenol, a perfectly harmless yellow compound which consists of one molecule of carbolic acid to which have been added two of nitric acid. If, however, instead of stopping with two nitro groups in the molecule, as is done in the preparation of sulfur black, we add a third nitro group—and that is easily done by a process similar to that used for the first two—the product becomes picric acid, an important military explosive.

Similarly, nitrotoluene is very extensively manufactured by the dye chemists for use as an intermediate for a large group of dyes. This contains but one nitro group. If two more are added to the molecule, we get trinitrotoluene, better known as T.N.T. In both cases it is obvious that the skill, experience and apparatus necessary for making a peace-time product can be shifted almost immediately to the production of a military explosive.

Next, consider ethylene, which can be most readily obtained by overheating oil or natural gas. It is largely used in this country to produce ethylene glycol, the base of several anti-freeze compounds for automobile radiators. Converting it to ethylene glycol is essentially a process of treating it with bleaching powder and water. If, instead, the ethylene is treated with sulfur and chlorine, the resulting compound rejoices in the chemical name of dichlor-diethyl-mono-sulfide. World War veterans called it Mustard Gas. Many other cases might be cited.

So the reason for classifying dye manufacturing as a key industry is clear. No other branch of the organic chemical industry is sufficiently large and diversified to contain the possibility of expansion in time of national emergency along lines with which it is already familiar. Other chemists could, of course, learn the procedure necessary, but the dye chemist does not have to learn the reactions necessary to produce such materials, if unhappily the need for them should arise.

While less spectacular, the dye industry ramifications into peace-time products are normally much more important than one might suppose. When a chemist discovers some new material, he wants to find out what it is good for. If he has to make a new intermediate to produce a new dye, instead of stopping at that point, he goes on and in some cases the path leads to results of more importance than what he originally had in mind.

Phenolphthalein, for example, was originally developed so that chemists might determine whether a solution was alkaline or acid. For years it was made in small quantities for this purpose only. Later, its physiological value was established and now large quantities are made for use in laxa-



It has been stated that cotton has 900 major uses. Whether that is true or not, the chemist has developed from cotton cellulose a great many interesting products

tive preparations and related compounds. Literally, hundreds of other drugs have been put on the market as the result of persistent research.

The Bayer Company alone has submitted to the medical profession probably 500 or more different compounds. Among those of outstanding merit one, Aspirin, has become a household name.

While all the synthetic drugs were not developed by the dye companies, yet without their service it would have been difficult, if not impossible, for the synthetic drug business to have become established. Only the dye industry could finance the long research work necessary to furnish the raw materials from which the drugs were made.

The name of one well-known drug indicates that over 600 experiments were made before the discoverer could develop a satisfactory formula. This means that more than 600 different compounds were synthesized in the course of his investigation.

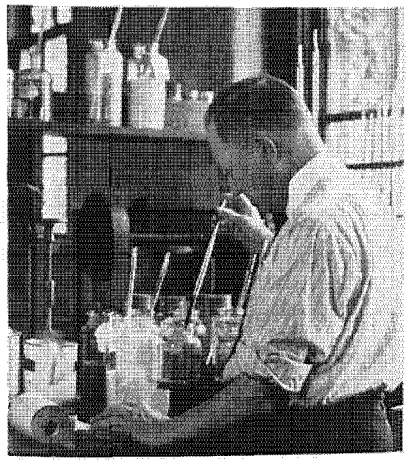
The remedy recently brought out for sleeping sickness bears a number which would indicate that more than 200 compounds were prepared before the right one was found.

In the rubber industry, results are even more spectacular. It is not many years since the average life of an automobile tire was from two to five thousand miles; now ten, fifteen and even twenty thousand miles are not uncommon performance records.

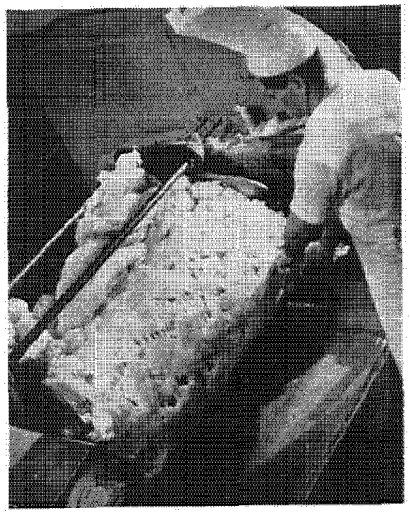
Part of the difficulty in making a long-wearing tire was the fact that in vulcanizing the rubber, it was necessary to heat it for hours. Prolonged heating of rubber injures it. The tire manufacturer was faced with this dilemma: he had to heat the rubber a long time to vulcanize it at all, and if he did so, his product would be of poor quality. The escape from this dilemma came with the discovery of rubber accelerators. Tires once requiring ten per cent of sulfur and six hours or more of heating are now vulcanized with three per cent of sulfur in forty-five minutes.

The resulting improvement in the quality of tires has been very marked. Considering, too, that large rubber companies have millions of dollars invested in the molds in which tires are vulcanized, and that this single discovery enables them to vulcanize from five to ten times as many tires per mold as was formerly the case, it can be easily seen why longer-wearing tires can be purchased at the low prices prevailing for several years. In fact, some enthusiasts claim that the phenomenal growth of the automobile industry during the past fifteen years would not have been possible without the use of accelerators. Every one of them now in use in the rubber trade is either a dye intermediate or is made from dye intermediates and raw materials.

Another difficulty the rubber manufacturer faced in trying to fabricate articles was the so-called aging. High-quality rubber would be turned out and within less than a year it would lose its elasticity, develop a sticky or resinous surface and become practically valueless. This behavior was traced to the action of air upon the rubber, particularly when heated.



Dyestuffs are indispensable in the textile industry. Their manufacture calls for the services of many trained chemists. In this picture you see one of them at work testing dyes in a du Pont laboratory at Deepwater Point, New Jersey



In the rolling room at the Arlington, New Jersey, plant, chemically-treated cellulose is shown here at one stage in the process of manufacturing Pyralin sheeting

Within a short time there was developed a class of substances known as anti-oxidants. While they do not absolutely prevent, they do reduce enormously the rate at which oxidation or aging takes place. Significantly, one of the most widely used anti-oxidants had been made for years as an intermediate for one of the wool colors. Quite a number of other rubber chemicals have been contributed by the dye and allied organic chemical industries, but these are probably the most striking and most important.

Now, let us turn to other fields. One recent discovery of importance in the paint trade ultimately rests upon a development in the dye industry. Exceptionally high-quality paints can be made from a class of synthetic resins known as glyptals. These resins in turn are made from phthalic anhydride, a material produced by the oxidation of naphthalene, which is the chief component of the common "moth-ball." For years before these resins were even thought of, phthalic anhydride was used in the dye industry, chiefly for such dyes as fluorescein and eosin. At one time indigo was made from the same intermediates. Its importance was such that its manufacture was intensively studied and finally a new and revolutionary method was developed by a chemist in the Color Laboratory in Washington. This brought the price down so that chemists, investigating other

(Continued on page 24)

HOW DU PONT PX CLOTH WAS DEVELOPED

A glimpse behind the scenes shows how a problem was approached in a du Pont laboratory, and solved

By PAUL W. SAMPSON

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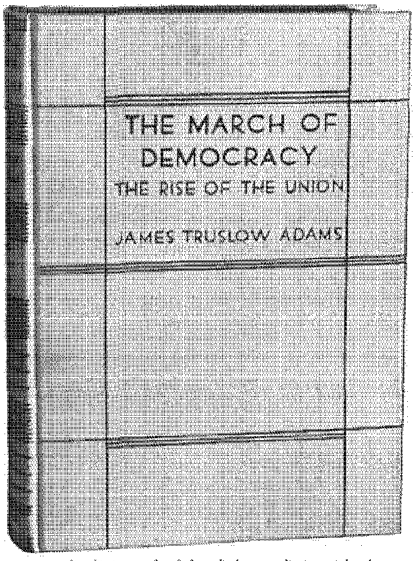
How would you like to take a glance behind the scenes at the development and marketing of a new du Pont product, and a final flash at the product on dress parade, already beginning to play a part in the everyday lives of millions of people the world over?

The product up for a case study is PX Cloth, one that you cannot escape if you read books, for already this material is beginning to appear as the binding of best sellers. It establishes a new standard in one of the most ancient of industries, bookbinding.

In du Pont laboratories very little is done on idle speculation. Dr. Elihu Thomson, a famous research expert of the General Electric Company, once outlined a philosophy of invention that applies perfectly to the du Pont plan: "The first step is to conceive a need or use, examining the existing art or processes or to imagine a desirable something or process which might respond to or create a demand. Another phase is to have presented an existing demand requiring the solution of a problem."

In this case the need had been recognized for some time, so that the idea of improving book cloth was neither new, nor was it brought into sharp focus by an overnight development in the bookbinding industry. It was a part of the background. The broad outlines of the picture were plain enough to be seen, but the details were not clearly defined. Here was a chance to do some constructive work by planning a program of research based on the facts and then building the product.

The first step in the development of PX Cloth was to find out if there was a definite need for it. In this case the du Pont Company did not have to go far to procure the information. With an intimate knowledge of the bookbinding industry and with more than twenty years' experience in supplying products used by bookbinders, the company was in a singularly fortunate



A distinguished book by a distinguished author. The publisher, Scribners, selected Du Pont PX Cloth as the binding material

position from the outset. Much information was already at hand, and more might easily be obtained.

Day by day thousands of yards of Fabrikoid are used in the binding of high-grade books. Hardly a week goes by that a du Pont technical expert is not called into consultation by a bookbinder on some particular problem. In addition, special representatives have submitted cover designs and bindings to publishers months before the public knows that a future best seller is rolling off the presses.

Over a period of years, the use of long-wearing and washable Fabrikoid on high-grade books had built up a need for a product with many of Fabrikoid's qualities at a price that would permit of its use on the $2.50 trade books, the fiction best sellers, and 100,000,000 textbooks used in the United States every year.

Field representatives and technical men, after studying this need intensively, finally brought back the information that the times were ripe to develop and market such a product. They had gathered enough information to be reasonably sure that bookbinders would welcome a material with improved properties, but the question was, could it be produced to meet the requirements of the trade? There were limitations surrounding the project on all sides—important ones that called for close study.

The problem turned over to the laboratory staff at Newburgh was a knotty one. Narrow profit margins, lower book prices, made it essential that the new product should be in the price range of a high-grade book cloth which was then in use on the better trade books. Cost was definitely a major consideration.

Physical properties were next considered. Fabrikoid, as used on high-grade books and subscription sets, and even on such editions as the *100 Best Short Stories*, published by Funk and Wagnalls, would have been perfect for the purpose, if a slightly higher price had not been a barrier which prevented Fabrikoid's conquest of this market from being entirely complete. A product possessing certain properties of Fabrikoid was highly desirable, for nothing finer for binding has ever been developed.

This, then, was another complication—the requirement that the material must have, to as great a degree as possible, Fabrikoid's major properties.

Nor was that all. It must conform entirely to the best bindery practice. Binders were accustomed to do ink stamping and gold stamping work with high-speed apparatus. This new material, when offered, must not necessitate any essential change in

equipment. It must offer no difficulties to end-sheet adhesion. (The end-sheet is the inside lining of the cover, back and front. Sometimes, in library books, it is made to serve as the pocket for the lending card.)

To be acceptable to the market, this processed cloth must wear as well, handle as well as other materials in general use, be in the same price range, and yet offer marked advantages over them.

How would you like to be a chemist, and have a problem like that assigned to you on a crowded Monday morning?

With that list of requirements to be met, the task was formidable enough. But there were still others which had to be considered.

The finished material must be water-repellent and cleanable, two of Fabrikoid's properties. Making it cleanable was highly important, for that would automatically make it a first choice by school boards who buy millions of textbooks each year. The germ-collecting textbook cover has long been the bugaboo of sanitation in the school. Such books go into all sorts of homes during their probable life of five years, so a cleanable cover has always been of prime importance to educators. Witness the brown paper jackets that are commonly used to protect the books your children study at school.

Water repellency was high in commercial significance, as every reader realizes, for the average cover had a tendency to become lumpy, and very much bedraggled, when wet. It needed a duck's back.

In bookstalls, too, cleanability was of great importance, inasmuch as it would cut down losses from books becoming shopworn through too much handling.

Another advantage was that publishers would be able to specify lighter colors for the sake of salability, something not possible with easily soiled, non-cleanable covers previously in use. Incidentally, "*The March of Democracy*," in Du Pont PX Cloth, is one example of how a light color has been successfully used.

Building the product began with the selection of a high-grade piece of base fabric, higher in thread count than the base fabrics ordinarily used. The term refers to the number of threads to the inch, both ways, and is a factor in determining tensile strength.

Chemists working on the project found the job of making the cover material water-repellent a relatively simple one. Some of them had spent half a life-time making fabrics waterproof. But that was only one phase of the problem. Could PX Cloth be processed so that it would retain the appearance and "feel" of book cloth, and at the same time meet all the other technical, trade, and market requirements. That was the difficult part of the work. Chemists and physicists tackled the assignment, made up experimental lots by the scores, and tested them, and after months of work, marked by many failures, learned how to make a processed fabric conformable with specifications.

Rolls of the material were made and delivered to binderies in New York for testing purposes. Technical men watched the material go through all steps of bindery practice. Not a kink developed.

PX Cloth was ready for the industry.

Research had scored again after a long, hard fight. Is it any wonder that this material should have become overnight the most talked of development in bookbinding?

Scribners chose it for their foreordained best seller, "*The March of Democracy.*" Other publishers followed suit rapidly. Simon and Schuster used it for their title, "*Money Contract*"; Dodd-Mead, for the book, "*Danger in the Dark.*" The list has grown so rapidly that the only possible way to "keep tabs" on it would be through a census of the bookstalls.

Plans are now being laid by leading school-book publishers to use PX Cloth on their 1933 editions. School superintendents and boards of education, anxious to make the wisest purchases in a time of economy, have been quick to sense the importance of this PX Cloth development in the school textbook field.

This quick glimpse behind the scenes will perhaps give a clearer idea of the work involved in developing a product to meet the need of the bookbinding and publishing industry. A new line in the log book of Progress has been written—Du Pont PX Cloth.

Du Pont PX Cloth is used extensively by many book publishers. Left to right, the books illustrated below are—

Danger in the Dark, by Arthur M. Chase (Dodd, Mead & Company)

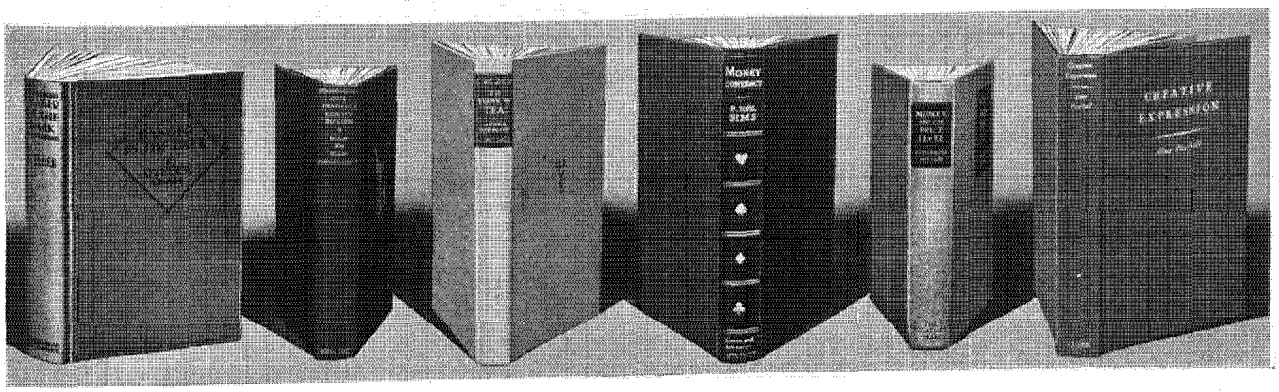
Our Obsolete Constitution, by Wm. Kay Wallace (The John Day Company)

To Think of Teal, by Agnes Repplier (Houghton Mifflin Company)

Money Contract, by Philip Hel Sims (Simon & Schuster, Inc.)

Money and the Price Level, by Huntington Wilson (The Century Company)

Creative Expression, by Alma Paschall (Harper's)





To millions of people in this country Emily Post is recognized as the final authority on etiquette and good taste. Twice each week she talks to the women of America on subjects of vital interest to them in their homes and daily social life

EMILY POST, HOSTESS TO 13,000,000 WOMEN

The Du Pont Cellophane Company is sponsoring a popular radio program that is educational, newsy and entertaining

By PAUL A. DILLMAN

In 1924, if you had asked a hundred people what "Cellophane" was, probably not more than one could describe it. Therefore, when du Pont first began to manufacture cellulose sheets under the trade name "Cellophane," a campaign was started to tell the other ninety-nine about its many advantages.

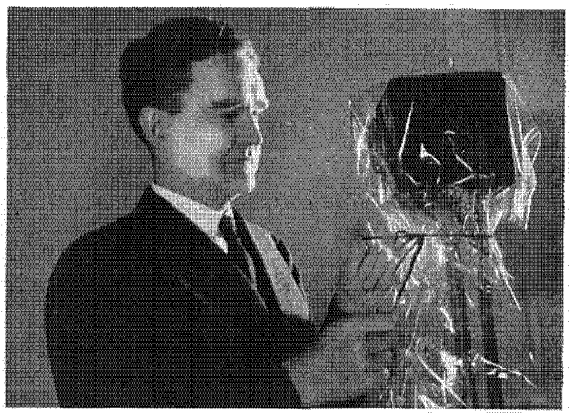
For six years leading national magazines have been used to build up a preference for products wrapped in Cellophane, with the result that millions of people know at least some of the properties that recommend Cellophane for use on all kinds of package merchandise. Their daily contact with it has in itself been an educational force. Public appreciation of its merits has reached the point where many manufacturers have considered it worth while to advertise extensively their acceptance and use of this cellulose film on their own packaged products.

During the latter part of 1932 it was believed that the American public would be interested to know more about the protective properties of Cellophane. A radio morning period was selected as a medium to round out the advertising program, particularly as a means of reaching a large group of women. The first broadcasts went on the air in November from WJZ and associated stations of the NBC Network. Since then they go out every Monday and Thursday morning to an estimated audience consisting of 13,000,000 women.

Among the artists on this program is Emily Post, who is recognized by millions of women as the final authority on etiquette and good taste in the home. She has written several books and her articles are regularly published by a number of leading newspapers throughout the country.

Mrs. Post talks each time about some subject of interest to women—the planning of inexpensive parties, good taste in entertainment, hospitality—in short, the art of living.

One recent suggestion for giving a small party is particularly representative of her talks. In it she explained how easy it is to be a successful hostess, if certain fundamental rules are observed. For example, in giving a party, it is important to invite a group of people who are congenial. For, as Mrs. Post pointed out: "A distinguished party is a collection of



The Master of Ceremonies at the initial Cellophane broadcast was the nationally-known writer, Bruce Barton. The program was officially opened when he removed the Cellophane from the "Mike"



The Harding Sisters, radio stars in their own right, are now Cellophane stars for they, too, are on these programs. Their tuneful pipe-organ and piano duets are acclaimed by appreciative fans

distinguished people; an amusing party is a collection of amusing people; a dull party a collection of dull people, and a friendly party a collection of people who are friendly to each other."

In another radio talk Mrs. Post discussed the art of conversation. She explained not only how to begin a conversation but also suggested what might be talked about with propriety, since the outstanding taboos of good taste are most frequently concerned with those of speech.

Other topics on the scheduled program are Children's Parties, Bridge Parties, The Hostess of Charm, Furnishing a New House on a Small Budget, and the list runs on.

Mrs. Post's talks each week deal with these and kindred subjects, and her remarks are always competent, authoritative, interesting and helpful to women in their homes and social activities.

Other artists on the program are Edward Nell, baritone, and the Harding Sisters, playing their unusual piano and organ duets.

Mr. Nell, who has a remarkably rich voice, thrilled the public some years ago when he sang the rôle of Francois Villon in "The Vagabond King." Besides his stage experience, he has been a popular concert singer, and has also made his mark in the motion picture world. The songs of this versatile, talented artist are greatly enjoyed by those who listen to these interesting programs.

If you have ever heard the combined music of a grand piano and a majestic pipe organ, you can appreciate the quality of entertainment the Harding Sisters offer on the Cellophane program. They are stars in their own right and their work is acclaimed by millions of appreciative radio fans.

In this series of broadcasts, Cellophane Homecraft—the national pastime of making useful articles in the home from Cellophane — is being discussed. Millions of women are invited to secure complete and authoritative instructions on how to make purses, lamp-shades and many other artistic and useful things from Cellophane. Thousands of these listeners have already accepted this invitation and are now busily engaged in making articles which have been recommended to them by means of the Cellophane radio program.

In addition to this, news about the latest developments in Cellophane is also being broadcast. Through it, housewives are learning more about Cellophane's protective advantages and its interesting applications to many fine products. Moreover, this information is presented timely, for it comes to them just before they go shopping in the morning, and it is a fifteen-minute period well spent for a program as entertaining, educational and newsy as this one.

If the feminine members of your family have not yet heard one of these radio programs, suggest that they tune in WJZ or one of its associated stations of the NBC next Monday or Thursday morning, at 10.45 Eastern Standard Time—9.45 C. S. T. A real treat is in store for them. And if they would like to receive a copy of Mrs. Post's talks or would like to have her discuss some particular topic, the way is open merely by addressing a request to the Du Pont Cellophane Company, Empire State Building, New York City.



Another artist on the Cellophane program is Edward Nell, whose rich, melodious baritone voice has often been heard in operatic and concert work and now furnishes a real thrill to the radio audience

BETTER CHAIRS FOR YOUNGSTERS

The story of how one manufacturer improved his products through the use of Pyralin Sheeting

By R. T. ELLIS



"Now, bring on the food." A well-pleased child is ready to be served with another tempting tidbit. His new tray is covered with Pearl Pyralin, an excellent material for the purpose

Back in the lush days of prosperity when merchandise moved freely from mills and factories to consumers' homes, a manufacturer who turned out an article as good as or a little better than that of his competitors was quite sure to build up his trade. Even a slight improvement in design or finish was usually enough to attract buyers. But when evil days came, alert manufacturers realized that if they expected to gain or hold leadership, they would have to develop really outstanding lines.

About a year ago a Wisconsin high chair manufacturer was struggling against competition and seeking to improve his products. He critically surveyed their design, workmanship, finish, the materials from which they were made, all in relation to the needs of children and their mothers. Where could he make any major improvement and in what particular? In the end he decided that trays were not as satisfactory as they might be. So he resolved to make better trays, and he began to look about for a material in which would be combined certain properties and qualities.

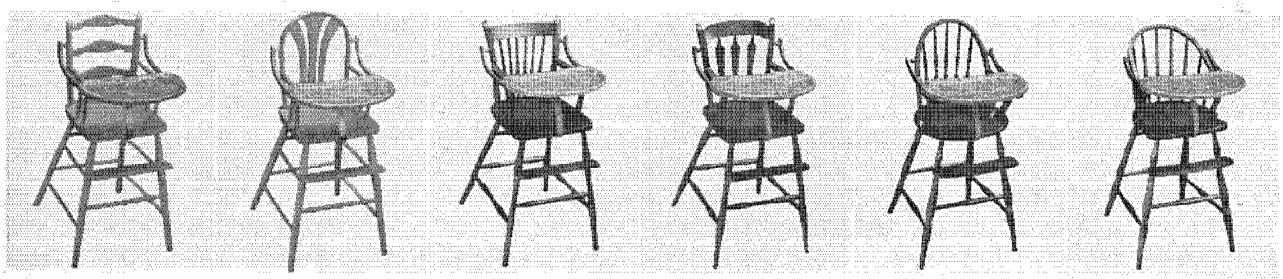
He needed a substance that would not break, chip, crack or tarnish. Moreover, it must be sanitary, easy to keep clean, and more attractive than any materials previously used.

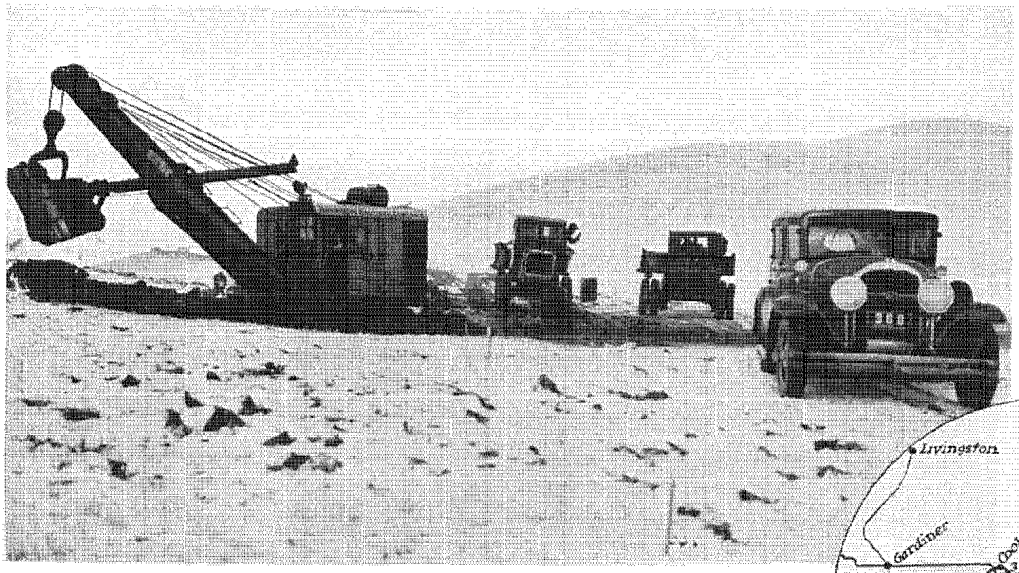
To find one material meeting all these requirements was not an easy task. Natural substances were good enough in some respects, but failed in others. Eventually, persistent search led to the consideration of chemical products and to Pyralin.

Samples were obtained, tests were made. A du Pont service engineer collaborated with the Phoenix Chair Company in developing a wooden tray which was covered with Pyralin Sheeting by a method that insured skin-tight adhesion of the two materials. Many experiments were conducted with various thicknesses of Pyralin under various conditions before the one best way was found, but these technical problems, one by one, were solved satisfactorily.

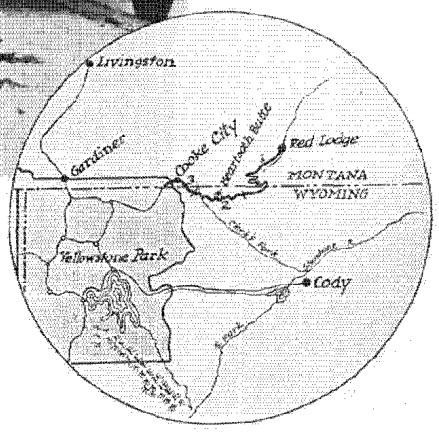
At the July Furniture Market last year, the Phoenix Chair Company introduced seven new patterns in various finishes with three types of trays—wood, plain Pyralin and Pearl Pyralin. The complete line consisted of seventy-eight chairs, and it was well received in trade circles. A major improvement had been made.

These Pyralin trays are sanitary, will not tarnish or chip, and the color combinations available are practically unlimited. Walnut, maple, ivory, blue, green and orchid are some of the colors in which these improved trays may be obtained. A few of them are illustrated here. But the point is, following this showing, sales went soaring to new heights, and now the company is one of the leaders in its field. Naturally, the company has profited by its use of Pyralin and is enthusiastic about the new line. It may be taken for granted, too, that requests for more information about these high chairs will receive prompt attention. The Phoenix Chair Company's address is Sheboygan, Wisconsin.





Highway building on the mountain top; elevation 10,000 feet. This view was taken August 15, 1932, but note the frost on the windshield of the nearby automobile. The map below shows approximately the location of the new highway



ROADS TO GEYSERLAND

Another highway entrance to Yellowstone Park is being constructed at a cost of $2,000,000

By E. H. SIMPSON

The Yellowstone Park in the northwest corner of Wyoming extends about three miles into Montana and Idaho, and is one of the most sparsely populated regions of the United States. This park is surrounded by Idaho, Montana and Wyoming, the combined area of which is nearly equal to that of all the states bordering on the Atlantic Coast. Yet the total population of these three states is twenty per cent less than that of Connecticut alone. Clearly, this paradise of wild life, this area of botanical grandeur and geological wonders, is not concerned with density of population. Except for small villages at the north and west entrances, there is not a town closer to its borders than fifty-five miles.

The park, embracing 3,114 square miles, spreads out boldly, almost defiantly, on the very backbone of the Rocky Mountains. It is a wilderness of mountains, groves and grass plots, of crags and canyons, of hundreds of lakes that find their outlets to both the Atlantic and Pacific through eager, rushing streams. To the south are the Tetons, to the west the Gallatins, and on the north and east the lofty Absarokas and Beartooths.

Most of these mountainous areas are heavily clothed with coniferous trees, and millions of acres have been set aside as National Forest lands.

Thus, the Yellowstone would seem almost inaccessible. But for Mother Nature, it would be. Waters from its hot springs, geysers and glaciers form into four well-defined rivers which, through the ages, have eroded deep canyons through these mountain barriers. The Shoshone flows eastward, and along this river the famous Cody Road has been built. The Snake flows down through the Jackson Hole country, making a south entrance possible. To the west, the Madison drains its largest geyser basins, and makes ingress easy from that direction. The Yellowstone, after tumbling in cascade form more than 300 feet from the lake of that name, has cut its way north through canyons more than 1,000 feet deep. Along this river trails an excellent paved highway; in fact, all four entrances are excellent highways—ninety per cent up to Bureau of Public Roads standards.

But public opinion demands more, and so another one is being built—the Red Lodge-Cooke City Highway which traverses a mountainous region, wild beyond description. Except for three "dude" ranches that operate in summer only, it passes no human habitation. It will be sixty-eight miles long, and will cost over two million dollars. Starting from Red Lodge, Montana—about 5,000 feet altitude—it follows a mountain stream for fifteen miles to an elevation of about 7,000 feet.

The topography here necessitated leaving the stream and climbing a very steep mountain 3,000 feet high, to a plateau over the state line into Wyoming, where the road reaches an altitude of 10,000 feet. Mr. H. E. Mitchell, resident engineer for the Bureau of Public Roads, and his coworkers spent many months in negotiating surveys, the final one being well within Federal-aid specifications both as to gradient and curvature.

This twenty-six mile section, which is being constructed by Morrison Knudsen Company of Boise, Idaho, involves building twelve miles of

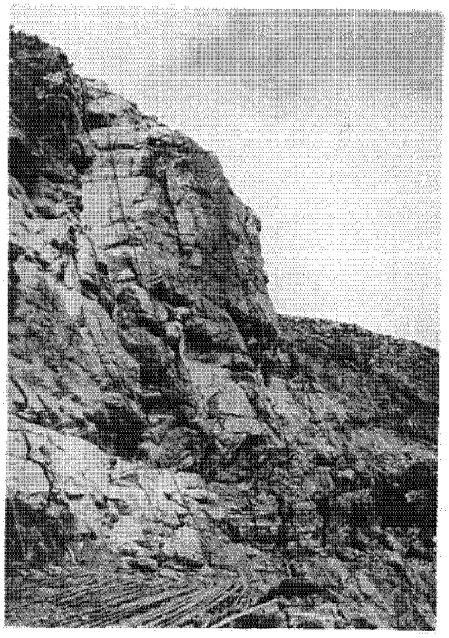
WHERE THE ROADWAY WILL OPEN NEW

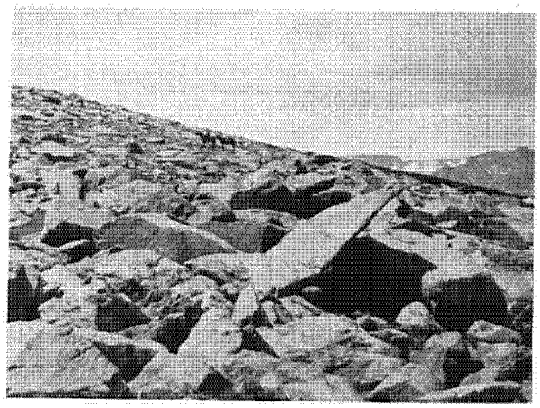
Right—Above the clouds on the Red Lodge-Cooke City Highway. The contractor's camp is about 2,000 feet below. At the extreme left you get a glimpse of the road



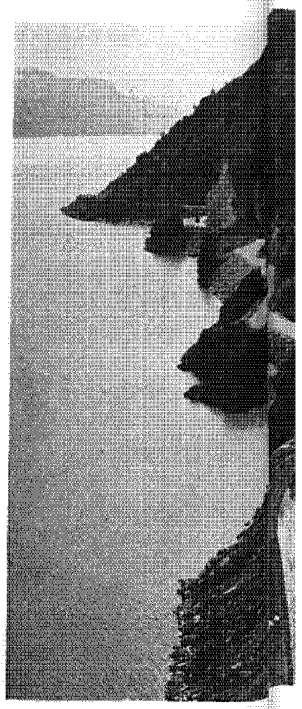


Top, center—After climbing 3,000 feet up the mountain over the twelve-mile switchback road, a backward glance shows the starting point in the valley, hardly more than a mile away





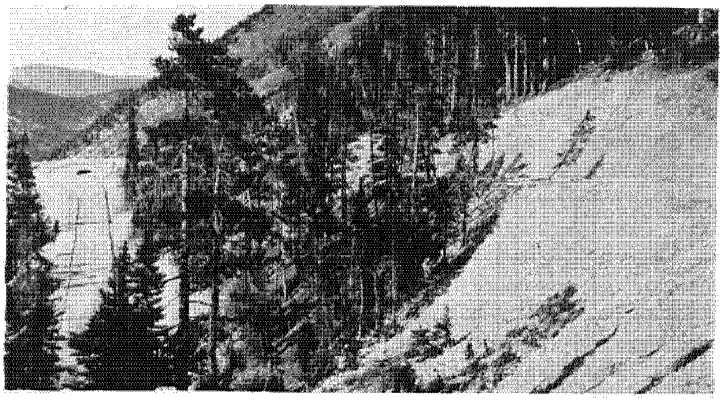
Above—The Red Lodge-Cooke City Highway route crosses miles of boulder fields like this. Glacial deposits here have made the work of building roads extremely difficult. For comparative size, note the two horses, left center, near the horizon line

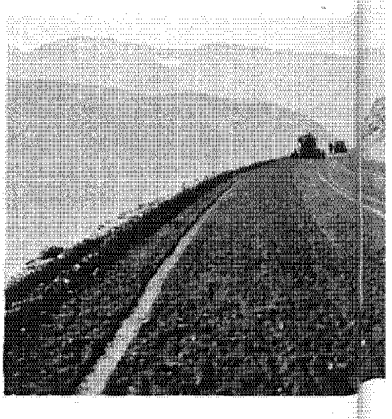


E. J. HISCOCK PHOTO

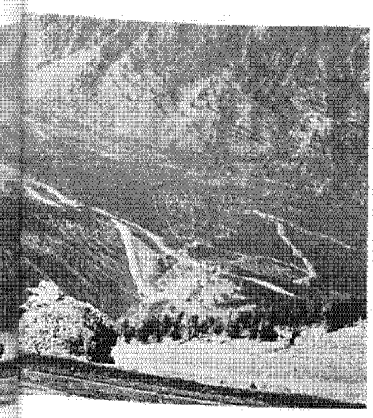
Above—Where the highway hugs a cliff of granite. Twenty thousand pounds of dynamite were used in this vicinity

Right—A section of the "switchback" up the mountain. In the distance at the left may be seen one of the hairpin turns





VIEWS TO YELLOWSTONE PARK TOURISTS





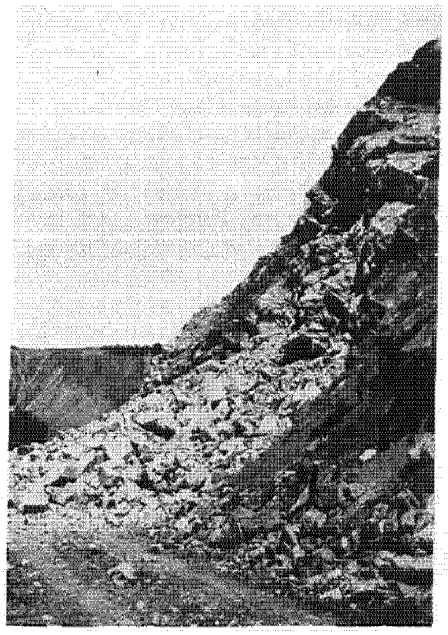
Left—The result of a blast on the switchback section. Debris thrown down from an upper level lodges on a part of the road already graded, necessitating some "clean-up work"

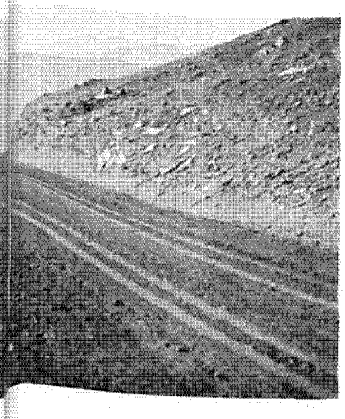


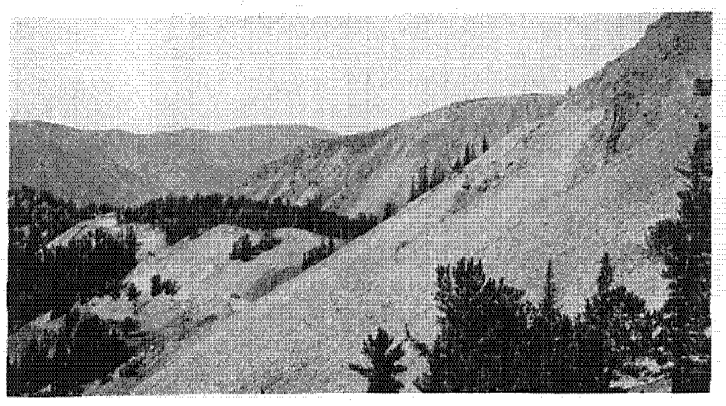
Left—Tourists who have traveled over the Cody-Yellowstone Highway will recall the scene pictured here . . . the tunnels and the beautiful expanse of Shoshone Lake at the side of the road



Above—A steam shovel working around the rim of the huge "bowl" described in the accompanying article. From this viewpoint, approximately 12,000 feet above sea level, future tourists will have a magnificent view of twenty lakes at the bottom of the depression, 1,000 feet below







Above—The result of a dynamite blast on a cliffside location

Left—A backward view of the road as it climbs the mountain

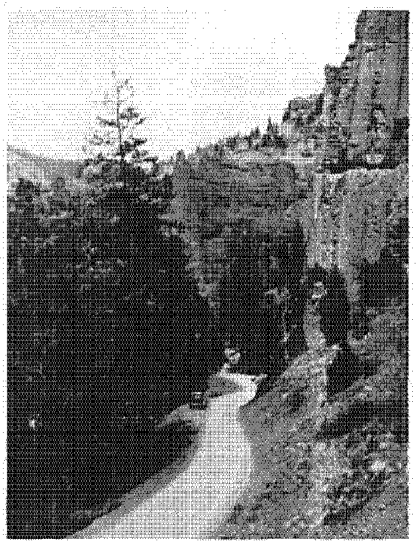
Bottom, center—A finished section above the timber-line on the Red Lodge-Cooke City Highway

serpentine switchback highway to advance a little more than one mile as the crow would fly.

Beyond, the survey traverses a plateau gradually reaching an altitude of about 12,000 feet—where summer never comes. It crosses great boulder fields, and for a distance of over a mile it skirts an almost perfect bowl-like depression, more than two miles in diameter and over 1,000 feet deep, created by a prehistoric glacier. Within this big "bowl" nestle more than twenty lakes, varying in size from that of a city block to ten acres. Glaciers cling to the mountain sides all around. This is the crest—cold, weird, awe-inspiring, unforgettable.

From this "top of the world" the route descends over a glaciated area, where for about three miles the highway builders had to blast through solid granite to get down to a lower plateau. Winding amid many small lakes the highway passes Beartooth Butte, a majestic mountain peak, and plunges through a canyon, finally emerging into a pastoral section, where elk, deer and moose graze in harmony. From this point you look down a thousand feet or more on the Clark's Fork River, while in the distance the Absaroka Range—snow-capped and majestic—is silhouetted against the sky. By easy gradient the road leads on down to Clark's Ford.

Work on this twenty-five mile section—marked No. 2 on the map—has been contracted to McNutt & Pyle-Washburn & Hall, of Eugene and Portland, Oregon.



This view shows a section of the Cody Road, about thirty-five miles west of the city. Note the fir and spruce trees on one side and the "Pallisades" on the other

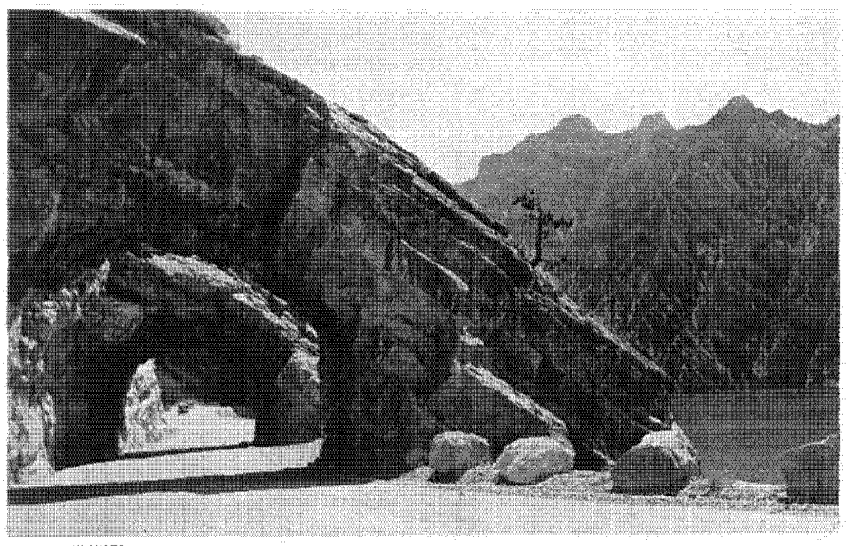
The remaining seventeen miles, section 3, is under contract to Winston Brothers, Minneapolis, Minnesota. The roadway follows the Clark's Fork and other streams for about seven miles and then climbs over and through a "pass" across the Absarokas; thence around the bases of Pilot and Index peaks, through a dense forest of fir and spruce into Cooke City, now a small village, although it once claimed a population of 3,000. That was back in the good old days when the lure of gold brought to the region a great many people who sought wealth, diligently and persistently using their picks and shovels until finally they grew disheartened and moved on to more promising localities. From this point the route follows the old stage road about three miles to the Yellowstone Park boundary.

Construction work on this 68-mile highway was started September 1, 1931, and will be finished by the fall of 1934. When completed, more than one-half million pounds of explosives will have been used. While the nature of the material blasted required many different kinds of explosives—du Pont Quarry Gelatin, 40 per cent and 60 per cent, and Red Cross Blasting F. R. Nos. 3 and 4 were the leaders.

Eventually, this highway will be continued another twenty-nine miles to Tower Falls Junction, where it will connect with Yellowstone Park's Grand Loop Highway, which touches the principal points of interest, with branches diverging to the four entrances; in all, 222 miles of excellent highway.

Since 1917, when motor vehicles were admitted to the Yellowstone, steady progress has been made in highway improvements. Now, less than seventy-five miles are below Federal standards. Nearly all the roads are tarvia paved, and they are well maintained for the use of many thousands of tourists who visit the park each year and enjoy motoring to places of unusual scenic interest.

Sections of the "Grand Loop" are now being relocated and reconstructed at a cost of about $1,000,000. The work is contracted to S. J. Groves & Sons Company, Minneapolis, Minnesota; Stevens Brothers, St. Paul, Minnesota; and Morrison-Knudsen Company, Boise, Idaho.



F. J. HASCOCK PHOTO

The Cody Road to Yellowstone Park is delightfully scenic with something new at every turn. Here you see the triple tunnels, where drillers and blasters have made the tourist's trail more inviting

AN INSTITUTION OLDER THAN THE NATION

It has rendered conspicuous service in New York City since 1769, and is now located in new quarters with excellent facilities for continuing that record

A MAGNIFICENT group of eleven buildings which has been rising for two years in New York City has finally reached completion. It is the New York Hospital and Cornell University Medical College.

The hospital was founded in 1769, under a royal charter from King George III, primarily to train doctors for the Colonies, but it was used as a military hospital during the Revolutionary War.

In 1791 civilians were admitted and for the next seventy years a large share of its facilities and staff was devoted to the care of patients suffering from epidemic diseases.

During the Civil War, more than 3,000 wounded soldiers were given free treatment in this hospital, and a similar service was rendered during the Spanish-American War. The World War saw it playing the same rôle of mercy, this time for the Navy and for shell-shocked Army officers.

During the past 161 years it has been closely associated with schools of medicine. The original hospital staff was the medical faculty for students of Kings College, now Columbia University. From 1807 to 1869, students at the College of Physicians and Surgeons received their instruction here. From 1866 to 1869 the hospital housed the Medical College of New York University, and also served Rutgers College. For the past twenty years, its chief affiliation has been with the Medical College of Cornell University.

Philanthropist George F. Baker, in 1912, enabled the hospital to devote more of its wards and services to teaching, and an endowment from the estate of Payne Whitney in 1927 made possible a further extension of this work. At this time relations with the medical school were strengthened through an agreement with Cornell University. A joint administrative board was established, composed of three governors of the New York Hospital, three representatives of Cornell, with J. Pierpont Morgan as the seventh member.

For over a century the rising barrier of buildings has kept New York Hospital moving farther uptown, where sunlight could be obtained. It was this consideration that led the management to acquire three city blocks between 68th and 71st Streets, where the East River and the grounds of the Rockefeller Institute for Medical Research will insure against further encroachments.

With its long background of service, it is fitting that this institution should be housed in one of the world's finest medical centers.

The completed project includes a central hospital unit, three special clinical institutes for psychiatry, pediatrics, maternity and gynecology; the school of nursing and nurses' home; a combined power plant, laundry and garage; a residence for employees, and the buildings for Cornell University Medical College. Altogether, they occupy six and one-quarter acres of ground.

In preparing the foundations, du Pont explosives were used to blast out 400,000 tons of rock, the excavation in some places extending forty feet below the river level.

The center will have a population of 3,000 persons, including patients, doctors, medical students, nurses and employees. Quarters are provided for 125 resident doctors and 500 nurses, and facilities for 300 medical students.

It may be noted, too, that in the finishing and furnishing of this new home, Myers, Minott & Company, Inc., of New York City, made use of a number of du Pont products, paints and varnishes and the like. Incidentally, natural sunlight is admitted to all of the 8,150 windows through another well-known product, du Pont Tontine washable window shades.



The main building of the institution, shown here, is twenty-seven stories high, and is a beautiful structure as you will note. The completed project includes eleven buildings occupying more than six and one-quarter acres of ground

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THE DU PONT MAGAZINE

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E. R. MANCHESTER . . . . . *Editor*

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VOL. XXVII FEBRUARY, 1933 NOS. 1-2

WHAT A MACHINE!

MACHINES in motion are always interesting, and those with wheels spinning rapidly rarely ever fail to attract one's notice. Large or small, there is something fascinating about them that invites speculation. All of which has its bearing on the illustration reproduced on the front cover of this number. For it may be assumed that few readers of this publication have seen a gas compressor as large as this one, and fewer still know its function in the manufacture of an important product, synthetic ammonia. The picture was taken in the plant of the du Pont Company at Belle, West Virginia.

Water gas from coke is the raw material used. The finished product is anhydrous ammonia, the chemical symbol of which is NH_3. In other words, a gas of one composition is transformed into another gas consisting of nitrogen and hydrogen in the proportions indicated. It is much too long a story to describe the process here, but it may interest you to know that the water gas is subjected to a pressure of about seven and one-half tons to the square inch, and later to a temperature of 1000° Fahrenheit, before the ammonia of commerce is produced. The machine illustrated is believed to be the largest unit operating at this super-pressure in any nitrogen fixation plant.

Ammonia compounds are used extensively in the manufacture of high explosives, commercial fertilizers and many other useful products.

THE PERFECT AVOCATION

AS an interesting sidelight on the PX Cloth article in this number, we learn that Mr. A. M. Chase, treasurer of Dodd, Mead & Company, publishers, of New York City, writes detective stories for his own diversion.

His well-known book, "The Party in the Penthouse," ran through three editions last year. "Danger in the Dark," his latest book, which came out early in January, gives promise of being equally successful. It is shown in the illustration on page seven.

Mr. Chase has evidently discovered the perfect avocation — one that affords pleasure and relaxation and furnishes an addition to the income.



A. M. CHASE, Publisher and Author

●

THE NEW YORK AUTOMOBILE SHOW

THE Thirty-third National Automobile Show, at the Grand Central Palace in New York City, furnished many surprises to visitors. Although some new features had been announced in advance, others were not disclosed until the show was formally opened.

On exhibit were 300 models, representing twenty-nine different makes of cars—a striking demonstration of the fruits of engineering research during the past year. Mechanical developments abounded. Some were just improvements of old ideas; others were entirely new.

The 1933 automobile is more definitely stream-lined than heretofore. Many radiators have been redesigned. The fenders are wider and most of them are skirted behind the wheels. Power brakes, automatic chokes and starters, down-draft carbureters with intake silencers, are found on many models. Free-wheeling, silent-mesh transmission and other devices have been greatly improved.

Blue, red, rich green, yellow, maroon and neutral colors were favorites at the show. They reveal luminous qualities differing from the finishes formerly used. The new range of colors is the result of applying a calibrated system to Duco colors which permit the selection of maximum intensity and allows automobile makers to present their products with the shiniest possible surfaces. Pure blue, which has never before been developed in Duco, made its appearance this year. Color specialists describe it as half way between green and purple.

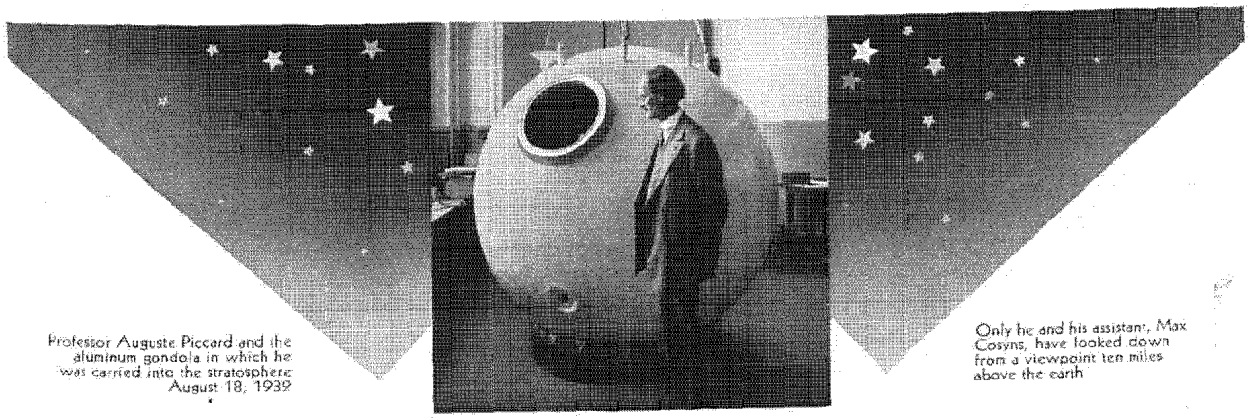
The 1933 motor car has been provided with more non-shatterable glass, as standard equipment, than its predecessors. Many buyers are insisting that windows, as well as windshields, be equipped with this glass.

The annual show at New York always gives the motorist an opportunity to see various applications of du Pont products.

●

A CHANGE IN ORGANIZATION

THE Roessler & Hasslacher Chemical Company, a subsidiary of E. I. du Pont de Nemours & Company, Inc., has been dissolved and its assets and business transferred to the parent organization. The former company now operates as an industrial department of the du Pont Company and is known as the R. & H. Chemicals Department. The executive offices are located in the Du Pont Building, Wilmington, Delaware, instead of New York City and Buffalo, and the business is being operated and managed by the same personnel as before. District sales offices are noted in the list which is published on the inside back cover of this number.



Professor Auguste Piccard and the aluminum gondola in which he was carried into the stratosphere August 18, 1939

Only he and his assistant, Max Cosyns, have looked down from a viewpoint ten miles above the earth

DULUX IN THE SKY

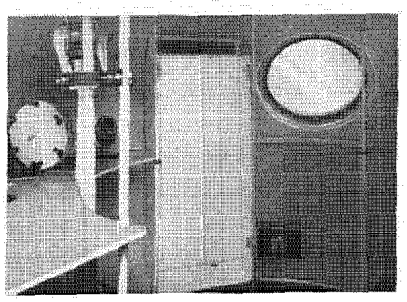
This du Pont finishing material participated in a world-famous trip into the stratosphere

THE recent arrival of Professor Auguste Piccard in this country has again drawn attention to the aerial exploits of this distinguished scientist who has twice ventured into the stratosphere, each time with an aide, to study the cosmic rays. In May, 1931, he and his assistant, Charles Kipfer, climbed into a black-painted sphere attached to a huge inflated balloon. When all was ready, a ground crew at Augsburg, Germany, released the ropes, and the big bag got away with a rush. Professor Piccard and his companion ascended 52,500 feet—almost ten miles—and incidentally broke the world's high altitude record, while seeking scientific information. Their return to earth about eighteen hours later was fortunate; the balloon came down on a snow-covered glacier in the Tyrolean Alps near Ober-Gurgl, Austria, but the gondola could not be salvaged and was abandoned.

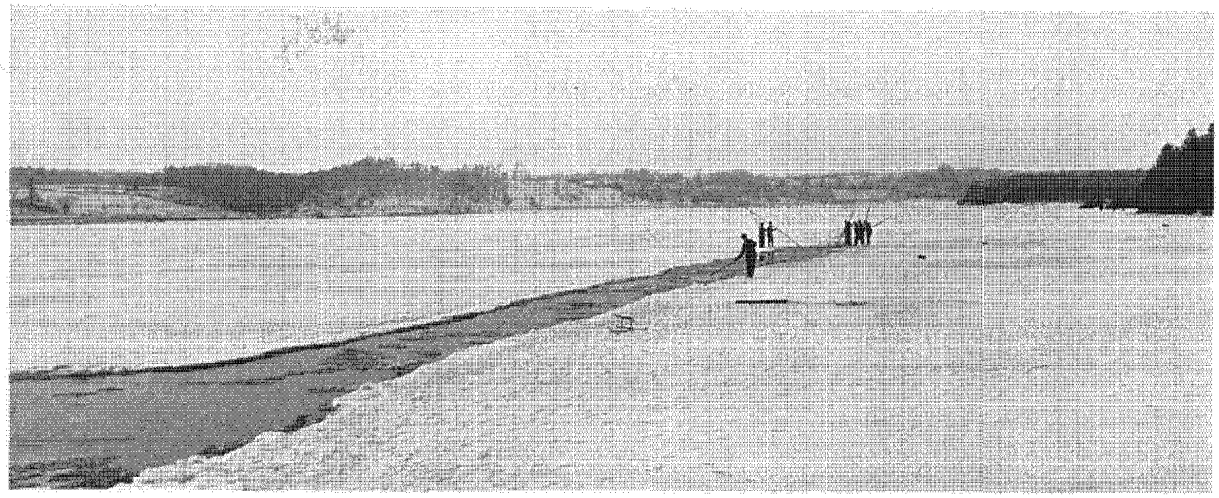
Undaunted, Professor Piccard made preparations for another ascent. He had gained valuable experience and, with a more intimate knowledge of conditions in the stratosphere, he was in position to suggest improvements in the design, construction and finish of the new aluminum sphere which was built in Belgium. The first one had a single port-hole at one side. For better observation the new gondola was equipped with several port-holes through which the occupants might get a view from the sides and at the bottom of the compartment. The manhole also was made larger, with a cover designed so that it could be opened from within. Changes were made to insure easy operation of the manœuvering cords and the safety valve. Trouble was experienced the year before when his balloon was becalmed for hours at an altitude of more than 20,000 feet. Improved finishing materials were used on the new gondola, and there was a good reason for that change.

Mention has been made that the "sphere" used in 1931 was painted black on the outside and white within. Black paint absorbs heat from the sun, and the balloonists expected to spend hours in the stratosphere, where sub-zero temperatures are encountered. So it seemed wise to take advantage of the heat rays from the sun by applying black paint to the outside surface of the sphere. But in those aerial heights the sun's rays were found to be more intense than had been expected. Instead of suffering from the cold, the men were uncomfortably warm. So when the new gondola was designed, a new set of specifications for the outside finish was prescribed. After investigating various finishing materials, Dulux White was selected as best for inside and outside use. The product was imported from the United States by General Agencies, the Belgian distributor for du Pont finishes, and it was applied in the Belgian factory where the gondola was built.

Following the completion of this work the metal sphere was placed on a lorry and transported from Brussels to Switzerland, along with some aluminum trunks or boxes, which had been finished with a black enamel. The weather was bright and under the influence of the solar rays the boxes became so hot that one could not hold his hand upon them, while the gondola finished with white Dulux was relatively cool, although similarly exposed. That was encouraging. (Continued on page 21)



An interior view of the famous gondola that was finished in Dulux, a du Pont product



Where ice formations in rivers cause flood hazards, it is a wise precaution to keep the channels open by blasting

DYNAMITING ICE JAMS

Some timely suggestions to blasters who may be called upon to serve in an emergency

It is a generally known fact that the use of dynamite offers an efficient and frequently the only means of breaking ice jams in rivers and harbors which otherwise would result in the paralyzing of factories and hydro-electric plants, the sweeping away of highway and railroad bridges, and the flooding of vast acreages. The loss of human life and the drowning of cattle, along with great property losses, have often followed in the wake of high water, caused by the formation of ice jams in streams and rivers.

Explosives experts are giving increasingly earnest attention to the effectual use of dynamite to break up such accumulations and to blast channels through frozen streams and thereby provide for the free flow of water. At present, the technique of ice blasting has been developed to a point where there is little, if any, reason why damage from flood water should occur.

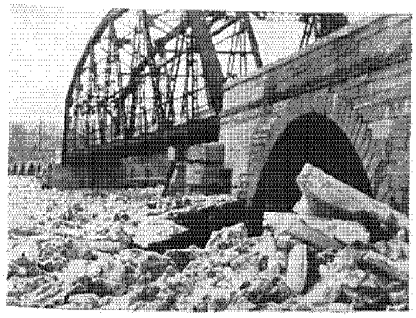
Since flood control is frequently an emergency measure, any kind of dynamite that is available may be used. It is best, however, to be guided by the experience of highly proficient blasters, and they recommend gelatin, because it is not injured by water and, also, is heavy enough to sink. Ordinarily, the thirty or forty per cent strength is sufficiently strong for the purpose. The next best explosive to use is forty or fifty per cent straight nitroglycerin dynamite. Where lower-strength dynamite is the only kind that can be obtained quickly, care should be exercised to have the charges strong enough to do what could be done with smaller quantities of the higher-strength explosives. Also, the blaster will do well to remember that the lower-strength dynamites must not be kept submerged more than a few minutes before the shooting is done.



Just before the shot. The electric firing method is recommended not only for safety, but also because it makes possible detonating a number of well-placed charges of dynamite simultaneously

Proper Amount of Dynamite

That a considerable quantity of dynamite may be necessary is a fact that should always be kept in mind. According to conditions, it will require from fifty pounds to several hundred pounds of explosive to blast an ice jam. Twenty-seven hundred pounds of dynamite were fired in two charges when the great ice gorge at Niagara Falls was blasted several years ago. The ice was seventy feet high and, of course, this caused an extreme situation; but it serves to illustrate the point that quantity of explosive is a prime consideration. Here, also, it may be in order to suggest that where there is possibility of an emergency need for dynamite, it is advisable to learn in advance just where explosives and blasting



It pays to keep the ice moving, particularly in the vicinity of bridge piers, where accumulations are likely to occur. Ice jams at such places may result in the necessity of building a new bridge

accessories may be obtained on the shortest possible notice.

How to Proceed

It is essential that the blaster work on the down-stream side of the jam, so that the current will carry the loosened ice away; otherwise, the broken pieces may pile up and increase the height or length of the barrier. The best procedure is to distribute the charges under the ice for several hundred feet below the jam—this, in addition to the charges directly under the jam itself—and to fire them all at one time by means of electric blasting caps, wired in series, and a blasting machine.

Attaching Blasting Cap to Primer Cartridge

To prepare smaller charges, tie the cartridges into a bundle with stout twine with the primer cartridge in the middle. These bundles can be anchored at the proper depth by wrapping the electric blasting cap wires around a stick laid across the mouth of the hole. The electric blasting cap must, of course, be firmly tied to the primer cartridge, so that it will not be pulled out if the bundle tugs on the wires. If any kind of dynamite other than gelatin be used, the bundle should be weighted with a rock to prevent it from floating up close to the ice. As most of the dynamite now made is low-freezing, one need not fear that it will freeze, if left in icy water or stacked up on the ice for several hours.

The quantity of dynamite for each charge, of course, depends upon the thickness of the ice, the width of channel desired, and also upon the nearness of buildings, bridges or piers. With ice two or three feet in thickness, and with thirty feet between holes in rows sixty or seventy feet apart, probably eight to ten pounds of dynamite in each charge should be sufficient.

The charge should be placed far enough below the ice to realize the full spreading effect of the blast. A charge of ten pounds should be placed two or three feet below the surface. If it is placed just under the ice, it will merely blow a hole through the ice at that point, with little or no effect upon the mass.

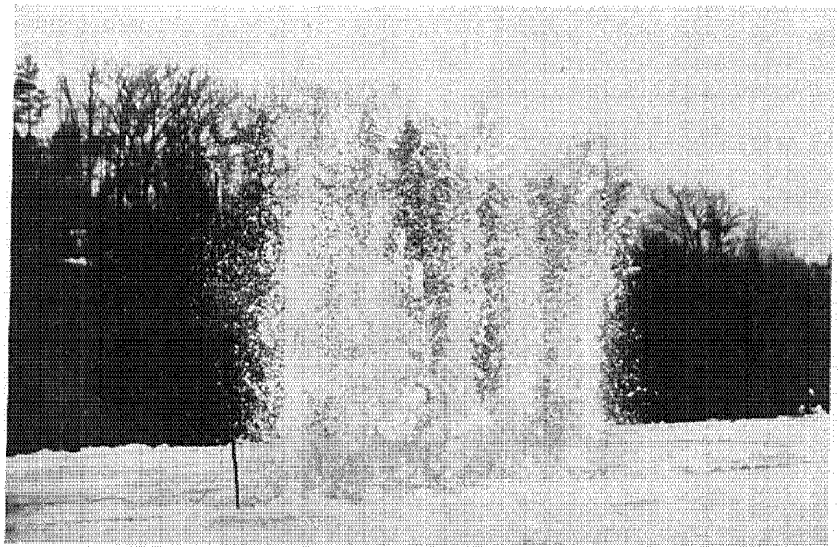
After the charges have all been anchored in the holes, connect the blasting cap wires with each other, working up-stream toward the charges under the ice jam itself. Connect the two end wires to the leading wires and these, in turn, to a blasting machine, which should be operated far enough away so that the blaster will be out of range of flying chunks of ice.

Fuse and Blasting Caps to Use

Ordinary blasting caps and a good grade of safety fuse can be used for firing the dynamite, if electric blasting caps cannot be secured; but this method does not permit the advantage of firing many charges at one time. If, in an emergency, blasting caps and fuse must be used, make sure to crimp the cap very securely to the fuse and waterproof the joint with axle grease or vaseline.

Since ice gorges are quite likely to form at about the same place in a stream every year, it is the part of wisdom not to wait until a huge mass has actually piled up, but to blast beforehand on the down-stream side of this point, and thus keep the ice broken and moving.

If mild weather prevails throughout this winter, people who live near rivers and streams will not need to worry about ice jams and floods. But those who are exposed to special hazards from this cause can hardly afford to be unprepared, should an emergency arise. Ice accumulations can and do cause much trouble and expense that can be avoided by the timely and proper use of explosives.



A dynamite blast gets under way in the ice-bound Mohawk River in New York State, where the channel was kept open to guard against the formation of a jam that might have caused disastrous results



The "take off" from one of the airports where United Air Line transport planes make daily stops for passengers

AIR TRANSPORT PROGRESS

This year you can travel from New York to San Francisco in twenty-two hours in a new-type transport plane capable of flying 175 miles an hour

By HAROLD CRARY
United Air Lines

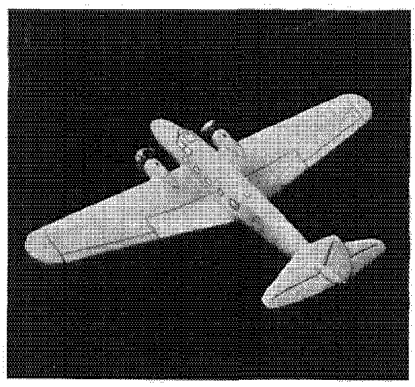
On the network of established airways which links all major cities of the United States and makes this country a nation of neighbors, airplanes in scheduled service have flown to international mileage and traffic records in world commercial aviation during the past few years.

Each year American air lines have shown material gains in amount of mail and express carried and in number of passengers transported, although prevailing economic conditions have hardly favored business expansion. Air transportation is already an essential unit in our national scheme of transportation and communication, and its future promises to be a rosy one.

An American organization, United Air Lines, has the distinction of being the world's largest air-transport system, with a record of 50,000,000 miles of flying experience and an annual schedule of 14,000,000 miles, approximately fifty per cent of it at night.

A number of du Pont products are widely used in aviation today, and a brief review of U. A. L. activities will not only serve as an indication of the progress air transportation is making in this country, but will also reveal some of the varied uses to which du Pont products are being put by the industry. While the aeronautical field is already a significant market for raw materials, it should develop at an increasingly fast pace with improved economic conditions.

During the first half of 1932, all companies in the air-transport field carried 217,274 passengers, 441,137 pounds of express and flew 22,201,395 miles on a network of approximately 100,000 miles of established airways. In all of these departments, appreciable increases were recorded over comparative totals for 1931.



Model of the new Boeing twin-engined, low-wing, all-metal monoplane, which has a high speed of 175 miles an hour. This model is accurate to one thousandth of an inch. The clean design of the plane is apparent

Because of the national scope of its operations, United Air Lines is a typical example of American air-transport service. It operates the New York-Chicago-Pacific Coast, the Chicago-Fort Worth-Dallas, the Seattle-San Diego and the Salt Lake City-Seattle mail, passenger and express routes over which its 100 planes fly 35,000 miles daily.

During the first nine months of 1932, these lines carried approximately 70,000 passengers while flying 10,000,000 miles, more than double the number transported in the corresponding period of 1931. Approximately half the mileage flown was recorded at night, over lighted airways and with equipment designed for both night and daylight flying.

Not only has this company forged steadily ahead, but it is expending over $2,000,000 on new flying equipment, and early this year will place in service a fleet of the world's fastest multi-motored commercial transport planes, which, incidentally, will be equipped with certain du Pont prod-

ucts. These new aircraft will carry ten passengers, 400 pounds of air mail and express. They will be operated by a crew of two pilots at a speed of 175 miles per hour, and it is expected that the elapsed air-travel time from San Francisco to New York, for instance, will be reduced from twenty-seven hours to twenty-two hours. That is fast service.

Riding across the continent in one of these multi-motored Boeing transport planes, the passengers will see various uses of du Pont products. Most prominent, perhaps, is the use of "dope" on the giant wings of the big air liner, which is a biplane type, with an upper wing span of eighty feet. During the process of manufacture at the Boeing Airplane Company of Seattle, Washington, the fabric covering the metal wing framework is treated with a number of coats of dope, for the dual purpose of tautening the cloth and of protecting it against the elements. Also, many of the metal parts of the plane are finished in Duco and Duco undercoats in the Boeing plant.

The window shades in the well-finished cabin are made of Tontine, a washable shade cloth, manufactured by the du Pont Company, and although they are seldom in evidence during daylight hours, they are drawn when the passengers prepare to sleep at night.

Pyralin is used in the compartment where the pilot and co-pilot handle the numerous controls, and much of the roof of this compartment is made of Pyralin. Navigating lights on the wings and the tail of the plane are equipped with a covering of cellulose material in red and green.

Even Cellophane is in evidence during the flight across the continent. In the Chicago-San Francisco planes are attractive stewardesses, or "air conductresses," whose duties include serving meals and otherwise attending to the comfort of the passengers. Foodstuffs served at mealtime in the air are frequently wrapped in this du Pont cellulose film, and the stewardesses several times daily offer the passengers fruits which are wrapped in Cellophane and carried in large baskets, so that the air traveler can make his own selection.

DULUX IN THE SKY

(*Continued from page 17*)

Early in the morning of August 18, 1932, Professor Piccard, with Max Cosyns as aide, entered the new gondola and took off on his second balloon journey to the stratosphere. The start was made from Dubendorf, Switzerland. After a twelve-hour ride in which they reached an elevation of 54,776 feet—almost 10.4 miles—these explorers of the sky returned to earth, landing safely on Italian soil near Lake Garda. They had learned more about conditions in the stratosphere than before—and they had again established a new high-altitude record. Never before in history had human eyes looked down upon the earth from such a lofty elevation.

The dramatic incidents of that thrilling exploit were reported fully in press dispatches, but it will be news to Du Pont Magazine readers to learn why Dulux accompanied the distinguished scientist on that memorable trip. The following is quoted from a statement he prepared last October in reference to the finishing materials.

"The enamel with which the cabin of the F. N. R. S. balloon was to be finished had to comply with certain conditions:

These Were the Conditions to Be Met:

"1. *Luminosity*—In order to render the interior of the cabin very luminous in spite of the reduced dimensions of the port-holes, we were anxious to enamel all the interior in white, including the shelves and certain instruments of large dimensions.

"2. *Safeguard against mercury*—To avoid all possibility of attack upon the aluminum walls of the cabin in case of effusion of mercury, we wanted the interior finished with a protective coating which would be perfectly mercury-proof, adhesive to aluminum, and resistant to the inevitable, mechanical, hard treatment.

"3. *Reflection of the heat rays* — Having suffered from the heat in the cabin interior during the first ascension of the F. N. R. S., due to absorption of the sun's rays, we desired to finish the exterior of the cabin with a white enamel which would not absorb the sunshine.

"*Choice of finish*—After a study, as much for the interior as for the exterior, we chose 83 line Dulux as manufactured by E. I. du Pont de Nemours & Company, Inc.

"Conclusions—

"1. We enjoyed good illumination in our cabin during the ascension.

"2. The adhesion of Dulux to the aluminum, and the resultant protection against mercury is perfect, the enamel having made a perfect bond with the metal.

"3. The reflection of the sun's heat rays was such that we suffered from cold during this second ascension. The temperature difference in the cabin interior was 40 degrees C. for the two ascensions.

"4. Upon landing and being transported, the cabin was dragged over a granite terrain, resulting in dents and scratches on the exterior surface of the cabin. However, the Dulux enamel was in no way peeled off; it was removed in spots with the outer layer of aluminum as if it were a part of the metal."

Probably further attempts will be made to learn more about the cosmic rays from scientific observations made in the stratosphere. If news reports from abroad may be credited, there is a possibility that Professor Piccard may take off in his balloon from some place in northern Canada, so Dulux may figure in another sky ride.

SAFETY FOR THE OCCASIONAL USER OF EXPLOSIVES

There is a right way and a wrong way to do everything. How to handle and use explosives safely is discussed here

By ARTHUR LA MOTTE
Manager, Technical Section
E. I. du Pont de Nemours & Co., Inc.

For a great many years the manufacturers of explosives in the United States have conducted a campaign to educate users of explosives in the safest, most economical methods of blasting. They have issued safety bulletins to quarry owners, mine operators, construction men and tunnel contractors, and this has been helpful, for accidents from explosives in the hands of experienced blasters seldom occur and have almost reached the vanishing point.

In addition to this literature, there is inserted in every case of dynamite a pamphlet of instructions and a list of things not to do. This list is commonly known as the "Official Don'ts." It happens, however, that occasionally some citizen has to blow a ditch, blast a stump or smash a boulder, or possibly even attempt to bring in a well which has gone dry.

Not having use for fifty pounds of dynamite—the usual amount contained in a case — he goes to a hardware store and buys a few sticks or cartridges. At the same time he is also likely to buy blasting caps and enough fuse for his purpose. He does not get the case inserts, nor does he receive the bulletins. He may ask the hardware dealer some questions as to how the dynamite should be used, and, generally, he gets a few hurried directions while his purchase is being wrapped up. So he drives home with his precious package of dynamite, fuse and caps and bravely saunters out to shoot a stump.

He knows that he has to get the explosive under the stump, so he procures a crowbar or possibly a drill or auger and prepares the hole to receive the dynamite. He puts the cap on the end of a piece of fuse, cuts off what he thinks is enough to allow him to retire to a safe place before the explosion occurs, punches a hole in the cartridge and puts his primer in the hole, either by itself or on top of several other sticks of dynamite. He then starts to light the fuse—and right there his trouble begins.

Fuse consists of a small train of a specially prepared black powder enclosed in several wrappings of jute, thread, tape and waterproofing; and it is not the easiest thing in the world to start this powder train burning. If he holds a lighted match under the end of the fuse, the outside of the fuse will start to burn, and when he sees the first sign of flame, he usually starts to sprint for safety and then waits for the explosion. Now these wrappings of jute, tape and waterproofing are not readily flammable.

Some types of better-quality fuse are hard to ignite, so nothing happens. These outer coverings may burn for a few seconds and then go out without communicating the flame to the powder core, in consequence of which, after waiting a while, he goes back to see what has happened. Either he uses another match and attempts to repeat the performance, or sometimes he lights a handful of grass or a roll of paper and holds that under the recalcitrant fuse. This may succeed or it may not, but it is likely to set fire again to the outer portion of the fuse. After a much longer time than is accounted for by the normal burning speed of the fuse, it may reach and ignite the powder core. Not being able to see this, he sometimes goes back to find out what has happened. His arrival may be just in time for the explosion, and he is seriously hurt or killed.

However, if he has been properly instructed and realizes that the only part of the fuse which should be lighted is the powder core, he will take a knife and slit the end for an inch or so, opening it up to expose the powder. He will then light his match and while the head is still glowing he will put it into the powder. The result is a healthy "spit" of the fuse, which spurts out sparks and flame for two or three inches. Then he knows the fuse is lighted.

Another method, which experts employ and which requires a little practice, is to use a safety match and its box in this manner: After slitting the fuse, hold the head of the match firmly against the end of the fuse in its exact center so that it touches the powder core. Then scrape the match head with the abrasive side of the box. This ignites the head of the

SOME DON'TS AND WHY

Don't store explosives of any kind in or near a residence. Every now and then one catches on fire and the explosives are pretty sure to blow up and do a great deal of damage; also children are likely to find and play with the caps, usually with serious consequences.

Don't store fuse in a hot place. This is likely to cause the waterproofing of the fuse to run into the powder core and cause a misfire.

Don't keep caps anywhere near dynamite. Caps are much more sensitive to sparks and rough handling than dynamite; and if a cap explodes, it may set off the dynamite.

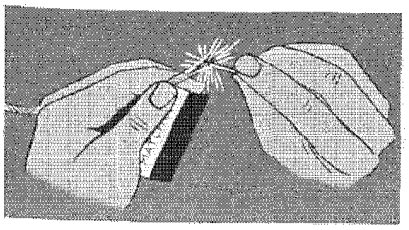
Don't leave packages of explosives or blasting caps uncovered. While the blaster may have sense enough not to smoke or throw lighted matches about, the sparks from a burning fuse may—and often have—set off a box of caps with disastrous results.

Don't smoke while handling any explosive. Dynamite may burn up peacefully when it is set on fire, but then again, it may explode. Caps invariably explode when lighted matches or hot cigarette ashes drop on them.

Don't crimp blasting caps with a knife blade or the teeth. It is neither efficient nor safe. A cap crimper is the only tool to use for this purpose.

Don't attempt to investigate a misfire too soon, even if it is thought the fuse has not been lighted or has gone out.

Don't use short fuse. Cut off a piece that will extend beyond the collar of the hole, and one sufficiently long to enable you to get to a safe place before the blast occurs. Cut the fuse square across, not at a slant, after cutting off an inch or more to insure having a fresh end inserted in the blasting cap.



match which instantly lights the powder core in contact with it.

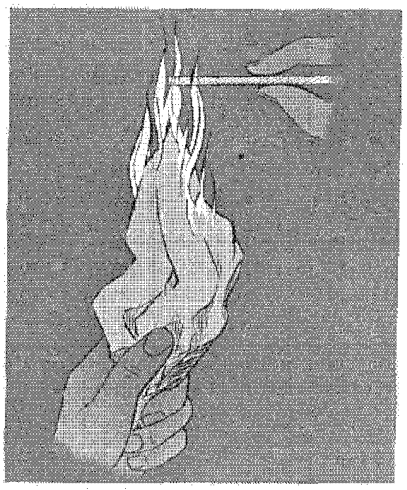
If a "strike-anywhere" match is used, the same procedure may be followed, using a smooth, dry stone instead of the match box.

There are, of course, a number of effective ignition devices provided for miners and quarrymen, such as the "Lead Spitter" and the "Hot-Wire Fuse Lighter," but these, unfortunately, do not often come into the hands of the occasional user.

However, lighting the fuse properly is not the only thing to be learned about the safe and effective use of dynamite. It is important that proper length of fuse be cut off. Incidentally, a pair of sharp pruning shears is one of the best implements in the world for this purpose. It is a good rule never to use less than three feet, and always enough to project from six to eight inches from the mouth of the hole. The fuse should be cut off square either with the shears or with a clean knife so that the square end, freshly cut, may be brought into contact *gently* with the explosive charge in the blasting cap. It is not enough to insert it, for the blasting cap must be held in place on the end of the fuse. This is best accomplished by the aid of a specially-made implement, called a cap crimper, and this crimp should be applied near the open end of the cap. The use of a jack-knife for crimping is never very satisfactory, neither is it conducive to longevity to crimp the cap with one's teeth. If a cap crimper is not available, a pair of flat-nosed pliers may be used to pinch the open end of the cap in such a way as to make an imitation of the flat-sleeve crimp.

After this operation has been performed satisfactorily, the next step is to insert the cap and fuse into the dynamite cartridge and secure it there. This is done by making a hole about the diameter of a lead pencil, either in the end of the cartridge or in its side. Then, taking a piece of string about eighteen inches long, or tar-binding twine if it is available, fasten the cap and fuse firmly in the cartridge. The string should be doubled over and a hitch taken on the fuse a few inches above the place where it enters the dynamite cartridge. Then the two free ends should be tied firmly around the cartridge in such a way that a sharp jerk will not pull the cap out of position.

The blasting cap itself should lie as nearly as possible in the axis or center of the cylinder of dynamite, whether the hole to receive the cap is made in the end or in the side. If



the hole is in the side, care should be taken to avoid any possibility of the closed end of the cap protruding from the opposite side of the cartridge.

Now the primer having been properly made, it is usually advisable, in loading, to place it either as the last or next to the last cartridge in the hole. High explosives are so quick and powerful in their action that, in comparison with black powder or gunpowder, fairly good results may be had without tamping the charge. Much better results, however, are obtained when the hole is properly stemmed or tamped with inert material, such as sand, clay or loam, for the greater confinement, the more work the dynamite will do. If the priming has been done carefully and the fuse lighted in the proper manner, the dynamite will certainly explode.

Another reason for the use of inert stemming on top of the charge is that fuse comes in coils and is rather stiff. It has happened, in setting off untamped shots, that the fuse, when released from the hands of the operator, curls around and "spits" directly into the hole, setting fire to the dynamite, which may explode immediately or may burn until it reaches the cap. This is a frequent cause of accidents and injuries.

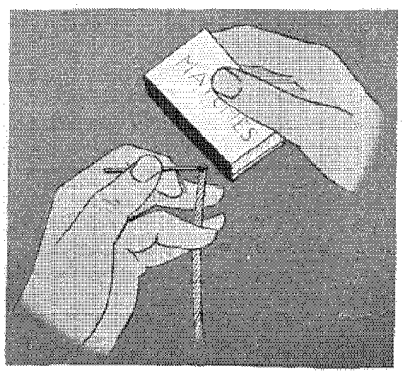
Again, the failure of a fuse to function as soon as was intended may cause the operator to return and attempt to relight it. And while he is doing so, the blast goes off. If he survives and reviews the incident, he is likely to believe that the fuse, when ignited the second time, burned through with more than normal speed, that it flashed or ran, an entirely wrong conclusion. The fuse had been burning since he lit it the first time. He went back too soon.

Standard makes of fuse burn at the rate of between thirty and forty seconds to the foot. Therefore, three feet of fuse will give the operator a minute and a half to two minutes in which to leave the place of danger. Almost anybody can run a considerable distance in that length of time.

It is well to bear this in mind: Modern standard fuses cannot be made to flash or burn instantaneously unless they have been subjected purposely to exceedingly rough treatment, such as pounding them on an anvil so violently as to break up completely the confining threads, tapes and waterproofing.

Detailed and explicit directions for the use of explosives are always avail-

(Continued on page 24, column 3)



COTTON, AND THE DYE CHEMIST

(Continued from page 5)

uses, quickly uncovered the glyptal resins which permit the production of a paint that will dry faster and last longer than those made with linseed oil. The new Dulux paints are of this new and improved type.

The importance of this development has been so great that the amount of phthalic anhydride now used in dyes is only a small percentage of that consumed in paint; ten years ago the dye industry used all of it.

A very recent development, which utilizes raw materials of the dye business rather than intermediates, was the synthesis of a new type of refrigerant, which is practically odorless and devoid of almost all offensive properties. It is non-flammable, non-toxic, and inert to almost all reactions, and for technical and other reasons it is made in a dye plant. Its mother substance is carbon tetrachloride.

Another outstanding achievement of the organic chemist has been the manufacture of a synthetic rubber. This is a distinct accomplishment, for it has not been found practicable to grow rubber in the United States, because of the high cost of land and labor. All of our rubber comes from across the ocean, and the supply could easily be cut off in time of war, as happened to Germany. The new rubber is made from salt, limestone, sulfur and coal, all abundantly available in this country. Numerous organic chemists have worked on this problem in France, England, Germany and the United States. Both Germany and England prepared synthetic rubber in small quantities, and during the war Germany made considerable quantities of it. For various reasons the processes were not commercially successful, but since then two of the great German dye firms, Bayer and Badische, have revived the work.

In this country the organic chemical group of the du Pont Company has developed an entirely new type of synthetic rubber, called Du Prene, which is being produced in a new plant at the du Pont Dye Works.

The du Pont Company has specialized in the development of cellulose products ever since it first began manufacturing smokeless powder. Cotton has figured largely in building its various industries. Du Pont chemists have contributed importantly; they have intensively studied cellulose chemistry and applied their knowledge in creative ways, and they have helped to write new pages in industrial history. That history is still in the making, and it is confidently expected that they will add many new chapters to it.

SAFETY FOR THE OCCASIONAL USER OF EXPLOSIVES

(Continued from page 23)

able from manufacturers and can be had for the asking. Any gentleman farmer or dirt farmer will certainly get his money's worth out of a three-cent stamp addressed to the dynamite manufacturer, in return for which he will get a leaflet, book or some other instructions that will insure the successful use of this most useful substitute for hard labor.

DU PONT

E. I. DU PONT DE NEMOURS & CO., Inc.

General Executive Offices, WILMINGTON, DELAWARE

All Inquiries Regarding du Pont Products Should Be Addressed to the Nearest Office

ACIDS, HEAVY CHEMICALS AND SPRAY PRODUCTS

Grasselli Chemical Company, Inc.

Chemicals for leather, textile, paper, paint, rubber, battery, glass, sheet, tin plate, steel and petroleum manufacturers. Chemically pure acids, electrolyte, filter alum, spray products for fruit trees, vegetables and flowers, silicate of soda, soldering fluxes, zinc, zinc chloride.

Birmingham, Ala., 2000 First Avenue, North
Boston, Mass., 140 Federal Street
Brooklyn, N. Y., 152 Morgan Avenue
Charlotte, N. C., 228 W. First Street
Chicago, Ill., 2101 Canalport Avenue
Cincinnati, Ohio, 305 Walnut Street
Cleveland, Ohio, 629 Euclid Avenue
Detroit, Mich., 1530 E. Hancock Avenue
Los Angeles, Calif., 2260 E. Fifteenth Street
Milwaukee, Wis., 1503 W. Canal Street
New Haven, Conn., 46 River Street
New Orleans, La., 1140 S. Robertson Avenue
New York, N. Y.,
District Sales Office, Empire State Building
Export Office, Empire State Building
Paterson, N. J., 6 Waite Street
Philadelphia, Pa., 3500 Gray's Ferry Road
Pittsburgh, Pa., 107 Sixth Street
Rensselaer, N. Y., 34 Riverside Avenue
San Francisco, Calif., 584 Mission Street
St. Louis, Mo., 116 West Ferry Street
St. Paul, Minn., 2303 Hampden Avenue

LITHOPONE, TITANIUM PIGMENT, ZINC OXIDE AND DRY COLORS

Krebs Pigment & Color Corporation
Boston, Mass., Everett Station
Chicago, Ill., 2101 Canalport Avenue
Cleveland, Ohio, 629 Euclid Avenue
Kansas City, Mo., 29th & Southwest Blvd.
Los Angeles, Calif., 918 E. 61st Street
Newark, N. J., 256 Vanderpool Street
Philadelphia, Pa., 3500 Gray's Ferry Road
San Francisco, Calif., 1001 17th Street
St. Louis, Mo., 1100 Levee Street
Toronto, Canada, 372 Bay Street

ANHYDROUS AMMONIA, ANTI-FREEZE METHANOL AND METHANOL

Methanol and anhydrous ammonia in tank cars. Anti-Freeze Methanol in tank cars and drums.

Wilmington, Del., Du Pont Building

AQUA AND ANHYDROUS AMMONIA

National Ammonia Company, Inc.

Anhydrous ammonia in cylinders. Aqua ammonia in drums and tank cars.

Chicago, Ill., 332 S. Michigan Boulevard
Los Angeles, Calif., 316 Commercial Street
New York, N. Y., Empire State Building
Philadelphia, Pa., Frankford P. O.
San Francisco, Calif., 601 Third Street
St. Louis, Mo., 3600 N. Broadway

SPECIAL CHEMICALS

The R&H Chemicals Department

Manufacturers of sodium, cyanides, peroxides, chlorine, heat-treating salts, formaldehyde, hexamethylenetetramine, gold, silver and platinum preparations, colors, oxides and opacifiers for the ceramic industry (pottery, glass and enameling), refrigerants, non-inflammable solvents, rubber accelerators and other chemicals for all industries.

Baltimore, Md., 301 O. T. National Bank Building
Boston, Mass., 140 Federal Street
Charlotte, N. C., 302 W. First Street
Chicago, Ill., 230 E. Ohio Street
Cleveland, Ohio, 607 Hanna Building
Kansas City, Mo., 2018 Guinotte Avenue
Newark, N. J., 1060 Broad Street
New Orleans, La., 1140 S. Robertson Street
New York, N. Y., Empire State Building
Philadelphia, Pa., 1616 Walnut Street
San Francisco, Calif., 625 Market Street
Canadian Representatives:
Canadian Industries, Ltd., 372 Bay Street, Toronto 2, Canada

FINE CHEMICALS

Aromatic chemicals for perfume and soap manufacturers. Photographic chemicals. Hydrogenated oils. Detergents and wetting-out agents.

New York, N. Y., 260 W. Broadway
Chicago, Ill., 7 S. Dearborn Street

CELLOPHANE

Du Pont Cellophane Company, Inc.

Cellophane—sheets and rolls.
Cel-O-Seal caps and bands.
Transparent seamless tubing.

New York, N. Y.
Executive and General Sales Offices
Empire State Building
New York District Sales Office
145 Hudson Street
Boston, Mass., 140 Federal Street
Chicago, Ill., 111 W. Washington Street
Philadelphia, Pa., 1616 Walnut Street
San Francisco, Calif., 351 California Street

DYESTUFFS

Dyestuffs, dyestuff intermediates and organic chemicals. Inhibitors, nitro-filters, Lignasan and plant sprays.

Boston, Mass., 140 Federal Street
Charlotte, N. C., 302 W. First Street
Chicago, Ill., 7 S. Dearborn Street
New York, N. Y., 61 Thomas Street
Philadelphia, Pa., 126 S. Front Street
Providence, R. I., 709 Hospital Trust Bldg.
San Francisco, Calif., 351 California Street

EXPLOSIVES

Explosives for all industrial, agricultural and sporting uses.

Birmingham, Ala., 601 Brown-Marx Bldg., 2000 First Avenue
Boston, Mass., 140 Federal Street
Chicago, Ill., 1814 McCormick Building
Denver, Colo., 922 Midland Savings Building, 444 Seventeenth Street
Duluth, Minn., Hartley Building, 742 E. Superior Street
Huntington, W. Va., Suite 1004 Union Bank Building, Fourth Ave. and Ninth Street
Joplin, Mo., 816 Joplin Nat'l Bank Building
Juneau, Alaska, Room 503 Goldstein Building
New York, N. Y., Empire State Building
Pittsburgh, Pa., 915 Gulf Building
Portland, Ore., American Bank Building
Pottsville, Pa., 516 Schuylkill Trust Company Building
St. Louis, Mo., 1176 Arcade Building
San Francisco, Calif., General Cigar Corp. Building, 601 Third Street
Seattle, Wash., 701 Hoge Building, Second Avenue and Cherry Street
Scranton, Pa., 701 First Nat'l Bank Bldg. 207 Wyoming Avenue
Spokane, Wash., 721–22 Old Nat'l Bank Bldg. Riverside Avenue and Stevens Street
Springfield, Ill., 716 Reisch Building
Wilkes-Barre, Pa., 902 Brooks Building

FABRIKOID AND RUBBER PRODUCTS

Fabrikoid for auto and furniture upholstery; auto topping, bookbinding, luggage, novelties, etc. Tontine Washable Window Shade Cloth. Everbright Pontop for closed car decks. Teal for sport cars. Rug Anchor. Ventube for mine ventilation. Fabrics for raincoats and rough wear. All types of rubberized fabrics.

Chicago, Ill.
Fabrikoid Office, 2100 Elston Avenue
Montana Street Station
Tontine Office, 2100 Elston Avenue
Montana Street Station
Detroit, Mich., 5–236 General Motors Bldg.
Newburgh, N. Y.
New York, N. Y., Empire State Building
San Francisco, Calif., 601 Third Street

FINISHES

AUTOMOTIVE FINISHES

Duco and a complete line of finishing materials for all automotive purposes.

Detroit, Mich., General Motors Building
Flint, Mich.
San Francisco, Calif., 601 Third Street

CHEMICAL SPECIALTIES

No. 7 Duco Polish, No. 7 Auto Top Finish
No. 7 Clear Waterproof Dressing,
No. 7 Touch-Up Black,
No. 7 Radiator Cleaner,
No. 7 Duco Wax,
No. 7 Pre-Wax Cleaner.

INDUSTRIAL FINISHES

Duco, Dulux, Duco Household Cement, bronze powders, collodion, leather belting cements, leather finishes, nitrocellulose and cellulose acetate and their solutions, Dulux synthetic resins, pyroxylin preparations and solvents and a complete line of finishing materials for all industrial purposes.

PAINTS, VARNISHES, DUCO (For Home Use)

A complete line of paint and varnish products for all home and industrial uses.

REFINISHING MATERIALS

Duco, Dulux and a complete line of finishing materials for all automobile refinishing purposes.

Atlanta, Ga., Volunteer Life Building
Boston, Mass., Everett Station 49
Chicago, Ill., 2100 Elston Avenue
New York, N. Y., Empire State Building
Philadelphia, Pa., 1616 Walnut Street
San Francisco, Calif., 601 Third Street

MILITARY AND SPORTING POWDERS

A complete line of military and sporting smokeless powders; also military explosives and black sporting powders.

Wilmington, Del., Du Pont Building

SEED DISINFECTANTS

Bayer-Semesan Company, Inc.
New York, N. Y., 105 Hudson Street

PHOTOGRAPHIC FILM

Du Pont Film Manufacturing Corp.
New York City, 35 W. 45th Street
Hollywood, Calif., 6656 Santa Monica Blvd.

PYRALIN, LUCITE AND VISCOLOID

Lucite, Pyralin and Arlton Boudoir Accessories. Toys, rattles, combs, gift articles, infants' sets, manicure sets, hair ornaments. Novelty and transparent sheeting, rods, tubes and beading. Also cleanable collars.

Factories at Arlington, N. J., and Leominster, Mass.
Du Pont Viscoloid Company, Inc.
New York, N. Y., Empire State Building
Chicago, Ill., North American Building
San Francisco, Calif., 351 California Street

RAYON

Du Pont Rayon Company, Inc.
Viscose Process Department
New York, N. Y., Empire State Building
Charlotte, N. C., 228 West First Street
Chattanooga, Tenn., 609–611 Provident Bldg.
Philadelphia, Pa., 1616 Walnut Street
Providence, R. I., 938 Hospital Trust Bldg.
San Francisco, Calif., 601 Third Street
Acele Department
New York, N. Y., Empire State Building
Waynesboro, Va.

RUBBER CHEMICALS

Anti-oxidants, vulcanization accelerators, rubber dispersed colors, Duprene and S. D. O. (corrosion-resistant coating).

Wilmington, Del., Du Pont Building
Boston, Mass., 140 Federal Street
Chicago, Ill., 7 S. Dearborn Street
San Francisco, Calif., 351 California Street

ALCOHOL

Denatured and specially denatured ethyl alcohol for anti-freeze use and as a general industrial solvent.

Wilmington, Del., Du Pont Building

FOREIGN OFFICES

(To which inquiries about du Pont products may be addressed.)

Buenos Aires, Argentine Republic
Foreign Trade Development Office
Av. Roque Sáenz Peña 616 (Casilla 490)
Hankow, China, No. 23 Tung Ting Road
Havana, Cuba, 548 Edificio Manzana de Gomez
Kobe, Japan, No. 83 Kyomachi (P. O. Box No. 384)
London, W. C. 2, England, Bush House, Aldwych
Mexico City, Mexico, Edificio Cidosa Avenida Uruguay 55 (*Office of Du Pont Rayon Company of Mexico, S. A.*)
Paris, France, Paris Development Office, 14 Rue Lincoln
Shanghai, China, Robert Dollar Building 3 Canton Road (P. O. Box No. 393)
Tientsin, China, 52 Taku Road

I. F. C. LINES

International Freighting Corporation, Inc.
Chicago, Ill., 1824 McCormick Building
New York, N. Y., 17 Battery Place
Buenos Aires, Argentine Republic, Avenida Roque Sáenz Peña 616

When you are in Atlantic City, New Jersey, visit the du Pont Exhibit at 1121 Boardwalk



SEE WHAT YOU BUY . . .

STRANGE HANDS. Inquisitive hands. Dirty hands. Touching, feeling, examining the things you buy in stores. Your sure protection against *hands-across-the-counter* is tough, clear, germ-proof Cellophane.

Customers have a right to *see*. Customers have a right to pick up things. Cellophane lets them see. It lets them handle, if they wish. But it keeps *hands off* the product protected by Cellophane cellulose film.

How important this is to you and your health, when you buy items of personal use, like toothbrushes, washcloths, powder-puffs, and many other things—or food for your family table. Such things *must* be sanitary. Cellophane keeps them so, guards every bit of original purity and quality.

Not only that, but Cellophane keeps out dust and dirt of every sort. It saves flavor and freshness. It protects against foreign odors. And because you *see* what you buy, Cellophane protects you against disappointment. All this protection is yours when you *select* products in Cellophane.

Cellophane for home use is available at leading stationery and chain stores.

TUNE IN and hear EMILY POST, famous authority on etiquette and good taste in the home, every Monday and Thursday at 10:45 A.M., E. S. T., 9:45 A.M., C. S. T., on the Cellophane Radio Program. Also featuring Edward Nell, baritone, and the Harding Sisters' piano and organ duet. WJZ and NBC Network.

Du Pont Cellophane Company, Inc., Empire State Building, New York City.

DU PONT
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