# The DuPont Magazine

Vol. 14 August-1920 No. 2

DU PONT

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E. I. DU PONT DE NEMOURS & COMPANY, INC., SALES DEPT., PYRALIN DIVISION, WILMINGTON, DEL.

# DU PONT MAGAZINE

Volume XIII AUGUST, 1920 Number 2


# Immigration and the Labor Supply

*An examination of the effect of the war upon the influx of foreigners into the United States*


By F. LESLIE HAYFORD
Economic Statistician
E. I. du Pont de Nemours & Co., Inc.


FOR many years immigration has been one of the most important factors in the industrial development of the United States. Before the Great War this country was largely dependent upon immigration for the additions to its labor supply necessary to meet the needs of its rapidly expanding industries. The war suddenly shut off the greater part of this stream of immigration; and even since the cessation of hostilities the number of foreigners coming into the country has been exceedingly small. This situation has created fears that the United States may be faced with a serious shortage of labor unless immigration is soon resumed on a large scale.

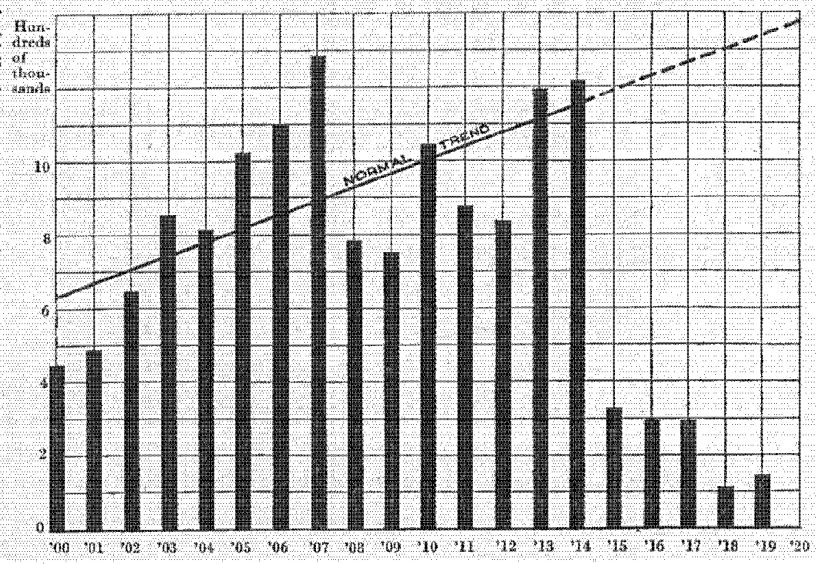
Without attempting to determine how great a labor supply the country needs, an examination of some immigration statistics may prove of interest.

In the 15 years ending June 30, 1914, a total of 13,377,089 immigrants arrived in the United States. This was an average of 891,805 a year. During the five of these years which immediately preceded the outbreak of the war (1910-1914) the total number of immigrants entering the country was 5,174,701, or an average of more than a million a year.

During the five years ending June 30, 1919 (that is, the five years beginning with the summer in which the war broke out) only 1,172,679 immigrants entered the United States—an average of 234,536 a year, or only a trifle more than a fifth of the number that had been coming before the war.

The effect of the war upon immigration is perhaps more clearly brought out in the accompanying graph showing the total number of immigrants arriving each year from 1900 to 1919, inclusive, with the normal trend of the pre-war years. While the actual falling off of immigration in the years following the outbreak of the war is striking, a comparison of the actual figures with the pre-war *trend* is even more significant. The normal trend of the pre-war years is indicated by a solid diagonal line, which has been projected (as a broken line) up to 1920. This pre-war trend of immigration has been determined by fitting a straight line to the annual data by the method of least squares. The normal trend line thus determined clearly brings out the fact that immigration was increasing at a very rapid rate up to the time of the war. The projection of this normal trend line shows us what might have been expected had the same forces that were affecting immigration before the war continued.

NUMBER OF IMMIGRANTS ARRIVING IN UNITED STATES, YEARS ENDING JUNE 30
WITH NORMAL TREND OF PRE-WAR YEARS




If immigration had continued after the outbreak of the war at the same rate as before we should have received during the five years beginning July 1, 1914, and ending June 30, 1919, a total of 6,316,425 immigrants. The actual number coming during these five years was only 1,172,679. A comparison of the actual number of immigrants entering the country during each of these five years, with the number we might have expected under pre-war conditions, is even more interesting. Such a comparison is shown in the following table:

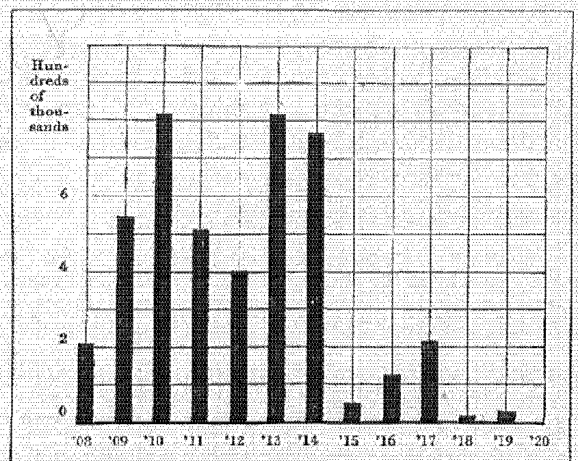
| YEAR ENDING JUNE 30 | NORMAL IMMIGRATION ON PRE-WAR BASIS | ACTUAL IMMIGRATION |
|---|---|---|
| 1915 | 1,188,989 | 326,700 |
| 1916 | 1,226,137 | 298,826 |
| 1917 | 1,263,285 | 295,403 |
| 1918 | 1,300,433 | 110,618 |
| 1919 | 1,337,581 | 141,132 |
| Total 1915-1919 | 6,316,425 | 1,172,679 |

A truer picture of the effect of the war upon immigration is gained, however, by an analysis of the excess of aliens entering this country over those leaving it—in other words, of the net increase in our population due to immigration.

For the five years ending June 30, 1919, the excess of arrivals over departures was only 431,884 or an average of 86,377 a year; whereas during the five years before the war the excess of arrivals amounted to 3,316,146, or an average of over 663,000 a year.

The graph at the right shows the annual net immigration for the years ending June 30, 1908, to 1919, inclusive. For the years ending June 30, 1918 and 1919, this excess had declined to 18,585 and 20,790, respectively, compared with 817,619 in 1910 and 815,303 in 1913.

From July 1 to December 31, 1919, a total of 253,926 aliens arrived in the United States, while 242,652 left, showing a net immigration for the half year of 11,274.




NET IMMIGRATION, 1908—1919
YEARS ENDING JUNE 30

Beginning with July 1, 1907, the United States Government has kept a record of the number of aliens leaving the country as well as the number entering it.

The above graph shows the net increase in the population of United States by excess of aliens arriving over those departing each year since this record has been kept.

The net immigration figures thus determined, from which the above graph was prepared, are as follows, the years being the Government's fiscal years, which end June 30:

| | | |
|---|---|---|
| 1908—209,867 | 1912—401,863 | 1916—125,941 |
| 1909—543,443 | 1913—815,303 | 1917—216,498 |
| 1910—817,619 | 1914—769,276 | 1918— 18,585 |
| 1911—512,085 | 1915— 50,070 | 1919— 20,790 |

### Loss of Unskilled Labor

Of course, the figures given above do not represent net changes in the country's labor supply, for they include many women and children. We find, indeed, that the departure of unskilled laborers was more pronounced than the figures given would indicate. During the five years ending June 30, 1919, the number of emigrant aliens leaving the country, who were classed as common unskilled laborers, exceeded by 151,780 the number of immigrant aliens of like classification who entered it. It is true that during this period there was a net gain of 74,563 foreigners who were classed as "farm laborers," many of whom doubtless entered industrial plants instead of going to farms after their arrival here; but even if we deduct this number from our net loss of those classified as unskilled laborers, there would still be a net loss of 77,217 in the five years.

During the last 6 months of 1919 the situation became even more acute, for only 20,375 immigrant aliens arrived who were classified as common unskilled laborers, while 109,208 emigrant aliens of like classification left the country, a net loss of 88,833 during these 6 months alone.

### The Outlook

This situation has made some observers fear that a very considerable actual reduction of the country's existing labor supply might be experienced in the next year or two. Apparently, however, the tide has now begun to turn. While no immigration statistics for the country as a whole are at present available for recent months, figures for the port of New York show that as many as 12,000 immigrants have arrived at that port in a single week, and that the excess of arrivals over departures has been as high as 8,000 in a single week. While these numbers are considerably below those of the years immediately preceding the war, they indicate the possibility of a much larger immigration than we have had since 1914.

It is believed by many competent observers that a decided revival of immigration will take place within the next year or two and that, unless drastic restrictions are imposed, we may see the pre-war immigration figures equaled before many years. There are, of course, obstacles still standing in the way. For one thing, our immigration laws now impose restrictions that did not exist before the war. Furthermore, steamship accommodations are not at present available on the pre-war scale and it may possibly be several years before they will be sufficient to take care of as great numbers as came in the years prior to 1914. Restrictions on the emigration of their people may also be imposed by foreign countries. It therefore seems probable that the growth of immigration to pre-war proportions may be delayed for several years. But very much larger numbers than came during the years from 1914 to 1919 may confidently be expected.

# Fewer Shotshell Loads

By E. R. GALVIN

FOR many years manufacturers of shells have recognized that a reduction in the number of loads would help increase production and efficiency, if only by eliminating thousands of orders for special and freaky loads on which there is little or no profit.

Three thousand or more jobbers, who carry shells in stock, catalog them, take orders for them, and endeavor to please their trade with the smallest stock and investment possible, have also felt that such a reduction would be desirable.

The advantage of fewer loads is even more pronounced when one considers 80,000 to 100,000 retail dealers, who handle shells.

The Du Pont Company, with the idea of rendering a common service to manufacturers, jobbers and dealers, addressed a letter to the jobbers, asking if they would favor a movement to reduce the number and variety of shotshell loads. It was pointed out that such a reduction would: Simplify shotshell stocks of jobbers and dealers; help to eliminate confusion in handling stocks and shipments; make the salesmen's work easier; release warehouse space for other profit-paying purposes; confine the investment to a minimum, and make for quicker turnover and greater profits.

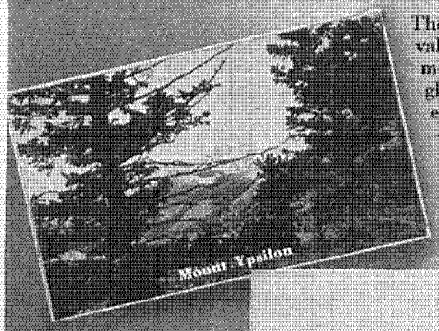
The response was unanimous. Hundreds of jobbers, by return mail, heartily indorsed the movement as the best step taken in the ammunition business in a long time.

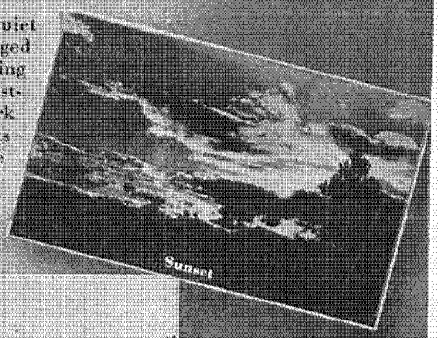
As all of the loading companies are members of the Society of American Manufacturers of Small Arms and Ammunition, the subject was brought up for discussion before that body. Every manufacturer commended the plan and promised co-operation in reducing the number of shell loads.

This movement, inaugurated by the Du Pont Company, is certain to be of great benefit to all parties interested.

# Estes Park and the "Sport Alluring"

The village of Estes Park, Colorado, nestles in a quiet valley surrounded by Nature's blending of rugged mountain peaks, silent forest groves, swift-flowing glacial streams and flowering terraces. It is the eastern gateway to the Rocky Mountain National Park—a hotel summer resort for thousands of tourists and a starting point for motorists crossing the Continental Divide in a region where the American Rockies rival the sublime beauty and grandeur of the European Alps.


Mount Ypsilon


Sunset


The Trapshooting Grounds


Long's Peak

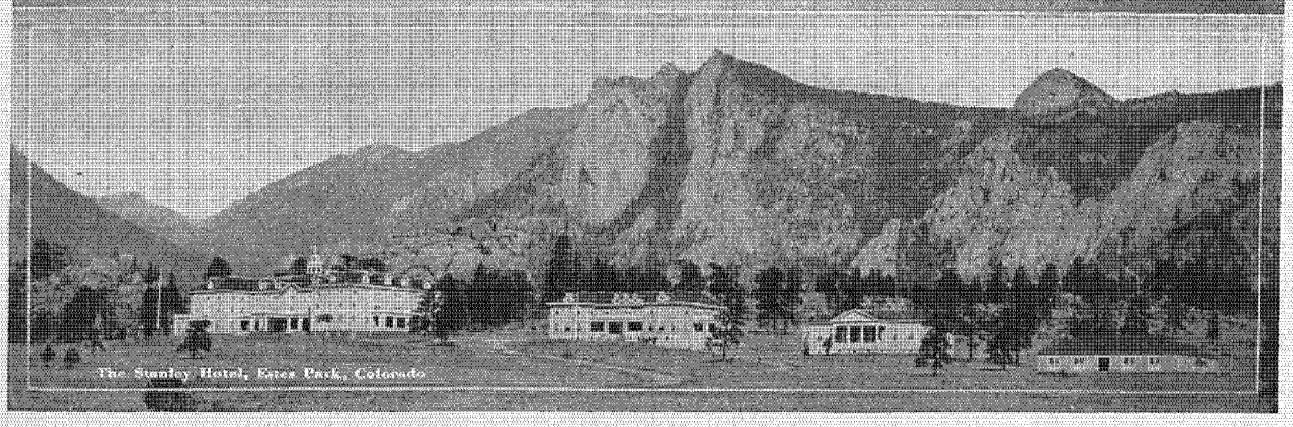
Mr. Lamborn, manager of the Stanley Hotel, believes in giving his guests the best possible facilities for recreation, amusement and sport. Naturally, trapshooting appealed to him as one well suited to the virile environment of Estes Park, and a complete equipment was installed on grounds of surpassing beauty.

The location is ideal—pine trees to shade non-participants, a splendid sky line for the shooters, and for all, the entrancing view of snow-capped mountains, including Long's Peak, and the Big Thompson River tumbling past only a short distance away.

Colorado tourists who enjoy trapshooting are invited to stop at Estes Park and join in the "Sport Alluring" amid the environments so fittingly described in Arthur Chapman's poem—

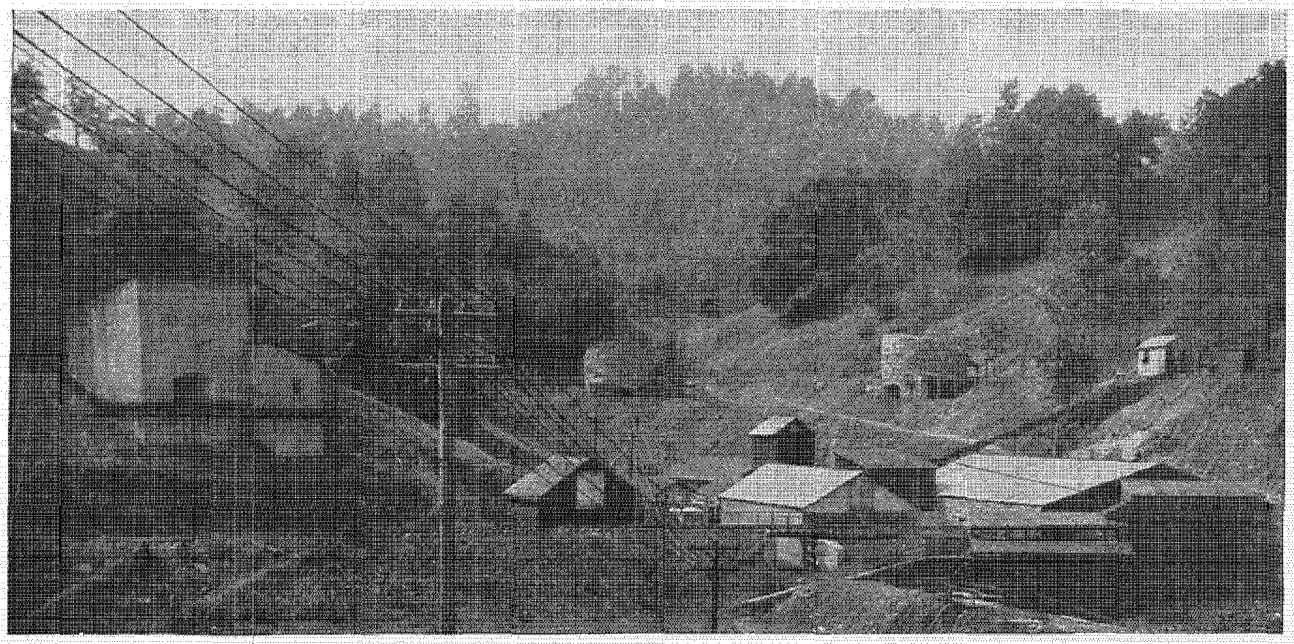

Fall River Road

## *"Out Where the West Begins"*


The Stanley Hotel, Estes Park, Colorado

# Charcoal, Sulphur and Saltpeter

*Take a trip with the writer to a plant where this trinity of raw materials is made into black powder*

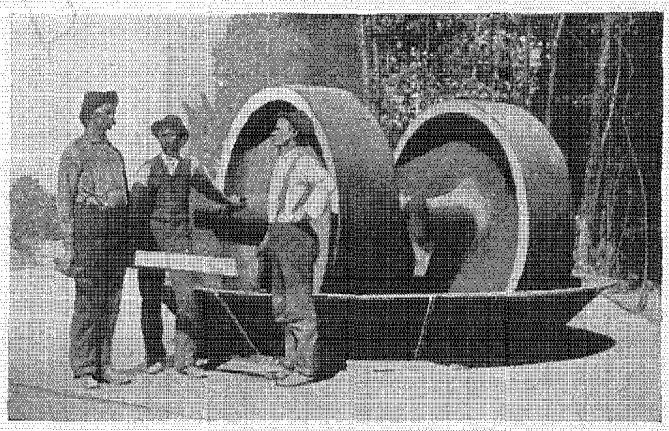


Partial view of Nemours Plant, West Virginia, showing three wheel mills. The buildings in the foreground are raw material storehouses

IT must be confessed that I experienced a vague feeling of uneasiness just as I was about to make my first visit to a black powder plant. However, as I stood on the crest of a hill, separating the village of its operatives from a large powder plant, and looked down upon the valley studded by a variety of buildings, all apprehension left me. For it must be said at once, that I had never seen a more beautiful setting. The sun was just peeping over the hill. The morning rays accentuated the picturesqueness of the slopes with their patches and fringes of the forest, not long ago an unbroken mantle of green. Off in the distance were cultivated areas, close to cozy-looking houses, whose spirals of smoke lazily announced the comforts of the hearth. The very stillness and beauty reassured me. The superintendent of the plant was to serve as my guide and together we walked down into the valley.

As we approached the entrance, I remarked the pronounced absence of rubbish or underbrush about the buildings. We went into the office which adjoined the one entrance to the extensive area. Here, I was requested to leave all matches in a metal container. My shoes were examined. They had rubber soles and heels and passed muster, as no projecting nails could cause chance friction.

Leaving the office, we proceeded to the raw material storage houses. My guide stated that the black powder made at this plant contained three ingredients—Chili saltpeter, or sodium nitrate, sulphur—often termed brimstone—and charcoal.



A wheel mill under construction. This one is ready for the superstructure

The sodium nitrate is shipped from Chili in bags. These bags are emptied into storage bins, and after being washed are salvaged. Huge heaps of the raw materials are kept in stock, and ample provision is made against a possible shortage, as a result of irregular transportation.

The first step in the process of manufacture is the pulverization of the sodium nitrate. This is accomplished by passing it between huge cylindrical rollers. The resultant powder then passes over an electrical magnet in order to remove particles of iron frequently found in crude sodium nitrate.

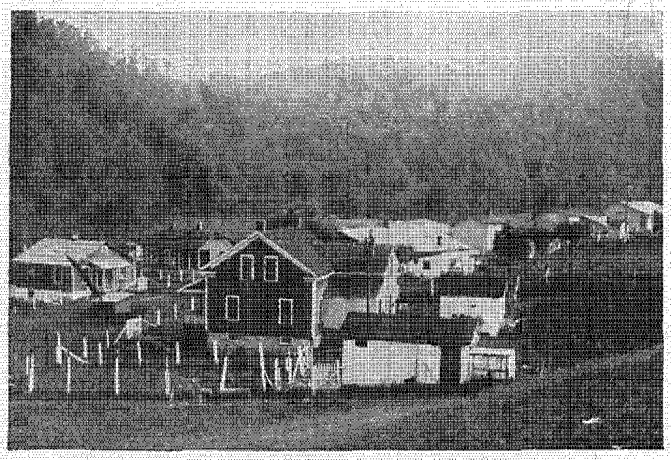
The requisite amounts of sulphur and charcoal are weighed, and charged together into cylindrical drums of iron. Each cylinder contains a number of iron balls. Their total weight is about one-half the weight of the charge. As the cylinders revolve, these tumbling balls grind and mix the sulphur and charcoal. After continuous revolution for about ten hours, the contents form a uniform, fine powder—the so-called "pulverize dust."

After the completion of this "powdering," the mixture is passed through a wire screen, with 24 meshes per square inch. This operation removes such foreign matter as may be present.

The three harmless materials are now ready to be mixed intimately with each other, thereby forming ordinary blasting powder.

We followed a small car containing weighed amounts of the crushed sodium nitrate and the mixture of sulphur and charcoal as it was pushed to a stone structure, called a

"wheel mill." This was simply a large, circular room, entirely open on the side facing the hill. The roof was constructed of light sheet-iron, loosely fastened to I-beams. The guide said that this was a safety precaution. If, by any chance, an explosion should occur, its force would be exerted upward and outward; away from, not in the direction of, adjacent buildings. The open side would offer an easy outlet for the expanding gases, and the result would be rather a flash than an explosion.

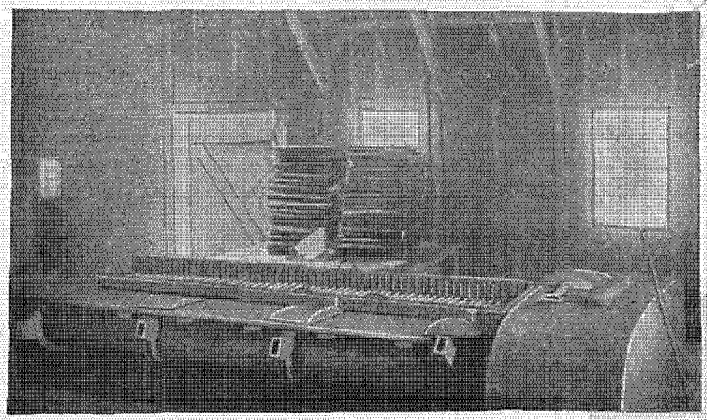


This view shows a section of the plant village at Nemours

In this room was the equivalent of a giant mortar and pestle. A bowl-like vessel of iron, about ten feet in diameter, formed the mortar. Wooden staves covered the lower surface and there was a wooden rim of this tub-like container. The pestle consisted of two iron wheels, each about six feet in diameter, with a face of twenty inches. Each wheel weighs about ten tons. They are mounted so as to revolve without touching the bed-plate. Small plows precede the wheels, and keep the powder under the latter.

As we were leaving the wheel-house, workmen approached with several cylinders containing the three ingredients which form the charge. The contents were poured into the vessel and moistened with water.

Standing outside, we next watched the operator who started the wheel-house machinery. "You see," said my guide, "the starting device is at a distance from the building. The operator must be far enough removed in order to avoid any possibility of injury, in case of a flash. No one is permitted to enter while the wheels are in motion, except the operator. He makes brief visits at intervals, to observe the condition of the charge."



Interior of a press mill, showing the press and a finished charge

It is human nature to "want to see the wheels go 'round," but I needed no urging to remain at a respectable distance, and to be satisfied with the explanation that the plows keep the ingredients under the wheels, and that the wheels bring about a perfect mixture by pushing forward and twisting sidewise, thereby producing a genuine mortar and pestle effect.

The product of this operation is termed "wheel cake." The cake is taken to the press mill. It contains less than three per cent of moisture at this stage.

The press used is quite similar to other hydraulic presses, but the action is in a horizontal direction. The box of the press is about ten feet long and two feet square. It is constructed of hard wood. Vertical plates of aluminum are placed in this press box. They are held in place by removable finger boards, in which the slats are at equal distances from each other.

The moist, thoroughly mixed powder is introduced into the box by means of wooden shovels and falls between the aluminum plates. It is slightly tamped by the aid of a wooden stick. When the box is filled, the finger boards are removed, the ram moves forward by the application of hydraulic pressure, and the powder is thus pressed into cakes about 1¼ inches thick and two feet square.

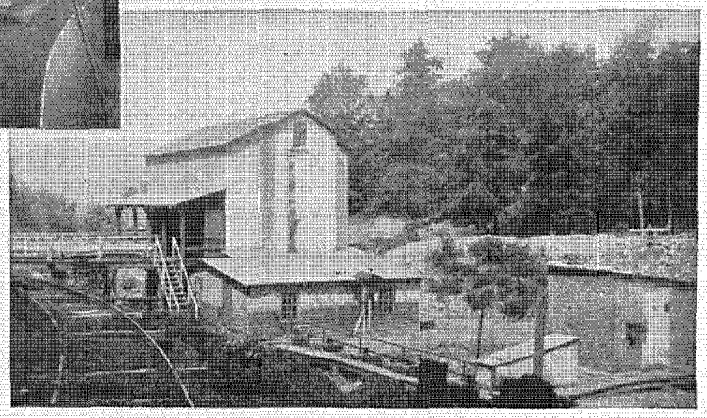
Next follows granulation in a so-called "corning mill" or "graining mill." The "press cake" passes between pairs of zinc rolls, four in number. The distance between the rolls regulates the size of the grains. Under these rolls an oscillating shaker screen separates the coarser from the finer grains. The coarser sizes pass from one pair of rolls to the other until they are all crushed to a standard size.

The grains are then conveyed from the corning mill to the glazing or finishing mill. Here they are dried and polished in large revolving barrels. A small amount of graphite is added to furnish the polish and give the grains a coating that makes them more resistant to moisture.

The dust resulting from the granulation of the powder in the corning mill and the glazing mill is returned to the press mill, where it is mixed with "wheel cake," and pressed again.

After being dried and polished the powder is taken to the packing house. There, in an oscillating, separating machine, fitted with screens of the proper mesh, it is separated into the different sized grains desired, and then packed into steel kegs ready for shipment. The operations required to make a finished keg were watched with interest, but this will be treated in another article.

I left the Nemours black powder plant, profoundly impressed with the operation that takes the three otherwise harmless materials—charcoal, sulphur and saltpeter—and compounds them into a product that has so materially aided in making and preserving our nation.



Exterior view of the corning mill at Nemours Works, West Virginia

# Walnut—the Cabinet Wood Superlative

*No one of the American hardwoods is prized more highly by the wood-worker and wood-finisher than this treasure of the forest*

By J. COLEMAN BENTLEY

THERE is a better reason than patriotism or national pride for the appreciation of American walnut above the English or Circassian variety. It deserves appreciation. Nor is this appreciation based on sentiment growing from thoughts that wander back to the boyhood bed you slept in, and of which your father said, "I cracked nuts that grew on the tree whose wood now makes your bed." There are heirlooms in nearly every home today, made of walnut, selected and built when the germ of modern industry was yet undiscovered. Such furniture possesses the natural charm of the wood itself, and in addition it is graced with the carvings that result from unhurried workmanship.

When we regard the great mass of furniture constructed annually, we look upon the treasured pieces with a sense of the enduring qualities of this product of American soil. We little wonder that a tidal wave of recurrent favor is in progress, bringing on its crest, walnut—"the cabinet wood of the elect."

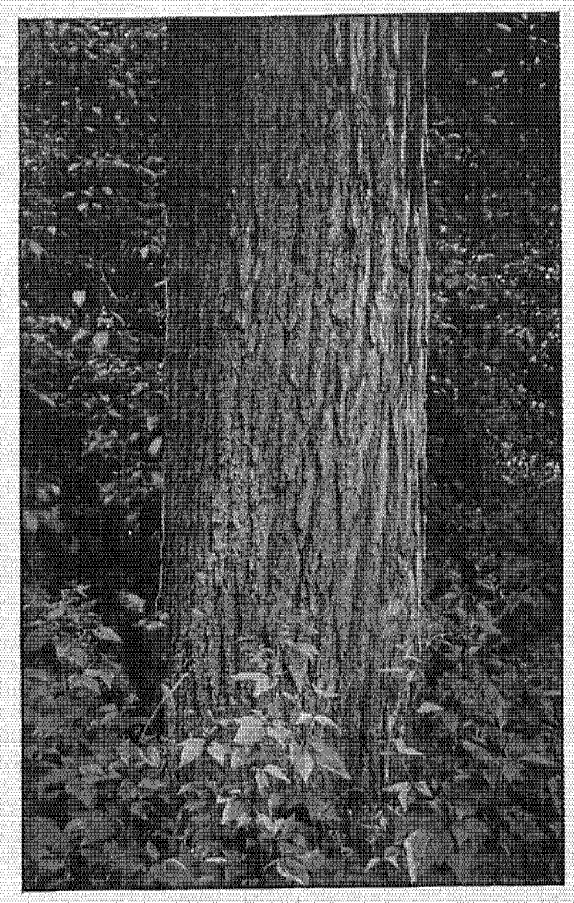
In the early settlement of our country, trees were cut down mainly for the purpose of clearing the land for agriculture, and few or none suffered more than black walnut. This came about because it occupied the best and most fertile lands in the valleys and low foothills bordering the principal streams. Hence it was the first to be attacked. This early land clearing exacted large toll from the trees. In the unthinking haste to dispose of them great numbers of trees were burned. Because it is durable and easily split it furnished fence rails for many farms.

The pioneers early realized that the qualities inherent in walnut made it a wood admirably adapted for purposes more valuable. There followed a period when this timber was cut without any consideration for future supply and alarm was felt that it would be exhausted. Its scarcity, or rather its value, is evidenced by the price during the eighteenth century when walnut was worth three and one-half pence per foot. At the same time two other important woods cost two-thirds of a penny and three-sevenths of a penny per foot respectively. At present, lumber cut from walnut brings the highest price of any of our native woods.

Nor is its value limited alone to lumber cut from the body of the tree in the sawmill. Limbs, crotches, and stumps are sought to be worked into veneers, gunstocks, and for numerous other purposes where fancy woods are desired. Stumps of trees cut years ago in clearing land or getting timber are being dug up and are sold for large sums. Fence rails have been gathered for turnery. Old furniture is secured and cut into veneers and for other purposes to which it is adapted.

There is no definite territorial boundary for black walnut. It is one of the most widely distributed of all our trees. It grows sparingly over a wide territory from New England west to Wisconsin and southern Minnesota, and as far south as Texas and Florida. Its best development, both in size and quality, was west of the Allegheny Mountains and on the fertile slopes of the Appalachians in North Carolina and Tennessee.

The walnut seldom is found in pure groves. The trees usually occur in widely scattered groups or as isolated individuals among those of other species. This condition of growth, together with the great demand for walnut lumber during the past, has tended to indicate a scarcity of marketable timber. It is true that a large portion of the available lumber has been cut, but a careful inventory made during the World War, of the amount of walnut available over the entire territory, has revealed unexpected quantities. This survey was made for the purpose of securing this particular wood for the manufacture of gunstocks and airplane propellers, but only a small proportion of the available supply has been utilized for this purpose.



A typical American walnut tree

In appearance, the walnut tree usually is very symmetrical, with a heavy crown and short trunk. This is particularly true when the tree is grown in the open where it sends out limbs low on the trunk and they become forked and gnarled. In dense forests, or where they are crowded during early development, the trunk tends to lengthen into a tall tapering column with a much reduced crown. It is a tree requiring a great amount of light, consequently its foliage is by nature very thin and does not completely shade the ground underneath.

The average height of the mature tree is from 70 to 90 feet, with a diameter at the trunk of 30 to 45 inches. There is quite a variance from these figures in different districts, as individual trees in the more fertile regions frequently attain a height of 110 feet, while low-spreading trees in the open may have a girth of 18 to 20 feet.

It is interesting to note that the white "English walnut" is of the same species as our own American walnut, as is also the Circassian walnut. This latter species comes from the Black Sea region where the trees grow under very unfavorable conditions. Their struggle for existence is evidenced by the weird, twisted and streaked appearance of the cut timber.

The grain of the American walnut is much more regular and uniform than the Circassian walnut, except in the "burls," which have an exceedingly involved grain. The sapwood is rather thin and light in color, while the heartwood is a chocolate brown which darkens with age and exposure. The sapwood is in particular demand for furniture, cabinet and interior work.

The walnut "burl" is a large swelling caused by injury or distortion, occurring sometimes in the branches of the trees, but more frequently at the base of the trunk or in the roots. These burls when sound are very highly prized as they produce veneers of unusual beauty.

The wood of walnut is open grained. It shrinks but slightly when drying, and with proper care will not check. It is used principally as a cabinet wood and interior finish, although many thousands of trees have been utilized in the manufacture of gunstocks and tool handles.

It is true that our present styles in furniture revert to the period designs, Queen Anne, William & Mary, Heppelwhite, Adam and Sheraton. True, also, that modern furniture art has added to the charm of these designs, by elimination of some of the elaborate detail without sacrificing good proportion or form. But even today the craftsman looks to the forest to supply the wood that will lend the proper character to the

Sixteenth century French carved walnut table

design. Due credit must be given, therefore, to the one wood that has served centuries of craftsmen—that has at all times met the requirements in utility, availability and beauty—walnut.

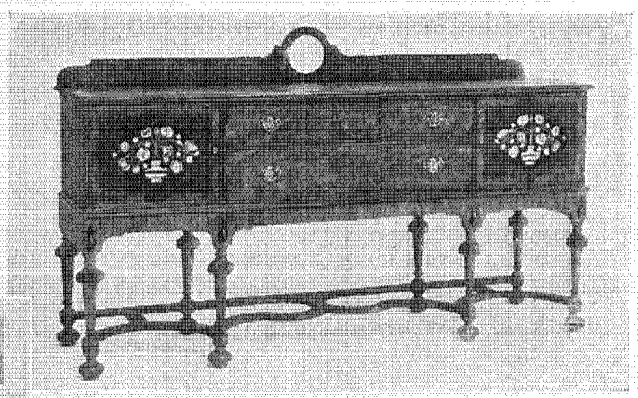
The American walnut even in the days of the earliest colonists possessed a real value. There are countless records to show that this wood commanded a prominent place in their lives.

As a mark of especial regard, Mrs. Washington, the mother of "George," selected a fine walnut writing table for a bequest to her grandmother, Betty Carter.

The inventory of Peter Faneuil of Boston in 1742 shows that he owned twelve walnut frame chairs. I might go on through a seemingly endless list, but the homes and museums have preserved specimens which offer sufficient proof that walnut has always represented the highest class of furniture even to the present day. It possesses a texture readily responsive to the carver's tools, yet with sufficient hardness and tenacity to prevent splitting or cracking of the intricate designs and figures.

As previously stated the development of our present-day furniture, although based on the period designs, has undergone a radical change. The grace and beauty of the period design have been retained, but the elaborate detail has been eliminated for the purpose of attaining distinctiveness through dignified simplicity. In this development walnut has been a predominating factor and now ranks on a par with the more expensive imported woods.

The present-day tendency is toward simplicity in interior finish, woodwork, paneling and doors. The burden for producing artistic effect therefore depends on the beauty of the wood



Modern buffet of American walnut

itself. For this reason walnut is selected for many of our public buildings, magnificent hotels and palatial residences.

The color of the wood—a chocolate brown, and its very fine, satiny texture demand a series of finishes somewhat different from those used on other American woods. This color must be developed and the beautiful graining

*Continued on page 13*

Modern American walnut bedstead. Note the beauty of the figured panels

# The Work of Making Playthings

*The manufacturer of playthings wrestles with many problems and worries, but Fabrikoid helps him out of many a hole*

By EARL R. JENKS

TOYS are made for fun, that is, if you regard toys from the juvenile viewpoint; their purpose is to give pleasure and amusement to little folks who play with them. But if you suggest to a manufacturer that it must be fun making toys, the chances are he'll give you a cold appraising look and either say "Yes," with a large-sized mental reservation, or else he'll say: "Fun? Well, from the outside one might think so, but from the viewpoint of a toy designer and manufacturer, take it from me, there's little fun in their making. Far from it!"

The truth is, toymaking is as serious a business as you will find anywhere. The factory hands probably get as much pleasure out of their work as any class of employes you are likely to find, but the pleasurable high spots in the front office are few and far between, if you accept the version of many manufacturers.

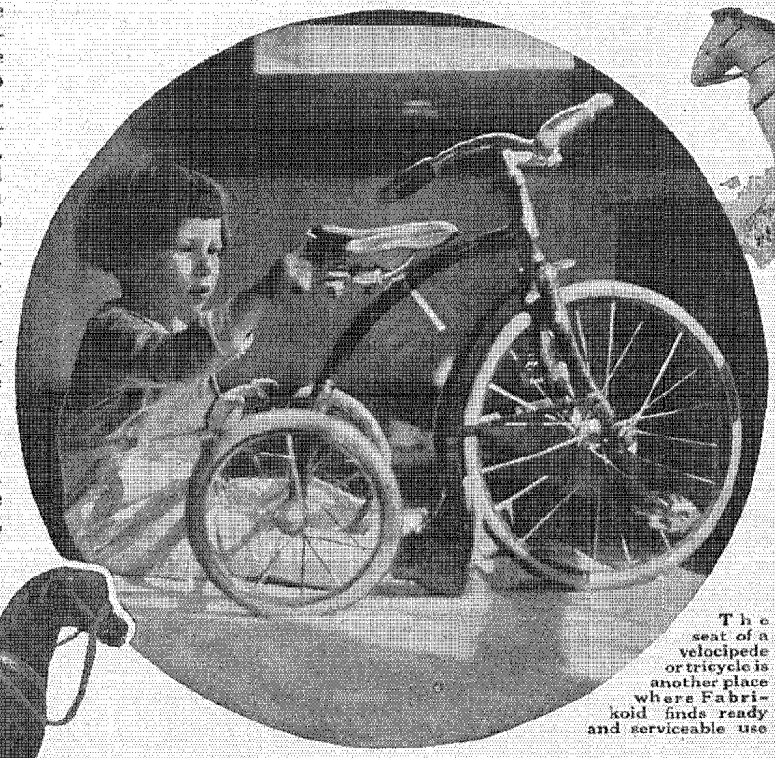
The reason is that toy manufacturing is a highly competitive business, and one that in a large degree requires ability to anticipate the whimsical fancies of the child mind. The man who can do it successfully needs to be a student of child psychology, somewhat of a prophet, a mechanic, inventor, and he must be a good buyer, a clever seller—and in short, a thorough-going business man; for planning, making and selling toys is not only highly competitive, but it is a highly speculative business.

It requires close figuring all around to make the profit and loss statement at the end of the year pleasurable to look upon. A few cents a yard on a fabric, a screw more or less, a slight difference in the gauge of a metal part, an operation added here or eliminated there in assembling, and the toy falls within or without the required selling price or the necessary margin of profit.

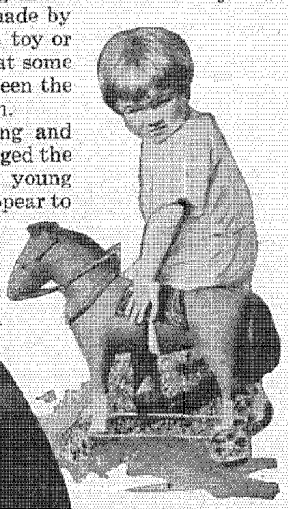
Back of this is the eternal racking of minds for ideas—the life blood of the toy trade; and after the toy is made, the worry and uncertainty about its reception in the toy market. Always there is the question: Will it fall flat or "go big" in toydom? There is the haunting fear that the new toy may not strike the childish fancy after the manufacturer has gone to the expense of equipping his factory to produce it on a large scale.

The brighter side of the picture is revealed when the manufacturer produces a toy or plaything that strikes the fancy and scores a hit. Fortunes have been made by the timely introduction of a single toy or plaything, and it is noteworthy that some of the best money-makers have been the simplest in design and construction.

Miniature reproductions of living and inanimate objects have always engaged the attention of toymakers because young children, from 1½ to 4 years old, appear to like such toys. Producing toys of this sort is relatively less speculative than attempting to introduce an entirely novel toy. Children like best the *things* that are found in the home environment, but they want them reduced in size to the measure of their little hands and minds. Look over the array of toys and playthings in any large department store. You'll be surprised to find that the world of toys is largely our own workaday world in miniature. The same things we older folks use, live with and work with are made for our children to play with. Examine the better grades of these toys and you will discover that they are not only facsimiles in form and appearance, but the toymakers have actually used the same materials as are found in the original objects reproduced.



The seat of a velocipede or tricycle is another place where Fabrikoid finds ready and serviceable use



Billy's little stablemate on wheels

Billy, the hobby horse, will likely have a saddle made of Fabrikoid, usually in a grain that looks exactly like real cowhide

Commenting on this fact, a toy designer says: "You must make good with the child; he is now more broadly educated than in the past; he is a surprisingly keen observer, never missing details. Miniature reproductions must be made as realistic as possible, for we know that any attempt to do wholesale faking or misrepresenting in the design of a toy is almost sure to be discovered by the child."

That explains one reason why Fabrikoid in its various quali-

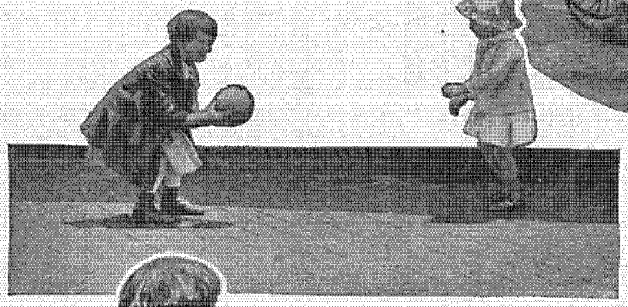
ties is so often found in toy construction. It is an extremely versatile material, widely used on all manner of real articles, and logically it is selected for use in the manufacture of their toy reproductions. It is only natural that dolly's carriage should have a Fabrikoid top just like the one on baby's own go-cart, and that dolly should wear Fabrikoid bootees. Why not? Baby wears them. Both the toy automobile and the real car have Fabrikoid cushions, although there is a vast difference between big horse power and little foot power. Likewise, daddy and baby's doll both find the Fabrikoid upholstery on their chairs comfortable.

Another important reason for the use of Fabrikoid on toys is explained by the fact that this material can be obtained in a wide variety of colors, grains and finishes. Probably no other type of fabric meets so many variable requirements in the toy trade. Some dolls are covered with Fabrikoid sheeting of just the right color and grain to give the appearance of an infant's pink skin. The same doll may wear slippers of black glazed Fabrikoid resembling patent leather, or perhaps a waterproof hat of blue, red or green. "Billy," the hobby horse, will likely have a saddle made of Fabrikoid, usually in a grain that looks exactly like real cowhide. Baby's toy football will be made of Fabrikoid in a most convincing pigskin grain. Big brother, with the baseball habit sprouting, will invest in a five-cent ball with a Fabrikoid cover that looks exactly like horsehide. And the seat of his velocipede or sister's tricycle will probably be covered with another type of the same material, very likely in the two-color effect of Spanish leather. And you'll find that the toy alligator in the play box feels quite at home and looks the part of his prototype in a skin of brown alligator-grain Fabrikoid. Incidentally, almost any other animal can be accommodated with a good reproduction of his own hide.

The sanitary qualities of Fabrikoid also recommend its use in toy making. Baby may throw his bean bag wherever he will—and he usually does—but it will not absorb impurities. It will get soiled, but no matter—mother can clean it perfectly under the water faucet. Even if baby puts a Fabrikoid-covered toy in his mouth, there is no harm done for the coloring matter does not come out.

Dolly wears Fabrikoid bootees. Why not? Baby wears them

Naturally dolly's carriage should have a Fabrikoid top just like the one on baby's own go-cart



A five-cent baseball, with a Fabrikoid cover that looks exactly like horsehide is bound to please

Both the toy automobile and the real car have Fabrikoid cushions

Finally, an important reason why toymakers use Fabrikoid so extensively is that it makes possible important economies in production. The toymaker can spread out fifty or more thicknesses, lay on his pattern and cut out at one operation with an electric knife all the material needed for hundreds of toys. The pieces are all of the exact shape and size required, and of uniform thickness and tensile strength. Manifold cutting saves time and labor. And the material loss is practically negligible. Subsequently these pieces go through the machines like so many pieces of wood or tin, wholly free from the variations that in some materials require such tedious and costly hand work. As the material lends itself to labor-saving processes that insure large production at low cost, it becomes invaluable to toy manufacturers, who are called upon to make many articles to retail at prices as low as ten cents each.

On high-grade toys, where it is important to use materials that will be durable and not show evidences of wear, nothing can take the place of Fabrikoid. The material is made to stand hard and rough usage without diminishing in any degree the beauty of its appearance. For these qualities it is also highly regarded by makers of Indian suits and other clothes for play purposes. Practically nothing can happen to alter the color or finish of Fabrikoid. The material does not fade, discolor or stain, and for all requirements of the toymaker it is readily available at a price that makes it extremely practicable.

Not long ago a noted kindergarten expert addressed a convention assembly of toy manufacturers. Her recommendations may be compressed in one sentence: Make toys more simple, more durable, more useful, and above all else make them hygienic. The trend is certainly in that direction and toward a more extended use of Fabrikoid.

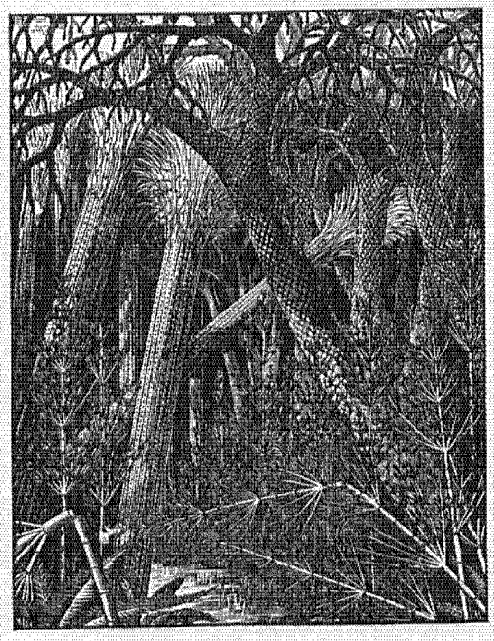
# Some Crudities on Coal-Tar Crudes

*The creative chemist has learned to release medicines, munitions, and dyes illimitable from unpromising black coal tar*

By DR. THOMAS H. NORTON

COAL-TAR chemistry is probably the most complex branch of human knowledge. All of the substances included under the designation of coal-tar compounds, as well as the whole category of organic compounds, contain carbon. With this carbon is combined either oxygen, hydrogen or nitrogen, often all three, more frequently but two, in a few cases but one of the trio. In not a few instances, even this single member is replaced by some other element, usually chlorine or sulfur.

The known compounds containing the four primary elements reach into the hundreds of thousands. Arithmetic fails to grasp the possibilities of the various forms in which the quartette are capable of existence, and infinite are their derivatives containing other elements.



A forest of the coal period

The countless host of coal-tar compounds, resulting from the multiple methods of combining carbon and its three close comrades, includes a vast number of substances most useful in the arts. Some are valued therapeutic agents; others are delicate flavors or fragrant perfumes; a small number are helpful to the photographer; a few belong in the class of powerful explosives; many replace in the arts divers widely used natural products, such as rubber, camphor or the like; finally, there is a vast and steadily increasing array of coloring matters, providing for all gradations of tint, and meeting all possible needs in the dyeing or staining of textiles, leather, wood, straw, feathers, hair, and other products, also, in the application of pigments. The poet visualizes a multitude of new and wonderful products, revolutionizing our tastes and habits and the very conditions of our existence, which the chemists of this and succeeding centuries will gradually evolve from the sadly non-esthetic and prosaic coal tar. If retrospective, there flashes through his mind the long panorama of eons and cataclysms preceding the formation of the somber-hued liquid; the luxuriant tropical vegetation of the carboniferous period; the slow conversion of that rank growth, buried beneath sand and mud, as thousands of years elapse, first to peat, then to lignite, finally to coal; the thud of the miner's pick; the dull report of a blasting charge; the return to sunlight; the entrance into the glowing coke oven; the swift tragedy of disintegration, as gas and tar and ammonia pour forth and leave behind an incandescent mass of coke; the separation of the three volatile constituents; the start of the humble, homely tar on a career of kaleidoscopic brilliancy!

Coal-tar products involve the use of raw materials and very frequently of semi-manufactured products. The former are termed technically *coal-tar crudes*, the latter, *coal-tar intermediates*. The first category is comparable to cotton, wool, iron ore, or the trees of the forest. The second finds its counterpart in cotton or woolen yarn, pig-iron or steel ingots, lumber or wood pulp.

For the present let us consider only the small group of coal-tar crudes.

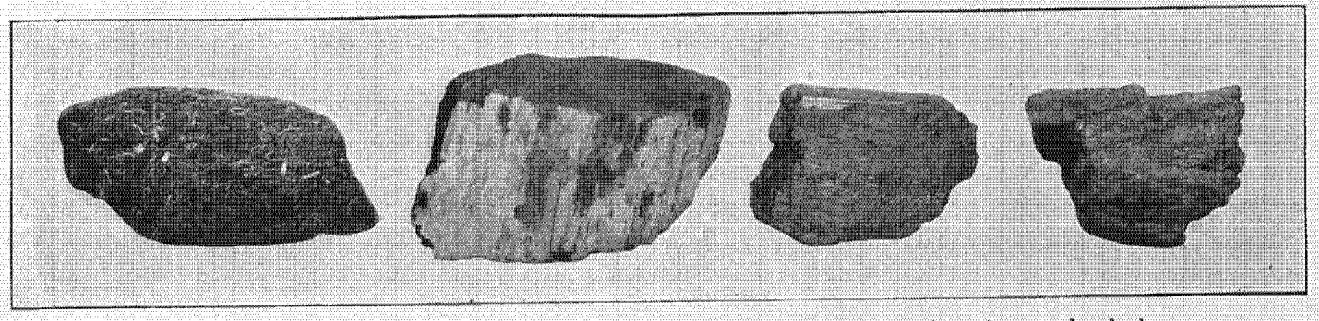
Most people think of coal tar as a material for roofing, for lining Bessemer converters, for making electric arc-lamp carbons, for preserving timber, and, in recent years, for laying the dust on the modern highways.

By the help of fractional distillation the chemical contemporaries of our grandfathers showed that tar was not a uniform, homogeneous body. On the contrary, it has been found possible to isolate from coal tar, thus far, no less than 190 substances of a definite composition. Many more still await complete separation in the pure state, and chemical identification. Most of these compounds are present in very small amounts. Many are liquids; a few are gases dissolved in the liquids; a number are solids, also, in the state of solution.

All of these substances result from the action of a high temperature upon complex combinations of carbon with the other elements, forming a considerable fraction of coal. Thus far they have not been isolated nor is their chemical nature known.

Carbon, in very finely divided particles, suspended in the tar, imparts to coal tar its black color, and forms from 7 to 33% of its weight. The world's annual production is in excess of 3,000,000 tons, derived partly from gas works, but chiefly from coke ovens.

Now how is tar separated from its constituents by "fractional distillation?" The tar-distiller begins by operating on large quantities of the liquid—as much as 40 tons at a time—using a cylindrical, wrought-iron, or steel retort. All vapors volatilized pass through a long condenser coil of iron tubing, with a bore of 2 to 4 inches, terminating in a suitable receptacle. The distillation is interrupted at certain points and the condensed



In the order of their development—Left to right the specimens shown are, peat, lignite, bituminous coal and coke

fractions are removed. These fractions are usually five in number, and average as follows:

| | TEMPERATURE ATTAINED | PERCENTAGE OF TAR |
|---|---|---|
| 1. Tar water (containing ammonia) | 110°C. | 4% |
| 2. Light oil | 210° | 2% |
| 3. Carbolic oil | 230° | 10% |
| 4. Creosote oil | 270° | 12% |
| 5. Anthracene oil | 400° | 15% |
| 6. Residual pitch | | 55% |

Fractions 1 and 2 separate from each other in two layers, the light oil having a density of 0.925, as compared with water.

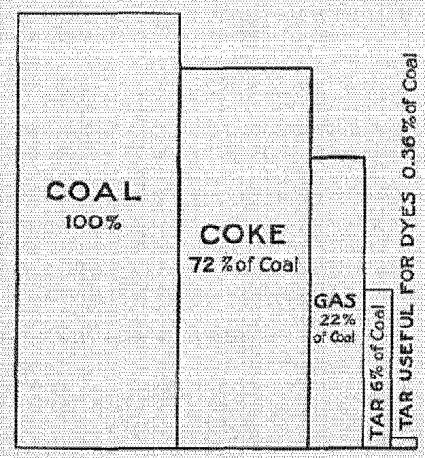
Each of the four fractions 2, 3, 4 and 5 is then submitted to a very careful rectification in a so-called Savalle still. The dominant feature of this apparatus is a long column, divided into a series of chambers by perforated plates, in which higher boiling portions of the current of vapor are condensed and returned to the still. The result is that liquids, having boiling points not very far apart, are separated from each other in a fairly high state of technical purity.

Fraction No. 2 yields benzene, toluene and the xylenes; No. 3 yields phenol, cresols and naphthalene; No. 4 yields small amounts of the same three compounds, but is used chiefly for impregnating and preserving timber, (especially railroad ties and telegraph poles); No. 5 contains about 10 per cent of anthracene, and the residue is used as in the case of the creosote oil.

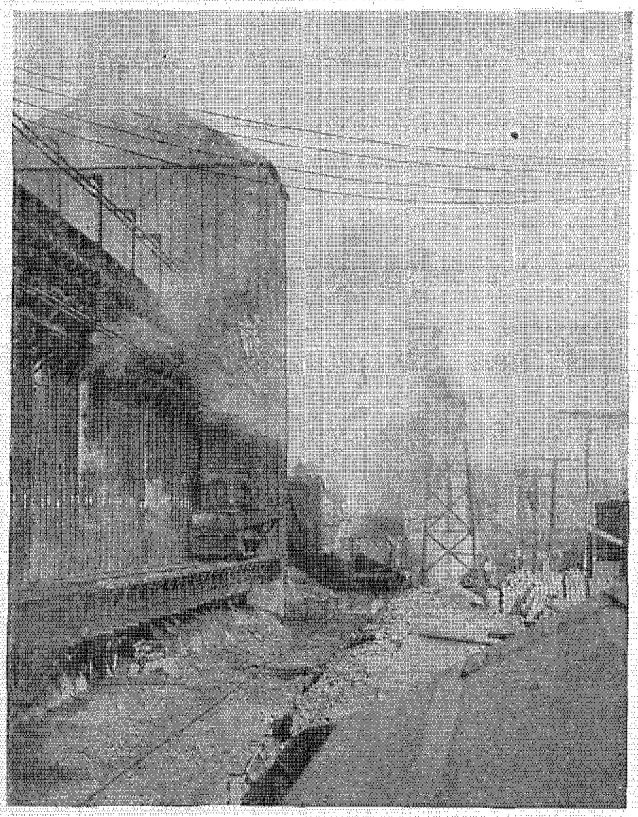
The compounds enumerated above form the essential basis upon which the coal-tar chemical industry of today has been erected. A few minor compounds, pyridine, quinoline, carbazol, acenaphthene have been isolated, and have a limited technical use, but quantitatively they may be almost neglected in studying the main outlines of the industry.

Benzene, toluene, the xylenes, naphthalene and anthracene are hydrocarbons, *i. e.* composed of hydrogen and carbon in varying proportions. Phenol and the cresols contain in addition, oxygen. They are allied by composition to the organic alcohols, but possess somewhat pronounced acid properties and form salts with the alkaline metals.

In point of importance for the dyestuff and allied industries, benzene and naphthalene are by far the leading members of the small group. A second class includes toluene, anthracene and phenol. A third class of greatly inferior value comprises the xylenes and the cresols. If they were non-existent in tar, the loss would be almost negligible. The other five compounds are indispensable. The separation into two classes concerns only the relative amounts employed in the chemical industry of today. But revolutions are as common in chemical technology as they are in Mexico. The year 1950 may witness a complete reversal of the above classification.




The average amounts of the products derived from the distillation of 1000 lbs. of bituminous coal are as follows:



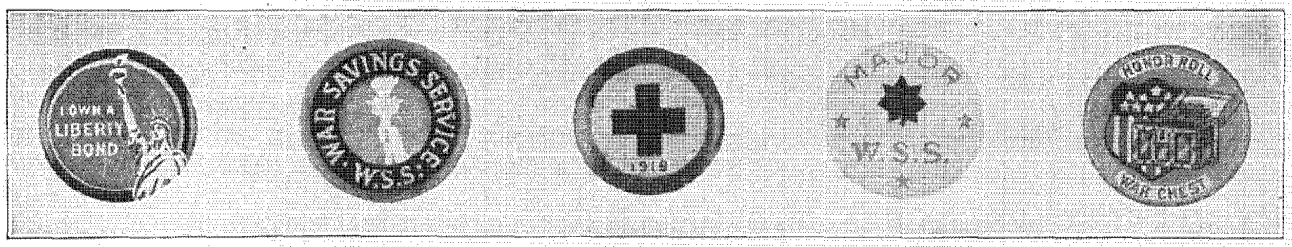
Battery of coke ovens

| | | |
|---|---|---|
| Coke | 700 | lbs. |
| Tar | 50 | lbs. |
| Gas water, 9 to 11 gallons, yielding ammonium sulfate | 12 | lbs. |
| Gas 300 cubic meters | 170.4 | lbs. |
| Benzene in the gas | 9.38 | lbs. |
| Benzene in the tar | .5 | lbs. |
| Total benzene | 9.88 | lbs. |
| Toluene in the gas | 3.12 | lbs. |
| Toluene in the tar | .4 | lbs. |
| Total toluene | 3.52 | lbs. |
| Total benzene and toluene | 13.4 | lbs. |
| Naphthalene | 3.0 | lbs. |
| Anthracene | .2 | lbs. |
| Phenol | .7 | lbs. |

Coke plants are usually so equipped that when the gas which issues from the ovens in such abundance is passed through so-called scrubbers most of the two hydrocarbons, benzene and toluene, present as vapor, is recovered in the liquid form. In the manufacture of illuminating gas, however, they are allowed to remain in the form of vapor, in order to increase the luminous power.

The coal-tar crudes are often submitted to various processes of purification by treatment with chemicals, or by redistillation or sublimation, in order to remove small amounts of impurities which might interfere with their satisfactory utilization for specific purposes. Sometimes this is done by the tar distiller. In large plants, manufacturing artificial colors or explosives, the refining often takes place in the works where the crudes are to be employed. This was notably the case with E. I. du Pont de Nemours & Co., when it began to manufacture synthetic dyes. Now, nearly all the crudes, required for its varied operations, are supplied in a state of sufficient purity by the tar

*Continued on page 16*




# Campaigning With Pyralin

*Fancy a circus without peanuts, popcorn and lemonade! The idea is less absurd than to think of a popular campaign without speeches, parades and campaign buttons*

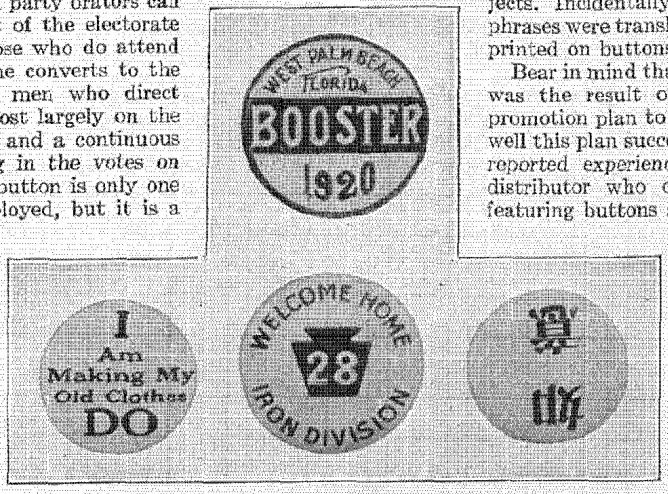
JOHN Hyatt, a typesetter in Albany, New York, in 1863 was nursing a sore finger where the skin had worn thin from handling a sharp-edged piece of metal. He went to a cupboard where a bottle of "liquid cuticle" was kept, but it had tipped over and the collodion had run out and solidified on the shelf. This hardened material interested the young printer, who experimented with it and eventually succeeded in producing pyroxylin. And a sore finger was the starting point in its discovery.

Pyroxylin is used in the industrial arts in thousands of ways that Mr. Hyatt never dreamed of when he discovered it. For example, he probably never considered that in another fabricated form this new material might some day help elect congressmen, governors and presidents of the United States. The chances are that he never dreamed of the utility of buttons in sales campaigns, nation-wide drives for funds and in scores of other ways. Yet buttons—campaign buttons—have become influential factors in almost every field of human endeavor.

Buttons have been employed in political campaigns for more than thirty years. A comparatively small number were distributed during Harrison's campaign in 1888. Four years later, in the presidential race that returned Cleveland a winner, more buttons were used; and in the next two campaigns, when McKinley and Bryan fought for White House honors, they were very extensively used. Since then no presidential campaign has been conducted without distributing millions of them. From now on until November they will be worn on the coat lapels of voters in all sections of the country.

Do buttons pay? Unquestionably they do, for otherwise their use would have been discontinued long ago by campaign managers. No nominee can interview every voter. Even the distinguished party orators can attract only a fractional part of the electorate to political meetings, and those who do attend are for the most part old-time converts to the cause. For this reason the men who direct modern campaigns depend most largely on the influence of personal workers and a continuous barrage of publicity to bring in the votes on election day. The campaign button is only one of many other mediums employed, but it is a good one because it lends itself both to general publicity purposes and to effective use by personal workers.

The psychology of a campaign button is subtle. Worn on the coat of a voter it indicates the wearer's preference for the candidate represented and identifies him with his party. If the wearer is influential in the community, the button visibly recommends his choice to other voters who are still undecided. The button prompts inquiries and discussions, suggests a topic of conversation wherever it goes and by the leaven of many personal contacts each day it helps mightily to arouse interest and enthusiasm in the campaign. The button is a booster, serving to "step up" the current of popular acclaim for the candidate whose photograph is reproduced on it.




**A few specimens of campaign buttons**

But let no one imagine that buttons have been limited in their use to political campaigns. Far from it. It may surprise you to know that probably as many are used in sales promotion campaigns as have ever been used in political campaigns. Some years ago one of the largest manufacturers of tobacco products in this country adopted the policy of inserting a handsomely lithographed button in each package of cigarettes prepared for market. Colored reproductions of more than seventy national flags were featured on those buttons, which were so attractive to buyers of cigarettes that millions of packages were sold. To supply the demand created, one manufacturer of buttons was called on to make them in lots of fifteen, twenty-five and even fifty millions at a time. People collected buttons just as at one time they collected postage stamps. The button craze was on.

Remember the photo-button series featuring famous baseball players? Fifteen millions of these buttons were distributed; and, of course, you recall the time when certain young individuals in your home town walked about the streets wearing buttons bearing such inscriptions on them as "Oh you kid," "Gee, I'm lonesome," "Let's get acquainted," and other expressions of the day. It was the aftermath of the period when heart-shaped candies appeared with sentimental phrases printed on them. Other series bore reproductions of the ships of the Navy, cartoons, Indians, brownies and many other subjects. Incidentally, many of the American slang phrases were translated into Chinese symbols and printed on buttons to induce the oriental smile.

Bear in mind that the so-called "button craze" was the result of a carefully prepared sales promotion plan to distribute merchandise. How well this plan succeeded may be judged from the reported experience of one manufacturer and distributor who conducted such a campaign, featuring buttons as a premium, and developed package sales of 800,000 a day.

Do buttons pay in business campaigns? The answer is that they have survived the test for longer than a generation, and they are still used successfully. The only trouble reported by the button makers at this time is that they are unable to get raw material and labor to keep their machines busy

turning out orders. In recent years buttons have found a remarkably extensive use in campaigns to raise money. Merely to mention the Liberty Loan campaigns, the War Savings Stamp campaign, and the numerous drives for contributions to the Red Cross, Salvation Army, Y. M. C. A., Y. W. C. A., K. of C., Y. M. H. A., and other agencies prominent during the war, brings to mind the role that buttons played only a short time ago in making these efforts so successful. Particularly in the Liberty Loan campaigns the presence of a button on a citizen's coat became an evidence of his subscription and the mark of his patriotism, just as the absence of a campaign button raised the presumption of disloyalty to the government.

It is idle to attempt enumerating all the types of campaigns in which buttons are used to serve purposeful ends. They fit into practically every plan that involves co-operative effort and requires publicity either in a local or national way. They boost towns and municipal projects; they identify delegates at conventions; they welcome home battle-scarred veterans; they protest against increase in trolley fares; they identify by numbers the employes of large industrial plants and of construction forces. In hundreds of other ways they serve useful purposes.


Which one?

Few people have any idea how many buttons are made each year for campaign and sales purposes. Even those who manufacture and sell them hold up their hands when you ask for a rough approximation of the number. Among several estimates obtained from men in the business, notably the most conservative one came from an interview with a branch office manager for one of the largest manufacturers of novelty buttons in the country. Incidentally, he has the reputation of having sold more sales promotion and political campaign buttons than any other man living. His estimate was from 75,000,000 to 100,000,000 a year.

Several operations are required in making buttons of this type. The shells and collets are stamped out of metal sheets by specially designed die-presses. Another machine fashions the pin device. Reproducing the photograph or printed design is accomplished in the usual manner employed by photo-engravers, printers and lithographers. The printed or lithographed impressions are made in multiple form either on sheets of pyroxylin or of paper. Manufacturers vary in this practice. If the impression is made directly on the pyroxylin, white or colored stock in sheets 20″ x 36″ or 20″ x 50″, and 10/1000″ thick are used, and a sheet of paper is cemented underneath. If the impression is made on paper, a sheet of transparent pyroxylin sheeting 5/1000″ thick is cemented over it. After the sheets are printed, the button disks are cut out on punch presses, and all the parts—except the pin device—are assembled on machines. So far no one has invented a machine to insert the pins as satisfactorily as this work can be done with human fingers.

In large establishments button making machinery is arranged in battery form, and the busy operators follow the practice of singing as they work. One girl can assemble about 10,000 buttons a day. Merely to handle the normal influx of orders in one plant requires a weekly production of 750,000 buttons, but it has mechanical facilities to produce 1,250,000 daily. Of course hundreds of thousands more are made by other manufacturers. Incidentally buttons are sold by the pound rather than by numerical count.

As this is being written, manufacturers are already speeding the production of millions of campaign buttons for one political party. When the wires flash the decision of the convention now in session, the go-ahead order will start millions more through the button factories of the country. How many millions of buttons will be employed in the coming presidential race cannot be estimated with any degree of accuracy, but as one manufacturer who was interviewed expressed it, "Probably there will be enough to go around."

Manufacturers who have succeeded most conspicuously in producing buttons have been careful to use the best raw materials obtainable in order to secure the most artistic effects. Obviously, the quality of the pyroxylin sheeting is of the utmost importance. It must be thoroughly seasoned stock of uniform thickness, color and composition and must present a smooth printing surface in order to be well adapted for half-tone reproductions and color work. Pyralin sheeting in both transparent and opaque colors 20″ x 50″ and 5/1000″ in thickness has been extensively used by manufacturers aiming to produce buttons of the finest quality. Although Pyralin, along with other products of its kind, will play a part in the campaigns of the year, it has no political favorite to boost and will likely be represented in all the buttons issued by the various campaign committees. Pyralin can be depended upon to do good publicity work for all candidates by visualizing and recommending them to the electors of the nation who will be called on to make their choice next fall.

# Walnut—the Cabinet Wood Superlative

*Continued from page 7*

accentuated to the best possible advantage. A paste wood filler is commonly used to fill the open grain of the wood. The finishing coats consist of the satiny sheen of wax or the semi-gloss of rubbed varnish. Quite frequently also the filler is preceded by a coat of walnut Acid Stain with the same types of finishing coats.

All of the finishes for walnut are formulated for use on walnut—and walnut alone. The wood possesses such an important place in furniture and interior work that these special developments are a necessity. It is true that other finishes have been used, but they do not develop the real beauty of the grain, and do not bring out the color and texture of the wood.

The natural walnut effect is produced by filling with Wheeler's Walnut Paste Wood Filler, followed by a coat of Du Pont White Shellac and finishing coats of Bridgeport Standard Prepared Wax, or Wheeler's Varnish.

A slightly darker finish is obtained by the use of Wheeler's Golden Oak Paste Wood Filler, with the usual finishing coats mentioned before. This Golden Oak Filler is sometimes designated as a Dark Walnut Filler.

A finish particularly adapted for period furniture of walnut may be had by filling with Wheeler's No. 78 William & Mary Paste Wood Filler, and finishing over with shellac and varnish, or shellac and wax. Still another effect of the same rich, brown walnut color is produced by the use of No. 4 American Walnut Acid Stain, No. 17 American Walnut Wheeler's Paste Filler and Wheeler's Interior Varnish.

All of the finishes mentioned are very similar in color. The difference consists mainly in the depth of color obtained—the purpose being to retain as nearly as possible the natural color of the wood with the full development of the beautiful grain. This is particularly true of the veneers cut from the "burls" which form particularly attractive panels for furniture and interior work.

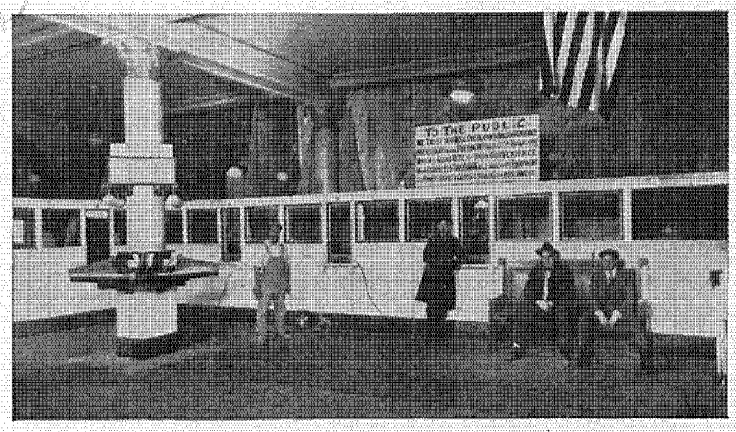
The Architectural Service Bureau, Paint & Varnish Section, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware, will gladly furnish additional data on the finishing of this wood, applicable to the furniture, cabinet and woodworking trade.

# Blowing a Bank Vault

*It was a neat job done after banking hours, but the yeggmen had no part in it*

By GUY G. MEANS

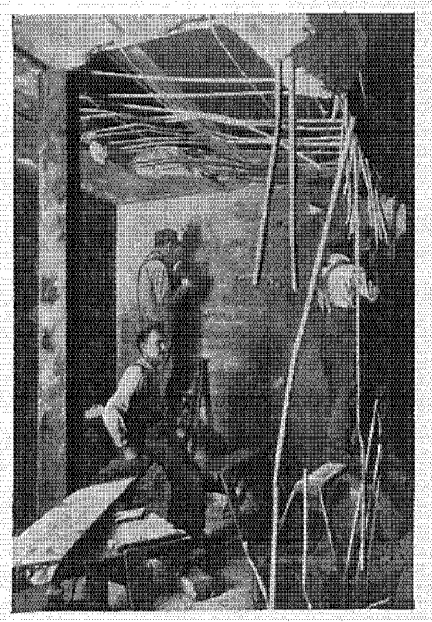
NO, the ancient order of safe-crackers had nothing whatever to do with the Superior Bank job. It was a legitimate industrial undertaking that required careful planning and a fine sense of judgment in doing the work. The A. Moorman & Company—large bank building contractors—were just beginning work on a $60,000 job that involved remodeling the vaults and lobby of the United States National Bank at Superior, Wisconsin. This institution had outgrown its space facilities, and needed a larger lobby, a new vault and more cage space. But a solid obstacle stood in the way, taking up floor space needed for enlarging the lobby and cage enclosures. It was the old vault. A new one was to be located further back in the room.



The location of the vault in the lobby

The most difficult, most expensive part of the work was to get rid of this old vault, which was 21 feet 2 inches long, 10 feet 6 inches wide and 10 feet 4 inches high. The walls, which averaged 10 inches in thickness, were built of concrete, reinforced with ¾-inch round steel rods spaced at intervals of six inches on center both ways. These walls had to be removed to the floor level without injury to a similar vault immediately underneath in the basement.

Out of doors this task would be a simple blasting job. But indoors, with the vault surrounded by valuable fixtures, and with plate glass near by, the use of high explosives would be attended with considerable risk of damage.



Showing the spacing of holes

Many claimed the only safe way to do the work was to tear it down piece by piece by hand labor. They considered the use of dynamite hazardous, and, therefore, impracticable for the task. Notwithstanding their fears, Mr. Albert, superintendent of construction, decided to try blasting. Arrangements were made and the work was begun one night after banking hours. The vault was shut in by a screen of 2-inch planks to protect the banking room from flying fragments. Holes, spaced eighteen inches apart on centers, were drilled into the vault to a depth of six inches. The loading charges varied from 1/8 to 1/6-pound of 20 per cent Red Cross Extra dyamite per hole. Each charge was primed with a No. 6 electric blasting cap. The holes were first tamped with ordinary plaster, but as this was found to be unsatisfactory, Superior red clay was substituted with much better results.

From three to nine holes were fired simultaneously. The largest single shot contained 1½ pounds. The concrete was cracked and loosened from the steel in such a way as to make its removal very easy.

Although considerable doubt was expressed as to the probable fate of the several large plate glass windows, absolutely no damage resulted either to the windows, the furniture or the vault below. The entire banking machinery was left in the room and the bank carried on its business without interruption.

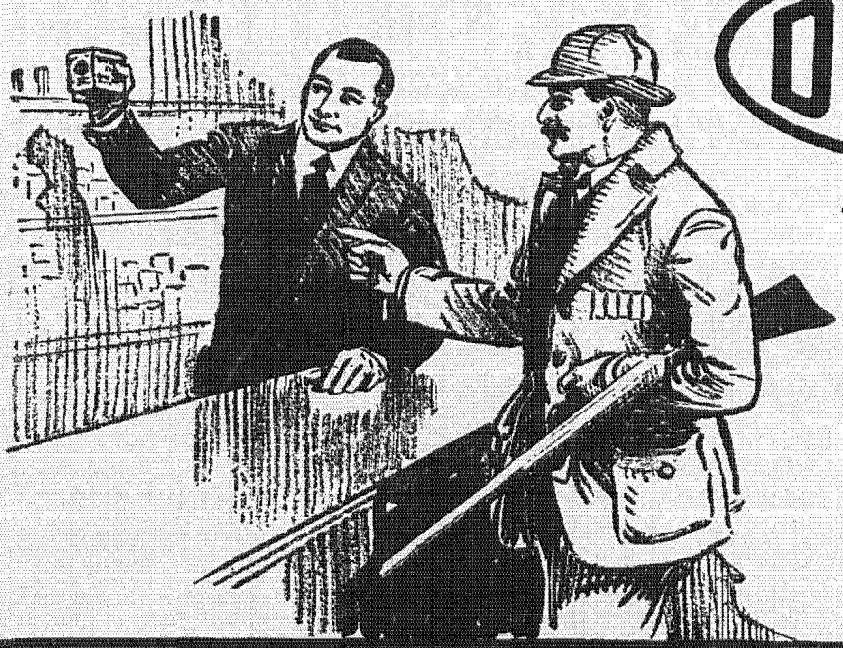
Altogether, 12½ pounds of dynamite were used. The total cost of demolishing the vault by the use of dynamite was $262.50—all of which, except about $15.00 was paid for labor. But if the work had been done by hand labor alone, the cost of demolishing the vault would have reached $675.00 according to a conservative estimate. Thus by investing about $15.00 in explosives, the Moorman Company saved $412.50.

Moreover, the method employed resulted in a saving of time. It is doubtful if the vault could have been torn down by hand within six weeks, and the employes of the bank would have been subjected to the annoyance of dust and noise during that period. A week's time sufficed to do the work with dynamite after banking hours. Thus, the contractors gained five weeks' time by using explosives.

The result of a small 3-shot hole blast

This work done in Superior clearly demonstrates the practicability and economy of using explosives to demolish bank vaults or other reinforced concrete structures inside of buildings as well as out in the open. It points again to the dependable qualities of Du Pont explosives and the helpful character of Du Pont service.

*7 out of 10 shooters use*



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## Some Crudities on Coal-Tar Crudes

*Continued from page 11*

refiners. The only exception is anthracene. This material is received from the tar works in a very impure form. The process of refining it is very complicated, involving both chemical and mechanical treatment. It is fully as difficult as the preparation of any intermediate from a crude.

Finally, a few descriptive notes on the leading coal-tar crudes:

BENZENE, discovered by Faraday in 1825, was first prepared in large quantities, in 1848, under the direction of A. W. Hofmann (the writer's teacher). It is, when pure, a colorless, mobile, highly refractive liquid, with a specific gravity of 0.874, boiling at 80.4°C., and solidifying at 0° to white crystals. It is an admirable solvent for fats, resins, iodine, sulfur, phosphorus, rubber and other substances. It can advantageously replace gasoline as a motor fuel. Its chief use is based upon its easy conversion to aniline, the most important of the coal-tar intermediates.

TOLUENE is very similar to benzene. It boils at 110°C. and does not solidify at —28°. The specific gravity is 0.869. It is not employed as a solvent, but is equally available, with benzene, as a motor fuel. It serves as the initial material for the manufacture of the high explosive, T.N.T. It is readily converted into toluidine, analogous to aniline in composition, properties, and use in color manufacture.

The three XYLENES are of almost identical chemical and physical properties, boiling at 138° to 142°. They are of limited use in dye manufacture, yielding colors similar in composition to those obtained from benzene and toluene.

NAPHTHALENE, discovered in 1816, is obtained in the form of white crystals, melting at 80° and boiling at 218°. It is easily sublimed and volatilizes slowly at ordinary temperatures. It is employed for carburetting illuminating gas, is a powerful antiseptic and is valuable in medicine. In the form of moth balls it is of common use. A multitude of derivatives are used in the manufacture of dyes.

ANTHRACENE, discovered in 1832, is obtained in the form of colorless crystals, with a beautiful blue fluorescence, melting at 213° and boiling at 360°. Its numerous derivatives are employed in the preparation of a variety of dyes, notably of artificial alizarin. Since 1900, the most important progress in tinctorial chemistry has been accomplished by the aid of anthracene compounds.

PHENOL (carbolic acid), discovered in 1834, is a white crystalline solid, melting at 41° and boiling at 181°. It is highly corrosive on the skin, extremely poisonous, and of widespread use as an antiseptic. Large amounts are required in the manufacture of phonographic records. Nitric acid converts phenol into picric acid, the powerful explosive.

The three CRESOLS are closely allied to phenol in every respect. They find a limited use in dye manufacture, but a more extended use as antiseptics.

The members of the quintet of principal crudes, two liquids and three solids, are closely interrelated. Phenol can be manufactured from benzene almost as cheaply as it can be isolated from coal tar. In fact, it was so produced on an enormous scale during the World War, when the demand for picric acid far outran all possible supplies, arising from the distillation of coal. Thomas A. Edison promptly introduced this synthetic production of phenol a few weeks after the war began. He has so perfected the process that it will continue to operate after a return to normal conditions. Toluene, likewise, can be manufactured from benzene with ease, but not with quite the same possibility of economic production as in the case of phenol.

Naphthalene has been prepared by synthesis from benzene, or rather from various derivatives of the hydrocarbon. The operations are, however, difficult and costly. There is no prospect that any of them will ever enter into the domain of technology. On the contrary, naphthalene and several of its derivatives are easily decomposed into benzene compounds, and these operations are of great economic importance.

Anthracene and some of its derivatives can be prepared from benzene and benzene compounds. In a few instances such operations are in current industrial use.

Similar relationships exist in the case of the minor crudes.

As in other families, despite the ties of kinship, there is a great diversity of temperament in this quintet.

Mobile, sparkling benzene and toluene present in their vivacity and volatility a genuine Gallic type.

Naphthalene is a restless Wandering Jew, ever changing condition and location.

Anthracene is a phlegmatic Dutchman, staid and unemotional, but capable, in the domain of color, of awakening to a riot of hues, rivaling those of Rembrandt in his Amsterdam studio.

Corrosive, biting phenol is the chemical counterpart of a cynical, pessimistic old maid, carefully to be avoided.

In the alembic and crucible of the chemist, these crudes are transformed into some three hundred compounds, destitute, in most cases, of distinct commercial value, but susceptible, by further chemical treatment, of conversion into thousands of dyes, medicinals and other products, demanded by our twentieth-century civilization.

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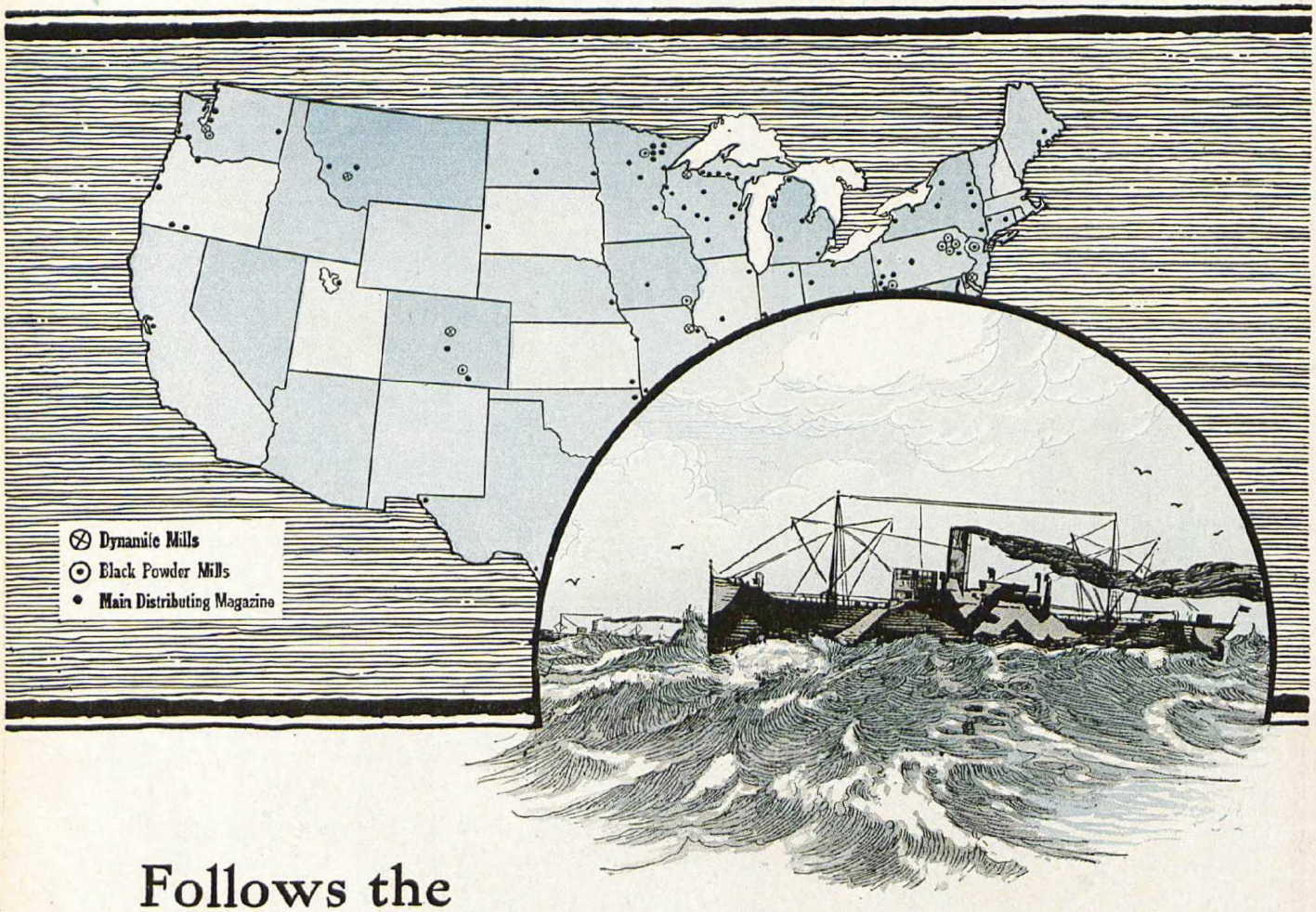


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