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Tariff Information Series—No. 32

Census of Dyes
and other
Synthetic Organic Chemicals
1923



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INTRODUCTION

This report is a survey of the domestic dye and synthetic organic chemical industry in 1923. It presents the results of a special investigation made by the United States Tariff Commission as to the production in the United States of coal-tar dyes and synthetic organic chemicals, both of coal-tar and of noncoal-tar origin. It includes a detailed census of dye imports and official pre and post war statistics for the imports and exports of coal-tar dyes by the large consuming and producing nations of the world.

The survey is divided into six parts, as shown in Table of Contents (pp. iii to vi).

In the preparation of this report the Tariff Commission had the services of Warren N. Watson, Frank Talbot, and C. R. De Long, of the chemical division of the commission's staff, and of others.

PART I

SUMMARY OF THE CENSUS OF DYES AND OTHER
SYNTHETIC ORGANIC CHEMICALS, 1923

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PART I

SUMMARY OF THE CENSUS OF DYES AND OTHER SYNTHETIC ORGANIC CHEMICALS, 1923

INTRODUCTORY

The United States Tariff Commission has reported annually, beginning with 1917, the progress of the American dye and coal-tar chemical industry. Since 1919, the production figures on dyes and other coal-tar chemicals have been supplemented by a detailed census of dye imports. Since 1921 the annual census of the industry has included a census of synthetic organic chemicals other than those derived from coal tar. A discussion of the international dye trade is also included, developments in the foreign dye-producing countries are considered, and information is given on the production of dyes in France, Italy, and Japan. Official statistics as to exports and imports of the more important dye-consuming and producing countries of the world in post-war years are compared with those of pre-war years. A new feature of the present report is the account of the deliveries and the percentage distribution of reparation dyes, together with the agreements and protocols concerning the German deliveries of both dyes and pharmaceuticals to the allied and associated Governments.

Other reports prepared by the Tariff Commission relating to conditions in the dye industry include (1) Costs of Production in the Dye Industry, 1918 and 1919, and (2) Dyes and Other Coal-Tar Chemicals, December 12, 1918.

The general grouping of coal-tar chemicals adopted in the present report follows that of the tariff act of 1922, which conforms in general, although not in every detail, with common practice. Crudes, paragraph 1549, free, are contained in and separated from crude coal tar; intermediates, dutiable under paragraph 27 at 55 per cent and 7 cents per pound, are produced from the crudes by chemical processes; with some exceptions, they are used only for the manufacture of dyes and other finished products by further chemical treatment; dyes and other finished products are dutiable under paragraph 28 at 60 per cent and 7 cents per pound. The term "other finished products" includes color lakes, photographic chemicals, medicinals, flavors, perfume materials, synthetic resins, and synthetic tanning materials. Explosives, derived from coal-tar materials, although dutiable under paragraph 28, are not included in this census. A summary of the production of coal-tar products in 1923 according to the classes given above, is contained in Table 1. The figures of production of dyes and coal-tar chemicals in the United States are compiled from the returns of 206 companies, and are believed to form a complete record of the manufacture of such products in that year. In presenting the figures the quantity and value of each product are given in as great detail as is possible without revealing the operations of individual manufacturers.

SUMMARY OF DOMESTIC PRODUCTION, 1923

CRUDES

A new record for the output of by-product coke was established in 1923, when the total production was 37,604,743 tons, an increase of 6,770,792 tons over the 1920 output, hitherto the maximum. The total production of coke in 1923 was 55,565,000 tons; of this quantity 67.7 per cent was from by-product ovens and 32.3 per cent from beehive ovens. In 1913 only 27.5 per cent of this country's coke was produced by the by-product ovens and 72.5 per cent by the beehive. The increase in the production of by-product coke has resulted in (1) an increased yield of valuable by-products, including ammonium compounds, for fertilizer and other uses, (2) the supply of gas used for industrial heating and municipal lighting, and (3) a delivery of coal tar far in excess of the needs of the domestic coal-tar chemical industry. The tar is converted by distillation into crudes, which serve as the basic materials for the domestic coal-tar chemical industry. The production of tar in 1923 established a record, reaching 440,000,000 gallons, about one-half of which was used as fuel. Only a part of the remainder was distilled into refined products, owing to the large demand for such partly refined products as motor fuel, solvents, and pitches. In general, there was an increased output of crudes during 1923, conspicuous among them being "motor benzol" and naphthalene. For the first time, the total domestic production of crudes from all sources has been combined, as shown in Table 6. The Geological Survey collects information on by-products obtained from coke-oven operations, the data being in Table 5. The United States Tariff Commission collects data as to the output of crudes by firms primarily engaged in tar distillation, and the results are summarized in Table 7.

INTERMEDIATES

The total production of intermediates by 103 firms in 1923 was 231,393,871 pounds compared with 165,048,155 pounds for 1922. The sales during 1923 totaled 83,582,808 pounds, valued at \$18,916,058. The average sales price of intermediates in 1923 was \$0.226 as compared with \$0.22 for 1922 and \$0.33 in 1917. Although the average price of intermediates changed but slightly during 1922 and 1923, it should be borne in mind that in 1923 there was an increased output of the more costly products, tending to increase the average price of intermediates. The average sales price of aniline, the most important of all intermediates, was \$0.16 for 1923 as compared with \$0.15 for 1922. The sales price of H acid decreased from \$0.73 in 1922 to \$0.68 in 1923, b-naphthol (tech) receded from \$0.24 to \$0.22, and anthraquinone, required for the manufacture of alizarin, alizarin dyes and vat dyes (anthraquinone derivatives) fell from \$1.34 to \$0.95 per pound. The total number of intermediates reported during 1923 was 311, of which over 80 were not reported during the previous year. Many of these additions to the country's manufacturing program are essential materials for the manufacture of the faster types of dyes and are also used in the production of other important coal-tar derivatives. The manufacture of these in the United States constitutes a noteworthy advance in the domestic industry. Coal-tar intermediates are required not only for the manu-

facture of dyes but also in the production of explosives, medicinals, flavors, perfume materials, photographic chemicals, synthetic resins, synthetic tanning materials and accelerators for the vulcanization of rubber.

DYES

Record production during 1923.—The domestic output of coal-tar dyes in 1923 by 88 firms was 93,667,524 pounds, compared with 64,632,187 pounds in 1922. The sales for the year 1923 totaled 86,567,446 pounds, valued at \$47,223,161. The present dye industry is largely a development of the war and post-war period. The pre-war production in 1914 of seven firms was 6,619,729 pounds, valued at \$2,470,096. Production in that year was dependent upon foreign countries, as most of the intermediates were imported, chiefly from Germany. Among the more important factors responsible for the large output of dyes during 1923 may be mentioned (1) the activity of the domestic textile and dye-consuming industries, (2) the occupation of the Ruhr, which caused a reduction in the output of the German dye factories and consequently enabled domestic producers to increase their exports of indigo, sulphur black, and certain other dyes, principally to the markets of the Far East, (3) the relatively high foreign price level of dyes as compared with those of the pre-war period, and (4) the effect of the tariff act of 1922.

Further reduction in prices.—The average selling price of all dyes in 1923 was 10 per cent below that of 1922. The average sales price for 1923 was \$0.545 per pound, compared with \$0.60 in 1922, \$0.83 in 1921, and \$1.26 in 1917, the first year for which a census of dyes of coal-tar chemicals was compiled by the Tariff Commission.

Continued advancement in the production of new dyes.—During 1923 nearly 100 new dyes were produced for which no production had been shown in 1922. In addition, other colors, heretofore reported in small quantities, were manufactured on a substantial commercial scale. These comprise for the most part special dyes of greater complexity, and more difficult and costly to manufacture. In most cases they do not individually represent a large tonnage. Their production, however, affords a better balance to the country's manufacturing program and reduces the number of dyes previously imported for special uses. The additions include colors for use on silk, cotton, wool, color lakes and for other purposes, and are representative of the different classes of dyes by chemical classification. Their production has, in many cases, already been reflected in a decline in the corresponding imports. The domestic industry, although to some extent deficient in the production of certain vat dyes and other colors, supplies over 95 per cent of the domestic requirements.

Relation of production to consumption.—Imports of dyes in 1923 were 3.3 per cent of the total production by quantity and 6.2 per cent by value. They were, by quantity, 3.9 per cent of the apparent consumption, assuming this to equal production plus imports minus exports. Dyes produced in the United States accordingly supplied about 96 per cent of the apparent consumption of coal-tar dyes and there was, in addition, an exportable surplus of certain coal-tar dyes amounting to about 18,000,000 pounds.

Production of dyes by classes.—The output of dyes in 1923, grouped by classes according to the method of application, was as follows:

Acid dyes, 12,498,817 pounds, or 13.34 per cent of the total output; basic dyes, 4,157,373 pounds, or 4.44 per cent; direct cotton dyes, 16,858,387 pounds, or 18 per cent; mordant and chrome dyes, 4,078,504 pounds, or 4.35 per cent; sulphur dyes, 21,558,469 pounds, or 23.02 per cent; vat dyes, including indigo, 30,113,642 pounds, or 32.15 per cent; indigo, 28,347,259 pounds, or 30.26 per cent; other vat dyes, 1,766,383 pounds, or 1.89 per cent; lake and spirit-soluble dyes, 1,171,854 pounds, or 1.25 per cent; unclassified and specialty dyes, 3,230,478 pounds, or 3.45 per cent of the total.

Imports of dyes decline.—The total imports of coal-tar dyes for 1923 were 3,098,193 pounds, valued at \$3,151,363, compared with 3,982,631 pounds, valued at \$5,243,257, for the year 1922. Total imports during 1913, prior to the extensive development of the domestic dye industry, were 45,950,895 pounds. Of the total imports during the year 1923, 47 per cent came from Germany, 28 per cent from Switzerland, 12 per cent from Italy, 6 per cent from France, 4 per cent from England, and 3 per cent from all other countries. Dye imports in 1923, classified by method of application, were as follows: Acid dyes, 544,048 pounds; vat dyes, 1,207,554 pounds; mordant and chrome dyes, 453,415 pounds; direct dyes, 527,014 pounds; sulphur dyes, 114,023 pounds; basic dyes, 210,896 pounds; spirit-soluble and color lake dyes, 23,213 pounds; and unidentified, unclassified and special dyes 18,030 pounds. The Swiss dye manufacturers have a much larger share of the domestic import trade—28 per cent in 1923, 39 per cent in 1922, and about 20 per cent in 1914—than the size of the Swiss industry, compared with that of Germany, would imply. The Ruhr occupation undoubtedly favored Swiss dye exports. Swiss dyes are for the most part of the higher-cost specialty type, to which most of the dyes imported into this country belong. Dyes shipped from Italy appear to be of German manufacture and are doubtless dyes delivered to Italy by Germany in reparation payment and later sold to the United States. Italy received up to December 31, 1923, 6,274,601 kilos (13,832,985 pounds) out of a total delivery by Germany in reparation payment of 25,583,390 kilos (56,401,142 pounds) of coal-tar dyes.

Exports of dyes increase.—The exports of coal-tar dyes during 1923 totaled 17,924,200 pounds, with a value of \$5,565,267, compared with a total of 8,344,187 pounds, with a value of \$3,996,443, during 1922. This increase in the domestic exports of coal-tar dyes may be largely accounted for by the effect of the occupation of the Ruhr by the French, which resulted in a decreased production of dyes in the German factories and consequently gave domestic manufacturers an opportunity to increase their exports to Far Eastern markets.

OTHER FINISHED COAL-TAR PRODUCTS

Color lakes.—The total output of this class of pigments in 1923 was 13,079,115 pounds, compared with 10,578,664 pounds in 1922. The total sales of color lakes in 1923 amounted to 12,627,359 pounds, valued at \$5,124,732.

Photographic chemicals.—The 1923 production of coal-tar chemicals used as photographic developers totaled 343,289 pounds, compared with 345,798 pounds in 1922. Sales in 1923 amounted to 321,083 pounds, valued at \$443,697.

Medicinals.—This class of coal-tar products may be considered as essential to the national welfare. The highest technical skill and the most exhaustive research are required in the development and commercial production of these chemicals. The total production in 1923 was 3,273,085 pounds, and sales amounted to 2,995,448 pounds, valued at \$4,720,253. The 1922 production amounted to 2,946,347 pounds, with sales of 3,092,915 pounds, valued at \$4,233,443.

Perfumes and flavors.—These coal-tar products are closely related, certain members of the class being used both as flavors and as perfumes. The total output of flavors in 1923 was 1,458,024 pounds, compared with 1,215,668 pounds in 1922. Sales amounted to 1,442,387 pounds, valued at \$1,780,313. The production of perfumes in 1923 was 1,365,449 pounds, compared with 793,148 pounds in 1922. Sales in 1923 amounted to 1,275,432 pounds, valued at \$789,431.

Synthetic phenolic resins.—These products are used as substitutes for amber in making pipe stems and a great variety of other articles, also for electrical insulators, varnishes, and lacquers. The 1922 production was 5,944,133 pounds; the figures for 1923 can not be published without revealing the output of individual companies.

Synthetic tanning materials.—The output of these products amounted to 1,910,519 pounds in 1922, but here, again, the 1923 production figures can not be published without revealing the output of individual companies.

The total output of synthetic phenolic resins and synthetic tanning materials in 1923 was 9,763,685 pounds. Each of these classes of coal-tar products shows an increase in production for the past year. The total sales of synthetic phenolic resins and synthetic tanning materials for 1923 was 10,068,431 pounds, valued at \$5,816,590.

STATISTICS OF PRODUCTION

TABLE 1.—Summary of the production of dyes and coal-tar chemicals, 1918-1923

	1918			1919		
	Number of manufacturers	Production		Number of manufacturers	Production	
		Pounds	Value		Pounds	Value
Group II—Intermediates	128	357,662,251	\$124,382,892	116	177,362,426	\$63,210,079
Group III—Finished products		76,802,959	83,815,746	155	82,532,390	84,585,544
Dyes	78	58,464,446	62,026,390	90	63,402,194	67,598,855
Color lakes	29	9,590,537	5,020,023	34	7,569,921	4,179,964
Photographic chemicals	6	316,749	823,915	10	335,509	1,059,340
Medicinals	31	3,623,352	7,792,984	31	6,777,988	7,883,071
Flavors	7	458,256	4,925,627	9	610,825	1,318,654
Perfumes	6	116,263	584,695	6	41,419	164,302
Tanning materials	1			1		
Synthetic phenolic resins	5	4,233,356	2,642,120	5	3,794,534	2,381,358

TABLE 1.—Summary of the production of dyes and coal-tar chemicals, 1918–1923—Continued

	1920			1921			
	Number of manufacturers	Production		Number of manufacturers	Production	Sales	
		Pounds	Value		Pounds	Pounds	Value
Group II—Intermediates.....	119	257,726,911	\$95,291,686	108	70,899,912	33,637,326	\$8,483,463
Group III—Finished products.....	161	112,942,227	112,731,547	147	51,457,565	60,434,009	47,996,514
Dyes.....	82	88,263,776	95,613,749	74	39,008,690	47,513,762	39,283,956
Color lakes.....	43	10,983,538	5,871,820	43	6,152,187	6,424,612	2,863,189
Photographic chemicals.....	8	440,759	1,015,848	5	183,798	170,221	248,041
Medicinals.....	35	5,184,989	5,726,776	34	1,545,917	1,876,246	2,930,324
Flavors.....	15	166,884	527,493	17	901,245	933,662	1,002,018
Perfumes.....	12	39,740	332,008	15	119,335	119,691	175,815
Tanning materials.....	4	3,142,861	233,674	4	1,902,597	1,721,359	141,005
Synthetic phenolic resins.....	4	4,659,680	3,410,179	3	1,643,796	1,674,456	1,352,166

	1922			
	Number of manufacturers	Production	Sales	
		Pounds	Pounds	Value
Group II—Intermediates.....	106	165,048,155	58,004,435	\$12,910,486
Group III—Finished products.....	164	88,368,131	93,370,065	57,067,326
Dyes.....	87	64,632,187	69,107,105	41,463,790
Color lakes.....	43	10,578,664	10,366,676	4,551,572
Photographic chemicals.....	7	345,798	347,647	483,269
Medicinals.....	35	2,946,347	3,092,915	4,233,443
Flavors.....	20	1,215,668	1,278,857	1,260,588
Perfumes.....	17	793,148	778,696	643,436
Tanning materials.....	4	1,910,519	1,981,588	103,598
Synthetic phenolic resins.....	5	5,944,133	6,415,931	4,315,196
Research chemicals.....	4	1,667	650	12,434

	1923			
	Number of manufacturers	Production	Sales	
		Pounds	Pounds	Value
Group II—Intermediates.....	103	231,393,871	83,582,808	\$18,916,058
Group III—Finished products.....	164	122,950,171	115,297,586	65,898,177
Dyes.....	88	93,667,524	86,567,446	47,223,161
Color lakes.....	43	13,079,115	12,627,359	5,124,732
Photographic chemicals.....	5	343,289	321,083	443,697
Medicinals.....	32	3,273,085	2,995,448	4,720,253
Flavors.....	16	1,458,024	1,442,387	1,780,313
Perfumes.....	20	1,365,449	1,275,432	789,431
Tanning materials.....	3	9,763,685	10,068,431	5,816,590
Synthetic phenolic resins.....	2			

SYNTHETIC ORGANIC CHEMICALS NOT DERIVED FROM COAL TAR

The Tariff Commission in 1921 compiled for the first time a census of organic chemicals other than those derived from coal tar or directly from natural sources. These included acids, alcohols, esters, ketones, aldehydes, derivatives of alkaloids, carbocyclic compounds, etc., used as perfume and flavoring ingredients, solvents, medicinals, also in industrial and other processes.

The development in the production of organic chemicals of non-coal-tar origin has been comparatively unnoticed during past years, because of the greater interest in the progress made in coal-tar chemicals. The rapid development in the past few years in these non-coal-tar organic chemicals indicates the probability of further expansion in this field, with the result that new products of great economic value will continue to be placed on the market by domestic manufacturers.

The production in 1923 of synthetic organic chemicals other than those derived from coal tar was 90,597,712 pounds, with sales amounting to 67,727,067 pounds, valued at \$13,875,521. Production in 1922 totaled 79,202,155 pounds.

Part IV of this report contains a detailed census of this group of organic chemicals, showing production and sales in so far as the publication of such figures does not disclose the output of individual manufacturers.

INTERNATIONAL DYE TRADE

Pre-war.—Prior to the war, Germany, with an output totaling three-fourths of all synthetic dyes produced, dominated the world's dye markets. Of the remaining one-fourth, one-half was made from German intermediates, and its production was accordingly dependent upon Germany. Switzerland, although without a domestic source of raw materials, ranked second, with about 7 per cent of the world's production. Great Britain produced about one-tenth of her requirements, and France produced in French-owned and operated plants from 10 to 15 per cent of her consumption. In order to meet the patent requirements of France and Great Britain, German manufacturers operated plants in those countries where the final assembling operations were completed. The small dye industry of the United States was almost entirely dependent upon intermediates from Germany.

Developments since 1914.—The acute shortage of dyes arising in the various dye-consuming markets, due to the disappearance of German dyes shortly after the beginning of the war, was soon followed by prices of unprecedented levels, while certain dyes were not to be had at any price. This dye famine threatened the activities of the vast textile industries as well as other industries dependent upon dyes for their operation. The manufacture of dyes was soon entered upon in the United States, Great Britain, France, and Italy, and each of these countries has developed a dye industry capable of supplying from 80 to over 90 per cent of its requirements and has, in addition, exported significant quantities of dyes since the war. As a result of this remarkable period of expansion and development, the world's present capacity to produce dyes is nearly double that of the pre-war period. The estimated annual capacity to produce dyes by the seven leading producers—Germany, United States, Great Britain, Switzerland, France, Japan, and Italy—is considerably in excess of 600,000,000 pounds. The maximum estimated or officially reported output of the seven leading dye producers is as follows: Germany (1913), 280,000,000 pounds; United States (1923), 94,000,000 pounds; Great Britain (1920), 43,000,000 pounds; Switzerland (1920), 24,000,000 pounds; France (1923), 24,000,000 pounds; Japan (1919), 16,000,000

pounds; and Italy (1922), 10,000,000 pounds. This existing capacity to produce over and above normal requirements is resulting in an era of severe competition in the world's markets, which may eliminate many of the plants now in operation. Owing to the position of supremacy held by the German industry prior to the war, the future position of Germany's industry in the world's trade is of peculiar interest. Her export trade has suffered severely as a result of developments during and since the war. In 1913 the German export of synthetic dyes amounted to about 240,000,000 pounds, with a value of about \$52,000,000, while in 1922 it amounted to about 114,000,000 pounds, with a value of about \$80,000,000. For the year 1923 exports from Germany totaled about 74,000,000 pounds, with a value of about \$17,000,000 (1913 basis) or \$42,000,000 (1923 basis).

Table 22, page 126, shows the imports of dyes into the chief consuming countries for the years 1913, 1921, 1922, and 1923; and Table 21, page 125, shows the exports of coal-tar dyes from the chief producing countries for the same years. These two tables indicate the remarkable readjustment in the international dye trade due to developments during and since the war.

On account of the commanding position in the welfare of the German nation held by the chemical industry, it is highly probable that Germany will make every effort to regain her lost export trade, amounting to about nine-tenths of her total trade. One of the first steps in this direction has been to form affiliations in the new producing countries. Thus, in Italy it is reported that one of the largest dye producers, the Bianchi Co., has a working agreement under whose terms the Germans are to supply technical assistance and in return for which Germany shares profits; exports of dyes by this firm are restricted to the Italian colonies. In France, the Compagnie Nationale is reported to have effected a similar arrangement with the German "Interessen Gemeinschaft,"¹ but the conditions arising from the occupation of the Ruhr by the French are reported to have affected the operation of this agreement. Negotiations have been conducted for some time between the British Dyestuffs Corporation and the I. G., although no final agreement had been made up to June, 1924.

In the establishment of branch plants in the new producing countries, the Swiss appear to have been much more successful to date than the Germans. Three large Swiss manufacturers now operate, either collectively or individually, plants in the United States, Great Britain, Italy, and France. It has been reported that the Swiss and the German dye makers have concluded a working agreement. The German industry has certain advantages over the industries of the new producing countries, including cumulative experience, unified organization for buying and selling, and lower manufacturing costs. The high post-war price levels of dyes exported from Germany would appear to indicate a strong probability of price reductions during the next few years. The commercial warfare which is likely to follow may involve the utilization of such methods as full-line forcing and dumping, such as were practiced by the German chemical industry prior to the war. The

¹ This body is universally known as "I. G.," and will be so referred to throughout the remainder of this report.

retention of a tariff and other protective measures by the new-producing countries will doubtless lead the German industry to form affiliations or to establish branch plants in those countries along the lines successfully followed by the Swiss manufacturers. In the case of tariff reductions in the new producing countries, it seems likely that Germany will attempt to recover these markets, and at the same time retain the domestic centralization of dye production. The war made clear the relationship of the coal-tar dye industry to the production of munitions, war gases, medicinals and other essential products, and demonstrated the desirability of home dye production as a means to prevent shortage in times of war. This will probably result in an effort by the large industrial nations to retain dye industries of sufficient size to meet peace requirements and to provide for war emergencies. Reduced production costs and constructive research will be vital factors in the maintenance of their competitive place in the world's trade.

The occupation of the Ruhr in 1923 resulted in a reduced production of dyes in Germany. The total output in 1923 was about 145,000,000 pounds, as compared with 193,000,000 pounds in 1922. This stimulated the export trade of the United States and Great Britain to meet the requirements of China, India, and other consuming nations, nonmanufacturers of dyes. The effects of the occupation had largely disappeared in the early part of 1924 and German dyes were again offered in sharp competition in the markets of the Far East. In the spring of 1923 the French and Belgian authorities seized about 6,500 tons of dyes, a large part consisting of indigo and alizarin red. The British Alizarin Co. purchased a large quantity of alizarin in order to prevent the demoralization of prices by the dumping of this dye on the market, and nearly 1,500,000 pounds of alizarin were imported into the United Kingdom in January, 1924.

PART II

PRODUCTION OF DYES AND COAL-TAR
CHEMICALS, 1923

PART II

PRODUCTION OF DYES AND COAL-TAR CHEMICALS, 1923

COAL-TAR CRUDES

Record output of by-product coke.—The preliminary figures for the domestic production of coke in 1923, as reported by the United States Geological Survey, show a total of 55,565,000 tons, an amount almost equal to that of 1917 and only 1.6 per cent less than the record set in the war year 1918. A new record in the output of by-product coke was established in 1923, the year's output of 37,604,743 net tons being an increase of 6,770,792 tons over the 1920 output, hitherto the maximum.

Since November, 1918, when the production of coke from by-product ovens passed the production of beehive ovens, the by-product coke has been continuously in the lead. In 1923, 67.7 per cent of the total was contributed by by-product ovens and 32.3 per cent by beehive ovens. These figures are especially significant when it is remembered that the year was one of heavy consumption and favorable prices, conditions which should call forth maximum activity in the beehive industry under the present ratio of capacity to demand.

TABLE 2.—*Production of beehive and by-product coke in the United States, 1913–1923*

Year	Net tons produced			Per cent of total output	
	Beehive	By-product	Total	Beehive	By-product
1913.....	33, 584, 830	12, 714, 700	46, 299, 530	72. 5	27. 5
1915.....	27, 508, 255	14, 072, 895	41, 581, 150	66. 2	33. 8
1917.....	33, 167, 548	22, 439, 280	55, 606, 828	59. 6	40. 4
1918.....	30, 480, 792	25, 997, 580	56, 478, 372	54. 0	46. 0
1919.....	19, 042, 936	25, 137, 621	44, 180, 557	43. 1	56. 9
1920.....	20, 511, 092	30, 833, 951	51, 345, 043	40. 0	60. 0
1921.....	5, 538, 042	19, 749, 580	25, 287, 622	21. 9	78. 1
1922.....	8, 573, 467	28, 550, 545	37, 124, 012	23. 1	76. 9
1923.....	17, 960, 000	37, 604, 743	55, 565, 000	32. 3	67. 7

The recovery in coke production was associated with great activity in the iron industry and with a shortage of household fuel. As stated in the census of 1921, the replacement of beehive ovens by the by-product variety, which recovers the tar, ammonia, and gas products entirely wasted by the old beehive type, is for the following reasons of great economic significance in the conservation of national resources: (1) The by-product ovens increase production of ammonium compounds for fertilizer and other uses; (2) the gas produced in these ovens is used for municipal lighting and industrial heating; and (3) the output of tar insures an abundant supply of coal tar for the preparation of crudes serving as a basis of the domestic coal-tar dye and chemical industry.

Production of tars.—The output of coal tar in 1923 was about 440,000,000 gallons, compared with 328,000,000 gallons in 1922. According to the preliminary figures sales of coal tar during 1923 were about 211,000,000 gallons, valued at \$9,200,000. The domestic supply of tar is far in excess of the requirements of the domestic coal-tar chemical industry. Of the total production during 1923, 48 per cent was sold and 52 per cent consumed, largely as boiler fuel, in metallurgical plants. This indicates that about one-half of the total production of tar is used as a fuel. That a similar condition existed in 1921 and 1922, is indicated by the production and disposition of coke-oven tar in the United States during the years 1918–1923, as given in Table 4.

In times of fuel shortage the value of tar as fuel increases; in any case, the tar distiller must pay somewhat more than the fuel value of the tar. Of the total tar sold by the coke-oven operators only part is distilled into refined benzene, toluene, naphthalene, and anthracene; this is accounted for by the demand for such partly refined products as motor fuel, solvents, and soft pitches.

TABLE 3.—*Production and sales of coke-oven, coal-gas, water-gas, and oil-gas tar in the United States, 1918–1923*

[Compiled by the United States Geological Survey from reports of producers. The difference between production and sales is accounted for by tar used by the producer, and by changes in stock]

	Coke-oven tar	Coal-gas tar	Total coal tar	Water and oil-gas tar
Production (gallons):				
1918.....	263,299,470	52,694,826	315,994,296	100,985,156
1919.....	288,901,739	(¹)	340,900,000	(²)
1920.....	360,664,124	51,264,956	411,929,080	116,073,907
1921.....	253,051,649	(¹)	303,000,000	(²)
1922.....	327,779,734	48,082,228	375,861,962	104,555,028
1923 ³	440,389,905	(¹)	488,389,905	(²)
Sales (gallons):				
1918.....	200,233,002	47,727,839	247,960,841	55,283,484
1919.....	217,707,157	(¹)	264,900,000	(²)
1920.....	174,363,696	46,604,133	220,967,829	59,238,730
1921.....	135,293,047	(¹)	179,200,000	(²)
1922.....	162,204,417	41,266,074	203,470,491	47,338,489
1923 ³	210,746,216	(¹)	251,946,216	(²)
Value of sales:				
1918.....	\$6,364,972	\$1,863,580	\$8,228,552	\$1,805,865
1919.....	6,918,549	(¹)	8,800,000	(²)
1920.....	6,378,040	2,010,186	8,388,226	2,109,388
1921.....	5,645,309	(¹)	7,760,000	(²)
1922.....	6,419,743	1,955,950	8,375,693	1,879,490
1923 ³	9,225,925	(¹)	11,203,925	(²)

¹ No report. Estimate included in total.

² No report.

³ Preliminary figures, subject to revision.

TABLE 4.—*Production and disposition of coke-oven tar in the United States, 1918–1923*

[Compiled by United States Geological Survey from reports of operators]

Year	Coke-oven tar		
	Gallons produced	Per cent sold ¹	Per cent used ¹
1918.....	263,299,470	76.0	24.0
1919.....	288,901,739	75.4	24.6
1920.....	360,664,124	48.3	51.7
1921.....	253,051,649	53.5	46.5
1922.....	327,779,734	49.5	50.5
1923 ²	440,389,905	47.9	52.1

¹ No account is here taken of changes in stocks.

² Preliminary figures, subject to revision.

Total commercial production of crudes.—The data on domestic production of crudes are collected either by the Tariff Commission or by the Geological Survey, according to the producer. Crudes distilled from tar at the by-product coke-oven plants are reported to the Geological Survey and the output by firms primarily engaged in the distillation of tar is reported to the Tariff Commission. For the first time, the total commercial production of benzene, "motor benzol," toluene, solvent naphtha, and naphthalene from all sources has been combined into a single compilation. This covers the period 1918–1923 and the production data shown in Table 6. An examination of this table shows that there was, in general, an increase in the output of these items in 1923. The production of "motor benzol" and naphthalene recorded notable increases over the figures for 1922.

The production of by-products obtained from coke-oven operations for the years 1921–1923, together with quantity and value of the sales, is given in Table 5. The production of crudes by firms engaged primarily in the distillation of coal tar is shown in Table 7. Noteworthy increases in the 1923 production are shown for naphthalene, cresylic acid, dead oil, anthracene oil, and other distillates.

TABLE 5.—By-products obtained from coke-oven operations, 1921–1923

[United States Geological Survey]

Product	Production	Sales		
		Quantity	Value	
			Total	Average
1921				
Tar..... gallons.....	253, 051, 649	135, 293, 047	\$5, 645, 309	\$0. 042
Ammonia:				
Sulphate..... pounds.....	528, 638, 763	530, 041, 716	13, 100, 703	.025
Ammonia liquor (NH ₃ content)..... do.....	31, 899, 398	35, 102, 561	3, 515, 416	.100
Other forms (NH ₃ content)..... do.....	191, 162	53, 993	10, 135	.188
Sulphate equivalent of all forms..... do.....	(657, 001, 003)	(670, 667, 932)	16, 626, 254	-----
Gas:				
Used under boilers, etc..... M cubic feet.....	1 310, 188, 713	12, 122, 777	1, 120, 087	.092
Used in steel or affiliated plants..... do.....		98, 352, 049	10, 593, 204	.108
Distributed through city mains..... do.....		43, 826, 172	14, 249, 961	.325
	1 310, 188, 713	154, 300, 998	25, 963, 252	.168
Light oil and derivatives:				
Crude light oil..... gallons.....	2 76, 917, 269	2, 433, 078	240, 111	.099
Benzol—				
Crude..... do.....	1, 494, 329	1, 536, 312	343, 463	.224
Refined..... do.....	4, 912, 131	5, 302, 709	1, 268, 258	.239
Motor benzol..... do.....	48, 052, 882	50, 022, 573	8, 966, 686	.179
Toluol—				
Crude..... do.....	26, 529	26, 529	4, 410	.166
Refined..... do.....	942, 982	808, 964	228, 968	.283
Solvent naphtha..... do.....	3, 822, 776	2, 881, 656	510, 509	.177
Other miscellaneous products..... do.....	590, 173	291, 635	12, 310	.042
	59, 841, 802	63, 303, 456	11, 574, 715	.183
Naphthalene:				
Crude..... pounds.....	2, 827, 756	1, 652, 466	40, 659	.025
Refined..... do.....	115, 229	331, 057	18, 676	.056
	2, 942, 985	1, 983, 523	59, 335	.030
Other products.....			121, 813	-----
Value of all by-products sold.....			59, 990, 678	-----
1922				
Tar..... gallons.....	327, 779, 734	162, 204, 417	6, 419, 743	.0396
Ammonia:				
Sulphate..... pounds.....	695, 543, 349	714, 752, 882	17, 818, 236	.0249
Ammonia liquor (NH ₃ content)..... do.....	50, 036, 646	48, 523, 937	4, 559, 535	.0940
Other forms (NH ₃ content)..... do.....	693, 782	192, 549	12, 041	.0625
Sulphate equivalent of all forms..... do.....	898, 465, 061	909, 618, 826	22, 389, 812	-----

¹ Includes gas wasted and gas used for heating retorts.

² Of this amount 75,760,334 gallons were refined on the premises to make the derived products listed.

TABLE 5.—By-products obtained from coke-oven operations, 1921-1923—Contd.

Product	Production	Sales		
		Quantity	Value	
			Total	Average
1922				
Gas:				
Used under boilers, etc.....M cubic feet.....	} 442,671,114	} 19,123,814 144,976,030 56,930,253 10,352,921	\$1,251,325 15,942,446 20,326,648 1,104,096	\$.0654 .1100 .3570 .1066
Used in steel or affiliated plants.....do.....				
Distributed through city mains.....do.....				
Sold for industrial use.....do.....				
		231,383,018	38,624,515	.1669
Light oil and derivatives:				
Crude light oil.....gallons.....	4 101,437,555	5,138,095	630,768	.1228
Benzol—				
Crude.....do.....	2,666,177	2,665,889	698,437	.2620
Refined.....do.....	10,419,504	9,590,459	2,736,944	.2854
Motor benzol.....do.....	57,025,699	54,930,203	10,491,309	.1910
Toluol—				
Crude.....do.....	38,159	3,938	652	.1656
Refined.....do.....	1,955,119	1,906,122	556,363	.2919
Solvent naphtha.....do.....	2,983,858	2,861,482	538,512	.1882
Other light oil products.....do.....	580,058	212,712	14,949	.0703
	75,668,574	77,308,900	15,667,934	.2027
Naphthalene:				
Crude.....pounds.....	6,107,742	3,298,851	52,103	.0158
Refined.....do.....	1,810,972	1,589,084	79,149	.0498
	7,918,714	4,887,935	131,252	.0269
Other products.....			154,507	
Value of all by-products sold.....			83,387,763	
1923 ⁵				
Tar.....gallons.....	440,390,000	210,746,000	9,226,000	.044
Ammonia:				
Sulphate.....pounds.....	904,465,000	875,163,000	25,595,000	.029
Ammonia liquor ⁶ (NH ₃ content).....do.....	60,659,000	59,573,000	5,771,000	.097
			31,366,000	
Sulphate equivalent of all forms.....do.....	1,147,101,000	1,113,455,000		
Gas:				
Used under boilers, etc.....M cubic feet.....	} 7598,412,000	} 34,382,000 197,149,000 68,902,000 17,709,000	1,813,000 22,402,000 24,348,000 3,594,000	.053 .114 .353 .203
Used in steel or affiliated plants.....do.....				
Distributed through city mains.....do.....				
Sold for industrial use.....do.....				
		318,142,000	52,157,000	.164
Light oil and derivatives:				
Crude light oil.....gallons.....	135,166,000	8,990,000	941,000	.105
Benzol—				
Crude.....do.....	} 16,252,000	16,279,000	3,596,000	.221
Refined.....do.....				
Motor benzol.....do.....	77,418,000	77,453,000	12,533,000	.162
Toluol—				
Crude.....do.....	51,000	6,000	1,000	.167
Refined.....do.....	2,793,000	2,676,000	765,000	.286
Solvent naphtha.....do.....	4,413,000	3,727,000	641,000	.172
Other light oil products.....do.....	441,000	200,000	16,000	.080
	101,368,000	109,331,000	18,493,000	.169
Naphthalene:				
Crude.....pounds.....	11,541,000	9,698,000	206,000	.021
Refined.....do.....	1,180,000	1,238,000	68,000	.055
	12,721,000	10,936,000	274,000	.025
Other products.....			200,000	
Value of all by-products sold.....			111,716,000	

³ Includes gas wasted and gas used for heating retorts.⁴ 98,432,100 gallons, including 4,200,000 gallons of purchased oil, was refined on the premises to make the derived products listed.⁵ Preliminary figures, subject to revision.⁶ Includes a small amount of other forms of ammonia.⁷ Includes gas wasted and gas used for heating retorts.

TABLE 6.—Total commercial production of benzene, toluene, solvent naphtha, and naphthalene from all sources in the United States, 1918–1923

[Data for coke ovens and gas works from reports to United States Geological Survey; for tar refineries and others to United States Tariff Commission]

	By-product coke plants (sales) ¹	Gas works (sales) ¹	Tar refineries and all other establishments (production)	Total commercial production ²
Benzene (all grades except motor benzol):				
Gallons—				
1918	43,441,980	2,177,168	3,015,848	48,634,996
1919 ³	63,077,463	(⁴)	1,826,373	³ 65,403,836
1920	17,230,776	(⁴)	875,561	18,141,337
1921	6,839,021	(⁴)	2,171,631	9,045,642
1922	12,256,348	(⁴)	³ 774,940	13,071,288
1923	16,279,000	(⁴)	394,906	16,708,906
Value—				
1918	\$11,966,367	\$572,950	\$994,161	\$13,533,478
1919 ³	11,643,645	(⁴)	560,547	12,296,192
1920	4,497,823	(⁴)	287,586	4,794,409
1921	1,611,721	(⁴)	463,205	2,082,926
1922	3,435,381	(⁴)	³ 215,136	3,664,517
1923	3,596,000	(⁴)	118,505	3,725,505
Motor benzol:				
Gallons—				
1918	Included under benzene above		(⁶)	(⁶)
1919	Included under benzene above		(⁶)	(⁶)
1920	⁷ 55,764,265	467,126	(⁶)	(⁶)
1921	50,022,573	⁸ 350,000	(⁶)	(⁶)
1922	54,930,203	(⁹)	(⁹)	55,622,482
1923	77,453,000	(⁹)	(⁹)	80,637,520
Value—				
1918	Included under benzene above		(⁶)	(⁶)
1919	Included under benzene above		(⁶)	(⁶)
1920	⁷ 12,644,931	112,849	(⁶)	(⁶)
1921	8,966,686	⁸ 70,000	(⁶)	(⁶)
1922	10,491,309	(⁹)	(⁹)	10,657,074
1923	12,533,000	(⁹)	(⁹)	13,238,871
Toluene, all grades:				
Gallons—				
1918	8,541,366	3,965,518	1,596,353	14,103,237
1919	1,353,827	(⁴)	510,957	1,884,784
1920	2,470,364	³ 2,000	(¹⁰)	(¹⁰)
1921	835,493	⁸ 1,000	(¹⁰)	(¹⁰)
1922	1,910,060	(¹⁰)	(¹⁰)	(¹⁰)
1923	2,682,000	⁸ 2,000	(¹⁰)	(¹⁰)
Value—				
1918	\$12,249,702	\$5,597,353	\$3,044,890	\$20,891,945
1919	355,990	(⁴)	235,321	596,511
1920	740,722	⁸ 300	(¹⁰)	(¹⁰)
1921	233,378	⁸ 270	(¹⁰)	(¹⁰)
1922	557,015	(¹⁰)	(¹⁰)	(¹⁰)
1923	766,000	⁸ 570	(¹⁰)	(¹⁰)
Solvent naphtha, crude and refined, including xylene:				
Gallons—				
1918	¹¹ 3,284,037	1,442,267	¹² 965,458	5,691,762
1919	¹³ 3,649,066	(⁴)	(⁹)	4,128,747
1920	4,695,464	(⁴)	(⁹)	5,384,560
1921	2,881,656	(⁴)	(⁹)	3,627,488
1922	2,861,482	(⁹)	(⁵) (⁹)	3,680,811
1923	3,927,000	(⁴)	(⁹)	4,568,593
Value—				
1918	¹¹ \$458,689	\$191,475	¹² \$232,003	\$882,167
1919	¹³ 557,416	(⁴)	(⁹)	672,685
1920	851,048	(⁴)	(⁹)	994,205
1921	510,509	(⁴)	(⁹)	644,548
1922	538,512	(⁹)	(⁵) (⁹)	773,336
1923	657,000	(⁴)	(⁹)	849,614
Naphthalene, all grades:				
Pounds—				
1918	15,890,447	\$96,080	40,138,092	56,924,619
1919	6,702,040	(⁴)	12,612,203	20,114,243
1920	14,448,762	1,760,293	26,393,411	42,602,466
1921	1,983,523	(⁴)	16,949,464	19,432,987
1922	4,887,935	(⁴)	19,323,393	25,411,328
1923	10,936,000	(⁴)	41,453,002	54,189,002

[For footnotes see page 20.]

TABLE 6.—Total commercial production of benzene, toluene, solvent naphtha, and naphthalene from all sources in the United States, 1918-1923—Continued.

	By-product coke plants (sales)	Gas works (sales)	Tar refineries and all other estab- lishments (production)	Total commercial production
Naphthalene, all grades—Continued				
Value—				
1918.....	\$650,229	\$14,282	\$1,281,440	\$1,945,951
1919.....	191,364	(¹)	327,201	542,565
1920.....	487,974	63,449	791,403	1,342,826
1921.....	59,335	(¹)	380,167	462,502
1922.....	131,252	(¹)	352,957	536,209
1923.....	274,000	(¹)	652,148	1,006,148

¹ Sales instead of production are here given to avoid double counting between production of crude and pure grades, and because such of the product as is used in the coke plant or gas works is not available for commercial use.

² Totals include estimates for firms not reporting, or actual figures for items that can not be shown separately without disclosing individual returns.

³ Includes motor benzol and 13,000 gallons of gasoline used in blending.

⁴ Reports incomplete. Estimate included in total.

⁵ Revised figure, to eliminate duplication through certain plants reporting both to the Tariff Commission and to the Geological Survey.

⁶ Data not collected from tar refiners prior to 1922.

⁷ Includes 1,333,000 gallons of gasoline used in blending.

⁸ Estimate.

⁹ Included in total, but can not be shown separately without disclosing individual returns.

¹⁰ A certain quantity of toluene was produced both at gas works and at tar refineries, but the figures can not be given without disclosing individual returns.

¹¹ Includes 52,847 gallons of xylene, valued at \$9,937, and 107,375 gallons of crude heavy solvent, valued at \$8,769.

¹² Includes 192,969 gallons of xylene, valued at \$67,935.

¹³ Includes 23,088 gallons of xylene, valued at \$4,563.

TABLE 7.—Production of coal-tar crudes, 1923, by firms not primarily engaged in the operation of coke-oven plants and gas houses

[The numbers in the second column refer to the numbered alphabetical list of manufacturers given on page 195. An X indicates that the corresponding product was made by a manufacturer who did not consent to the publication of his name in connection therewith. A blank in the third and fourth columns indicates that there was actual production of the corresponding article, but that the figures can not be published without revealing the output of individual firms.]

Name	Manufacturers' identification numbers according to list on page 195	Unit of quantity	1923		
			Quantity	Value	Value per unit
Total crudes ¹				\$25,067,086	
Benzene.....	16, 21, 49, 152, X, X.....	Gallons.....	394,906	118,505	\$0.300
Toluene.....	16, X.....	do.....			
Xylene.....	16.....	do.....			
Naphthalene(crude).....	8, 15, 16, 34, 49, 53, 97, 114, 134, 152, 158, 167, 181, X.....	Pounds.....	41,453,002	652,148	.016
Anthracene (crude, less than 30 per cent).....	158, 167.....	do.....			
Carbazole (crude, less than 65 per cent).....	158, 185.....	do.....			
Cresol or cresylic acid (crude).....	13, 16, 42, 49, 114, 158.....	Gallons.....			
Pyridine.....	16, 130.....	do.....			
Solvent naphtha.....	13, 16, 49, 97, 167, X.....	do.....	501,754	142,122	.283
Dead or creosote oil.....	8, 13, 16, 21, 34, 42, 49, 53, 97, 101, 114, 134, 158, 167, 181, 201, X.....	do.....	38,636,974	4,266,785	.110
Anthracene oil.....	8, 158, 167.....	do.....			
Pitch of tar.....	8, 13, 16, 21, 34, 42, 49, 53, 97, 101, 114, 134, 158, 167, 181, X, X.....	Tons.....	675,628	9,654,547	14.334
Other distillates.....	8, 16, 34, 42, 49, 101, 114, 158, 181, X, X.....	Gallons.....	14,801,569	1,941,495	.131
Refined tar.....	8, 16, 21, 34, 42, 53, 97, 101, 114, 134, 167, 181, X, X.....	Barrels.....	1,675,213	5,944,085	3.548
Motor fuel.....	49, 152, X.....	Gallons.....			

¹ The instructions sent to manufacturers were as follows: Include under dead or creosote oil only products which may be used for creosoting. Include under other distillates shingle stain oils, disinfectant oils, and flotation oils which do not contain over 5 per cent of phenol. Include under refined tars those tars which are used for road treatment, saturating felt, and for protective coatings. Phenol and all distillates which, on being subjected to distillation, yield in the portion distilling below 190° C. a quantity of tar acids equal to or more than 5 per cent of the original distillate, or which, on being subjected to distillation, yield in the portion distilling below 215° C. a quantity of tar acids equal to or more than 75 per cent of the original distillate, are not to be included here but are to be placed under intermediates.

Imports.—Domestic imports for consumption are given in the Appendix in Part VI of this publication. In general, imports of crudes in 1923 registered an increase over those of 1922. One of the principal reasons for this was the large raw material requirements of the timber preserving and chemical industries. Dead or creosote oil, used largely as a timber preservative, led this group both in quantity and value, with a total of 64,199,636 gallons, valued at \$10,071,393. This was approximately a 54 per cent increase over the figures for 1922.

The imports of naphthalene ranked second, totaling 20,992,439 pounds, valued at \$575,702, compared with 3,144,332 pounds, valued at \$54,029, for 1922. Owing to the demand for this product, imports were large during the first seven months of 1923. The increase in price stimulated production and during the latter part of the year the price receded to the January level. Imports of crude cresylic acid totaled 5,761,011 pounds, with a value of \$489,824. Other coal-tar crudes showing an increased importation during 1923 include anthracene (purity less than 30 per cent), 869,780 pounds, valued at \$23,925; pyridine, 764,918 pounds, valued at \$266,184; and benzene, 701,857 pounds, valued at \$21,903.

INTERMEDIATES

DESCRIPTION

This class of coal-tar chemicals does not occur as such in coal tar, but is prepared from the crudes (benzene, toluene, naphthalene, and anthracene) by chemical treatment with sulphuric acid, nitric acid, alkalis, chlorine, or other chemicals. From fewer than 10 coal-tar crudes 200 to 300 intermediates are prepared for use in the production of hundreds of dyes. The various chemical stages in the conversion of crudes to intermediates are (1) nitration, (2) reduction, (3) sulphonation, (4) caustic fusion, (5) chlorination, (6) alkylation, (7) liming, (8) condensation, (9) carboxylation, (10) oxidation, and (11) diazotization.

Intermediates are therefore the raw materials which are converted by complex chemical processes into dyes, medicinals, perfumes, flavors, photographic chemicals, and synthetic resins and tanning materials. They are also used as accelerators in the vulcanization of rubber, as camphor substitutes, in the direct production of dyes on the fiber, and for increasing the fastness of dyed colors, in which case they are known as "developers." After purification, many intermediates are used directly as drugs, perfumes, and flavors.

PRODUCTION

The production of intermediates in the United States in 1923 is given in Table 8 in as great detail as is possible without revealing the output of individual manufacturers. The total output in 1923 was 231,393,871 pounds, compared with 165,048,155 pounds in 1922. Sales in 1923 totaled 83,582,808 pounds, with a value of \$18,916,058. The average price of intermediates sold in 1923 was

\$0.226, as compared with \$0.223 for 1922. Although the average price of the total sales for 1923 and 1922 shows practically no change, there were marked decreases in the average sales prices of certain basic intermediates. As an offset to these declines there were increased quantities of the special and more costly intermediates entering into the production of the faster types of dyes. The average sales price of aniline showed little change, being \$0.158 for 1923, as compared with \$0.151 for 1922. It is of interest to note, in this connection, that aniline oil was quoted at \$0.10 $\frac{1}{8}$ in 1913 and that the invoice value of imports in the fiscal year 1913-14 was \$0.071. During the war it was quoted as high as 40 to 50 cents per pound. H acid decreased from \$0.73 in 1922 to \$0.675 in 1923, while b-naphthol, tech., declined from \$0.24 to \$0.22. Naphthalene, refined, declined from \$0.06 to \$0.058 per pound, and anthraquinone (100 per cent), required for the manufacture of synthetic alizarin and anthraquinone vat dyes, receded from \$1.34 to \$0.947 per pound.

The total number of intermediates reported was 311, of which over 80 were not reported during 1922. Many of these new products comprised intermediates of great complexity, and their production represents notable progress in the dye industry. They are almost entirely required for the manufacture of the fast and special types of colors, in which field the industry made a conspicuous expansion during 1923.

Aniline.—Aniline manufactured from benzene, through the intermediate product nitrobenzene, is the most important of all finished intermediates. It ranked, in 1923, first in value and quantity. Aniline is used in the production of dyes of almost every class, whether the classification be based on the method of application or on the chemical constitution. Three of the leading domestic dyes by quantity of output, namely, Indigo, Direct black EW, and Agalma black 10B, require aniline in their manufacture. The output of aniline in 1923 was 26,671,961 pounds, compared with 21,401,864 pounds in 1922. The largest output was in 1920, when the total was 39,234,186 pounds, valued at \$10,923,648.

Naphthalene derivatives.—The most important intermediate derived from naphthalene is b-naphthol. The output in 1923 was 5,741,355 pounds, compared with a production of 3,255,901 pounds in 1922. Sales in 1923 were 4,528,236 pounds, valued at \$994,635, or 22 cents per pound, a decrease of 2 cents per pound from that of the previous year.

H acid (1-amino-8-naphthol-3:6-disulphonic acid) ranks second among naphthalene derivatives and is one of the most important intermediates required for the production of direct cotton and acid dyes of the azo class. Production of H acid in 1923 was 3,462,664 pounds, with sales amounting to 1,392,506 pounds, valued at \$940,272.

Phthalic anhydride is another intermediate derived from naphthalene. It is essential to the preparation of synthetic anthraquinone, which, in turn, is the intermediate used in the production of synthetic alizarin and the anthraquinone vat dyes, including the indanthrenes and most of the alcols. In addition, phthalic anhydride is used in the preparation of fluorescein, the eosine dyes, and the rhodamines.

The domestic production of phthalic anhydride in 1923 established a new record, 2,343,802 pounds, compared with 1,629,182 pounds in 1922.

Fumaric and maleic acid.—In 1923 production was reported for the first time of these two acids by a synthetic process—the direct oxidation of benzene with air in the presence of a catalyst. This is a notable discovery of the domestic chemical industry. These two acids appear to hold considerable promise of application in the chemical and associated industries. Maleic acid may serve as the base for the manufacture of many hitherto rare compounds. It is now converted into malic acid, which is used as a food acidulant. Fumaric acid is used in the textile industry.

Anthraquinone.—The large increase in the production of anthraquinone in 1923 represents one of the significant stages of progress in that year. Anthraquinone is used in the manufacture of certain vat dyes (including indanthrenes and most of the algal dyes, synthetic alizarin, and other alizarin derivatives.) Anthraquinone is produced in the United States by the oxidation of anthracene, the latter being derived from coal tar, and by synthesis from phthalic anhydride and benzene. There has been a marked tendency to increase the proportion of the total domestic output by the synthetic process. The total production of anthraquinone in 1923 was 857,190 pounds, compared with 395,107 pounds in 1922. Approximately one-half of the total 1923 output was produced by the synthetic process, this representing a very large increase in the proportion produced by this process over that of 1922.

Special intermediates register large increase.—An examination of the intermediates used in the preparation of fast and special dyes, these being consumed in relatively small quantities as compared with bulk colors, shows a greatly increased output of these special products in 1923. Among these may be mentioned Chicago acid (1-amino-8-naphthol-2:4-disulphonic acid), J-acid urea, diethyl-m-aminophenol, ethyl benzyl aniline, xyloidine, Broenner's acid, 2-chloro-5-toluidine-4-sulphonic acid, J-acid (2-amino-5-naphthol-7-sulphonic acid), pyrazolone, Michler's ketone, benzoyl chloride, and the anthraquinone derivatives.

New intermediates.—In 1923 production of 311 coal-tar intermediates was reported, of which over 80 were new products not reported during the year 1922. These new products comprise for the most part intermediates used in the manufacture of the more complex dyes and other coal-tar products and several used in the vulcanization of rubber. The developments of the year are indicated by the production of these more complex products, presenting many technical problems in their production on a commercial scale. Among these recent additions are included chloropyrazolone, dehydrothio-m-xyloidine, dibenzylsulphoxide, dimethyltetra aminodiphenylmethane, ethyl carbazole, fumaric acid, maleic acid, methyl anthraquinone, phenazine, quinaldine, tetraaminoditolylmethane, and several anthraquinone derivatives.

INVESTIGATION OF PHENOL AND CRESYLIC ACID UNDER SECTION 315

Phenol.—An investigation under the provisions of section 315, Title III of the act of 1922, was ordered by the Tariff Commission on May 4, 1923, in response to a request for a decrease in the duty on phenol.

The foreign (Great Britain) and domestic costs investigations were completed during the period from June to November, 1923, and on December 13, 1923, after giving due notice as required by law, the commission ordered a public hearing for January 24, 1924. The hearing was completed on that date and further oral argument was waived. Interested parties were given until March 15, 1924, for the filing of briefs.

The present annual consumption of phenol is estimated to be about 11,000,000 pounds. The production of natural phenol from coal tar is only a fraction of this, and the production from this source in the United States is supplemented by synthetic phenol.

The cost of manufacture of synthetic phenol is higher than that of natural phenol. A comparison of the cost of manufacture of phenol (natural) in England, obtained by the Tariff Commission, with a weighted average of the cost of the domestic natural and synthetic phenol show that if the total English cost is taken as 100 the domestic weighted average is 142.5.

The manufacturer in Great Britain has the advantage of cheaper raw materials (tar acids) than the American manufacturer, and furthermore the percentage of phenols is higher in the British tar than in the American tar.

The lower-cost natural phenol at the time of the investigation supplied a greater part of consumption than the synthetic product. The output of synthetic phenol is increasing and in future will be a factor of increasing importance in supplying requirements.

Large increase in output of phenol: The large output of phenol in 1923 represents one of the notable expansions in the industry during that year. The production for 1923 was 3,310,911 pounds, compared with 1,285,978 pounds in 1922. Total sales during 1923 were 2,180,244 pounds, valued at \$589,822 (\$0.27 per pound), as against a total sales of 1,266,552 pounds, valued at \$268,311, in 1922 (\$0.21 per pound).

The Government war stock carry-over of phenol, which amounted to approximately 35,000,000 pounds, was believed to be sufficient for a four years' normal supply based upon pre-war consumption of about 9,000,000 pounds a year. Owing to the increased demand for phenol in the manufacture of synthetic phenolic resins, the war stocks were exhausted sooner than was anticipated.

Several manufacturers started producing synthetic phenol in 1923. One of the large manufacturers of phenolic resins has built a synthetic phenol plant and estimates that its production will be at the rate of 7,000,000 pounds a year by the end of 1924. The Barrett Co. estimates its production of phenol for the year 1924 at from 2,000,000 to 2,500,000 pounds.

The synthetic phenol will probably be a factor of increasing importance in supplying domestic requirements.

Cresylic acid.—On May 4, 1923, the commission ordered an investigation of cresylic acid for the purposes of section 315 of the tariff act of 1922, in response to requests for a decrease in the duty on cresol or cresylic acid.

The foreign and domestic costs investigations were completed during the period from June to November, 1923, and on December 13, 1923, the commission ordered a public hearing for January 24, 1924, which was postponed at that time to February 14, 1924. The hearing was completed on that date and further oral argument was waived. Interested parties were given until March 15, 1924, for the filing of briefs. As a result of the cost investigation conducted by the Tariff Commission, it was found that, taking the domestic cost of manufacture of cresylic acid as 100, the cost of manufacture in the United Kingdom was 50.46 in 1923.

It is difficult accurately to estimate domestic consumption of cresylic acid. In the period from 1917 to 1920, inclusive, when imports were fairly uniform and when there was little domestic production, the total imports indicate an annual consumption of cresylic acid of between 8,000,000 and 10,000,000 pounds. Although the total potential capacity of domestic producers of cresylic acids is estimated at approximately 9,500,000 pounds, domestic production has been about one-half of the maximum capacity.

Taking into consideration the expansion of the consuming industries, it seems likely that the present consumption of cresol and cresylic acid is between 10,000,000 and 12,000,000 pounds per year.

In the manufacture of cresols and cresylic acid from coal-tar distillates as carried on both in the United States and abroad phenol is one of the by-products obtained. The crude tar acids, after removal of the crude phenol fraction, yield various grades of cresols and cresylic acids. In American practice the fractions usually obtained, in their order after the crude phenol fraction, are (1) ortho cresol, (2) meta and para cresol, (3) cresol U. S. P., (4) refined cresylic acid, (5) crude cresylic acid 97–99 per cent straw color, and (6) crude cresylic acid 95 per cent dark. Both in the United Kingdom and in this country the companies consider that the production cost of cresylic acid and the production cost of crude carbolic acid are the same, because they are produced simultaneously in the same plant.

Cresylic acid records large increase in production: As in the case of phenol, the production of cresylic acid registered a notable increase, being about double that of the previous year.

The production of cresylic acid has shown a large increase since the passage of the tariff act of 1922. During recent months the imports of duty-free cresylic acid have increased greatly. These imports comprised in large part a grade of cresylic acid just below the specifications of the dutiable grades of paragraph 27 of the act, a grade which is readily converted into a refined cresylic acid by a simple distillation.

STATISTICS OF PRODUCTION.

TABLE 8.—Production and sales of coal-tar intermediates, 1923

[The numbers in the second column refer to the numbered alphabetical list of manufacturers printed on page 195. An X signifies that the manufacturer did not consent to the publication of his identification number in connection with the designated product. A blank in the third and fourth columns indicates that sales figures can not be published without revealing information in regard to the output of individual firms. A blank in the sixth column indicates that the production of the corresponding product in the United States can not be published without revealing information in regard to the output of individual firms. The figures thus concealed are, however, included in the total]

Name	Manufacturers' identification numbers according to list on page 195	Sales			Total production Pounds
		Quantity Pounds	Value \$	Average price per pound	
Total intermediates		83,582,808	\$18,916,058	\$0.23	231,393,871
Acetanilide, tech.	7, 80, 122, 128, 166, 167.	249,099	65,306	.26	
Acetyl-p-phenylenediamine (p- amino acetanilide).	6, 7, 63, 82, 88, 131, 167.				133,214
Acetyl-o-toluidine.	63				
Acetyl-p-toluidine.	39, 63, 167				237,927
Acridine, base.	151				
Aldehyde aniline derivatives.	X				
b-Amino anthraquinone.	63, 137.				
Aminoazobenzene.	7, 32, 36, 64, 74, 88, 91, 131, 133.				122,370
Aminoazobenzene sulfonic acid.	63, 133				
Aminoazobenzene disulfonic acid.	131, 133				
Aminoazotoluene.	32, 63, 64, 88, 91, 131, 133, 155.				95,202
Aminoazotoluene sulfonic acid.	133				
Aminoazotoluene disulfonic acid.	63				
Aminoazoxylene.	131				
p-Aminobenzoic acid.	63, 126, 166				18,241
p-Aminodimethylaniline.	85				
Aminodiphenylamine sulfonic acid.	202				
1-Amino-2-naphthol-4-sulfonic acid.	6, 19, 32, 39, 63, 88, 133, 167, X, X.			.60	792,639
1-Amino-8-naphthol-4-sulfonic acid.	39, 63, 131, 137				143,945
1-Amino-8-naphthol-2:4-disulfonic acid (Chicago acid).	39, 63, 131, 137				101,570
1-Amino-8-naphthol-3:6-disulfonic acid (H acid).	25, 63, 88, 125, 131, 137.	1,392,506	940,272	.68	3,462,664
2-Amino-5-naphthol-7-sulfonic acid (J acid).	39, 63, 131, 137, X				145,540
2-Amino-8-naphthol-6-sulfonic acid (gamma acid).	25, 32, 39, 63, 131, 137, X.			1.51	306,605
2-Amino-8-naphthol-3:6-disulfonic acid.	137				
o-Aminophenol.	82, 195, 202	14,483	33,812	2.33	
p-Aminophenol and hydrochloride.	9, 57, 63, 68, 82, 137, 195, 202.	60,859	68,646	1.13	135,564
o-Aminophenol-p-sulfonic acid.	7, 25, 63, 131, 202				30,119
Aminosalicylic acid.	6, 39, 52, 63, 88, 131, 137.				62,136
Anhydroformaldehyde aniline.	63				
Anhydroformaldehyde p-toluidine.	63				
Aniline disulfonic acid.	131, X				
Aniline hydrochloride.	27, 87, 131	775,571	174,850	.23	800,350
Aniline oil.	27, 63, 87, 122, 124, 128, 131, 132.	14,506,027	2,293,639	.16	26,671,961
Aniline sulfate.	63, 91, 131, 132, 151	13,279	3,958	.30	
Aniline for red.	131				
Anisidine.	63, 137, 202	3,717	9,628	2.59	15,418
Anthracene, refined (average content 86 per cent).	8, 63, 185				
Anthranilic acid (o-aminobenzoic acid).	62, 63, 128, 190			1.03	45,312
Anthraquinone 100 per cent.	18, 63, 107, 131, 163, 185.			.95	857,190
Anthraquinone-1:5-disulfonic acid.	88, 131				
Anthraquinone hydrazine.	137				
Anthraquinone-2-sodium sulfonate (silver salt).	18, 63, 131, 137				450,701
Anthrarufin.	131				
Benzaldehyde.	44, 78, 142, 180, 192, X	227,521	165,431	.73	263,007
Benzanthrone.	63, 122, 137				
Benzidine, base.	32, 39, 63, 78, 88, 131	202,560	162,775	.80	768,880
Benzidine sulfate and hydrochloride.	3, 88, 131, 137, X				

TABLE 8.—Production and sales of coal-tar intermediates, 1923—Continued

Name	Manufacturers' identification numbers according to list on page 195	Sales			Total production Pounds
		Quantity Pounds	Value	Average price per pound	
Benzoate of soda	44, 95, 166, X	749, 645	\$450, 889	\$0. 60	749, 885
Benzoic acid, tech	44, 63, 95, 137, 166			. 59	118, 058
Benzoic acid, U. S. P.	44, 166, X	38, 381	25, 911	. 68	62, 822
Benzotrichloride	142				
Benzoyl benzoic acid	131				
Benzoyl chloride	17, 95, X				
Benzyl chloride	131, 142, 192				
Benzylamine	132				
Bromobenzene	62				
Broenner's acid. (See 2-naphthylamine-6-sulfonic acid.)					
Carbazole, refined (average content 95 per cent)	63, 185				
Chloroacetophenone	68				
p-Chloro-o-aminophenol	202				
o-Chloroaniline	202				
o-Chloroaniline sulfonic acid	202				
p-Chloroaniline sulfonic acid	202				
Chlorobenzaldehyde	131				
Chlorobenzanthrone	63, 137				
Chlorobenzene (mono)	62, 95, 107, X	5, 293, 974	390, 940	. 07	7, 024, 604
Chloroisodibenzanthrone	137				
Chlorometanilic acid	80, 133				
1-Chloro-2-methyl anthraquinone	X				
2-Chloro-4-nitroaniline	63				
p-Chloro-o-nitrophenol	202				
Chloro-m-phenylenediamine	133				
Chloropyrazolone	63				
o-Chlorotoluene	131				
o-Chlorotoluene sulfonic acid	63				
2-Chloro-5-toluidine-4-sulfonic acid	63, 121, 167, 202				
Chromotropic acid. (See 1:8-dihydroxy naphthalene-3:6-disulfonic acid.)					
Cresol, ortho, meta and para	118				
o-Cresotinic acid	93				
Cresylic acid, refined (distillates yielding below 215° C. tar acids equal to or more than 75 per cent of the original distillate.)	13, 16				
Dehydrothio-p-toluidine sulfonic acid	19, 70, 80, 137, 147, X				62, 011
Dehydrothio m-xylidine	137				
Diaminochlorobenzene sulfonic acid	133				
Diaminostilbene disulfonic acid	6, 63, 70, 80, 131, 137				129, 625
Dianisidine	39, 63, 131, 137			3. 69	89, 929
Diazoamine H acid	131				
1-Diazo-2-naphthol-4-sulfonic acid	32, 39, 88, 131, 133, X				249, 714
Dibenzanthrone	137				
Dibenzysulfoxide	132				
1:3-Dibromo-2-amino anthraquinone	137				
Dibromo anthraquinone azine	137				
p-Dibromobenzene	62				
Dichloroaniline	39, 202				
Dichloroaniline sulfonic acid	151				
o-Dichlorobenzene	62, 107, X				
p-Dichlorobenzene	62, 95, 107, 138, X	1, 315, 546	200, 434	. 15	1, 419, 879
Dichlorophenylhydrazine sulfonic acid	151				
Dichlorophthalic anhydride	56				
Diethyl-m-aminophenol	63				
Diethylaniline	63, 131, 180, 205			. 48	125, 713
Diethylaniline sulfonic acid	63				
Dihydroxyanthraquinone sulfonic acid	190				
5:5-Dihydroxy-7:7-disulfonic-2:2-dinaphthyl urea (J acid urea)	131, 137, X				
1:5-Dihydroxynaphthalene	6, 88				
1:8-Dihydroxynaphthalene-3:6-disulfonic acid (chromotropic acid)	125, 131, 137				151, 303
Dimethylaniline	7, 27, 63, 85, 87, 131	1, 502, 265	562, 992	. 38	2, 681, 751
2:2-Dimethyl-1:1-dianthraquinonyl	63				
Dimethylphenazine (tolazine)	131				
Dimethyltetraaminodiphenylmethane	151				
Dinitroanthraquinone	84, 131				

TABLE 8.—Production and sales of coal-tar intermediates, 1923—Continued

Name	Manufacturers' identification numbers according to list on page 195	Sales			Total production Pounds
		Quantity Pounds	Value	Average price per pound	
Dinitrobenzanthrone	137				
Dinitrobenzene	27, 63, 131, 195	575, 089	\$107, 258	\$0. 19	2, 064, 150
m-Dinitrobenzene	12				
Dinitrochlorobenzene	12, 63, 88, 107, 131	1, 039, 333	166, 277	. 16	7, 445, 467
Dinitrochlorobenzene-p-sulfonic acid.	133				
2:6-Dinitrochlorobenzene-4-sulfonic acid.	202				
Dinitrophenol, and sodium salt	12, 88				
Dinitrosalicylic acid	133				
Dinitrotoluene	12, 63, 64, 81, 91, 131	1, 243, 945	183, 016	. 15	4, 304, 198
Diphenylamine	63				
Diphenylguanidine	12, 61, 63, 131, 149, X	846, 431	914, 618	1. 09	867, 019
Diphenylmethane sulfonate	131				
Diphenyl sulfoxide	132				
Distilbenediphenol	131				
Dithiobenzoyldisulfide	132				
o-Ditolyguanidine	63				
Ditolylmethane	131				
p-Ditolylsulfoxide	132				
Ditolythiourea	X				
o-Ditolythiourea	63, 85, 132				
Ethyl acetanilide	131				
Ethyl-p-aminoacetanilide	131				
Ethyl-p-amino benzoate	126				
Ethylaniline (mono)	36, 63, 131, 205				
Ethylbenzylaniline	36, 63, 131, 180, 205			1. 14	213, 034
Ethylbenzylaniline disulfonic acid	36, 63				
Ethylbenzylaniline sulfonic acid	36, 80, 131				
Ethyl carbazole	63				
Ethylidene aniline	132				
m-Ethoxyphenyl-p-toluidine	X				
Fluorescein	7, 56, 63, 91				61, 636
Formaldehyde-p-amino aniline	85				
Formanilide	63, 132, 167, X				
Fumaric acid	131				
Gamma acid. (See 2-amino-8-naphthol-6-sulfonic acid.)					
H acid. (See 1-amino-8-naphthol-3:6-disulfonic acid.)					
Heptylidene aniline	132				
b-Hydroxy naphthoic acid	39, 63				
b-Hydroxy naphthoic anilide (naphthol AS).	63, 131				
p-Hydroxy phenyl arsonic acid and sodium salt.	108, 120				
m-Hydroxy phenyl-o-toluidine	X				
Indanthrene RS	137				
Indophenol	X				
Isodibenzanthrone	137				
J acid. (See 2-amino-5-naphthol-7-sulfonic acid.)					
Laurent's acid. (See 1-naphthylamine-5-sulfonic acid.)					
Lead dithiobenzoate	X				
Maleic acid	131				
dl-Malic acid	131				
Mercaptobenzothiazol and derivatives.	X				
Metanilic acid	6, 39, 63, 64, 88, 91, 131, 133.				412, 791
Methylaniline (mono)	205				
Methylaniline sulfonic acid	X				
Methyl anthraquinone	163, X				
4:4-Methyl diphenylsulfone	132				
Methyl ester of p-tolyl sulfonic acid.	131				
Methylene dianilide	63				
Methylene p-toluidine	137, X				
Michler's hydrol. (See Tetramethyldiamino benzhydrol.)					
Michler's ketone. (See Tetramethyldiamino benzophenone.)					
Naphthalene, solidifying 79° C. or above (refined, flake).	13, 16, 27, 34, 35, 114, 137, 182, 201, X.	21, 871, 196	1, 270, 722	. 06	28, 183, 784
1:5-Naphthalene disulfonic acid	63, 131, 137				85, 502
2:7-Naphthalene disulfonic acid	63, 167				

TABLE 8.—Production and sales of coal-tar intermediates, 1923—Continued

Name	Manufacturers' identification numbers according to list on page 195	Sales			Total production Pounds
		Quantity Pounds	Value	Average price per pound	
1:3:6-Naphthalene trisulfonic acid	167				
1:8-Naphthasulfone-3-sulfonic acid	137				
a-Naphthol	7, 32, 39, 91, 96, 131, 171, 184.	57, 274	\$35, 674	\$0. 62	233, 578
b-Naphthol, tech	27, 32, 39, 91, 167, 171	4, 528, 236	994, 635	. 22	5, 741, 355
b-Naphthol, U. S. P.	27				
1-Naphthol-8-chloro-3:6-disulfonic acid (chloro H acid).	131				
1-Naphthol-4-sulfonic acid (Nevile & Winther's acid).	7, 32, 52, 63, 88, 131, 137.				285, 317
1-Naphthol-5-sulfonic acid	6, 39, 63, 88, 125, 131, 133, 137.				166, 191
1-Naphthol-3:6-disulfonic acid	167				
1-Naphthol-3:8-disulfonic acid	63				
1-Naphthol-3:6:8-trisulfonic acid	32, 131, 137				
2-Naphthol-1-sulfonic acid	63				
2-Naphthol-6-sulfonic acid (Schaefer's acid).	6, 32, 39, 63, 64, 88, 131, 137, X.				146, 755
2-Naphthol-7-sulfonic acid	39, 63, 167				
2-Naphthol-8-sulfonic acid	63, X				
2-Naphthol-3:6-disulfonic acid	3, 25, 27, 32, 39, 63, 88, 131, 137, 167, 190, 198, X.	150, 149	75, 911	. 51	613, 777
2-Naphthol-6:8-disulfonic acid	25, 27, 32, 39, 131, X				
Naphtho - 1:8 - sultam - 2:4 - disulfonic acid.	63				
Naphtho - 1:3 - sulton - 8 - sulfonic acid.	39				
a-Naphthylamine	16, 63, 137	862, 518	260, 218	. 30	
b-Naphthylamine	6, 39, 63, 131			. 75	505, 819
1-Naphthylamine-4-sulfonic acid (naphthionic acid).	7, 32, 39, 52, 63, 91, 131, 137, X	121, 694	49, 054	. 40	1, 491, 963
1-Naphthylamine-5-sulfonic acid (Laurent's acid).	6, 32, 63, 88, 91, 131, 133, X				277, 288
1-Naphthylamine-6-sulfonic acid	131				
1-Naphthylamine-6 and 7-sulfonic acid.	39, 131, 137, X				341, 295
1-Naphthylamine-8-sulfonic acid	6, 63, 131, 133				
1-Naphthylamine-3:6-disulfonic acid (Freund's acid).	6				
1-Naphthylamine-3:8-disulfonic acid.	39, 63, 137				55, 577
1-Naphthylamine-4:8-disulfonic acid.	39, 63, 131, 137				595, 493
1-Naphthylamine-3:6:8-trisulfonic acid.	63, 131, 137				3, 524, 246
2-Naphthylamine-1-sulfonic acid	28, 39, 66, 167	169, 018	159, 567	. 94	281, 738
2-Naphthylamine-6-sulfonic acid (Broenner's acid).	6, 39, 63, 131				28, 884
2-Naphthylamine-4:8-disulfonic acid.	39, 63, 137				
2-Naphthylamine-5:7-disulfonic acid.	39, 63, 131, 137, X				247, 501
2-Naphthylamine-6:8-disulfonic acid.	32, 39, 63, 131, 137, X				552, 010
2-Naphthylamine-3:6:8-trisulfonic acid.	137				
Nevile & Winther's acid. (See 1-naphthol-4-sulfonic acid.)					
p-Nitroacetanilide	25, 39, 63, 167				104, 496
Nitroaminophenol	64, 88, 133				25, 138
Nitroaminosalicylic acid	133				
m-Nitroaniline	63, 195				
p-Nitroaniline	7, 25, 166, 167, X	1, 530, 837	1, 054, 881	. 69	2, 008, 003
p-Nitroaniline-o-sulfonic acid	63, 80, 88, 167, 202	8, 217	8, 203	1. 00	22, 260
o-Nitroaniline-p-sulfonic acid	202				
o-Nitroanisole	63, 137				
p-Nitro-o-anisidine	63				
Nitroarsanilic acid	126				
Nitrobenzene (oil of mirbane)	27, 63, 87, 131, 132, 137.	2, 523, 592	261, 780	. 10	45, 068, 881
p-Nitrobenzoic acid	1, 63, 166				40, 162
Nitrobenzoyl chloride	X				
Nitrochlorobenzene	63				
o-Nitrochlorobenzene	63, 128				
p-Nitrochlorobenzene	63, 128				

TABLE 8.—Production and sales of coal-tar intermediates, 1923—Continued

Name	Manufacturers' identification numbers according to list on page 195	Sales			Total production Pounds
		Quantity Pounds	Value	Average price per pound	
o-Nitrochlorobenzene-p-sulfonic acid.	133, 202				
p-Nitrochlorobenzene-o-sulfonic acid.	131, 202				
8-Nitro-1-diazo-2-naphthol-4-sulfonic acid.	39, 63				
o-Nitro-p-dichlorobenzene	202				
3-Nitro-4-hydroxyphenyl arsonic acid.	108, 120, 126				
Nitronaphthalene	16, 63, 137				
o-Nitrophenol	195, 202				
p-Nitrophenol	46, 63, 128, 137, 195, 202				133, 989
Nitroso-b-naphthol	X				
Nitrosodimethylaniline and hydrochloride.	27, 46, 63, 88, 107, 131, 132, 137, 204, 205, X	23, 279	\$27, 327	\$1. 17	284, 873
Nitrosophenol	6, 9, 12, 18, 68, 88, 131, X, X				399, 308
Nitrosulfoanthranufin	131				
Nitrotoluene	63, 64, 81, 91, 131, 137				7, 005, 352
o-Nitrotoluene	12, 63, 81, 131, 137, X				3, 764, 647
m-Nitrotoluene	12, 63				
p-Nitrotoluene	12, 63, 81, 131, 137, X	220, 784	112, 982	. 51	2, 285, 120
o-Nitrotoluene sulfonic acid	80				
p-Nitrotoluene-o-sulfonic acid	6, 39, 63, 80, 131, 137, 202				891, 537
m-Nitro-p-toluidine	39, 63, 167	158, 350	317, 308	2. 00	160, 016
p-Nitro-o-toluidine	39, 63, 131, 190				
Nitroxylene	27, 39, 63, 131, 137				648, 192
Oxalyl arsonic acid	126				
Oxalyl-p-nitroaniline	63				
Oxalyl-m-phenylenediamine	63				
Oxalyl-p-phenylenediamine	63				
Phenazine	107				
Phenol	16, 62, 93, 118, 128, 148, 171, X	2, 180, 244	589, 822	. 27	3, 310, 911
Phenylglycine, and sodium salt	62, 63, 131				11, 166, 650
Phenylhydrazine, base and hydrochloride.	179				
Phenyl hydrazine-o-sulfonic acid	88				
Phenyl hydrazine-p-sulfonic acid	27, 63, 151, 183				200, 632
Phenyl-1: 8-dihydroxynaphthalenedisulfonic acid (phenyl I acid).	131				
Phenyl-a-naphthylamine	63				
Phenyl-1-naphthylamine-sulfonic acid.	6, 63, 88, 131, 133				328, 836
Phenylmethylpyrazolone	63				
Phenyl pyrazolone	133				
Phenyl rosinduline	63				
Phenyl sulfide	132				
Phenyl thiourea	132				
m-Phenylenediamine	6, 27, 32, 39, 52, 63, 88, 91, 131, 137, 140, 195, X				900, 412
m-Phenylenediamine sulfonic acid	X				
p-Phenylenediamine	74, 82, 167, X	282, 204	372, 124	1. 32	280, 656
Phthalamide	128, 190				
Phthalic acid and anhydride	63, 128, 131, X	2, 091, 100	596, 508	. 29	2, 343, 802
Picramic acid	25, 27, 131, X				149, 310
Primuline, base	19, 63, 80, 131, 147				166, 580
Pyrazolone	133, 151				
Quinaldine	26, 131				
Resorcinol, tech	148, X				
Resorcinol, U.S.P	148, X				
Salicylic acid, tech	62, 63, 93, 124, 128, X			. 31	2, 857, 281
Salicylic acid, U.S.P	93, 124, 128, X	1, 244, 028	393, 343	. 32	1, 330, 048
Sulfanilic acid	27, 32, 39, 63, 87, 88, 91, 118, 131, 151, 183, 195	186, 480	31, 104	. 17	1, 861, 884
Sulfoanilide	133				
o-Sulfobenzoic acid	99				
o-Sulfobenzoic acid, ammonium salt.	99				
o-Sulfobenzoic acid, chloride of	99				
Tetraaminoditolylmethane	63				
Tetrachlorophthalic anhydride	56				

TABLE 8.—Production and sales of coal-tar intermediates, 1923—Continued

Name	Manufacturers' identification numbers according to list on page 195	Sales			Total production
		Quantity	Value	Average price per pound	
		Pounds			Pounds
Tetraethyldiaminobenzhydrol (ethylhydrol)	131				
Tetraethyldiaminodiphenylmethane (ethylmethane)	131				
Tetramethyldiaminobenzhydrol (Michler's hydrol)	63, 80				
Tetramethyldiaminobenzophenone (Michler's ketone)	63				
Tetramethyldiaminodiphenylmethane	63, 80, 88, 131				
Tetramethylthiouramidisulfide	132				
Thioaniline	6				
Thiocarbanilide	12, 85, 131, 132, X, X	2, 113, 059	\$517, 748	\$0.25	3, 309, 414
Tolidine and salts	39, 63, 131, 137				166, 121
Tolidine disulfonic acid	X				
o-Toluene sulfamide	X				
p-Toluene sulfamide	X				
p-Toluene sulfochloride	128				
Toluenesulfonyl ethyl ester	131				
Toluidine	63, 81, 131				
o-Toluidine	12, 39, 63, 81, 131, 137, X	807, 795	107, 936	.13	1, 440, 884
p-Toluidine	12, 39, 63, 81, 131, 137, 202, X	293, 212	253, 399	.86	1, 060, 848
Toluidine sulfonic acid	39, 63, 88, 91, 133, 202				101, 348
p-Tolyl-o-benzoic acid	137				
m-Tolylenediamine	6, 12, 32, 39, 52, 63, 64, 88, 91, 107, 131, 137, X	351, 172	326, 326	.93	1, 179, 457
p-Tolylenediamine	12				
Tolylenediamine, meta and para	137				
m-Tolylenediamine sulfate	131				
m-Tolylenediamine sulfonic acid	131				
o-Tolylthiourea	132				
Tolyl-1-naphthylamine-8-sulfonic acid (tolyl-peri acid)	131				
Tribromophenol	62				
Trichlorofluorescein	63				
Tricresyl phosphate	31				
Triphenylguanidine	131, 132				
Xylidine and salt	27, 39, 63, 131, 137	168, 752	72, 726	.43	363, 029
m-Xylidine acetate	131				
Zinc dimethyl dithiocarbamate	132				
Zinc dithiobenzoate	X				
All other intermediates	137				

TABLE 8A.—Production of intermediates, by groups, according to unit values, 1921, 1922, and 1923

Group	1923		1922		1921	
	Pounds	Per cent of total	Pounds	Per cent of total	Pounds	Per cent of total
0-15 cents	104, 419, 258	45.127	94, 688, 278	57.372	28, 682, 310	40.455
16-25 cents	50, 233, 638	21.709	26, 233, 604	15.894	16, 986, 701	23.959
26-50 cents	42, 556, 640	18.391	24, 399, 085	14.783	11, 457, 747	16.160
51-75 cents	16, 486, 159	7.125	8, 289, 387	5.022	4, 329, 047	6.106
\$0.76-\$1	9, 664, 153	4.176	5, 918, 904	3.586	4, 689, 343	6.614
\$1.01-\$1.50	5, 587, 436	2.415	3, 957, 355	2.398	2, 517, 764	3.551
\$1.51-\$2	914, 837	.395	568, 339	.344	1, 204, 584	1.699
\$2.01-\$3	951, 521	.411	721, 637	.437	731, 758	1.032
\$3.01-\$4	136, 302	.059	197, 071	.119	110, 316	.156
Over \$4	443, 927	.192	74, 495	.045	190, 348	.268
Total	231, 393, 871	100.00	165, 048, 155	100.00	70, 899, 912	100.00

DYES AND OTHER FINISHED COAL-TAR PRODUCTS

INTRODUCTORY

Finished coal-tar products are divided into the following eight classes: (1) Dyes, (2) color lakes, (3) photographic chemicals (developers), (4) medicinals, (5) flavors, (6) perfume materials, (7) synthetic phenolic resins, (8) synthetic tanning materials. In previous reports the Tariff Commission has emphasized the close relationship existing between the manufacture of explosives, poisonous gases, and dyes, also the fact that many explosive plants since the signing of the armistice have been converted into dye factories. During the war the dye plants of Germany supplied the army of that country with poisonous gases and explosives. The dye industry is also closely connected with the manufacture of flavors, perfume materials, photographic chemicals, medicinals, and other coal-tar products, which, although produced in smaller quantities than dyes, use as raw materials many of the by-products obtained in the manufacture of coal-tar dyes.

The production of dyes and other finished products in 1923 is shown in Table 12 in as great detail as is possible without revealing the output of individual manufacturers.

The total production of dyes and other finished coal-tar chemicals in 1923, by 164 firms, was 122,950,171 pounds, compared with a 1922 production, by 164 firms, of 88,368,131 pounds. Total sales in 1923 amounted to 115,297,586 pounds, with a value of \$65,898,177. Production during 1923 represented a 39 per cent increase in quantity compared with that of 1922.

SUMMARY OF DYE PRODUCTION IN 1923

Large increase in output.—The output of dyes by 88 firms was 93,667,524 pounds, compared with 64,632,187 pounds in 1922. Sales for the year 1923 totaled 86,567,446 pounds, with a value of \$47,223,161. In this connection it is of interest to compare the size of the industry in 1923 with that existing prior to the war, the output in 1914, by 7 firms, being 6,619,729 pounds, with a value of \$2,470,096. This production was almost entirely from imported intermediates, chiefly from Germany.

Among the more important factors responsible for the large output of dyes in 1923 may be included (1) the activity of the domestic textile and dye-consuming industries, (2) the occupation of the Ruhr, which caused a reduction in the output of the German dye factories and consequently enabled the domestic producers to increase their exports to Far East markets, (3) the relatively high foreign price levels of dyes compared with those of the pre-war period, and (4) the effect of the tariff act of 1922, giving special protection to coal-tar products.

In contrast with other ad valorem rates in that act, the rates under paragraphs 27 and 28, on imported coal-tar products competitive with the same or similar domestic products, are assessed on the American selling price of the domestic articles. As against this, products noncompetitive with domestic products are assessed on the "United States value," being the selling price of the imported dyes in the domestic markets. In determining the dutiable value, cer-

tain statutory deductions are made from the selling price to cover transportation, duty, importer's expenses, and profits.

Another new feature was the basing of the specific duty on dyes upon standards of strength in ordinary commercial use.

Further price reduction in dyes.—The average selling price of dyes during 1923 was \$0.545 per pound, compared with \$0.60 in 1922 and \$1.26 in 1917. The 1923 selling price is a 10 per cent decline from that of 1922.

The average selling price of Indigo, which led in quantity of production, was \$0.23 for 1923 as against \$0.24 for 1922. The average price of Sulphur black for 1923 was \$0.20 compared with \$0.21 for 1922. This dye was second in quantity of production. The third dye—Direct deep black EW—showed little change; the average price for 1923 was \$0.428 compared with \$0.42 in 1922. In the case of Agalma black 10B, the average price receded from \$0.79 in 1922 to \$0.71 in 1923. Reductions were also recorded in the average prices of many of the so-called special colors, which do not comprise a large proportion of the total output, as is shown in the following table.

Table 9 presents a comparison of the domestic sales prices of 100 dyes for the years 1917–1923, together with the invoice prices of the same dyes imported during the year 1914. The colors for which statistics are given in this table represent about 90 per cent of the domestic production. It should be noted that the domestic sales price is not directly comparable with the invoice prices in 1914. Invoice prices do not represent the cost to the consumer, as they do not include the importer's profit, or, in most cases, "charges for containers and packing, freight, and insurance to seaport, consular certification, minor shipping charges at point of departure and at seaport."

The Schultz number as indicated in column 1 is that of "Farbstoff-Tabellen" (Dyestuff Tables), by Gustav Schultz, 1914 edition. Column 2 gives the common name of the dye as adopted by the Tariff Commission for designating all dyes reported under a given Schultz number (column 1). The invoice price (1914), shown in column 3, represents the weighted average of all dyes classified under a given Schultz number in "Artificial Dyestuffs Used in the United States," Department of Commerce, Special Agents Series No. 121. This weighted average price for all types is usually higher than the invoice price per pound for dyes representing the bulk of the importation under a given Schultz number. The individual dyes imported under given Schultz numbers in the Norton Census show a wide variation in price, frequently amounting to several hundred per cent. This is due chiefly to the great divergence in concentration of the different dyes and also to the variation in prices of special and pure brands, which are more costly than the ordinary brands. Column 4 gives the domestic sales price as reported to the Tariff Commission, representing the weighted average price of all manufacturers for the dyes reported under a given Schultz number. Most of these prices were published in the "Census of Dyes and Coal-Tar Chemicals, for the years 1917–1922."

TABLE 9.—Domestic sales prices of 100 dyes, 1917–1923, compared with invoice values of the same dyes imported, 1914

Schultz No.	Name	1914 invoice value imported dyes (weighted average of all types)	Average price per pound						
			1917	1918	1919	1920	1921	1922	1923
9	Direct yellow R	\$0.178	\$2.55	\$2.61	\$1.74	\$1.49	\$1.07	\$0.88	\$0.81
10	Stilbene yellow	.162				1.53	1.22		1.00
11	Chloramine orange G	.239	3.32	2.86	1.90	1.88	1.60	1.32	1.22
23	Tartrazine	.200	1.50	1.91	2.04	1.86	1.80	1.08	.87
33	Chrysoidine Y	.136	1.09	.77	1.04	.87	.77	.63	.58
34	Chrysoidine R	.165	1.22	1.22	1.12	.79	.78	.63	.57
37	Croceine orange	.133	1.13	.89	.88	1.04	.86	.77	.58
38	Orange G	.148	1.25	.92	1.04	1.22	.96	.58	.59
42	Amido naphthol red G	.150	3.04	1.16	.97	1.78	1.46	.83	.71
48	Alizarin yellow G	.077	.59	.68	.74	.63	.53	.50	.52
58	Alizarin yellow R	.154	.83	.91	.84	.86	.69	.61	.61
66	Amido naphthol red 6 B	.604		.88	.81	1.51	1.25	.66	.78
82	Ponceau 2 R	.095	1.15	.79	.80	.80	.73	.61	.58
112	Bordeaux B	.159	1.46	1.02	.91	.93	.84	.75	.73
119	Diamine rose	.411		5.50	5.15	5.33	3.89	3.01	2.46
134	Metanil yellow	.164	2.24	1.61	1.65	1.64	1.20	.92	.80
137	Acid yellow G	.176	1.32	.85		.63	1.04	1.03	.87
141	Azo yellow	.249	2.04	2.02	1.95	2.08	1.85	1.30	1.06
145	Orange II	.081	.98	.68	.63	.62	.51	.38	.37
154	Palatine chrome brown	.256	1.90	2.00	1.68	1.55	1.53	1.34	1.09
157	Diamond black P. V	.130				1.65	1.25		
161	Fast red A	.118	1.19	1.03	1.05	1.04	.96	.83	.78
163	Azo rubine	.198	2.71	1.51	1.43	1.43	1.26	.92	.85
164	Fast red V. R	.188	2.25	1.25	2.20	2.28	1.96	1.50	1.27
163	Amaranth	.138	1.31	.88	2.98	2.11	3.23	.86	.71
169	Cochineal red	.127	1.44	1.16	1.32	1.26	.99	.76	.73
173	Lithol red R	.083	1.25	2.38	.39	1.52	1.63	1.25	1.15
177	Mordant yellow	.149	.74	1.35	1.89	.81	.98	.76	.65
181	Salicine black U	.156	2.92	1.62	1.25	1.10	.75	.55	.53
188	Sulphon acid blue R	.252	2.25	2.25	2.02	1.95	1.67	.91	.85
217	Agalma black 10 B	.134	1.08	1.26	1.47	1.29	1.09	.79	.71
227	Brilliant croceine	.165	1.35	1.92	2.41	2.23	1.56	1.09	
236	Wool red B	.143	2.50	2.10	2.67	2.64	1.41	1.02	1.16
257	Sulphon cyanine G	.166	2.25	2.25	2.21	2.26	1.74	1.21	.91
265	Sulphon cyanine black	.110	2.25	2.10	1.91	1.80	1.48	1.14	
266	Naphthylamine black D	.144	1.89	.84	1.01	.87	.94	.66	.86
275	Diamond black	.172	2.50	1.40	1.48	1.55	1.25	.94	.87
283	Bismark brown	.186	1.17	.81	1.01	.84	.78	.66	.60
284	Bismark brown 2 R	.183	1.48	.97	1.04	.91	.85	.63	.58
304	Chrysofenine G	.270	12.64	5.71	2.53	2.81	2.03	1.70	1.03
307	Congo red	.179	2.47	2.01	1.12	.86	.89	.65	.59
327	Diamine violet N	.255			3.32	2.97	2.17	1.44	1.39
333	Oxamine black B H N	.133	2.50	3.25	2.72	2.49	1.48	.91	.73
337	Benzo blue 2 B	.041	2.00	1.37	1.00	.88	.69	.48	.41
340	Benzo orange R	.231	2.00	1.56	.88	1.07	.86	.89	.80
342	Chrysamine G	.189	1.97	1.53	1.36	1.08	.99	.93	1.15
343	Diamine fast red F	.362			2.72	2.59	2.09	1.39	1.20
344	Diamine brown	.194		2.60	2.20	1.99	1.65	1.10	.95
363	Benzo purpurine 4 B	.133	2.82	2.46	1.80	1.46	1.20	.90	.89
391	Benzo blue 3 B	.209	2.32	2.23	1.69	1.67	1.03	.78	.54
405	Benzo purpurine 10 B	.234	4.73	2.07	2.47	2.33	1.64	1.67	
410	Benazaurine G	.267		3.00	3.18	1.98	1.53	1.28	
419	Chicago blue R W	.222		2.40	1.88	1.67	1.45	1.51	
424	Chicago blue 6 B	.275		3.08	2.11	1.90	1.52	1.40	
426	Benamine pure blue	.440	5.00	4.40	1.97	2.43	1.39	1.22	.97
462	Direct deep black E W	.144	.75	.85	1.04	1.03	.79	.42	.43
463	Erie direct black R X	.139			1.04	.99	.71	.61	.52
474	Oxamine green B	.174	2.30	2.20	1.85	1.51	1.21	.92	.82
475	Oxamine green G	.230	2.16	2.09	2.14	1.20	1.03	.98	.83
476	Benamine brown 3 G O		1.80	1.70	1.65	1.60	1.15	.73	.64
477	Congo brown G	.194	2.00	2.25	1.83	1.58	1.45	.88	.94
485	Benzo brown G	.170	1.80	1.50	1.23	1.39	1.06	.93	.78
493	Auramine	.240	3.08	3.76	3.08	2.48	2.02	1.66	1.72
495	Malachite green	.241	6.28	5.60	3.26	3.32	1.97	1.22	1.60
499	Brilliant green	.221		5.63	4.66	4.23	3.63		
502	Guinea green	.255	8.50	8.10	5.12	5.22	3.94	1.77	1.72
512	Magenta	.294	9.10	7.72	4.57	4.67	3.28	2.26	2.08
515	Methyl violet	.248	3.84	2.78	2.44	2.39	1.66	1.29	1.25
521	Aniline blue	.368	4.85	5.56	4.86	6.82	2.91	4.56	
530	Acid violet	.281	8.50	7.00	4.93	5.20	3.64	1.86	1.86
536	Alkali blue	.409	4.71	8.33	6.35	5.90	3.42	2.42	2.39
543	Patent blue	.305	10.78	8.68					
559	Victoria blue B	.312	11.91	8.46	3.65	5.14	3.86		

TABLE 9.—Domestic sales prices of 100 dyes, 1917-1923, compared with invoice values of the same dyes imported, 1914—Continued

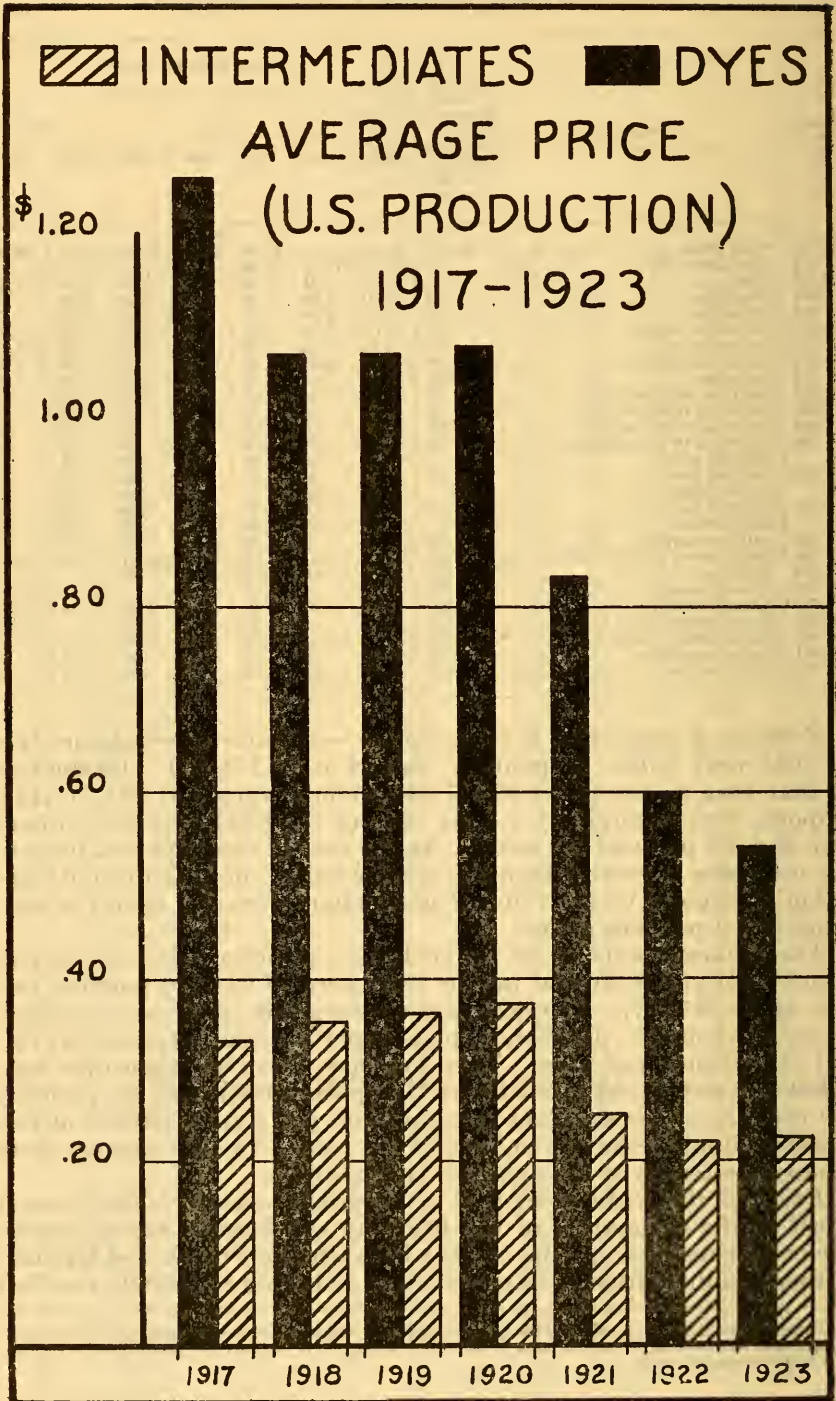
Schultz No.	Name	1914 invoice value imported dyes (weighted average of all types)	Average price per pound						
			1917	1918	1919	1920	1921	1922	1923
566	Wool green S.....	\$0.353	\$6.98	-----	\$5.95	\$4.99	\$1.88	\$1.10	\$0.83
573	Rhodamine B.....	.415	10.00	\$15.92	6.90	6.72	-----	-----	-----
587	Eosine.....	.418	8.58	7.81	6.30	4.19	2.51	1.90	1.84
606	Phosphine.....	.352	6.00	6.00	3.86	4.17	3.70	2.05	1.93
616	Primuline.....	.144	4.43	3.04	1.71	1.59	1.37	1.07	.70
617	Columbia yellow.....	.136	3.00	3.56	2.66	2.36	1.59	1.29	1.17
626	Gallocyanine.....	.347	5.96	5.12	3.03	3.06	2.44	1.92	1.93
659	Methylene blue.....	.390	3.09	2.80	3.03	2.94	1.94	1.40	1.47
679	Safranine.....	.359	5.93	5.85	4.02	3.88	2.60	1.69	1.45
697	Induline (spirit-soluble).....	.198	5.41	1.46	.53	1.21	.75	.94	.93
698	Nigrosine (spirit-soluble).....	.126	1.11	.71	.71	.88	.70	.54	.52
699	Induline (water-soluble).....	.258	1.51	.70	.67	1.03	.96	.82	.83
700	Nigrosine (water-soluble).....	.149	.80	.63	.59	.72	.68	.53	.46
	Sulphur yellow.....	-----	.99	1.09	.83	.71	.73	.78	.73
720	Sulphur black.....	.100	.60	.29	.37	.25	.23	.21	.20
	Sulphur blue.....	-----	1.63	1.45	1.11	.98	.64	.60	.50
725	Sulphur brown.....	.107	.55	.48	.47	.35	.38	.40	.39
	Sulphur tan.....	-----	.90	.65	.84	.47	.59	.56	.48
739	Sulphur maroon.....	.186	-----	-----	1.23	1.62	.95	.79	.77
763	Indanthrene dark blue B O.....	.227	-----	-----	-----	2.12	2.31	1.65	2.00
778	Alizarin.....	.100	3.38	1.95	1.58	1.45	.65	-----	.55
779	Alizarin orange.....	.224	-----	-----	1.45	1.46	-----	-----	-----
782	Alizarin brown.....	.290	.88	.80	1.58	1.68	1.32	1.86	1.24
842	Indanthrene blue G C D.....	.354	-----	-----	6.96	2.40	2.41	-----	1.63
849	Indanthrene yellow.....	.334	-----	-----	17.62	4.68	3.76	-----	1.24
874	Indigo synthetic.....	.128	1.42	.88	.59	.74	.45	.25	.23
877	Indigo extract.....	.340	.38	.62	.64	1.00	.65	.45	.58

Relation of production to consumption.—Imports of synthetic dyes in 1923 were 3,098,193 pounds,¹ valued at \$3,151,363. Production in that year amounted to 93,667,524 pounds, valued at \$51,517,138. Imports were accordingly 3.3 per cent of the total output by quantity and 6.2 per cent by value. As the cost of the imported dyes to the consumer is greater than the invoice value, the true ratio of sales value of imports to the value of production is greater than the estimate of 6.2 per cent given.

The domestic exports of "color lakes and other colors, dyes, and stains" derived from coal tar for 1923 were 17,924,200 pounds, valued at \$5,565,267. The domestic consumption of dyes is assumed to equal domestic production plus imports minus exports, or 78,-841,517 pounds per year. This does not, however, take into consideration any stocks carried over. Imports constituted by quantity 3.9 per cent of the apparent consumption, and dyes produced in this country supplied the remaining 96.1 per cent. In 1914 imports were about nine-tenths of the domestic consumption.

Effect of the Ruhr occupation on domestic exports.—The general effect of the occupation of the Ruhr by the French, together with the export restrictions, the conflict between the French and German authorities, difficulties of transportation, and other conditions, resulted

¹ This total poundage is in excess of the quantity actually imported, most of the vat dyes having been reduced to a single-strength basis in order to facilitate comparison of imports and production of vat dyes on a uniform-strength basis.



in a large decrease in the total production of dyes in Germany, which amounted in 1923 to 25 per cent less than for the previous year. The occupation of the Ruhr had little effect on the supply of dyes for the domestic textile and other industries, as over nine-tenths of the domestic consumption is manufactured in this country.

The reduced production in Germany materially curtailed exports from that country, and important consuming countries in Far East markets, such as China, looked to the United States to supply a part of their requirements. As a result exports from the United States during 1923 were about double in quantity those of 1922 and they increased in value from \$3,996,443 to \$5,565,267. During the latter part of 1923 the output of dyes by Germany steadily increased, and the economic effect of the occupation of the Ruhr was being gradually overcome. Early in 1924 German dyes were again offering sharp competition to both domestic and British dyes in the markets of the Far East.

Continued production of new dyes.—An examination of the dyes for which production was recorded in 1923 shows the addition of nearly 100 new dyes to the United States manufacturing program. These were not restricted to any one class either by chemical derivation or by application on the fiber; they include dyes for silks, cotton, wool, color lakes, and for other purposes. The additions are almost entirely dyes of the special types consumed in relatively small quantities and are mostly colors of great complexity and difficult to manufacture, representing a creditable advance in the industry. The industry is still deficient to some extent in the production of certain vat dyes and certain other products, as shown by the analysis of imports, Table 15.

Reduction in duty.—Under the provisions of the tariff act of 1922 the ad valorem rates on the coal-tar products covered by paragraphs 27 and 28 will be reduced 15 per cent on September 22, 1924. The ad valorem rate on dyes and other finished products, paragraph 28, will be reduced from 60 per cent to 45 per cent, and that on intermediates, paragraph 27, from 55 per cent to 40 per cent. The specific duty will remain at 7 cents per pound.

In considering the effect of this reduction it should be borne in mind that the specific duty is more effective on the lower-priced dyes, while the ad valorem rate is more effective on the higher-priced products; the reduction in the ad valorem rate will therefore more directly affect the higher-priced dyes. The reduction will probably not greatly affect the larger tonnage of color produced in the United States, nor is it probable that it will seriously restrict the development of the dye industry, as the 15 per cent reduction is a minor factor when compared with the protection afforded by other provisions of the act.

The following table shows the actual and the equivalent ad valorem duty on seven groups of dyes ranging from \$0.25 to \$3 per pound under the tariff act of 1922, both for competitive and noncompetitive products. The duties resulting from the 60 per cent ad valorem rate (September 22, 1922, to September 22, 1924) and the 45 per cent ad valorem rate (beginning September 22, 1924) are separately tabulated.

TABLE 9A.—Duty on dyes under the tariff act of 1922.

		Competitive dyes						Noncompetitive dyes							
		7 cents plus 60 per cent ad valorem Sept. 22, 1922, to Sept. 22, 1924			7 cents plus 45 per cent ad valorem after Sept. 22, 1924			7 cents plus 60 per cent ad valorem Sept. 22, 1922, to Sept. 22, 1924			7 cents plus 45 per cent ad valorem after Sept. 22, 1924				
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Value of dye per pound	60 per cent duty	B plus 7 cents	Ad valorem equivalent of 7 cents	Ad valorem equivalent of C	45 per cent duty	F plus 7 cents	Ad valorem equivalent of G	Domestic selling price of imported dyes	"United States value"	60 per cent duty	K plus 7 cents	Equivalent ad valorem of L	45 per cent duty on J	N plus 7 cents	Equivalent ad valorem of O
\$0.25	\$0.15	\$0.22	Per cent 28	Per cent 88	\$0.113	\$0.18	Per cent 72	\$0.25	\$0.0697	\$0.0418	\$0.1118	Per cent 44.7	\$0.0814	\$0.1014	Per cent 40.6
.50	.30	.37	14	74	.225	.295	59	.50	.202	.1212	.1912	38.2	.0909	.1609	32.2
.75	.45	.52	9.3	69.3	.338	.408	54.4	.75	.334	.20	.27	36	.1503	.2203	29.4
1.00	.60	.67	7	67	.45	.52	52	1.00	.4665	.28	.35	35	.2099	.2799	28
1.50	.90	.97	4.7	64.7	.68	.745	49.7	1.50	.73	.438	.508	33.9	.3285	.3985	25.6
2.00	1.20	1.27	3.5	63.5	.90	.97	48.5	2.00	.995	.597	.667	33.35	.4478	.5178	25.9
3.00	1.80	1.87	2.3	62.3	1.35	1.42	47.33	3.00	1.52	.912	.98	32.7	.684	.754	25.1

PRODUCTION OF DYES BY CLASSES

The dyes produced in the United States in 1923 are classified according to method of application as follows: (1) Acid dyes, (2) basic dyes, (3) direct dyes, (4) lake and spirit-soluble dyes, (5) mordant or chrome dyes, (6) sulphur dyes, (7) vat dyes, subdivided into indigo and other vats, and (8) unclassified dyes. While in certain cases the classification of a color is arbitrary, because a dye may have properties which permit of its application by more than one method, it is believed that the above classifications facilitate the comparison of production and import figures.

The production of dyes in the United States from 1917 to 1923, inclusive, as compared with imports during the fiscal year 1914 and the calendar years 1920 to 1923, inclusive, are arranged according to the classes given in Table 10.

TABLE 10.—Comparison of imports of dyes, by classes, fiscal year 1914, with domestic production, calendar years 1917-1923

Class	1914		1917		1918	
	Imports	Per cent of total	United States production	Per cent of total	United States production	Per cent of total
	<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>	
Acid.....	9,286,501	20.2	9,372,121	20.4	9,799,071	16.8
Basic.....	3,002,480	6.5	2,073,043	4.5	2,879,639	4.9
Direct.....	10,264,757	22.3	11,181,761	24.3	12,285,683	21.1
Lake and spirit-soluble.....	1,512,605	3.3	934,360	2.2	1,068,466	1.8
Mordant and chrome.....	4,450,442	9.7	4,164,902	9.1	5,447,192	9.3
Sulphur.....	7,053,879	15.4	15,588,222	33.9	23,698,826	40.5
Vats (including indigo).....	10,352,663	22.5	259,296	.6	3,281,337	5.6
(a) Indigo.....	8,407,359	18.3	274,771	.55	3,083,888	5.3
(b) Other vats.....	1,945,304	4.2	14,525	.05	197,449	.3
Unclassified.....	27,568	.1	2,368,541	5.0	4,232	.....
Total.....	45,950,895	100.0	45,977,246	100.0	58,464,446	100.0

Class	1919		1920			
	United States production	Per cent of total	United States production	Per cent of total	Imports	Per cent of total
	<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>	
Acid.....	12,195,968	19.2	17,741,538	20.1	733,405	21.5
Basic.....	4,036,532	6.4	4,993,001	5.7	192,163	5.7
Direct.....	14,444,934	22.8	19,882,631	22.5	571,581	16.8
Lake and spirit-soluble.....	1,813,199	2.8	2,205,281	2.5	17,527	.5
Mordant and chrome.....	3,985,050	6.3	3,900,209	4.4	709,482	20.9
Sulphur.....	17,624,418	27.8	20,034,500	22.7	229,140	6.7
Vats (including indigo).....	9,252,982	14.6	19,338,099	21.9	932,464	27.4
(a) Indigo.....	8,863,824	14.0	18,178,231	20.6	171,101	5.0
(b) Other vats.....	389,158	.6	1,159,868	1.3	761,363	22.4
Unclassified.....	49,111	.1	168,517	.2	16,820	.5
Total.....	63,402,194	100.0	88,263,776	100.0	3,402,582	100.0

TABLE 10.—Comparison of imports of dyes, by classes, fiscal year 1914, with domestic production, calendar years 1917–1923—Continued.

Class	1921				1922			
	United States production	Per cent of total	Imports	Per cent of total	United States production	Per cent of total	Imports	Per cent of total
	<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>	
Acid.....	7,843,009	20.11	1,455,823	34.24	9,880,014	15.29	601,395	15.10
Basic.....	1,853,094	4.75	163,527	3.84	2,937,585	4.54	155,084	3.89
Direct.....	7,053,761	18.08	537,604	12.64	11,931,737	18.46	671,621	16.86
Lake and spirit-soluble.....	720,406	1.85	43,553	1.02	1,009,512	1.56	76,853	1.93
Mordant and chrome.....	3,997,442	10.25	695,961	16.36	3,749,701	5.80	716,790	18.00
Sulphur.....	10,239,255	26.25	220,938	5.20	16,913,767	26.17	194,883	4.89
Vats (including indigo).....	7,019,120	17.99	1,116,345	26.25	16,926,744	26.19	1,549,024	38.90
(a) Indigo.....	6,673,968	17.11	70,975	1.66	15,850,752	24.52	505	.01
(b) Other vats.....	345,152	.88	1,045,370	24.59	1,075,992	1.67	1,548,519	38.89
Unclassified.....	282,603	.72	19,100	.45	1,283,127	1.99	16,981	.43
Total.....	39,008,690	100.00	4,252,911	100.00	64,632,187	100.00	3,982,631	100.00

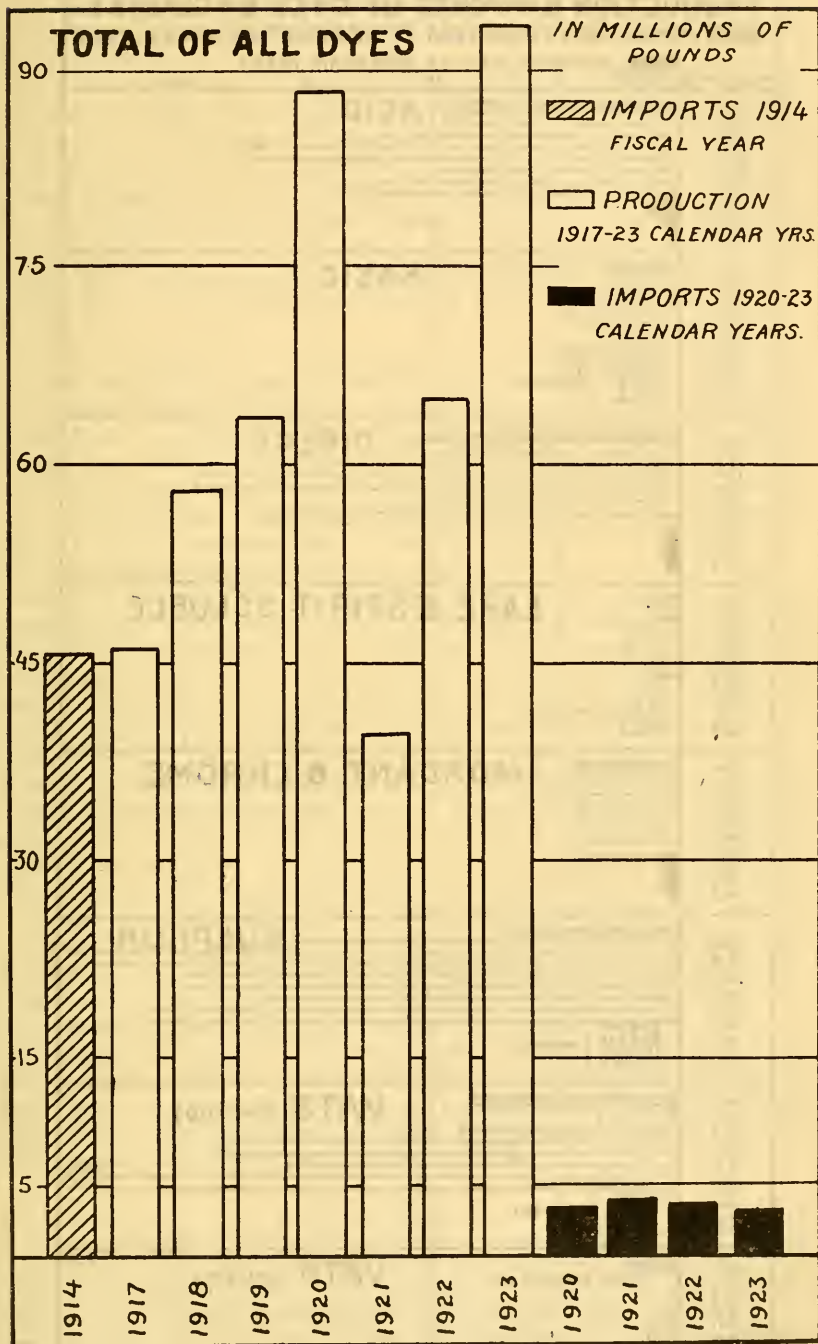
Class	1923			
	United States production	Per cent of total	Imports	Per cent of total
Acid.....	12,498,817	13.34	544,048	17.56
Basic.....	4,157,373	4.44	210,896	6.81
Direct.....	16,858,387	18.00	527,014	17.01
Lake and spirit-soluble.....	1,171,854	1.25	23,213	.75
Mordant and chrome.....	4,078,504	4.35	453,415	14.63
Sulphur.....	21,558,469	23.02	114,023	3.68
Vats (including indigo).....	30,113,642	32.15	1,207,554	38.98
(a) Indigo.....	28,347,259	30.26		
(b) Other vats.....	1,766,383	1.89	1,207,554	
Unclassified and special.....	3,230,478	3.45	18,030	.58
Total.....	93,667,524	100.00	3,098,193	100.00

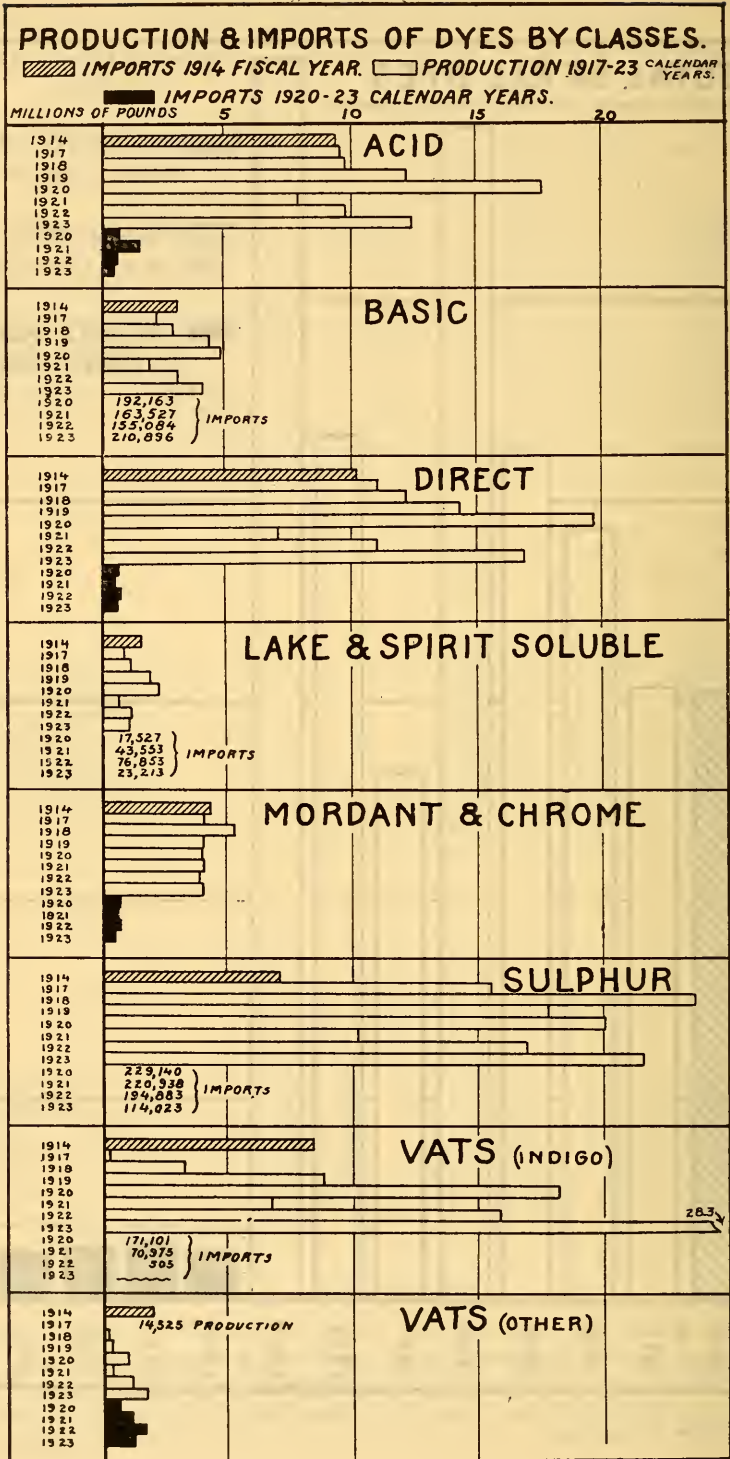
TABLE 10A.—Production of dyes, by groups, according to unit value

Group	1923		1922		1921	
	Pounds	Per cent of total	Pounds	Per cent of total	Pounds	Per cent of total
0-25 cents.....	44,651,483	47.670	28,728,401	44.449	7,832,696	20.079
26-50 cents.....	15,205,298	16.234	10,237,825	15.840	7,941,977	20.360
51-75 cents.....	12,717,546	13.577	8,418,271	13.025	6,843,004	17.542
\$0.76-\$1.....	8,604,351	9.186	6,992,018	10.818	4,762,791	12.209
\$1.01-\$1.50.....	8,207,420	8.762	6,833,577	10.573	6,329,421	16.226
\$1.51-\$2.....	2,318,343	2.475	2,010,413	3.111	3,321,581	8.515
\$2.01-\$3.....	1,244,493	1.329	838,849	1.298	1,220,966	3.130
Over \$3.....	718,590	.767	572,833	.886	756,254	1.939
Total.....	93,667,524	100.00	64,632,187	100.00	39,008,690	100.00

ACID DYES

Description.—The acid dyes are commonly applied in an acid bath; they have acid properties and are usually sodium salts of a color acid. They constitute the most important group used in wool dyeing, being especially adapted to the dyeing of hosiery and carpet yarns, suitings, dress goods, and hat materials; they have, in addition, considerable





application on silk. They are little used on cotton or linen because of their lack of affinity for vegetable fibers, but are of value in the dyeing of jute. In general they are used on goods not requiring repeated washings.

Acid dyes yield clear, bright shades. They are superior to the direct and mordant dyes in purity of shade, but are not equal to basic dyes in this respect. They have a wide color range, and in fastness they show great individual variation; as a rule they are fairly fast to light and acids, and have a tendency to bleed in washing. They yield faster shades on wool than on silk. Some of the more complex acid dyes produce shades of good general fastness. A considerable part of this group is of the lowest-priced dyes produced. Their method of application in an acid bath is simple and of low labor cost.

The line of demarcation between acid dyes and certain colors of the direct and mordant groups is arbitrary. Certain acid dyes when "aftertreated" with sodium or potassium dichromate yield shades of good fastness to milling, light, washing, and other agents. These dyes, known as acid chrome colors, are used chiefly on wool, especially on loose wool yarns and piece goods, such as men's suitings. Most of the acid dyes are chemically included in one of the following groups: (1) Nitro compounds, (2) azo compounds, (3) sulphonated basic dyes (mostly triphenylmethane derivatives).

Production and imports.—Acid dyes ranked fourth in 1923 in order of quantity produced, with a total of 12,498,817 pounds, or 13.34 per cent of all dyes manufactured. Imports of this group amounted to 544,048 pounds, or 17.56 per cent of the total imports and 0.6 per cent of the total production. In the pre-war year 1914 they amounted to 9,286,501 pounds, or one-fifth of the total imports of that year.

Agalma black 10B was first in quantity of production of the acid dyes, with a total of 2,568,458 pounds. This dye ranked fourth of all dyes manufactured during that year. Sales amounted to 2,377,290 pounds, with a value of \$1,694,148. Orange II ranked second in this group in quantity of production, with a total of 1,617,668 pounds, followed by Nigrosine (Water soluble), with a total of 1,389,106 pounds, by Tartrazine with a total of 735,608 pounds, and by Azo rubine with an output of 526,596 pounds. Among the new acid dyes reported during 1923 are Naphthalene green V, Eosine BN, and Azo acid violet. Notable increases were reported in the output of Sulphon acid blue R, Eriocyanine, and Fast light yellow.

The eight leading acid dyes imported in 1923 were Patent blue, 66,279 pounds; Alizarin rubinol 3G, 5G, GW, R, 48,826 pounds; Xylene light yellow, 46,886 pounds; Erioglaucline, 38,254 pounds; Palatine black, 33,500 pounds; Cyanol, 19,979 pounds; Eriocyanine 19,202 pounds; and Fast green, 17,190 pounds.

Basic Dyes

Description.—The basic dyes surpass all others in depth, brilliancy of shade, and purity of tone. They possess high tinctorial power, but as a class lack fastness, especially to light and washing.

Basic colors are used on cotton in dyeing and printing where bright shades or color tints are desired without special requirements

for fastness. They are also employed in the dyeing of paper and jute and for lithographic inks, typewriter ribbons, copy paper, and pencils. With the exception of Rhodamine B and a few others they have little application on wool. Dyes of this class are chemically basic in character and are fixed on vegetable fibers with an acid mordant, namely, tannic acid.

They are historically the oldest of the coal-tar dyes. Mauve or Perkin violet, discovered by W. H. Perkin in 1856, was the first aniline dyestuff produced on a commercial scale. Basic dyes are not as important as formerly; for cotton dyeing they have been superseded by direct and sulphur dyes, which possess advantages in economy of application and in many cases excel in fastness. In wool dyeing the acid dyes have almost entirely displaced the basic colors. Chemically the basic dyes include a large number of the triphenylmethane derivatives and, in addition, members of the following classes: (1) Azines, (2) azos, (3) thioazines, (4) thioazols, and (5) acridines.

Production and imports.—Basic dyes in 1923 ranked fifth in quantity of production, with an output of 4,157,373 pounds, or 4.44 per cent of the total. Imports in that year amounted to 210,896 pounds, or one-fourth of 1 per cent of production. The production of this group of dyes is well developed in this country. Bismarck brown 2R leads this group, with an output of 672,544 pounds, followed by Methyl violet, with an output of 578,183 pounds, and Chrysoidine Y, with an output of 545,836 pounds. The output of Auramine, 471,359 pounds, showed a conspicuous increase over that of 1922, when the production was only 344,827 pounds. Large increases in the production of Phosphine and Rhodamine B constitute the outstanding development in the production of this group of dyes during 1923.

The five leading basic dyes (by quantity) imported in 1923 were Phosphine, 42,176 pounds; Rhodamine 6G, 31,242 pounds; Rhodamine B, 29,083 pounds; Thioflavine T, 20,283 pounds; and Euchry-sine, 9,483 pounds.

Direct Cotton Dyes

Description.—The direct or substantive dyes have been introduced within the past 25 years. Their method of application is simple, as they dye vegetable fibers full shades in a neutral or alkaline bath, "directly," without the use of mordants. Although their principal application is on cotton, they are of special value in dyeing fabrics containing both cotton and wool, or silk and cotton (union goods). They are also used on linen, silk, and paper and to an increasing extent on wool, especially for knitting yarns, worsted and shoddy yarns, and loose wool.

In fastness, individual dyes of this group show a wide variation. On account of their high solubility they have a tendency to run when washed. Many direct dyes, particularly those first introduced, are sensitive to acids and fade on exposure to sunlight; others, especially the newer direct dyes, have good fastness to both acids and light as well as to other agents. Certain direct colors are of good fastness, particularly to washing, after a treatment of the dyed fiber by "coupling" with certain intermediates. An aftertreatment with metallic

salts or formaldehyde also improves the fastness of certain direct dyes. These "developed" direct dyes were not available in the early part of the war; the ordinary direct dyes then used for hosiery were unsatisfactory to consumers. Developed blacks, such as Zambesi black V, are now manufactured in this country for hosiery.

With a few exceptions the direct dyes are chemically "azo" compounds and are nearly all derivatives of benzidine, tolidine, diamino stilbene, or a group closely approximating one of these. A small but valuable group of direct colors belongs in the thiazol class.

Production and imports.—The direct cotton dyes, with a production of 16,858,387 pounds, ranked third in quantity of production, comprising 18 per cent of all dyes produced. Imports of this group in 1923 were 527,014 pounds, which may be contrasted with 10,264,757 pounds in 1914. The first direct cotton dye by quantity of production was Direct black EW, with an output of 6,957,581 pounds. This ranked third, or 7.4 per cent, of all dyes produced in that year. Sales of this color in 1923 were 6,720,905 pounds, with a value of \$2,875,928.

Benzo blue 2B ranked second in this group, with an output of 1,065,539 pounds, followed by Benzamine brown 3GO, with a production of 999,554 pounds, and Oxamine black BHN, with a total of 905,491 pounds. Congo red ranked fifth, with a production of 590,548 pounds.

One of the more important developments in the production of this group of dyes consists in the continued addition to the range of "developed" direct dyes capable of producing shades of good fastness on cotton and silk. Production of Zambesi blacks recorded a notable increase, and among the new direct colors are Erica B, Terra cotta F, Neutral gray B, Diaminogene B, Congo rubine, Benzo fast red, Chicago blue 2R, Diazo indigo blue M, and Direct black V.

The eight leading direct dyes, by quantity, imported in 1923, were Diaminogene blue, 88,778 pounds; Diaminogene B, 32,903 pounds; Trisulphon brown B, 26,980 pounds; Diphenyl red, 21,160 pounds; Diamine fast orange EG, ER, R, 17,793 pounds; Diphenyl brown BN, 17,534 pounds; Benzo fast blue, 17,036 pounds; and Trisulphon brown GG, 16,150 pounds.

Mordant and Chrome Dyes

Description.—These colors, in conjunction with metallic mordants, such as salts of chromium, aluminum, iron, and tin, dye both vegetable and animal fibers. The resulting shades are, in general, of exceptional fastness to color-destroying agents. The mordant dyes yield on wool the fastest shades to light, washing, and other agents. They are also important in textile printing, particularly on cotton piece goods, but are little used on silk.

The mordant dyes are frequently designated as chrome colors. As many of these colors are derived from alizarin, they were formerly called alizarin dyes. Certain dyes may be acid, acid chrome, or chrome, according to the method of application. The true alizarins are generally used with a mordant; some of the new alizarins, known as acid alizarins, can be used either with or without. In the application of chrome dyes on wool, the mordant may be applied before, during, or after the dyeing operation. The labor cost of dyeing with mordant and chrome dyes is higher than for other groups.

The most important dye of this class, alizarin, is used in the production of the well-known Turkey red on cotton. This is one of the shades produced in ancient times from madder root. Alizarin has been prepared synthetically from anthracene for about 50 years.

Chemically, the mordant dyes are members of the following classes: (1) Anthracene, (2) azo, (3) oxazine, (4) triphenylmethane, (5) nitroso, (6) oxyquinone, and (7) xanthone.

Production and imports.—The output of mordant and chrome dyes was 4,078,504 pounds, or 4.35 per cent of all dyes manufactured in 1923. Imports of this class in that year were 453,415 pounds, or one-half of 1 per cent of production and 14.6 per cent of the total import. Imports in the pre-war year 1914 amounted to 4,450,442 pounds.

Salicine black U ranked first in quantity among the mordant and chrome dyes, with a production by 14 firms of 1,242,283 pounds and sales of 1,290,536 pounds, valued at \$686,266. Other leading dyes of this group include Alizarin yellow G, with an output of 395,361 pounds; Alizarin saphirol B, 309,124 pounds; and Metachrome brown B, 308,559 pounds.

The rapid increase in the production of Eriochrome black T and A during the last two years is reflected in a decrease in the imports of these two dyes. Notable increases were recorded in the output of Alizarin brown, Alizarin GI, Palatine chrome red B, and Alizarin. Among the new mordant and chrome dyes produced in 1923, not reported in 1922, are Anthracene blue, Acid alizarin black R, and several unidentified chrome browns.

The five leading mordant and chrome dyes, by quantity, imported in 1923 were Alizarin blue black, 70,917 pounds; Gallamine blue, 29,244 pounds; Alizarin, 27,716 pounds; Alizarin saphirol B, 26,615 pounds; and Alizarin red, 25,017 pounds.

Sulphur Dyes

Description.—This group of dyes produces heavy deep shades of blue, green, brown, and black. They are used almost entirely in cotton dyeing, being especially adapted to uniform cloths, hosiery, gingham yarns, and cotton warps to be woven with wool and later dyed with acid dyes. Their greatly extended use during the war served to increase permanently their application in cotton dyeing. Sulphur colors are also used in the dyeing of linen and artificial silk.

The sulphur dyes possess excellent fastness to washing, fulling, alkalis, and acids in cross dyeing. With some exceptions, their fastness to light is good. As they are not fast to chlorine, they do not withstand the repeated bleaching action of hypochlorites in the modern laundry treatment. They are applied in a sodium sulphide solution with, in certain cases, aftertreatment with metallic salts to improve their fastness. The first dye discovered in this group, "Cachou de Laval," was made in 1867 by the fusion of sawdust with sodium sulphide and sulphur. Sulphur dyes are now prepared by the fusion of various intermediates (containing the nitro, amino, or imino groups) with sodium sulphide and sulphur. These dyes are not pure, distinct compounds, and the presence of other substances renders them of comparatively low color value. Recent developments, however, have greatly increased the tinctorial value and shade range of many of them.

Production and imports.—This group of dyes ranked second in quantity of production, with a total of 21,558,469 pounds, equivalent to 23.02 per cent of all dyes produced in 1923. The domestic production of sulphur dyes has been well developed both in quantity and variety for several years. This is indicated by the relatively small quantity of sulphur colors imported, constituting in 1923 only one-tenth of 1 per cent of the total production. Sulphur black ranked second among all dyes manufactured in 1923, with an output of 16,276,409 pounds, or 17.4 per cent of the total. Sales during 1923 were 15,212,142 pounds, valued at \$3,017,207. The production of sulphur browns totaled 2,203,893 pounds; of sulphur blues, 1,349,864 pounds; of sulphur yellow, 670,023 pounds; and of sulphur maroon, 373,899 pounds.

The five leading sulphur dyes imported in 1923 were:

	Pounds
Thionol brown.....	28, 802
Cross dye green B.....	26, 242
Eclipse brown.....	10, 000
Thionol brown G.....	9, 228
Pyrogene blue.....	8, 929

Vat Dyes

Description.—Because of their exceptional fastness, variety, and beauty of shade, vat dyes are of special importance for cotton goods where laundry-fast dyes are desired. They are used on both dyed and printed shirtings, on blouse material, dress goods, ginghams, muslin curtains, and other cotton wash goods, and have a limited application on silk and wool. Because of their high cost, they have a comparatively limited use in solid or heavy shades, but they are used for color stripes or for small printed patterns on a white background. They possess technical advantages in application over the alizarin mordant dyes.

Vat dyes as a class possess exceptional fastness to light, washing, acids, alkalies, and to chlorine. Some of them are not fast to all of these agents. With a gradual increase in demand by the ultimate consumer of textiles for fast-dyed fabrics, the consumption of vat dyes is increasing. As cotton goods dyed with these colors withstand the severe treatment of the modern laundry, the relatively high cost of dye per yard is a minor factor compared with the increased life of a fabric dyed with fast colors.

With the exception of indigo, one of the oldest dyes known, vat dyes are of recent origin. They are among the most complex of dyes, difficult to manufacture, and relatively high in cost. Chemically divided, they consist of indigoids (including thioindigoids), anthraquinone derivatives, and the carbazole derivatives.

Production and imports.—The production of vat dyes, including indigo, again led by quantity, in 1923 totaling 30,113,642 pounds (32.15 per cent of the total output), compared with 16,926,744 pounds for the previous year.

The indigo output of 28,347,259 pounds was greater than that of any other single dye, comprising 30.26 per cent of the total domestic output. This represents a very large increase over the 1922 output of 15,850,752 pounds. This increase may be accounted for in large part by the exports of this dye to China, as a result of the reduced exports of Germany following the occupation of the Ruhr district.

The output of vat dyes (other than indigo) in 1923 was 1,766,383 pounds—the largest in the history of the domestic industry and an increase of 690,391 pounds over that of 1922.

Among the vat dyes other than indigo, Indanthrene yellow led in quantity of production, with an increase in output of 170 per cent over that of 1922. Indanthrene blue GCD, second in quantity of output, showed an increase over the 1922 production. Among the new vat dyes reported as produced during 1923 are, Indanthrene violet B, Indanthrene blue 3G, Hydron pink FF, and Indanthrene golden orange R.

In 1914 imports of vat dyes other than indigo were 1,945,304 pounds, and none of these dyes were produced in this country in that year; in 1920, a year of great business activity, domestic production plus imports was 1,921,231 pounds. In 1921, a year of business reaction, the corresponding total was 1,390,522 pounds, and for 1922, 2,624,511 pounds, increasing to a maximum of 2,973,937 pounds in 1923.

The nine leading vat dyes, by quantity, imported in 1923 were:

	Pounds
Indanthrene yellow (single strength)-----	87, 946
Indanthrene golden orange R (single strength)-----	79, 717
Indanthrene blue GCD (single strength)-----	70, 546
Indanthrene golden orange G (single strength)-----	67, 265
Ciba violet B (single strength)-----	64, 517
Hydron pink FB, FF (single strength)-----	55, 428
Algol brown B (single strength)-----	55, 081
Helindone pink B, R, RN (single strength)-----	47, 771
Indanthrene green B (single strength)-----	40, 420

Color-lake and Spirit-soluble dyes

These dyes constitute one of the smaller groups. The color lake dyes are used in the preparation of a class of pigments known as color lakes, discussed in detail under that heading.

The spirit-soluble dyes are insoluble in water, but dissolve in either oils, fats, or various organic solvents; they consequently find application for coloring varnishes (both spirit and oil), fats, oils, waxes, and similar products. As many of the spirit-soluble dyes are converted by chemical treatment, such as sulphonation, into water-soluble dyes for use in textile dyeing, they may be considered as partly completed dyes.

The output of lake and spirit-soluble dyes in 1923 was 1,171,854 pounds, or 1.25 per cent of the total dye production. Of these, 57 per cent were lake dyes and 43 per cent spirit-soluble dyes. In 1922 the output was 1,009,512 pounds. Imports of this group in 1923 amounted to 23,213 pounds, or 0.75 per cent of the total imports of coal-tar dyes.

Food Dyes

Dyes classified under this group include a limited number of selected dyes which meet the specifications of the Bureau of Chemistry, Department of Agriculture. There are also included the figures for a highly refined grade of methyl violet, used for marking meats and certain other food products. The total production of food dyes in 1923 was 230,343 pounds, with sales of 228,686 pounds, valued at \$860,077. Production in 1922 was 186,600 pounds, and in 1921, the first year in which they were separately compiled, 50,709 pounds. The average value of the sales was \$3.76 per pound in 1923, \$3.82 in 1922, and \$5.80 in 1921.

DYES EXPORTED FROM THE UNITED STATES

Large increase in 1923.—The total exports of “color lakes” and “other colors, dyes, and stains” in 1923 amounted to 17,924,200 pounds, valued at \$5,565,267. This is slightly more than double the quantity exported in 1922 and a 40 per cent increase by value.

Prior to 1922 the Department of Commerce reported only the value of exports of domestic dyes and dyestuffs, using the following groups: (1) Aniline dyes, (2) logwood extracts, (3) all other dyes and dyestuffs. The third classification covers both coal-tar dyes and natural dyes, other than logwood extract. Since logwood extract is by far the most important natural dye exported from the United States it is reasonable to assume that a large part of the figures returned for all other dyes and dyestuffs covers coal-tar dyes. The most important natural dye included in Group 3 is derived from the bark of the black oak (*Quercus velutina*) in two forms, viz., quercitron and flavine. These were exported in considerable amounts during the war and in smaller amounts previously. In 1922 the Department of Commerce adopted a new classification, grouping coal-tar dyes under (1) color lakes and (2) other colors, dyes, and stains. For the first time the quantity as well as the value of the exports was published. Table 11 shows by months the total exports of dyes from the United States from 1919 to April, 1924, inclusive.

The countries to which dyes are exported are shown in detail in Part VI, Appendix.

The combined value of exports of “aniline dyes” and “all other dyes” was \$15,728,499 in 1919, compared with \$29,823,591 for 1920, the highest in the history of the industry. This was during a year of world-wide business activity, prior to the reappearance of German dyes in international trade.

Exports of “color lakes” in 1922 were 28,228 pounds, with a value of \$19,928, and the total exports of “other colors, dyes, and stains” were 8,315,959 pounds, with a value of \$3,976,515, making a total of 8,344,187 pounds and a value of \$3,996,443. The total export of “coal-tar colors, dyes, and stains” for 1923, as reported in the Monthly Summary of Foreign Commerce, was 17,924,200 pounds, with a value of \$5,565,267. No exports of color lakes were reported in that year. In January, 1924, exports of “other colors, dyes, and stains” were 1,432,721 pounds, valued at \$494,666, and for the month of February 1,739,400 pounds, valued at \$571,776. The large increase in exports of dyes in 1923, compared with 1922, was largely due to the effect of the occupation of the Ruhr by the French in 1923, as a result of which German production was greatly reduced and the export trade of that country in dyes and chemicals was severely affected. The monthly production of the German dye plants increased rapidly in the later months of 1923 and in the early months of 1924, indicating that interference with Germany’s dye production had practically disappeared. In fact, there have been, in 1924, unceasing efforts by German manufacturers in the Far East and other large dye markets to recapture those lost markets by the initiation of a price-cutting campaign.

TABLE 11.—Domestic exports of dyes, by months, 1919–1924 (four months)

Month	1919			1920		
	Aniline dyes	All other dyes ¹	Total	Aniline dyes	All other dyes ¹	Total
January.....	\$1,405,017	\$755,382	\$2,160,399	\$917,574	\$372,468	\$1,290,042
February.....	1,231,355	617,050	1,848,405	1,850,662	379,825	2,230,487
March.....	492,291	278,591	770,882	2,648,615	850,695	3,499,310
April.....	777,123	359,512	1,136,635	1,829,771	891,467	2,721,238
May.....	585,970	239,744	825,714	2,180,606	817,713	2,998,319
June.....	858,661	475,571	1,334,232	2,389,515	1,239,191	3,628,706
July.....	574,274	267,425	841,699	1,770,780	947,411	2,718,191
August.....	761,009	350,491	1,111,500	1,151,196	623,181	1,774,377
September.....	785,497	557,005	1,342,502	2,114,915	551,113	2,666,028
October.....	1,037,708	453,390	1,491,098	1,802,142	334,167	2,136,309
November.....	887,710	300,041	1,187,751	2,006,534	211,465	2,217,999
December.....	1,327,456	350,226	1,677,682	1,788,170	154,415	1,942,585
Total.....	10,724,071	5,004,428	15,728,499	22,450,480	7,373,111	29,823,591

Month	1921		
	Aniline dyes	All other dyes ¹	Total
January.....	\$943,595	\$349,114	\$1,292,709
February.....	397,123	72,641	469,764
March.....	574,969	95,322	670,291
April.....	305,760	59,250	365,010
May.....	278,331	91,753	370,084
June.....	444,273	81,477	525,750
July.....	310,357	65,626	375,983
August.....	513,012	70,663	583,675
September.....	322,477	70,228	392,705
October.....	349,981	73,706	423,687
November.....	372,244	78,703	450,947
December.....	254,878	94,656	349,534
Total.....	5,067,000	1,203,139	6,270,139

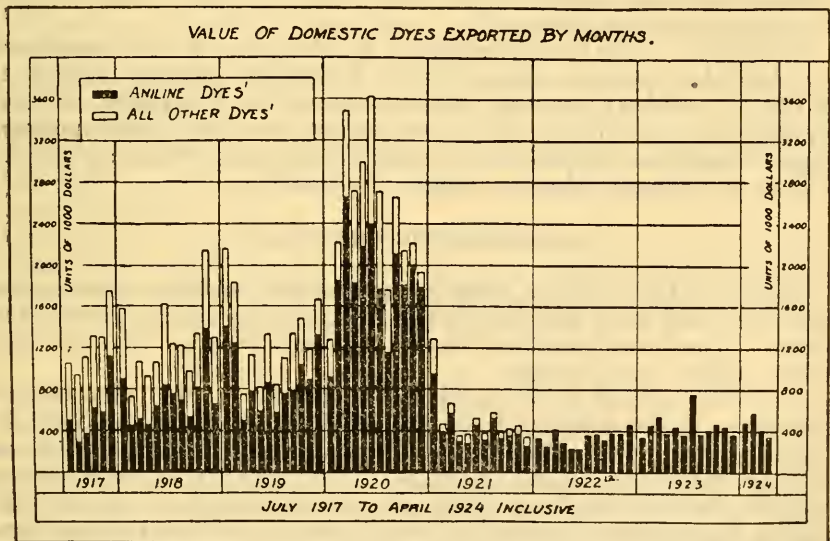
Month	1922					
	Color lakes		Other colors, etc.		Total	
	Pounds	Value	Pounds	Value	Pounds	Value
January.....	5,059	\$4,188	364,971	\$325,048	370,030	\$329,236
February.....	6,796	5,124	298,364	230,544	305,160	235,668
March.....	3,612	3,162	708,792	405,250	712,404	408,412
April.....	8,446	2,105	581,367	271,571	589,813	273,676
May.....	401	500	328,733	227,898	329,134	228,398
June.....	282	361	398,975	222,370	399,257	222,731
July.....	356	249	726,624	364,737	726,980	364,986
August.....	593	411	896,701	383,692	897,294	384,103
September.....	341	607	664,348	304,022	664,689	304,629
October.....	576	890	954,922	399,439	955,498	400,329
November.....	1,702	2,228	1,084,890	395,579	1,086,592	397,807
December.....	64	103	1,307,272	446,365	1,307,336	446,468
Total.....	28,228	19,928	8,315,959	3,976,515	8,344,187	3,996,443

¹ Commerce and Navigation reports under domestic exports of "dyes and dyestuffs"—"aniline dyes," "logwood extract," and "all other dyes and dyestuffs." Under this last-named designation may be included both natural and coal-tar dyes. However, since logwood extract—shown separately—is the most important natural dye exported from the United States, it may be assumed that a considerable portion of the exports under "all other dyes and dyestuffs" are coal-tar dyes.

TABLE 11.—Domestic exports of dyes, by months, 1919–1924 (four months)—Continued

Month	1923		Month	1923	
	Other colors, dyes, and stains			Other colors, dyes, and stains	
	Pounds	Value		Pounds	Value
January	821,847	\$332,008	August	1,008,878	\$388,815
February	1,338,395	443,505	September	1,514,228	402,751
March	1,606,168	513,129	October	1,543,869	474,215
April	1,690,402	498,421	November	1,390,927	433,892
May	1,830,068	539,358	December	1,261,631	377,684
June	1,002,256	383,321	Total	17,924,200	5,565,267
July	2,915,531	778,168			

Month	1924		Month	1924	
	Other colors, dyes, and stains			Other colors, dyes, and stains	
	Pounds	Value		Pounds	Value
January	1,432,721	\$494,666	March	1,244,264	\$408,029
February	1,739,400	571,776	April	1,014,824	344,605



¹The domestic exports of dyes, as shown by the Commerce Department, are divided into 3 groups—(1) aniline dyes, (2) logwood extract, and (3) all other dyestuffs.

The third classification may include both natural dyes (other than logwood extracts, shown separately) as well as coal-tar dyes. Since logwood extract, however, is the most important natural dye exported from the United States, it is reasonable to assume that a considerable portion of "all other dyes and dyestuffs" represents coal-tar dyes.

In 1922, however, the Commerce Department adopted a new classification. Coal-tar dyes were grouped under coal-tar finished products and were divided into (1) color lakes and (2) other colors, dyes and stains.

OTHER FINISHED COAL-TAR PRODUCTS

COLOR LAKES

Description.—A color lake is an insoluble color pigment consisting of a precipitating agent, the coloring matter (a coal-tar dye), and a carrier (the base). The desired properties of a color lake are good coloring power, easy workability, brightness, and fastness to weather, light, alkali, and acids. The precipitating agents used for coal-tar colors include barium chloride, lead salts, aluminium hydroxide, and tannin or tannin tartar-emetic. Among the more important carriers are aluminium hydroxide, zinc white, lithopone, barytes, whitening, China clay and certain native clays, and ocher. The principal requirements of a carrier are (1) ready reduction to a finely divided state and (2) absence of any deleterious effect on the shade of the finished lake. The coloring matter includes those coal-tar dyes known as acid dyes, basic dyes, and mordant dyes, as well as certain azo dyes produced directly on the carrier. An example of the latter is the preparation of Para red from the intermediates p-nitroaniline and b-naphthol. Another group of color lakes is made by the precipitation of a water-soluble acid dye, with the aid of the mineral salt to form an insoluble product.

After precipitation the soluble lake is filtered, dried, and ground with or without oil; it is then ready for use as a pigment in paints, lithographic inks, artists' colors, wall paper, rubber products, and for similar coloring purposes.

Production.—The total production of color lakes in 1923 amounted to 13,079,115 pounds, and sales to 12,627,359 pounds valued at \$5,124,732, with an average value per pound of 40.6 cents. This is an increase over 1922, when the output was 10,578,664 pounds. Sales in that year amounted to 10,366,676 pounds, valued at \$4,551,572, or an average value per pound of 44 cents.

PHOTOGRAPHIC CHEMICALS

Owing to their strong reducing properties, coal-tar chemicals of this class are used for developing photographic films, plates, and prints. They are popularly known as "developers," and are sold under various trade names.

The total output of photographic chemicals in 1923 was 343,289 pounds, a slight decrease from the 1922 figure of 345,798 pounds. Sales for 1923 were 321,083 pounds, valued at \$443,697, with an average value per pound of \$1.38. The quantity of each photographic chemical made in 1923 can not be published without disclosing the output of individual manufacturers. The developer produced in largest quantity was hydroquinol, followed by p-hydroxyphenylglycine. The 1923 production of the latter shows a large increase, while that of metol (methyl-p-aminophenol sulphate) shows a decrease.

MEDICINALS

Description.—From the standpoint of national welfare this class of coal-tar derivatives is of high importance. Chemically, it includes a variety of products used for a diversity of purposes. The develop-

ment of medicinals constitutes one of the most creditable accomplishments of the coal-tar industry, as the highest technical skill is required in their manufacture.

Production.—The total production of medicinals in 1923 was 3,273,085 pounds; sales were 2,995,448 pounds, valued at \$4,720,253, an average price of \$1.58 per pound. Production in 1922 was 2,946,347 pounds, with sales of 3,092,915 pounds valued at \$4,233,443.

Arsphenamine, known also as salvarsan and as "606," the hydrochloride of 3-diamino-4-dihydroxy-1-arsenobenzene, used for combating syphilis and other protozoan infections, is one of the most important medicinals of this group. Its production by 7 manufacturers in 1923 was 616 pounds; sales were 576 pounds, valued at \$173,381, or \$301.01 per pound, as compared with 917 pounds, valued at \$257,022—\$280.28 per pound—in 1922. Nearsphenamine (3-diamino-4-dihydroxy-1-arsenobenzene methanol sulphoxylate) had a total production, by 6 manufacturers, of 3,365 pounds. Total sales were 3,035 pounds, valued at \$1,029,121, an average price of \$339.08 per pound.

Aspirin (acetylsalicylic acid) led all coal-tar medicinals in quantity produced with an output, by 4 firms, of 1,525,795 pounds, compared with 1,482,998 pounds in 1922. Sales in 1923 were 1,337,998 pounds, valued at \$1,088,977. This shows an increase in the price per pound from 74 cents in 1922 to 81.3 cents in 1923. Acetanilide, of which 564,498 pounds were produced by 4 firms, ranked second in quantity manufactured; total sales were 520,390 pounds, valued at \$156,111, or 30 cents per pound. This shows a large increase in production over 1922, when 222,517 pounds were recorded.

Sodium salicylate, of which 416,382 pounds were produced, ranked third, with sales of 410,840 pounds, valued at \$165,759. Phenol sulphonates (calcium, sodium, zinc, etc.), with a production of 208,902 pounds, ranked fifth. Other medicinals showing a relatively large production were phenolphthalein, salol, acetphenetidin, chloramine T, and cincophen.

Some of the medicinals reported in 1923 but not in 1922 are: sulphoarsphenamine, with a production by 4 firms of 164 pounds; peralga (1-diethylbarbituric-2-amidopyrene) and dihydroxy-dihydroxy-mercury benzophenone sodium sulphionate.

FLAVORS AND PERFUME MATERIALS

Description.—There is no sharp line of demarcation between these two classes of coal-tar chemicals, many of them being used both as flavors and perfumes; a separate classification is, therefore, in certain cases arbitrary. They serve as perfume materials for soaps and other toilet articles, and for other similar products, and as flavors for food and food products.

Production.—The total production of flavors in 1923 was 1,458,024 pounds; sales amounted to 1,442,387 pounds, valued at \$1,780,313. In 1922, production amounted to 1,215,668 pounds.

Some of these products show a large increase in production, notably saccharin, used as a sugar substitute, and methyl salicylate, used largely as an artificial wintergreen flavor. The total 1923 production of methyl salicylate was 967,505 pounds.

The output of perfume materials in 1923 was 1,365,449 pounds, this being a large increase over 1922, when 793,148 pounds were

produced. Sales of these products in 1923 totaled 1,275,432 pounds, valued at \$789,431.

Diethylphthalate ranked first in quantity of production and value of sales. The production in 1923 was 1,250,280 pounds; sales were 1,170,939 pounds, valued at \$592,039. Production in 1922 was 725,984 pounds. Diethylphthalate is used under a special formula as an ethyl alcohol denaturant. The production of benzyl benzoate for 1923 was 29,185 pounds, an increase over that of 1922. Two other benzyl compounds showing increases in production for 1923 are benzyl alcohol and benzyl acetate, with a production of 12,080 and 21,937 pounds respectively.

Other products of this group made in quantity are amyl salicylate, diphenyl oxide, benzylidene acetone, methyl anthranilate, and phenyl acetic acid. The production of phenyl ethyl alcohol shows a large increase over the 1922 figure, but the quantity produced is still far below the domestic consumption. Production of phenylacetic aldehyde and cinnamyl alcohol is also below the domestic demand; artificial musks are not reported at all, although large quantities are imported.

Among products reported in 1923 but not in 1922 were benzyl propionate, para cresyl acetate, para cresyl phenyl acetate, dibenzyl ketone, ethyl fumarate, and phenyl glycol acetate.

SYNTHETIC PHENOLIC RESINS

The manufacture of synthetic resins is distinctly an American development and has resulted only from the most careful research and engineering skill. These were first made by the condensation of phenol with formaldehyde and ammonia and later with hexamethylenetetramine, but in recent years para-cumarone, as well as cresol, has been used as a base. Synthetic resins are used as a substitute for amber in the manufacture of pipe stems, cigarette holders, and similar articles. There is also a large consumption for electric insulating materials and for varnishes and lacquers. The consumption for radio equipment has shown a rapid increase. With a total production for 1922 of 5,944,133 pounds, sales were 6,415,931 pounds, valued at \$4,315,196. Production for 1923 shows an increase, but figures cannot be published without disclosing the operations of individual concerns.

SYNTHETIC TANNING MATERIALS

The synthetic tanning materials known as "syntans" are of very recent development, having come into commercial use in Germany and England since 1912. They give considerable promise for use in the tanning of leather in conjunction with natural tanning extracts.

Synthetic tans are made by condensation of certain coal-tar derivatives, such as the sulphonated phenols, cresols, and naphthols, with formaldehyde in the presence of an acid. They are commonly used in conjunction with the natural tanning extracts. Their use is reported to result in (1) an economy of the time required for tanning, (2) a satisfactory leather of light color, and (3) a reduction in the amount of natural extract required.

The total production in 1922 was 1,910,519 pounds, with sales amounting to 1,981,588 pounds, valued at \$103,598. Production for 1923 shows an increase.

The combined production of synthetic phenolic resins and synthetic tanning materials in 1923 was 9,763,685 pounds, with sales amounting to 10,068,431 pounds and valued at \$5,816,590.

STATISTICS OF PRODUCTION

TABLE 12.—Production and sales of dyes and other finished coal-tar products, 1923

[The number in the first column identifies the dyes according to the 1914 edition of the Schultz tables. The second column gives the common name of the product. The numbers in the third column refer to the numbered alphabetical list of manufacturers printed on page 195. An X signifies that a manufacturer did not consent to the publication of his identification number in connection therewith. A blank in the fourth and fifth columns indicates that the sales figures can not be published without revealing information in regard to the output of individual firms. A blank in the seventh column indicates that the production of the corresponding dye in the United States can not be published without revealing information in regard to the output of individual firms. The figures thus concealed are, however, included in the total.]

Schultz No.	Common name	Manufacturers' identification number according to list on p. 195	Sales			Production Pounds
			Quantity	Value	Average price per pound	
	Total finished coal-tar products.		Pounds 115,297,586	\$65,898,177	\$0.57	Pounds 122,950,171
	NITROSO DYES					
4	Naphthol green	6, 64				
	NITRO DYES					
7	Naphthol yellow S	32, 91, 96, 184	47,578	45,135	.95	44,508
8	Pigment chlorine	190				
	STILBENE DYES					
9	Direct yellow R	6, 7, 32, 39, 70, 80, 131, 137, 146, 147.	506,785	412,343	.81	569,910
10	Stilbene yellow	63, 70, 80				
11	Chloramine orange G	6, 7, 70, 80, 131, 137	144,421	175,494	1.22	147,422
	PYRAZOLONE DYES					
19	Fast light yellow	7, 63, 88, 131, 133, 151.				112,752
22	Xylene yellow	39, 151				
23	Tartrazine	27, 88, 131, 151, 183, 184, 205.	712,329	618,163	.87	735,608
29	Eriochrome red B	63, 133				
	AZO DYES					
	MONOAZO DYES					
32	Butter yellow	7, 32, 45, 91, 137, X	96,191	48,259	.50	101,249
33	Chrysoidine Y	6, 7, 12, 27, 32, 45, 63, 88, 91, 131.	569,596	332,768	.58	545,836
34	Chrysoidine R	6, 12, 32, 45, 63, 64, 88, 91, 131.	167,524	95,767	.57	152,370
35	Sudan G	45				
36	Sudan I	32, 91, 131, 137, X	32,115	27,899	.87	36,668
37	Croceine orange	6, 39, 107, 131	38,819	22,521	.58	
38	Orange G	27, 32, 63, 131, 167	123,950	73,178	.59	119,639
40	Chromotrope 2R	131, 133, 137, X	10,736	13,238	1.23	29,444
41	Fast acid fuchsine B	7, 32, 36, 46, 131, 137	20,879	13,474	.65	22,082
42	Amino naphthol red G	6, 7, 32, 39, 63, 80, 88, 131, 146.	145,149	102,913	.71	159,889
45	Brilliant lake red R	121				
48	Alizarin yellow G	7, 27, 39, 46, 63, 88, 131, 140, X, X, X.	348,043	182,499	.52	395,361
56	Paranitraniline red	X				
57	Chromotrope 2B	137				
58	Alizarin yellow R	6, 7, 27, 39, 46, 63, 88, 137, 167, X, X.	175,417	106,387	.61	168,777
61	Victoria violet	6, 39, 80, 131, 137, 146, X.	136,155	142,766	1.05	172,925
64	Lanafuchsine	137, 167				
65	Azo coralline	80, 88				

TABLE 12.—Production and sales of dyes and other finished coal-tar products, 1923—Continued

Schultz No.	Common name	Manufacturers' identification number according to list on p. 195	Sales			Production
			Quantity	Value	Average price per pound	
AZO DYES—Continued						
MONOAZO DYES—continued						
			<i>Pounds</i>			<i>Pounds</i>
66	Amino naphthol red 6B.....	6, 7, 32, 63, 80, 88, 131, 137.	112, 915	\$88, 402	\$0. 78	126, 503
67	Chromotrope 6B.....	131, 137, 146.....	97, 299	78, 336	. 81	108, 408
68	Spirit yellow R.....	32, 45, 131, X.....	46, 735	44, 298	. 95	43, 926
72	Pigment orange R.....	190.....				
73	Helio fast red.....	X.....				
76	Sudan II.....	7, 32, 45, 63, 91, 131.....	41, 915	44, 768	1. 07	43, 817
82	Ponceau 2R.....	6, 7, 27, 32, 39, 63, 131, 137, 167.	419, 573	241, 334	. 58	342, 140
88	Acid anthracene brown R.....	63.....				
89	Metachrome brown B.....	6, 27, 63, 131, X.....	323, 871	223, 353	. 69	308, 559
93	Sudan R.....	137.....				
94	Azo eosine C.....	137.....				
102	Diamond flavine G.....	25, 88, 133, X.....	14, 890	12, 021	. 81	26, 003
105	Sudan brown.....	7.....				
106	Autol red RLP.....	32.....				
112	Bordeaux B.....	6, 7, 27, 32, 39, 45, 88, 131, 137, 167.	215, 552	156, 208	. 73	223, 714
114	Chromotrope 10B.....	7, 137.....				
117	Erica 2 GN.....	70, 147.....				
119	Diamine rose.....	19, 70, 131, 147.....				
121	Erica B.....	70, 137.....				
134	Metanil yellow.....	7, 39, 63, 64, 88, 91, 131.	412, 255	330, 349	. 80	405, 563
137	Acid yellow G.....	7, 63, 64, 131.....	4, 453	3, 875	. 87	4, 614
139	Orange IV.....	184.....				
141	Azo yellow.....	7, 32, 63, 64, 88, 131, 184.	137, 892	145, 779	1. 06	138, 012
143	Tropaeoline.....	91.....				
144	Orange I.....	32.....				
145	Orange II.....	6, 7, 27, 32, 39, 45, 63, 91, 131, 135, 146, 167.	1, 442, 413	526, 736	. 37	1, 617, 668
147	Azo fuchsine 6B.....	63.....				
151	Orange R.....	7, 63, 91, 131.....	77, 157	32, 436	. 42	88, 781
152	Permanent red 4B.....	39, 63, 121.....	48, 233	126, 039	2. 61	68, 435
153	Lake red C.....	121, 167, 170.....	143, 932	196, 583	1. 37	160, 791
154	Palatine chrome brown.....	25, 46, 107, 131, 133.....	35, 411	38, 581	1. 09	38, 254
155	Acid alizarin garnet R.....	6, 25, 131.....				
156	Palatine chrome violet.....	25, 63, 88, 131, 133.....	7, 801	8, 502	1. 09	4, 289
157	Diamond black PV.....	88, 131.....				
158	Chrome brown RR.....	46.....				
159	Acid alizarin black R.....	25.....				
160	Fast brown N.....	88.....				
161	Fast red A.....	7, 27, 32, 39, 63, 91, 131, 137, 140, 167.	221, 263	171, 915	. 78	225, 461
163	Azo rubine.....	6, 7, 32, 39, 45, 63, 88, 107, 131, 137.	518, 908	440, 008	. 85	526, 596
164	Fast red VR.....	6, 39, 131, 133, 137.....	155, 405	197, 888	1. 27	205, 646
166	Fast red E.....	6.....				
167	Croceine scarlet 3 BX.....	39.....				
168	Amaranth.....	32, 39, 63, 131, 137, 167.	50, 863	36, 263	. 71	45, 246
169	Cochineal red.....	27, 32, 63, 131, 167.....				
173	Lithol red R.....	28, 39, 66, 167, 170, 190, X.....	273, 570	315, 614	1. 15	265, 787
177	Mordant yellow.....	6, 39, 131.....	60, 728	39, 208	. 65	38, 722
178	Crumpsall yellow.....	131.....				
179	Lake bordeaux B.....	190.....				
180	Eriochrome blueblack B.....	39, 96, 107, 131, 133.....				
181	Salicine black U.....	6, 7, 19, 25, 32, 39, 45, 63, 88, 131, 133, 137, 167, X.....	1, 290, 536	686, 266	. 53	1, 242, 283
183	Eriochrome black T.....	25, 39, 63, 96, 133.....				
184	Eriochrome black A.....	39, 63, 88, 131, 133.....	118, 143	92, 374	. 78	162, 962
186	Lanaeal violet B.....	63.....				
188	Sulphon acid blue R.....	6, 39, 63, 88, 131, 133.....	282, 023	240, 261	. 85	362, 736
189	Sulphon acid blue B.....	131.....				
190	Alkali brown.....	147.....				
193	Stanley red.....	147.....				
194	Thiazine red R.....	70, 137.....				
195	Rosophenine SG.....	70, 147, X.....	11, 869	21, 636	1. 82	13, 715

TABLE 12.—Production and sales of dyes and other finished coal-tar products, 1923—Continued

Schultz No.	Common name	Manufacturers' identification number according to list on p. 195	Sales			Production
			Quantity	Value	Average price per pound	
	AZO DYES—(Continued)					
	MONOAZO DYES—continued					
			<i>Pounds</i>			<i>Pounds</i>
197	Thiazine red G.....	80, 88, 147.....	1,076	\$1,575	\$1.46	
198	Mimosa C.....	19, 137, 147.....	706	1,234	1.75	2,183
200	Lake red D.....	190.....				
202	Palatine chrome red B.....	7, 32, 39, 63, 131, 137, 190, X.....	91,816	90,677	.99	106,833
	DISAZO DYES					
209	Terra cotta F.....	88.....				
211	Resorcin brown.....	6, 7, 63, 80, 91, 131, 140, 146, X, X.....	160,944	128,076	.80	169,340
213	Fast brown.....	7, 32, 131, X.....				25,116
217	Agalma black 10B.....	6, 7, 25, 32, 39, 46, 63, 88, 107, 131, 137, 140, 146, 167, X.....	2,377,290	1,694,148	.71	2,568,458
220	Palatine black.....	39.....				
221	Anthracene acid brown.....	63.....				
223	Sudan III.....	32.....				
227	Brilliant croceine.....	32, 63, 88, 131, 167.....				
228	Ponceau 5R.....	32.....				
229	Azo acid violet.....	64.....				
230	Cloth red 3G.....	63.....				
232	Sudan IV.....	7, 32, 39, 45, 91, 131, 137, X.....	37,253	34,576	.93	41,421
233	Cloth red B.....	7, 88.....				
234	Cloth red G.....	39, 64.....				
236	Wool red B.....	6, 39, 64, 131, 133.....	45,183	52,551	1.16	51,845
241	Neutral gray G.....	137.....				
246	Cloth scarlet G.....	64, 91.....				
247	Scarlet EC.....	7, 64, 131, 133.....	33,701	44,781	1.33	54,730
250	Milling orange G.....	64, 133.....				
257	Sulphoneyanine G.....	6, 63, 88, 131, 133.....	426,779	388,284	.91	481,141
261	Buffalo black 10B.....	6, 131, 133.....	28,657	26,600	.93	23,325
264	Fast sulphon black F.....	25, 88.....				
265	Sulphoneyanine black.....	63, 88, 131.....				
266	Naphthylamine black D.....	6, 63, 88, 137.....	11,673	10,026	.86	
270	Brilliant Croceine 9B.....	32.....				
274	Diaminogen.....	63.....				
275	Diamond black.....	6, 52, 63, 107, 131.....	176,662	152,800	.87	
276	Diamond green.....	6, 63, 88.....	13,184	14,748	1.12	12,122
279	Benzo fast scarlet.....	63, 131, 137.....				
283	Bismarck brown.....	7, 12, 32, 52, 63, 70, 88, 91, 131.....	200,677	120,457	.60	177,419
284	Bismarck brown 2R.....	6, 7, 12, 32, 39, 45, 52, 63, 64, 88, 91, 131, X.....	698,317	405,241	.58	672,544
288	Palatine chrome black.....	133.....				
289	Acid alizarin black SN.....	133.....				
294	Fast mordant yellow.....	6.....				
296	Benzo fast yellow.....	63.....				
297	Benzo fast pink 2BL.....	63.....				
303	Paper yellow.....	6, 7, 63, 131, 137.....	71,654	97,078	1.36	54,347
304	Chrysophenine G.....	7, 63, 70, 131, 137.....	413,494	423,892	1.03	447,963
307	Congo red.....	7, 63, 107, 131, 137, 140.....	504,068	297,725	.59	590,548
311	Orange TA.....	131.....				
312	Congo corinth G.....	6, 7, 32, 52, 88, 131, 137, 140.....	157,659	168,633	1.07	144,321
313	Congo rubine.....	39, X.....				
319	Diamine scarlet.....	63, 131, X.....	32,184	51,684	1.61	36,095
322	Trisulphon violet B.....	39, 131, 137.....	42,694	50,282	1.18	39,605
323	Dianil blue R.....	147.....				
327	Diamine violet N.....	7, 25, 32, 39, 63, 107, 131, 137, 140, X.....	41,269	57,477	1.39	41,177
328	Diamine black R O.....	7.....				
332	Benzo fast red.....	63.....				
333	Oxamine black BHN.....	6, 7, 25, 32, 39, 63, 107, 131, 137, 140, 146.....	866,800	634,140	.73	905,491
336	Benzo cyanine R.....	131.....				

TABLE 12.—Production and sales of dyes and other finished coal-tar products, 1923—Continued

Schultz No.	Common name	Manufacturers' identification number according to list on p. 195	Sales			Production
			Quantity	Value	Average price per pound	
	DISAZO DYES—continued					
337	Benzo blue 2B-----	6, 7, 25, 32, 39, 45, 46, 131, 137, 140, 146, X, X	Pounds 883,882	\$360,164	\$0.41	Pounds 1,065,539
340	Benzo orange R-----	39, 46, 63, 88, 137----	82,891	66,235	.80	96,484
341	Crumpsall direct fast red R.	X-----				
342	Chrysamine G-----	7, 39, 46, 63, 131, X----	19,184	21,996	1.15	27,455
343	Diamine fast red F-----	6, 7, 25, 32, 39, 63, 70, 107, 131, 137, 140	75,967	90,945	1.20	63,383
344	Diamine brown-----	6, 7, 25, 32, 39, 63, 70, 80, 107, 131, 137, 140	169,148	160,209	.95	127,868
349	Diamine brown B-----	140, X-----				
351	Cresotine yellow G-----	52, 131-----				
355	Anthracene red-----	137-----				
362	Oxydiamine orange-----	64, 131-----				
363	Benzopurpurine 4B-----	7, 32, 39, 63, 107, 131, 137.	413,250	368,923	.89	470,51
365	Benzopurpurine B-----	6, 52-----				
378	Trisulphon blue R-----	137-----				
382	Azo mauve B-----	131-----				
384	Chicago blue 2R-----	63-----				
385	Oxamine blue 4R-----	131-----				
386	Benzo blue BX-----	39, 131, 137-----	41,249	35,373	.86	35,216
391	Benzo blue 3B-----	7, 12, 32, 39, 45, 107, 131, 137.	174,141	94,072	.54	215,587
392	Toluylene orange G-----	131, 137-----				
393	Diphenyl brown 3 GN-----	45-----				
400	Acid anthracene red-----	X-----				
405	Benzopurpurine 10B-----	7, 63, 131, 137-----	25,964	43,280	1.67	33,837
410	Benazarine G-----	63, 131, 137-----				
415	Dianil blue G-----	137-----				
419	Chicago blue RW-----	7, 39, 63, 131, 137-----	95,427	143,970	1.51	111,517
421	Oxamine blue B-----	131-----				
424	Chicago blue 6B-----	7, 63, 131, 137-----				
426	Benзамine pure blue-----	6, 7, 39, 63, 131, 137, 146.	225,615	218,222	.97	221,905
	TRIAZO DYES					
436	Columbia black-----	6, 7, 39, 46, 63, 131-----	169,970	161,005	.95	177,185
441	Diazo blue black RS-----	131, 137-----				
442	Direct black V-----	137-----				
456	Benzo fast blue-----	63-----				
462	Direct deep black EW-----	6, 7, 32, 39, 46, 63, 131, 137, 140, X.	6,720,905	2,875,928	.43	6,957,581
463	Erie direct black RX-----	6, 7, 39, 46, 63, 131, 137.	349,659	180,559	.52	455,768
464	Erie direct green ET-----	7, 46, 52, 131-----	51,495	43,755	.85	37,040
470	Chloramine green B-----	137-----				
471	Chloramine blue 3G-----	137-----				
473	Diamine black HW-----	7, 140, 147-----	4,098	5,002	1.22	
474	Oxamine green B-----	6, 7, 32, 39, 52, 63, 70, 131, 137.	306,023	250,980	.82	312,511
475	Oxamine green G-----	6, 12, 32, 39, 63, 137, 140, X, X.	84,896	70,526	.83	99,869
476	Benзамine brown 3 GO-----	6, 7, 32, 39, 45, 52, 70, 88, 131, 133, 137, 140, X.	931,242	596,366	.64	999,554
477	Congo brown G-----	7, 63, 88, 131, 137, 147, X.	207,793	194,688	.94	245,198
480	Congo brown R-----	63-----				
	TETRAKISAZO DYES					
485	Benzo brown G-----	32, 52, 63, 171, 40-----	154,208	120,914	.78	138,437
487	Benzo brown B-----	70, 137-----				
	All other azo dyes-----		1,948,206	2,287,417	1.17	2,372,765
	Total azo dyes-----		30,292,072	21,597,247	.71	32,348,948
	DIPHENYLMETHANE DYES					
493	Auramine-----	63, 77, 106, 131-----	393,189	677,192	1.72	471,359

TABLE 12.—Production and sales of dyes and other finished coal-tar products, 1923—Continued

Schultz No.	Common name	Manufacturers' identification number according to list on p. 195	Sales			Production
			Quantity	Value	Average price per pound	
TRIPHENYLMETHANE DYES						
495	Malachite green.....	63, 106, 131.....	<i>Pounds</i> 178, 271	\$285, 585	\$1. 60	<i>Pounds</i> 183, 684
499	Brilliant green.....	106, 131.....				
502	Guinea green.....	36, 63, 131.....				
503	Brilliant milling green B.....	131.....				
505	Light green.....	63.....				
506	Erioglaucine.....	131.....				
511	Para fuchsine.....	131.....				
512	Magenta (or fuchsine).....	39, 55, 91, 98, 131, 157, X.....	75, 051	156, 081	2. 08	87, 717
513	New fuchsine O.....	131.....				
515	Methyl violet.....	32, 55, 63, 91, 104, 131, 135, X.....	563, 579	702, 515	1. 25	578, 183
516	Crystal violet.....	25, 63.....				
517	Methyl violet 5B.....	131.....				
521	Aniline blue.....	39, 91, 98.....				
524	Acid magenta.....	39, 98.....				
528	Fast violet 10B.....	36, 63, 137.....	21, 413	46, 063	2. 15	15, 541
530	Acid violet.....	36, 39, 63, 80, 131, 146.....	137, 887	255, 733	1. 86	148, 258
531	Eriocyanine.....	131.....				
536	Alkali blue.....	39, 55, 98, 131, 135, 157, 167, X.....	157, 877	377, 527	2. 39	154, 845
537	Methyl blue for silk.....	91.....				
538	Methyl blue for cotton.....	98.....				
539	Soluble blue.....	39, 55, 98, 131.....	10, 694	36, 907	3. 45	15, 366
543	Patent blue V.....	131.....				
545	Patent blue A.....	36, 131.....				
548	Acid violet 6 BN.....	63.....				
555	Aurine.....	63, 155.....				
558	Victoria blue R.....	63.....				
	Total triphenylmethane dyes.....		1, 539, 140	2, 677, 418	1. 74	1, 608, 653
DIPHENYL-NAPHTHYLMETHANE DYES						
559	Victoria blue B.....	25, 63.....				
562	Fast acid blue.....	63.....				
564	Naphthalene green V.....	131.....				
566	Wool green S.....	25, 63, 80, 88, 131, 146.....	382, 427	317, 370	. 83	375, 858
XANTHONE DYES						
571	Rhodamine 6G.....	63.....				
573	Rhodamine B.....	63.....				
580	Fast acid violet B.....	63.....				
582	Fast acid violet A 2R.....	63.....				
585	Uranine.....	7, 56, 91, 135.....	957	2, 978	3. 11	2, 398
587	Eosine.....	7, 56, 91, 135.....	100, 745	185, 814	1. 84	80, 648
590	Eosine BN.....	7.....				
592	Erythrosine B.....	7, 56, 63, 91, 135.....	8, 506	41, 973	4. 94	7, 250
593	Phloxine P.....	56.....				
596	Phloxine.....	63, 91.....				
597	Rose bengale B.....	63, 91.....				
599	Gallein.....	208.....				
600	Coerulein.....	208.....				
	Total xanthone dyes.....		267, 511	555, 071	2. 08	254, 639
ACRIDINE DYES						
606	Phosphine.....	63, 91, 131, 151.....	86, 500	166, 667	1. 93	122, 853
QUINOLINE DYES						
613	Quinoline yellow.....	26, 131, 137.....				
THIOBENZENYL DYES						
615	Thioflavine S.....	147.....				
616	Primuline.....	19, 70, 80, 131, 137, 147, X.....	224, 784	157, 912	. 70	227, 824
617	Columbia yellow.....	19, 70, 80, 131, 137, 147.....	215, 810	252, 347	1. 17	188, 595

TABLE 12.—Production and sales of dyes and other finished coal-tar products, 1923—Continued

Schultz No.	Common name	Manufacturers' identification number according to list on p. 195	Sales			Production
			Quantity	Value	Average price per pound	
	OXAZINE AND THIAZINE DYES					
			Pounds			Pounds
622	Delphine blue B.....	7, 46, 131.....				
626	Galocyanine.....	7, 27, 46, 131, 208.....	82, 512	\$159, 279	\$1. 93	52, 577
631	Chromocyanine V.....	7.....				
636	Prune pure.....	131.....				
649	Cotton blue or Meldola's blue.....	7, 46, 107, 131.....	56, 116	93, 787	1. 67	58, 307
659	Methylene blue.....	27, 46, 131, 204.....	410, 003	601, 118	1. 47	424, 174
660	Methylene green.....	131.....				
667	Brilliant alizarin blue.....	80, 88.....				
	AZINE DYES					
672	Azo carmine.....	63.....				
679	Safranine.....	63, 131, 155.....	126, 151	183, 365	1. 45	99, 414
681	New fast gray.....	27, 137.....				
683	Safranine MN.....	131.....				
687	Rosolane O.....	63.....				
697	Induline (spirit-soluble).....	19, 32, 39, 88, 91, 131.....	20, 929	19, 435	. 93	12, 086
698	Nigrosine (spirit-soluble).....	19, 27, 32, 88, 91, 131, 133.....	284, 235	148, 006	. 52	342, 739
699	Induline (soluble in water).....	19, 39, 88, 91, 131.....	89, 500	74, 130	. 83	113, 817
700	Nigrosine (soluble in water).....	19, 27, 88, 91, 131, 133.....	1, 374, 363	633, 742	. 46	1, 389, 106
	SULPHUR DYES					
720	Sulphur black.....	12, 46, 63, 88, 94, 107, 131.....	15, 212, 142	3, 017, 207	. 20	16, 276, 409
	Sulphur blue.....	12, 18, 46, 63, 88, 107, 131, 137, X, X, X.....	1, 213, 085	610, 171	. 50	1, 349, 864
	Sulphur brown.....	7, 12, 39, 46, 47, 56, 63, 88, 107, 131, 165, 173, 187, 206, X, X.....	2, 049, 475	806, 684	. 39	2, 203, 893
	Sulphur green.....	6, 12, 46, 63, 107, 131, 137, 165, 206.....	164, 344	140, 651	. 86	
	Sulphur maroon.....	6, 12, 46, 63, 107, 206.....	387, 158	297, 104	. 77	373, 899
	Sulphur olive.....	19, 46, 47, 63, 70, 88, 137, 173, 206.....	168, 356	85, 687	. 51	220, 093
	Sulphur orange.....	46, 88, 173, 206.....	47, 083	23, 107	. 49	
	Sulphur tan.....	6, 39, 47, 88, 165, 206, X.....	202, 824	97, 997	. 48	255, 877
	Sulphur yellow.....	12, 46, 63, 87, 88, 131, 137, 165, 173, X, X.....	561, 461	408, 771	. 73	670, 023
	Total sulphur dyes.....		20, 005, 928	5, 487, 379	. 27	21, 558, 469
	CARBAZOLE DYES					
748	Hydron blue R, G.....	63, 107.....				
	ANTHRAQUINONE DYES					
761	Indanthrene golden orange R.....	63.....				
763	Indanthrene dark blue BO.....	63, 122, 137.....	25, 130	50, 167	2. 00	
765	Indanthrene black and green B.....	63, 122, 137.....	20, 673	42, 505	2. 07	25, 001
767	Indanthrene violet RR.....	63.....				
768	Indanthrene violet B.....	63.....				
778	Alizarin.....	18, 131.....				
779	Alizarin orange.....	18, 131.....				
780	Alizarin red S.....	18.....				
782	Alizarin brown.....	46, 63, 65, 131, 184, 190, 208, X.....	134, 941	167, 294	1. 24	157, 416
784	Alizarin SX.....	131.....				
785	Alizarin GI.....	18, 137.....				
789	Anthracene blue WR.....	65, 84, 102, 131, 135.....	54, 505	117, 198	2. 15	44, 150
800	Anthracene blue.....	84.....				
838	Indanthrene blue RS.....	63, 137.....				
840	Indanthrene blue 3G.....	63.....				

TABLE 12.—Production and sales of dyes and other finished coal-tar products, 1923—Continued

Schultz No.	Common name	Manufacturers' identification number according to list on p. 195	Sales			Production Pounds
			Quantity	Value	Average price per pound	
ANTHRAQUINONE DYES—continued						
			<i>Pounds</i>			<i>Pounds</i>
842	Indanthrene blue GCD	63, 137				
843	Indanthrene blue GC	137				
849	Indanthrene yellow	63, 137				
858	Alizarin saphirol B	88, 102, 131	272, 471	\$952, 216	\$3. 50	309, 124
862	Alizarin blue black	36, 65				
865	Alizarin cyanine green	36				
867	Indanthrene brown B	137				
	Total anthraquinone dyes.		1, 952, 601	3, 438, 677	1. 76	2, 123, 966
INDIGO AND ITS DERIVATIVES						
874	Indigo, synthetic (20 per cent).	62, 63, 131	25, 492, 201	5, 884, 712	. 23	28, 347, 259
876	Indigo, white	46				
877	Indigo extract	7, 14, 63, 113, 131, X, X.	328, 440	190, 493	. 58	330, 810
880	Indigo RB	62				
881	Ciba blue 2B, 2BD	62				
882	Ciba blue G	62				
883	Indigo 6B	62				
ANILINE BLACK GROUP						
923	Ursol	82, 167, X				
FOOD DYES						
7	Naphthol yellow S	X				
23	Tartrazine	7, 27, 131, 198, X	53, 801	188, 608	3. 51	58, 117
83	Ponceau 3R	7, 131, X	17, 694	96, 068	5. 43	16, 098
144	Orange I	7, 27, 131, X	38, 739	116, 593	3. 01	
168	Amaranth	7, 27, 107, 131, 198, X.	89, 821	279, 847	3. 12	82, 450
502	Guinea green B	131, 198				
505	Light green SF (yellowish)	131, 198				
515	Methyl violet	131				
592	Erythrosine	7, 131, X				
877	Indigo disulfonic acid	7, 131, X				6, 498
	Yellow AB	7, 66, 91, 131, 175	7, 168	18, 852	2. 63	6, 523
	Yellow OB	7, 66, 91, 131, 175	9, 108	24, 682	2. 71	7, 586
	Total food dyes		228, 686	\$60, 077	3. 76	230, 343
PHOTOCHEMICAL DYES						
	Orthochrome T	68				
	Pinacyanole	68				
	All other dyes	63, 147				
	Bacteriological, biological stains and indicators, and research chemicals.	41, 54, 68, 86, 99, 111, 131, 154, 172, 179, X.				
	Total dyes		86, 567, 446	47, 223, 161	. 55	93, 667, 524

DYES NOT CLASSIFIED BY SCHULTZ NUMBER

Manufacturers were requested to report separately, in terms of their familiar pre-war designations, the production of dyes not classified by Schultz. The following table is a list of such dyes,

together with certain new dyes of American development for which there are no foreign equivalents:

Name of dye	Manu- facturers' identi- fication number according to list on page 195	Name of dye	Manu- facturers' identi- fication number according to list on page 195
Acid anthracene brown A, B, RH	88	Direct black GX	39
Acid anthracene orange GR	80	Direct blue 3RX	39
Acid anthracene yellow GR	80	Direct blue 4R	39
Acid chrome brown R	80	Direct brown R	140
Acid black BA	6	Direct brown GR, G2R, G3R	39
Acid brown	X	Direct dark brown B	80
Acid claret B	167	Direct dark green	6
Acid naphthol blue black	39	Direct fast blue B, R	39
Acid navy blue	140	Direct fast light blue FF	39
Acid red OTH	137	Direct fast orange R	39, 137
Acid yellow HM	91	Direct fast orange RCL, 2R	39
Alizarin black	208	Direct fast yellow 6GL extra	80
Alizarin black GS paste	65	Direct fast yellow 2R, 2RCL	39
Alizarin blue IS	208	Direct navy R	140
Alizarin brown 3R	167	Direct salmon red	X
Alizarin brown 5R	208	Direct violet B conc. extra	X
Alizarin green	X	Direct violet R conc	X
Alizarin serge blue GS	65	Dyelene chromate brown EBN	64
Alizarin yellow 4G	7	Empire coralline	X
Anthracene chrome black DNN	36	Empire fast violet AA	X
Anthranol chrome brown FB	133	Fast acid violet ERR extra	63
Anthranol chrome green 3G	133	Fast chrome brown R	137
Anthranol chrome yellow DF extra	133	Furol DB	X
Anthranol chrome yellow SS	133	Helio bordeaux BL	63
Anthrene blue GX	137	Hydron pink FF	63
Anthrene jade green	137	Indanthrene black BCS	137
Artificial silk black G	63	Indanthrene blue BCS, 20 per cent paste	63
Atlantamine blue	12	Indomine navy blue 2BM	133
Atlantamine green	12	Jet black APX	63
Atlantamine red	12	Marine blue SW	25
Atlantamine yellow	12	Midland vat cadet blue	62
Atlantole wood blue	12	Midland vat blue MB	62
Azo dark green	137	Naphthanol red for printing	137
Azo eosine 2B	137	Navy blue T	27
Azo fast violet 2R	131	Nerol black 2B	137
Azo violet BS, 2B	6	Oil brown I-2494	91
Azo wool blue G, R	80	Oil brown	X
Benzo black LM	133	Oil brown R	7, 45
Benzo chrome brown G, R, 2R	7	Oil brown H-8808	91
Benzo chrome dark brown	7	Oil orange	X
Benzo fast black L, LM ¹	6, 63, 80	Oil orange Y-293	91
Benzo fast orange S	63	Oil red	19, X
Benzo fast pink 2B	80	Oil red C, S	203
Benzo fast scarlet 4BA	63	Oil scarlet T	203
Benzo rhoduline red B	63	Oil yellow PHW, OB	91
Brilliant crocein FL	63	Oil soluble yellow	203
Bromo fluorescein	56, 135	Oxamine copper blue RRX	63
Chloramine fast orange GR, GG, G3G	80	Oxydiaminogen OB	131
Chrome black	27, 46	Pacco direct fast gray BL	X
Chrome black special	25	Palachrome maroon	X
Chrome black A, T, BC, RX	X	Palaside brown B	X
Chrome green	6	Paranol direct orange 9L	133
Chrome green B	39, 70	Permanent red R	190
Chrome green G	39	Pluto orange G	88
Chrome green SW	25, X	Pontachrome brown R, SW	63
Chrome green SE, SW	25	Pontachrome yellow SW	63
Chrome red SW	X	Pontamine diazo black H	63
Chrome yellow	6, 27, 137	Rosanthrene A, R	63
Chrome yellow SS	88	Rosanthrene orange	63
Cindiazo blue B	39	Scarlet 2RG	167
Copper blue 2RX	6	Silk black 4BF	39
Cotton brown R	6	Solamine blue FF	63, 137
Developed black 2BN, G	137	Sudan orange	203
Diamine bordeaux B	63, 131	Sudan AT, AX, T	32
Diamine catechine	63	Sulphon acid black N2	80
Diamine catechine 3G	131	Victoria fast violet 2R	88
Diamond green	80	Wool black B	137
Diamond red BHA	88	Wool blue black	39
Dianol dark blue B	63	Wool blue G	36
Diazo bordeaux 7B	63	Wool fast violet 2R	80
Diazo fast red 5BL	63	Zambesi black A	6
Diazo fast red 7BL	63	Zambesi black D	131
Diazo indigo blue M	63	Zambesi black PC	39
Diazo seal brown	X	Zambesi black V, VX ²	39, 63, 131, 137

¹ Sales of Benzo fast black LM and L are 102,872 pounds, valued at \$192,452.

² Sales of Zambesi black V and VX are 361,326 pounds valued at \$470,320 and the production was 452,352 pounds.

Production and sales of dyes and other coal-tar products, 1923

Common name	Manufacturers' identification number according to list on page 195	Sales			Production
		Quantity	Value	Unit value	
COLOR LAKES					
Black lakes.....	6, 37, 46, 50, 67, 92, 167, 168, 203, X.	<i>Pounds</i> 565,097	\$61,271	\$0.11	<i>Pounds</i> 587,344
Blue lakes.....	11, 22, 28, 37, 46, 59, 63, 67, 73, 90, 92, 100, 109, 112, 119, 162, 167, 168, 169, 170, 177, 188, 189, 190, X, X, X, X, X, X.	766,492	377,572	.49	770,751
Brown lakes.....	28, 37, 46, 59, 73, 100, 112, 168, 169, 177, 188, 189, 203, X.	222,950	20,502	.09	214,012
Eosine lakes.....	11, 22, 28, 59, 67, 73, 92, 100, 119, 162, 167, 168, 169, 170, 177, 188, 189, 190, 203, X, X, X, X, X, X, X, X, X, X.	486,864	335,093	.69	529,962
Green lakes.....	11, 22, 28, 37, 59, 63, 67, 73, 85, 90, 92, 100, 109, 119, 162, 167, 168, 169, 170, 177, 189, X, X, X, X, X, X, X, X.	626,403	181,481	.29	666,180
Lithol red lakes.....	11, 22, 28, 37, 46, 59, 63, 73, 90, 92, 100, 105, 112, 119, 162, 167, 168, 169, 170, 177, 188, 189, 190, 203, X, X, X, X, X, X.	706,479	495,101	.70	741,556
Maroon lakes.....	11, 22, 28, 37, 59, 63, 67, 92, 100, 105, 115, 116, 119, 123, 162, 167, 168, 169, 170, 177, 188, 189, 190, 199, 203, X, X, X, X.	1,229,610	392,308	.32	1,266,216
Orange lakes.....	11, 22, 28, 37, 59, 63, 67, 73, 92, 100, 109, 112, 119, 162, 167, 168, 169, 170, 177, 188, 189, 203, X, X, X, X, X, X, X, X.	585,292	150,548	.26	602,331
Para red lakes.....	11, 22, 28, 46, 50, 59, 63, 67, 92, 100, 105, 112, 115, 116, 119, 167, 168, 170, 177, 188, 189, 190, 199, 203, X, X, X, X, X, X, X.	3,196,651	1,018,090	.32	3,379,767
Red lakes.....	11, 22, 28, 37, 46, 50, 59, 63, 67, 73, 90, 92, 100, 105, 109, 112, 116, 119, 123, 162, 167, 168, 169, 170, 177, 188, 189, 190, 199, 203, X, X, X, X, X, X, X, X.	1,644,597	992,224	.60	1,689,027
Scarlet lakes.....	11, 22, 28, 37, 59, 63, 67, 73, 90, 92, 100, 105, 115, 116, 119, 123, 162, 167, 168, 169, 170, 177, 188, 190, 199, X, X, X, X, X, X, X, X.	1,047,206	393,442	.38	1,076,419
Violet lakes.....	11, 22, 28, 37, 46, 59, 63, 67, 73, 90, 92, 100, 109, 119, 162, 167, 168, 169, 170, 177, 188, 189, 190, 203, X, X, X, X, X, X, X, X.	387,176	378,876	.98	388,001

Production and sales of dyes and other coal-tar products—Continued

Common name	Manufacturers' identification number according to list on page 195	Sales			Production
		Quantity	Value	Unit value	
COLOR LAKES—continued					
Yellow lakes	11, 28, 37, 59, 63, 73, 92, 100, 109, 119, 167, 168, 169, 170, 177, 189, 203, X, X, X, X, X, X, X.	Pounds 1, 162, 542	\$328, 224	\$0. 28	Pounds 1, 167, 549
Total color lakes		12, 627, 359	5, 124, 732	. 41	13, 079, 115
PHOTOGRAPHIC CHEMICALS					
Diaminophenol hydrochloride.	202				
Hydroquinol	124, 208, X	214, 099	217, 706	1. 02	230, 079
Methyl p-aminophenol sulfate (Metol).	68, X				
p-Hydroxyphenylglycine	68				
Total photographic chemicals.		321, 083	443, 697	1. 38	343, 289
MEDICINALS					
Acetanilide	122, 124, 136, 153	520, 390	156, 111	. 30	564, 498
Acetphenetidin	X				
Acriflavine (3:6-diamino-10-methyl acridine chloride).	1, 131				
Acriflavine, neutral.	131				
Ammonium salicylate.	93				
Anesthesin. (See Benzocaine.)	X				
Apothesine (hydrochloride of diethylaminopropyl-cinnamate).	X				
Arsphenamine	1, 60, 108, 120, 126, 153, 174.	576	173, 381	301. 01	616
Aspirin (acetylsalicylic acid).	17, 62, 124, 128	1, 337, 998	1, 088, 977	. 81	1, 525, 795
Atophan. (See Cincophen.)					
Benzocaine or Anesthesin (Ethyl p-amino benzoate.)	1, 126, 166	2, 014	32, 219	16. 00	2, 243
Benzyl benzoate. (See Perfumes.)					
Benzyl succinate.	166, 175				
Bismuth betanaphthol.	124, 136, 153	1, 039	3, 403	3. 28	
Bismuth tribromophenol.	75, 124, 136				
Butyn (p-amino benzoyl-gamma di normal butyl amino propanol sulfate).	1				
Chloramine T (sodium p-toluene sulfochloramide).	108, X				
Cincophen (phenyl cinchoninic acid) (Atophan).	1, 5, 27	31, 911	299, 010	9. 37	32, 710
Creosote benzoate.	166				
Creosote carbonate.	63, 142				
Dibromohydroxy mercury fluorescein, sodium salt of.	99				
Dichloramine T (p-toluene sulfone dichloramide).	108, 128				
Dihydroxy-dihydroxy mercury benzophenone sodium sulfonate.	99				
Formidine (methylene disalicylic acid derivative).	X				
Guaiacol carbonate.	63				
Guaiacol crystals.	63, 137				
Guaiacol liquid.	63, 122, 142	5, 710	12, 591	2. 21	5, 793
Lithium benzoate.	122				
Luminal (phenylethyl barbituric acid and sodium salt).	17				
Magnesium salicylate.	93				
Methyl salicylate. (See Flavors.)					
Methylhydroxymethylester of salicylic acid.	17				
Monoglycol ester of salicylic acid.	17				
b-Naphthol benzoate.	75				

Production and sales of dyes and other coal-tar products—Continued

Common name	Manufacturers' identification number according to list on page 195	Sales			Production
		Quantity	Value	Unit value	
MEDICINALS—continued					
Neocinchophenamine.....	1, 60, 108, 126, 153, 174.	<i>Pounds</i> 3, 035	\$1, 029, 121	\$339. 08	<i>Pounds</i> 3, 365
Neocinchophen. (See Toly- sin.)	17.....				
Novaspirin (Methyleneeci- trilsalicylic acid).	5.....				
Peralga (1-diethylbarbarturic- 2-amidopyrene).	126.....				
Phenacaine (ethenyl-p-die- thoxy-diphenylamidine hy- drochloride).	150, X.....				
Phenolphthalein.....	1, 118, 124, 153.....	196, 173	61, 914	. 32	208, 902
Phenolsulfonates (calcium, sodium, zinc, etc.).	86.....				
Phenolsulfonephthalein.....	X.....				
Phenylthiocarbamide.....	1, 126.....				
Procaine (p-amino benzoyl- diethyl aminoethanol).	1, 131.....				
Proflavine (3:6 diamino acrid- ine sulfate).	X.....				
Proposote (creosote deriva- tive).	68.....				
Resorcinol monoacetate.....	27.....				
Salicaine (salicyl alcohol)	153.....				
Salicylates, miscellaneous	93, 124, 128.....	89, 206	71, 467	. 80	98, 597
Salol (phenyl salicylate)	17.....				
Salophen (Acetylparamino- phenol salicylate).	131.....				
Scarlet red.....	126.....				
Silver arsphenamine.....	62, 93, 124, 128, X.....	410, 840	165, 759	. 40	416, 382
Sodium salicylate.....	93.....				
Strontium salicylate.....	120, 126, 153, 174.....	119	65, 676	550. 97	164
Sulfoarsphenamine.....	1-27.....				
Tolysin- neocinchophen (p- methylphenyl-cinchoninic ethyl ester).	131.....				
Trypan blue.....					
Total medicinals.....		2, 995, 448	4, 720, 253	1. 58	3, 273, 085
FLAVORS					
Coumarin (synthetic).....	62, 75, 103, 128, X, X.....	104, 200	389, 799	3. 74	114, 682
Ethyl benzoate.....	44, 75, 79, 141, 178, 191, 194, X.....	1, 041	1, 611	1. 55	950
Ethyl cinnamate.....	75, 79, 103, 178, 194.....				
Ethyl salicylate.....	75, 79, 178, 191, 194, X.....				
Methyl cinnamate.....	75, 79, 103, 178, X, X.....	815	3, 725	4. 57	796
Methyl salicylate.....	62, 79, 93, 103, 124, 178, X, X.....	940, 795	544, 426	. 58	967, 505
Saccharin.....	93, X, X.....	363, 048	661, 913	1. 82	340, 944
Vanillin (<i>see</i> Part IV).....	X.....				
Total flavors.....		1, 442, 387	1, 780, 313	1. 23	1, 458, 024
PERFUME MATERIALS					
Acetophenone.....	75, 79, 103, 178, 192.....	238	855	3. 59	277
Amyl benzoate.....	79.....				
Amyl salicylate.....	75, 79, 93, 103, 129, 178, 192, X.....	11, 562	16, 569	1. 43	9, 217
Aubepine (Anisic aldehyde).....	75, 78, 103, 178, 192.....	2, 742	9, 566	3. 49	3, 045
Benzophenone.....	75.....				
Benzyl acetate.....	75, 79, 103, 129, 178, 192, X.....	21, 179	27, 635	1. 31	21, 937
Benzyl alcohol.....	103, 129, 178, 192, X.....	4, 101	4, 976	1. 21	12, 080
Benzyl benzoate.....	75, 79, 103, 124, 129, 178, 192.....	26, 372	37, 545	1. 42	29, 185
Benzyl butyrate.....	79, 103.....				
Benzyl cinnamate.....	75, 79, 103, 178, 192.....				
Benzyl formate.....	178, X.....				
Benzyl propionate.....	79, 178, X.....				
Benzyl salicylate.....	178.....				
Benzylidine acetone.....	129, 178.....				

Production and sales of dyes and other coal-tar products—Continued

Common name	Manufacturers' identification number according to list on page 195	Sales			Production
		Quantity	Value	Unit value	
PERFUME MATERIALS—CON.					
		<i>Pounds</i>			<i>Pounds</i>
Benzylphenyl acetate	178				
Bromstyrol	75, 79, 103, 178, 192	148	\$718	\$4.85	154
Butyl salicylate	79				
Cinnamic acid	79, 103, 178, 192				1,595
Cinnamic alcohol	178				
Cinnamic aldehyde	75, 78, 103, 178, 192	1,536	5,000	3.26	1,422
p-Cresyl acetate	75, 129				
p-Cresylphenyl acetate	75				
Dibenzyl ketone	75				
Diethyl phthalate	20, 75, 79, 103, 129, 178, 191, 192, X, X.	1,170,939	592,039	.51	1,250,280
Dimethyl acetophenone	178				
Dimethyl anthranilate	75, 178				
Dimethylbenzyl carbinol	75				
Dimethyl hydroquinone	75				
Dimethyl resorcinol	178				
Diphenylmethane	79, 178, 192				393
Diphenyloxide	178, X				
Ethyl fumarate	191				
Ethylphenyl acetate	178				
Ethylphenyl ether	79				
Hydratropic aldehyde	178				
Indol	75				
Isobutyl anthranilate	75				
Isobutyl indol	75				
Isobutylphenyl acetate	75, 129				
Isobutyl salicylate	178				
Methyl acetophenone	178				
Methyl anisate	178				
Methyl anthranilate	20, 62, 75, 103, 178, 186, 192	1,564	5,247	3.36	2,554
Methyl benzoate	44, 75, 79, 141, 178, X.	172	254	1.48	24
p-Methylbenzyl acetate	75				
p-Methylbenzyl anthranilate	75				
Methyl p-cresol	178				
Methyl p-cresyl ether	79				
Methyl guaiacol	178				
Methylphenyl acetate	75, 79, 103, 129, 178, 192, X.	1,014	5,120	5.05	1,285
Methylphenyl ether	79				
Methylphenyl glycidate	75				
Methyl-p-tolyl ketone	75				
b-Naphthyl anthranilate	75				
Nerolin (b-naphthol ethyl ether)	75, 79, 178				
Nonyl anthranilate	75				
Phenylacetic acid	79				
Phenylacetic aldehyde	75, 103, 178, 192	453	4,615	10.19	457
Phenylethyl acetate	75, 103, 178, 194				
Phenylethyl alcohol	62, 75, 103, 178, 192, X.	799	5,167	6.47	1,238
Phenylethyl benzoate	178				
Phenylethyl formate	178				
Phenylethyl phenyl acetate	178				
Phenylethyl propionate	178				
Phenylglycol acetate	75				
Phenylpropyl alcohol	194				
Phenylvinylethylenemethyl ketone	178				
Santalylphenyl acetate	75				
Skatol (methyl indol)	75, 178				
Sodium cinnamate	79				
Tetrahydroparamethyl quinoline	75				
Yara yara (b-naphthol methyl ether)	79, 178				
All other perfumes	X				
Total perfumes		1,275,432	789,431	.62	1,365,449
Synthetic tanning materials	107, 207, X	10,068,431	5,816,590	.58	9,763,685
Synthetic phenolic resins	16, X				

EMPLOYEES AND RATES OF PAY

The number of employees receiving specified rates of pay on December 18, 1923, or on the nearest representative date for which this information could be obtained, as reported by 181 of the 206 firms manufacturing coal-tar products in 1923, is contained in Table 13. The 25 firms not reporting either conducted a business in which coal-tar products were not the primary articles of manufacture or they did not have separately organized departments dealing therewith.

According to the Bureau of the Census, the number of firms engaged in the manufacture of coal-tar colors and other products in 1914 was 7, with 528 employees, divided as follows: Salaried employees, 130; wage earners (average number), 398. In 1923 there were 181 firms reporting 14,841 employees. This represents a decrease of 1,418 from 1922, which in turn is an increase of 2,967 over 1921.

The chemists and technically trained men in 1923 constituted 12.7 per cent of all employees, as compared with 10.8 per cent in 1922. Of the 1,882 men of this class in 1923, 28.27 per cent received \$50 or more but under \$75 per week, 23.32 per cent received \$75 per week and over, 9.83 per cent received \$45 or more but under \$50 per week. Of those without technical training, 21.99 per cent received \$30 but under \$35 per week, 19.97 per cent received \$25 but under \$30, 16.39 per cent received \$35 but under \$40, 15.58 per cent received \$20 but under \$25. In general, the wages of 1923 for chemists and technically trained men showed a small decrease from those of 1922, while for all men without technical training there was a large increase during the same period. Table 13 compares specified rates of pay of technically trained men with those of men not having such training. Among the technically trained men there was an increase of 0.51 per cent in the pay of the group receiving \$75 per week and over and a small decrease in the groups receiving \$35 to \$40, \$40 to \$45, \$45 to \$50, and \$50 to \$75. Of men without technical training there was an average increase of about 25 per cent in the weekly wages of the three classes receiving \$25 to \$30, \$30 to \$35, and \$35 to \$40 per week.

As previously stated, the dye and coal-tar chemical industry has probably a larger proportion of technically trained men than will be found in any other manufacturing industry in the United States.

TABLE 13.—Employees and rates of pay, dye and coal-tar chemical industry, 1923

Wages per week	Number of employees at each specified wage engaged in manufacturing operations			Percentage receiving each specified wage		Percentage receiving each specified wage or more	
	Chemists and technically trained men	Men without technical training	All employees	Chemists and technically trained men	Men without technical training	Chemists and technically trained men	Men without technical training
Under \$10.....	2	74	76	0.11	0.57	100.00	100.00
\$10 but under \$15.....	16	348	364	0.85	2.69	99.89	99.43
\$15 but under \$20.....	37	773	810	1.97	5.96	99.04	96.74
\$20 but under \$25.....	74	2,018	2,092	3.93	15.58	97.07	90.78
\$25 but under \$30.....	110	2,583	2,698	5.84	19.97	93.14	75.20
\$30 but under \$35.....	173	2,850	3,023	9.19	21.99	87.30	55.23
\$35 but under \$40.....	178	2,123	2,301	9.46	16.39	78.11	33.24
\$40 but under \$45.....	136	1,108	1,244	7.23	8.55	68.65	16.85
\$45 but under \$50.....	185	643	828	9.83	4.96	61.42	8.30
\$50 but under \$75.....	532	414	946	28.27	3.19	51.59	3.34
\$75 and over.....	439	20	459	23.32	0.15	23.32	0.15
Total.....	1,882	12,959	14,841	100.00	100.00		

TABLE 13.—*Employees and rates of pay, dye and coal-tar chemical industry, 1923—Continued*

Wages per week	Percentage receiving each specified wage					
	Chemists and technically trained men			Men without technical training		
	1923	1922	Increased percentage	1923	1922	Increased percentage
Under \$10.....	100.00	100.00	-----	100.00	100.00	-----
\$10 but under \$15.....	99.89	99.83	0.06	99.43	99.33	0.10
\$15 but under \$20.....	99.04	99.06	1.05	96.74	95.92	.82
\$20 but under \$25.....	97.07	97.10	1.03	90.78	75.89	14.89
\$25 but under \$30.....	93.14	92.94	.20	75.20	46.73	28.47
\$30 but under \$35.....	87.30	84.22	3.08	55.23	24.60	30.63
\$35 but under \$40.....	78.11	78.41	1.30	33.24	11.62	21.62
\$40 but under \$45.....	68.65	71.86	¹ 3.21	16.85	5.61	11.24
\$45 but under \$50.....	61.42	62.01	1.59	8.30	2.29	6.01
\$50 but under \$75.....	51.59	52.74	¹ 1.15	3.34	.96	2.38
\$75 and over.....	23.32	22.81	.51	0.15	.06	.09

¹ Decrease.

RESEARCH WORK

Of the 206 firms engaged in 1923 in the manufacture of dyes and other coal-tar chemicals, 65 had separately organized research laboratories for the solution of technical problems and for the development or discovery of new products. The total cost of the research work carried on in these laboratories, together with that done in laboratories not separately organized for research, was \$2,085,901. This figure is about the same as the amount (\$2,172,508), expended in 1922 for this purpose. For the first time the Tariff Commission's census of 1923 has obtained not only the total cost of the research work carried on by the companies, but the net cost of that work chargeable to coal-tar products alone, amounting in 1923 to \$1,900,281. The cited figures are doubtless an understatement of the real cost of experimental work, since they do not include, in all cases, the cost of research forming a part of manufacturing operations and not charged against research on the books of the companies.

The value of the finished coal-tar products produced in 1923 was about \$65,000,000, not including crudes or intermediates. The foregoing figures give some indication of the large expenditure for research work considered necessary if the industry is to be self-contained and kept on a stable, efficient basis of operation. The coal-tar chemical industry must not only keep in view, as in the past, the development of products already known but must always be alert to the discovery of new products if it is to maintain a competitive position in the world's markets.

PART III

DYES IMPORTED FOR CONSUMPTION IN THE
UNITED STATES, 1923 .

1829

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PART III

DYES IMPORTED FOR CONSUMPTION IN THE UNITED STATES, 1923

INTRODUCTORY

Since 1919 the United States Tariff Commission has compiled a detailed census of dye imports similar to that published by the Department of Commerce under the title "Artificial Dyestuffs used in the United States (fiscal year 1913 and 1914)," commonly known as the "Norton import census."

The commission first compiled such statistics for use in the administration of section 501, title 5, of the tariff act of September 8, 1916, which made the continuance of specific duties on coal-tar products, after September 8, 1921, dependent upon the production in the United States of as much as 60 per cent in value of the consumption of these products. As the information was found to be of direct value to manufacturers, consumers, and importers, as well as to the commission itself, in considering the tariff aspects of the coal-tar chemical industry, the annual census of imports has been continued.

Through cooperation with the Treasury Department the invoices covering dye importations through the various ports of the United States, with the exception of New York, have been sent to the commission for tabulation. In the year 1923, the monthly import statistics for the port of New York were compiled and published under a cooperative arrangement between the respective Chemical Divisions of the Department of Commerce and the Tariff Commission. In obtaining the final 1923 figures shown in this report, the monthly data previously available for the port of New York were rechecked and the statistics for the warehouse withdrawals completed for that year. Data were also obtained for imports through ports other than New York.

In tabulating the statistics the commission has followed in the main the "Schultz Farbstoff Tabellen," which are based upon the chemical composition of the dye. Certain types were also identified according to the "Colour Index" issued by the British Society of Dyers and Colourists, the Norton census, and other sources of information in the files of the Tariff Commission. Dyes identified by Norton as "a, b, and c" classes under a given Schultz number are listed under that number (without subdivision) except in a few instances in which they had been incorrectly designated. Dyes included under these "a, b, and c" classes are not always chemically identical with the original Schultz types. Such dyes as could not be identified by Schultz numbers are classified by the ordinary method of application, as follows; Acid, basic, direct, lake and spirit-soluble,

mordant and chrome, sulphur, and vat.¹ In many cases the classification of a dye by its method of application is arbitrary, as certain colors may be applied by either of two methods. A few dyes could not be classified either by the Schultz tables or by the method of application, and are therefore listed under the heading "Unclassified and unidentified dyes."

The rate of exchange used in converting foreign invoice values to United States currency was either the rate given on the invoice or, in comparatively few cases, the exchange value published by the Treasury Department for the month in which consular certification occurred.

SUMMARY OF IMPORTS OF DYES IN 1923

The total imports of coal-tar dyes during the year 1923 were 3,098,193 pounds, valued at \$3,151,363, as compared with 3,982,631 pounds, valued at \$5,243,257, for 1922.

Of the total imports in 1923, 47 per cent came from Germany, 28 per cent from Switzerland, 12 per cent from Italy, 6 per cent from France, 4 per cent from England, and 3 per cent from other countries.

Table 16 shows the quantity and the value (when publishable) of individual dyes imported in 1923. Table 14 is a summary of dyes imported from 1920 to 1923, inclusive, classified according to their method of application. Table 15 gives the quantity of each of the leading dyes imported in 1923, compared with corresponding imports for the years 1922, 1921, and 1914.

Swiss dyes.—The coal-tar dyes imported into this country from Europe fall largely into two groups, (1) dyes shipped directly from foreign factories, chiefly German and Swiss products, and (2) reparation dyes delivered by Germany in payment to the Allies and subsequently resold and shipped to the United States and other countries. In addition, there is a small percentage of dye imports originating with jobbers in the different foreign countries. Swiss dyes constitute 28 per cent, or 867,494 pounds, of total imports during 1923.

The prominent position maintained in the United States by Swiss dyes calls for a brief review of Switzerland's export trade. In 1913 the total quantity of Swiss dyes exported was 19,458,902 pounds, valued at \$5,549,752; in 1920, the year of maximum export, 23,739,794 pounds, valued at \$35,411,115, were exported.

Prior to the war the value of Swiss exports of dyes was slightly more than 10 per cent of the total value of Germany's dye exports. The proportion of Swiss exports to Germany at that time is significant, averaging approximately one-fifth of the total. Since the war, however, exports of Swiss dyes to Germany have been small.

From a broad economic viewpoint the Swiss dye industry is not self-contained or economically independent, on account of lack of coal and coke and their products, as well as other raw materials. Prior to the war many of its essential raw materials were imported from Germany. Since the war the situation has been materially changed, raw materials having become available from Great Britain, France, the United States, Czechoslovakia, and, more recently, again from Germany. Dye producers in Switzerland to-day enjoy an open competitive market wherein to purchase their raw materials.

¹ In nearly every case vat dyes have been reduced to a single strength.

In 1922 domestic imports of dyes were larger than in 1923, totaling for the former year 3,982,631 pounds, with an invoice value of \$5,243,257. Of these, Swiss dyes constitute 39 per cent by quantity and 41 per cent by value. Most of the remainder were of German manufacture. In 1923 Swiss dyes, amounting to about one-half of the above quantity, represented 28 per cent of the total imports. Notwithstanding this decrease, the Swiss dye manufacturers secured a much greater share of the domestic import trade than would have been anticipated from the size of the Swiss industry, as compared with that of Germany. The recent increases reported in the selling prices of German dyes should favor increased exports of Swiss dyes. The reduction in the ad valorem duty on September 22, 1924, from 60 to 45 per cent will also tend to increase domestic imports of the higher-cost special types, such as are manufactured by the Swiss industry.

The prominence of Swiss dyes in the domestic market is not entirely a recent development, as the United States received about one-fifth of the total Swiss exports in 1914.

During the period of licensed control of dye imports under the Trading With the Enemy Act and up to the passage of the Dye and Chemical Control Act on May 27, 1921, licenses were refused for the importation of competitive types of enemy origin, but were granted for competitive types of nonenemy origin. This resulted in an extensive use of Swiss dyes in many of the textile mills of this country. Buyers consequently became well acquainted with Swiss products, and their use continued to a considerable extent even after the German dyes were placed on equal terms with respect to import facilities.

The Swiss have an excellent variety of dyes, consisting mainly of those of relatively high cost and special type, for which the demand is comparatively small. Indigo, however, is an important bulk color produced in Switzerland. An efficient manufacturing and distributing organization and the advantage of long experience favor the development of the Swiss industry.

An examination by class of application of the 66 leading dyes imported into the United States in 1923 shows that 23 of them were wholly or largely of Swiss manufacture. These include both competitive and noncompetitive products, as regards American manufacturers. The leading Swiss dyes imported in 1923 are as follows:

- | | |
|---|---|
| <p>Acid:
 Xylene light yellow.
 Erioglaucine.
 Eriocyanine.
 Polar red.
 Polar yellow.</p> <p>Mordant and chrome:
 Gallamine blue.
 Alizarin light blue B.
 Omega chrome brown.
 Erio chrome flavine A.</p> <p>Direct:
 Trisulphon browns.
 Diazamine blue.
 Diphenyl brown BN.
 Chlorantine fast brown.
 Chlorantine fast orange.</p> | <p>Vat:
 Ciba violet B.
 Ciba scarlet.
 Ciba bordeaux B.</p> <p>Basic:
 Phosphine.
 Rhodamine B.
 Rhodamine 6G.</p> <p>Sulphur:
 Eclipse brown.
 Thional brown G.
 Pyrogene blue.
 Thional yellow.</p> |
|---|---|

Dyes imported from Italy.—In addition to the imports of dyes originating in plants of foreign manufacturers, a significant portion of domestic imports was made up of German reparation dyes resold by the countries receiving them and purchased by American importers. In 1923, 12 per cent, by quantity, of total domestic imports of dyes came from Italy, and examination of the individual imports shows that they include the faster and special types, apparently of German origin. They furthermore include many types, such as the anthraquinone vat dyes, which are not produced in Italy. It may be assumed, therefore, that these dyes were delivered to Italy in payment for reparation and later resold to consumers in the United States and other countries. Official Italian statistics of imports for 1922 show that 1,634,270 pounds of German reparation dyes were received in that year and 2,156,760 pounds in the first nine months of 1923.

From the 50 per cent stocks of dyes² on hand in the German plants as of August 15, 1919, (totaling 10,353,057 kilos, or 22,824,349 pounds), subject to the Reparation Commission's option, 5,200 tons were withdrawn for immediate delivery. Of these Italy received 700 tons, the United States and Great Britain each 1,500 tons, France 1,000 tons, and Belgium 500 tons. The remainder of the stock was distributed on the basis of the pre-war consumption, taking into account new conditions and home production. In this way Italy received 7 per cent of the Indanthrene blue GCD compared with the United States 55 per cent, and 13 per cent of the other vat dyes, as against 39 per cent for the United States. The total dye deliveries from the stocks on hand to the allied and associated Governments were 9,889,650 kilos (21,802,722 pounds).

During the period of United States participation the option for the delivery of 25 per cent of the German daily production gave no GCD blue to Italy and only 9 per cent of the other vat dyes, while the United States received 60 per cent of GCD blue and 42 per cent of other vats.

After the cessation of deliveries to the United States, the percentages accorded to Italy, France, and Belgium showed a conspicuous increase of GCD blue; Italy received 25 per cent, and of other vat dyes Italy and France each received 20 per cent, Belgium 10 per cent, and Great Britain 50 per cent.

According to the report of the Reparation Commission, Italy had received up to December 31, 1923, 6,274,601 kilos (13,832,985 pounds) of all dyes out of a total delivery by Germany of 25,583,390 kilos (56,401,142 pounds). Italy ranked second to Great Britain, the latter receiving 7,664,993 kilos (16,898,244 pounds) of all dyes. These reparation figures are of interest in any consideration of the possible imports of reparation dyes from Italy and France in 1924, especially in view of the renewed deliveries of the I. G. to the different allied countries.

²"Report on the Works of the Reparation Commission from 1920-1922, printed and published by His Majesty's Stationery Offices."

IMPORT STATISTICS.

TABLE 14.—Summary of dyes imported for consumption, classified by method of application, 1920-1923.

Class	1923		1922	
	Pounds	Per cent of total	Pounds	Per cent of total
Acid.....	544,048	17.56	601,395	15.10
Vat:				
(a) Indigo.....			505	.01
(b) Vat (other than indigo).....	1,207,554	38.98	1,548,519	38.89
Total.....	1,207,554	38.98	1,549,024	38.90
Mordant and chrome:				
(a) Alizarin.....	27,716	.89	27,086	.68
(b) Mordant and chrome.....	425,699	13.74	689,704	17.32
Total.....	453,415	14.63	716,790	18.00
Direct.....	527,014	17.01	671,621	16.86
Sulphur.....	114,023	3.68	194,883	4.89
Basic.....	210,896	6.81	155,084	3.89
Spirit-soluble and color-lake.....	23,213	.75	76,853	1.93
Unidentified, unclassified special.....	18,030	.58	16,981	.43
Total.....	3,098,193	100.00	3,982,631	100.00

Class	1921		1920	
	Pounds	Per cent of total	Pounds	Per cent of total
Acid.....	1,455,823	34.24	733,405	21.55
Vat:				
(a) Indigo.....	70,975	1.66	171,101	5.04
(b) Vat (other than indigo).....	1,045,370	24.59	761,363	22.37
Total.....	1,116,345	26.25	932,464	27.41
Mordant and chrome:				
(a) Alizarin.....	136,283	3.58	73,252	2.16
(b) Mordant and chrome.....	559,678	12.78	636,230	18.71
Total.....	695,961	16.36	709,482	20.87
Direct.....	537,664	12.64	571,581	16.80
Sulphur.....	220,938	5.20	229,140	6.73
Basic.....	163,527	3.84	192,163	5.64
Spirit-soluble and color-lake.....	43,553	1.02	17,527	.51
Unidentified, unclassified special.....	19,100	.45	16,820	.49
Total.....	4,252,911	100.00	3,402,582	100.00

TABLE 15.—*Dyes of each class according to method of application, imported in largest quantity during the calendar year 1923, compared with imports in 1922, 1921, and fiscal year 1914*

Schultz No.	Class and name of dye	1923	1922	1921	1914
ACID DYES					
		<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
543	Patent blue.....	66,279	49,136	42,708	196,228
	Alizarin rubinol 3G, 5G, GW, R.....	48,826	26,457	(1)	10,917
22	Xylene light yellow.....	46,886	12,937	60,422	23,074
506	Erioglucine.....	38,254	25,852	16,004	66,526
220	Palatine black.....	33,500	11,436	14,850	299,274
546	Cyanol.....	19,979	20,658	14,271	40,015
531	Eriocyanine.....	19,202	14,808	16,808	25,091
523	Fast green.....	17,190	52,498	22,619	14,347
265	Sulphonycyanine black.....	15,543	14,858	615	69,590
	Polar red 3B, G. R. RS.....	15,031	14,926	2,579	2,821
	Polar yellow, 2G, 5G.....	13,453	2,998	-----	782
564	Naphthalene green.....	13,328	19,298	23,926	22,144
545	Patent blue A.....	11,872	3,436	16,170	63,744
503	Neptune green.....	8,825	1,661	7,462	40,868
	Brilliant milling blue.....	8,540	872	2,175	9,966
VAT DYES					
849	Indanthrene yellow (single strength).....	87,946	15,507	49,609	12,683
761	Indanthrene golden orange R (single strength).....	79,717	78,145	56,390	50,496
842	Indanthrene blue GCD (single strength).....	70,546	16,802	201,835	478,980
760	Indanthrene golden orange G (single strength).....	67,265	73,305	33,423	20,092
901	Ciba violet B (single strength).....	64,517	131,661	21,987	20,836
	Hydron pink FB, FF (single strength).....	55,428	20,250	-----	-----
869	Algol brown B (single strength).....	55,081	16,778	6,640	1,596
	Helindone pink B, R, RN (single strength).....	47,771	40,668	-----	-----
765	Indanthrene green B (single strength).....	40,420	57,344	6,932	72,251
838	Indanthrene blue RS (single strength).....	38,235	39,999	28,908	187,379
907	Ciba scarlet (single strength).....	37,524	33,246	10,695	22,265
919	Ciba bordeaux B (single strength).....	35,714	33,621	4,625	899
840	Indanthrene blue 3G (single strength).....	31,748	24,992	19,715	6,120
759	Anthraflavone G (single strength).....	27,721	20,594	10,594	7,143
819	Algol red FF, R (single strength).....	25,228	14,825	14,489	2,322
MORDANT AND CHROME DYES					
862	Alizarin blue black.....	70,917	22,277	43,277	54,706
637	Gallamine blue.....	29,244	29,237	15,179	2,756
778	Alizarin (synthetic).....	27,716	27,086	136,283	202,392
858	Alizarin saphirol B.....	26,615	46,596	28,606	77,148
780	Alizarin red.....	25,017	25,872	15,565	81,929
854	Alizarin viridine.....	17,217	25,910	9,499	-----
865	Alizarin direct green G.....	16,241	11,669	36,534	2,000
782	Alizarin brown.....	14,531	4,596	20,700	114,586
	Acid alizarin gray G.....	13,526	7,555	2,818	-----
785	Alizarin GL, RG.....	12,528	6,500	18,266	49,021
856	Alizarin astrol.....	11,224	8,155	24,657	-----
	Omega chrome brown G, PB.....	11,511	8,570	5,486	-----
	Eriochrome flavine A.....	10,713	12,293	110	-----
774	Alizarin black.....	10,521	7,343	26,524	200,743
779	Alizarin orange.....	8,444	15,523	5,854	14,239
DIRECT DYES					
273	Diaminogene blue.....	88,778	22,420	19,182	8,308
274	Diaminogene B.....	32,903	8,527	7,864	313,629
449	Trisulphon brown B.....	26,980	45,697	38,558	16,781
358	Diphenyl red.....	21,160	33,945	4,036	14,305
	Diamine fast orange EG, ER, R.....	17,793	8,719	6,261	17,387
348	Diphenyl brown BN.....	17,534	2,598	-----	13,471
456	Benzo fast blue.....	17,036	6,997	3,768	100,495
457	Trisulphon brown GG.....	16,150	37,648	22,872	7,562
392	Toluylene orange.....	14,382	36,920	523	67,032
	Chlorantine fast brown 3GL, RL.....	13,558	7,715	4,589	-----
	Zambesi black D, V.....	13,000	3,000	1,752	629,359
207	Diphenyl fast brown GNC.....	10,126	9,797	969	992
319	Diamine scarlet.....	9,950	14,137	12,399	41,175
	Diazo pure blue B, 3G, 3GL.....	9,026	14,067	6,892	6,370
SULPHUR DYES					
	Thionol brown.....	28,802	48,750	20,632	-----
	Cross dye green B.....	26,242	27,834	51,074	100
	Eclipse brown.....	10,000	35,991	21,248	4,393
747	Thional brown G.....	9,228	-----	-----	110
726	Pyrogene blue.....	8,929	24,251	11,718	10,934
	Thional yellow.....	7,306	-----	17,704	-----

¹ Included in Schultz No. 856.² Figures for Indanthrene black included.³ Figures incomplete⁴ Figures from Department of Commerce.

TABLE 15.—Dyes of each class according to method of application, imported in largest quantity during the calendar year 1923, compared with imports in 1922, 1921, and fiscal year 1914—Continued

Schultz No.	Class and name of dye	1923	1922	1921	1914
	BASIC DYES				
		<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
606	Phosphine.....	42,176	51,711	21,325	168,225
571	Rhodamine 6G.....	31,242	13,545	10,069	37,515
573	Rhodamine B.....	29,083	5,077	10,890	59,354
618	Thioflavine T.....	20,283	6,765	7,297	35,224
608	Euchrysrine.....	9,483	3,476	872	15,403
603	Acridine orange.....	9,349	711	1,613	2,336
663	New methylene blue.....	6,343	2,060	4,329	30,392
661	Thionine blue.....	6,129	2,746	421	18,618
500	Setopaline.....	5,853	2,824	-----	923

KEY TO ABBREVIATIONS USED IN TABLE 16

1. THE SIX LEADING GERMAN COMPANIES

- A Actien-Gesellschaft für Anilin-Fabrikation, Berlin. Founded 1873.
- B Badische Anilin- und -Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.
- By Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862.
- C Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.
- K Kalle & Co., A. G., Biebrich on the Rhine. Founded 1870.
- M Farbwerke, vormals Meister Lucius & Brüning, Höchst-on-the-Main. Founded 1862.

2. THE SMALLER GERMAN COMPANIES

- BK Leipziger Anilinfabrik Beyer & Kegel, Fürstenberg, near Leipzig. Founded 1882.
- CG Chemikalienwerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1881.
- CJ Carl Jäger G. m. b. H., Anilinfarbenfabrik, Düsseldorf. Founded 1823.
- GrE Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.
- L Farbwerk Mühlheim, vormals A. Leonhardt & Co., Mühlheim-on-the-Main. Founded 1879.
- tM Chemische Fabriken, formals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.
- WD Wülfig, Dahl & Co., A. G., Barmen. Founded 1842.
- A-S Co... Arzberger & Schöpff & Co., Eisenach.

3. DUTCH, BELGIAN, AND FRENCH COMPANIES

- FA Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888.
- NF Niederländische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.
- LG Lazard Godchaux, of Brussels. (These products are probably compounded largely from the dyes made by A. Wiescher & Co., of Haeren, Belgium.)
- P Société Anonyme des Matières colorantes et produits chimiques St. Denis (formerly A. Poirrier), St. Denis, near Paris, France. Founded 1830.

4. SWISS COMPANIES, ALL AT BASEL

- DH Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.
- G Anilinfarben-und-Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.
- I Gesellschaft für chemische Industrie. Founded 1885.
- S Chemische Fabrik, vormals Sandoz & Co. Founded 1887.

5. ENGLISH COMPANIES

Bro.----- Brotherton and Co. (Ltd.), City Chambers, Leeds.
 B. A. C.--- British Alizarine Co. (Ltd.), Manchester.
 B. D.----- British Dyestuffs Corporation (Ltd.), London.
 Cl. Co.--- The Clayton Aniline Co. (Ltd.), Clayton, Manchester.
 C. V.----- The Colne Vale Dye and Chemical Co. (Ltd.), Milnsbridge, Huddersfield.
 Hol.----- L. B. Holliday and Co. (Ltd.), Huddersfield.
 Scot.----- Scottish Dyes (Ltd.), Grangemouth.

TABLE 16.—*Dyes imported into the United States, 1923*

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
	Total		Pounds 3,098,193	\$3,151,363
6	Martius yellow.....		400	
	Aniline yellow.....	B		
9	Direct yellow.....		2,102	
	Sun yellow G.....	S		
11	Chloramine orange.....		55	
	Chloramine orange G.....	By		
14	Diphenyl chrysoine.....		4,409	
	Diphenyl chrysoine GC.....	G		
19	Fast light yellow.....		6,211	8,510
	Fast light yellow.....	WD		
	Fast light yellow 2G.....	By		
	Fast light yellow 2G.....	WD		
	Fast light yellow 3G.....	By		
	Fast light yellow 3G.....	WD		
	Fast light yellow R.....	WD		
21	Pigment chrome yellow.....		100	
	Pigment chrome yellow L paste.....	M		
22	Xylene light yellow.....		46,886	37,860
	Xylene light yellow 2G conc. 75 per cent.....	S		
	Xylene light yellow 2G conc. 100 per cent.....	S		
	Xylene light yellow R conc.....	S		
25	Dianil yellow 3G.....	M	100	
28	Hansa yellow G—.....			
	Hansa yellow G paste.....	M	4,081	
	Hansa yellow G pdr.....	M	1,900	
34	Chrysoidine R.....		55	
	Chrysoidine RL.....	B		
38	Orange G.....		254	
	Orange 2G.....	C		
	Orange 2G.....	WD		
48	Alizarin yellow G.....		1,589	429
	Alizarin yellow 2G.....	M		
	Alizarin yellow 2G.....	I		
	Alizarin yellow 5G.....	I		
	Alizarin yellow GD.....	S		
56	Autol red.....		994	
	Nitrosamine red paste.....	B		
58	Alizarin yellow R.....		75	
	Alizarin yellow R paste.....	I		
	Ultra orange R.....	S		
61	Victoria violet.....		350	
	Azo wool blue SE.....	C		
	Victoria violet 4BS conc.....	S		
63	Azo acid blue.....		210	
	Azo acid blue B conc.....	S		
65	Azo coralline.....		4	
	Azo coralline L.....	WD		
73	Helio fast red.....		551	
	Sitara fast red RL.....	tM		
74	Tannin orange R.....		400	
	Tannin orange R pdr.....	C		
81	Brilliant cochineal.....		101	
	Palatine scarlet A.....	B		
84	Azo chromine.....		55	
	Azo chromine NR paste.....	G		
88	Acid anthracene brown.....		7,810	7,723
	Acid anthracene brown PG.....	By		
	Acid anthracene brown R.....	By		
	Acid anthracene brown RH.....	By		
93	Sudan R.....		25	
	Pigment purple A pdr.....	M		

TABLE 16.—Dyes imported into the United States, 1923—Continued

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
			<i>Pounds</i>	
100	Eosamine B.....	A	7,501	
117	Erica 2GN.....	A	260	
118	Geranine.....		447	
	Geranine G.....	By		
	Brilliant geranine B.....	By		
119	Diamine rose.....		400	
	Diamine rose GD.....	C		
121	Erica B.....		3,298	\$5,866
	Cotton pink B extra.....	Q		
	Cotton pink BN.....	B		
	Erica B extra.....	A		
122	Erica G.....		345	
	Cotton pink GN.....	B		
124	Diazine green.....		10	
	Janus green B.....	M		
125	Diazine black.....		80	
	Black JD.....	B		
	Janus black I.....	M		
126	Indoine blue R.....		10	
	Naphthindone BB.....	C		
129	Chromazone red.....		1,323	
	Chromazone red, new conc.....	G		
140	Curcumeine.....		5,991	5,843
	Chromocitronine R.....	DH		
	Chromocitronine 3R.....	DH		
	Chromocitronine V.....	DH		
	Jasmine, highly conc.....	G		
141	Azo yellow.....		100	
	Indian yellow FF.....	C		
152	Permanent red 4B.....		2,240	
	Permanent red 4B extra pdr.....	A		
154	Palatine chrome brown.....		1,459	1,419
	Palatine chrome brown GGX.....	B		
	Palatine chrome brown RX.....	B		
	Palatine chrome brown W.....	B		
	Palatine chrome brown WNRTX.....	B		
158	Chrome brown RR.....		1,054	
	Chrome brown R.....	G		
	Chrome brown RVV.....	G		
159	Acid alizarin black.....		3,920	
	Acid alizarin black R.....	M		
160	Naphthylamine brown.....	B	6	
161	Fast red.....		170	
	Fast red AV.....	B		
	Fast red AVX.....	B		
168	Amaranth.....		500	
	Amaranth B.....	C		
	Amaranth B conc.....	C		
175	Acid ponceau.....		220	
	Acid ponceau E.....	G		
177	Mordant yellow.....		700	588
	Milling yellow GA.....	A		
	Milling yellow 3G.....	A		
	Milling yellow O.....	C		
180	Eriochrome blue black.....		2,205	
	Eriochrome blue black G.....	G		
182	Brilliant sulphon red.....		7,414	7,438
	Brilliant sulphon red B.....	S		
	Brilliant sulphon red 5B.....	S		
	Fast sulphon violet 5BS.....	S		
184	Eriochrome black A.....		4,409	
	Eriochrome black E.....	G		
193	Stanley red.....	Cl Co.	300	
198	Thiazol yellow.....		25	
	Thiazol yellow 3G.....	By		
206	Diphenyl catechine G.....		750	
	Diphenyl catechine G supra.....	G		
207	Diphenyl fast brown G.....		10,126	
	Diphenyl fast brown GNC.....	G		
217	Agalma black 10B.....		150	
	Naphthylamine black 4B.....	By		
220	Palatine black.....		33,500	18,425
	Wool black 6B.....	A		
	Wool black GRF.....	A		
	Wool jet black 3B.....	A		
221	Anthracene acid brown G.....	C	453	

TABLE 16.—Dyes imported into the United States, 1923—Continued

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
222	Janus yellow		Pounds 760	
	Janus yellow G	M		
	Yellow IG	M		
	Yellow JG	M		
236	Wool red B		115	
	Fast bordeaux B	BK		
240	Janus red B		700	\$1,292
	Janus red B	M		
	Red IB	M		
	Red JB	M		
250	Milling orange	WD	551	
256	Sulphon black 3B		200	
	Azo cyanine GR	K		
257	Sulphon cyanine		333	
	Cloth fast blue R	I		
260	Eriochrome verdon S	G	2,205	
265	Sulphonyaniline black		15,543	8,111
	Acid milling black	G		
	Acid milling black B 50 per cent.	G		
	Acid milling black B 100 per cent.	G		
266	Naphthylamine black		798	
	Naphthylamine black 6B	By		
273	Diaminogene blue		88,778	93,814
	Diaminogene blue NA	C		
	Diaminogene blue NBB	C		
	Diazamine blue NA	CN		
	Diazamine blue BR	S		
	Diazamine blue RR	S		
	Naphthogene blue RR	A		
274	Diaminogene B		32,903	26,917
	Black extra	C		
	Diaminogene extra	C		
	Diaminogene black extra	C		
	Diazo indigo blue BR	By		
	Diazo indigo blue 2RL	By		
	Zambesi pure blue 4BG	A		
276	Diamond green		99	
	Diamond green B	By		
277	Anthracene acid black		119	
	Anthracene acid black ST	C		
	Acid chrome black STC	By		
279	Benzo fast scarlet		5,196	7,078
	Benzo fast scarlet 5BS	By		
	Benzo fast scarlet SBS	By		
	Benzo fast scarlet GS	By		
	Direct fast scarlet SE	I		
283	Bismark brown		2,429	1,225
	Bismark brown	WD		
	Excelsior brown	WD		
	Leather brown A	C		
	Vesuvine extra	B		
	Vesuvine 3R	M		
288	Palatine chrome black		179	
	Acid alizarin black SE pdr	M		
293	Milling red		100	
	Milling red G	C		
294	Fast mordant yellow		11	
	Fast mordant yellow G pdr	B		
296	Cotton yellow		3,329	3,456
	Benzo fast yellow RL	By		
	Cotton yellow	B		
	Cotton yellow GI	B		
	Cotton yellow GX	B		
	Diamine fast yellow 3G	C		
297	Benzo fast pink 2BL	By	121	
303	Paper yellow		1,501	
	Brilliant yellow	By		
	Brilliant yellow conc.	S		
306	Pyramine orange 3G	B	4,500	
308	Diazo black OT	By	501	
313	Congo rubine	A	100	
319	Diamine scarlet		9,950	9,910
	Chloramine red 3B	S		
	Diamine brilliant bordeaux R	C		
	Diamine scarlet B	C		
	Diamine scarlet 3B	C		
	Triazol red 3B	GE		
322	Trisulphon violet B	S	500	

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

Schultz No.	Name of dye	Manu- facturer	Imports	
			Quantity	Invoice value
325	Columbia blue R	A	Pounds 10	
326	Oxydiamine violet		, 633	
	Benzo violet O	By		
	Naphthamine violet BE	K		
330	Zambesi brown		50	
	Zambesi brown 4R	A		
332	Benzo fast red		1,042	\$1,335
	Benzo fast red 8BL	By		
333	Diamine black		5	
	Oxamine black BHN extra	B		
338	Naphthamine blue		1,981	
	Naphthamine blue JEF	K		
339	Brilliant orange		3,821	2,656
	Diamine orange B	C		
340	Benzo orange R		50	
	Benzo fast orange WS	By		
342	Chrysamine		5,002	
	Chrysamine K	S		
	Chrysamine KS	S		
343	Diamine fast red		200	
	Diamine fast red 8BL	C		
346	Oxamine red		900	
	Oxamine red X	B		
	Oxamine red 3BX	B		
348	Diphenyl brown		17,534	
	Diphenyl brown BBNC	G		
	Diphenyl brown GS	G		
349	Diamine brown B	C	451	
354	Direct gray R paste	G	2,172	
358	Diphenyl red		21,160	17,614
	Aceto purpurine 8B	A		
	Chloramine red SBS	By		
	Tolylene red	GrE		
	Tolylene red OO	GrE		
360	Pyramine orange R		6,895	
	Ignamine (Pyramine) orange R	B		
364	Diazo brilliant black		782	
	Diazo brilliant black B	By		
366	Delta purpurine		441	
	Delta purpurine 5B	By		
370	Brilliant congo		330	
	Brilliant congo R	By		
373	Congo orange		2,020	
	Congo orange R	A		
	Congo orange R	By		
386	Benzo blue		900	
	Chloramine blue BXR conc.	S		
387	Columbia blue G	A	25	
392	Tolylene orange		14,382	13,101
	Direct fast orange K	I		
	Pyrazol orange G conc.	S		
	Tolylene fast orange GL	By		
405	Benzopurpurine 10B	S	100	
411	Benzoazurine 3G	By	22	
424	Chicago blue 6B		7,431	
	Brilliant benzo blue 6B	By		
	Chloramine sky blue FF conc.	S		
426	Benzo pure blue conc.	By	11	
435	Janus brown		50	
	Janus brown B	M		
436	Columbia black		50	
	Patent dianil black FF conc.	M		
448	Diamine bronze		800	
	Diamine bronze G	C		
449	Trisulphon brown		26,980	39,210
	Diphenyl brown TB conc.	G		
	Trisulphon brown B	S		
	Trisulphon brown B conc.	S		
456	Benzo fast blue		17,036	31,338
	Benzo fast blue 2GL	By		
	Benzo fast blue 4GL	By		
	Benzo light blue 2GL	By		
	Benzo light blue 4GL	By		
457	Trisulphon brown GG		16,150	19,495
	Trisulphon brown GG	S		
	Trisulphon brown GG conc. 50 per cent.	S		
	Trisulphon brown GG conc. 70 per cent.	S		
472	Chloramine blue HW		100	
	Chloramine blue HW	S		

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
475	Oxamine green G		Pounds 250	
	Naphthamine green AN	K		
476	Benzamine brown 3GO		100	
	Dianil chrome brown G	M		
485	Benzo brown D3G	By	6	
493	Auramine		3,944	
	Auramine N conc	S		
	Auramine OO	G		
494	Auramine G		3,637	
	Auramine G	G		
	Auramine G	I		
496	Setoglaucine		3,498	\$7,152
	Setoglaucine 753	G		
	Setoglaucine 753, 55 per cent.	G		
	Setoglaucine 753, 100 per cent.	G		
497	Victoria green	B	5	
498	Turquoise blue BB, G	By	4	
500	Setopaline		5,853	
	Setopaline conc. 707	G		
501	Brilliant glacier blue	I	110	
503	Neptune green		8,825	10,932
	Brilliant acid green 6B	By		
	Brilliant milling green B	C		
	Erioviridine B supra	G		
	Guinea fast green B	A		
	Night green A	tM		
	Patent green AGL	M		
505	Light green (yellowish)		468	473
	Acid green GG extra	By		
	Light green SF yellowish	B		
	Light green SF yellowish XX	B		
506	Erioglaucine		38,254	74,110
	Brilliant acid blue EG	By		
	Erioglaucine	G		
	Erioglaucine A	G		
	Erioglaucine AB	G		
	Erioglaucine AP	G		
	Erioglaucine EP	G		
	Erioglaucine supra conc	G		
507	Xylene blue VS		6,104	
	Xylene blue VS conc.	S		
512	Magenta		148	
	Diamond magenta I, small crystals	B		
	Magenta, small crystals	M		
514	Red violet		220	
	Violet 4RN	I		
515	Methyl violet		690	1,003
	Methyl violet crystals	S		
	Methyl violet NFB	B		
	Methyl violet 300 XE	P		
516	Crystal violet		3,738	6,258
	Crystal violet crystals	tM		
	Crystal violet extra conc.	K		
	Crystal violet extra	B		
	Crystal violet pdr	WD		
	Crystal violet O	M		
	Crystal violet 5BO	S		
518	Ethyl purple		3,852	
	Ethyl violet	B		
	Ethyl violet 6B	GrE		
522	Victoria blue 4R		1,350	
	Victoria blue 4R	I		
	Victoria blue 4R highly conc.	B		
523	Fast green		17,190	18,910
	Fast green bluish	By		
	Fast green extra bluish	By		
	Fast green extra bluish conc.	By		
524	Acid magenta		577	
	Acid fuchsine S conc.	A		
	Acid magenta	C		
527	Acid violet 4BN		6,305	11,065
	Acid violet 4BNS conc.	S		
	Acid violet 6BNOO	By		
	Acid violet 7BN	By		
528	Fast acid violet 10B		5,862	11,940
	Fast acid violet 10 B	By		
	Kiton fast violet 10 B	I		
	Kiton fast violet 10 B conc.	I		

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
			<i>Pounds</i>	
530	Acid violet.....		197	
	Acid violet 3BNO.....	B		
	Acid violet 6BNG.....	G		
	Acid violet C 10B.....	B		
	Formyl violet S 4B.....	C		
	Acid violet 4 BS.....	WD		
	Acid violet 10B.....	C		
531	Eriocyanine.....		19,202	
	Eriocyanine A.....	G		
	Eriocyanine AC.....	G		
532	Alkali violet.....		142	\$420
	Alkali violet CA.....	C		
	Alkali violet 4BNOO.....	B		
	Alkali violet 6BOO.....	B		
534	Acid violet 7B.....		25	
	Acid violet 7B conc.....	B		
535	Methyl alkali blue.....		195	
	Methyl alkali blue.....	M		
	Methyl alkali blue pdr.....	GrE		
536	Alkali blue.....		100	
	Alkali blue 3R conc.....	tM		
537	Methyl blue for silk.....		7,058	20,523
	Methyl Lyons blue.....	G		
	Methyl silk blue new.....	G		
	Pure blue 2G.....	tM		
539	Soluble blue.....		1,165	2,392
	Cotton blue No. 2 conc.....	M		
	Silk blue BSIC.....	GrE		
	Soluble blue T.....	B		
	Water blue.....	A		
541	Brilliant dianil blue 6G.....		440	
	Brilliant cotton blue 6B.....	K		
	Direct brilliant blue 8B.....	L		
543	Patent blue.....		66,279	50,586
	Brilliant acid blue V.....	By		
	Carmine blue V.....	L		
	Neptune blue BGX.....	B		
	Patent blue V.....	A		
	Patent blue V.....	M		
	Patent marine blue LE.....	M		
	Tetra cyanol V.....	C		
544	Cyanine B.....		440	
	Cyanine B.....	M		
545	Patent blue A.....		11,872	10,646
	Brilliant acid blue A.....	By		
	Brilliant acid blue F.....	By		
	Brilliant acid blue FF.....	By		
	Neptune blue BXX.....	B		
	Patent blue A.....	A		
	Patent blue A.....	M		
	Tetracyanol A.....	C		
546	Cyanol.....		19,979	23,576
	Cyanol extra.....	C		
	Cyanol extra.....	Q		
	Cyanol extra A.....	Q		
	Cyanol FF.....	C		
	Glaucol FF.....	L		
548	Acid violet 6BN.....		957	4,836
	Acid violet 6BNOO.....	B		
	Acid violet 6BS.....	WD		
	Acid violet GENG.....	G		
550	Chrome bordeaux.....		55	
	Chrome bordeaux B.....	DH		
553	Eriochrome cyanine.....		999	
	Eriochrome cyanine RC.....	G		
554	Chrome azurol.....		1,601	
	Chrome azurol S conc.....	G		
	Chrome azurol SXT.....	G		
555	Aurine.....		560	
	Aurine 100 per cent.....	Q		
557	Chrome violet.....		550	
	Chrome violet CG.....	DH		
558	Victoria blue R.....		4	
	Cornflower blue B.....	WD		

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
559	Victoria blue B.....		Pounds 1,722	\$3,322
	Victoria blue B.....	Q		
	Victoria blue B extra conc.....	Q		
	Victoria blue B highly conc.....	B		
	Victoria blue base.....	B		
560	Victoria pure blue BO.....	B		
	Night blue.....		28	
	Night blue.....	B		
562	Night blue greenish D.....	G		
	Fast acid blue.....		2,103	2,966
	Acid blue RBF.....	I		
	Brilliant wool blue FFR extra.....	By		
564	Brilliant wool blue G.....	G		
	Fast acid blue B.....	By		
	Wool blue N.....	By		
	Naphthalene green.....		13,328	20,967
	Erio green BB supra.....	G		
565	Kiton fast green V X conc.....	I		
	Naphthalene green conc.....	M		
	Naphthalene green V.....	M		
	Xylene fast green B conc.....	S		
	Acid blue B.....		500	
566	Wool blue 2B.....	A		
	Wool blue 5B.....	A		
	Wool green S.....		105	
568	Cyanol fast green G.....	C		
	Wool green S extra conc.....	B		
569	Pyronine G.....		55	
	Pyronine G.....	L		
571	Acridine red.....		55	
	Acridine red 3B.....	L		
572	Rhodamine 6G.....		31,242	97,991
	Rhodamine 6G extra.....	B		
	Rhodamine 6G extra.....	By		
	Rhodamine 6G extra.....	I		
	Rhodamine 6G extra.....	M		
	Rhodamine 6G conc.....	G		
	Rhodamine 6GD extra.....	M		
	Rhodamine 6GDN.....	BD		
	Rhodamine 6GDN extra.....	B		
	Rhodamine 6GDN extra.....	M		
	Rhodamine 6GH.....	L		
	573	Rhodamine G.....		412
Rhodamine G extra.....		B		
Rhodamine RRR.....		G		
574	Rhodamine B.....		29,083	50,058
	Rhodamine B conc.....	G		
	Rhodamine B extra.....	B		
	Rhodamine B extra.....	By		
	Rhodamine B extra.....	I		
	Rhodamine B extra conc.....	Q		
575	Rosazeine B extra.....	M		
	Rhodamine 3B.....		110	
	Rhodamine 3B extra.....	I		
579	Xylene red.....		941	
	Sulpho rhodamine B.....	M		
	Sulpho rosazeine BG.....	M		
580	Fast acid violet B.....		251	771
	Fast acid violet B.....	M		
	Fast acid violet R.....	M		
	Violamine B.....	M		
582	Fast acid violet A2R.....		232	
	Acid violet 4RNOO.....	B		
	Erio fast fuchsine BL conc.....	G		
584	Fast acid blue R.....	M	25	
587	Eosine.....		5	
	Eosine A conc.....	Q		
597	Rose bengale B.....		59	
	Rose bengale B.....	Q		
	Rose bengale B.....	M		
601	Coerulein S.....		50	
	Coerulein S pdr.....	Q		
602	Acridine yellow.....		440	
	Acridine golden yellow 2G.....	L		
603	Acridine orange.....		9,349	26,623
	Acridine orange DHE.....	DH		
	Acridine orange LP new.....	BD		
	Brilliant acridine orange A.....	DH		
	Rhoduline orange N.....	By		
	Rhoduline orange NO.....	By		

TABLE 16.—Dyes imported into the United States, 1923—Continued

Schultz No.	Name of dye	Manu- facturer	Imports	
			Quantity	Invoice value
			<i>Pounds</i>	
606	Phosphine.....		42,176	\$70,475
	Acid phosphine R.....	B.....		
	Canelle AL.....	B.....		
	Coriphosphine OX extra.....	By.....		
	Leather phosphine G.....	G.....		
	Leather phosphine 2G.....	G.....		
	Patent phosphine G.....	G.....		
	Patent phosphine G.....	By.....		
	Patent phosphine G.....	I.....		
	Patent phosphine 2G.....	G.....		
	Patent phosphine R.....	I.....		
	Philadelphia yellow 2G.....	A.....		
	Phosphine O.....	M.....		
	Phosphine 3R.....	A.....		
	Phosphine 3R.....	GrE.....		
607	Rheonine.....		565	
	Runic (Rheonine) AL conc.....	B.....		
	Runic (Rheonine) GD.....	B.....		
608	Euchrysrine.....		9,483	15,537
	Euchrysrine GRNTN.....	B.....		
	Euchrysrine RRX.....	B.....		
	Euchrysrine RRDX.....	B.....		
	Patent phosphine R.....	B.....		
	Patent phosphine 2R.....	B.....		
	Patent phosphine GRNTN.....	B.....		
	Patent phosphine RRDX.....	B.....		
609	Homophosphine.....		2,520	4,432
	Auracine G conc.....	By.....		
	Corioflavine GOOO.....	GrE.....		
	Flavophosphine G conc.....	M.....		
612	Quinoline yellow, spirit-soluble.....		1,320	2,104
	Quinoline yellow.....	By.....		
	Quinoline yellow.....	S.....		
	Quinoline yellow conc.....	S.....		
613	Quinoline yellow.....		7,168	10,071
	Quinoline yellow conc.....	By.....		
	Quinoline yellow conc.....	S.....		
	Quinoline yellow extra.....	B.....		
	Quinoline yellow KT extra conc.....	By.....		
	Quinoline yellow N.....	By.....		
	Quinoline yellow O.....	M.....		
615	Thioflavine S.....		35	
	Direct yellow S.....	C.....		
617	Columbia yellow.....		1,652	1,307
	Chloramine yellow GG.....	By.....		
	Diamine fast yellow AGG.....	C.....		
	Diphenyl chlorine yellow FF supra.....	G.....		
618	Thioflavine T.....		20,283	37,527
	Basic yellow T.....	C.....		
	Basic yellow TCN.....	C.....		
	Methylene yellow H.....	M.....		
	Rhoduline yellow 6G.....	By.....		
	Rhoduline yellow 6GT.....	By.....		
	Tannoflavine T.....	S.....		
	Thioflavine T.....	C.....		
	Thioflavine TCN.....	C.....		
	Yellow T.....	C.....		
620	Capri blue.....		110	
	Capri blue GON conc.....	L.....		
622	Delphine blue B.....		2,001	
	Brilliant delphine blue B.....	S.....		
624	Modern violet N.....		440	
	Modern violet N pdr.....	DH.....		
625	Chrome heliotrope.....		110	
	Modern heliotrope.....	DH.....		
626	Gallocyanine.....		2,202	
	Brilliant chrome blue P.....	S.....		
	Gallocyanine paste.....	S.....		
627	Anthracyanine.....		3,082	8,001
	Anthracyanine S pdr.....	DH.....		
	Chromacetine blue S pdr.....	DH.....		
	Modern cyanine V pdr.....	DH.....		
	Modern royal blue pdr.....	DH.....		
631	Chromocyanine.....		432	
	Chromocyanine B paste.....	DH.....		
633	Indalizarin.....		330	
	Indalizarin J paste.....	DH.....		

TABLE 16.—*Dyes imported into the United States, 1923*—Continued

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
635	Modern violet.....		Pounds 990	\$2,340
	Blue 1900 dbl. pdr.....	DH		
	Gallo violet DF.....	By DH		
636	Prune.....		330	
	Naphtha chrome violet 2R.....	I		
637	Violet PDH pdr.....	DH		
	Gallamine blue.....		29,244	
644	Gallamine blue extra paste.....	G		
	Ultra cyanine.....		200	
645	Ultra cyanine RB.....	S		
	Gallazine.....		712	
649	Gallazine A paste conc.....	DH		
	Gallazine No. 90.....	DH		
	Cotton blue.....		1,404	979
650	Cotton blue R extra.....	B		
	Meldola's blue 3R paste.....	S		
	Meldola's blue 3R conc.....	S		
653	Cotton blue BB.....	B	5	
	Nile blue.....		3,435	
658	Danubia (Nile) blue BX.....	B		
	Danubia blue BBX.....	B		
	Fast black.....		1,163	
660	Gallophenine P.....	By		
	Gallophenine VS paste.....	By		
	Methylene green.....		505	50
661	Methylene green extra yellowish.....	M		
	Methylene green B conc.....	By		
	Methylene green IA.....	M		
663	Thionine blue.....		6,129	11,639
	Thionine blue G.....	I		
	Thionine blue GO.....	M		
663	Thionine blue GO old.....	M		
	New methylene blue.....		6,443	10,889
	Methylene blue NNX.....	B		
	New methylene blue N.....	C		
667	New methylene blue NX.....	C		
	New methylene blue NSS.....	C		
	Indochromine.....		201	
	Brilliant alizarin blue R.....	By		
672	Azo carmine.....		7,218	7,147
	Azo carmine GX.....	B		
	Azo carmine GX 97 per cent.....	B		
	Azo carmine GX standard strength.....	B		
673	Azo carmine B.....		2,209	2,131
	Azo carmine.....	B		
	Azo carmine BX.....	B		
	Azo carmine BXH.....	B		
679	Rosinduline 2 B bluish.....	K		
	Safranine.....		110	
681	Safranine superfine dbl. yellowish.....	G		
	New fast gray.....		3,144	1,872
	Malta gray B.....	P		
685	Malta gray J.....	P		
	New fast gray.....	By		
686	Tannin heliotrope.....	C	50	
	Iris violet extra.....	B	30	
687	Rosolane O, T, R.....		49	
	Methylene heliotrope extra strong.....	M		
688	Rosolane O pdr.....	M		
	Rosolane.....		125	
695	Rosolane paste.....	P		
	Paraphenylene violet.....		500	
699	Diphene blue B.....	A		
	Induline NN.....		155	
	Fast blue R.....	B		
700	Induline NN.....	B		
	Nigrosine (soluble in water).....		3,079	1,752
	Nigrosine T.....	B		
	Nigrosine W extra.....	WD		
705	Nigrosine WLG.....	B		
	Silver gray P.....	A		
	Indamine 6R.....		3,500	
712	Acid cyanine BF.....	A		
	Indocyanine B.....	A		
712	Sulphur yellow.....		10	
	Sulphur yellow G extra.....	B		

TABLE 16.—Dyes imported into the United States, 1923—Continued

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
720	Sulphur black		Pounds	
	Thiogene black MA highly conc.	M	500	
724	Immedial black		940	
	Immedial direct blue B	C		
726	Pyrogene blue		8,929	
	Pyrogene direct blue RL	I		
733	Immedial indone		570	
	Immedial indogene GLC conc.	C		
734	Pyrogene yellow		551	
	Pyrogene yellow M	I		
735	Pyrogene indigo		2,314	
	Pyrogene indigo	I		
	Pyrogene indigo conc.	I		
746	Katigene green		4,283	
	Immedial green GG extra	C		
	Pyrogene green 3G conc.	I		
747	Thional brown		9,228	
	Thional brown G	S		
748	Hydon blue (single strength)		280	\$116
	Hydon blue G paste	C		
	Hydon blue G pdr	C		
	Hydon blue R paste	C		
	Hydon blue R pdr	C		
754	Kryogene violet		1,110	
	Kryogene violet 3 RX	B		
759	Anthraflavone G (single strength)		27,721	25,537
	Anthraflavone G paste	B		
	Anthraflavone GC paste	B		
	Anthraflavone GC paste, fine	B		
	Anthraflavone GC pdr	B		
	Anthra yellow G paste	B		
	Anthra yellow GC paste	B		
	Anthra yellow GC paste, fine	B		
	Anthra yellow GC pdr	B		
760	Indanthrene golden orange G (single strength)		67,265	63,342
	Duranthrene golden orange Y paste	BD		
	Helindone golden orange IG paste	M		
	Helindone golden orange IG dbl. paste	M		
	Indanthrene golden orange G paste	B		
	Indanthrene golden orange G dbl. paste	B		
	Indanthrene golden orange G pdr	B		
	Vat golden orange G dbl. paste	B		
761	Indanthrene golden orange R (single strength)		79,717	88,968
	Helindone golden orange IRRT paste	M		
	Helindone golden orange IRRT paste, fine	M		
	Helindone golden orange IRRT pdr	M		
	Indanthrene golden orange RRT paste	B		
	Indanthrene golden orange RRT paste, fine	B		
	Indanthrene golden orange RRT pdr	B		
	Indanthrene golden orange RRTS pdr	B		
	Vat orange RRT paste	B		
	Vat orange RRT paste	By		
762	Indanthrene scarlet GS pdr		566	
	Indanthrene scarlet GS pdr	B		
	Vat orange 4R pdr	B		
763	Indanthrene dark blue BO (single strength)		5,051	2,944
	Helindone dark blue IBOA paste	M		
	Indanthrene dark blue BO extra paste	B		
	Indanthrene dark blue BO pdr	B		
765	Indanthrene green B (single strength)		40,420	18,607
	Helindone black IBB pdr	M		
	Helindone blue green IB dbl. paste	M		
	Indanthrene black	B		
	Indanthrene black 2B extra paste	B		
	Indanthrene black 2B dbl. paste	B		
	Indanthrene blue green B dbl. paste	B		
	Vat black BB dbl. paste	B		
	Vat blue green B dbl. paste	B		
767	Indanthrene violet RR (single strength)		24,506	15,752
	Helindone violet IRR extra paste	M		
	Helindone violet IRR extra pdr	M		
	Helindone violet DIRR extra paste	M		
	Indanthrene violet RR extra paste	B		
	Indanthrene violet RR dbl. paste	B		
	Indanthrene violet RR pdr	B		
	Indanthrene violet RR extra pdr	B		
	Vat brilliant violet RR paste	B		
	Vat brilliant violet RR pdr	B		
	Vat brilliant violet RRP pdr	B		
768	Indanthrene violet B paste	B	53	

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
774	Alizarin black 25 per cent paste.....		<i>Pounds</i> 10,521	\$4,123
	Alizarin black S paste 25 per cent.....	B		
	Alizarin black S paste 25 per cent.....	M		
	Alizarin black S pdr.....	M		
	Alizarin black W R pdr.....	B		
778	Alizarin black WX extra S paste 40 per cent.....	B	27,716	4,396
	Alizarin, synthetic—20 per cent paste.....			
	Alizarin.....	A-S Co.		
	Alizarin pdr.....	A-S Co.		
	Alizarin VI extra pure 20 per cent.....	B		
779	Alizarin red IB extra paste 20 per cent.....	By		
	Alizarin red DIB extra paste 20 per cent.....	By		
	Alizarin orange 20 per cent paste.....		8,444	3,628
	Alizarin orange 20 per cent.....	BAC		
	Alizarin orange AG 20 per cent.....	BAC		
780	Alizarin orange A 20 per cent.....	B		
	Alizarin orange pdr. 80 per cent.....	M		
	Alizarin red powder.....		25,017	23,633
	Alizarin carmine pdr.....	BAC		
	Alizarin red IWS pdr.....	M		
782	Alizarin red S pdr.....	B		
	Alizarin red S pdr.....	BAC		
	Alizarin red W pdr.....	By		
	Alizarin brown.....		14,531	
	Anthracene brown R pdr.....	By		
784	Anthracene brown RD paste.....	G		
	Alizarin SX, GD paste.....		8,206	1,493
	Alizarin SX 20 per cent paste.....	B		
	Alizarin red SX extra paste.....	By		
	Alizarin red SX 20 per cent paste.....	BAC		
785	Alizarin RG, GI.....		12,528	2,746
	Alizarin SDG 20 per cent paste.....	M		
	Alizarin red XGP 20 per cent paste.....	By		
	Alizarin red YCA 20 per cent paste.....	BAC		
	Alizarin cyanine.....		442	
790	Alizarin cyanine NS pdr.....	By		
	Acid alizarin blue BB.....		912	1,494
	Anthracene blue SWB pdr.....	B		
	Anthracene blue SWGG extra pdr.....	B		
	Anthracene blue SWR pdr.....	B		
792	Cibonone orange R (single strength).....		5,000	
	Cibonone orange R pdr.....	I		
	Cibonone black (single strength).....		5,175	
	Cibonone black B paste 10 per cent.....	I		
	Cibonone black 2G pdr. 100 per cent.....	I		
795	Cibonone yellow R (single strength).....		8,373	
	Cibonone yellow R paste 10 per cent.....	I		
	Cibonone yellow R pdr.....	I		
	Alizarin maroon W.....		500	
	Alizarin maroon.....	B		
799	Alizarin cyanine G.....		2,607	
	Alizarin cyanine G pdr.....	By		
	Alizarin cyanine NSG pdr.....	By		
	Anthracene blue.....		3,379	929
	Anthracene blue WG paste.....	B		
803	Anthracene blue WBU paste.....	B		
	Anthracene blue WGU paste.....	B		
	Alizarin blue WX, A.....		441	
	Alizarin blue B pdr.....	Q		
	Alizarin blue S.....		17,948	6,502
804	Alizarin blue S extra paste.....	By		
	Alizarin blue S pdr.....	By		
	Alizarin blue SB pdr.....	M		
	Alizarin black S.....		1,876	
	Alizarin black S paste.....	M		
808	Alizarin green S paste.....		3,898	
	Alizarin green S paste.....	B		
	Alizarin green S paste.....	BAC		
	Helindone yellow (single strength).....		4	
	Vat yellow RK paste.....	B		
811	Vat yellow RK pdr.....	B		
	Algol yellow 3G (single strength).....		1,471	
	Algol yellow 3G paste.....	By		
	Algol yellow 3G pdr.....	By		
	Indanthrene copper R paste.....	B	494	

¹ 5,815 pounds of paste, 2,133 pounds of pdr.

TABLE 16.—Dyes imported into the United States, 1923—Continued

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
814	Algol yellow WF (single strength).....		Pounds 792	
	Algol yellow WF pdr.....	By		
816	Algol red 5G (single strength).....		793	\$381
	Algol red 5G pdr.....	By		
	Algol red 5GK paste.....	By		
	Algol red 5GK pdr.....	By		
817	Algol yellow R (single strength).....		3,517	1,070
	Algol yellow R pdr.....	By		
	Vat yellow GK paste.....	By		
	Vat yellow GK pdr.....	By		
818	Algol pink R (single strength).....		1,636	
	Algol pink R paste.....	By		
	Algol pink R pdr.....	By		
819	Algol red FF, R (single strength).....		25,228	12,809
	Algol brilliant red 2B paste.....	By		
	Algol brilliant red 2B pdr.....	By		
	Algol brilliant red 2B extra pdr.....	By		
	Algol red FF extra paste.....	By		
	Algol red FF pdr.....	By		
	Algol red R paste.....	By		
	Algol red R pdr.....	By		
820	Algol brilliant violet R (single strength).....		15,381	12,763
	Algol brilliant violet R paste.....	By		
	Algol brilliant violet R pdr.....	By		
	Duranthrene brilliant violet R paste.....	BD		
	Duranthrene brilliant violet R pdr.....	BD		
	Vat brilliant violet RK paste.....	By		
	Vat brilliant violet RK pdr.....	By		
821	Algol brilliant violet 2B (single strength).....		5,591	4,496
	Algol brilliant violet 2B pdr.....	By		
	Indanthrene brilliant violet 2BK paste.....	By		
	Indanthrene brilliant violet 2BK pdr.....	By		
822	Algol brilliant orange FR (single strength).....		4,684	3,989
	Algol brilliant orange FR paste.....	By		
	Algol brilliant orange FR pdr.....	By		
	Indanthrene orange RRR pdr.....	Q		
824	Algol orange R (single strength).....		4,222	1,777
	Algol orange R paste.....	By		
	Algol orange R pdr.....	By		
	Indanthrene orange 6RTK pdr.....	By		
825	Algol red B (single strength)*.....		160	
	Algol red B pdr.....	By		
827	Indanthrene claret B extra (single strength).....		13,306	13,361
	Antra bordeaux R paste.....	B		
	Antra claret R paste fine.....	B		
	Antra bordeaux R pdr.....	B		
	Indanthrene bordeaux R extra paste.....	B		
828	Indanthrene claret B (single strength).....		7,180	
	Indanthrene bordeaux B pdr.....	B		
	Vat heliotrope R dbl. paste.....	B		
830	Indanthrene red R (single strength).....		1,317	
	Indanthrene red R paste.....	B		
831	Indanthrene red BN (single strength).....		16,825	16,590
	Caledon red BN paste.....	Scot.		
	Duranthrene red BN paste.....	BD		
	Helindone red BIDN paste.....	M		
	Indanthrene red BN pdr.....	B		
	Indanthrene red BN extra paste.....	B		
	Indanthrene red BN extra pdr.....	B		
	Indanthrene red RK paste.....	B		
	Indanthrene red RK paste fine.....	B		
	Indanthrene red RKP pdr.....	B		
832	Indanthrene violet RN (single strength).....		20,435	26,381
	Helindone violet IBN extra paste.....	M		
	Indanthrene violet BN paste.....	B		
	Indanthrene violet BN extra paste.....	B		
	Indanthrene violet BN paste fine.....	B		
	Indanthrene violet BN pdr.....	B		
833	Algol olive R (single strength).....		1,050	583
	Algol olive R paste.....	By		
	Algol olive R pdr.....	By		
	Vat olive R paste.....	By		
834	Algol gray (single strength).....		1,557	
	Algol gray 2B paste.....	By		
	Vat gray K pdr.....	By		
836	Helindone brown 3GN paste.....	M	110	

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
837	Indanthrene blue R powder	B	<i>Pounds</i> 176	
838	Indanthrene blue RS (single strength)	B	38,235	\$15,270
	Indanthrene blue RS paste	B		
	Indanthrene blue RS pdr	B		
	Indanthrene blue RS triple pdr	B		
	Indanthrene blue RSP dbl. paste	B		
	Indanthrene blue RSP triple pdr	B		
840	Indanthrene blue 3G (single strength)	B	31,748	19,644
	Indanthrene blue 3G paste	B		
	Indanthrene blue 3G pdr	B		
	Indanthrene blue 3G dbl. paste	B		
	Indanthrene blue 3G paste fine	B		
841	Indanthrene blue GGS (single strength)	B	2,200	
	Indanthrene blue GGSP dbl. paste	B		
	Indanthrene blue GGSP quintuple pdr	B		
842	Indanthrene blue GCD (single strength)	B	70,546	42,166
	Helindone blue IGCD dbl. paste	M		
	Indanthrene blue GCD paste	B		
	Indanthrene blue GCD dbl. paste	B		
	Indanthrene blue GCD dbl. paste fine	B		
	Indanthrene blue GCD pdr	B		
844	Algol blue 3G (single strength)	B	5,516	4,032
	Algol blue 3G paste	By		
	Algol blue 3G pdr	By		
	Indanthrene blue 5G paste	B		
	Indanthrene blue 5G pdr	B		
847	Algol green B paste	By	201	
848	Indanthrene gray (single strength)	B	50	
	Indanthrene gray B dbl. paste	B		
849	Indanthrene yellow (single strength)	B	87,946	28,551
	Helindone yellow IG dbl. paste	M		
	Helindone yellow DIG dbl. paste	M		
	Indanthrene yellow G paste	B		
	Indanthrene yellow G dbl. paste	B		
	Indanthrene yellow G pdr	B		
	Indanthrene yellow GP pdr	B		
850	Indanthrene blue WB powder	B	2,434	
851	Alizarin direct blue B	M	240	
852	Alizarin irisol D, R	B	2,987	7,298
	Alizarin blue JR pdr	By		
	Alizarin direct violet R pdr	M		
	Alizarin irisol R pdr	By		
853	Anthraquinone violet powder	B	1,610	2,611
	Anthraquinone violet	B		
	Anthraquinone violet, standard strength	B		
	Anthraquinone violet pdr	B		
854	Alizarin viridine	B	17,217	
	Alizarin viridine FF paste	By		
855	Alizarin pure blue	B	9,132	21,710
	Alizarin pure blue B pdr	By		
	Alizarin sky blue B pdr	By		
	Alizarin sky blue B 65 per cent pdr	By		
856	Alizarin astrol	B	11,224	16,017
	Alizarin astrol B	By		
	Alizarin astrol B pdr	By		
	Alizarin blue AS pdr	By		
858	Alizarin sapphirol B	B	26,615	58,162
	Alizarin blue SAP pdr	By		
	Alizarin light blue B	S		
	Alizarin light blue B conc	S		
	Alizarin sapphirol B pdr	By		
	Alizarin sapphirol SE pdr	By		
	Alizarin sapphirol SAE pdr	By		
	Alizarin sapphirol WSA pdr	By		
	Alizarin sapphirol SAWSA pdr	By		
	Helio fast blue BL pdr	By		
	Helio fast blue SL conc	By		
859	Cyananthrol R	B	2,941	14,652
	Alizarin direct blue RXO	B		
	Cyananthrol R	B		
	Cyananthrol RXO	B		
860	Cyananthrol G	B	4,618	10,044
	Alizarin direct blue BGAOO	B		
	Cyananthrol BGA	B		
	Cyananthrol BGAO	B		
	Cyananthrol BGAOO	B		
861	Anthraquinone blue SR	B	1,250	
	Anthraquinone blue SR extra pdr	B		

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
862	Alizarin blue black		<i>Pounds</i> 70,917	\$49,153
	Alizarin blue black B pdr	By		
	Alizarin blue black B pdr	M		
	Alizarin blue black 3B pdr	By		
	Alizarin blue black 3B pdr	M		
863	Alizarin blue black BT pdr	B		
	Anthraquinone blue green		179	
864	Anthraquinone blue green BXO pdr	B		
	Anthraquinone green GX		1,050	
865	Anthraquinone green GXNO pdr	B		
	Alizarin direct green G		16,241	28,764
866	Alizarin brilliant green G	C		
	Alizarin cyanine green G extra pdr	By		
	Alizarin cyanine green 3G pdr	By		
	Alizarin cyanine green E pdr	By		
	Alizarin cyanine green EF pdr	L		
	Alizarin direct green G pdr	M		
867	Indanthrene brown (single strength)		12,799	2,541
	Duranthrene brown B paste	BD		
	Anthra brown B dbl. paste	B		
	Indanthrene brown B dbl. paste	B		
868	Cibanone brown (single strength)		2,007	
	Cibanone brown B pdr	L		
869	Algol brown B (single strength)		55,081	54,242
	Algol brown R paste	By		
	Algol brown R pdr	By		
	Indanthrene brown R paste	By		
	Indanthrene brown R pdr	By		
870	Algol corinth R (single strength)		1,592	1,444
	Algol corinth R pdr	By		
	Indanthrene corinth RK paste	By		
873	Indanthrene corinth RK pdr	By		
	Helindone brown AN (single strength)		836	869
	Helindone brown AN paste	M		
	Indanthrene brown GR paste	B		
	Indanthrene brown GR pdr	B		
876	Indanthrene red brown R extra paste	B		
	Indanthrene red brown R pdr	B		
	Indigo, white		110	
	Indigosol DH	DH		
	Indigo RB (single strength)		690	348
880	Helindone blue BB paste	M		
	Indigo MLB/2B pdr	M		
	Indigo RB dbl. paste	B		
	Ciba blue 2BD paste	L	6,417	
882	Ciba blue G (single strength)		11	
	Indigo MLB/5B pdr	M		
883	Indigo KG (single strength)		4,855	
	Durindone blue 6B pdr	BD		
	Indigo MLB/6B pdr	M		
885	Brilliant indigo BD (single strength)		14,835	
	Brilliant indigo B paste	B		
	Brilliant indigo B paste	By		
886	Brilliant indigo G paste	B	2,565	
	Brilliant indigo 4G (single strength)		2,917	2,794
887	Brilliant indigo 4G paste	B		
	Brilliant indigo 4G pdr	B		
	Brilliant indigo BASF/4G paste	B		
	Ciba yellow G paste 10 per cent	L	2,204	
892	Helindone green G (single strength)		2,202	
	Helindone green G paste	M		
893	Helindone green G pdr	M		
	Alizarin indigo G paste 10 per cent		17,289	
	Alizarin indigo G paste	By		
894	Alizarin indigo G pdr	By		
	Alizarin indigo B paste		1,763	
895	Alizarin indigo green B paste	By		
	Alizarin indigo 3R paste	By	1,362	
896	Helindone blue 3GN (single strength)		7,360	
	Helindone blue 3GN pdr	M		
897	Ciba heliotrope B paste	L	110	
899	Ciba gray paste		882	
	Ciba gray G paste 20 per cent	J		

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

Schultz No.	Name of dye	Manu- fac- turer	Imports	
			Quantity	Invoice value
901	Ciba violet B (single strength).....		<i>Pounds</i> 64,517	\$29,122
	Ciba violet B paste 10 per cent.....	I		
	Ciba violet B paste 20 per cent.....	I		
	Ciba violet B pdr.....	I		
	Ciba violet R paste 20 per cent.....	I		
902	Ciba violet R pdr.....	I		
	Helindone brown 2R (single strength).....		1,570	
	Helindone brown 2R paste.....	M	(745)	
904	Thioindigo brown R pdr.....	K	(825)	
	Helindone brown G (single strength).....		1,741	
	Helindone brown G paste.....	M	(661)	
906	Thioindigo brown G pdr.....	K	(1,080)	
	Ciba red G paste.....	I	551	
907	Ciba scarlet (single strength).....		37,524	37,436
	Ciba scarlet G extra paste.....	I		
	Ciba scarlet G pdr.....	I	(22,145)	
	Helindone fast scarlet C paste.....	M	(7,678)	
	Thioindigo scarlet 2G paste.....	K		
908	Thioindigo scarlet 2G pdr.....	K	(7,701)	
	Ciba red R paste 20 per cent.....	I	7,388	
910	Helindone pink (single strength).....		10,378	8,052
	Helindone pink AN paste.....	M		
	Helindone pink Bn paste.....	M	(8,666)	
	Thioindigo pink AN paste.....	K		
	Thioindigo pink BN extra paste.....	K	(1,712)	
911	Ciba orange G paste 10 per cent.....	I	330	
	Thioindigo red B (single strength).....		8,860	8,943
912	Ciba pink B paste.....	I		
	Ciba pink BG paste.....	I		
	Ciba pink BG pdr.....	I		
	Durindone red B paste.....	BD		
	Helindone orange R (single strength).....		22,571	19,652
913	Helindone orange R paste 10 per cent.....	M		
	Helindone orange R pdr.....	M	(16,791)	
	Thioindigo orange R pdr.....	K		
	Thioindigo orange RY paste 20 per cent.....	K	(5,780)	
	Thioindigo yellow 3GN paste 20 per cent.....	K		
915	Helindone fast scarlet R (single strength).....		7,666	
	Helindone fast scarlet R paste.....	M		
	Helindone fast scarlet R pdr.....	M		
917	Helindone red B paste.....	M	50	
918	Helindone red 3B (single strength).....		21,916	15,579
	Durindone red 3B paste.....	BD		
	Helindone red 3B paste 20 per cent.....	M		
	Helindone red 3B pdr.....	M		
	Thioindigo red 3B paste.....	K		
	Thioindigo red 3B pdr.....	K		
	Vat red violet RH paste 20 per cent.....	B		
	Vat red violet RH pdr.....	B		
	Ciba bordeaux B (single strength).....		35,714	
919	Ciba bordeaux B paste 10 per cent.....	I		
	Ciba bordeaux B pdr.....	I		
920	Helindone violet (single strength).....		2,255	
	Helindone violet R pdr.....	M		
921	Helindone gray BB (single strength).....		6	
	Vat gray 6B paste.....	B		
	Vat gray 6B pdr.....	B		
923	Ursol.....		14,071	16,894
	Fur black DB, DG.....	A		
	Fur blue black A, SA.....	A		
	Fur blue gray.....	A		
	Fur brown NZ, NZD, P, PR, PY, 2R, 4R, SK, SKG, SP, SO.....	A		
	Fur gray AL, ALA, B, G, R.....	A		
	Fur gray brown SLA.....	A		
	Fur olive DA, 3G.....	A		
	Fur red brown 6R.....	A		
	Fur yellow 2G, 4G.....	A		
	Fur yellow brown A, 4GL.....	A		
	Fur dye DF, 2G, SB, SC.....	A		
	Nako DR, 3GA, PS, RH.....	M		
	Nako black DD, D2B, O.....	M		
	Nako yellow SEL.....	M		
	Ursol D lumps.....	A		
	Ursol SG.....	A		

TABLE 16.—Dyes imported into the United States, 1923—Continued

UNIDENTIFIED ACID DYES

Name of dye	Manu- facturer	Imports	
		Quan- tity	Invoice value
		<i>Pounds</i>	
Acid black SR.....	I.....	220	
Acid milling red R conc.....	G.....	110	
Acid milling yellow G conc.....	S.....	2, 202	
Acid pure blue R supra.....	G.....	5, 201	
Acid rhodamine.....		3, 568	\$4, 478
Acid rhodamine BG.....	B.....		
Acid rhodamine G.....	B.....		
Acid rhodamine 3R.....	G.....		
Acid rhodamine R.....	Q.....		
Acid rhodamine RG.....	Q.....		
Acid red violet.....	Q.....	11	
Acid silver gray.....	Q.....	22	
Acid violet 7B purple.....	Q.....	22	
Alizarin direct violet ER pdr.....	B.....	355	
Alizarin emeraldole G pdr.....	By.....	126	
Alizarin emeraldole green G.....	Q.....	30	
Alizarin rubinol.....		48, 826	110, 212
Alizarin rubinol 3G pdr.....	By.....		
Alizarin rubinol 5G pdr.....	By.....		
Alizarin rubinol GW pdr.....	By.....		
Alizarin rubinol R pdr.....	By.....		
Alizarin uranole.....		550	925
Alizarin uranole 2B.....	By.....		
Alizarin uranole R.....	By.....		
Alphanol brown.....		20	
Alphanol brown B.....	C.....		
Alphanol brown R.....	C.....		
Anthosine.....		965	
Onis (Anthosine) 3B.....	B.....		
Onis (Anthosine) 5B.....	B.....		
Anthracyanine brown GL.....	By.....	105	
Anthrarubine B pdr.....	K.....	110	
Azo blue B conc.....	S.....	201	
Azo orseille BB.....	C.....	202	
Azo rhodine 2G conc., 2GN conc.....	S.....	700	
Azo wool violet 7R.....	C.....	1, 000	
Brilliant milling blue B.....	C.....	8, 540	7, 574
Brilliant milling red R.....	C.....	1, 100	
Brilliant naphthol blue R.....	C.....	220	
Brilliant pure yellow 6G extra.....	By.....	396	
Cashmere black TN.....	By.....	55	
Cloth fast black.....		330	503
Cloth fast black BN.....	I.....		
Cloth fast black 2BN.....	I.....		
Cloth fast black 4BN.....	I.....		
Cloth fast red GR conc.....	I.....	661	
Eosine BG.....	GrE.....	100	
Erio blue AB.....	G.....	7, 804	
Erio fast cyanine.....		2, 315	5, 931
Erio fast cyanine S.....	G.....		
Erio fast cyanine S conc.....	G.....		
Erio fast cyanine SE.....	G.....		
Erio fast violet.....		275	
Erio fast violet BMS conc.....	G.....		
Erio fast violet RMS conc.....	G.....		
Erythrosine TB pdr.....	DH.....	55	
Fast acid blue A pdr.....	GrE.....	4, 480	
Fast acid green 8B pdr.....	GrE.....	1, 792	
Fast acid marine blue.....		800	
Fast acid marine blue HBBX.....	B.....		
Fast acid marine blue HBT A.....	B.....		
Fast acid red RH.....	BD.....	500	
Fast light red BL.....	By.....	899	
Fast sulphon green 2G conc.....	S.....	110	
Guinea brown.....		250	188
Guinea brown GL.....	A.....		
Guinea brown 2GL.....	A.....		
Guinea brown R.....	A.....		
Guinea brown RD.....	A.....		
Guinea brown 2R.....	A.....		
Guinea brown 2RD.....	A.....		
Guinea fast red.....		8, 325	7, 129
Guinea fast red BL.....	A.....		
Guinea fast red 2BL.....	A.....		
Guinea fast red 2R.....	A.....		
Guinea rubine 4R.....	A.....	10	

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

UNIDENTIFIED ACID DYES—Continued

Name of dye	Manu- facturer	Imports	
		Quan- tity	Invoice value
Havana brown		Pounds 40	
Havana brown 5G	B		
Havana brown S	C		
Ink blue		744	\$1,179
Ink blue BITN	GrE		
Ink blue BJTNO	GrE		
Ink blue BJTBNOO	GrE		
Kiton fast green A conc	I	992	
Kiton fast red 4BL	I	2,454	
Kiton pure blue AFL	I	441	
Kiton yellow G	I	331	
Milling brown		235	
Milling brown 3G	A		
Milling brown R	A		
Naphthalene blue black	Q	45	
Neolan black 2G	I	110	
Neolan blue		991	
Neolan blue B	I		
Neolan blue 2G	I		
Neolan green B	I	220	
Neolan gray B new	I	110	
Neolan navy blue		66	
Neolan navy blue 2G	I		
Neolan navy blue R	I		
Neolan pink		661	
Neolan pink B	I		
Neolan pink G	I		
Neolan red R	I	110	
Oxamine acid brown		2,700	
Minaxo acid brown G	B		
Oxamine acid brown G	B		
Palatine light yellow		3,961	
Palatine light yellow RX	B		
Pilatus light yellow RX	B		
Polar maroon VC	G	2,205	
Polar orange R conc	G	6,908	
Polar red		15,031	14,900
Polar red 3B conc	G		
Polar red G conc	G		
Polar red R conc	G		
Polar red RS conc	G		
Polar yellow		13,453	
Polar yellow 2G conc	G		
Polar yellow 5G conc	G		
Radio brown B	C	200	
Radio red G	C	100	
Radio yellow R	C	20	
Scarlet 2R	S	500	
Silk blue BIC	A	500	
Special blue G	B	125	
Sulphon acid brown 2R	By	33	
Sulphon orange G	By	20	
Sulphon yellow 5G conc	By	11	
Supramine black BR	By	1,030	
Supramine brown R	By	656	
Supramine red		745	817
Supramine red B	By		
Supramine red 2G	By		
Spruce red B	B		
Supramine yellow		1,106	1,687
Supramine yellow G	By		
Supramine yellow R	By		
Spruce yellow R	B		
Wool black N for printing	I	441	
Wool fast blue		2,154	2,390
Wool fast blue BL	B		
Wool fast blue BL	By		
Wool fast blue GL	By		
Wool fast orange G	B	50	
Wool fast red BL	By	134	
Wool fast yellow 3G	B	660	
Wool printing black CUI	I	441	
Wool red G	B	50	
Wool violet RC	G	55	
Xylene fast blue AE conc	S	110	
Xylene milling red B conc	S	110	

TABLE 16.—Dyes imported into the United States, 1923—Continued

UNIDENTIFIED VAT DYES

Name of dye	Manu- facturer	Imports	
		Quan- tity	Invoice value
Algol brilliant pink (single strength)		<i>Pounds</i> 3,452	\$3,995
Algol brilliant pink FB paste	By		
Algol brilliant pink FF paste	By		
Vat brilliant pink FF paste	By		
Algol brilliant red B (single strength)		936	
Algol brilliant red B pdr	By		
Algol brown G (single strength)		18,074	16,556
Algol brown G paste	By		
Algol brown G pdr	By		
Vat brown G paste	By		
Vat brown G pdr	By		
Alizarin indigo brown R paste	By	10	
Alizarin indigo 5R paste	By	399	
Ciba printing black 20 per cent paste		220	
Ciba printing black B	I		
Ciba printing black G	i		
Cibanone brown R paste	I	1,984	
Grelanone yellow G paste	GrE	560	
Helindone black		528	
Helindone black paste	M		
Helindone black T	M		
Helindone bordeaux B extra paste	M	220	
Helindone brown JG paste	M	300	
Helindone fast scarlet	M	992	
Helindone fast scarlet G paste	M		
Helindone fast scarlet GG paste	M		
Helindone golden orange DJG (single strength)		881	
Helindone golden orange DJG paste	M		
Helindone golden orange DJG pdr	M		
Helindone pink		47,771	44,643
Helindone pink B extra paste	M		
Helindone pink R extra paste	M		
Helindone pink RN extra paste	M		
Helindone violet 2R paste	M	209	
Helindone yellow		150	
Helindone yellow AGC paste	M		
Helindone yellow DAGC paste	M		
Hydron bordeaux (single paste)		1,208	
Hydron bordeaux B dbl. paste	C		
Hydron bordeaux R dbl. paste	C		
Hydron brown (single strength)		4,065	3,439
Hydron brown CG	C		
Hydron brown G paste	C		
Hydron brown OG pdr	C		
Hydron brown R paste	C		
Hydron dark blue (single strength)		80	32
Hydron dark blue G paste	C		
Hydron dark blue G pdr	C		
Hydron dark blue GG paste	C		
Hydron dark blue GG pdr	C		
Hydron green		689	
Hydron green B paste	C		
Hydron green G paste	C		
Hydron navy blue (single strength)		52	40
Hydron navy blue C paste	C		
Hydron navy blue C pdr	C		
Hydron navy blue G paste	C		
Hydron olive		503	
Hydron olive GN paste	C		
Hydron olive R paste	C		
Hydron orange		3,521	3,916
Hydron orange FB paste	C		
Hydron orange R paste	C		
Hydron orange RE paste	C		
Hydron pink (single strength)		55,428	62,364
Hydron pink FB paste	C		
Hydron pink FF paste	C		
Hydron pink FF pdr	C		
Hydron scarlet (single strength)		17,354	19,012
Hydron scarlet 2B paste	C		
Hydron scarlet 2B pdr	C		
Hydron scarlet 3B paste	C		
Hydron violet (single strength)		1,232	1,138
Hydron violet B paste	C		
Hydron violet R paste	C		
Hydron violet R pdr	C		

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

UNIDENTIFIED VAT DYES—Continued

Name of dye	Manu- facturer	Imports	
		Quan- tity	Invoice value
		<i>Pounds</i>	
Hydron wool brown D, G.....	C.....	10	
Hydron wool olive B.....	C.....	5	
Hydron wool red BB.....	C.....	5	
Hydron wool yellow G.....	C.....	5	
Hydron yellow NF paste.....	C.....	700	
Indanthrene blue BCD (single strength).....		800	
Indanthrene blue BCD dbl. paste fine.....	B.....		
Indanthrene blue BCS (single strength).....		12, 240	
Indanthrene blue BCS pdr.....	B.....		
Indanthrene blue RC (single strength).....		3, 336	
Indanthrene blue RC paste.....	B.....		
Indanthrene blue RC pdr.....	B.....		
Indanthrene blue RO paste.....	B.....	988	
Indanthrene blue RZ (single strength).....		5, 430	\$1, 448
Indanthrene blue RZ dbl. paste.....	B.....		
Indanthrene blue RZ pdr.....	B.....		
Indanthrene blue REZ pdr.....	B.....		
Indanthrene blue 3GT paste.....	By.....	10	
Indanthrene brilliant red 2B paste.....	By.....	1, 001	
Indanthrene brown 3R paste.....	Q.....	716	
Indanthrene golden orange 3R (single strength).....		1, 974	1, 873
Helindone golden orange I3R paste.....	M.....		
Indanthrene golden orange 3R paste.....	B.....		
Indanthrene orange 3R paste.....	B.....		
Indanthrene gray 3B (single strength).....		200	
Indanthrene gray 3B dbl. paste.....	B.....		
Indanthrene pink (single strength).....		13, 348	12, 232
Anthra pink B extra paste.....	B.....		
Anthra pink R extra paste.....	B.....		
Indanthrene pink B dbl. paste.....	B.....		
Indanthrene red violet (single strength).....		3, 682	3, 313
Indanthrene red violet RRN paste.....	B.....		
Vat red violet RRK paste.....	B.....		
Vat red violet RRK paste fine.....	B.....		
Thioindigo pink RN.....		6, 487	5, 510
Thioindigo pink RN paste.....	K.....		
Thioindigo pink RN extra paste.....	K.....		
Thioindigo rose RN extra paste.....	K.....		
Thioindigo violet 2R (single strength).....		4, 280	
Thioindigo violet 2R paste.....	K.....		
Thioindigo violet 2R pdr.....	K.....		
Vat orange R paste.....	GrE.....	336	
Vat violet BR paste.....	GrE.....	112	
Vat yellow 3RT (single strength).....		6	
Vat yellow 3RT pdr.....	B.....		

UNIDENTIFIED MORDANT AND CHROME DYES

Acid alizarin gray G.....	M.....	13, 526	\$22, 818
Acid chrome blue.....		12	
Acid chrome blue BH.....	By.....		
Acid chrome blue 2R.....	By.....		
Alizarin bordeaux 2G paste.....	By.....	155	
Alizarin cyclamine R paste.....	By.....	797	
Alizarin fast black SP paste.....	By.....	418	
Alizarin fast gray 2BL pdr.....	By.....	5, 257	12, 914
Alizarin geranole B pdr.....	By.....	991	
Alizarin light green EF pdr.....	GrE.....	2, 240	
Alliance fast brown 5G.....	BD.....	25	
Anthracene chromate brown EB.....	C.....	8, 420	10, 217
Anthracene chrome blue R.....	C.....	50	
Brilliant chrome blue.....		440	
Brilliant chrome blue 2B.....	DH.....		
Brilliant chrome blue S.....	DH.....		
Chromanol black RVI.....	DH.....	110	
Chromanol blue NR pdr.....	DH.....	881	
Chrome azurine.....	DH.....	396	
Chrome azurine G.....	DH.....		
Chrome azurine P.....	DH.....		
Chrome fast cyanine GN.....	I.....	110	
Chrome fast green B.....	S.....	220	
Chrome fast phosphine R.....	DH.....	55	

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

UNIDENTIFIED MORDANT AND CHROME DYES—Continued

Name of dye	Manu- facturer	Imports	
		Quan- tity	Invoice value
Chrome fast printing red.....		Pounds 200	
Chrome fast printing red BD paste.....	By		
Chrome fast printing red GD paste.....	By		
Chrome printing azurine G pdr.....	I	5	
Chrome printing bordeaux B pdr.....	I	5	
Chrome printing brown 5G pdr.....	I	5	
Chrome printing green B pdr.....	I	5	
Chrome printing orange.....		10	
Chrome printing orange G pdr.....	I		
Chrome printing orange 2R pdr.....	I		
Chrome printing red.....		555	\$1,267
Chrome printing red B pdr.....	DH		
Chrome printing red B pdr.....	I		
Chrome printing red RY.....	DH		
Chrome printing red Y.....	DH		
Chrome printing violet N.....	I	661	
Chrome violet.....		340	1,053
Chrome violet CBD.....	DH		
Chrome violet C3BD.....	DH		
Chrome violet YM pdr.....	M		
Chromochlorine G pdr.....	DH	110	
Chromorhodine.....		2,917	9,256
Chromorhodine BN pdr.....	DH		
Chromorhodine BR pdr.....	DH		
Chromorhodine 6GN extra pdr.....	DH		
Chromoxane brilliant blue G.....	By	2,505	3,012
Chromoxane violet R.....	By	99	
Cloth yellow R pdr.....	Gr E	100	
Eriochrome black DF conc.....	G	220	
Eriochrome brilliant green G supra.....	G	110	
Eriochrome flavine A conc.....	G	10,713	
Eriochrome green.....		771	
Eriochrome green L.....	G		
Eriochrome green O.....	G		
Eriochrome red.....	G	3,085	
Lanasol blue B.....	I	881	
Lanasol brown 2R.....	I	1,102	
Metachrome black AG.....	A	5	
Metachrome blue black 2BX.....	A	7,000	
Metachrome brilliant blue BL.....	A	5	
Metachrome brown 6G.....	A	5	
Metachrome green 3G.....	A	5	
Metachrome olive.....		2,505	1,404
Metachrome olive B.....	A		
Metachrome olive D.....	A		
Metachrome olive 2G.....	A		
Metachrome olive brown.....		5,800	
Metachrome olive brown G.....	Bro		
Metachrome olive brown G.....	A		
Metachrome violet.....		470	
Metachrome violet B.....	A		
Metachrome violet 2R.....	A		
Modern green N pdr.....	DH	220	
Modern gray RCN.....	DH	220	
Modern olive IN pdr.....	DH	165	
Monochrome brown EF.....	By	500	
Naphthochrome blue BN.....	I	110	
Naphthochrome cyanine R.....	I	110	
Naphthochrome green G.....	I	110	
Naphthochrome violet 4B.....	I	110	
Nitrosine pdr.....	DH	55	
Omega chrome brown.....		11,511	
Omega chrome brown G conc.....	S		
Omega chrome brown PB conc.....	S		
Oxychrome blue black BG pdr.....	GrE	1,344	
Printing violet BD paste.....	I	132	
Ultra brown R.....	S	55	
Ultra cyanol B conc.....	S	600	

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

UNIDENTIFIED DIRECT DYES

Name of dye	Manu- facturer	Imports	
		Quan- tity	Invoice value
Benzo bordeaux 6B.....	By.....	<i>Pounds</i> 220	
Benzo chrome blue black B.....	By.....	110	
Benzo chrome brown.....		327	\$362
Benzo chrome brown B.....	By.....		
Benzo chrome brown 5G.....	By.....		
Benzo chrome brown R.....	By.....		
Benzo copper blue 2B.....	By.....	110	
Benzo dark brown extra.....	By.....	551	
Benzo fast black.....		4,539	3,014
Benzo fast black.....	Q.....		
Benzo fast black L.....	By.....		
Benzo fast black NL.....	Q.....		
Benzo fast blue FFL.....	By.....	220	
Benzo fast bordeaux.....		2,202	2,623
Benzo fast bordeaux 6BL.....	By.....		
Benzo light bordeaux 6BL.....	By.....		
Benzo fast brown.....		5,903	6,601
Benzo fast brown 3GL.....	By.....		
Benzo fast brown RL.....	By.....		
Benzo light brown 3GL.....	By.....		
Benzo fast eosine BL.....	By.....	153	
Benzo fast gray BL.....		2,854	
Benzo fast gray BL.....	By.....		
Benzo light gray BL.....	By.....		
Benzo fast heliotrope.....		3,289	5,278
Benzo fast heliotrope BL.....	By.....		
Benzo fast heliotrope 4BL.....	By.....		
Benzo fast heliotrope 5RH.....	By.....		
Benzo fast orange.....		1,537	2,135
Benzo fast orange 2R.....	By.....		
Benzo fast orange 2RL.....	By.....		
Benzo light orange 2RL.....	By.....		
Benzo fast orange S.....	By.....	1,421	
Benzo fast rubine.....		132	
Benzo fast rubine BL.....	By.....		
Benzo light rubine BL.....	By.....		
Benzo fast scarlet 5BL, 2GL.....	By.....	22	
Benzo fast violet BL.....	By.....	564	
Benzo red 12B.....	By.....	3,722	3,051
Benzo rhoduline red.....		1,862	1,020
Benzo rhoduline red B.....	By.....		
Benzo rhoduline red 3B.....	By.....		
Benzo scarlet BC.....	By.....	110	
Brilliant benzo fast violet 2RL.....	By.....	218	
Brilliant benzo fast yellow GL.....	By.....	11	
Brilliant benzo green B.....	By.....	10	
Brilliant benzo violet B, 2BH, 2BR.....	By.....	3,179	3,905
Brilliant congo blue 5R.....	A.....	5	
Brilliant congo violet R.....	A.....	5	
Brilliant cotton blue R conc.....	K.....	200	
Brilliant fast blue B, 2G.....	By.....	176	
Brilliant sky blue.....		8,458	10,687
Brilliant sky blue 8G extra.....	By.....		
Brilliant sky blue 2RM.....	By.....		
Brilliant sky blue 2RN.....	By.....		
Carbazol yellow W pdr.....	B.....	11	
Chicago red 111.....	G.....	1,550	
Chloramine brown 2R conc.....	S.....	500	
Chloramine light blue BS.....	S.....	200	
Chloramine light violet R conc.....	S.....	200	
Chloramine sky blue RF conc.....	S.....	55	
Chloramine violet FFB.....	Q.....	100	
Chlorantine black Y.....	I.....	4,409	
Chlorantine brown Y.....	I.....	2,205	
Chlorantine fast brown.....		13,558	16,234
Chlorantine fast brown 3GL.....	I.....		
Chlorantine fast brown 3GL conc.....	I.....		
Chlorantine fast brown RL.....	I.....		
Chlorantine fast gray B.....	I.....	991	
Chlorantine fast orange TRL.....	I.....	8,708	
Chlorantine fast violet 2RL.....	I.....	1,102	
Chlorantine fast yellow 4GL.....	I.....	2,205	
Chlorazol fast black.....		325	
Chlorazol fast black N.....	BD.....		
Chlorazol fast black No. 1.....	BD.....		
Chlorazol fast brown RK.....	BD.....	1,100	

TABLE 16.—Dyes imported into the United States, 1923—Continued

UNIDENTIFIED DIRECT DYES—Continued

Name of dye	Manu- facturer	Imports	
		Quan- tity	Invoice value
Chlorazol violet R.....	BD	<i>Pounds</i> 2,000	
Chromanil black.....		700	
Chromanil black BF.....	A		
Chromanil black FF.....	A		
Chromopurpurine JJ pdr.....	DH	220	
Cotton pink RN.....	B	130	
Developing blue.....		1,600	\$1,190
Developing blue B.....	A		
Developing blue 2R.....	A		
Developing blue 4R.....	A		
Diamine azo fast green G.....	C	52	
Diamine brilliant scarlet S.....	C	2,508	
Diamine brilliant violet B.....	C	3,000	
Diamine catechine.....		6,643	6,326
Diamine catechine B.....	C		
Diamine catechine G.....	C		
Diamine catechine GR dbl. strength.....	I		
Diamine fast blue.....		3,808	5,696
Diamine fast blue FFB.....	C		
Diamine fast blue FFG.....	C		
Diamine fast blue F3G.....	C		
Solamine blue FF.....	A		
Diamine fast bordeaux.....		4,066	5,117
Diamine fast bordeaux.....	C		
Diamine fast bordeaux 6BS.....	C		
Diamine fast brown.....		2,789	2,772
Diamine fast brown G.....	C		
Diamine fast brown GB.....	C		
Diamine fast brown G2B.....	C		
Diamine fast brown 3G.....	C		
Diamine fast brown R.....	C		
Diamine fast gray.....		2,268	
Diamine fast gray BN.....	C		
Diamine fast gray NBN.....	C		
Diamine fast orange.....		17,793	15,443
Diamine fast orange EG.....	C		
Diamine fast orange ER.....	C		
Diamine fast orange R.....	C		
Diamine fast pink.....		800	1,128
Diamine fast pink B.....	C		
Diamine fast pink C.....	C		
Diamine fast pink G.....	C		
Diamine fast red violet FR.....	C	270	
Diamine fast scarlet.....		155	
Diamine fast scarlet 6BS.....	C		
Diamine fast scarlet GS.....	C		
Diamine fast violet.....		663	
Diamine fast violet FFBN.....	C		
Diamine fast violet FFRN.....	C		
Diamine fast yellow 4G.....	C	50	
Diamine nitrazol green GF.....	C	518	
Diamine orange.....		425	
Diamine orange F.....	C		
Diamine orange G.....	C		
Diaminogene sky blue.....		2,261	2,172
Diaminogene sky blue 3B.....	C		
Diaminogene sky blue N.....	C		
Sky blue N.....	C		
Dianil fast blue.....		210	
Dianil fast blue GL.....	M		
Dianil fast blue RL.....	M		
Dianil fast gray RL.....	M	25	
Dianil fast orange RR.....	M	100	
Dianil fast scarlet.....		225	271
Dianil fast scarlet 8BS.....	M		
Dianil fast scarlet 4BSN.....	M		
Dianil fast scarlet GS.....	M		
Dianil fast violet BL.....	M	220	
Dianil light red 8BL.....	M	600	
Diazamine black N extra.....	CN	2,205	
Diazanil black V.....	M	1,170	
Diazanil blue 2R.....	M	100	
Diazanil pink B.....	M	750	

TABLE 16.—*Dyes imported into the United States, 1933—Continued*

UNIDENTIFIED DIRECT DYES—Continued

Name of dye	Manu- facturer	Imports	
		Quan- tity	Invoice value
Diazanil scarlet		Pounds 2,552	\$5,319
Diazanil scarlet 3BA	M.		
Diazanil scarlet 4BA	M.		
Diazanil scarlet 6BA	M.		
Diazo blue NA	L.	2,205	
Diazo bordeaux 7B	By	7	
Diazo brilliant blue 2BL	By	10	
Diazo brilliant green		325	
Diazo brilliant green BL	By		
Diazo brilliant green 3G	By		
Diazo brilliant scarlet		7,032	8,765
Diazo brilliant scarlet B extra	By		
Diazo brilliant scarlet 2BL extra	By		
Diazo brilliant scarlet 5BL extra	By		
Diazo brilliant scarlet 3B extra	By		
Diazo brilliant scarlet 3BA extra	By		
Diazo brilliant scarlet 6B extra	By		
Diazo brilliant scarlet G extra	By		
Diazo brown		502	406
Diazo brown G	By		
Diazo brown 3G	By		
Diazo brown 3RB	By		
Diazo brilliant orange GR, 5G	By	322	
Diazo dark blue 3B	By	284	
Diazo fast blue		1,983	2,843
Diazo fast blue BR	I.		
Diazo fast blue 4RW	I.		
Diazo fast blue 6GW	I.		
Diazo fast bordeaux BL	By	442	
Diazo fast green		26	
Diazo fast green BL	By		
Diazo fast green BL	A.		
Diazo fast red 5BL, 7BL	By	8	
Diazo fast violet		961	
Diazo fast violet BL	By		
Diazo fast violet 3RL	By		
Diazo fast yellow		553	
Diazo fast yellow G	By		
Diazo fast yellow 2G	By		
Diazo geranine B extra	By	738	
Diazo indigo blue 4GL extra	By	2,482	4,326
Diazo light green 2RL	By	11	
Diazo olive G	By	50	
Diazo pure blue		9,026	3,927
Diazo sky blue B	By		
Diazo sky blue 3G	By		
Diazo sky blue 3GL	By		
Diazo rubine B	By	2,930	3,798
Diazo violet R	By	137	
Diazo yellow R	By	199	
Diazogene red B	CJ	850	
Diazol pink NR	F	2,204	
Diazophenyl black V	G	5,407	
Diphenyl fast bordeaux G conc.	G	110	
Direct black RMW	C	50	
Direct brown 5G	I.	2,205	
Fast cotton blue		510	724
Fast cotton blue FF	A.		
Fast cotton blue FFG	A.		
Fast cotton blue 4GL	A.		
Fast cotton gray VL	A.	305	
Formal fast black G conc.	G	110	
Ionamine		20	
Ionamine B	BD		
Ionamine H	BD		
Naphthamine fast black KS	K	250	
Naphthamine green AG extra	K	250	
Naphthamine light blue 4B	K	100	
Naphthamine light brown 2G	K	500	
Naphthamine light green G	K	1,000	
Naphthamine light red R	K	500	
Naphthamine light violet 2B	K	500	
Naphthamine pink 2B conc.	K	110	
Naphthogene blue B	By	249	

TABLE 16.—*Dyes imported into the United States, 1923*—Continued

UNIDENTIFIED DIRECT DYES—Continued

Name of dye	Manu- facturer	Imports	
		Quan- tity	Invoice value
Nitranil brown.....		<i>Pounds</i> 330	
Nitranil brown B.....	I.....		
Nitranil brown R.....	I.....		
Nitranil brown S.....	I.....		
Nitranil green B.....	I.....	110	
Oxamine black.....		80	
Oxamine black BBN.....	B.....		
Oxamine black BBNX.....	B.....		
Oxamine fast blue.....		2,702	\$2,637
Oxamine fast blue 6B.....	B.....		
Oxamine fast blue RR.....	B.....		
Oxamine fast blue RRX.....	B.....		
Oxamine fast pink BX.....	B.....	130	
Oxamine light red ESB.....	B.....	200	
Oxydiaminogene.....	C.....	50	
Para blue 2BX.....	By.....	10	
Paranil black 2B.....	A.....	5	
Parasulphon brown.....		1,200	
Parasulphon brown B.....	S.....		
Parasulphon brown V.....	S.....		
Pluto brown 2G.....	By.....	209	
Plutoform black.....		50	
Plutoform BL.....	By.....		
Plutoform black 3GL.....	By.....		
Pyrazol orange.....		400	
Pyrazol orange R conc.....	S.....		
Pyrazol orange RR conc.....	S.....		
Rosanthere orange R conc.....	I.....	1,604	
Rosanthere pink.....	I.....	661	
Toluylene fast brown 2R.....	By.....	11	
Triazol light blue 4GL.....	GrE.....	280	
Triazol pure blue 6B.....	GrE.....	2,240	
Zambesi black.....		13,000	5,705
Zambesi black D.....	A.....		
Zambesi black D 60 per cent.....	A.....		
Zambesi black V.....	A.....		
Zambesi black V 77 per cent.....	A.....		

UNIDENTIFIED SULPHUR DYES

Cross dye green B.....	BD.....	26,242	
Eclipse brown BK.....	G.....	10,000	
Immedial violet C.....	C.....	850	
Katigene yellow brown GR extra.....	By.....	10	
Pyrogene brown DTB new.....	I.....	1,102	
Pyrogene cutch brown 2R extra.....	I.....	2,205	
Pyrogene indigo blue.....	S.....	220	
Pyrogene violet brown X.....	I.....	5,070	
Sulphide (thiogene) violet V.....	M.....	300	
Sulphur brilliant blue CLB.....	A.....	800	
Thiogene new blue 2RL.....	M.....	81	
Thional yellow GG.....	S.....	7,306	
Thional black XXN conc.....	BD.....	100	
Thionol brown.....		28,802	
Thionol brown O.....	BD.....		
Thionol brown R.....	BD.....		
Thionol purple B conc.....	BD.....	2,500	

TABLE 16.—*Dyes imported into the United States, 1923—Continued*

UNIDENTIFIED BASIC DYES

Name of dye	Manu- facturer	Imports	
		Quan- tity	Invoice value
Acridine scarlet J	DH	Pounds 77	
Brilliant acridine orange	DH	770	
Brilliant acridine orange 3R	DH		
Brilliant acridine orange 5R	DH		
Brilliant cresyl blue 2BS conc.	L	110	
Brilliant rhodamine red B	By	24	
Corvoline BT conc.	B	100	
Dahlia violet	Q	11	
Flavophosphine GO	M	765	
Indoine A extra pure	G	110	
Leather black TBO	C	50	
Leather brown 5GX	B	5	
Methylene blue 3G	B	105	
New ethyl blue BS	M	11	
Phosphine brown L	G	110	
Phosphine orange	G	110	
Rhodamine 4G		552	\$1,548
Rhodamine 4GD	Q		
Rhodamine 4GD extra	M		
Rhodamine 4GDN extra	Q		
Rhoduline blue		77	
Rhoduline blue GO	By		
Rhoduline blue 3GO	By		
Rhoduline sky blue 3G	By	55	

UNIDENTIFIED SPIRIT-SOLUBLE AND COLOR-LAKE DYES

Alizarin green C (soluble in oil)	By	198	
Azonine G, RR, S	C	30	\$28
Brilliant lake blue G extra	By	127	
Hansa green G pdr	M	25	
Hansa yellow 5G lumps	M	300	
Helio bordeaux BL paste	By	2,455	
Helio fast violet AL	By	31	
Helio red RM, RMT pdr	By	769	
Japan black		779	68L
Japan black extra	B		
Japan black MBG	B		
Japan black MGB	B		
Oil blue Z	K	10	
Oil brown AN	K	10	
Oil green ALB, ALG	K	20	
Paper fast bordeaux B	By	3,015	
Pigment black extra pdr	B	100	
Printing red	A-S Co	110	
Stone (lithol) fast orange R pdr	B	2,610	
Stone (lithol) fast yellow	B	650	952
Stone fast yellow 2G extra pdr	B		
Stone fast yellow 5G lumps	B		
Stone fast yellow GN lumps	B		
Stone fast yellow GR lumps	B		
Tero (typophor) black FB	B	5	
Tero (typophor) brown FR	B	7	
Tero (typophor) carmine FB	B	12	
Tero (typophor) red FG	B	25	
Tero (typophor) yellow FR	B	205	
Yellow II	B	38	
Zapon blue R	B	5	
Zapon violet R	B	5	

UNIDENTIFIED, UNCLASSIFIED DYES

All other aniline dyes		3,151	\$3,455
Beaver reddish brown	Q	22	
Pinatype complement red D	M	11	
Red violet HR	P	220	
Sumazine blue	SMS ²	500	
Thio violet 5R pdr	DH	55	

² The Sugar Manufacturers' Supply Co., Ltd., Great Britain.

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Name of dye	Schultz No.	Page	Name of dye	Schultz No.	Page
Aceto purpurine 8B	358	81	Alizarin cyanine NS	788	88
Acid alizarin black R	159	79	Alizarin cyanine NSG	799	88
Acid alizarin black SE	288	80	Alizarin cyanine green E, EF	865	91
Acid alizarin gray G		96	Alizarin cyanine green G, 3G	865	91
Ac.d anthracene brown PG, R, RH	88	78	Alizarin cyclamine R		96
Acid black SR		93	Alizarin direct blue B	851	90
Acid blue RBF	562	84	Alizarin direct blue BG AOO	860	90
Acid chrome black STC	277	80	Alizarin direct blue RXO	859	90
Acid chrome blue BH, 2R		95	Alizarin direct green G	865	91
Acid cyanine BF	705	86	Alizarin direct violet R	852	90
Acid fuchsine S	524	82	Alizarin direct violet ER		93
Acid green 2G	505	82	Alizarin emeraldole G		93
Acid magenta	524	82	Alizarin emeraldole green G		93
Acid milling black, B	265	80	Alizarin fast black SP		96
Acid milling red R		93	Alizarin fast gray 2BL		96
Acid milling yellow G		93	Alizarin geranole B		96
Acid phosphine R	606	85	Alizarin green C		102
Acid ponceau E	175	79	Alizarin green S	808	88
Acid pure blue R		93	Alizarin indigo G	893	91
Acid red violet		93	Alizarin indigo 3R	895	91
Acid rhodamine BG		93	Alizarin indigo 5R		95
Acid rhodamine R, RG		93	Alizarin indigo brown R		95
Acid rhodamine 3R		93	Alizarin indigo green B	894	91
Acid silver gray		93	Alizarin irisol R	852	90
Acid violet 3BNO	530	83	Alizarin light blue B	858	90
Acid violet 4BN	527	82	Alizarin light green EF		96
Acid violet 4BS	530	83	Alizarin maroon	798	88
Acid violet 4BNS	527	82	Alizarin orange, A, AO	779	88
Acid violet 6BNG	530	83	Alizarin pure blue B	855	90
Acid violet 6BS	548	83	Alizarin red 1B, DIB	778	88
Acid violet 6BNOO (B)	548	83	Alizarin red IWS, S	780	88
Acid violet 6BNOO (By)	527	82	Alizarin red SX	784	88
Acid violet 7BN	527	82	Alizarin red W	780	88
Acid violet 7B	534	83	Alizarin red XGP, YCA	785	88
Acid violet 7B purple		93	Alizarin rubinol 3G, 5G, GW, R		93
Acid violet 10B	530	83	Alizarin saphirol B	858	90
Acid violet C 10B	530	83	Alizarin saphirol SE, SAE	858	90
Acid violet 4RNOO	582	84	Alizarin saphirol WSA, SAWSA	858	90
Acid violet GENG	548	83	Alizarin sky blue B	855	90
Acridine golden yellow 2G	602	84	Alizarin uranol 2B, R		93
Acridine orange DHE, LP	603	84	Alizarin viridine FF	854	90
Acridine red 3B	569	84	Alizarin yellow 2G, 5G, GD	48	78
Acridine scarlet J		102	Alizarin yellow R	58	78
Algol blue 3G	844	90	Alkali blue 3R	536	83
Algol brilliant orange FR	822	89	Alkali violet CA	532	83
Algol brilliant pink FB, FF		95	Alkali violet 4BNOO	532	83
Algol brilliant red B		95	Alkali violet 6BOO	532	83
Algol brilliant red 2B	819	89	Alliance fast brown 5G		96
Algol brilliant violet 2B	821	89	Alphanol brown B, R		93
Algol brilliant violet R	820	89	Amaranth B	168	79
Algol brown G		95	Aniline yellow	6	78
Algol brown R	869	91	Anthosine 3B, 5B		93
Algol corinth R	870	91	Anthra bordeaux R	827	89
Algol gray 2B	834	89	Anthra claret R	827	89
Algol green B	847	90	Anthra pink B, R		95
Algol olive R	833	89	Anthra rubine B		93
Algol orange R	824	89	Anthra yellow G, GC	759	87
Algol pink R	818	89	Anthracene acid black ST	277	80
Algol red B	825	89	Anthracene acid brown G	221	79
Algol red FF	819	89	Anthracene blue WBU	800	88
Algol red 5G	816	89	Anthracene blue WG, WGU	800	88
Algol red R	819	89	Anthracene blue SWB, SWR	790	88
Algol yellow 3G	811	88	Anthracene blue SWGG	790	88
Algol yellow R	817	89	Anthracene brown R, RD	782	88
Algol yellow WF	814	89	Anthracene chromate brown EB		96
Alizarin, synthetic	778	88	Anthracene chrome blue R		96
Alizarin, SX	784	88	Anthracyanine S	627	85
Alizarin SDG	785	88	Anthracyanine brown GL		93
Alizarin VI	778	88	Anthraflavone G, GC	759	87
Alizarin astrol B	836	90	Anthraquinone blue SR	861	90
Alizarin black S (M)	807	88	Anthraquinone blue green BXO	863	91
Alizarin black S, WX	774	88	Anthraquinone green GXNO	864	91
Alizarin blue AS	856	90	Anthraquinone violet	853	90
Alizarin blue B	803	88	Anthrarubine B		93
Alizarin blue JR	852	90	Auracine G	609	85
Alizarin blue S, SB	804	88	Auramine G	494	82
Alizarin blue S, AP	858	90	Auramine N, O	493	82
Alizarin blue black B, BT, 3B	862	91	Aurine	555	83
Alizarin bordeaux 2G		96	Azo acid blue B	63	78
Alizarin brilliant green G	865	91	Azo blue B		93
Alizarin carmine	780	88	Azo carmine BX, BXH	673	86
Alizarin cyanine GG	799	88	Azo carmine GX	672	86

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Name of dye	Schultz No.	Page	Name of dye	Schultz No.	Page
Azo chromine NR.....	84	78	Brilliant naphthol blue R.....		93
Azo coralline L.....	65	78	Brilliant pure yellow 6G.....		93
Azo cyanine GR.....	256	80	Brilliant rhodamine red B.....		102
Azo orsellite BB.....		93	Brilliant sky blue 8G, 2RM, 2RN.....		98
Azo rhodine 2G.....		93	Brilliant sulphur red B, 5B.....	182	79
Azo wool blue SE.....	61	78	Brilliant wool blue FFR, G.....	562	84
Azo wool violet 7R.....		93	Brilliant yellow.....	303	80
Azonine G, RR, S.....		102	Caledon red BN.....	831	89
Basic yellow T, TCN.....	618	85	Cannelle AL.....	606	85
Beaver reddish brown.....		102	Capri blue GON.....	620	85
Benzoazurine 3G.....	411	81	Carbazol yellow W.....		98
Benzo bordeaux 6B.....		98	Carmine blue V.....	543	83
Benzo brown D 3G.....	485	82	Cashmere black TN.....		93
Benzo chrome black blue B.....		98	Chicago red III.....		98
Benzo chrome brown B, R.....		98	Chloramine blue BXR.....	386	81
Benzo chrome brown 5G.....		98	Chloramine blue HW.....	472	81
Benzo copper blue 2B.....		98	Chloramine brown 2R.....		98
Benzo dark brown.....		98	Chloramine light blue BS.....		98
Benzo fast black L, NL.....		98	Chloramine light violet R.....		98
Benzo fast blue FFL.....		98	Chloramine orange G.....	11	78
Benzo fast blue 2GL, 4GL.....	456	81	Chloramine red 3B.....	319	80
Benzo fast bordeaux 6BL.....		98	Chloramine red 8B, 8BS.....	358	81
Benzo fast brown 3GL, RL.....		98	Chloramine sky blue FF.....	424	81
Benzo fast eosine BL.....		98	Chloramine sky blue RF.....		98
Benzo fast gray BL.....		98	Chloramine violet FFB.....		98
Benzo fast heliotrope BL.....		98	Chloramine yellow GG.....	617	85
Benzo fast heliotrope 4BL, 5RH.....		98	Chlorantine black Y.....		98
Benzo fast orange 2R, 2RL.....		98	Chlorantine brown Y.....		98
Benzo fast orange S.....		98	Chlorantine fast brown 3G, L, RL.....		98
Benzo fast orange WS.....	340	81	Chlorantine fast gray B.....		98
Benzo fast pink 2BL.....	297	80	Chlorantine fast orange TRL.....		98
Benzo fast red 8BL.....	332	81	Chlorantine fast violet 2RL.....		98
Benzo fast rubine BL.....		98	Chlorantine fast yellow 4GL.....		98
Benzo fast scarlet 5BS, 8BS, GS.....	297	80	Chlorazol fast black N.....		98
Benzo fast scarlet 2GL, 5BL.....		98	Chlorazol fast brown RK.....		98
Benzo fast yellow RL.....	296	80	Chlorazol violet R.....		99
Benzo light blue 2GL, 4GL.....	456	81	Chromacetin blue S.....	627	85
Benzo light bordeaux 6BL.....		98	Chromanil black BF, FF.....		99
Benzo light brown 3GL.....		98	Chromanol black RVI.....		96
Benzo light gray BL.....		98	Chromanol blue NR.....		96
Benzo light orange 2RL.....		98	Chromazone red new conc.....	129	79
Benzo light rubine BL.....		98	Chromazurine G, P.....		96
Benzo pure blue.....	426	81	Chromazurol S, SXT.....	554	83
Benzo red 12B.....		98	Chrome bordeaux B.....	550	83
Benzo rhoduline red B, 3B.....		98	Chrome brown R, RVV.....	158	79
Benzo scarlet BC.....		98	Chrome fast cyanine GN.....		96
Benzo violet O.....	326	81	Chrome fast green B.....		96
Benzopurpurine 10B.....	405	81	Chrome fast phosphine R.....		96
Bismark brown.....	283	80	Chrome fast printing red BD, GD.....		97
Black extra.....	274	80	Chrome printing azurine G.....		97
Black JD.....	125	79	Chrome printing bordeaux B.....		97
Blue 1900.....	635	86	Chrome printing brown 5G.....		97
Brilliant acid blue A, F, FF.....	545	83	Chrome printing green B.....		97
Brilliant acid blue EG.....	506	82	Chrome printing orange G, 2R.....		97
Brilliant acid blue V.....	543	83	Chrome printing red B, RY, Y.....		97
Brilliant acid green 6B.....	508	82	Chrome printing violet N.....		97
Brilliant acridine orange A.....	603	84	Chrome violet CBD, C 3BD.....		97
Brilliant acridine orange 3R, 5R.....		102	Chrome violet CG.....	557	83
Brilliant alizarin blue R.....	667	86	Chrome violet VM.....		97
Brilliant benzo blue 6B.....	424	81	Chromochlorine G.....		97
Brilliant benzo fast violet 2RL.....		98	Chromocitronine R, 3R, V.....	140	79
Brilliant benzo fast yellow GL.....		98	Chromocyanine B.....	631	85
Brilliant benzo green B.....		98	Chromopurpurine JJ.....		99
Brilliant benzo violet B, 2BH, 2R.....		98	Chromorhodine BN, BR, 6GN.....		99
Brilliant chrome blue P.....	626	85	Chromoxane brilliant blue G.....		97
Brilliant chrome blue 2B, S.....		96	Chromoxane violet R.....		97
Brilliant congo R.....	370	81	Chrysamine K, KS.....	342	81
Brilliant congo blue 5R.....		98	Chrysoidine RL.....	34	78
Brilliant congo violet R.....		98	Ciba blue 2BD.....	881	91
Brilliant cotton blue 6B.....	541	83	Ciba bordeaux B.....	919	92
Brilliant cotton blue R.....		98	Ciba gray G.....	899	91
Brilliant delphine blue B.....	622	85	Ciba heliotrope B.....	897	91
Brilliant fast blue B, 2G.....		98	Ciba orange G.....	911	92
Brilliant geranine B.....	118	79	Ciba pink B, BG.....	912	92
Brilliant glacier blue.....	501	82	Ciba printing black B, G.....		95
Brilliant indigo B.....	885	91	Ciba red G.....	906	92
Brilliant indigo G.....	886	91	Ciba red R.....	908	92
Brilliant indigo 4G.....	887	91	Ciba rose BG.....	912	92
Brilliant lake blue G.....		102	Ciba scarlet G.....	907	92
Brilliant milling blue B.....		93	Ciba violet B, R.....	901	92
Brilliant milling green B.....	503	82	Ciba yellow G.....	890	91
Brilliant milling red R.....		93	Cibanone black B, 2G.....	794	88

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Name of dye	Schultz No.	Page	Name of dye	Schultz No.	Page
Cibanone brown B	868	91	Diazamine black N extra		99
Cibanone brown R		95	Diazamine blue BR, NA, RR	273	80
Cibanone orange R	792	88	Diazanil black V		99
Cibanone yellow R	795	88	Diazanil blue 2R		99
Cloth fastblack BN, 2BN, 4BN		93	Diazanil pink B		99
Cloth fast blue R	257	80	Diazanil scarlet 3BA, 4BA, 6BA		100
Cloth fast red GR		93	Diazo black OT	308	80
Cloth yellow R		97	Diazo blue NA		100
Coerulein S	601	84	Diazo Bordeaux 7B		100
Columbia blue G	387	81	Diazo brilliant black B	364	81
Columbia blue R	325	81	Diazo brilliant blue 2BL		100
Congo orange R	373	81	Diazo brilliant green BL, 3G		100
Congo rubine	313	80	Diazo brilliant orange GR, 5G		100
Corioflavine GOOO	609	85	Diazo brilliant scarlet B		100
Coriphosphine OX	606	85	Diazo brilliant scarlet G		100
Cornflower blue B	558	83	Diazo brilliant scarlet 6B		100
Corvoline BT		102	Diazo brilliant scarlet 2BL, 3BA, 5BL		100
Cotton blue No. 2	539	83	Diazo brown 3G, 3RB		100
Cotton blue R	649	86	Diazo dark blue 3B		100
Cotton blue BB	650	86	Diazo fast blue BR, 4RW, 6GW		100
Cotton pink B, BN	121	79	Diazo fast Bordeaux BL		100
Cotton pink GN	122	79	Diazo fast green BL		100
Cotton pink RN		99	Diazo fast red 5BL, 7BL		100
Cotton yellow, GI, GX	296	80	Diazo fast violet BL, 3RL		100
Cross dye green B		101	Diazo fast yellow G, 2G		100
Crystal violet, O, 5BO	516	82	Diazo geranine B		100
Cyananthrol BGA, BGAO, BGAOO	860	90	Diazo indigo blue BR, 2RL	274	80
Cyananthrol R, RXO	859	90	Diazo indigo blue 4GL		100
Cyanin B	544	83	Diazo light green 2RL		100
Cyanol extra	546	83	Diazo olive G		100
Cyanol extra A	546	83	Diazo rubine B		100
Cyanol FF	546	83	Diazo sky blue B, 3G, 3GL		100
Cyanol fast green G	566	84	Diazo violet R		160
Dahlia violet		102	Diazo violet R		100
Danubia blue BBX	653	86	Diazogene red B		100
Delta purpurine 5B	366	81	Diazol pink NR		100
Developing blue B, 2R, 4R		99	Diazophenyl black V		100
Diamine azo fast green G		99	Diphen blue B	695	86
Diamine brilliant bordeaux R	319	80	Diphenyl brown BBNC, GS	348	81
Diamine brilliant scarlet S		99	Diphenyl brown TB	449	81
Diamine brilliant violet B		99	Diphenyl catechine G	206	79
Diamine brown B	349	81	Diphenyl chlorine yellow FF supra	617	85
Diamine bronze G	448	81	Diphenyl chrysoine GC	14	78
Diamine catechine B, G		99	Diphenyl fast Bordeaux G		100
Diamine catechine GR		99	Diphenyl fast brown GNC	207	79
Diamine fast blue FFB, FFG, F3G		99	Direct black RMW		100
Diamine fast Bordeaux, 6BS		99	Direct brilliant blue 8B	541	83
Diamine fast brown G, 3G		99	Direct brown 5G		100
Diamine fast brown GB, G2B		99	Direct fast orange K	392	81
Diamine fast brown R		99	Direct fast scarlet SE	279	80
Diamine fast gray BN, NBN		99	Direct gray R	354	81
Diamine fast orange EG, R, ER		99	Direct yellow S	615	85
Diamine fast pink B, C, G		99	Duranthrene brilliant violet R	820	89
Diamine fast red 8BL	343	81	Duranthrene red BN	831	89
Diamine fast red violet FR		99	Duranthrene brown B	867	91
Diamine fast scarlet 6BS, GS		99	Duranthrene golden orange Y	760	87
Diamine fast violet FFBN, FFRN		99	Durindone blue 6B	883	91
Diamine fast yellow AGG	617	85	Durindone red B	912	92
Diamine fast yellow 3G	296	80	Durindone red 3B	918	92
Diamine fast yellow 4G		99	Eclipse brown BK		101
Diamine nitrazol green GF		99	Eosamine B	100	79
Diamine orange B	339	81	Eosine A	587	84
Diamine orange F, G		99	Eosine BG		93
Diamine rose GD	119	79	Erica B	121	79
Diamine scarlet B, 3B	319	80	Erica 2GN	117	79
Diaminogene extra	274	80	Erio blue AB		93
Diaminogene black extra	274	80	Eriochrome black E	154	79
Diaminogene blue NA, NBB	273	80	Eriochrome black DF		97
Diaminogene sky blue N, 3B		99	Eriochrome blue black G	180	79
Diamond green B	276	80	Eriochrome brilliant green G		97
Diamond magenta	512	82	Eriochrome cyanine RC	553	83
Dianil chrome brown G	476	82	Eriochrome flavine A conc		97
Dianil fast blue GL, RL		99	Eriochrome green L, O		97
Dianil fast gray RL		99	Eriochrome red		97
Dianil fast orange RR		99	Eriochrome verdon S	260	80
Dianil fast scarlet 8BS, 4BSN, GS		99	Eriocyanine A, AC	531	83
Dianil fast violet BL		99	Erio fast cyanine S, SE		93
Dianil light red 8BL		99	Erio fast fuchsine BL	582	84
Dianil yellow 3G	25	78	Erio fast violet BMS, RMS		93

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Name of dye	Schultz No.	Page	Name of dye	Schultz No.	Page
Erioglaucine A, AB, AP, EP	506	82	Helindone fast scarlet G, GG		95
Erio green BB supra	564	84	Helindone fast scarlet R	915	92
Erio viridine B	503	82	Helindone golden orange DJG		95
Erythrosine TB		93	Helindone golden orange IG	760	87
Ethyl violet, 6B	518	82	Helindone golden orange IRRT	761	87
Euchrysine GRNTN	608	85	Helindone golden orange I3R		95
Euchrysine RRX, RRD	608	85	Helindone gray BB	921	92
Excelsior brown	283	80	Helindone green G	892	91
Fast acid blue A		93	Helindone orange R	913	92
Fast acid blue B	562	81	Helindone pink AN, BN	910	92
Fast acid blue R	584	84	Helindone pink B, R, RN		95
Fast acid green 8B		93	Helindone red B	917	92
Fast acid marine blue HBBX		93	Helindone red DIBN	831	89
Fast acid marine blue HBT A		93	Helindone red 3B	918	92
Fast acid red RH		93	Helindone violet R	920	92
Fast acid violet B, R	580	84	Helindone violet 2R		95
Fast acid violet 10B	528	82	Helindone violet I2R, DI2R	767	87
Fast blue R	699	86	Helindone violet IBN	832	89
Fast bordeaux B	236	80	Helindone yellow AG, DAGC		95
Fast cotton blue FF, FFG, 4GL		100	Helindone yellow IG, DIG	849	90
Fast cotton gray VL		100	Helindone yellow 3GN	810	88
Fast green bluish	523	82	Helio bordeaux BL		102
Fast green extra bluish	523	82	Helio fast blue BL, SL	858	90
Fast light red BL		93	Helio fast violet AL		102
Fast light yellow, 2G	19	78	Helio red RM, RMT		102
Fast light yellow 3G, R	19	78	Hydron blue G, R	748	87
Fast mordant yellow G	294	80	Hydron bordeaux B, R		95
Fast red AV, AVX	161	79	Hydron brown G, CG, OG, R		95
Fast sulphon green 2G		93	Hydron dark blue G, GG		95
Fast sulphon violet 5BS	182	79	Hydron green B, G		95
Flavophosphine G	609	85	Hydron navy blue C, G		95
Flavophosphine GO		102	Hydron olive GN, R		95
Formal fast black G		100	Hydron orange FR, R, RE		95
Formyl violet S4B	530	83	Hydron pink FB, FF		95
Fur black DB, DG	923	92	Hydron scarlet 2B, 3B		95
Fur blue black A, SA	923	92	Hydron violet B, R		95
Fur blue gray	923	92	Hydron wool brown D, G		96
Fur brown NZ, NZD	923	92	Hydron wool olive B		96
Fur brown P, PR, PY	923	92	Hydron wool red BB		96
Fur brown 2R, 4R paste	923	92	Hydron wool yellow G		96
Fur brown SK, SKG, SP, SO	923	92	Hydron yellow NF		96
Fur gray AL, ALa	923	92	Immedial direct blue B	724	87
Fur gray, B, G, R	923	92	Immedial green GG	746	87
Fur gray brown SLA	923	92	Immedial indogene GCL	733	87
Fur olive DA, 3G	923	92	Immedial violet C		101
Fur red brown 6R	923	92	Indalizarin J	633	85
Fur yellow 2G, 4G	923	92	Indanthrene black BB	765	87
Fur yellow brown A, 4GL	923	92	Indanthrene blue BCD		96
Fur dye DF, 2G, SB, SC	923	92	Indanthrene blue BCS		96
Gallamine blue	637	86	Indanthrene blue GCD	842	90
Gallazine A	645	86	Indanthrene blue GGSP	841	90
Gallazine #90	645	86	Indanthrene blue GGSNP	841	90
Gallocyanine	626	85	Indanthrene blue 3G	840	90
Gallophenine P, VS	658	86	Indanthrene blue 5G	844	90
Gallo violet DF	635	86	Indanthrene blue R	837	90
Geranine G	118	79	Indanthrene blue RC, RO		96
Glaucol FF	546	83	Indanthrene blue RS, RSP	838	90
Grelanone yellow G		95	Indanthrene blue WB	850	90
Guinea brown GL, 2GL		93	Indanthrene blue RZ, REZ		96
Guinea brown RG, 2R, 3RD		93	Indanthrene blue 3GT		96
Guinea fast green B	503	82	Indanthrene blue green B	765	87
Guinea fast red BL, 2BL		93	Indanthrene bordeaux B extra	827	89
Guinea fast red 2R		93	Indanthrene brilliant red 2B		96
Guinea rubine 4R		93	Indanthrene brilliant violet BBK	821	89
Hansa green G		102	Indanthrene bordeaux B	828	89
Hansa yellow G	28	78	Indanthrene brown B	867	91
Hansa yellow 5G		102	Indanthrene brown GR	873	91
Havana brown 5G, S		94	Indanthrene brown R	869	91
Helindone black IBB	765	87	Indanthrene claret B	828	89
Helindone black T		95	Indanthrene copper R	813	88
Helindone blue BB	880	91	Indanthrene corinth RK	870	91
Helindone blue IGCD	842	90	Indanthrene dark blue BO	763	87
Helindone blue 3GN	896	91	Indanthrene golden orange G	760	87
Helindone blue green IB	765	87	Indanthrene golden orange RRT	761	87
Helindone bordeaux B		95	Indanthrene golden orange RRTS	761	87
Helindone brown AN	873	91	Indanthrene golden orange 3R		96
Helindone brown G	904	92	Indanthrene gray B	848	90
Helindone brown 3GN	836	89	Indanthrene gray 3B		96
Helindone brown JG		95	Indanthrene orange RRK	822	89
Helindone brown 2R	902	82	Indanthrene orange 6RTK	824	89
Helindone dark blue IBOA	763	87	Indanthrene pink B		96
Helindone fast scarlet C	907	92	Indanthrene red BN	831	89

Index to table of imports—Continued

Name of dye	Schultz No.	Page	Name of dye	Schultz No.	Page
Indanthrene red RK, RKP	831	89	Modern olive IN		97
Indanthrene red R	830	89	Modern royal blue	627	85
Indanthrene red brown R	873	91	Modern violet	635	86
Indanthrene red violet RRN		96	Modern violet N	624	85
Indanthrene violet GS	763	87	Monochrome brown EF		97
Indanthrene violet B	768	87	Nako DR, 3GA, PS, RH	923	92
Indanthrene violet BN	832	89	Nako DD, D2B, O black	923	92
Indanthrene violet RR	767	87	Nako yellow SEL	923	92
Indanthrene yellow G	849	90	Naphthalene blue black		94
Indanthrene yellow GP	849	90	Naphthalene green, V	564	84
Indian yellow FF	141	79	Naphthamine blue JEF	338	81
Indigo 2B	880	91	Naphthamine fast black KS		100
Indigo RB	880	91	Naphthamine green AG		100
Indigo 5B	882	91	Naphthamine green AN	475	82
Indigo 6B	883	91	Naphthamine light blue 4B		100
Indigosol DH	876	91	Naphthamine light brown 2G		100
Indochromine	667	86	Naphthamine light green G		100
Indocyanine B	705	86	Naphthamine light red R		100
Indoime A		102	Naphthamine light violet 2B		100
Induline NN	699	86	Naphthamine pink 2B		100
Ink blue BITN		94	Naphthamine violet BE	326	81
Ink blue BJTNO, BJTNOO		94	Naphthindone BB	126	79
Ionamine B, H		100	Naphthochrome blue BN		97
Iris violet	686	86	Naphthochrome cyanine R		97
Janus black I	125	79	Naphthochrome green G		97
Janus brown B	435	81	Naphthochrome violet 4B		97
Janus green B	124	79	Naphthochrome violet 2R	636	86
Janus red B	240	80	Naphthogene blue B		100
Janus yellow G	222	80	Naphthylamine black 4B	217	79
Japan black, MBG, MGB		102	Naphthylamine black 6B	266	80
Jasmine, highly conc.	140	79	Naphthylamine brown	160	79
Katigene yellow brown GR		101	Neolan black, 2G		94
Kiton fast green A		94	Neolan blue B, 2G		94
Kiton fast green VX	564	84	Neolan green B		94
Kiton fast red 4BL		94	Neolan gray B new		94
Kiton fast violet 10B	528	82	Neolan navy blue 2G, R		94
Kiton purc blue AFL		94	Neolan pink B, G		94
Kiton yellow G		94	Neolan red R		94
Kryogene violet 3RX	754	87	Neptune blue BGX	543	83
Lanasol blue B		97	Neptune blue BXX	545	83
Lanasol brown 2R		97	New ethyl blue BS		102
Leather black TBO		102	New fast gray	681	86
Leather brown A	283	80	New methylene blue N, NX	663	86
Leather brown 5GX		102	New methylene blue NNX, NSS	663	86
Leather phosphine G, 2G	606	85	Night blue	560	84
Light green SF yellowish	505	82	Night blue greenish D	560	84
Light green SF yellowish XX	505	82	Night green A	503	82
Lithol fast orange R		102	Nigrosine T, W, WLG	700	86
Lithol fast yellow 2G, 5G		102	Nile blue BX	653	86
Lithol fast yellow GN, GR		102	Nitranil brown B, R, S		101
Magenta	512	82	Nitranil green B		101
Malta gray, B, J	681	86	Nitrosamine red	56	78
Meldola's blue 3R conc.	649	86	Nitrosine pdr.		97
Metachrome black AG		97	Oil blue Z		102
Metachrome blue black 2BX		97	Oil brown AN		102
Metachrome brilliant blue BL		97	Oil green ALB		102
Metachrome brown 6G		97	Omega chrome brown G, PB		97
Metachrome green 3G		97	Onis 3B, 5B		93
Metachrome olive, B, D, 2G		97	Orange 2G	38	78
Metachrome olive brown G		97	Oxamine acid brown G		94
Metachrome violet B2R		97	Oxamine black BBN, BBNX		101
Methyl alkali blue	535	83	Oxamine black BHN	333	81
Methyl Lyons blue	537	83	Oxamine fast blue 6B, RR, RRX		101
Methyl silk blue new	537	83	Oxamine fast pink BX		101
Methyl violet NFB	515	82	Oxamine light red ESB		101
Methyl violet 300XE	515	82	Oxamine red 3BX, X	346	81
Methylene blue 3G		102	Oxychrome blue black BG		97
Methylene blue NNX	663	86	Oxydiaminogene		101
Methylene green extra yellowish	660	86	Palatine chrome brown GGX	154	79
Methylene green B	660	86	Palatine chrome brown RX, W	154	79
Methylene green A		102	Palatine chrome brown WRNTX	154	79
Methylene heliotrope	687	86	Palatine light yellow RX		94
Methylene yellow H	618	85	Palatine scarlet A	81	78
Milling brown 3G, R		94	Paper fast bordeaux B		102
Milling orange	250	80	Para blue 2BX		101
Milling red G	293	80	Paranil black 2B		101
Milling yellow GA, O, 3G	177	79	Parasulphon brown B, V		101
Minaxo acid brown G		94	Patent blue A	545	83
Modern cyanine V	627	85	Patent blue V	543	83
Modern gray RCN		97	Patent dianil black FF	436	81
Modern green N		97	Patent green AGL	503	82
Modern heliotrope	625	85	Patent marine blue LE	543	83

Index to table of imports—Continued

Name of dye	Schultz No.	Page	Name of dye	Schultz No.	Page
Patent phosphine G	606	85	Sulpho rhodamine B	579	84
Patent phosphine 2G	606	85	Sulpho rosazeine BG	579	84
Patent phosphine R (I)	606	85	Sulphon acid brown 2R		94
Patent phosphine R (B)	608	85	Sulphon orange G		94
Patent phosphine 2R	608	85	Sulphon yellow 5 G		94
Patent phosphine GRNTN	608	85	Sulphur brilliant blue CLB		101
Patent phosphine RRDX	608	85	Sulphur yellow G	712	86
Permanent red 4B	152	79	Sumazine blue		102
Philadelphia yellow 2G	606	85	Sun yellow G	9	78
Phosphine O, 3R	606	85	Supramine black BR		94
Phosphine brown L		102	Supramine brown R		94
Phosphine orange		102	Supramine red B, 2G		94
Pigment black extra		102	Supramine yellow G, R		94
Pigment chrome yellow L	21	78	Tannin heliotrope	685	86
Pigment purple A	93	78	Tannin orange R	74	78
Pilatus light yellow RX		94	Tannoflavine T	618	85
Pinatype complement red D		102	Tero black FB		102
Pluto brown 2G		101	Tero brown, FR		102
Plutoform black BL, 3GL		101	Tero carmine FB		102
Polar maroon VC		94	Tero red FG		102
Polar orange R		94	Tero yellow FR		102
Polar red G, R, RS, 3B		94	Tetra cyanol A	545	83
Polar yellow 2G, 5G		94	Tetra cyanol V	543	83
Pure blue 2G	537	83	Thiazol yellow 3G	198	79
Printing violet BD		97	Thioflavine T, TCN	618	85
Printing red		102	Thiogene black MA	720	87
Pyranine orange 3G	306	80	Thiogene new blue 2RL		101
Pyranine orange R	360	81	Thiogene violet V		101
Pyrazol orange G	392	81	Thioindigo brown R	902	92
Pyrazol orange R, RR		101	Thioindigo brown G	904	92
Pyrogene brown DTB		101	Thioindigo orange R	913	92
Pyrogene catch brown 2R		101	Thioindigo orange RY	913	92
Pyrogene direct blue RL	726	87	Thioindigo pink AN, BN	910	92
Pyrogene green 3G	746	87	Thioindigo pink RN		96
Pyrogene indigo	735	87	Thioindigo red 3B	918	92
Pyrogene indigo blue		101	Thioindigo rose RN		96
Pyrogene violet brown X		101	Thioindigo scarlet 2G	907	92
Pyrogene yellow M	734	87	Thioindigo violet 2R		96
Pyronine G	568	84	Thioindigo violet 5R		96
Quinoline yellow	613	85	Thioindigo yellow 3GN	913	92
Quinoline yellow (spirit-soluble)	612	85	Thional brown G	747	87
Quinoline yellow KT, N, O	613	85	Thional yellow GG		101
Radio brown B		94	Thionine blue G, GO	661	86
Radio red G		94	Thionine blue GO old	661	86
Radio yellow R		94	Thional black XXX		101
Red IB, JB	240	80	Thional brown O, R		101
Red violet HR		102	Thionol purple B		101
Rheonine AL, GD	607	85	Toluylene fast brown 2R		101
Rhodamine B	573	84	Toluylene fast orange GL	392	81
Rhodamine 3B	574	84	Toluylene red, OO	358	81
Rhodamine G, 3R	572	84	Triazol light blue 4GL		101
Rhodamine 4GD, 4GDN		102	Trizaol pure blue 6B		101
Rhodamine 6G, 6GD	571	84	Trizaol red 3B	319	80
Rhodamine 6GDN, 6GH	571	84	Trisulphon brown B	449	81
Rhoduline blue GO, 3GO		102	Trisulphon brown GG	457	81
Rhoduline orange N, NO	603	84	Trisulphon violet B	322	80
Rhoduline sky blue 3G		102	Turquoise blue BB, G	498	82
Rhoduline yellow 6G, 6GT	618	85	Typophor black FB		102
Rosanthrene orange R		101	Typophor brown FR		102
Rosanthrene pink		101	Typophor carmine FB		102
Rosazeine B extra	573	84	Typophor red FG		102
Rose bengale B	597	84	Typophor yellow FR		102
Rosinduline 2B bluish	673	86	Ultra brown R		97
Rosolane	688	86	Ultra cyanine RB	644	86
Rosolane O	687	86	Ultra cyanol B		97
Safarine	679	86	Ultra orange R	58	78
Scarlet RR		94	Ursol D, SG	923	92
Setoglaucine	496	82	Vat black BB	765	87
Setopaline	500	82	Vat blue green B	765	87
Silk blue BIC (A)		94	Vat brilliant violet RR, RRP	767	87
Silk blue BSIC	539	83	Vat brilliant violet RK	820	89
Silver gray P	700	86	Vat brown G		95
Sitara fast red RL	73	78	Vat golden orange G	760	87
Solamine blue FF		99	Vat gray K	834	89
Soluble blue T	539	83	Vat gray 6B	921	92
Special blue G		94	Vat heliotrope R	828	89
Spruce red B		94	Vat olive R	833	89
Stanley red	193	79	Vat orange R		96
Stone fast orange R		102	Vat orange RRT	761	87
Stone fast yellow 2G, 5G		102	Vat orange 4R	762	87
Stone fast yellow GN, GR		102	Vat red 5GK	816	89
Sulphide violet V		101	Vat red violet RH	918	92

Index to table of imports—Continued

Name of dye	Schultz No.	Page	Name of dye	Schultz No.	Page
Vat red violet RRK		96	Wool fast orange G		94
Vat violet BR		96	Wool fast red BL		94
Vat yellow GK	817	89	Wool fast yellow 3G		94
Vat yellow BK	810	88	Wool green S	566	84
Vat yellow 3RT		96	Wool jet black 3B	220	79
Vesuvine extra	283	80	Wool printing black CUI		94
Vesuvine 3R	283	80	Wool red G		94
Victoria blue B	559	84	Wool violet RC		94
Victoria blue 4R	522	82	Xylene blue VS	507	82
Victoria green	497	82	Xylene fast blue AE		94
Victoria pure blue BO	559	84	Xylene fast green B	564	84
Victoria violet 4BS	61	78	Xylene light yellow 2G	22	78
Violamine B	580	84	Xylene light yellow R	22	78
Violet PDH	636	86	Xylene milling red B		94
Violet 4RN	514	82	Yellow IG, JG	222	80
Water blue	539	83	Yellow II		102
Wool black GRF	220	79	Yellow T	618	85
Wool black 6B	220	79	Zambesi black, D, V		101
Wool black N		94	Zambesi brown 4R	330	81
Wool blue 2B, 5B	565	84	Zambesi pure blue 4BG	274	80
Wool blue N	562	84	Zapon blue R		102
Wool fast blue BL		94	Zapon violet R		102
Wool fast blue GL		94			

CHAPTER I

Year	Event
1776	Declaration of Independence
1787	Constitution of the United States
1791	Bill of Rights
1800	Transfer of the Capital to Washington
1803	Louisiana Purchase
1812	War of 1812
1820	Missouri Compromise
1848	Texas Annexation
1850	Compromise of 1850
1861	Secession of Southern States
1862	Emancipation Proclamation
1865	End of the Civil War
1877	Compromise of 1877
1890	Wreck of the S.S. Titanic
1901	Spanish-American War
1913	16th Amendment
1917	United States Enters World War I
1918	19th Amendment
1920	Prohibition
1929	Stock Market Crash
1933	Prohibition Ends
1939	World War II Begins
1945	End of World War II
1948	Truman Doctrine
1950	McCarthyism
1954	Brown v. Board of Education
1957	First African American in Space
1960	John F. Kennedy Elected
1963	Civil Rights Act
1964	Great Society Programs
1968	Richard Nixon Elected
1970	Vietnam War Escalates
1973	Watergate Scandal
1974	Nixon Resigns
1976	Gerald R. Ford Elected
1980	Jimmy Carter Elected
1981	Iran Hostage Crisis
1982	Reagan Elected
1984	Star Wars Program
1987	Reagan Resigns
1989	End of the Cold War
1991	Gulf War
1993	Clinton Elected
1994	North American Free Trade Agreement
1997	Clinton Resigns
1998	Clinton Elected
2001	9/11 Attacks
2001	Bush Elected
2002	Afghanistan War
2003	Iraq War
2008	Obama Elected
2009	Health Care Reform
2011	Arab Spring
2012	Obama Re-elected
2013	Syrian Civil War
2014	Ukraine Crisis
2016	Trump Elected
2017	Trade Wars
2020	COVID-19 Pandemic
2021	January 6th Insurrection
2021	Biden Elected

PART IV

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CENSUS OF SYNTHETIC ORGANIC CHEMICALS
OTHER THAN THOSE OF COAL-TAR
ORIGIN, 1923

PART IV

CENSUS OF SYNTHETIC ORGANIC CHEMICALS OTHER THAN THOSE OF COAL-TAR ORIGIN, 1923

INTRODUCTORY

The United States Tariff Commission has compiled a census of the production of synthetic organic chemicals for the year 1923. A similar census, made for the first time in 1921, has been repeated each year. The quantity of production and the amount and value of the sales have been given in all cases where the figures could be published without disclosing the operations of the individual producer.

The products included in this census are synthetic organic compounds derived from sources other than coal tar. Aliphatic compounds derived from natural sources by isolation, distillation, extraction, hydrolysis, or purification, as for example, alkaloids, constituents of essential oils, sugars, and acids, such as stearic and tartaric, are not included, nor are cyanides, cyanamides, or carbides of metals or inorganic radicals. Statistics for products obtainable from other sources have been excluded in most cases.

As the Bureau of the Census collects data for the more important non-coal-tar organic compounds, the Tariff Commission has not attempted to collect statistics on such, except in a few instances where the importance of the industry or other conditions appeared to warrant this departure.

The production in 1923 of synthetic organic chemicals other than those derived from coal tar was 90,597,712 pounds, compared with 79,202,155 pounds in 1922. Sales in 1923 amounted to 67,727,067 pounds, valued at \$13,875,521. This total includes the production of research chemicals, sales of which amounted to 437 pounds, valued at \$7,930, or \$1.81 per pound.

DEVELOPMENTS IN THE INDUSTRY

Previous to the World War the United States produced a few synthetic organic chemicals other than those of coal-tar origin. Among these were acetone, chloroform, ether, acetic acid, formaldehyde, acetaldehyde, amyl acetate, and vanillin. Although few in number, the chemicals of this group required large scale production.

Shortly after the outbreak of the war the manufacturers of finished perfumes, flavors, pharmaceuticals, and other products, who had been dependent upon imports of fine chemicals from Germany, were confronted with a serious situation. The American manufacturers who then undertook to supply these products have since developed an industry not only of considerable size but the source of most of the synthetic organic chemicals consumed in the United States.

Synthetic aromatic chemicals.—The synthetic aromatic chemical industry is a source of supply of raw materials for the flavor and perfume industries. The past year (1923) was probably one of the

most successful that American manufacturers of these products have enjoyed. Progress has been made in overcoming the former prejudice against synthetic aromatic chemicals, and the most important factor in this result has been the successful and systematic development of quality products. American manufacturers of these products have not neglected that essential unit of their business, namely, the research laboratory, and the industry has consequently been placed upon a stable and scientific basis. Workers in the field of perfumes and flavors know it to be one of the most extensive and difficult branches of organic chemistry and, although much important work has been accomplished, further developments may be expected.

Heliotropin, ionone, isoeugenol, rhodinol, terpineol and vanillin show conspicuous increases in production. Several of the esters used in perfumery, as well as nerol, an alcohol similar to geraniol, were reported in 1923, but not in 1922. Among the products showing a decrease in production are linalyl acetate and citronellol.

Esters.—Several of the esters show a large increase in production. The production of amyl acetate in 1923 reached 3,207,022 pounds and of ethyl acetate (85 per cent), 25,887,720 pounds, as compared with 16,114,458 pounds in 1922. Ethyl chloride shows an increase in production, and butyl acetate a decrease.

Chloroform and carbon tetrachloride.—The production of chloroform and carbon tetrachloride was greatly increased in 1923, the output of chloroform in that year amounting to 1,585,250 pounds, and that of carbon tetrachloride to 13,513,644 pounds.

Pharmaceuticals.—Manufacturers of synthetic medicinals have increased production in chloral hydrate, glycerophosphoric acid and salts, iodoform, and formaldehyde. Formaldehyde is used as a disinfectant and antiseptic, and in the manufacture of hexamethylenetetramine. The latter, which serves not only in medicine but in greater amounts as an accelerator in the vulcanization of rubber and in the manufacture of synthetic resins, shows a decrease in production for 1923.

Some medicinals of special interest, reported in 1923 but not in the previous year, are alphozone (succinic dioxide) and dibromin (dibromomalonylureide).

Acetylene derivatives.—Aldol and paracetaldehyde each show an increased production for the year 1923; on the other hand, the production of acetaldehyde shows a decrease. These products are imported from Canada, where during the war a large plant was erected at Shawinigan Falls to produce acetic acid and acetone from acetylene. The production of aldehyde-ammonia, used as an accelerator in the vulcanization of rubber, shows a decrease in production for the year 1923. Acetylene derivatives reported in 1923 but not in 1922 include acetylene tetrabromide and acetylene tetrachloride.

Ethylene and propylene derivatives.—Ethylene shows a considerable increase in production for 1923, being used as an anesthetic in place of ether or nitrous oxide. Several derivatives of ethylene and propylene were made in commercial quantities in 1923. Probably the most important of these is ethylene chlorohydrin, which shows a large increase in production. These derivatives are manufactured by at least two companies. The process used is based upon the recovery of ethylene and propylene from the waste gases of petroleum-cracking and from other hydrocarbon gases. Other products from

these sources are diethyl sulphate, used as an ethylating agent, particularly in dye manufacturing, and isopropyl alcohol, used in organic synthesis, particularly for the perfumery and flavoring industries.

Gallic and pyrogallic acids are important products of this group. Gallic acid is a white crystalline substance made from nutgalls, used in the manufacture of dyes, pyrogallic acid, ink, and in medicine. Pyrogallic acid is one of the oldest of photographic developers. Both of these products showed an increased production in 1923.

Dihydroxytartaric acid.—A large increase in the manufacture of this product is noted for 1923. It finds application in the manufacture of a dye known as tartrazine.

Furfural, first reported in commercial quantities in 1922, shows a large increase in production in 1923. This synthetic is made from corncobs, a waste material available in practically unlimited quantities. Furfural may have valuable uses in the synthetic resin and varnish industry.

Lactic acid, used in the leather, textile, and dye industries, shows a decreased production for 1923. The manufacture of this product by a controlled fermentation process is an American development.

Oxalic acid, one of the most important chemicals of this group of synthetics, showed a decrease in production in 1923.

Tetraethyl lead is one of the synthetics reported for the first time in 1923. It is finding use as an anti-knock compound in gasoline engines.

STATISTICS OF PRODUCTION AND IMPORTS

TABLE 17.—Production and sales of synthetic organic chemicals, 1923

(Not derived from coal tar)

[The numbers in the second column refer to the numbered alphabetical list of manufacturers printed on page 195. An X indicates that the manufacturer did not consent to the publication of his name in connection with the particular product. A blank in the third and fourth columns indicates that these sales can not be published without revealing information in regard to the sales of individual firms. A blank in the sixth column indicates that the production can not be published without revealing information in regard to the output of individual firms. The details thus withheld are, however, included in the totals]

Name	Manufacturer's identification number according to list on p. 195	Sales			Total production Pounds
		Quantity	Value	Average price per pound	
Total.....		Pounds 67,727,067	\$13,875,521	\$0.20	Pounds 90,597,712
Acetaldehyde.....	29, 75, 118, 149, X	1,003	614	.61	
Acetamide.....	54, 68				
Acetin (mono).....	191				
Acetylene tetrabromide.....	62				
Acetylene tetrachloride.....	29				
Aldehyde ammonia.....	149				
Aldol (β-hydroxybutyraldehyde).....	29				
Alloxan (mesoxalyl urea).....	179				
Allyl alcohol.....	144				
Allyl isothiocyanate.....	33				
Alphozone (succinic dioxide).....	X				
Aminopropionic acid.....	197				
Amyl acetate and sec. amyl acetate.....	10, 63, 72, 75, 117, 127, 129, 141, 191, 193, X, X	1,858,176	1,017,627	.55	3,207,022
Amyl alcohol and sec. amyl alcohol.....	X, X, X				
Amyl isovalerate.....	191				
Amyl oenanthate.....	75				

TABLE 17.—Production and sales of synthetic organic chemicals, 1923—Continued

Name	Manufacturer's identification number according to list on p. 195	Sales			Total production Pounds
		Quantity Pounds	Value	Average price per pound	
Anethol	75, 79, X	573	\$636	\$1. 11	305
Anisic acid	79				
Aubepine (anisaldehyde)	24, 75				
Barbital (veronal) (diethylbarbituric acid)	1, 17, X	9, 116	176, 960	19. 41	
Barbital sodium	17				
Borneol	69, 137				
Brometone (tribromotertiarybutyl alcohol)	X				
Bromodihylacetylcarbamide	17				
Bromocamphor	62, 118				
Bromoform	62				
Butanol (n-butyl alcohol)	29, 43				
sec.-Butyl alcohol	X				
Butyl acetate (n, and sec.)	10, 63, 75, 79, 117, 127, 141, 191, 193, X	351, 041	151, 673	. 43	1, 816, 086
n-Butyl bromide	68				
Butyl butyrate	79				
n-Butyl iodide	68				
Butyl propionate	79				
Butyraldehyde	29, 43				
n-Butyric acid	72, 79, 141				23, 569
Butylxanthic disulphide	X				
d-Camphoric acid	118				
n-Caproic acid	75, 141				
Carbon tetrachloride	62, 139, 200, X	11, 007, 361	\$74, 281	. 08	13, 513, 644
Chaulmoogric ester	17				
Chloroacetyl chloride	62				
Chloral hydrate	124, X				
Chloretone (trichlorotertiarybutyl alcohol)	X				
Chloroacetic acid (mono)	62, 63				
Chloroform	62, 139, 160, X	1, 442, 479	355, 319	. 25	1, 585, 250
Chlorodimethyl ether	17				
Chloro-theophylline	17				
Cinnamyl alcohol	75				
Cinnamyl ketone	75				
Cinnamyl valerate	75				
Citronellol	75, 103, 194				
Citronellyl acetate	75, 178, X				99
Crotonaldehyde	29				
Crotonic acid	29				
Cyanacetic acid, sodium salt	17				
Decyl alcohol	75				
Decyl aldehyde	75				
Dibromin (dibromomalonylureide)	X				
Dibromobehenate of calcium	17				
n-Dibutylamine	1				
Dichloroacetic acid	62				
Dichloroethylether	29				
Dichloromethane	62				
Dichloropentanol	17				
Diethylacetic acid	17				
Diethylamine	1, 205				
Diethylaminoethyl alcohol	205				
Diethylbromoacetyl bromide	17				
Diethyl malonate (malonic ester)	1, 17				
Diethyl sulfate	29				
Dihydrovanillone	75				
Dihydroxycitronellie ketone	75				
Dihydroxytartaric acid	27, 88, 151, 205				100, 029
Diiodohydroxypropane	17				
Dimethylamine	205				
Dimethylglyoxime	68, 111				
1:3-Dimethylxanthine	17				
1:3-Dimethylxanthine sodium acetate	17				
Disodiummonoethylarsone	X				
Duodecyl alcohol	75				
Duodecyl aldehyde	75				
Erucic acid	17				
Ethyl acetate, 85 per cent	10, 63, 72, 75, 117, 127, 129, 191, 193, 194, X	16, 970, 972	1, 936, 217	. 11	25, 887, 720

TABLE 17.—Production and sales of synthetic organic chemicals, 1923—Continued

Name	Manufacturer's identification number according to list on p. 195	Sales			Total production Pounds
		Quantity Pounds	Value	Average price per pound	
Ethyl acetoacetate	191				
Ethyl anisate	79				
Ethyl azelate	79				
Ethyl bromide	17, 62, 118, 194, 205			\$0.39	124, 842
Ethyl butyrate	24, 72, 75, 79, 141, 191, 194, X, X	40, 791	\$51, 581	1.27	40, 477
Ethyl n-caproate	141				
Ethyl carbonate	75, 191				
Ethyl chloride	48, 62, 78, 83, 118, 160, 191, X, X	219, 594	68, 505	.31	270, 180
Ethyl chloroacetate	62, 191				
Ethyl citrate	194				
Ethyl xanthic acid, ethyl ester of	X				
Ethyl ether	48, 63, 118, 153, 174, 191	4, 666, 832	554, 203	.12	5, 104, 157
Ethyl formate	75, 79, 118, 141, 191, X	2, 016	1, 220	.61	1, 958
Ethyl glycolic acid ester of menthol	17				
Ethyl iodide	68, 118, 124, 153, 179	226	1, 234	5.46	261
Ethyl isovalerate	75, 141, 191				
Ethyl lactate	75, 191				
Ethyl laurate	75				
Ethyl malonate (mono)	1, 75				
Ethyl nitrite	118, 153, X	29, 946	15, 428	.52	35, 140
Ethyl oenanthane	75, 79, 141, 194, X	3, 965	6, 942	1.75	3, 476
Ethyl oxalate	17, 75, 191, 194				
Ethyl pelargonate	24, 75, 79, 129				823
Ethyl propionate	72, 75, 194, X			1.81	1, 869
Ethyl n-valerate	72, 75, 194, X				
Ethylene	191				
Ethylene bromide	62, 118				
Ethylene chlorohydrin	29, 62				
Ethylene diamine	29, X				
Ethylene dibromide	62				
Ethylene dichloride	29, 62				
Ethyleneglycol	29				
Ethylene oxide	29				
Formaldehyde	58, 93, 127, 142, 149, X	18, 854, 535	2, 474, 506	.13	24, 081, 188
Formic acid, 85 per cent.	196				
Furfural	156				
Galic acid	68, 118, 208	161, 399	88, 342	.55	469, 941
Geranyl acetate	75, 79, 129, 178, X				
Geranyl butyrate	75, 103, X	20	125	6.25	
Geranyl formate	75, 103, 178, X	22	129	5.86	
Geranyl propionate	75				
Geranylphenyl acetate	75				
Glycerol monochlorohydrin	68				
Glycerophosphoric acid and salts of	142, X				
Glycol diacetate	29				
Guaiaicol acetate	75				
Guaiaicolphenyl acetate	75				
Hellotropin	24, 75, 78, 192, X	12, 914	24, 572	1.90	11, 696
Heptadecyl aldehyde	75				
Heptaldehyde	75, 79, X				
Heptaldehyde ammonia	X				
Heptoic acid	79				
n-Heptyl alcohol	75				
Heptylideneethylamine	X				
Heroin (diacetylmorphine)	118, 136, 153	1, 000	118, 433	118.43	
Hexachloroethane	29, 62				
Hexadecyl alcohol	75				
Hexadecyl aldehyde	75				
Hexadecyl ketone	75				
Hexamethylenetetramine	93, 142, 149, X	1, 155, 083	974, 877	.84	1, 381, 073
Hexamethylene tetramine anhydromethylene citrate	17				
Hydroxycitronellal	186, X				
Iodobehenate of calcium	17				
Iodobehenate of iron basic	17				
Iodobehenic acid	17				
Iodoform	118, 124, 136, 153	12, 179	63, 758	5.24	13, 231
Ionone	75, 103, 129, 192, 194, X	23, 476	98, 478	4.20	

TABLE 17.—Production and sales of synthetic organic chemicals, 1923—Continued

Name	Manufacturer's identification number according to list on p. 195	Sales			Total production Pounds
		Quantity, Pounds	Value	Average price per pound	
Isoamyl acetate	141				
Isoamyl butyrate	24, 75, 79, 141, 191, X, X.	9,362	\$13,189	\$1.41	9,733
Isoamyl formate	75, 79, 141, 191			1.20	84
Isoamyl nitrite	68				
Isoamyl n-valerate	72				
Isoamyl isovalerate	75, 79, 141, 191, X.	399	1,196	3.00	430
Isobutyl acetate	75, 79, 141, 191	83	274	3.30	111
Isobutyl alcohol	103				
Isobutyl butyrate	75, 141, 191	12	34	2.83	
Isobutyl formate	75, 191				
Isobutyl isobutyrate	79				
Isobutypropionate	75				
Iso butyraldehyde	75				
Iso butyric acid	79, 141				
Isoeugenol	24, 75, 103, 192, 195, X.	2,063	9,502	4.61	
Isopropyl acetate	75				
Isopropyl alcohol (Isopropanol)	29, 144, X				
Isopropyl chloride	144				
Isopropyl oxalate	191				
Isovaleric acid	79, 141, 176				
Jasmone ketone	75				
Lactic acid	197				
Limonene alcohol	194				
Linalyl acetate	75, 103, 178, 192	453	3,570	7.88	238
Linalyl butyrate	75				
Linalyl formate	75, 178, 192				
Linalyl propionate	75				
Linalyl valerate	75				
Methaform (chlorobutanol)	X				
Methyl acetate	79, 127, 191				
Methylamine	205				
Methyl anisate	79				
Methyl bromide	62				
Methyl n-butyrate	75, 141, 191				
Methyl chloride	X				
Methyl eug nol	75, 178				
Methyl formate	191				
Methyl iodide	179				
Methyl isoeugenol	178				
Methylnonylacetate aldehyde	75				
Methyl oxalate	75, 191				
Methyl propionate	75				
p-Methyl quinoline	75				
Methyl sulfate	X				
Methyl xanthic acid, ethyl ester of	X				
Methylene citric acid	17				
Nerol	194				
Nonyl alcohol	75				
Nonyl aldehyde	75				
Octadecyl alcohol	75				
Octadecyl aldehyde	75				
Octadecyl ketone	75				
Octoic alcohol	178				
sec-Octyl acetate	75, 192				
n-Octyl alcohol and sec-octyl alcohol (capryl alcohol)	75, 179, 192				45
Octyl aldehyde	75, 103				
Octyl formate	178				
Oxalic acid	143, 196				
Paracetalddehyde	29, 110				
Pentachloroethane	29, 62				
Paraformaldehyde	93, 142, 149	117,506	57,670	.49	112,846
Piperonone (piperinic ketone)	75				
Piperonone vanillone	75				
Potassium ethyl xanthate	X				
Potassium methyl xanthate	X				
Propionaldehyde	75				
Propionic acid	72				
n-Propyl acetate	75				
n-Propyl alcohol	144				
n-Propyl n-butyrate	191				
n-Propyl isovalerate	191				
Propyl cenanthate	75				
n-Propyl propionate	75				

TABLE 17.—Production and sales of synthetic organic chemicals, 1923—Continued

Name	Manufacturer's identification number according to list on p. 195	Sales			Total production Pounds
		Quantity Pounds	Value	Average price per pound	
Propylene chlorohydrin	29				
Propylenedichloride	29				
Propylene glycol	29				
Propylene oxide	29				
Pyrogallol (pyrogallie acid)	68, 118, 208	222, 929	\$218, 066	\$0. 98	235, 389
Pyruvic acid	27				
Rhodinol	75, 103, 129, 178, 186, 192, 194, 75, 178	2, 985	43, 558	14. 69	5, 729
Rhodinyl acetate	75				
Rhodinyl butyrate	75				
Rhodinyl formate	178				
Succinic anhydride	X				
Tannyl acetate (tannigen)	17				
Terpineol	137, 192, X, X	260, 318	129, 430	. 50	322, 337
Terpineoline	X				
Terpin hydrate	153, 195				
Terpinyl acetate	75, 79, 103, 129, 178, 192, X	7, 655	11, 250	1. 47	13, 638
Terpinyl butyrate	75				
Tetrachloroethylene	62				
sym-Tetrachloroethane	62				
Tetradecyl alcohol	75				
Tetradecyl aldehyde	75				
Tetradecyl ketone	75				
Tetraethyl lead	63				
Tetramethyldiaminopentanol	17				
Triacetin	79, 129, 191				
Trichloroethylene	29, 62				
Triethyltrimethylenetriamine	X				
Trimethylene bromide	1				
n-Valeric acid	72				
Vanillic acid	75				
Vanillic alcohol	75				
Vanillin ¹	78, 79, 122, 195, X, X				269, 941
Vanillyl vanillate	75				
Zinc butyl xanthate	X				
All other synthetic organic chemicals	111				
Research chemicals	54, 68, 172	437	7, 930	1. 81	

¹ Includes vanillin reported by one firm under coal-tar flavor.

TABLE 18.—Comparison of production of synthetic organic chemicals, 1922 and 1923

Name	1923	1922
	<i>Pounds</i>	<i>Pounds</i>
Amyl acetate	3, 207, 022	1, 692, 074
Butyl acetate (n. and sec.)	1, 816, 086	2, 467, 506
Carbon tetrachloride	13, 513, 644	11, 166, 318
Citronellyl acetate	99	105
Ethyl acetate (85 per cent)	25, 887, 720	16, 114, 458
Ethyl bromide	124, 842	155, 162
Ethyl butyrate	40, 477	22, 958
Ethyl chloride	270, 180	164, 198
Ethyl ether	5, 104, 157	4, 017, 043
Ethyl formate	1, 958	1, 627
Ethyl iodide	261	238
Ethyl oenanthatate	3, 476	4, 731
Ethyl pelargonate	823	971
Formaldehyde	24, 081, 188	23, 958, 152
Galic acid	469, 941	411, 768
Heliotropin	11, 696	6, 794
Hexamethylenetetramine	1, 381, 073	2, 015, 161
Iodoform	13, 231	11, 811
Isoamyl butyrate	9, 733	5, 576
Isoamyl formate	84	155
Isobutyl acetate	111	510
Linalyl acetate	238	736
n-Octyl alcohol and sec. octyl alcohol	45	106
Pyrogallol	235, 389	187, 536
Rhodinol	5, 729	777
Terpinyl acetate	13, 638	13, 802
Vanillin	269, 941	221, 046

TABLE 19.—Imports and production of synthetic organic chemicals (except those of coal-tar origin), 1922, 1923

Name	Imports, 1922		Production 1922	Imports, 1923		Production 1923
	Pounds	Value	Pounds	Pounds	Value	Pounds
Acetaldehyde.....	82,390	\$13,192	71,537	163,913	\$26,338	-----
Acetic or pyroigneous acid.....	18,706	1,318	-----	-----	-----	-----
Containing by weight not more than 65 per cent acetic acid.....	43	19	-----	37,052	4,758	-----
Containing more than 65 per cent acetic acid.....	-----	-----	-----	664,034	79,553	-----
Formic acid.....	278,141	20,481	-----	1,282,004	96,174	-----
Gallic acid.....	4,490	2,387	411,768	6,048	2,743	469,941
Glycerophosphoric, and salts and compounds.....	12,481	8,659	-----	28,265	38,100	-----
Lactic acid.....	380,840	37,913	-----	-----	-----	-----
Containing by weight 55 per cent or more of lactic acid.....	5,000	758	-----	66,648	16,056	-----
Oxalic acid.....	1,290,075	106,486	3,978,807	2,621,302	206,100	-----
Pyrogallie acid.....	1	3	187,536	342	417	235,389
Methanol.....	127	43	16,808,911	15,786	12,573	18,593,727
Carbon tetrachloride.....	66,131	1,854	11,166,318	1,429	130	13,513,644
Chloroform.....	15	3	-----	381	133	1,585,250
Chloral hydrate.....	1,354	1,186	-----	6,135	1,819	-----
Cocaine, etc.....	27,518	18,572	-----	200	238	-----
Ethers and esters:	-----	-----	-----	-----	-----	-----
Containing not more than 10 per cent alcohol—	-----	-----	-----	-----	-----	-----
Ethyl ether.....	906	158	4,017,043	103	75	5,104,157
Ethyl chloride.....	17,096	10,906	164,198	9,519	11,899	270,180
Amyl acetate.....	200	258	1,692,074	26,418	9,612	3,207,022
Amyl nitrite.....	6	17	-----	56	114	-----
Ethyl acetate.....	200	276	16,114,458	27,202	11,664	25,887,720
Nitrous, spirits of.....	1,998	1,365	-----	-----	-----	-----
Other, n. s. p. f.....	4,374	1,781	-----	11,448	6,458	-----
Containing more than 50 per cent alcohol.....	1,616	1,442	-----	668	1,436	-----
Formaldehyde solution (not more than 40 per cent).....	407	67	23,958,152	-----	-----	24,081,188
Formaldehyde solution (form- alin).....	300	50	-----	166	67	-----
Hexamethylenetetramine.....	16,010	7,765	2,015,161	47,373	24,722	1,381,073
Urea.....	260,636	61,561	-----	47,711	5,898	-----
Thymol.....	11,403	34,426	-----	12,136	27,067	-----
Vanillin.....	23,514	1,448	221,046	-----	-----	269,941

¹ Gallons.² Ounces.³ Alcohol content unknown.

PART V

INTERNATIONAL DYE TRADE

1887

GRANTING OF LANDS

PART V
INTERNATIONAL DYE TRADE

INTRODUCTORY

In the census of 1922 the world's trade in synthetic dyes was the subject of discussion. This included a review of the conditions existing before the war, when Germany dominated the world trade, and a consideration of manufacturing developments during and since the war, as a result of which the United States, Great Britain, France, and Italy have established home dye industries producing a great part of the requirements of each country and which have to some extent developed an export trade in dyes. The dye industries of Great Britain, Switzerland, and France were considered in detail. Available statistical information from official sources on production, consumption, imports and exports of dyes by different nations was also included in Part V, International Dye Trade.

GENERAL DEVELOPMENTS DURING 1923

The occupation of the Ruhr.—The occupation of the Ruhr by the French during 1923 had a pronounced effect on the international dye trade through the partial elimination, for some months of that year, of active competition by German dye manufacturers. The total output of dyes in the German factories in January, 1923, was at the rate of 240,000,000 pounds per year or approximately 85 per cent of the output in 1913. The monthly production figures of the German dye plants declined from January to May, when they reached a minimum output for that year, being at the rate of about 35 per cent of the 1913 output. Then, from June until December, each month registered a gain in production, the rate in the latter month being equivalent to nearly 185,000,000 pounds per year. The total production of 1923 (144,859,572 pounds) was smaller by 47,946,992 pounds than the 1922 output, which had amounted to 192,806,564 pounds. This decrease represents a significant portion of the world's total annual consumption. The requirements of China, India, and other large nonmanufacturing consumers were in part met by the United States, Great Britain, France, and Switzerland, as is apparent from the official dye statistics of those countries. The exports of the United States increased in 1923 to 17,924,200 pounds, valued at \$5,565,267, from a 1922 total of 8,344,187 pounds, with a value of \$3,996,443. The exports of dyes similarly increased in the United Kingdom, totaling in 1923, 14,132,944 pounds, valued at \$4,719,924, compared with 5,299,504 pounds, valued at \$2,714,612, in 1922. The exports during 1923 of both the United Kingdom and the United States fell below those of 1920, a year of world-wide business activity, before German dyes had reappeared in the world's markets. Germany's monthly production figures for January and February, 1924, show an output at the rate of nearly 190,000,000

pounds per year. This expansion in production is obviously a factor in the world's large dye markets, such as the Far East countries, and will probably affect exports of dyes from the United States and Great Britain. The output of the early months of 1924 indicates that the effects of the Ruhr occupation, which extended from the early part of 1923 to the latter part of the year, have very largely disappeared.

Seizure of German dyes by French and Belgian authorities.—According to reports from France, 6,560 tons of dyes were seized in May, 1923, in the dye plants at Höchst, Ludwigshafen, and Biebrich. Of this total, 2,100 tons were sold in order to pay sums due the German Coal Syndicate by the German dye concerns from which the dyes were taken. It is understood that the remaining 4,460 tons were to be divided between France and Belgium. A portion of the first dye seizure was resold for exportation. Later seizures were reported to consist of pharmaceuticals and chemicals.

Indigo and alizarin red comprised a large portion of the seized stocks. The British Alizarin Company purchased alizarin in quantity in order to prevent the demoralization of price levels by the dumping of this dye on the market. The official import figures for the United Kingdom show a total of 1,445,024 pounds of alizarin, valued at \$391,535, for the month of January, 1924. This amount exceeded by 503,216 pounds the total imports of alizarin during the entire year 1923.

Increased post-war capacity to produce dyes.—The combined capacity of the world's synthetic dye plants in 1924 is estimated to exceed 600,000,000 pounds per year, or nearly double the pre-war capacity. In arriving at this estimate the capacity of the seven leading dye-producing nations has been used. In addition, there is probably productive plant capacity in Austria, Czechoslovakia, Belgium, Holland, Sweden, Russia, and possibly other countries, but the aggregate of these minor producers will, it is believed, not seriously affect this estimate. The estimated capacity for the first seven countries given in the following table was obtained by adding 25 per cent to the maximum reported or estimated output.

The existing capacity to produce in excess of normal requirements can not fail to result in an era of severe competition in the world's markets, and will finally eliminate many of the plants now producing dyes.

TABLE 20.—*World's estimated annual capacity to produce dyes*

Country	Maximum reported or estimated output	Estimated annual capacity
	<i>Pounds</i>	<i>Pounds</i>
Germany ¹	280,000,000	350,000,000
United States ²	94,000,000	117,500,000
Great Britain ³	43,000,000	54,000,000
Switzerland ⁴	24,000,000	30,000,000
France ⁵	24,000,000	30,000,000
Italy ⁶	10,000,000	12,500,000
Japan ⁶	16,000,000	20,000,000
Total.....	491,000,000	614,000,000

¹ For the year 1913, exports totaled 239,598,133 pounds and home consumption is estimated at 40,000,000 pounds.

² For 1923.

³ For 1920.

⁴ For 1923.

⁵ For 1922.

⁶ For 1919

The following tables show exports from the principal dye-producing countries and imports into the chief dye-consuming countries:

TABLE 21.—Exports of coal-tar dyes from chief producing countries, 1913, 1921–1923

Exported from—	1913		1921	
	Pounds	Value	Pounds	Value
Germany.....	239, 598, 133	\$51, 689, 400	¹ 48, 304, 991	¹ \$15, 935, 585
United States.....				⁴ 6, 270, 139
Great Britain.....	5, 451, 376	862, 566	7, 621, 600	5, 033, 828
Switzerland.....	19, 458, 902	5, 549, 752	10, 779, 612	11, 654, 516
France.....	1, 152, 134	275, 716	5, 947, 131	1, 608, 308
Italy.....	117, 725	22, 458	607, 812	274, 128

Exported from—	1922		1923	
	Pounds	Value	Pounds	Value
Germany.....	114, 213, 300	\$79, 826, 618	73, 974, 473	² \$41, 580, 742
United States.....	⁵ 8, 344, 187	⁵ 3, 996, 443	⁵ 17, 924, 200	⁵ 5, 565, 267
Great Britain.....	3, 860, 416	2, 300, 298	14, 132, 944	4, 719, 924
Switzerland.....	16, 167, 655	13, 042, 635	18, 282, 967	12, 253, 711
France.....	1, 251, 551	1, 094, 420	4, 650, 382	3, 749, 442
Italy.....	372, 578	254, 250	⁶ 432, 983	⁶ 417, 906

¹ May to December, 1921.

² 1923 basis.

³ 1913 basis.

⁴ Includes natural and coal-tar dyes, with exception of logwood extract.

⁵ New classification for coal-tar colors adopted in 1922 was "Color Lakes" and "Other colors, dyes, and stains."

⁶ First nine months.

TABLE 22.—Imports of dyes into chief consuming countries, 1913, 1921–1923

Imported into—	1913		1921	
	Pounds	Value	Pounds	Value
China.....	¹ 60, 696, 533	\$11, 673, 779	46, 939, 187	\$19, 283, 019
United States.....	² 45, 950, 895	7, 537, 870	4, 252, 911	5, 156, 779
Great Britain.....	41, 203, 008	9, 207, 684	6, 686, 288	5, 930, 054
Austria-Hungary.....	17, 168, 764	3, 616, 199	3, 439, 837	931, 610
British India ³	16, 923, 607	3, 741, 031	11, 731, 237	11, 798, 262
Italy.....	15, 542, 429	3, 611, 705	⁴ 7, 450, 665	2, 556, 457
Japan.....	⁵ 9, 755, 260	2, 100, 255	7, 752, 896	9, 858, 807
Germany.....	7, 138, 495	1, 682, 422	⁶ 291, 457	33, 497
Russia.....	4, 835, 647	3, 701, 186		
France.....	4, 706, 601	1, 416, 316	2, 531, 320	1, 539, 907
Canada ³	2, 633, 516	594, 414	2, 366, 855	1, 692, 873
Turkey.....	2, 631, 703	641, 321		
Sweden.....	2, 376, 166	699, 737	984, 028	851, 265
Spain.....	⁷ 2, 303, 709	1, 021, 368	3, 178, 365	1, 264, 929
Switzerland.....	2, 201, 292	431, 197	1, 084, 337	668, 843
Dutch East Indies.....	⁶ 2, 073, 434	890, 366	2, 166, 053	1, 385, 364
Czechoslovakia.....			10, 854, 128	6, 901, 737
Netherlands.....			2, 666, 518	1, 937, 097

[For footnotes see next page.]

TABLE 22.—Imports of dyes into chief consuming countries, 1913, 1921-1923—
Continued

Imported into—	1922		1923	
	Pounds	Value	Pounds	Value
China.....	56,300,385	\$17,788,624		
United States.....	3,982,631	5,243,257	3,098,193	\$3,151,363
Great Britain.....	6,450,192	5,873,160	6,289,584	4,591,038
Austria-Hungary.....	2,760,380	817,737		
British India.....	14,119,822			
Italy.....	⁹ 5,484,383	2,751,374		
Japan.....	12,526,817	9,025,223		
Germany.....	1,003,300	111,906	466,494	123,522
Russia.....				
France.....	3,279,786	2,778,480	3,022,505	2,986,200
Canada.....	3,290,349	2,287,159		
Turkey.....				
Sweden.....				
Spain.....	2,115,627	1,777,938		
Switzerland.....	1,290,793	672,769	1,980,171	974,518
Dutch East Indies.....	2,091,102		2,238,238	
Czechoslovakia.....	7,826,320	5,765,175	5,118,341	2,688,556
Netherlands.....	3,816,162	2,124,263		

¹ Exports to China, 1913, from France, Germany, and Switzerland amounted to 69,181,230 pounds, valued at \$11,516,567. Chinese statistics show value but not quantity of aniline dyes, and include "unclassified dyes," which may contain other than coal-tar dyes.

² Fiscal year 1914—Quantity from Special Agents Series No. 121; value from Commerce and Navigation Reports.

³ Years ended March 31, 1914, and 1922 and 1923.

⁴ Figures include 3,496,275 pounds of reparation dyes for which no value is shown.

⁵ Aniline only, in 1913.

⁶ 1921 imports, May to December.

⁷ 1914.

⁸ Quantity of synthetic indigo not shown, 1913.

⁹ Figures include 1,666,237 pounds of reparation dyes for which no value is shown.

GERMANY'S POSITION IN THE WORLD'S DYE TRADE

Of primary importance in a consideration of international dye trade is the pre-war supremacy of Germany and her recent efforts to regain her lost trade.

The chemical industry is one of the leading industries of Germany. Its vital place in the welfare of the country is fully appreciated and the severe loss of trade in dyes and chemicals as a result of the war can not be considered as permanent.

The organization and growth of the dye industry in Germany up to the outbreak of the war has been described in great detail in many technical publications. Accordingly, mention is made here only of the more important influences which have favored the expansion of the German industry, together with statistics of the exports of dyes from 1880 to 1913, demonstrating the remarkable rate of their growth.

The coal-tar dye industry was established in England and France several years before it was started in Germany. Professor Hoffman and other German chemists who had resided in England were thoroughly familiar with the initial work on these dyes carried out in the Royal College of Chemistry and in other English institutions. They returned to Germany, to find the significance and promise of the coal-tar dye and chemical industry fully appreciated. The value of research was, from the start, recognized by the German universities, the Government, and the industrial firms. This probably more than any other factor favored the rapid growth and development of the

industry. Other vital factors in the growth of this chemical branch were (1) the heavy capital investment; (2) the availability of raw material; (3) the concentration within a small area; (4) the fact that foreign patent laws in consuming countries, such as France, Great Britain, and the United States, were unfavorable to the establishment of domestic dye industries, but favorable to German ownership of patents; and (5) the intimate relationship between different concerns which resulted, in recent years, in the formation of a powerful trust.

PRE-WAR TRADE

Prior to the war German dye manufacturers succeeded in eliminating any serious foreign competition, using to that end such methods as price cutting, full-line forcing, and dumping.

In 1913, the total exports of dyes reached a maximum, 239,598,133 pounds; adding 40,000,000 pounds as the estimated home consumption, total production during that year approximated 280,000,000 pounds. As Germany then dominated the world's market an analysis of official dye-export figures throws much light on the world's dye trade at that time. Table 23 shows total exports of dyes from Germany in 1913 for the first 10 importing countries both by quantity and value.

TABLE 23.—Exports of coal-tar dyes from Germany to leading countries, 1913

Exported to—	Pounds	Exported to—	Value
China.....	65,743,387	China.....	\$10,957,190
United States.....	44,030,272	United States.....	9,027,780
Great Britain.....	32,744,924	Great Britain.....	6,617,240
Austria-Hungary.....	16,933,533	Austria-Hungary.....	3,787,380
British India.....	15,008,916	Japan.....	3,453,900
Italy.....	10,908,360	British India.....	3,168,060
Japan.....	9,744,333	Italy.....	2,524,920
Belgium.....	5,531,341	Russia.....	1,929,420
Netherlands.....	5,072,785	France.....	1,524,480
France.....	5,055,148	Belgium.....	1,405,380

Table 24 shows exports by countries for the year 1913, giving value and quantity for the three following classes of synthetic dyes, "aniline and other coal-tar dyes, not elsewhere mentioned," "alizarin, alizarin dyes and anthracene dyes," and "synthetic indigo."

TABLE 24.—Exports of coal-tar dyes from Germany, 1913

	1913			1913	
	Pounds	Value		Pounds	Value
Alizarin, alizarin red, variegated colors from anthracene:			Alizarin, alizarin red, variegated colors from anthracene—Continued.		
Alsace-Lorraine.....			Sweden.....	127,867	\$47,640
France.....	489,421	\$190,560	Switzerland.....	661,380	95,280
Great Britain.....	5,857,622	976,620	Spain.....	50,706	23,820
Italy.....	416,669	119,100	British India, etc.....	5,866,441	905,160
Netherlands.....	716,495	119,100	Japan.....	205,028	95,280
Austria-Hungary.....	1,192,689	333,480	East Indies, etc.....	1,298,509	238,200
Austria.....			United States.....	5,855,418	1,310,100
Czechoslovakia.....			Total.....	24,338,784	5,145,120
Russia.....	725,313	428,760			

TABLE 24.—Exports of coal-tar dyes from Germany, 1913—Continued

	1913			1913	
	Pounds	Value		Pounds	Value
Aniline and other coal-tar dyes not specifically mentioned:			Aniline and other coal-tar dyes not specifically mentioned—Continued.		
Belgium.....	5, 531, 341	\$1, 405, 38	Brazil.....	1, 382, 284	\$404, 940
Bulgaria.....	384, 393	71, 460	Canada.....	976, 638	190, 560
Alsace-Lorraine.....			Chile.....	123, 458	47, 640
France.....	3, 853, 641	1, 024, 260	Mexico.....	1, 197, 098	285, 840
Great Britain.....	24, 285, 874	5, 259, 500	United States.....	30, 544, 733	6, 717, 240
Italy.....	9, 032, 246	2, 167, 620	Other countries.....		
Netherlands.....	3, 009, 279	666, 960	Total.....	141, 729, 325	33, 835, 604
Norway.....	595, 242	142, 920			
Austria-Hungary.....	12, 740, 383	2, 977, 503	Indigo:		
Austria.....			Alsace-Lorraine.....		
Jugoslavia.....			France.....	712, 086	309, 660
Czechoslovakia.....			Great Britain.....	2, 601, 428	381, 120
Hungary.....			Italy.....	1, 459, 445	238, 200
East Poland.....			Netherlands.....	1, 347, 011	214, 380
Portugal.....	921, 523	238, 200	Austria-Hungary.....	3, 000, 461	476, 400
Rumania.....	496, 035	119, 100	Czechoslovakia.....		
Denmark.....	806, 884	142, 920	Hungary.....		
Russia.....	2, 420, 651	833, 700	Russia.....	956, 796	666, 960
South Russia.....			Spain.....	147, 708	119, 100
Baltic States.....			Egypt.....	976, 638	214, 380
Finland.....	520, 286	142, 920	British India, etc.....	714, 290	309, 660
Sweden.....	1, 986, 345	476, 400	China.....	47, 090, 256	6, 396, 964
Switzerland.....	1, 728, 406	500, 220	Japan.....	1, 809, 977	1, 357, 740
Serbia.....	211, 642	47, 640	East Indies, etc.....	2, 103, 188	357, 300
Spain.....	1, 446, 218	428, 760	United States.....	7, 630, 121	1, 000, 440
Turkey.....	963, 410	214, 380	Dutch Indies.....		
British India, etc.....	8, 428, 185	1, 953, 240	Other countries.....		
China.....	18, 653, 121	4, 536, 994	Total ¹	73, 530, 014	12, 685, 444
Japan.....	7, 729, 328	2, 000, 880			
Dutch East Indies.....	531, 309	119, 100			
Argentina.....	350, 531	119, 100			

¹ Officially published totals do not check with items shown.

EXPORTS SINCE THE WORLD WAR

The establishment of dye industries in the United States, Great Britain, France, and Italy, able to supply most of the home requirements and, in addition, to enter the export trade to some extent, has resulted in the loss of a large part of Germany's export trade in dyes, as shown in the following table:

TABLE 25.—Exports of coal-tar dyes from Germany, 1913, 1920-1923

Year	Pounds	Value
1913.....	239, 598, 133	\$51, 666, 168
1920.....	61, 140, 171	53, 002, 407
1921 ¹	48, 304, 991	15, 935, 585
1922.....	115, 974, 900	80, 781, 892
1923.....	73, 974, 473	² 41, 580, 742 ³ 17, 125, 528

¹ May to December.

² 1923 basis.

³ 1913 basis.

Of the leading consuming countries which are now dye producers, the United States ranks first (rating second by quantity of the world's consumers and first by value). The recovery of this market is of great importance to Germany, as the United States now possesses a dye industry ranking second to that of Germany and not only supplies more than 90 per cent of its domestic requirements, but has

exported significant amounts of indigo, sulphur black, and other dyes to Far East markets, a feature tending to prevent German domination in these markets. It is accordingly a logical move on the part of Germany to seek to regain the United States market, even at very great cost and over a prolonged period of effort.

EFFORTS TO REGAIN EXPORT TRADE

No doubt is possible as to the determination of the "I. G." to regain for Germany her former supremacy in the world's dye trade. Of the various methods open to her in the effort to accomplish this purpose, the following appear to be of leading importance:

(a) Affiliation with concerns in the new dye-producing countries to establish a foothold in them.

(b) The exercising of influence in competing countries, either directly or indirectly through consumers, to bring about tariff changes facilitating a freer entrance of dyes into those countries.

(c) By attacking the export trade of the United States, Great Britain, and France, to weaken the industry of those nations to the extent to which the export trade serves as a source of revenue and a balance of production, and thus to admit of more continuous operation at lower manufacturing costs.

(d) The use of propaganda directed against the new foreign industries and their products and favorable to the German organization and its dyes.

(e) Commercial warfare, by such well-known methods as price cutting, full-line forcing, and dumping.

Affiliations.—The new dye-producing nations, the United States, Great Britain, France, Italy, and Japan, have adopted tariff measures or import restrictions calculated to protect and stimulate the production of dyes in those countries. Germany has consequently not had free access to the markets of these countries, which before the war were dominated by German dyes.

One method open to Germany for establishing a foothold and sharing the profits is to enter into an affiliation with one or more of the large dye producers, and to obtain control by purchase of the major portion of the stock carrying voting rights. In the event of high protective measures being continued in those countries, Germany might find it advantageous to purchase outright an existing American plant, or to establish new plants in the United States, where their processes could be conducted and their trade secrets retained exclusively in the hands of German agents. A price-cutting campaign might be resorted to for the purpose of forcing some of the existing concerns out of business.

Italy.—The Germans have established themselves in Italy by affiliation. The Bianchi Co., one of the largest Italian producers, is reported to have an agreement with the Cassella Co. of Germany, under which the Germans agree to supply technical assistance and personnel, and the Italians in turn agree not to sell any products so produced outside of Italy or its colonies. The profits are divided on the basis of the relative German and Italian stock ownership. The effect of this affiliation is (1) to diminish the volume of Italian dyes in the export market; (2) to effect a sharing of profits in the Italian home market by the "I. G.," and (3) to enable the exercise of German influence in Italy.

France.—An arrangement between the French dye concern *Matieres Colorantes*, and the "I. G." was reported in 1922. The Germans are understood to have agreed to furnish technical aid in return for the French undertaking to restrict exports to their colonies. The complications of the Ruhr occupation are reported to have unfavorably affected the operation of this agreement.

Great Britain.—Negotiations were conducted in 1923 between the British Dye Corporation and the "I. G.," but no working agreement had been reached to June, 1924.

The United States.—In 1923 and 1924 it was reported that endeavors were being made by German manufacturers to secure affiliations with certain firms in the United States. Up to June, 1924, however, no authoritative statement in regard to the conclusion of such agreements had been published.

Attack on the export trade of the United States, Great Britain, and France.—The export trade comprises nearly nine-tenths of Germany's dye business. In the case of the new dye-producing nations it has been a minor part of the total trade, as the home market demands made up the bulk of the business. Nevertheless, the dye export trade for the new industries in the United States and Great Britain constitutes an important balance for stabilizing production by offsetting the fluctuations of home consumption. Furthermore, as the output increases, the unit cost of production declines.

The destruction by Germany of the dye export trade of the United States, Great Britain, France, and Italy would be an important step in a program to weaken the new industries. The existence of competition in the Far East and in other dye markets prevents German domination and the arbitrary fixing of prices.

In 1921, Germany regained a large part of her trade in Far East markets, lost during the war. The occupation of the Ruhr in 1923 diminished the German export trade and stimulated that of the United States and other new dye-producing nations. In 1924, Germany returned with renewed energy to the Far East markets and began to regain her former supremacy in them.

Commercial warfare.—The well-known methods employed by the Germans prior to 1914 may be revived or extended at any time, the first being price cutting or destructive underselling. In the past, when a German firm encountered competition in a dye or other chemical product, it sold the goods at or below cost until the rival concerns were forced out of business. Such losses as may result from this price cutting designed to be, and usually are, made up by a higher selling price in countries where no competition is encountered or by a subsequent increase in price when competition has been eliminated. In this connection it should be borne in mind that the export-price levels of dyes in Germany since the war are far above those of pre-war years.

Full-line forcing has also been an effective weapon of commercial warfare. Germany produced certain products not duplicated elsewhere; the sale of these products can be and was made contingent upon the acceptance of a full line or by a refusal to sell any dyes whatever to consumers who attempted to divide their orders. Dumping,¹ and dishonest and deceptive labeling, are among measures which may be utilized.

¹ United States Tariff Commission report on Dyes and Related Coal-Tar Chemicals, 1918; see p. 26

EFFECT OF THE OCCUPATION OF THE RUHR.

In the month of January, 1923, just before the occupation of the Ruhr by the French, the production of dyes in German plants, based on the monthly reparation lists, totaled slightly over 20,000,000 pounds, or at the rate of 240,000,000 pounds per year—approximately 85 per cent of the pre-war production (1913). In the month of February, the total production receded to nearly 16,000,000 pounds and the output declined from that month until May, when it reached a minimum of 7,431,962 pounds, or 37 per cent of the January output. During the months of July, August, and September the output registered a slight increase; the average production being about 9,000,000 pounds per month. From October to December, however, the increase was more rapid, reaching an output of 15,390,586 pounds in December, or at the rate of nearly 185,000,000 pounds per year.

The effect of the occupation of the Ruhr was most pronounced in the Höchst and the Badische plants. These are two of the largest dye producers in the occupied zone. The equivalent quarterly output of the Höchst plant in January was 1,225,010 pounds, rapidly declining to 57,181 pounds in March, and during April and May production ceased. From June until November the average monthly production was about 15 per cent of the January figure. The November output showed a large increase, and the December production was over 70 per cent of the January figure. In the case of the Badische plant at Ludwigshafen, the January output was 5,304,426 pounds. After a slight drop in February an abrupt decline was registered, reaching in June the minimum of 131,385 pounds. Then, starting from an output of 419,641 pounds in July, the upward movement continued until it reached 5,506,835 pounds in December.

An examination of the monthly output figures of the other dye plants shows that the occupation had less effect on their output. The total monthly output of all plants in December had reached 76 per cent of the January figure, showing that the effect of the occupation had been overcome in the latter part of the year. The total output of 1923 was 75 per cent of the total 1922 production, and about 13 per cent of the production of the pre-war year 1913.

The production in January, 1924, was 14,153,841 pounds and that of February, 1924 increased to 15,750,430 pounds, equivalent to about 189,000,000 pounds per year.

STATISTICS OF EXPORTS AND IMPORTS.

The following tables show the development of Germany's trade in dyes since 1880:

TABLE 26.—Development of the German export trade in coal-tar dyes, 1880-1913

Year	Aniline and other coal-tar dyes				Alizarin and Alizarin dyes			
	Quantity		Value		Quantity		Value	
	Tons	Pounds	1,000 marks	Dollars	Tons	Pounds	1,000 marks	Dollars
1880.....	2, 140	4, 717, 844	31, 307	7, 457, 327	5, 888	12, 980, 685	20, 607	4, 908, 587
1885.....	4, 646	10, 242, 572	34, 846	8, 300, 317	4, 284	9, 444, 506	9, 510	2, 265, 282
1890.....	7, 280	16, 049, 488	37, 854	9, 016, 823	7, 905	17, 427, 363	12, 649	3, 012, 992
1895.....	15, 789	34, 808, 429	63, 156	15, 043, 759	8, 928	19, 682, 669	11, 606	2, 764, 549
1900.....	23, 781	52, 427, 593	77, 289	18, 410, 240	8, 591	18, 939, 719	11, 167	2, 659, 979
1905.....	36, 570	80, 622, 222	100, 654	23, 975, 783	9, 339	20, 588, 759	15, 532	3, 699, 722
1910.....	49, 997	110, 223, 386	125, 790	29, 963, 178	9, 220	20, 326, 412	21, 279	5, 068, 658
1911.....	52, 480	115, 697, 408	119, 507	28, 466, 567	9, 624	21, 217, 070	19, 647	4, 679, 915
1912.....	59, 696	131, 605, 802	133, 764	31, 862, 585	11, 589	25, 549, 109	23, 639	5, 630, 810
1913.....	64, 288	141, 729, 325	142, 079	33, 843, 218	11, 040	24, 337, 902	21, 573	5, 138, 689

Year	Indigo			
	Quantity		Value	
	Tons	Pounds	1,000 marks	Dollars
1880.....				
1885.....				
1890.....				
1895.....				
1900.....	1, 873	4, 129, 216	9, 364	2, 230, 505
1905.....	11, 165	24, 614, 359	25, 721	6, 126, 742
1910.....	17, 564	38, 721, 594	39, 613	9, 435, 817
1911.....	21, 618	47, 659, 043	41, 830	9, 963, 906
1912.....	24, 827	54, 733, 604	45, 216	10, 770, 451
1913.....	33, 353	73, 530, 024	53, 323	12, 701, 539

¹ Ullmann Enzyklopädie der technischen Chemie, vol. 5, p. 299.

TABLE 27.—Germany: Imports of coal-tar dyes, by groups, 1923

	Pounds	Value (1913 basis)		Pounds	Value (1913 basis)
Aniline and other not specially mentioned coal-tar dyes, sulphur colors:			Alizarin (red) and alizarine colors (variegated) from anthracene.....	8, 598	1, 190
Czechoslovakia.....	183, 864	-----	Indigo, natural and synthetic.	18, 078	13, 090
Other countries.....	255, 954	-----	Indigo carmine, color lakes and blues of indigo and indigo carmine.....	-----	-----
Total.....	439, 818	\$109, 242			

TABLE 28.—Germany: Exports of coal-tar dyes, by countries, 1923

Exported to—	Aniline and other not specially mentioned coal-tar dyes, sulphur colors	Alizarin; alizarine red	Alizarin dyes, variegated, from anthracene	Indigo, natural and artificial	Indigo, carmine color lakes, and new blue of indigo
	Pounds	Pounds	Pounds	Pounds	Pounds
Belgium.....	37, 699				
Bulgaria.....	512, 892				
Denmark.....	598, 990				
France.....	26, 014				
Greece.....	242, 506				
Great Britain.....	959, 853		59, 304		
Italy.....	2, 699, 974		65, 918		
Netherlands.....	2, 053, 585		78, 925	472, 887	
Norway.....	333, 336				
Austria.....	1, 313, 721			80, 247	
Jugoslavia.....	445, 109				
Czechoslovakia.....	3, 195, 127		13, 669	162, 038	17, 837
Hungary.....	533, 954			43, 872	
East Poland.....	2, 491, 198				
West Poland.....	253, 529				
Portugal.....	539, 466				
Rumania.....	827, 607				
North Russia.....	2, 619, 065				
South Russia.....	156, 527				
Estonia.....	187, 611				
Latvia.....	532, 190				
Lithuania.....	169, 754				
Finland.....	566, 582				
Sweden.....	1, 586, 430				
Switzerland.....	2, 457, 027				
Spain.....	1, 014, 336			16, 755	
Turkey.....	253, 749				
Egypt.....	123, 237			69, 445	28, 659
British India.....	6, 379, 451	344, 359	572, 755	234, 349	
China.....	16, 916, 116			6, 146, 645	
Japan.....	8, 668, 046		26, 014	329, 367	
Dutch Indies.....	496, 917	46, 076	96, 561	147, 047	
Argentina.....	537, 702				
Brazil.....	964, 513				
Canada.....	751, 107				
Chile.....	192, 462				
Colombia.....	98, 546				
Mexico.....	623, 461				
Uruguay.....	76, 059		83, 334		
United States.....	824, 300		388, 671	492, 508	
Other countries.....	263, 670	199, 516			56, 879
Total.....	63, 700, 815	589, 951	1, 385, 151	8, 195, 160	103, 395
Value, 1923 basis.....	\$34, 223, 210	\$258, 230	\$813, 008	\$6, 199, 900	\$86, 394
Value, 1913 basis.....	15, 197, 966	96, 866	373, 898	1, 415, 624	41, 174

THE BRITISH DYE INDUSTRY

Great Britain's pre-war position.—As stated in the Census of 1922, the consumption of dyes in Great Britain prior to the war has been estimated at about 20,000 tons. In 1913 the total imports of coal-tar dyes were 41,203,008 pounds, with a value of \$9,207,684. In 1907, as reported by the First Census of Production of the United Kingdom, the production was 139,000 hundredweight (15,568,000 pounds), valued at £373,000 (\$1,855,204). It is estimated that the

British production of dyes before the war was somewhat over one-tenth of the consumption. In the manufacture of alizarin and sulphur black, British dye producers before the war held a notable position, as they entered into national conventions in regard to these products dominated by German influence. A limited variety of acid, direct, basic, sulphur, and some other of the simpler dyes were produced in that period. In 1913 the exports of dyes totaled 5,451,376 pounds, with a value of \$862,566. The United States was the principal consumer, taking 33 per cent by weight and value, followed by Italy with 11.4 per cent by weight and 9.4 per cent by value, while Germany took 7.3 per cent by quantity and 11.5 per cent by value. Of the total British exports 27 per cent by weight and 23 per cent by value was shipped to British possessions. British India was the principal consumer among the dominions, taking in the fiscal year ended March, 1914, a total of 1,070,047 pounds, valued at \$153,286, subdivided as follows: Alizarin dyes, 963,698 pounds, value \$114,660; aniline dyes, 102,869 pounds, value \$37,409; all other, 4,480 pounds, value \$1,217.

Developments since the war.—Expansion in the dye industry of Great Britain from 1916 to 1920 resulted in the production of many colors in excess of the home requirements. In 1920, a year of world-wide business boom, before the reappearance of German dyes in the world markets, exports reached a total of 13,791,680 pounds, with a value of \$9,385,429. This is 153 per cent greater by quantity and nearly 100 per cent greater by value than the 1913 export figures. Since 1920 exports have shown an annual decline, the total for 1921 being 7,621,600 pounds, valued at \$5,033,828, and for 1922, 3,860,416 pounds, valued at \$2,300,298. In 1923, however, as the result of the Ruhr occupation, exports rose sharply to 14,132,944 pounds, valued at \$4,719,924.

The year 1920 was probably the year of maximum production. The production of the British Dyestuffs Corporation was reported at about 16,000² tons. As this concern is stated to have produced about three-fourths of the total output, it would appear that the total production during that year was nearly 45,000,000 pounds. More recently, it has been reported that this concern produces about one-half of the total production. The total production of Great Britain³ in 1922 is reported to have approximated 21,000,000 pounds, of which vat dyes exceeded 180,000 pounds and indigo 1,000,000 pounds. As the result of post-war developments in particular, the British dye industry (19 producers) is able to supply approximately eight-tenths of the home requirements, including an excellent variety of the vat dyes, with production fairly well balanced in the other classes.

*Conditions in 1923.*⁴—Although the continued trade depression in Great Britain has affected the demand for dyes, the year 1923 was a better year for the industry than 1922. In certain groups of dyes there was a decided improvement. The increased repair work by the railroads stimulated the consumption of paints and allied products and consequently increased the demand for color-lake dyes.

² Report on Dyes and Dyestuffs, subcommittee appointed by the Standing Committee on Trusts, printed and published by His Majesty's stationery office, London, 1921.

³ U. S. Department of Commerce, *Trade Information Bulletin No. 231*.

⁴ *The Dyestuffs Industry in 1923*, Sir William Alexander, *The Chemical Age*, Dec. 29, 1923.

The high price of cotton, however, has been an adverse factor in the improvement of the cotton manufacturing industry, and normal conditions in the dye industry can not be looked for until the cotton trade is itself in a more active state. The political situation in Germany and the occupation of the Ruhr by the French seriously interfered with the export of British dyes. On the other hand, the reduction in the available supply of German dyes for the world's markets was reflected in an increased demand for dyes of British manufacture. The official figures of exports of coal-tar dyes in Great Britain show that in 1923 they totaled 14,132,944 pounds, with a value of \$4,719,924, as against 1922 figures of 3,860,416 pounds, valued at \$2,300,298.

British dye firms have devoted much attention to quality and standard of production. It has been stated that "the general level of quality of British makers' production is equal to that of the best continental manufacturers."

The more important gaps in the range of British-made dyes are being rapidly reduced, about a score of dyes not previously manufactured in Great Britain being placed on the market in 1923. Among Great Britain's contributions to the range of existing dyes are the Caledon Jade-greens of the Scottish Dyes, Limited, and the Cettutyl series of the British Dyestuffs Corporation, used for Celanese silk. Owing to the general business depression in Great Britain, with consequent intermittent production, the maximum reduction in the costs of producing coal-tar dyes is not yet attainable. The great importance of reduced production costs is fully realized by the dye makers. It is reported that the 1923 trading⁵ profits of the British Dyestuffs Corporation amounted to £251,423, as compared with £102,657 for 1922. The debit balance of £700,699 was reduced to £449,276.

Anglo-German negotiations.—Negotiations for a working arrangement between the British Dyes Corporation and the I. G. were carried on during 1922 and 1923. Up to July, 1924, no agreement had been concluded. Details of the proposals were not officially announced until April 8, 1924, when Sir William Alexander, Chairman and Managing Director of the British Dyes Corporation, speaking at the fifth annual meeting of the concern, summarized the negotiations and the replies to some of the principal criticisms of the proposed arrangement. The statement of Sir William Alexander is, in part, as follows:

"I now pass to a subject which has caused discussion and criticism in many quarters recently—namely, the negotiations which have been proceeding for the conclusion of a working agreement between your corporation and the Association of German Dyestuffs Manufacturers, generally known as the *Interessen Gemeinschaft*, or I. G. At the ordinary general meeting held in 1922 I told you that informal negotiations between ourselves and the I. G. had been proceeding, and that whilst we would welcome an arrangement it must leave inviolate the principles upon which your undertaking was founded; namely, the establishment of a dye-making industry in this country adequate to our needs both in peace and in war.

"At that time the I. G. did not see their way clear to make or accept proposals consistent with this principle, chiefly, in my opinion,

⁵ *Chemical Trade Journal and Chemical Engineer*, Apr. 4, 1924, p. 419.

because they were not convinced that this country was really determined to maintain the Dyestuffs (Import Regulations) Act, and also because at that time they had not sufficient proof that we could manufacture quality for quality as regularly and as well as themselves. At the end of last year negotiations were reopened, and it was found possible to agree on certain heads which, if incorporated in a document in legal form, might form the basis of a contract which your directors could recommend their shareholders to accept.

"During the extended negotiations modifications have been made from time to time in the form of the proposals, following suggestions which have been made to us and criticisms which have reached us from many directions.

"I would remind the shareholders that in a matter of such national and international importance as the conclusion of an agreement between your undertaking and the great German combine, the Government, under the articles of association, has the final and decisive voice. Until the Government has indicated at least its general approval of the lines on which we have proceeded, it is impossible to enter into details. In any event, the board would not venture to submit a scheme for the approval of shareholders which did not safeguard the interests of the undertaking both from a national and from a shareholders' point of view.

"Reply to Criticisms.—It is said that pressure would be exerted on the score of cost of production to concentrate production in Germany as far as possible, with diminution of the output of the corporation's factories. We are sure that with our natural resources in raw materials we should be able to manufacture with the assistance of the I. G. as cheaply and efficiently as they themselves, and the whole spirit of the negotiations is against any diminution in the output of the corporation's factories, and is even in favor of an increased production.

"We have taken our stand on the principles enunciated two years ago with regard to the objects for which the corporation was formed, namely, to "concentrate, extend, and expedite the manufacture of synthetic dyestuffs and colors in this country."

"There are those who think that acceptance of the contract would curtail or eliminate research from our activities, since it may be cheaper and easier to take the results of research ready-made from the I. G. I wish to declare categorically that there is not the slightest intention of diminishing the activities of our research department, and in the preamble to the agreement we propose to state that it is essential that research in organic chemistry and its application to industry must be continued and developed in this country. The establishment and development of the industry in this country is a fundamental condition of any arrangement. In the past the efforts of the research department have been mainly expended in improving existing processes, in cheapening costs, and in developing manufacturing recipes for dyestuffs already known to the I. G. Continuous pressure from consumers for lower prices and a wider range of dyestuffs has forced us in that direction, but with all further technical information readily forthcoming from the I. G. on dyestuffs which are already known, our research department should be free to enter upon entirely new fields of investigation. Our works chemists would have the freest access to German plants and methods.

There was a fear that a contract might be concluded which would close the free access of dyestuff consumers in this country to German sources of supply with the advantages which that access confers in the way of technical assistance in dyeing problems, information regarding new developments, and in other ways. The proposals, as originally drafted, provided that the I. G. should retire so far as selling is concerned from the British market. To meet the views of users, the proposed arrangement has been modified to permit their obtaining German dyestuffs in any way they please, subject, of course, to any legislative restrictions.

"Anticipated benefits.—We believe that, if we are able to bring our negotiations to a satisfactory conclusion, they will result in an expansion of our range of dyestuffs to a point where the quality, quantity, variety, and price would guarantee the British consumer all the security he could reasonably ask for. We are also of opinion that not only would the arrangement secure a national industry for peacetime requirements, but would provide the nation with an equipped and trained personnel as a most valuable contribution to our defenses in time of peril. Increased output by securing a greater share of British and overseas requirements will mean more employment for workmen and chemists and a reasonable return on their investments to the shareholders who have invested capital, many from patriotic motives, in this young industry."

The general terms of the proposed agreement are understood to be as follows:⁶

1. The British Dyestuffs Corporation shall have a monopoly of the British market and a percentage share of foreign and colonial markets.

2. It shall be able to draw upon the I. G. for personnel and information as to manufacturing and technical processes on lines similar to those adopted between the I. G. and a corresponding French firm.

3. In return the I. G. shall receive one-half of the profits of the British Dyestuffs Corporation.

4. The British Dyestuffs Corporation shall offer users of dyes a guaranty that such dyes as it continues to import into this country shall not be sold at a higher price than is obtained abroad.

5. There will be no more reparation deliveries of dyestuffs.

Statistics of imports and exports.—The following tables show the trade of the United Kingdom in coal-tar dyes, 1922 and 1923:

TABLE 29.—*The United Kingdom: Imports of coal-tar dyes, 1922*

Imported from—	1922		Imported from—	1922	
	Pounds	Value		Pounds	Value
Alizarin:			Other coal-tar dyes—Con.		
Germany.....	1, 274, 224	\$265, 994	Netherlands.....	1, 680	\$1, 634
Netherlands.....	1, 120	2, 205	Belgium.....	27, 325	49, 880
United States.....		208	Switzerland.....	1, 894, 369	3, 546, 746
Total.....	1, 275, 344	268, 407	United States.....	16, 800	6, 187
Synthetic indigo:			Other foreign coun-tries.....	7, 729	10, 150
Germany.....	572, 768	13, 321	British possessions.....	25, 648	18, 565
Other coal-tar dyes:			Total.....	4, 602, 080	5, 591, 431
Germany.....	2, 628, 529	1, 958, 269			

⁶ United States Department of Commerce, Chemical Division, *Trade Information Bulletin No. 231.*

TABLE 30.—*The United Kingdom: Exports of coal-tar dyes, 1922*

Exported to—	1922		Exported to—	1922	
	Pounds	Value		Pounds	Value
Alizarin:			Other sorts—Continued.		
Java.....	33,936	\$10,536	Spain.....	77,056	\$39,264
France.....	47,264	27,068	Italy.....	22,064	7,002
United States.....	33,824	19,672	China ²	70,000	43,312
Brazil.....	448	877	Japan ¹	3,696	4,960
Other foreign countries.....	6,160	939	United States.....	180,656	126,651
Total to foreign countries.....	121,632	59,092	Brazil.....	53,552	31,917
British India.....	698,208	184,272	Other foreign countries.....	50,400	33,910
Other British possessions.....	9,520	7,352	Total foreign countries.....	1,414,112	825,704
Total British possessions.....	707,728	191,624	Egypt.....	8,512	7,657
Total.....	829,360	250,716	Union of South Africa.....	127,456	101,638
Indigo, synthetic:			British India—		
Spain.....	560	\$159	Bombay (including Karachi).....	261,408	\$132,992
China ¹	9,408	5,169	Madras.....	46,144	24,765
Other foreign countries.....	1,680	850	Bengal, Assam, Bihar, and Orissa.....	28,672	23,237
Total foreign countries.....	11,648	6,178	Burmah.....	3,696	3,481
Australia.....	52,416	22,502	Hongkong.....	9,072	11,444
Other British possessions.....	448	266	Australia—		
Total British possessions.....	52,864	22,768	Western Australia.....	2,912	3,118
Total.....	64,512	28,946	South Australia (including northern territory).....	17,136	9,818
Other sorts:			Victoria.....	389,424	394,008
Russia.....	560	979	New South Wales.....	204,512	190,459
Sweden.....	50,624	40,602	Queensland.....	27,552	12,595
Norway.....	49,168	44,038	Tasmania.....	224	323
Denmark.....	32,368	15,336	New Zealand.....	125,664	99,476
Germany.....	13,328	10,956	Canada.....	255,920	146,730
Netherlands.....	208,208	133,378	Other British possessions.....	44,128	33,193
Belgium.....	137,648	89,999	Total British possessions.....	1,552,432	1,194,934
France.....	106,624	67,896	Total.....	2,966,544	2,020,638
Switzerland.....	310,128	125,672			
Portugal.....	18,032	9,832			

¹ Exclusive of Hongkong, Macao, and leased territories.² Including Formosa and Japanese leased territories in China.TABLE 31.—*The United Kingdom: Imports and exports of coal-tar dyes, 1922, 1923*

	1922		1923	
	Pounds	Value	Pounds	Value
Imports:				
Alizarin.....	1,275,344	\$268,407	941,808	\$332,809
Indigo, synthetic.....	572,768	13,321	926,688	60,573
Others.....	4,602,080	5,591,432	4,421,088	4,197,656
Exports.....	3,860,416	2,300,298	14,132,944	4,719,924

Exchange values: £, year, 1922=\$4.42865; £, year, 1923=\$4.5740.

THE SWISS DYE INDUSTRY

Prior to the war the Swiss dye industry, notwithstanding the absence of raw materials, ranked second to that of Germany, producing about 7 per cent of the total world's output, the value of dye exports in 1913 from Switzerland exceeding one-tenth of the total value of the products exported from Germany. The raw materials were formerly imported almost entirely from Germany. During and since the war these materials have been imported from Great Britain, the United States, France, Italy, Poland, and more recently from Germany.

The absence of German dyes from the world's markets during and immediately after the war resulted in a period of unprecedented prosperity for Swiss dye manufacturers. In 1920 the exports of Swiss dyes totaled 23,739,793 pounds, with a value of \$35,411,115—over six times that of the pre-war year 1913.

The three leading dye producers of Switzerland located in Basel, namely, Die Gesellschaft für Chemische Industrie (known as "Ciba"), Die Chemische Fabrik, vormal's Sandoz, and the J. R. Geigy Co., formed a union of interests ("Interessen Gemeinschaft") similar to that of the German dye producers. A significant development among the Swiss dye manufacturers is the establishment and operation of their branch plants in foreign countries. In the United States, the branch plants are the Cincinnati Chemical Works, at Norwood and St. Bernard, Ohio; in Great Britain, the Clayton Aniline Co. (Ltd.), at Clayton, near Manchester; in Italy, the Fabbrica Lombarda Colori D'Anilina and the Felli Co. (successors of Fisher and Hunold) are understood to be connected with the Swiss manufacturers; in France, the Swiss manufacturers are similarly reported to have branch plants. Prior to the war, the Society of the Chemical Industry of Basel had a branch plant at St. Fous, and the J. R. Geigy Co., of Basel, operated a branch at Maronne, near Rouen. Although the new dye-producing nations—Great Britain, the United States, France, and Italy—have adopted tariff and other protective measures which have resulted in a diminution of dye exports from Switzerland, the Swiss industry has been able, through the branch plants operated in those countries, to cater to their dye requirements to an extent beyond that indicated merely by the imports originating directly in Switzerland.

Statistics of imports and exports.—The following tables show the extent of Switzerland's trade in coal-tar dyes in 1923:

TABLE 32.—Switzerland: Imports and exports of coal-tar dyes, 1923

	Aniline and other coal-tar dyes		Indigo, indigo solution		Alizarin, synthetic	
	Pounds	Value	Pounds	Value	Pounds	Value
IMPORTS						
Germany.....	1,456,579	\$792,834	22,046	\$9,030	243,167	\$40,093
Austria.....	882	903	441	181	-----	-----
France.....	17,416	18,241	201,280	84,882	3,307	2,528
Italy.....	23,148	18,782	-----	-----	-----	-----
Great Britain.....	9,700	4,696	-----	-----	-----	-----
Other countries.....	2,205	2,348	-----	-----	-----	-----
Total.....	1,509,930	837,804	223,767	94,093	246,474	42,621
EXPORTS						
Germany.....	49,824	38,829	-----	-----	-----	-----
Austria.....	116,182	105,832	121,253	34,856	-----	-----
France.....	1,925,498	1,936,574	6,393	6,502	-----	-----
Italy.....	537,481	568,168	128,528	38,107	-----	-----
Belgium.....	953,269	521,392	73,854	22,214	-----	-----
Holland.....	258,820	234,780	90,830	23,117	-----	-----
Great Britain.....	1,308,871	1,713,352	-----	-----	-----	-----
Spain.....	104,498	167,416	13,669	16,796	-----	-----
Portugal.....	108,246	85,604	-----	-----	-----	-----
Denmark.....	176,368	175,543	7,937	10,114	-----	-----
Norway.....	36,155	39,371	-----	-----	-----	-----
Sweden.....	517,640	469,741	-----	-----	-----	-----
Finland.....	94,798	77,658	-----	-----	-----	-----
Poland.....	114,198	131,116	-----	-----	-----	-----
Czechoslovakia.....	681,883	515,794	-----	-----	-----	-----
Hungary.....	15,873	23,839	-----	-----	-----	-----
Greece.....	15,432	13,364	-----	-----	-----	-----

TABLE 32.—*Switzerland: Imports and exports of coal-tar dyes, 1923—Contd.*

	Aniline and other coal-tar dyes		Indigo, indigo solution		Alizarin, synthetic	
	Pounds	Value	Pounds	Value	Pounds	Value
EXPORTS—continued						
Bulgaria.....	29,983	\$19,866				
Rumania.....	22,707	19,686	22,487	\$5,599		
Russia.....	11,464	27,090				
Egypt.....	20,282	18,421	268,079	95,718		
Mesopotamia.....	2,646	3,973	8,157	6,682		
British India.....	219,578	155,677	33,510	14,448		
Dutch India.....	65,036	63,932	214,948	57,250		
China.....	100,971	82,895	7,085,364	1,806,903		
Japan.....	654,546	653,591	573,857	558,596		
Canada.....	189,816	161,456				
United States.....	837,968	1,063,734				
Mexico.....	93,696	93,190				
Brazil.....	150,133	210,941				
Uruguay.....	7,937	6,682				
Argentina.....	103,175	87,952				
Chile.....	18,739	19,144				
Algeria.....			4,409	3,070		
Other.....	23,148	26,006	62,831	21,130		
Total.....	9,566,861 ¹	9,532,609	8,716,106	2,721,102		

Converted from francs to dollars on the basis of 1 franc=\$0.1806—the annual average for 1923.

THE FRENCH DYE INDUSTRY

In the commission's report in 1922⁷ the French dye industry for the following periods was considered:

Dye production in France, immediately prior to the war.

Developments during and after the war, together with the production figures for the years 1919, 1920, 1921, and part of 1922.

Merger of Kuhlmann and Compagnie Nationale.—The merger of "Etablissements Kuhlmann" and the "Compagnie Nationale de Matières Colorantes et de Produits Chimiques" on December 27, 1923, is probably the most significant event of that year in the French chemical industry, involving as it did a consolidation of organic and inorganic chemical undertakings. The new firm is known as "Compagnie Nationale de Matières Colorantes et Manufactures de Produits Chimiques du Nord Réunies."

The merger is expected to result in administrative and sales economy, reduction of overhead, the avoidance of duplication in manufacture, and the union of technical staffs. The new firm will produce a diversity of organic and inorganic products, affording added stability and security in times of crisis.

The financial advantages are conspicuous, as the Compagnie Nationale, while possessing an excellent technical staff, had not established itself on a solid financial basis. The Kuhlmann is in a strong financial position and has a century-long tradition of good administration. The nominal capital of the Etablissements Kuhlmann will be increased to 150,000,000 francs by an issue of 50,000,000 francs of new shares having a par value of 250 francs each. The shares of the Compagnie Nationale de Matières Colorantes will be exchanged share for share for the new Kuhlmann stock, dated as of

⁷ U. S. Tariff Commission, *Census of Dyes and Other Synthetic Organic Chemicals*, p. 134.

January 1, 1924, and will receive an exchange settlement of 25 francs per share. This settlement will largely cover the tax applying to the operation of fusing the two companies.

The new concern produces a variety of products, including mineral acids, phosphate, nitrogen fertilizer, raw materials for the glass industry, ice plants, and the tanning industry; fungicides, dyes, pharmaceutical and other organic chemicals.

The Etablissements Kuhlmann manufactures mineral acids and has already produced certain intermediates at La Madeleine-lez-Lille plant. Intermediates will continue to be made at Oissel, with the exception of a few products consuming a large amount of acid to be drawn from La Madeleine plant. Dye manufacture will remain centralized in large works developed by the Compagnie Nationale at Villers-Saint-Paul.

The Compagnie Nationale de Matières Colorantes et de Produits Chimiques was formed in 1916 with the support of the Government and the cooperation of many French industrial and financial interests. It had originally a capital of 40,000,000 francs, increased in 1919 to 71,000,000 on its fusion with the Société de Produits Chimiques et Colorantes Français. In 1921 the capital was increased to 100,000,000 francs. The rapid development of this concern enabled it to supply a large part of French dye requirements, attention being first given to the bulk colors and later to some of the specialties.

Statistics of production, imports, and exports.—The following table, taken from an advertisement of the Compagnie Nationale of France, shows for the years 1918–1922 its production of 20-per cent indigo paste and of other coal-tar colors.

	1918	1919	1920	1921	1922
Indigo paste, 20-per cent, pounds	33, 415	1, 119, 381	6, 537, 521	5, 812, 428	3, 039, 041
Other dyes, pounds.....	16, 627	695, 364	3, 440, 931	2, 667, 204	5, 986, 624

TABLE 33.—France: Dye production¹ (pounds), 1920–1923

Year	Azo dyes	Indigo and sulphonated derivatives	Sulphur dyes	Diphenyl and triphenyl methane	Alizarin and other oxyketone	Indo-phenols, oxazines, and thiazines	Unspecified	Total
1920.....	4, 975, 782	6, 571, 913	3, 452, 404	141, 094	19, 841	19, 841	374, 782	15, 555, 657
1921.....	4, 204, 172	5, 839, 985	1, 814, 386	403, 442	211, 642	136, 685	328, 485	12, 938, 797
1922.....	7, 881, 445	3, 075, 417	3, 769, 866	1, 234, 576	731, 927	191, 800	897, 272	17, 782, 303
1923.....	11, 296, 370	4, 700, 207	5, 024, 283	1, 483, 696	570, 991	145, 504	959, 001	24, 180, 052

¹ L'Industrie Chimique, April, 1924. Does not include data for Swiss plant at St. Fous.

TABLE 34.—France: Imports and exports of coal-tar dyes, 1922 and 1923

IMPORTS

Class	1922				1923			
	Dry		Paste		Dry		Paste	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Nitroso.....	4,189	\$2,458	441	\$328	4,630	\$4,188		
Nitro.....	2,646	2,704			1,984	1,093		
Pyrazolone.....	121,694	165,744	220	82	133,819	118,729		
Stilbene.....	58,201	50,223			41,887	34,296		
Monoazo.....	784,838	568,676	27,998	9,258	447,313	287,293	12,125	\$6,374
Polyazo.....	1,165,352	916,961	20,062	4,015	517,199	438,558	2,425	2,064
Thiobenzoyl.....	34,612	40,064			22,707	31,868	441	364
Sulphur.....	172,841	133,382			118,607	84,677	9,039	2,125
Indophenol.....	550,930	241,530	91,270	35,803	304,896	390,908	104,719	92,810
Azines.....	86,200	92,253	14,991	3,277	76,720	46,375	5,291	1,275
Pyronines.....	35,935	82,585		82	24,030	55,176	661	304
Eosines.....	12,566	27,556	441	246	24,912	49,895	441	61
Diphenylmethane.....	406,087	603,169	220	574	425,047	456,343	441	243
Acridines.....	44,753	86,764			54,013	85,587		
Hydroquinones.....	57,320	83,241	68,343	27,938	130,512	188,109	75,838	33,749
Indigotines.....	19,841	22,695	7,275	5,080	6,834	6,616	1,323	1,093
Insoluble vat colors other than indigo.....	38,581	34,820	98,766	40,228	168,652	279,402	236,554	221,069
Cibanones.....	12,566	12,044	25,573	28,594	28,219	38,787	41,226	26,769
Total.....	3,609,152	3,167,169	355,600	155,505	2,531,981	2,597,900	490,524	388,300

EXPORTS

Class	1922				1923			
	Dry		Paste		Dry		Paste	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Nitroso.....	39,903	\$19,581	9,480	\$1,639	120,151	\$47,164	2,425	\$364
Nitro.....	441	328	441	164	18,078	8,984		
Pyrazolone.....	882	655	2,866	819	661	304		
Stilbene.....	220	164			19,400	8,377	220	61
Monoazo.....	4,850	1,884	1,323	328	34,392	10,805	882	243
Polyazo.....	1,102	492	220	82	326,060	128,016		
Thiobenzoyl.....					1,984	1,578		
Sulphur.....	12,787	3,359	1,323	246	8,157	1,700		
Indophenol.....	7,496	8,111			9,480	8,255	1,323	486
Azines.....	2,646	2,294	441	246	8,818	6,313		
Pyronines.....	48,060	122,567			658,294	1,346,690		
Eosines.....	882	1,475			18,960	29,075	1,984	668
Diphenylmethane.....	655,648	628,731	69,665	31,133	1,990,313	1,526,726	27,337	9,773
Acridines.....							220	
Hydroquinones.....	3,086	4,916	5,952	1,966	4,409	5,645	798,065	208,747
Indigotines.....	188,714	150,751	143,299	76,686	185,848	118,790	268,079	114,784
Insoluble vat colors other than indigo.....	18,078	26,381	31,746	9,422	141,756	164,801	2,425	607
Cibanones.....							661	486
Total.....	984,795	971,689	266,756	122,731	3,546,761	3,413,223	1,103,621	336,219

Exchange rate, 1922, 1,000 francs=\$81.93.

Exchange rate, 1923, 1,000 francs=\$60.70.

THE ITALIAN DYE INDUSTRY

Pre-war production.—Prior to the war the production of dyes in Italy was practically negligible, the country's requirements being mostly imported from Germany. On account of the lack of coal, Italy, like Switzerland, is very largely dependent upon imported raw materials although having a limited output of crudes, together with sulphur and salt and the advantage of electrolytic development for

the manufacture of chlorine and caustic soda. The sulphur dye named Italian Green was manufactured by Lepetit & Dollgus before the war, and some dyes, including sulphur black, were made from imported intermediates. The sulphur black was made in small quantities in 1908 by Rinaldo Ghisotti, at Turro; this plant was later acquired by A. Bonneti, who produced aniline. The company which is now known as Società Chimica Lombarda, A. E. Bianchi Company of Rho (Milan), began to manufacture sulphur black in 1913.

Post-war developments.—The Bianchi firm, on the outbreak of the war, began the manufacture of explosives and particularly of dinitrophenol; they increased their output of sulphur black and started the production of certain azo dyes. In 1923 the output of dyes by this firm was about 5 tons per day and they are to-day one of the larger producers. The concern has an agreement with the Cassella Works, of Frankfort, and imports some of its intermediates from Germany. In 1914, Dellapiane & Co. began the production of sulphur black and in 1915 produced other sulphur dyes. The plant was moved to Rho in 1916, and in 1918 was reorganized under the name Società Italica Colori Artificiali (Italica). It now produces many azo dyes, including direct dyes for cotton and a number of basic dyes, together with a wide range of sulphur colors. All these dyes are said to be produced from intermediates manufactured at the plant. In 1916 this firm had only four chemists, but in 1923 had 28, and its daily output of dyes in the latter year was about 5,000 kilos (11,000 pounds).

The Botelli Company, of Madonna di Campagna (Turin), began the production of sulphur black during the war. In 1919 the firm amalgamated with the Fabrique de Produits Chimiques, the Rohner Company, of Isvizzera, and the new concern is now producing intermediates for azo dyes, chrome colors, etc. The Schiapparelli concern, of Turin, produces aniline oil and sulphur black, and the Ledogia firm at Garesio manufactures sulphur colors.

The plant of the Società Italiana Prodotti Esplosive (known as "S. I. P. E."), more particularly designed for the manufacture of explosives, was later diverted to the manufacture of synthetic dyes. The company produces at its Cengio (Liguria) works large quantities of aniline oil and other intermediates and is reported to be connected with the Società Italica Colori Artificiali.

During the war, the Industria Nazionali Colori de Anilina (known as "I. N. C. A.") produced dinitrophenol, and in 1916 acquired licenses for operating a number of patents owned by Levinstein's Limited, of Great Britain; in 1919 it began the production of sulphur dyes, direct cotton dyes, and acid dyes. In 1923 it produced 1,600 tons of sulphur black and 200 tons of other colors.

The Fabbriche Italiane Materie Coloranti Bonelli, organized during the war for the manufacture of munitions, especially dinitrophenol, erected in the immediate post-war period a large electrolytic alkali plant and began the production of dyes. At present it is one of the largest dye producers in Italy. Among other firms may be mentioned the Fabbrica Lombarda Colori Anilina ("I. P. C. A."), which, following a commercial agreement with the Swiss manufacturers, Sandoz & Co., began the production of sulphur black and a few direct cotton colors at its Bovisa (Milan) works.

The Industria Piemontese Colori di Anilina produces sulphur blacks and direct cotton dyes, but does not manufacture intermediates.

Felli & Co. (successors of Fisher & Hunold) began, during the war, the production of aniline oil, dinitrophenol, betanaphthol, and sulphur black. They ceased operations after the war, but have since resumed activities with the help of the Ciba Co., of Switzerland.

Production, 8 1918-1922.—In 1918 the total Italian production of synthetic dyes was about 10,000 quintals (2,204,600 pounds), almost entirely sulphur dyes. In 1922 the production was about 50,000 quintals (11,023,000 pounds), of which about 39,000 quintals (8,597,940 pounds) were sulphur dyes.

According to Professor Poma,⁹ in his paper of June, 1923, the present production in Italy of dyes is about 2,000,000 kilograms (4,409,200 pounds) of sulphur black and 200,000 kilograms (440,921 pounds) of other sulphur colors. The production of azo and basic dyes totals about 2,000,000 kilos (4,409,200 pounds), making a total of 4,200,000 kilos (9,259,300 pounds). Among the basic dyes produced in Italy are: Methyl violet, Methylene blue, Vesuvine, Chrysoidine, and Malachite green.

In 1922 the Cesana Maderno works began the construction of a large indigo plant, but the work was suspended. No attempt has been made to manufacture anthraquinone vat dyes in Italy.

TABLE 35.—Italy: Production of coal-tar dyes, 1918-1922

[Department of Commerce: Trade Information Bulletin No. 234]

Dyes	1918	1919	1920	1921	1922
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Synthetic organic colors, sulphur.....	2,190,776	8,139,372	3,438,240	6,362,948	8,485,400
Synthetic organic colors, all other.....	16,530	606,100	1,020,452	1,556,024	2,327,424

TABLE 36.—Italy: Imports and exports of coal-tar dyes, 1922, and first nine months of 1923

	1922		First 9 months, 1923	
	Pounds	Value	Pounds	Value
IMPORTS				
Sulphur dyes.....	274,032	\$160,089	413,583	\$216,402
German reparation.....	31,967			
Other colors:				
In dry state or with less than 50 per cent water....	3,214,968	2,429,087	2,162,051	1,573,672
German reparation.....	1,389,559		1,764,562	
In paste or liquid with 50 per cent or more of water..	329,147	162,198	132,937	58,436
German reparation.....	244,711		392,198	
EXPORTS				
Sulphur dyes.....	38,801	12,163	30,433	21,660
Other colors:				
In dry state or with less than 50 per cent of water..	318,565	231,529	379,853	383,713
In paste or liquid with 50 per cent or more of water..	15,212	10,558	22,707	12,533

One quintal = 220.46 pounds.

One lire, year 1922 = \$0.04752.

One lire, January-September, inclusive, 1923 = \$0.0466.

⁸ "The Italian Dyestuffs Industry," Chemical Trade Journal, May 2, 1924, p. 530.

⁹ L'industria delle materie coloranti in Italia ed i nuovi processi per la fabbricazione di taluni dei grandi prodotti. Conferenza tenuta al Congresso Nazionale di Chimica, Rome, June, 1923.

THE JAPANESE DYE INDUSTRY

War developments.—Previous to the outbreak of the World War, Japan was largely dependent upon imports of synthetic coal-tar colors from Germany. The exports of coal-tar dyes from Germany to Japan in 1913 were 9,744,333 pounds, valued at \$3,453,900. In view of the importance of her textile industries, Japan was seriously affected by the shortage of dyes when German imports were cut off at the beginning of the war. Although Japan has in its coal-gas industry a domestic source of crude coal-tar materials, it is reported that the Japanese production of coal tar is insufficient to supply crudes for all the dyestuffs required. The nine gas and other companies producing coal-tar products in 1918 are credited with an output for that year of 5,415 tons of crudes, including 3,100 tons of benzene; 590 tons of toluene; 40 tons of xylene; 125 tons of phenol; 1,400 tons of refined naphthalene, and 160 tons of crude anthracene. With the encouragement of the Government, the dye industry developed so that more than 100 factories were engaged in that industry during the war. There were large post-war imports of foreign dyes and the manufacturers who have remained in business have had to receive considerable aid from the Japanese Government.

Production.—Figures for 1918–1923 are given in the following table:

TABLE 37.—Japan: Production of coal-tar dyes, 1918–1923

[From "Chemical Trade Bulletin No. 24-B," and "Trade Information Bulletin No. 217," U. S. Department of Commerce]

Class	1918	1919	1920	1921	1923
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Direct.....	923,848	557,575	276,861	396,660	628,026
Acid.....	141,685	205,474	144,632	119,113	242,204
Basic.....	409,994	324,231	364,360	463,227	264,377
Mordant.....	153,478	-----	86,003	170,034	13,546
Acid mordant.....	53,182	-----	13,508	9,205	4,802
Vat.....	106	-----	265	96,442	3,144
Sulphur.....	7,353,034	14,130,935	6,659,532	10,585,063	11,296,931
Miscellaneous.....	2,746,897	1,250,063	471,718	766,708	1,004,705
Total.....	11,782,224	16,468,278	8,016,879	12,606,452	13,457,735

The tendency in Japan to-day is to import the more expensive dyes and to manufacture the cheaper colors. As may be seen from the above table, sulphur colors form the bulk of the requirements of the domestic market. Sulphur black in large quantities, as well as smaller amounts of the other sulphur colors, are used for dyeing cotton fabrics to be made into garments. In addition to the manufacture of sulphur colors the Japanese manufacturers have successfully produced direct colors, among which may be mentioned Benzo fast red A; Congo red; Benzo purpurine; Chrysophenine yellow; Direct black and Direct blue; basic dyes, such as Methylene blue; Methyl violet, and Rhodamine B; also some acid dyes and alizarines. It is reported that only two dye factories are now operating on a large scale in Japan—the Japan Dye Manufacturing Co., Osaka, and the Mitsui Mining Co.

Imports, 1920–1923.—Since 1918 there has been a steady increase in the quantity of foreign dyes imported. The present duty (May, 1924) on natural indigo dry is \$12.69 per 100 pounds; on natural

indigo paste 20 per cent ad valorem. The duty on artificial indigo is 20 per cent ad valorem, and on other coal-tar dyes 35 per cent ad valorem. Germany has made a strong effort to capture this market and in 1921 was the leading exporter; on the other hand, imports of dyes from the United States have more or less steadily declined until, in 1923, they amounted to less than 4 per cent of the total.

TABLE 38.—*Japan: Imports of coal-tar dyes, by classes, 1920, 1921, 1922, and first six months of 1923*

Class	1920		1921		1922		1923 (6 months)	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Indigo, dry natural.....	1,915,515	\$3,940,086	1,186,765	\$1,611,763	375,115	\$392,258	49,851	\$34,164
Indigo, artificial.....	480,864	1,237,374	2,174,319	3,374,973	3,175,726	2,498,463	1,537,131	992,115
Aniline dyes.....	4,330,299	7,457,798	5,461,901	6,262,283	8,999,886	6,198,386	5,745,564	2,807,693
Other coal-tar dyes.....	114,074	273,911	116,576	221,551	351,205	328,374	51,720	48,720

TABLE 39.—*Japan: Imports of coal-tar dyes, 1922 and first six months of 1923*

Imports from—	1922		1923 (6 months)	
	Pounds	Value	Pounds	Value
Great Britain.....	39,551	\$26,201	32,032	\$21,087
France.....	73,401	59,413	74,098	52,330
Germany.....	8,264,733	5,946,265	4,983,203	2,416,377
Switzerland.....	154,518	126,839	336,726	237,560
United States.....	796,093	353,203	338,428	107,133
Other countries.....	22,795	14,837	32,798	21,925
Total.....	9,351,091	6,526,760	5,797,284	2,856,413

One kin.=1.32277 pounds avoirdupois.

Exchange rate for yen, 1920=\$0.50066.

Exchange rate for yen, 1921=\$0.48154.

Exchange rate for yen, 1922=\$0.47808.

Exchange rate for yen, 1923=\$0.48745 first six months.

THE DYE TRADE OF OTHER COUNTRIES

TABLE 40.—*Argentina: Imports of coal-tar dyes, 1921 and 1922*

	1921		1922	
	Pounds	Value	Pounds	Value
Aniline dyes.....	919,556	\$322,435	1,043,799	\$401,574
Indigo.....	985	402	741	468

One gold peso, average, 1921=\$0.7290.

One gold peso, average, 1922=\$0.81814.

TABLE 41.—Austria: Imports and exports of coal-tar dyes, 1921, 1922, and first six months of 1923

	Imports		Exports	
	1921	1922	1921	1922
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Germany.....	3,405,886		6,834	
Switzerland.....	18,298		220	
Czechoslovakia.....	6,393		46,297	
Hungary.....	1,323		120,592	
France.....	441			
Great Britain.....			220	
Italy.....	220		3,527	
Turkey.....				
Netherlands.....				
Poland.....			20,723	
Jugoslavia.....			88,404	
Rumania.....			75,177	
Other countries.....	5,071		8,818	
Total.....	3,437,632	2,760,380	370,812	179,895

1923 (6 months)

Country	Alizarin colors		Synthetic indigo		Other coal-tar colors	
	Imports	Exports	Imports	Exports	Imports	Exports
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Germany.....	41,887		22,046	5,512	382,939	3,086
Italy.....		661				
Rumania.....		441				20,062
Switzerland.....	4,189		15,653		33,510	
Hungary.....		1,323		661	220	14,109
Czechoslovakia.....			10,803		7,055	2,866
Poland.....						3,307
Jugoslavia.....						20,282
Other countries.....		661			3,968	3,086
Total.....	46,076	3,086	48,501	6,173	427,692	66,799
Value.....	\$18,639	\$1,418	\$10,535	\$1,621	\$176,870	\$23,907

TABLE 42.—Belgium: Imports and exports of indigo, natural and artificial, 1922 and 1923

	1922		1923	
	Pounds	Value	Pounds	Value
Imported from—				
Great Britain.....	5,922	\$3,239	8,285	\$1,699
British India.....	3,053	5,689		
Netherlands.....			185,012	33,403
France.....				
Other countries.....	2,317	699		
Total.....	11,292	9,627	193,297	35,102
Exported to—				
China.....				
Great Britain.....	31,753	25,331		
Japan.....				
Other countries.....	3,655	641	33,737	7,531
Total.....	35,408	25,972	33,737	7,531

One franc, average of year, 1922=\$0.07676.

One franc, average of year, 1923=\$0.0519.

TABLE 43.—Brazil: Imports of coal-tar dyes, 1922

	1922	
	Pounds	Value
Aniline or fuchsine dyes.....	1, 541, 952	\$702, 533
Indigo and ultramarine blue.....	1, 142, 025	248, 145

One milreis, paper, average of year, 1922=\$0.12935.

TABLE 44.—Canada: Imports of coal-tar dyes, fiscal year ended March 31, 1923 and 9 months ended December 31, 1923

	Fiscal year ended March 31, 1923		Nine months ended December 31, 1923	
	Pounds	Value	Pounds	Value
Aniline and coal-tar dyes soluble in water, including alizarin and artificial alizarin:				
United Kingdom.....	326, 393	\$166, 179	207, 366	\$100, 841
United States.....	1, 974, 555	1, 214, 598	1, 347, 474	786, 462
Germany.....	254, 533	358, 288	509, 964	354, 245
Netherlands.....	338, 251	238, 508	193, 158	155, 046
Switzerland.....	202, 786	183, 026	142, 930	115, 195
Sweden.....			142, 270	67, 050
Other countries.....	88, 043	76, 067	4, 947	2, 139
Total.....	3, 184, 561	2, 237, 265	2, 548, 109	1, 580, 978
Indigo:				
United States.....	639	933	322	371
Other countries.....				
Total.....	639	933	322	371
Indigo, paste and extract:				
United Kingdom.....				
United States.....	54, 691	11, 998	85, 371	16, 497
Germany.....	11, 431	28, 576		
Other countries.....	39, 027	8, 387	43, 935	7, 136
Total.....	105, 149	48, 961	129, 306	23, 633

Canadian dollar, average for year ended March 31, 1923=\$0.99137.

Canadian dollar, average April-December, inclusive, 1923=\$0.97761.

TABLE 45.—China: Imports of "dyes, colors, and paints" (aniline), 1921

Imported from—	Value	Imported from—	Value
Hong Kong.....	\$1, 062, 621	Switzerland.....	\$103, 456-
Macao.....	21, 777	Austria and Hungary.....	319
French Indo-China.....	1, 132	Russia, Pacific Ports.....	777
Siam.....	225	Korea.....	482
Singapore, Straits, etc.....	129	Japan (including Formosa).....	531, 951
British India.....	4, 847	Philippine Islands.....	281
Great Britain.....	190, 534	Canada.....	881
Sweden.....	62, 668	United States (including Hawaii).....	520, 029
Germany.....	2, 576, 611	Direct gross import.....	\$6, 476, 397
Netherlands.....	791, 310	Reexported abroad.....	412, 726
Belgium.....	570, 097		
France.....	7, 362	Total net import.....	6, 063, 671
Italy.....	28, 907		

Haikwan tael; 1921=\$0.76.

The 1921 Chinese imports of synthetic indigo and unclassified dyes were published in the "Census of Dyes and other Synthetic Organic Chemicals, 1922," pp. 148, 149.

TABLE 46.—China: Imports of dyes, colors, and paints, 1922

(Foreign Trade of China, 1922)

Imported from—	Aniline	Indigo, artificial		Dyes and colors, unclassified ¹	
	Value	Pounds	Value	Pounds	Value
Hongkong.....	\$1,058,423	1,790,800	\$709,624	12,186,264	\$508,195
Macao.....				94,000	2,653
French Indo-China.....	6,242	22,533	15,764	198,533	3,682
Siam.....	235			400	105
Singapore, Straits, etc.....	138			683,867	36,631
Dutch India.....	10,397	1,333	664	123,200	7,622
British India.....	12,087			103,867	14,321
Great Britain.....	93,854	235,333	162,658	183,733	44,376
Norway.....	1,892			10,533	7,282
Sweden.....	13,140				
Denmark.....	10,269			1,067	104
Germany.....	2,574,609	13,374,263	4,397,183	1,282,800	241,229
Netherlands.....	1,431,709	8,030,665	2,768,004	610,667	90,550
Belgium.....	322,164	1,130,400	418,003	277,733	38,258
France.....	5,726	932,133	360,633	173,200	23,378
Switzerland.....	33,848	5,234,265	1,604,105		92
Italy.....	447	479,867	133,739	45,600	4,362
Austria and Hungary.....					
Russia and Siberia by land frontier.....	1,610	1,733	962	70,267	5,693
Russia and Amur ports.....				61,867	7,320
Russia and Pacific ports.....	310			643,866	41,311
Korea.....	6,661	267	108	1,942,133	30,090
Japan (including Formosa).....	308,600	13,200	5,234	7,385,198	779,238
Canada.....	274	33,333	11,970	8,933	5,094
United States (including Hawaii).....	150,607	2,137,200	795,500	43,467	27,915
Turkey, Persia, Egypt, etc.....					7
Total.....	6,043,242	33,417,325	11,384,151	26,131,194	1,919,505
Reexport.....	358,649	3,117,733	1,174,150	130,400	25,475
Net total.....	5,684,593	30,299,592	10,210,001	26,000,793	1,894,030

Equivalent of the "haikwan tael," 1922, = \$0.83.

Converted from "piculs" to pounds = 133.3333 piculs to pound.

¹ Probably includes colors other than coal-tar dyes.

TABLE 47.—Czechoslovakia: Imports of coal-tar dyes, 1920, 1921, and 1922

	1920		1921		1922	
	Pounds	Value	Pounds	Value	Pounds	Value
Indigo, natural:						
France.....			24,057	\$60,996	1,545	\$2,013
Austria.....			2,817	7,144	44	45
Germany.....			351	889	14,112	18,636
Total.....	7,906	\$6,653	27,225	69,029	15,701	20,694
Alizarin, alizarin colors, indigo, synthetic:						
Germany.....			1,649,041	1,412,570	401,678	82,340
Switzerland.....			4,189	3,588	661	145
Austria.....			441	378		
Total.....	425,267	148,533	1,653,670	1,416,536	402,339	82,485
Azo and sulphur dyes:						
Germany.....			1,509,269	951,531	299,826	150,259
Switzerland.....			22,707	14,316	38,581	18,345
Total.....	1,558,873	1,088,934	1,531,976	965,847	338,407	168,604
Coal-tar dyes, other:						
Germany.....			7,353,443	4,333,689	6,684,127	5,198,925
Switzerland.....			250,443	147,596	364,641	285,798
Austria.....			39,903	23,517	20,503	16,836
France.....			23,589	13,902	8,157	5,959
Hungary.....			882	520	441	289
China.....			220	130		
Italy.....					5,291	4,426
Poland.....					1,323	1,128
Saar Basin.....					1,102	723
Total.....	4,223,352	3,097,686	7,668,481	4,519,354	7,085,584	5,514,084

TABLE 48.—Czechoslovakia: Exports of coal-tar dyes, 1920, 1921, and 1922

	1920		1921		1922	
	Pounds	Value	Pounds	Value	Pounds	Value
Indigo, natural:						
Jugoslavia.....			35	\$89	11	\$15
Ethiopia.....			2	6		
Great Britain.....						
Total.....			37	95	11	15
Alizarin, alizarin colors and indigo, synthetic:						
British possessions in Asia.....			359,791	320,525	112,876	24,686
Hamburg.....			139,772	124,518		
Switzerland.....			93,475	83,274	31,746	6,943
Netherlands.....			12,566	11,195	79,145	17,309
Germany.....			8,157	7,267	661	145
Belgium.....			5,732	5,106		
Poland.....			3,527	3,142	4,850	1,061
Austria.....			1,323	1,178	3,086	675
Italy.....			1,102	982		
Denmark.....					1,102	241
Japan.....					5,071	1,109
Total.....	697,756	\$194,964	625,445	557,187	238,537	52,169
Azo and sulphur dyes:						
Germany.....			4,850	3,158	14,550	7,377
Poland.....			16,094	10,477	5,512	2,290
Austria.....					4,409	1,929
Rumania.....			4,189	2,727		
Jugoslavia.....					2,425	928
Italy.....					220	84
Other countries.....			9,700	6,315		
Total.....	11,905	9,148	34,833	22,677	27,116	12,608
Coal-tar dyes, other:						
Germany.....			54,454	31,719	59,304	47,472
Poland.....			33,069	19,262	23,589	18,447
Jugoslavia.....			21,385	12,456	67,020	51,068
Rumania.....			19,180	11,172	8,157	6,625
Italy.....			11,905	6,934	14,109	11,147
Hungary.....			4,850	2,825	4,189	3,404
Austria.....			3,036	1,798	14,330	9,517
Spain.....					3,086	2,141
Belgium.....					3,527	2,739
Possessions of France in Africa.....					1,543	1,051
France.....					3,086	2,411
Other countries.....			7,937	4,623	2,205	1,639
Total.....	227,294	166,713	155,866	90,789	204,145	157,661

One crown, average 1920=\$0.0154.

One crown, average 1921=\$0.0151077.

One crown, average 1922=\$0.024107.

One quintal=\$220.46 pounds

TABLE 49.—Czechoslovakia: Imports and exports of coal-tar dyes, 1923

	1923	
	Pounds	Value
IMPORTS		
Germany.....	4,348,847	\$2,253,434
Hungary.....	2,983	1,095
Switzerland.....	573,024	362,722
Other countries.....	193,487	71,305
Total.....	5,118,341	2,688,556
EXPORTS—OUT OF FREE TRAFFIC		
Netherlands.....	124,511	27,195
Germany.....	226,095	55,336
Poland.....	23,946	7,058
Jugoslavia.....	8,139	3,502
Switzerland.....	55,552	25,723
East Indies.....	167,371	30,377
Other countries.....	180,233	85,860
Total.....	785,847	235,051

Exchange rate for Czecho crowns, 1923=.029465 average.

TABLE 50.—*Dutch East Indies: Imports of coal-tar dyes, 1922 and 1923*

	1922				1923
	Wet		Dry		Wet and dry
	Pounds	Value	Pounds	Value	Pounds
Alizarin dyes:					
Netherlands.....	250,398	\$134,613	21,054	\$21,211	206,836
Great Britain.....	56,416	24,526	110	88	246,430
Germany.....	180,006	85,584	33,962	36,055	250,471
Belgium.....					7,936
Japan.....					45,770
Total.....	486,820	244,723	55,126	57,354	757,443
Aniline dyes:					
Netherlands.....	4,674		125,742		98,579
Great Britain.....					2,130
Germany.....	2,888		196,176		373,153
Belgium.....			14,037		11,072
Italy.....					6,107
Switzerland.....			7,793		49,626
Singapore.....			4,852		260
Hongkong.....					244
Other countries.....	110		10,723		440
Total.....	7,672		359,323		541,611
Synthetic indigo:					
Netherlands.....	591,505	357,507	5,558		214,012
Great Britain.....					30,093
Germany.....	499,322	282,527	1,462		194,911
France.....					142,285
Belgium.....	6,614	2,887			
Italy.....	51,632	19,012	4,189		71,947
Switzerland.....	19,841	7,044			153,793
Hongkong.....					43,651
China.....					86,112
Japan.....					2,248
Other countries.....			2,039		132
Total.....	1,168,914	668,977	13,248		939,184

One gulden, average 1922=\$0.3849.

TABLE 51.—*Dutch East Indies: Exports of natural indigo, 1920-1923*

Java and Madura	1920	1921	1922	1923
Indigo, dry:	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Netherlands.....	586	2,363	7,394	
Singapore.....	58,510	97,399	11,023	
China.....				441
Japan.....	9,963	54,068	10,582	8,457
Total.....	69,059	153,830	28,999	8,898
Indigo, wet:				
British India.....			5,445	
Singapore.....	346,299	13,779	4,409	2,646
Other countries.....	127			
Total.....	346,426	13,779	9,854	2,646

TABLE 52.—*Egypt: Imports and reexports of coal-tar dyes, 1923*

	Pounds	Value
IMPORTS		
Synthetic indigo:		
United Kingdom.....	4, 478	\$1, 431
Belgium.....	5, 884	2, 267
France.....	68, 261	21, 423
Germany.....	230, 537	177, 282
Switzerland.....	267, 259	101, 269
United States.....		
Total.....	576, 419	303, 672
Other coal-tar dyes:		
United Kingdom.....	6, 920	2, 922
Belgium.....	24, 830	4, 623
France.....	5, 088	2, 709
Germany.....	224, 918	115, 597
Switzerland.....	36, 565	32, 104
Syria.....	578	1, 333
United States.....		
Other countries.....	1, 411	1, 222
Total.....	300, 310	160, 510
REEXPORTS		
Synthetic indigo.....	1, 766	1, 134
Other coal-tar dyes.....	4, 200	4, 126

£ E. Par = \$4.943; applying the percentage of the fluctuation of the pound sterling for 1923, or 93.99 per cent = \$4.646.

INDIA

India, with its large population, ranks among the world's leading consumers of dyes. An analysis of the German dye export figures for 1913, the year of maximum exportation for that country, shows that British India was fifth among the world's nations receiving German dyes by quantity (15,008,916 pounds) and sixth by value (\$3,168,060). As it is primarily a cotton-consuming country, cotton dyes constitute the great majority of imports, and with continued expansion in cotton manufacturing it promises to become an increasingly large market for synthetic dyes. A few natural dyes are extensively used, particularly natural indigo. In 1907 and 1908, 405,900 acres of indigo were under cultivation, the exports in that year amounting to 3,249,000 pounds, valued at \$2,665,766. This product is now, however, relatively unimportant as an export item, being unable to compete with synthetic indigo in the world's market. Synthetic indigo is even imported into the country.

As an indication of the position occupied by India among the dye-consuming nations, imports for the pre-war year, 1913, totaled 16,923,607 pounds, valued at \$3,741,031, of which "alizarin dyes made up nearly 25 per cent by value and 38 per cent by weight." Imports in 1922 were 11,731,237 pounds, valued at \$11,798,262, with red as the prevailing color, led by alizarin paste, used for the production of turkey red. In 1914, 72 per cent of the alizarin dyes came from Germany and 15 per cent from the United Kingdom.

Estimates for the imports of the individual leading dyes for 1922 are as follows: Alizarin, 3,600,000 pounds; Congo red, 2,100,000 pounds; and Sulphur black, 1,000,000 pounds. The imports of Congo red are reported to exceed all other direct cotton dyes, while the imports of sulphur black similarly exceed all other Sulphur colors

Basic dyes have a less extensive consumption; they find application for cotton, silk, jute, and coir. The principal members of that class used in India include Magenta, Auramine, Methyl violet, and Malachite green; in the case of the latter two dyes, the trade is accustomed to large crystals.

Acid dyes are imported for wall paper and ceremonial powders, while chrome dyes are in small demand. As to methods of dyeing, yarn dyeing leads, followed by piece and raw stock dyeing. Considerable hand printing with wooden blocks is also carried on. Bombay, on account of the large number of cotton mills in that Province, is probably the leading Indian port for the importation of coal-tar dyes. It is a distributing dye center for coastwise and country shipments.

Recovery of import trade by Germany.—An examination of the import figures of British India shows that Germany in 1921 and 1922 regained a large share of the import trade which had been taken over by Great Britain, the United States, and Switzerland during the war. According to Indian official figures, more than three-fourths of the dye imports of 1914, both by weight and value, originated in Germany. In 1920, the year before Germany reentered the world's markets, imports of German dyes into India were insignificant. In 1921, however, they reappeared in the world's markets and comprised slightly over one-third of that year's imports into India, increasing to about one-half of the imports in 1922. The increase in Germany's share in the import trade is reflected in a conspicuous drop in the 1922 dye imports, as compared with 1921, from the United Kingdom and even more so from the United States. Imports from the United Kingdom in 1921 totaled 3,613,820 pounds, valued at \$3,619,734; they declined in 1922 to 2,960,634 pounds, valued at \$3,107,969. The decrease in the imports of dyes from the United States is still more striking; in 1921 they amounted to 2,019,871 pounds, valued at \$2,831,326, as compared with 1922 figures of 723,285 pounds and \$1,029,090, respectively.

TABLE 53.—*India: Imports of coal-tar dyes and exports of natural indigo, British India, 1923*

Imports of coal-tar dyes year ended Mar. 31, 1923	Pounds	Exports of natural indigo year ended Mar. 31, 1923	Pounds
Alizarin dyes.....	5, 285, 661		
Aniline dyes.....	8, 741, 929		
Other coal-tar dyes.....	92, 232		
	14, 119, 822		
From—		To—	
United Kingdom.....	1, 326, 261	United Kingdom.....	86, 128
Germany.....	9, 922, 018	Asiatic Turkey.....	129, 808
Belgium.....	1, 002, 955	Persia.....	63, 728
Switzerland.....	53, 259	Japan.....	41, 216
United States.....	726, 391	Egypt.....	129, 136
Other countries.....	1, 088, 938	Other countries.....	57, 904
Total.....	14, 119, 822	Total.....	507, 920

TABLE 54.—Mexico: Imports of coal-tar, May, 1920, and May, 1921

	May, 1920		May, 1921	
	Pounds	Value	Pounds	Value
Aniline, alizarin (natural and artificial) and anthracene colors:				
United States.....	14, 198	\$5, 507	130	\$67
Germany.....	5, 244	2, 423	4, 980	647
Great Britain.....	-----	-----	6, 265	2, 101
Total.....	19, 442	7, 930	11, 375	2, 815

One peso, average, May, 1920, \$0.49352.

One peso, average, May, 1921, \$0.48983.

TABLE 55.—The Netherlands: Imports and exports of coal-tar dyes, 1922

	1922	
	Pounds	Value
IMPORTS		
Aniline and other coal-tar dyes:		
Germany.....	3, 035, 734	\$1, 778, 238
Belgium.....	48, 501	36, 950
Switzerland.....	191, 800	153, 960
All other countries ¹	171, 959	61, 969
Synthetic indigo.....	3, 447, 994	2, 031, 117
	368, 168	93, 146
EXPORTS		
Aniline and other coal-tar dyes:		
Germany.....	121, 253	60, 044
Great Britain.....	154, 322	68, 897
France.....	35, 274	37, 720
United States.....	57, 320	42, 724
Dutch East Indies.....	33, 069	12, 702
All other countries ¹	194, 004	97, 765
Synthetic indigo.....	595, 242	319, 852
	2, 205	385

One ton, 2,204.6 pounds; 1,000 gulden, average for 1922, \$384.90.

¹ Computed on difference between given total and individual countries.

TABLE 56.—Persia: Imports and exports of indigo, years ended March 20, 1922, and March 20, 1923

	Year ended Mar. 20, 1922		Year ended Mar. 20, 1923	
	Pounds	Value	Pounds	Value
IMPORTS				
Natural indigo:				
Afghanistan.....			62	\$55
Great Britain.....	937	\$955	105	59
British India.....	290, 218	308, 174	215, 947	154, 419
France.....	21	32	-----	-----
Russia.....	-----	-----	72	64
Switzerland.....	-----	-----	514	369
European Turkey.....	128	205	-----	-----
Total.....	291, 304	309, 366	216, 700	154, 966
Germany.....	94, 210	134, 015	114, 596	98, 309
Great Britain.....	111	251	56	33
British India.....	524	655	94, 425	63, 045
France.....	-----	-----	15	19
Russia.....	1, 928	2, 579	7	4
Switzerland.....	-----	-----	2, 744	1, 972
Total.....	96, 774	137, 500	211, 843	163, 382

TABLE 56.—*Persia: Imports and exports of indigo, years ended March 20, 1922, and March 20, 1923—Continued*

	Year ended Mar. 20, 1922		Year ended Mar. 20, 1923	
	Pounds	Value	Pounds	Value
EXPORTS				
Natural indigo:				
Afghanistan.....			963	\$577
Russia.....	888	\$873	28,145	26,331
Mascoti.....			98	38
Oman.....			1,408	553
Total.....	888	873	30,614	27,499
Synthetic indigo:				
Afghanistan.....			295	607
Russia.....			7,709	7,525
Switzerland.....			7	9
Total.....			8,011	8,141

One kran approximately equivalent to French franc.

Average exchange franc 1922, \$0.08193.

Average exchange franc, 1923, \$0.0607.

One Batman—2.970 kilos—6.55 pounds.

TABLE 57.—*Spain: Imports of coal-tar dyes, 1922, and first six months of 1923*

	1922		1923 (6 months)	
	Pounds	Value	Pounds	Value
Colors derived from coal and other artificial colors in powder or crystal, including thio carbon.....	1,725,320	\$1,574,904	983,618	\$892,064
Indigo, synthetic.....	325,258	171,061	105,226	54,983
Colors derived from coal in paste or solid containing 50 per cent water.....	65,049	31,973	26,881	13,127

One peseta, average of 1922, \$0.1548.

One peseta, average, January to June, 1923, \$0.1538.

TABLE 58.—*Sweden: Imports and exports of coal-tar dyes, 1921*

	1921	
	Pounds	Value
IMPORTS		
Alizarin colors.....	42,531	\$43,393
Aniline and other coal-tar colors.....	914,475	793,064
Indigo:		
Artificial.....	23,713	14,133
Natural.....	22	47
Other indigo colors.....	3,309	675
EXPORTS		
Alizarin colors.....	82	272
Aniline and other coal-tar colors.....	64,921	60,819

One krona, average of 1921, \$0.225.

REPARATION DYES¹⁰

1. Under the terms of the treaty of Versailles provision was made for deliveries in kind by Germany. Annex VI to Part VIII of the treaty dealt with the delivery of dyes and pharmaceutical products. The full text of Annex VI follows:

I

Germany accords to the Reparation Commission an option to require as part of reparation the delivery by Germany of such quantities and kinds of dyestuffs and chemical drugs as the commission may designate, not exceeding 50 per cent of the total stock of each and every kind of dyestuff and chemical drug in Germany or under German control at the date of the coming into force of the present treaty.

This option shall be exercised within 60 days of the receipt by the commission of such particulars as to stocks as may be considered necessary by the commission.

II

Germany further accords to the Reparation Commission an option to require delivery during the period from the date of the coming into force of the present treaty until 1st June, 1920, and during each period of six months thereafter until 1st January, 1925, of any specified kind of dyestuff and chemical drug up to an amount not exceeding 25 per cent of the German production of such dyestuffs and chemical drugs during the previous six months' period. If in any case the production during such previous six months was, in the opinion of the commission, less than normal, the amount required may be 25 per cent of the normal production.

Such option shall be exercised within four weeks after the receipt of such particulars as to production and in such form as may be considered necessary by the Commission; these particulars shall be furnished by the German Government immediately after the expiration of each six months' period.

III

For dyestuffs and chemical drugs delivered under paragraph 1, the price shall be fixed by the commission, having regard to pre-war net export prices and to subsequent increases of cost.

For dyestuffs and chemical drugs delivered under paragraph 2, the price shall be fixed by the commission, having regard to pre-war net export prices and subsequent variations of cost, or the lowest net selling price of similar dyestuffs and chemical drugs to any other purchaser.

IV

All details, including mode and times of exercising the options, and making delivery, and all other questions arising under this arrangement shall be determined by the Reparation Commission; the German Government will furnish to the commission all necessary information and other assistance which it may require.

V

The above expression "dyestuffs and chemical drugs" includes all synthetic dyes and drugs and intermediate or other products used in connection with dyeing, so far as they are manufactured for sale. The present arrangement shall also apply to cinchona bark and salts of quinine.

DYES

As regards dyestuffs the intention of the Reparation Commission was as follows:

1. To place at the disposal of the Allied and Associated Powers the dyes immediately necessary for their industries.

2. To furnish a continuous supply up to January 1, 1925.

Following the signing of the treaty, consideration was given to Annex VI in view of the urgent needs of dyes by the Allied countries.

¹⁰ The information on reparation dyes is taken from "Report on the Works of the Reparation Commission from 1920-1922, printed and published by His Majesty's Stationery Office, 23 Imperial House, King's Way, London, WC2.

The subcommittee, composed of dye experts from the United States, Great Britain, Italy, and Belgium, was appointed, as was also a German expert committee, comprising representatives of the leading German dye firms and presided over by Herr Carl von Weinberg.

Agreement was made at the first meeting on August 8, 1919, at Versailles, to take an inventory of stocks on hand in the German factories as on August 15. The inventory of dyes on hand submitted by Germany totaled 20,706,114 kilos (20,380 tons¹¹) and in addition 816,610 kilos (804 tons) of intermediates. The following table shows the stocks of dyes and intermediates on hand in each of the German factories on August 15, 1919:

TABLE 59.—Stock of dyestuffs in German factories, August 15, 1919

Factory	Dyestuffs	Intermediates	Total dyestuffs and intermediates	50 per cent of the total of dyestuffs and intermediates
	Kilograms	Kilograms	Kilograms	Kilograms
A. G. F. A. (Berlin).....	1,077,759.000	47,963.000	1,125,722.000	562,861.000
Badische.....	7,984,435.000	143,494.000	8,127,929.000	4,063,964.500
Bayer.....	5,444,805.000	27,433.000	5,472,238.000	2,736,119.000
Cassella.....	2,235,683.000	45,536.000	2,281,219.000	1,140,609.500
Griesheim.....	506,330.500	49,167.400	555,497.900	277,748.950
Grunau.....		1,992.000	1,992.000	996.000
Jäger.....	22,540.000		22,540.000	11,270.000
Kalle.....	339,855.300	25,325.000	365,180.300	182,590.150
Meister L. & B.....	2,566,721.158	473,601.200	3,040,322.358	1,520,161.179
Muehlheim.....	80,306.000	300.000	80,606.000	40,303.000
Weiler-ter-Meer.....	423,004.000	798.000	423,802.000	211,901.000
Wülfing Dahl.....	24,675.000	1,000.000	25,675.000	12,837.500
Grand total.....	20,706,113.958	816,609.600	21,522,723.558	10,761,361.779

In theory the option on these stocks could not be exercised until the treaty entered into force. None the less, in view of the urgent needs of France, Italy, and Belgium, it was decided, with the consent of Germany, in the course of a meeting of the Allies held in London for that purpose on September 15, 1919, to authorize the immediate withdrawal of 5,200 tons from the stocks of August 15. This agreement was ratified by the organization committee on September 17, the details governing the deliveries were arranged with the German experts at the beginning of October, and a protocol finally signed on November 3.

Deliveries on the 5,200-ton account began on November 22, 1919. After a prolonged consideration of the distribution of the remainder of the stocks on hand (August 15, 1919) it was decided to divide the dyes into groups and to base the percentage of distribution on the German export statistics of 1913. These figures were modified to allow for new conditions and for home consumption. The following table shows the percentage distribution:

TABLE 60.—Percentages of distribution of dyestuffs—Balance of the stock of August 15, 1919

Group	United States	Great Britain	France	Italy	Belgium
I. Alizarine red.....	25	35	16	16	8
II. Indigo.....	5	29	28	18	20
III. Vat dyes other than indanthrene blue G. C. D.....	39	30	13	13	5
IV. Indanthrene blue G. C. D.....	55	30	8	7	
V. Alizarine dyes other than red.....	37	30	14	14	5
VI. Direct cotton colors.....	15	25	23	20	17
VII. Developed cotton colors.....	20	25	26	20	9
VIII. Acid wool colors.....	15	25	28	20	12
IX. Chrome colors.....	20	30	23	18	9
X. Basic colors.....	15	25	25	23	12
XI. Sulphur colors.....	10	35	17	17	21
XII. Lake colors.....	25	25	25	15	10
Intermediates.....	20	30	21	19	10

¹¹ Except where otherwise stated, the "ton" is the long ton.

Orders for deliveries from the stocks on hand continued to be forwarded up to September 1, 1920, and the total deliveries of dyes amounted to 9,889,650 kilos (9,733 tons).

Paragraph 2 of Annex VI gave the commission an option for each six monthly period for delivery "of any specific kind of dyestuff and chemical drug up to an amount not exceeding 25 per cent of the German production of such dyestuffs and chemical drugs during the previous six months' period." The option came into force with the treaty, that is, on January 10, 1920.

At a meeting held in January, 1920, the German experts proposed that the Allies should establish a program, to be carried out by Germany, of their real needs for three months and that the Reparation Commission should exercise its option on the monthly production. This proposal was accepted and a provisional protocol for its execution was signed on January 30, 1920. Since that date Germany has had to inform the commission each month of the production of the preceding month of all dyestuffs, as well as of the lowest prices at which they have been supplied to other purchasers. In practice the prices quoted are always those of the German internal market. The monthly lists of production are communicated to the interested Governments and they are given a certain time to pass orders up to the amount of the percentages attributed to them. These percentages were drawn up on the basis employed for the distribution of the balance of the stocks of August 15; they have been modified on more than one occasion, owing to unforeseen demands from Japan, and again owing to the provisional abandonment of deliveries by Japan and subsequently by the United States.

The two following tables show the percentage distribution by countries of 25 per cent of the daily production of dyes, (1) when the United States received them, and (2) after withdrawal of the United States:

TABLE 61.—Percentages of distribution of the 25 per cent of the daily production of dyestuffs

[United States included]

Group	United States	Great Britain	France	Italy	Belgium
I. Alizarin red.....	25	35	16	16	8
II. Indigo.....	5	35	23	23	14
III. Vat dyes other than indanthrene blue G. C. D.....	42	35	9	9	5
IV. Indanthrene blue G. C. D.....	60	35	5		
V. Alizarin dyes other than red.....	45	35	8	8	4
VI. Direct cotton colors.....	15	25	25	18	17
VII. Developed cotton colors.....	23	30	18	15	9
VIII. Acid wool colors.....	15	33	26	15	11
IX. Chrome colors.....	25	33	18	15	9
X. Basic colors.....	20	30	20	20	10
XI. Sulphur colors.....	10	35	17	17	21
XII. Lake colors.....	30	30	15	15	10
Intermediates.....	20	30	21	19	10

TABLE 62.—Existing percentages of distribution of the 25 per cent of the daily production of dyestuffs

Group	Great Britain	France	Italy	Belgium
I. Alizarin red.....	45	15	25	15
II. Indigo.....	37	20	25	18
III. Vat dyes other than indanthrene blue G. C. D.....	50	20	20	10
IV. Indanthrene blue G. C. D.....	35	25	25	15
V. Alizarin dyes other than red.....	55	20	17	8
VI. Direct cotton colors.....	34	26	21	19
VII. Developed cotton colors.....	42	25	21	12
VIII. Acid wool colors.....	37	30	19	14
IX. Chrome colors.....	43	20	25	12
X. Basic colors.....	38	25	25	12
XI. Sulphur colors.....	35	15	20	30
XII. Lake colors.....	40	20	25	15
Intermediates.....	37	26	24	13

After the expiration of the time limit the remaining dyes were offered to the different countries without regard to the percentages, and withdrawals were also made for deliveries to countries having no percentage (the Serb-Croat-Slovene State and Greece):

The drawing up of the quarterly program of the needs of the Allied countries for the purpose of the agreement, which was to replace the provisional agreement of January 30, 1920, presented serious difficulties, and the protocol of that date was first renewed on April 28, 1920, and a second time in a slightly different form on May 31.

The protocol for the delivery of dyes of May 31, 1920, follows:

Pending the final execution of the agreement outlined at the meeting of the dyestuff subcommission of the Reparation Commission, January 28, 1920, or of a similar agreement, the German Government undertakes to deliver to the Reparation Commission from June 1, 1920, forward, 25 per cent of the German daily production of dyestuffs.

It will likewise deliver intermediate products used in dyeing and printing in such quantities as shall equal the quantities of those same products delivered to the various countries before the war for the same uses.

The prices at which these dyestuffs and intermediate products will be delivered shall be the lowest price at which these same dyestuffs and intermediate products have been offered ¹² during the same month to any buyer, German or other.

These deliveries will be credited to Germany in the reparation account.

It is understood that the present agreement in no way constitutes a renunciation by the Reparation Commission of any of the rights conferred upon it by the treaty of Versailles, particularly as regards the paragraphs above concerning intermediate products and prices.

(Signed)

DUBOIS.
D'AMELIO.
BERGMANN.

N. B.—This protocol and all the other protocols and agreements concerning Annex VI having been prepared in the French language, and the French text being the only one signed by the Germans, the French text alone is authentic.

The German factories continued to turn out large quantities of the simpler dyestuffs, which were also being produced in United States, British, French, and Italian factories, with the result that a proportion of them remained at the disposal of the commission. In order not to disturb the markets by putting these dyestuffs on sale, the commission negotiated the sale of the untaken balances to the Association of German Dyestuff Manufacturers (Interessengemeinschaft) and on February 3, 1921, an agreement was signed under which this association bought them back at 75 per cent of the value shown on the monthly lists of production. This contract dealt with all the balances of the 25 per cent of production from February to May, 1920, and the sum paid to the commission amounted to 44,384,420 paper marks (3,026,100 gold marks).

In the case of many types of dyestuffs 25 per cent of the German production was not sufficient to satisfy the needs of the Allied countries, and, indeed, many of the products for which there was a demand were not even manufactured. The commission sought to fill this gap. The chief requirements were to enable the Allied distributing organizations to satisfy their own clients, whatever might be the quantity called for, and to provide the materials at a reasonable price. Several conferences were held with the German experts in July, 1921. It appeared desirable, in order to interest the German factories in the smooth working of the agreement which was under negotiation, to make a concession on the price of the quantities in excess of those the delivery of which was provided for in the earlier protocols, and it was in this spirit that the supplementary agreement of the 19th August, 1921, was signed after long negotiations.

¹² In the French text "tarifés."

This agreement follows:

APPENDIX XXVIII

AGREEMENT SUPPLEMENTARY TO THE DYESTUFFS PROTOCOL OF MAY 31, 1920

PARIS, 19th August, 1921.

The following clauses shall be applied to the protocol of 31st May, 1920, which governs, in so far as dyestuffs are concerned, the execution of paragraph 2, Annex VI to Part VIII of the treaty of Versailles.

ARTICLE 1

The I. G. of the German dye factories, whilst continuing to hold at the disposal of the Reparation Commission 25 per cent of the amount of dyestuffs manufactured each month, agrees to deliver, as far as possible, on reparation account, dyestuffs asked for in quantities superior to 25 per cent of the production of such dyes.

However, the total value of the dyes delivered on reparation account out of the production of any one month shall not exceed 25 per cent of the total value of the total production for that month.

ARTICLE 2

Those quantities superior to 25 per cent of the production of each dyestuff shall be debited in reparation account at the lowest price that the I. G. of the German dye factories shall have sold at¹³ in each of the receiving countries during the month preceding the month of delivery or during the month of delivery, but always at the lower of these two prices.

However, the prices fixed by the protocol of 31st May, 1920, shall be applied to a minimum quantity of each dyestuff to be delivered in accordance with articles 1 and 2, such minimum quantity to be agreed upon jointly by the Reparation Commission and the I. G. on the basis of the production of each dyestuff during the 15 months from 1st February, 1920, to 30th April, 1921 (see letter from I. G. attached).

ARTICLE 3

For such dyestuffs as the amount asked for is liable to exceed 25 per cent of the production, firm orders shall be given by each Allied and Associated Power within one month of the signing of the present agreement for the first three months' period and for the succeeding three-monthly periods during the last month of the preceding period. The quantities thus ordered shall not exceed the needs of the consuming industries of each country.

ARTICLE 4

The Reparation Commission recognizes that dyestuffs delivered on reparation account should not be reexported, and will therefore ask the Governments of the Allied and Associated Powers receiving dyestuffs to give to their respective distributing organizations the instructions necessary to prevent, as far as possible, this reexportation.

ARTICLE 5

As to dyestuffs of which deliveries are not to exceed 25 per cent of the production and of which 25 per cent of the production is held at the disposal of the Reparation Commission, the commission agrees that firm orders for these shall be given within 60 days after receipt of the monthly lists of production. Quantities for which firm orders are not given within this period shall automatically remain at the free disposal of the I. G.

¹³ In the French text "au plus bas prix que l'I. G. * * * aura pratiqué," which is less restrictive than the term "sold."

ARTICLE 6

There shall be left at the free disposal of the I. G.—

- (a) On the signing of this agreement the reliquats of the seven months from 1st June to 31st December, 1920;
 (b) Within 30 days of the date of signature of this agreement, the reliquats of the months of January and February, 1921;
 (c) Within 60 days of the date of signature of this agreement, the reliquats of the three months from 1st March to 31st May, 1921.

ARTICLE 7

The Reparation Commission will forward to the "Centrale des Usines de Matieres Colorantes" at Frankfort within 30 days of the date of this agreement a provisional list of specified dyestuffs, which in future will no longer have to be held at the disposal of the Reparation Commission. This list will be subject to change as the Reparation Commission may direct.

It is, moreover, understood that the monthly lists of production handed over to the Reparation Commission by the "Centrale" of Frankfort shall continue to show the production of all dyestuffs manufactured, whether or not they are to be held at the disposal of the commission.

ARTICLE 8

The present agreement will remain in force until revoked by the Reparation Commission. Notice of such revocation must be given at the beginning of a three-monthly period to take effect for the next period.

ARTICLE 9

The I. G. will do the necessary to be assured that the German Government will not oppose the present agreement.

For the I. G. of German synthetic dyestuff factories.

(Signed)

SALVAGO RAGGI.
 B. A. KEMBALL-COOK.
 C. VON WEINBERG.

ANNEX TO AN AGREEMENT SUPPLEMENTARY TO THE PROTOCOL OF
MAY 31, 1920

Letter from the I. G. of German synthetic dyestuff factories to the bureau for dyestuffs and pharmaceutical products of the Reparation Commission:

PARIS, 12th July, 1921.

The I. G. declares that it will carry out article 2 of the supplementary agreement to the protocol of 31st May, 1920, concerning dyestuffs, as follows:

When a product is concerned which has not been manufactured during the 15 months taken as a basis, and such manufacture is undertaken to fill an order from the Allies, during the first three-monthly period 50 per cent of the amount delivered will be priced at the price prevailing on the German interior market. This, however, does not apply to products never manufactured before the coming into effect of the treaty.

When a product is concerned which was manufactured during the 15 months taken as a basis, but in quantity considered insufficient, the lower price will be applied to a quantity to be determined by common agreement, which quantity will be between the 25 per cent of the average monthly production of the 15 months and 50 per cent of the amount ordered.

However, the lower price will always be applied to a quantity equal at least to 25 per cent of the actual production.

For the I. G. of German synthetic dyestuff factories.

(Signed)

C. VON WEINBERG.

This agreement enabled the Allied distributing agencies to place quarterly orders for their requirements and to provide for reserves. It only binds Germany to deliver "as far as possible," and does not fix the price in advance. However, in nearly all cases the syndicate manufactured the desired products, and with few exceptions prices were reasonable.

The quarterly orders under this agreement up to December, 1922, are indicated below:

	Tons ordered
July-September, 1921.....	496
October-December, 1921.....	1, 178
January-March, 1922.....	1, 198
April-June, 1922.....	1, 549
July-September, 1922.....	2, 061
October-December, 1922.....	2, 433

The agreement of August 19, 1921, was modified on June 12, 1922, to facilitate the calculation of prices.

This amendment, given below, was extended "sine die" on December 15, 1922.

PARIS, June 12, 1922.

PROVISIONAL AMENDMENT TO THE SUPPLEMENTARY AGREEMENT OF
AUGUST 19, 1921, RELATIVE TO DYESTUFFS

I. To facilitate the application of the supplementary agreement of August 19, 1921, it is decided that the following rules will apply to the quarterly orders July-September, and October-December, 1922. In so far as these two periods are concerned, the text which follows shall constitute a provisional amendment to such clauses of the supplementary agreement as might be contradictory to the present text.

II. All quarterly orders for July-September and October-December, 1922, will be invoiced as follows: 50 per cent at the price fixed by the protocol of May 31, 1920; 50 per cent at the lowest price that the I. G. shall have sold at in each of the receiving countries during the month preceding the month of delivery or during the month of delivery, but always at the lower of these two prices.

III. Upon receipt of the quarterly orders, the Centrale will furnish, for information, the export prices quoted for the countries interested at the time the orders are placed.

IV. To obtain the 25 per cent of the daily production, the quantities ordered in the quarterly orders will be deducted from the total actual production of the factories during the corresponding quarter. The 25 per cent of the difference between the actual production and the quarterly orders will appear in the production lists of the months from July to December, 1922. This entire 25 per cent will be at the disposal of the Reparation Commission in accordance with the Protocol of May 31, 1920.

(Signed)

LEON DELACROIX.
JOHN BRADBURY.
VON WEINBERG.

Two other agreements of minor importance included: (1) An agreement between the German factories and the French holders of pre-war contracts of dyes; (2) a Belgian-German agreement under which Belgium could order on reparation account, at open market prices, any dyes not obtainable within its share of the 25 per cent of daily production or within the quarterly orders.

A question of interpretation arose on the intermediates in paragraph 5 of Annex VI, as the French and English texts were not identical. The question was whether the commission's option extended to intermediates used in making dyes or was limited to those products used in dyeing and printing. The Reparation Commission provisionally limited its option to the intermediates used in dyeing and printing. The Allied experts considered it desirable to encourage the dye makers

in their respective countries to produce their own intermediates and, in order to avoid their use in dye making, the option was restricted to the pre-war consumption by the Allied countries. In order to provide for new products and such products as naphthol A. S., the provision was further modified. Group I includes intermediates used in dye making. Orders were passed without restriction at the lowest price of the German factories, provided that the products be used only for dyeing and printing and not reexported. Group II includes products specially employed in dyeing or printing. Option is accorded at prices provided for by the treaty up to 25 per cent of production, and quantities in excess can be ordered at the lowest price quoted by Germany in the country placing the order.

Shortly after the treaty came into force the Reparation Commission organized a bureau for dyestuffs and pharmaceutical products which works in liaison with the Allied expert committee, while Germany created at Frankfort a service (Zentrale der Farbstoff Fabriken, under the direction of Herr Muehlen), in touch with the German expert committee. Since the Reparation Commission allots dyes as a general rule only to Allied Governments or to agencies specifically appointed for this purpose by the Governments, France and Italy each set up a "Union des Producteurs et Consommateurs de Matieres Colorantes" for the receipt and distribution of reparation dyes. Great Britain appointed first of all the Central Importing Agency and later the British Dyestuffs Corporation. The Belgian Government itself receives and distributes its dyestuffs. The United States gave a mandate to the Textile Alliance (Inc.) of New York, but withdrew the mandate on the 14th December, 1921, without replacing the Textile Alliance. Nevertheless, the commission at that time decided, in consideration of the requirements of the United States industry and in the absence of objection from the United States Government, to continue to deliver to the Textile Alliance the portion previously assigned to the United States. On the 29th November, 1922, the Textile Alliance informed the commission that it renounced any right to order reparation dyes, and the share of the United States was then distributed between Great Britain, France, Italy, and Belgium.

The Frankfort Zentrale draws up every month lists indicating, in the case of each product manufactured in Germany during the preceding month, 25 per cent of the production and the lowest current price. These lists are immediately communicated by the dyestuffs bureau to the different Governments, which have 30 days in which to forward their orders up to the amount of their percentages to the Zentrale at Frankfort. After 30 days the dyestuffs bureau draws up a new list indicating the quantities still available. This list is immediately communicated to the Allied Governments, who have a further period of 30 days within which to forward to the bureau their orders for these balances. The balances are distributed a first time in proportion to the orders received on the tenth day and then later distributed in accordance with the orders without regard to percentages. Quantities not ordered within the total period of 60 days remain at the disposal of Germany. Orders for the 25 per cent of the daily German production must be carried out by Germany within three weeks except in the case of "force majeure." An invoice accompanies each consignment, and the amount, after conversion into gold marks, is then credited to Germany and debited to the receiving country on reparation account. As regards the United States, which has no reparation account, payments were made in dollars to the commission by the receiving agency. The same method was adopted for the dyes sold directly to the Textile Alliance.

Certain Allied countries were put to inconvenience through the reexportation of dyestuffs made by other Allied countries, and requested the commission to take steps to prevent such reexports. The attitude of the commission was defined in a letter addressed to the delegations of all the interested countries, the gist of which is contained in the two following extracts:

Dyes received subsequent to August 9, 1921:

It is definitely understood that such dyes are ordered for domestic consumption and are not to be reexported to countries receiving dyes through the medium of the Reparation Commission. In distributing these dyes to domestic consumers the receiving countries are expected to bring home this understanding to purchasers in such a way as to make it practically effective.

* * * * *

Dyes delivered before August, 1921:

If practicable, the commission would be desirous of having the same restrictions as to reexportation of these dyes as are adopted for the dyes delivered since August. As regards dyes ordered under the supplementary agreement of the 19th August, 1921, or its amendment, the question of reexportation was regulated by article 4 of the former.

The deliveries of the dyes by the commission to the various countries up to December 31, 1922, are given below:

	Quantity (kilos)	Value (gold marks)		Quantity (kilos)	Value (gold marks)
United States Textile Alliance:			Italy:		
Stock.....	1,948,958	2,102,913.21	Stock.....	1,566,214	1,811,728.18
Daily production.....	280,734	1,499,291.13	Daily production.....	3,180,866	11,106,367.33
Supplementary agreement.....	161,823	1,281,132.53	Supplementary agreement.....	403,804	1,787,400.49
Total.....	2,391,515	4,883,336.87	Total.....	5,150,884	14,705,496.00
Great Britain:			Japan:		
Stock.....	2,923,453	3,806,101.03	Stock.....	88,001	64,487.61
Daily production.....	2,280,452	5,774,614.66	Daily production.....	591,312	2,565,227.76
Supplementary agreement.....	955,678	4,653,776.82	Total.....	679,313	2,629,715.37
Total.....	6,159,583	14,234,492.51	Serb-Croat Slovene State: Daily production.....	10,140	22,623.61
France:			Greece: Daily production.....	63,004	251,084.79
Stock.....	2,259,829	2,871,672.16	Total:		
Daily production.....	1,826,247	8,687,467.25	Stock.....	9,889,650	11,859,118.43
Supplementary agreement.....	127,207	796,465.34	Daily production.....	9,965,036	33,947,022.67
Pre-war contracts.....	28,549	86,419.32	Supplementary agreement.....	2,806,540	12,764,750.81
Total.....	4,241,832	12,442,024.07	Pre-war contracts.....	28,549	86,419.32
Belgium:			Grand total.....	22,689,775	58,657,311.23
Stock.....	1,103,195	1,202,216.24			
Daily production.....	1,732,281	4,040,346.14			
Supplementary agreement.....	1,158,028	4,245,975.63			
Total.....	3,993,504	9,488,538.01			

TABLE 63.—Reparation dyes delivered to December 31, 1923

	Kilos	Gold marks		Kilos	Gold marks
United States.....	2,391,589	4,875,568	Japan.....	679,313	2,629,705
Great Britain.....	7,664,993	19,197,311	Greece.....	67,006	256,200
France.....	4,276,533	12,515,487	Serbia.....	10,140	22,624
Italy.....	6,274,601	18,722,218	Total.....	25,583,390	68,133,019
Belgium.....	4,219,215	9,913,905			

PHARMACEUTICAL PRODUCTS

The questions involved in the case of pharmaceutical products were intrusted to a subcommittee of experts. At the first meeting, held September 12, 1919, the United States, Great Britain, France, Italy, and Belgium were represented. The German experts suggested September 20, 1919, as the date on which inventories should be taken of stocks on hand, and this date was agreed upon. The French and Belgian experts desired prompt exercise of the option, in view of the needs of pharmaceuticals in their countries. The United States and British experts stood for a compliance with legal limitation of the treaty, whereby the option could be exercised only by the commission itself, i. e., after the treaty came into force.

On December 9, 1919, Germany reported the inventories of pharmaceuticals, and the experts met on January 5 to 10 for their examination. It was found that the quantities were too low for certain products and that other products covered by the treaty were not listed.

As a result of a discussion on January 30, 1920, and the explanations offered, the German inventories were accepted "en bloc," to which stocks of certain products were to be added. In the case of codeine and cocaine, only half of their stocks were declared, as it was not proved that the patents covering their synthesis were being operated. Synthetic pharmaceuticals were defined as "all organic products which are not natural or which are not obtained by simple extraction from a natural product and which are employed in therapeutics."

After the treaty came into force pharmaceuticals were dealt with in the same manner as dyes. A distribution organization for pharmaceutical products was maintained at Frankfort, Germany.

Agreement was made on April 9, 1920, for the distribution of pharmaceuticals on the basis of pre-war imports, and on April 12 the Allied and German experts signed a protocol governing the delivery of 50 per cent of the stocks.

The deliveries were modified as a result of the abandonment of their respective shares by the United States and Great Britain and of a request of Japan to participate. Percentages were allotted to France, Italy, and Belgium, and Japan received a small fixed amount. On August 28, 1920, the option on stocks was exercised, the total deliveries amounting to 93,776 kilos (92 tons).

It was decided, in agreement with Germany, to exercise the option on the daily production in a manner which differed slightly from that stipulated in the treaty; it was agreed that Germany should forward monthly to the commission a list of the quantities manufactured in the course of the preceding month and that orders for 25 per cent of this production should be forwarded immediately. The protocol of October 19, 1920, governs these deliveries:

PARIS, October 19, 1920.

PROTOCOL FOR THE DELIVERY OF PHARMACEUTICAL PRODUCTS

The German Government, in execution of paragraph 2, Annex VI, Part VIII of the treaty of Versailles, undertakes to deliver to the Reparation Commission any synthetic pharmaceutical products and salts of quinine up to an amount not exceeding 25 per cent of the German production manufactured from July 1, 1920, onward.

The production of cocaine and codeine, however, will be delivered only up to an amount of 12.5 per cent of the total production of these products.

The prices at which these products shall be delivered shall in principle be the lowest net selling price at which these products have been quoted¹⁴ during the month of their production to any other purchaser (German or otherwise). The Reparation Commission, however, reserves the right to fix the prices, according to the provisions of paragraph 3, Annex VI, Part VIII of the treaty of Versailles, if it considers that the prices charged by Germany are excessive.

These deliveries will be credited to Germany in the reparation account.

The present agreement, until revoked or modified by the Reparation Commission, will govern all future deliveries of pharmaceutical products under the provisions of the treaty above quoted.

It is understood that in making the present agreement the Reparation Commission reserves all the rights conferred upon it by the treaty of Versailles.

(Signed) DUBOIS.
THEUNIS.
BERGMANN.

¹⁴ In the French text "les prix les plus bas auxquels ces memes produits ont ete tarifés."

The distribution of these quantities among the different Allies gave rise to long discussions and was subjected to modifications when the United States and Great Britain provisionally renounced their right to participate. For a few months Japan received fixed quantities, the balance being distributed between France, Italy, and Belgium in proportions which will be found in the following table:

PERCENTAGE DISTRIBUTION OF THE 25 PER CENT OF THE DAILY PRODUCTION OF PHARMACEUTICAL PRODUCTS SINCE JULY, 1920

Titles of the groups:

I. Quinine and its salts (No. 380 A of the German customs tariff of 1913).

II. Salicylic and benzoic acids and their salts (No. 317 N).

III. Alkaloids other than quinine and the glucosides (No. 380 B).

IV. Ethyl ether and the esters (No. 382).

V. Chloroform and chloral hydrate (No. 382).

VI. General synthetic products (Nos. 346 F, 346 G, 278, 317 G, 350, 351, 383, 390).

	Groups					
	I	II	III	IV	V	VI
France.....	33.0	42.5	42.5	57.5	40.0	51.5
Italy.....	60.5	43.0	42.5	17.0	40.0	33.0
Belgium.....	6.5	14.5	15.0	25.5	20.0	15.5

Rumania, the Serb-Croat-Slovene State, and Greece receive pharmaceutical products drawn from the quantities of which the other countries do not avail themselves, quantities which are relatively important in the aggregate owing to the development of the pharmaceutical industry in France and in Italy.

Rumania, the Serb-Croat-Slovene State, and Greece, in particular, urgently requested the delivery of salts of quinine and, the German manufacture of this product having greatly declined since the war, several special agreements were made for the delivery of a total quantity of over 56 tons.

The table below shows the deliveries of pharmaceutical products made to the different countries up to December 31, 1922:

TABLE 64.—*Pharmaceuticals delivered to December 31, 1922*

	Quantity (kilos.)	Value (gold marks)		Quantity (kilos.)	Value (gold marks)
France:			Japan:		
Stock.....	29,879	176,148.67	Stock.....	1,401	5,696.13
Daily production.....	26,431	189,527.48	Daily production.....	16,108	132,688.57
Total.....	56,310	365,676.15	Total.....	17,509	138,384.70
Italy:			Serb-Croat-Slovene State:		
Stock.....	49,507	481,731.93	Daily production.....	123,445	1,570,828.89
Daily production.....	268,797	2,073,392.82	Greece: Daily production	201,194	1,769,134.18
Total.....	318,304	2,555,124.75	Rumania: Daily produc- tion.....	80,790	5,608,020.59
Belgium:			Grand total.....	1,013,847	13,550,944.19
Stock.....	12,989	145,241.00			
Daily production.....	203,306	1,398,533.93			
Total.....	216,295	1,543,774.93			

TABLE 65.—*Pharmaceuticals delivered to December 31, 1923.*

	Kilos	Gold marks		Kilos.	Gold marks
France.....	57,525	394,399	Serbia.....	176,093	2,563,340
Italy.....	417,180	3,528,279	Rumania.....	80,790	5,608,020
Belgium.....	248,892	1,617,427			
Japan.....	17,509	138,385	Total.....	1,299,549	16,891,446
Greece.....	301,560	3,041,596			

In December, 1923, it was reported that the I. G. agreed to resume normal reparation deliveries in kind under Annex VI of the Versailles treaty and later agreements with the Reparation Commission.



PART VI
—
APPENDIX
STATISTICS OF DOMESTIC IMPORTS
AND EXPORTS

1871

1872

1873

STATISTICS OF IMPORTS AND EXPORTS

TABLE 66.—Imports of coal-tar products entered for consumption, calendar years
1917 to 1923

[Act of Sept. 8, 1916]

GROUP I, CRUDE (FREE)

	Years			
	1917		1918	
	Quantity	Value	Quantity	Value
Acids, carbolic, which on being subjected to distillation yield in the portion distilling below 200° C. a quantity of tar acids less than 5 per cent of original distillate.....	151, 254	\$9, 894	155, 236	\$17, 260
Anthracene oil.....	61, 200	3, 105		
Benzene.....	3, 598, 733	341, 700	2, 673, 855	87, 570
Cresol.....	7, 665, 442	532, 529	8, 873, 271	779, 045
Dead or creosote oil.....	9, 817, 085	786, 638	1, 545, 247	162, 869
Naphthalene having a solidifying point less than 79° C.				
.....pounds.....	5, 206, 980	175, 554	3, 902, 731	130, 098
Pyridine and quinoline.....	12, 247	1, 480	9, 237	1, 036
Coal tar, crude.....	6, 780	10, 745	13, 087	21, 200
Pitch, coal tar.....	5, 926	12, 039	14, 029	29, 095
Metacresol, orthocresol, and paracresol—purity less than 90 per cent.....	20, 708	1, 404		
Xylene.....	9, 332	2, 928		
All other products found naturally in coal tar whether produced or obtained from coal tar or other sources, n. s. p. f.		10, 448		2, 756
All other distillates, which on being subjected to distillation yield in the portion distilling below 200° C. a quantity of tar acids less than 5 per cent of the original distillate.....		1, 502		10, 473
Anthracene, purity less than 25 per cent.....	(1)	(1)	18	5
Acenaphthene, cumol fluorene, methylanthracene, and methylnaphthalene.....	(1)	(1)		
Carbazole, purity less than 25 per cent.....	(1)	(1)		

	Years			
	1919		1920	
	Quantity	Value	Quantity	Value
Acids, carbolic, which on being subjected to distillation yield in the portion distilling below 200° C. a quantity of tar acids less than 5 per cent of original distillate.....	1, 965, 289	\$187, 788	192, 692	\$19, 848
Anthracene oil.....	18, 699	3, 994	15, 054	3, 945
Benzene.....	217, 865	5, 617	486, 619	10, 868
Cresol.....	6, 435, 650	557, 214	10, 318, 070	901, 381
Dead or creosote oil.....	11, 268, 379	1, 374, 217	18, 427, 152	3, 796, 399
Naphthalene having a solidifying point less than 79° C.				
.....pounds.....	3, 239, 256	92, 265	15, 012, 096	530, 219
Pyridine and quinoline.....	165, 064	20, 543	863, 456	168, 800
Coal tar, crude.....	22, 339	38, 476	11, 901	24, 140
Pitch, coal tar.....	3, 364	8, 598	8, 780	26, 022
Metacresol, orthocresol, and paracresol—purity less than 90 per cent.....	11, 200	1, 221		
Toluene.....	1, 195, 706	30, 768		
All other products found naturally in coal tar whether produced or obtained from coal tar or other sources, n. s. p. f.	380, 525	6, 334	240, 096	14, 046
All other distillates, which on being subjected to distillation yield in the portion distilling below 200° C. a quantity of tar acids less than 5 per cent of the original distillate.....	104, 568	10, 548		
Anthracene, purity less than 25 per cent.....	82, 669	2, 022	202, 569	16, 590
Acenaphthene, cumol fluorene, methylanthracene, and methylnaphthalene.....	15, 759	946		
Carbazole, purity less than 25 per cent.....	112	82		

¹ Imports not available by calendar year.

TABLE 66.—Imports of coal-tar products entered for consumption, calendar years 1917 to 1923—Continued

GROUP I, CRUDE FREE—Continued

	Years				
	1921		1922		
	Quantity	Value	Quantity	Value	
Acids, carbolic, which on being subjected to distillation yield in the portion distilling below 200° C. a quantity of tar acids less than 5 per cent of original distillate.....	pounds.....	214, 185	\$22, 849	311, 914	² \$33, 781
Anthracene oil.....	gallons.....	12, 776	5, 019	13, 368	3, 242
Benzene.....	pounds.....	1, 722, 085	442, 370	172, 528	1, 223
Cresol.....	do.....	3, 353, 882	253, 886	3, 756, 651	258, 536
Dead or creosote oil.....	gallons.....	33, 239, 432	4, 756, 618	41, 566, 767	4, 239, 949
Naphthalene having a solidifying point less than 79° C.....	pounds.....	4, 495, 806	135, 943	3, 144, 332	54, 029
Pyridine and quinoline.....	do.....	72, 515	11, 367	119, 973	21, 113
Coal tar, crude.....	barrels.....	21, 551	46, 784	23, 451	54, 324
Pitch, coal tar.....	do.....	417	1, 264	1, 422	4, 193
Metacresol, orthocresol, and paracresol—purity less than 90 per cent.....	pounds.....			3, 962	352
Toluene.....	do.....			144, 237	6, 061
All other products found naturally in coal tar whether produced or obtained from coal tar or other sources, n. s. p. f.....	pounds.....	40, 707	3, 111	424, 530	8, 049
All other distillates which on being subjected to distillation yield in the portion distilling below 200° C. a quantity of tar acids less than 5 per cent of the original distillate.....	pounds.....	7, 310	959	459, 727	50, 652
Anthracene, purity less than 25 per cent.....	do.....	58, 111	1, 198	33, 600	400
Acenaphthene, cumol, fluorene, methylanthracene and methylnaphthalene.....	pounds.....	100	64	66	17
Carbazole, purity less than 25 per cent.....	do.....				
				1923	
				Quantity	Value
Benzene.....	pounds.....			701, 857	\$21, 902
Dead or creosote oil.....	gallons.....			64, 199, 636	10, 071, 393
Naphthalene, solidifying at less than 79° C.....	pounds.....			20, 992, 439	575, 702
Coal tar, crude.....	barrels.....			10, 131	31, 671
Pitch, coal tar.....	do.....			4, 644	15, 154
Toluene.....	pounds.....			194, 660	7, 928
Acenaphthene, fluorene, methylanthracene, and methylnaphthalene.....	do.....			23, 673	2, 826
Anthracene, purity less than 30 per cent.....	do.....			869, 780	23, 925
Anthracene oil.....	gallons.....			31, 198	7, 078
Cumene, cymene.....	pounds.....			2	24
Metacresol, orthocresol, and paracresol, purity less than 90°.....	do.....			3, 805	2, 846
Pyridine.....	do.....			764, 918	266, 184
Xylene.....	do.....			136, 438	8, 179
All other distillates n. s. p. f., which on being subjected to distillation yield in the portion distilling below 190° C. a quantity of tar acids less than 5 per cent of the original distillate.....	pounds.....			5, 761, 011	489, 824
All other products found naturally in coal tar, whether produced or obtained from coal tar or other sources, n. s. p. f.....	pounds.....			1, 635, 025	69, 373

² First 9 months.

TABLE 66.—Imports of coal-tar products entered for consumption, calendar years 1917 to 1923

GROUP II (DUTIABLE AT 15 PER CENT AD VALOREM PLUS 2½ CENTS PER POUND; DUTIABLE AT 55 PER CENT PLUS 7 CENTS PER POUND AFTER SEPTEMBER 21, 1922)

Article and year	Pounds	Value	Duty	Actual and computed ad valorem rate
Not colors, dyes, or stains, photographic chemicals, medicinal flavors, or explosives, n. s. p. f.:				
Acids—				
Amidosalicylic—				
1917				
1918				
1919				
1920	11,199	\$8,182	\$1,507	18.42
1921				
1922				
1923				
Arsanilic—				
1923	223	3,345	1,855	55.47
Benzoic—				
1917	4,653	20,539	3,190	15.53
1918	1,791	14,060	2,154	15.32
1919	63	374	58	15.42
1920	250	1,087	169	15.58
1921	11,263	3,012	733	24.35
1922 ¹	100	365	57	15.68
1923	100	410	233	56.71
Carbolic (phenol) which on being subjected to distillation yields in the portion distilling below 200° C. a quantity of tar acids equal to or more than 5 per cent of the original distillate—				
Crystal—				
1917	30,676	4,954	1,510	30.48
1918	148,261	47,085	10,769	22.87
1919				
1920				
1921	250	142	28	19.40
1922 ¹	280,224	30,414	11,568	38.03
1922 ²	69,310	16,102	13,708	85.13
1923	126,618	21,389	20,627	96.44
Liquid—				
1917	314,585	24,246	11,502	47.44
1918	134,406	15,186	5,638	37.13
1919	2,061	264	91	34.52
1920	1,040	244	63	25.66
1921				
1922 ¹	1,702	1,801	313	17.36
1922 ²	145,375	18,488	20,345	110.04
1923	2,815	257	338	131.67
Cinnamic—				
1923	112	389	222	57.02
Dichlorophthalic—				
1923	10	8	5	63.75
Phenyglycine orthocarboxylic—				
1923	17,376	74,492	42,187	56.63
Salicylic—				
1917	26,273	23,575	4,193	17.79
1918	117	112	20	17.62
1919				
1920				
1921				
1922 ¹	2,276	1,881	339	18.02
Salicylic and salts of, not medicinal—				
1923	1,107	854	547	64.07
Sulphanilic—				
1923	16	19	12	60.89
Amidonaphthol—				
1917				
1918				
1919	150	72	15	20.21
1920				
1921	11,025	9,990	1,774	17.76
1922				
1923				

¹ Act of 1916.² Act of 1922.

TABLE 66.—Imports of coal-tar products entered for consumption, calendar years 1917 to 1923—Continued

GROUP II (DUTIABLE AT 15 PER CENT AD VALOREM PLUS 2½ CENTS PER POUND; DUTIABLE AT 55 PER CENT PLUS 7 CENTS PER POUND AFTER SEPTEMBER 21, 1922)—Continued

Article and year	Pounds	Value	Duty	Actual and computed ad valorem rate
Not colors, dyes, or stains, photographic chemicals, medicinal flavors, or explosives, n. s. p.—Continued.				
Amidophenol—				
1917				
1918				
1919	1,028	\$2,417	\$388	16.06
1920				
1921	14,623	11,699	2,120	18.12
1922				
1923				
Aniline oil—				
1917				
1918				
1919				
1920	220	72	16	22.64
1921	11,243	1,799	551	30.62
1922 (included in aniline oil and salts) ¹				
Aniline salt—				
1917				
1918	21,273	3,250	1,019	31.36
1919				
1920	4	1		25.00
1921	18,316	12,109	2,274	18.78
1922 (included in aniline oil and salts)				
Aniline oil and salts—				
1922 ²	55	11	10	90.00
1923	30	220	123	55.95
Anthracene, purity of 25 per cent or more—				
1917				
1918				
1919	51,895	8,011	2,499	31.19
1920	648,095	87,413	29,314	33.54
1921	261,645	12,639	8,437	66.75
1922 ²	2	2	1	62.00
1923				
Anthraquinone—				
1917				
1918				
1919	3,147	2,643	375	14.20
1920	13,053	5,612	1,168	20.82
1921	127,427	78,255	14,924	19.07
1922				
1923				
Benzaldehyde—				
1917				
1918				
1919	24,472	17,790	3,280	18.44
1920	9,479	5,928	1,126	19.00
1921	1,056	465	96	20.68
1922 ²	20	11	7	67.73
Benzaldehyde, not medicinal—				
Nitrobenzaldehyde				
1923	200	240	146	60.83
Benzidine, bensidine sulphate—				
1923	7	23	13	57.13
Benzylchloride—				
1917				
1918				
1919	1,000	430	90	20.81
1920	150	22	7	32.05
1921				
1922 ¹				
Benzylchloride, benzalchloride, and benzoylchloride—				
1922 ²	29	10	8	75.30
1923	10	22	13	58.18
Binitrotoluol—				
1917	61,632	10,471	3,111	29.71
1918	22,635	3,333	1,066	31.98
1919	6,896	1,331	372	27.95
1920	4,692	1,216	300	24.64
1921	1,164	155	52	33.77
1922				
1923				

¹ Act of 1916.² Act of 1922.

TABLE 66.—Imports of coal-tar products entered for consumption, calendar years 1917 to 1923—Continued

GROUP II (DUTIABLE AT 15 PER CENT AD VALOREM PLUS 2½ CENTS PER POUND; DUTIABLE AT 55 PER CENT PLUS 7 CENTS PER POUND AFTER SEPTEMBER 21, 1922)—Continued

Article and year	Pounds	Value	Duty	Actual and computed ad valorem rate
Not colors, dyes, or stains, photographic chemicals, medicinal flavors, or explosives, n. s. p. f.—Continued				
Binitrobenzol—				
1921.....	5	\$3		19.33
1922.....				
1923.....				
Carbazole, purity of 25 per cent or more—				
1917.....				
1918.....				
1919.....				
1920.....	157	27	\$8	29.56
1921.....				
1922 ¹	8,820	3,865	800	20.70
1922 ²				
1923.....				
Dimethylaniline—				
1917.....				
1918.....				
1919.....	1,120	427	92	21.56
1920.....	22,400	15,968	2,955	18.51
1921.....				
1922 ¹	23,565	3,828	1,163	30.39
1922 ²				
Dimethylaniline and benzylethylaniline—				
1923.....	1	2	1	58.50
Metacresol, orthocresol, and paracresol, purity of 90 per cent or more—				
1917.....				
1918.....				
1919.....				
1920.....	2,444	2,230	396	17.74
1921.....	556	341	65	19.08
1922 ¹	2,224	107	72	66.96
1922 ²	1,008	167	162	97.24
1923.....	8,754	5,410	3,588	66.33
Methylanthraquinone—				
1917.....				
1918.....				
1919.....	3,147	2,643	375	14.20
1920.....	13,053	5,612	1,168	20.82
1921.....				
1922.....				
1923.....	977	1,221	740	60.60
Naphthalene solidifying at 79° C. or above—				
1917.....	267,057	12,125	8,497	70.02
1918.....	2,795	171	96	55.87
1919.....	7,650	384	249	64.80
1920.....	3,697,562	416,172	154,865	37.21
1921.....	441,685	31,458	15,761	50.10
1922 ¹	75,680	7,684	3,045	39.61
1922 ²				
1923.....	9,605	194	779	401.57
Naphthol—				
1917.....	1,027	1,069	186	17.40
1918.....				
1919.....				
1920.....				
1921.....	333,356	112,922	25,272	22.38
1922 ¹	658	799	136	17.96
1922 ²				
Naphthol, alpha and beta not medicinal—				
1923.....	13,376	29,569	17,199	58.17
Naphthylamine—				
1917.....				
1918.....	11,761	5,985	1,192	19.91
1919.....				
1920.....	69,695	7,208	2,824	39.18
1921.....				
1922.....				
1923.....				
Naphthylenediamine—				
1923.....	5	6	4	60.83

¹ Act of 1916.² Act of 1922.

TABLE 66.—Imports of coal-tar products entered for consumption, calendar years 1917 to 1923—Continued

GROUP II (DUTIABLE AT 15 PER CENT AD VALOREM PLUS 2½ CENTS PER POUND; DUTIABLE AT 55 PER CENT PLUS 7 CENTS PER POUND AFTER SEPTEMBER 21, 1922)—Continued

Article and year	Pounds	Value	Duty	Actual and computed ad valorem rate
Not colors, dyes, or stains, photographic chemicals, medicinal flavors, or explosives, n. s. p. f.—Continued				
Nitrobenzol—				
1917				
1918				
1919	21,513	\$4,003	\$1,138	28.44
1920	45,891	6,009	2,049	34.09
1921				
1922				
1923				
Nitronaphthalene—				
1917	18,102	7,758	1,616	20.83
1918				
1919				
1920				
1921				
1922				
1923				
Nitrophenylenediamine—				
1921	1,132	6,590	1,017	15.43
1922				
1923				
Nitrotoluol—				
1917				
1918				
1919	542	452	81	18.00
1920	684	359	71	19.76
1921				
1922				
1923				
Phenylenediamine—				
1917				
1918				
1919	2,746	1,769	334	18.88
1920	2,429	1,887	344	18.22
1921				
1922 ¹	6	16	9	57.62
1922 ²				
1923				
Phenylhydrazine—				
1923	18	39	23	58.23
Phthalic anhydride—				
1917	98	1,853	280	15.13
1918				
1919				
1920				
1921				
1922 ¹	3,374	2,517	1,621	64.38
1922 ²				
1923				
Resorcin—				
1917	134	672	104	15.50
1918				
1919				
1920	51,529	39,932	7,278	18.23
1921	109,658	75,022	13,995	18.65
1922				
1923	12,520	16,976	10,213	60.16
Tolidine—				
1923	5	6	4	60.83
Toluidine—				
1923	60	31	21	68.55
Tolylenediamine—				
1921	175	238	40	16.48
1922				
1923				
Xylidine—				
1917				
1918				
1919				
1920	56,047	41,237	7,587	18.40
1921				
1922				
1923	150	60	44	72.50

¹ Act of 1916.² Act of 1922.

TABLE 66.—Imports of coal-tar products entered for consumption, calendar years 1917 to 1923—Continued

GROUP II (DUTIABLE AT 15 PER CENT AD VALOREM PLUS 2½ CENTS PER POUND; DUTIABLE AT 55 PER CENT PLUS 7 CENTS PER POUND AFTER SEPTEMBER 21, 1922)—Continued.

Article and year	Pounds	Value	Duty	Actual and computed ad valorem rate
All distillates n. s. p. f., which on distillation, yield in the portion distilling below 200° C. a quantity of tar acid equal to or more than 5 per cent of the original distillate:				
1917				
1918	1,550	\$2,008	\$340	16.93
1919	3,170	4,587	767	16.73
1920	85,474	36,041	7,543	20.93
1921	16,240	11,811	2,178	18.43
1922 ¹	328,601	33,784	13,283	39.32
1922 ^{2,3}	22,163	9,128	6,572	72.00
1923 ³	245,119	30,328	33,839	111.58
All distillates of coal, blast-furnaces, oil-gas, and water-gas tar which on being subject to distillation below 215° C. a quantity of tar acids equal to or more than 75 per cent of the original distillate:				
1922 ²	18,257	4,102	3,534	86.16
1923	195,757	36,382	33,713	92.66
All similar products, obtained, derived, or manufactured in whole or in part from the products provided for in Group I (free):				
1917	193,021	17,595	7,465	42.43
1918	13,445	8,640	1,632	18.89
1919	51,214	39,861	7,260	18.21
1920	87,911	74,514	13,375	17.95
1921	87,207	41,965	8,475	20.19
1922 ¹	389,708	153,625	32,786	21.34
1922 ²	187,377	61,967	47,198	76.17
1923	1,436,982	330,514	282,371	85.43
All sulfoacids or sulfoacid salts of Group II:				
1917				
1918				
1919				
1920	100	87	16	17.88
1921	6,789	2,944	611	20.76
1922 ¹	11,374	12,058	2,093	17.36
1923				

¹ Act of 1916.

² Act of 1922.

³ At 190° C. instead of 200° C.

GROUP III (DUTIABLE AT 30 PER CENT AD VALOREM; DUTIABLE AT 60 PER CENT AD VALOREM PLUS 7 CENTS PER POUND AFTER SEPTEMBER 21, 1922)

Article and year	Pounds	Value	Duty	Actual and computed ad valorem rate
When obtained, derived, or manufactured in whole or in part from any of the products provided for in Group I (free) or II, including natural indigo and their derivatives:				
Alizarin, natural—				
1917	6,899	\$12,216	\$3,665	30.00
1918	108,711	158,816	47,645	30.00
1919	6,684	8,612	2,584	30.00
1920	58,583	41,381	12,414	30.00
1921	59,306	81,816	24,545	30.00
1922 ¹	28,399	63,304	18,991	30.00
1922 ²	1,547	3,094	1,965	63.50
1923	9,283	18,600	11,810	63.49
Alizarin, synthetic—				
1917	19,180	55,179	16,554	30.00
1918				
1919				
1920	73,232	24,072	7,222	30.00
1921	136,283	49,707	14,912	30.00
1922 ¹	21,614	22,190	666	30.00
1923	1,836	3,699	2,348	63.47

TABLE 66.—Imports of coal-tar products entered for consumption, calendar years 1917 to 1923—Continued

GROUP III (DUTIABLE AT 30 PER CENT AD VALOREM; DUTIABLE AT 60 PER CENT AD VALOREM PLUS 7 CENTS PER POUND AFTER SEPTEMBER 21, 1922)—Continued

Article and year	Pounds	Value	Duty	Actual and computed ad valorem rate
When obtained, derived, or manufactured in whole or in part from any of the products provided for in Group I (free) or II, including natural indigo, and their derivatives—Continued				
Dyes obtained, derived, or manufactured from alizarin—				
1917.....	34	\$75	\$23	30.00
1918.....	6,446	13,399	4,020	30.00
1919.....	1,920	3,864	1,159	30.00
1920.....	29,436	25,498	7,647	30.00
1921.....	246,837	356,658	106,997	30.00
1922 ¹	293,005	468,134	140,440	30.00
Colors, dyes, stains, etc., obtained, derived, or manufactured from alizarin—				
1922 ²	56,294	82,981	53,729	64.75
1923.....	274,799	379,673	247,040	65.07
Dyes obtained, derived, or manufactured from anthracene and carbazole—				
1917.....	23,146	11,326	3,398	30.00
1918.....	12,827	20,087	6,026	30.00
1919.....	7,162	7,772	2,332	30.00
1920.....	216,508	208,754	62,626	30.00
1921.....	226,956	422,941	126,882	30.00
1922 ¹	330,129	605,187	181,556	30.00
Colors, dyes, obtained, derived, or manufactured from anthracene or carbazol—				
1922 ²	17,697	26,002	16,840	64.76
1923.....	7,319	8,126	5,388	66.30
Indigoids, whether or not obtained from indigo—				
1917.....	129,983	140,932	42,280	30.00
1918.....	3,376	13,744	4,123	30.00
1919.....	34,049	82,779	24,834	30.00
1920.....	86,439	196,783	59,035	30.00
1921.....	76,123	72,154	21,646	30.00
1922 ¹	184,886	267,059	80,118	30.00
1923.....				
Indigo, natural—				
1917.....	2,261,122	4,230,510	1,269,153	30.00
1918.....	1,637,914	2,007,958	602,387	30.00
1919.....	234,991	285,925	85,778	30.00
1920.....	36,537	69,528	20,858	30.00
1921.....	77,121	154,538	46,361	30.00
1922 ¹	14,461	19,074	5,722	30.00
1922 ²				
1923.....	9,102	4,149	3,427	73.70
Indigo, synthetic—				
1917.....	1,379,349	871,267	261,380	30.00
1918.....	690,414	342,589	102,777	30.00
1919.....	537,697	327,133	98,140	30.00
1920.....	171,101	207,299	62,190	30.00
1921.....	70,975	84,901	25,470	30.00
1922 ¹	86,585	123,702	37,111	30.00
1922 ²				
1923.....	356	117	95	81.30
Colors, dyes, stains, etc., derived from indigo—				
1922 ²	872	1,482	950	64.11
1923.....	13,864	18,636	12,152	65.21
Colors, or color lakes obtained, derived, or manufactured from alizarin—				
1917.....	7,062	18,680	5,957	31.89
1918.....	1,499	4,490	1,422	31.67
1919.....	15,358	14,405	5,089	35.33
1920.....	98,735	172,841	56,789	32.86
1921.....	59,290	66,171	22,816	34.48
1922 ¹	79,542	62,986	27,077	35.05
1922 ²				
1923 (see, "Dyes, etc., from alizarin").				

¹ Act of 1916.² Act of 1922.

TABLE 66.—Imports of coal-tar products entered for consumption, calendar years 1917 to 1923—Continued

GROUP III (DUTIABLE AT 30 PER CENT AD VALOREM; DUTIABLE AT 60 PER CENT AD VALOREM PLUS 7 CENTS PER POUND AFTER SEPTEMBER 21, 1922)—Continued

Article and year	Pounds	Value	Duty	Actual and computed ad valorem rate
When obtained, derived, or manufactured in whole or in part from any of the products provided for in Group I (free) or II, including natural indigo and their derivatives—Continued				
Colors, or color lakes obtained, derived, or manufactured from anthracene and carbazols—				
1917.....	53, 205	\$49, 729	\$17, 579	35. 35
1918.....	27, 900	22, 546	8, 159	36. 19
1919.....	38, 073	55, 475	18, 546	33. 43
1920.....	260, 060	529, 966	171, 993	32. 45
1921.....	62, 748	65, 635	22, 828	34. 78
1922 ¹	27, 535	63, 102	20, 032	31. 75
1923 (see, "Dyes, etc., from anthracene and carbazole").				
All other color, dyes, or stains, whether soluble or not in water, color acids, color bases, or color lakes—				
1917.....	2, 257, 476	2, 574, 363	885, 183	34. 38
1918 ³	1, 799, 467	2, 161, 799	738, 513	34. 16
1919.....	1, 991, 687	2, 848, 294	954, 073	33. 50
1920.....	2, 807, 807	4, 093, 389	1, 368, 407	33. 43
1921.....	2, 751, 535	3, 968, 319	1, 328, 072	33. 47
1922 ¹	2, 077, 712	2, 941, 773	965, 640	32. 83
1922 ²	677, 849	894, 844	584, 356	65. 30
1923.....	3, 059, 361	4, 154, 091	2, 706, 610	65. 16
Phenolic resin, synthetic—				
1917.....	134, 702	11, 596	10, 214	88. 08
1918.....				
1919.....	1, 114	2, 860	914	31. 95
1920.....	2, 479	2, 681	928	34. 63
1921.....	1, 420	2, 366	781	33. 00
1922 ¹	762	1, 404	452	32. 17
1923.....				
Resinlike products prepared from articles provided for in pars. 27 and 1549:				
1922 ²	1, 756	2, 094	1, 379	65. 87
1923.....	3, 183	10, 512	6, 530	62. 12
Photographic chemicals—				
1917.....	12, 632	101, 406	31, 053	30. 62
1918.....	14, 550	108, 537	33, 289	30. 67
1919.....	12, 059	77, 876	23, 966	30. 77
1920.....	21, 808	67, 640	21, 382	31. 61
1921.....	29, 281	65, 906	21, 236	32. 22
1922 ¹	3, 287	4, 465	1, 471	32. 94
1922 ²	8, 183	8, 208	5, 498	66. 98
1923.....	10, 182	28, 504	17, 815	62. 50
Coal tar medicinals:				
Acetanilid—				
1917.....	15	22	6	25. 00
1918.....				
1919.....	124	50	13	25. 00
1920.....				
1921.....				
1922.....				
1923.....	58	82	53	64. 95
Acetphenctidin—				
1917.....	3, 280	40, 352	10, 088	25. 00
1918.....				
1919.....				
1920.....				
1921.....				
1922.....				
1923.....	25	238	145	60. 74
Acetylsalicylic acid—				
1917.....	1, 474	4, 670	1, 168	25. 00
1918.....				
1919.....	26	76	19	25. 00
1920.....				
1921.....				
1922.....	1	7	4	61. 00
1923.....				

¹ Act of 1916.² Act of 1922.³ Does not include 110 pounds, valued at \$322, duty \$31.68, from Cuba.

TABLE 66.—Imports of coal-tar products entered for consumption, calendar years 1917 to 1923—Continued

GROUP III (DUTIABLE AT 30 PER CENT AD VALOREM; DUTIABLE AT 60 PER CENT AD VALOREM PLUS 7 CENTS PER POUND AFTER SEPTEMBER 21, 1922)—Continued

Article and year	Pounds	Value	Duty	Actual and computed ad valorem rate
Coal tar medicinals—Continued				
Antipyrine—				
1917	21,842	\$62,411	\$15,603	25.00
1918	9,416	106,643	26,661	25.00
1919	13,736	135,565	33,891	25.00
1920	14,737	53,293	13,323	25.00
1921				
1922 ¹	12,604	18,468	4,617	25.00
1922 ²	913	1,740	1,108	63.68
1923	14,250	20,602	13,359	64.89
Arsphenamine (salvarsan) and neo-arsphenamine—				
1923	5	211	127	60.17
Benzaldehyde—				
1922	571	914	588	64.38
1923	2,780	4,059	2,630	64.80
Novocain or procaine—				
1923	5	210	126	60.17
Phenolphthalein (25 per cent)—				
1917				
1918	100	1,200	300	25.00
1919				
1920	200	726	181	25.00
1921	5,055	2,385	596	25.00
1922 ¹	64	36	9	25.00
1922 ²	1,487	8,877	5,430	61.17
1923	2,931	10,891	6,740	61.88
Salicylic acid and its salts, medicinal—				
1923	40	81	51	63.46
Medicinals—				
1917		284,346	85,304	30.00
1918		301,074	90,322	30.00
1919		168,466	50,540	30.00
1920		165,055	49,517	30.00
1921		280,299	84,090	30.00
1922 ¹		154,620	46,386	30.00
1922 ^{2,3}	7,937	24,410	15,202	62.27
1923	43,325	164,238	101,576	61.85
Flavors—				
1917	35	408	122	30.00
1918	160	816	245	30.00
1919				
1920	14	27	8	30.00
1921				
1922				
1923	31	90	56	62.41
Saccharin—				
1917	554	6,544	360	5.50
1918				
1919				
1920	40	39	26	66.67
1921	46	103	30	29.03
1922 ¹	1	15	1	4.33
1922 ²	1	14	8	60.50
Explosives: Picric acid—				
1923	1,980	3,929	2,496	63.53
Ink powder—				
1923	261	308	203	65.93
Synthetic tanning material—				
1923	1,412	2,162	1,396	64.57

¹ Act of 1916.² Act of 1922.³ Other coal-tar medicinals.

TABLE 67.—General imports of coal-tar products, by countries, calendar years 1918-1923

DEAD OR CREOSOTE OIL (FREE)

Imported from—	1918		1919		1920		1921	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	<i>Gallons</i>		<i>Gallons</i>		<i>Gallons</i>		<i>Gallons</i>	
England.....			8,934,045	\$1,085,617	12,514,150	\$2,568,235	19,465,981	\$3,114,867
Scotland.....	1,125	\$862	60,756	10,462	147,377	21,096	819	189
Canada.....	1,543,660	161,693	2,273,578	278,138	1,619,903	227,624	374,845	64,713
All other countries.....	462	314			14,145,722	979,444	13,397,787	1,576,849
Total.....	1,545,247	162,869	11,268,379	1,374,217	18,427,152	3,796,399	33,239,432	4,756,618

Imported from—	1922		1923	
	Quantity	Value	Quantity	Value
	<i>Gallons</i>		<i>Gallons</i>	
United Kingdom.....	22,383,535	\$2,235,686		
Netherlands.....	14,471,820	1,528,941		
Germany.....	2,406,364	193,804		
Belgium.....	1,537,376	184,485		
Canada.....	768,442	97,533		
All other countries.....				
Total.....	41,567,537	4,240,449	64,199,636	\$10,071,393

BENZOL OR BENZENE

Imported from—	1918		1919		1920		1921	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>	
Canada.....	1,315,696	\$33,303	217,865	\$5,617	486,619	\$10,868	1,562,951	\$39,020
All other countries.....							159,134	3,350
Total.....	1,315,696	33,303	217,865	5,617	486,619	10,868	1,722,085	42,370

Imported from—	1922		1923	
	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>	
Canada.....	172,108	\$1,167		
Germany.....	420	56		
All other countries.....				
Total.....	172,528	1,223	701,901	\$21,937

¹ All from the Netherlands, except 6 gallons from Japan.

TABLE 67.—General imports of coal-tar products, by countries, calendar years 1918-1923—Continued

CRESOL¹

Imported from—	1918		1919		1920		1921	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
England.....	<i>Pounds</i> 3,051,833	\$256,917	<i>Pounds</i> 4,935,748	\$408,407	<i>Pounds</i> 6,037,223	\$509,710	<i>Pounds</i> 1,708,992	\$139,737
Scotland.....	1,676,354	196,116	1,516,610	149,373	4,198,397	382,637	934,842	86,380
Canada.....			800	1,028	16,400	1,360	4,600	501
Germany.....					66,050	7,674	705,448	27,268
Total.....	4,728,187	453,033	6,453,158	558,808	10,318,070	901,381	3,353,882	253,886

¹ No imports in 1922 and 1923.

NAPHTHALENE

Imported from—	1918		1919		1920		1921	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
United Kingdom.....	<i>Pounds</i> 424,147	\$13,253	<i>Pounds</i> 1,342,091	\$47,076	<i>Pounds</i> 10,155,579	\$357,954	<i>Pounds</i> 2,644,997	\$83,353
Belgium.....					413,274	16,972	96,928	5,412
Canada.....	1,328,496	44,540	1,836,478	43,795	2,959,976	78,704	1,708,868	44,541
Germany.....					381,740	34,135	42,683	2,383
Japan.....			612	42	98,695	7,653	2,320	252
Italy.....					494,644	17,077		
Australia.....			60,075	1,352	168,923	3,528		
All other countries.....					339,340	14,198		
Total.....	1,752,643	57,793	3,239,256	92,265	15,012,171	530,221	4,495,796	135,941

Imported from—	1922		1923	
	Quantity	Value	Quantity	Value
United Kingdom.....	<i>Pounds</i> 2,488,716	\$38,619	<i>Pounds</i>	
Canada.....	532,935	12,823		
Netherlands.....	110,365	2,047		
Germany.....	11,316	446		
Japan.....	1,000	94		
Total.....	3,144,332	54,029	21,036,458	\$578,563

TAR AND PITCH OF COAL

Imported from—	1918		1919		1920		1921	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
England.....	<i>Barrels</i> 51	\$686	<i>Barrels</i> 600	\$2,725	<i>Barrels</i> 1,127	\$4,166	<i>Barrels</i> 7	\$82
Scotland.....			100	256	580	3,706		
Canada.....	26,499	49,069	25,003	44,093	18,824	41,940	21,948	47,913
All other countries.....					150	350	13	53
Total.....	26,550	49,755	25,703	47,074	20,681	50,162	21,968	48,048

TABLE 67.—General imports of coal-tar products, by countries, calendar years 1918-1923—Continued

TAR AND PITCH OF COAL—Continued

Imported from—	1922		1923	
	Quantity	Value	Quantity	Value
	<i>Barrels</i>		<i>Barrels</i>	
England.....	162	\$1,241	-----	-----
Scotland.....	100	956	-----	-----
Canada.....	24,563	56,229	-----	-----
All other countries.....	28	91	-----	-----
Total.....	24,853	58,517	14,775	\$46,825

TOLUOL OR TOLUENE

Imported from—	1918		1919		1920		1921	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>	
Canada.....	-----	-----	1,195,706	\$30,768	-----	-----	-----	-----
Total.....	-----	-----	1,195,706	30,768	-----	-----	-----	-----

Imported from—	1922		1923	
	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>	
Canada.....	143,900	\$6,044	-----	-----
Sweden.....	337	17	-----	-----
Total.....	144,237	6,061	194,660	\$7,928

ALL OTHER CRUDES: VALUE

Imported from—	1918	1819	1820	1821	1922	1923
France.....	\$823	\$54	\$10,903	\$1,507	\$308,895	-----
England.....	57,364	42,875	178,866	19,015	54,943	-----
Scotland.....	825	870	1,581	-----	1,570	-----
Canada.....	104,765	1,891	876	840	8,199	-----
Germany.....	-----	-----	9,179	352	6,373	-----
Netherlands.....	-----	-----	-----	-----	142	-----
All other countries.....	-----	-----	2,886	4	-----	-----
Total.....	163,777	45,690	204,381	21,718	380,122	\$807,641

CARBOLIC ACID

Imported from—	1918				1919			
	Carbolic acid, free		Carbolic acid, dutiable (phenol)		Carbolic acid, free		Carbolic acid, dutiable (phenol)	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
England.....	<i>Pounds</i> 155,236	\$17,260	<i>Pounds</i> 208,037	\$54,884	<i>Pounds</i> 1,619,823	\$158,820	<i>Pounds</i> 2,061	\$264
Canada.....	-----	-----	75,300	7,613	-----	-----	-----	-----
Scotland.....	-----	-----	-----	-----	345,466	28,968	-----	-----
Total.....	155,236	17,260	283,337	62,497	1,965,289	187,788	2,061	264

TABLE 67.—General imports of coal-tar products, by countries, calendar years 1918-1923—Continued

CARBOLIC ACID—Continued

Imported from—	1920				1921			
	Carbolic acid, free		Carbolic acid, dutiable (phenol)		Carbolic acid, free		Carbolic acid, dutiable (phenol)	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
England.....	<i>Pounds</i> 178,652	\$18,258	<i>Pounds</i> 1,040	\$244	<i>Pounds</i> 205,113	\$21,841	<i>Pounds</i> 250	\$142
Scotland.....	14,040	1,590	-----	-----	-----	-----	-----	-----
Canada.....	-----	-----	-----	-----	9,072	1,008	-----	-----
Total.....	192,692	19,848	1,040	244	214,185	22,849	250	142

Imported from—	1922 ¹		1923 ¹	
	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>	
England.....	610,789	\$87,325	-----	-----
Netherlands.....	62,715	12,258	-----	-----
Germany.....	11,098	898	-----	-----
All other countries.....	1,702	1,801	-----	-----
Total.....	686,304	102,282	61,561	\$14,762

¹Dutiable

ALL OTHER ACIDS

Imported from—	1918		1919		1920		1921		1922		1923	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
England.....	<i>Lbs.</i> 125	\$1,114	<i>Lbs.</i> 63	\$374	<i>Lbs.</i> 250	\$1,057	<i>Lbs.</i> -----	-----	<i>Lbs.</i> 60,471	5,228	<i>Lbs.</i> -----	-----
Japan.....	5	2	-----	-----	-----	-----	-----	-----	5	3	-----	-----
France.....	-----	-----	-----	-----	11,199	3,182	-----	-----	-----	-----	-----	-----
Germany.....	-----	-----	-----	-----	309	500	11,263	\$3,012	4,445	2,394	-----	-----
All other countries.....	-----	-----	-----	-----	-----	-----	-----	-----	8,938	9,936	-----	-----
Total.....	130	1,116	63	374	11,758	9,769	11,263	3,012	73,859	17,561	18,944	\$79,517

ANILINE OIL

Imported from—	1918	1919	1920	1921	1922	1923
France.....	-----	-----	<i>Lbs.</i> 220	\$72	-----	-----

ANILINE SALTS

Imported from—	1918		1919		1920		1921		1922		1923	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
England.....	<i>Lbs.</i> 21,273	\$3,250	<i>Lbs.</i> -----	-----	<i>Lbs.</i> -----	-----	<i>Lbs.</i> 18,301	\$12,029	<i>Lbs.</i> -----	-----	<i>Lbs.</i> -----	-----
Germany.....	-----	-----	-----	-----	4	\$1	15	80	-----	-----	-----	-----
Total.....	21,273	3,250	-----	-----	4	1	18,316	12,109	-----	-----	-----	-----

TABLE 67.—General imports of coal-tar products, by countries, calendar years 1918-1923—Continued

ALL OTHER INTERMEDIATES

Imported from—	1918	1919	1920	1921
Belgium.....			\$41,291	\$18,774
France.....		\$26,611	140,095	62,028
Germany.....			191,732	80,306
Italy.....			17,491	740
England.....	\$15	48,722	302,235	98,502
Straits Settlements.....			41,237	.....
Japan.....	4,348	82	68,323	15
Canada.....		20,788	.....	40,587
All other countries.....			29,264	40,650
Total.....	4,363	96,203	831,668	341,602

Imported from—	1922		1923	
Belgium.....				
France.....	45,666	31,180		
Germany.....	514,437	83,397		
Netherlands.....	83,998	18,898		
England.....	669,475	124,632		
Switzerland.....	62,261	43,556		
Japan.....	400	39		
Canada.....	329	308		
All other countries.....				
Total.....	1,376,566	302,310	2,598,281	513,692

ALIZARIN AND DERIVATIVES

Imported from—	1918		1919		1920		1921	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>	
Germany.....					141,213	\$197,562	285,007	\$393,374
Switzerland.....	440	\$572	220	\$2,517	222,417	81,393	110	374
United Kingdom.....	4,310	3,739	23,417	21,084	25,196	18,898	44,026	54,869
Canada.....	1	2	215	414	297	1,806	2	5
Japan.....	15,141	58,948						
Belgium.....					46,283	32,857	13,280	9,964
Netherlands.....					5,906	10,314	12,483	21,582
All other countries.....	500	7,629	23	265	444	689	20,204	29,870
Total.....	20,392	70,890	23,875	24,280	441,756	343,519	375,112	510,038

Imported from—	1922		1923	
	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>	
Belgium.....	1,232	\$2,359		
Denmark.....	1,560	2,240		
France.....	7,379	10,137		
Germany.....	323,239	498,548		
Italy.....	46,340	57,686		
Netherlands.....	47,791	61,043		
Switzerland.....	28,672	41,670		
United Kingdom.....	22,758	28,002		
Canada.....		857		
All other countries.....				
Total.....	479,858	701,934	290,130	\$403,612

TABLE 67.—General imports of coal-tar products, by countries, calendar years 1918-1923—Continued

ANTHRACENE AND CARBAZOLE COLORS AND DYES

Imported from—	1922 ¹		1923	
	Pounds	Value	Pounds	Value
Germany.....	11,900	\$23,128	-----	-----
England.....	5,797	2,874	-----	-----
Total.....	17,697	26,002	8,319	\$8,976

COLOR LAKES

Imported from—	1922 ¹		1923	
	Pounds	Value	Pounds	Value
France.....	16	23	-----	-----
Germany.....	223	239	-----	-----
Total.....	239	262	4,263	\$3,635

¹ Beginning Sept. 22, 1922.

INDIGO

Imported from—	1918				1919			
	Indigo, natural (dutiabie)		Indigo, synthetic (dutiabie)		Indigo, natural (dutiabie)		Indigo, synthetic (dutiabie)	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Switzerland.....	<i>Pounds</i> 25,762	\$38,719	<i>Pounds</i> 770,212	\$410,421	<i>Pounds</i> 15,796	\$29,857	<i>Pounds</i> 726,440	\$388,067
England.....	264,975	463,510	6,817	5,587	10,584	16,647	1,468	1,970
British India.....	1,138,176	1,284,434	-----	-----	99,597	99,901	-----	-----
Salvador.....	234,452	299,554	-----	-----	60,940	67,262	8,400	5,729
All other countries..	83,709	108,150	-----	-----	40,557	46,448	87,570	36,607
Total.....	1,747,074	2,194,367	777,029	416,008	227,474	260,115	823,878	432,373

Imported from—	1920				1921				1922			
	Indigo, natural (dutiabie)		Indigo, synthetic (dutiabie)		Indigo, natural (dutiabie)		Indigo, synthetic (dutiabie)		Indigo, natural (dutiabie)		Indigo, synthetic (dutiabie)	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Switzerland.....	<i>Lbs.</i> 57,411	\$150,957	<i>Lbs.</i> 285,153	\$252,708	<i>Lbs.</i> 27,366	\$55,142	<i>Lbs.</i> 59,873	\$101,073	<i>Lbs.</i> 6,501	\$9,482	<i>Lbs.</i> 63,355	\$84,553
England.....	27,269	51,556	1,229	361	9,245	9,857	6,895	5,045	4,413	2,904	2,000	815
Salvador.....	10,214	20,296	-----	-----	13,158	11,112	-----	-----	-----	-----	-----	-----
France.....	50,066	70,008	400,589	172,692	-----	-----	331,320	87,407	-----	-----	5,324	13,920
Germany.....	4,346	5,171	25,029	18,220	882	2,382	2,829	2,288	1,536	1,462	610	1,756
India.....	2,850	7,392	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Italy.....	-----	-----	54,422	37,311	-----	-----	532	128	-----	-----	929	401
All other countries..	48	48	-----	-----	1,838	7,202	6,813	4,962	-----	-----	-----	-----
Total.....	152,204	305,428	766,422	481,292	52,489	85,695	408,262	200,903	12,450	13,848	72,218	101,443

Imported from—	1923			
	Indigo, natural (dutiabie)		Indigo, synthetic (dutiabie)	
	Quantity	Value	Quantity	Value
Total.....	<i>Pounds</i> 10,473	\$5,216	<i>Pounds</i> 631	\$458

TABLE 67.—General imports of coal-tar products, by countries, calendar years 1918-1923—Continued

INDIGO, DYES, COLORS, STAINS, ETC. (DUTIABLE) ¹

Imported from—	1922		1923	
	Quantity	Value	Quantity	Value
Germany.....	<i>Pounds</i> 100	\$752	<i>Pounds</i>	
Italy.....	772	730		
All other countries.....				
Total.....	872	1,482	13,809	\$18,174

¹ Sept. 22 to Dec. 31.

COAL-TAR COLORS OR DYES (DUTIABLE)

Imported from—	1918, value	1919		1920		1921	
		Quantity	Value	Quantity	Value	Quantity	Value
Belgium.....		<i>Pounds</i> 36,968	\$63,119	<i>Pounds</i> 190,414	\$153,020	<i>Pounds</i> 31,813	\$56,481
France.....	\$76,506	11,746	20,853	70,821	100,884	62,468	90,328
Germany.....		143,031	83,563	1,155,501	1,565,300	1,050,028	1,718,776
Switzerland.....	1,762,688	1,284,199	2,176,463	1,372,490	2,693,653	1,504,970	2,005,265
England.....	561,699	609,703	664,548	345,889	394,668	287,377	358,463
All other countries.....	68,546	165,750	160,730	351,758	351,277	169,699	216,035
Total.....	2,469,439	2,215,397	3,169,276	3,486,873	5,258,802	3,106,355	4,445,348

Imported from—	1922 ¹		1922 ^{2 3}	
	Quantity	Value	Quantity	Value
Belgium.....	<i>Pounds</i> 1,941	\$849	<i>Pounds</i>	
France.....	36,163	16,038	15,111	\$17,523
Germany.....	1,138,951	1,662,608	206,255	344,569
Italy.....	49,657	51,584	48,248	64,608
Netherlands.....	48,266	75,911	73,244	149,538
Switzerland.....	1,109,301	1,809,778	295,470	390,457
England.....	165,683	139,577	31,374	27,812
All other countries.....	3,614	6,496	8,657	12,417
Total.....	2,553,576	3,762,841	738,359	1,006,924

	1923	
	Quantity	Value
Germany.....	<i>Pounds</i> 1,580,403	\$1,945,814
Switzerland.....	857,466	1,331,075
United Kingdom.....	108,410	111,969
All other countries.....	706,103	1,035,453
Total.....	3,252,382	4,424,311

ALL OTHER COAL-TAR PRODUCTS

Imported from—	1918 ⁴	1919	1920	1921	1922	1923
France.....	\$11,900					
Netherlands.....	50					
Switzerland.....	3,045					
England.....	47,548					
Mexico.....	32					
Total.....	62,575					

¹ Jan. 1 to Sept. 21.

² Title changed to: Colors, dyes, stains, color acids and color bases, n. e. s.

³ Sept. 22 to Dec. 31.

⁴ July 1 to Dec. 31.

TABLE 67.—General imports of coal-tar products, by countries, calendar years 1918-1923—Continued

MEDICINAL PREPARATIONS (VALUE)

Imported from—	1918	1919	1920	1921	1922 ¹	1923
France.....	\$32, 129	\$58, 749	\$21, 724	\$45, 378	\$20, 089	-----
Germany.....	-----	-----	59, 133	124, 862	74, 983	-----
Italy.....	-----	1, 329	8	60	16, 953	-----
Netherlands.....	-----	12, 257	21, 203	11, 680	25, 462	-----
Spain.....	-----	94	523	268	11	-----
Switzerland.....	154	1, 761	18, 571	39, 151	35, 473	-----
England.....	7, 499	20, 302	40, 339	59, 681	31, 701	-----
Scotland.....	-----	137	87	-----	-----	-----
Canada.....	53, 324	77, 162	-----	1	16	-----
Peru.....	114	-----	-----	-----	-----	-----
Venezuela.....	-----	69	7	-----	-----	-----
Japan.....	6, 142	351	162	299	35	-----
All other countries.....	10	-----	3, 816	227	3, 947	-----
Total.....	99, 372	172, 211	165, 573	281, 607	208, 670	\$212, 255

¹ Sept. 22, to Dec. 31. Jan. 1 to Sept. 21, included in medicinal preparations (n. e. s.), a total value of \$372,674.

EXPLOSIVES

	Quantity	Value
Italy.....	<i>Pounds</i> 5, 470	\$6, 843
Total.....	5, 470	6, 843

ALL OTHER FINISHED PRODUCTS

Imported from—	1918	1919	1920	1921
France.....	\$4, 162	\$25, 955	\$37, 192	\$39, 314
Germany.....	-----	-----	21, 406	6, 518
Switzerland.....	2, 901	1, 447	6, 715	15, 011
England.....	54, 502	57, 166	10, 307	2, 657
Canada.....	816	-----	-----	-----
All other countries.....	-----	-----	29	302
Total.....	62, 381	84, 568	75, 649	63, 802

Imported from—	1922		1923	
	Quantity	Value	Quantity	Value
France.....	-----	\$430	<i>Pounds</i>	-----
Germany.....	-----	16, 658	-----	-----
Switzerland.....	-----	715	-----	-----
England.....	-----	2, 157	-----	-----
Canada.....	-----	1	-----	-----
All other countries.....	-----	-----	-----	-----
Total.....	-----	19, 961	14, 885	\$51, 303

TABLE 68.—Domestic exports of coal tar and of dyes and dyestuffs, calendar years 1918-1923.

COAL TAR

Exported to—	1918		1919		1920		1921	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Europe.....	<i>Barrels</i> 2, 069	\$12, 297	<i>Barrels</i> 230	\$900	<i>Barrels</i> 243	\$1, 441	<i>Barrels</i> 212	\$1, 394
North America.....	54, 149	139, 456	71, 749	158, 205	74, 374	208, 561	91, 716	185, 063
South America.....	808	6, 288	2, 759	20, 166	3, 725	23, 656	457	3, 125
Asia.....	198	1, 505	475	3, 174	10	65	17	1, 857
Oceania.....	154	1, 739	45	301	81	995	-----	-----
Africa.....	1, 176	7, 435	1, 334	15, 757	17	49	4	43
Total.....	58, 554	168, 720	76, 592	198, 503	88, 350	234, 767	92, 406	191, 482

TABLE 68.—Domestic exports of coal tar and of dyes and dyestuffs, calendar years 1918–1923—Continued

COAL TAR—Continued

Exported to—	1922		1923	
	Quantity	Value	Quantity	Value
	<i>Barrels</i>		<i>Barrels</i>	
Europe.....	46	\$392		
North America.....	101,396	209,631		
South America.....	580	3,142		
Asia.....	63	545		
Oceania.....	57	245		
Africa.....	8	100		
Total.....	102,150	214,055	513,834	\$1,694,494

COAL-TAR DISTILLATES, n. e. s.

Benzol

	1918		1919		1920		1921	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>		<i>Pounds</i>	
France.....	32,599,682	\$1,854,216	12,319,900	\$407,622	2,528,494	\$138,850	24,344,624	\$1,095,063
Chile.....					229,079	16,760		
England.....			113,300	10,197	57,500	4,970	46,073,896	1,797,780
Germany.....					669,494	36,902		
Canada.....	136,571	7,389	335,799	21,313	389,783	23,904	44,725	287
Belgium.....					3,150,240	238,617		
Argentina.....	75,442	7,329	973,978	60,563	353,522	23,907	549,896	37,571
Japan.....	136,480	8,680	280,442	18,590	67,200	6,720	900	81
Italy.....	299,659	22,704			4,961,878	357,956	348,880	22,030
All other countries.....	46,743	4,042	215,000	16,847	767,078	79,354	667,479	54,355
Total.....	33,294,577	1,904,360	14,238,419	535,132	13,174,268	927,940	72,030,400	3,007,086

	1922		1923	
	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>	
France.....	20,158,912	\$738,078		
Spain.....	44,697	8,045		
England.....	39,649,410	1,390,924		
Ireland.....	448,728	27,400		
Canada.....	2,045,994	69,984		
Mexico.....	13,405	1,048		
Argentina.....	445,136	27,464		
Chile.....	156,251	9,521		
Java and Maderia.....	48,216	2,550		
Australia.....	86,350	7,067		
British South Africa.....	17,312	1,500		
Algeria and Tunis.....	1,529,483	68,935		
All other countries.....	96,508	10,305		
Total.....	64,740,402	2,362,821	111,336,768	\$3,647,660

ALL OTHER COAL-TAR DISTILLATES (VALUE)

Exported to—	1918	1919	1920	1921
France.....	\$2,188,439	\$33,387	\$445,520	\$10,347
Belgium.....			474,793	
Italy.....	345,407	14,674	290,449	
England.....	927,295	127,583	1,632,599	28,498
Canada.....	1,477,984	105,335	314,641	156,917
Spain.....	96,798	64,917	615,284	26,334
Mexico.....	78,160	61,441	136,063	14,090
Brazil.....	72,162	101,305	193,089	32,550
Japan.....	475,377	250,061	1,158,196	79,746
Switzerland.....	46,831	8,144	1,632,599	44,833
All other countries.....	159,377	336,903	69,016	116,193
Total.....	5,867,830	1,103,750	6,962,249	509,508

TABLE 68.—*Domestic exports of coal tar and of dyes and dyestuffs, calendar years 1918-1923—Continued*

ALL OTHER COAL-TAR DISTILLATES (VALUE)—Continued

Exported to—	1922 ¹	1923 ¹
France.....	\$995	
Belgium.....	12,849	
Canada.....	51,718	
Norway.....	1,444	
Honduras.....	15,454	
Mexico.....	13,691	
Brazil.....	29,738	
Cuba.....	2,561	
Japan.....	3,644	
All other countries.....	22,889	
Total.....	154,983	\$300,257

¹ Includes toluol and solvent naphtha.

CARBOLIC ACID

Exported to—	1922		1923	
	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>	
Canada.....	15,306	\$1,143		
Mexico.....	50,096	4,040		
Cuba.....	7,009	694		
Japan.....	91,073	9,100		
Kwangtung (leased territory).....	44,211	4,563		
All other countries.....	15,451	3,683		
Total.....	223,146	23,223	232,830	\$34,389

ANILINE OILS AND SALTS

Spain.....	10,000	\$1,450		
Canada.....	211,010	40,919		
Mexico.....	26,895	3,575		
British India.....	29,302	7,000		
Japan.....	30,600	6,120		
Philippines.....	17,597	2,993		
Australia.....	9,012	1,610		
All other countries.....	6,804	1,945		
Total.....	341,220	65,602	497,457	\$95,023

NAPHTHALENE

Switzerland.....	6,000	\$1,600		
Canada.....	17,542	297		
Mexico.....	11,558	1,044		
Cuba.....	21,127	1,204		
British India.....	11,853	770		
Japan.....	14,610	4,329		
Philippines.....	8,358	739		
All other countries.....	18,426	2,674		
Total.....	109,514	12,657	95,164	\$10,386

NITROBENZOL¹

Norway.....	26,880	\$2,957		
Canada.....	5,682	683		
Cuba.....	3,203	399		
Dominican Republic.....	3,040	608		
Australia.....	2,147	312		
All other countries.....	2,028	337		
Total.....	42,980	5,296		

¹ Included in other intermediates for 1923.

TABLE 68.—*Domestic exports of coal tar and of dyes and dyestuffs, calendar years 1918-1923—Continued*

OTHER INTERMEDIATES

Exported to—	1922		1923	
	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>	
Greece.....	28,463	\$7,280	-----	-----
Spain.....	65,438	13,834	-----	-----
Switzerland.....	5,054	1,500	-----	-----
Canada.....	172,186	33,695	-----	-----
Mexico.....	77,642	3,481	-----	-----
Cuba.....	10,199	1,636	-----	-----
Brazil.....	42,618	8,275	-----	-----
Chile.....	12,192	1,823	-----	-----
China.....	314,774	65,047	-----	-----
Japan.....	54,888	12,910	-----	-----
Australia.....	20,050	11,844	-----	-----
All other countries.....	31,630	6,277	-----	-----
Total.....	835,134 ¹	167,602	1,218,183	\$243,060

COLOR LAKES¹

Canada.....	16,900	\$14,627	-----	-----
Cuba.....	7,616	1,028	-----	-----
Peru.....	100	30	-----	-----
China.....	1,000	800	-----	-----
Hongkong.....	135	86	-----	-----
Japan.....	2,440	3,298	-----	-----
All other countries.....	-----	-----	-----	-----
Total.....	28,228	19,928	-----	-----

¹ Figures for 1923 included in other colors, dyes, and stains.

DYES AND DYESTUFFS (VALUE)

Exported to—	1918			1919		
	Aniline dyes	Logwood extracts	All other	Aniline dyes	Logwood extracts	All other
Portugal.....	\$176,769	\$10,541	\$131,280	\$70,296	\$2,319	\$36,063
Belgium.....	-----	-----	-----	90	34,787	19,193
France.....	6,345	263,610	496,875	127,059	596,042	229,689
Germany.....	-----	-----	-----	150	290	-----
Italy.....	274,903	70,237	234,238	269,130	58,716	180,359
Netherlands.....	-----	-----	-----	26,284	21,735	9,104
Russia.....	-----	-----	12,825	8,570	-----	-----
Switzerland.....	22,500	7,728	5,000	193	22,824	-----
United Kingdom.....	380,181	345,458	524,576	413,700	304,686	423,719
Canada.....	836,445	82,292	724,522	1,015,334	119,871	1,007,892
Mexico.....	289,327	5,666	181,029	467,806	17,438	230,359
Central America.....	5,617	400	5,498	5,941	892	14,544
West Indies.....	23,447	742	35,473	34,307	137	40,900
South America.....	1,719,408	128,645	931,600	1,651,872	66,099	585,127
Asia.....	4,248,367	504,542	2,720,399	5,565,053	48,063	1,921,202
Oceania.....	100,490	20,194	133,493	177,964	14,041	143,223
Africa.....	3,993	715	15,534	45,566	1,508	8,281
Denmark.....	-----	-----	1,055	5,334	9,671	2,438
Spain.....	518,895	104,748	472,222	535,383	18,349	84,544
Sweden.....	-----	-----	-----	22,694	8,584	15,708
Norway.....	-----	985	4,529	13,663	1,300	7,303
All other countries.....	22,924	4,877	6,761	267,682	8,584	44,780
Total.....	8,629,611	1,551,380	6,636,099	10,724,071	1,355,936	5,004,428

TABLE 68.—Domestic exports of coal tar and of dyes and dyestuffs, calendar years 1918-1923—Continued

DYES AND DYESTUFFS (VALUE)—Continued

Exported to—	1920			1921		
	Aniline dyes	Logwood extracts	All other	Aniline dyes	Logwood extracts	All other
Portugal.....	\$66,752	\$5,970	\$20,688	\$1,432		
Belgium.....	507,371	118,339	41,523	100,821	\$6,843	\$45
France.....	807,241	607,017	391,060	67,535	66,762	8,334
Germany.....	454	1,456	7,745	653	13,885	6,352
Italy.....	582,236	404,367	275,149	45,068	8,723	70
Netherlands.....	39,682	73,472	56,057	1,938	2,535	6,590
Russia (European).....	100					
Switzerland.....	182,359	60,157	92,017	20,374		19
United Kingdom.....	1,318,498	729,026	1,079,871	165,711	21,096	58,630
Canada.....	1,547,109	183,061	982,665	584,664	71,331	423,914
Mexico.....	1,091,603	11,092	210,145	149,009	3,560	132,075
Central America.....	13,159	1,852	13,730	7,982	975	5,680
West Indies.....	52,745	18,144	97,922	1,585	91	2,057
South America.....	2,282,210	45,586	497,029	432,881	16,466	89,156
Asia.....	12,783,303	195,493	3,208,107	3,131,071	347,610	333,709
Oceania.....	277,660	41,283	134,196	207,473	13,190	51,743
Africa.....	65,077	1,248	28,251	61,699	486	13,179
Denmark.....	26,463	2,903	2,794	1,305		3,849
Spain.....	682,998	77,183	149,365	36,844	535	12,040
Sweden.....	67,921	1,250	29,802	2,786		8,976
Norway.....	4,568	1,110	15,998	1,800		1,304
All other countries.....	100,971	25,051	38,997	44,369	15,868	45,433
Total.....	22,450,480	2,605,060	7,373,111	5,067,000	589,756	1,203,155

OTHER COLORS, DYES, AND STAINS

Exported to—	1922		1923 ¹	
	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>	
Belgium.....	107,712	\$76,342		
France.....	12,100	11,975		
Greece.....	16,830	8,434		
Italy.....	25,702	51,469		
Netherlands.....	16,915	2,792		
Portugal.....	24,973	10,787		
Spain.....	87,566	42,426		
United Kingdom.....	16,139	5,342		
Canada.....	1,861,255	1,108,518		
Mexico.....	159,857	87,920		
Cuba.....	39,344	27,335		
South America.....	425,551	323,922		
British India.....	753,425	311,504		
China.....	3,588,563	924,026		
Japan.....	959,409	844,458		
Philippine Islands.....	33,584	8,618		
Australia.....	58,665	31,265		
New Zealand.....	36,680	21,439		
British South Africa.....	28,542	31,976		
All other countries.....	71,397	50,669		
Total.....	8,324,209	3,981,217	17,924,536	¹ \$5,565,371

MEDICINALS

Belgium.....	3,040	\$450		
Greece.....	3,300	850		
Turkey in Europe.....	297,223	80,954		
England.....	80,540	31,709		
Canada.....	55,874	13,001		
Honduras.....	5,916	3,091		
Mexico.....	37,829	30,476		
Cuba.....	11,375	16,122		
Venezuela.....	3,148	1,796		
British India.....	3,330	3,107		
Australia.....	27,575	21,135		
British South Africa.....	4,848	3,863		
All other countries.....	20,168	17,992		
Total.....	554,166	224,546	237,975	\$164,160

¹ Includes color lakes.

TABLE 68.—*Domestic exports of coal tar and of dyes and dyestuffs, calendar years 1918-1923—Continued*

SYNTHETIC PHENOLIC RESINS:

	1922		1923	
	Quantity	Value	Quantity	Value
	<i>Pounds</i>		<i>Pounds</i>	
England.....	500	\$69	.....	.....
Canada.....	121,183	7,786	.....	.....
Mexico.....	250	43	.....	.....
China.....	1,600	1,762	.....	.....
Japan.....	4,620	3,523	.....	.....
Total exports.....	128,153	13,183	.....	.....

¹Included in total "Other coal-tar finished products, n. e. s.," for 1923.

PHOTOGRAPHIC CHEMICALS

England.....	11,274	\$4,896	.....	.....
Canada.....	65,411	15,971	.....	.....
Mexico.....	15,019	7,228	.....	.....
Cuba.....	16,738	6,306	.....	.....
Argentina.....	24,526	9,124	.....	.....
Japan.....	39,815	26,809	.....	.....
Philippines.....	11,709	5,509	.....	.....
Australia.....	10,806	9,018	.....	.....
New Zealand.....	13,094	4,302	.....	.....
All other countries.....	39,727	14,690	.....	.....
Total.....	248,119	103,853	214,160	\$96,317

OTHER COAL-TAR FINISHED PRODUCTS, N. E. S.

Denmark.....	37,226	\$1,540	.....	.....
France.....	80,800	2,560	.....	.....
Norway.....	48,767	1,275	.....	.....
England.....	264,009	33,285	.....	.....
Canada.....	2,797,967	63,908	.....	.....
Costa Rica.....	28,262	2,655	.....	.....
Panama.....	67,434	2,079	.....	.....
Mexico.....	470,344	26,902	.....	.....
British West Indies.....	95,545	5,401	.....	.....
Cuba.....	984,063	43,497	.....	.....
Argentina.....	107,043	8,831	.....	.....
Brazil.....	39,692	2,598	.....	.....
Chile.....	78,574	4,664	.....	.....
Colombia.....	80,661	13,442	.....	.....
Peru.....	80,470	13,415	.....	.....
Japan.....	67,948	17,550	.....	.....
Australia.....	21,533	4,533	.....	.....
All other countries.....	194,752	24,707	.....	.....
Total.....	5,545,090	272,842	4,527,146	\$480,749

TABLE 69.—Imports and exports of inks, 1918–1923

IMPORTS FOR CONSUMPTION

Calendar year	Ink and ink powders ¹		Printers' ink ²			Writing and copying inks			All other, including ink powders		
	Quantity	Value	Rate of duty	Value	Duty collected	Rate of duty	Value	Duty collected	Rate of duty	Value	Duty collected
	<i>Pounds</i>		<i>Per cent</i>			<i>Per cent</i>			<i>Per cent</i>		
1918.....			15	\$4,154	\$623	15	\$13,363	\$2,004	15	\$6,343	\$951
1919.....			15	199	30	15	15,116	2,267	15	8,143	1,221
1920.....			15	15,228	2,284	15	15,505	2,326	15	10,657	1,599
1921.....			15	5,554	833	15	4,625	694	15	10,813	1,622
1922 ³			15	9,259	1,389	15	6,279	942	15	7,907	1,186
1922 ⁴	33,783	13,132	20	7,070	1,414	20	3,125	625	20	2,877	575
1923.....	101,993	23,730	20	5,613	1,123	20	4,979	996	20	13,265	2,653

DOMESTIC EXPORTS

Exported to—	Calendar year									
	1918		1919		1920		1921		1922	
	Printers' ink	All other inks	Printers' ink	All other inks	Printers' ink	All other inks	Printers' ink	All other inks	Printers' ink	All other inks
Europe.....	\$48,394	\$25,371	\$210,482	\$68,382	\$224,129	\$96,699	\$101,914	\$71,818	.....	.....
North America.....	256,507	206,360	320,008	297,959	366,784	328,889	321,389	200,361	.....	.....
South America.....	353,023	100,833	603,758	210,212	535,265	208,272	140,612	49,336	.....	.....
Asia.....	224,345	67,736	435,664	155,420	579,843	187,988	291,719	75,867	.....	.....
Oceania.....	116,424	42,452	113,288	109,962	171,640	105,984	108,453	45,017	.....	.....
Africa.....	42,189	5,429	29,726	14,282	15,091	8,887	6,743	6,700	.....	.....
Total.....	1,040,882	448,181	1,712,926	856,217	1,892,752	936,719	970,830	449,099	\$993,352	\$328,978

Exported to—	Calendar year					
	1922			1923		
	Writing ink	Printers' and lithographic ink	Other ink	Writing ink	Printers' and lithographic ink	Other ink
Europe.....	\$30,722	\$103,790	\$17,447	.....	.....	.....
North America.....	76,003	288,293	69,595	.....	.....	.....
South America.....	25,023	193,371	7,556	.....	.....	.....
Asia.....	62,790	255,151	20,191	.....	.....	.....
Oceania.....	7,992	140,653	8,474	.....	.....	.....
Africa.....	1,417	12,094	1,768	.....	.....	.....
Total.....	203,947	993,352	125,031	\$257,909	\$1,273,813	\$200,744

¹ General import figures.² Beginning Sept. 22, 1922, heading changed to "Printers' and lithographic ink."³ Jan. 1 to Sept. 21.⁴ Sept. 22 to Dec. 31.

Directory of manufacturers of dyes and other synthetic organic chemicals, 1923

No.	Name of company	Office address (location of plant given in parentheses if not in same city as office)
1	Abbott Laboratories.....	4753 Ravenswood Avenue, Chicago, Ill.
2	Acids Manufacturing Corporation.....	50 East Forty-second Street, New York, N. Y. (Packer, Conn.)
3	Agawam Chemical Works (Inc.).....	10 Weybosset Street, Providence, R. I. (North Attleboro, Mass.)
4	Althouse Chemical Co.....	500-540 Pear Street, Reading, Pa.
5	Alyco Manufacturing Co. (Inc.).....	86-90 Orange Street, Bloomfield, N. J.
6	Amalgamated Dyestuff & Chemical Works (Inc.).....	Plum Point Lane, Newark, N. J.
7	American Aniline Products (Inc.).....	80 Fifth Avenue, New York, N. Y. (Lock Haven, Pa.)
8	American Tar Products Co. (Inc.).....	208 South La Salle Street, Chicago, Ill. (Youngstown, Ohio; St. Louis, Mo.; Woodward, Ala.; Carrollville, Wis.; Follansbee, W. Va.; Chicago, Ill.)
9	Amido Products Co.....	126 Maiden Lane, New York, N. Y. (228 Emmet Street, Newark, N. J.)
10	Anderson Chemical Co.....	P. O. Box 307, Passaic, N. J. (266 Main Avenue, Wallington, N. J.)
11	Ansbacher & Co., A. B.....	527 Fifth Avenue, New York, N. Y. (Brooklyn, N. Y.)
12	Atlantic Dyestuff Co.....	Box 89, Portsmouth, N. H. (Newington, N. H.)
13	Atlantic Tar & Chemical Works (Ltd.).....	P. O. Box 234, Bayway, Elizabeth, N. J.
14	Atlas Color Works.....	322 Ninth Street, Brooklyn, N. Y.
15	Baird & McGuire (Inc.).....	Holbrook, Mass.
16	Barrett Co.....	40 Rector Street, New York, N. Y. (Plants distributed throughout United States.)
17	Bayer Co. (Inc.).....	117 Hudson Street, New York, N. Y. (Rensselaer, N. Y.)
18	Beaver Chemical Corporation.....	Damascus, Va.
19	Beaver Manufacturing Co.....	Ballardvale, Mass.
20	Berghausen Chemical Co., E.....	915 Carr Street, Cincinnati, Ohio.
21	Berkheimer Manufacturing Co., J. E.....	2928 South M Street, Tacoma, Wash.
22	Brooklyn Color Works (Inc.).....	Stewart Avenue and Cherry Street, Brooklyn, N. Y.
23	Brown Co.....	404 Commercial Street, Portland, Me. (Berlin, N. H.)
24	Bush Co. (Inc.), W. J.....	370 Seventh Avenue, New York, N. Y. (Linden, N. J.)
25	Butterworth-Judson Corporation.....	30 Church Street, New York, N. Y. (Newark, N. J.)
26	Cable Chemical Works.....	1700 Elston Avenue, Chicago, Ill. (Cable, Wis.)
27	Calco Chemical Co.....	Boundbrook, N. J.
28	California Ink Co.....	Station A, West Berkeley, Calif.
29	Carbide & Carbon Chemicals Corporation.....	30 East Forty-second Street, New York, N. Y. (Clendenin, W. Va.)
30	Carey Manufacturing Co., Philip.....	Lockland, Ohio.
31	Celluloid Co.....	36 Washington Place, New York, N. Y. (290 Ferry Street, Newark, N. J.)
32	Central Dyestuff & Chemical Co.....	Plum Point Lane, Newark, N. J.
33	Central Specialty Co.....	524 Delaware Street, Kansas City, Mo.
34	Certain-teed Products Corporation.....	100 East Forty-second Street, New York, N. Y. (East St. Louis, Ill.)
35	Chatfield Manufacturing Co., The.....	Seventy-fourth and Lebanon Streets, Cincinnati, Ohio.
36	Chemical Company of America (Inc.), The.....	46 Murray Street, New York, N. Y. (Springfield, N. J.)
37	Childs & Co. (Inc.), Charles M.....	43 Summit Street, Brooklyn, N. Y.
38	Chiris & Co., Antoine.....	147-153 Waverly Place, New York, N. Y. (Delawanna, N. J.)
39	Cincinnati Chemical Works (Inc.).....	Evanston Station, Box 20, Cincinnati, Ohio. (Norwood and St. Bernard, Ohio.)
40	Citizens Gas Co.....	Majestic Building, Indianapolis, Ind.
41	Coleman & Bell Co., The.....	Norwood, Ohio.

Directory of manufacturers of dyes and other synthetic organic chemicals, 1923—Con.

No.	Name of company	Office address (location of plant given in parentheses if not in same city as office)
42	Combustion Utilities Corporation.....	8-10 Bridge Street, New York, N. Y. (Toledo, Ohio.)
43	Commercial Solvents Corporation.....	17 East Forty-second Street, New York, N. Y. (Terre Haute, Ind.; Peoria, Ill.)
44	Commonwealth Chemical Corporation.....	25 West Forty-third Street, New York, N. Y. (Newark, N. Y.)
45	Commonwealth Color & Chemical Co.....	Neavins, Butler, and Baltic Streets, Brooklyn, N. Y.
46	Consolidated Color & Chemical Co.....	122 Hudson Street, New York, N. Y. (Newark, N. J.)
47	Cooks Falls Dye Works (Inc.).....	68 Williams Street, New York, N. Y. (Cooks Falls, N. Y.)
48	Cooper & Co. (Inc.), Charles.....	Van Buren and Clifford Streets, Newark, N. J.
49	Coopers Creek Chemical Co.....	West Conshohocken, Pa.
50	Corona Chemical Division (Pittsburgh Plate Glass Co.).....	213-215 Lake Street, Milwaukee, Wis.
51	Crescent Color & Chemical Works.....	Fifty-ninth Street and Eleventh Avenue, New York, N. Y. (Dunnellen, N. J.)
52	Croton Color & Chemical Co. (Inc.).....	293 Broadway, New York, N. Y. (Croton-on-Hudson, N. Y.)
53	Crown Tar Works.....	900 Fifteenth Street, Denver, Colo.
54	Crystal Chemical Co.....	3414 North Karlov Avenue, Chicago, Ill.
55	David Chemical Co., Albert.....	44 Watts Street, New York, N. Y. (Chicago Heights, Ill.)
56	Debrook Co. (Inc.).....	1105 Metropolitan Avenue, Brooklyn, N. Y.
57	Dehls & Stein.....	237 South Street, Newark, N. J.
58	Delta Chemical & Iron Co.....	Wells, Delta County, Mich.
59	Devoe & Reynolds Co. (Inc.).....	101 Fulton Street, New York, N. Y. (New York N. Y., and Chicago, Ill.)
60	Diarsenol Laboratories (Inc.).....	454 Ellicott Square, Buffalo, N. Y.
61	Dovan Chemical Corporation.....	30 Church Street, New York, N. Y. (441 Riverside Avenue, Newark, N. J.)
62	Dow Chemical Co.....	Midland, Mich.
63	duPont de Nemours & Co., E. I.....	Wilmington, Del. (Deepwater Point and Lodi, N. J.)
64	Dye Products & Chemical Co.....	200 Fifth Avenue, New York, N. Y. (202 Vanderpool St., Newark, N. J.)
65	Dyes & Chemicals of New Jersey (Inc.).....	702 Court Street, Brooklyn, N. Y.
66	Dyestuffs & Chemicals (Inc.).....	11th and Monroe Streets, St. Louis, Mo.
67	Eakins (Inc.), J. S. & W. R.....	24 Wallabout Street, New York, N. Y.
68	Eastman Kodak Co.....	343 State Street, Rochester, N. Y.
69	Essential Oil Co.....	Mulberry and New York Avenues, Trenton, N. J.
70	Essex Aniline Works (Inc.).....	88 Broad Street, Boston, Mass. (So. Middleton Mass.)
71	Federal Color Laboratories (Inc.).....	Norwood, Ohio.
72	Finch Chemical Co., L. S.....	R. F. D. No. 2, Box 143, Los Angeles, Calif. (Vernon, Calif.)
73	Fine Colors Co. (Inc.).....	2129 McBride Avenue, Paterson, N. J.
74	Fletcher Chemical Co.....	South River, N. J.
75	Florasynth Laboratories (Inc.).....	Olmstead and Starling Avenues, Unionport, N. Y.
76	Foster-Heaton Co.....	2731 Badger Avenue, Newark, N. J.
77	Franken Color Works, A.....	116 West Thirty-second Street, New York, N. Y. (Chatham, N. J.)
78	Fries Bros.....	92 Reade Street, New York, N. Y. (Bloomfield, N. J.)
79	Fries & Fries Co.....	1501 West Sixth Street, Cincinnati, Ohio.
80	Garfield Aniline Works.....	Midland Avenue, Garfield, N. J.
81	Gary Chemical Co.....	749 Broadway, Gary, Ind. (Chesterton, Ind.)
82	Gaskill Chemical Corporation.....	157 Spencer Street, Brooklyn, N. Y.
83	Gebauer Chemical Co.....	619 Bangor Building, Cleveland, Ohio.
84	General Synthesis Co.....	53 Canal Street, Providence, R. I.
85	Goodrich Co., The B. F.....	Akron, Ohio.
86	Grahame Chemical Co.....	P. O. Box 88, Trenton, N. J.
87	Granton Chemical Co.....	350 Madison Avenue, New York, N. Y. (New Brunswick, N. J.)
88	Grasselli Chemical Co.....	Cleveland, Ohio. (Rensselaer, N. Y.; Grasselli, N. J.)
89	Harmer Laboratories Co.....	2 South Twenty-first Street, Philadelphia, Pa. (Lansdowne, Pa.)
90	Harmon Color Works (Inc.).....	361-371 Harman Street, Brooklyn, N. Y.
91	Heller & Merz Co.....	338 Wilson Avenue, Newark, N. J.
92	Hermann Co., Morris.....	200 Fifth Avenue, New York, N. Y. (878 Mt. Prospect Ave., Newark, N. J.)
93	Heyden Co. of America (Inc.).....	80 Fifth Avenue, New York, N. Y. (Garfield, N. J.)
94	Hind & Harrison Plush Co., The.....	Clark Mills, N. Y.
95	Hooker Electrochemical Co.....	25 Pine Street, New York, N. Y. (Niagara Falls, N. Y.)
96	Hord Color Products Co., The.....	1636 Columbus Avenue, Sandusky, Ohio.
97	Huggins & Son, James.....	239 Medford Street, Malden, Mass.

Directory of manufacturers of dyes and other synthetic organic chemicals, 1923—Con.

No.	Name of company	Office address (location of plant given in parentheses if not in same city as office)
98	Hydrocarbon Chemical Co.....	951 East Orange Street, Lancaster, Pa.
99	Hynson, Westcott & Dunning.....	Charles and Chase Streets, Baltimore, Md.
100	Imperial Color Works (Inc.).....	Glens Falls, N. Y.
101	Independent Coal Tar Co.....	88 Broad Street, Boston, Mass. (Taunton, Mass.)
102	Interstate Chemical Co.....	667 Garfield Avenue, Jersey City, N. J.
103	Ising Corporation, The C. E.....	Flushing, N. Y.
104	Kent Color Corporation.....	2 South Ninth Street, Brooklyn, N. Y.
105	Kentucky Color & Chemical Co.....	Thirty-fourth Street south of Bank Street. (Louisville, Ky.)
106	Kerin Manufacturing Co., The.....	Central National Bank, Marietta, Ohio.
107	Klipstein & Sons Co., E. C.....	644 Greenwich Street, New York, N. Y. (Carteret, N. J.; South Charleston, W. Va.)
108	Kober Chemical Co.....	Nepera Park, N. Y.
109	Kohnstann & Co. (Inc.), H.....	87 Park Place, New York, N. Y. (Brooklyn, N. Y.)
110	Lakeview Laboratories.....	2 Jersey Street, Buffalo, N. Y.
111	LaMotte Chemical Products Co.....	13 West Saratoga Street, Baltimore, Md.
112	Lasher & Co. (Inc.), F. G.....	Maspeth and Gardner Avenues, Brooklyn, N. Y.
113	Lee Co., A.....	Lawrence, Mass. (Methuen, Mass.)
114	Lewis Mfg. Co., F. J.....	2513 South Robey Street, Chicago, Ill.
115	Lucas Paint Co., Alston.....	1031 Currier Street, Chicago, Ill.
116	Lucas & Co. (Inc.), John.....	322 Race Street, Philadelphia, Pa. (Gibbsboro, Camden County, Pa.)
117	Maas & Waldstein Co.....	45 John Street, New York, N. Y. (Newark, N. J.)
118	Mallinckrodt Chemical Works.....	3600 North Second Street, St. Louis, Mo.
119	Marx Color & Chemical Co., Max.....	192 Coit Street, Irvington, N. J.
120	Massachusetts Department of Public Health.....	Room 540, State House, Boston, Mass.
121	May Chemical Works.....	204 Niagara Street, Newark, N. J.
122	Maywood Chemical Works.....	Maywood, N. J.
123	Mephram & Co., George S.....	Twentyeth and Lynch Avenues, E. St. Louis, Ill.
124	Merck & Co.....	45 Park Place, New York, N. Y. (Rahway, N. J.)
125	Merrimac Chemical Co.....	148 State Street, Boston, Mass. (Woburn, Mass.)
126	Metz Laboratories (Inc.), H. A.....	122 Hudson Street, New York, N. Y. (Brooklyn, N. Y.)
127	Miner-Edgar Co., The.....	110 William Street, New York, N. Y. (Newark, N. J.)
128	Monsanto Chemical Works.....	1724 South Second Street, St. Louis, Mo.
129	Morana (Inc.).....	118 East Twenty-seventh Street, New York, N. Y. (Elizabeth, N. J.)
130	National Ammonia Co. of Pennsylvania.....	Delaware Avenue and Kirk Street, Philadelphia, Pa.
131	National Aniline & Chemical Co. (Inc.).....	40* Rector Street, New York, N. Y. (Buffalo, N. Y.; Marcus Hook, Pa.)
132	Naugatuck Chemical Co.....	Naugatuck, Conn.
133	New England Aniline Works (Inc.).....	95 Broad Street, Boston, Mass. (Ashland, Mass.)
134	New Haven Gas Light Co.....	80 Crown Street, New Haven, Conn.
135	New York Color & Chemical Co.....	Belleville, N. J. (Belleville, N. J.; Philadelphia, Pa.)
136	New York Quinine & Chemical Works (Inc.).....	152-154 William Street, New York, N. Y. (Brooklyn, N. Y.)
137	Newport Company, The.....	P. O. Box, 1882, Milwaukee, Wis. (Carrollville, Wis.; Passaic, N. J.)
138	Niagara Alkali Co.....	Buffalo Avenue, Niagara Falls, N. Y.
139	Niagara Smelting Corporation.....	Bridge Station, Niagara Falls, N. Y.
140	Noil Chemical & Color Works (Inc.).....	182 West One hundred and eighth Street, New York, N. Y.
141	Northwestern Chemical Co.....	137 Sixth Avenue, Wauwatosa, Wis.
142	Norvell Chemical Corporation.....	99 John Street, New York, N. Y. (Perth Amboy, N. J.)
143	Oldbury Electrochemical Co.....	Niagara Falls, N. Y.
144	Organo-Chemico Co.....	Columbus Avenue, Sandusky, Ohio.
145	Palatine Aniline & Chemical Corporation.....	81 North Water Street, Poughkeepsie, N. Y.
146	Passaic Color Corporation.....	50-60 Eighth Street, Passaic, N. J.
147	Peerless Color Co.....	521-535 North Avenue, Plainfield, N. J.
148	Pennsylvania Coal Products Co.....	Reiber Building, Butler, Pa.
149	Perth Amboy Chemical Works.....	709-717 Sixth Avenue, New York, N. Y. (Perth Amboy, N. J.)
150	Pfizer & Co., Charles.....	81 Maiden Lane, New York, N. Y.
151	Pharma Chemical Corporation.....	233 Broadway, New York, N. Y. (Bayonne, N. J.)
152	Portland Gas & Coke Co.....	Gasco Building, Portland, Ore.
153	Powers-Weightman-Rosengarten Co.....	916 Parrish Street, Philadelphia, Pa.
154	Providence Chemical Laboratories.....	51 Empire Street, Providence, R. I.
155	Puritan Dye & Chemical Co.....	Northborough, Mass.
156	Quaker Oats Co.....	80 East Jackson Street, Chicago, Ill. (Cedar Rapids, Iowa.)
157	Radiant Dye & Color Works.....	2837 West Twenty-first Street, Brooklyn, N. Y.
158	Republic Creosoting Co.....	1614 Merchants Bank Building, Indianapolis, Ind. (Norfolk, Va.; Seattle, Wash.; St. Louis Park, Minn.; Mobile, Ala.; Indianapolis, Ind.)

Directory of manufacturers of dyes and other synthetic organic chemicals, 1923—Con.

No.	Name of company	Office address (location of plant given in parentheses if not in same city as office)
159	Rhodia Chemical Co.....	89 Fulton Street, New York, N. Y. (New Brunswick, N. J.)
160	Roessler & Haslach Chemical Co.....	709-717 Sixth Avenue, New York, N. Y. (Niagara Falls, N. Y.)
161	Rossville Co., The.....	Lawrenceburg, Ind.
162	Ruxton (Inc.), Philip.....	220 West Forty-second Street, New York, N. Y. (Brooklyn, N. Y.)
163	Sanborn Chemical Works.....	Putnam, Conn.
164	Selden Co.....	339 Second Avenue, Pittsburgh, Pa.
165	Sepoy Color & Chemical Co.....	371 Durham Avenue, Metuchen, N. J.
166	Seydel Chemical Co.....	86 Forrest Street, Jersey City, N. J. (Nitro, W. Va.)
167	Sherwin-Williams Co.....	601 Canal Road, Cleveland, Ohio. (Kensington, Ill.)
168	Siegle Corporation of America, G.....	Chestnut & Tompkins Avenue, Rosebank, Staten Island, N. Y.
169	Siemon & Elting (Inc.).....	93 Nassau Street, New York, N. Y. (Irvington, N. J.)
170	Sinclair & Valentine Co.....	11 St. Clair Place, New York, N. Y.
171	Southern Dyestuffs Co.....	Nitro, W. Va.
172	Special Chemicals Co.....	Highland Park, Ill.
173	Springdale Finishing Co. (Inc.).....	Pine Street, Canton, Mass.
174	Squibb & Sons, E. R.....	80 Beekman Street, New York, N. Y. (Brooklyn, N. Y.; New Brunswick, N. J.)
175	Stearns & Co., Frederick.....	6533 East Jefferson Avenue, Detroit, Mich.
176	Sterling Chemical Works (Inc.).....	344 Thomas Street, Newark, N. J.
177	Sun Chemical & Color Co.....	309 Sussex Street, Harrison, N. J.
178	Synflour Scientific Laboratories (Inc.).....	Monticello, N. Y.
179	Synthetical Laboratories of Chicago.....	1326 W. Congress Street, Chicago, Ill.
180	T. M. & G. Chemical Co.....	Elizabeth, N. J.
181	Tar Products Corporation.....	140 ¹ Turk's Head Building, Providence, R. I. (East Providence, R. I.)
182	Terpene Chemical Co.....	409 W. Washington Street, Sandusky, Ohio.
183	Texdel Chemical Co.....	120 Maiden Lane, New York, N. Y. (Jersey City and Nutley, N. J.)
184	Textile Chemical Co. (Inc.).....	Public Street and Allens Avenues, Providence, R. I.
185	Thatcher Process Co. (Inc.).....	523 Tracy Street, Syracuse, N. Y.
186	Todd Co., A. M.....	North Rose Street, Kalamazoo, Mich.
187	Trico Chemical Co.....	502 Iroquois Building, Buffalo, N. Y.
188	Uhlich & Co. (Inc.), Paul.....	11 Cliff Street, New York, N. Y. (Brooklyn, N. Y.)
189	Ullman Co., Sigmund.....	Park Avenue and One-hundred and Forty-sixth Street, New York, N. Y.
190	Ultro Chemical Corporation.....	41 Union Square, New York, N. Y. (Brooklyn, N. Y.)
191	U. S. Industrial Chemical Co.....	110 East Forty-second Street, New York, N. Y. (Baltimore, Md.)
192	Van Dyk & Co.....	4-6 Platt Street, New York, N. Y. (Jersey City, N. J.)
193	Van Schaack Bros. Chemical Works.....	3358 Avondale Avenue, Chicago, Ill.
194	Vernon Synthetic Chemical Corp. (Inc.).....	164 Vernon Avenue, Long Island City, N. Y.
195	Verona Chemical Co.....	26 Verona Avenue, Newark, N. J.
196	Victor Chemical Works.....	343 South Dearborn Street, Chicago, Ill. (Chicago Heights, Ill.)
197	Wamesit Chemical Co.....	Lowell, Mass. (Wamesit, Mass.)
198	Warner-Jenkinson Co.....	2526 Baldwin Street, St. Louis, Mo.
199	Western Dry Color Co.....	Fifty-second and Wallace Streets, Chicago, Ill.
200	Westvaco Chlorine Products (Inc.).....	52 Vanderbilt Avenue, New York, N. Y. (South Charleston, W. Va.)
201	White Tar Company of N. J. (Inc.); The.....	56 Vesey Street, New York, N. Y. (Kearney, N. J.; Cincinnati, Ohio.)
202	White Chemical Co., Wilbur.....	Owego, N. Y.
203	Wilhelm Co., The A.....	Third and Bern Streets, Reading, Pa.
204	Williamsburg Chemical Co. (Inc.).....	230 Morgan Avenue, Brooklyn, N. Y.
205	Wolf-Alport Chemical Corporation.....	593 Irving Avenue, Brooklyn, N. Y.
206	Wyoming Dyestuff & Chemical Corp.....	1 Carbon Street, Scranton, Pa.
207	Yocum Laboratories (Inc.).....	168 Coit Street, Irving, N. J.
208	Zinsser & Co.....	Hastings-on-Hudson, N. Y.

