

that is to come. They arranged the notes and instruments. Here and there a chirp, a rasp is heard, like the tuning of the string before the real performance begins. Full of expectation we lean against a tree or stretch out under a sweet-smelling elder bush. Everything is ready and full of inspiration drawn from the beautiful June night, the thousands of nocturnal choristers of the grass sing and play their notes. There is a buzzing and chirping and trilling and rasping without end; each in itself perhaps without account and not much to listen to, but the blending is restful and charming and almost overwhelming.

And now comes the soloist of the bug orchestra, a tree toad, that sings its note with a serious deep voice but full of enthusiasm. The chirping of the bugs is more than a summer's monotonous lullaby, it becomes the musical background of a more skilled performer and assumes a new higher quality. Suddenly the soloist ceases and it appears as if everybody was quiet; the solemnity and grandeur of a June night seems for a moment to overpower all the other charms. Then he begins again—perhaps he has only stopped for refreshments and eaten some of his musicians—and anew the little buzzers and chirpers intonate their songs.

As we listen in rapture we try to analyze the performance and identify the individual performer, the cricket, the grasshopper, the locust, the golden beetle and others. But we fail in our task and wearily close our eyes, not to sleep, but to relax into a sweet vagrant reverie. Dream pictures appear before us as from the embers of an open fireplace in midwinter. Sweet recollections of our childhood and scenes of days long past and almost forgotten rise in our minds, and the untiring song of nature recalls the harmonies of a Beethoven sonata or Liszt's rhapsody to our ears, when in the circle of a contented family we mused in the twilight while a beloved one, long departed, gently touched the keys with magic finger.

The commercial druggist who knows no music but the clang of coin, may laugh and sneer at our weird imagination that sees beauty in useless weeds and hears melody in the noise of bugs. Let him sneer, poor man. He knows not what he misses. The revelations of nature are for him a sealed book, and his heart never thrills in ecstasy of the wonderful pleasures that she willingly gives to those who understand her, pure and innocent, sweeter than music, richer than gold.

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#### DYESTUFF SITUATION IN THE UNITED STATES.\*

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THOMAS M. NORTON.

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If the plans of the officials of the Commerce Department shall materialize, the urgent suggestions made by the experts of that and other departments of the government, who are constantly examining into the situation with respect to dyestuffs, will be carried out by President Wilson's administration in urgent recommendations that Congress shall safeguard any developments of the dyestuffs industry in this country by effective legislation in the form of an anti-dumping clause, or such amendments to existing laws as will prevent the German dyestuffs manufacturers flooding this country with their products and putting the domestic industry out of business when the European war shall end. It is known that

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strong recommendations have been made that President Wilson shall take a positive stand on the subject. Such suggestions have been made by Commercial Agent Thomas M. Norton who virtually has charge of the investigation and developments of the situation, so far as information regarding dyestuffs in this country and in foreign countries is concerned.

A summarization has been made by Dr. Norton in connection with his report showing in brief form the points he has brought out. He has itemized these points as constituting factors of controlling importance in the general situation as to dyestuffs production. He says:

In reviewing the general situation the following factors are of controlling importance:

The stocks of dyes of German origin in American warehouses and mills is rapidly approaching exhaustion. It will probably disappear before the end of July.

Permission for the free passage of two cargoes of German dyes for American consumption—sufficient for two to three months—was granted by the British government on April 14, but thus far permit for export has not been granted by the German government.

An ample stock of coal-tar dyes, ready for export to the United States, is held by the German manufacturing firms. It awaits the opportunity and assurance of safe transport.

The importation of Swiss dyes—forming normally about 9 percent of the total imports of artificial colors, and exceeding \$9,000,000 in annual value—continues in diminished volume. The value during the March quarter, 1915, was \$191,000.

The existing American coal-tar chemical industry is making every effort to increase its output, and is rapidly overcoming the handicap resultant from its dependence in the past on German intermediates. This output will steadily increase with each passing week from now on.

An ample supply of American coal-tar crudes is assured for the prospective needs of dye-stuff manufacturers.

The American manufacture of aniline and other coal-tar intermediates, from American crudes, has been started upon a generous scale by all existing dye-stuff works, and by five new plants specially devoted to this field. Several other works are in process of erection or in contemplation.

The foundations for a genuine American coal-tar chemical industry are apparently being laid.

This industry can supply only a small share of the American demand for the current year, but is susceptible of steady and relatively rapid expansion.

No provision is yet made for the American manufacture of alizarin or of synthetic indigo.

American consumers of artificial dyestuffs are promptly taking steps to use natural dyestuffs and mineral colors during the time that the output of American dyes is necessarily limited.

American manufacturers of natural dyestuffs in the form of pastes, extracts, etc., are making adequate preparations to supply the expected demand. They are providing ample instruction in the modern approved methods of using vegetable dyes.

There is a general recognition of the fact that the prospective scarcity of artificial dyestuffs is due to circumstances entirely beyond the control of the American government and of the American color industry, and that both are making every effort to lessen the inevitable hardships attendant upon the unprecedented conditions.

Consumers of dyestuffs are resolutely adjusting manufacturing processes, so that they may be prepared in time to revert to the use of natural dyestuffs or mineral colors with a minimum of friction should the necessity arise. Consumers of dyed materials are good-humoredly accommodating themselves to a prospective limitation in the gamut of colors. All sense of hardship disappears before the huge pall of misery and suffering hanging over the countries now engaged in the struggle that has caused this temporary famine in a class of materials almost indispensable to many American industries.

#### IS A SELF-CONTAINED AMERICAN COAL-TAR INDUSTRY PROBABLE?

The spontaneous effort on the part of American capital and enterprise to meet the exigencies of the present emergency reveals the existence of dormant possibilities of far-reaching importance.

Adequate steps have been taken to assure an abundant supply of all the coal-tar crudes needed by a well-rounded American coal-tar industry as fast as the demand develops.

A strong effort is being made to establish upon a firm basis the manufacture of a wide range of American coal-tar intermediates.

The manufacture of a limited number of staple coal-tar dyes is being pushed with remarkable energy, and the number of these dyes promises to increase steadily.

Evidently much has been done during the last few months to lay the foundations of a genuine national industry, capable ultimately of meeting the great mass of American demands for artificial dyestuffs.

Unquestionably much of the capital invested during the last few months has been in the nature of a speculation. At current rates for aniline and for finished dyestuffs there was a fair chance of quickly covering the cost of a new plant, of making a good profit, and of being in a satisfactory shape at the return of normal conditions to embark in competitive manufacture under favoring circumstances.

Numerous interviews with those who have participated in these preliminary steps in the evolution of a national industry have brought to light a marked confidence on their part in the final success of the undertaking, provided the capital invested is exposed to no more danger than that involved in fair and open competition with foreign manufacturers of dyestuffs.

Capital hesitates under existing conditions to embark heavily in an undertaking where there is a strong probability, if not a certainty, that upon the return of normal conditions an incipient, half-developed American industry would be exposed to prolonged and relentless underselling by foreign competitors possessing almost boundless resources, financial and technical.

There is a very strong conviction among those experienced in the industry and among those just entering it that the majority of the coal-tar intermediates required in making dyes, and the great bulk of the coal-tar dyes now imported from

Europe, can be profitably manufactured on American soil under existing tariff rates if there is adequate statutory protection against the so-called "dumping" of foreign wares; or, in other words, protection against unfair competition in restraint of trade by persons or firms outside of American jurisdiction.

Whether public opinion will recognize general legislation in this direction as of urgent necessity remains to be seen. There seems, however, to be no question but that ample capital is available for the needs of an American coal-tar chemical industry, and that a large measure of enterprise and technical skill is ready to enter the new field, provided this one serious obstacle is definitely removed.

There are no plans in view at present for any attempt to establish in our country the manufacture of those coal-tar dyes which for a number of years have been upon the free list, namely, synthetic indigo, synthetic alizarin, and the various anthracene and carbazol colors. They constitute about 20 percent of our imports of foreign dyes. The establishment of works for producing these colors can profitably be postponed for a few years, as the complete installation of adequate plants to produce the remaining 80 percent of artificial dyes involves problems not to be solved entirely in one or two years.

After thus summarizing the points brought out in his report it is well to call attention to the details as they are set forth by Dr. Norton, covering the present supplies, activity of American manufacture and the present output of finished coal-tar dyes. Mention is also made by Dr. Norton of the educational propaganda which he seeks to demonstrate is necessary to a complete understanding of the requirements of the situation. This part of Dr. Norton's report is as follows:

The scarcity of artificial dyestuffs is being felt more and more acutely each day throughout the country. The great textile interests, the manufacturers of paper, ink, varnish, pigments, leather articles, feathers, etc., find it increasingly difficult to obtain needed supplies of colors. Many brands have completely disappeared from the market. Small supplies of Swiss coal-tar dyes, shipped via Bordeaux, are still received. Since March 19 no shipments from Germany have entered American ports.

#### HOW CONSUMERS ARE FACING THE SITUATION.

Some large consumers of dyestuffs were far-sighted enough to lay in very heavy supplies immediately after the outbreak of the European war. One of the largest textile firms in New England has now on hand a stock adequate for its needs until the beginning of next winter. There are a few other houses similarly supplied, but the number is very limited. Most of the textile and other works dependent upon dyestuffs have not attempted to carry a reserve above what would cover normal consumption for a period of about two months. Such reserves have tended to decrease as a result of the restricted distribution from the stocks of importing agencies. The great mass of consumers of foreign-made dyes will probably have exhausted their supplies by the middle of July, 1915, under existing conditions.

The majority of such consumers appear to have begun promptly to make preparations for the inevitable changes following a cessation in the customary supply of colors. These changes are manifold in their nature. They involve alterations and modifications in styles and color schemes, the utilization of dyeing materials requiring unfamiliar methods of application and a more or less serious

dislocation and readjustment of all phases of manufacture dependent upon the element of color.

Careful attention has been given to the supplies of aniline dyes that the few American manufacturers of such products are able to place upon the market in the immediate future. In most cases the technical staff is earnestly studying the problems connected with a temporary use of natural dyestuffs.

#### ACTIVITY OF AMERICAN MANUFACTURERS.

In all this period of uncertainty and anxiety, when vast business interests are threatened at a vital point, there is something decidedly cheering in the enterprise and intelligence being brought to bear to solve the difficult problem in a genuinely national way.

With each added week since the shipment of German dyes has been placed under embargo, and each successive indication that a lengthy period must probably elapse before the customary machinery of supply can again be set in motion, there has been a steady growth in the feeling throughout wide circles that the time is ripe for our American coal-tar chemical industry to expand from its present very modest proportions to a position where it can become the dominant factor in meeting the needs of sister industries.

This conviction is finding practical expression in a variety of directions. A review of what is being done shows clearly that not only is every effort being made to meet the urgent demands of a critical situation, but that the foundations are being laid for the more permanent evolution, along natural and healthful lines, of a distinctly American color industry, using American raw material and meeting the bulk of American needs.

The three phases of the complete industry are the production of coal-tar "crudes," of "intermediates" or semi-manufactured compounds, and finished dyes. Along all three lines pronounced progress has been made during the last few months.

#### MANUFACTURE OF COAL-TAR CRUDES.

The erection of adequate recovery plants in connection with coke works is making rapid progress. In addition to a list of such plants given in Commerce Reports for April 20, 1915, mention may be made of the new Laclede Coke Works at St. Louis, built at an expense of \$2,000,000. Active operations begin June 1. The daily consumption of coal is 1,000 tons. Ample provision is made for the collection of by-products. The large Zenith Coke Works at Duluth have recently completed the installation of a benzol-recovery plant. Within a few weeks the daily output of benzol from American coke works will exceed fifty tons. Inquiries made at the Bureau of Foreign and Domestic Commerce regarding constructors of by-product recovery apparatus show that there is a widespread interest in stopping the current wastage of a valuable by-product and in insuring an increased supply of raw material for the use of dyestuff manufacturers.

Under ordinary circumstances this rapid development in the output of benzol, naphthalene and the other important crudes would have meant an oversupply. As it is, the demand for benzol and for toluol in the manufacture of high explosives, chiefly in the forms of picric acid and of trinitrotoluol, has become so

pressing that the current prices for the two hydrocarbons, when not covered by contract, are at least quadruple those prevailing a year ago.

This circumstance hampers to some extent the efforts of those engaged in the manufacture of intermediates. The price of naphthalene, also, has rapidly risen during the last few months. Before the war two-thirds of our current consumption was imported from Great Britain and Germany. It is probable that with the steady expansion of by-product recovery plants in the coke industry and the enlargement of the facilities in the work for separating and purifying the various crudes, prices will now begin to fall, at least for benzol and naphthalene.

#### PRODUCTION OF INTERMEDIATES.

The manufacture of intermediates is actually the most difficult part of the whole problem connected with the dyestuff industry. The production of finished dyes from the various intermediates is in most cases relatively much simpler than the transformation of crudes into intermediates. Hitherto American makers of artificial dyestuffs have depended almost exclusively upon intermediates of German origin. Since the outbreak of the war in Europe it has become clearly evident that the manufacture of the leading intermediates on a generous scale is necessary to the continued activity of American dyestuff plants and the evolution of an independent, self-contained industry.

#### ANILINE OIL.

The most important intermediate is aniline. The equipment of a large plant for the manufacture of this product by the Benzol Products Company has been the most important factor in the situation. The output of the works at Frankford and Marcus Hook, in Pennsylvania, is now sufficient to meet the needs of American dyestuff makers. The Edison Company has likewise established a large plant for the production of aniline at Orange, N. J. It is in active operation and will be enlarged.

The E. I. du Pont de Nemours Powder Company of Wilmington, Del., has acquired the large works of the Bayway Distilling Company at Elizabeth, N. J., used for rectifying and preparing pure benzol and toluol, and has arranged for manufacturing aniline from such benzol as may not be required in the production of high explosives.

At Elizabeth, also the Midvale Chemical Works of St. Louis is erecting a large plant destined for the manufacture of aniline and other intermediates, and ultimately of finished dyestuffs. The plans are extensive and include separate buildings for each product.

It is plain that very ample provision is being made for the production of aniline on a large scale. There will be an adequate supply for manufacturers who are engaged in the preparation of more complex intermediates derived from aniline—dimethyl-aniline, etc.—and of the aniline dyes made from them. There will also probably be a large amount of aniline salt available to use in dyeing aniline black.

#### NATURE OF CONTRACTS FOR INTERMEDIATES.

The output of these aniline works is largely contracted for ahead. A typical contract runs for three years, beginning with July 1, 1915. The buyer fixes in the month of May, preceding each year, the amount of aniline required monthly,

during the twelve months commencing July 1. This amount may be increased or diminished in any month by the buyer to the extent of 5 percent. He may not increase his monthly average for an ensuing year by more than 10 percent except at the option of the seller. Subject to these conditions the buyer purchases from the seller all aniline oil to be used by him during the three years. The price may vary between 10.93 cents and 25 cents per pound during 1915 and between 10.93 and 15 cents after January 1, 1916. It is to be regulated "by the fair, average market price in the United States, as the same may be determined by competitive offerings and sale." The contract "embodies the terms of a co-operative effort, which it is intended will lead to the establishing in the United States of a coal-tar chemical industry. It is entered into by the buyer with the intent of furnishing the seller with a firm outlet, at a fair price, for a large portion of his production during the currency hereof, and with a view of encouraging the seller to embark and continue in the manufacture of aniline oil and other derivatives of crude benzol on a large and permanent scale; and in order that the buyer may derive the benefits consequent upon securing at a fair price an ample, adequate and permanently regular supply of prime aniline oil of domestic manufacture on a preferential basis."

A contract of this nature appears to be regarded as well adapted to meet the exigencies of the situation and has been readily accepted by users of aniline. It relieves dyestuff manufacturers from the responsibility of providing their most important intermediate, and leaves them free to concentrate their efforts upon products of a more complex nature, involving a higher grade of technical skill and operations of a more difficult character. At the same time the American aniline industry has three years' leeway to establish itself so firmly that it may easily resist all foreign competition of a legitimate character.

Aniline was sold in American markets at 10 cents per pound a year ago. Evidently a minimum of about 11 cents is regarded as the lowest price at which it can be produced in this country at a fair profit.

#### OTHER INTERMEDIATES.

The American manufacturers of coal-tar dyes have taken up seriously the production of those intermediates needed to make the more important colors which they have hitherto furnished to the American trade.

The Schoellkopf, Hartford & Hanna Company, at Buffalo, the oldest and largest of the American establishments, started last autumn extensive preparations in this field. It has now seven complete plants for the preparation of various intermediates. The attempt has not been made to produce at once all of the numerous intermediates that were formerly imported from Germany. A sufficient variety, however, is now in regular process of manufacture to enable the company to produce regularly such colors as formed the bulk of its output before the war.

This policy is evidently dictated by the circumstances, which plainly require in the interests of American consumers that there should be a maximum output in the shortest time possible of a small group of recognized staple colors.

Essentially the same policy has guided the activity of the smaller plants. The W. Beckers' Aniline and Chemical Company, at Brooklyn, is erecting twenty-

three buildings in its new plant. Of these seven are completed and manufacturing operations have already been started. The firm will make all of the fourteen intermediates required in the production of the group of dyes that it carried on successfully before the war.

The same is also true of Heller & Merz and of the Central Dyestuff Company, of Newark, N. J. Each of these two firms is erecting commodious new buildings and starting the manufacture of the intermediates formerly imported from abroad.

In addition two new companies have been organized for the manufacture of coal-tar products, the American Synthetic Color Company, at Stamford, Conn., and the Standard Aniline Company, at Wappingers Falls, N. Y. Both have well-equipped plants and have already begun the manufacture of intermediates, delaying for the time being any attempt to turn out finished dyes.

The more important intermediates hitherto imported from Germany and now being manufactured regularly in the United States are: Aniline oil and salts, A and B naphthols, para nitraniline, dinitrobenzol, dinitrotoluol, toluidine, nitro-toluidines, toluylenediamine, A and B naphthylamines, phenylenediamine, phthalic acid, acetyl-salicylic acid, salicylic acid.

The names of the intermediates are arranged in the order of the extent to which they have been imported, aniline leading the list.

It is also of interest to know that one manufacturer has found it feasible to make a very satisfactory grade of dinitrochlor-benzol, the all-important intermediate for the production of fast sulphur black, a dye now used in vast amounts in this country, especially for hosiery.

#### OUTPUT OF FINISHED COAL-TAR DYES.

Of prime importance to the numerous categories of consumers of dyestuffs is the question, How far will American color works be able to meet the deluge of demands as the date approaches when the supply of German-made dyes will be entirely exhausted?

There is no question but that from now on each day will see an increased output of American-made coal tar colors.

The large works at Buffalo are now running night and day, busying six hundred operatives. The volume of the output is already double what it was before the war. Manufacture is concentrated upon a few staple dyes, chiefly in demand, the lack of which would be felt most severely by the great textile interests. This firm has brought out a direct black capable of replacing satisfactorily, as far as quality is concerned, both aniline black and sulphur black. It is felt that the use of this dye, along with the rapidly increasing output of aniline available for aniline black, will go far to lessen the hardships attendant upon a complete disappearance of German-made sulphur blacks from the market.

The smaller companies at Newark are straining every nerve to bring their output up to the normal amount manufactured regularly before the war, and hope soon to advance far beyond those figures.

It will probably require more than two months for the Brooklyn plant to attain the volume of output customary before the war and before the disastrous ex-



plosion and fire of last autumn. There is every indication that these works will rapidly expand and become an important factor in the situation.

E. C. Klipstein, of 644 Greenwich street, New York City, is meeting with success in establishing the manufacture of the oldest sulphur color, Cachou de Laval, a fast brown susceptible of many applications, and is extending operations to other sulphur colors.

The American branch of the famous Bayer Company, one of the leading German dyestuff firms, is located at Rensselaer, N. Y. It has been practically closed for some months, but will resume active operations on July 1. Prior to the war the firm manufactured nigrosines, alkali blue and a few other colors especially in favor in the American market. The intermediates required were imported from Germany. The company now plans to resume the manufacture of the same colors, making also the needed intermediates from American crudes. The firm will employ 350 operatives, a part of whom, however, will be occupied in the manufacture of coal-tar pharmaceutical specialties owned by the Bayer Company—*aspirin*, *phenacetin*, etc.

#### THE USE OF NATURAL DYESTUFFS.

The combined efforts of these works will unquestionably do much to mitigate the difficulties inevitable upon a cessation of a supply of German dyes. Still, at the best, they can replace for the next few months, or even for a year, only a relatively small quantity of the lacking colors.

This fact has been quickly recognized by large consumers of dyestuffs and by the group of firms devoted to the production of dyewood extracts. The latter are making ample preparations for meeting heavy demands during the coming months. The four establishments extracting American quercitron are in a position to expand their output rapidly. The supply of *cutch* seems to be fairly adequate. Largely increased amounts of *logwood*, *fustic* and *Brazil wood* have been ordered from the West Indies and southern countries. Some difficulty is encountered in obtaining sufficient freight accommodation. Prices have risen on account of higher freights, lack of practiced woodchoppers, the temporary interruption in the export of *logwood* from Mexico and the enormously increased demand for dyewoods from Great Britain to meet the dyestuff famine now threatening British textile interests.

The demand for natural dyestuffs by American mills has already set in. One large dyewood establishment has increased its sales by 25 percent during the last few months. Another reports that the current orders for *logwood extract* are 50 percent greater than during last autumn, orders for *quercitron*, *fustic* and *cutch* have tripled, and those for *hypernic* (*brazilwood*, etc.) have doubled.