

THE DU PONT MAGAZINE



FEBRUARY 1929

W.D.T.



THE DEMAND NOBODY KNEW

A SALESMAN'S got a hard enough time lugging around a big sample case without trying to talk the chemistry of colors or stuff like that. And the buyer said his job was buying, not being king's taster to the public. Anyway you couldn't expect a sales-girl to know the secret life of all the merchandiseshe sold. Well, the truth came out with the colors in the very first wash, the truth that even the complaint department couldn't deny, the truth about the dyes.

It seems there were two kinds of dyes: one would wash and one just wouldn't. You couldn't really tell, of course, until you'd washed the goods. And the customer was the first one to

do any washing. And that seemed kind of late to find out about the colors because the customer seemed to think that somebody ought to have done some washing earlier and learned something about the dyes.

Well, there was a great deal of talking pro and con, a good deal of con in the store, the factor's office, and the mill, and very little pro for the store or anybody else as far as the customer went. It seems further that a lot of the customers didn't bother with the complaint department; they told everybody

else instead. People have a way of liking to buy where they have confidence so they didn't bother much with that store. As a matter of fact—



Everybody gets more for their money in

FAST-DYED FABRICS

E. I. DU PONT DE NEMOURS & CO., Inc. Dyestuffs Department WILMINGTON, DEL.

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THE CHEMIST'S AID TO AGRICULTURE

*Excerpts from an address made at the annual meeting of the American
Farm Bureau Federation, held recently in Chicago*

THE chemist often thinks of the farm as a huge chemical factory and of the farmer as the factory manager. The sunlight furnishes the power consumed in the chemical reactions involved in plant growth and development, and the farm equipment is the apparatus for facilitating the process. The soil is not only the factory area, but is partially the apparatus and partially the raw materials for the production of the end products—the finished crops. It is the energy of the sunlight that is consumed by the growing plant in transforming the carbon dioxide of the air and the moisture of the soil into combinations of carbon, hydrogen and oxygen which we know as cellulose, starch, sugar and the like.

A century ago the chemist broke through the barrier which was supposed to exist between the mineral kingdom and the vegetable and animal kingdoms when Woechler succeeded in preparing urea, a waste product of animal metabolism, from materials belonging to what was then regarded as the mineral kingdom. For many centuries agriculture has used urea in animal manures as a source of nitrogen for the soil. One of the most impressive developments of modern chemistry is the fact that for the year 1928, the world's production of fixed nitrogen approximates 2,000 tons a day, or 1,200,000,000 pounds a year. This truly astounding amount of nitrogen has been made available for agriculture and industry, and yet only a century ago Woechler first prepared urea in the laboratory.

By DR. CHARLES M. A. STINE
Chemical Director
E. I. du Pont de Nemours & Co., Inc.

The achievements of the chemist since then have been many and startling, and one would be bold to prophesy how far he can go in the analysis of the compounds of nature to determine what makes them valuable and to duplicate them.

Chemists are in the habit of distinguishing between the materials that nature produces as a result of vital processes—fats, sugar, starch, wood and the like, products of plant and animal growth—and those other classes of materials

—minerals, such as coal, stone, chalk, gypsum and the like. Some of them are, indeed, the modified products of the life of a bygone day, but they are not the immediate products of living organisms. Members of the first class are called by the chemist organic products; that is, products of organic life or origin. The chemist terms materials of the second class products of inorganic origin or inorganic substances. There is, however, no sharp line of distinction, since many products may have an organic origin or may be produced as a result of chemical changes in the inanimate world.

Then, too, some products such as petroleum are of uncertain origin, some chemists inclining to the belief that they came from the animate world, others preferring to endow them with an inanimate origin.

The one unfailing constituent of products of animal and vegetable origin is the element carbon, which is familiar to you in the form of graphite, charcoal and the diamond. Due to the great number and variety of carbon compounds,

"THE American Chemical Society issued a statement recently emphasizing the importance of synthetic organic chemistry in the growth of American industry. Listing industries dependent upon synthetic organic chemistry, it mentioned pyroxylin lacquers, used as a finish for 'practically all' automobiles, pyroxylin plastics, rayon, synthetic resins used in varnishes, insulating materials and articles of personal adornment, flotation agents used in treating ores, new pharmaceutical products, antiseptics, anaesthetics, dyes and explosives."

—The New York Times

a special branch of chemistry has evolved—organic, or carbon chemistry. This deals with the materials of animate origin and similar materials prepared by the chemist in his laboratory. The great majority of these substances of relatively simple structure have been prepared in the laboratory, or synthesized; hence the term "synthetic." The extent of the chemist's activities may be seen from the fact that approximately 250,000 different organic compounds are tabulated in the latest chemical dictionaries. Only a few are the result of nature unassisted.

Now, it must be admitted that the cases in which the chemist has succeeded in duplicating nature's products by putting various elements together in the laboratory are not exceedingly numerous. In fact, most of these synthetic organic compounds are comparatively simple in structure when we consider the tremendous complexity of many compounds which occur in the bodies of living organisms.

INDUSTRIAL USES OF FARM PRODUCTS

We are not so much interested in the synthetic efforts of the organic chemist as we are in what uses he may be able to find for farm products. Perhaps the best approach to this subject would be to enumerate briefly some of the more important industrial uses which have been developed. Of course, some of the oldest uses for products of agricultural origin are the manufacture of leather from hides of animals, and of clothing from cotton and wool. Making linen from flax and paper from reeds and growing certain special plants for use as coloring matters or as medicinal products are also very old enterprises. The wrappings of mummies were often dyed with indigo, indicating a knowledge of this vegetable dye long before the Christian era.

The development of the steam engine and the replacement of hand looms by power looms have created a factory market for cotton, wool and other fibers.

The development of a process for making sugar from beets, or from sugar-cane, and processes for manufacturing starch from potatoes and from corn are well-known examples of the consumption of farm products by the factory.

In an effort to find uses for the various by-products obtained in the production of cotton fiber for the textile market, the chemist has found ways for preparing cottonseed-oil and treating it chemically to increase its attractiveness as a food. The purified, bleached cottonseed-oil and the solid fat which may be prepared from it by chemical methods have found a large market. Some of the other oils of animal or vegetable origin which are consumed in large amounts in the factory are linseed-oil, rapeseed-oil, peanut-oil, corn-oil, and a long list of others, such as oil of wintergreen and oil of cloves, which are produced either as spices or for medicinal purposes. The du Pont Company alone used approximately a million dollars' worth of linseed-oil during 1927.

When a farm product becomes a factory raw material and begins to receive the attention of the chemist, an effort is made to find uses for all the by-products which may develop in the manufacture of the main product. The utilization of cotton is a nice example of this.

Cottonseed, itself, is a pretty good fertilizer. It contains about 3 per cent of fixed nitrogen, about 1 per cent of phosphoric acid, and around 1.25 per cent of potash. In a cotton crop having a value of around \$1,500,000,000, the cottonseed produced as a by-product has a value of over \$200,000,000. It has been estimated that the chemist has added \$10 per bale to the value of the cotton crop. This illustrates the importance of the uses which have been developed for what was originally merely a by-product of the growth of cotton fiber for the textile trade. Oil, hulls, cottonseed, meal and cake, and the hairs which are shaved off the cottonseed itself are all valuable materials. Refined cottonseed-oil, which has largely replaced olive-oil, and from which are prepared fats serving the same purpose as lard, yields other by-products in the course of its processing. For example, the poorer grades of cottonseed-oil are used for the manufacture of lower grades of soap, for candles and for lamp-oil. The hulls are used for fuel and, when mixed with meal, for cattle feed. The linters or seed hairs are used largely in the manufacture of chemical compounds.

PRODUCTS FROM CELLULOSE

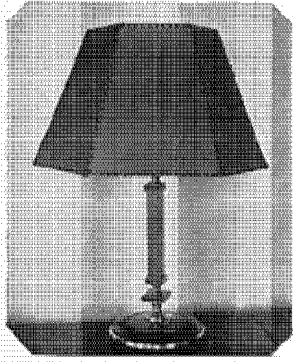
Chemical compounds prepared from cellulose, as well as the woven textile itself, are used in the manufacture of millions of yards of coated textiles consuming millions of pounds of cotton in the production of a wide variety of coated fabrics for the automobile trade, upholstery and interior decoration, as well as for other uses; cements for leather, textiles and paper; waterproofing compositions, smokeless powder, gun-cotton, blasting gelatin, coal mine explosives, commercial high explosives of various types for the removal of stumps, the blasting of ditches, draining, grading and the like.

Plastic compounds from cellulose derivatives give us such articles of commerce as billiard and golf balls, toilet articles, electrical insulators, photographic films and materials, clear, transparent sheets for windows, scientific instruments, enamels and many other useful products.

I should not omit to mention that rayon, the first man-made fiber, is manufactured from cellulose from both wood and cotton. In fact, a large use for cellulose derivatives is in the manufacture of synthetic textiles such as cellulose nitrate or Chardonnet silk, zinc chloride silk, cuprammonium silk, xanthate or viscose silk and cellulose acetate silk. Not only has rayon become an important item in the clothing of civilized man, but it has a wide usefulness in interior furnishings for his home, and this same chemical process has resulted in the development of an interesting variation in the form of a casing for sausages, since Cellophane has recently been widely adopted instead of animal casings for this purpose.

You are familiar with the preparation of commercial solvents by fermenting sugar and starch. From corn and molasses are made such materials as ethyl and butyl alcohols, acetone, acetic acid, glycerin and other products. A rather large proportion of the corn crop is now processed by the factory and not by the hog, a consumption of over

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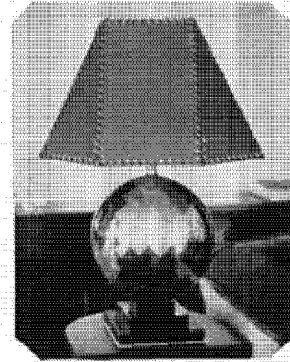


This lamp, suitable for a room of any style, is made by the Ivorycraft Company, Long Island City, N. Y. The base is green Pyralin, with green acetate shade.

BEAUTIFUL LAMPS FOR THE HOME

*Designers and manufacturers today produce
lighting fixtures that fit in well with
many decorative schemes*

By ROSE ESTELLE BROWN



A typical modern lamp, with sleek black Pyralin stand and copper-colored acetate shade, designed by Ilonka Kurasz and made by Egmont Arens, of New York City.

ARTIFICIAL LIGHT is probably one of the most important factors in interior decoration. Yet it has taken several years for designers to appreciate the full possibilities of lighting fixtures as decorative adjuncts and not merely utilitarian objects. This is mainly due to the fact that decorators did not consider the appearance of a room under lamp light, and left the lighting problem to their clients for solution.

Today, however, they are beginning to realize the importance of proper lighting and are finding it worthy of careful consideration. They have learned that the foundation of many excellent decorative schemes is the play of light and shadow, the balance between light and darkness. Their objective is a soft, subdued, indirect glow—a mist of light—rather than an intense, luminous glare like that which came from the old ceiling fixtures.

Several years ago Mr. Morgan Brooks took up the consideration of proper lighting before the Society of Illuminating Engineers. His prediction is extremely interesting and practical. "A rapid advance in lamp making," he said, "which gives us powerful units, also necessitates new methods of indirect or concealed sources to avoid glare. Yet possibly the successful attempt to introduce light from nowhere has outdone itself, as the logical mind is baffled by the absence of a source of light. Not only is it a satisfaction to know where light emanates, but it is artistically pleasing to have illumination non-uniform."

When a room is flooded with light, it loses its charm; it is completely grasped at a glance and there is no opportunity for the play of the imagination. A room can also be made to appear larger than it really is by an effective use of light. Floor or table lamps are particularly helpful in creating individual effects. They cast a strong light upward and downward, and, as a result, the limited area of illumination lends charm to the well-furnished room.

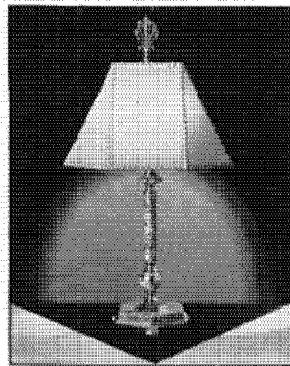
Harmony of colors, an important note in decoration, can easily be enhanced or lessened by correct or incorrect lighting. Almost every one has seen rooms that were beautiful during the day literally "fall to pieces" when the lights were turned on. The colors assumed different shades and were a collection of inharmonious tones. In the same manner an incongruous selection of lamps can spoil an otherwise attractive room.

In the past, lamp designers and manufacturers have devoted most of their time to reproducing fixtures to harmonize with period furnishings. Some of the most important of these are the slender wrought-iron stem with a long wax candle, topped by an unshaded electric bulb for the Hollywood-Italo-Spanish room; the converted glass kerosene lamp for the Provincial-Colonial room; the Chinese and Empire period lamps; Louis XV chandeliers, and numerous others that are well known.

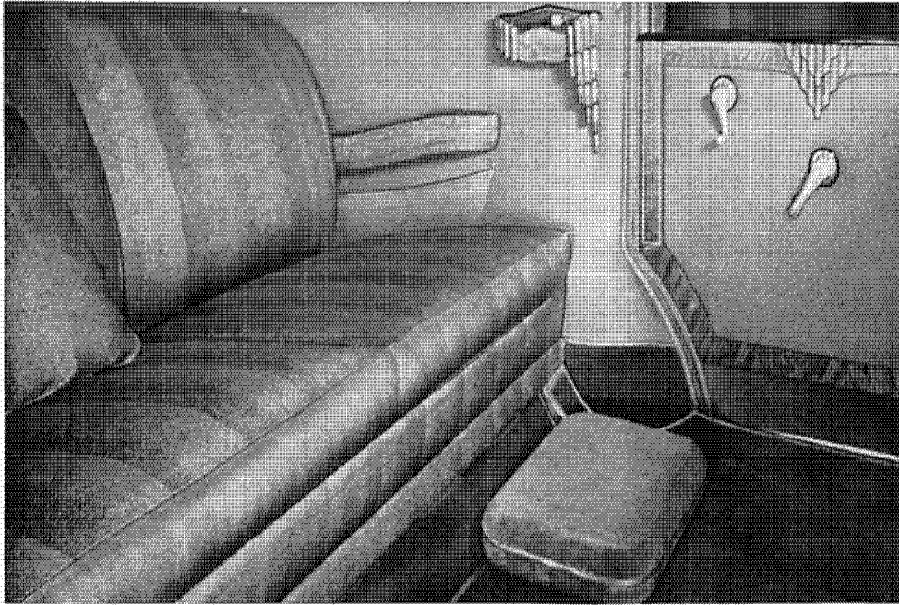
Just recently manufacturers, in coöperation with designers, have begun to produce really beautiful, durable and practical lamps for the modern home. Many of the bases for these lamps are now being made from du Pont Pyralin. It lends itself admirably well to the designs of modern art, not only because it is easy to fabricate, but also because its wide range of colors affords unlimited opportunity for creating striking combinations.

The problem of finding a material suitable in texture and color for shades has also been solved by the use of another du Pont product—a new, fire-resisting acetate. The complete lamps with Pyralin bases and acetate shades express an atmosphere of comfort and luxury by employing controlled proportions, restrained details, durable textures and the cleanest of surfaces.

Any one interested in securing additional information about the use of Pyralin for lamp bases and of acetate for shades may write to the Du Pont Viscoloid Company, Inc., at 330 Fifth Avenue, New York City.



A product of the Zyloware Company of Long Island City—admired by those who are not attracted by l'art moderne



Interior of one of the cars exhibited at the coachwork salon, which was held at the Commodore Hotel, New York City, last December. The permanent upholstery is a rayon and linen fabric, the design of which was created by Honka Karasz, prominent New York decorative artist



WHAT SELLS THE MODERN CAR?

A study of this question prompted the Du Pont Rayon Company to institute its new Fabric Development Service

TO those who remember the old "horseless carriage" exhibits in Madison Square Garden, a stroll through the coachwork salons and motor shows of 1929 must seem like an excursion into other worlds. Those were the days when good-natured skeptics crowded about strange contrivances that used to be buggies; when silver-tongued salesmen mystified the throng with words like "carburetor," "ignition," and "spark-plug;" when a lesson in driving a car was a short course in mechanical engineering, nothing less.

Remember them?

Well, if you do, the transition of the motor car must indeed seem extraordinary. Today, the new models are displayed on rich carpets in hotel lobbies in palm-bordered ballrooms, in luxurious salons. From their glistening sides are reflected all the colors of the rainbow. Their long, low lines breathe speed and more speed, their colors are soft blendings of the rainbow. Proper accessories are in their proper places.

Around these beautiful cars throng hundreds, thousands of men and women, just as they swarmed about the "gas buggies." But it isn't the "carburetor" that draws them today, nor the motor. The modern automobile appeals to the inborn love of beauty that is in all of us. It is *beauty* that sells these cars—beauty of line, color, fittings, interior decoration, and the riding comfort and pleasure

By HOWARD J. WHITE

General Manager, Viscose Process Department
Du Pont Rayon Company, Inc.

to be directly derived therefrom.

No little credit for the brilliance of our modern cars should be given to women. They have played an important part in the development of line and color both within and without the car bodies. The expression of individual taste is the woman's way of creating style. The instinctive correctness of her taste has led automobile manufacturers to address their efforts quite as strongly to the feminine side of the home as to the masculine side.

Every woman is an interior decorator at heart. Motor-car makers and body builders have only recently begun to modernize the interiors of their models. Body designs have been revolutionized, color has arrived as a tremendous force, and accessories and furnishings have kept in step with the times. It is apparent that Milady should enjoy upholstery in keeping with the modern trend.

It was this situation that prompted the Du Pont Rayon Company, a few months ago, to start a careful investigation into the relation of upholstery to the buying motives of the public. As a result of that study, and collateral researches into fabric construction and design, the Du Pont Rayon Company has established a Fabric Development Service, an organization of experts who devote their time to working with motor-car manufacturers and coach builders on designs and textures involving the use of a material entirely new to the automotive field—rayon.

This Fabric Development Service first introduced rayon for automobile upholstery in the famous New York Salon last December. The response from builders of fine cars was immediate, and led to the display of rayon-upholstered models by prominent manufacturers in the current New York and Chicago automobile shows. By careful study, intelligent research and artistic interpretation of modern trends, the new Du Pont Rayon service has awakened tremendous interest throughout motordom.

ADVANTAGES OF RAYON

The importance of rayon to upholstery for automobiles is embodied in advantages unequaled by any other textile fiber. In the first place, rayon permits an infinite variety of design and color harmonies in the interior of a car. As one artist has stated, "It is just like adding another color to the spectrum." Rayon also brings to upholstery fabrics rich smoothness, cleanliness and relief from the present uncomfortable "sticky" feeling in most of the upholstery seen today.

Under the expert guidance of fabric artists, this yarn has been combined with linen, wool or cotton to form textures that range from the ultra-conservative to the decidedly modern, without affecting the fundamental advantages of smoothness and cleanliness. It follows, naturally, that this wide breadth of design possibilities has in itself become most important. It is now possible for motor-car makers to install, in their semi-custom jobs, upholstery that will be strictly in keeping with the "ensemble" of line and color in the body. Moreover, the woman of taste may select precisely the upholstery best suited to her desires. People are trying more and more to obtain things distinctive and "different." This fact is accepted by hundreds of manufacturers in many industries. In the constant effort by automotive designers to provide such individualism in their products, the advent of rayon upholstery, therefore, has a distinct function.

All of these points were discussed and studied by the Du Pont Rayon Company before entering this new field of service. The time is ripe for the exercise of more individuality and greater variety in the creation of upholstery fabrics. Progress-

sive automobile manufacturers have echoed the same belief. For example, several cars, among them Cadillac, Stutz and Isotta-Fraschini, appeared in the New York Salon, last December, with smart and serviceable rayon upholstery in some of their closed models. When it is realized that motor-car manufacturers nowadays do not grasp at every novelty that happens along, it is all the more interesting to note this quick acceptance of rayon by leaders in the industry.

CHANGEABLE COVERS, TOO

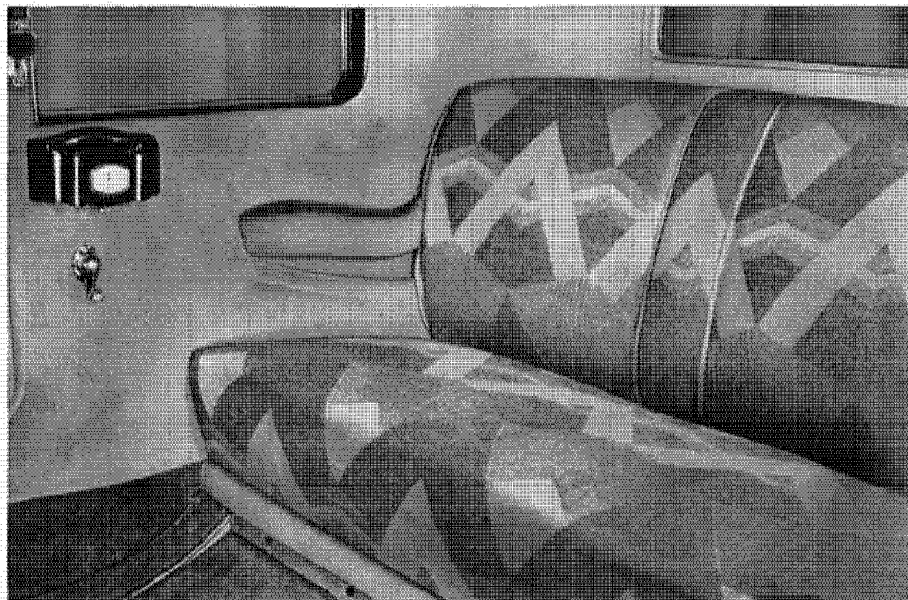
Of almost equal importance has been the development of rayon-cotton, rayon-jute and rayon-wool fabrics for detachable upholstery or slip covers.

Coverings have been designed to permit an owner to change completely the interior of his or her car in less than three minutes. This is accomplished by means of a patented device which takes all the "work" out of slip cover installation. In other words, it is now possible for the woman of fashion to have an interior in her car for every purpose—for shopping, for the afternoon, for the theater or for sports. Father, too, can have a cover to use while on hunting or fishing trips, or for business. Along with the permanent rayon upholstery available for the car when new, these covers express more than ever before the real desires of car owners.

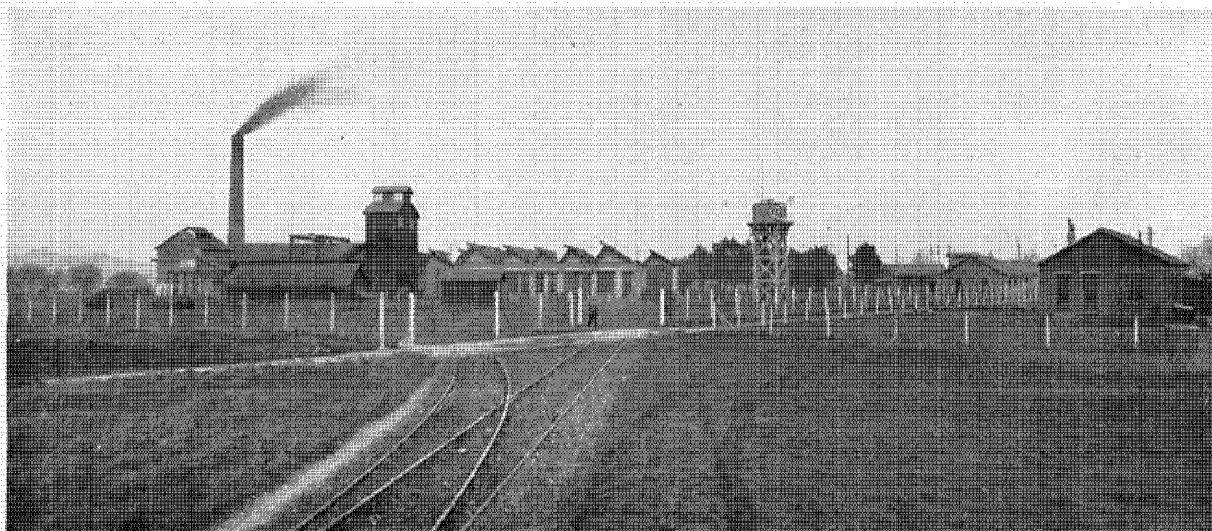
Aside from their smartness, they are exceedingly durable. Rayon upholstery, as here described, has been tested in New York taxicabs where for thousands of miles it was subjected to the hardest kind of service without showing the slightest wear. Moreover, permanent or detachable upholstery fabrics, woven flat with rayon, resist dust and dirt and can be easily cleaned.

In developing a wide variety of these modern fabrics, the Du Pont Rayon Company's Fabric Development Service enlisted the aid of a group of high-grade weaving

(Continued on page 16)



The upholstery shown here is a combination of rayon, cotton and jute, and it is detachable. It was designed in the modern manner by Lucille Buchanan, of New York City. Seat coverings of this type may now be obtained to express the individual tastes of car owners.



General view of the plant of the Société Française Fabrikoid which is located near the town of Gaillon, France

FABRIKOID IN FRANCE

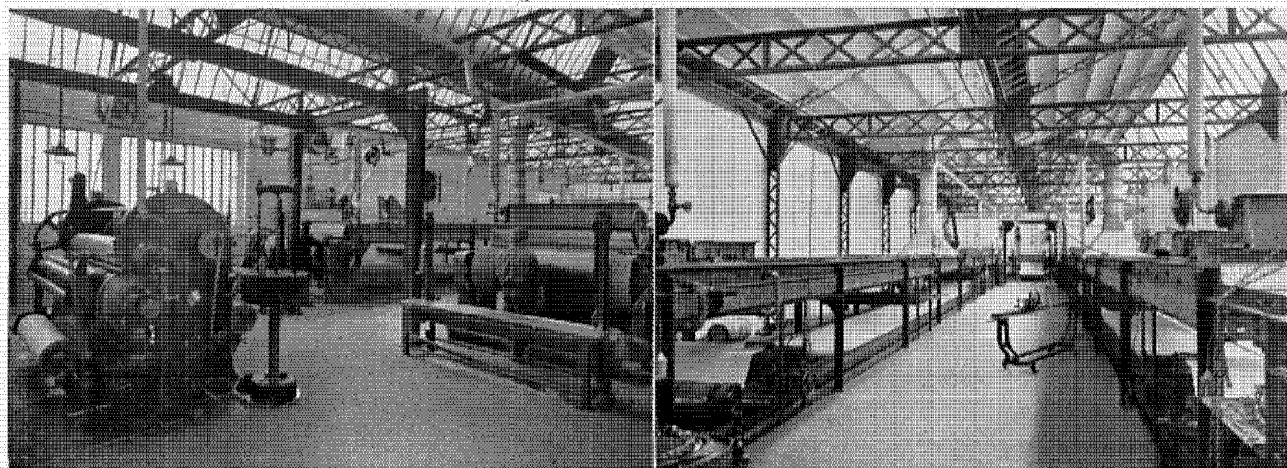
In a section of Normandy rich in historical interest, the Société Française Fabrikoid makes the well-known du Pont product

ALTHOUGH in America we are well acquainted with the appearance of the du Pont oval, due to the extensively advertised articles carrying it, one gets an unusual thrill to see the word "Fabrikoid" in the familiar red oval, painted in large characters on a water tower in old Normandy.

In this part of France, the railroad following the general direction of the River Seine from Le Havre to Paris passes by a small village called Gaillon, near which is the site of the French Fabrikoid factory erected two years ago.

By J. C. EMHARDT
Foreign Development Engineer
Fabrikoid Division

Interesting as the valley of the Seine always is, it seems that this country around Gaillon is unusually rich in historical lore. It is only a few miles from the city of Rouen where Jeanne d'Arc died. It was in this part of the country near Gaillon that Richard the Lion-Hearted, King of England and Duke of Normandy, returning from the Crusades 735 years ago, built the Chateau Gaillard, which is the finest example of a Norman fortress, and the ruins of which still stand high on the chalk cliffs above the gently flowing river. Though the



Inside the French plant. These views show sections of two coating rooms, with an embossing press in one of them

Chateau Gaillard is five miles away on the opposite bank of the Seine, there was once an underground passage which connected Chateau Gaillard with the Chateau Gaillon. We are told that these tunnels were made to connect important Norman castles so that no one would be completely shut off from communication with the rest of the country. The tunnels were always built by serfs who were afterwards put to death to preserve the secrecy of the locations.

In this romantic district where knights of old with their retinues used to hunt and ride, Fabrikoid, which is used the world over for many purposes such as bookbinding, automobile coverings and upholstery, wall coverings, luggage and so on, is manufactured today. From the windows of the factory one can see the ruins of the towers of the chateau where Louis IX was married. This was about 250 years before Columbus discovered America.

For a number of years France has represented a very important market for du Pont Fabrikoid. About four years ago, due to various local conditions, the idea was conceived that it would be well to undertake the manufacture of Fabrikoid in France. This was suggested by a group of prominent French industrialists who approached the du Pont Company with a view of forming a French company affiliated with the du Pont Company. As a result

of the ensuing negotiations there was brought into being the Société Française Fabrikoid.

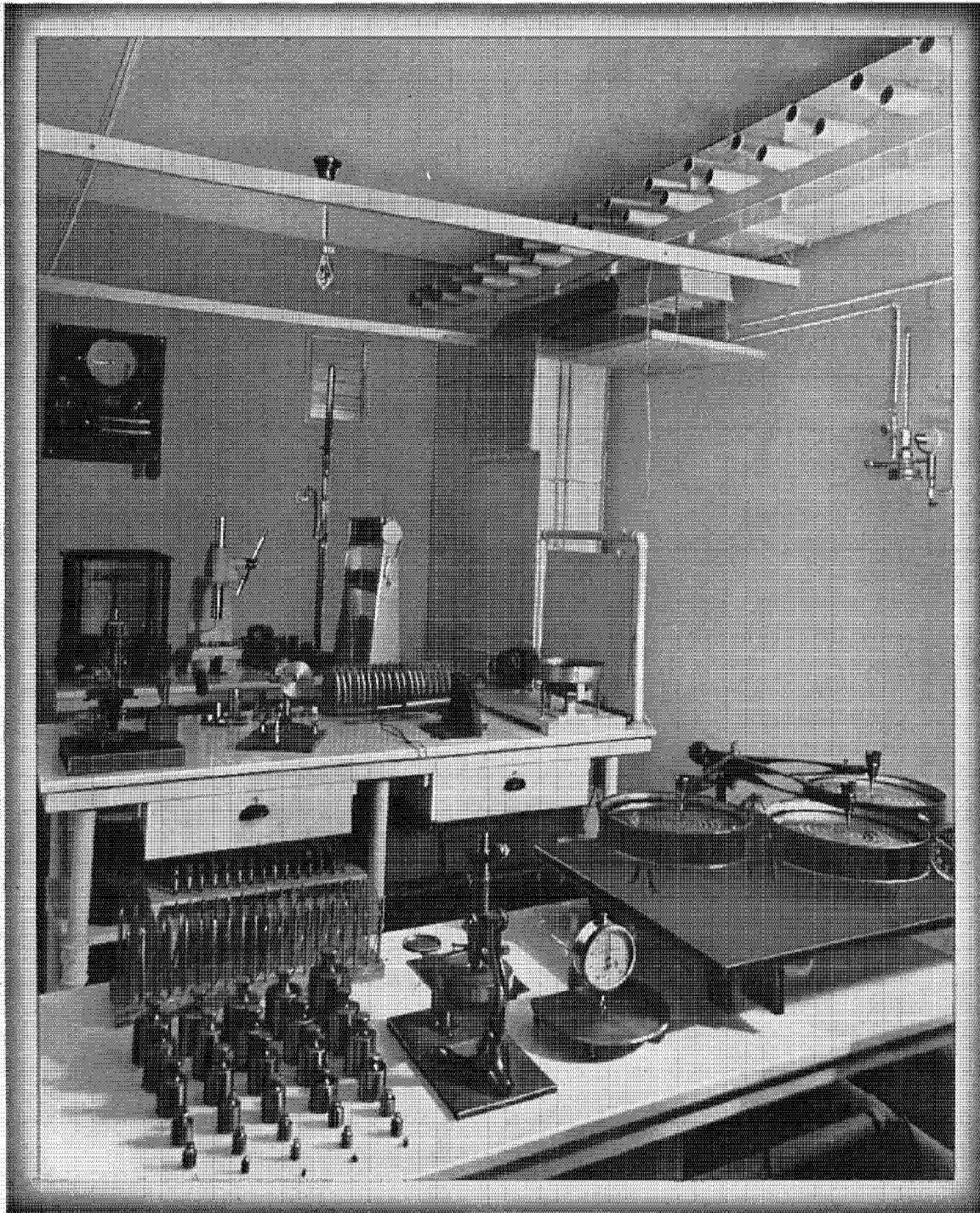
Naturally, there are many considerations involved in a project of this kind. The company had to be organized, a site for the factory selected and purchased, the type of plant planned with the selection of equipment necessary to produce the various types of Fabrikoid currently used in the French market, before actually starting any construction. In view of the many complex problems to be solved, the French sponsors of the enterprise organized a mission to visit Newburgh, New York, headquarters of the Fabrikoid industry, where many of these things were discussed and settled. Later they sent two of their men to this factory for a protracted stay, during which time a detailed study of American methods was undertaken.

In constructing the new factory, full advantage was taken of all the latest developments in methods and equipment, which had been found to be productive of the best results in manufacturing the highest types of pyroxylin-coated fabrics. The machinery was largely of special design and fabricated in France by specialists in each field. Carrying out the idea of having this a thoroughly French enterprise, as much as possible of the plant equipment was obtained in France, and all the ingredients entering into the French manufacture of Fabrikoid today are of

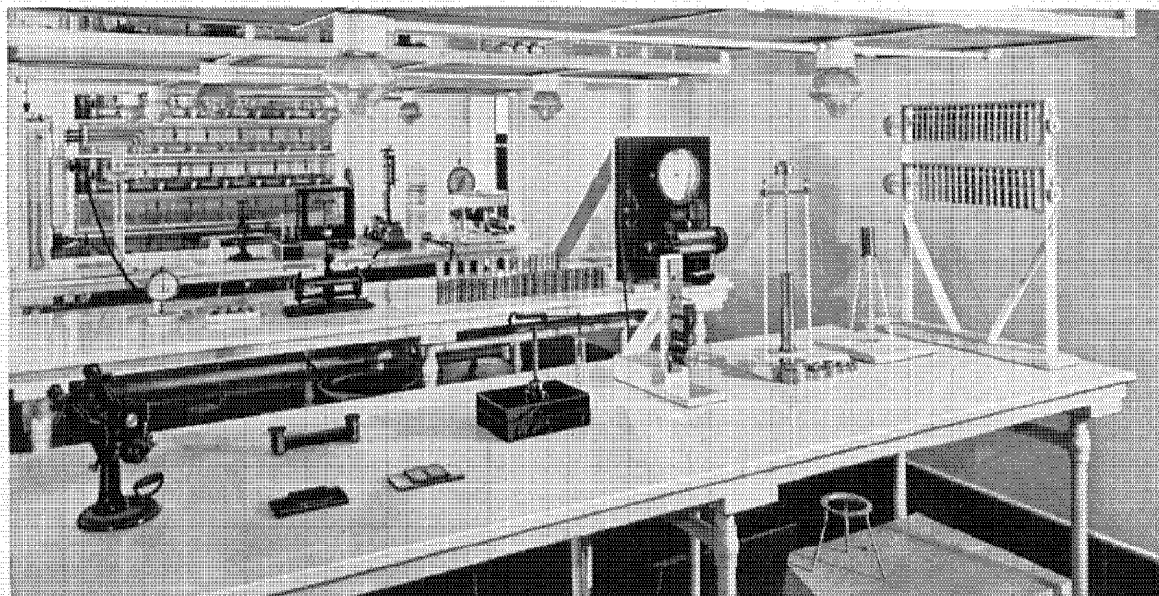
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Part of the administrative and sales organization, from a photograph taken at the recent Paris Automobile Show. Top row, left to right: Messrs. Serrand, Loiseau, Septier, Capellieres, Stora, Charles, Gallay and Basset; middle row, Messrs. Cassati, Boutillier, Meurier, Bouchet, Medus, Fourtain, Guersent and Duprat; bottom row, Messrs. Bazoché, Laimet, Drieux, Mlle. Arrondelle, Messrs. Michaux, Jaqueau and Hochapfel.



The constant temperature room at the Experimental Station. Some of the testing equipment used here is shown on the tables. On the rear table, for example, there is an analytical balance, an arbor press for preparing definite sections of stripped films, an elongation and tensile strength apparatus and a rack for body tubes for measuring viscosity. On the center table is a hardness tester, a print test, a surface tension apparatus, a rack of plates for the hardness test, an instrument for measuring gloss, a spinning device for preparing uniform films and a flow board. On the table in the foreground is another rack of plates for hardness determinations, the weights used in this work, another hardness tester, a film-thickness gauge and a drying-time meter.



The constant temperature room at the Central Technical Laboratory, Philadelphia. A recording wet-and-dry bulb thermometer may be seen at the end of the middle table, with a chart from it reproduced below. See page 10 for a description of the equipment

THE WEATHER NEVER VARIES

Du Pont chemists test paint and varnish products in rooms where the air is maintained the year round at constant temperature and humidity

IT may be freezing in Kalamazoo or broiling in Timbuktu; it may be rainy in Nicaragua or sultry in the Everglades, but there are at least two places where the weather is always ideal. Every day in the year, twenty-four hours a day, in a room at the du Pont Experimental Station, near Wilmington, Delaware, and in another room at the Central Technical Laboratory in Philadelphia, the temperature, humidity, light and air circulation are always the same. These are the rooms in which the standards for du Pont paints and varnishes are set.

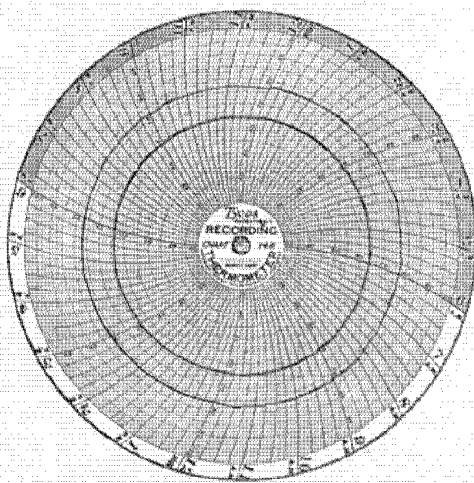
When the company entered the paint business some years ago, its chemical engineers were told to apply their talents to the improvement of paints and varnishes. At the request of the Paint Department, the Chemical Department at Wilmington began its investigation work. The first surveys showed that chemical analysis alone is not a true index of quality. Considering the vast number of raw materials

By D. V. GREGORY
Central Technical Laboratory

and their complex relationships—many of them colloidal in nature—it was clear that physical properties were more important. One of the first problems was the development of satisfactory testing methods for these properties.

The properties of paint vary with each fluctuation of temperature and humidity. It soon became apparent that any comparison of the properties of paint films would be difficult unless some way could be found to secure uniformity of atmospheric conditions. As a result, there was constructed at the Experimental Station a well-insulated room in which the temperature and humidity could be carefully controlled. When the centralization of the paint and varnish development work was effected and the Central Technical Laboratory was established at Philadelphia, a similar room was installed there.

Let us see first how temperature and humidity affect the properties of paint films. Take hardness, for



This chart indicates that the actual variation in temperature and humidity is very small

example. One of the first investigations made with a quantitative hardness tester revealed the fact that two out of four products tested actually became softer, rather than harder, as time went on. The weather reports for this period showed that humidity had increased. In other words, the effect on the film of increasing the humidity was greater than the rate of drying. Not until the humidity dropped again did these products harden. Later results under carefully controlled atmospheric conditions showed increasing hardness of these same products with time. Other tests showed that in some cases raising the temperature 20° F. caused the films to soften to one-tenth of their former value. In a series of products tested none of them was harder at elevated temperatures. In the case of humidity the effect is not so great as with temperature, but a 25 per cent increase in relative humidity decreased the hardness to one-fifth of the original value. Relative humidity may be defined as the percentage of moisture in the air at any one time, compared to the amount of moisture in saturated air at the same temperature.

Temperature and humidity also affect the drying time, although not so much as they do hardness. For example, dropping the temperature from 77° to 42° F., and raising the relative humidity 35 per cent, in a number of cases caused a slowing up of drying to one-third, and in a few instances to one-fifth and one-tenth the former rate.

These same factors also affect the elongation and tensile strength of protective coating films. For example, the elongation of a film in a saturated atmosphere—100 per cent relative humidity—may be as much as 60 per cent greater than is the case with an absolutely dry film. Under these conditions the tensile strength may decrease to one-tenth the former value. A ten-degree increase of temperature may raise the elongation to as much as 10 per cent and drop the tensile strength 25 per cent.

From the foregoing it is obvious that for an accurate evaluation of the physical properties of paint and varnish films it is necessary to maintain a careful control of temperature and humidity in the testing rooms.

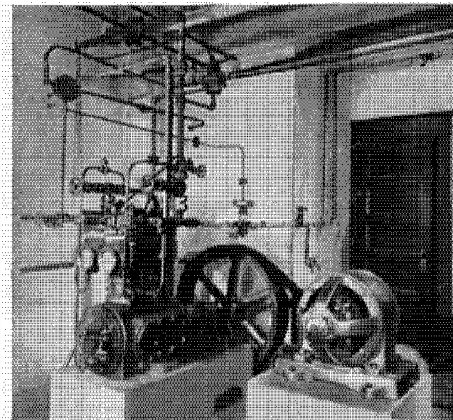
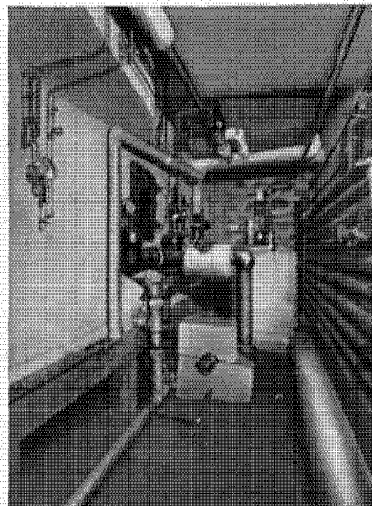
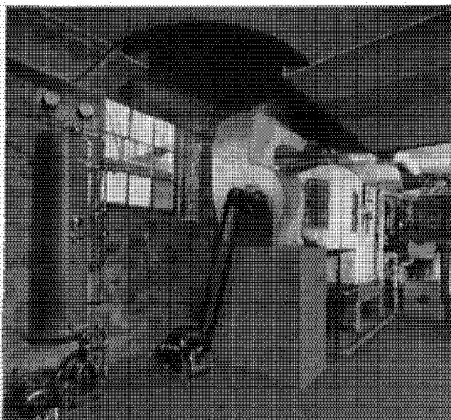
The laboratory equipment used by the du Pont Company for making physical tests under controlled conditions is housed in the rooms illustrated on pages 8 and 9. You will note in the larger picture, near the ceiling, two rows of ejector nozzles. Conditioned air from the apparatus in the basement is forced up through the vertical duct in the corner and is brought into the room through these nozzles. The room air is drawn out through other ducts connecting with the apparatus below, thus insuring a constant flow throughout the system. The room itself is fifteen feet long, ten feet wide and ten feet high. It is carefully insulated and the wall and ceiling surfaces are painted with Du-Lite to assist in the illumination.

The atmospheric conditions maintained—77° F. and 50 per cent relative humidity—together with the light and air circulation, also carefully standardized, make the environment a comfortable one in which to work, for the conditions represent an excellent average of winter and summer conditions throughout the United States.

The air-conditioning process itself takes place in the basement. It is essentially a factory operation. Outdoor air is the "raw material," and it comes in as variable in temperature and humidity as the weather itself. Accordingly, the task is to take this air and make it conform to the required specifications. If too cold, it must be heated; if too hot, it must be cooled; if the moisture content is too high or too low, that must be corrected—and the machinery for doing this is simple and effective. Steam-heated coils, a refrigerating machine, an air-compressor, baffle plates, a water pump, pipes, gauges and the like make up the essential apparatus. See illustrations below.

The process of conditioning the air consists in forcing it through banks of water sprays. During this operation the air attains the same temperature as the water and holds a certain amount of moisture, depending on the temperature. By selecting the right degree of temperature it is possible to have in the air that amount of moisture which, when heated to the temperature of the room above, will yield the relative humidity desired.

(Continued on page 24)



At the left is shown a miniature air-compressor which is a part of the conditioning equipment located in the basement of the Experimental Station. In the center illustration is a pump used to circulate water from the bottom of the spray tank up through the sprays. At the right is the 5-ton refrigeration machine, also a part of the apparatus.



A view of the south end of Beverly cut, north of Manitou, New York. The ledge of rock, averaging from 60 to 80 feet in height, is being cut away for a distance of almost a mile. Note the proximity of operations to the main-line tracks.

FROM STORM KING TO MANITOU

Du Pont explosives are being used to clear a right of way for additional trackage between these two points on the main line of the New York Central Railroad

THE New York Central Railroad has been engaged for more than a year in widening its main line, driving new tunnels and enlarging old ones for a distance of nearly fifteen miles between Storm King and Manitou, New York, on the east bank of the picturesque Hudson River. It is planned eventually to lay down a four-track system between New York City and Albany and when this is accomplished it will expedite both passenger and freight transportation between these points and beyond.

The work undertaken thus far may be divided into four operations:

1. Enlarging the Garrison tunnel to a width of 38 feet and to a height of 26 feet; lining it with concrete and widening the right of way to the north of it by removing a point of rock 85 to 90 feet high.
2. Driving a two-track tunnel parallel to and west of the old Breakneck tunnel; enlarging the latter so that both the old and the new one will be the same size as the Garrison tunnel.
3. Widening the cut north and south of Cold Spring

By R. H. NICOL

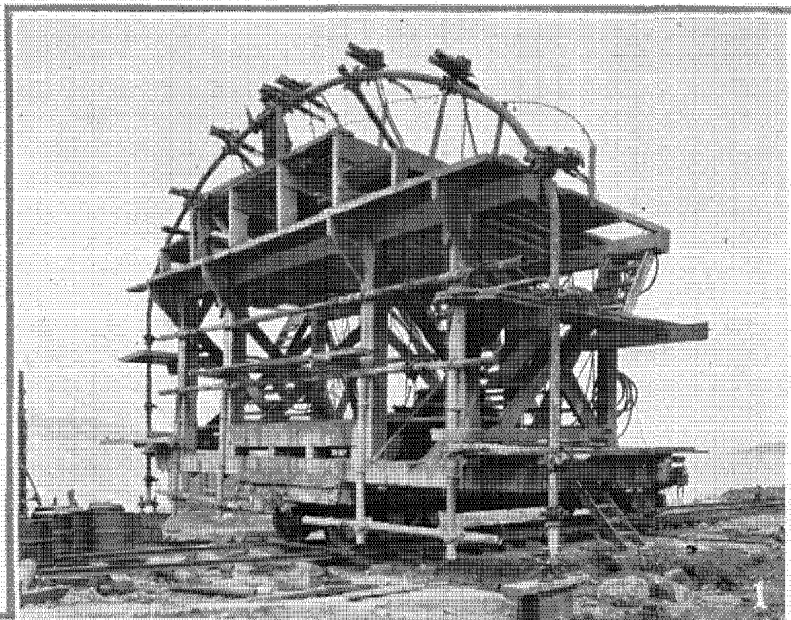
for a distance of five to six miles to permit the laying of two additional tracks.

4. Widening the right of way between Garrison and Manitou to allow for four tracks, two in addition to those at present in service. This work involves clearing a right of way through a ledge of rock which rose to an average height of from 60 to 65 feet for a distance of 5,000 or more feet.

The task of clearing the way for additional tracks on the main line of a busy system seemed almost an impossible undertaking at first. It meant that cliffs would have to be cut away and tunneled through while from 125 to 130 trains a day sped by within a few feet of the operations. This traffic handicapped the contractor, but a way has been found to do this work and still not interfere with train schedules.

Blasting operations have to be carried on so close to the tracks that holes of only 10 to 20 feet in depth can be made. These are spaced from 3 to 4 feet apart and loaded with small charges of dynamite—just enough to permit rock to be displaced with as little secondary or mud-cap

SCENES OF WIDENING OPERATIONS ALONG

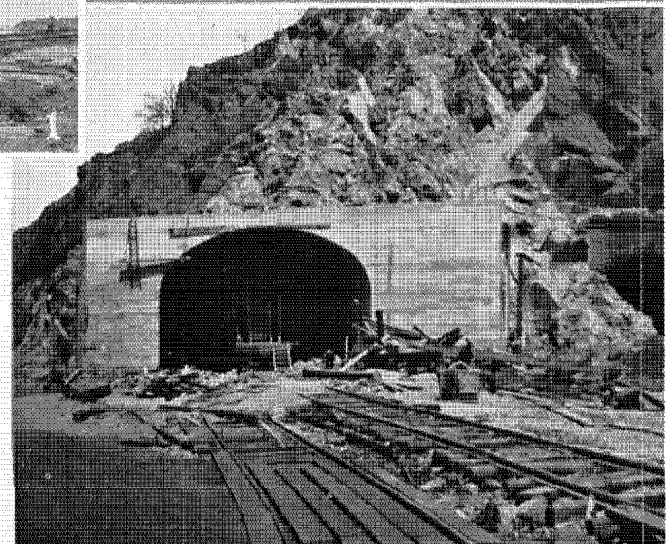


1. The front view of one of two special drill carriages constructed to drive the new Breakneck tunnel

2. The old Breakneck tunnel is at the left. A train of cars entering the north portal of the new tunnel which is driven at the time this picture was taken. On the right is the siphon shafthouse of the Catskill water supply system for New York City. The proximity of this building to the new tunnel greatly complicated the work at this point

3. Some idea of the height of the rock ledge through which the new tunnel was driven may be gained by comparing its size with two men standing at its mouth

4. South portals of the Storm King tunnels—the old (left) and the new (right). The facing on the new tunnel has just been finished



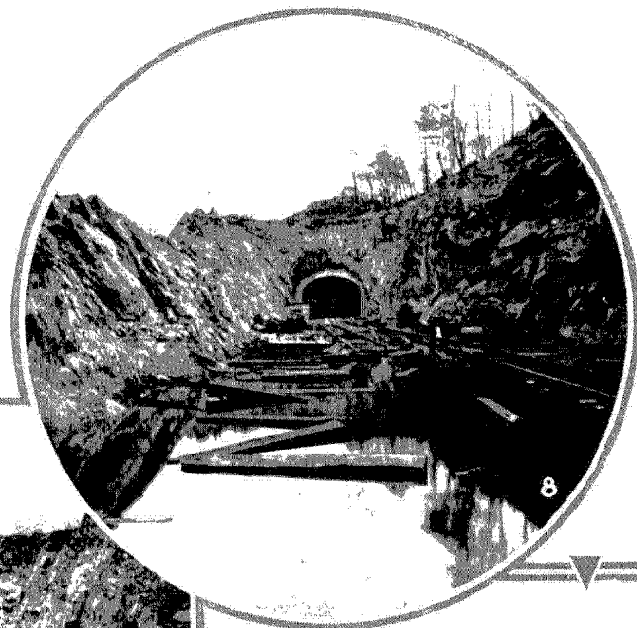
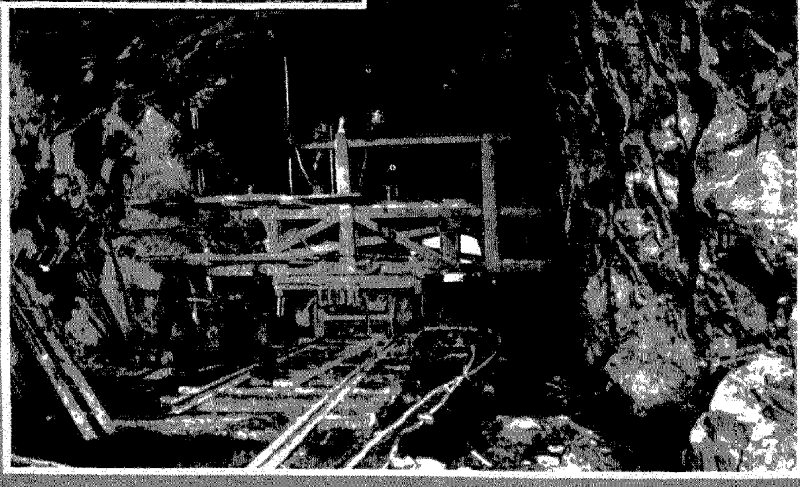
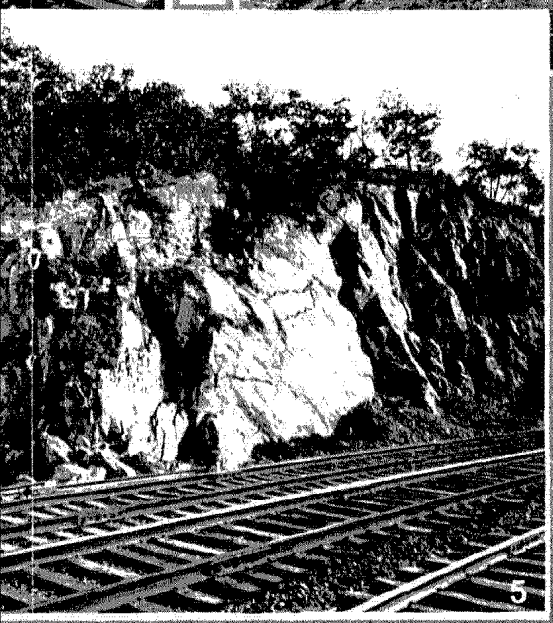
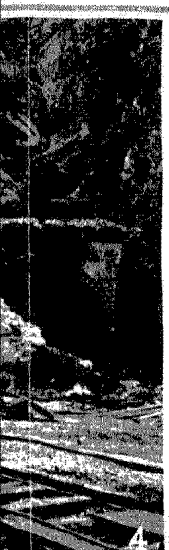
ONG THE NEW YORK CENTRAL MAIN LINE

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5. A section of the right of way north of Garrison which is being widened to permit four tracks—two more than are being used at the present time. Drillers may be seen at work on top of the ledge. At the left, across the tracks, is some rock which has been brought down by a shot.
6. Rock excavation work in the cut south of Manitou. A 100-B Bucyrus shovel is cutting away the ledge while the drillers work ahead. The main-line tracks, over which more than 125 trains pass each day, are close by to the left of the operations.
7. An interior view of the Garrison tunnel showing the drill car, equipped with four drills, which was used to enlarge the tunnel to a width of 38 feet and a height of 26 feet.
8. The north portal of the same tunnel. Here the right of way was widened by cutting through a point of rock 85 to 90 feet high.



shooting as possible, and to place the rock so as to make it accessible for the powerful shovels to handle. In this type of rock excavating, care must be exercised in determining the burden, height of slope, the stratification and type of rock to be moved before the holes are placed, and the amount of explosives loaded.

Only two shots a day are permitted. In the morning the section farthest from the tracks is shot, twenty minutes being allowed for clearing the adjacent track. At noon the face of the cliff close to the tracks is shot, and thirty minutes are allowed for the blast and the clearing. The rock which is brought down by this shot keeps the shovel busy until night. Drilling is done at night with power supplied by stationary plants composed of one or more oil-engine compressor units and portable compressors.

Approximately 40,000 cubic yards of rock were removed from the Garrison tunnel and its approaches, and, because of the blasting restrictions, it was an exacting task. The tunnel enlargement had to be made without disturbing the remaining rock or causing a slide into the two-track open cut which flanks the tunnel on the east.

A similar procedure is being followed in the work of enlarging the old Breakneck tunnel now that the new one is completed and in use. The length of the former is about 540 feet between portal faces, and that of the latter 450 feet. In all, approximately 40,000 cubic yards will be removed from the new tunnel, its approaches and the old tunnel when work on it is finished.

The widening of the cut north and south of Cold Spring required the excavation of 30,000 cubic yards of rock. All

of these operations—some of which have been completed—involve the excavation of between 800,000 and 900,000 cubic yards of rock.

The Walsh Construction Company, of Davenport, Iowa, one of the largest railroad contracting organizations in the United States, has the contract for the work. With its large, new shovels, up-to-date drilling equipment and able management, the difficult job is being executed to the satisfaction of the engineers and in keeping with the progress expected under present conditions.

This is the second large project this company has undertaken for the New York Central Railroad. The first was the Castleton, New York, cut-off which was completed several years ago, at which time a description of the work was published in this magazine. Du Pont explosives were used on the Castleton project and in the present instance they are helping the contractor push the work to completion. About six hundred thousand pounds of dynamite will be required.

H. C. Kahl is directing operations from the company's field office which is maintained at Garrison, almost directly across the Hudson River from the United States Military Academy at West Point. The successful, rapid and safe manner in which the work is being handled is a tribute to the efficiency of the company's organization.

The Walsh Construction Company maintains district offices at Indianapolis, Indiana; Cleveland, Ohio, and Chicago, Illinois. T. J. Walsh is president of the company; H. C. Kahl and David Small are vice-presidents; E. P. Walsh is treasurer, and M. A. Kennedy is secretary.



This view of the old Breakneck tunnel was taken before the work of driving the north portal of the new tunnel had started. Its location may be seen in illustration 2 on the preceding pictorial page

HIGH SPOTS IN DYE PRODUCTION

The year 1927 is the latest period on which authentic data concerning the domestic dye industry are available. The following excerpts are taken from the recently published U. S. Tariff Commission's 1927 "Census of Dyes." They present illuminating side-lights on a most essential industry—one in which, by reason of being a dye manufacturer, the du Pont Company is vitally interested

THE output of dyes by fifty-five firms in 1927 was 95,167,905 pounds, an increase of 8.2 per cent over 1926. Sales amounted to 98,339,204 pounds, valued at \$38,532,795, as compared with 86,235,836 pounds, valued at \$36,312,648 in 1926. The increase in production is almost entirely due to the increased output of indigo, sulfur black, and vat dyes (other than indigo). Increased sales are largely accounted for by the increase of sulfur black, indigo, other vat, direct and acid dyes."

The dye industry is correctly called a key industry because thousands of plants are dependent on dyes for the perfection of their merchandise, yet the sales value of its entire output is picayune compared with the net earnings of many industries. Dyestuffs directly influence the marketability of billions' worth of goods.

"The weighted average price of all domestic dyes sold in 1927 was 7 per cent less than the weighted average of those sold in 1926. There has been a steady decline in prices since 1917, when the average was \$1.26 per pound. Prices in recent years have run as follows: 1921, 83 cents; 1922, 60 cents; 1925, 47 cents; 1926, 42 cents; 1927, 39 cents. Using the average price received for dyes in 1921 as a basis of valuation, sales in 1927 would have totaled \$81,621,539 instead of the actual figure—\$38,532,795."

It will be recalled that the present tariff act was enacted in 1922, so that despite the protection afforded the dyestuffs industry there has been available to the consuming trades constantly improving dyes at lowering prices.

FEWER DYE PRODUCERS

"In 1927, fifty-two firms reported the production of dyes (exclusive of three firms producing stains and indicators). This is a decrease of seventeen producers since 1925 and of thirty-eight since 1919, when the largest number of domestic manufacturers operated. The reduction in the number of dye plants is a natural result of severe competition and comparatively little coöperation."

Severe domestic competition has eliminated all but those efficiently organized, despite tariff protection.

"The outstanding feature of the year 1927 was the expansion in the domestic manufacture of vat dyes. The output of vat dyes other than indigo was 5,961,688 pounds, an increase of 48 per cent over 1926, which in turn was 54 per cent gain over 1925. The superior fastness of vat dyes and the variety and beauty of shades that they produce

By W. F. VAN RIPER

have been largely responsible for a steady increase in their use. They are

used on dyed and printed shirtings, blouse material, dress goods, ginghams, muslin curtains, and other cotton wash goods, and have a limited application on silk and a still smaller one on wool."

More and more textile producers are turning to vat dyes for the solution of their fast-color problems. This is particularly true of cotton finishers. When material is required to be fast to severe washing and sunlight, it is only a proper selection of vat dyes that will satisfy the specifications.

MORE VAT DYES USED

"Classified by method of application, 41 per cent of our imports in 1927 were vat dyes, 17 per cent direct dyes, 15.5 per cent acid dyes, 11.5 per cent mordant and chrome dyes, and the rest basic, sulfur, and spirit soluble dyes."

These figures indicate the increasing use of vat dyes, for almost half the total imports were of this class.

"Exports in 1927 were 26,770,560 pounds, valued at \$5,498,322. These figures represent an increase in quantity, but a decline of 8 per cent in value from 1926. The principal markets for domestic dyes in 1927 were China, Japan, Canada, and British India. Only China was a better market in 1927 than in 1926; sales there showed an increase of nearly 20 per cent. The low-priced bulk dyes, such as indigo and sulfur black, are the principal colors exported by the United States."

While the total of dye exports is appreciable, it is composed in most part of the large-scale production colors where the severest of domestic competition has forced the prices down to a level comparable with those of foreign competitors. With all other colors it is the labor item in the cost of production that precludes exports.

It might be concluded from all of the foregoing that the increasing popularity of fast colors in the United States will force a greater production of vat dyes. In this field of endeavor, however, domestic dye manufacturers are forced to meet keen foreign competition in their own market, despite tariff protection.

The du Pont Company, as the pioneer American vat-dye manufacturer, is expending every effort to enlarge the range of vat dyes and to keep pace with the increasing demand for these colors, the use of which allows the consumers of the country to purchase truly fast-dyed fabrics.

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Vol. XXIII FEBRUARY, 1929 No. 2

THE CHEMIST

MORE and more industry looks to its chemists for the solution of great problems. The field of research is practically unlimited in scope, and it is pleasing to reflect that in the du Pont organization scores of chemists are constantly endeavoring to improve existing products and to develop new ones. Their work is along the pathway of progress, and they are forging ahead. In recognition of their service we dedicate the cover page to them. The painting reproduced was done by Charles A. MacLellan.

THE "QUESTION MARK"

AS this is written newspapers, magazines and radio broadcasting stations are still acclaiming the great feat of those aviators who set a new record for continuously sustained flight in the airplane "Question Mark." Keeping the big plane aloft for one hundred and fifty hours was indeed a striking demonstration of man's more complete mastery of the air. And refueling the craft from time to time in its own element was another forward stride in aviation, indicating the possibility that some day non-stop flights may be made around the earth.

The plane that has added a new page to the history of famous flights is a product of the Atlantic Aircraft Corporation, and we are naturally pleased to learn that du Pont Pyralin sheeting was one of the materials used in its construction.

ANOTHER USE FOR DYNAMITE

ACCORDING to the *Houston Post-Dispatch*, dynamite is figuring in efforts of west Texas ranchmen to rid the plains country of rattlesnakes, dreaded enemies of sheep and goat herds. When the first chill blasts of winter send the snakes into their rock caverns to hibernate until warmer weather, parties armed with dynamite seek the hiding places of the reptiles, place charges of explosives in the crevices and blow out the varmints.

Those not killed by the explosion are shot, roped or caught with forked sticks. Stock raisers declare that the number of snakes has decreased appreciably in arid sections of Texas as a result of this winter activity.

WHAT SELLS THE MODERN CAR?

(Continued from page 1)

mills to make the cloth. To strike the correct note in design, the services of New York's leading fabric designers were employed. Nothing was left to chance; for that reason the fabrics, as shown at the salon and as accepted by leading motor-car manufacturers, bear the stamp of absolute authenticity and reflect the best artistic skill.

Because the work of its new service is purely creative and advisory in nature, the Du Pont Rayon Company will not enter into commercial manufacture of the cloths. Its purpose is to establish a radically new idea in its rightful place as a sound principle; to assist manufacturers of cars in the selection of interior designs and colors to best coordinate with the car itself; and, finally, to open up a new textile market of tremendous proportions.

In setting out as the leader in a new field of endeavor, the Development Service, even at this early date, has met with gratifying success. A great deal of work remains, but it has been established beyond doubt that these upholstery fabrics have struck a new note in motor-car interiors. They have given to car owners, particularly women, the long-looked-for opportunity to express their inborn tastes precisely where taste is important. As in the case of outside finishes for motor cars, du Pont has again pioneered—this time in the important field of interior decoration.

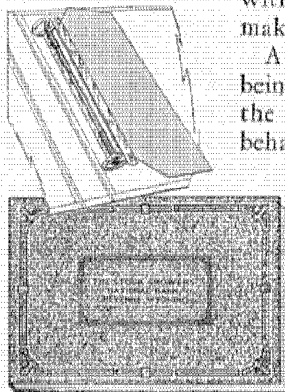
Is it beyond reason, therefore, to prophesy that the motor cars of tomorrow will possess in richness of their rayon upholstery a sales asset of inestimable importance?

A CHECK BOOK BINDER

WRITING checks, unless drawn to one's self, is an unpleasant task, and it is made still more arduous because many check books are clumsy to handle. As the book becomes partially used, the stubs simply will not "stay put." Almost the only way to make an entry in one of them is to hold it down with one hand while with the other you struggle to make legible figures.

A clever bookbinding device, now being marketed, promises to make the most recalcitrant check book behave. It is called the Flat-Lay Roll-Ring Binder. Its design allows the checks to be flat, while the used stubs roll back out of the way, instead of forming a springy bundle that must be held down somehow or other.

This new binder is easily refilled, thus making check writing more convenient than heretofore. It is covered with genuine du Pont Fabrikoid, which is scuff-proof, cleanable and durable. Bankers may obtain full information about it by writing to the Pass Book and Check Cover Company, 232 Broadway, Denver, Colorado.



WHY CIGARS SHOULD BE PROPERLY WRAPPED

Nowadays more cigars are sold in protective wrappers than was the case a few years ago and the reasons are set forth in this article

THE problem of getting his merchandise to the consumer in good condition is one to which the manufacturer of cigars, in common with manufacturers in many other lines, has been giving close attention. It is particularly important to him that the cigar should be palatable when it reaches the smoker, and to be palatable it should contain the right amount of moisture. A cigar that has dried out and has become brittle is an offense to the average smoker. It breaks in his pocket, and when lighted burns too rapidly, and the smoke is hot to the mouth. The delicate aroma—the real test of any cigar's value to the man who is smoking it—is lost.

It is only within the past few years—more particularly since the war—that manufacturers have given this proper consideration. Theraw tobacco that is being rolled into cigars acquires a certain amount of moisture in the process of manufacture, and when a box of cigars leaves the factory, it may be taken for granted that it is in proper condition. In past years, however, that is about the extent of the manufacturer's interest in seeing that the cigar was fit to be smoked when it reached the buyer. The average jobber (wholesaler) usually has a good humidor which is a storeroom for his stock and in which the humidity and temperature can be controlled. When the cigars reach the retailer, they are usually in good condition. But here is where the trouble begins.

Some retailers know how to keep their stock in good condition and have the necessary equipment to do this. But a great many cigars are sold through smaller shops, cigar stands, drug stores, country grocery stores, boot-black stands, barber shops, and the like, and in these places they are likely to dry out and deteriorate.

Since 1922 there has been a slow, steady decline in the number of cigars consumed in this country. Cigar manufacturers made an investigation to learn the reason for this lack of popularity in their product, and many of them came to the conclusion that smokers were going to other forms of tobacco as much because cigars were not reaching them in proper condition as for any other reason.

Manufacturers of the "shredded-filler" cigar were the first to study this problem because they had suffered most. Their product, due to the fact that the filler was made up

By P. V. HOYLE
Business Manager, "The Tobacco Leaf"

MR. HOYLE has been identified with the cigar industry for many years and is recognized as an authority in that field.

While on a recent trip throughout the Middle West he observed the increasing use, in several large plants, of moisture-proof Cellophane as a wrap for cigars. His analysis of the needs of the trade will be illuminating.

—The Editor

of small shreds and particles of tobacco, dried out more rapidly than the ordinary, standard "long-filler" cigar. In order to avoid this they began to cover their cigars with foil, either individually or in packages of three to five. The foil, in addition to causing the cigars to retain their moisture until they reached the smoker's mouth, also protects them against breakage in the pocket. Within a short time practically all the shredded-filler brands in the country were foil wrapped.

Shortly thereafter, manufacturers of other types of cigars began to protect their products with foil, and at the present time a substantial percentage of all the cigars made in the United States are so wrapped. Some manufacturers have met the same problem by packing their cigars in tin cans.

When foil wrapping is used, the color of the leaf wrapper cannot be seen by the smoker. Many—probably most—smokers believe that a

light tobacco-leaf wrapper denotes a mild cigar. This is a fallacy, but the smoker cannot be made to believe it; and in order to make his cigars salable the average manufacturer buys as many light wrappers as he can. These are much more costly than dark ones of the same quality, and when a manufacturer has gone to extra expense to provide them for his cigars, he is loath to cover up this wrapper, thus losing the sales advantage. So he has been obliged to choose between the risk that the smoker will receive the cigars in poor condition or that they will be wrapped in such a fashion that he cannot tell whether he is getting a light wrapper or not.

This latter issue has been met by the use of the new moisture-proof Cellophane, which, it is declared, keeps the cigars in perfect condition and, being absolutely transparent, permits the smoker to see the color of the tobacco-leaf wrapper and to judge the quality of the cigar by the evidences of workmanship. Visibility and protection make a very desirable combination of advantages. Cellophane costs slightly more than foil, and it is more slowly applied to individual cigars. Foil wrappers may be put on by machinery, whereas up to the present time wrapping cigars in Cellophane is a hand-work proposition. But this material promises to solve the problem manufacturers have been wrestling with for years.

HOTELS YESTERDAY AND TODAY

What a contrast! Artist decorators have refinished a choice suite of rooms in the Du Pont Biltmore by using materials of du Pont manufacture

REMEMBER back in the gay 90's when you left home to spend some time in the city? Arriving at the station, you were met by a "cabby" who escorted you to his palatial vehicle with its red and gold rococo decoration, and off to the hotel you rode to be welcomed by another dignified gentleman who carried your luggage upstairs to the room "once occupied by a nephew of General Grant," as he said. And a small tip paid for both the service and the compliment implied.

What a room! But we shall spare you any description other than to identify it with the "golden oak" period of decoration—the age of Morris chairs, couches, cozy-corners, plaster of Paris statuary and rococo ornaments. The furniture—big and brutal—had plenty of "gingerbread" on it for decoration, but that was the fashion.

Today thereminiscence brings forth a smile, for changes have taken place. Gone are many of the old hotels; they have been replaced by gigantic structures that house thousands of people under one roof. Between the old and the new is a wide gap—thirty years of progress.

Up-to-date hotel managers want their guests to have every comfort and convenience, even radio receivers. Naturally, the interiors, the furnishings and fittings have also received attention. The simple, graceful lines of the Georgian, the Early American and French designs have replaced the ornate effects of earlier years, and now art moderne, with its clean-cut simplicity, is finding a place in hotels. The managements are becoming patrons of this art. They are doing over guest rooms in the modern manner because they believe the public will respond to the art appeal.

A suite of rooms has recently been redecorated and refinished in the Du Pont Biltmore, at Wilmington, Delaware. This hotel—in the Bowman-Biltmore chain—is one of the first to employ American decorative artists who use modern materials. These rooms represent the work of Winold Reiss, L. S. Utley and O. W. Wentz, artist designers and leaders in the art moderne

movement in America. Manufacturers and the furniture and decorating departments of large art galleries and stores have collaborated with them.

Art nowadays looks to industry to supply materials for its expression—new textiles, finishes, metal alloys, plastics, glass and the like. The artist designer seeks quality products possessing great utility and versatility to insure freedom for their creative work. And a number of du Pont products—dyestuffs, rayon, Pyralin, Duco, Nemoursa and others—lend themselves admirably to both manufacturing and art uses.

The Du Pont Biltmore suite—a foyer, bachelor's room, living room, bedroom and two bathrooms—reveals the part these products play in the dual rôle. Without describing their specific applications to individual pieces of

furniture, appointments and other decorations, it is enough to say that du Pont dyestuffs give color to the Wilton carpetings. Duco, in air-brushed designs, is applied to some of the walls, and is also used on ceilings, woodwork and furniture. Nemoursa appears on the walls and as an upholstery and drapery material. Other curtains, draperies, upholsteries and the like are made wholly or in part of du Pont rayon, and the window shades are Tontine. Pyralin gives a charming touch to the reading lamps—see page 3—and it appears also in furniture accessories such as drawer pulls and knobs.

Throughout the entire suite, O. W. Wentz of the Fabrikoid Development Bureau, in conjunction with Winold Reiss, has carried out the ensemble idea in both the color schemes and furnishings. While the rooms are modern, the treatment is restrained and in keeping with

THE execution of the Du Pont Biltmore suite was made possible through the assistance and collaboration of the following:

Furniture: John Wanamaker, Philadelphia; Johnson, Handley and Johnson, Grand Rapids, Mich.; Singer and Sons, Mallin Bros., H. Veit and Son, Improved Office Partition Co., Hearthstone Furniture Co., and Park Avenue Galleries, all of New York City.

Lamps: Almco Galleries, Chicago; Ivorycraft Co., Long Island City; The Egli Co., and the Apartment Novelty Company, of New York City.

Bath Fixtures: Speakman Co., Wilmington, Del.

Carpets: Crex Carpet Co., Newburgh, N. Y.

Curtain Rods: McManus & Murphy, Philadelphia.

Picture Frames: Metropolitan Picture Frame Co., New York City.

Original Paintings: Winold Reiss, New York City.

Air-brush Décoration: Gingold Novelty Co., New York City.

Pleated Curtains: Star Harrison Co., New York.

Objets d'Art: United Arts & Crafts Co., New York City.

Fabrics: F. Schumacher & Co., Record Lace & Embroidery Co., and H. Stiefel & Co., of New York City; Scranton Lace Co., Scranton, Pa., and E. I. du Pont de Nemours & Co., Inc.

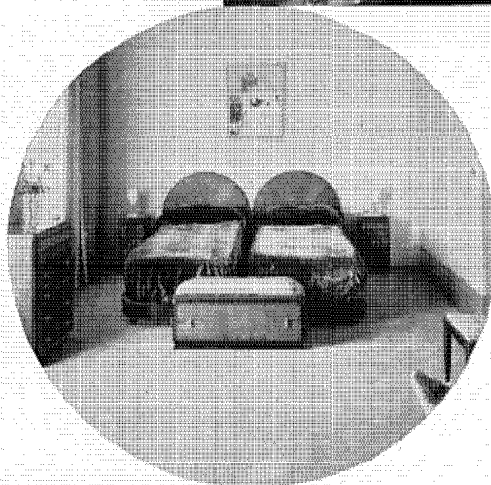
the environment. Simplicity, dignity, comfort, color—these impressions one gains from even a casual inspection of the suite. Few guests perhaps will realize to what extent du Pont materials have been used, but certainly those who inspect these rooms critically will not question their value or utility for refinishing rooms in the modern manner.

L'ART MODERNE IN A HOTEL SUITE

*Pleasing and inviting effects are
attained in rooms where the
interior decoration is
up to date*



*In the bedroom, a section of
which is shown at the right,
blue and silver are the out-
standing colors. The carpet
is light, ultramarine blue.
The walls are finished in
silver Muralart with air-
brushed highlights. Yellow
Duco with blue airbrushed
effects is used on the ceiling.
Simplicity of design marks
the furniture. The beds are
covered with silver-gray
rayon velvet, and the glass
curtains over the Tontine
shades are rayon net in a
modernistic pattern.*



*The predominating colors of
the living room are green
and black. Muralart, air-
brushed with Duco, is the
striking covering for the
walls. Here rayon, Ne-
mourso, Pyralin and Tontine
are also used. The fireplace
of modern design cannot be
seen in this picture.*

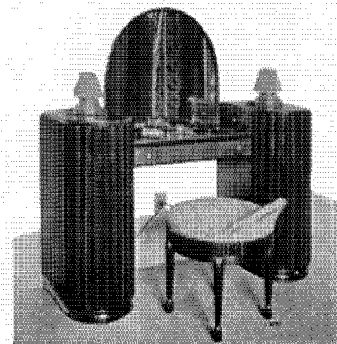


*Above — A group in the
bachelor's room which is
not shown in the illustra-
tion at the left. Rayon
velvet covers the pillow in
the English easy chair,
which can be trans-
formed into a
chaise longue.*



*The bachelor's room is done in a claret color scheme, with even the
furniture finished in red Duco. The glass curtains, overdraperies and
upholstery are rayon. The side drapes are embroidered Fabrikoid.
Pyralin is used for drawer pulls and knobs. The copper-ball lamp at
the head of the day-bed has an acetate cellulose shade.*

*The dressing table
in the bedroom is
of Duco-finished
mahogany with
gray hawwood
facing on the top.
Fluted columns
conceal spacious
drawers.*



FABRIKOID IN FRANCE

(Continued from page 7)

French origin. During the erection of the plant and installation of the equipment, the French markets were canvassed to obtain the many important essential materials of manufacture. These had to be tested with a view to their adaptability for being incorporated in the finished product.

To assist in the preparation and operation of the plant, the du Pont Company sent technical experts to France. By this means it was possible to obtain the benefit of the long manufacturing experience of the Newburgh staff, since the idea was to produce in France exactly the same type of material that America has been supplying to the French market.

Upon the physical completion of the plant there ensued the necessary period devoted to collecting raw materials, acquiring and training the operating men, preliminary manufacture and testing of the products, and perfecting the organization.

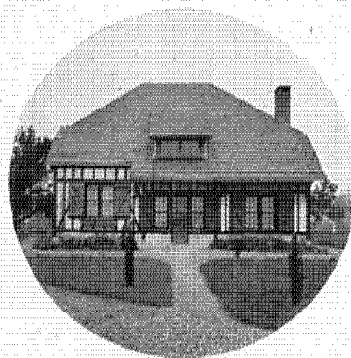
On the twenty-eighth of September, 1926, the Gaillon factory was formally opened. The ceremony was attended by many prominent people and especially by the rep-

resentatives of all the larger French users of Fabrikoid.

The products made at first were mainly those which were already widely used in France, but after a time it was found that the field could be broadened to include some of the newer uses which had not been developed there up to that time.

So great has been the success attending the efforts of the Société Française Fabrikoid that even after this comparatively short interval an expansion program seems to be in order. As is the case in other parts of the world, the French market for Fabrikoid is steadily expanding and new uses for the product are being constantly developed; and, due to the progressive spirit of the Gaillon management, no time was lost in taking advantage of these opportunities for growth.

With a plant that is unquestionably the most modern and efficient of its type in Europe, and with the progressive spirit of its management, the Société Française Fabrikoid is admirably equipped to serve the most exacting requirements of its market.



Home of the directeur général
on the factory grounds

A BEAUTY TREATMENT FOR YOUR MAGAZINES



YOU have seen magazines just out of their wrappers, with clean, smooth, gaily printed covers; and then those same magazines after a day or two of reading by the whole family—tattered, torn, often minus covers. What a jarring note they strike in the decorative scheme of the living room or library!

But smart, colorful, new jackets, called Guild Covers, transform the most woebegone collection of well-thumbed periodicals into a charming decorative feature. Their simple, modern designs, their softly blending pastel shades harmonize delightfully with any color scheme. Simply slip a cover over each magazine and the transformation is accomplished.

These striking covers will hold *The Saturday Evening Post* or smaller publications. They are made in five sizes. In addition, there are five striking, modern, airbrushed patterns and five well-chosen colors to please the most fastidious. To match, there are jackets for novels, book-ends, writing portfolios and other attractive accessories.

These new Guild Covers and related products are made of genuine du Pont Fabrikoid; so their permanency and beauty are assured. When dusty or soiled, a damp cloth restores their original freshness.

They are obtainable in most large stationery, gift and department stores, or the Periodical Readers' Guild, a division of the Harris Wolff Estate, at 520 W. 26th Street, New York City, will tell you where they may be purchased.

ELIMINATING "BLUE MONDAYS"

*An extra half day of leisure awaits the modern housewife
who uses a Faultless Aluminum Washer*

WHOEVER named Monday as laundry day for the women folks certainly failed to realize the extent to which thoughts of "blue Monday" can spoil a care-free and otherwise enjoyable week-end fifty-two times a year. The toil and drudgery of the wash tub is hardly in accord with twentieth century standards of living, and certainly not with the ideals of American husbands who pride themselves on supplying modern equipment to lighten the burdens of housework.

Modern industry and invention have accomplished wonders in perfecting household appliances that reduce long hours of labor to a minimum and at the same time provide more leisure and freedom for other activities. The machine illustrated here is a case in point, for the Vulcan Manufacturing Company, of Kansas City, Missouri, has demonstrated that it is possible to reduce the time required for home laundry work by at least 50 per cent. Its product, the Faultless Washer, is the outgrowth of twenty-seven years of successful manufacturing experience, and one-third of that time has been devoted to specializing in the production of the Faultless line.

Years ago this company set out to build a quality aluminum tub washer of maximum efficiency and durability. While this type of machine is costly to construct, no expense was spared to insure correct design and the use of the best possible materials for each part. Cast aluminum was finally selected as best for the purpose.

Every detail of design has been given careful thought and attention. After exhaustive tests, it was concluded that the so-called "square tub" design was most desirable. This type was adopted because the course of the water is broken by the corners of the tub, resulting in increased agitation. In a round tub it is uninterrupted. The agitator is a large, one-piece, aluminum casting with four blades one inch in width, of special design. An oil-tight, main gear case contains only five working parts—four machine-cut gears and a connecting rod, lubricated by the splash

By HENRY L. D. MOORE

system. The purpose of the Vulcan Manufacturing Company has been to offer not only an aluminum washer that would work efficiently, but also one that would be simple to operate and require little attention. For example, the lower framework is entirely open, so that there is nothing to catch and accumulate dust and dirt. The clutch is located in the top of the agitator where it is conveniently operated. There

are no gear-shifting contrivances in the gear box to shorten the life of the mechanism, and the possibility of oil leaks has been eliminated, since the box is completely closed. Nothing requires periodic oiling except the motor.

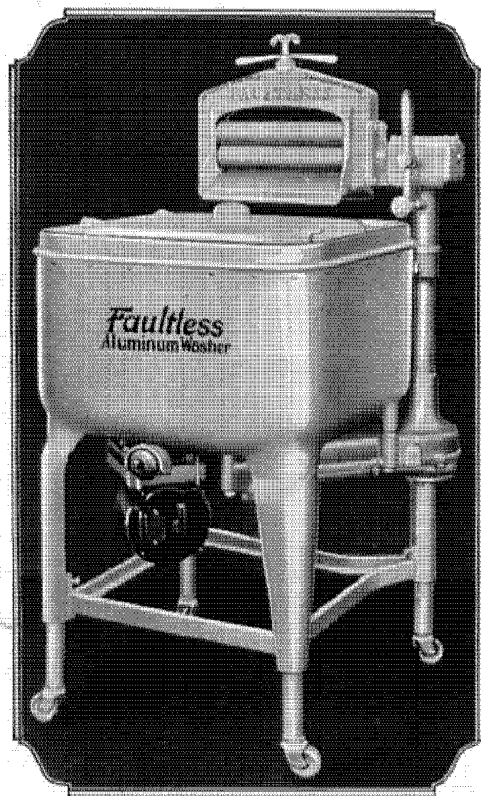
To facilitate operation, every machine is equipped with a specially designed gas heater so that the water may be heated when it is in the tub—to the boiling point, if desired. This eliminates the necessity of carrying hot water.

A cast-aluminum swinging wringer turns the water in either direction and is fitted with a quick-acting safety release and tension thumbscrew. Its large cushion rolls, covered with high-grade rubber, will not crush buttons in the wringing process. A convenient, hinged lid holds the clothes.

The motor of one-quarter horsepower is insulated from the frame. The machine has adjustable legs and may be raised or lowered to any desired height. This feature is especially convenient, since it permits the washer to rest perfectly level on an uneven floor. Large,

easy-rolling steel casters greatly facilitate the handling and moving of the washer.

Du Pont Duco finish—selected as the standard by the Vulcan Manufacturing Company—contributes materially to the beauty and utility of the Faultless Aluminum Washer. An attractive, conservative color scheme of "El Paso" tan with light green trimming lends a touch of color to the kitchen or laundry. The toughness and durability of Duco make it hard to scratch or mar. Its smooth, lustrous surface—easy to keep clean—will retain its original richness and beauty throughout years of service.



The machine is of the square tub type, finished in "El Paso" tan Duco with light green trimming

THE CHEMIST'S AID TO AGRICULTURE

(Continued from page 2)

230,000,000 bushels being estimated for 1927, or approximately 10 per cent of the crop.

A large part of the business of the du Pont Company is based upon the consumption of products of animal or vegetable origin. Glycerin, for example, comes either from sugar by fermentation or from animal products as a by-product of the manufacture of soaps from fats. It is used for making not only nitroglycerin for high explosives, but also a great many other chemical compounds which serve as solvents, resins and plasticizers in the manufacture of paints, varnishes, lacquers, enamels, transparent materials, such as Pyralin sheeting for automobile windows, toiletware and scores of other articles. Into these products, in many cases, chemical compounds made from cotton enter to the extent of many thousands of tons.

We use a great many by-products of agriculture as well as principal products. We not only use sugar, but also sugar-cane and molasses. We not only use cotton, but oil as well. From button manufacturers we buy ivory-nut waste. We use straw, cornstarch, wood pulp, flour, hulls of certain kinds of grains, and linseed-oil. We have manufactured a great many tons of camphor from turpentine and we consume rosin in the manufacture of various chemical compounds. American-made propellant powder for sporting and military purposes is, as you know, produced entirely from cotton; and in its manufacture various solvents are used, such as alcohol and ether which, in their turn, are also made from agricultural products.

One of the most important chemical products of agricultural origin is Duco, first developed by the du Pont Company. This durable finish uses products made from cellulose and the solvents are derived from corn, sugar and molasses. The consumption of Duco-type materials has multiplied many fold, as much as 240 per cent in a single year.

Cloth, itself woven from cotton, is coated with chemical compounds and embossed to produce upholstering materials such as Fabrikoid. These materials have supplanted leather for many uses, especially in automobile upholstering, being better adapted to some purposes than leather itself. Coated textiles are made up almost entirely of products of agricultural origin. The farm furnishes the cotton for the woven textile backing, and more cotton for the coating material, while other agricultural products yield the oils and solvents used in the manufacturing process.

The annual supply of by-products of agriculture in this country has been variously estimated at 750,000 to 260,000,000 tons. These by-products or wastes consist of cereal, flax and rice straw, sugar-cane bagasse, corn-stalks and cobs, oat hulls, peanut hulls, cotton stalks, cull potatoes and lemons, unmarketable dried fruits, the residue from beet sugar manufacture, and the skins and pits of all kinds of fruits. Various commercial products have been developed from these waste materials.

A comparatively recent development is the manufacture

of furfural from oat hulls. This material has become a large-scale industrial product, being sold in tank car lots; it is utilized in a variety of products.

FROM FARM TO FACTORY

Opinions differ on the question of developing factory outlets for farm products. Some writers predict a time when the factory will use more farm products than will be consumed for food; others look to the economic utilization of such agricultural wastes as a very limited possibility. While there are commercial factory outlets for some of them, hardly more than a beginning has been made.

Wheat straw is used in quantities for the production of corrugated board for shipping containers. Recently, the preparation of cellulose from corn-stalks on a factory scale has been commenced. The manufacture of a building board from sugar-cane bagasse has attained considerable proportions with the result that some additional sugar-cane areas are being planted in the South because of the favorable effect brought about by the price received for bagasse. A very good insulating material is made from straw of seed flax, and ground peanut hulls have been used to a limited extent in building construction.

I do not know where the greatest field for the utilization of farm products may be, but certainly the demand for waste utilization in the corn and wheat belts of our central states is a very important one because of the considerable quantities of materials which are available without paying high freight charges for their assemblage at some central consuming point. These materials contain cellulose and products closely related to it, but there is much work to be done to find out how best to utilize them.

In preparing cellulose from wood, everything except the so-called alpha cellulose is destroyed by the chemical processes now employed. Accordingly, the chemist has turned his attention to the recovery and utilization of such materials as lignin and other by-products of the manufacture of alpha cellulose. A beginning has been made in this direction. Attempts have also been made to produce alcohol and synthetic tanning materials from the waste liquors of paper pulp manufacture. This work, however, is still in the experimental stage. The rising cost of wood emphasizes the importance of this type of chemical research, because economic conditions are likely to demand that cellulose be obtained from cheaper sources.

I am informed there is a foreign process which produces a binder for coal briquettes from the products of decayed vegetable fibers, and that bio-chemical processes for employing molds and bacteria under carefully controlled conditions to break up the elementary raw materials and by-products into useful products are becoming of increasing importance.

The chemistry of the utilization of agricultural products and by-products or wastes is still in its infancy. The economic questions of collection and transportation of these

materials are important, and the drying and processing of these widely scattered materials are engineering problems of the first magnitude. At present those which can be obtained from the farm at a nominal cost of as low as a dollar a ton can hardly be handled economically in competition with sawdust piles and waste lumber piles as sources of cellulose, because the cost of assembling these wastes has been borne by the lumber which is produced.

The present factory consumption of agricultural wastes is very small compared with the aggregate tonnage of such products available. And the existence of a large supply of raw material does not, of itself, constitute an adequate reason for studying its utilization. One must first determine the cost of assembling the material at suitable points for consumption and the probable costs of materials with which it will compete. Even slight differences in cost may preclude the use of some waste products. We must, therefore, recognize that not merely chemical research is required to find new uses for agricultural waste, but economic studies must be made to ascertain present and future conditions before large sums of money can be safely invested in plants and manufacturing equipment for converting agricultural wastes into useful articles of commerce.

An example of the successful application of research to the problem of agricultural wastes is furnished by the citrus industry. The disposal of cull or waste fruits was a pressing problem, since it involved not merely a waste of products on which time and labor had been expended, but also an additional expense for disposal of the material. Research by the Bureau of Chemistry developed uses for the waste lemons in the manufacture of citric acid, lemon and orange oils, pectin and the like. A profit of approximately \$1,000,000 a year was thus realized and the citrus grower, instead of paying a dollar per ton for disposing of his waste material, receives twelve dollars per ton from the by-product manufacture.

It has been proposed that a sugar known as "levulose" could be profitably prepared from Jerusalem artichokes, a crop readily grown and yielding a large tonnage per unit area. I have already mentioned that the increasing use of bagasse as a building material has stimulated the planting of additional sugar-cane, but these examples are striking chiefly because they are scarce. Research and economic development must multiply examples of this type, before the factory is likely to become an important market for farm products, except in a few special cases.

The utilization of agricultural waste is, however, not the only aspect, perhaps not the most important aspect of the application of chemistry to the problem of broadening farm markets. Chemical developments in the past have displaced agricultural products from the market; for example, synthetic indigo displaced the natural indigo which used to be grown upon thousands of acres of land in India. By the same token it is conceivable that industry may demand raw materials which originate upon the farm for the manufacture of synthetic products. Science has made possible the manufacture of fertilizers in abundant supply to increase crop yields. Scientific applications have led to

the development of motorized farm machinery, and all this has helped to increase the productivity of the ground. Fewer men can now produce from smaller areas larger yields of indispensable foodstuffs. What more logical than that applied science should develop new products dependent upon the growth of new crops for the supply of the raw materials required? Let me clarify that by an illustration:

THE FUEL SUPPLY

We believe coal to be a kind of fossilized vegetation which once grew upon the surface of this earth. We have had a continued and persistent effort to devise processes for the manufacture of a liquid fuel suitable for the internal combustion engine. The effort has been to produce oil, gasoline and the like from such raw materials as lignite, peat and coal. Now gasoline for automobile use is only a somewhat different combination of carbon and hydrogen from the coal we shovel into our furnaces. Chemical processes are capable of effecting much more profound changes in chemical structure and physical form than is illustrated by the difference between a lump of coal and a pint of gasoline, but the processes for making synthetic fuels must be improved and cheapened in order that economic laws may stimulate the replacement of coal or oil by some synthetic fuel. Today it seems incredible that coal should ever be completely displaced by oil or petroleum distillates, and yet liquid fuel, with its ease of stoking, transportation and handling, and absence of ash, is a most attractive combustible.

You may consider it fantastic if I were to suggest that some day all the world's fuel will be grown in great areas of the globe where the rapid growth of a great volume of vegetation will provide a cheap method of supplying a combination of hydrogen and carbon. After all, the energy of the waterfall is merely the result of sunlight lifting water from the seas in order that it may fall as rain upon the higher slopes and be impounded to turn the wheels of our great hydroelectric plants; and it is the sunlight of a bygone age which enabled the growing tree or plant to combine water with the carbon dioxide of the air, separating the oxygen partially, to give us the carbon or hydrocarbon product—coal.

Earlier I pointed out that sunlight brings about the chemical reactions illustrated by the growth and maturity of the farm crops. The cultivation of some highly prolific and fast-growing plant would employ the energy of the sun for combining carbon and hydrogen as cellulose or carbohydrates, and great chemical factories might subsequently transform the crop into a fuel. While this may be distant in time, it is not quite so fanciful as might appear.

CHEMICAL RESEARCH IN GOVERNMENT LABORATORIES

We believe, however, that other and more likely utilizations of the land for growing raw materials for the factory would result from a broad consideration of the question, and here is an argument for fundamental chemical research in Government laboratories. These problems are nation-wide in scope; they call for a combination of

the best scientific brains that can be made available for their consideration. Obviously, nothing save waste can result from a haphazard and discontinuous attack upon the problem. Only the long-continued and constantly applied effort which is available in Government laboratories would seem to be adequate. Only laboratories of this sort could carry on the fundamental research demanded by this problem of developing the potentialities of the nation's farms from the standpoint of their usefulness for the nation's factories as well as for the growth of foodstuffs.

It has been said that it requires 100 pounds of foodstuffs to produce three pounds of beef, and three acres of land to support a cow, but thousands of pounds of solid yeast protein may be developed and separated in a few hours in a very limited space by growing yeast upon such fermentable agricultural waste as molasses. Whether we shall eventually take appreciable amounts of our protein in the form of a yeast protein instead of beef, I do not know. This merely serves to illustrate the tremendous, revolutionary changes which applied science is capable of bringing about in the lives of men. If you had told the gas and coke manufacturer of the early days that his stinking coal-tar would some day become the raw material for the production of a whole world of colors, drugs and medicinal products, he would have been no less skeptical than you

may be when I talk of the possibility that science will evolve new uses for entirely new crops which will automatically take care of a number of our problems today, such as the utilization of certain agricultural wastes.

I wish to emphasize the character of this research; it must be fundamental, not aimed at the immediate solution of some small specific problem. This follows from a number of facts: First, the problem of today is not the urgent problem of tomorrow; second, years, rather than months, are required to make any appreciable progress in the solution of problems of this nature; third, man is limited in his knowledge and since he cannot foresee the specific problems of the next decade, the only safe method of approaching the general problem is upon a fundamental basis. The application of chemistry as an aid to agriculture is much broader than merely finding uses for present agricultural by-products. It is the problem of finding the best way to use the tillable acreage of this country in the light of the findings of applied science, and the application of the broad economic laws which are as infallible in their operation as the law of gravity.

Chemical research of a fundamental nature, carried out over an extended period in Government laboratories, would be quite certain to contribute findings of the greatest value in the solution of this vast and complex problem.

THE WEATHER NEVER VARIES

(Continued from page 16)

Increasing the temperature is accomplished by means of the steam coils, and the reverse effect is secured by utilizing the refrigeration equipment. The air-compressor is a necessary adjunct to operate the air controls, and the water pump serves to keep the water in circulation. The entire apparatus is arranged to operate automatically. Human hands have little to do except to set the controls and oil the machinery from time to time; and there are only two controls requiring attention. One regulates the temperature and the other the moisture content of the air.

The constant temperature room at Philadelphia is three times as large as the one at the Experimental Station. It is a cork-insulated room, with wall and ceiling surfaces finished in white Duco. Essentially the same type of apparatus is employed to supply conditioned air to it as has been previously described. The units are, of course, considerably larger. For instance, the refrigerating machine could produce seven and one-half tons of ice daily, if used for that purpose. The temperature and humidity conditions in this room are precisely the same as those maintained in the room at the Experimental Station, and essentially the same methods of control are operative.

This room is equipped, as the illustration shows, with a drying-time meter extending across the rear wall. On the nearby table is a plastometer to measure the consistency of paint; a hardness tester, a balance, an apparatus for measuring elongation and tensile strength; a rack of plates for the hardness tester, and a spinning device for

producing uniform films. On the middle table, left to right, is a film-thickness gauge, a balance, gallon-weight and viscosity cups, and a recording wet-and-dry bulb thermometer. And on the table in front may be seen a refractometer, a film-spreader, two cryptometers for measuring the hiding power of paint films; a Westphal balance for measuring specific gravity, a mobilometer for consistency measurements, a viscosity cup set-up and a body-tube rack with standards.

Completely equipped air-conditioned rooms such as this are invaluable for scientific testing work. In developing new protective films where a careful comparison of the effect of the ingredients on finished products is necessary, such facilities are essential. They are also of enormous value in setting up specifications for finished products. Having determined by quantitative tests their properties at definite conditions of temperature and humidity, it is possible to go back months later and make exact comparisons.

While for comparison work it is desirable to maintain these rooms at constant temperature and humidity, it is nevertheless possible to duplicate the atmospheric conditions found any time of the year anywhere in the United States, except where both temperature and humidity are very low. By this means one can study the effect of varying climatic conditions on the properties of a product which may be sold and used in any state of the Union.

In a subsequent number some of the devices used for quantitative evaluation work will be discussed in detail.



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